Table of Contents

Contents

1. Introduction

This chapter addresses the background and purpose of this plan, who was involved, and how it was developed. Combined, these elements are expected to provide an overview of the decision making process on disaster mitigation issues.

A. Adoption

The Appanoose County Multi-Jurisdictional Hazard Mitigation Plan was adopted by the following jurisdictions on the dates listed. Some communities are still reviewing the document and will adopt in the near future. See *Appendix A: Resolutions Adopting Appanoose Disaster Mitigation Plan*. Adoption is important for the communities to receive the benefits of the plan; if the plan is not adopted by a particular jurisdiction, that jurisdiction is not eligible for certain disaster recovery and disaster prevention programs and funds.

Adoption of plan by respective jurisdictions is pending FEMA and State conditional approval.

Jurisdiction	Adoption date
Unincorporated Appanoose County	6/20/2011
Centerville	Yet to adopt
Cincinnati	Yet to adopt
Exline	Yet to adopt
Moravia	Yet to adopt
Moulton	Yet to adopt
Numa	Yet to adopt
Plano	Yet to adopt
Rathbun	Yet to adopt
Udell	Yet to adopt
Unionville	Yet to adopt
Mystic	Yet to adopt
Centerville Public Schools	Yet to adopt
Moravia Public Schools	Yet to adopt

B. Purpose and Participation

The purpose of the Hazard Mitigation Plan is to identify steps to prevent or reduce the impact of disasters on the residents and property in Appanoose County. This is accomplished through compliance with the Federal Emergency Management Agency's (FEMA) Mitigation Planning Regulations under Code of |Federal Regulations (CFR), Title 44, Part 201 (Standard 44 CFR 201.4, 44CFR 201.5) Administrative Code 29C 605-7.3(4)(d)(1)(2).

The development of this Hazard Mitigation Plan is the result of the input from elected officials, emergency management and other governmental personnel, agency representatives, business people, interested citizens, and the State of Iowa Hazard Mitigation Plan.

As the cost of disasters continue to rise, it became evident that more pre-disaster steps are necessary if we expected to reduce the damage that can affect the communities we live in. Hazard mitigation plans are intended to break the cycle of losses from various disasters. The emergency management agency of ADLM (serving Appanoose (A), Davis(D), Lucas (L), and Monroe (M) counties) secured grant funds from FEMA for the development of a multi-jurisdictional plan for Appanoose County. The county then contracted with

Chariton Valley Planning and Development Council of Governments to write and aid in the development of their Hazard Mitigation Plan. This plan identifies all of the natural hazards that affect and risks that pose a threat to the county. A hazard analysis, which is a part of this plan, provides a better understanding of each hazard, knowledge of the impacts the hazard could have on the county, and a prioritized list of actions for each hazard identified as a possible threat to the county. By assessing the current mitigation actions already in effect, evaluating alternatives, prioritizing and outlining a strategy for implementation the hazard mitigation plan has been developed and written. It is recognized that the community of Mystic has the only a previously FEMA approved plan (as of 9-23-2009) in the county and that the Appanoose County Multi-jurisdictional plan will supersede the existing Mystic Plan.

Mission Statement

To make Appanoose County citizens, communities, and businesses less vulnerable to the effects of natural and human-created hazards through the effective administration of hazard mitigation grant programs, a coordinated approach to mitigation policy through regional and local planning activities, and public education and participation.

Vision Statement

Institutionalize a County-wide hazard mitigation commitment through leadership, professionalism, and excellence, leading the way to a safe, sustainable Appanoose County.

Planning Committee Members

The following chart contains the Appanoose Disaster Planning Policy Sub-Committee members and the organization, agency, or jurisdiction they represent. Cities were asked to appoint a primary and alternate representative to ensure their continued participation throughout the process. See *Appendix U: Planning Meeting summaries* for a full list of invitees and participants to this process.

Member	Representing	Title	Primary	Alternate
Robert Bozwell	Centerville	Fire Chief	X	
Tom Demry	Centerville	Chief of Police		X
Jean Morrison	Cincinnati	Councilperson	X	
Deb Henkle	Cincinnati	Mayor		X
Jim Casteel	Exline	Mayor	X	
Jim Burns	Exline	Councilperson		X
Charles Turner	Moravia	Councilperson	X	
Gary Dhority	Moravia	Business Owner		X
Gary Harris	Moulton	Mayor	X	
John Replogle	Moulton	Mayor Pro-Tem		X
Phil Hudson	Mystic	Fire Chief	X	
Kristina Kieltyka	Mystic	Councilperson		X
Richard Brooke	Numa	Mayor	X	
Jolene Fadiga	Numa	Councilperson		X
Richard Gorden	Plano	Mayor	X	
Wendell DeVore	Plano	Councilperson		X
Tom Anderson	Rathbun	City Clerk	X	
Dave Coffin	Rathbun	Mayor		X

Eric Pace	Udell	Mayor	X	
Cori Ballanger	Udell	City Clerk		X
Henry Herman	Unionville	Councilperson	X	
Roger Selix	Unionville	Mayor		X
Pat Tresmer	Centerville & Moulton-Udell CSD	School Nurse	-	-
Jody McDanel; Chair	Appanoose County	Supervisor	-	-
Ryan Kayler	Moravia CSD	Janitor	-	-
John Arnold; Vice-Chair	ADLM Emergency Management	Emergency Manager	-	-
John Pasa	Lake Rathbun	Army Corp of Eng		

Participation

Rosters and summaries of each meeting can be found in *Appendix U: Appanoose Disaster Mitigation Plan Summaries*.

C. What is a Hazard Mitigation Plan?

Generally the first question asked when communities begin the process of preparing a Hazard Mitigation Plan is very simply "What is a Hazard Mitigation Plan and what is its intended purpose?" First, it is imperative to define what precisely the term mitigation entails. One definition of the term is stated perhaps most effectively by the Federal Emergency Management Agency (FEMA) and is as follows:

> "Mitigation is defined as any sustained action taken to reduce or eliminate long-term risk to human life and property from a hazard event. Mitigation, also known as prevention (when done before a disaster), encourages long-term reduction of hazard vulnerability. The goal of mitigation is to decrease the need for response as opposed to simply increasing the response capability." *(www.fema.gov).*

A mitigation plan is a document that is intended to accomplish several things. First, through the planning process the hazards that pose a risk to the community are identified. Second, an assessment of the hazards is made that takes into account historic occurrence, the number of people impacted, the area of the jurisdictions affected, potential costs that the jurisdictions, individuals, and organization may incur, the likelihood of future occurrence, and the amount of warning time before an event occurs.

Once the assessment is completed, a list of current and historic mitigation efforts are evaluated. Through this discussion, areas that can be improved upon are identified and developed into "action steps". Early in the planning process meeting attendees identify broad goals that briefly state what the plan should attempt to accomplish. Every action step should, if implemented, work toward one or more of the goals of the plan. An action step may suggest continuing a current mitigation effort or propose a new project altogether.

Finally, once the hazards have been assessed, mitigation steps have been identified, and action steps have been prioritized, the plan makes some suggestions for implementation and makes estimates as to the costs of implementation. Some proposed projects are small in scope and thus relatively low cost. However, other projects are broad in nature and would require more funding than the local community can reasonably provide. Therefore, the final piece of the plan suggests methods to implement the plan, how to keep the public involved, and what steps should be taken by local government to ensure that the concept of hazard mitigation is always a priority.

When implemented appropriately, mitigation projects can save lives, reduce property damage, save public monies, and protect the environment. Mitigation can reduce the enormous cost of disasters to property owners and all levels of government. In addition, mitigation can protect critical community facilities, reduce exposure to liability, and minimize community disruption.

D. The Planning Process

The Appanoose Disaster Planning Committee developed this Disaster Mitigation Plan in conjunction with professional services from Chariton Valley Planning and Development Council of Governments. The Committee consisted of a Community Development Planner from Chariton Valley Planning Development, ADLM emergency management representation, public officials, human services representatives, business representatives, and emergency response representatives.

The committee met 10 times from September 25, 2008 and May 4, 2010. All meetings complied with the Iowa Open Meetings Law; this simply means all sessions are open to the public and appropriate notifications were present. Meeting attendees discussed elements incorporated into the plan in stages starting with general hazard discussion and progressing to mitigation and plan maintenance strategies. The progression of the plan is roughly represented in the composition of this document. It was established that all jurisdictions would participate in the planning process through a representative at the meetings. This representative would also be able to share information back to the councils/communities about the development of the plan. It was recognized that it is difficult to make meetings work for everyone so attendance is importance but clear communication of jurisdictions with CVPD is also acceptable. No required detailed attendance number was established by the committee but there were frequent discussion that indirect participation would be acceptable so that all jurisdictions could be included in the document.

The Appanoose Disaster Mitigation Plan was then sent to FEMA and the State for conditional approval prior to being subjected to the adoption process by each incorporated community and the Appanoose County Board of Supervisors.

Ads for some of the Planning Committee Meetings were announced in the Daily Iowegian News Paper, the local paper serving the whole of Appanoose County. These announcements ran at least four days and no more than twenty days prior to each meeting and were generally on the paper's website as well. Invitations to the orientation meeting were also sent to numerous individuals ranging from elected officials, local businesses, non-profit organizations, neighboring communities and jurisdictions (Corydon, Albia, and Chariton) and educational institutions (Centerville Public Schools, Moravia Public Schools, and Indian Hills Community College). Flyers were also posted at the Appanoose County Courthouse and at Chariton Valley Planning & Development Council of Government's office. See the attached flyers and a form letter in Appendix U sent to neighboring communities courthouses of Wayne, Lucas and Monroe counties.

Ten working sessions were conducted from September 25, 2008 through May 4, 2010 to make decisions and gather data. The details of each meeting are shown in Appendix U of this document.

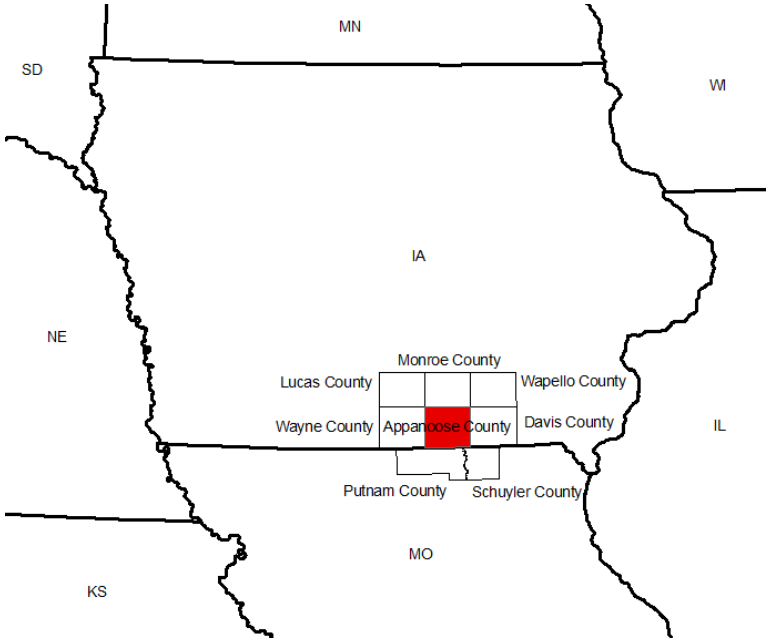
E. Materials Reviewed

In the preparation of the Appanoose Hazard Mitigation Plan, various materials were reviewed that provided which informed the development of this plan. Important documents among these include various FEMA 386 "How to" guidebooks, Iowa's *Hazard Analysis and Risk Assessment: 2007 Local Guide*, and *Iowa Hazard*

Mitigation Plan: Iowa Comprehensive Emergency Plan September 2007.[1] Other sources of information include:

- Iowa Department of Natural Resources
- Iowa Department of Transportation
- U.S Census Bureau
- Environmental Protection Agency
- United States Geological Survey
- Federal Emergency Management Agency
- ADLM - Emergency Management
- National Weather Service
- National Climatic Data Center (NCDC)
- Iowa Homeland Security and Emergency Management Division
- Mystic's FEMA approved Hazard Mitigation Plan
- FEMA-R5 document of "Mitigation Ideas: Possible Mitigation Measures by Hazard Type"

Figure 1: Location of Appanoose County



Source: National Atlas and IA DOT GIS data compiled by Chariton Valley Planning and Development

These resources were used to compile information on community background information, population data, risk assessment and analysis, vulnerability analysis, and development of mitigation goals and strategies. Each item is above will be referenced throughout the document as a source of providing critical information to this plan. For example, national Climatic Data Center provides a detailed listing of specific weather events throughout the county. The U.S. Census Bureau information indicates a estimate on profiled data of each jurisdiction.

Wikipedia, Sperling's Best Places, and community websites were used along with past newspaper clippings for an overview of communities and their histories. Other materials were consulted and utilized in this plan as well, most of which indicated in the sections where they were used.

[1] This document can be found on either of the following websites; http://www.iowahomelandsecurity.org/AboutUs/SecuringCommunities/Mitigation/tabid/98/Default.aspx or http://www.iowahomelandsecurity.org/Partners/CountyCoordinators/Planning/tabid/108/Default.aspx

2. Community Profiles

The various communities in Appanoose County are in relatively close proximity to one another and share many of the same topographic and geographic features in addition to socio-economic characteristics. Each community will be addressed separately in this section to ensure that the needs of each are adequately covered. The following profiles are divided into official jurisdictions; unincorporated communities are lumped into Appanoose County as the county is the most direct level of government for them.

A. Unincorporated Appanoose County

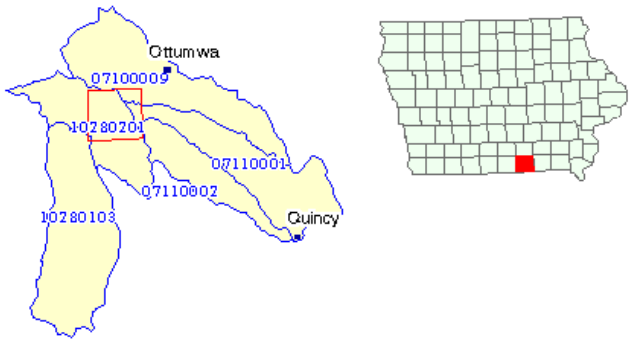
Appanoose County is located in the southern tier of counties in Iowa adjoining the Missouri border. There are twenty-four unincorporated communities in Appanoose County and eleven incorporated cities. There is at least one subdivision in the unincorporated county that is not shown in *Appendix B: Communities of Appanoose County* located north-west of Centerville named Golfview.

Geography

Appanoose County is located in the south-central sector of Iowa at coordinates 40° 44' 17" N, 92° 52' 2" W and bordering the Missouri counties of Putnam and Schuyler. The Iowa counties surrounding Appanoose are as follows; Davis, Wapello, Monroe, Lucas, and Wayne, see *Figure 1: Location of Appanoose County*. Appanoose County encompasses an area of 496.25 square miles with a population density of 27.7 people per square mile according to the 2000 Census.

Rathbun Lake is located primarily in Appanoose County covering a total area of 12,040 acres in four counties. Rathbun Lake is the second largest water body in Iowa. Fourteen rivers and creeks cross through Appanoose County, the most significant of which is the Chariton River which created Rathbun Lake once dammed in the 1970's (see *Table 1: Appanoose County Rivers and Creeks and Figure 3: Water Bodies in Appanoose County*). Appanoose County's terrain is predominantly undulating topography that characterizes the rolling hills of the Southern Iowa Drift Plain (see *Appendix C: Hillshade Image of Appanoose County*).

Figure 2: Appanoose County Watersheds



- 07100009 Lower Des Moines; state(s): IL, IA, MO
- 07110001 Bear-Wyaconda; state(s): IL, IA, MO
- 07110002 North Fabius; state(s): IA, MO
- 10280103 Lower Grand; state(s): IA, MO
- 10280201 Upper Chariton; state(s): IA, MO

Source: US EPA Surf Your Watershed, http://cfpub.epa.gov/surf/county.cfm?fips_code=19007

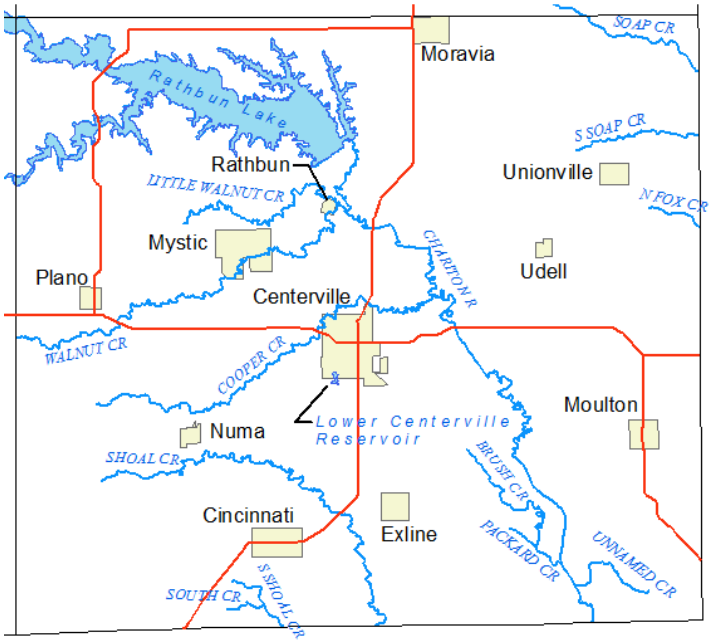
Appanoose County is located in 5 different watersheds, all within the Mississippi Basin. The Upper Chariton watershed encompasses most of the county and extends into Missouri. See *Figure 2: Appanoose County Watersheds* and the US EPA "Surf Your Watershed" website for more information.

Table 1: Appanoose County Rivers and Creeks

BRUSH CREEK
CHARITON RIVER
CHARITON RIVER, SOUTH FORK
COOPER CREEK
LITTLE WALNUT CREEK
NORTH FOX CREEK
NORTH CREEK
PACKARD CREEK
SOUTH SHOAL CREEK
SOUTH SOAP CREEK
SHOAL CREEK
SOUTH CREEK
UNNAMED CREEK
WALNUT CREEK

Source: IA DNR GIS data compiled by Chariton Valley Planning and Development

Figure 3: Water Bodies in Appanoose County



Source: IA DNR GIS data compiled by Chariton Valley Planning and Development

Climate

The climate in Appanoose County is of a continental character much like other parts of the Midwest. Four distinct seasons are experienced in the area. On average, Appanoose County receives about 35 inches of rain annually and 20 inches of snow annually. There are 202 sunny days per year with 92 days of measurable precipitation on average. July tends to be the hottest month with highs around 86 degrees and January tends to be the coldest month with lows around 13 degrees on average.

There are seasonal variations in weather patterns and there are extremes that can pose risks to residents. Climate projections by the Union of Concerned Scientists, the US EPA, the USDA, and International Panel of Climate Change suggest that Appanoose County and the mid-west overall will experience more extreme and more frequent weather fluctuations in the near future.

Vegetation

Initially the county was predominantly forest and prairie land with a scattering of wetlands and fields in the mid-1800s when the land was surveyed. This land cover has been transformed into various cropland uses as of 2002. Appanoose County retains perhaps more substantial stands of deciduous forest than may be found elsewhere in Iowa which is of potential importance to the area economy. See *Appendix D: Changes in Vegetative Cover* for a graphic comparison.

Soils Information

According to the Natural Resource Conservation Service (NRCS), Appanoose County is located in two soil regions; Loess Ridges / Glacial Till Side slopes and Loess Ridges / Clay Paleosol. Loess is fine, loamy, wind-blown sediment that is typically yellowish or brownish in color that is unstratified (Dictionary.com). Geologically, Loess is highly erodible, but in terms of the human life-span it is relatively stable soil. Loess

soils tend to become very rich soil after it accumulates over time. See *Appendix I: NRCS Iowa Soil Regions Map*.[2]

There are areas of Karst soils in Appanoose County which are at risk of subsidence, a hazard that will be addressed in the respective hazard profiles. Karst soils are soil compositions that contain rock that can be dissolved by water thereby creating a gap in the soil that can collapse. Numa, Plano, and Centerville are located in or adjacent to Karst soils (see *Appendix O: Karst Soils Map*).

History / Development Trends

Appanoose County was formed on February 17, 1843, from open territory. It was named for the chief of the Sac and Fox Nation, who did not engage in war against Black Hawk, advocating peace. The present county seat was formerly called Chaldea, and was later renamed to Centerville in honor of Governor Senter of Tennessee. In April 1848, the courthouse, constructed at the expense of $160, was put into use and served as such until 1857. The second courthouse was opened in 1864, and was burned down to the first floor during an explosive Fourth of July fireworks demonstration. The third courthouse was dedicated on May 21, 1903, and remains in use (Wikipedia).

Table 2: Appanoose County Population

CENSUS	POPULATION	HOUSEHOLDS
2000	13,721	5,792
1990	13,743	5,663

Source: US Census Bureau

Table 3: Unincorporated Population and Proportion of Total Population

CENSUS	POPULATION	HOUSEHOLDS
2000	4805	1963
1990	4896	1851

CENSUS	POPULATION	HOUSEHOLDS
2000	35.02%	33.89%
1990	35.63%	32.69%

Source: US Census Bureau

Appanoose County was initially a coal mining region and numerous coal mines and entrances are present under much of the county. The coal mining industry began to decline between the 1910 Census and 1920 Census; by 1930 the county had lost approximately 20% of its population. The decline was associated with the advent of mechanized mining that was more suited to mines in the eastern United States. The railroad service in the county began to decline which was followed by mine closures.

The regional population and economic decline led to a civic movement in the county for a new economy which saw a significant milestone in 1971 with the dedication of the Rathbun Dam and the creation of Rathbun Lake. The lake was and is a major economic driver in the region due to its role in providing reliable and relatively inexpensive water for homes and industries. Rathbun Lake is also becoming a major tourist draw with the opening of Honey Creek Resort operated by the Iowa Department of Natural Resources. The lake hosts various recreational opportunities including fishing and boating as well as hunting in the surrounding wildlife management areas.

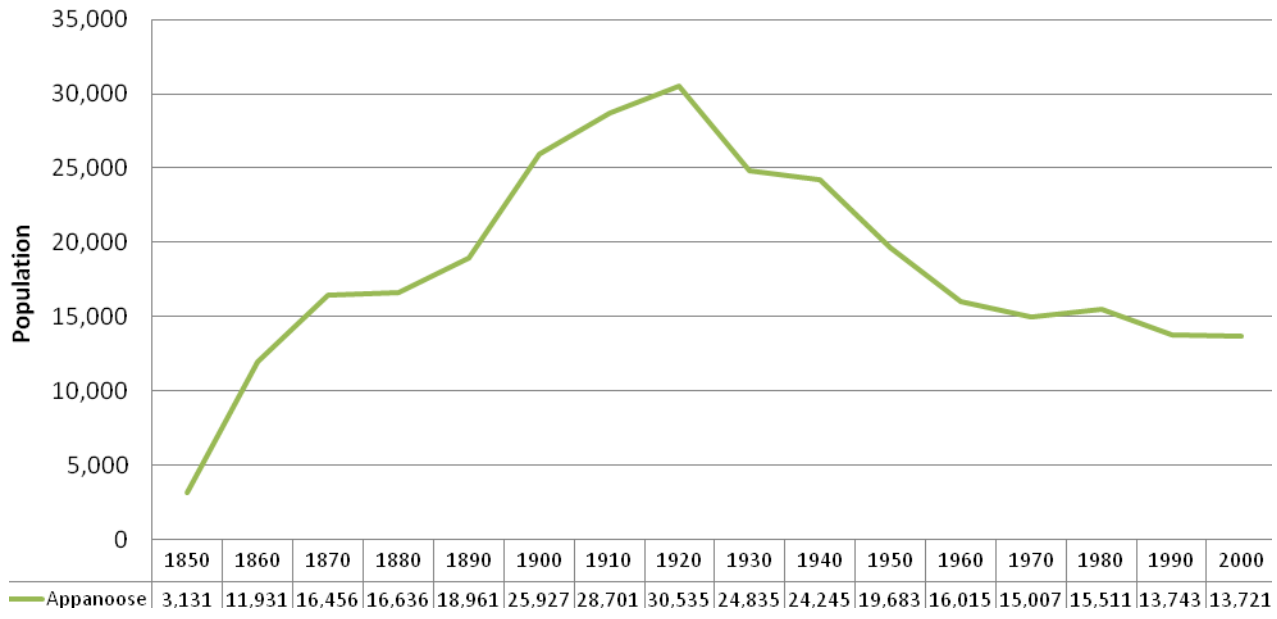
[2] More detailed information and information for smaller areas can be found through the NRCS Web Soil Survey website; http://websoilsurvey.nrcs.usda.gov/app/

Population and Projections

As of the 2000 Census, the total population of Appanoose County was 13,271 with a total of 5,792 households. This is down 472 persons since the 1990 Census count of 13,743 people; a total decline of 3.4%. In 1990 there were 5,663 households. According to Iowa State University's Regional Capacity Analysis Program[3] (ReCAP), Appanoose County has faced consistent population decline since the 1930s with declines of 18-19% for three Census periods. This decline corresponds largely with the closure of coal mines which once was the primary economic driver in the region. There was slight growth between 1970 and 1980 of about 3% but then a drop of over 11% between 1980 and 1990.

The population of the unincorporated county is approximately one-third of the total population of the county. Like the county on whole, the unincorporated portion declined in population from 1990 to 2000. The proportion of households increased in this time in relation to the total county numbers by about one percent suggesting that fewer extended families were living in one home. A unique segment of the population that resides in the unincorporated region of Appanoose County are the Amish residents. It is very difficult to know the exact number of residents because they are not actively involved in communities or census information. Many families contact ADLM Environmental Services to have outdoor septic systems approved and it is their estimate that approximately 40 families reside in Appanoose County.

Figure 4: Appanoose County Historic Population



Source: ReCAP - http://www.recap.iastate.edu/atlas/population/population-historical.php

Woods and Poole Economics, Inc. provided population projecti

[3] Historic Population Census data is available for the State of Iowa through ReCAP at the following website; http://www.recap.iastate.edu/atlas/population/population-historical.php.

Table 4: Woods & Poole Population Projection for Appanoose County

AREA	2000	2005	2010	2015	2020	2025	2030
APPANOOSE	13,704	13,584	13,268	13,081	12,928	12,811	12,739
PERCENT CHANGE		-0.88%	-2.38%	-1.43%	-1.18%	-0.91%	-0.57%

Source: Iowa State Data Center, http://www.iowadatacenter.org

ons for each of the counties in Iowa in 2007 for 2010 through 2030.[4] Appanoose County is projected to continue to lose population through 2030, but the losses are far more stable than in previous years. Cumulative projected loss for Appanoose County is about 7% suggesting that by 2030 the county's population could be 12,739. See Table 4 for the Woods and Poole population projection for Appanoose County on whole (including incorporated communities).

Table 5: Potential Appanoose County At Risk Population: 2000

	UNDER 5	UNDER 18	65+	LINGUISTICALLY ISOLATED: 2000
TOTAL COUNTY	771	3267	2739	19
UNINCORPORATED COUNTY	230	994	903	3

Source: US Census Bureau

Population decline is not inevitable however. Population projections do not always consider emerging or qualitative issues. Appanoose County does have relatively good access to water resources and the region is affordable in terms of cost of living. These factors may make the area attractive to some segments of the broader Mid-Western or even US population thereby increasing the population locally.

Table 6: Median Household Incomes in Appanoose County

	1999	1989
TOTAL COUNTY	$28,612	$17,833
CENTERVILLE	$25,498	$15,425
CINCINNATI	$26,641	$13,177
EXLINE	$22,019	$14,875
MORAVIA	$26,042	$18,164
MOULTON	$22,692	$15,132
MYSTIC	$25,568	$12,500
NUMA	$26,625	$17,083
PLANO	$30,625	$20,000
RATHBUN	$40,000	$16,458
UDELL	$24,688	$11,875
UNIONVILLE	$33,333	$18,000

Source: US Census Bureau

At Risk Groups

The elderly are often identified as an "at risk group" for various reasons including potential health frailties and mobility challenges. Likewise younger populations are at potential risk due to lack of familiarity with disasters and especially with actions to take following a disaster. However, young people may also have more education and more current education due to school drills that may not be as well known among populations over the age of 18. The elderly population of unincorporated Appanoose County was about 7% (903) of the total county population as of the 2000 Census. Young people in the unincorporated county comprised about 7% (994) with only about 1.7% (203) of those young people under age 5.

Another population that is often identified as an "at risk group" are those that are deemed "linguistically isolated" in the Census. This designation for households is defined as all members of the household over age 5 speak little or no English, or speak English "not very well." The

[4] The Iowa State Data Center has made these projections available to the public reprinted with permission from the document "2007 State Profile: Iowa"; http://www.iowadatacenter.org.

reason for this population as an "at risk group" is the concern that they may not understand storm warnings or information provided by law enforcement or emergency responders. In unincorporated Appanoose County the proportion of linguistically isolated households is only about .2% (3 households) in 2000, while a small proportion, it is still important to consider their needs.

Income

In the 2000 Census, median household income for Appanoose County was $28,612, up from $17,833 in the 1990 Census. Nearly one-third of the households in unincorporated Appanoose County (32.76%) had incomes under $25,000 annually. Seventy-five percent of the households in the unincorporated county had incomes under $50,000 annually. In 2000, 439 people in Appanoose County were determined to be under the Federal Poverty Guidelines in 1999 comprising only about 3% of the unincorporated population.

Table 7: Unincorporated Appanoose County Household Incomes

	LESS THAN $24,999	$25,000 TO $49,999	$50,000 TO $74,999	$75,000+
HOUSEHOLDS	643	824	282	214
PROPORTION	32.76%	41.98%	14.37%	10.90%

Source: US Census Bureau

Major Employers

Ten major employers are identified in Appanoose County by the Location One Information System (LOIS) website. Appanoose Economic Development Corporation provided additional information.

Appanoose County Schools	Barker Co LTD
Curwood Inc	Honey Creek Resort
Hy-Vee	Iowa Steel & Wire Co
Mercy Medical Center – Centerville	Wal-Mart
Wells Manufacturing Corp	Fareway Stores Inc
Lee Container	C & C Machining

Housing Information

Private homes are an important element in disaster mitigation as they represent not only a place of residence but one of the most significant investments that Americans own. Lack of protection of homes can have devastating impacts on their owners in many ways, not the least being economically and psychologically.

Age of Housing

Some of the housing stock (13.49%) in Appanoose County was constructed before 1940 suggesting that the structural integrity of the buildings likely does not met newer building codes designed to ensure the safety of residents. These structures are likely the most vulnerable to various hazards due to their age and the difference in construction techniques which have improved in many ways since they were built. A larger proportion of the older housing stock is found in incorporated communities. Median year built of the homes in unincorporated Appanoose County is 1955, meaning that half of the homes were built before and half after this year. See *Appendix Q: Housing Built Before 1940 by Block Group* for a map showing the Census designated areas where older housing is located.

Another potential concern is the prevalence of bottled fuels such as LP gas, kerosene, and oil used as heating fuel in the homes in Appanoose County; 60% (1168) of homes use LP gas or other fuel oil as heating fuel (see *Appendix R: Homes Heated with Bottled Fuel by Block Group*). While LP tanks can be safe forms of fuel containment and transport, liquefied petroleum gas is flammable and can explode. LP gas is heavier than air and so it will sink to the lowest level possible; if inhaled it can cause asphyxiation through oxygen deprivation but is otherwise nontoxic. A further concern is that 156 homes (8%) in 2000 reported using wood as the primary heating fuel. This becomes a concern due to its potential fire hazard but also to carbon monoxide poisoning in the home if a chimney is blocked.

Condition of Housing

There is not a current housing assessment for unincorporated Appanoose County.

Value of Housing

About one fifth of the owner-occupied homes in the unincorporated county were valued at less than $40,000 (22.35%) as of the 2000 Census and no homes were valued above $500,000. Only 23 homes were valued above $200,000 in the 2000 Census.

Table 8: Unincorporated County Housing Valuations

	LESS THAN $40,000	$40,000 TO $99,999	$100,000 TO $149,999	$150,000 +
HOMES	135	326	79	64
PROPORTION	22.35%	53.97%	13.08%	10.60%

Source: US Census Bureau

Transportation

There are no US highways in Appanoose County, though US Hwy 34 runs east-west to the north in Monroe County and US Hwy 65 runs north-south to the west in Wayne County. Four distinct state highways connect Appanoose County communities to one another, three of which connect to communities in surrounding counties. No interstate routes cross Appanoose County. A snowmobile trail runs along the northern half of Rathbun Lake and the Island View Trail is located in Island View Park on the southeast portion of Rathbun Lake. One other trail is located in Appanoose County, the Lelah Bradley Hike & Bike Trail in the southwest portion of Centerville, connecting to the Lower Centerville Reservoir.

Six natural gas pipelines cross or are located in Appanoose County in addition to one crude oil / petroleum pipeline. Two distinct railroads are in the county, the Appanoose Community Railroad, a short line, and the IMRL line now operated by Iowa, Chicago, and Eastern Railroad. See *Appendix S: Transportation Routes in Appanoose County*.

According to preliminary crash analysis released December 3rd, 200 by the Iowa DOT, Highway S70 ending about 600 feet west of 137th Ave is considered a “high crash horizontal curve.”

Existing Programs, Policies, and Technical Documents

There are many tools available to communities for them to determine their own futures; many of these tools are not as common in rural areas or small communities as they are in more populated places. However, these tools are of possible use to protecting residents of an area from various hazards, such as

flooding, land sliding, and cave-ins among others. See Appendix HH to view existing policies for the Unincorporated region of Appanoose County.

Community Assets

Community assets are not always easily identified and can often include cultural resources which are similar but may be more focused on historical or scientific significance (see 2.A.xiv. below). Generally speaking, community assets are those buildings, public or private facilities, and other infrastructure that make a settlement more than a cluster of homes. Often if such assets leave a community or are severely damaged, there may be a sense of loss in the community and it may signal impending decline of population. In these terms, community assets are more difficult to define for an unincorporated area or county since communities are generally thought of as a town or a city.

Table 9: County Community Assets

Assets	Number
Colleges	0
Schools	0
Community Centers	0
Places of Worship	4

Source: Google Maps

None-the-less, the same assets that can be identified for an incorporated community in Appanoose County, can be identified as an asset to the unincorporated county where they are present. This section also includes critical facilities which are assets that play a role in disaster recovery or are particularly vulnerable to disasters due to their vital role in the community. Grocery stores are included in this category as a vital resource to area residents.

Table 10: County Critical Facilities

Facilities	Number
Nursing / Convalescent / Retirement Homes	1
Hospitals	2
Ambulance Services	1
Fire Departments / Stations	0
Police / Law Enforcement Facilities	1
Courthouses	1
Grocery Stores	0
Communications	1
Other Facilities	2

Source: Google Maps

For a geographic area like a county, community assets may also include water resources, wildlife preserves, and parkland. See Table 9: Community Assets for buildings *located* in the unincorporated county, Table 10: Critical Facilities, and Appendix F: Public Lands for natural and recreation areas. See Appendix G: Community Assets and Critical Facilities for listing of which assets and facilities are present in Appanoose County. See *Table 11: Unincorporated Community Valuations* below for a breakdown of property values in the unincorporated county.

Table 11: Unincorporated Community Valuations

Type of Structure (Occupancy Class)	Number of Structures	Total Valuation	Average Valuation
Residential	2432	$194,641,377	$80,033.46
Commercial	122	$17,018,799	$139,498.35
Industrial	2	$558,259	$279,129.5
Agricultural		$133,392,847	
Religious / Non-profit			
Government			
Education			
Utilities			
Total	2556	$345,611,282	

Source: Appanoose County Assessor

Cultural Resources

Non-living examples of objects acquired and preserved because of their potential value as examples, as reference material, or as objects of artistic, historic, scientific, educational, or social importance, either individually or as a collection. Cultural resources include "moveable heritage," such as collections of artifacts, statuary, artwork, and important documents or repositories. Often housed in libraries, museums, archives, historical repositories, or historic properties, these resources range from three-dimensional examples such as sculptures, historic furnishings, family heirlooms, or textiles, to two-dimensional examples such as family records, written history or memorabilia, old photographs and maps, and other archival materials.

Source: FEMA Guide 386-6 pgvii

Most of the Cultural Resources in Appanoose County that are identified in external sources are of either archeological nature or on the National Register of Historic Sites. These sources do not necessarily capture all of the cultural resources in the county, but they are a start. There are no libraries or museums located in the unincorporated county.

The National Register of Historic Places is a program under the National Park Service that identifies places of historic significance as initiated by local efforts. These places then are subject to regulations to preserve their intrinsic nature but also qualify for funding to maintain them when available and may qualify for Federal tax benefits.

Table 12: National Register of Historic Places

Property	Address	City	Date Listed
Appanoose County Courthouse	Van Buren and N 12th Street	Centerville	7/2/1981
Appanoose County Sheriff's House and Jail	527 N Main Street	Centerville	10/30/1997
Appanoose Courthouse Square Historic District	Roughly bounded by Van Buren, Haynes, Maple, and 10th Sts	Centerville	10/30/1997
C B&Q Passenger Depot	1124 S 18th Street	Centerville	8/28/2003
Drake Public Library	115 Drake Ave	Centerville	10/30/1997
Franklin Regular Baptist Church	135th Ave & 590th Street	Seymour vicinity	2/20/2008
Porter Hall	708 Drake Ave	Centerville	1/24/1980
Second Baptist Church	422 s 18th Street	Centerville	10/14/1999
Stratton House	303 E Washington Street	Centerville	9/9/1975
Sturdivant-Sawyer House	707 Drake Ave	Centerville	1/12/1984
U.S. Post Office	100 W Maple Street	Centerville	11/7/1978
Vermilion Estate	Valley Drive	Centerville	4/26/1978
Wabash Combination Depot	W North Street near jct with Brandon Street	Moravia	10/18/1996

Source: http://www.nps.gov/history/nr/

There are approximately 190 historic sites in Appanoose County; these sites include Historic Sites, Prehistoric Sites, and Unknown Age Sites. See *Appendix H: Historic Sites in Appanoose County* for an image of the county by section with a count of historic sites listed for each. Some of these historic sites now reside under Rathbun Lake. Exact location and details of the historic sites is not publicly available in order to protect the sites from looting or intentional damage, the exception to this may be sites that are on the National Historic Registry. The State Archeologist's office may be contacted for more information as needed.

Endangered Species

Endangered or threatened animal species in Appanoose County are confined to the Indiana Bat (endangered). Plant species on the endangered species list includes the Western Prairie Fringed Orchid (threatened) and the Prairie Bush Clover (threatened). See the *Iowa List of Federally Endangered, Threatened, Proposed, and Candidate Species – by County* list from the U.S. Fish and Wildlife Service for more information.

Figure 5: Indiana Bat

Source: US Fish and Wildlife Service, photo by Adam Mann, Environmental Solutions and innovations, http://www.fws.gov/midwest/Endangered/esday/index.html

Figure 6: Western Prairie Fringed Orchid

Source: Iowa Department of Natural Resources, http://www.iowadnr.com/other/images/platanthera.jp

Figure 7: Prairie Bush Clover

Photo by USFWS; Phil Delphey

Source: US Fish and Wildlife Service, photo by Phil Delphey http://www.fws.gov/midwest/endangered/plants/prairieb.html

B. Centerville

Centerville is the County Seat of Appanoose County; see *Appendix B: Communities of Appanoose County* for location of Centerville in relation to other communities in the county.

Geography

Centerville is located in approximately the center of the county at coordinates 40° 43' 47" N, 92° 52' 19" W. The city encompasses an area of 4.6 square miles with a population density of 1310.5 people per square mile according to the 2000 Census. Cooper Creek runs through the northwest corner of the city and the Lower Centerville Reservoir extends outside of the municipal boundaries to the southwest (see *Figure 3: Waterbodies in Appanoose County*).

History / Development Trends

Centerville was founded in 1846 by Jonathon Stratton under the name of Chaldea, the city was planned around a unique two-block long city square. The name was later changed to Centerville, named after Dewitt Clinton Senter, a prominent Tennessee politician. When incorporation papers were filed in 1855, someone mistook the name for a misspelling and corrected it to Centerville.[2]

A mining town

Map of the Centerville area from 1908, showing the railroads and shipping coal mines (shown in red) of the region. Centerville is in the lower right quadrant. Smaller mines that did not ship by rail are not shown.

The first coal mine in Centerville was opened in 1868, with its mine shaft about one-half mile from the Chicago, Burlington and Quincy Railroad depot. Horse-power was used to raise coal from the mines until 1872, when the Watson Coal Company opened a mine equipped with a steam hoist. The Centerville Block Coal Company, organized in 1894, consolidated the operation of numerous mines in the region to become the dominant mining company. In 1914, Centerville Block Coal produced over 100,000 tons of coal, ranking among the top 24 coal producers in the state. Centerville Block's largest competitor, formed around the same time, was the Scandinavian Coal Company, organized by a group of Swedish immigrants.[3][4] By 1938, coal production in the Centerville region was 600,000 tons per year.[5] The mines were in the Mystic coal bed, 125 feet below ground in Centerville but exposed at the surface in Mystic, 5 miles to the northwest.[6]

The upper works of the Relay Mine No. 3, circa 1908.

Centerville Block Coal's Relay Mine Number 3 was located on the west side of town (Number 31 on the map). By 1908, the coal face was a mile from the base of the shaft. Mules were used to haul trains of loaded coal tubs to the main haulage way, where they were hauled by a continuous loop of cable the last half mile to the shaft. The coal seam here was about 3 feet thick, and the shaft was 107 feet deep. A centrifugal blower 12 feet in diameter provided ventilation, and compressed air was used to power mining machinery.[7][8]

In 1910, the Scandinavian Coal Company drilled a 550 foot exploratory hole in Centerville, discovering a deposit of gypsum and anhydrite 10 feet thick near the bottom. The Centerville Gypsum Company was formed to exploit this deposit, and between 1912 and 1913, the company bored a shaft down to the

gypsum. Water problems delayed the opening of the mine until 1917, and commercial production began in 1919.[9] The mine was closed in the early 1930s.[10]

The Sunshine mine, about 3 miles west of Centerville (number 30 on the map), was very small in 1908, with just a horse-powered hoist at the pit head.[8] By the 1930s, this was a large mine with an attached mining camp and a mountain of mine waste 500 feet long.[11] The Sunshine Mine Drive-In is a theater on the former mine site that opened in 2005.[12]

The post-coal era

Centerville experienced its peak population in the early 1900s as the popularity of coal peaked. After that point, as usage dwindled, the coal industry that had been the community's life blood collapsed. In the 1950s and 1960s a civic movement to promote new industries began. This effort culminated in the building of Rathbun Dam, near the city of Rathbun, Iowa, forming Rathbun Lake, known as "Iowa's Ocean", that was dedicated on July 31, 1971 by President Richard M. Nixon.

Today the city is supported by several small industrial plants, mostly in the area of plastic products. In June 2006 the Centerville Daily Iowegian reported that the city's largest employer, a Rubbermaid plant, that opened in Centerville in 1985, would shut down in September 2006 displacing 500 workers. In 2007, the former Rubbermaid building was purchased by Lee Container Corp. of Homerville, Georgia, and is planned to be re-opened in 2008. Lee Container is a manufacturer of H.D.P.E. blow molded containers for crop protection-, lubricant-, pet care-, beverage-, specialty- and household products. The city (and county) is also served by several other manufacturing operations, including Curwood, a Bemis Company, a major supplier of flexible packaging and pressure sensitive materials used by leading food, consumer products, manufacturing, and other companies worldwide. The Barker Company, of Keosauqua, Iowa that manufactures many lines of refrigerated, non-refrigerated and hot display cases for the supermarket, convenience store and food service industries located a manufacturing plant in Centerville in 1998.

As county seat, Centerville had a thriving retail sector, serving people from smaller communities and farms in the area as well as local residents. Many shops were located around the Courthouse Square Historic District, which has hundreds of parking spaces between the shops' sidewalks and the courthouse lawn—in effect, six-lane wide steering around the Appanoose County Courthouse provides four lanes of public parking. In the latter decades of the 20th century, Centerville, like many other small American communities, experienced a change in its retail economy as many long-established locally owned shops closed, due in large part to loss of business to large nationally owned retailers. Many of the former stores have been replaced by specialty gift shops and antique stores, catering to tourists as well as locals.

In 1999, the Lake Center Mall was destroyed by an act of arson. The entire site sat unoccupied until a cineplex and a Pizza Ranch were built there in the early 2000s.

In 1984, the Appanoose County Community Railroad was formed out of discarded pieces of the Wabash and Rock Island lines to maintain a rail link to the outside world. Forming the railroad helped to bring Rubbermaid to the city.

Since the 1990s, Centerville has focused on quality-of-life issues in an attempt to attract and keep young families in the area. A new emphasis on the arts, culture and local history has emerged, culminating in the Townscape project to beautify the Courthouse Square Historic District.

http://en.wikipedia.org/wiki/Centerville,_Iowa

Population

As of the 2000 Census, the total population of Centerville was 5,904 with a total of 2,565 households. Between 1990 and 2000, Centerville lost 32 people and 30 households in contrast with the County's loss of population and gain in households. This is a loss of less than 1% of population and about 1% loss of households.

Table 13: Centerville Population

CENSUS	POPULATION	HOUSEHOLDS
2000	5904	2565
1990	5936	2595

Source: US Census Bureau

At Risk Groups

As discussed in 2.A.vii, the Appanoose County section on at risk groups, young children, the elderly, and those that are linguistically isolated are generally identified as a "at risk groups." Nearly half of all of the potential at risk population in Appanoose County is located in Centerville (45 to 49% each category) except for the linguistically isolated population. The majority (68.42%) of the linguistically isolated population in 2000 was located in Centerville.

Table 14: Potential Centerville At Risk Population (2000)

	UNDER 5	UNDER 18	65+	LINGUISTICALLY ISOLATED
TOTAL COUNTY	771	3267	2739	19
CENTERVILLE	357	1482	1334	13

Source: US Census Bureau

Income

In the 2000 Census, median household income for Centerville was $25,498, up from $15,425 in the 1990 Census. Once inflation is accounted for, the real median household income has increased by nearly 19% since 1990 meaning that increased incomes were exceeding inflation.[5] More than 80% of the households in Centerville had incomes less than $50,000 in 1999. About 18% (1,032 people) of the population of Centerville have incomes below the 1999 Federal Poverty Guidelines.

Table 15: Centerville Household Income (2000)

	LESS THAN $24,999	$25,000 TO $49,999	$50,000 TO $74,999	$75,000+
HOUSEHOLDS	1262	842	342	119
PROPORTION	49.20%	32.83%	13.33%	4.64%

Source: US Census Bureau

Major Employers

See 2.A.ix. for major employers in Appanoose County for a chart of major area employers.

Housing Information

There is no current housing assessment for the community of Centerville as the most recent was dated to the early 1990's.

[5] Various Inflation and Consumer Price Index calculators are available online, for the estimates in this plan utilizes www.coinnews.net's calculator; http://www.coinnews.net/tools/cpi-inflation-calculator/. The Bureau of Labor Statistics website has a similar calculator yielding similar estimates; http://www.bls.gov/bls/inflation.htm.

Age of Housing

The majority (40%) of homes in Centerville were built prior to 1940 though there was a slight spike in new homes built in the 1970's with nearly 17% of the housing stock built during this decade. Less than 1% of homes (23 homes) in Centerville are heated with bottled fuels and only 19 homes were heated by firewood in 2000.

Table 16: Year Built of Centerville Housing (2000)

	Built before 1940	Built 1940 to 1949	Built 1950 to 1959	Built 1960 to 1969	Built 1970 to 1979	Built 1980 to 1989	Built 1990 to 2000
Housing Units	1162	350	325	278	490	168	128
Proportion	40.06%	12.06%	11.20%	9.58%	16.89%	5.79%	4.41%

Source: US Census Bureau

Condition of Housing

Table 17: Centerville Housing Valuations (2000)

	Less than $40,000	$40,000 to $99,999	$100,000 to $149,999	$150,000+
Homes	591	697	105	20
Proportion	41.83%	49.33%	7.43%	1.42%

Source: US Census Bureau

Value of Housing

Over 90% of the owner-occupied homes in Centerville were valued at less than $100,000 and most homes were valued at less than $175,000. Only six homes were valued between $200,000 and $250,000 and seven homes were valued between $500,000 and $750,000.

Table18: Centerville Community Assets

Assets	Number
Colleges	1
Schools	11
Community Centers	1
Places of Worship	15

Source: Google Maps

Transportation

Highways 2 and 5 cross in Centerville slightly north and east of the center of the municipal boundaries. There are about 54 miles of roadway in Centerville. The Appanoose Community Railroad enters the community from the southeast and crosses the southern portion of town with a stub connecting to the industrial park. A natural gas pipeline connects to Centerville from the north. The Lelah Bradley Hike and Bike Trail connects the east and south sides of the Centerville Reservoir to a park in the southwestern part of town.

Existing Programs, Policies, and Technical Documents

There are many tools available to communities for them to determine their own futures; many of these tools are not as common in rural areas or small communities as they are in more populated places. However, these tools are of possible use to protecting residents of an area from various hazards, such as flooding, land sliding, and cave-ins. Please see Appendix HH for a complete list. Since there are not conventional planning mechanisms currently in place in this community, and future development of such mechanisms should consider the goals and objectives detailed in this plan as well as the mitigation actions evaluated here. Any budgetary development should consider mitigation actions and incorporate them where applicable. The development of ordinances that restrict future development should consult the hazard areas identified in this plan and consider the goals and objectives in this plan.

Table19: Centerville Critical Facilities

FACILITIES	NUMBER
NURSING / CONVALESCENT / RETIREMENT HOMES	4
HOSPITALS	2
AMBULANCE SERVICES	1
FIRE DEPARTMENTS / STATIONS	1
POLICE / LAW ENFORCEMENT FACILITIES	1
COURTHOUSES	1
GROCERY STORES	3
COMMUNICATIONS	1
OTHER FACILITIES	4

Source: Google Maps

Community Assets

Refer to 2.A.xiii. for a description of what constitutes community assets in this plan.

See Table 18: Community Assets and Table 19: Critical Facilities for buildings located in Centerville. See Appendix G: Community Assets and Critical Facilities for listing of which assets and facilities are present in Centerville. The one courthouse in Centerville is the County Courthouse and is listed under the county profile as well.

Table 20: Centerville Valuations

Type of Structure (Occupancy Class)	Number of Structures	Total Valuation	Average Valuation
Residential	2133	$110,843,858	$51,966.18
Commercial	122	$17,018,799	$139,498.35
Industrial	4	$11,790,212	$2,947,533
Agricultural		$483,580	
Religious / Non-profit			
Government			
Education			
Utilities			
Total			

Source: Appanoose County Assessor

Cultural Resources

Refer to 2.A.xiv. for a description of what constitutes cultural resources in this plan. Centerville is home to one museum and two libraries including the Drake Public Library and the Centerville Center Library on the Indian Hills campus. There is one historic site in a section that is in both Centerville and the unincorporated county, the site may or may not be within Centerville's municipal boundaries. See *Appendix H: Historic Sites in Appanoose County* for an image of the county by section with a count of historic sites listed for each.

Community Identified Hazards & Mitigation Strategies

City of Centerville Representatives of Robert Boswell and Tom Demry participated in the Hazard mitigation planning meetings. Centerville officials provided pertinent information in the plan and then had opportunity to review this plan. The representatives have identified the major hazards the City of Centerville (*See Appendix GG*) are most concerned about are: Thunderstorms/Lighting, Severe Winter Storms, and Tornados. The members considered the overall rankings of the county hazards and considered the historical data from the City to make this decision. The corresponding Mitigation actions of a generator for power to emergency shelter sites, replace the broken early storm warning system, public outreach and education, and smoke/fire/CO detectors/sprinkler systems were the major priorities to the City of Centerville.

C. Cincinnati

See *Appendix B: Communities of Appanoose County* for location of Cincinnati in relation to other communities in the county.

Geography

Cincinnati is the southern-most incorporated community in Appanoose County at coordinates 40° 37' 49" N, 92° 55' 25" W. The city encompasses an area of 1.7 square miles with a population density of 425.9 people per square mile according to the 2000 Census. Shoal Creek and South Shoal Creek each run by Cincinnati, about one mile to the north-east and to the south-west, respectively.

History / Development Trends

The first buildings erected in Cincinnati were those of Walter Johnson and Dr. Sayres in 1855. The growth of the town was rather slow for several years, but it became the trading center for a large neighborhood from the first. Solomon Holbrook built a steam flour-mill before the war, which helped the business of the town very much. This business burnt to the ground a few years later.

The Burlington Northern and Southwestern Railroad was finished to Cincinnati in 1873, giving the fertile region roundabout an outlet to market, and adding considerably to the growth of the town. The community aided he construction of the road by donation. The shipments were mainly live cattle, swine, oats, hoop-poles, etc.

The town of Cincinnati was incorporated early in 1875, the principal motive being to obtain power to lay sidewalks along the streets. The local schoolhouse was

Table 21: Cincinnati Population

CENSUS	POPULATION	HOUSEHOLDS
2000	421	173
1990	363	173

Source: US Census Bureau

Table 22: Potential Cincinnati At Risk Population (2000)

	UNDER 5	UNDER 18	65+	LINGUISTICALLY ISOLATED
TOTAL COUNTY	771	3267	2739	19
CINCINNATI	36	120	60	0

Source: US Census Bureau

built in Cincinnati also began educating children about that time.

(**The History of Appanoose County**, copyright 1989 re-print of 1878)

Population

As of the 2000 Census, the total population of Cincinnati was 421 with a total of 173 households. Between 1990 and 2000, Cincinnati gained 58 people and had no change in number of households in contrast with the County's loss of population and gain in households. This is a gain of about 14% of population.

At Risk Groups

As discussed in 2.A.vii, the Appanoose County section on at risk groups, young children, the elderly, and those that are linguistically isolated are generally identified as a "at risk groups." About 5% of all of the potential at risk population in Appanoose County is located in Cincinnati except for the linguistically isolated population. No one in Cincinnati was considered linguistically isolated in the 2000 Census.

Income

In the 2000 Census, median household income for Cincinnati was $26,641, up from $13,177 in the 1990 Census. Once inflation is accounted for, the real median household income has increased by nearly 34% since 1990 meaning that increased incomes were exceeding inflation. Nearly 85% of the households in Cincinnati had incomes less than $50,000 in 1999. About 11% (48 people) of the population of Cincinnati have incomes below the 1999 Federal Poverty Guidelines.

Table23: Cincinnati Household Income (2000)

	LESS THAN $24,999	$25,000 TO $49,999	$50,000 TO $74,999	$75,000+
HOUSEHOLDS	76	70	20	7
PROPORTION	43.93%	40.46%	11.56%	4.05%

Source: US Census Bureau

Major Employers

See 2.A.ix. for major employers in Appanoose County for a chart of major area employers.

Housing Information

Age of Housing

A large proportion (45.23%) of homes in Cincinnati were built prior to 1940 though there was a spike in new homes built in the 1970's with about 20% of the housing stock built during this decade. About 6% of homes (11 homes) in Cincinnati are heated with bottled fuels and 7 homes were heated by firewood in 2000.

Table 24: Year Built of Cincinnati Housing (2000)

	Built before 1940	Built 1940 to 1949	Built 1950 to 1959	Built 1960 to 1969	Built 1970 to 1979	Built 1980 to 1989	Built 1990 to 2000
Housing Units	90	20	17	10	41	12	9
Proportion	45.23%	10.05%	8.54%	5.03%	20.60%	6.03%	4.52%

Source: US Census Bureau

Condition of Housing

There is not a current formal housing assessment for the city of Cincinnati.

Value of Housing

Over 80% of the owner-occupied homes in Cincinnati were valued at less than $40,000 and all of the homes were valued at less than $100,000.

Table 25: Cincinnati Housing Valuations (2000)

	Less than $40,000	$40,000 to $99,999	$100,000 to $149,999	$150,000+
Homes	109	27	0	0
Proportion	80.15%	19.85%	0.00%	0.00%

Source: US Census Bureau

Transportation

Highway 5 passes through Cincinnati and a natural gas pipeline connects to the town from the west. A crude oil / petroleum pipeline passes Cincinnati approximately one mile to the east. There are a little over 7 miles of road-ways in Cincinnati (6.55 miles).

Table 26: Cincinnati Critical Facilities

Facilities	Number
Nursing / Convalescent / Retirement Homes	0
Hospitals	0
Ambulance Services	0
Fire Departments / Stations	1
Police / Law Enforcement Facilities	0
Courthouses	0
Grocery Stores	0
Communications	0
Other Facilities	0

Source: Google Maps

Existing Programs, Policies, and Technical Documents

There are many tools available to communities for them to determine their own futures; many of these tools are not as common in rural areas or small communities as they are in more populated places. However, these tools are of possible use to protecting residents of an area from various hazards, such as flooding, land sliding, and cave-ins. Please see Appendix HH for a complete list. Since there are not conventional planning mechanisms currently in place in this community, and future development of such mechanisms should consider the goals and objectives detailed in this plan as well as the mitigation actions evaluated here. Any budgetary development should consider mitigation actions and incorporate them where applicable. The development of

Table 27: Cincinnati Community Assets

ASSETS	NUMBER
COLLEGES	0
SCHOOLS	1
COMMUNITY CENTERS	1
PLACES OF WORSHIP	2

Source: Google Maps

ordinances that restrict future development should consult the hazard areas identified in this plan and consider the goals and objectives in this plan.

Community Assets

Refer to 2.A.xiii. for a description of what constitutes community assets in this plan.

See Table 27: Community Assets and Table 26: Critical Facilities for buildings located in Cincinnati. See Appendix G: Community Assets and Critical Facilities for listing of which assets and facilities are present in Cincinnati.

Table 28: Cincinnati Valuations

Type of Structure (Occupancy Class)	Number of Structures	Total Valuation	Average Valuation
Residential	197	$6,011,450	$30,514.97
Commercial	3	$292,650	$97,550
Industrial			
Agricultural		$482,065	
Religious / Non-profit			
Government			
Education			
Utilities			
Total	200	$6,786,165	

Source: Appanoose County Assessor

Cultural Resources

Refer to 2.A.xiv. for a description of what constitutes cultural resources in this plan. No museums or libraries are located in Cincinnati. There are two prehistoric sites in a section that is predominantly within the municipal boundaries; the site may or may not be within Cincinnati's municipal boundaries. See *Appendix H: Historic Sites in Appanoose County* for an image of the county by section with a count of historic sites listed for each. According to an old newspaper clipping found at the Drake Public Library in Centerville, Cincinnati was once an important stop on the Underground Railroad.

Community Identified Hazards & Mitigation Strategies

City of Cincinnati Representatives participated in some of the Hazard mitigation planning meetings. Newly elected officials came into this project mid-term and were uncertain of the purpose of the Hazard Mitigation planning although there were notified and supplied with information numerous times. Cincinnati officials were provided with the opportunity to review this plan and gather a better understanding of the purpose and intention. The attached letter (Appendix EE) from the City of Cincinnati provides documentation that city representative have reviewed this plan and agree with the information supplied in it. The city would also like to collaborate with the efforts of Appanoose County to better mitigation for any hazards that could occur. The representatives have identified the major hazards the City of Cincinnati (See *Appendix GG*) are most concerned about are: Thunderstorms/Lighting, Severe Winter Storms, and Tornados. The members

considered the overall rankings of the county hazards and considered the historical data from the City to make this decision. The corresponding Mitigation actions of a generator for power to emergency shelter sites, a new community storm shelter, acquisition of buildings and developing a temporary debris disposal plan were of priority to the City of Cincinnati.

D. Exline

See *Appendix B: Communities of Appanoose County* for location of Exline in relation to other communities in the county.

Geography

Exline is located in southern third of the county at coordinates 40° 39' 0" N, 92° 50' 24" W. The city encompasses an area of 1 square mile with a population density of 192.3 people per square mile according to the 2000 Census. Shoal Creek runs past Exline about one mile to the south-west.

History / Development Trends

"Caldwell City" was first established because of the Burlington and Southwestern Railway tracks. A first the railway company was disposed to ignore this as a stopping place, but a switch was put in, owing to this begin a better location for receiving farm produce and railway ties than Caldwell, which lies two miles further east. Mr. Exline, the proprietor of the plat, however started in the dry goods business some years ago, and is now building a larger store to accommodate his growing business. In 1877-78 the community had 2 stores, a drug store, and a saloon.

An application was made for the establishment of a post office in April, 1876, but was without success until February of 1877. The post office was named "Exline", and soon after the railway company gave the stopping-place the same name.

(**The History of Appanoose County**, copyright 1989 re-print of 1878)

Population

As of the 2000 Census, the total population of Exline was 197 with a total of 75 households. Between 1990 and 2000, Exline gained 10 people and 2 households in contrast with the County's loss of population and gain in households. This is a loss of less than 5% of population and about 2.5% loss of households.

Table 29: Exline Population

CENSUS	POPULATION	HOUSEHOLDS
2000	197	75
1990	187	77

Source: US Census Bureau

At Risk Groups

As discussed in 2.A.vii, the Appanoose County section on at risk groups, young children, the elderly, and those that are linguistically isolated are generally identified as a "at risk groups." Less than 2% of all of the young people and less than 1% of the elderly population in Appanoose County were located in Exline. There were no linguistically isolated people in Exline in 2000.

Table 30: Potential Exline At Risk Population (2000)

	UNDER 5	UNDER 18	65+	LINGUISTICALLY ISOLATED
TOTAL COUNTY	771	3267	2739	19
EXLINE	15	58	20	0

Source: US Census Bureau

Income

In the 2000 Census, median household income for Exline was $22,019, up from $14,875 in the 1990 Census. Once inflation is accounted for, the real median household income has increased by about 9% since 1990 meaning that increased incomes were exceeding inflation. About 80% of the households in Exline had incomes less than $50,000 in 1999. About 27% (54 people) of the population of Exline have incomes below the 1999 Federal Poverty Guidelines.

Table 31: Exline Household Income (2000)

	Less than $24,999	$25,000 to $49,999	$50,000 to $74,999	$75,000+
Households	40	20	13	2
Proportion	53.33%	26.67%	17.33%	2.67%

Source: US Census Bureau

Major Employers

See 2.A.ix. for major employers in Appanoose County for a chart of major area employers.

Housing Information

Age of Housing

Many (42.5%) of homes in Exline were built prior to 1940 though there was a spike in new homes built in the 1980's with nearly 24% of the housing stock built during this decade. More than half of homes (43 homes) in Exline are heated with bottled fuels and 5 homes were heated by firewood in 2000.

Table32: Year Built of Exline Housing (2000)

	Built before 1940	Built 1940 to 1949	Built 1950 to 1959	Built 1960 to 1969	Built 1970 to 1979	Built 1980 to 1989	Built 1990 to 2000
Housing Units	34	11	4	5	4	19	3
Proportion	42.50%	13.75%	5.00%	6.25%	5.00%	23.75%	3.75%

Source: US Census Bureau

Condition of Housing

There is not a current formal housing assessment for the city of Exline.

Value of Housing

All of the owner-occupied homes in Exline were valued at less than $100,000 and most homes (58.97%) were valued at less than $40,000.

Table 33: Exline Housing Valuations (2000)

	Less than $40,000	$40,000 to $99,999	$100,000 to $149,999	$150,000+
Homes	23	16	0	0
Proportion	58.97%	41.03%	0.00%	0.00%

Source: US Census Bureau

Transportation

Highway 5 passes Exline less than one mile to the west and a crude oil / petroleum pipeline passes about one-quarter of a mile to the west of town. There are about 5.6 miles of roads in Exline.

Existing Programs, Policies, and Technical Documents

There are many tools available to communities for them to determine their own futures; many of these tools are not as common in rural areas or small communities as they are in more populated places. However, these tools are of possible use to protecting residents of an area from various hazards, such as flooding, land sliding, and cave-ins. Please see Appendix HH for a complete list. Since there are not conventional planning mechanisms currently in place in this community, and future development of such mechanisms should consider the goals and objectives detailed in this plan as well as the mitigation actions evaluated here. Any budgetary development should consider mitigation actions and incorporate them where applicable. The development of ordinances that restrict future development should consult the hazard areas identified in this plan and consider the goals and objectives in this plan.

Community Assets

Refer to 2.A.xiii. for a description of what constitutes community assets in this plan.

See Table 34: Community Assets and Table 35: Critical Facilities for buildings located in Exline. See Appendix G: Community Assets and Critical Facilities for listing of which assets and facilities are present in Exline.

Table 34: Exline Community Assets

Assets	Number
Colleges	0
Schools	0
Community Centers	1
Places of Worship	1

Source: Google Maps

Table 35: Exline Critical Facilities

Facilities	Number
Nursing / Convalescent / Retirement Homes	1
Hospitals	0
Ambulance Services	0
Fire Departments / Stations	1
Police / Law Enforcement Facilities	0
Courthouses	0
Grocery Stores	1
Communications	0
Other Facilities	0

Source: Google Maps

Table36: Exline Valuations

Type of Structure (Occupancy Class)	Number of Structures	Total Valuation	Average Valuation
Residential	77	$2,451,760	$30,514.97
Commercial	8	$670,220	$83,777.5
Industrial			
Agricultural		$320,790	
Religious / Non-profit			
Government			
Education			
Utilities			
Total	85	$3,442,770	

Source: Appanoose County Assessor

Cultural Resources

Refer to 2.A.xiv. for a description of what constitutes cultural resources in this plan. No museums or libraries are located in Exline. There are no known historic sites in or adjacent to Exline. See *Appendix H: Historic Sites in Appanoose County* for an image of the county by section with a count of historic sites listed for each.

Community Identified Hazards & Mitigation Strategies

City of Exline Representatives, Jim Casteel and Jim Burns, participated in of the Hazard mitigation planning meetings. They are the representatives appointed to the committee have identified all concerns (See *Appendix GG*) and have chosen the major hazards the City of Exline are most concerned about are: Thunderstorms/Lightning, Severe Winter Storms, and Tornados. Those members also considered the overall rankings of the county hazards and considered the historical data from the City to make this decision. The corresponding Mitigation actions of a generator, a new storm shelter and the maintenance of the older buildings were selected as a priority for the community.

E. Moravia

See *Appendix B: Communities of Appanoose County* for location of Moravia in relation to other communities in the county.

Geography

Moravia is located at the northern border of the county at coordinates 40° 53’ 26” N, 92° 48’ 57” W. The city encompasses an area of 1.2 square miles with a population density of 615.8 people per square mile according to the 2000 Census. No streams or rivers pass through or near Moravia.

History / Development Trends

Moravia was laid out by Joseph Stauber, Theophilus Vierle and Ephraim Conrad and was surveyed in June 1851. These tree men emigrated with their families from North Carolina in 1849 and stayed in Jefferson County during that winter. In the spring of 1850 they came to Appanoose County and Mr. Stauber bought a claim held by a Mormon, and which, the following year, became the site of the present village of Moravia.

One of the Mormon trails leading from Nauvoo westward, in 1846, passed directly through where Moravia now stands, thence along the ridge through Iconium and so on west. The was subsequently adopted as a public highway, and there is hardly a road in Iowa more closely bordered with farm dwellings.

Moravia grew rapidly during the first ten years of its existence and just prior to the building of the Burlington & Missouri Railroad, there were six or seven stores in the town, as well as other business places. A small-flouring mill was built in 1877 also.

The schoolhouse was built in 1853, by members of the Moravian Church. It stood for 3years before it burned down. A commodious two-story building that was standing in the public square was built in 1867, under the authority of the township district.

Table37: Moravia Population

CENSUS	POPULATION	HOUSEHOLDS
2000	721	330
1990	679	287

Source: US Census Bureau

(**The History of Appanoose County**, copyright 1989 re-print of 1878)

Population

As of the 2000 Census, the total population of Moravia was 721 with a total of 330 households. Between 1990 and 2000, Moravia gained 42 people and 43 households in contrast with the County's loss of population and gain in households. This is a gain of almost 6% of population and about 13% gain in households.

At Risk Groups

As discussed in 2.A.vii, the Appanoose County section on at risk groups, young children, the elderly, and those that are linguistically isolated are generally identified as a "at risk groups." Over 5% of the young people in Appanoose County were located in Moravia and nearly 7% of the elderly population lived in Moravia in 2000. Ten percent of the linguistically isolated people in the county were located in Moravia in 2000.

Table38: Potential Moravia At Risk Population (2000)

	UNDER 5	UNDER 18	65+	LINGUISTICALLY ISOLATED
TOTAL COUNTY	771	3267	2739	19
CENTERVILLE	50	177	188	2

Source: US Census Bureau

Income

In the 2000 Census, median household income for Moravia was $26,042, up from $18,164 in the 1990 Census. Once inflation is accounted for, the real median household income has declined by about 6% since 1990 meaning that increased incomes were exceeding inflation. Nearly 80% of the households in Moravia had incomes less than $50,000 in 1999. About 14% (99 people) of the population of Moravia have incomes below the 1999 Federal Poverty Guidelines.

Table39: Moravia Household Income (2000)

	Less than $24,999	$25,000 to $49,999	$50,000 to $74,999	$75,000+
Households	155	109	55	11
Proportion	46.97%	33.03%	16.67%	3.33%

Source: US Census Bureau

Major Employers

See 2.A.ix. for major employers in Appanoose County for a chart of major area employers.

Housing Information

Age of Housing

Many (39.4%) of homes in Moravia were built prior to 1940 though there was a spike in new homes built in the 1970's with 20% of the housing stock built during this decade. Less than 2% of homes (4 homes) in Moravia are heated with bottled fuels and no homes were heated by firewood in 2000.

Table40: Year Built of Moravia Housing (2000)

	Built before 1940	Built 1940 to 1949	Built 1950 to 1959	Built 1960 to 1969	Built 1970 to 1979	Built 1980 to 1989	Built 1990 to 2000
Housing Units	132	25	23	28	67	29	31
Proportion	39.40%	7.46%	6.87%	8.36%	20.00%	8.66%	9.25%

Source: US Census Bureau

Condition of Housing

There is not a current formal housing assessment for the city of Moravia.

Value of Housing

Over 90% of the owner-occupied homes in Moravia were valued at less than $100,000. Slightly more than half of the homes were valued between $40,000 and $99,999. Only six homes were valued between $100,000 and $149,999.

Table41: Moravia Housing Valuations (2000)

	Less than $40,000	$40,000 to $99,999	$100,000 to $149,999	$150,000+
Homes	92	106	6	0
Proportion	45.10%	51.96%	2.94%	0.00%

Source: US Census Bureau

Transportation

Highway 5 passes by Moravia on its western side, crossing through only a small part of town. Highway 142 connects to Highway 5 from the west but does not enter Moravia; a local road continues from the intersection of the two highways into town. Two railroads cross paths in the Moravia municipal boundary on the southwest part of town. A natural gas pipeline passes Moravia on the eastern side of town from one-tenth of a mile and one-third of a mile. There are almost ten miles of roadway in Moravia.

Table 42: Moravia Critical Facilities

FACILITIES	NUMBER
NURSING / CONVALESCENT / RETIREMENT HOMES	1
HOSPITALS	0
AMBULANCE SERVICES	1
FIRE DEPARTMENTS / STATIONS	1
POLICE / LAW ENFORCEMENT FACILITIES	0
COURTHOUSES	0
GROCERY STORES	2
COMMUNICATIONS	0
OTHER FACILITIES	1

Source: Google Maps

Existing Programs, Policies, and Technical Documents

There are many tools available to communities for them to determine their own futures; many of these tools are not as common in rural areas or small communities as they are in more populated places. However, these tools are of possible use to protecting residents of an area from various hazards, such as flooding, land sliding, and cave-ins. Please see appendix HH for a complete list. Since there are not conventional planning mechanisms currently in place in this community, and future development of such mechanisms should consider the goals and objectives detailed in this plan as well as the mitigation actions evaluated here. Any budgetary development should consider mitigation actions and incorporate them where applicable. The development of ordinances that restrict future development should consult the hazard areas identified in this plan and consider the goals and objectives in this plan.

Community Assets

Refer to 2.A.xiii. for a description of what constitutes community assets in this plan.

See Table 43: Community Assets and Table 42: Critical Facilities for buildings located in Moravia. See Appendix G: Community Assets and Critical Facilities for listing of which assets and facilities are present in Moravia.

Table 43: Moravia Community Assets

ASSETS	NUMBER
COLLEGES	0
SCHOOLS	1
COMMUNITY CENTERS	1
PLACES OF WORSHIP	2

Source: Google Maps

Table 44: Moravia Valuations

Type of Structure (Occupancy Class)	Number of Structures	Total Valuation	Average Valuation
Residential	291	$15,560,965	$53,474.11
Commercial	8	$2,041,640	$255,205
Industrial	3	$73,347	$244,449
Agricultural		$294,950	
Religious / Non-profit			
Government			
Education			
Utilities			
Total	302	$17,970,902	

Source: Appanoose County Assessor

Cultural Resources

Refer to 2.A.xiv. for a description of what constitutes cultural resources in this plan. One museum and one library are located in Moravia; the museum is the Wabash Depot Museum. There are no known historic sites in or adjacent to Moravia. See *Appendix H: Historic Sites in Appanoose County* for an image of the county by section with a count of historic sites listed for each.

Community Identified Hazards & Mitigation Strategies

City of Moravia Representative, Charles Turner, participated in the planning meetings. The Mayor and Council members have identified all concerns (See *Appendix GG*) and the major hazards the City of Moravia are most concerned about are: Severe Winter Storms, rail transportation incident and Tornados. The members considered the overall rankings of the county hazards and considered the historical data from the City to make this decision. The corresponding Mitigation actions of improving or replacing their early storm warning system, implementing a storm water ordinance, obtaining a generator for power to all emergency shelters, assessing/improving the fire hydrant systems, and enforcing a tree management/trimming ordinance were of priority to the City of Moravia.

O. Moravia Public Schools

The mission statement for the school is as follows: *"Learning flourishes in an environment of disciplined inquiry that develops and integrates knowledge and skills. The best learning occurs in an environment that is rich in resources, provides opportunity for active, participatory learning, and stresses responsibility and initiative. Learning is achieved through a clear integration and alignment of curriculum, instruction, and assessment. All students can learn and are expected to achieve high standards."*

Geography

Moravia Public schools lies within the city limit of Moravia, Iowa. Moravia is located at the northern border of the county at coordinates 40° 53' 26" N, 92° 48' 57" W. The city encompasses an area of 1.2 square miles with a population density of 615.8 people per square mile according to the 2000 Census. No streams or

rivers pass through or near Moravia. Geographically, the district is a long district that runs between Appanoose and Monroe counties and engulfs Lake Rathbun to the west and Lake Sundown to the east.

History/Development Trends

The first schoolhouse was built in 1853, by members of the Moravian Church. It stood for 3years before it burned down. A commodious two-story building that was standing in the public square was built in 1867, under the authority of the township district. The current building was erected in 1960.

The enrollment for the district has slightly increased over recent years and the Iowa Department of Education projects continued increase of enrolled children through the next 20 years.

The Moravia Community School is proud to announce it was one of the top ten schools in the state of Iowa when it comes to ACT test scores. It is great to see students in the same boat as the likes of Ames Community School, who was number one. ACT tests are used by schools throughout the nation to best determine whether a student is prepared to be successful in college. The ACT consists of curriculum-based tests of educational development in English, mathematics, reading, and science designed to measure the skills needed for success in first year college course work.

The school is proud to announce it has again met all of its academic goals set out at the beginning of the 2008-2009 school year. CSIP stands for Comprehensive School Improvement Plan as these plans are determined by the district. The CSIP requires that the district review its assessment data to identify where student learning needs to improve. In order for that to happen, the data first has to be collected, disaggregated by socioeconomic group, race, gender, grade level, etc., and put into tables for easy interpretation. The administration and staff have to review that data and identify those areas that indicate a need for increased school district attention – particularly in the areas of Reading, Math, and Science. Goals then need to be drafted and presented to the Citizens' Advisory Committee for their review and approval. After the CSIAC committee has approved the student learning goals for the coming school year, they need to be presented to the Board of Directors, as a recommendation for Board approval.

Population/Enrollment

ENROLLMENT CHARACTERISTICS 2010-2011

Total Schools:		2
	Total Students:	357
	Classroom Teachers (FTE):	32.4
	Student/Teacher Ratio:	11.0
	ELL (formerly LEP) Students:	1
	Students with IEPs:	44

Enrollment by Elementary Grades:

	PK	KG	1	2	3	4	5	6
Students	33	22	33	18	27	29	19	29

Enrollment by Race/Ethnicity:

	Amer Ind/ Alaskan	Asian	Black	Hispanic	White
Students	1	2	4	3	200

Enrollment by Gender:

	Male	Female
Students	104	106

Free lunch eligible: 79 **Reduced-price lunch eligible:** 28

Middle school & High school Enrollment by Grade:

	7	8	9	10	11	12
Students	22	27	28	21	27	22

Enrollment by Race/Ethnicity:

	Amer Ind/ Alaskan	Asian	Black	Hispanic	White
Students	0	1	4	0	142

Enrollment by Gender:

	Male	Female
Students	75	72

Free lunch eligible: 36 **Reduced-price lunch eligible:** 21

At Risk Groups

The school identifies the following characteristics to determine a child to be "At Risk": Children with disabilities, families who live below the median household income, and those who have English as a second language.

Children with disabilities or delays are provided with an Individual Education Plan (IEP) through the school district. It is hopeful that the individual plan assist each child in reach their utmost potential. Moravia Public Schools are currently serving 44 children with an I.E.P.

Approximately 52% of enrolled children qualify for the free and reduce lunch program that benefits low income families in the Moravia school district.

The school has identified one child whose primary language is that other than English.

Major Employers

See 2.A.ix. for major employers in Appanoose County for a chart of major area employers.

Transportation

Highway 5 passes by Moravia on its western side, crossing through only a small part of town. Highway 142 connects to Highway 5 from the west but does not enter Moravia; a local road continues from the intersection of the two highways into town. Two railroads cross paths in the Moravia municipal boundary on the southwest part of town. A natural gas pipeline passes Moravia on the eastern side of town from one-tenth of a mile and one-third of a mile. There are almost ten miles of roadway in Moravia.

In addition, the Moravia school district operates five buses and three vans throughout the district providing transportation to the children enrolled. These vehicles cover the 160 square miles of the entire district.

Existing Programs, Policies, and Technical Documents

The school district enforces a student and faculty handbook that offers recommendations on what to do in the event of an emergency, daily procedures, and discipline measures enforced by the school. The Emergency Response Plan implemented by the school is very precise to provide step-by-step direction in the event of transportation incident, chemical spill, bomb threats, violence outbreak, earthquake, thunderstorm/lighting, and severe winter storms. The school is not located within an identified floodplain and, therefore, does not have an established plan.

http://nces.ed.gov

http://moraviacsd.com/

xii. Community Identified Hazards & Mitigation Strategies

Moravia Public Schools did not directly participate in the beginning of the HMG planning sessions for this version of the Appanoose County Multi-Jurisdictional Plan. They were confused about the purpose and commitment that this plan would require. Chariton Valley Planning & Development included them in emails throughout the process, there was no participation documented. When there was a change in staff at CVPD, the new member made phone calls to clarify the school's interest and they expressed interest at that time. Kathy Carr, School Principal, indicated that the school is considering all options for funding for keeping their families safe. Although they have missed out on the process up to this time, it is their intentions to participate fully in the current process of the plan as well as the updating and revisions of this document. Julie Pribyl and Kathy Carr met on June 17, 2010 to review the intent and purpose of hazard mitigation planning. Kathy read over the existing document and was able to provide critical information about the Moravia Public School so that it may be profiled in the Appanoose County HMGP. Kathy met with Julie on several other occasions and has supplied all information requested from the school district. Kathy has spoken with the Moravia School Board to educate them on hazard mitigation and has their full support to proceed with committee participation.

The school system is concerned about the safety of students, parents, and visitors that could be at a school function during the event of a disaster. The school has established and approved emergency procedures in place for the number of students enrolled in the facilities. However, greater concern happens when there are a large number of people attending the numerous events held at the school. Moravia Public School has identified Thunderstorm/Lighting, Severe winter storm, and tornado. The school plans to apply for any grant funded opportunities to assist them in constructing a Safe Room for their district.

F. Moulton

See *Appendix B: Communities of Appanoose County* for location of Moulton in relation to other communities in the county.

Geography

Moulton is located in the south-eastern quadrant of the county at coordinates 40° 41' 7" N, 92° 40' 40" W. The city encompasses an area of 1 square mile with a population density of 647.8 people per square mile according to the 2000 Census. No streams or rivers pass through or near Moulton.

History / Development Trends

The community of Moulton was established in 1867 and was named in honor of John Benjamin Moulton. He was from an old English family with ties to the east coast as early as 1611. He was an engineer by trade and was responsible for the development of the rail line from Kansas City, through Moberly, MO and north through what would be the town named in his honor, Moulton.

The first white men of this county were from a company of Dragoons who came from Rock Island on their way to Kansas. The company of soldiers came through what is now Agency, Drakesville, Unionville, to the place where Moulton was to be. Some of them remained in this area to assist in the development of the community. As the Mormans were driven from their homes in Nauvoo, Ill. and were going to Salt Lake City to live, the followed this same trail taken by the Dragoons. In fact, so many passed over this same road that it became known as the "Mormon Trail" and is honored with a monument in the community of Moulton.

In the early 1920's, Moulton was a growing community. Many businesses were established in the community, including grocery stores, drug stores, restaurant, hardware stores, cigar store, millinery shop, oil/gas stations, etc. The city suffered tremendously through the Depression era and the recovery years that followed. At that point, a number of families were finding employment elsewhere. People then took advantage of the transportation changes with better roads and improved automobiles with traveling away much easier and convenient. Families were finding their supplies for everyday living elsewhere with more choice and bargain prices. This trend continued through the forties and fifties which lead to the decline of local businesses in Moulton.

Population

As of the 2000 Census, the total population of Moulton was 658 with a total of 294 households. Between 1990 and 2000, Moulton gained 18 people and 12 households in contrast with the County's loss of population and gain in households. This is a gain of nearly 3% of population and about 4% gain of households.

Table 45: Moulton Population

CENSUS	POPULATION	HOUSEHOLDS
2000	658	294
1990	613	282

Source: US Census Bureau

At Risk Groups

As discussed in 2.A.vii, the Appanoose County section on at risk groups, young children, the elderly, and those that are linguistically isolated are generally identified as a "at risk groups." Nearly 5% of all of the potential at risk population in Appanoose County is

Table46: Potential Moulton At Risk Population (2000)

	UNDER 5	UNDER 18	65+	LINGUISTICALLY ISOLATED
TOTAL COUNTY	771	3267	2739	19
MOULTON	28	154	129	0

Source: US Census Bureau

located in Moulton except for the linguistically isolated population. No linguistically isolated people were located in Moulton in 2000.

Income

In the 2000 Census, median household income for Moulton was $22,692, up from $15,132 in the 1990 Census. Once inflation is accounted for, the real median household income has increased by about 10% since 1990 meaning that increased incomes were exceeding inflation. More than 85% of the households in Moulton had incomes less than $50,000 in 1999. Nearly 15% (93 people) of the population of Moulton have incomes below the 1999 Federal Poverty Guidelines.

Table 47: Moulton Household Income (2000)

	LESS THAN $24,999	$25,000 TO $49,999	$50,000 TO $74,999	$75,000+
HOUSEHOLDS	159	91	37	7
PROPORTION	54.08%	30.95%	12.59%	2.38%

Source: US Census Bureau

Major Employers

See 2.A.ix. for major employers in Appanoose County for a chart of major area employers.

Housing Information

Age of Housing

About one-third (35%) of homes in Moulton were built prior to 1940 though there was a substantial spike in new homes built in the 1970's with nearly 23% of the housing stock built during this decade. Over 6% of homes (19 homes) in Moulton are heated with bottled fuels and 14 homes were heated by firewood in 2000.

Table 48: Year Built of Moulton Housing (2000)

	BUILT BEFORE 1940	BUILT 1940 TO 1949	BUILT 1950 TO 1959	BUILT 1960 TO 1969	BUILT 1970 TO 1979	BUILT 1980 TO 1989	BUILT 1990 TO 2000
HOUSING UNITS	112	21	22	39	74	26	26
PROPORTION	35.00%	6.56%	6.88%	12.19%	23.13%	8.13%	8.13%

Source: US Census Bureau

Condition of Housing

There is not a current formal housing assessment for the city of Moulton.

Value of Housing

Over 90% of the owner-occupied homes in Moulton were valued at less than $100,000 and most homes were valued at less than $40,000. Only nine homes were valued above $100,000.

Table 49: Moulton Housing Valuations (2000)

	Less than $40,000	$40,000 to $99,999	$100,000 to $149,999	$150,000+
Homes	97	53	6	3
Proportion	61.01%	33.33%	3.77%	1.89%

Source: US Census Bureau

Transportation

Highway 202 connects Moulton to Highway 2 to the north and extends into Missouri and Davis County south of town. The Appanoose Community Railroad connects Moulton to Centerville, Udell, and Moravia and passes through the western portion of Moulton. A natural gas pipeline owned by Moulton Municipal Gas connects into town from the north. Nearly 13 miles of roadway are contained within the municipal boundaries of Moulton.

Existing Programs, Policies, and Technical Documents

There are many tools available to communities for them to determine their own futures; many of these tools are not as common in rural areas or small communities as they are in more populated places. However, these tools are of possible use to protecting residents of an area from various hazards, such as flooding, land sliding, and cave-ins. Please see Appendix HH for a complete list. Since there are not conventional planning mechanisms currently in place in this community, and future development of such mechanisms should consider the goals and objectives detailed in this plan as well as the mitigation actions evaluated here. Any budgetary development should consider mitigation actions and incorporate them where applicable. The development of ordinances that restrict future development should consult the hazard areas identified in this plan and consider the goals and objectives in this plan.

Table 51: Moulton Critical Facilities

Facilities	Number
Nursing / Convalescent / Retirement Homes	0
Hospitals	0
Ambulance Services	1
Fire Departments / Stations	1
Police / Law Enforcement Facilities	1
Courthouses	0
Grocery Stores	1
Communications	1
Other Facilities	0

Source: Google Maps

Community Assets

Refer to 2.A.xiii. for a description of what constitutes community assets in this plan.

See Table 50: Community Assets and Table 51: Critical Facilities for buildings located in Moulton. See Appendix G: Community Assets and Critical Facilities for listing of which assets and facilities are present in Moulton.

Table 50: Moulton Community Assets

Assets	Number
Colleges	0
Schools	1
Community Centers	1
Places of Worship	3

Source: Google Maps

Table 52: Moulton Valuations

Type of Structure (Occupancy Class)	Number of Structures	Total Valuation	Average Valuation
Residential	269	$11,240,353	$41,785.70
Commercial	15	$1,517,240	$101,149.33
Industrial			
Agricultural		$162,090	
Religious / Non-profit			
Government			
Education			
Utilities			
Total	284	$12,919,683	

Source: Appanoose County Assessor

Cultural Resources

Refer to 2.A.xiv. for a description of what constitutes cultural resources in this plan. There is a library but no museums located in Moulton; the library is the Garrett Memorial Library. There are no known historic sites in or adjacent to Moulton. See *Appendix H: Historic Sites in Appanoose County* for an image of the county by section with a count of historic sites listed for each.

Community Identified Hazards & Mitigation Strategies

City of Moulton Representatives, Gary Harris and John Replogle, considered the overall rankings of the county hazards, considered the historical data from the City and reviewed the STAPLEE to make this decision. The representatives have identified all concerns (See *Appendix GG*) and the major hazards the City of Moulton are most concerned about are: Thunderstorms/Lighting, Severe Winter Storms, and Tornados. The members considered the overall rankings of the county hazards and considered the historical data from the City to make this decision. The corresponding Mitigation actions are establishing a community response team and improving/replacing the early storm warning system was of priority.

G. Mystic

See *Appendix B: Communities of Appanoose County* for location of Mystic in relation to other communities in the county. The City of Mystic was the only jurisdiction that started with a separate, local and FEMA approved (9/2/09) hazard mitigation plan which was incorporated into this Appanoose County plan. This reflects some of the slight differences in the presentation of information in this section from the rest of the community profiles. The State of Iowa has provided recommendation that Multi-Jurisdictional Hazard Mitigation Plans will be more effective for all regions. The City of Mystic completed the process for a single jurisdiction plan immediately prior to the process of the Appanoose County Multi-Jurisdictional Plan (which began a month later). Their involvement for the countywide plan was indirect participation since the information and decisions of their City plan were current and accurate. Much of the information provided in Mystic's Mitigation plan provided a foundation for the conception of the Appanoose County plan. The Mystic Mitigation plan states in the intent that the Multi-Jurisdictional plan will supersede the existing community plan (See **Appendix II).**

Table 53: Mystic Potential At Risk Populations

Population 65+			
Male	Female	Total	Proportion 65+
25	26	51	8.67%

Youth Population			
Under 18	Under 18 Proportion	Under 5	Under 5 Proportion
169	28.74%	38	6.46%

Source: US Census Bureau

Geography

The City of Mystic is located in northwest quadrant of Appanoose County, Iowa in the south-central sector of Iowa at coordinates 40° 46′ 43.02″ N, 92° 56′ 41.76″ W. Elevations in Mystic peak at 1,050 feet above sea level, with an average elevation of 899 feet. Mystic has a total land area of 2.9 square miles and is primarily served by county highway T14.

No major rivers run through or near Mystic, however Walnut Creek does and is located in the area where the August 2007 flood damage took place. Little Walnut Creek runs north of Mystic, both creeks feeding into the Chariton River which is about two miles north east of Mystic.

History / Development Trends

Mystic was founded in the mid-1800's and coal mining dominated the local economy and culture by the mid-1860's. Coal outcroppings near the Walnut or Little Walnut Creek were discovered and became the initial driver of mining activities. Homes and businesses grew up around these new mines and still sit above old mines and among mine shafts.

Table 54: Mystic Population

Year	Total	Under 5	5 to 17	18 to 64	65+
2000	588	38	131	347	51
1990	545	21	151	286	83

Source: US Census Bureau

Once Mystic was connected to surrounding areas, the town thrived. In 1910, "the interurban" train connected Mystic and Centerville providing additional access to the town for workers and for coal shipments. By this time the town had several general stores, dentist offices, restaurants, and other shops and lodges.

Significant development has not occurred since the area began to decline and based on population projections, is not anticipated to occur in the future without significant economic changes in the region.

Table 55: Mystic Potential At Risk Populations

Population 65+			
Male	Female	Total	Proportion 65+
25	26	51	8.67%

Youth Population			
Under 18	Under 18 Proportion	Under 5	Under 5 Proportion
169	28.74%	38	6.46%

Source: US Census Bureau

Population and Projections

As of the 2000 Census, the total population of Mystic was 588 with a total of 207 households. This is up 43 persons since the 1990 Census count of 545 people; a total growth of 7.3%. In 1990 there were 202 households. There was slight growth between 1970 and 1980 of about 3% but then a drop of over 11% between 1980 and 1990.

Population projections for areas with small populations are difficult to make accurately. In the absence of any reason to expect Mystic to differ from Appanoose County demographic trends and the challenges of

small area projections, the County trends are extrapolated and applied to Mystic as a reasonable projection. See Appanoose County Profile, 2.A.vi for county population projection.

At Risk Groups

The elderly are often identified as an "at risk group" for various reasons including potential health frailties and mobility challenges. Likewise younger populations are at potential risk due to lack of familiarity with disasters and especially with actions to take in the event of a disaster. However, young people may have more education due to school drills that may not be as well known among populations over the age of 18. The elderly population of Mystic was about 9% of the total population as of the 2000 Census; young people comprised about 29% with only about 6% of young people under age 5.

Income

In the 2000 Census, median household income for Mystic was $25,568, up from $12,500 in the 1990 Census. Accounting for inflation, real household incomes in Mystic have increased by nearly 34% exceeding the effects of inflation. Nearly two-thirds of the households in Mystic (57%) had incomes under $30,000 annually. Of the 588 residents of Mystic, 129 were determined to be under the Federal Poverty Guidelines in 1999 comprising about 22% of the population.

Table 56: Household Incomes in Mystic (2000)

	TOTAL	> $15,000	$15,000 - $29,999	$30,000 - $49,999	$50,000 +
HOUSEHOLDS	207	55	63	56	33
PERCENTAGE	100.00%	26.57%	30.43%	27.05%	15.94%

Source: US Census Bureau

Major Employers

Listed in the table below are the ten largest employers employing Mystic residents in Appanoose County according to the Iowa Department of Economic Development.

Table57: Major Employers in Mystic

Employer	Location
C & C Machining	Centerville
Curwood Inc	Centerville
Iowa Steel and Wire	Centerville
West Enterprises	
Centerville Community School District	Centerville & Mystic
Mystic Fire Department	Mystic
Rathbun Marina	Moravia
Young's Salvage and Trucking	Mystic
ZKO Enterprises	Mystic
Zaputil Trucking	Mystic

Source: Iowa Department of Economic Development, Location One Information Service. Hoovers

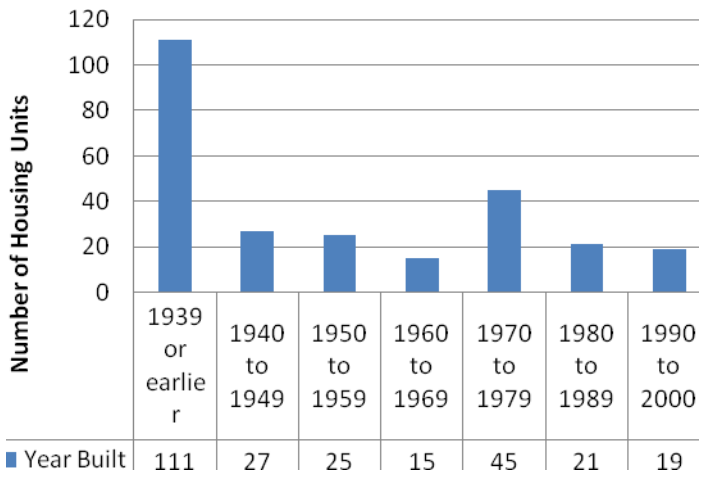
Housing Information

a. Age of Housing

Much of the housing stock (42%) in Mystic was constructed before 1940 suggesting that the structural integrity of the buildings likely does not met newer building codes designed to ensure the safety of residents. These structures are likely the most vulnerable to various hazards due to their age and the difference in construction techniques which have improved in many ways since they were built. Mystic does not enforce building codes at the time this plan was being developed. Median year built of the homes in Mystic is 1948, meaning that half of the homes were built before and half after this year.

Another potential concern is the prevalence of LP gas used as heating fuel in the homes in Mystic; 74% of homes use LP gas as heating fuel (US Census Bureau). While LP tanks can be safe forms of fuel containment and transport, liquefied petroleum gas is flammable and can explode. LP gas is heavier than air and so it will sink to the lowest level possible; if inhaled it can cause asphyxiation through oxygen deprivation but is otherwise nontoxic.

Figure 8: Year Built of Housing Stock in Mystic (2000)



Condition of Housing

While a comprehensive evaluation of the housing stock in Mystic has not yet been completed, preliminary conclusions can be drawn. Quality of housing in terms of state-of-repair and outwardly maintenance varies significantly. Some homes are clearly poorly maintained, some of which may well be ones damaged by the August 2007 floods, while others may lag due to limitations on financial resources of the inhabitants. Other homes, while often older, do appear to be in good repair.

Value of Housing

About one third of the owner-occupied homes in Mystic was valued at less than $20,000 (31.5%) as of the 2000 Census and no homes were valued above $125,000. Median housing valuation was $32,200 in 2000.

Table 58: Housing Values in Mystic (2000)

Mystic Housing Values: Owner-occupied Homes					
Value	> $20,000	$20,000 to $34,999	$35,000 to $49,999	$50,000 to $69,999	$70,000 +
Number of Homes	58	48	41	24	13

Source: US Census Bureau

Transportation

Mystic is served by one primary county highway, T14; four local roads provide access into and out of Mystic. Most of the roads in Mystic are gravel and one street is brick. There is a railroad track that runs through town, see *Appendix S: Transportation routes in Appanoose County*.

Existing Programs, Policies, and Technical Documents

There are many tools available to communities for them to determine their own futures; many of these tools are not as common in rural areas or small communities as they are in more populated places. However, these tools are of possible use to protecting residents of an area from various hazards, such as flooding, land sliding, and cave-ins. Please see Appendix HH for a complete list. Since there are not conventional planning mechanisms currently in place in this community, and future development of such mechanisms should consider the goals and objectives detailed in this plan as well as the mitigation actions evaluated here. Any budgetary development should consider mitigation actions and incorporate them where applicable. The development of ordinances that restrict future development should consult the hazard areas identified in this plan and consider the goals and objectives in this plan.

Community Assets

Refer to 2.A.xiii. for a description of what constitutes community assets in this plan.

See Table 59: Community Assets and Table 60: Critical Facilities for buildings located in Mystic. See Appendix G: Community Assets and Critical Facilities for listing of which assets and facilities are present in Mystic.

Table 59: Mystic Community Assets

Assets	Number
Colleges	0
Schools	1
Community Centers	1
Places of Worship	1

Source: Google Maps

Table 60: Mystic Critical Facilities

Facilities	Number
Nursing / Convalescent / Retirement Homes	0
Hospitals	0
Ambulance Services	0
Fire Departments / Stations	1
Police / Law Enforcement Facilities	0
Courthouses	0
Grocery Stores	
Communications	0
Other Facilities	0

Source: Google Maps

Table 61: Mystic Valuations

Type of Structure (Occupancy Class)	Number of Structures	Total Valuation	Average Valuation
Residential	227	$6,445,315.00	$28,393.46
Commercial	3	$640,280.00	$213,426.67
Industrial	0	$0.00	
Agricultural	Not given	$600,136.00	
Religious / Non-profit	1	Not given	
Government	1	Not given	
Education	1	Not given	
Utilities	0	$0.00	
Total	233	$7,685,731.00	

Source: Appanoose County Assessor

Mystic's municipal water is supplied by Rathbun Rural Water Association. There are no other municipal utilities provided by the City of Mystic. There is a wastewater lagoon on a hill southeast of Mystic. About 30 to 35 homeowner and public pumping stations are present in town. Details of the system from the wastewater permit are as follows;

Design PE	Design BOD	Design ADW Flow (MGD)	Design AWW Flow (MGD)	Operator Certification Facility Type	Operator Certification Facility Grade
725.00	121.00	0.07	0.07	WL	I

Source: IA DNR, http://www.iowadnr.com/water/npdes/holders.html

Cultural Resources

Refer to 2.A.xiv. for a description of what constitutes cultural resources in this plan. One historic site is located in a section mostly located within the municipal boundaries. In a section adjacent to Mystic to the east are two historic and two prehistoric sites. See *Appendix H: Historic Sites in Appanoose County* for an image of the county by section with a count of historic sites listed for each.

Single Jurisdiction Plan Updates

City of Mystic is the only Appanoose County community that had completed a single jurisdiction HMGP plan with guidance of John Dawson of Chariton Valley Planning and Development. Research for the county and the city of Mystic overlapped as efforts were put forth on both documents at the same time. FEMA approved and the City of Mystic adopted their plan on September 2, 2009. The State of Iowa has now provided recommendations that Single Jurisdiction Plans be rolled into Multi-Jurisdiction plans. Mystic representatives believed that the information stated in that plan was very recent and accurate to be incorporated into the Appanoose County Multi-Jurisdictional plan. CVPD planners and committee members approved their participation in the county plan in a indirect capacity and will call for clarification if needed.

The City does recognize that the Multi-Jurisdictional plan will supersede the single community plan once it is federally approved as indicated in the single jurisdiction plan.

There are several hazards that were not detailed in the Mystic Mitigation plan that the committee realized would be included in the county wide plan. Those anticipations were documented on page 23 of the city's plan and can be viewed in Appendix II. The excluded hazards were Levees, Expansive Soils, Pipeline Transportation Incident, Waterway Incident, Human Disease Pandemic, and Animal/Plant/Crop Disease. Although these are detailed in the Multi-Jurisdictional plan, Mystic has not identified them as a hazard of concern for their individual community.

The mitigation actions selected by the Mulit-Jurisdictional committee were primarily the same as the City of Mystic. There were additional mitigation strategies due to the inclusion of other hazards to be comprehensive of the entire county. The top ten Mitigation Action Rankings are identified to be the same for both committees but vary slightly in consecutive order. For example, Mystic ranked Community Emergency Response Team as one and the Mulit-Jursidictional committee ranked it as second.

The risk assessments and community profile remains the same for the community as what was presented in the FEMA approved 2009 plan.

The City of Mystic representatives (Patsy Seals, Chris Chester, Pat & Phil Hudson) were informed of the decisions the Appanoose County committee through minutes that were emailed to them after each meeting. There were no questions as the members received that information. The City council was presented with the draft plan of the Appanoose County Multi-Jurisdictional plan on January 25, 2011. They were also provided handouts illustrating the differences of the two plans and clear statements that the City's Plan would be superseded by the County's FEMA approved plan. There were no questions and all accepted the adjustments.

Mitigation Action Updates

There has been a reduction to the repetitive loss properties through the mitigation actions of Acquisition and demolition of flooded properties. The project was accepted and began in 2008 and will be completed in 2011. These 8 residential structures and multiple out buildings were located within the estimated floodplain of Mystic. A Flash Flooding event in 2007 destroyed these structures and the acquisition/demolition was funded by FEMA, Iowa Homeland Security and Iowa Department of Economic Development. There were other structures affected by this event identified but it was a voluntary program with homeowners and 3 opted not to participate. The FEMA approved Mystic City Plan also indicates that the City Maintenance shop, lift station and south bridge lie within the estimated floodplain.

The City has also indicated that the maintenance of the Mystic dam was a priority for to the City of Mystic. It has not been able to be restored due to lack of funding.

Mystic committee members stated that there has been some improvement to the community center. The building maintenance included installing a new roof and repairs to the restrooms.

The Mystic Mitigation Planning Committee is currently making arrangements to reconvene. It has been brought to their attention that the Multi-Jurisdictional plan has not yet replaced their City plan and the

annual evaluation process for that plan must begin. Committee members reviewed all other Mitigation Strategies and do not have any other progress toward accomplishing other strategies.

Community Identified Hazards & Mitigation Strategies

City of Mystic Representatives considered the overall rankings of the county hazards, considered the historical data from the City and reviewed the STAPLEE to make this decision. Mystic has a FEMA approved Hazard Mitigation Plan and completed the extensive process prior to the development of this plan. The selected mitigation action of completing the Acquisition and demolition of flooded properties is near completion as referenced above. Another significant mitigation strategy that the community is focusing on is to repair/replace the sewage lift station lies within the floodplain, has been critically damaged in flooding events and is minimally functioning.

H. Numa

See *Appendix B: Communities of Appanoose County* for location of Numa in relation to other communities in the county.

Geography

Numa is located in the south-west quadrant of the county at coordinates 40° 41' 8" N, 92° 58' 43" W. The city encompasses an area of .4 square miles with a population density of 245.7 people per square mile according to the 2000 Census. Cooper Creek and Shoal Creek pass Numa to the north and south, respectively, within about one-half of a mile.

Table 62: Numa Population

CENSUS	POPULATION	HOUSEHOLDS
2000	109	49
1990	151	52

Source: US Census Bureau

History / Development Trends

The town of Numa was laid out by G.R. Huston and E.E. Harvey and acknowledged by them March 13, 1871. The businesses of the town were a "well-stocked store, a grocery, physician's office, black-smith shop, etc." (History of Appanoose County, 1989 Reprint). Quite a number of men in the area work in the quarrying and rock hauling to the depot, the Rock Island Company is purchasing.

In 1907, fire destroyed the surface equipment of the Numa Block mine, at the time, the most productive mine in the county. The Numa Block shaft was 150 feet deep, giving access to a 30-inch coal seam. The Numa Block Coal Company also owned mines in Seymour, Iowa (about 8 miles to the west).[2]

The original Numa Block mine was closed in 1915, after having undermined 240 acres. In 1911, the Numa Block Coal Company started a new mine, about a mile east of Numa. When fully developed, this mine employed 155 men, hoisting 300 tons of coal daily to ship 175 carloads of coal monthly. A new company town, Martinstown, was platted around this mine in 1913. The 40 or so houses in Martinstown were frequently known as Shantytown. The mine closed in 1937, after undermining 96 acres. Aside from the blackened remains of the Martinstown slag pile, little remains of

Table 63: Potential Numa At Risk Population (2000)

	UNDER 5	UNDER 18	65+	LINGUISTICALLY ISOLATED
TOTAL COUNTY	771	3267	2739	19
NUMA	2	19	13	0

Source: US Census Bureau

this mine today.[3] In 1914, the Numa Block Coal Company produced over 100,000 tons of coal, ranking among the top 24 coal producers in the state.[4]

http://en.wikipedia.org/wiki/Numa,_Iowa

Population

As of the 2000 Census, the total population of Numa was 112 with a total of 49 households. Between 1990 and 2000, Numa lost 39 people and 3 households in contrast with the County's loss of population and gain in households. This is a loss of nearly 26% of population and about 6% loss of households.

At Risk Groups

As discussed in 2.A.vii, the Appanoose County section on at risk groups, young children, the elderly, and those that are linguistically isolated are generally identified as a "at risk groups." Less than 1% of each of the potential at risk populations in Appanoose County was located in Numa except for the linguistically isolated population. There were no linguistically isolated populations in 2000 located in Numa.

Income

In the 2000 Census, median household income for Numa was $26,625, up from $17,083 in the 1990 Census. Once inflation is accounted for, the real median household income has increased by nearly 14% since 1990 meaning that increased incomes were exceeding inflation. More than 75% of the households in Numa had incomes less than $50,000 in 1999. About 10% (12 people) of the population of Numa have incomes below the 1999 Federal Poverty Guidelines.

Table 64: Numa Household Income (2000)

	LESS THAN $24,999	$25,000 TO $49,999	$50,000 TO $74,999	$75,000+
HOUSEHOLDS	18	20	8	3
PROPORTION	36.73%	40.82%	16.33%	6.12%

Source: US Census Bureau

Major Employers

See 2.A.ix. for major employers in Appanoose County for a chart of major area employers.

Housing Information

Age of Housing

The majority (73.13%) of homes in Numa were built prior to 1940 though there was a spike in new homes built in the 1970's with over 16% of the housing stock built during this decade. More than 85% of homes (42 homes) in Numa are heated with bottled fuels and only 2 homes were heated by firewood in 2000.

Table 65: Year Built of Numa Housing (2000)

	Built before 1940	Built 1940 to 1949	Built 1950 to 1959	Built 1960 to 1969	Built 1970 to 1979	Built 1980 to 1989	Built 1990 to 2000
Housing Units	49	0	2	1	11	2	2
Proportion	73.13%	0.00%	2.99%	1.49%	16.42%	2.99%	2.99%

Source: US Census Bureau

Condition of Housing

There is not a current formal housing assessment for the city of Numa.

Value of Housing

Over 80% of the owner-occupied homes in Numa were valued at less than $40,000 and all homes were valued at less than $100,000.

Table 66: Numa Housing Valuations (2000)

	Less than $40,000	$40,000 to $99,999	$100,000 to $149,999	$150,000+
Homes	27	6	0	0
Proportion	81.82%	18.18%	0.00%	0.00%

Source: US Census Bureau

Transportation

Numa is not connected to any state or US highways and is accessed by rural and county roads. No railroads pass Numa but a natural gas pipeline does pass Numa on the east by less than one-tenth of a mile. Less than three and a half miles of roadway are contained within Numa's municipal boundary.

Existing Programs, Policies, and Technical Documents

There are many tools available to communities for them to determine their own futures; many of these tools are not as common in rural areas or small communities as they are in more populated places. However, these tools are of possible use to protecting residents of an area from various hazards, such as flooding, land sliding, and cave-ins. Please see Appendix HH for a complete list. Since there are not conventional planning mechanisms currently in place in this community, and future development of such mechanisms should consider the goals and objectives detailed in this plan as well as the mitigation actions evaluated here. Any budgetary development should consider mitigation actions and incorporate them where applicable. The development of ordinances that restrict future development should consult the hazard areas identified in this plan and consider the goals and objectives in this plan.

Community Assets

Refer to 2.A.xiii. for a description of what constitutes community assets in this plan.

See Table 67: Community Assets and Table 68: Critical Facilities for buildings located in Numa. See Appendix G: Community Assets and Critical Facilities for listing of which assets and facilities are present in Numa.

Table67: Numa Community Assets

ASSETS	NUMBER
COLLEGES	0
SCHOOLS	0
COMMUNITY CENTERS	0
PLACES OF WORSHIP	1

Source: Google Maps

Table68: Numa Critical Facilities

FACILITIES	NUMBER
NURSING / CONVALESCENT / RETIREMENT HOMES	0
HOSPITALS	0
AMBULANCE SERVICES	0
FIRE DEPARTMENTS / STATIONS	0
POLICE / LAW ENFORCEMENT FACILITIES	0
COURTHOUSES	0
GROCERY STORES	
COMMUNICATIONS	0
OTHER FACILITIES	0

Source: Google Maps

Table 69: Numa Valuations

Type of Structure (Occupancy Class)	Number of Structures	Total Valuation	Average Valuation
Residential	59	$1,678,410	$28,447.63
Commercial	1	$58,720	$58,720
Industrial			
Agricultural		$52,864	
Religious / Non-profit			
Government			
Education			
Utilities			
Total	60	$1,789,994	

Source: Appanoose County Assessor

Cultural Resources

Refer to 2.A.xiv. for a description of what constitutes cultural resources in this plan. There are no libraries or museums located in Numa. There is one prehistoric site in a section adjacent to Numa to the south. See *Appendix H: Historic Sites in Appanoose County* for an image of the county by section with a count of historic sites listed for each.

Community Identified Hazards & Mitigation Strategies

City of Numa Representative, Richard Brooke was present at the orientation meeting for Hazard Mitigation but had no other participation. The newly elected city state it was uncertain of the purpose of the Hazard Mitigation planning although there were notified and supplied with information numerous times. The city has indicated they would like to collaborate efforts in the future of Appanoose County to better mitigate for any hazards that could occur. The city clerk had indirect participation by supplying CVPD with information and County representatives have identified all concerns (See *Appendix GG*) and the major hazards the City

of Numa as being the most concerned of the entire county as: Thunderstorms/Lighting, Severe Winter Storms, and Tornados. The members considered the overall rankings of the county hazards and considered the historical data from the City to make this decision. The corresponding Mitigation actions of a generator for power to emergency shelter sites, updating/repair/replace early warning system and getting weather radios for households were of priority to the City of Numa.

I. Plano

See *Appendix B: Communities of Appanoose County* for location of Plano in relation to other communities in the county.

i. Geography

Plano is the western-most incorporated community of the county at coordinates 40° 45' 22" N, 93° 2' 47" W. The city encompasses an area of .6 square miles with a population density of 102.7 people per square mile according to the 2000 Census. Walnut Creek passes within one mile of Plano to the south and south-east.

ii. History / Development Trends

Not provided for this portion of the Appanoose County Plan.

iii. Population

As of the 2000 Census, the total population of Plano was 65 with a total of 35 households. Between 1990 and 2000, Plano lost 10 people but gained 3 households matching the County's loss of population and gain in households. This is a loss of more than 13% of population and about 9% gain of households.

Table70: Plano Population

CENSUS	POPULATION	HOUSEHOLDS
2000	65	35
1990	75	32

Source: US Census Bureau

iv. At Risk Groups

As discussed in 2.A.vii, the Appanoose County section on at risk groups, young children, the elderly, and those that are linguistically isolated are generally identified as a "at risk groups." Less than 1% of all of the potential at risk populations in Appanoose County are located in Plano. There were no linguistically isolated populations in 2000 located in Plano.

Table71: Potential Plano At Risk Population (2000)

	UNDER 5	UNDER 18	65+	LINGUISTICALLY ISOLATED
TOTAL COUNTY	771	3267	2739	19
PLANO	0	3	15	0

v. Income

In the 2000 Census, median household income for Plano was $30,625, up from $20,000 in the 1990 Census. Once inflation is accounted for, the real median household income has increased by about 12% since 1990 meaning that increased incomes were exceeding inflation. Nearly 75% of the households in Plano had incomes less than $50,000 in 1999. About 23% (15 people) of the population of Plano have incomes below the 1999 Federal Poverty Guidelines.

Table 72: Plano Household Income (2000)

	Less than $24,999	$25,000 to $49,999	$50,000 to $74,999	$75,000+
Households	16	10	7	2
Proportion	45.71%	28.57%	20.00%	5.71%

Source: US Census Bureau

Major Employers

See 2.A.ix. for major employers in Appanoose County for a chart of major area employers.

Housing Information

Age of Housing

About one-third (30.95%) of homes in Plano were built prior to 1940 however nearly 43% of the homes in Plano were built in the 1970's. Nearly 70% of homes (24 homes) in Plano are heated with bottled fuels and none are heated by firewood in 2000.

Table 73: Year Built of Plano Housing (2000)

	Built before 1940	Built 1940 to 1949	Built 1950 to 1959	Built 1960 to 1969	Built 1970 to 1979	Built 1980 to 1989	Built 1990 to 2000
Housing Units	13	4	0	2	18	0	5
Proportion	30.95%	9.52%	0.00%	4.76%	42.86%	0.00%	11.90%

Source: US Census Bureau

Condition of Housing

There is not a current formal housing assessment for the city of Plano.

Value of Housing

About 60% of the owner-occupied homes in Plano were valued at less than $40,000 and no homes were valued above $100,000.

Table 74: Plano Housing Valuations (2000)

	Less than $40,000	$40,000 to $99,999	$100,000 to $149,999	$150,000+
Homes	14	9	0	0
Proportion	60.87%	39.13%	0.00%	0.00%

Source: US Census Bureau

Transportation

Plano is connected to Highway 2 to the south by Highway 142 which also extends north then east to Highway 5 near Moravia. A railroad and natural gas pipeline both pass Plano over 1 mile to the southeast of town. There are about three miles of roadway in Plano's municipal boundaries.

Existing Programs, Policies, and Technical Documents

There are many tools available to communities for them to determine their own futures; many of these tools are not as common in rural areas or small communities as they are in more populated places. However, these tools are of possible use to protecting residents of an area from various hazards, such as flooding, land sliding, and cave-ins. See appendix HH for a complete list. Since there are not conventional planning mechanisms currently in place in this community, and future development of such mechanisms should consider the goals and objectives detailed in this plan as well as the mitigation actions evaluated here. Any budgetary development should consider mitigation actions and incorporate them where applicable. The development of ordinances that restrict future development should consult the hazard areas identified in this plan and consider the goals and objectives in this plan.

Table 75: Plano Community Assets

Assets	Number
Colleges	0
Schools	0
Community Centers	0
Places of Worship	1

Source: Google Maps

Table 76: Plano Critical Facilities

Facilities	Number
Nursing / Convalescent / Retirement Homes	0
Hospitals	0
Ambulance Services	0
Fire Departments / Stations	0
Police / Law Enforcement Facilities	0
Courthouses	0
Grocery Stores	
Communications	0
Other Facilities	0

Source: Google Maps

Community Assets

Refer to 2.A.xiii. for a description of what constitutes community assets in this plan.

See Table 75: Community Assets and Table 76: Critical Facilities for buildings located in Plano. See Appendix G: Community Assets and Critical Facilities for listing of which assets and facilities are present in Plano.

Table77: Plano Valuations

Type of Structure (Occupancy Class)	Number of Structures	Total Valuation	Average Valuation
Residential	40	$1,593,740	$39,843.5
Commercial	3	$31,360	$10,453.33
Industrial			
Agricultural		$224,950	
Religious / Non-profit			
Government			
Education			
Utilities			
Total	43	$1,850,050	

Source: Appanoose County Assessor

Cultural Resources

Refer to 2.A.xiv. for a description of what constitutes cultural resources in this plan. There are no libraries or museums located in Plano. There are no archeological sites in or adjacent to Plano. See *Appendix H: Historic Sites in Appanoose County* for an image of the county by section with a count of historic sites listed for each.

Community Identified Hazards & Mitigation Strategies

City of Plano Mayor, Richard Gordan was involved in the planning process and have identified all concerns (See *Appendix GG*) and the major hazards the City of Plano are most concerned about are: Thunderstorms/Lighting, Severe Winter Storms, and Tornados. The council members considered the overall rankings of the county hazards, considered the historical data from the City, and the STAPLEE to make this decision. The corresponding Mitigation action of a generator for power to emergency shelter site was a priority to the City of Plano.

J. Rathbun

See *Appendix B: Communities of Appanoose County* for location of Rathbun in relation to other communities in the county.

Geography

Rathbun is located near the center of the county at coordinates 40° 48’ 5” N, 92° 53’ 18” W. The city encompasses an area of .2 square miles with a population density of 408.7 people per square mile according to the 2000 Census. Walnut Creek and Little Walnut Creek meet just east of Rathbun and each passes through extremities of town.

History / Development Trends

Incorporated in 1897, Rathbun was established in 1892 as a mining town. [2] At the end of the 19th century, "the valley of Walnut Creek was one continuous mining camp, known under different names, Jerome, Diamond, Mystic, Clarksdale, Rathbun and Darby" (later known as Darbyville)[3]

The Star Coal Company of Streator, Ill. operated the Rathbun Mine, with an 82 foot deep shaft. This mine was in operation in 1895, and by 1908 it was considered one of the best equipped longwall mines in the county. The Darby mine, operated by the Unity Block Coal Company, was about a mile northeast of Rathbun. This had a 50 foot shaft and was nearly played out by 1908. The Evans Mine, about halfway between the Rathbun and Darbyville, formerly operated by the American Coal Company, had already been closed by 1908.

http://en.wikipedia.org/wiki/Rathbun,_Iowa

Population

As of the 2000 Census, the total population of Rathbun was 88 with a total of 34 households. Between 1990 and 2000, Rathbun lost 1 person and 1 household in contrast with the County's loss of population and gain in households. This is a loss of about 1% of population and about 3% loss of households.

Table 78: Rathbun Population

CENSUS	POPULATION	HOUSEHOLDS
2000	88	34
1990	89	35

Source: US Census Bureau

At Risk Groups

As discussed in 2.A.vii, the Appanoose County section on at risk groups, young children, the elderly, and those that are linguistically isolated are generally identified as a "at risk groups." Less than 1% of each of the potential at risk populations in Appanoose County was located in Rathbun except for the linguistically isolated population. There were no linguistically isolated populations in 2000 located in Rathbun.

Table79: Potential Rathbun At Risk Population (2000)

	UNDER 5	UNDER 18	65+	LINGUISTICALLY ISOLATED
TOTAL COUNTY	771	3267	2739	19
RATHBUN	2	25	10	0

Source: US Census Bureau

Income

In the 2000 Census, median household income for Rathbun was $40,000, up from $16,458 in the 1990 Census. Once inflation is accounted for, the real median household income has increased by nearly 45% since 1990 meaning that increased incomes were exceeding inflation. More than 70% of the households in Rathbun had incomes less than $50,000 in 1999. About 17% (15 people) of the population of Rathbun have incomes below the 1999 Federal Poverty Guidelines.

Table80: Rathbun Household Income (2000)

	LESS THAN $24,999	$25,000 TO $49,999	$50,000 TO $74,999	$75,000+
HOUSEHOLDS	9	16	7	2
PROPORTION	26.47%	47.06%	20.59%	5.88%

Source: US Census Bureau

Major Employers

See 2.A.ix. for major employers in Appanoose County for a chart of major area employers.

Housing Information

Age of Housing

The majority (62.96%) of homes in Rathbun were built prior to 1940 though there was a spike in new homes built in the 1970's with nearly 13% of the housing stock built during this decade. Less than 76% of homes (26 homes) in Rathbun are heated with bottled fuels and 4 homes were heated by firewood in 2000.

Table 81: Rathbun Housing Valuations (2000)

	Less than $50,000	$50,001 to $99,999	$100,000 to $149,999	$150,000+
Homes	23	2	0	2
Proportion	85.2%	7.4%	0.00%	7.41%

Source: US Census Bureau

Table82: Year Built of Rathbun Housing (2000)

	Built before 1940	Built 1940 to 1949	Built 1950 to 1959	Built 1960 to 1969	Built 1970 to 1979	Built 1980 to 1989	Built 1990 to 2000
Housing Units	34	4	3	2	7	2	2
Proportion	62.96%	7.41%	5.56%	3.70%	12.96%	3.70%	3.70%

Source: US Census Bureau

Condition of Housing

There is not a current formal housing assessment for the city of Rathbun.

Value of Housing

Over 90% of the owner-occupied homes in Rathbun were valued at less than $100,000 and most homes were valued at less than $40,000. Only two homes were valued above $150,000; both houses were valued under $175,000 however.

Table 83: Rathbun Critical Facilities

Facilities	Number
Nursing / Convalescent / Retirement Homes	0
Hospitals	0
Ambulance Services	0
Fire Departments / Stations	0
Police / Law Enforcement Facilities	0
Courthouses	0
Grocery Stores	
Communications	0
Other Facilities	0

Source: Google Maps

Transportation

Rathbun is not connected by any state or US highway and is accessed by rural and county roads. Highway 5 passes Rathbun about one-and-a-half miles to the east and is accessed by county road J29. One railroad passes through the southeastern portion of town but no pipelines are located near Rathbun. About 2 ½ miles of roadway are located within Rathbun's municipal boundary.

Existing Programs, Policies, and Technical Documents

There are many tools available to communities for them to determine their own futures; many of these tools are not as

common in rural areas or small communities as they are in more populated places. However, these tools are of possible use to protecting residents of an area from various hazards, such as flooding, landsliding, and cave-ins. See appendix HH for a complete list. Since there are not conventional planning mechanisms currently in place in this community, and future development of such mechanisms should consider the goals and objectives detailed in this plan as well as the mitigation actions evaluated here. Any budgetary development should consider mitigation actions and incorporate them where applicable. The development of ordinances that restrict future development should consult the hazard areas identified in this plan and consider the goals and objectives in this plan.

Community Assets

Refer to 2.A.xiii. for a description of what constitutes community assets in this plan.

See Table 84: Community Assets and Table 85: Critical Facilities for buildings located in Rathbun. See Appendix G: Community Assets and Critical Facilities for listing of which assets and facilities are present in Rathbun.

Table 84: Rathbun Community Assets

ASSETS	NUMBER
COLLEGES	0
SCHOOLS	0
COMMUNITY CENTERS	0
PLACES OF WORSHIP	0

Source: Google Maps

Table 85: Rathbun Valuations

Type of Structure (Occupancy Class)	Number of Structures	Total Valuation	Average Valuation
Residential	51	$2,037,980	$39,960.39
Commercial	2	$136,260	$68,130
Industrial			
Agricultural		$8,970	
Religious / Non-profit			
Government			
Education			
Utilities			
Total	53	$2,183,210	

Source: Appanoose County Assessor

Cultural Resources

Refer to 2.A.xiv. for a description of what constitutes cultural resources in this plan. There are no libraries or museums located in Rathbun. There are two prehistoric sites in a section that is partially within the municipal boundaries and one prehistoric site in a section adjacent to Rathbun to the south. See *Appendix H: Historic Sites in Appanoose County* for an image of the county by section with a count of historic sites listed for each.

Community Identified Hazards & Mitigation Strategies

Community of Rathbun had active representatives, David Coffin and Tom Anderson, that have identified all concerns (See *Appendix GG*) and the major hazards the City of Rathbun are most concerned about are:

Thunderstorms/Lighting, Severe Winter Storms, and Tornados. The members considered the overall rankings of the county hazards, considered the historical data from the City, and the STAPLEE to make this decision. The corresponding Mitigation actions selected were every household to have weather radios and homeowners to have surge protection were identified as a priority to the City of Rathbun.

K. Udell

See *Appendix B: Communities of Appanoose County* for location of Udell in relation to other communities in the county.

Geography

Udell is located in the south-west quadrant of the county at coordinates 40° 46' 48" N, 92° 44' 29" W. The city encompasses an area of .3 square miles with a population density of 183 people per square mile according to the 2000 Census. No stream or river passes within one mile of Udell.

History / Development Trends

Udell was called Udell from the name of the "Udell Township", which was named from the Udells, a very prominent family that was active in the early history of Unionville, Centerville, and Blakesburg. Udell Township was one of the first townships settled in this area by the Crow family in 1843. It was organized in 1858 and was one of the first to invite settlers.

As Udell town grew in the early 1900's, employment found tree eight hour agents and night operators, large sections gangs and work trains on the sidings with groups of men working on the railroads. Many Udell men worked on both railroads. Later years there were as many as fourteen passenger trains going through Udell every day. There were also frequent mail trains that brought mail to the reason and were then distributed to near-by communities.

There were approximately 23 businesses and 2 doctors in Udell in 1914. Progressive successful business seemed to be typical of a portion of these decades toward the time of the depression in 1933 when it began to decline. During this progressive time, several community churches and schools were established. A two story school house was built in Udell prior to the school for consolidation in 1914 which was the first consolidated school in southern Iowa. Classes were held in this building including senior high and grades until 1960 when the high school was moved to Moulton. The building was vacated in the fall of 1974.

Considerable changes and differences had began in Udell around the time of the thirties and after the depression. The school was still in full schedule which was the promoting factor for the town but this was the beginning of the pattern of small town that occurred during that period. A number of families were finding employment elsewhere. People now took advantage of the transportation changes with better roads and improved automobiles with traveling away much easier and convenient. Families were finding their supplies for everyday living elsewhere with more choice and bargain prices. This trend continued through the forties and fifties. Udell was found without the stores and businesses that had been available in previous years. The Rock Island Railroad was moved away in 1947 and soon afterwards the Wabash services dwindled to no services for Udell.

Table 86: Udell Population

CENSUS	POPULATION	HOUSEHOLDS
2000	65	23
1990	76	25

Source: US Census Bureau

(**Moulton, Iowa American Revolution Bicentennial**, 1976)

Population

As of the 2000 Census, the total population of Udell was 65 with a total of 23 households. Between 1990 and 2000, Udell lost 11 people and 2 households in contrast with the County's loss of population and gain in households. This is a loss of over 14% of population and about 8% loss of households.

At Risk Groups

As discussed in 2.A.vii, the Appanoose County section on at risk groups, young children, the elderly, and those that are linguistically isolated are generally identified as a "at risk groups." Less than 1% of all of the potential at risk populations in Appanoose County are located in Udell. There were no linguistically isolated populations in 2000 located in Udell.

Table 87: Potential Udell At Risk Population (2000)

	UNDER 5	UNDER 18	65+	LINGUISTICALLY ISOLATED
TOTAL COUNTY	771	3267	2739	19
UDELL	2	30	1	0

Source: US Census Bureau

Income

In the 2000 Census, median household income for Udell was $24,688, up from $11,875 in the 1990 Census. Once inflation is accounted for, the real median household income has increased by about 35% since 1990 meaning that increased incomes were exceeding inflation. More than 75% of the households in Udell had incomes less than $24,000 in 1999. About 15% (9 people) of the population of Udell have incomes below the 1999 Federal Poverty Guidelines.

Table88: Udell Household Income (2000)

	LESS THAN $24,999	$25,000 TO $49,999	$50,000 TO $74,999	$75,000+
HOUSEHOLDS	7	2	0	0
PROPORTION	77.78%	22.22%	0.00%	0.00%

Source: US Census Bureau

Major Employers

See 2.A.ix. for major employers in Appanoose County for a chart of major area employers.

Housing Information

Age of Housing

Many (40.91%) of the homes in Udell were built prior to 1940 though there was growth between 1950 and 1970 with more than 45% of the housing stock built during these two decades. More than half of the homes (12 homes) in Udell are heated with bottled fuels and none were heated by firewood in 2000.

Table89: Year Built of Udell Housing (2000)

	Built before 1940	Built 1940 to 1949	Built 1950 to 1959	Built 1960 to 1969	Built 1970 to 1979	Built 1980 to 1989	Built 1990 to 2000
Housing Units	9	0	6	4	2	1	0
Proportion	40.91%	0.00%	27.27%	18.18%	9.09%	4.55%	0.00%

Source: US Census Bureau

Condition of Housing

There is not a current formal housing assessment for the city of Udell.

Value of Housing

Over 75% of the owner-occupied homes in Udell were valued at less than $40,000 and all homes were valued at less than $100,000.

Table 90: Udell Housing Valuations (2000)

	Less than $40,000	$40,000 to $99,999	$100,000 to $149,999	$150,000+
Homes	7	2	0	0
Proportion	77.78%	22.22%	0.00%	0.00%

Source: US Census Bureau

Transportation

No state or US highways connect to Udell; Udell is accessed by rural and county roads. The Appanoose Community Railroad passes through town and a crude oil / petroleum pipeline crosses through the extreme southeastern corner of Udell. Less than 3 miles of roadways are contained within the municipal boundaries of Udell.

Existing Programs, Policies, and Technical Documents

There are many tools available to communities for them to determine their own futures; many of these tools are not as common in rural areas or small communities as they are in more populated places. However, these tools are of possible use to protecting residents of an area from various hazards, such as flooding, land sliding, and cave-ins. See appendix HH for a complete list. Since there are not conventional planning mechanisms currently in place in this

Table 91: Udell Community Assets

Assets	Number
Colleges	0
Schools	0
Community Centers	0
Places of Worship	1

Source: Google Maps

Table 92: Udell Critical Facilities

Facilities	Number
Nursing / Convalescent / Retirement Homes	0
Hospitals	0
Ambulance Services	0
Fire Departments / Stations	0
Police / Law Enforcement Facilities	0
Courthouses	0
Grocery Stores	
Communications	0
Other Facilities	0

Source: Google Maps

community, and future development of such mechanisms should consider the goals and objectives detailed in this plan as well as the mitigation actions evaluated here. Any budgetary development should consider mitigation actions and incorporate them where applicable. The development of ordinances that restrict future development should consult the hazard areas identified in this plan and consider the goals and objectives in this plan.

Community Assets

Refer to 2.A.xiii. for a description of what constitutes community assets in this plan.

See Table 91: Community Assets and Table 92: Critical Facilities for buildings located in Udell. See Appendix G: Community Assets and Critical Facilities for listing of which assets and facilities are present in Udell.

Table 93: Udell Valuations

Type of Structure (Occupancy Class)	Number of Structures	Total Valuation	Average Valuation
Residential	24	$596,200	$24,841.67
Commercial	1	$5,670	$5,670
Industrial			
Agricultural		$81,040	
Religious / Non-profit			
Government			
Education			
Utilities			
Total	25	$682,910	

Source: Appanoose County Assessor

Cultural Resources

Refer to 2.A.xiv. for a description of what constitutes cultural resources in this plan. There are no libraries or museums located in Udell. There are no archeological sites in or adjacent to Udell. See *Appendix H: Historic Sites in Appanoose County* for an image of the county by section with a count of historic sites listed for each.

Community Identified Hazards & Mitigation Strategies

City of Udell Representatives were uncertain of the purpose of the Hazard Mitigation planning although there were notified and supplied with information numerous times. The city was indirectly involved with participation by simply supplying statistical information when requested but then were also later contacted when planners changed. Udell officials, Eric (Mayor) and Melissa (City Clerk) Pace, indicated more interest and were provided with the opportunity to review this plan on March 12, 2010. Both spent time reading the document and asking questions while in the CVPD office. The city would also like to collaborate with the efforts of Appanoose County to better mitigate for any hazards that could occur. The representatives have identified all concerns (See *Appendix GG*) and the major hazards the City of Udell are most concerned about are: Thunderstorms/Lightning, Severe Winter Storms, and Tornados. The members considered the overall rankings of the county hazards and considered the historical data from the City to make this decision. The corresponding Mitigation actions of a generator for power to emergency shelter site, developing an evacuation plan and weather radios at each residence were of priority to the City of Udell.

L. Unionville

See *Appendix B: Communities of Appanoose County* for location of Unionville in relation to other communities in the county.

Geography

Unionville is located in the south-west quadrant of the county at coordinates 40° 49' 7" N, 92° 41' 40" W. The city encompasses an area of .7 square miles with a population density of 170.5 people per square mile according to the 2000 Census. South Soap Creek passes just over half of a mile to the north of Unionville.

History / Development Trends

Unionville was the first town to be recorded in Appanoose County, Iowa. It was located on the old Dragooon Trail and on the same road traveled by the Morman's on their exodus from Nauvoo, Illinois to Salt Lake City, Utah.

Earliest settlers in the region before the town was formally laid out were J. Clancy and William Crow coming from Missouri to settle in about 1844 or 1845.

The first school to be built in Unionville was constructed of hewn logs and erected in 1850. Previous to that some teaching had been done in private homes, especially in some fo the residences of the settlers coming from the Tennessee. An Independent School district was organized in 1862 and work was begun on a new school house in the following year. The building was known as the "Academy" as that was the common term for secondary schools of that period of time. It housed students through what would correspond to about the tenth grade of modern day school systems. This school house was used until late 1890's when it was replaced by a larger building, the last school building in Unionville, ad used until the district came under school reorganization and students were bused to the central building at Moravia.

The first general store and trading post opened in 1850 as many items were received in trade as were dispensed. The business prospered until the Civil War Period. The development of the railway system was crucial in the development of the city. The Chicago and Southern Railway company obtained a right of way through Unionville in 1870. A population boom followed the building of the railroad. This growth later spurred more development of local businesses. As one time in the dim past, Unionville was a thriving community boasting of 2 hotels, 3 general stores, a grist mill, a drug store, a blacksmith shop and saw mill to mention a few of its businesses. Unionville also became famous for some its lovely built homes.

Table 94: Unionville Population

CENSUS	POPULATION	HOUSEHOLDS
2000	124	44
1990	133	52

Source: US Census Bureau

Many of the business and professional leaders of Centerville are descendants of early Unionville pioneer families. As every small community falters, Unionville did also. The bacnk ceased to operate, stores burned or were destroyed by the other elements, the railroad was moved, hotels failed to operate as time moved on in search of progress. An early pioneer resident of the community would not recognize it today because many of the old landmarks are now gone.

(**Moulton, Iowa American Revolution Bicentennial**, 1976)

Population

As of the 2000 Census, the total population of Unionville was 124 with a total of 44 households. Between 1990 and 2000, Unionville lost 9 people and 8 households in contrast with the County's loss of population and gain in households. This is a loss of about 7% of population and about 15% loss of households.

At Risk Groups

As discussed in 2.A.vii, the Appanoose County section on at risk groups, young children, the elderly, and those that are linguistically isolated are generally identified as a "at risk groups." Less than 2% of each of the potential at risk populations in Appanoose County was located in Unionville except for the linguistically isolated population. There were no linguistically isolated populations in 2000 located in Unionville.

Table 95: Potential Unionville At Risk Population (2000)

	UNDER 5	UNDER 18	65+	LINGUISTICALLY ISOLATED
TOTAL COUNTY	771	3267	2739	19
UNIONVILLE	11	36	15	0

Source: US Census Bureau

v. Income

In the 2000 Census, median household income for Unionville was $33,333, up from $18,000 in the 1990 Census. Once inflation is accounted for, the real median household income has increased by over 27% since 1990 meaning that increased incomes were exceeding inflation. More than 60% of the households in Unionville had incomes less than $50,000 in 1999. About 11% (14 people) of the population of Unionville have incomes below the 1999 Federal Poverty Guidelines.

Table 96: Unionville Household Income (2000)

	LESS THAN $24,999	$25,000 TO $49,999	$50,000 TO $74,999	$75,000+
HOUSEHOLDS	15	13	12	4
PROPORTION	34.09%	29.55%	27.27%	9.09%

Source: US Census Bureau

Major Employers

See 2.A.ix. for major employers in Appanoose County for a chart of major area employers.

Housing Information

Age of Housing

Many (40%) of homes in Unionville were built prior to 1940 though there was a spike in new homes built in the 1970's with over 21% of the housing stock built during this decade. More than 70% of homes (32 homes) in Unionville are heated with bottled fuels and 4 homes were heated by firewood in 2000.

Table 97: Year Built of Unionville Housing (2000)

	Built before 1940	Built 1940 to 1949	Built 1950 to 1959	Built 1960 to 1969	Built 1970 to 1979	Built 1980 to 1989	Built 1990 to 2000
Housing Units	26	6	0	8	14	3	8
Proportion	40.00%	9.23%	0.00%	12.31%	21.54%	4.62%	12.31%

Source: US Census Bureau

Condition of Housing

There is not a current formal housing assessment for the city of Unionville.

Value of Housing

More than half of the owner-occupied homes in Unionville were valued at less than $40,000 and all homes were valued at less than $100,000.

Table98: Unionville Housing Valuations (2000)

	Less than $40,000	$40,000 to $99,999	$100,000 to $149,999	$150,000+
Homes	13	10	0	0
Proportion	56.52%	43.48%	0.00%	0.00%

Source: US Census Bureau

Transportation

Unionville is not accessible by state or US highways but is by county roads. No railroad comes close to Unionville; however a crude oil / petroleum pipeline passes through the extreme northwestern corner of town. There are slightly more than 3 miles of roadways in the municipal boundaries of Unionville.

Existing Programs, Policies, and Technical Documents

There are many tools available to communities for them to determine their own futures; many of these tools are not as common in rural areas or small communities as they are in more populated places. However, these tools are of possible use to protecting residents of an area from various hazards, such as flooding, land sliding, and cave-ins. See appendix HH for a complete list. Since there are not conventional planning mechanisms currently in place in this community, and future development of such mechanisms should consider the goals and objectives detailed in this

Table 99: Unionville Community Assets

Assets	Number
Colleges	0
Schools	0
Community Centers	0
Places of Worship	2

Source: Google Maps

Table100: Unionville Critical Facilities

Facilities	Number
Nursing / Convalescent / Retirement Homes	0
Hospitals	0
Ambulance Services	0
Fire Departments / Stations	0
Police / Law Enforcement Facilities	0
Courthouses	0
Grocery Stores	
Communications	0
Other Facilities	0

plan as well as the mitigation actions evaluated here. Any budgetary development should consider mitigation actions and incorporate them where applicable. The development of ordinances that restrict future development should consult the hazard areas identified in this plan and consider the goals and objectives in this plan.

Community Assets

Refer to 2.A.xiii. for a description of what constitutes community assets in this plan.

See Table 99: Community Assets and Table 100: Critical Facilities for buildings located in Unionville. See Appendix G: Community Assets and Critical Facilities for listing of which assets and facilities are present in Unionville.

Table 101: Unionville Valuations

Type of Structure (Occupancy Class)	Number of Structures	Total Valuation	Average Valuation
Residential	58	$1,728,350	$29,799.14
Commercial		$50,000	
Industrial			
Agricultural		$157,470	
Religious / Non-profit			
Government			
Education			
Utilities			
Total	58	$1,935,820	

Source: Appanoose County Assessor

Cultural Resources

Refer to 2.A.xiv. for a description of what constitutes cultural resources in this plan. There are no libraries or museums located in Unionville. There is one prehistoric site in a section partially encompassed in the municipal boundaries. See *Appendix H: Historic Sites in Appanoose County* for an image of the county by section with a count of historic sites listed for each.

Community Identified Hazards & Mitigation Strategies

City of Unionville Representatives were uncertain of the purpose of the Hazard Mitigation planning although there were notified and supplied with information numerous times. Unionville officials were provided with the opportunity to review this plan and gather a better understanding of the purpose and intention. The attached letter (Appendix EE) from the City of Unionville provides documentation that city representative have reviewed this plan and agree with the information supplied in it. They had indirect participation by supplying CVPD with information as requested and they would also like to collaborate with the efforts of Appanoose County to better mitigation for any hazards that could occur. The representatives have identified all concerns (See *Appendix GG*) and the major hazards the City of Unionville are most concerned about are: Thunderstorms/Lighting, Severe Winter Storms, and Tornados. The members considered the overall rankings of the county hazards and considered the historical data from the City to make this

decision. The corresponding Mitigation actions of maintenance of older buildings and hazardous materials disposal were the priority to the City of Unionville.

M. Lake Rathbun

See *Appendix B: Communities of Appanoose County* for location of Lake Rathbun in relation to other communities in the county.

Rathbun Lake is maintained by the U.S. Army Corps of Engineers. Its 11,000 acres are popular for water sports and fishing spring through fall, locally the lake is called Iowa's Ocean. An abundance of public-use land around the lake provides additional recreation opportunities.

Access to the lake is easy from five Corps parks, Honey Creek State Park, and two marinas. Top water sports include sail boating, motor boating, water skiing, and fishing. Three areas are designated swimming beaches. Fishing is popular: in spring for crappie, in summer for walleye and bass, and for catfish, late summer through fall.

There are eight campgrounds around the lake. On the northern shore of the lake Honey Creek State Park offers 828 acres of camping and trails. Marinas at both the east and west ends of the lake provide supplies, slip rentals, campgrounds, and a hotel.

Public-use land around the lake is open for off-lake activities. Hunting, for a variety of birds; pheasant, turkey, duck, quail, and geese, and also for deer, is open in designated areas. Snowmobile trails along the lake's north shore provide 35 miles of winter fun. Birdwatching is popular along the one-third mile Oxbow Trail in the Chariton River Valley. South of the lake, a 125-acre abandoned rock quarry provides year round off-road trails for motorcycle and ATVs. Below the dam, the Rathbun Fish Hatchery raises catfish, walleye, and largemouth bass that stock lakes and rivers statewide. It is open for self-guided tours during weekdays.

HISTORY

Rathbun Lake was dedicated July 31, 1971 with President Richard Nixon being the keynote speaker. Iowa Governor Robert Ray, Senator Jack Miller and Congressman John Kyl also attended the dedication.

The construction of Rathbun Dam and Reservoir was authorized by the Flood Control Act of 1954 (Public Law 83-780). Construction of the dam and embankment began in September 1964. Operation as a multi-purpose unit began November 1969 and the top of multi-purpose pool (904 msl) was reached on October 10, 1970.

Rathbun Lake Pioneers (people who were dedicated in establishing Rathbun Dam) are honored north of the Rathbun Lake Visitor Center with stone markers and trees

THE LAKE

The U.S. Army Corps of Engineers has the responsibility for managing the 55 square miles of land and water at Rathbun Lake.

Lands around the lake are managed by the Corps of Engineers to preserve their natural value. Land management practices such as prairie restoration, prescribed burning and tree planting help conserve soil and benefit wildlife.

Rathbun Lake provides flood protection for 149,300 acres of land along the Chariton River downstream from the dam and is part of a network of Corps Lakes that help control flooding on the Missouri and Mississippi River.

THE DAM & SPILLWAY

Rathbun Lake was constructed and is operated by the U.S. Army Corps of Engineers. Located at Chariton River mile marker 142, approximately 7 miles north of Centerville Iowa, in Appanoose County, it is one of the largest lakes in Iowa. The lake was constructed to control flooding, provide recreation opportunities, abate stream pollution, fish and wildlife enhancement, and maintain minimum stream flow on the Chariton, Missouri, and Mississippi Rivers.

The Chariton and South Fork of the Chariton River are the major sources of water flowing into Rathbun Lake. The Chariton River Basin drains a total or 2,309 square miles, of which 549 square miles are located above the dam. The basin runs generally from north to south. The drainage area has a maximum width of 25 miles and an average width of 12 miles. Rathbun Lake has a flood control pool of 20,948 surface acres and a multipurpose pool of 11,013 surface acres. Rathbun Lake averages about one mile in width and has 155 miles of shoreline at the top of multipurpose pool elevation. At full pool elevation, the lake has 319 miles of shoreline and extends generally westward a distance of about 21 miles into Lucas, Wayne, and Monroe Counties.

The dam consists of a rolled earthfill embankment with an uncontrolled spillway located approximately 3,000 feet westward of the right abutment. Discharges enter a concrete stilling basin. Rathbun Dam is considered a "High Hazard Dam" in the 2007 State of Iowa Mitigation Plan. The Army Corp of Engineer's has an entire Emergency Plan to prevent and handle such an event if it were to occur. This plan is a confidential document housed at the Army Corp of Engineer's headquarters. The community of Rathbun lies directly downstream of the dam and it's discharge. This entire small community would be indunated with water if there was a breach in the dam. The emergency sounds would alert residents to evacuate but there may not be enough time allowed.

CAMPING

Seven campgrounds are conveniently located around Rathbun Lake. The Corps manages five of these campgrounds Buck Creek, Prairie Ridge, Bridge View, Island View, and Rolling Cove Parks. The Iowa

Department of Natural Resources manages Honey Creek campground. A private concessionaire manages the South Fork and Buck Creek Marina campgrounds.

User fees are charged for camping in parks that the Corps of Engineers operates. The amount of the fee is based on the type of facilities provided.

Campgrounds contain level campsites, many with electrical hookups, lantern hanging posts, picnic tables, and fire rings. Shower buildings, sanitary dump stations, playgrounds, and fish cleaning stations are located in most parks. Please click on campground specific information for a complete list of amenities and fees for each campground.

Entrance stations are located at most campgrounds and all campgrounds are patrolled routinely by Park Rangers and Appanoose County Sheriff's Deputies

Table 101: Services offered at Lake Rathbun sites

Recreation Area	Camping	Lodging	Showers	Boat Ramps	Marina	Gas	Picnic Area \ Shelter	Playground	Swimming Area	Fishing Facilities	Trails	Golf Course	Amphitheater	Grocery / Snack Bar
Bridgeview	**E N D**		**X**	**X**			**A GS**	**X**						
Buck Creek	**E D**		**X**	**X**			**A GS**	**X**	**BE**	**C**				
Honey Creek Resort Park	x	x	x			x	x	x			x	x		
Honey Creek State Park	**E N T G D**			**X**						**C**	**H M**			
Island View	**E N T G D**		**X**	**X**			**A GS**	**X**	**BE**	**D**				
Outlet Area				**X**			**A GS**	**X**			**I**			

Prairie Ridge	**E N G D**		**X**	**X**			**GS**	**X**		**C**				
Rathbun Marina	**E**	**X**		x		x								**G**
Rolling Cove	**N D**		**X**	**X**			**A**			**C**				
South Fork Marina	**E D**			**X**										**G**

Corps Managed **$** Corps Collected Fees Managed by Others in *Italics*

X Exists at lake

Camping

E Electric Campsites

N Non-electric Campsites

T Pull Through Campsites

G Group Camping

D Dump Station

Picnic

A Picnic Area

G Group Picnic

GS Group Picnic Shelter

Swimming

BE Beach

P Swimming Pool

Fishing

C Fish Cleaning Stations

D Fishing Docks

Trails

B Bike Trails

Q Equestrian Trails

H Hiking Trails

I Hiking Trails - Interpretive

R Off Road Vehicle Trails

M Miscellaneous Trails

VISITATION (1971-2009)

Year	Visitor Hours*	Visitor Days*
2009	9,740,553	

2008	6,085,684	
2007	6,515,824	
2006	7,223,052	
2005	6,614,623	
2004	5,610,891	
2003	5,600,757	
2002	5,821,404	
2001	5,393,430	
2000	5,437,933	
1999	5,754,431	
1998**	6,052,658	
1997	5,912,993	
1996	6,301,211	
1995	5,721,990	
1994	5,209,416	
1993	4,547,438	
1992	5,354,010	
1991	3,381,151	
1990	3,358,470	
1989	3,233,589	
1988	2,836,429	
1987*		1,032,461
1986		951,799
1985		1,039,120

1984		853,319
1983		873,574
1982		858,581
1981		1,030,268
1980		1,166,177
1979		1,169,567
1978		1,334,172
1977		1,482,044
1976		2,004,843
1975		2,076,310
1974		1,748,564
1973		1,213,228
1972		1,587,685
1971		1,157,292
*Rathbun Lake changed from calculating visitation in visitor-days to visitor-hours in 1987. **Reporting changed from calendar year to fiscal year		

***Visitor hour**

The presence of one or more persons on an area of land or water for the purpose of engaging in recreation activities during continuous or intermittent periods of time aggregating 60 minutes.

***Visitor day**

A visit by one individual to a recreation development or area for recreation purposes during any reasonable portion or all of a 24-hour period.

John Pasa, Army Corp of Engineer's, participated in the majority of the Appanoose Hazard Mitigation planning meetings. He explained that the of the Corp of Engineers estimates that on holiday weekends the lake could see the population of the park attendance exceed 40,000 people.

BOATING

Whether power boating or sailing, Rathbun Lake, also known as Iowa's Ocean, has something to offer for all.

Power boaters on Rathbun Lake will enjoy the large main body of the lake on calm days for water skiing on its glass like surface. If the wind blows too hard, the Buck Creek, Honey Creek and South Fork arms of the lake offer protection from rough water.

Sail boaters can find plenty of room to maneuver on Rathbun Lake's nine-mile fetch of open water on the main body of the lake. The size of the lake combined with the prevailing winds make Rathbun Lake one of the best sailing lakes in Iowa.

Marinas at both ends of the lake – Buck Creek Marina on the east end and South Fork on the west – provide fuel mooring facilities and other supplies.

Day use fees are required for launching at Corps managed boat ramps. A daily fee of $3.00 is charged to launch at ramps. In lieu of the daily permit an annual pass may be purchased for $30.00. This pass is good at any Corps of Engineers facility nationwide.

Boaters should be aware that hazardous boating areas do occur on Rathbun Lake. For locations of the hazardous boating please refer to the lake map.

Remembering to follow safety rules while boating may be easier now at Rathbun Lake. Four of the main boat ramps have 4' x 8' billboards for posting safety messages, thanks to a Grassroots Grant and the collaborative effort of the Rathbun Lake Association, the U.S. Army Corps of Engineers and the BoatUS Foundation.

Boat Ramps

Boat Ramps are available for usage at all eight parks. The Corps of Engineers has ten boat ramps. A day use pass is required at Corps of Engineers managed boat ramps. Honey Creek State Park has two boat ramps.

Handicapped Docks and Loading Facilities

A loading facility is available at the Corps of Engineers Island View Park Dedication Site boat ramp. This facility provides a three level loading ramp, which provides easier and better boating access to everyone.

A handicapped accessible fishing dock is available at the Island View Dedication Site boat ramp located closest to the main dam.

(www.nwk.usace.army)

HONEY CREEK RESORT STATE PARK

Honey Creek Resort State Park opened September 19th, 2008. The golf course, 105 room lodge, water park, restaurant and conference center, docks and 28 cottages are all open. Work continues on the boat ramp, and picnic area as well as landscaping of the entire area.

Honey Creek Resort State Park, located on the shores of Rathbun Lake, was developed as a high quality natural area with high quality amenities for use by outdoor enthusiasts during all four seasons.

The Iowa Department of Natural Resources (IDNR) owns the facilities which include a 105 room lodge, an indoor water park, a large conference center, eighteen-hole golf course, courtesy docks, RV park and two and one-half miles of nature/primitive hiking trails. Also included in the park are: three miles of paved bike trails, and twenty-eight modern cottages. Picnic shelters, a boat ramp, swimming beach and an activities center are under development.

The park has a biologically diverse natural preserve area set aside to protect rare prairie plants within the park. IDNR will provide a wide variety of programming to provide outdoor experiences and learning opportunities to visitors.

The U.S. Army Corps of Engineers is one of several partners in this development project. The Corps of Engineers manages Rathbun Lake, a 34,000 acre, multi-purpose lake project, in southern Iowa. The Corps has leased 450 acres of shoreline and uplands to the State of Iowa for use as at this site. The State of Iowa owns an additional 375 acres of land in the park.

xii. Community Identified Hazards & Mitigation Strategies

Representatives from the Corps of Engineer's (John Pasa) at Rathbun Lake have participated throughout the entire process of the Hazard Mitigation planning process as a separate identity than the community of Rathbun. The Corp would like to collaborate with the efforts of Appanoose County to better mitigation for any hazards that could occur. The representatives have identified all concerns (See *Appendix GG*) and the major hazards they are most concerned about are: Thunderstorms/Lighting, Severe Winter Storms, and Tornados. The members considered the overall rankings of the county hazards and considered the historical data from the County to make this decision. The corresponding Mitigation actions a safe room, increased storm shelter locations, a generator for power to emergency shelter sites, and additional early warning systems expanded to the all divisions campgrounds around the lake were identified as a priority to the safety of visitors to the lake.

N. Centerville Public Schools

Centerville High School beliefs as adopted by the student council are: "We, the students and staff of CHS, believe: in having an environment that fulfills the needs of students and staff; in respecting self, others, property, and space; that attendance is important. It establishes habits to live by for the rest of our lives; in quality work and personal responsibility; and in having a clean and safe environment."

Total enrollment for the 2010-2011 for the school district is 1,489. Later charts will illustrates the student enrollment per building, grade levels housed at each site, ethnicity breakdown and the number of students participating in the free or reduced lunch program.

Geography

The school district serving Centerville, Mystic, and Cincinnati is the K-12 Centerville Community School District. It facilities include:

Centerville High School (grades 9-12) – 600 CHS Drive, Centerville; student enrollment 507
Howar Junior High (grades 7-8) – 850 South Park Street, Centerville; student enrollment 233
Lakeview Middle School (grades 4-5-6) – 1800 South 11th Street, Centerville; student enrollment 318
Central Ward Elementary – 320 Drake Avenue, Centerville; student enrollment 153
Lincoln Elementary School – 603 North 10th Street, Centerville; student enrollment 71
Garfield Grade Schools – 505 East Walsh Street, Centerville; student enrollment 79
Cincinnati Grade School – 105 Alpine Street, Cincinnati; student enrollment
Mystic Grade School – 500 Clarkdale Road, Mystic; student enrollment

The majority of the enrollment is housed in the city of Centerville. The city encompasses an area of 4.6 square miles with a population density of 1310.5 people per square mile according to the 2000 Census.

History/Development Trends/Population

The combined student enrollment for the Centerville district in 2010-2011 is 1,489. The largest percentage of students (34%) are located in High school and 21% of students are located in the Middle school facility. This school district has seen a decrease in its enrollment over the last 10 years. This is largely due to the several industries closing in the area and families forced to relocated due to other employment opportunities. According to the Iowa Department of education in 2000, Centerville Community School's total enrollment was 1700 and in October 2010 it is 1,422. This parallels the decrease in population to the entire community of Centerville.

At Risk Groups

As discussed in 2.A.vii, the Appanoose County section on at risk groups, young children, and those that are linguistically isolated are generally identified as a "at risk groups."

Table 102: Potential Centerville Community Schools At Risk Population (2000)

	UNDER 5	UNDER 18	LINGUISTICALLY ISOLATED
TOTAL COUNTY	771	3267	19
CENTERVILLE	357	1482	13
CINCINNATI	36	120	0
MYSTIC	2	19	0

Source: US Census Bureau

The school would also include children who live in poverty and those who are of a minority race. The Centerville school is predominantly (97%) white ethnicity, which places approximately 45 students at risk due to a minority race.

The current number of students who are enrolled for the Free and Reduced Lunch program is used to determine the number of at risk students who reside in poverty. There are approximately 695 or 47% of students that participate in that program. This is much higher (indicating greater poverty) in comparison to 38% average in the state of Iowa.

Income

The current number of students who are enrolled for the Free and Reduced Lunch program is used to determine the number of students who reside in poverty. There are approximately 695 or 47% of students that participate in that program. This is much higher (indicating greater poverty) in comparison to 38% average in the state of Iowa.

Transportation

The Centerville Community Schools operates 24 buses throughout the district to provide transportation to all enrolled families.

Cultural Resources

Refer to 2.A.xiv. for a description of what constitutes cultural resources in this plan. Centerville is home to one museum and two libraries including the Drake Public Library and the Centerville Center Library on the Indian Hills campus. There is one historic site in a section that is in both Centerville and the unincorporated county, the site may or may not be within Centerville's municipal boundaries. See *Appendix H: Historic Sites in Appanoose County* for an image of the county by section with a count of historic sites listed for each.

BUDGET INFORMATION

CENTERVILLE	2010-11	2009-10	2008-09	2007-08	2006-07	2005-06
Budget Enrollment	1474.8	1,522.0	1,508.8	1,520.0	1580.40	1586.70
Enrollment Audit Adjustment			(.30)			
Regular Program Growth Per Pupil	$115	$222	$213	$205	$197	$190
Regular Program District Cost Per Pupil	$5,942	$5,827	$5,605	$5,392	$5,187	$4,990

http://www.centerville.k12.ia.us/
www.publicschoolreview.com
http://nces.ed.gov

xii. Community Identified Hazards & Mitigation Strategies

Centerville Public schools has multiple locations throughout Centerville and Appanoose County. The school has agreed that each location could be at potential risk of experiencing Thunderstorm/Lighting, Severe Winter storms, and Tornados. The Centerville Public Schools also identifies and has had experiences with multiple flash flooding events over the past 2 years wet cycle in the summers. There has been repetitive damage to the gymnasium, locker rooms and offices at Lakeview Elementary School as profiled in the "Flash Flooding" hazard profile in this document. At the time this document is written, they are applying for a FEMA number for possible assistance, but would also like to continue seeking further assistance with this reoccurring problem. This damage is a result of flashing flooding due to summer storms, as none of the school structures are located within a floodplain.

Centerville Public Schools were actively involved in the HMG planning sessions (See Appendix GG). Pat Tresmer, school nurse, participated in over half of the meeting held. The school system is concerned about the safety of students, parents, and visitors that could be at a school function during the event of a disaster. The school has established and approved emergency procedures in place for the number of students enrolled in the facilities. However, greater concern happens when there are a large number of people attending the numerous events held at the school. Particular concern lies at the Lakeview Elementary site because it has now been designated as a storm shelter site for a newly constructed sports complex nearby. Centerville Public Schools plan to apply for any grant funded opportunities to assist them in constructing a Safe Room for their district. This mitigation action would help them address major hazards they are concerned about: Tornado and Thunderstorms/Lightning.

3. Risk Assessment

The risk assessment and hazard analysis identifies how people, properties, and structures will be impacted by an event. If the hazard can harm people or damage their homes and other structures, they are vulnerable. Finding the weak points in the system, for example, identifying building types that are

vulnerable to damage and anticipating the loss in high risk areas, will help the community decide what mitigation measure should be undertaken and how to implement the activities they select.

Some information in the following hazard analyses is drawn from Iowa's *Hazard Analysis and Risk Assessment: 2007 Local Guide* and the *Iowa Hazard Mitigation Plan: Iowa Comprehensive Emergency Plan September 2007.* In making their hazard analysis and risk assessment, the Appanoose County Hazard Mitigation Planning Committee considered the following:

- Historical Occurrence
- Probability
- Vulnerability
- Maximum Threat
- Severity of Impact
- Speed of Onset

The following tables define each factor and the rating scale the Planning Committee used to assess the hazards risk to the community.

Historical Occurrence: Number of times that a hazard has occurred in the community in the past.

Rating	Number of Historical Occurrences
1	Fewer than 4 occurrences
2	5 to 7 occurrences
3	8 to 12 occurrences
4	More than 12 occurrences

Probability: Likelihood of the hazard occurrence, sometimes without regard to hazard history.

Rating	Likelihood	Frequency of Occurrence
1	Unlikely	Less than 1% probability in the next 100 years
2	Possible	Between 2 and 10% probability in next year, or at least one chance in the next 100 years
3	Likely	Between 11 and 100% probability in next year, or at least one chance in next 10 years
4	Very Likely	Near 100% chance in the next year

Vulnerability: Measure of the percentage of people and property that would be affected by the hazard event.

Rating	Magnitude	Percentage of people and property affected
1	Negligible	Less than 10%
2	Limited	11 to 25%
3	Critical	26 to 50%
4	Catastrophic	More than 50%

Maximum Threat: Spatial extent of the community that might be impacted.

Rating	Magnitude	Percentage of jurisdiction that can be affected
1	Negligible	Less than 10%
2	Limited	11 to 25%
3	Critical	26 to 50%
4	Catastrophic	More than 50%

Severity of Impact: Assessment of the severity in terms of fatalities, injuries, property losses, and economic losses.

Rating	Level	Characteristics
1	Negligible	Few if any injuries or illness. Minor quality of life lost with little or no property damage. Brief interruption of essential facilities and services for less than four hours.
2	Limited	Minor injuries and illness. Minor or short term property damage which does not threaten structural stability. Shutdown of essential facilities and services for 4 to 24 hours.
3	Critical	Serious injury and illness. Major or long term property damage, which threatens structural stability. Shutdown of essential facilities and services for 24 to 72 hours.
4	Catastrophic	Multiple deaths. Property destroyed or damaged beyond repair. Complete shutdown of essential facilities and services for 3 days or more.

The State of Iowa expands this evaluation element by specifically addressing nine factors of any given hazard's impacts. These factors are as follows;

A) Health and Safety of persons in the affected area at the time of the incident (injury and death)
B) Health and Safety of persons responding to the incident
C) Continuity of operations
D) Property, facilities, and infrastructure
E) Delivery of services
F) The environment
G) Economic and financial conditions
H) Regulatory and contractual obligations
I) Reputation of the entity

Speed of Onset: Potential amount of warning time available before the hazard occurs.

Rating	Probable amount of warning time
1	More than 24 hours warning time.
2	12 to 24 hours warning time.
3	5 to 12 hours warning time.
4	Minimal or no warning time.

A. Hazard Analysis Summary

	Historical	Probability	Vulnerability	Threat	Impact	Onset	Comb.
Natural Hazards							
Flash Flood	4	4	2	2	3	4	19
Tornado	4	3	3	2	3	4	19
Windstorms / High Wind Events	4	4	3	3	3	4	21
Extreme Heat	1	3	3	4	3	2	16
Hailstorm	4	4	2	2	2	4	18
Grass / Wildfire	3	4	1	1	2	4	15
Sink Holes	2	3	1	1	1	4	12
River Flooding	4	4	2	2	2	2	16
Severe Winter Storm	4	4	4	4	3	3	22
Drought	2	2	3	4	3	1	15
Earthquake	1	1	2	4	2	4	14
Levee Failure	1	2	4	4	4	4	19
Dam Failure	1	2	4	4	4	4	19
Expansive Soils	2	2	1	1	1	1	8
Thunderstorm / Lightning	4	4	2	2	3	3	18
Radon/lead	4	4	3	3	3	1	18
Human Caused and Combination Hazards							
Climate Change	1	3	3	4	3	1	15
Air Transport. Incident	1	3	1	1	4	4	14
Rail Transport. Incident	2	2	1	1	2	4	12
Pipeline Incident	1	2	2	1	3	4	13
Highway Transport. Incident	4	4	2	1	3	4	18
Transport. Haz. Materials	3	3	2	2	2	4	16
Transport. Rad. Materials	1	2	3	3	2	1	12
Waterway Incident	1	2	3	3	2	4	15
Human Disease Incident	2	2	2	3	3	1	13
Human Disease Pandemic	2	3	3	3	3	1	15
Fixed Hazardous Materials	4	4	2	1	2	4	17
Animal/plant/crop disease	2	2	2	3	3	1	13
Energy Failure	3	4	3	3	2	4	19
Communications Failure	1	3	3	3	2	4	16
Structural Failure	1	3	2	2	3	4	15
Structural Fire	1	3	2	2	3	4	15

B. Fire Insurance Rating

The fire insurance rating is measured on a scale of 1 to 10 with 1 representing exemplary public protection. A rating of 10 indicates that a community's fire suppression program does not meet minimum requirements

of ISO. ISO is an organization that provides data, analysis, and decision-making support for various professions about risk.

Community	Fire Dept. (Y/N)	Rating 1 - 10
Appanoose County	N	-
Centerville	Y	
Cincinnati	Y	
Exline	N	-
Moravia	Y	
Moulton	Y	

Community	Fire Dept. (Y/N)	Rating 1 - 10
Mystic	Y	8
Numa	N	-
Plano	N	-
Rathbun	N	-
Udell	N	-
Unionville	N	-

C. National Flood Insurance Program (NFIP) Participation

The following table organizes information provided by the Iowa DNR's flood plain coordinator for Appanoose County and its communities.

Community	Participates? (Y / N)	NFIP #	Mapped? (Y / N)	Map Date	Repetitive Loss Properties
Appanoose County	N	-	N	-	0
Centerville	Y	190009	Y	07/02/1987	0
Cincinnati	N	-	-	-	-
Exline	N	-	-	-	-
Moravia	Y	190623	Y	07/01/1987	0
Moulton	N	-	N	-	0
Mystic	Y	190010	Y	01/01/1987	0
Numa	N	-	-	-	-
Plano	N	-	-	-	-
Rathbun	N	-	-	-	-
Udell	N	-	-	-	-
Unionville	Y	190923	Y	07/01/1988	0

4. Hazards Identified & Results

In order to properly identify mitigation strategies and activities, the hazards that may affect the County must be identified. This section lists the potential hazards to the County that were identified by the planning committee. This section also discusses previous occurrences of the hazards, the areas of the County most at risk from each hazard, and the populations most at risk. By identifying the hazards and quantifying the risks, the city can better assess current mitigation strategies, develop future mitigation strategies, and identify needed mitigation projects. The hazards identified by individual jurisdictions are given in Appendix HH.

The hazards addressed in this plan were identified by taking the list of hazards from the Iowa Hazard Mitigation Plan (*Figure 9*) which were evaluated in relation to local conditions. Descriptions of the hazards and preliminary data on the impacts and the vulnerable populations and structures were taken largely from the State Plan supplemented with local knowledge during the meeting where the hazards were selected initially. There were hazards that clearly apply to Appanoose County, some that may or may not, and a few that clearly do not apply. The ones that do not apply were removed from the list of hazards that were detailed in the hazard profiles.

Figure 9: Hazards Identified in State Plan

Natural Hazards	Human Caused/Combination Hazards
Flash Flood	Human Disease Pandemic
Tornadoes	Fixed Hazardous Materials
Windstorms	Transportation Hazardous Materials Incident
Extreme Heat	Structural Fire
Hailstorms	Cyber Terrorism
Grass or Wild land Fire	Highway Transportation Incident
Sink Holes	Air Transportation Incident
River Flooding	Rail Transportation Incident
Severe winter storms	Bioterrorism
Levee Failure	Radiological Terrorism
Drought	Enemy Attack
Earthquakes	Pipeline Transportation Incident
Landslide	Fixed Radiological Incident
Dam Failure	Chemical Terrorism
Expansive Soils	Agro-Terrorism
Thunderstorm & Lightning	Human Disease Incident
	Waterway Incident
	Energy Failure
	Conventional Terrorism
	Public Disorder
	Structural Failure
	Communications Failure
	Animal/ Plant/ Crop Disease
	Radiological Transportation

Source: Iowa Hazard Mitigation Plan: Iowa Comprehensive Emergency Plan September 2007

The hazards that may or may not apply were predominantly human caused or combination hazards; these were evaluated by the planning committee as far as their local relevance. This was done in an early committee meeting where attendees discussed the State hazard list and determined which ones have a credible chance of occurring locally based on local knowledge. Three hazards were added to the State list for the committee to consider; radon, climate change, and economic disruption / decline. During the meeting, public health personnel recommended that lead be added to the radon hazard as environmental human health threats.

The preliminary research on what hazards are likely to occur in Appanoose County consisted of the Description, Historical Occurrence, and Probability elements in the hazard profiles. This method of incorporating the information to determine what hazards *are likely* into the profiles themselves was used to avoid repetition of hazard information.

The potential hazards identified for Appanoose County and discussed in detail below correspond to hazards identified by FEMA and the Iowa Department of Homeland Security with additional hazards locally identified. The committee used the list of suggested hazards from the State Hazard Mitigation Plan and narrowed down by history and likelihood of impacts to this area. McDanel pointed out that conceivably all of these hazards could occur in Appanoose County, so why not say yes to all of them? Dawson responded that the City of Mystic took this more inclusive approach initially and then received comments from FEMA that they should consider narrowing the focus of the plan to hazards that can be locally addressed. In addition, this plan should focus not on what could happen here in this county, but on those hazards that 1)

originate or directly impact Appanoose County and 2) those that the local expertise and resources can reasonably address (including seeking grants for projects). Therefore, the compiled list below reflect the selections that could affect the entire county or may be more localized to a specific jurisdiction. A table of hazards affecting individual jurisdictions is provided in Appendix GG.

The list of hazards addressed in this plan is as follows:

Natural Hazards

- Flash Floods
- Tornado
- Windstorms / High Wind Events
- Extreme Heat
- Hailstorms
- Grass or WildFire
- Sink Holes
- Severe Winter Storms
- River Flooding
- Drought
- Earthquake
- Levee Failure
- Dam Failure
- Thunderstorm & Lightning
- Radon / Lead
- Expansive Soils

- ***Human Caused and Combination Hazards***
- Climate Change
- Air Transport Incident
- Rail Transportation Incident
- Highway Transportation Incident
- Transportation Hazardous Materials
- Human Disease Incident
- Fixed Hazardous Materials
- Energy Failure
- Communications Failure
- Structural Failure
- Structural Fire
- Waterway Incident
- Pipeline Incident
- Animal/Plant/Crop Disease
- Human Disease Pandemic
- Transportation of Radiological Materials

Appanoose County contains 11 communities in relatively close proximity to one another and share similar topography, land uses, and land cover in addition to sharing other socio-economic characteristics. Events that impact one community, likely impacts or could impact another within the county.

A. State and FEMA Recognized Hazards not Detailed

The State of Iowa and FEMA recognize a certain list of hazards that all hazard mitigation plans are to address at the beginning of the hazard mitigation process. However, not all hazards impact all areas or are deemed relatively insignificant or unlikely; this brief section indicates what hazards are not addressed here and why. Individual jurisdictions exclude additional hazards on the basis of what is of local concern. These excluded hazards are addressed at the county level unless otherwise noted.

Landslide – Iowa DNR data indicates that Appanoose County is an area of low susceptibility and no known events have occurred locally of any significance.

Agro-Terrorism – Through discussion on the March 29, 2009 meeting (*Appendix U*), the committee decided that Appanoose County would be a low-likelihood target and eliminated the hazard.

Biological Terrorism – Through discussion on the March 29, 2009 meeting (*Appendix U*), the committee decided that Appanoose County would be a low-likelihood target and eliminated the hazard.

Chemical Terrorism – Through discussion on the March 29, 2009 meeting (*Appendix U*), the committee decided that Appanoose County would be a low-likelihood target and eliminated the hazard.

Conventional Terrorism – Through discussion on the March 29, 2009 meeting (*Appendix U*), the committee decided that Appanoose County would be a low-likelihood target and eliminated the hazard.

Cyber Terrorism – Through discussion on the March 29, 2009 meeting (*Appendix U*), the committee decided that Appanoose County would be a low-likelihood target and eliminated the hazard.

Radiological Terrorism – Through discussion on the March 29, 2009 meeting (*Appendix U*), the committee decided that Appanoose County would be a low-likelihood target and eliminated the hazard.

Enemy Attack – Through discussion on the March 29, 2009 meeting (*Appendix U*), the committee decided that Appanoose County would be a low-likelihood target and eliminated the hazard.

Fixed Radiological Incident – There are no radiological materials located in Appanoose County of any significant quantity and Appanoose County is not on a likely radiological material transportation route.

Economic Disruption / Decline – Meeting attendees indicated that Appanoose County has experienced economic decline for so long now that it is not worth addressing as a hazard.

B Composite Scoring

FEMA and Iowa Emergency Management Department provides communities with a Cascading Event Matrix tool. This matrix analyzes each hazard and how each hazard has the potential to cause and affect other

hazards. The hazards that the Appanoose Planning committee identified are shown below with the approximate number of cascading events that could occur with each event. The composite score is a total of the profile scores assigned by the committee and the cascading estimates corresponding to it. The composite score will then be used to prioritize the hazards.

	Profile Scores	Cascading	Composite
Natural Hazards			
Flash Flood	19	23	42
Tornado	19	13	32
Windstorms / High Wind Events	21	13	34
Extreme Heat	16	5	21
Hailstorm	18	6	24
Grass / Wildfire	15	13	28
Sink Holes	12	13	25
River Flooding	16	21	37
Severe Winter Storm	22	12	34
Drought	15	7	22
Earthquake	14	14	28
Levee Failure	19	8	27
Dam Failure	19	4	23
Expansive Soils	8	2	10
Thunderstorm / Lightning	18	17	35
Radon/lead	18	2	20
Climate Change	15	11	26
Air Transport. Incident	14	12	26
Rail Transport. Incident	12	19	31
Pipeline Incident	13	9	22
Highway Transport. Incident	18	23	41
Transport. Haz. Materials	16	21	37
Transport. Rad. Materials	12	20	32
Waterway Incident	15	3	18
Human Disease Incident	13	9	19
Human Disease Pandemic	15	7	23
Fixed Hazardous Materials	17	9	26
Animal/plant/crop disease	13	9	22
Energy Failure	19	23	42
Communications Failure	16	20	36
Structural Failure	15	23	38
Structural Fire	15	21	36

The cascading matrix score is important as is shows how one hazard can quickly lead to a larger, more disastrous event or more significant combination hazards. When examining the above table, some hazards such as flash flooding or structural failure received the highest composite scores. This occurrence is due to

the fact that so many other events can result from or contribute to the severity of these types of incidents. These are two examples of how cascading events can result in exponential consequences.

C. Hazard Prioritization

	Composite Score Ranking	
High Risk Hazards	Flash Flood	42
	Energy Failure	42
	Highway Transport Incident	41
	Structural Failure	38
	Transport Haz. Materials	37
	River Flooding	37
	Structural Fire	36
	Communication failure	36
	Thunderstorm / Lightning	35
	Windstorms / High Wind Events	34
	Severe Winter Storm	34
	Tornado	32
	Transport Rad. Materials	32
	Rail Transport Incident	31
	earthquake	28
	Grass / Wildfire	28
	Levee failure	27
	Climate Change	26
Moderate Risk Hazards	Air Transport Incident	26
	Fixed Hazardous Materials	26
	Sinkhole	25
Acceptable Risk Hazards	Hailstorms	24
	Dam Failure	23
	Human Disease Pandemic	23
	Animal/plant/crop disease	22
	Pipeline incident	22
	Drought	22
	Extreme Heat	21
	Radon/lead	20
	Human Disease Incident	19
	Waterway	18
	Expansive Soils	10

Once the Appanoose County Hazard Mitigation Committee had identified and scored the hazards, they examined each hazard in relation to the cascading events that hazard presented to the community. All of the identified hazards were then given a priority. The Committee defined high-risk hazards to be those hazards that caused the substantial damage to the county in the past, have a high probability of occurring in the future, contribute to other hazards happening, or have the potential to affect a large proportion of the communities. High-risk hazards were also considered to be the hazards for which immediate planning and mitigation activities were to be focused.

The Committee considered moderate-risk hazards to be those hazards that should be addressed by the county in the future, however the need for mitigation activities for these hazards was not considered to be as immediate. Finally, acceptable risk hazards were defined by the Committee as those hazards that, at the present time, have an acceptable level of risk. This does not mean that they are not of concern for the communities. The hazards are listed below by priority.

5. Hazard Profiles

This chapter contains more detailed discussion of the individual hazards than the previous which simply provides a summary of the hazards.

A. Natural Hazards

Some natural hazards impact a broad area simply due to their nature; these hazards are often weather related. This section addresses those hazards that may impact a broader area than one community.

Hazard	**Flash Flood**	Rating
Definition	**Flash Flood**: A flood caused by heavy or excessive rainfall in a short period of time, generally less than 6 hours. Flash floods are usually characterized by raging torrents after heavy rains that rip through river beds, urban streets, or mountain canyons sweeping everything before them. They can occur within minutes or a few hours of excessive rainfall. They can also occur even if no rain has fallen, for instance after a levee or dam has failed, or after a sudden release of water by a debris or ice jam (National Weather Service).	
Description	Flooding causes more damage in the United States than any other severe weather related event, an average of $5 billion a year. Flooding can occur in any of the 50 states or U.S. territories at anytime of the year. Flash flooding is an extremely dangerous form of flooding which can reach full peak in only a few minutes and allows little 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. Two common terms to describe areas that are prone to flooding are 100-year flood plain and 500-year flood plain. The meaning of these terms are often confused; though they sound like a flood in the designated areas only happens once every 100 or 500 years, this interpretation is incorrect. What the designation actually means is that for a 100-year flood plain, the chance of a flood occurring in any given year is 1% which is statistically about once every 100 years. Likewise, for the 500-year flood plain, the probability is .2% for any given year. Floods may certainly occur more frequently in either flood plain designation, but these would be rare occurrences. Flash floods do not always occur in flood plains, during heavy downpours the capacity of the soil to absorb rain can be overwhelmed leading to water accumulating and running off of the surface of the land. Similarly with compaction of soil due to built infrastructure such as roads and buildings heavy rain is limited in its local soil infiltration capacity leading to runoff. This runoff can accumulate very quickly resulting in flash flooding.	
Historical Occurrence	Since 1993, there have been fourteen recorded flash flood events in	4

<table>
<tr><td></td><td>Appanoose County. These flash flood events caused $1.32 million in property damage with no injuries or loss of life reported. About $330 thousand in crop damage has resulted from these events. Not all of these events are confined to just Appanoose County and so the impacts listed are distributed between more than one or two counties. Thousands of dollars have been spent to rebuild damaged roadways and replace necessary rock on them.

Centerville Community School also cites damage in the Lakeview Elementary school building due to flash floods in the summers of 2008 and 2010. This is the only location that frequently experiences water backing up through the floors in the locker rooms and offices near the gymnasium.

See Appendix N: NCDC Storm Events for a record of events that have impacted Appanoose County. The chart below provides a summary of NCDC recorded flash floods; property and crop damages are in thousands of dollars.

<table>
<tr><td colspan="6">Flash Floods since 1993</td></tr>
<tr><td>Jurisdiction</td><td>number</td><td>deaths</td><td>injuries</td><td>property</td><td>crop</td></tr>
<tr><td>Total</td><td>14</td><td>0</td><td>0</td><td>1320</td><td>330</td></tr>
<tr><td>Udell</td><td>1</td><td>0</td><td>0</td><td>100</td><td>5</td></tr>
<tr><td>Rathbun</td><td>1</td><td>0</td><td>0</td><td>250</td><td>10</td></tr>
<tr><td>Mystic</td><td>1</td><td>0</td><td>0</td><td>25</td><td>0</td></tr>
<tr><td>Numa</td><td>2</td><td>0</td><td>0</td><td>50</td><td>25</td></tr>
<tr><td>Centerville</td><td>2</td><td>0</td><td>0</td><td>50</td><td>5</td></tr>
</table></td><td></td></tr>
<tr><td>Probability</td><td>With fourteen reported flash flooding events occurring in Appanoose County in the last fifteen years, the probability of future flash floods is high. Approximately one flash flood has occurred in Appanoose County per year and given the nature of flash floods, one or more can be expected in the next 10 years. The State hazard mitigation plan suggests that there is a 60% chance of a flash flood in Iowa in the next year. Climate change projections for Iowa suggest that Iowa is and will become wetter with increased precipitation which contributes to flash floods. Projections suggest an increase in 20% more precipitation in the summer, 10% in the winter and spring, and 15% in the fall. (Climate Change and Iowa, US EPA, September 1998).</td><td>4</td></tr>
<tr><td>Vulnerability</td><td>Flood zones and low-lying areas are most vulnerable to flash floods as this is where the water will accumulate and move fastest. People in vehicles are historically vulnerable when they attempt to drive through water flowing over a road or bridge. Two feet of flowing water can carry away most vehicles, including SUVs and a mere foot of water can float most vehicles.

Jurisdictions that have identified recent experience with flash flooding include Centerville, Cincinnati, Exline, Mystic, Numa, Rathbun, and Udell and</td><td>2</td></tr>
</table>

<table>
<tr><td></td><td>multiple regions within the rural area of Appanoose County. There have been record breaking rain totals through the summers of 2008 and 2010 that have contributed to this problem. Ten inch rainfalls are not common, but have, however, been occurring in Appanoose County the past years. This has forced the City of Centerville to address problems with flash flooding and storm water drainage systems in the housing district of “Golfview”. The Lakeview Elementary school in Centerville has also discovered drainage and inundation problems during times of heavy rain.

The smaller communities of Cincinnati, Exline, Mystic, Numa, Rathbun and Udell have also events that forced them to realize that their drainage of storm water may not be adequate. The backed up water has primarily forced damage into residential structures and not effect businesses in these jurisdictions. Cincinnati has applied for Community Development Block Grants to assist with their replacement. Exline and Mystic have been award assistance from FEMA. The other communities have yet to take measures to improve this situation.</td><td></td></tr>
<tr><td>Maximum Threat</td><td>The most threat is to property and persons within flood plains, especially near streams and rivers and individuals in vehicles. More than half of all flash-flooding fatalities result from individuals misjudging the depth and strength of flood waters.

As flash floods can happen anywhere at any time during a severe weather event, the any portion of the county could be considered a hazard area depending upon the event. However, properties located in floodplains are at higher risk than those on high ground. See Appendix C: Hillshade Image of Appanoose County for a representation of lower-lying areas. A major low area is along the Chariton River approximately southeast of highway 5 and between Exline and Moulton where three unincorporated communities and Sedan Bottoms are located. Sedan Bottoms includes wetlands which generally slow flood waters and can help mitigate flash floods.

There are regions along the Chariton River that are more of a threat than other portions of the county. Specific concern lies with the communities of Rathbun, Mystic, and Centerville because of their close proximity of the Chariton river or it’s tributaries. Estimated flood mapping indicates that the following number of structures could possibly be affected in the event of a flash flood:

<table>
<tr><th>Community</th><th># of homes affected</th><th># of businesses affected</th></tr>
<tr><td>Centerville</td><td>426</td><td>12</td></tr>
<tr><td>Exline</td><td>15</td><td>2</td></tr>
<tr><td>Cincinnati</td><td>79</td><td>1</td></tr>
<tr><td>Rathbun</td><td>5</td><td>1</td></tr>
</table>
</td><td>2</td></tr>
</table>

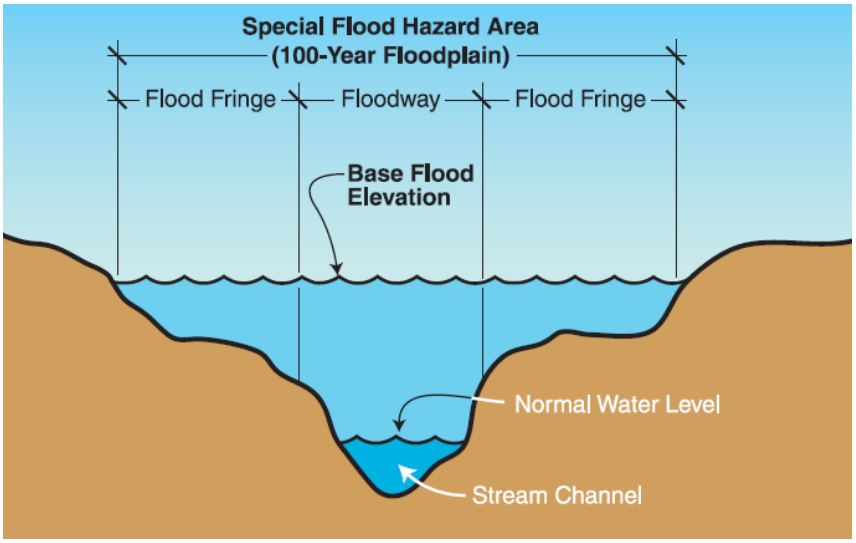
Numa	29	1
Udell	7	1
Mystic	12	2

It does make it difficult to estimate the potential flooding since the majority of Appanoose County does not have a floodplain map. This data was collected using the estimated floodplain mapping by the Appanoose County engineer and/or FIRMs.

Severity of Impact	A. Flash floods can result in death and injury, typically to individuals caught either in vehicles swept off of roads or who may be in low-lying areas when fast moving water moves through B. Flash floods can present a challenge to first responders by limiting access to a site or by requiring alternative modes of access such as by boat or helicopter; special training is often necessary for such rescues C. Continuity of operations can be affected depending on the facilities impacted, transportation impacts, and delays in government responses D. Property can be impacted either by being damaged by the force of flowing water, water damage inside buildings, and compromises to structural integrity due to erosion E. Flash floods can quickly inundate areas thought to be out of flood-prone areas. Loss of life; property damage and destruction; damage and disruption of communications, transportation, electric service, and community services; crop and livestock damage and loss and interruption of business are common impacts from flash flooding. F. Hazards of fire, health and transportation accidents, and contamination of water supplies are likely effects of flash flooding situations. Materials swept away by flood waters can contaminate and leave a lasting impact on the environment. G. Most impacts are indirect due to disruption of business and damage to infrastructure on which industry and services rely upon. H. Regulations and Contractual Obligations: None directly. I. Flash floods can be damaging to the reputation of the community if proper notification and warning are not given. Often times the victim will blame development or other changes in the community as the cause of the flooding on their property.	3
Speed of Onset	Flash floods are unpredictable, but there are factors that can point to the likelihood of a flood's occurring in the area. Flash floods occur within a few minutes or hours of excessive rainfall, a dam or levee failure, or a sudden	4

	release of water held by an ice jam. Warnings may not always be possible for these sudden 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 time the flow is expected to occur at a particular location.	
	Hazard Worksheet Score	19
	Composite Score	42

Figure 10: Cross Section of Flood Plain



Source: FEMA 386-2 CD August 2001, Understanding Your Risks: Identifying Hazards and Estimating Losses

<table>
<tr><td>Hazard</td><td>Tornado</td><td rowspan="3">Rating</td></tr>
<tr><td>Definition</td><td>Tornado: A tornado is a violently rotating column of air extending from a thunderstorm to the ground. The most violent Tornado are capable of tremendous destruction with wind speeds of 250 mph or more. Damage paths can be in excess of 1 mile wide and 50 miles long (FEMA 386-2 CD).</td></tr>
<tr><td>Description</td><td>Tornado are among the most unpredictable of weather phenomena. While Tornado can occur almost anywhere in the world, they are most prevalent in the United States. According to the National Weather Service, about 42 people are killed because of Tornado each year. Tornado can occur in any state but are more frequent in the Midwest, Southeast, and Southwest. Tornado season runs ordinarily from March through August; however, Tornado can strike at any time of the year if the essential conditions are present.

Thunderstorms and hurricanes spawn Tornado when cold air overrides a layer of warm air, causing the warm air to rise rapidly. The winds produced from hurricanes, earthquake-induced fires, and wildfires have also been known to produce Tornado. The frequency of Tornado in the nation's midsection is the result of the recurrent collision of moist, warm air moving north from the Gulf of Mexico with colder fronts moving east from the Rocky Mountains.

Tornado are generally measured in intensity by a rating scale known as the Fujita Scale. The Enhanced Fujita Scale and the Pearson Scale follow this hazard profile in Figure 11.</td></tr>
<tr><td>Historical Occurrence</td><td>In the U.S., Iowa is ranked third in the number of strong-violent (F2-F5) Tornado per 10,000 square miles. From 1950-95, Iowa averaged 31 twisters per year. In Iowa most Tornado occur in the spring and summer months, but twisters can and have occurred in every month of the year. Late afternoon to evening hour Tornado are the most common, but they can occur at any time of the day.

Appanoose County has had 18 recorded Tornado between 1961 and 2008. None of these Tornado has exceeded F2 status. A total of eight injuries, $6.283 million in property damage, and $5,000 in crop damage.

One funnel cloud is on record occurring in 1995 in Rathbun, about 2 miles north east of Mystic. No damage or injuries are reported from this event.

See Appendix N: NCDC Storm Events for a record of events that have impacted Appanoose County. The chart below provides a summary of NCDC recorded Tornado; property and crop damages are in thousands of dollars.

Tornados since 1961
<table>
<tr><td>Jurisdiction</td><td>number</td><td>mag.</td><td>deaths</td><td>injuries</td><td>property</td><td>crop</td></tr>
<tr><td>Total</td><td>18</td><td>F2 max</td><td>0</td><td>8</td><td>6.3 M</td><td>5</td></tr>
</table></td><td>4</td></tr>
</table>

<table>
<tr><td></td><td>
<table>
<tr><td>Rathbun</td><td>1</td><td>F0</td><td>0</td><td>0</td><td>1</td><td>0</td></tr>
<tr><td>Moravia</td><td>1</td><td>F1</td><td>0</td><td>0</td><td>70</td><td>0</td></tr>
<tr><td>Udell</td><td>1</td><td>F1</td><td>0</td><td>0</td><td>5</td><td>5</td></tr>
<tr><td>Centerville</td><td>1</td><td>F0</td><td>0</td><td>0</td><td>2</td><td>0</td></tr>
<tr><td>Plano</td><td>1</td><td>F0</td><td>0</td><td>0</td><td>0</td><td>0</td></tr>
</table>
</td><td></td></tr>
<tr><td>Probability</td><td>There have been 18 recorded Tornado in Appanoose County in the past 47 years. This equates to approximately one event per 2.6 years. Because Tornado are sporadic there cannot be a reliable long-term prediction made as to when they may occur. Likewise, the chance of a tornado occurring at an exact location is very low making forecasting of tornado paths or touch-downs impossible. If, however, the tornado events hold to their average, Appanoose County can expect approximately three Tornado for any given decade.</td><td>3</td></tr>
<tr><td>Vulnerability</td><td>Everyone is vulnerable to the powerful forces that accompany a tornado.

There are those who are more vulnerable than others. For example:

1. People in automobiles,

2. People in mobile homes,

3. People who may not understand warnings due to language barriers,

4. The elderly and very young,

5. People with physical or mental impairments.

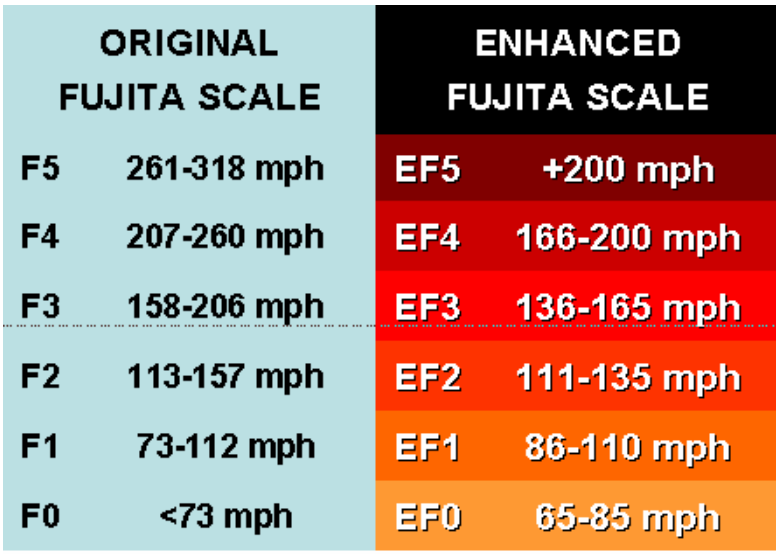
See each jurisdiction’s respective profiles for demographic information relevant to vulnerable populations. There are approximately 245 mobile homes in the unincorporated county and the table below shows the number per community as of the 2000 Census.

Mobile Home Count (2000)
<table>
<tr><td>Centerville</td><td>Cincinnati</td><td>Exline</td><td>Moravia</td><td>Moulton</td><td>Mystic</td><td>Numa</td><td>Plano</td><td>Rathbun</td><td>Udell</td><td>Unionville</td></tr>
<tr><td>194</td><td>36</td><td>15</td><td>53</td><td>70</td><td>33</td><td>8</td><td>3</td><td>0</td><td>6</td><td>12</td></tr>
</table>
The number of mobile homes comprises less than 1% of housing units in each of the jurisdictions. The most vulnerable populations of each jurisdiction ranges between 20% and 30% encompassing the very young, the elderly, the linguistically isolated, and individuals residing in mobile homes.</td><td>3</td></tr>
<tr><td>Maximum Threat</td><td>Generally the destructive path of a tornado is only a couple hundred feet in width, but as stated earlier, stronger Tornado can be over one mile wide and fifty miles long. Appanoose County communities are relatively small and so a single tornado could damage the entire town. Likewise, a single tornado could</td><td>2</td></tr>
</table>

	cross the entire county. 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 spatial threat to communities from a single is far greater than for the county ranging from limited impact to catastrophic damage. The impact of a single tornado in the unincorporated county is relatively smaller due to the size of the county; one event is more likely to be negligible to limited.	
Severity of Impact	A. Injury or death related to Tornado most often occurs when buildings collapse; people are hit by flying objects or are caught trying to escape the tornado in a vehicle. B. Response personnel are exposed to the same risk as the general public when caught in the storm without shelter. C. Tornado can destroy government facilities just as they could other property. Disruption of critical services can also affect operations. Employees may be affected and unable to attend work-related issues. D. Impacts can range from broken tree branches, shingle damage to roofs, and some broken windows; all the way to complete destruction and disintegration of well-constructed structures, infrastructure, and trees. E. Tornado can impact many critical services, mainly electrical power. Buried services are not as vulnerable, but can be affected by their system components that are above ground. F. Tornado are naturally occurring phenomena. Damages to the environment could result from spills and other contaminants from the built environment. G. Whole towns have been known to be "wiped off the map" such as Greensburg, KS in recent years. Economic impacts can result from direct damages to facilities or business disruption from the lack of critical services such as power, gas, or water. H. Debris removal is a vital service that is often too vast for the jurisdiction to do without contractual assistance. These plans should be in place and monitored; a debris management plan is in progress including Appanoose County. I. Adequate warning is critical to the positive reputation of the jurisdiction. Responding in a timely manner and reconstructing the community is also important. Bringing critical services back on line quickly will ensure the residents can begin their personal recovery process sooner.	3
Speed of Onset	Tornado watches can warn of likely conditions hours in advance of an upcoming storm. Although significant advances in meteorological technology has allowed for much more effective forecasting, specific Tornado cannot be predicted with any precision any more than minutes before they develop. The rapid change in direction a tornado can achieve makes it difficult to say with certainty the path the tornado will continue on even after it has been identified. Therefore warning time can sometimes be very short or occasionally	4

	non-existent.	
	Hazard Worksheet Score	19
	Composite Score	32

Figure 11: Fujita Scale



Source: National Oceanic and Atmospheric Administration, http://www.srh.noaa.gov/lch/jamb/jambalaya0407-5.php

Figure 12: Fujita-Pearson Scale

Fujita-Pearson Tornado Scale

Pearson Rating	length	Width	Fujita Rating	Wind Speed
P0	0.3 - 0.9 miles	6-17 yards	F0	40-72 mph
P1	1.0-3.1 miles	18-55 yards	F1	73-112 mph
P2	3.2-9.9 miles	56-175 yards	F2	113-157 mph
P3	10.0-31.0 miles	176-566 yards	F3	158-206 mph
P4	32.0-99.0 miles	0.3-0.9 miles	F4	207-260 mph
P5	100.0-315.0 miles	1.0-3.1 miles	F5	261-318 mph

Source: http://www.stormfax.com/fujita.htm

Hazard	Windstorms / High Wind Events	
Definition	**Windstorm**: A storm with high winds or violent gusts but little or no rain (American Heritage Dictionary). **High Wind Event**: An event where sustained winds of at least 40 mph or gusts are 58 mph or more (NOAA).	
Description	Damage from severe thunderstorm winds account for half of all severe reports in the lower 48 states and is more common than damage from Tornado. Wind speeds can reach up to 100mph and can produce a damage path extending for hundreds of miles. These winds are often called "straight-line" winds to differentiate the damage they cause from tornado damage. Strong thunderstorm winds can come from a number of different processes. Damaging winds are classified as those exceeding 50-60mph. Since most thunderstorms produce some straight-line winds as a result of outflow generated by the thunderstorm downdraft, anyone living in thunderstorm-prone areas of the world is at risk for experiencing this phenomenon. High winds can result from thunderstorm inflow and outflow, or downburst winds when the storm cloud collapses, and can result from strong frontal systems, or gradient winds (high or low pressure systems) moving across a region. High winds are defined as speeds reaching 50 mph or greater, either sustaining (continuous) or gusting. Downdraft winds are from a strong thunderstorm downburst which causes damaging winds on or near the ground, and can extend to as little as 2 ½ miles or extend over a hundred miles. Downdraft wind speeds can be from 80 mph up to 168 mph, and occur quite suddenly as a thunderstorm cloud collapses. This is different from the winds associated with Tornado. Winds associated with storms are convective. Non-convective winds are caused by fronts or gradient winds. These speeds can range from light breezes to sustained speeds of 80 to 100 mph. Windstorms can be with little or no rain. Appanoose County is located within Zone IV which means that wind speeds can reach and exceed 250 mph. A map showing extents of each wind speed follows this hazard profile.	Rating
Historical Occurrence	High winds have been responsible for 22 recorded events since 1993 in Iowa and Appanoose County. However, many other high wind events are on record combined with thunderstorms since 1965. High winds tend to affect a large area so an event that impacts Appanoose County is very likely to include surrounding counties as well. Of the high wind events that impacted Appanoose County, there were $38.295 million in property damages, $260 thousand in crop damage, one death, and 9 injuries. These numbers encompass more than Appanoose County and so the impacts within the county are far less	4

<table>
<tr><td></td><td>severe.

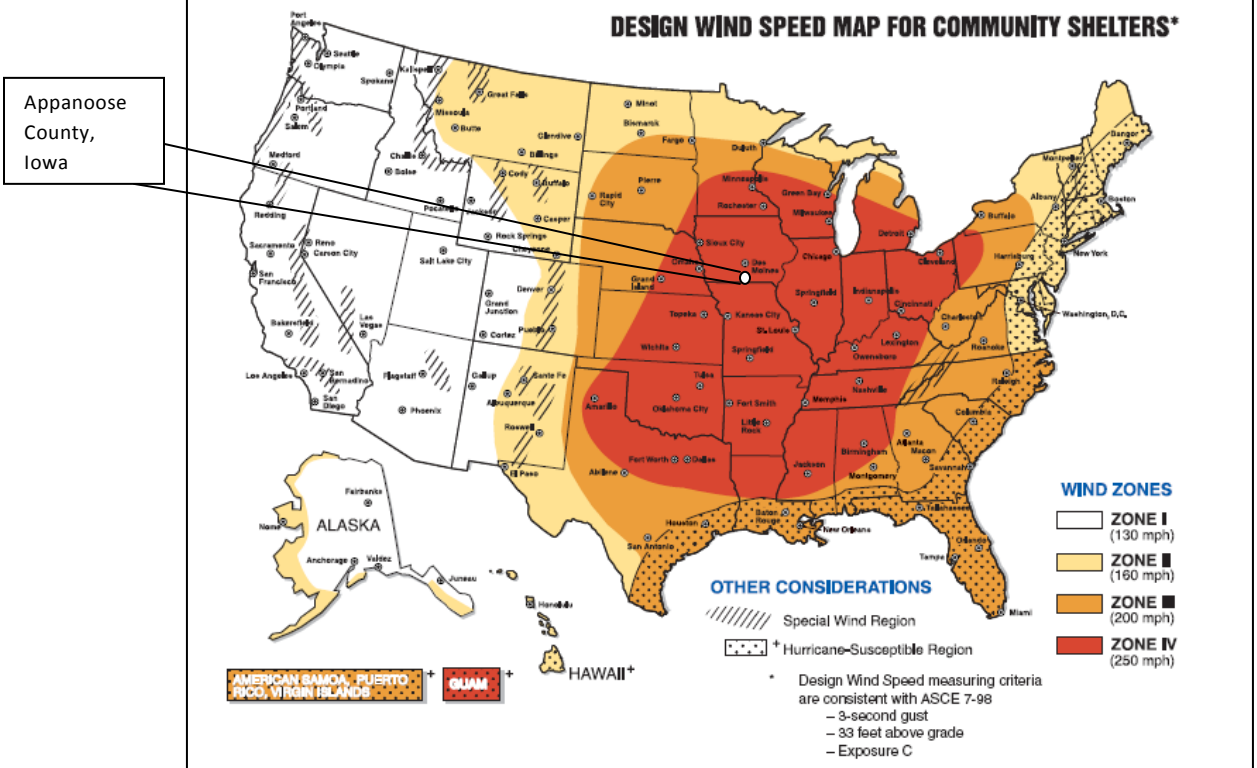
The highest recorded wind speed from a high wind event was 72 knots which is equivalent to almost 83 miles per hour.

One of the most significant events was on November 10, 1998 which affected 52 counties and resulted in $17.3 million in property damage, $260 thousand in crop damages, and one death. This amounts to about $333 thousand in property damage on average per county, however it is unlikely that each of the affected counties were impacted equally. See Appendix N: NCDC Storm Events for a record of events that have impacted Appanoose County. The chart below provides a summary of NCDC recorded high wind events; property and crop damages are in thousands of dollars.

High Winds since 1965
<table><tr><th>Jurisdiction</th><th>number</th><th>mag.</th><th>deaths</th><th>injuries</th><th>property</th><th>crop</th></tr><tr><td>Total</td><td>22</td><td>72kts max</td><td>1</td><td>9</td><td>38M</td><td>260</td></tr></table></td><td></td></tr>
<tr><td>Probability</td><td>Based on the high wind events occurring since 1993, there is on average about 1.5 events each year. The State of Iowa estimates that throughout the state there will be 7-10 high wind events in excess of 70 knots (80.5 mph) annually.</td><td>4</td></tr>
<tr><td>Vulnerability</td><td>Vulnerability to windstorms is very similar to Tornado as windstorms mimic Tornado in their effects. Buildings may be damaged by debris picked up by the storm, windows could be potentially blown out, and vehicles may be overturned. Persons in mobile homes, outdoors, and in vehicles during windstorms are at the most risk. See the Tornado profile above for additional relevant information.</td><td>3</td></tr>
<tr><td>Maximum Threat</td><td>The maximum threat of a windstorm may be spread over a wider area than many Tornado since the winds are not confined to a rotating and therefore concentrated area. A windstorm that occurs within Appanoose county would likely impact the entire county.</td><td>3</td></tr>
<tr><td>Severity of Impact</td><td>A. Injury or death related to windstorms most often occur from building failure, or people struck by flying objects
B. Response personnel are exposed to the same risk as the public when caught in storms without shelter.
C. Windstorms can damage government facilities just as they could other property. Disruption of critical services can also affect operations. Employees may be affected and unable to attend work-related issues.
D. Impacts can range from broken tree branches, shingle damage to roofs, and some broken windows; all the way to complete destruction of well constructed structures, infrastructure, and trees.
E. Windstorms can affect many critical services, especially electrical power. Buried Services are not as vulnerable, but can be affected by their system components that are above ground.
F. Windstorms are naturally occurring phenomena. Damages to the environment could result from hazardous materials spills and other contaminants from the built environment.</td><td>3</td></tr>
</table>

	G. Economic impacts can result from direct damages to facilities or business disruption from the lack of critical services such as power. Crop damage is often associated with windstorms; laying down crops, breaking stalks, and twisting plants, reducing the yield and making it difficult to harvest. H. Debris removal is a vital service that is often too vast for the jurisdiction to do without contractual assistance. These plans should be in place and monitored. I. Adequate warning is critical to the positive reputation of the jurisdiction. Responding in a timely manner and reconstructing the community is also important. Bringing critical services back on line quickly will ensure the residents can begin their personal recovery process sooner.	
Speed of Onset	Although significant advances in meteorological technology has allowed for much more effective forecasting, windstorms are the hardest of storm events to predict due to the variety of conditions that create them. Doppler radar can help to identify windstorms and their strength but may not provide much warning for people in the affected area to seek shelter. Currently the best lead-time for a specific severe storm is about 30 minutes.	4
	Hazard Worksheet Score	21
	Composite Score	34

Figure 13: Wind Zones in the United States



Source: FEMA 386-2 CD August 2001, Understanding Your Risks: Identifying Hazards and Estimating Losses

Hazard	Extreme Heat	
Definition	**Extreme Heat**: Temperatures (including heat index) in excess of 100 degrees Fahrenheit or 3 successive days of 90+ degrees Fahrenheit. A heat advisory is issued when temperatures reach 105 degrees and a warning is issued at 115 degrees. Note: Extreme cold is addressed in the severe winter storm hazard, matching the State hazard mitigation plan.	
Description	A prolonged period of excessive heat and humidity. The heat index is a number in degrees Fahrenheit that tells how hot it really feels when relative humidity is added to the actual air temperature. Exposure to full sunshine can increase the heat index by at least 15 degrees. 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	Rating

<table>
<tr><td></td><td>structures and surfaces such as roadways and railroad tracks.</td><td></td></tr>
<tr><td>Historical Occurrence</td><td>Two periods of extreme heat between 1994 and 2001 resulted in 4 deaths and $3.8 million in property damage for the region including Appanoose County. See Appendix N: NCDC Storm Events for a record of events that have impacted Appanoose County.

During the summers of 1997 and 1998, there were a combined total of 31 days when the high temperature was 90 degrees Fahrenheit or higher. There were 3 periods when temperatures were 90 degrees or above for at least 3 consecutive days between 2001 and 2003.

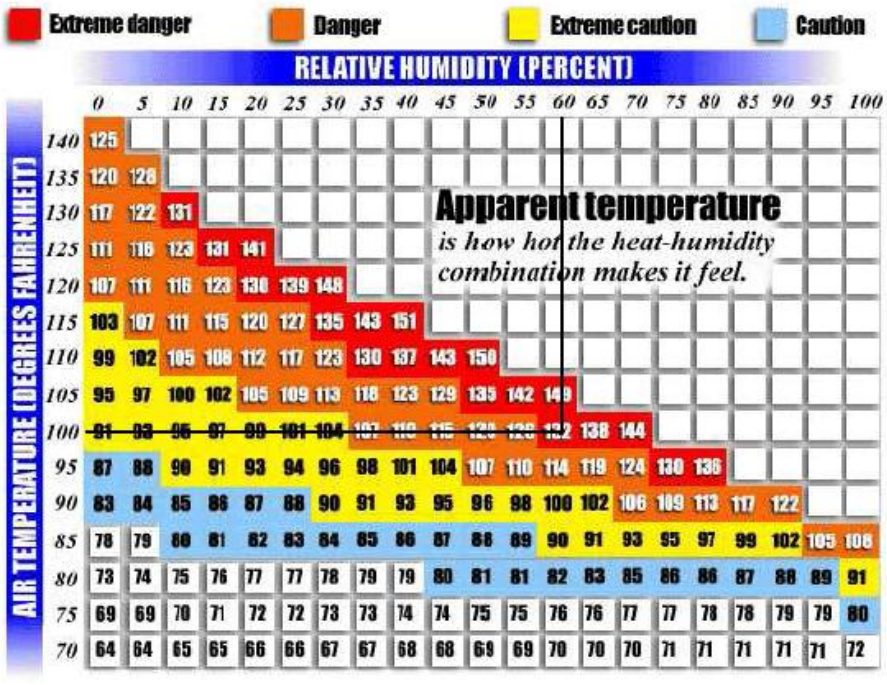
Extreme Heat since 1994
<table><tr><td>Jurisdiction</td><td>number</td><td>mag.</td><td>deaths</td><td>injuries</td><td>property</td><td>crop</td></tr><tr><td>Total</td><td>2</td><td>n/a</td><td>4</td><td>0</td><td>3.8 M</td><td>0</td></tr></table></td><td>1</td></tr>
<tr><td>Probability</td><td>Indicated in Iowa's Hazard Analysis and Risk Assessment: 2007 Local Guide, Iowa will likely experience about 26 days a year with temperatures above 90 degrees. There is a very good chance that there will also be a period of 3 consecutive days or more with temperatures in the 90s. It is also common for the temperature to hit 100 degrees or more once every three years during the summer months.

Climate projections suggest that Iowa will experience more frequent very hot days and longer periods of high temperatures. This is despite the fact that the average annual temperature in Iowa has declined by .2 degrees over the last century (Climate Change and Iowa, US EPA, September 1998).</td><td>3</td></tr>
<tr><td>Vulnerability</td><td>The very young and the elderly are particularly vulnerable to extreme heat as are low income populations. Likewise, those on certain medications or drugs (especially tranquilizers and anticholinergics), and persons with weight and alcohol problems are particularly susceptible to heat reactions. Children are less likely to recognize the risk and therefore less likely to take precautionary measures. Likewise, the elderly may have more difficulty in sensing the extremities and may become over-exposed to the dangers.

See individual jurisdiction profiles for specifics on the size of vulnerable populations. Generally speaking, the vulnerable population is no more than about 30-40% in any given jurisdiction.</td><td>3</td></tr>
<tr><td>Maximum Threat</td><td>Most of the state would likely be impacted by extreme heat, but urban areas pose special risks. The stagnant atmospheric conditions of the heat wave trap pollutants in urban areas and add to the stresses of hot weather.</td><td>4</td></tr>
<tr><td>Severity of Impact</td><td>A. Nationally, over the last 30 years, excessive heat accounts for more reported deaths annually than hurricanes, floods, Tornado, and lightning combined.
B. Response personnel could suffer heat stroke and dehydration working in extreme heat conditions.</td><td>3</td></tr>
</table>

	C. Continuity of Operations: None directly affected, see E. D. Transportation impacts include the loss of lift for aircrafts, softening of asphalt roads, buckling of highways and railways, and stress on automobiles and trucks (increase in mechanical failures). E. Electric transmission systems are impacted when power lines sag in high temperatures. High demand for electricity also outstrips supply, causing electric companies to have rolling black outs. The demand for water also increases sharply during periods of extreme heat. This can contribute to fire suppression problems for both urban and rural fire departments. F. Livestock and other animals are adversely impacted by extreme heat. High temperatures at the wrong time inhibit crop yields as well. G. Economic costs in transportation, agriculture, production, energy, and infrastructure. These direct costs could impact many other economic sectors indirectly. H. Regulations and Contractual Obligations: None I. No reputation should suffer if response is adequate and timely.	
Speed of Onset	As with some other weather phenomena, periods of extreme heat are predictable within a few degrees within about 3 days. Variations in local conditions can affect the actual temperature within a matter of hours or even minutes. The National Weather Service will initiate alert procedures in the event of extreme heat.	2
	Hazard Worksheet Score	16
	Composite Score	21

Figure 14: Apparent Temperature; Heat-Humidity Combination



Source: National Oceanic and Atmospheric Administration

Hazard	**Hailstorm**	
Definition	**Hailstorm**: An outgrowth of a severe thunderstorm in which balls or irregularly shaped lumps of ice greater than 0.75 inches in diameter fall with rain.	
Description	Hail is frozen water droplets formed inside a thunderstorm cloud. They are formed during the strong updrafts of warm air and downdrafts of cold air, when the water droplets are carried well above the freezing level to temperatures below 32 deg F, and then the frozen droplet begins to fall, carried by cold downdrafts, and may begin to thaw as it moves into warmer air toward the bottom of the thunderstorm. This movement up and down inside the cloud, through cold then warmer temperatures, causes the droplet to add layers of ice and can become quite large, sometimes round or oval shaped and sometimes irregularly shaped, before it finally falls to the ground as hail. 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. Hailstorms impact an area about 15 miles in diameter on average. See *Appendix J: TORRO Hailstorm Intensity Scale* for charts indicating the impacts of hail based on size of hail.	Rating
Historical Occurrence	A total of 4,472 hail events have occurred in Iowa since 1993 according to the National Climatic Data Center. These have resulted in 11 injuries and 4 deaths in the state. Since 1961 there have been 55 recorded hail storms in Appanoose County. The cumulative damage of these events on property amounted to $329 thousand and $190 thousand in crop losses. The largest diameter hail found in Appanoose County was 3 inches! See *Appendix N: NCDC Storm Events* for a record of events that have impacted Appanoose County. The chart below provides a summary of NCDC recorded hailstorms; property and crop damages are in thousands of dollars.	4

Hail since 1961

Jurisdiction	number	mag.	deaths	injuries	property	crop
Total	55	3 in max	0	0	329	190
Moravia	5	1 in max	0	0	11	65
Unionville	3	1.75 in max	0	0	60	50
Rathbun	2	.88 in max	0	0	2	5
Plano	3	1.75 in max	0	0	30	0
Centerville	9	2.75 in max	0	0	123	10
Moulton	6	2 in max	0	0	29	5
Udell	1	1.75 in	0	0	25	5
Cincinnati	1	1 in	0	0	5	5

	Numa | 1 | 1.75 in | 0 | 0 | 10 | 0	
Probability	According to the 2007 Iowa State Hazard Mitigation Plan, data on probability and frequency of occurrence of hailstorms is limited, but research indicates that any given point in Iowa can expect on average two to three hailstorms in a year (Iowa's *Hazard Analysis and Risk Assessment: 2007 Local Guide*). Based on the recorded events that have impacted Appanoose County, the county could expect about one hailstorm annually.	4
Vulnerability	Agricultural crops such as corn and beans are particularly vulnerable to hailstorms stripping the plant of its leaves. Hail can also do considerable damage to vehicles and buildings. Hail only rarely results in loss of life directly although injuries can occur. As a storm, large areas of the county or whole communities would be impacted.	2
Maximum Threat	There are many similarities between hailstorms and thunderstorms as they often occur together. Hail can cause debris to accumulate in roads along with the hail itself making travel more difficult, visibility can be reduced, and the hail can cause significant damage to vehicles and buildings. As a storm, large areas of the county or whole communities would be impacted.	2
Severity of Impact	A. Exposure to hail larger than a nickel can be very dangerous and life threatening. B. Risk to response personnel is the same as the risk to others without shelter from the hail. C. Operations should not be affected to any significant degree. D. Damage to property, facilities, and infrastructure is usually limited to broken windows and damaged roofs. E. Delivery of services should not be affected to any significant degree. There may be minor disruptions, but they would likely come from high winds and lightning (usually associated with hailstorms). F. Hail can strip plants of their vegetation in very little time. If this occurs at a critical time in the life cycle of plants, it could have fatal consequences. G. Hailstorms cause nearly $1 billion dollars annually in property and crop damage in the United States. The peak hail activity coincides with the Midwest's peak agricultural season. Financial impacts resulting from damage to property is in the millions of dollars every year, most of which is covered by crop and hazard insurance. H. Regulations and Contractual Obligations: None known. I. Timely and adequate response to the event is the key.	2
Speed of Onset	Forecasting hailstorms as with their parent thunderstorms, is becoming quite accurate due to the advancement in Doppler Radar and other technologies operated by the National Weather Service and local television weather departments. Warnings in the 20 to 30 minute range are usually available prior to the occurrence of the storm.	4
	Hazard Worksheet Score	18
	Composite Score	24

Hazard	Grass or Wildfire	Rating
Definition	**Wildfire**: An uncontrolled fire spreading through vegetative fuels, exposing and possibly consuming structures (FEMA). **Grass Fire**: An uncontrolled fire in a grassy area	
Description	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. Fires may also occur as a secondary effect from an initial disaster, such as lightning, high winds, Tornado, or transportation disasters. Grass and wildfires can occur when conditions are favorable such as during periods of drought when natural vegetation would be drier and subject to combustibility.	
Historical Occurrence	Over 11,400 grass fires were reported in Iowa during the years 1994 to 1999. There have been no recorded grass or wildfires in the NCDC database in Appanoose County currently; however the risk does exist especially if droughts affect the area. Anecdotal evidence suggests that there have been grass or wildfires in Appanoose County despite the lack of documentation. Committee members spoke with their respective fire departments and discovered that many have heard stories of Grass fires long ago but none are able to recall recent occurrences within the past 20 years nor find documentation to support it.	3
Probability	The State of Iowa indicates that there is nearly 100% chance that there will be a grass fire in each county in the state each year.	4
Vulnerability	For most grass or wildfires, the number of people or properties impacted would be negligible. However, firefighters are vulnerable to health hazards resulting from the fires themselves as well as the physical stresses of fighting such fires.	1
Maximum Threat	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.	1
Severity of Impact	A. Grass and wildfires pose a threat to individuals ranging from smoke inhalation to severe burns and death. B. Risk to response personnel includes heart attack and smoke inhalation. C. Operations could be impacted if facilities are damaged by a grass or wildfire or if electrical transmission lines are damaged.	2

	D. Damage to property, facilities, and infrastructure can range from minor smoke damage to incineration. Grass and wildfires pose a threat to crops and livestock as well as structures. E. Delivery of services may not see major impacts though some delays may occur depending on where the fires occur. F. Grass and wildfires may be of particular concern in Appanoose County due to the presence of old coal mines. Not all of these mines were exhausted of coal, most abandoned as coal mining technology changed in the early part of the 20th Century. A fire spreading to coal mines could lead to mine collapse and the associated impacts.[6] G. Economic impacts would be most significant on the agricultural community unless such a fire were to spread into a settled community. Insurance policies may or may not cover grass or wildfire damage. H. Regulations and Contractual Obligations: None known. I. Timely and adequate response to the event is critical to reputation.	
Speed of Onset	Most grassfires occur without warning and travel at a moderate rate. This situation depends upon conditions at the time such as moisture, wind, and land cover.	4
	Hazard Worksheet Score	15
	Composite Score	28

Hazard	**Severe Winter Storm**	Rating
Definition	**Severe Winter Storm**: Severe winter weather conditions that affect day-to-day activities. These can include blizzard conditions, heavy snow, blowing snow, freezing rain, heavy sleet, and extreme cold.	
Description	Winter storms are common during the winter months of October through April. The various types of extreme winter weather cause considerable damage. Heavy snows cause immobilized transportation systems, downed trees and power lines, collapsed buildings, and loss of livestock and wildlife. Blizzard conditions are winter storms which last at least three hours with sustained wind speeds of 35 mph or more, reduced visibility of 1/4 mile or less, and white-out conditions. Heavy snows of more than six inches in a 12-hour period or freezing rain greater than 1/4 inch accumulation causing hazardous conditions in the community can slow or stop the flow of vital supplies as well as disrupting emergency and medical services. 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 result in fallen trees, broken tree limbs, downed power lines and utility poles, fallen	

[6] Such mine fires and community abandonments are not without historical precedent; Centralia, Pennsylvania has had a coal mine fire burning underneath it for 46 years. The town had a population of about 1,000 until 1981 when a sinkhole suddenly opened and nearly killed a young boy. The population has declined to about 9 as of 2007 and much of the town has been condemned.

<table>
<tr><td></td><td>communications 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.

Winter storms, when accompanied by a repeated freeze-thaw cycle can cause substantial damage to rural, gravel roads by essentially turning them to mud. In rural southern Iowa counties this is a significant challenge that puts additional pressures on secondary roads departments' budgets and staff. While temperatures are projected to continue to increase in Iowa on average by a few degrees, precipitation is expected to increase by about 10% in future winters (US EPA, Climate Change and Iowa, September 1998).</td><td></td></tr>
<tr><td>Historical Occurrence</td><td>There have been 40 recorded snow and ice events in Appanoose County since 1993 including freezing rain, snow, ice storms, and winter storms. Six deaths are associated with these events and property damage totaling $16.818 million are recorded. In 1995 two snow events that affected Appanoose County, were recorded for a larger part, or all of Iowa totaling $60 thousand in property damage for all included areas.

Since 1994 there were 11 periods of extreme cold or extreme wind chill amounting to $1.8 million in property damages and $281 million in crop damages. Only one death is associated with these events. Each of these events included a broader area than just Appanoose County. See Appendix N: NCDC Storm Events for a record of events that have impacted Appanoose County.

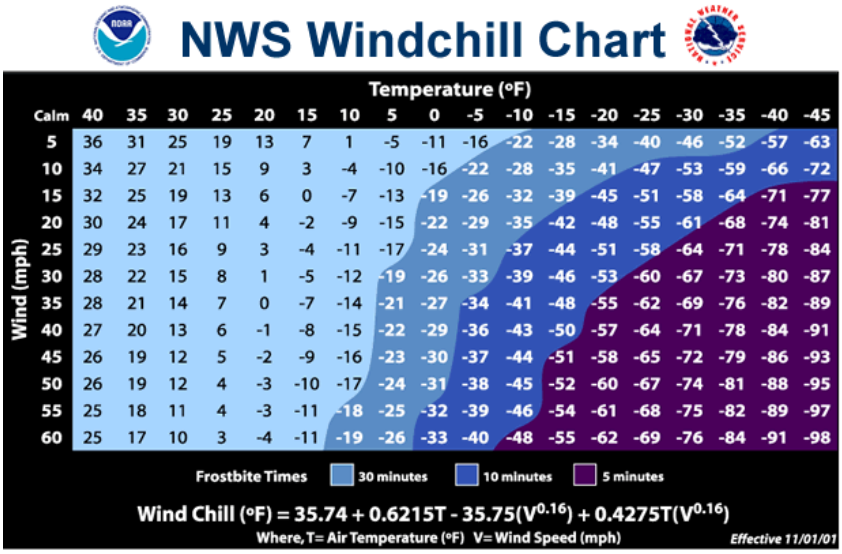
Severe Winter Storms since 1993
<table><tr><th>Jurisdiction</th><th>number</th><th>mag.</th><th>deaths</th><th>injuries</th><th>property</th><th>crop</th></tr><tr><td>Total</td><td>40</td><td>n/a</td><td>6</td><td>0</td><td>16.8 M</td><td>0</td></tr></table>
Extreme Cold since 1994
<table><tr><th>Jurisdiction</th><th>number</th><th>mag.</th><th>deaths</th><th>injuries</th><th>property</th><th>crop</th></tr><tr><td>Total</td><td>11</td><td>n/a</td><td>1</td><td>0</td><td>1.8 M</td><td>281 M</td></tr></table></td><td>4</td></tr>
<tr><td>Probability</td><td>Winter storms regularly move easterly and use both the southward plunge of arctic cold air from Canada and the northward flow of moisture from the Gulf of Mexico to produce heavy snow and sometimes blizzard conditions in Iowa and other parts of the Midwest. The cold temperatures, strong winds, and heavy precipitation are the ingredients of winter storms.

According to the State mitigation plan, most counties can usually expect 2 or 3 winter storms a season with an extreme storm every 3 to 5 years on average (more in the northwest, fewer in the southeast). A snowfall of six inches or</td><td>4</td></tr>
</table>

	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.	
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 for feed, water and shelter for livestock are unable to be met. People, pets, and livestock are also susceptible to frostbite and hypothermia during winter storms. Those at risk are primarily either engaged in outdoor activity (shoveling snow, digging out vehicles, or assisting stranded motorists), or are the elderly or very young. Schools often close during extreme cold or heavy snow conditions to protect the safety of children and bus drivers. Citizens' use of kerosene heaters and other alternative forms of heating may create other hazards such as structural fires and carbon monoxide poisoning. About 35% of the population of Appanoose County resides in the unincorporated county. More than 40% of the population lives in Centerville which due to its size and resources may be better situated to handle winter storms. At the same time, smaller communities, especially those without grocery stores, may be more vulnerable as residents are more likely to be on the roads for work, household supplies, and groceries. Individuals who may experience certain medical and psychological conditions or who may be under the influence of alcohol or drugs may be particularly vulnerable.	4
Maximum Threat	Although the developments in technology have been very beneficial in reducing the long-term negative effects of winter storms, certain dangers still exist. The maximum threat of winter conditions would be realized if it was accompanied by power outages and elimination of travel due to hampered road conditions. This could result in the inability for some of the population to maintain temperatures necessary for the body. In addition long winter events that eliminate communication could result in the reduction of adequate medical response time. Due to the nature of winter storms, the whole county as well as surrounding counties would likely be impacted by an event. 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 area.	4
Severity of Impact	A. Severe winter storms can lead to injury and death through traffic accidents or to individuals that may be caught outdoors. Cold temperature impacts on agriculture are frequently discussed in terms of frost and freeze impacts early or late in growing seasons and unprotected livestock. B. Response personnel are exposed to cold temperatures and traffic	3

	accidents when responding to the victims needs. C. Operations can be limited or halted when critical services are not available. Staff may not be able to make it to the place of work, thus, limiting the continuity of operations. D. 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 impacts of a severe winter storm. Vehicle batteries and diesel engines are stressed and the fuel often gels in extreme cold weather. This impacts transportation, trucking, and rail traffic. E. 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. 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 of 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. F. Winter storms are a natural occurrence and there would be no direct significant impact on the environment beyond tree damage and the impacts related to ice dams. G. The cost of snow removal, repairing damage, and loss of business can have large economic impacts on the community. Also, the state estimated $76,159,000 in property damage, and $346,900,000 in lost crops due to heavy snow, ice storm, or extreme wind-chill events statewide. H. Enforced snow ordinances allow the jurisdiction to more effectively open transportation routes. Delivery and adequate supplies of salt, sand, and saline are important inputs to the snow removal process. These contracts should be in place. Removal of debris and reinstatement of energy are vital to safety of the public as well. Agreements should be in place with the power company to ensure power is restored in an effective and timely manner following the storm. Severe winter storms can contribute to substantial damage to rural roads and place a strain on secondary roads departments in maintaining them and keeping rural roads safe for travel. I. Effective and timely response to the snowstorm is critical to maintaining a good reputation. Streets clear of snow and ice are important factors to the mobile public.	
Speed of Onset	The National Weather Service (NWS) has developed effective weather advisories that are promptly and widely distributed. Radio, TV, and Weather Alert Radios provide the most immediate means to do this. Accurate information is made available to public officials and the public up to days in advance. Several notifications made by the National Weather Service include winter storm watch, winter storm warning, blizzard warning, winter weather advisory, and a frost/freeze advisory.	3
	Hazard Worksheet Score	22
	Composite Score	34

Figure 15: Windchill Chart



Source: National Oceanic and Atmospheric Administration, National Weather Service

Hazard	Drought	
Definition	**Drought**: A period of prolonged lack of precipitation for weeks at a time producing severe dry conditions.	
Description	There are three types of drought conditions that are relevant to Iowa: **Meteorlogic drought**, which refers to precipitation deficiency; **Hydrological drought**, which refers to declining surface water and groundwater supplies; and **Agricultural drought**, which refers to soil moisture deficiencies. 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. At a meeting in the preparation for a neighboring county's hazard mitigation plan, a representative from the Natural Resource Conservation Service indicated that the region is well on its way to handling floods. However it is not well situated to handle droughts. This passing comment is important as Iowa is generally considered to be "water rich" and is not known as an area that must prepare for droughts. This lack of preparedness places the state and the various jurisdictions within it at greater risk should a drought occur. See *Figure 16: Example of Palmer Index for Drought Severity* for a graphic representation of the Palmer Index.	Rating
Historical Occurrence	There have been six droughts affecting Appanoose County since 1995 when the first recorded drought occurred. No deaths or injuries are associated with these events; however $645.15 million in property damage resulted from the most recent drought in August of 2003. A combined total of $1.5 billion in crop damage is recorded among the six events. All of these six recorded events included multiple counties thus the costs of damages are dispersed. According to the Palmer Drought Severity Index, a composite of evapotranspiration, recharge, runoff, loss, and precipitation, Iowa has suffered seven periods of drought conditions since 1910. These periods are 1910-1913, 1933-1935, 1955-1958, 1967-1969, 1976-1977, 1980-1982, and 1988-1990. While some may have been more severe than others, agricultural areas were impacted much more than the metropolitan areas where impacts were indirect.	2

<table>
<tr><td></td><td>Drought since 1995<table><tr><th>Jurisdiction</th><th>number</th><th>mag.</th><th>deaths</th><th>injuries</th><th>property</th><th>crop</th></tr><tr><td>Total</td><td>6</td><td>n/a</td><td>0</td><td>0</td><td>645 M</td><td>1.5 B</td></tr></table></td><td></td></tr>
<tr><td>Probability</td><td>Drought is part of normal climate fluctuations. Climatic variability can bring dry conditions to the region for up to years at a time. Research and observations of the El Nino/La Nina climatic events are resulting in more predictable climatic forecasts. However, with climatic changes currently taking place, greater variability in precipitation can be expected in coming years increasing the frequency and/or severity of future droughts.</td><td>2</td></tr>
<tr><td>Vulnerability</td><td>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 impacted a large area) would be impacted. 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 impact all citizens if there were to be a dramatic drop in the stream flow coupled with the drop in the water table.

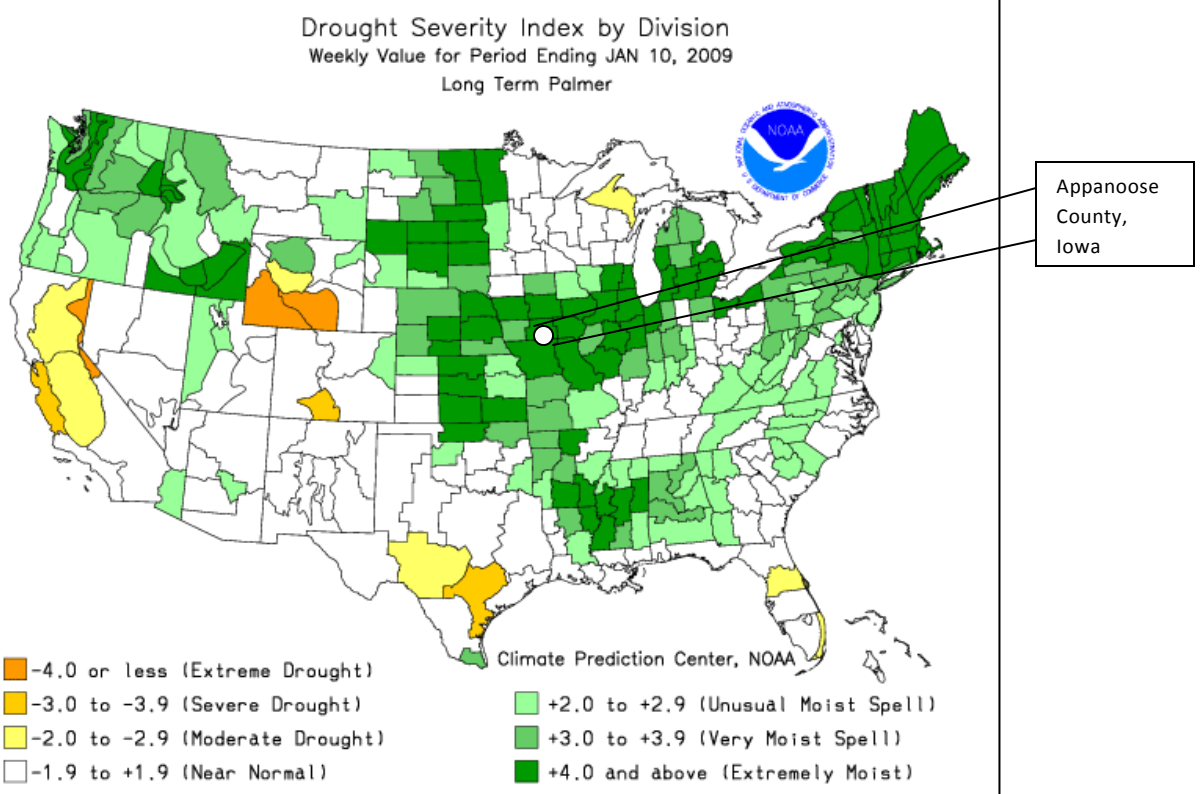
Fire suppression can also become a problem due to the dryness of the vegetation and possible lack of water. This would be most threatening to older buildings, especially those that are attached or are located very close to adjacent structures such as in commercial clusters such as on town squares. While the water supply for Appanoose County comes from Rathbun Lake, a prolonged, severe drought could compromise the best efforts of Fire Departments in fighting fires anywhere in town.

Since Rathbun Lake water has replaced the individual municipal water sources, the majority of the county could be impacted by a particularly severe drought. Aside from municipal water, about 35% of the county's residents are in rural areas and presumably on well water. A number of ponds and small wetlands are present in the county which presumably supply water needs for agricultural and livestock needs.</td><td>3</td></tr>
<tr><td>Maximum Threat</td><td>A drought would likely affect most of Iowa if not the Midwest as a whole. Because of the dependence on precipitation and water, the agricultural community would be impacted the most. The agricultural areas would be most adversely impacted, but the entire state would likely feel at least some impact. Geographically, most or all of the county could be affected by a drought.

Rathbun Lake is a significant resource in Appanoose County and surrounding counties that may well mitigate drought events. However, numerous counties draw from Rathbun Lake for water resources and so a prolonged, severe drought could negatively impact local water supplies. Likewise, the lake is an economic resource for the region including tourism; drought could have deep impacts on the local and regional economy.</td><td>4</td></tr>
<tr><td>Severity of</td><td>A. Few if any health impacts to people in the affected area because of</td><td>3</td></tr>
</table>

Impact	secondary sources of water. Drought in the U.S. seldom results directly in the loss of life. Health impacts would be more significant on livestock without auxiliary water supplies. B. Response personnel are at minimal risk. C. Continuity of operations would not be affected. D. Property losses would be limited to livestock and crops to the agricultural community. Facilities would not be impacted. Infrastructure could be affected in areas of expansive soils due to drying soils, lower water levels around dams, etc. E. Delivery of services would be limited to source water delivery and those services that consume large amounts of water. F. Drought is a naturally occurring hazard that occurs about every 20 years. The environmental impacts are usually short-term (resilient) and the natural environment is used to drought cycles. Drought more directly affects agricultural crops, livestock, natural vegetation, wildlife, and stream flows (fish and aquatic vegetation). G. Drought can lead to large and damaging impacts to the agricultural economy. Because of Iowa's reliance on the agricultural economy, the economic and financial impacts would certainly ripple out into other sectors. Rural areas can be especially affected by long-term drought. If restrictions are put on manufacturers that use large amounts of water, the local economy can be impacted that way as well. H. Regulations in the agricultural sector can be and are often adjusted to provide some lenience for adverse conditions for livestock and crop loss. I. Drought is a naturally occurring hazard and is "out of the hands" of local and state officials. Local jurisdictions can have their reputation damaged if they do not provide source water to residents or respond in a satisfactory manner to provide an alternative supply.	
Speed of Onset	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, and 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.	1
	Hazard Worksheet Score	15
	Composite Score	22

Figure 16: Example of Palmer Index for Drought Severity



Source: National Oceanic and Atmospheric Administration, http://www.cpc.noaa.gov/products/analysis_monitoring/regional_monitoring/palmer.gif

Note: The Palmer Index ranges from -4 (or less) to +4 (or more) to indicate the severity of droughts with 0 indicating normal conditions.

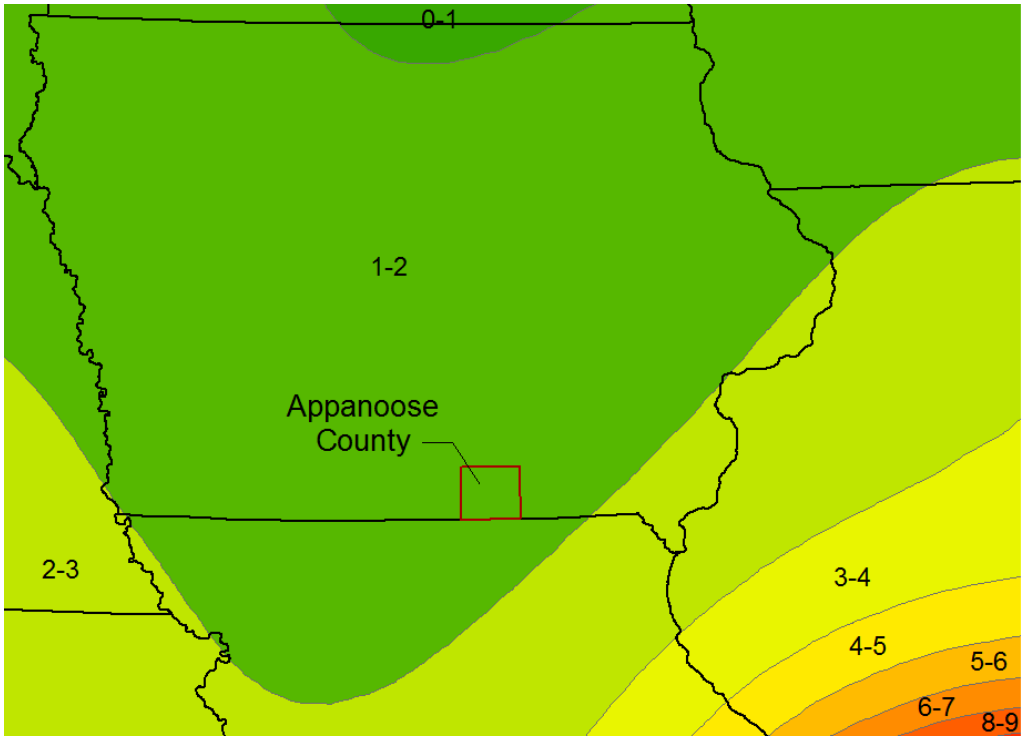
Hazard	Earthquake	Rating
Definition	**Earthquake**: A sudden motion or trembling that is caused by a release of strain accumulated within or along the edge of earth's tectonic plates (FEMA). **Mercalli Intensity Scale**: The Mercalli Scale is based on observable damage which while is more subjective, is easier to comprehend for the general populace (USGS FAQ – Measuring Earthquakes). See *Appendix X: Modified Mercalli Scale for Earthquake Intensity*. **Richter Scale**: The Richter Scale is a measure of size and power of earthquakes; "as an estimate of energy, each whole number step in the magnitude scale corresponds to the release of about 31 times more energy than the amount associated with the preceding whole number value" (USGS Visual Glossary – Richter Scale). See *Appendix P: Richter Scale*.	
Description	An earthquake is a sudden, rapid shaking of the earth caused by the breaking and shifting of rock beneath the Earth's surface. This shaking can cause buildings and bridges to collapse; disrupt gas, electric, and phone service; and sometimes trigger landslides, flash floods, and fires. The three general classes of earthquakes now recognized are: tectonic, volcanic, and artificially produced. While Iowa is not thought of as a state that can experience an earthquake, the New Madrid fault line is located where Missouri, Arkansas, Kentucky, and Tennessee meet. Additionally the Wabash Valley seismic zone is located along the south eastern boarder of Illinois and Indiana.	
Historical Occurrence	Iowa as a whole has experienced the effects of only a few earthquakes in the past 175 years. The epicenters of 12 earthquakes have been located in the state. The majority has been along the Mississippi River, and none have been in central Iowa, nor any of the participating jurisdictions. While more than 20 earthquakes have occurred in or impacted Iowa over the past 175 years, they have not seriously impacted the state. See *Appendix W: Iowa Historic Earthquakes*. In 1811 and 1812 earthquakes struck the broader region with a magnitude of between 7.5 and 8.0 accompanied by accounts of the Mississippi River reversing direction. The damage was significant within many miles of the quake and could be felt throughout several states. The nature of the soils in the Midwest helps in transmitting tremors over longer distances than in areas	1

	where earthquakes are more commonly thought of. In the spring of 2008, slight tremors could be felt in parts of Iowa resulting from an earthquake originating in south eastern Illinois.[7]	
Probability	Appanoose County is in an area where the probability of exceeding horizontal peak gravity acceleration by 1-2% is 10% over a period of 50 years (see Figure 8). In other words, there is a 90% chance that any earthquake in the next 50 years affecting the county will not exceed an acceleration of 1-2% of the force of gravity. An intensity of 6-7 on the Mercalli Scale is approximately equal to 10% gravity acceleration, meaning the speed at which the ground shakes. This magnitude is roughly equivalent to a strong earthquake that would be very noticeable with some structural damage, especially to older or poorly built structures and movement of heavy furniture. Ground acceleration of 1-2%, the intensity applicable to Appanoose County, would be minor or negligible. Based on recurrence intervals for small earthquakes, scientists estimate a 90% chance of a Richter magnitude 6.0 earthquake in the New Madrid Fault Zone by 2040. A magnitude 6.5 in New Madrid would create a magnitude 4 effect in Iowa resulting in little or no damage.	1
Vulnerability	Vulnerability to earthquakes in Iowa is largely related to buildings and infrastructure. As Iowa is not known as an area at risk of earthquakes, buildings often do not incorporate the earthquake resistant features that those in California and other earthquake-prone regions do. Unreinforced brick structures face the risk of collapse or similar significant damage which poses a risk to the inhabitants and those that may be outside but near. Likewise, damage to infrastructure ranging from roadways, to buried pipelines, to structures could cripple a municipality's capacity to maintain services or recover following a significant earthquake. Buildings at most risk to earthquake damage in the Midwest are unreinforced brick buildings. Many of these structures are older and some may be historic buildings which if lost, would not likely be rebuilt to similar aesthetic or functional standards. This would be a loss to the community. The proportion of people and property that this would impact directly would likely be limited or negligible, though the economic impact could ripple through the affected communities. Perhaps the most severe impact of an earthquake affecting Appanoose	2

[7] The Kalamazoo Gazette ran a story about the earthquake indicating that it could be felt as far into Iowa as Des Moines, Midwestern earthquake felt in southwestern Michigan by Sara Waisanen <http://www.mlive.com/news/index.ssf/2008/04/midwest_earthquake_felt_in_sou.html>, the Cedar Rapids Gazette had a number of reader accounts on their website about the earthquake <http://www.gazetteonline.com/apps/pbcs.dll/article?AID=/20080418/NEWS/718266055/1001/NEWS>.

	County would be damage to Rathbun Dam which would impact everyone in the region. Compromise of the dam could result in severe flooding in parts of the county (see the flooding and flash flooding hazard profiles) in addition to compromising the region's water supply.	
Maximum Threat	Estimated effects of a 6.5 Richter magnitude earthquake along the New Madrid Fault Zone suggest Iowans in four southeast counties could experience trembling buildings, some broken dishes and cracked windows. About 29 other counties, from Page to Polk to Muscatine, could experience vibrations similar to the passing of a heavy truck, rattling of dishes, creaking of walls, and swinging of suspended objects. This would include Appanoose County. Specific parts of Central Iowa could sustain different levels of damage based on the soundness of the structures; structures built after 1985 will likely have the greatest resistance to damage while those built prior to 1940 will have the greatest risk (USGS, definition of "%"). A large proportion of the homes in Appanoose County were built prior to 1980 suggesting some limited damage may be seen from even minor earthquake effects felt in the area. See individual community profiles for more detailed information on housing stock.	4
Severity of Impact	A. Few if any injuries would likely be seen in Iowa from an earthquake. However, the elderly and individuals with mobility or balance challenges may face some injuries from falls. B. Response personnel are at minimal risk in Iowa. C. Continuity of operations would not likely be affected. D. Property losses would likely be minimal generally confined to minor cracks in walls to potentially knocking pictures or other objects hung on walls down. Dams may be most at risk, though given the distance from the nearest known fault lines, the risk would likely be limited. E. Delivery of services is unlikely to be affected. F. Earthquakes are naturally occurring events though threats to the environment may occur through chemical spills or hazardous substances disturbed by an earthquake. G. Damage to infrastructure and buildings, while minor, could result in costs to repair damaged brick or utilities. H. Earthquake coverage in Iowa insurance policies is not common, however the monetary impacts of an earthquake are likely minor given the distance to the nearest known fault lines. I. Since Iowa is not known for earthquakes, the reputation of local jurisdictions would likely not face much risk unless there is a significant event and lack of local response.	2
Speed of Onset	Earthquake prediction is an inexact science. Even in areas that are well monitored with instruments, such as California's San Andreas Fault Zone, scientists only very rarely predict earthquakes.	4
	Hazard Worksheet Score	14
	Composite Score	28

Figure 17: Earthquake Hazard Map for the Midwest



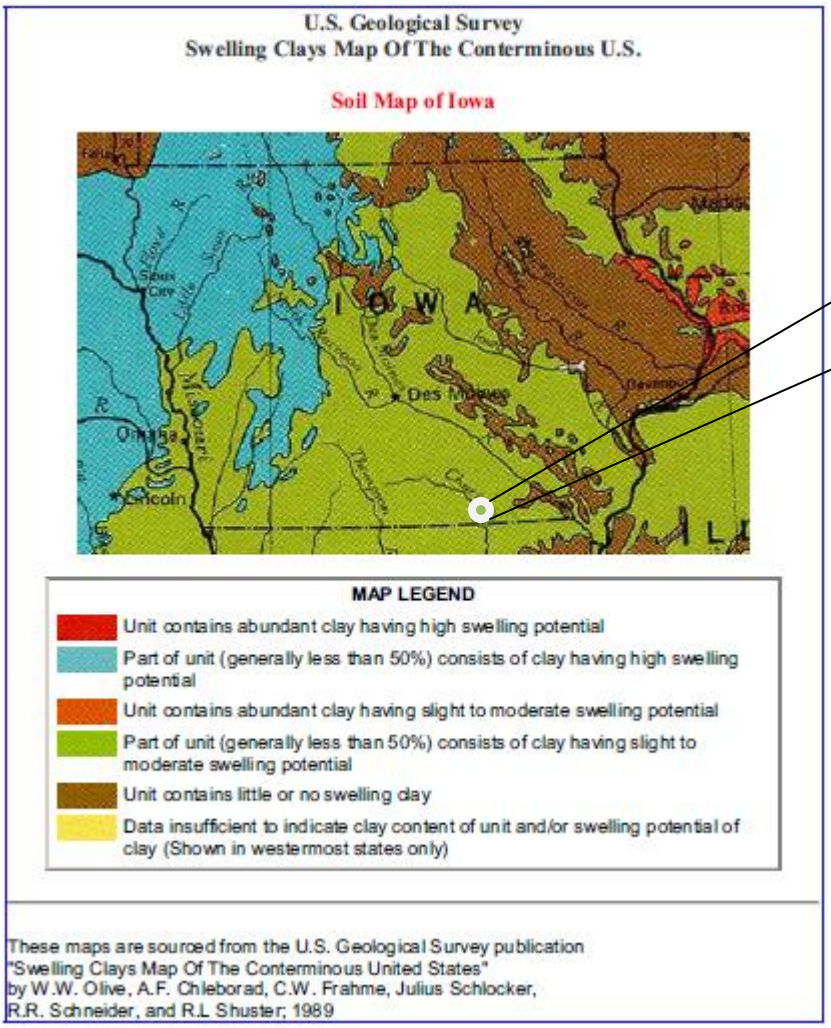
Note: The numbers indicated on the map are in percentage of gravity horizontal acceleration. The lower the percentage indicates the lower intensity of shaking and thus lower potential damage.

Source: Iowa Department of Natural Resources and USGS GIS data compiled by Chariton Valley Planning and Development

Hazard	Expansive Soils	
Definition	**Expansive Soils**: Soils and soft rock that tend to swell or shrink excessively due to changes in moisture content.	
Description	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 occurs in many parts of 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. Appanoose County is considered by the State of Iowa to be in a soil area that has a "slight to moderate swelling potential."	Rating
Historical Occurrence	No formal documentation could be located in libraries, Appanoose County Courthouse, or the State Department of roads. It is believed by the county engineer and other members of the committee that some of the problems the county and cities have with road could be evidence of the Expansive Soils. The roadways frequently experience "frost heaves (boils)" that cause damage to the roadways.	2
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. It is difficult to predict probability without adequate data to support it. The committee has identified this as a necessary mitigation strategy in order to better address this hazard and it is addressed under the mitigation strategy of "Hazard Occurrence Data Collection".	2
Vulnerability	Little if any direct human impacts. Impacts 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.	1
Maximum Threat	The availability of data on expansive soils varies greatly. In or near metropolitan areas and at dam sites, abundant information on the amount of clay generally is available. However, for large areas of the U.S., little information is reported other than field observations of the physical characteristics of clay.	1
Severity of Impact	A. Health and Safety: None. B. Health and Safety of Response personnel: None. C. Continuity of Operations: None. D. Property, facilities, and Infrastructure: Minor damages to walls or surface but major life systems should not be affected. E. The most extensive damage from expansive soils occurs to highways and	1

	streets. Houses and one-story commercial buildings are more apt to be damaged by the 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. Utilities could be affected because of constant pushing and pulling resulting in cracks, breaks, and severing of underground infrastructure. F. Naturally occurring phenomena. Environmental impacts would be limited to spills and leaks of containment facilities. G. Economic and financial impacts would be felt by individual owners of buildings and facilities. These would occur over time and would not be a onetime impact. H. Building code requirements may impose due burden on construction to ensure proper performance of buildings and utilities in areas with expansive soils. I. Very limited if any. 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 the 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.	
Speed of Onset	Speed of onset is generally slow and substantial warning time is typically available. This is consistent with other geologic hazards that occur slowly over time.	1
	Hazard Worksheet Score	8
	Composite Score	10

Figure 18: Expansive Soils Map of Iowa



Source: Iowa Hazard Mitigation Plan: Iowa Comprehensive Emergency Plan, September 2007.

Hazard	Thunderstorm & Lightning	
Definition	**Thunderstorm**: A thunderstorm is formed from a combination of moisture, rapidly rising warm air and a force capable of lifting air such as a warm and cold front, a sea breeze or a mountain. All thunderstorms contain lightning. Thunderstorms may occur singly, in clusters or in lines. Thus, it is possible for several thunderstorms to affect one location in the course of a few hours. Some of the most severe weather occurs when a single thunderstorm affects one location for an extended time. **Lightning**: 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 a temperature approaching 50,000 degrees Fahrenheit in a split second. The rapid heating and cooling of air near the lightning causes thunder.	
Description	Thunderstorms are common in Iowa and can occur singly, in clusters, or in lines. They are formed 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 Tornado, high straight-line winds above 58 mph, microburst's, lightning, hailstorms, and flooding. The NWS considers a thunderstorm severe if it produces hail at least 3/4-inch in diameter, wind 58 mph or higher, or Tornado. High straight-line winds, which can often exceed 60 mph, are common occurrences and are often mistaken for Tornado. 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. Lightning associated with thunderstorms is itself a major hazard. In the United States, from 75 to 100 Americans are hit and killed each year by lightning. The power of lightning's electrical charge and intense heat can electrocute on contact, split trees, ignite fires and cause electrical failures.	Rating
Historical Occurrence	Since 1965 there has been 58 Thunderstorm events recorded in Appanoose County. Since 1965, thunderstorms have caused approximately $760 thousand in property damage, $60 thousand in crop damage, and 1 injury. Between 1996 and 2007 there have been three recorded Lightning events in Appanoose County. Between these three events, $87 thousand in property	4

damage and one injury were reported.

Thunderstorm / Wind since 1965

Jurisdiction	number	mag.	deaths	injuries	property	crop
Total	61	78 kts max	0	2	800	205
Moulton	6	61 kts max	0	0	118	5
Unionville	2	56 kts max	0	0	15	6
Centerville	8	75 kts max	0	1	148	9
Moravia	6	70 kts max	0	0	133	3
Plano	3	61 kts max	0	0	55	2
Numa	4	78 kts max	0	0	235	25
Udell	1	70 kts max	0	0	50	10
Cincinnati	2	52 kts max	0	0	6	0
Exline	1	52 kts	0	0	5	0

Lightning since 1996

Jurisdiction	number	mag.	deaths	injuries	property	crop
Total	3	n/a	0	1	82	0
Centerville	2	n/a	0	1	7	0
Moulton	1	n/a	0	0	75	0

Probability — 4

Iowa experiences between 30 and 50 thunderstorm days per year on average. 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 a 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).

Based on the events over the last 44 years, Appanoose County may anticipate at least one thunderstorm or lightning event per year.

Vulnerability — 2

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 following flooding and flash flooding. 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 Tornado 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 particularly vulnerable to the

	impacts of severe thunderstorms. No more than about 1% of Appanoose County households reside in mobile homes, however a great number of people may be on the roads when a thunderstorm hits. However the whole county would likely be impacted by a thunderstorm; lightning would impact a much more localized area per strike.	
Maximum Threat	Although the developments in technology have been very beneficial in reducing the long-term negative effects of thunderstorms, certain dangers still exist. The maximum threat of a thunderstorm would be realized if it was accompanied by power outages and limitation of travel due to debris in the roadways. In addition lightning damage to communication centers could result in the reduction of adequate medical response time. 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. While short-lived, a thunderstorm could impact up to the entire county.	2
Severity of Impact	A. Like Tornado, thunderstorms 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. B. Response personnel are exposed to the same risk as the general public when caught in the storm without shelter. Work on ladders and other apparatus during lightning can expose responders to higher risk situations. C. Continuity of operations would be affected through indirect impacts such as loss of critical services. D. High winds can damage trees, homes (especially mobile homes), and businesses and can knock vehicles off of the road. Straight-line winds are responsible for most thunderstorm damage. E. 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. F. Thunderstorms and lightning can damage trees, but this is a naturally occurring hazard and the environment proves to be resilient following these and other natural hazards. G. Thunderstorms and lightning occur rapidly and do not persist. The aftermath may cause moderate economic impacts, but most will be related to cascading hazards such as flooding. H. Regulations and Contractual Obligations: None known. I. Timely and adequate response will stave off any negative reputation that the jurisdiction could be exposed to. Clean up procedures should be established including a debris removal and disposal plan.	3
Speed of Onset	The National Weather Service has developed effective weather advisories, which are promptly and widely distributed. Radio, TV, and Weather Alert Radios provide the most immediate means to do this. Accurate information is	3

	made available to public officials and the public in advance of the storm. Again, weather prediction capabilities have made significant improvements in the past few years. There are several notifications made by the National Weather Service. These include severe thunderstorm watch, severe thunderstorm warning, tornado watch, tornado warning, flash flood watch, and flash flood warning.	
	Hazard Worksheet Score	18
	Composite Score	35

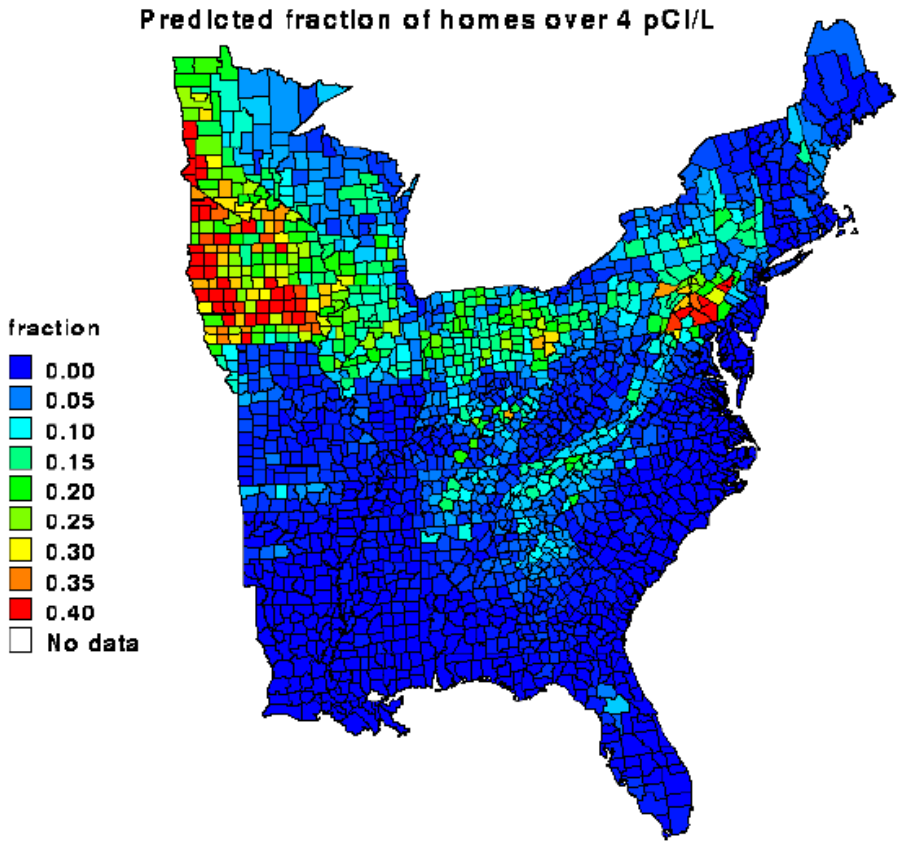
Hazard	Radon / Lead	Rating
Definition	**Radon**: Radon is a colorless, odorless, and tasteless gas resulting from the radioactive decay of naturally occurring substances in many types of soil. **Lead**: Lead was a common component in paints prior to 1970 as well as gasoline and is a known carcinogen.	
Description	Radon percolates through the soil and can infiltrate homes through cracks in basements or lower-level floors. Radon is a problem inside enclosed spaces such as basements and the first two to three floors of buildings. Once it is outside of an enclosed space, radon disperses and dilutes quickly and thus is not a problem outdoors. Radon results from the radioactive decay of uranium and radium which are naturally occurring elements found in soil and ground water. Radon is measured in picocuries per liter (pCi/L); 4 pCi/L is a threshold set by the US EPA as the level where action should be taken to mitigate radon levels. However, no amount of radon exposure is safe. Radon levels tend to be higher during periods when homes and other buildings have windows and doors closed such as during the winter as the gas can build up greater concentrations. Fans and open windows can help to disperse the gas. Lead becomes a problem when existing paint is disturbed such as through sanding prior to repainting, carpentry activities, and home maintenance. Flaking paint chips can become a significant health hazard to young children and pets that may eat the chips.	
Historical Occurrence	Radon can occur in any home and any building, but certain parts of the country are more susceptible than others due to soil composition and radium content in the soil. Iowa has some of the highest estimated rates of radon infiltration into homes in the western United States. Appanoose County has an estimated 15% to 20% of homes with elevated levels of radon. See *Figure 19: Predicted Proportion of Homes with High Radon Levels*. About two-thirds of the homes in Appanoose County were built before 1970 which exposes them to the high likelihood that lead paint was used.	4
Probability	Iowa State University Extension and the EPA found that 70% of homes in Iowa had radon levels exceeding 4 pCi/L. This study includes the entire state. *Figure 19* suggests that for Appanoose County, about one in five homes has elevated levels of radon. However, each home would need to be tested to be certain of radon levels since there is variation in soils and homes. About 63% of the homes in Appanoose County were built before 1970 and thus have a high likelihood of containing lead paint unless they have had lead mitigation previously conducted.	4
Vulnerability	People are most at risk in basements with radon levels equal to or exceeding	3

	4 pCi/L. Following basements, risk exists in enclosed spaces in lower levels of buildings There is little risk to people outdoors and little if any risk to property. A conservative estimate of vulnerability to lead and radon would likely be limited given 1) the exposure to elevated levels of radon gas in enclosed spaces and 2) the exposure to lead through ingesting or inhaling dust or chips of lead-based paints.	
Maximum Threat	Radon affects the entire state of Iowa though there are areas with greater and areas with lesser risk. Radon levels can vary from home to home, even between buildings located next to one another. Lead is more predictable as a common component of paints prior to 1970 when the Federal government banned its use. Nearly two-thirds of homes were built prior to 1970, a proportion that may be more for businesses and farm structures. As environmental human health hazards, more than half of Appanoose County residents are potentially exposed.	3
Severity of Impact	A. Radon does not harm people immediately, the health impacts take time to manifest. Despite this fact, radon is known as the second most prevalent cause of lung cancer deaths after tobacco smoke and causes more deaths than drunk drivers, drowning, home fires, and others. Tobacco smokers exposed to radon have ten times the risk of developing lung cancer than non-smokers as radon reacts to compounds found in tobacco smoke. Likewise, lead does not harm human health immediately, though the effects of lead exposure compound and lead to more severe health impacts. B. Response personnel are generally health care professionals and are not generally exposed to the same health threats as the patients. C. Continuity of Operations: None. D. Lead and Radon do not pose a threat to the built environment though renovations to structures containing lead can release this toxin. Lead that accumulates in the soil or in sediment behind dams can become a health threat when disturbed. E. Delivery of Services: None. F. Radon is a naturally occurring gas that rapidly dissipates once outside of an enclosed space. Lead can cause fish and animal poisoning if ingested and may accumulate in the food chain as it does not decay, dissipate, or dissolve. G. Mitigation of lead can be particularly costly due to the health threats to contractors. Mitigation of radon is relatively inexpensive. Health costs for people poisoned by either substance could be significant. H. Regulations and Contractual Obligations: None known. I. Reputation: little or none likely.	3
Speed of Onset	As a naturally occurring pollutant, radon varies from location to location. Without testing a particular enclosed space, there is no way of knowing whether radon is present. Radon tests are available for purchase, many for less than $20 and can be mailed into a given laboratory for results. Mitigation of radon hazards are relatively simple and inexpensive, generally involving the installation of a pipe extending under the lowest level of a structure to the outside with a fan to draw the gas out of the structure. Lead is a similarly	1

	slow onset hazard generally requiring inhalation or ingestion of lead-containing products before health impacts are seen.	
		Hazard Worksheet Score 18
		Composite Score 20

Additional Resources:	
"Radon Facts"	Iowa State Extension Service - http://www.extension.iastate.edu/Publications/PM1336.pdf
"Radon"	US EPA - http://www.epa.gov/radon/
Air Quality: Radon	American Lung Association - http://www.lungusa.org/site/pp.asp?c=dvLUK9O0E&b=35395
Iowa | Where You Live | Indoor Air Quality | US EPA | Air	US EPA - http://www.epa.gov/iaq/states/iowa.html
"A Citizen's Guide to Radon"	US EPA - http://www.epa.gov/iaq/radon/pubs/citguide.html

Figure 19: Predicted Proportion of Homes with High Radon Levels



Source: E.O. Lawrence Berkeley National Laboratory (http://eetd.lbl.gov/IEP/high-radon/efrac4.htm)

Hazard	Sink Holes	Rating
Definition	**Sinkhole**: A natural depression in a land surface communicating with a subterranean passage, generally occurring in limestone regions and formed by solution or by collapse of a cavern roof (American Heritage Dictionary).	
Description	Sinkholes, also known as subsidence, come in two primary forms in Iowa, Karst subsidence and Mine subsidence. Mines subsidence occurs when a mine or part of a mine collapses causing surface land to create a basin or hole. Karst subsidence occurs as water dissolves underlying rock creating a gap that ultimately collapses. Most of Iowa's sinkholes occur in rural areas where their main impact is rendering some land unsuitable for row-crop agriculture. Sinkholes have also resulted in the failure of farm and other types of ponds, roads, and one sewage-treatment lagoon. As sinkholes sometimes allow surface runoff to directly enter bedrock aquifers, their presence has a potential impact on groundwater quality. Given the history of mining in Appanoose County, mine subsidence may well be of concern for the county and its communities.	
Historical Occurrence	There have been no recorded incidents of sinkholes opening in Appanoose County. However, anecdotal evidence suggests that the railroads in the area have had some problems from sinkholes impacting their infrastructure. Other stories indicate that a home in Centerville collapsed into a mine and methane was released from the hole. The Iowa Department of Natural Resources tracks sinkholes and provides Geographic Information Systems (GIS) data on their locations. The vast majority of sinkholes in Iowa have occurred in the northeast quarter of the state. See *Figure 20* for a map of Iowa sinkholes, following this hazard profile.	2
Probability	While records of sinkholes in Appanoose County are sparse, there is a possibility of subsidence occurring. The prevalence of mines in parts of the county provides the potential of large areas being damaged by mine cave ins. The Iowa Department of Natural Resources monitors and maps sinkholes and mines in Iowa. Not all of the mines in Appanoose County are fully mapped; the extents of some mines are estimated. Based on these mapping limitations, the condition of at least some of the mines is presumably not fully known.	3
Vulnerability	Anyone is vulnerable to sinkholes should they occur in a developed area. Buildings and infrastructure such as roads, underground pipes, and railroad lines face potentially severe damage from mine subsidence. In the county the potentially for damage from Karst subsidence is low given the soil composition of the area (i.e. a lack of Karst soils). Personal injury or even death is possible should a cave in happen suddenly; indirect injury or death is possible from building collapse or damage to infrastructure. Likewise,	1

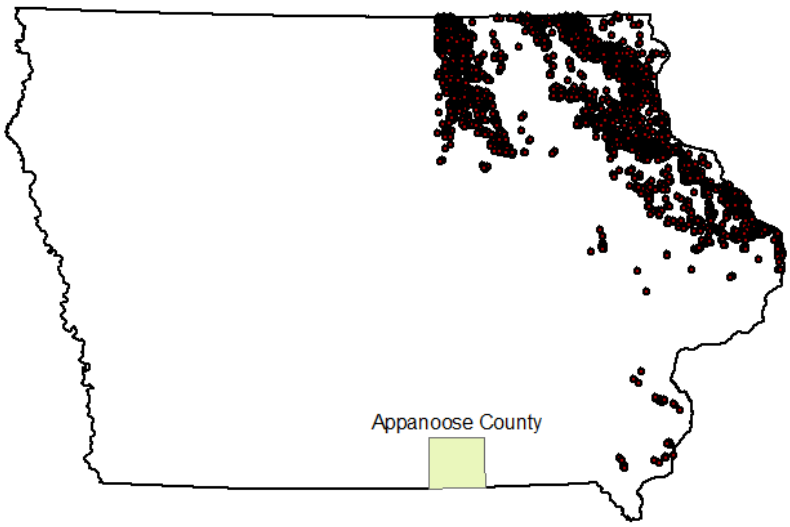
<table>
<tr><td></td><td>motorists are at risk if a road collapses suddenly or is not identified promptly.

Vulnerable Communities
Name — Approx. Area
Streepyville (uninc.) — 50% +
Thirty (uninc.) — 50% +
Jerome (uninc.) — 50% +
Sunshine (uninc.) — 50% +
Darbyville (uninc.) — 50% +
Centerville — 30 - 40%
Cincinnati — 30%
Exline — 35 - 40%
Mystic — 50% +
Numa — 35 - 40%
Plano — 15 - 20%
Rathbun — > 10%</td><td></td></tr>
<tr><td>Maximum Threat</td><td>The maximum threat of subsidence would be if one or more of the underlying mines were to collapse damaging homes, businesses, and infrastructure. While it may be unlikely for multiple mines to collapse simultaneously, it is not impossible, especially if it is due to some triggering event such as an earthquake. See the table above for approximate geographic area in each community that has underlying mines.</td><td>1</td></tr>
<tr><td>Severity of Impact</td><td>A. Generally subsidence poses a greater risk to property than to people. However, should a depression or hole open or occur suddenly, people may be injured or killed. Likewise if a road were to collapse due to subsidence and it is not identified promptly, motorists may fall into the gap and be injured or killed.[8]
B. Impacts on response personnel is minimal and would be most likely confined to falls or subsequent collapse in the event of a mine cave-in.
C. Impacts on continuity depend on the structures or infrastructure damaged.
D. Damage to structures and infrastructure depends on the severity of the subsidence ranging from foundation cracking to building collapse in the event of a mine-collapse.
E. Delivery of services depends on the structures and infrastructure impacted.
F. Most sinkholes are the result of naturally occurring events. However mine collapse can disturb harmful substances contained in the soil, in mines, and in structures located above.
G. Economic and financial impacts: Depends on the affected area.
H. Regulations and Contractual Obligations: None known.
I. Impacts to the reputation of the DNR, local government, and emergency management may occur if the threat of mine collapse is not addressed.</td><td>1</td></tr>
</table>

[8] Resulting from flooding in 2007 a road northwest of Moulton washed out leading to a car falling into the hole entirely. While this is the result of a wash-out, similar events may occur from a mine collapse. Likewise, a sewer in Centerville collapsed leading to a large hole opening in the street.

	Based on available data from the DNR, many mines in Appanoose County are not mapped and so condition and full extent of these mines may not be known.	
Speed of Onset	The speed of onset can vary from a sudden collapse with little if any warning to more gradual "sinking" of the ground. Monitoring of the area mines could provide additional warning if signs of subsidence or structural stress in the mines are found.	4
	Hazard Worksheet Score	12
	Composite Score	25

Figure 20: Locations of Iowa Sinkholes in Relation to Appanoose County



Source: Iowa Department of Natural Resources GIS, compiled by Chariton Valley Planning and Development

Hazard	**River Flooding**	Rating
Definition	**River Flood**: A rising or overflowing of a tributary or body of water that covers adjacent land not usually covered by water when the volume of water	

<table>
<tr><td></td><td>in a stream exceeds the channel's capacity.</td><td></td></tr>
<tr><td>Description</td><td>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. Flooding is a natural and expected phenomenon that occurs annually, usually restricted to specific streams, rivers or watershed areas.

Two common terms to describe areas that are prone to flooding are 100-year flood plain and 500-year flood plain. The meaning of these terms are often confused; though they sound like a flood in the designated areas only happens once every 100 or 500 years, this interpretation is incorrect. What the designation actually means is that for a 100-year flood plain, the chance of a flood occurring in any given year is 1% which is statistically about once every 100 years. Likewise, for the 500-year flood plain, the chance is .2% chance of a flood occurring in any given year. Floods may certainly occur more frequently in either flood plain designation, but these would be rare occurrences.</td><td></td></tr>
<tr><td>Historical Occurrence</td><td>Since 1993 there have been forty two flood events in Appanoose County in addition to the flash floods previously detailed. There have been no deaths or injuries directly attributed to these events. Of these floods, many impacted an area broader than just Appanoose County and so the damages listed in the total row are distributed among multiple counties.

Floods since 1993
<table><tr><th>Jurisdiction</th><th>number</th><th>deaths</th><th>injuries</th><th>property</th><th>crop</th></tr><tr><td>Total</td><td>42</td><td>0</td><td>0</td><td>138M</td><td>33M</td></tr><tr><td>Centerville</td><td>2</td><td>0</td><td>0</td><td>275</td><td>15</td></tr><tr><td>Moravia</td><td>1</td><td>0</td><td>0</td><td>50</td><td>5</td></tr><tr><td>Moulton</td><td>3</td><td>0</td><td>0</td><td>45</td><td>65</td></tr></table>Damages are given in thousands of dollars unless otherwise noted.

See Appendix N: NCDC Storm Events for a record of events that have impacted Appanoose County. See Appendix L: Appanoose County River Flooding Threats for more information.</td><td>4</td></tr>
<tr><td>Probability</td><td>Flooding is a regular and frequent hazard in Iowa; in Appanoose County, the number of flooding events suggests that there can be 2-3 floods annually. Many floods tend to be along river and stream corridors and impacting limited areas.</td><td>4</td></tr>
</table>

	With the projections that Iowa will see an increase in precipitation in the next century of approximately 20% annually, an increase in frequency and severity of floods should be anticipated (Climate Change and Iowa, US EPA, September 1998).	
Vulnerability	In river flooding events, the flood plains and flood zones are at the most risk, but this is not necessarily the case for flash floods as detailed previously. Only four communities in the county have flood plain maps and the flood zone boundaries on each are only approximate as of when they were created (See Appendix AA, BB, and CC). This makes it difficult to precisely identify what structure lie in jeopardy. However, permanent rivers or streams only pass through two of these communities. Centerville has Cooper Creek which enters a small portion of its northern city limits and the western boundary. Based on the city's review of the FIRM, this places approximately 320 residential structures and 6 businesses at risk. Mystic has seen river flooding occur within its city limits by the "No Name Creek" which is a tributary of Walnut Creek. This stream has caused inundation to occur in the past and the City of Mystic is just completing an Acquisition and Demolition project with the support of Homeland Security and FEMA. This has removed 8 residential structures that lie in the identified flood plain. However, it still leaves 15 other residential structures, 2 commercial structures and 2 government structures at risk of experiencing damage. Rivers or streams also pass through Rathbun which does not have a flood map. It is estimated that River flooding could affect 38 homes and 1 business in Rathbun Additionally; several unincorporated communities are located close to or in low-lying areas around rivers or streams. Because boundaries of the unincorporated communities are not readily available, approximate area of these communities is not given. **Vulnerable Communities** **Name** — Approx. Area **Sedan (uninc.)** — - **Dean (uninc.)** — - **Coal City (uninc.)** — - **Mendota (uninc.)** — - **Centerville** — 15 - 20% **Mystic** — 20 - 30% **(Rathbun)** — 60% **Moravia** — > 10% **Unionville** — 5% Given the 1) rolling hill nature of Appanoose County, 2) the fact that two railroad lines and each of the state highways pass through low-lying areas containing rivers or streams, and 3) the limited number of goods and services available in the county, severe flooding would impact most of the county. This was evidenced in the 2008 floods. Some of this impact is limited to traveling inconveniences. The City of Unionville has a FIRM because North Fox Creek extends across the	2

	south edge of the corporate city limits. However, the creek is down a hill a distance away from the physical location of structures in the city. Approximately 5% of the residential structures could be affected. Increasing wetlands on Rathbun Project has been a goal of local managers since Rathbun Lake reached its multipurpose pool in 1970. The original river bottom wetlands had been lost to Rathbun's lake bed and flood control operations. The Goodwater, Hickory Hollow, and Woodpecker Marshes (approx. 160 acres) were constructed in the late 1970's thru the mid 1980's to supplement the existing Colyn and Brown's Slough wetlands (approx. 300 acres). The Coffey Marsh (approx. 230 acres) was completed in the Fall 1996. The S56 Marsh (200 acres) was completed in 2004, and Greenville Marsh (90 acres) was completed in 2005. Plans are currently underway for two additional marshes, one west of Highway S56 and one east of Highway J5T. These wetlands will also address concerns with the potential for future floods in Appanoose County. (www.nwk.usace.army)	
Maximum Threat	The Flood Insurance Rate Maps for Centerville, Mystic, Moravia, and Unionville are given in the above table. Approximately 10 – 15% of the county is located in low-lying areas where permanent rivers or streams pass through.	2
Severity of Impact	A. Flooding impacts include potential loss of life. River flooding does not have as high of risk as does flash flooding because of the slower onset of the river flood. B. Responding to river flooding often includes sandbagging and working in floodwaters. Response personnel should have current tetanus and hepatitis shots. Rescuing victims often requires rescue from boat. Wearing personal protective gear such as life vests at all times can prevent most injuries related to river flooding. C. Operations could be disrupted from direct impacts if facilities are in the floodplain and indirectly from loss of critical services to maintain operations. Backup power and other services can eliminate the impact to operations. D. Personal property can be extensively damaged and destroyed by swift moving water. Facilities and infrastructure can be scoured around and degrading its structural integrity. E. Damage and disruption of communications, transportation, electric service, and community services are likely in severe cases. Wastewater treatment facilities may be located in the floodplain and thus at high risk of flooding; this is not uncommon around Iowa and eventually results in them being taken offline for a period of time. F. Hazards of fire, health and transportation accidents; and contamination of water supplies are likely affects of flooding situations as well. G. Crop and livestock losses and interruption of businesses either from	2

	direct flooding or loss of the delivery of critical services can have damaging impacts on the local economy. River flooding can last for weeks and the impacts can last for months and even years following the flood. Economic impacts can be felt with only a couple days of disruption. H. Regulations and Contractual Obligations: None known. I. Jurisdictions should pay careful attention to disclosing flood risk in the community. Participation in the National Flood Insurance Program and providing accurate and up to date flood insurance rate maps will head off most allegations of poor service by the jurisdiction by the citizens.	
Speed of Onset	Gauges along streams and rain gages 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 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.	2
	Hazard Worksheet Score	16
	Composite Score	37

Hazard	Dam Failure	
Definition	**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. Dam failure is deemed as the uncontrollable release of impounded water resulting in downstream flooding, which can affect life and property. Flooding, earthquakes, blockages, landslides, lack of maintenance, improper operation, and poor construction, vandalism, or terrorism cause dam failure. Dams are constructed for a variety of uses, including flood control, erosion control, water supply impoundment, hydroelectric power generation, and recreation.	
Description	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. There are a number of dams in Appanoose County, the most significant one forming the south east boundary of Rathbun Lake where the Chariton River empties the lake. The one at Rathbun Lake is named Rathbun Dam, owned by Cenwk completed in 1972. See *Figure 20: Appanoose County Dams* for more information on dam locations. Small rural dams located throughout the county include Mystic Reservoir, Sundown, Centerville, Soap Creek and Moulton reservoir. There are also numerous small farm ponds that have small retaining dams.	Rating
Historical Occurrence	There are no incidents of dam failure in Appanoose County on record.	1
Probability	With increased attention to sound design, quality 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). Rathbun Dam was completed in 1972 and the 50 year design life will be reached in 2022. The dam classifications used by the National Inventory of Dams (NID) reflect the potential for death and/or destruction due to the size of the dam and the characteristic that lie downstream of the dam. The NID sates there are three "High Hazard Dams" in Appanoose County. This is a bit deceiving because "Rathbun Dam" and "Buck Branch Dam" is actually a continuous dam that serves both now. A levee had separated the two bodies of water but that levee has now been broken to allow open flow of the creek and the water of Lake Rathbun. Therefore, the Iowa State Plan 2007 only identifies one dam as "Lake Rathbun dam". NID also identifies two "Significant Dams" in	2

	Appanoose County. The two dams listed are "Lower Centerville Reservoir and Upper Centerville Reservoir Dams. Rathbun Dam is considered a "high hazard" dam according to Iowa DNR GIS data and does have an emergency action plan (http://rathbun.uslakes.info/DamInfo.asp?DamID=100199). Dams assigned the high hazard potential classification are those where failure or mis-operation will probably cause loss of human life. Significant hazard potential are those dams where failure or mis-operation results in no probable loss of human life but can cause economic loss. Dams assigned the low hazard potential classification are those where failure or mis-operations results in no probable loss of human life and low economic and/or environmental losses. Losses are principally limited to the owner's property. This hazard potential classification does not indicate the condition of the dam. National Inventory of Dams indicates that the two "High Hazard Dams" in Appanoose County are Rathbun Dam and Lake Sundown Dam. Lake Sundown is in the eastern portion of Appanoose County and there are no communities downstream from that dam. If it were to fail, agriculture land would suffer primary damage and possibly a few residential structures would be impacted. The Inventory also states that the Lower Centerville Reservoir Dam and the Upper Centerville Reservoir Dam are both considered "Significant Hazard Dams".	
Vulnerability	People and property along streams are most vulnerable. Facilities and lives 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, a flash flood from a dam failure can travel a significant distance. Four unincorporated communities are located along the low-lying area containing the Chariton River where the greatest impact from a failure of Rathbun Dam would be seen. A significant critical facilities impact from the failure of the Rathbun Dam would be the potential compromise of drinking water for the whole county as the lake provides municipal water throughout the county and surrounding regions in Iowa and Missouri through Rathbun Regional Water. **Vulnerable Communities** **Name** — Approx. Area **Sedan (uninc.)** — - **Dean (uninc.)** — - **Coal City (uninc.)** — - **Darbyville (uninc.)** — - **Centerville** — 10 - 15% **(Rathbun)** — 60%	4

The City of Rathbun is also located in close proximity to the dam, about 1.5 miles to the south. Because of the close proximity to the dam the majority of the community would be placed at risk of significant damage should the dam fail. This would include 31 residential structures, 2 commercial buildings, one church and all critical facilities. The dam directly releases into the Chariton River, which extends to the tributaries of Cooper Creek, Walnut Creek, and little Walnut Creek. These would carry volumes of water to the communities of Mystic and Centerville in the event of a dam failure. Mystic is approximately 8 miles from Rathbun Lake; the two nearest creeks (one running through Mystic) flow northwesterly. Chariton River which flows out of Rathbun Lake flows southeasterly. The most direct impact of a dam failure on Mystic would be one or both creeks flowing backward due to the influx of water into the Chariton River. The topography of the area between Mystic and the lake would likely preclude water flowing overland into town other than through these two creeks. As with the flooding hazard, the floodplain amounts to about 25-35% of the town, though a catastrophic dam failure would likely flood more areas than are identified in the FIRM. Estimates from local city officials place approximately 60% of the city being affected in the event of a devastating dam failure.

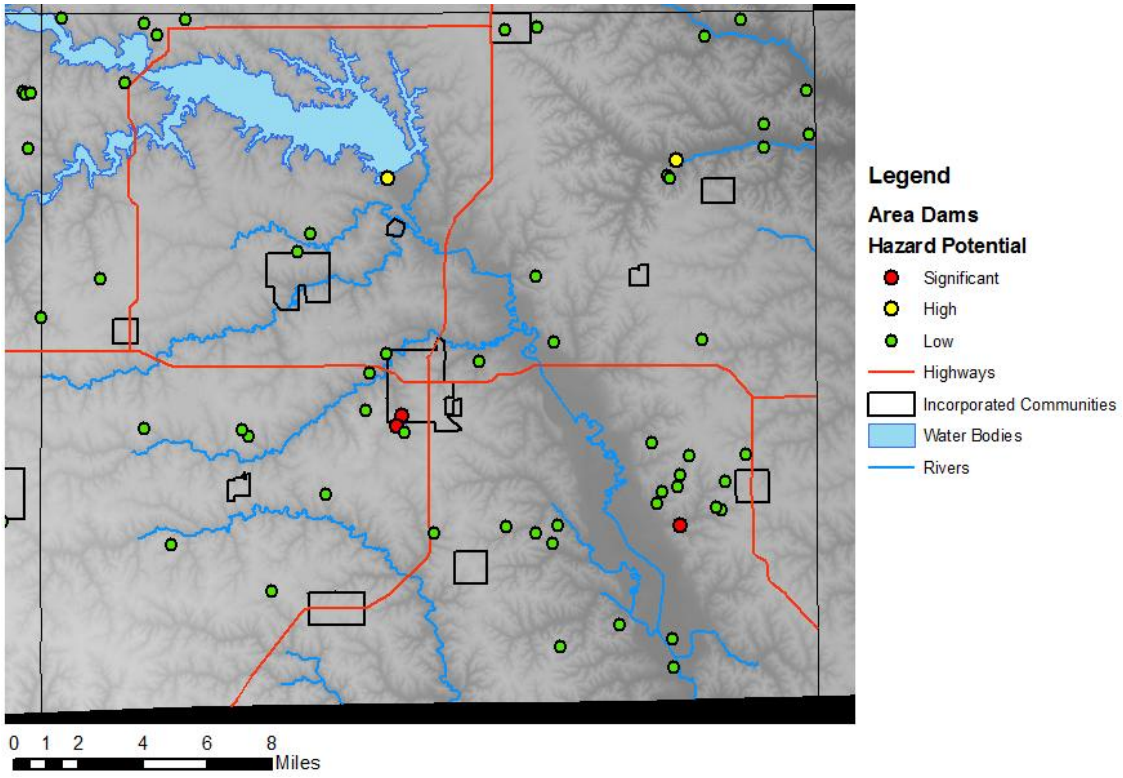
Centerville could experience damage in the event of dam failure with the concern of 3 different dams which places approximately 10% of the city at risk. The largest event would be in the event of failure of Rathbun dam, which is deemed a "High hazard dam" by the National Inventory of Dams. Rathbun releases into the Chariton river and is approximately 2 miles from the north edge of Centerville. This would place approximately 5% of the community at risk. This region would affect about 6 businesses and 105 residential structures. The Upper and Lower Centerville Reservoir are both located in the very southern edge of the city. The Lower Centerville Reservoir dam faces to the south and a failure would send flooding waters through 5% of the southwest portion of the City of Centerville. This region would include approximately 6 business and 106 residential structures. The Upper Centerville Reservoir is located near the Lower Reservoir and will impact a similar region. These two significant risk dams would directly impact Centerville and affect the west sewer treatment plant for the city and possibly the bridge crossing Cooper Creek on Highway 2 if they were to breach. No other community have mapped dams up-stream from them, however depending on the dam that might break, the impacts can vary.

Lake Sundown Dam is located approximately 6 miles to the west of the City of Moulton. The dam is identified as a "High Risk Dam" in the National Inventory of Dams. The dam faces to the southeast and releases into a valley region of agriculture land. If it were to fail, agriculture land would suffer primary damage and possibly a few residential structures would be impacted.

Maximum Threat	The area impacted following a dam failure would be limited to those areas in and near the floodplain. People and property outside the floodplain could also be impacted depending on the proximity to the dam and the height above the normal stream level. Approximately 10-15% of the county would be impacted should the Rathbun Dam fail, primarily through resulting flooding. However a much more significant impact could be seen as the lake provides municipal water throughout the region, including all of Appanoose County.	4
Severity of Impact	A. The severity of damage could be death and injury, typically to individuals caught either in vehicles swept off of roads or who may be in low-lying areas when fast moving water moves through it. B. Health & Safety of response personnel: None directly, but operations could be affected by communication loss, critical facility damage/destruction, etc. C. Depends upon the downstream property, facilities, and infrastructure. Worst case scenario could involve whole subdivisions being swept away by the fast flowing water. D. Property can be impacted either by being damaged by the force of flowing water, water damage inside buildings, and compromises to structural integrity due to erosion. E. Dam Failure can quickly inundate areas thought to be out of flood-prone areas. Loss of life; property damage and destruction; damage and disruption of communications, transportation, electric service, and community services; crop and livestock damage and loss and interruption of business are common impacts from flash flooding. F. Hazards of fire, health and transportation accidents, and contamination of water supplies are likely effects of dam failure situations. Materials swept away by flood waters can contaminate and leave a lasting impact on the environment. G. Most impacts are indirect due to disruption of business and damage to infrastructure on which industry and services rely upon. H. Regulations and Contractual Obligations: None directly. I. Reputation: Dam failure can be damaging to the reputation of the community if proper notification and warning are not given. Often times the victim will blame the community leaders for lack of maintenance as part of the failure in the structure.	4
Speed of Onset	In the event of dam failure, advanced notice would likely be minimal and the onset of the event could occur very rapidly. With maintenance and	4

	monitoring, weak areas and possible failure points can be identified allowing time for evacuation and securing of the dam. Most dams are only inspected periodically thus allowing problems to go undetected until a failure occurs. Rathbun Dam is inspected every five years (http://rathbun.uslakes.info/DamInfo.asp?DamID=100199).	
	Hazard Worksheet Score	19
	Composite Score	23

Figure 21: Appanoose County Dams



Source: Iowa Department of Natural Resources GIS data compiled by Chariton Valley Planning and Development

Hazard	**Levee Failure**	Rating
Definition	**Levee Failure**: The failure of a levee can be attributed to the loss of structural integrity of a wall, dike, berm, or elevated soil, by erosion, piping, saturation, or under seepage causing water to inundate normally dry areas.	
Description	When a levee failure occurs the structure fails to hold back the water, resulting in flooding. In the event of a levee failure, the energy of the water stored behind even a small levee is capable of causing loss of life and great property damage if there are people downstream of the levee.	

	There are a number of agricultural levees in the unincorporated regions Appanoose County. Failure of any of these levees would have minimal structural loss or loss of life as they are not located near a jurisdiction. Primary damage would be in the loss of crops or potentially livestock.	
Historical Occurrence	There are no incidents of levee failure in Appanoose County on record.	1
Probability	It is unlikely to see such an event occur in Appanoose, however, with the existence of agriculture levees there is a slight chance of it occurring. The Iowa State Hazard Mitigation Plan does not recognize any Federal or non-Federal levees within Appanoose county.	2
Vulnerability	Property, land, and livestock areas below the agricultural levees are most vulnerable. In most situations, damage would occur to crops and the washing away of the top soil.	4
Maximum Threat	The area impacted following a Levee failure would be limited to those areas in and near the low-lying areas on the backside of the levee. People and property outside this area could also be impacted depending on the proximity to the levee, however the agricultural levees in this area are rather small in comparison to other river/lake levees and therefore the major damage would be to the soil and cropland near it.	4
Severity of Impact	D. The severity of damage could be death and injury, typically to individuals caught either in vehicles swept off of roads or who may be in low-lying areas when fast moving water moves through it.. E. None directly, but operations could be affected by communication loss, critical facility damage/destruction, etc. C. Depends upon the low-lying property and structures. F. Property can be impacted either by being damaged by the force of flowing water, water damage inside buildings, and compromises to structural integrity due to erosion. E. Levee Failure can quickly inundate areas thought to be out of flood-prone areas. Loss of life; property damage and destruction; damage and disruption of communications, transportation, electric service, and community services; crop and livestock damage and loss and interruption of business are common impacts from flash flooding. F. Hazards of fire, health and transportation accidents, and contamination of water supplies are likely effects of dam failure situations. Materials swept away by flood waters can contaminate and leave a lasting impact on the environment. G. Most impacts are indirect due to disruption of business and damage to	4

	infrastructure on which industry and services rely upon. H. Regulations and Contractual Obligations: None directly. I. Reputation: Levee failure can be damaging to the reputation of the community if proper notification and warning are not given. Often times the victim will blame the community leaders for lack of maintenance as part of the failure in the structure.	
Speed of Onset	In the event of Levee failure, advanced notice would likely be minimal and the onset of the event could occur very rapidly.	4
	Hazard Worksheet Score	19
	Composite Score	27

C. Human / Combination Hazards – Common

Hazard	**Climate Change**	
Definition	**Climate Change**: significant change in measures of climate (such as temperature, precipitation, or wind) lasting for an extended period (decades or longer). Climate change may result from: • natural factors, such as changes in the sun's intensity or slow changes in the Earth's orbit around the sun; • natural processes within the climate system (e.g. changes in ocean circulation); • human activities that change the atmosphere's composition (e.g. through burning fossil fuels) and the land surface (e.g. deforestation, reforestation, urbanization, desertification, etc.) Source: US EPA (http://www.epa.gov/climatechange/basicinfo.html)	
Description	Climate Change is perhaps the ultimate combination hazard given its widespread impacts. Some of these impacts include less predictable weather patterns, more frequent and stronger storms, more and longer periods of localized droughts, more infiltration of invasive species as warmer and longer periods of warm temperatures allowing more tropical species to move northerly, and so on. More frequent and stronger storms can mean that there may be an increase in flash floods and erosion. This hazard is particularly insidious as the general trend can be predicted as the Intergovernmental Panel on Climate Change, the US EPA, the Union of Concerned Scientists, the USDA, and others have been doing, however no single storm event can be absolutely determined as caused by climate change, yet. Climate Change is associated with increased concentrations of carbon and other pollutants in the atmosphere which changes the dynamics of weather patterns. This occurs through the trapping of solar heat in the atmosphere and also suppressing some of the solar energy from reaching the earth's	Rating

	surface. While atmospheric carbon is good for plants and can help them grow faster and larger, the potential positive impacts on agriculture are uncertain. This is for a number of reasons, 1) increases in severe weather can damage crops regardless of how fast or large they grow, 2) surface-level ozone, often called smog in larger urban areas, has been increasing in rural areas for the last 50 years and is projected to continue to increase, and 3) the growing benefits of carbon for crops is also gained by weeds and other invasive plants. Regarding invasive plants, they have been found to become more resistant to common herbicides as they can establish deeper roots faster and thus recover from herbicidal applications. Ozone is the result of an atmospheric chemical reaction between sunlight, hydrocarbons, and nitrogen oxides, common ingredients in commercial fertilizers and pollutants resulting from combustion. Surface level ozone is toxic to many plants and harmful to human health. The majority of ozone occurring in rural areas comes from larger urban areas; ozone is very mobile. In addition to expanding areas of invasive species, the range of diseases may increase as insects and other pests that often act as carriers are able to spread into new areas. This would be due to potentially longer Iowa summers, shorter and warmer winters, and increased precipitation. These conditions are anticipated to be favorable to both the pests and to some diseases not currently found in Iowa. The US EPA anticipates diseases that are associated with warm and tropical climates spreading into Iowa including Malaria and California Encephalitis. Major flooding such as seen in 2008 and 1993 may occur roughly every ten years as the climate in Iowa continues to change. This has the potential of increasing mosquito habitat. The near-term impacts (25-50 years) of climate change are assured, what is not is the longer term impacts (100 years+). Adaptation to the induced effects will be required to minimize damage and injury and to maintain a quality of life we are most familiar with.	
Historical Occurrence	The earth's climate has changed in the past; however the speed of onset was generally over many centuries. Since the Industrial Revolution in the mid-1800, climatic changes have been occurring rapidly, especially in the last half of the 20th Century – over a period of decades. The difference in speed of onset has dramatic impacts on the capacity for flora and fauna to adapt. The more rapid climatic changes are attributed to carbon and other air pollutants resulting from human activities whereas slower changes are the result of natural factors. There is scientific evidence that climate change has occurred across southern Iowa, including Appanoose County, and will continue to occur in the future. The change of the climate has occurred slowly over centuries so that committee members believe that the appropriate scoring would be reflected as "1" to indicate "less than 4 occurrences.	1
Probability	The scientific consensus is that climate change is occurring now and will continue for at least a generation if 1) concerted global efforts are made to	3

	mitigate it and 2) longer if no mitigation is implemented. The induced hazards from climate change are difficult to predict given current technology, methods, and available data. The committee believes there is one chance of a noticeable climate change in the next 10 years.	
Vulnerability	Everyone is vulnerable to the multitude of induced hazards from climate change. Those at most risk however are the young, the elderly, and those without the financial resources to adapt. The last includes areas with weak economies and little economic development, such as rural areas in Iowa. Structures and populations at risk are more threatened by the induced effects of this hazard such as increased flooding, severe storms, drought, and so on. Each of these induced hazards threatens buildings and infrastructure as indicated in the respective profiles.	3
Maximum Threat	Maximum threat includes multiple severe weather events in all seasons along with the associated threats of each, overloading of existing and largely insufficient infrastructure, and growing strains on health care systems. The threat of climate change itself is widespread, but the induced effects can be localized such as increases in severe storms in a relatively small geographic area.	4
Severity of Impact	A. Long term impacts including asthma and infectious disease spread by bacteria and pests, other impacts caused by related hazards. B. Same as A; few if any immediate impacts. C. Continuity of operations can be affected depending on the facilities impacted, transportation impacts, and delays in government responses D. Property can be impacted either by being damaged by the force of flowing water, water damage inside buildings, and compromises to structural integrity due to erosion E. Climate Change can quickly inundate areas thought to be out of flood-prone areas. Loss of life; property damage and destruction; damage and disruption of communications, transportation, electric service, and community services; crop and livestock damage and loss and interruption of business are common impacts from flash flooding. Some additional strain on budgets and staff time may result if adaptation requires more significant local action. F. Climate change in the past has been a natural occurrence, however the speed of onset this time is contributing to species loss and fostering invasive species expansion; more unpredictable and severe weather patterns may threaten the natural environment as detailed in flash floods, drought, and storm-related hazards. G. The cost of adaptation may place a severe strain on some local jurisdictions though the most significant costs will be on coastal areas. Economic impacts in more populous areas may impact	3

	Appanoose County through ripple effects. Crop damage from invasive species and changes in the composition of elements in the air may increase crop growth, but severe storms may counter-act this gain. H. Adaptation and response to the impacts of climate change may require revisions to contracts and regulations. I. Most negative impact would be directed to the State and Federal Government; however some impact may be seen locally as detailed in flash flood, drought, and storm-related hazards.	
Speed of Onset	The speed of onset of climate change is slow in terms of a human life-span but very quick in relation to the ability of plants, animals, and cities to adapt to such changes. The speed of onset of induced hazards, are variable. The US EPA provides daily air quality forecasts which may be seen on The Weather Channel for some areas or on the AirNow.org website for atmospheric pollution.	1
	Hazard Worksheet Score	15
	Composite Score	26

Additional Resources:	
"The effects of climate change on agriculture, land resources, water resources, and biodiversity"	USDA - http://www.climatescience.gov/Library/sap/sap4-/default.php
Climate Change website	US EPA - http://www.epa.gov/climatechange/index.html
"How Climate Change Will Affect Iowa"	Des Moines Register - http://data.desmoinesregister.com/climatechange/climatechange.php
Extreme Events | Climate Change: Health and Environmental Effects	US EPA - http://www.epa.gov/climatechange/effects/extreme.html
"Climate Change in the Hawkeye State"	Union for Concerned Scientists - http://www.ucsusa.org/global_warming/science_and_impacts/impacts/climate-change-in-the-hawkeye.html

Hazard	**Air Transportation Incident**	
Definition	**Air Transportation Incident**: Any incident involving a military, commercial, or private aircraft.	
Description	An air transportation incident may involve a military, commercial, or private aircraft. Air transportation is playing a more prominent role in transportation as a whole; airplanes, helicopters, and other modes of air transportation are used to transport passengers for business and recreation as well as thousands of tons of cargo. A variety of circumstances can result in an air transportation incident; mechanical failure, pilot error, enemy attack, terrorism, weather conditions, and on-board fire can all lead to an incident at	Rating

	or near the airport. Air transportation incidents can occur in remote unpopulated areas, residential areas, or downtown business districts, incidents involving military, commercial, or private aircraft can also occur while the aircraft is on the ground. The Centerville Municipal Airport is located in the unincorporated county about 2 miles south of Centerville. A heliport is located at the Mercy Medical Center about one-third of a mile north of Centerville; see *Figure 22: Appanoose County Air Facilities*. The airport location is in a remote setting with the nearest community of Numa being approximately 5 miles away. It is estimated that there are 5 residences in a one mile radius of the public airport.	
Historical Occurrence	According to the National Transportation Safety Board (NTSB), there have been no aviation accidents or incidents in Appanoose County in the last ten years. Only a few major accidents have impacted Iowa since 1935 but numerous less severe accidents have occurred around the state in both large and small cities.	1
Probability	The lack of precedent does not mean that an air incidents and accidents cannot impact Appanoose County or its communities. There are airports and/or heliports in or near county seats of surrounding counties in Iowa. Private airports are also in the area as well as major airports within 200 miles located in Des Moines and in Kansas City. The Centerville airport location is in a remote setting with the nearest community of Numa being approximately 5 miles away. It is estimated that there are 5 residences in a one mile radius of the public airport. This does create an increased probability of occurrence for the unincorporated region. Also, one private landing strip is located in another unincorporated region northeast of Lake Rathbun Dam by 9 miles. Owners report that it is a seldom used strip but that it is still accessible if needed. These considerations caused the committee scored this hazard with a "3" to show likelihood that an event could possibly occur once in the next ten years. This rating also is appropriate for the jurisdiction of Centerville because Mercy Medical Helipad is located at the hospital approximately one-third of a mile from the north edge of Centerville. Should an event occur, the nearest area of impact would include the retirement community/assisted living center of "Continental at St Joseph's" and approximately 10 private residences that could possibly be affected.	3
Vulnerability	Despite the increase in the number of people using air travel, incidents that require response personnel and involve casualties are likely to continue to decrease in number due to increases in the quality of training, equipment, and safety. Carefully planned land-use near the airport will also decrease the	1

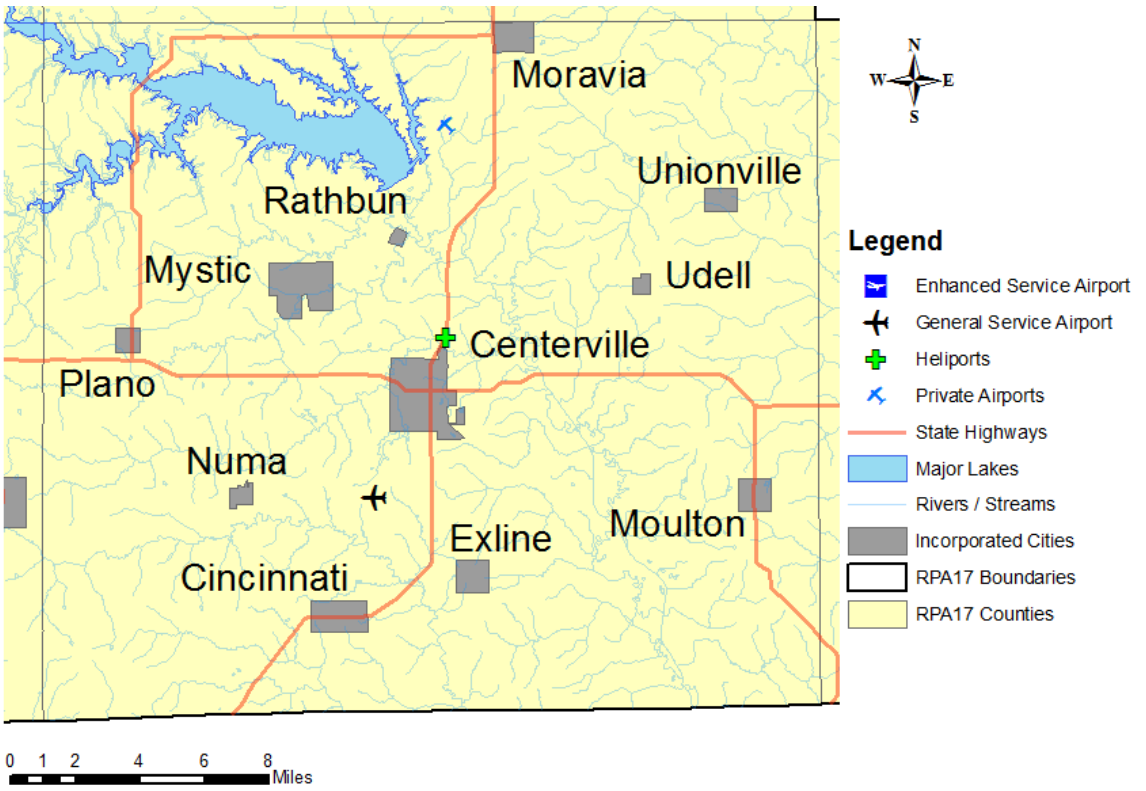
	chance that people and property on the ground will suffer significant impacts in the event of an air transportation accident. Such land use controls generally consist of zoning ordinances. Most incidents involving airplanes takes place in or immediately near airports such as during take-offs and landings. However, planes can and do crash or need to make emergency landings, sometimes in populated places. One example is the October 6, 2008 incident of a small plane that crashed in an Iowa City residential neighborhood.[9] Ice or other debris may fall from planes flying overhead which may cause injuries or damage, although reports of such incidents are rare. Anything struck by falling debris is vulnerable to damage regardless of type of building. People aboard airplanes are the most vulnerable. Statistics from the National Transportation Safety Board and the airline industry show that the majority (over 75%) of airplane crashes and accidents occur during the takeoff or landing phases of a flight. As a result, developed areas adjacent to the airports and in airport flight paths are particularly vulnerable to this hazard. For areas away from the airport, a smaller percentage of the population would be directly in the area of impact. Because of the infrequency of aircraft in the skies above areas away from the airport, these areas would not be considered as vulnerable.	
Maximum Threat	As mentioned above, most accidents occur during takeoffs and landings. Accordingly, the spatial extent of the majority of incidents would occur on airport grounds or adjacent areas. Compared to many other hazards, an air transportation accident would occupy a relatively small area. The extent to which the impacts would be felt would depend on the materials involved. For example, if a plane is used to transport volatile or hazardous substances were involved in an accident, the area of concern would be significantly larger than the area for an accident involving a small personal aircraft carrying stable materials. The largest share of accidents would likely affect only a few hundred yards at most.	1
Severity of Impact	A. Passengers may be severely injured or killed from a plane crash and injuries may be seen if a plane fails on the runway. B. Fire, hazardous chemicals, the threat of explosion, and debris threaten the health and safety of responders. C. Impact on continuity of operations depends on the facilities impacted; a runway may be shut-down temporarily while wreckage is cleared, the same impact would occur if a plane lands or crashes on a road; if a plane or helicopter crashes into a building, the building may be destroyed or severely damaged leading. D. Buildings and infrastructure could be destroyed or severely damaged by a plane or helicopter crash. E. Depends on the facilities impacted.	4

[9] Des Moines Register. *Iowa City plane crash injures one*. <http://www.desmoinesregister.com/article/20081006/NEWS/81006035/1001/>. October 6, 2008.

	F. Hazardous chemicals may impact the local environment, fire may damage foliage, and wreckage may block streams. G. Shut down of an airport or hospital heliport may cause economic losses through disrupted services plus the cost of clean-up and repair. H. Actual or perceived safety issues with air traffic or airports/heliports may result in increased regulation. I. Depending on the cause of the incident, the regulating and operating agencies/organizations may face damaged reputations.	
Speed of Onset	The amount of warning time prior to an aircraft accident could vary from tens of minutes to a matter of seconds. Crew aboard a troubled aircraft can radio to ground crew to prepare for the incident, but little can be done to lessen the direct effects of the impact. Rarely is there adequate time to do more than position onsite response personnel and alert mass casualty care providers of the possible event.	4
	Hazard Worksheet Score	14
	Composite Score	26

Additional Resources:	
FAA Accident & Incident Data	http://www.faa.gov/data_statistics/accident_incident/
NTSB Aviation Accident Database Query	http://www.ntsb.gov/ntsb/query.asp

Figure 22: Appanoose County Air Facilities



Source: IA DNR and IDOT GIS data compiled by Chariton Valley Planning and Development

<table>
<tr><td>Hazard</td><td>Highway Transportation Incident</td><td rowspan="2">Rating</td></tr>
<tr><td>Definition</td><td>Highway Transportation Hazard: A hazard to the community resulting from an incident related to or caused by any road or highway vehicle used to transport persons or items, such as cars and trucks.</td></tr>
<tr><td>Description</td><td>A highway transportation incident can be single or multi-vehicle requiring responses exceeding normal day-to-day capabilities. Hundreds of thousands of trips a day are made on the streets, roads, highways, and interstates in the state; if the designed capacity of the roadway is exceeded, the potential for a major highway incident increases. Weather conditions play a major factor in the ability of traffic to flow safely in and through the state as does the time of day (rush hour) and day of week.

Numerous major and minor traffic accidents occur daily in Iowa and result in property damage and injury, major accidents involving multiple vehicles and serious injury are not uncommon. Although traffic engineering, inspection of traffic facilities, land use management of adjacent areas to roads and highways, and the readiness of local response agencies has increased, highway incidents continue to occur.

As the volume of traffic on Iowa streets, highways, and interstates increase, the number of traffic accidents will increase. The combination of large numbers of people on the road, unpredictable weather conditions, potential mechanical problems, and human error create the potential for a transportation accident.</td><td></td></tr>
<tr><td>Historical Occurrence</td><td>The Department of Transportation does not make accident data available for cities under 5,000 residents online so obtaining an accurate number of traffic accidents is difficult for some communities.

About 5-6% of traffic accidents in Appanoose County are serious defined as involving a fatality or a major injury. See Figures 23 and 24 for severe crash locations and all crashes reported for 2001 through 2006.

Highway/Roadway Incidents (2001-2006)
Name Total Fatal Major Injury
County total 1412 15 62
Centerville 213 0 12</td><td>4</td></tr>
<tr><td>Probability</td><td>The probability of highway transportation incidents is often higher on heavily used roads. However more than 80% of the serious accidents in Appanoose County have occurred on rural roads and county highways between 2001 and 2006.

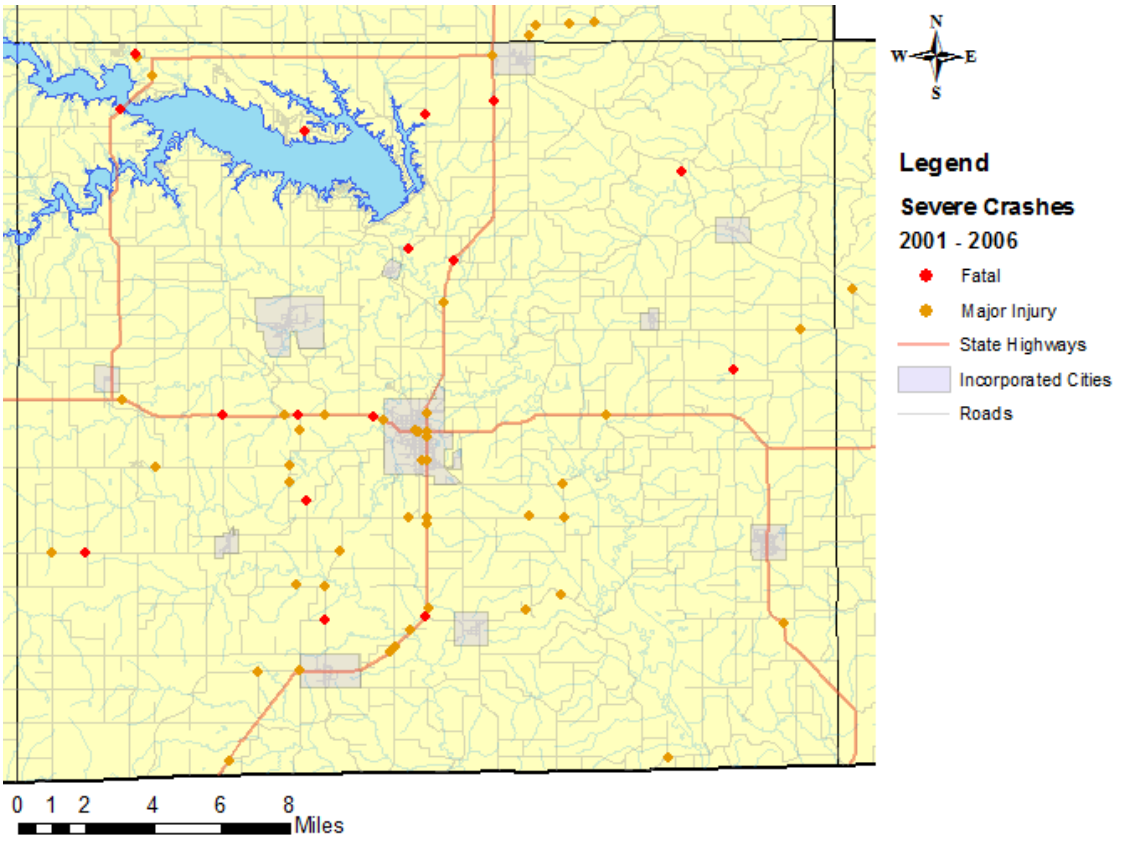
Given the reliance on private vehicles and trucking in rural Iowa, the</td><td>4</td></tr>
</table>

	probability of an accident on any given roadway is relatively high, each jurisdiction can anticipate at least one accident in the next year, not all will necessarily be serious. **Jurisdictions with a State Highway** **Name** Highway **County** 2, 5, 142, 202 **Centerville** 2, 5 **Cincinnati** 5 **Moravia** 5 **Moulton** 202 **Plano** 142 The committee particularly notes the intersections of Highway 5 and Route J18 on the edge of Moravia. This is a high traffic intersection that has a spur accessing recreational activities at Lake Rathbun and Honey Creek Resort. There is currently a turning lane to allow south bound traffic to turn west. There are many complaints of blocked vision for J6 traffic merging onto Highway 5. The other intersection that has similar concerns as the previous mentioned, is located just west of Centerville on Highway 2 and T14. Highway 2 is a heavily traveled road that allows for west-bound vehicles to utilize a turning lane. This once again obstructs the view for vehicles coming off T14 and hoping to merge onto Highway 2.	
Vulnerability	For most incidents, the people and property impacted would likely be negligible. However, if a truck hauling combustible materials was involved or a chemical spill from an accident was to spread beyond the road, a large number of people could be impacted.	2
Maximum Threat	Spatially, any given highway transportation incident would impact a relatively small area. However in smaller towns, the impact could still affect a significant area. Highways pass through the center or near center of Centerville, Cincinnati, Moulton, and Plano.	1
Severity of Impact	A. Drivers, passengers, and bystanders may be injured or killed in a highway accident. Amish populations in the area may be a concern as they use the shoulders of the roads when driving their buggies and thus may be more vulnerable to injury or death. B. Fire, explosion, and debris may pose a threat to responders. C. Depending on where the accident occurs, a disruption to services or operations may occur, though generally confined to a few hours at most. D. Most accidents would involve only a small number of properties or buildings. However if a bridge is involved, the impact may be more widespread if damaged or shut down for extended periods.	3

	E. Highway accidents may delay the delivery of services by surface transport, though generally for a relatively short period of time. F. Hazardous chemicals released from vehicles may contaminate waterways. The impact on the environment may be more severe if a truck hauling chemicals is involved. G. Temporary closure of roads and bridges due to a highway accident may lead to minor economic impacts. The impact would be more severe if the accident causes significant damage to a bridge causing the bridge to be closed for an extended period. H. Regulations and Contractual Obligations: None known. I. Due to the relative frequency of highway accidents many drivers assume accidents as part of driving and thus little impact is seen on the reputation of local jurisdictions.	
Speed of Onset	Due to their nature, there is little or no way to predict when or where a traffic accident will occur. The same can be said for rail disasters and air disasters.	4
	Hazard Worksheet Score	18
	Composite Score	41

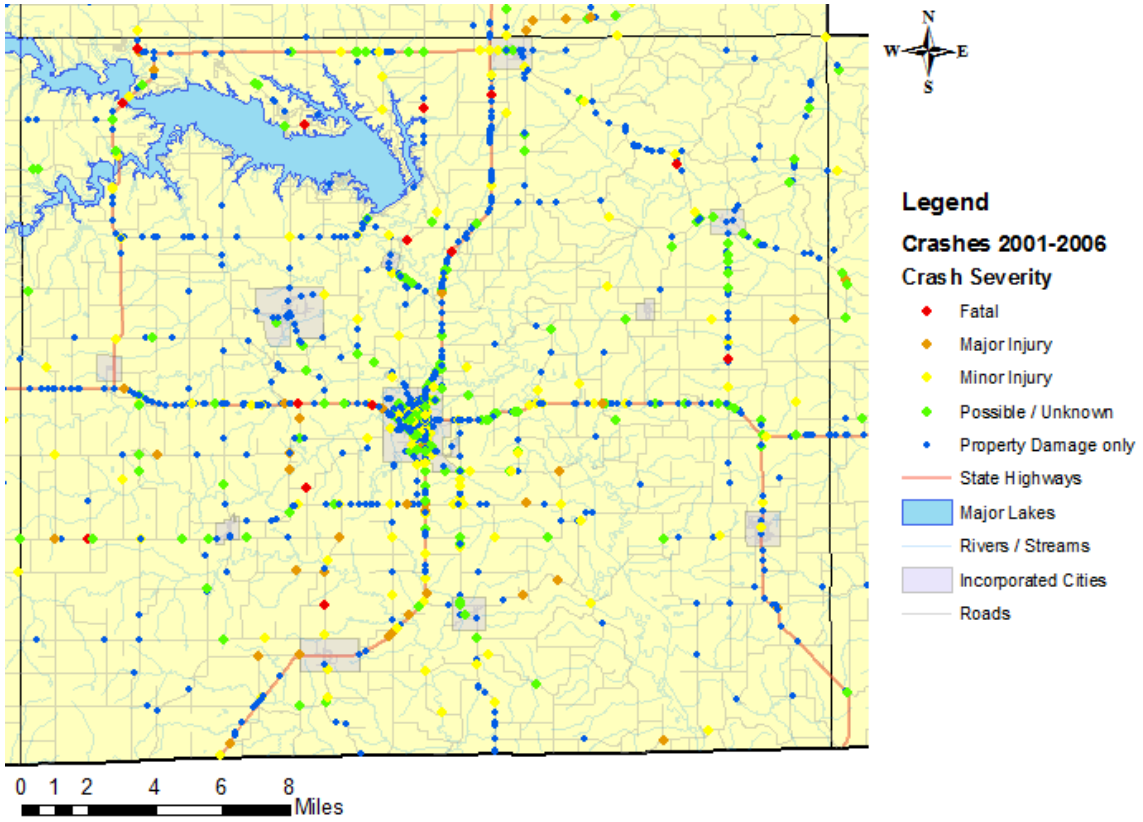
Additional Resources:	
Iowa DOT Crash Data by County	http://www.iowadot.gov/crashanalysis/county.htm
Iowa DOT Annual Average Daily Traffic	http://www.iowadotmaps.com/msp/traffic/aadtpdf.html

Figure 23: Appanoose County Severe Crashes (2001-2006)



Source: Chariton Valley Transportation Planning Affiliation Long Range Transportation Plan 2010-2030

Figure 24: Appanoose County Traffic Accidents (2001-2006)



Source: Chariton Valley Transportation Planning Affiliation Long Range Transportation Plan 2010-2030

Hazard	Transportation Hazardous Materials	
Definition	**Transportation Hazardous Materials**: An accidental release of chemical substances or mixtures that present a danger to public health or safety as a result of transportation.	
Description	This hazard constitutes an accidental release of chemical substances or mixtures that presents a danger to public health or safety during transportation. A hazardous substance is one that may cause damage to person(s), property, or the environment when released to soil, water, or air. Chemicals are manufactured and used in ever increasing types and quantities, as many as 500,000 products pose physical or health hazards and can be defined as "hazardous chemicals." Hazardous substances are categorized as toxic, corrosive, flammable, irritant, or explosive and each year, over 1,000 new synthetic chemicals are introduced and transported across the county via semi-truck and train. Hazardous materials incidents generally affect a localized area and the use of planning and zoning can minimize the area of impact. Large quantities of hazardous materials are transported daily on Iowa streets, highways, interstates, and railways. Roadways are a common site for the release of hazardous materials, as are railways. The Department of Transportation (DOT) regulates the routes and speed limits used by carriers and monitor the types of hazardous materials crossing state lines. Despite increasing safeguards, more and more potentially hazardous materials are being used in commercial, agricultural, and domestic uses and are being transported on Iowa roads and railways.	Rating
Historical Occurrence	According to the Department of Natural Resources, there have been eleven chemical releases related to transportation in Appanoose County since 2000. Most of the releases were in Centerville, though there have been releases in Mystic, Moravia, and Plano has been documented. Most (7) of these releases involved petroleum.	3

Spill Date	Town	Incident Mode	Incident Type
3/1/2002	Centerville	Transportation	Organic Chemical
3/25/2002	Centerville	Transportation	Petroleum
3/3/2001	Mystic	Transportation	Organic Chemical
3/8/2004	Cincinnati	Transportation	Petroleum
6/7/2004	Centerville	Transportation	Fertilizer/Pesticide
7/14/2004	Centerville	Transportation	Petroleum
9/6/2002	Centerville	Transportation	Petroleum
3/6/2007	Centerville	Transportation	Petroleum
5/8/2007	Centerville	Transportation	Petroleum
5/29/2007	Moravia	Transportation	Fertilizer/Pesticide
8/31/2007	Plano	Transportation	Petroleum

Probability	Large quantities of hazardous materials are transported daily on Iowa streets, highways, interstates, and railways. Roadways are a common site for the release of hazardous materials. The Department of Transportation regulates routes and speed limits used by carriers and monitor the types of hazardous materials crossing state lines. Despite increasing safeguards, more and more potentially hazardous materials are being used in commercial, agricultural, and domestic uses and are being transported on Iowa roads and railways. The SHMT (State Hazard Mitigation Team) evaluated the probability of a highway transportation incident occurring in Iowa as high, with more than a 60% chance in the next year. Given the rural nature of Appanoose County, transportation of chemicals that are generally hazardous substances is relatively common. The previous chart details eleven occurrences in the past ten years. This would indicate that there is a high probability of an annual occurrence of Transportation Hazardous Materials in Appanoose County. There is an increased likelihood of an event happening in the City of Centerville as there are approximately seven petroleum stations, which could experience a spill. Moravia, Moulton, Cincinnati and Exline also have gas stations to be at risk.	3
Vulnerability	A hazardous materials incident can occur almost anywhere, so any area is considered vulnerable to an accident. People, pets, livestock, and vegetation in close proximity to transportation corridors and populations downstream, downwind, and downhill of a released substance are particularly vulnerable. Depending on the characteristics of the substance released, a larger area may be in danger from explosion, absorption, injection, ingestion, or inhalation. Occupants of areas previously contaminated by a persistent material may also be harmed either directly or through consumption of contaminated food and water. For the most part, any one event is likely to impact fewer than 25% of the population for one of the incorporated communities and less than 10% for the county. Particular areas of concern include the rail lines that enter the communities of Centerville, Moulton, Moravia, and Mystic.	2
Maximum Threat	Most of the hazardous materials incidents are localized and are quickly contained or stabilized by the highly trained fire departments and hazardous materials teams. Depending on the characteristic of the hazardous material or the volume of product involved, the affected area can be as small as a room in a building or as large as 5 square miles or more. Many times, additional regions outside the immediately affected area are evacuated for precautionary reasons. More widespread effects occur when the product contaminates the municipal water supply or water system such as a river, lake, or aquifer.	2
Severity of Impact	A. Hazardous chemicals may cause burns, illness, suffocation, and death to individuals in direct contact. If there is a fire resulting from a vehicle	2

	accident that comes in contact with a hazardous material, the health and safety impacts may be magnified. B. Responders are subject to the same threats as in A. C. HazMat response may require the shut-down of a transportation corridor for a number of hours until the situation is contained and cleaned up. D. Most accidents would involve only a small number of properties or buildings. However if a bridge is involved, the impact may be more widespread if damaged or shut down for extended periods. E. The shut-down may delay the delivery of services by surface transport for a potentially extended period of time. F. Contamination of water, air, and soil may result harming crops and wildlife. Some contaminants may remain for years and can cause birth defects, disease, and potentially contribute to cancer rates in humans and animals. G. Loss of crops or livestock can contribute to economic hardship. H. The DOT regulates the transportation of hazardous chemicals, however once released the DNR is the responsible agency. I. Few people are familiar with the risks associated with the transportation of chemicals used in manufacturing and agriculture. Education, public information, and timely response will reduce the negative impacts on jurisdictions' reputation.	
Speed of Onset	When managed properly under current regulations, hazardous materials pose little risk. However, when handled improperly or in the event of an accident, hazardous materials can pose a significant risk to the population. Hazardous materials incidents usually occur very rapidly with little or no warning. Even if reported immediately, people in the area of the release have very little time to be warned and evacuated. During some events, sheltering in-place is the best alternative to evacuation because the material has already affected the area and there is no time to evacuate safely. Public address systems, television, radio, and the NOAA Weather Alert Radios are used to disseminate emergency messages about hazardous materials incidents.	4
	Hazard Worksheet Score	16
	Composite Score	37

Hazard	**Transportation of Radiological Materials**	Rating
Definition	**Transportation of Radiological Materials**: is an incident resulting in a release of radioactive material during transportation. Transportation of radioactive materials through Iowa over the interstate highway system is considered a radiological hazard. The transportation of radioactive material by any means of transport is license and regulated by the federal government.	
Description	When these materials are moved across Iowa highways, Iowa officials are notified and appropriate escorts are provided. As a rule there are two (2) categories of radioactive materials that are shipped over the interstate highways. Low level radioactive substances, but pose no serious threat except through long term exposure. These materials are shipped in sealed drums within placarded trailers. The danger to the public is no more than a	

	wide array of other hazardous materials. High-level waste usually in the form of spent fuel from nuclear plants is transported in specially constructed casks that are built to withstand a direct hit from a locomotive.	
Historical Occurrence	Since 1990, hundreds of shipments have made it through Iowa. There have been no occurrences of a radiological incident in Iowa or in Appanoose County. Transportation accidents are the most common type of incidents involving radioactive materials because of the sheer number of radioactive shipments.	1
Probability	There are no recorded events of a Transportation of Radiological incident in Iowa. This creates a very low probability of such an event occurring in Appanoose County. Such a probability would be under 5%.	2
Vulnerability	A hazardous materials incident can occur almost anywhere, so any area is considered vulnerable to an accident. People, pets, livestock, and vegetation in close proximity to transportation corridors and populations downstream, downwind, and downhill of a released substance are particularly vulnerable. Depending on the characteristics of the substance released, a larger area may be in danger from explosion, absorption, injection, ingestion, or inhalation. Occupants of areas previously contaminated by a persistent material may also be harmed either directly or through consumption of contaminated food and water. For the most part, any one event is likely to impact fewer than 25% of the population for one of the incorporated communities and less than 10% for the county. Particular areas of concern include the rail lines that enter the communities of Centerville, Moulton, Moravia, and Mystic.	3
Maximum Threat	Operators of facilities that use radioactive materials and transporters of radioactive waste are circumspect in the packaging, handling, and shipment of the radioactive waste and, since they are closely regulated by a variety of federal, state, and local organizations the likelihood of an incident is remote. Appanoose county committee members believe that State Highway 2 extending across all southern Iowa is sparingly used for transportation of radiological materials. Members also wonder if the railroad could be transporting such materials. Although neither of these options would be utilized often, it could still place residents and property along highway 2 and all rail lines. This could potential impact small portion in the Cities of Centerville, Moravia, Mystic, Moulton, and Udell.	3
Severity of Impact	A. Hazardous chemicals may cause burns, illness, suffocation, and death to individuals in direct contact. If there is a fire resulting from a vehicle accident that comes in contact with a hazardous material, the health and safety impacts may be magnified.	2

	B. Responders are subject to the same threats as in A. C. HazMat response may require the shut-down of a transportation corridor for a number of hours until the situation is contained and cleaned up. D. Most accidents would involve only a small number of properties or buildings. However if a bridge is involved, the impact may be more widespread if damaged or shut down for extended periods. E. The shut-down may delay the delivery of services by surface transport for a potentially extended period of time. F. Contamination of water, air, and soil may result harming crops and wildlife. Some contaminants may remain for years and can cause birth defects, disease, and potentially contribute to cancer rates in humans and animals. G. Loss of crops or livestock can contribute to economic hardship. H. The DOT regulates the transportation of radiological materials, however once released the DNR is the responsible agency. I. Few people are familiar with the risks associated with the transportation of chemicals used in manufacturing and agriculture. Education, public information, and timely response will reduce the negative impacts on jurisdictions' reputation.	
Speed of Onset	Radiological materials incidents would occur very rapidly with little or no warning. Even if reported immediately, people in the area of the release have very little time to be warned and evacuated. During some events, sheltering in-place is the best alternative to evacuation because the material has already affected the area and there is no time to evacuate safely. Public address systems, television, radio, and the NOAA Weather Alert Radios are used to disseminate emergency messages about radiological materials incidents.	1
	Hazard Worksheet Score	12
	Composite Score	32

Additional Resources:		
Iowa DNR Spill Data	http://www.iowadnr.gov/spills/data.html	
NTSB Hazardous Material Incidents	http://www.ntsb.gov/Publictn/Z_Acc.htm	
Hazard	**Waterway Incident**	Rating
Definition	A waterway incident is an accident involving any vessel that threatens life or which adversely impacts a community's capability to provide emergency service. Waterway incidents will primarily involve pleasure craft on area rivers and lakes. In the event of an incident involving a water vessel, the greatest threats would be drowning, fuel spillage, and property damage. Water rescue events would largely be handled by first responding agencies. Waterway incidents may also include events in which persons fell through the ice on partially frozen water bodies.	
Description	Waterway incidents obviously will only take place on a body of water; consult the community profile for a map of rivers and streams in the area. Waterway	

	incidents in Appanoose county are usually isolated events. There are no riverboats or other large passenger vessels in the area, so typically do not carry more than a dozen or so people. People on these vessels are most vulnerable to boating related waterway incidents and vulnerability does not normally extend beyond these people. However, waterway rescues can be dangerous and responders can be at risk also, particularly if poor weather conditions are involved or incidents take place near dams. Incidents can also involve people entering the water way without a boat, either by falling through the ice, swimming in fast current, or jumping or falling from a bridge. As with other waterway incidents, those who are most vulnerable are the person or persons who are experiencing distress in the waterway and the rescuers. Typically the only property damage that would result from a waterway incident is damage to or loss of a boat, typically no larger than described above. In rare cases, damage to a dock may also occur. Typically no structural damage would occur unless a very large watercraft became lodged against a bridge. This would be more likely to occur in a flooding situation, but could cause structural damage to a bridge by either the direct impact or redirection of the water's force against another part of the bridge.	
Historical Occurrence	US Army Corp of Engineers sites that there have been two drowning and one minor hazardous spill since 1996 at Lake Rathbun. There have been no other documented events in Appanoose County in the past 15 years.	1
Probability	There have been limited events that have occurred in Appanoose county over the past ten years. However, with the Lake Rathbun being such a large body of water in this county, an event could happen at any given time.	2
Vulnerability	The people directly involved in the incident are most vulnerable. This is typically swimmers, boaters, or people canoeing the rivers. There are 14 rivers/creeks in Appanoose County where a waterway incident could potentially occur. A greater risk could occur in larger bodies of water within the county. Lake Rathbun is the second largest man-made lake in Iowa. Also in this county there are other smaller watersheds that are Sundown Lake and the Centerville Reservoir, In the event that someone must be rescued from Lake Rathbun, a river or a farm pond, the rescuers are also are at risk. No other people would be directly affected.	3
Maximum Threat	The maximum extent of a waterway incident would be limited. Impacts would not extend beyond the immediate incident scene. The only exception would include a search and rescue event that could expand downstream. In the case of a hazardous material being released to the waterway, the impact could expand considerably.	3

Severity of Impact	Impacts would be limited to the personal injuries and possibly death of the persons directly involved. Property damage would be restricted to the crafted involved. Small fuel spills could result from damaged watercraft. Environmental damage could impact the aquatic flora & fauna if hazardous materials are released from boats.	2
Speed of Onset	Incidents would occur with little or no warning. Leading causes of waterway incidents are inclement weather and operator error. Weather forecasts are usually available days in advance and would give ample time to take shelter off water. Some particular events also increase traffic on waterways (Memorial weekend, July 4th weekend and Labor Day weekend), and thus responders can prepare for the increased likelihood of an incident during these times. Appanoose County has a certified dive team that is comprised of members from each Jurisdiction's fire department. Those members can respond in their local, respective areas or anywhere throughout the county.	4
	Hazard Worksheet Score	15
	Composite Score	18

Hazard	**Human Disease Pandemic**	
Definition	**Human Disease Pandemic**: A pandemic is defined as a disease that has spread around the world to many people.	
Description	A pandemic human disease is defined as a disease that has spread around the world to many people. The word, "pandemic", means that a disease has caused illness in a person on nearly every continent. Many diseases throughout the history of the world have been pandemic. Examples are HIV/AIDS/Influenza. A pandemic will have wide spread economic and societal implications for our state. Response and recovery to a pandemic will likely be lengthy. From 1900-2000, there were three (3) influenza pandemics, all about 30 years apart. In 2003, there were 80 new HIV patients and 76 new AIDS patients in Iowa. The last influenza pandemic in the United States was in 1968, historically pandemics occur every 30 years, and to date it has been 38 years since the last incident indicating the probability is high. Typically people who become ill are the elderly, the very young and people with chronic medical conditions and high risk behaviors. Greater than 20% of Iowa's population is considered high risk and about 46% of Appanoose County's population. The SHMT (State Hazard Mitigation Team) had much discussion of the Speed of Onset to the disease. If the disease is highly infectious by the time it is	Rating

	discovered, it will likely have already spread across the state or nation. This will put us at a severe disadvantage during the response and recovery. The Appanoose County committee members discussed how mobile our society is and that this mobility would allow for diseases to quickly spread and how quickly viruses pass throughout school systems.	
Historical Occurrence	Pandemics of influenza have occurred three times about every 100 years. From 1900-2000, there were three influenza pandemics, all about 30 years apart. In 2003 there were 80 new HIV patients and 76 new AID's patients in Iowa. Iowa Department of Public Health states that in 2005 there were 6 residents living with AID's in Appanoose County. There are no recorded outbreaks of any human disease pandemics in Appanoose County.	2
Probability	Public health agencies work to protect Iowans from infectious diseases and preserve the health and safety of Iowans through disease surveillance, investigation of suspect outbreaks, education and consultation to county, local and public/private health agencies. The last influenza pandemic in the US was in 1968, historically pandemics occur every 30 years, and to date it has been 38 years since the last incident suggesting the probability is high. Appanoose County Public Health Department closely monitors the number of residents' diagnosis with all infectious disease. They report that there are yearly outbreaks of influenza viruses; however, none in recent years have been serious enough to be deemed a "pandemic". The SHMT (State Hazard Mitigation Team) determined that based on the probability Iowa is likely to be between a 25% and 60% chance to have a pandemic outbreak occur in the next year. There is no history of an outbreak in Appanoose county and any of the jurisdictions; therefore, it is difficult to calculate a probability any different than the 25-60% calculated by the state. Committee members believe that this would be an accurate estimate for this region.	3
Vulnerability	Influenza (flu) happens every year in nearly every country in the world. It spreads through a population for a few months and then will disappear or will move onto another country. Influenza usually occurs in the fall and winter months. Typically people who usually become ill are the elderly, the very young and people with chronic medical conditions and high risk behaviors. The individuals that travel internationally and have high exposure to potential vectors of disease are the most susceptible. Greater than 20% of Iowa's population is considered high risk. The elderly population of Appanoose County makes up nearly 20% according to the 2000 Census with a youth population of nearly 24%, about 6% of which are under 5. About 26%	3

	of Appanoose County may be considered at high risk based on age alone.	
Maximum Threat	Because of our highly mobile society, these diseases can move rapidly across the state and across the nation within days, weeks, or months.	3
Severity of Impact	A. Pandemics have historically caused severe illness if not death. B. Medical workers are at high risk due to their role in aiding infected people. C. Health care, government, and emergency response operations may be compromised if staff members of such organizations contract the illness. D. It is not anticipated that there would be Property, facilities, and infrastructure damage. E. Healthcare & essential services infrastructure impact - human resource personnel infrastructure. F. Potential impact to essential environmental service personnel. G. Large outbreaks may warrant travel advisories to the area and will impact the tourism and general commerce in the area. High number of ill human resources across the board. H. Regulations and Contractual Obligation should not be affected by Human Disease Pandemic.	3
Speed of Onset	If the disease is highly infectious by the time it is discovered, it will likely have already spread across the state or nation. This will put us at a severe disadvantage during response and recovery. However, hospitals and public health agencies have access to Health Alert, an online system through the CDC (http://www2a.cdc.gov/han/Index.asp) to help with disseminating information quickly.	1
	Hazard Worksheet Score	15
	Composite Score	23

Hazard	**Human Disease Incident**	
Definition	**Human Disease Incident**: A medical, health, or sanitation threat to the general public (such as contamination, epidemics, plagues, and insect infestation).	
Description	An incident related to human disease is defined as a medical, health, or sanitation threat to the general public (such as contamination, epidemics, plagues, and insect infestation). Public health action to control infectious diseases in the 21st century is based on the 19th century discovery of microorganisms as the cause of many serious diseases (e.g., cholera and TB). Disease control resulted from improvements in sanitation and hygiene, the discovery of antibiotics, and the implementation of universal childhood vaccination programs. Scientific and technological advances played a major role in each of these areas and are the foundation for today's disease surveillance and control systems. Scientific findings have contributed to a new understanding of the evolving relationship between humans and microbes. As of January 1, 2000, sixty (60) infectious diseases were	Rating

	designated as notifiable at the national level. A notifiable disease is one for which regular, frequent, and timely information regarding individual cases is considered necessary for the prevention and control of the disease. The Iowa Department of Public Health tracks epidemiological statistics in Iowa. Their data indicate no major incidents of diseases that have high percentages of loss of life or severe illness in the last 25 years. Public health agencies work to protect Iowans from infectious diseases and preserve the health and safety of Iowans through disease surveillance, investigation of suspect outbreaks, education and consultation to county, local, and health agencies. Public health agencies also work to reduce the impact of communicable diseases in Iowa and to eliminate the morbidity associated with these diseases. Programs guide community-based prevention planning, monitor current infectious disease trends, prevent transmission of infectious diseases, provide early detection and treatment for infected persons, and ensure access to health care for refugees in Iowa. While vaccines are available for many diseases, Iowans remain vulnerable to other diseases known and unknown.	
Historical Occurrence	The Iowa Department of Public Health tracks epidemiological statistics in Iowa. Their data indicate no major incidents of diseases that have high percentages of loss of life or severe illness in the last 25 years.	2
Probability	Public health agencies work to protect Iowans from infectious diseases and preserve the health and safety of Iowans through disease surveillance, investigation of suspect outbreaks, education and consultation to county, local, public health agencies. Climatic changes are predicted to impact disease vectors by changing the range of habitat for disease carriers. This includes mosquitoes and diseases such as West Nile Virus, Lyme Disease, and even Malaria and California Encephalitis. Iowa Department of Public Health (IDPH) reports a 47% increase across Iowa of cases of Lyme disease from 2003 to 2006. There were no diagnosed cases in Appanoose county. IDPH also reports five West Nile Cases in Iowa in 2008-2009, which has a decrease from the 3 years prior. No cases were identified in Appanoose County. The SHMT (State Hazard Mitigation Team) analysis evaluated the probability of a human disease incident between 10% and 25% in the next year. The committee determined that this is an accurate estimate for this region as well because there is no decisive data of past occurrence to indicate otherwise.	2
Vulnerability	Public health agencies also work to reduce the impact of communicable diseases in Iowa and to eliminate the morbidity associated with these diseases. Programs guide community-based prevention planning, monitor	2

	current infectious disease trends, prevent transmission of infectious diseases, provide early detection and treatment for infected persons, and ensure access to health care for refugees in Iowa. While vaccines are available for many diseases, Iowans remain vulnerable to other diseases known and unknown.	
Maximum Threat	Because of our highly mobile society, these diseases can move rapidly across the state and across the nation within days, weeks, or months.	3
Severity of Impact	A. Many of the diseases on the national notification list result in serious illness if not death. Some are treatable, other only the symptoms are treatable. B. Doctors, nurses, paramedics, and emergency medical technicians are vulnerable to contagious diseases. Universal precautions can greatly diminish the transfer rate and risk to responders to human disease. C. Continuity and Operations: Minor impacts may be experienced. D. Property, facilities, and infrastructure: None. E. Limited impact on critical services. Healthcare services may be at the limits of capacity. F. Environment: No direct impact. G. No direct impact to economic and financial sources, but large outbreaks may warrant travel advisories to the area and will impact the tourism and general commerce in the area. H. Regulations and Contractual Obligations: None known. I. Adequate disease prevention programs and response to the outbreak can limit the damage to the jurisdiction's reputation.	3
Speed of Onset	The private practitioner is the first line of defense and will undoubtedly be the first to witness the symptoms of human disease incidents. The Iowa Department of Public Health and the U.S. Centers for Disease Control monitor reports submitted by doctors, hospitals, and labs to identify patterns. The Department and CDC are proactive in providing information to the health care community on medical concerns. Conditions related to scope and magnitude can escalate quickly and area resources can be drained of personnel, medications, and vaccinations rather quickly.	1
	Hazard Worksheet Score	13
	Composite Score	19

Hazard	**Animal / Plant / Crop Disease**	Rating
Definition	**Animal / Plant / Crop Disease**: An outbreak of disease that can be transmitted from animal to animal. The disease outbreak will likely have a significant economic implications or public health impact. The crop/plant pest infestation will likely have severe economic implications, cause significant crop production losses, or significant environmental damage. The crop/plant pests may also have implications for public health.	
Description	An outbreak of disease that can be transmitted from animal to animal or plant to plant represents an animal/crop/plant disease. The crop/plant pest	

	infestation will likely have severe economic implications, cause significant crop production losses, or significant environmental damage. The crop/plant pests may also have implications for public health. The introduction of some high consequence diseases may severely limit or eliminate our ability to move, slaughter, and export animals and animal products. Response and recovery to infectious animal disease outbreaks will be lengthy, and many producers may never be able to return to business. There will be many indirect effects on our economy. Rumors of an infectious animal disease outbreak could cause significant damage to the markets; as was evidenced in an incident in Kansas in 2003 where the mere rumor of a Foot and Mouth Disease outbreak caused the market to plummet. Crop/plant pest infestations can cause widespread crop/plant loss and severe economic hardship on farmers and landowners and related businesses. Once infestation occurs, the pest may become endemic, causing repeated losses in subsequent growing years. Loss of production will affect all related industries, such as fuel, food, synthetics, processors, etc.	
Historical Occurrence	Every year the Iowa Department of Agriculture and Land Stewardship (IDALS) conduct numerous animal disease investigations. In 2005, IDALS and USDA conducted 19 highly infectious disease investigations. Fortunately the investigation results are negative. IDALS, under the direction of the state plant regulatory official works with Iowa's universities and industries to conduct regular crop / plant pest surveillance. To date, there has not been a founded case in Appanoose County.	2
Probability	Disease/pests are present in many other areas of the country/world. Many disease/pests are easily transmitted therefore the probability of introduction is high. Iowa leads the nation in production of pork, soybeans, eggs, and corn and is among the leading beef production states. Human disease outbreaks can have an economic impact on agricultural products as well as recently seen with the H1N1 scare and the resulting aversion to pork products or even eradication of pigs in areas around the world. With the millions of animals and animal products that move across our state yearly, probability is high. The SHMT analysis evaluated the probability that an animal/crop/plant disease infestation is highly likely to occur in Iowa next year with more than a 60% chance. Iowa is a productive agricultural state producing both crop and livestock. Appanoose County is home to 731 farms that encompass 197,904 acres of land. Thirty-six percent of these acres produce forage (hay, silage, etc) and the same approximate amount of acres dedicated to yielding corn. The farm land also provides nutrients for 28,626 head of cattle/calves, 1,817 hogs, and 642 horses. This agricultural region has ranked the hazard as high due to the severity of potential agricultural losses. With such a high percentage of crop land and livestock inventory, this area would be at a at risk of such an incident, but the committee believes that a serious outbreak is not as likely. It was stated that it is more likely to be a 10% chance of it	2

	occurring in this region in the next 100 years or a single occurrence in the next 10 years.	
Vulnerability	The movement of people, animals, animal products, wildlife, plants, crops and potential disease/pest vectors could all cause the introduction of diseases/pests. Diseases/pests could also be introduced naturally, for example by hurricanes or jet streams. Emerging disease is also a threat such as West Nile Virus, new more virulent influenza strains, etc. Because many diseases/pests are not present in Iowa, our populations of animals, crops, and plants have no immunity and are highly susceptible.	2
Maximum Threat	The impact will vary by disease/pest and the type of animal/crop/plant infected/infested. When the United Kingdom faced an outbreak of Foot and Mouth Disease in 2001, the total economic loss to that country exceeded $7 billion. This incident was one of the most economically significant historically, second only to World War II. Several states are currently dealing with an Emerald Ash Borer infestation and some threat now exists in northeastern Iowa along the Wisconsin-Iowa border. To date the state and federal governments have spent in excess of $550 million to detect, delimit, control and eradicate the pest. Should the disease/pest have public health implications, the economic and social impact would be even greater. A changing climate increases the risk of pests and diseases spreading in agricultural sectors as well as in human populations. On average, Appanoose County farms have an annual agricultural product value of about $52,000 which is relatively low in relation to other Iowa Counties (2007 Agricultural Census, USDA).	3
Severity of Impact	The severity will vary by disease/pest. The types of animals, crops, or plants affected will also significantly influence the severity. [This hazard element reflects the description in the State Hazard Mitigation Plan which does not break severity of impact out further than this.]	3
Speed of Onset	If the diseases / pests are highly infectious (many animals that are infected with disease can be transmitting disease before they show clinical signs), by the time they are discovered, they will likely have spread across the state or nation. This will put us at a severe disadvantage during response and recovery.	1
	Hazard Worksheet Score	13
	Composite Score	22

Table 103: Appanoose County Farm Statistics

Number of Farms	
Appanoose County	731
Iowa	90,655
% of Iowa Farms in Appanoose County	0.90%

Average Farm Size (acres)	
Appanoose County	271
Iowa	350
% size of Appanoose Farms to Iowa average	82.57%

Source: USDA, National Agricultural Statistical Service, 2007

Hazard	Fixed Hazardous Materials	
Definition	**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. **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.	
Description	A fixed hazardous materials incident is the accidental release of chemical substances or mixtures, which presents a danger to the public health or safety, during production or handling at a fixed facility. A hazardous substance is one that may cause damage to persons, property, or the environment when released to soil, water, or air. Chemicals are manufactured and used in ever-increasing types and quantities, each year, over 1,000 new synthetic chemicals are introduced, and as many as 500,000 products pose physical or health hazards and can be defined as “hazardous chemicals”. Hazardous substances are categorized as toxic, corrosive, flammable, irritant, or explosive. Hazardous material incidents generally affect a localized area and the use of planning and zoning can minimize the area of impact. During the period 2002-2005, fixed facilities experienced 1,888 incidents according to the Iowa Department Natural Resources (DNR). Fixed facility releases accounted for about 71% of total releases. Despite increasing safeguards, more and more potentially hazardous materials are being used in commercial, agricultural, and domestic activities. This situation is made worse by the density of people and hazardous materials in Iowa. 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. Meth labs are of particular concern in rural areas where smaller populations and remote places reduce the risk of being caught for meth producers. There are no Superfund Sites in Appanoose County. See the chart below for a	Rating

<table>
<tr><td></td><td>list of the Hazardous Materials Releases and locations of various hazardous materials releases on file with the EPA.</td><td></td></tr>
<tr><td>Historical Occurrence</td><td>Of the 28 hazardous materials releases on file with the DNR between 2001 and 2008, eleven were transportation related and are addressed in the respective hazard profile. Nine of the incidents involve petroleum products but only one related to illegal dumping.

Four meth labs have been discovered in Appanoose County in the last two years (see Appendix 17: Iowa Meth Labs by County). The manufacturing plants, automobile repair, and gas stations are potential sites for hazardous materials incidents in Appanoose County.

<table>
<tr><th>Spill Date</th><th>Town</th><th>Incident Mode</th><th>Incident Type</th></tr>
<tr><td>10/27/2001</td><td>Centerville</td><td>Handling And Storage</td><td>Petroleum</td></tr>
<tr><td>4/6/2003</td><td>Centerville</td><td>Handling And Storage</td><td>Inorganic Chemical</td></tr>
<tr><td>7/20/2004</td><td>Centerville</td><td>Handling And Storage</td><td>Petroleum</td></tr>
<tr><td>7/21/2004</td><td>Centerville</td><td>Handling And Storage</td><td>Petroleum</td></tr>
<tr><td>11/1/2005</td><td>Centerville</td><td>Handling And Storage</td><td>Petroleum</td></tr>
<tr><td>8/18/2006</td><td>Centerville</td><td>Handling And Storage</td><td>Petroleum</td></tr>
<tr><td>9/11/2005</td><td>Centerville</td><td>Other</td><td>Petroleum</td></tr>
<tr><td>8/17/2007</td><td>Centerville</td><td>Other</td><td>Petroleum</td></tr>
<tr><td>6/6/2002</td><td>Centerville</td><td>Transformer</td><td>Transformer oil/PCB</td></tr>
<tr><td>9/8/2001</td><td>Centerville</td><td>Transformer</td><td>Transformer oil/PCB</td></tr>
<tr><td>7/15/2006</td><td>Centerville</td><td>Transformer</td><td>Transformer oil/PCB</td></tr>
<tr><td>7/28/2008</td><td>Centerville</td><td>Transformer</td><td>Transformer oil/PCB</td></tr>
<tr><td>7/16/2008</td><td>Centerville</td><td>Vandalism</td><td>Transformer oil/PCB</td></tr>
<tr><td>7/16/2008</td><td>Exline</td><td>Transformer</td><td>Transformer oil/PCB</td></tr>
<tr><td>10/31/2000</td><td>Moravia</td><td>Handling And Storage</td><td>Petroleum</td></tr>
<tr><td>3/20/2005</td><td>Mystic</td><td>Dumping</td><td>Petroleum</td></tr>
<tr><td>8/24/2003</td><td>Plano</td><td>Transformer</td><td>Transformer oil/PCB</td></tr>
</table></td><td>4</td></tr>
<tr><td>Probability</td><td>Anecdotal evidence suggests that meth use and production is not uncommon in Appanoose County. Chemical spills can occur anytime there is a traffic accident as oil, gasoline, and other fluids used in vehicles are released. Dumping of household cleaners, paints, and old oil can happen at any time and are more likely in areas where people do not understand hazardous materials laws.

A number of homes (60%) in Appanoose County use LP Gas for heating fuel. Liquid petroleum is not by nature toxic, but can cause asphyxiation through oxygen deprivation. LP Gas is heavier than air so it will sink to the lowest places possible and is flammable. Stores of anhydrous ammonia in the county pose health and safety threats to potentially large areas of the county and are potential targets for meth producers as a source of raw materials. The</td><td>4</td></tr>
</table>

	communities of Centerville and Moravia have an increased probability of occurrence due to locations that sell large amounts of Anhydrous Ammonia to farmers in the region. Moravia's MFA Anhydrous distribution site is located within 50 yards of a rail line that passes through the city. Centerville's Anhydrous distribution site is located on the very edge of the community and places fewer residents at risk in the event of an incident.	
Vulnerability	A hazardous materials accident can occur almost anywhere, so any area is considered vulnerable to an accident. People, pets, livestock, and vegetation in close proximity to facilities producing, storing, or transporting hazardous substances are at higher risk. Populations downstream, downwind, and downhill of a released substance are particularly vulnerable. Depending on the characteristics of the substance released, a larger area may be in danger from explosion, absorption, injection, ingestion, or inhalation. Occupants of areas previously contaminated by a persistent material may also be harmed either directly or through consumption of contaminated food and water. Facilities are required to have an off-site consequence plan that addresses the population of the surrounding area. Responding personnel are required to be trained to HAZMAT Operations Level to respond to the scene, and those personnel that come into direct contact with the substances released are required to have HAZMAT Technician level training. Most of the industrial sites in Appanoose County are located in or near Centerville.	2
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. Most of the hazardous materials incidents are localized and are quickly contained or stabilized by the highly trained fire departments and hazardous materials teams. Depending on the characteristic of the hazardous material or the volume of product involved, the affected area can be as small as a room in a building or as large as 5 square miles or more. Many times, additional regions outside the immediately affected area are evacuated for precautionary reasons. More widespread effects occur when the product contaminates the municipal water supply or water system such as a river, lake, or aquifer.	1
Severity of Impact	A. The release of some toxic gases may cause immediate death, disablement, or sickness if absorbed through the skin, injected, ingested, or inhaled. Some chemicals may cause painful and damaging burns to skin if they come in direct contact with your body. B. Specialized training is needed to respond to these types of incidents. If inadequately trained personnel attempt to respond, the impacts could be the same as those for the general public exposed to the toxic materials. Proper training and equipment greatly reduce the risk to response personnel. C. Continuity of Operations: None directly unless the incident occurs on or	2

	near critical facilities or services. D. Damage is usually limited to the immediate property involved. Proper decontamination is needed before the facilities go back in service. E. Contaminated water resources may be unsafe and unusable, depending on the amount of contaminant. F. Contamination of air, ground, or water may result in harm to fish, wildlife, livestock, and crops. The release of hazardous materials into the environment may cause debilitation, disease, or birth defects over a long period of time. G. Loss of livestock and crops may lead to economic hardships within the community. H. Regulations and Contractual Obligations: None known. I. Safe and timely response will greatly limit any damage to the jurisdiction's reputation. Proper warning and public information before, during, and after the incident can also limit reputation damage.	
Speed of Onset	Most hazardous materials events happen suddenly and unexpectedly from transportation or other accidents. When managed properly under regulations, hazardous materials pose little risk. However, when handled improperly or in the event of an accident, hazardous materials can pose a significant risk to the population. Hazardous materials incidents usually occur very rapidly with little or no warning. Even if reported immediately, people in the area of the release have very little time to be warned and evacuated. During some events, sheltering in-place is the best alternative to evacuation because the material has already affected the area and there is no time to evacuate safely. Public address systems, television, radio, and the NOAA Weather Alert Radios are used to disseminate emergency messages about hazardous materials incidents.	4
	Hazard Worksheet Score	17
	Composite Score	26

Additional Resources:	
National Priority Sites in Iowa	http://www.epa.gov/superfund/sites/npl/ia.htm
US EPA Enviromapper	http://www.epa.gov/enviro/html/em/
IA DNR Spill Response	http://www.iowadnr.gov/spills/data.html

Note LUST sites: http://programs.iowadnr.gov/ims/website/lust_sites/viewer.htm for hazardous materials plus EPA release inventory? - http://www.iowadnr.com/mapping/index.html

Hazard	Energy Failure	
Definition	**Energy Failure**: An extended interruption of electric, petroleum or natural gas service, which could create a potential health problem for the population and possibly mass panic.	
Description	An extended interruption of service either electric, petroleum or natural gas, which by an actual or impending acute shortage of usable energy could create a potential health problem for the population and possibly mass panic. International events could potentially affect supplies of energy producing products while local conditions could affect distribution of electricity, petroleum or natural gas. The magnitude and frequency of energy shortages are associated with international markets. Local and state events such as ice storms can disrupt transportation and distribution systems; if disruptions are long lasting, public shelters may need to be activated to provide shelter from extreme cold or extreme heat. Stockpiles of energy products eliminate short disruptions but can increase the level of risk to the safety of people and property near the storage site. With India and China rapidly industrializing and the surge in private vehicle ownership in both countries, the price of oil will increase as international demand for it also increases. This is at a time when global oil supplies are diminishing as acknowledged by several petroleum industries and numerous scientists, scientific organizations, and governments. The 2008 price fluctuations of gasoline, asphalt, and some other building products reflect some of this uncertainty and global occurrences. The state of Iowa has three strategies to limit the likelihood of an energy shortage. Through voluntary and mandatory demand reduction mechanisms; the substitution of alternative energy sources when possible; and state government programs to curtail excessive use, energy supply and demand can be kept in check. The federal government has a strategic petroleum reserve to supplement the fuel supply during energy emergencies. These reserves cannot last indefinitely and cannot completely mitigation price fluctuations such as in the event of a global oil shortage. Shortages, especially electrical shortages, can be unpredictable with immediate effects. Natural events, human destruction, price escalation, and national security energy emergencies can cause unavoidable energy shortages.	Rating
Historical Occurrence	The energy crisis of the 1970s had significant impacts on many consumers in Iowa. High inflation and unemployment were associated with the excessive dependence on foreign oil during the early and mid 1970s. In 2001 panic over access to gasoline was experienced throughout the United States and resulted in some of the longest lines at fuel pumps since the 1970's. Loss of power due to severe storms is not uncommon and is often regarded	3

	as merely a nuisance. However, extended periods without power are rare but more severe. Periods of power disruption in southern Iowa are most severe during the winter and have lasted for several days to over a week in recent years. Energy failure in the 2008 ice storm in Appanoose County involved real or perceived gasoline shortages and downed power lines.	
Probability	Given the frequency of severe storms, the probability of short term energy failure is fairly high, likely occurring annually. International events are increasingly likely as the global demand for oil is increasing in India and China. Violence in countries such as Nigeria centered on oil production have occurred in the last five years and may well increase as global oil exploration continues to become more expensive and difficult. Likewise, pirate attacks on oil supply tankers off of the coast of Somalia in November 2008 may be setting a precedent for other groups that wish to disrupt oil supplies to the west, India, and China. The committee discussed the frequency that the jurisdictions and region loses power due to severe winter storms and thunderstorms. Most often it is a short term disruption but could still be considered an energy failure and it is recognized that it has the potential for extensive problems. The committee rated the probability of occurrence as very likely with a 100% probability of occurring in at least once in a given year.	4
Vulnerability	Because Iowa is almost entirely dependent on out-of-state resources for energy, Iowans must purchase oil, coal, and natural gas from outside sources. World and regional fuel disruptions are felt in Iowa. It is likely that increasing prices will occur as market mechanisms are used to manage supply disruptions. This will disproportionately affect the low-income population because of their lower purchasing power. Agricultural, industrial, and transportation sectors are also vulnerable to supply, consumption, and price fluctuations. In Iowa, petroleum represents 97% of transportation fuel. Individual consumers such as commuters and businesses are also vulnerable.	3
Maximum Threat	The effects of an energy shortage would be felt throughout the state. Because the distribution systems are very well developed, local shortages can quickly be covered. Storm-related energy disruptions may impact a few homes or the entire community and surrounding areas. Response to such disruptions depends on the severity of the damage and the availability of staff to repair the system. During the holiday season, staff availability may be limited.	3
Severity of Impact	A. Injuries and fatalities would not be directly caused by an energy shortage. Injuries and fatalities could occur if energy was not available for heating during extreme cold periods or for cooling during extreme heat. B. Health and Safety of response personnel: None directly. C. Hospitals, shelters, emergency response vehicles and facilities, and other critical facilities would have priority during energy shortages.	2

	D. Property, facilities, & Infrastructure: No direct damages. E. Effects could range from minor heating and air conditioning disruptions to transportation limitations all the way to civil unrest due to the high demand, low supply, and subsequent high price. F. Environment: None directly. G. Rotating blackouts, voluntary conservation measures, and possibly mandatory restrictions could be used to limit the severity of an energy shortage. Business disruption and increased cost of business would have far-reaching financial implications across many sectors of the economy. H. Regulations and Contractual Obligations: None known. I. Reputation could be harmed if the reason for the shortage or failure could have been avoided by good planning. If caused by natural events, there would be no significant impact unless the response to the outage was poor.	
Speed of Onset	The Iowa Department of Natural Resources Energy Bureau monitors domestic and international energy situations and has developed a plan to deal with an energy crisis. Signs that an energy shortage may be developing can be recognized even months in advance, but energy shortages/emergencies can rise suddenly and unexpectedly. Supply distribution problems in other countries and local weather situations can lead to low supply coupled with high demand in a matter of a day or two.	4
	Hazard Worksheet Score	19
	Composite Score	42

Hazard	Communications Failure	
Definition	**Communications Failure**: When the method of communication fails to deliver the required information as needed.	
Description	Communication failure is the widespread breakdown or disruption of normal communication capabilities. This could include major telephone outages, loss of local government radio facilities, long-term interruption of electronic broadcast services, emergency 911, law enforcement, fire, emergency medical services, public works, and emergency warning systems are just a few of the vital services which rely on communication systems to effectively protect citizens. Business and industry rely heavily on various communication media as well. Mechanical failure, traffic accidents, power failure, line severance, and weather can affect communication systems and disrupt service. Disruptions and failures can range from localized and temporary to widespread and long-term. If switching stations are affected, the outage could be more widespread	Rating
Historical Occurrence	Communications failures have presumably occurred in Appanoose County; however documentation is not readily available. One incident that is available is a communications tower collapse at the Rathbun Rural Water Association Treatment Plant in 2005.	1
Probability	The Iowa Hazard Mitigation Plan indicates that communications failure has a 10% chance of occurring in the next year in Iowa. While massive failures are unlikely to occur or to last long due to redundancy measures, the possibility of such an event does exist. Weather events are the most likely cause of communications failures in Appanoose County. With the estimated probably to expect a one annual severe storm (including winter, Thunderstorm, or tornado) the probability of the state of Iowa's 10% would be low for this region. The committee stated that an occurrence is likely to occur in a given year and 50% is an accurate estimate for Appanoose County. The severe weather events of Thunderstorm, tornado or severe winter storm can cover a wide territory and therefore, become difficult to predict. Any of the jurisdictions throughout Appanoose county could be at a 50% chance of experiencing a form of communications failure in any given year.	3
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 or if the cell towers are damaged.	3
Maximum Threat	In the event of a communications failure, the entire County could be impacted, especially if the failure occurred during a community wide hazard	3

	event.	
Severity of Impact	A. A communications failure would not directly result in injuries or fatalities. If 911 systems were to fail due to phone communication disruption, secondary impacts could occur by the inability of citizens to alert responders of their needs. B. Health & Safety of response personnel: None directly. C. Inter-agency and intra-agency communications would be limited. Data transmission could also be affected. D. Financial losses would be incurred due to the direct damage to electronic equipment and the communication system infrastructure. E. If 911 systems were to fail due to phone communication disruption, secondary impacts could occur by the inability of citizens to alert responders of their needs. F. Environment: None directly, but failed communications could result in malfunctioning systems and potential does exist for facilities to discharge hazardous materials into the environment. G. Most economic impacts would be felt on those sectors dependent upon the communication system. This could result in multi-sector far reaching impacts due to business disruption. H. Regulations and Contractual Obligations: None known. I. Widespread communication failures could moderately harm the reputation of the jurisdiction. If 911 systems are affected, the reputation damage could be more serious. J. The severity of the impact will be reduced by activating the ADLM Emergency Communications trailer. This mobile unit can establish a temporary means of emergency communication for law, fire, and rescue personnel.	2
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.	4
	Hazard Worksheet Score	16
	Composite Score	36

Hazard	Structural Failure	
Definition	**Structural Failure**: The collapse (part or all) of any public or private structure including roads, bridges, towers, and buildings.	
Description	The collapse (part or all) of any public or private structure including roads, bridges, towers, and buildings is considered a structural failure. A road, bridge, or building may collapse due to the failure of the structural components or because the structure was overloaded. Natural events such as heavy snow may cause the roof of a building to collapse under the weight of snow. Heavy rains and flooding can undercut and washout a road or bridge. The age of the structure is sometimes independent of the cause of the failure. Enforcement of building codes can better guarantee that structures are designed to hold-up under normal conditions. Routine inspection of older structures may alert inspectors to "weak" points. The level of damage and severity of the failure is dependent on factors such as the size of the building or bridge, the number of occupants of the building, the time of day, day of week, amount of traffic on the road or bridge, and the type, and amount of products stored in the structure. Civil structures may fail in a variety of modes. The unprecedented growth in technology has resulted in a host of problems related to complex structures, special materials, and severe operational and environmental loads, such as fire, excessive vibrations, explosion, high-energy piping failures, and earthquakes. With the possible exception of misuse, accidental or environmental loads, the causes of failure may be found in deficiencies of design, detailing, material, workmanship, or inspection. With the aging structures in the country along with problems with new materials discussed above, structural failures will continue to occur. Efforts to inspect and maintain these structures will lessen the probability of a failure, but not guarantee that it will not happen in the future. Internal weaknesses can be hidden from inspectors and not be realized until it is too late. The I-35 bridge collapse in Minneapolis in August 2007 dramatically underscored the critical nature of the nation's infrastructure. Infrastructure such as roads, water and waste water systems, bridges, and civil buildings are aging, many are reaching or have reached their design capacity or intended lifespan. Most of these systems were designed to handle particular conditions but with population expansion in some areas, the capacity alone is under strain. In rural areas, the resources to maintain infrastructure is sparser than in more heavily populated areas due to tax base. With increasing environmental stresses such as increasingly severe and frequent storm and weather fluctuations, additional strains on infrastructure are being felt throughout the country.	Rating

	Sixty percent of Iowa's bridges are rated as "functionally obsolete" meaning that they were designed for very different and much less intense conditions than they are subjected to. This may also include the width of the bridge being insufficient for modern vehicles and farm machinery.	
Historical Occurrence	A communications Tower collapsed at the Rathbun Rural Water Association Treatment Plan in 2005. During the winter of 2007-2008, Appanoose County faced widespread damage and closure of roads and bridges placing strains on county engineering budgets. In December 2006 a section of road pavement collapsed in Centerville due to structural failure of the underlying brick sewer line. The sewer was estimated to have been installed in the 1920's or 1930's.	1
Probability	Given the age of homes in Appanoose County and on when the County flourished and nationwide concerns over aging infrastructure, the risk of structural failures may be relatively high. This risk is alongside the risk of mine collapses addressed in the sink hole hazard profile. Additionally, many of the buildings in Appanoose County were constructed in the late 1800's and early 1900's prior to the advent of building codes in the United States. The Appanoose county engineer has estimated that approximately half of the bridges throughout the county could be considered in Sub-standard condition. Although they all pass safety regulations at this time, they are not to the integrity the engineer would like have. Considering the age of the homes, infrastructure, and bridges, the committee gave structural failure the probability of "Likely" to occur. The committee recognizes that at least one event could occur in the next ten years or possibly up to 50% chance of occurring any time.	3
Vulnerability	There are many buildings in the County that are very old (over 13% of homes built prior to 1940) or which may become hazardous in the event of an earthquake, fire, high winds, or other natural events. All bridges are vulnerable to the effects of the elements and the deterioration that results. Increases in the amount and weight of traffic they are expected to support increase their vulnerability to failure. When secondary roads are compromised by weather events (especially significant wet weather leaving gravel roads too soft to carry traffic), farm machinery use other routes which may include bridges not sufficiently capable of carrying the loads.	2
Maximum Threat	The impacts of the failed structure would be contained to the immediate area and adjacent properties. This could be as small as the house and yard of a fallen chimney, or the area could be more extensive if a whole building were to collapse. Of particular concern would be if subsurface structures such as sewers were to collapse as the warning signs may not be observed until too late. Dam and levee failures would affect a much larger area and are discussed as separate hazards.	2
Severity of	A. Personal injury, death, and property damage may occur in the collapse	3

Impact	itself or by falling debris from nearby structures. B. Response personnel could limit their risk through proper training and equipment. Structural collapse rescue is a specialized form of rescue and can result in injury or death to responders. C. Functional purpose of the building would be terminated or suspended until the integrity of the structure could be restored. D. Impacts could range from minor disruption to full destruction of the structure. Structures that could be impacted would range from private homes and businesses to government facilities to transportation infrastructure. E. Bridge failures and debris in the streets and sidewalks would interrupt normal routes of travel. Utilities may be cut off to surrounding areas and communication transmissions may be lost for a period of time. F. No severe impact to the environment unless the structural failure released a hazardous substance that could contaminate the air, water, or soil. G. There would also be a considerable price tag to replace or fix the structure, not to mention the loss of revenue that would occur because the structure could not be used. H. Failure during construction can be the liability of the contractor or the owner. This would depend upon the contract for construction and at which time the property ownership is transferred. Code development and enforcement can play a significant role in limiting the impact from structural failures in the jurisdiction. I. If the structural collapse could have been averted or limited in any way by code enforcement, the reputation could suffer from public outcry.	
Speed of Onset	The actual failure of the structure would likely occur suddenly with little or no warning. There are several events that could lead up to the failure, and these have various warning times and are discussed in separate hazard worksheets. Causal hazards can include fire, explosion, overloading of ice and snow, vibration, earthquakes, flooding, high wind, erosion, chemical corrosion, subsidence, and lack of general upkeep.	4
	Hazard Worksheet Score	15
	Composite Score	38

Hazard	**Structural Fire**	
Definition	**Structural Fire**: An uncontrolled fire in populated area that threatens life and property and is beyond normal day-to-day response capabilities.	
Description	A structural fire is an uncontrolled fire in populated areas that threatens life and property and is beyond normal day-to-day response capability. Structural fires present a far greater threat to life and property and the potential for much larger economic losses. Modern fire codes and fire suppression requirements in new construction and building renovations, coupled with improved firefighting equipment, training, and techniques lessen the chance and impact of a major urban fire. Most structural fires occur in residential	Rating

	structures, but the occurrence of a fire in a commercial or industrial facility could affect more people and pose a greater threat to those near the fire or fighting the fire because of the volume or type of the material involved. Structural fires are almost a daily occurrence in some communities. Nearly all are quickly extinguished by on-site personnel or local fire departments. There have been 1,535 deaths in Iowa from fires between the years 1974-2002 (this does not include the years 1978-79).	
Historical Occurrence	In January 1911 a major fire broke out in Mystic causing $100,000 in damage in 1911 dollars, equivalent to over $2.2 million in 2008 dollars.[10] This fire damaged or destroyed 20 homes in the east portion of town and damaged or destroyed several general stores, the Egypt Coal Co. building, restaurants, dentist buildings, drug stores, and others. As mentioned in other hazard profiles, the presence of coal mines under much of the County poses an additional and unique risk to the town. Other fires have occurred around the county including the 1999 fire that destroyed parts of the Lake Center Mall in Centerville due to arson. Fires have been caused by various factors including one on the Centerville square on December 24th, 2008 in a Ben Franklin where melting ice caused a short in an electrical box. There have been a number of fires that have occurred within Appanoose County. However, nearly all of these fires there have been individual house fires or small fires started by train sparks from the railroad tracks and extend beyond a 20 year window of time. Interviews were made with the local fire departments of Centerville, Mystic and Moulton. Information gathered and research read indicates that structure fires were common in each small town in the early 1900's, but since that time prevention measures have been more successful.	1
Probability	Much of the fire prevention efforts have gone into nonresidential fires and the results have been highly effective. Even with an increase in the prevention efforts in residential fires, both residential and nonresidential fires will continue to occur. During colder months, clogged chimneys and faulty furnaces and fire places can increase the probability of structural fires. The age of structures in the County may make put them at more risk of fires due to faulty or substandard wiring and obsolete building methods.	3
Vulnerability	Older structures with outdated electrical systems not built to current fire codes are particularly vulnerable to fire. Combustible building materials obviously are more vulnerable than structures constructed of steel or concrete. Structures without early detection devices are more likely to be completely destroyed before containment by response agencies. Structures	2

[10] Consumer Price Index and inflation calculators use data starting in 1913 so the amount is approximate. One inflation calculator can be found at http://www.coinnews.net/tools/cpi-inflation-calculator/.

	in areas served by older, smaller, or otherwise inadequate water distribution infrastructure such as water mains and hydrants are also at significant risk. Problems vary from region to region, often because of climate, poverty, education, and demographics. The fire death risk for the elderly and children under 5 years of age is more than two times that of the average population. All people in the County are potentially at risk, but elderly and young children comprise about 26% of the total county population.	
Maximum Threat	With modern training, equipment, fire detection devices, and building regulations and inspections, most fires can be quickly contained and limited to the immediate structure involved. Certain circumstances, such as the involvement of highly combustible materials, flammable chemicals, or high winds, can threaten a larger area. The age and density of a particular neighborhood can also make it more vulnerable to fire due to the spreading of fire from neighboring structures.	2
Severity of Impact	A. Based on national averages in the 1990s, there is one death for every 119 residential structure fires and one injury for every 22 residential fires in nonresidential fires, there is one death for every 917 fires, one injury for each 52 fires. Statistically, in 1999 Iowa had 15 fire-related deaths per million people. (According to best available information, data is unchanged.) B. In the US, about 100 firefighters die each year in duty-related incidents. (According to best available information, data is unchanged.) C. Only in rare cases would a structural fire affect continuity of operations. These cases could be fire at a critical facility, data storage areas, communications, infrastructure, etc. D. On average, each residential fire causes nearly $11,000 of damage. Each nonresidential fire causes an average of $20,000 in damage. (According to best available information, data is unchanged.) E. Fires can affect critical services such as electrical energy. F. Environment: No significant impacts. G. Economic and financial: Localized impacts. H. Regulations and Contractual Obligations: No significant impact known. I. Structural fires are common occurrences hence little damage is done to reputations.	3
Speed of Onset	While fires usually start with little or no warning time, alert devices can allow time for responders to contain the fire and allow occupants to evacuate the area. Fires can spread very rapidly in buildings. Improvements in technology have enabled the development of affordable early warning systems such as 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.	4

Hazard Worksheet Score	15
Composite Score	36

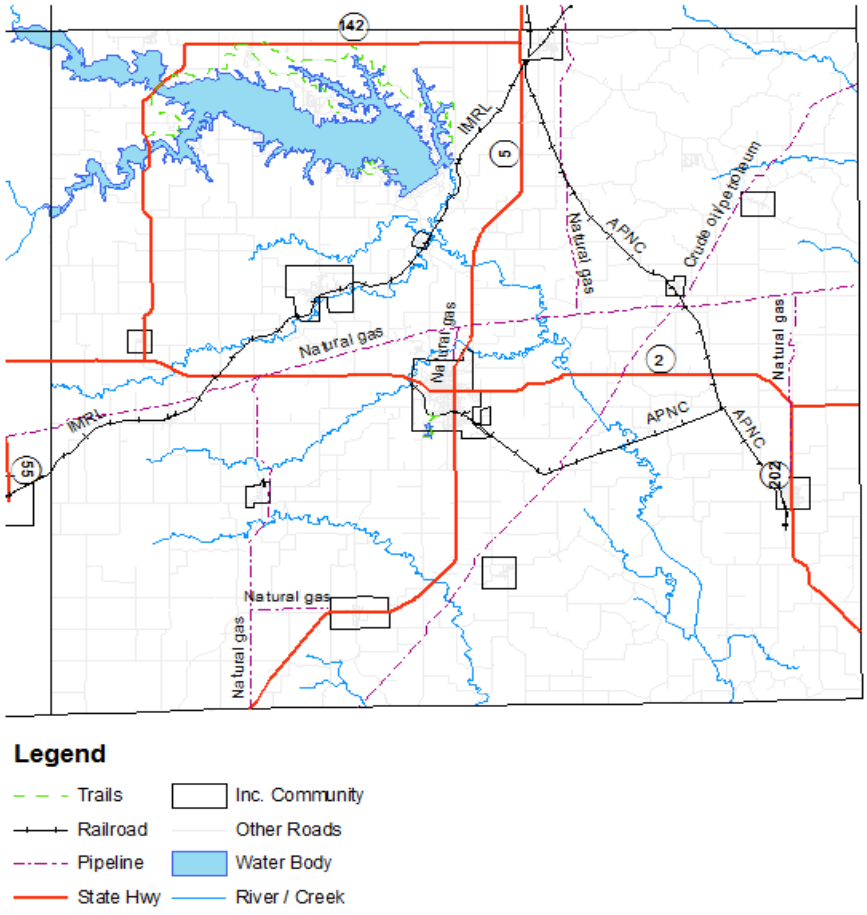
D. Human / Combination Hazards – Unique

Hazard	Rail Transportation Incident	
Definition	**Rail Transport Incident**: A derailment or a train accident which directly threatens life or property, or which adversely impacts a community's capabilities to provide emergency services.	
Description	A railway transportation incident is a train accident that directly threatens life and/or property, or adversely impacts a community's capabilities ability to provide emergency services. Railway incidents may include derailments, collisions, and highway/rail crossing incidents. Train incidents can result from a variety of causes. Human error, mechanical failure, faulty signals, and problems with the track can all lead to railway incidents. Results of an incident can be range from minor "track hops" to catastrophic hazardous materials incidents and even passenger casualties. With the many miles of track in Iowa, there are numerous at-grade crossings at which vehicles must cross the railroad tracks. See *Figure 25: Railroad Route Through Appanoose County* for location of all rail lines.	Rating
Historical Occurrence	According to the National Transportation Safety Board, there have been eight railway accidents in Iowa since 1967. In 2001 there was a train derailment in Mystic involving 11 cars, two of which containing hazardous chemicals. The next closest railroad accident occurred in 1987 in Russell to the northwest of Mystic in Lucas County. This accident involved a collision and subsequent derailment on the Burlington Northern Line.	2
Probability	Crossings present the opportunity for train-vehicle or pedestrian accidents throughout the county. Derailments are also possible, while major derailments are less likely. An increased probability exists for the communities that the rail lines intersect the city limits and create multiple intersections in each city. Those cities that would have an increased chance for an incident include: Centerville, Moravia, Rathbun, and Mystic.	2
Vulnerability	People and property in close proximity to the railway lines, crossings, sidings, switching stations, and loading/unloading points are most at risk. Those away from railroad tracks and facilities are vulnerable only to large-scale incidents including those in which hazardous materials are involved. There are very few buildings located within 100 feet of the railroad track that runs through Mystic. The railroad passes part of Main Street but only the structures on the south side of the street are within about 500 feet of the line. This does include the community center.	1

	The APNC rail line intersects the city limits of Moravia. The rail extends parallel to highway 5 and continues through the west edge of the community from the north to the south. The MRL rail line also crosses the city from the southwest corner to the northeast corner of the city. With both lines intersecting the city approximately 43 residential structures, a large church, the public school and 4 businesses would lie within 500 feet of the line. Appanoose Community railroad begin their line within the city limits of Centerville. The rail line is utilized for the transportation of products manufactured locally in the industrial park area. It is estimated that 10% (213) of the homes in the community could potentially be affected in the event of a disaster. Potentially, twelve commercial businesses and 3 industries would be affected. Rathbun is brushed by the MRL tracks on the very east edge of the community. An incident would likely affect 10% or 5 homes in this community.	
Maximum Threat	Numerous railways crisscross Iowa. Vehicle-train collisions are usually limited to areas in and near intersections. Rarely, the incident will result in widespread effects. The direct area of impact is usually quite small, but depending on the products and materials involved, the area could become extensive. If hazardous materials are involved, the effects could reach areas up to 1.5 miles from the scene; this could encompass much or most of Mystic if it occurred in town. Harmful products may contaminate streams, rivers, water distribution systems, and storm water systems. If this occurs, a large portion of the community could be affected. The ability of response agencies to contain the product on-scene usually limits the area affected.	1
Severity of Impact	Deaths and bodily injury can range from those on a train or in the crossing to persons in the vicinity where debris may scatter. Depending on the contents of the train, hazardous materials may be released with their related hazards. Debris may damage nearby property or block transportation routes beyond the railroad itself. Railway or road infrastructure could be damaged by debris or by derailed train cars.	2
Speed of Onset	Like other transportation incidents, a railway incident would occur with no warning. There may be a limited amount of time to warn those in the pathway of the harmful effects.	4
	Hazard Worksheet Score	12
	Composite Score	31

Additional Resources:	
NTSB Railroad Accidents	http://www.ntsb.gov/Publictn/R_Acc.htm

Figure 25: Railroad Route Through Appanoose County



Source: IA DNR and IDOT GIS data compiled by Chariton Valley Planning and Development

Hazard	**Pipeline Incident**	
Definition	**Pipeline Incident**: A break in a pipeline creating a potential for an explosion or leak of a dangerous substance (oil, gas, etc.) possibly requiring evacuation.	
Description	A pipeline transportation incident occurs when a break in a pipeline creates the potential for an explosion or leak of a dangerous substance (oil, gas, etc.) possibly requiring evacuation. An underground pipeline incident can be caused by environmental disruption, accidental damage, or sabotage. Incidents can range from a small slow leak to a large rupture where an explosion is possible. Inspection and maintenance of the pipeline system along with marked gas line locations and an early warning and response procedure can lessen the risk to those near to the pipelines. According to the Iowa Utilities Board (IUB), 186 pipeline accidents, incidents,	Rating

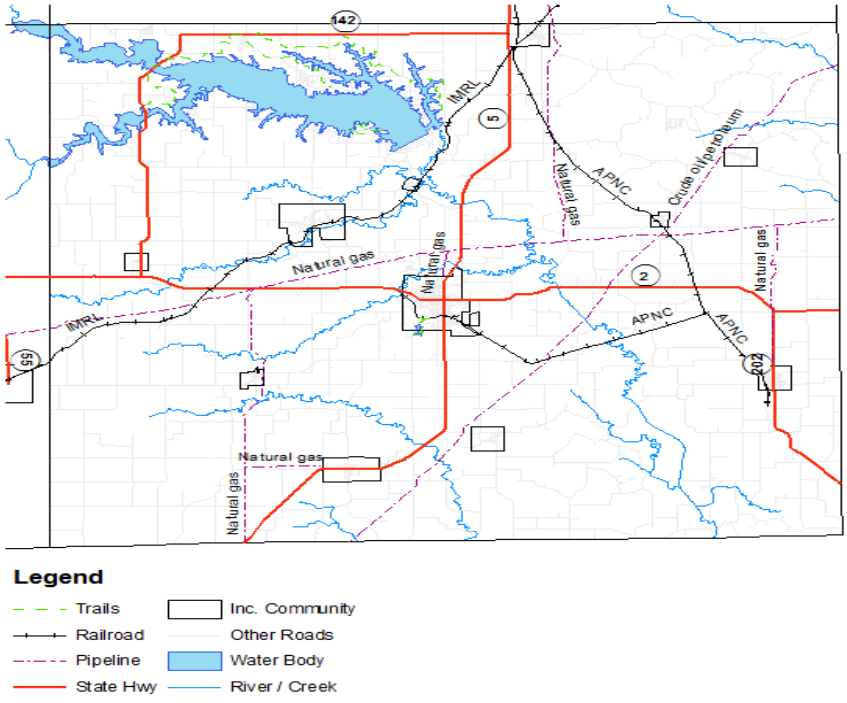
	or service outages were reported between 2000 and 2005, resulting in a total of 29 injuries and six (6) fatalities. Across the nation, hundreds of deaths and many more injuries have been caused by underground pipeline incidents. The vast majority of pipeline incidents that occur are caused by third party damage to the pipeline, often due to construction or some other activity that involves trenching or digging operations. With development occurring at an unprecedented rate and the ground becoming more and more congested with utilities, the probability of an underground pipeline incident is significant. Petroleum and natural gas pipeline accidents occur with some regularity, but they usually have a limited impact and are quickly and adequately handled by pipeline company emergency crews and local and state responders. Pipeline operators are required to coordinate all safety preparedness and response activities with the communities. Continuing to plan, train, and exercise emergency procedures help to limit the occurrence and severity of incidents. Iowa is served by many high pressure pipelines to residents and industries.	
Historical Occurrence	According to the National Transportation Safety Board (NTSB), there have been no pipeline incidents in Appanoose County since 1969. However, there have been pipeline explosions and fires in Iowa during this time period.	1
Probability	The vast majority of pipeline incidents that occur are caused by third-party damage to the pipeline, often due to construction or some other activity that involves trenching or digging operations. With development occurring at an unprecedented rate and the ground becoming more and more congested with utilities, the probability of an underground pipeline incident is significant. Petroleum and natural gas pipeline accidents occur with some regularity, but they usually have a limited impact and are quickly and adequately handled by pipeline company emergency crews and local and state responders. Pipeline operators are required to coordinate all safety preparedness and response activities with the communities. Planning, training, and exercising of emergency procedures with all involved parties help to limit the occurrence and severity of incidents. The SHMT (State Hazard Mitigation Team) evaluated the probability a pipeline transportation incident will occur in Iowa is more than a 60% chance in the next year. It is estimate that there is approximately 75 miles of pipeline intersecting Appanoose county. One event in the past 40 years in Appanoose County would indicate a low occurrence lever with a probability of less than a 10% chance of occurring in any given year. The Vulnerability section will further discuss specific jurisdictions at risk.	2

Vulnerability	About 5 interstate pipelines operate in the state under federal pipeline jurisdiction. There are many high-pressure gas mains throughout the state which supply residential and industrial users. People and property with pipelines on their land or nearby are the most at risk. People excavating earth near a pipeline are also at risk. Whether the greater hazard is posed to those upwind or downwind from a site depends on the product spilled, for example - natural gas is lighter than air. Private homes and business served by natural gas have smaller diameter pipelines connected to their structure. The underground pipelines cross public streets, roads, and highways as well as streams. Iowa's natural environment is also vulnerable to contamination from an underground pipeline incident. One natural gas pipeline runs near Mystic about 1 ½ miles to the south and east of town. There are several intersecting Natural gas lines throughout Appanoose County. (See Appendix S.) One main line crosses the center of the county from west to east and by not though a specific community. A spur of that line goes south through the community Numa with an additional line feeding east into the community of Cincinnati. There are additional lines that also connect off the main line north to Moravia and south Moulton. There is a crude oil/petroleum line that runs from Mendota to the edge of Exline and between Udell and Unionville. The unincorporated region just outside of the edge of Udell lies in a particularly vulnerable area because of the intersection of the crude oil/petroleum line and the Natural gas line.	2
Maximum Threat	Though often overlooked, petroleum and natural gas pipelines pose a real threat in the community. Most incidents affect only the area directly above or near the damaged pipeline. Depending on the size of pipeline and amount of product released, the extent of impact could be several hundred feet in diameter. Large areas may need to be evacuated to remove people from the threat of fire, explosion, or exposure. Pipelines have automatic shutoff valves installed so that damaged sections can be isolated and the volume of product escaping can be limited. Identification and caution signs are posted wherever pipelines pass under roads, streams, fence lines, or at any aboveground utilities.	1
Severity of Impact	All petroleum liquids pose dangers from fire or explosion and the fire may produce poisonous or irritating gasses. Toxic fumes and direct contact can cause health hazards. Vapor clouds can travel a distance and settle in low-lying areas where the fumes may overcome people and animals. Released products should be treated as any other hazardous material. Large areas may need to be evacuated to remove people from the threat of fire, explosion, or exposure. Severity of impact could range from localized fire and hazardous fumes to closure of the county highway that accesses Mystic from the south to fumes settling in the Walnut Creek area in town. Walnut Creek is the lowest lying	3

	portion of town.	
Speed of Onset	A pipeline incident may occur suddenly, but sight, sound, and smell can alert individuals that there may have been damage done to a pipeline in the area. Products may bubble up from the ground or collect in low-lying areas, a roaring or hissing noise may be heard, and most products give off a distinct odor. These warning signs can alert individuals not to use any devices that may act as ignition sources and cause a fire or explosion.	4
	Hazard Worksheet Score	13
	Composite Score	22

Additional Resources:	
NTSB Pipeline Accidents	http://www.ntsb.gov/Publictn/P_Acc.htm

Figure 26: Appanoose County Pipelines



Source: IA DNR and IDOT GIS data compiled by Chariton Valley Planning and Development

6. Assessing Vulnerability Locations

The HARA process assisted the committee members to assess the risk to the assets in the participating jurisdictions of the county. The assessments of risks include analysis of how each natural hazard and pertinent man-made hazards affecting populations, structures, and land. It is important to identify and protect the critical facilities within each jurisdiction.

Summary of Vulnerability to Hazards

Appanoose County is susceptible to 32 hazards that were previously identified and some of the natural hazards that may affect all people and property (buildings and land) in Appanoose County. This would place the majority households or properties (including private and commercial) within Appanoose County and its jurisdictions would be at risk because it would be difficult to determine a specific target area when it could be a wide ranging event. Such hazards of: 1) drought, 2) earthquake, 3) extreme heat, 4) hailstorm, 5) severe winter storm, 6) thunderstorm & lightning, 7) tornado, 8) climate change, and 9) windstorm. The man-made events and combination hazards that can affect people and any or all properties (buildings and land) would be: 10) animal/crop/plant disease, 11) communication failure, 12) energy failure, 13) human disease incident, and 14) human disease pandemic. There are no real target zones at risk for these 14 hazards. Therefore, all jurisdictions in Appanoose County are at risk of experiencing any of the given hazards.

Limited parts of the county would be affected by a number of the other hazards identified. Seven of those NATURAL HAZARDS with limited areas affected include: 15) Grass and Wildfires have the greatest risk of occurring in the rural regions (unincorporated) of Appanoose County. This region accounts for approximately 35% of the county and would be placed at a higher vulnerability for a fire event. Such event would primarily affect agriculture land and forestry. 16) Flash flooding can occur anywhere that there are low-lying areas throughout the unincorporated regions, rural or communities. It is estimated that 15% of the rural portions of the rural county are considered "low-lying" and at risk for flash flooding. Recent occurrences in the past two years of record rainfall, has forces events to happen in the areas of: between Exline and Cincinnati, on State Highway 5 and also on State Highway 2 west of Centerville. Within the city limits of Centerville, flash flooding has occurred in the suburb known as "Golfview" on the northwest edge of the city and at Centerville Public School's building Lakeview Elementary. There have also been flash flooding along the north edge of the community on State Highway 5 at the bridge crossing the Chariton River. Poor drainage has also created flash flood problems in the communities of Cincinnati, Mystic, Numa, Rathbun, and Udell during those same storms.

Additional natural hazard risks include the possibility of events due to 17) expansive soils. Any one event can be very small with limited long-term impacts to the residents of the area. Cracks in basements and road surface damage are most likely. It is undetermined where the most likely location for an expansive soils event to occur. It appears that the best mitigation strategies may be just to use quality construction materials. 18) Radon/Lead concerns are prominent throughout Appanoose County. It is a concern as we review the age more than 13% of the homes which were constructed prior to 1970. It is known that a standard construction element during that time was Radon or Lead. Public outreach and education currently exist as a mitigation strategy but it will continue to be an essential component to keep residents healthy. The area impacted by 19) Dam Failure will greatly vary depending on the size and location of the dam affected. Lake Rathbun Dam contains 11,000 acre capacity of water that if it were released it would

affect three cities (Centerville, Mystic and Rathbun) and approximately 20% of the rural county. Such an event would also jeopardize the region water source for south central Iowa and north central Missouri. There are other smaller dams that impact a much smaller region of the county and primary damage would be croplands that lie downstream or adjacent to tributaries.

20) River Flooding is a hazard that has had frequent occurrences in the past three years in Appanoose County. Primary damage has occurred along the banks of the Chariton River and the small tributaries that extend from it. The flooding is usually limited to the areas shown in flood plan maps of cities or to the recent record-setting floods. A local challenge is that many of the communities or regions in Appanoose are not currently mapped the local to specify the floodplain region. There are FIRMETTES for the communities of Centerville, Unionville, Moravia, and Mystic. It is estimated that up to 25% of the rural areas of the county are susceptible to river flooding. In those regions, the greatest impact would be on the roads, bridges and farmland.

Appanoose County has a rich history of coal mining throughout the area. There are sketchy maps that estimate the layout of some mine but there are known mines that have no history of the mapping associated. The mine shafts pose a possible risk of 21) sink holes and risk the integrity of any structure or road lies on the surface. It is known that Centerville, Mystic, Numa, Cincinnati, Plano and Exline have all had a rich history of coal mining. Due to poor mapping of the mines in the region, it can only be estimated what percentages of each city would lie at risk of experiencing a sink hole. Based upon the limited data it is estimated that 40% of Centerville, 50% of Mystic, 40% of Numa, 30% of Cincinnati, 20% of Plano and about 40% of Exline lie at particular risk of having modern development over old mines.

22) Levee Failure has the largest potential of occurring in the unincorporated region of Appanoose County. There are multiple agricultural levees throughout the county and a breach of such levee would create soil washout and damage to crops but have little effect on structures throughout the county. There are no federally recognized levees in Appanoose County, nor in any participating jurisdictions.

MAN-MADE AND COMBINATION HAZARDS can also impact each portion of the county differently. A 23) fixed hazardous material event will only occur and impact an area of 500 feet radius of a recognized fixed facility in most situations. Minimal impact will be felt over 500 feet away from the site. There are numerous small towns throughout Appanoose County and it is a possibility that an entire community would be evacuated but rather unlikely. A threat appears in many communities because it is common for agriculture farm supplies to be located at dealerships throughout the county. Crops, livestock and rural residents could also be affected by an event a 3 rural locations (Moravia, Centerville & Moulton) but the risk only impact a few people.

24) Highway Transportation Incident can occur only along highways that speeds can reach in excess of 35mph. This places areas inside and outside city limits for approximately 100 feet from a highway. Particular risks in Appanoose County lie along state highways of 2, 5, and J42. Along these routes, could also be 25) Transportation of Hazardous Materials. These events affect areas up to 250 feet from a State or Federal highway that it is noted where frequently materials are transported. This county is predominately an agriculture community that could experience a small hazardous incident on a secondary road, but the significant exposure would be limited to those immediately around the scene.

There are multiple rail lines that could allow for the 26) Transportation of Radiological Materials and a possible incident. These rail lines place approximately 15% of Moravia, 15% of Mystic, 40% of Moulton, 10% of Rathbun, 10% of Centerville, and 10% of Udell of residents at risk of potentially experiencing a

radiological incident as a result of transportation of radiological material. An additional route for potential incident is the state highway 2 that crosses the southern portion of Appanoose County and intersects the City of Centerville. This single highway could place 10% of residential structures and 5% of businesses in the city at risk of adverse effects from the transportation of radiological materials.

27) Pipeline Incident can only occur where pipelines are located within the county. Pressure stations, valves, and terminals along the pipeline are at a higher level of susceptibility. Up to 250 feet on each side of a major line or a special point is vulnerable. Homes that operate off a natural gas line could see damage up to 50 feet from a smaller residential gas line. There are several intersecting Natural gas lines throughout Appanoose County. One natural gas pipeline runs near Mystic about 1 ½ miles to the south and east of town. Another main line crosses the center of the county from west to east and by not though a specific community. A spur of that line goes south through the community Numa with an additional line feeding east into the community of Cincinnati. There are additional lines that also connect off the main line north to Moravia and south Moulton. There is a crude oil/petroleum line that runs from Mendota to the edge of Exline and between Udell and Unionville. The unincorporated region just outside of the edge of Udell lies in a particularly vulnerable area because of the intersection of the crude oil/petroleum line and the Natural gas line.

28) Structural failure and 29) fire events can occur anywhere that a structure is located. The majority of the structures in the county are original to when the communities were incorporated in the late 1800's and early 1900's. Therefore, many of the structures in the county are very old and are not built to modern codes and/or are deteriorating, making them highly susceptible to fire and failure because many have not updated the wiring of the structure as well.

30) Waterway Incident can occur in lakes with enough water capacity and access (typically 5 acres or more) to allow for boat access and shoreline construction. Most notably Lake Rathbun and its size of 11,000 acres placing it as the most susceptible for an incident. The Chariton River is large enough to be a threat for riverine waterway incident and at particular risk recently with frequent river flooding. Sundown Lake is yet another recreation facility that has frequent boaters and outdoor enthusiasts on or near the water.

Much of Appanoose County could be considered at risk of experiencing a 31) rail transportation incident because of the large number of miles that extend throughout the county. People and property in close proximity to the railway lines, crossings, sidings, switching stations, and loading/unloading points are most at risk. Those away from railroad tracks and facilities are vulnerable only to large-scale incidents including those in which hazardous materials are involved.

There are very few buildings located within 100 feet of the railroad track that runs through Mystic. The railroad passes part of Main Street but only the structures on the south side of the street are within about 500 feet of the line. The APNC rail line intersects the city limits of Moravia. The rail extends parallel to highway 5 and continues through the west edge of the community from the north to the south. The MRL rail line also crosses the city from the southwest corner to the northeast corner of the city. Appanoose Community railroad begin their line within the city limits of Centerville. The rail line is utilized for the transportation of products manufactured locally in the industrial park area. An incident would likely affect 10% or 5 homes in this community.

Appanoose County could be at risk of experiencing an 32) air transportation incident because of the small airport located in the unicorporated region of the county, south of Centerville and the local hospital has a helipad located on very north city limits of Centerville. The airport has approximately 5 homes within a one

mile radius of the location. Mercy Medical helipad is located on the north edge of town and an air incident there could place approximately 10 private residential structures and one retirement/assisted living care center. Committee members have had lengthy discussions that the possibility of an air incident could occur anywhere with Des Moines International Airport and Kansas City International Airport are both within 200 miles of Appanoose County.

There are no properties in Appanoose County that are deemed "Repetitive Loss Properties" as determined by the State of Iowa.

Please see Appendix GG to review the chart that identifies the hazards that could impact each jurisdiction.

Critical Facilities

In order to identify the most appropriate mitigation techniques and projects, the community determined to identify the assets in the community. This includes a preliminary inventory of critical facilities, structures and infrastructure. It is determined to be important to target for protection from hazard damage or that may serve a hazard response or mitigation purpose.

The Appanoose Planning Committee named various buildings and infrastructure in a preliminary discussion of critical facilities. Committee members were advised to consider buildings and infrastructure that represent health and welfare of unincorporated residents and residents in communities, high potential loss facilities, hazardous materials storage, emergency access, and lifeline facilities such as drinking water and power supply. This advice was derived from the FEMA guidance document Understanding Your Risk: Identifying Hazards and Estimating Losses (FEMA 386-2, August 2001). A full assessment of the critical facilities has not been completed, but preliminary information is available. The following charts show the types of information that would be useful in estimating potential losses and thus help in prioritizing mitigation actions. These preliminary charts only include city owned or governmental critical facilities. The information was supplied by each of the city's council members or employee. Some of the jurisdictions were not able to locate such information or only portions of the requested information. More information will be supplied in the updating of this plan in the future.

EXLINE

Facility	Location	Bldg size	Occupancy	Replacement Value	Content Value	Function/ Use value	Displacement Cost
1.Lift station	W Main st & W 3rd st						
2.City Hall/community center	112 Main St	30x35		$100,000			
3. Ambulance garage/city shop				$50,000			
4. Post Office	Corner of 1st & Main St						
5. Store/Gas Station	Corner of 1st & Main St						
6. Sewer Lagoon	East corner of cemetery						
7. Museum							

Mystic							
Name	Location	building size	Occupancy / capacity	replacement value	content value	Function/use value	displacement cost
1. Lift Station	South of railroad in east-central Mystic			$166,192			
2. Mystic Community Church	1st Street between North and Lewis Streets						
3. Community Center	Main Street			$241,500			
4. City Hall	Main Street			$83,500			
5. South Bridge	T14 over Walnut Creek	N/A	N/A	$1.7 million	N/A	Not determined	Not determined
6. North Bridge	T14 over Little Walnut Creek	N/A	N/A	$800,000	N/A	Not determined	Not determined
7. Fire Station	1st Street between Jefferson and Washington Streets			$71,000			
8. City Shop	2nd Street by railroad						
9. School	Clarkdale Rd, northeast portion of Mystic			$1,117,839 building $14,588 playground	$138,074 personal property		
10. Post Office	Main Street						
11. Legion Hall	Main Street						

Moulton

Name	Location	Building size	Occupancy/ Capacity	Replacement Value	Content Value	Function/ Use value	Displacement cost
Lift Station							
Library	123 S. Main St						
Senior Center/ Legion	320 N Main St						
Ambulance shed	109 Main St						
Fire Dept	105 E. 3rd St						
City Shop							
Post Office							
City Hall	111 S. Main						
Fox Valley Jr/Sr High school	202 N Union St						
Moulton-Udell Community School	305 E 8th St						

MORAVIA

Name	Location	Building size	Occupancy/ Capacity	Replacement Value	Content Value	Function/ Use value	Displacement cost
Lift Station	N East St	200	0	$8,740			
Library/ Community Center	100 E. Chariton St			$223,024			

Fire Dept	112 N William St			$135,000	$200,000		
ADLM	12307 Hwy 5						
City Hall	116 S William St	7100	125	$245,406	$70,000		
Post Office	107 N William						
Washbash Depot Museum	800 W North St.						
Moravia High School	505 N Trussell Ave						
RR overpass on Hwy 5	SW corner of town						
Nazarene Church (shelter site)	405 Myra Lane						
Community Center	115 S William St						

RATHBUN

Name	Location	Building size	Occupancy/ Capacity	Replacement Value	Content Value	Function/ Use value	Displacement cost
No Govt owned properties							

UNIONVILLE

Name	Location	Building size	Occupancy/ Capacity	Replacement Value	Content Value	Function/ Use value	Displacement cost
Lift Station							
City Shop							
Post Office							
City Office	308 Center St						

UDELL

Name	Location	Building size	Occupancy/ Capacity	Replacement Value	Content Value	Function/ Use value	Displacement cost
Post Office	201 Main St						

NUMA

Name	Location	Building size	Occupancy/ Capacity	Replacement Value	Content Value	Function/ Use value	Displacement cost
Lift Station							
City Shop		40x60		$30,000	$25,000		
Post Office							
City Office		32x40		$95,000	$10,000		

PLANO

Name	Location	Building size	Occupancy/ Capacity	Replacement Value	Content Value	Function/ Use value	Displacement cost
Church/ Fellowship hall (shelter site)	3rd St			$125,000			
Post Office	Main St						
City Hall Museum	3rd Street	40x50	35	$54,000			

CINCINNATI

Name	Location	Building size	Occupancy/ Capacity	Replacement Value	Content Value	Function/ Use value	Displacement cost
Lagoon/ Blower bldg	End of Walnut St	244 sq ft	NA	91,387.00	90,000		
City Shop/ City hall	105 W Pleasant St	5366S Sq ft	30	168,548.00	130,000		
Post Office							
Community Center	Depot Lane	2160 sq ft	100	110,160			
Gas Station/ store	Pleasant St						
Sampler Bldg	End of Walnut St	48 sq ft	NA	5,696.00			
Sewer Pumps (12)	Through-out city	NA	NA	90,000			
Pump Control panels (12)	Through-out city	NA	NA	100,000			

CENTERVILLE

Name	Location	Building size	Occupancy/ Capacity	Replacement Value	Content Value	Function/ Use value	Displacement cost
City Hall/Fire Dept	312 Maple St	8,800 sq ft		$683,014	$230,000		
Police/ Sherriff office	1125 W Van Buren St				City- $30,000		
Water Works office	112 N 12th St	1920 sq ft		$131,268	$90,000		
Water Clarifying bldg	1010 Cottage	9432 sq/ 2900sq					
Mercy Medical Center: Ambulance	1 Saint Joseph Dr						
Waste-water plant (main)		8500sq ft		$1.7 million	$7,000		
Waste-water-west plant		19,000 Sq ft		$270,000	$125,000		
Drake Public Library	115 Drake Ave	2,870 sq ft		$1,414,988	$770,000		
Appanoose County Courthouse	201 N 12th St						
Airport & hangers		24,000 sq ft		$1.3 million	$100,000		
Centerville Street Dept		5,000 sq ft		$270,000	$20,000		

Community Assets by Hazard

The following estimates of structures and people within hazard areas are preliminary for this plan due to data limitations on the actual hazard areas and mapping data available. Valuations of tax exempt and utility properties are not readily separated by jurisdiction from data provided by the Appanoose County Assessor's office contributing to the lack of some value estimates. Alternate forms of estimating such valuations (as well as occupancy, square footage, replacement value, etc.) exist but were not employed for this version of the Appanoose County Mulit-Jurisdictional Plan due to challenges with obtaining the necessary information, see *Appendix Y: Alternate Facility Valuation Estimate Tools*.

Government structures considered in the charting below do include City Hall, the post office, the City Shop, and the Lift Stations. (This differs from the feedback received from the County Assessor in order to account for the presence of these facilities which may be treated differently by the Assessor's Office.) The numbers of structures within hazard areas is estimated based on the hazard maps (such as the FIRMETTE) but many of the jurisdictions do not have any mapping so it is the estimate of participants from the communities.

No significant changes to the number of buildings or infrastructure in hazard areas are expected based on population and development trends. However with improved hazard mapping, when undertaken, the estimates of vulnerable buildings and infrastructure may change; these changes will be addressed in future updates to the Appanoose County Multi-Jurisdiction Hazard Mitigation Plan. The community of Mystic is currently completing a property acquisition and demolition of flooded homes in the City Limits. This Mitigation action will remove 8 residential structures from on the southern edge floodplain in Mystic.

The following table lists community assets that would be affected in the event of a large hazard that would affect the entire community. These "Large Event hazards" would be widespread and include: High Wind Events, Severe Winter Storms, Thunderstorms/Lightning, Hailstorms, Drought, Excessive Heat, Climate Change, and Earthquakes among others. In these events, the entire Communities are the "Hazard Area." Specific detailed hazard charts are then provided to illustrate the estimated affected area for a specific hazard in each jurisdiction that has identified the hazard as possibly occurring in that region.

UNINCORPORATED COUNTY AREA

Type of Structure	Number of Structures			Value of Structures			Number of People		
	# in unincorp region	# in Hazard Area	% in Hazard Area	$ in unincorp region	$ in Hazard Area	% in Hazard Area	# in unincorp region	# in Hazard Area	% in Hazard Area
Residential	2432	2432	100%	$194,641,377	$194,641,377	100%	4,805	4,805	100%
Commercial	122	122	100%	$17,018,799	$17,018,799	100%			100%
Industrial	2	2	100%	$558,259	$558,259	100%	-	-	-
Agricultural	-	-	100%	$133,392,847	$133,392,847	-100%	-	-	-
Religious / Non-profit	4	4	100%						
Government									
Education									
Utilities	-	-	-	-	-	-	-	-	-

CENTERVILLE - all large event hazards (drought, earthquake, extreme heat, hailstorm, severe winter storm, thunderstorm & lighting, tornado, climate change, windstorm. In Centerville, a large event is widespread and can happen anywhere in the city or could impact the entire jurisdiction. Additionally, most of these hazards, can impact assets that are not accounted for in the following table. Such examples would include streets, public land without buildings and public utilities infrastructure.)

Type of Structure	Number of Structures			Value of Structures			Number of People		
	# in City	# in Hazard Area	% in Hazard Area	$ in City	$ in Hazard Area	% in Hazard Area	# in City	# in Hazard Area	% in Hazard Area
Residential	2133	2133	100%	$110,843,858	$110,843,858	100%	5904	5904	100%
Commercial	122	122	100%	$17,018,799	$17,018,799	100%			100%
Industrial	4	4	100%-	$11,790,212	$11,790,212	100%	-	-	-
Agricultural	-	-	-	$483,580	$483,580	100%	-	-	-
Religious / Non-profit	15	15	100%						
Government	3	3	100%						
Education	12	12	100%						
Utilities	2	2	100%	-	-	-	-	-	-

CINCINNATI - all large event hazards (drought, earthquake, extreme heat, hailstorm, severe winter storm, thunderstorm & lighting, tornado, climate change, windstorm. In Cincinnati, a large event is widespread and can happen anywhere in the city or could impact the entire jurisdiction. Additionally, most of these hazards, can impact assets that are not accounted for in the following table. Such examples would include streets, public land without buildings and public utilities infrastructure.)

Type of Structure	Number of Structures			Value of Structures			Number of People		
	# in City	# in Hazard Area	% in Hazard Area	$ in City	$ in Hazard Area	% in Hazard Area	# in City	# in Hazard Area	% in Hazard Area
Residential	197	197	100%	$6,011,450	$6,011,450	100%	421	421	100%
Commercial	3	3	100%	$292,650	$292,650	100%			100%
Industrial	-	-	-	-	-	-	-	-	-
Agricultural	-	-	-	$482,065	-	-	-	-	-
Religious / Non-profit	2	2	100%						
Government	2	2	100%						
Education	1	1	100%						
Utilities	-	-	-	-	-	-	-	-	-

EXLINE - all large event hazards (drought, earthquake, extreme heat, hailstorm, severe winter storm, thunderstorm & lighting, tornado, climate change, windstorm. In Exline, a large event is widespread and can happen anywhere in the city or could impact the entire jurisdiction. Additionally, most of these hazards, excluding human disease incidents, human disease pandemic, and animal/plant/crop disease, can impact assets that are not accounted for in the following table. Such examples would include streets, public land without buildings and public utilities infrastructure.)

Type of Structure	Number of Structures			Value of Structures			Number of People		
	# in City	# in Hazard	% in Hazard	$ in City	$ in Hazard	% in Hazard	# in City	# in Hazard	% in Hazard

		Area	Area		Area	Area		Area	Area
Residential	77	77	100%	$2,451,760	$2,451,760	100%	197	197	100%
Commercial	8	8	100%	$670,220	$670,220	100%			100%
Industrial	-	-	-	-	-	-	-	-	-
Agricultural	-	-	-	-	$320,790	-	-	-	-
Religious / Non-profit	2	2	100%						
Government	2	2	100%						
Education			100%						
Utilities	-	-	-	-	-	-	-	-	-

NUMA -- all large event hazards (drought, earthquake, extreme heat, hailstorm, severe winter storm, thunderstorm & lighting, tornado, climate change, windstorm. In Numa, a large event is widespread and can happen anywhere in the city or could impact the entire jurisdiction. Additionally, most of these hazards, can impact assets that are not accounted for in the following table. Such examples would include streets, public land without buildings and public utilities infrastructure.)

Type of Structure	Number of Structures			Value of Structures			Number of People		
	# in City	# in Hazard Area	% in Hazard Area	$ in City	$ in Hazard Area	% in Hazard Area	# in City	# in Hazard Area	% in Hazard Area
Residential	59	59	100%	$1,678,410	$1,678,410	100%	112	112	100%
Commercial	1	1	100%	$58,720	$58,720	100%			100%
Industrial	-	-	-	-	-	-	-	-	-
Agricultural	-	-	-	-	-	-	-	-	-
Religious / Non-profit	1	1	100%						
Government									
Education									
Utilities	-	-	-	-	-	-	-	-	-

PLANO - all large event hazards (drought, earthquake, extreme heat, hailstorm, severe winter storm, thunderstorm & lighting, tornado, climate change, windstorm. In Plano, a large event is widespread and can happen anywhere in the city or could impact the entire jurisdiction. Additionally, most of these hazards, can impact assets that are not accounted for in the following table. Such examples would include streets, public land without buildings and public utilities infrastructure.)

Type of Structure	Number of Structures			Value of Structures			Number of People		
	# in City	# in Hazard Area	% in Hazard Area	$ in City	$ in Hazard Area	% in Hazard Area	# in City	# in Hazard Area	% in Hazard Area
Residential	40	40	100%	$1,593,740	$1,593,740	100%	65	65	100%
Commercial	3	3	100%	$31,360	$31,360	100%			100%
Industrial	-	-	-	-	-	-	-	-	-
Agricultural	-	-	-	-	$224,950	-	-	-	-
Religious / Non-profit	1		100%	$125,000	$125,000				
Government									
Education									
Utilities									

MYSTIC - all large event hazards (drought, earthquake, extreme heat, hailstorm, severe winter storm, thunderstorm & lighting, tornado, climate change, windstorm. In Mystic, a large event is widespread and can happen anywhere in the city or could impact the entire jurisdiction. Additionally, most of these hazards, can impact assets that are not accounted for in the following table. Such examples would include streets, public land without buildings and public utilities infrastructure.)

Type of Structure	Number of Structures			Value of Structures			Number of People		
	# in City	# in Hazard Area	% in Hazard Area	$ in City	$ in Hazard Area	% in Hazard Area	# in City	# in Hazard Area	% in Hazard Area
Residential	227	227	100%	$6,445,315	$6,445,315	100%	588	588	100%
Commercial	3	3	100%	$640,280	$640,280	100%			100%
Industrial	-	-	-	-	-	-	-	-	-
Agricultural	-	-	-	-	-	-	-	-	-
Religious / Non-profit	1	1	100%						
Government	4	4	100%			100%			100%
Education	1	1	100%			100%			100%
Utilities	-	-	-	-	-	-	-	-	-

RATHBUN - all large event hazards (drought, earthquake, extreme heat, hailstorm, severe winter storm, thunderstorm & lighting, tornado, climate change, and windstorm. In Rathbun, a large event is widespread and can happen anywhere in the city or could impact the entire jurisdiction. Additionally, most of these hazards, can impact assets that are not accounted for in the following table. Such examples would include streets, public land without buildings and public utilities infrastructure.)

Type of Structure	Number of Structures			Value of Structures			Number of People		
	# in City	# in Hazard Area	% in Hazard Area	$ in City	$ in Hazard Area	% in Hazard Area	# in City	# in Hazard Area	% in Hazard Area
Residential	51	51	100%	$2,037,980	$6,445,315	100%	89	89	100%
Commercial	2	2	100%	$136,260	$136,260	100%			100%
Industrial	-	-	-	-	-	-	-	-	-
Agricultural	-	-	-	-	,$8,970-	100%	-	-	-
Religious / Non-profit	1	1	100%						
Government									
Education									
Utilities	-	-	-	-	-	-	-	-	-

MORAVIA - all large event hazards (drought, earthquake, extreme heat, hailstorm, severe winter storm, thunderstorm & lighting, tornado, climate change, and windstorm. In Moravia, a large event is widespread and can happen anywhere in the city or could impact the entire jurisdiction. Additionally, most of these hazards, , can impact assets that are not accounted for in the following table. Such examples would include streets, public land without buildings and public utilities infrastructure.)

Type of Structure	Number of Structures			Value of Structures			Number of People		
	# in City	# in Hazard Area	% in Hazard Area	$ in City	$ in Hazard Area	% in Hazard Area	# in City	# in Hazard Area	% in Hazard Area

Residential	291	291	100%	$15,560,965	$15,560,965	100%	721	721	100%
Commercial	8	8	100%	$2,041,640	$2,041,640	100%			100%
Industrial	3	3	-	-	-	-	-	-	-
Agricultural	-	-	-	-	-	-	-	-	-
Religious / Non-profit	2	2	100%						
Government	3	3	100%						
Education	1	1	100%						
Utilities	-	-	-	-	-	-	-	-	-

UNIONVILLE - all large event hazards (drought, earthquake, extreme heat, hailstorm, severe winter storm, thunderstorm & lighting, tornado, climate change, and windstorm. In Unionville, a large event is widespread and can happen anywhere in the city or could impact the entire jurisdiction. Additionally, most of these hazards, can impact assets that are not accounted for in the following table. Such examples would include streets, public land without buildings and public utilities infrastructure.)

Type of Structure	Number of Structures			Value of Structures			Number of People		
	# in City	# in Hazard Area	% in Hazard Area	$ in City	$ in Hazard Area	% in Hazard Area	# in City	# in Hazard Area	% in Hazard Area
Residential	58	58	100%	$1,728,350	$1,728,350	100%	124	124	100%
Commercial			100%	$50,000	$50,000	100%			100%
Industrial	-	-	-	-	-	-	-	-	-
Agricultural	-	-	-	-	-	-	-	-	-
Religious / Non-profit	2	2	100%						
Government	1	1	100%						
Education									
Utilities	-	-							

UDELL - all large event hazards (drought, earthquake, extreme heat, hailstorm, severe winter storm, thunderstorm & lighting, tornado, climate change, and windstorm. In Udell, a large event is widespread and can happen anywhere in the city or could impact the entire jurisdiction. Additionally, most of these hazards, can impact assets that are not accounted for in the following table. Such examples would include streets, public land without buildings and public utilities infrastructure.)

Type of Structure	Number of Structures			Value of Structures			Number of People		
	# in City	# in Hazard Area	% in Hazard Area	$ in City	$ in Hazard Area	% in Hazard Area	# in City	# in Hazard Area	% in Hazard Area
Residential	24	2	10%	$596,200	$59,620	10%	65	7	10%
Commercial	1	1	10%	$5,670	$567	10%			10%
Industrial	-	-	-	-	-	-	-	-	-
Agricultural	-	-	-	-	$81,040	-	-	-	-
Religious / Non-profit	1	1	10%						
Government									
Education									
Utilities	-	-	-	-	-	-	-	-	-

MOULTON - all large event hazards (drought, earthquake, extreme heat, hailstorm, severe winter storm, thunderstorm & lighting, tornado, climate change, and windstorm. In Moulton, a large event is widespread and can happen anywhere in the city or could impact the entire jurisdiction. Additionally, most of these hazards, can impact assets that are not accounted for in the following table. Such examples would include streets, public land without buildings and public utilities infrastructure.)

Type of Structure	Number of Structures			Value of Structures			Number of People		
	# in City	# in Hazard Area	% in Hazard Area	$ in City	$ in Hazard Area	% in Hazard Area	# in City	# in Hazard Area	% in Hazard Area
Residential	269	269	100%	$11,240,353	$11,240,353	100%	631	631	100%
Commercial	15	15	100%	$1,517,240	$1,517,240	100%			100%
Industrial	-	-	-	-	-	-	-	-	-
Agricultural	-	-	-	-	$162,090	-	-	-	-
Religious / Non-profit	3	3	100%						
Government	3	3	100%						
Education	1	1	100%						
Utilities	-	-	-	-	-	-	-	-	-

Some hazards impact a more constrained or fixed area of the community, these hazards are drawn out and evaluated separately in the table(s) below. For these hazards, the "Hazard Area" is estimated based on the hazard profiles and the base maps developed for this plan. Below are the following charts that illustrate potential hazards that are specific for a jurisdiction. Each jurisdiction identified the hazard that they were at risk of experiencing.

CENTERVILLE PUBLIC SCHOOLS - all large event hazards (drought, earthquake, extreme heat, hailstorm, severe winter storm, thunderstorm & lighting, tornado, climate change, windstorm. In Centerville, a large event is widespread and can happen anywhere in the city or could impact the entire jurisdiction. Additionally, most of these hazards, can impact assets that are not accounted for in the following table. Such examples would include streets, public land without buildings and public utilities infrastructure.)

Type of Structure	Number of Structures			Value of Structures			Number of People		
	# in City	# in Hazard Area	% in Hazard Area	$ in City	$ in Hazard Area	% in Hazard Area	# in City	# in Hazard Area	% in Hazard Area
Residential									
Commercial									
Industrial									
Agricultural									
Religious / Non-profit									
Government									
Education	5		100%						
Utilities			100%	-	-	-	-	-	-

MORAVIA PUBLIC SCHOOL - all large event hazards (drought, earthquake, extreme heat, hailstorm, severe winter storm, thunderstorm & lighting, tornado, climate change, windstorm. In Cincinnati, a large event is widespread and can happen anywhere in the city or could impact the entire jurisdiction.

Additionally, most of these hazards, can impact assets that are not accounted for in the following table. Such examples would include streets, public land without buildings and public utilities infrastructure.)

Type of Structure	Number of Structures			Value of Structures			Number of People		
	# in City	# in Hazard Area	% in Hazard Area	$ in City	$ in Hazard Area	% in Hazard Area	# in City	# in Hazard Area	% in Hazard Area
Residential									
Commercial									
Industrial									
Agricultural									
Religious / Non-profit									
Government									
Education	1								
Utilities									

LAKE RATHBUN - all large event hazards (drought, earthquake, extreme heat, hailstorm, severe winter storm, thunderstorm & lighting, tornado, climate change, windstorm. In Exline, a large event is widespread and can happen anywhere in the city or could impact the entire jurisdiction. Additionally, most of these hazards, excluding human disease incidents, human disease pandemic, and animal/plant/crop disease, can impact assets that are not accounted for in the following table. Such examples would include streets, public land without buildings and public utilities infrastructure.)

Type of Structure	Number of Structures			Value of Structures			Number of People		
	# in City	# in Hazard Area	% in Hazard Area	$ in City	$ in Hazard Area	% in Hazard Area	# in City	# in Hazard Area	% in Hazard Area
Residential									
Commercial	1								
Industrial									
Agricultural									
Religious / Non-profit									
Government	2								
Education									
Utilities									

Rathbun – River Flooding

Type of Structure	Number of Structures			Value of Structures			Number of People		
	# in City	# in Hazard Area	% in Hazard Area	$ in City	$ in Hazard Area	% in Hazard Area	# in City	# in Hazard Area	% in Hazard Area
Residential	51	38	60%	$2,037,980	$1,630,384	60%	89	71	60%
Commercial	2	1	60%	$136,260	$109,008	60%			
Industrial	-	-	-	-	-	-	-	-	-
Agricultural	-	-	-	-			-	-	-
Religious / Non-profit	1	0	0%						

Government									
Education									
Utilities	-	-	-	-	-	-	-	-	-

The community of Rathbun lies downstream from the discharge of Lake Rathbun and near the Chariton River, Walnut Creek and Little Walnut Creek. Although there is no official floodplain map (Mitigation Strategy selected) for the community so the estimates are based on committee representative input and city officials.

Centerville – River Flooding

Type of Structure	Number of Structures			Value of Structures			Number of People		
	# in City	# in Hazard Area	% in Hazard Area	$ in City	$ in Hazard Area	% in Hazard Area	# in City	# in Hazard Area	% in Hazard Area
Residential	2133	320	15%	$110,843,858	$16,626,579	15%	5904	886	15%
Commercial	122	6	5%	$17,018,799	$850940	5%			30%
Industrial	4	0	0%				-	-	-
Agricultural	-	-	-				-	-	-
Religious / Non-profit	15	1	10%						
Government	3	0	0%						
Education	12	1	10%						
Utilities	2	1	10%	-	-	-	-	-	-

The City of Centerville is at risk of experiencing River Flooding due to the proximity of Cooper Creek entering the city limits on the west edge and north boundary of the formal city limits. This places approximately 15% of residential structures and 5% of businesses.

Mystic -River Flooding

Type of Structure	Number of Structures			Value of Structures			Number of People		
	# in City	# in Hazard Area	% in Hazard Area	$ in City	$ in Hazard Area	% in Hazard Area	# in City	# in Hazard Area	% in Hazard Area
Residential	227	23	10%	$6,445,315	$64,453	10%	588	58	10%
Commercial	3	2	66%	$640,280	$422,584	66%	25	16	%
Industrial	-	-	-	-	-	-	-	-	-
Agricultural	-	-	-	-	-	-	-	-	-
Religious / Non-profit	1	0	0%		$0	0%	0	0	0%
Government	4	2	50%			%			%
Education	1	0	0%		$0	%	0	0	0%
Utilities	-	-	-	-	-	-	-	-	-

The estimates of damage are based on the FIRM map of the city of Mystic and the FEMA approved plan for the jurisdiction. The plan indicates that the City Shop, Community Center, Sewer Lift Station, and a couple private businesses. There are several structures that could be at risk because they lie on the border of the floodplain. The buildings include the post office, city hall, legion, and additional residential structures.

UNIONVILLE – River Flooding

Type of Structure	Number of Structures			Value of Structures			Number of People		
	# in City	# in Hazard	% in Hazard	$ in City	$ in Hazard	% in Hazard	# in City	# in Hazard	% in Hazard

		Area	Area		Area	Area		Area	Area
Residential	58	3	5%	$1,728,350	$86,418	5%	124	6	5%
Commercial				$50,000	$2,500	5%			
Industrial	-	-	-	-	-	-	-	-	-
Agricultural	-	-	-	-	-	-	-	-	-
Religious / Non-profit	2	1	5%						
Government									
Education									
Utilities	-	-							

The only risk of river flooding for Unionville is the North Fox Creek that is south of the physical location of the jurisdiction but yet it still intersects the very south edge of the corporate city limits to create a small floodplain.

Mystic - Sink Holes (Mine Subsidence)

Type of Structure	Number of Structures			Value of Structures			Number of People		
	# in City	# in Hazard Area	% in Hazard Area	$ in City	$ in Hazard Area	% in Hazard Area	# in City	# in Hazard Area	% in Hazard Area
Residential	227	170	70%	$6,445,315	$4,833,986	70%	588	412	70%
Commercial	3	1	33%	$640,280	$211,292	33%	25	8	33%
Industrial	-	-	-	-	-	-	-	-	-
Agricultural	-	-	-	-	-	-	-	-	-
Religious / Non-profit	1	1	100%						
Government	4	2	50%			%			%
Education	1	1	100%			%			%
Utilities	-	-	-	-	-	-	-	-	-

Not all of the mines in Appanoose County or Mystic are fully mapped; the extents of the mines are estimated. Based on these mapping limitations, the condition of at least some of the mines are presumably full unknown. Mitigation actions in this plan are to investigate and compile more mining history that may allow for more precise mapping of the mining zones. The approve mitigation plan for Mystic states that the local elementary school, the city shop, a church, and the post office. Again this is only an estimate and additional structures and homes could be at risk.

Centerville - Sink Holes (Mine Subsidence)

Type of Structure	Number of Structures			Value of Structures			Number of People		
	# in City	# in Hazard Area	% in Hazard Area	$ in City	$ in Hazard Area	% in Hazard Area	# in City	# in Hazard Area	% in Hazard Area
Residential	2133	1066	50%	$110,843,858	$55,421,929	50%	5904	2952	50%
Commercial	122	61	50%	$17,018,799	$8,509399	50%			50%
Industrial	4	2	50%	$11,790,212	$5,895,106	50%	-	-	-
Agricultural	-	-	-	$483,580	$241,790	50%	-	-	-
Religious / Non-profit	15	7	50%						
Government	3	1	50%						
Education	12	6	50%						
Utilities	2	1	50%	-	-	-	-	-	-

Not all of the mines in Appanoose County or Centerville are fully mapped; the extents of the mines are estimated. Based on these mapping limitations, the condition of at least some of the mines are presumably full unknown. Mitigation actions in this plan are to investigate and compile more mining history that may allow for more precise mapping of the mining zones.

Numa - Sink Holes (Mine Subsidence)

Type of Structure	Number of Structures			Value of Structures			Number of People		
	# in City	# in Hazard Area	% in Hazard Area	$ in City	$ in Hazard Area	% in Hazard Area	# in City	# in Hazard Area	% in Hazard Area
Residential	59	29	50%	$1,678,410	$839,205	50%	112	56	50%
Commercial	1	0	50%	$58,720	$29,360	50%			50%
Industrial	-	-	-	-	-	-	-	-	-
Agricultural	-	-	-	-	-	-	-	-	-
Religious / Non-profit	1	1	100%						
Government									
Education									
Utilities	-	-	-	-	-	-	-	-	-

Not all of the mines in Appanoose County or Numa are fully mapped; the extents of the mines are estimated. Based on these mapping limitations, the condition of at least some of the mines are presumably full unknown. Mitigation actions in this plan are to investigate and compile more mining history that may allow for more precise mapping of the mining zones.

Cincinnati - Sink Holes (Mine Subsidence)

Type of Structure	Number of Structures			Value of Structures			Number of People		
	# in City	# in Hazard Area	% in Hazard Area	$ in City	$ in Hazard Area	% in Hazard Area	# in City	# in Hazard Area	% in Hazard Area
Residential	197	89	45%	$6,011,450	$2,705,153	45%	421	189	45%
Commercial	3	1	45%	$292,650	$131,693	45%			45%
Industrial	-	-	-	-	-	-	-	-	-
Agricultural	-	-	-	$482,065	-	-	-	-	-
Religious / Non-profit	3	1	10%						
Government	2	2	10%						
Education	1	1	10%						
Utilities	-	-	-	-	-	-	-	-	-

Not all of the mines in Appanoose County or Cincinnati are fully mapped; the extents of the mines are estimated. Based on these mapping limitations, the condition of at least some of the mines are presumably full unknown. Mitigation actions in this plan are to investigate and compile more mining history that may allow for more precise mapping of the mining zones.

Plano - Sink Holes (Mine Subsidence)

Type of Structure	Number of Structures			Value of Structures			Number of People		
	# in City	# in Hazard Area	% in Hazard Area	$ in City	$ in Hazard Area	% in Hazard Area	# in City	# in Hazard Area	% in Hazard Area

Residential	40	8	20%	$1,593,740	$318,748	20%	65	65	20%
Commercial	3	1	10%	$31,360	$3,136	10%			10%
Industrial	-	-	-	-	-	-	-	-	-
Agricultural	-	-	-	-	$224,950	-	-	-	-
Religious / Non-profit	1		100%	$125,000	$125,000				
Government									
Education									
Utilities	-	-	-	-	-	-	-	-	-

Not all of the mines in Appanoose County or Plano are fully mapped; the extents of the mines are estimated. Based on these mapping limitations, the condition of at least some of the mines are presumably full unknown. Mitigation actions in this plan are to investigate and compile more mining history that may allow for more precise mapping of the mining zones.

Exline - Sink Holes (Mine Subsidence)

Type of Structure	Number of Structures			Value of Structures			Number of People		
	# in City	# in Hazard Area	% in Hazard Area	$ in City	$ in Hazard Area	% in Hazard Area	# in City	# in Hazard Area	% in Hazard Area
Residential	77	31	40%	$2,451,760	$980,704	40%	197	197	40%
Commercial	8	3	40%	$670,220	$268,088	40%			40%
Industrial	-	-	-	-	-	-	-	-	-
Agricultural	-	-	-	-		-	-	-	-
Religious / Non-profit	1	1	100%						
Government	2	2	50%						
Education									
Utilities	-	-	-	-	-	-	-	-	-

Not all of the mines in Appanoose County or Exline are fully mapped; the extents of the mines are estimated. Based on these mapping limitations, the condition of at least some of the mines are presumably full unknown. Mitigation actions in this plan are to investigate and compile more mining history that may allow for more precise mapping of the mining zones.

Rathbun – Sink Holes (Mine Subsidence)

Type of Structure	Number of Structures			Value of Structures			Number of People		
	# in City	# in Hazard Area	% in Hazard Area	$ in City	$ in Hazard Area	% in Hazard Area	# in City	# in Hazard Area	% in Hazard Area
Residential	51	5	10%	$2,037,980	$203,798	10%	89	9	10%
Commercial	2		0%	$136,260	$13,626	10%			
Industrial	-	-	-	-	-	-	-	-	-
Agricultural	-	-	-	-			-	-	-
Religious / Non-profit	1	0	0%						
Government									
Education									
Utilities	-	-	-	-	-	-	-	-	-

Not all of the mines in Appanoose County or Rathbun are fully mapped; the extents of the mines are estimated. Based on these mapping limitations, the condition of at least some of the mines are presumably full unknown. Mitigation actions in this plan are to investigate and compile more mining history that may allow for more precise mapping of the mining zones.

Moravia- Rail Transportation Incident

Type of Structure	Number of Structures			Value of Structures			Number of People		
	# in City	# in Hazard Area	% in Hazard Area	$ in City	$ in Hazard Area	% in Hazard Area	# in City	# in Hazard Area	% in Hazard Area
Residential	291	43	15%	$15,560,965	$7,780,482	100%	721	108	15%
Commercial	8	1	15%	$2,041,640	$306,246	15%			15%
Industrial	3	1	15%	-	-	-	-	-	-
Agricultural	-	-	-	-	-	-	-	-	-
Religious / Non-profit	2	1	50%						
Government	3	3	15%						
Education	1	0	0%						
Utilities	-	-	-	-	-	-	-	-	-

The rail line extends parallel to highway 5 (north and south) and continues through the west edge of the jurisdiction. A second line also crosses from the southwest corner to the northeast corner of the city. With both lines intersecting the city limits it places approximately 43 residential structures and 4 private businesses within 500 feet of either rail line. An incident could also impact a large church (that is also a designated Red Cross Shelter site) and the local school (kindergarten through grade 12).

Mystic –Rail Transportation Incident

Type of Structure	Number of Structures			Value of Structures			Number of People		
	# in City	# in Hazard Area	% in Hazard Area	$ in City	$ in Hazard Area	% in Hazard Area	# in City	# in Hazard Area	% in Hazard Area
Residential	227	170	15%	$6,445,315	$966,797	15%	588	88	15%
Commercial	3	1	50%	$640,280	$320,140	50%	25	12	50%
Industrial	-	-	-	-	-	-	-	-	-
Agricultural	-	-	-	-	-	-	-	-	-
Religious / Non-profit	1	1	0%						
Government	4	2	50%						
Education	1	0	0%						
Utilities	-	-	-	-	-	-	-	-	-

There are very few buildings located within 100 feet of the railroad track that runs through Mystic. The railroad passes part of Main Street but only the structures on the south side of the Main Street are within about 500 feet of the line. This would include the community center, private business, city park and the sewage lift station.

Rathbun – Rail Transportation Incident

Type of Structure	Number of Structures			Value of Structures			Number of People		
	# in City	# in Hazard Area	% in Hazard Area	$ in City	$ in Hazard Area	% in Hazard Area	# in City	# in Hazard Area	% in Hazard Area

Residential	51	5	10%	$2,037,980	$203,798	10%	89	9	10%
Commercial	2		0%	$136,260	$13,626	10%			
Industrial	-	-	-	-	-	-	-	-	-
Agricultural	-	-	-	-			-	-	-
Religious / Non-profit	1	0	0%						
Government									
Education									
Utilities	-	-	-	-	-	-	-	-	-

The jurisdiction of Rathbun has a rail road line that brushes the eastern edge of the community. There is minimal risk to possible structures along this outer lying boundary. Additional concerns could arise if there were damage to a critical bridge and major road way leading into the community.

Centerville – Rail Transportation Incident

Type of Structure	Number of Structures			Value of Structures			Number of People		
	# in City	# in Hazard Area	% in Hazard Area	$ in City	$ in Hazard Area	% in Hazard Area	# in City	# in Hazard Area	% in Hazard Area
Residential	2133	213	10%	$110,843,858	$22,168,771	20%	5904	5904	20%
Commercial	122	12	10%	$17,018,799	$5,105,640	30%			30%
Industrial	4	3	70%	$11,790,212	$8,253,148	70%	-	-	-
Agricultural	-	-	-				-	-	-
Religious / Non-profit	15	1	10%						
Government	3	0	0%						
Education	12	1	10%						
Utilities	2	1	10%	-	-	-	-	-	-

Appanoose Community Railroad begin their lines within the city limits of Centerville. The rail line is utilized for the transportation of products manufactured locally in the industrial park area. It is estimated that 213 residential structures, 12 private businesses and three industries could be affected. A lower income-housing region is near the industrial park and could be affects as well.

MORAVIA PUBLIC SCHOOL- Rail Transportation Incident

Type of Structure	Number of Structures			Value of Structures			Number of People		
	# in City	# in Hazard Area	% in Hazard Area	$ in City	$ in Hazard Area	% in Hazard Area	# in City	# in Hazard Area	% in Hazard Area
Residential	51	5	10%	$2,037,980	$203,798	10%	89	9	10%
Commercial	2		0%	$136,260	$13,626	10%			
Industrial	-	-	-	-	-	-	-	-	-
Agricultural	-	-	-	-			-	-	-
Religious / Non-profit	1	0	0%						
Government									
Education									
Utilities	-	-	-	-	-	-	-	-	-

Exline – Flash Flooding

Type of Structure	Number of Structures			Value of Structures			Number of People		
	# in City	# in Hazard Area	% in Hazard Area	$ in City	$ in Hazard Area	% in Hazard Area	# in City	# in Hazard Area	% in Hazard Area
Residential	77	15	20%	$2,451,760	$490,352	20%	197	39	20%
Commercial	8	2	20%	$670,220	$134,044	20%			20%
Industrial	-	-	-	-	-	-	-	-	-
Agricultural	-	-	-	-		-	-	-	-
Religious / Non-profit	1	0	0%						
Government	2	0	0%						
Education									
Utilities	-	-	-	-	-	-	-	-	-

Exline has experienced flash flooding streets in the recent summer rains. The ten inch rains caused flash flooding on multiple street corners where the storm drainage system exists. This has placed multiple residential structures at risk of water damage and a couple private businesses. The low-income retirement community is also at risk of flash flooding due to the flat land the facility is housed on.

UNINCORPORATED COUNTY AREA – Flash flooding

Type of Structure	Number of Structures			Value of Structures			Number of People		
	# in unincorp region	# in Hazard Area	% in Hazard Area	$ in unincorp region	$ in Hazard Area	% in Hazard Area	# in unincorp region	# in Hazard Area	% in Hazard Area
Residential	2432	486	20%	$194,641,377	$38,928,275	20%	4,805	961	20%
Commercial	122	24	20%	$17,018,799	$3,403,760	20%			
Industrial	2	1	20%	$558,259	$111,652	20%	-	-	-
Agricultural	-	-		$133,392,847	$13,339,284	10%	-	-	-
Religious / Non-profit	4	1	10%						
Government									
Education									
Utilities	-	-	-	-	-	-	-	-	-

The rural/unincorporated region of Appanoose County has sustained thousands of dollars in damage to roadways, erosion to flash flooding, repair to roads, and resurfacing roadways. The low-lying rural region that is southeast of highway 5 between Exline and Moulton have experienced frequent damage in the past 3 years. This includes three unincorporated communities and the Sedan Bottoms Wetlands. The Wetlands have been effective in slowing the flood waters and mitigating flash flooding but the unusually wet and heavy summer rains have proven too much for it's capacity. The storms in the summer of 2010 created damage to 80% of Appanoose County rural Bridges and many are still in need of improvements.

Centerville – Flash Flooding

Type of Structure	Number of Structures			Value of Structures			Number of People		
	# in City	# in Hazard Area	% in Hazard Area	$ in City	$ in Hazard Area	% in Hazard Area	# in City	# in Hazard Area	% in Hazard Area
Residential	2133	426	20%	$110,843,858	$22,168,771	20%	5904	1,181	20%
Commercial	122	12	10%	$17,018,799	$1,701,880	10%			
Industrial	4	3	40%	$11,790,212	$4,716,085	40%	-	-	-
Agricultural	-	-	-				-	-	-
Religious / Non-profit	15	1	10%						
Government	3	0	0%						
Education	12	1	10%						
Utilities	2	1	10%	-	-	-	-	-	-

The City of Centerville has had the storm sewer drainage systems extensively in the past three summers when ten inch rain falls have become common. The City is currently in the second phase of a three phase major replacement of the drainage system in the city. It is hopeful that this will improve drainage and decrease concerns for flash flooding in the community. Currently, there has been ongoing flash flooding problems in the suburb of "Golfview" even with minimal amounts of rain. This homeowner association is currently exploring funding options to rectify the problems. Other water damage has occurred to the Lakeview Elementary School building for Centerville Community Schools. The problem occurs when the ground is over saturated and the moisture seeps up into the locker rooms, offices and gymnasium. There are other isolated reports of damaged homes throughout the city.

Centerville Public Schools – Flash Flooding

Type of Structure	Number of Structures			Value of Structures			Number of People		
	# in City	# in Hazard Area	% in Hazard Area	$ in City	$ in Hazard Area	% in Hazard Area	# in City	# in Hazard Area	% in Hazard Area
Residential	2133	426	20%	$110,843,858	$22,168,771	20%	5904	1,181	20%
Commercial	122	12	10%	$17,018,799	$1,701,880	10%			
Industrial	4	3	40%	$11,790,212	$4,716,085	40%	-	-	-
Agricultural	-	-	-				-	-	-
Religious / Non-profit	15	1	10%						
Government	3	0	0%						
Education	12	1	10%						
Utilities	2	1	10%	-	-	-	-	-	-

Cincinnati – Flash Flooding

Type of Structure	Number of Structures			Value of Structures			Number of People		
	# in City	# in Hazard Area	% in Hazard Area	$ in City	$ in Hazard Area	% in Hazard Area	# in City	# in Hazard Area	% in Hazard Area
Residential	197	79	40%	$6,011,450	$2,404,580	14%	421	42	10%
Commercial	3	1	20%	$292,650	$58,530	20%			
Industrial	-	-	-	-	-	-	-	-	-
Agricultural	-	-	-	$482,065	-	-	-	-	-
Religious / Non-profit	3	1	40%						
Government	2	2	50%						
Education	1	1	10%						
Utilities	-	-	-	-	-	-	-	-	-

The City of Cincinnati has discovered that their current storm sewer drainage system is deteriorating due to age. The current system has had difficulty with the large amounts of rain that the city has experienced in recent summers. During these incidents, the result has been backflow into private residential structures. The city recognizes the need to replace this system and has received disaster funds from the State of Iowa to address this problem.

Rathbun – Flash Flooding

Type of Structure	Number of Structures			Value of Structures			Number of People		
	# in City	# in Hazard Area	% in Hazard Area	$ in City	$ in Hazard Area	% in Hazard Area	# in City	# in Hazard Area	% in Hazard Area
Residential	51	5	30%	$2,037,980	$611,394	30%	89	27	30%
Commercial	2	1	10%	$136,260	$13,626	10%			
Industrial	-	-	-	-	-	-	-	-	-
Agricultural	-	-	-	-			-	-	-
Religious / Non-profit	1	0	0%						
Government									
Education									
Utilities	-	-	-	-	-	-	-	-	-

The community of Rathbun has experienced one flash flooding event in the past seventeen years. This lower lying area on the extreme north edge places approximately 5 residential structures at risk of water damage.

Numa – Flash Flooding

Type of Structure	Number of Structures			Value of Structures			Number of People		
	# in City	# in Hazard Area	% in Hazard Area	$ in City	$ in Hazard Area	% in Hazard Area	# in City	# in Hazard Area	% in Hazard Area
Residential	59	29	50%	$1,678,410	$839,205	50%	112	56	50%
Commercial	1	0	50%	$58,720	$29,360	50%			50%

Industrial	-	-	-	-	-	-	-	-	-
Agricultural	-	-	-	-	-	-	-	-	-
Religious / Non-profit	1	1	100%						
Government									
Education									
Utilities	-	-	-	-	-	-	-	-	-

Although the community of Numa has limited experience with flash flooding events, the residents are still at risk of potential damage. However, no critical facilities have been impacted.

UDELL – Flash Flooding

Type of Structure	Number of Structures			Value of Structures			Number of People		
	# in City	# in Hazard Area	% in Hazard Area	$ in City	$ in Hazard Area	% in Hazard Area	# in City	# in Hazard Area	% in Hazard Area
Residential	24	7	30%	$596,200	$178,860	30%	65	20	30%
Commercial	1	1	30%	$5,670	$1,701	30%			30%
Industrial	-	-	-	-	-	-	-	-	-
Agricultural	-	-	-	-	$81,040	-	-	-	-
Religious / Non-profit	1	1	100%						
Government									
Education									
Utilities	-	-	-	-	-	-	-	-	-

Although the community of Udell has limited experience with flash flooding events, the residents are still at risk of potential damage. However, no critical facilities have been impacted.

Mystic –Flash Flooding

Type of Structure	Number of Structures			Value of Structures			Number of People		
	# in City	# in Hazard Area	% in Hazard Area	$ in City	$ in Hazard Area	% in Hazard Area	# in City	# in Hazard Area	% in Hazard Area
Residential	227	170	15%	$6,445,315	$966,797	15%	588	88	15%
Commercial	3	1	50%	$640,280	$320,140	50%	25	12	50%
Industrial	-	-	-	-	-	-	-	-	-
Agricultural	-	-	-	-	-	-	-	-	-
Religious / Non-profit	1	1	0%						
Government	4	2	50%						
Education	1	0	0%						
Utilities	-	-	-	-	-	-	-	-	-

Mystic has experienced severe flash flooding in 2007 and is currently completing a FEMA Acquisition & Demolition project that removed 8 damaged residential structures from this flood zone. This still leaves multiple private structures in the floodplain at risk. Also included in the floodplain region is the City Shop, Community Center, Sewer Lift Station, and a couple private businesses. There are several structures that could be at risk because they lie on the border of the floodplain. The buildings include the post office, city

hall, legion, and additional residential structures. The City is currently working with FEMA for possible assistance to address the failing lift station that has been damaged in multiple flooding events.

Centerville – Dam Failure

Type of Structure	Number of Structures			Value of Structures			Number of People		
	# in City	# in Hazard Area	% in Hazard Area	$ in City	$ in Hazard Area	% in Hazard Area	# in City	# in Hazard Area	% in Hazard Area
Residential	2133	213	10%	$110,843,858	$11,084,385	10%	5904	590	10%
Commercial	122	12	10%	$17,018,799	$5,105,640	30%			
Industrial	4	1	10%	$11,790,212	$1,179,021	10%	-	-	-
Agricultural	-	-	-				-	-	-
Religious / Non-profit	15	1	10%						
Government	3	0	0%						
Education	12	1	10%						
Utilities	2	1	10%	-	-	-	-	-	-

Centerville could experience damage in the event of dam failure with the concern of 3 different dams which places approximately 10% of the city at risk. The largest event would be in the event of failure of Rathbun dam, which is deemed a "High hazard dam" by the National Inventory of Dams. Rathbun releases into the Chariton river and is approximately 2 miles from the north edge of Centerville. This would place approximately 5% of the community at risk. This region would affect about 6 businesses and 105 residential structures. The Upper and Lower Centerville Reservoir are both located in the very southern edge of the city. The Lower Centerville Reservoir dam faces to the south and a failure would send flooding waters through 5% of the southwest portion of the City of Centerville. This region would include approximately 6 business and 106 residential structures. The Upper Centerville Reservoir is located near the Lower Reservoir and will impact a similar region. These two significant risk dams would directly impact Centerville and affect the west sewer treatment plant for the city and possibly the bridge crossing Cooper Creek on Highway 2 if they were to breach. No other community have mapped dams up-stream from them, however depending on the dam that might break, the impacts can vary.

UNINCORPORATED COUNTY AREA – Dam Failure

Type of Structure	Number of Structures			Value of Structures			Number of People		
	# in region	# in Hazard Area	% in Hazard Area	$ in area	$ in Hazard Area	% in Hazard Area	# in region	# in Hazard Area	% in Hazard Area
Residential	2432	243	10%	$194,641,377	$19,464,137	10%	4,805	480	10%
Commercial	122	12	10%	$17,018,799	$1,701,879	10%			10%
Industrial	2	1	10%	$558,259	$55,825	10%	-	-	-
Agricultural	-	-		$133,392,847	$13,339,284	10%	-	-	-
Religious / Non-profit	4	1	10%						
Government									
Education									
Utilities	-	-	-	-	-	-	-	-	-

Four unincorporated communities are located along the low-lying area containing the Chariton River where the greatest impact from a failure of Rathbun Dam would be seen. A significant critical facilities impact from the failure of the Rathbun Dam would be the potential compromise of drinking water for the whole county as

the lake provides municipal water throughout the county and surrounding regions in Iowa and Missouri through Rathbun Regional Water.

Lake Sundown Dam is located approximately 6 miles to the west of the City of Moulton. The dam is identified as a "High Risk Dam" in the National Inventory of Dams. The dam faces to the southeast and releases into a valley region of agriculture land. If it were to fail, agriculture land would suffer primary damage and possibly a few residential structures would be impacted.

Mystic –Dam Failure

Type of Structure	Number of Structures			Value of Structures			Number of People		
	# in City	# in Hazard Area	% in Hazard Area	$ in City	$ in Hazard Area	% in Hazard Area	# in City	# in Hazard Area	% in Hazard Area
Residential	227	136	60%	$6,445,315	$3,867,189	60%	588	353	60%
Commercial	3	2	60%	$640,280	$384,168	60%	25	15	60%
Industrial	-	-	-	-	-	-	-	-	-
Agricultural	-	-	-	-	-	-	-	-	-
Religious / Non-profit	1	1	100%						
Government	4	2	50%						
Education	1	1	100%						
Utilities	-	-	-	-	-	-	-	-	-

Mystic is approximately 8 miles from Rathbun Lake; the two nearest creeks (one running through Mystic) flow northwesterly. Chariton River which flows out of Rathbun Lake flows southeasterly. The most direct impact of a dam failure on Mystic would be one or both creeks flowing backward due to the influx of water into the Chariton River. The topography of the area between Mystic and the lake would likely preclude water flowing overland into town other than through these two creeks. As with the flooding hazard, the floodplain amounts to about 25-35% of the town, though a catastrophic dam failure would likely flood more areas than are identified in the FIRM. Estimates from local city officials place approximately 60% of the city being affected in the event of a devastating dam failure.

Rathbun – Dam Failure

Type of Structure	Number of Structures			Value of Structures			Number of People		
	# in City	# in Hazard Area	% in Hazard Area	$ in City	$ in Hazard Area	% in Hazard Area	# in City	# in Hazard Area	% in Hazard Area
Residential	51	31	60%	$2,037,980	$1,222,788	60%	89	53	60%
Commercial	2	1	60%	$136,260	$81,756	60%			
Industrial	-	-	-	-	-	-	-	-	-
Agricultural	-	-	-	-			-	-	-
Religious / Non-profit	1	1	60%						
Government									
Education									
Utilities	-	-	-	-	-	-	-	-	-

The City of Rathbun lies 1.5 miles south of Lake Rathbun dam. If this large dam should fail the majority of the community would be inundated with water. This includes the critical sewage facility, the water supply for the south central Iowa and north central Missouri region, a church and private businesses.

Centerville – Highway Transportation Incident

Type of Structure	Number of Structures			Value of Structures			Number of People		
	# in City	# in Hazard Area	% in Hazard Area	$ in City	$ in Hazard Area	% in Hazard Area	# in City	# in Hazard Area	% in Hazard Area
Residential	2133	213	40%	$110,843,858	$44,337,543	40%	5904	2362	40%
Commercial	122	12	40%	$17,018,799	$6,807,520	40%			
Industrial	4	3	30%	$11,790,212	$3,537,064	30%	-	-	-
Agricultural	-	-	-				-	-	-
Religious / Non-profit	15	1	30%						
Government	3	0	0%						
Education	12	1	10%						
Utilities	2	1	10%	-	-	-	-	-	-

State Highways 5 and 2 intersect near the center of the city of Centerville. Both highways provide access to critical services and commuting routes for employers, therefore they are very busy roadways. Each are also lined with businesses and residential structures that could potentially be effected in a Highway Transportation Incident. Critical businesses could include a Dialysis Center, 5 gas stations, and the County Sheriff's office.

A particular concern lies just west of Centerville on Highway 2 and T14. Highway 2 is a heavily traveled road that allows for west-bound vehicles to utilize a turning lane. This once again obstructs the view for vehicles coming off T14 and hoping to merge onto Highway 2.

Moravia- Highway Transportation Incident

Type of Structure	Number of Structures			Value of Structures			Number of People		
	# in City	# in Hazard Area	% in Hazard Area	$ in City	$ in Hazard Area	% in Hazard Area	# in City	# in Hazard Area	% in Hazard Area
Residential	291	43	15%	$15,560,965	$7,780,482	100%	721	108	15%
Commercial	8	1	15%	$2,041,640	$306,246	15%			15%
Industrial	3	1	15%	-	-	-	-	-	-
Agricultural	-	-	-	-	-	-	-	-	-
Religious / Non-profit	2	1	50%						
Government	3	3	15%						
Education	1	0	0%						
Utilities	-	-	-	-	-	-	-	-	-

State Highway 5 enters the west edge of the city limits in Moravia.

Particular concern is for the intersection of Highway 5 and Route J18 on the edge of Moravia. This is a high traffic intersection that has a spur accessing recreational activities at Lake Rathbun and Honey Creek Resort. There is currently a turning lane to allow south bound traffic to turn west. There are many complaints of blocked vision for J6 traffic merging onto Highway 5.

Moravia Public Schools- Highway Transportation Incident

Type of Structure	Number of Structures			Value of Structures			Number of People		
	# in City	# in Hazard Area	% in Hazard Area	$ in City	$ in Hazard Area	% in Hazard Area	# in City	# in Hazard Area	% in Hazard Area

Residential	291	43	15%	$15,560,965	$7,780,482	100%	721	108	15%
Commercial	8	1	15%	$2,041,640	$306,246	15%			15%
Industrial	3	1	15%	-	-	-	-	-	-
Agricultural	-	-	-	-	-	-	-	-	-
Religious / Non-profit	2	1	50%						
Government	3	3	15%						
Education	1	0	0%						
Utilities	-	-	-	-	-	-	-	-	-

Old highway 5

Cincinnati – Highway Transportation Incident

Type of Structure	Number of Structures			Value of Structures			Number of People		
	# in City	# in Hazard Area	% in Hazard Area	$ in City	$ in Hazard Area	% in Hazard Area	# in City	# in Hazard Area	% in Hazard Area
Residential	197	89	45%	$6,011,450	$2,705,153	45%	421	189	45%
Commercial	3	1	45%	$292,650	$131,693	45%			45%
Industrial	-	-	-	-	-	-	-	-	-
Agricultural	-	-	-	$482,065	-	-	-	-	-
Religious / Non-profit	3	1	10%						
Government	2	2	10%						
Education	1	1	10%						
Utilities	-	-	-	-	-	-	-	-	-

State Highway 5 intersects the center of Cincinnati with many travelers. This places the city at an increase risk of experiencing a Highway Transportation Incident. There are residential structures that line both sides of this highway the entire length and could place approximately 89 of them at risk. It also could affect the one gas station within the jurisdiction.

Rathbun – Highway Transportation Incident

Type of Structure	Number of Structures			Value of Structures			Number of People		
	# in City	# in Hazard Area	% in Hazard Area	$ in City	$ in Hazard Area	% in Hazard Area	# in City	# in Hazard Area	% in Hazard Area
Residential	51	26	50%	$2,037,980	$1,018,990	50%	89	45	50%
Commercial	2	1	50%	$136,260	$68,130	50%			
Industrial	-	-	-	-	-	-	-	-	-
Agricultural	-	-	-	-			-	-	-
Religious / Non-profit	1	1	50%						
Government									
Education									
Utilities	-	-	-	-	-	-	-	-	-

A small county black top highway passes through the city of Rathbun. This highway provides access to the busy camp grounds and boating offered at near-by Lake Rathbun. This large amount of traffic can place a small community at a higher risk of experiencing a Transportation incident. Such an event could affect place approximately 26 residential structures at risk and the local convenience station.

Centerville – Air Transportation Incident

Type of Structure	Number of Structures			Value of Structures			Number of People		
	# in City	# in Hazard Area	% in Hazard Area	$ in City	$ in Hazard Area	% in Hazard Area	# in City	# in Hazard Area	% in Hazard Area
Residential	2133	43	2%	$110,843,858	$2,216,877	2%	5904	118	2%
Commercial	122	2	2%	$17,018,799	$340,376	2%			
Industrial	4	1	2%	$11,790,212	$455,804	2%	-	-	-
Agricultural	-	-	-				-	-	-
Religious / Non-profit	15	1	2%						
Government	3	0	0%						
Education	12	1	2%						
Utilities	2	1	2%	-	-	-	-	-	-

Mercy Medical Helipad is located at the hospital approximately one-third of a mile from the north edge of Centerville. Should an event occur, the nearest area of impact would include the retirement community/assisted living center of "Continental at St Joseph's" and approximately 10 private residence that could possibly be affected.

UNINCORPORATED COUNTY AREA – Air Transportation Incident

Type of Structure	Number of Structures			Value of Structures			Number of People		
	# in region	# in Hazard Area	% in Hazard Area	$ in City	$ in Hazard Area	% in Hazard Area	# in region	# in Hazard Area	% in Hazard Area
Residential	2432	49	2%	$194,641,377	$3,892,828	2%	4,805		2%
Commercial	122	2	2%	$17,018,799	$340,376	2%			2%
Industrial	2	1	2%	$558,259	$11,165	2%	-	-	-
Agricultural	-	-		$133,392,847	$2,667,857	2%	-	-	-
Religious / Non-profit	4	1	2%						
Government									
Education									
Utilities	-	-	-	-	-	-	-	-	-

The Centerville airport location is in a remote setting with the nearest community of Numa being approximately 5 miles away. It is estimated that there are 5 residences in a one mile radius of the public airport.

One private landing strip is located northeast of Lake Rathbun Dam by 9 miles. Owners report that it is a seldom used strip but that it is still accessible if needed.

Centerville – Pipeline Incident

Type of Structure	Number of Structures			Value of Structures			Number of People		
	# in City	# in Hazard	% in Hazard	$ in City	$ in Hazard Area	% in Hazard	# in City	# in Hazard	% in Hazard

		Area	Area			Area		Area	Area
Residential	2133	107	5%	$110,843,858	$5,542,193	5%	5904	295	5%
Commercial	122	1	1%	$17,018,799	$170,188	1%			
Industrial	4	1	10%	$11,790,212	$1,179,021	10%	-	-	-
Agricultural	-	-	-				-	-	-
Religious / Non-profit	15	1	10%						
Government	3	0	0%						
Education	12	1	10%						
Utilities	2	1	10%	-	-	-	-	-	-

Centerville has a small spur of a natural gas pipeline that enters into the city limits at the very north edge of the jurisdiction. This area is a less populated region of the city and would not impact any other critical facilities.

Mystic –Pipeline Incident

Type of Structure	Number of Structures			Value of Structures			Number of People		
	# in City	# in Hazard Area	% in Hazard Area	$ in City	$ in Hazard Area	% in Hazard Area	# in City	# in Hazard Area	% in Hazard Area
Residential	227	2	1%	$6,445,315	$64,453	1%	588	6	1%
Commercial	3	1	1%	$640,280	$6,403	1%	25	1	1%
Industrial	-	-	-	-	-	-	-	-	-
Agricultural	-	-	-	-	-	-	-	-	-
Religious / Non-profit	1	1	1%						
Government	4	1	1%						
Education	1	1	1%						
Utilities	-	-	-	-	-	-	-	-	-

One natural gas pipeline runs near Mystic about 1 ½ miles to the south and east of town because of the distance from the edge of the city there would be minimal structures at risk being affected.

UNINCORPORATED COUNTY AREA – Pipeline Incident

Type of Structure	Number of Structures			Value of Structures			Number of People		
	# in region	# in Hazard Area	% in Hazard Area	$ in City	$ in Hazard Area	% in Hazard Area	# in region	# in Hazard Area	% in Hazard Area
Residential	2432	243	10%	$194,641,377	$19,464,137	10%	4,805	480	10%
Commercial	122	12	10%	$17,018,799	$1,701,879	10%			10%
Industrial	2	1	10%	$558,259	$55,825	10%	-	-	-
Agricultural	-	-		$133,392,847	$13,339,284	10%	-	-	-
Religious / Non-profit	4	1	10%						
Government									
Education									
Utilities	-	-	-	-	-	-	-	-	-

There are several intersecting Natural gas lines throughout Appanoose County. (See Appendix S.) One main line crosses the center of the county from west to east and by not though a specific community.

The unincorporated region just outside of the edge of Udell lies in a particularly vulnerable area because of the intersection of the crude oil/petroleum line and the Natural gas line.

Cincinnati – Pipeline Incident

Type of Structure	Number of Structures			Value of Structures			Number of People		
	# in City	# in Hazard Area	% in Hazard Area	$ in City	$ in Hazard Area	% in Hazard Area	# in City	# in Hazard Area	% in Hazard Area
Residential	197	89	10%	$6,011,450	$601,145	10%	421	42	10%
Commercial	3	1	10%	$292,650	$29,265	10%			
Industrial	-	-	-	-	-	-	-	-	-
Agricultural	-	-	-	$482,065	-	-	-	-	-
Religious / Non-profit	3	1	10%						
Government	2	2	10%						
Education	1	1	10%						
Utilities	-	-	-	-	-	-	-	-	-

A spur of a natural gas line goes enters the west edge of the jurisdiction of Cincinnati and place that immediate area at risk. No critical facilities would be affected.

Numa – Pipeline Incident

Type of Structure	Number of Structures			Value of Structures			Number of People		
	# in City	# in Hazard Area	% in Hazard Area	$ in City	$ in Hazard Area	% in Hazard Area	# in City	# in Hazard Area	% in Hazard Area
Residential	59	29	50%	$1,678,410	$839,205	50%	112	56	50%
Commercial	1	0	50%	$58,720	$29,360	50%			50%
Industrial	-	-	-	-	-	-	-	-	-
Agricultural	-	-	-	-	-	-	-	-	-
Religious / Non-profit	1	1	100%						
Government									
Education									
Utilities	-	-	-	-	-	-	-	-	-

A natural gas line extends north and south from the Missouri state line to connect with another line at Highway 2. It does enter through the east edge of the community of Numa.

Exline – Pipeline Incident

Type of Structure	Number of Structures			Value of Structures			Number of People		
	# in City	# in Hazard Area	% in Hazard Area	$ in City	$ in Hazard Area	% in Hazard Area	# in City	# in Hazard Area	% in Hazard Area
Residential	77	1	2%	$2,451,760	$49,035	2%	197	4	2%
Commercial	8	1	2%	$670,220	$13,404	2%			2%
Industrial	-	-	-	-	-	-	-	-	-
Agricultural	-	-	-	-		-	-	-	-
Religious / Non-profit	1	0	0%						
Government	2	0	0%						

Education									
Utilities	-	-	-	-	-	-	-	-	-

There is a crude oil/petroleum line that brushes the city limits of Exline which places the community at a very small risk in an event.

Moravia- Pipeline Incident

Type of Structure	Number of Structures			Value of Structures			Number of People		
	# in City	# in Hazard Area	% in Hazard Area	$ in City	$ in Hazard Area	% in Hazard Area	# in City	# in Hazard Area	% in Hazard Area
Residential	291	43	15%	$15,560,965	$7,780,482	100%	721	108	15%
Commercial	8	1	15%	$2,041,640	$306,246	15%			15%
Industrial	3	1	15%	-	-	-	-	-	-
Agricultural	-	-	-	-	-	-	-	-	-
Religious / Non-profit	2	1	50%						
Government	3	3	15%						
Education	1	0	0%						
Utilities	-	-	-	-	-	-	-	-	-

A branch of the natural gas line extends north and south of the unincorporated area next to the jurisdiction of Moravia. The gas line is within 2 miles to the east of Moravia and places approximately 43 residential structures at risk and one private business.

UDELL – Pipeline Incident

Type of Structure	Number of Structures			Value of Structures			Number of People		
	# in City	# in Hazard Area	% in Hazard Area	$ in City	$ in Hazard Area	% in Hazard Area	# in City	# in Hazard Area	% in Hazard Area
Residential	24	10	40%	$596,200	$238,480	40%	65	26	40%
Commercial	1	1	40%	$5,670	$2,268	40%			
Industrial	-	-	-	-	-	-	-	-	-
Agricultural	-	-	-	-	$81,040	-	-	-	-
Religious / Non-profit	1	1	100%						
Government									
Education									
Utilities	-	-	-	-	-	-	-	-	-

A crude oil/petroleum pipeline diagonally intersects the county from Exline to Udell. This line touches the very southeastern corner of the community and has a limited effect on the area. With approximately 10 structures affected.

UNIONVILLE – Pipeline Incident

Type of Structure	Number of Structures			Value of Structures			Number of People		
	# in City	# in Hazard Area	% in Hazard Area	$ in City	$ in Hazard Area	% in Hazard Area	# in City	# in Hazard Area	% in Hazard Area

Residential	58	6	10%	$1,728,350	$172,835	10%	124	50	10%
Commercial				$50,000	$5,000	10%			
Industrial	-	-	-	-	-	-	-	-	-
Agricultural	-	-	-	-	-	-	-	-	-
Religious / Non-profit	2	1	10%						
Government	1	1	0%						
Education									
Utilities	-	-							

The crude oil/petroleum pipeline continues from the southeastern corner of Udell to the northwestern corner of Unionville. This places a limited number of properties at risk of experiencing such an event and no critical facilities.

Centerville – Transportation of Radiological Material or Transportation of Hazardous Materials

Type of Structure	Number of Structures			Value of Structures			Number of People		
	# in City	# in Hazard Area	% in Hazard Area	$ in City	$ in Hazard Area	% in Hazard Area	# in City	# in Hazard Area	% in Hazard Area
Residential	2133	853	40%	$110,843,858	$44,337,543	40%	5904	2362	40%
Commercial	122	12	10%	$17,018,799	$1,701,880	10%			
Industrial	4	3	40%	$11,790,212	$4,716,085	40%	-	-	-
Agricultural	-	-	-				-	-	-
Religious / Non-profit	15	1	10%						
Government	3	0	0%						
Education	12	1	10%						
Utilities	2	1	10%	-	-	-	-	-	-

Appanoose Community Railroad begin the lines within the city limits of Centerville. The rail line is utilized for the transportation of products manufactured locally in the industrial park area and could potential transport Radiological materials. It is estimated that 213 residential structures, 12 private businesses and three industries could be affected. A lower income-housing region is near the industrial park and could be affects as well.

State Highways 5 and 2 intersect near the center of the city of Centerville. Both highways provide access to critical services and commuting routes for employers, therefore they are very busy roadways. Each are also lined with businesses and residential structures that could potentially be effected in a Highway Transportation Incident. Critical businesses could include a Dialysis Center, 5 gas stations, and the County Sheriff's office.

Moravia- Transportation of Radiological Materials or Transportation of Hazardous Materials

Type of Structure	Number of Structures			Value of Structures			Number of People		
	# in City	# in Hazard Area	% in Hazard Area	$ in City	$ in Hazard Area	% in Hazard Area	# in City	# in Hazard Area	% in Hazard Area
Residential	51	5	10%	$2,037,980	$203,798	10%	89	9	10%
Commercial	2		0%	$136,260	$13,626	10%			
Industrial	-	-	-	-	-	-	-	-	-
Agricultural	-	-	-	-			-	-	-

Religious / Non-profit	1	0	0%						
Government									
Education									
Utilities	-	-	-	-	-	-	-	-	-

The jurisdiction of Rathbun has a rail road line that brushes the eastern edge of the community and could potentially provide opportunity for an incident with Radiological materials. There is minimal risk to possible structures along this outer lying boundary.

Moravia- Transportation of Radiological Materials or Transportation of Hazardous Materials

Type of Structure	Number of Structures			Value of Structures			Number of People		
	# in City	# in Hazard Area	% in Hazard Area	$ in City	$ in Hazard Area	% in Hazard Area	# in City	# in Hazard Area	% in Hazard Area
Residential	291	43	15%	$15,560,965	$7,780,482	100%	721	108	15%
Commercial	8	1	15%	$2,041,640	$306,246	15%			15%
Industrial	3	1	15%	-	-	-	-	-	-
Agricultural	-	-	-	-	-	-	-	-	-
Religious / Non-profit	2	1	50%						
Government	3	3	15%						
Education	1	0	0%						
Utilities	-	-	-	-	-	-	-	-	-

The Radiological materials may commute along a rail line that extends parallel to highway 5 (north and south) and continues through the west edge of the jurisdiction. A second line also crosses from the southwest corner to the northeast corner of the city. With both lines intersecting the city limits it places approximately 43 residential structures and 4 private businesses within 500 feet of either rail line. An incident could also impact a large church (that is also a designated Red Cross Shelter site) and the local school (kindergarten through grade 12).

Mystic –Transportation of Radiological Materials or Transportation of Hazardous Materials

Type of Structure	Number of Structures			Value of Structures			Number of People		
	# in City	# in Hazard Area	% in Hazard Area	$ in City	$ in Hazard Area	% in Hazard Area	# in City	# in Hazard Area	% in Hazard Area
Residential	227	170	15%	$6,445,315	$966,797	15%	588	88	15%
Commercial	3	1	50%	$640,280	$320,140	50%	25	12	50%
Industrial	-	-	-	-	-	-	-	-	-
Agricultural	-	-	-	-	-	-	-	-	-
Religious / Non-profit	1	1	0%						
Government	4	2	50%						
Education	1	0	0%						
Utilities	-	-	-	-	-	-	-	-	-

There are very few buildings located within 100 feet of the railroad track that runs through Mystic that would be possibly affected by the transportation of Radiological Materials by rail way. The railroad passes part of Main Street but only the structures on the south side of the Main Street are within about 500 feet of the line. This would include the community center, private business, city park and the sewage lift station.

Mystic –Waterway Incident

Type of Structure	Number of Structures			Value of Structures			Number of People		
	# in City	# in Hazard Area	% in Hazard Area	$ in City	$ in Hazard Area	% in Hazard Area	# in City	# in Hazard Area	% in Hazard Area
Residential	227	170	15%	$6,445,315	$4,833,986	15%	588	412	15%
Commercial	3	1	15%	$640,280	$211,292	15%	25	8	15%
Industrial	-	-	-	-	-	-	-	-	-
Agricultural	-	-	-	-	-	-	-	-	-
Religious / Non-profit	1	1	100%						
Government	4	2	50%						
Education	1	1	100%						
Utilities	-	-	-	-	-	-	-	-	-

The community of Mystic has a Resevior on the northern edge of the City limits. This small body of water offers opportunity for fisherman, swimmers and potential waterway incidents.

Centerville – Waterway Incident

Type of Structure	Number of Structures			Value of Structures			Number of People		
	# in City	# in Hazard Area	% in Hazard Area	$ in City	$ in Hazard Area	% in Hazard Area	# in City	# in Hazard Area	% in Hazard Area
Residential	2133	213	10%	$110,843,858	$11,084,386	10%	5904	590	10%
Commercial	122	6	5%	$17,018,799	$850,940	5%			
Industrial	4	1	5%	$11,790,212	$589,511	5%	-	-	-
Agricultural	-	-	-				-	-	-
Religious / Non-profit	15	1	5%						
Government	3	0	0%						
Education	12	1	5%						
Utilities	2	1	5%	-	-	-	-	-	-

Centerville has the Upper and Lower Reservior on the southern edge of the jurisdiction that could experience a Waterway incident. Also the Chariton River touches the northern edge of the city limits and has frequent fisherman and boaters on it.

Rathbun – Waterway Incident

Type of Structure	Number of Structures			Value of Structures			Number of People		
	# in City	# in Hazard Area	% in Hazard Area	$ in City	$ in Hazard Area	% in Hazard Area	# in City	# in Hazard Area	% in Hazard Area
Residential	51	20	40%	$2,037,980	$815,192	40%	89	36	40%
Commercial	2	1	50%	$136,260	$54,504	40%			
Industrial	-	-	-	-	-	-	-	-	-
Agricultural	-	-	-	-			-	-	-

Religious / Non-profit	1	0	0%						
Government									
Education									
Utilities	-	-	-	-	-	-	-	-	-

This jurisdiction is less than 2 miles downstream from Lake Rathbun. A waterway incident could potentially occur on the Chariton river or a higher risk of occurrence on nearby Lake Rathbun.

Lake Rathbun- Waterway Incident

Type of Structure	Number of Structures			Value of Structures			Number of People		
	# in City	# in Hazard Area	% in Hazard Area	$ in City	$ in Hazard Area	% in Hazard Area	# in City	# in Hazard Area	% in Hazard Area
Residential	2133	213	10%	$110,843,858	$11,084,386	10%	5904	590	10%
Commercial	122	6	5%	$17,018,799	$850,940	5%			
Industrial	4	1	5%	$11,790,212	$589,511	5%	-	-	-
Agricultural	-	-	-				-	-	-
Religious / Non-profit	15	1	5%						
Government	3	0	0%						
Education	12	1	5%						
Utilities	2	1	5%	-	-	-	-	-	-

UNINCORPORATED COUNTY AREA – Waterway Incident

Type of Structure	Number of Structures			Value of Structures			Number of People		
	# in region	# in Hazard Area	% in Hazard Area	$ in City	$ in Hazard Area	% in Hazard Area	# in region	# in Hazard Area	% in Hazard Area
Residential	2432	243	10%	$194,641,377	$19,464,137	10%	4,805	480	10%
Commercial	122	12	10%	$17,018,799	$1,701,879	10%			10%
Industrial	2	1	10%	$558,259	$55,825	10%	-	-	-
Agricultural	-	-		$133,392,847	$13,339,284	10%	-	-	-
Religious / Non-profit	4	1	10%						
Government									
Education									
Utilities	-	-	-	-	-	-	-	-	-

There are 14 rivers/creeks in Appanoose County where a waterway incident could potentially occur. A greater risk could occur in larger bodies of water within the county. Lake Rathbun is the second largest man-made lake in Iowa. Also in this county there are other smaller watersheds that are Sundown Lake located in the rural section of Appanoose County about 6 miles from Moulton.

Centerville – Fixed Hazardous Materials

Type of Structure	Number of Structures			Value of Structures			Number of People		
	# in City	# in Hazard	% in Hazard	$ in City	$ in Hazard Area	% in Hazard	# in City	# in Hazard	% in Hazard

		Area	Area			Area		Area	Area
Residential	2133	213	10%	$110,843,858	$4,433,754	10%	5904	590	10%
Commercial	122	12	10%	$17,018,799	$170,188	10%			
Industrial	4	1	10%	$11,790,212	$471,608	10%	-	-	-
Agricultural	-	-	-				-	-	-
Religious / Non-profit	15	1	10%						
Government	3	0	0%						
Education	12	1	10%						
Utilities	2	1	10%	-	-	-	-	-	-

The opportunity of an incident of Fixed Hazardous Materials increases in the City of Centerville because there are seven fuel stations located throughout the city, although such an event could occur anywhere as an accidental spill.

Cincinnati – Fixed Hazardous Materials

Type of Structure	Number of Structures			Value of Structures			Number of People		
	# in City	# in Hazard Area	% in Hazard Area	$ in City	$ in Hazard Area	% in Hazard Area	# in City	# in Hazard Area	% in Hazard Area
Residential	197	10	5%	$6,011,450	$300,573	5%	421	21	5%
Commercial	3	1	5%	$292,650	$14,633	5%			
Industrial	-	-	-	-	-	-	-	-	-
Agricultural	-	-	-	$482,065	-	-	-	-	-
Religious / Non-profit	3	1	5%						
Government	2	2	5%						
Education	1	1	5%						
Utilities	-	-	-	-	-	-	-	-	-

Cincinnati offers one fuel station, but such an event could occur anywhere as an accidental spill.

Moravia- Fixed Hazardous Materials

Type of Structure	Number of Structures			Value of Structures			Number of People		
	# in City	# in Hazard Area	% in Hazard Area	$ in City	$ in Hazard Area	% in Hazard Area	# in City	# in Hazard Area	% in Hazard Area
Residential	291	15	5%	$15,560,965	$778,048	5%	721	36	5%
Commercial	8	1	5%	$2,041,640	$102,082	5%			5%
Industrial	3	1	5%	-	-	-	-	-	-
Agricultural	-	-	-	-	-	-	-	-	-
Religious / Non-profit	2	1	50%						
Government	3	3	5%						
Education	1	0	0%						
Utilities	-	-	-	-	-	-	-	-	-

Moravia offers two fuel stations and an anhydrous ammonia service, but such an event could occur anywhere as an accidental spill.

Moulton – Fixed Hazardous Materials

Type of Structure	Number of Structures			Value of Structures			Number of People		
	# in City	# in Hazard Area	% in Hazard Area	$ in City	$ in Hazard Area	% in Hazard Area	# in City	# in Hazard Area	% in Hazard Area
Residential	269	13	5%	$11,240,353	$4,496,141	40%	631	252	40%
Commercial	15	1	5 %	$1,517,240	$151,724	10%			
Industrial	-	-	-	-	-	-	-	-	-
Agricultural	-	-	-	-		-	-	-	-
Religious / Non-profit	3	1	10%						
Government	3	3	10%						
Education	1	0	0%						
Utilities	-	-	-	-	-	-	-	-	-

Moulton offers two fuel stations and an anhydrous ammonia service, but such an event could occur anywhere as an accidental spill.

Exline – Fixed Hazardous Materials

Type of Structure	Number of Structures			Value of Structures			Number of People		
	# in City	# in Hazard Area	% in Hazard Area	$ in City	$ in Hazard Area	% in Hazard Area	# in City	# in Hazard Area	% in Hazard Area
Residential	77	2	2%	$2,451,760	$49,035	2%	197	4	2%
Commercial	8	1	2%	$670,220	$13,404	2%			2%
Industrial	-	-	-	-	-	-	-	-	-
Agricultural	-	-	-	-		-	-	-	-
Religious / Non-profit	1	0	0%						
Government	2	0	0%						
Education									
Utilities	-	-	-	-	-	-	-	-	-

Exline offers one fuel station, but such an event could occur anywhere as an accidental spill.

UNINCORPORATED COUNTY AREA – Levee failure

Type of Structure	Number of Structures			Value of Structures			Number of People		
	# in region	# in Hazard Area	% in Hazard Area	$ in City	$ in Hazard Area	% in Hazard Area	# in region	# in Hazard Area	% in Hazard Area
Residential	2432	49	2%	$194,641,377	$3,892,828	2%	4,805		2%
Commercial	122	2	2%	$17,018,799	$340,376	2%			2%
Industrial	2	1	2%	$558,259	$11,165	2%	-	-	-
Agricultural	-	-		$133,392,847	$2,667,857	2%	-	-	-
Religious / Non-profit	4	1	2%						
Government									
Education									
Utilities	-	-	-	-	-	-	-	-	-

There are many agricultural levees scattered throughout Appanoose County. This is a beneficial farm technique to enhance crop growth but provides little security of flood control to structures. The failure of such levees would result in the potential loss of crops and income for farms but otherwise have a very small impact on other residents of the county.

CENTERVILLE- Radon/Lead

Type of Structure	Number of Structures			Value of Structures			Number of People		
	# in City	# in Hazard Area	% in Hazard Area	$ in City	$ in Hazard Area	% in Hazard Area	# in City	# in Hazard Area	% in Hazard Area
Residential	2133	1557	73%	$110,843,858	$80,916,016	73%	5904	4,310	73%
Commercial	122	89	73%	$17,018,799	$12,423,723	73%			
Industrial	4	2	50%	$11,790,212	$5,895,106	50%	-	-	-
Agricultural	-	-	-	$483,580	$241,790	50%	-	-	-
Religious / Non-profit	15	8	50%						
Government	3	1	10%						
Education	12	0	0%						
Utilities	2	1	50%	-	-	-	-	-	-

The estimated percentage of structures in Centerville is based on the 2000 Census housing information and the Appanoose County Assessor's Office. This identifies structures that are built prior to the year of 1970 when lead was a common component used in construction.

CINCINNATI – Radon/Lead

Type of Structure	Number of Structures			Value of Structures			Number of People		
	# in City	# in Hazard Area	% in Hazard Area	$ in City	$ in Hazard Area	% in Hazard Area	# in City	# in Hazard Area	% in Hazard Area
Residential	197	136	69%	$6,011,450	$4,147,901	69%	421	421	69%
Commercial	3	2	50%	$292,650	$146,325	50%			
Industrial	-	-	-	-	-	-	-	-	-
Agricultural	-	-	-	$482,065	-	0%	-	-	-
Religious / Non-profit	2	1	50%						
Government	2	1	50%						
Education	1	0	0%						
Utilities	-	-	-	-	-	-	-	-	-

The estimated percentage of structures in Cincinnati is based on the 2000 Census housing information and the Appanoose County Assessor's Office. This identifies structures that are built prior to the year of 1970 when lead was a common component used in construction.

EXLINE – Radon/Lead

Type of Structure	Number of Structures			Value of Structures			Number of People		
	# in City	# in Hazard Area	% in Hazard Area	$ in City	$ in Hazard Area	% in Hazard Area	# in City	# in Hazard Area	% in Hazard Area

Residential	77	52	68%	$2,451,760	$1,667,197	68%	197	134	68%
Commercial	8	5	68%	$670,220	$455,750	68%			
Industrial	-	-	-	-	-	-	-	-	-
Agricultural	-	-	-	-	$320,790	-	-	-	-
Religious / Non-profit	2	1	50%						
Government	2	0	0%						
Education									
Utilities	-	-	-	-	-	-	-	-	-

The estimated percentage of structures in Exline is based on the 2000 Census housing information and the Appanoose County Assessor's Office. This identifies structures that are built prior to the year of 1970 when lead was a common component used in construction.

NUMA – Radon/Lead

Type of Structure	Number of Structures			Value of Structures			Number of People		
	# in City	# in Hazard Area	% in Hazard Area	$ in City	$ in Hazard Area	% in Hazard Area	# in City	# in Hazard Area	% in Hazard Area
Residential	59	47	80%	$1,678,410	$1,342,728	80%	112	90	80%
Commercial	1	1	100%	$58,720	$58,720	100%			
Industrial	-	-	-	-	-	-	-	-	-
Agricultural	-	-	-	-	-	-	-	-	-
Religious / Non-profit	1	1	100%						
Government									
Education									
Utilities	-	-	-	-	-	-	-	-	-

The estimated percentage of structures in Numa is based on the 2000 Census housing information and the Appanoose County Assessor's Office. This identifies structures that are built prior to the year of 1970 when lead was a common component used in construction.

PLANO – Radon/Lead

Type of Structure	Number of Structures			Value of Structures			Number of People		
	# in City	# in Hazard Area	% in Hazard Area	$ in City	$ in Hazard Area	% in Hazard Area	# in City	# in Hazard Area	% in Hazard Area
Residential	40	18	45%	$1,593,740	$717,183	45%	65	29	45%
Commercial	3	2	50%	$31,360	$14,112	45%			
Industrial	-	-	-	-	-	-	-	-	-
Agricultural	-	-	-	-		-	-	-	-
Religious / Non-profit	1	0	0%	$125,000					
Government									
Education									
Utilities									

The estimated percentage of structures in Plano is based on the 2000 Census housing information and the Appanoose County Assessor's Office. This identifies structures that are built prior to the year of 1970 when lead was a common component used in construction.

MYSTIC – Radon/Lead

Type of Structure	Number of Structures			Value of Structures			Number of People		
	# in City	# in Hazard Area	% in Hazard Area	$ in City	$ in Hazard Area	% in Hazard Area	# in City	# in Hazard Area	% in Hazard Area
Residential	227	154	68%	$6,445,315	$4,382,814	68%	588	400	68%
Commercial	3	2	68%	$640,280	$435,390	68%			
Industrial	-	-	-	-	-	-	-	-	-
Agricultural	-	-	-	-	-	-	-	-	-
Religious / Non-profit	1	1	50%						
Government	4	4	25%						
Education	1	0	0%						
Utilities	-	-	-	-	-	-	-	-	-

The estimated percentage of structures in Mystic is based on the 2000 Census housing information and the Appanoose County Assessor's Office. This identifies structures that are built prior to the year of 1970 when lead was a common component used in construction.

RATHBUN – Radon/Lead

Type of Structure	Number of Structures			Value of Structures			Number of People		
	# in City	# in Hazard Area	% in Hazard Area	$ in City	$ in Hazard Area	% in Hazard Area	# in City	# in Hazard Area	% in Hazard Area
Residential	51	41	80%	$2,037,980	$1,630,384	80%	89	71	80%
Commercial	2	1	80%	$136,260	$109,008	80%			
Industrial	-	-	-	-	-	-	-	-	-
Agricultural	-	-	-	-			-	-	-
Religious / Non-profit	1	1	100%						
Government									
Education									
Utilities	-	-	-	-	-	-	-	-	-

The estimated percentage of structures in Rathbun is based on the 2000 Census housing information and the Appanoose County Assessor's Office. This identifies structures that are built prior to the year of 1970 when lead was a common component used in construction.

MORAVIA – Radon/Lead

Type of Structure	Number of Structures			Value of Structures			Number of People		
	# in City	# in Hazard Area	% in Hazard Area	$ in City	$ in Hazard Area	% in Hazard Area	# in City	# in Hazard Area	% in Hazard Area
Residential	291	180	62%	$15,560,965	$9,647,798	62%	721	447	62%

Commercial	8	5	62%	$2,041,640	$1,265,817	62%			
Industrial	3	1	50%	-	-	-	-	-	-
Agricultural	-	-	-	-	-	-	-	-	-
Religious / Non-profit	2	1	50%						
Government	3	1	50%						
Education	1	0	0%						
Utilities	-	-	-	-	-	-	-	-	-

The estimated percentage of structures in Moravia is based on the 2000 Census housing information and the Appanoose County Assessor's Office. This identifies structures that are built prior to the year of 1970 when lead was a common component used in construction.

UNIONVILLE – Radon/Lead

Type of Structure	Number of Structures			Value of Structures			Number of People		
	# in City	# in Hazard Area	% in Hazard Area	$ in City	$ in Hazard Area	% in Hazard Area	# in City	# in Hazard Area	% in Hazard Area
Residential	58	58	62%	$1,728,350	$1,071,577	62%	124	77	62%
Commercial			0%						
Industrial	-	-	-	-	-	-	-	-	-
Agricultural	-	-	-	-	-	-	-	-	-
Religious / Non-profit	2	1	50%						
Government	1	0	0%						
Education									
Utilities	-	-							

The estimated percentage of structures in Unionville is based on the 2000 Census housing information and the Appanoose County Assessor's Office. This identifies structures that are built prior to the year of 1970 when lead was a common component used in construction.

UDELL – Radon/Lead

Type of Structure	Number of Structures			Value of Structures			Number of People		
	# in City	# in Hazard Area	% in Hazard Area	$ in City	$ in Hazard Area	% in Hazard Area	# in City	# in Hazard Area	% in Hazard Area
Residential	24	21	86%	$596,200	$512,732	86%	65	56	86%
Commercial	1	1	100%	$5,670	$567	100%			
Industrial	-	-	-	-	-	-	-	-	-
Agricultural	-	-	-	-		-	-	-	-
Religious / Non-profit	1	1	100%						
Government									
Education									
Utilities	-	-	-	-	-	-	-	-	-

The estimated percentage of structures in Udell is based on the 2000 Census housing information and the Appanoose County Assessor's Office. This identifies structures that are built prior to the year of 1970 when lead was a common component used in construction.

MOULTON – Radon/Lead

Type of Structure	Number of Structures			Value of Structures			Number of People		
	# in City	# in Hazard Area	% in Hazard Area	$ in City	$ in Hazard Area	% in Hazard Area	# in City	# in Hazard Area	% in Hazard Area
Residential	269	164	61%	$11,240,353	$6,856,615	61%	631	385	61%
Commercial	15	7	50%	$1,517,240	$758,620	50%			
Industrial	-	-	-	-	-	-	-	-	-
Agricultural	-	-	-	-		-	-	-	-
Religious / Non-profit	3	1	50%						
Government	3	1	10%						
Education	1	0	0%						
Utilities	-	-	-	-	-	-	-	-	-

The estimated percentage of structures in Moulton is based on the 2000 Census housing information and the Appanoose County Assessor's Office. This identifies structures that are built prior to the year of 1970 when lead was a common component used in construction.

CENTERVILLE- Structural Failure & Structural Fire

Type of Structure	Number of Structures			Value of Structures			Number of People		
	# in City	# in Hazard Area	% in Hazard Area	$ in City	$ in Hazard Area	% in Hazard Area	# in City	# in Hazard Area	% in Hazard Area
Residential	2133	1557	73%	$110,843,858	$80,916,016	73%	5904	4,310	73%
Commercial	122	89	73%	$17,018,799	$12,423,723	73%			
Industrial	4	2	50%	$11,790,212	$5,895,106	50%	-	-	-
Agricultural	-	-	-	$483,580	$241,790	50%	-	-	-
Religious / Non-profit	15	8	50%						
Government	3	1	10%						
Education	12	0	0%						
Utilities	2	1	50%	-	-	-	-	-	-

The estimated percentage of structures at risk of failure or fire is determined by the age of the structures deemed by the 2000 US Census and Appanoose County Assessor's office. The jurisdictions in this region were established during the late 1800's to the early 1900's and many of the original buildings are utilized now. The age of the structures and the wiring of the buildings would not meet current codes and places most of the structures at risk. There are multiple businesses located around the historic square of Centerville that utilize the structures which places the approximately twenty-five businesses at risk in this area alone.

CINCINNATI – Structural Failure & Structural Fire

Type of Structure	Number of Structures			Value of Structures			Number of People		
	# in	# in	% in	$ in City	$ in	% in	# in	# in	% in

	City	Hazard Area	Hazard Area		Hazard Area	Hazard Area	City	Hazard Area	Hazard Area
Residential	197	136	69%	$6,011,450	$4,147,901	69%	421	421	69%
Commercial	3	2	50%	$292,650	$146,325	50%			
Industrial	-	-	-	-	-	-	-	-	-
Agricultural	-	-	-	$482,065	-	0%	-	-	-
Religious / Non-profit	2	1	50%						
Government	2	1	50%						
Education	1	0	0%						
Utilities	-	-	-	-	-	-	-	-	-

The estimated percentage of structures at risk of failure or fire is determined by the age of the structures deemed by the 2000 US Census and Appanoose County Assessor's office. The jurisdictions in this region were established during the late 1800's to the early 1900's and many of the original buildings are utilized now. The age of the structures and the wiring of the buildings would not meet current codes and places most of the structures at risk. A current building that has been identified and cited by Department of Transportation and Department of Public Health is the Mason's building that is collapsing in the direction of the state highway. A small portion of the attached building is rented by the US Postal service. The city is actively pursuing options to mitigation this action but is limited by funding.

EXLINE – Structural Failure & Structural Fire

Type of Structure	Number of Structures			Value of Structures			Number of People		
	# in City	# in Hazard Area	% in Hazard Area	$ in City	$ in Hazard Area	% in Hazard Area	# in City	# in Hazard Area	% in Hazard Area
Residential	77	52	68%	$2,451,760	$1,667,197	68%	197	134	68%
Commercial	8	2	25%	$670,220	$167,555	25%			
Industrial	-	-	-	-	-	-	-	-	-
Agricultural	-	-	-	-		-	-	-	-
Religious / Non-profit	2	1	50%						
Government	2	0	0%						
Education									
Utilities	-	-	-	-	-	-	-	-	-

The estimated percentage of structures at risk of failure or fire is determined by the age of the structures deemed by the 2000 US Census and Appanoose County Assessor's office. The jurisdictions in this region were established during the late 1800's to the early 1900's and many of the original buildings are utilized now. The age of the structures and the wiring of the buildings would not meet current codes and places most of the structures at risk.

NUMA – Structural Failure & Structural Fire

Type of Structure	Number of Structures			Value of Structures			Number of People		
	# in City	# in Hazard Area	% in Hazard Area	$ in City	$ in Hazard Area	% in Hazard Area	# in City	# in Hazard Area	% in Hazard Area
Residential	59	47	80%	$1,678,410	$1,342,728	80%	112	90	80%

Commercial	1	1	100%	$58,720	$58,720	100%			
Industrial	-	-	-	-	-	-	-	-	-
Agricultural	-	-	-	-	-	-	-	-	-
Religious / Non-profit	1	1	100%						
Government									
Education									
Utilities	-	-	-	-	-	-	-	-	-

The estimated percentage of structures at risk of failure or fire is determined by the age of the structures deemed by the 2000 US Census and Appanoose County Assessor's office. The jurisdictions in this region were established during the late 1800's to the early 1900's and many of the original buildings are utilized now. The age of the structures and the wiring of the buildings would not meet current codes and places most of the structures at risk.

PLANO – Structural Failure & Structural Fire

Type of Structure	Number of Structures			Value of Structures			Number of People		
	# in City	# in Hazard Area	% in Hazard Area	$ in City	$ in Hazard Area	% in Hazard Area	# in City	# in Hazard Area	% in Hazard Area
Residential	40	18	45%	$1,593,740	$717,183	45%	65	29	45%
Commercial	3	2	50%	$31,360	$14,112	45%			
Industrial	-	-	-	-	-	-	-	-	-
Agricultural	-	-	-	-		-	-	-	-
Religious / Non-profit	1	0	0%	$125,000					
Government									
Education									
Utilities									

The estimated percentage of structures at risk of failure or fire is determined by the age of the structures deemed by the 2000 US Census and Appanoose County Assessor's office. The jurisdictions in this region were established during the late 1800's to the early 1900's and many of the original buildings are utilized now. The age of the structures and the wiring of the buildings would not meet current codes and places most of the structures at risk.

MYSTIC – Structural Failure & Structural Fire

Type of Structure	Number of Structures			Value of Structures			Number of People		
	# in City	# in Hazard Area	% in Hazard Area	$ in City	$ in Hazard Area	% in Hazard Area	# in City	# in Hazard Area	% in Hazard Area
Residential	227	154	68%	$6,445,315	$4,382,814	68%	588	400	68%
Commercial	3	2	68%	$640,280	$435,390	68%			
Industrial	-	-	-	-	-	-	-	-	-
Agricultural	-	-	-	-	-	-	-	-	-
Religious / Non-profit	1	1	50%						
Government	4	4	25%						
Education	1	0	0%						

Utilities	-	-	-	-	-	-	-	-	-

The estimated percentage of structures at risk of failure or fire is determined by the age of the structures deemed by the 2000 US Census and Appanoose County Assessor's office. The jurisdictions in this region were established during the late 1800's to the early 1900's and many of the original buildings are utilized now. The age of the structures and the wiring of the buildings would not meet current codes and places most of the structures at risk. This would include the city's community hall/red cross site, and all the buildings /businesses on Main Street.

RATHBUN – Structural Failure & Structural Fire

Type of Structure	Number of Structures			Value of Structures			Number of People		
	# in City	# in Hazard Area	% in Hazard Area	$ in City	$ in Hazard Area	% in Hazard Area	# in City	# in Hazard Area	% in Hazard Area
Residential	51	41	80%	$2,037,980	$1,630,384	80%	89	71	80%
Commercial	2	1	80%	$136,260	$109,008	80%			
Industrial	-	-	-	-	-	-	-	-	-
Agricultural	-	-	-	-			-	-	-
Religious / Non-profit	1	1	100%						
Government									
Education									
Utilities	-	-	-	-	-	-	-	-	-

The estimated percentage of structures at risk of failure or fire is determined by the age of the structures deemed by the 2000 US Census and Appanoose County Assessor's office. The jurisdictions in this region were established during the late 1800's to the early 1900's and many of the original buildings are utilized now. The age of the structures and the wiring of the buildings would not meet current codes and places most of the structures at risk.

MORAVIA – Structural Failure & Structural Fire

Type of Structure	Number of Structures			Value of Structures			Number of People		
	# in City	# in Hazard Area	% in Hazard Area	$ in City	$ in Hazard Area	% in Hazard Area	# in City	# in Hazard Area	% in Hazard Area
Residential	291	180	62%	$15,560,965	$9,647,798	62%	721	447	62%
Commercial	8	5	62%	$2,041,640	$1,265,817	62%			
Industrial	3	1	50%	-	-	-	-	-	-
Agricultural	-	-	-	-	-	-	-	-	-
Religious / Non-profit	2	1	50%						
Government	3	1	50%						
Education	1	0	0%						
Utilities	-	-	-	-	-	-	-	-	-

The estimated percentage of structures at risk of failure or fire is determined by the age of the structures deemed by the 2000 US Census and Appanoose County Assessor's office. The jurisdictions in this region were established during the late 1800's to the early 1900's and many of the original buildings are utilized now. The age of the structures and the wiring of the buildings would not meet current codes and places most of

the structures at risk. There are aged-structures located on the old square/business district of the community that are at particular risk.

UNIONVILLE – Structural Failure & Structural Fire

Type of Structure	Number of Structures			Value of Structures			Number of People		
	# in City	# in Hazard Area	% in Hazard Area	$ in City	$ in Hazard Area	% in Hazard Area	# in City	# in Hazard Area	% in Hazard Area
Residential	58	58	62%	$1,728,350	$1,071,577	62%	124	77	62%
Commercial			0%						
Industrial	-	-	-	-	-	-	-	-	-
Agricultural	-	-	-	-	-	-	-	-	-
Religious / Non-profit	2	1	50%						
Government	1	0	0%						
Education									
Utilities	-	-							

The estimated percentage of structures at risk of failure or fire is determined by the age of the structures deemed by the 2000 US Census and Appanoose County Assessor's office. The jurisdictions in this region were established during the late 1800's to the early 1900's and many of the original buildings are utilized now. The age of the structures and the wiring of the buildings would not meet current codes and places most of the structures at risk. There are no longer any businesses located in the city limits of Unionville, but there many residential structures that are aged and at risk also.

UDELL – Structural Failure & Structural Fire

Type of Structure	Number of Structures			Value of Structures			Number of People		
	# in City	# in Hazard Area	% in Hazard Area	$ in City	$ in Hazard Area	% in Hazard Area	# in City	# in Hazard Area	% in Hazard Area
Residential	24	21	86%	$596,200	$512,732	86%	65	56	86%
Commercial	1	1	100%	$5,670	$567	100%			
Industrial	-	-	-	-	-	-	-	-	-
Agricultural	-	-	-	-		-	-	-	-
Religious / Non-profit	1	1	100%						
Government									
Education									
Utilities	-	-	-	-	-	-	-	-	-

The estimated percentage of structures at risk of failure or fire is determined by the age of the structures deemed by the 2000 US Census and Appanoose County Assessor's office. The jurisdictions in this region were established during the late 1800's to the early 1900's and many of the original buildings are utilized now. The age of the structures and the wiring of the buildings would not meet current codes and places most of the structures at risk. There are no longer any businesses located in the city limits of Udell, but there many residential structures that are aged and at risk also.

MOULTON – Structural Failure & Structural Fire

Type of Structure	Number of Structures			Value of Structures			Number of People		
	# in City	# in Hazard Area	% in Hazard Area	$ in City	$ in Hazard Area	% in Hazard Area	# in City	# in Hazard Area	% in Hazard Area
Residential	269	164	61%	$11,240,353	$6,856,615	61%	631	385	61%
Commercial	15	7	50%	$1,517,240	$758,620	50%			
Industrial	-	-	-	-	-	-	-	-	-
Agricultural	-	-	-	-		-	-	-	-
Religious / Non-profit	3	1	50%						
Government	3	1	10%						
Education	1	0	0%						
Utilities	-	-	-	-	-	-	-	-	-

The estimated percentage of structures at risk of failure or fire is determined by the age of the structures deemed by the 2000 US Census and Appanoose County Assessor's office. The jurisdictions in this region were established during the late 1800's to the early 1900's and many of the original buildings are utilized now. The age of the structures and the wiring of the buildings would not meet current codes and places most of the structures at risk. Most notably are the business structures that line the Main Street of Moulton. These are the original buildings erected about 100 years ago. There are also a large number of residential homes that are occupied in the aging housing stock to be at risk of failure or fire.

UNINCORPORATED COUNTY AREA – Animal/crop/plant Disease

Type of Structure	Number of Structures			Value of Structures			Number of People		
	# in region	# in Hazard Area	% in Hazard Area	$ in City	$ in Hazard Area	% in Hazard Area	# in region	# in Hazard Area	% in Hazard Area
Residential	2432			$194,641,377	$3,892,828		4,805		
Commercial	122			$17,018,799	$340,376				
Industrial	2			$558,259	$11,165		-	-	-
Agricultural	-			$133,392,847	$133,392,847	100%	-	-	-
Religious / Non-profit	4								
Government									
Education									
Utilities	-	-	-	-	-	-	-	-	-

CINCINNATI – Communication Failure

Type of Structure	Number of Structures			Value of Structures			Number of People		
	# in City	# in Hazard Area	% in Hazard Area	$ in City	$ in Hazard Area	% in Hazard Area	# in City	# in Hazard Area	% in Hazard Area
Residential	197	99	50%	$6,011,450	$3,005,725	50%	421	211	50%
Commercial	3	2	50%	$292,650	$146,325	50%			
Industrial	-	-	-	-	-	-	-	-	-
Agricultural	-	-	-	$482,065	-	0%	-	-	-
Religious /	2	1	50%						

Non-profit									
Government	2	1	50%						
Education	1	0	0%						
Utilities	-	-	-	-	-	-	-	-	-

Centerville - Communication Failure

Type of Structure	Number of Structures			Value of Structures			Number of People		
	# in City	# in Hazard Area	% in Hazard Area	$ in City	$ in Hazard Area	% in Hazard Area	# in City	# in Hazard Area	% in Hazard Area
Residential	2133	1066	50%	$110,843,858	$55,421,929	50%	5904	2952	50%
Commercial	122	61	50%	$17,018,799	$8,509399	50%			50%
Industrial	4	2	50%	$11,790,212	$5,895,106	50%	-	-	-
Agricultural	-	-	-	$483,580	$241,790	50%	-	-	-
Religious / Non-profit	15	7	50%						
Government	3	1	50%						
Education	12	6	50%						
Utilities	2	1	50%	-	-	-	-	-	-

Numa – Communication Failure

Type of Structure	Number of Structures			Value of Structures			Number of People		
	# in City	# in Hazard Area	% in Hazard Area	$ in City	$ in Hazard Area	% in Hazard Area	# in City	# in Hazard Area	% in Hazard Area
Residential	59	29	50%	$1,678,410	$839,205	50%	112	56	50%
Commercial	1	0	50%	$58,720	$29,360	50%			50%
Industrial	-	-	-	-	-	-	-	-	-
Agricultural	-	-	-	-	-	-	-	-	-
Religious / Non-profit	1	1	100%						
Government									
Education									
Utilities	-	-	-	-	-	-	-	-	-

Exline – Communication Failure

Type of Structure	Number of Structures			Value of Structures			Number of People		
	# in City	# in Hazard Area	% in Hazard Area	$ in City	$ in Hazard Area	% in Hazard Area	# in City	# in Hazard Area	% in Hazard Area
Residential	77	31	40%	$2,451,760	$980,704	40%	197	197	40%
Commercial	8	3	40%	$670,220	$268,088	40%			40%
Industrial	-	-	-	-	-	-	-	-	-
Agricultural	-	-	-	-		-	-	-	-
Religious / Non-profit	1	1	100%						
Government	2	2	50%						
Education									

Utilities	-	-	-	-	-	-	-	-	-

MOULTON – Communications Failure

Type of Structure	Number of Structures			Value of Structures			Number of People		
	# in City	# in Hazard Area	% in Hazard Area	$ in City	$ in Hazard Area	% in Hazard Area	# in City	# in Hazard Area	% in Hazard Area
Residential	269	164	61%	$11,240,353	$6,856,615	61%	631	385	61%
Commercial	15	7	50%	$1,517,240	$758,620	50%			
Industrial	-	-	-	-	-	-	-	-	-
Agricultural	-	-	-	-		-	-	-	-
Religious / Non-profit	3	1	50%						
Government	3	1	10%						
Education	1	0	0%						
Utilities	-	-	-	-	-	-	-	-	-

UNIONVILLE – Communications Failure

Type of Structure	Number of Structures			Value of Structures			Number of People		
	# in City	# in Hazard Area	% in Hazard Area	$ in City	$ in Hazard Area	% in Hazard Area	# in City	# in Hazard Area	% in Hazard Area
Residential	58	58	62%	$1,728,350	$1,071,577	62%	124	77	62%
Commercial			0%						
Industrial	-	-	-	-	-	-	-	-	-
Agricultural	-	-	-	-	-	-	-	-	-
Religious / Non-profit	2	1	50%						
Government	1	0	0%						
Education									
Utilities	-	-							

Mystic –Communications Failure

Type of Structure	Number of Structures			Value of Structures			Number of People		
	# in City	# in Hazard Area	% in Hazard Area	$ in City	$ in Hazard Area	% in Hazard Area	# in City	# in Hazard Area	% in Hazard Area
Residential	227	170	15%	$6,445,315	$966,797	15%	588	88	15%
Commercial	3	1	50%	$640,280	$320,140	50%	25	12	50%
Industrial	-	-	-	-	-	-	-	-	-
Agricultural	-	-	-	-	-	-	-	-	-
Religious / Non-profit	1	1	0%						
Government	4	2	50%						
Education	1	0	0%						

Utilities	-	-	-	-	-	-	-	-	-

UDELL – Communications Failure

Type of Structure	Number of Structures			Value of Structures			Number of People		
	# in City	# in Hazard Area	% in Hazard Area	$ in City	$ in Hazard Area	% in Hazard Area	# in City	# in Hazard Area	% in Hazard Area
Residential	24	21	86%	$596,200	$512,732	86%	65	56	86%
Commercial	1	1	100%	$5,670	$567	100%			
Industrial	-	-	-	-	-	-	-	-	-
Agricultural	-	-	-	-		-	-	-	-
Religious / Non-profit	1	1	100%						
Government									
Education									
Utilities	-	-	-	-	-	-	-	-	-

MORAVIA – Communications Failure

Type of Structure	Number of Structures			Value of Structures			Number of People		
	# in City	# in Hazard Area	% in Hazard Area	$ in City	$ in Hazard Area	% in Hazard Area	# in City	# in Hazard Area	% in Hazard Area
Residential	291	180	62%	$15,560,965	$9,647,798	62%	721	447	62%
Commercial	8	5	62%	$2,041,640	$1,265,817	62%			
Industrial	3	1	50%	-	-	-	-	-	-
Agricultural	-	-	-	-	-	-	-	-	-
Religious / Non-profit	2	1	50%						
Government	3	1	50%						
Education	1	0	0%						
Utilities	-	-	-	-	-	-	-	-	-

UNINCORPORATED COUNTY AREA – Communication Failure

Type of Structure	Number of Structures			Value of Structures			Number of People		
	# in region	# in Hazard Area	% in Hazard Area	$ in City	$ in Hazard Area	% in Hazard Area	# in region	# in Hazard Area	% in Hazard Area
Residential	2432			$194,641,377	$3,892,828		4,805		
Commercial	122			$17,018,799	$340,376				
Industrial	2			$558,259	$11,165		-	-	-
Agricultural	-			$133,392,847	$133,392,847	100%	-	-	-
Religious / Non-profit	4								
Government									
Education									

Utilities	-	-	-	-	-	-	-	-	-

Centerville Public School - Communication Failure

Type of Structure	Number of Structures			Value of Structures			Number of People		
	# in City	# in Hazard Area	% in Hazard Area	$ in City	$ in Hazard Area	% in Hazard Area	# in City	# in Hazard Area	% in Hazard Area
Residential	2133	1066	50%	$110,843,858	$55,421,929	50%	5904	2952	50%
Commercial	122	61	50%	$17,018,799	$8,509399	50%			50%
Industrial	4	2	50%	$11,790,212	$5,895,106	50%	-	-	-
Agricultural	-	-	-	$483,580	$241,790	50%	-	-	-
Religious / Non-profit	15	7	50%						
Government	3	1	50%						
Education	12	6	50%						
Utilities	2	1	50%	-	-	-	-	-	-

Moravia Public School - Communication Failure

Type of Structure	Number of Structures			Value of Structures			Number of People		
	# in City	# in Hazard Area	% in Hazard Area	$ in City	$ in Hazard Area	% in Hazard Area	# in City	# in Hazard Area	% in Hazard Area
Residential	2133	1066	50%	$110,843,858	$55,421,929	50%	5904	2952	50%
Commercial	122	61	50%	$17,018,799	$8,509399	50%			50%
Industrial	4	2	50%	$11,790,212	$5,895,106	50%	-	-	-
Agricultural	-	-	-	$483,580	$241,790	50%	-	-	-
Religious / Non-profit	15	7	50%						
Government	3	1	50%						
Education	12	6	50%						
Utilities	2	1	50%	-	-	-	-	-	-

Lake Rathbun- Communication Failure

Type of Structure	Number of Structures			Value of Structures			Number of People		
	# in City	# in Hazard Area	% in Hazard Area	$ in City	$ in Hazard Area	% in Hazard Area	# in City	# in Hazard Area	% in Hazard Area
Residential	2133	1066	50%	$110,843,858	$55,421,929	50%	5904	2952	50%
Commercial	122	61	50%	$17,018,799	$8,509399	50%			50%
Industrial	4	2	50%	$11,790,212	$5,895,106	50%	-	-	-
Agricultural	-	-	-	$483,580	$241,790	50%	-	-	-
Religious / Non-profit	15	7	50%						
Government	3	1	50%						
Education	12	6	50%						
Utilities	2	1	50%	-	-	-	-	-	-

CINCINNATI – Energy Failure

Type of Structure	Number of Structures			Value of Structures			Number of People		
	# in City	# in Hazard Area	% in Hazard Area	$ in City	$ in Hazard Area	% in Hazard Area	# in City	# in Hazard Area	% in Hazard Area
Residential	197	99	50%	$6,011,450	$3,005,725	50%	421	211	50%
Commercial	3	2	50%	$292,650	$146,325	50%			
Industrial	-	-	-	-	-	-	-	-	-
Agricultural	-	-	-	$482,065	-	0%	-	-	-
Religious / Non-profit	2	1	50%						
Government	2	1	50%						
Education	1	0	0%						
Utilities	-	-	-	-	-	-	-	-	-

Centerville - Energy Failure

Type of Structure	Number of Structures			Value of Structures			Number of People		
	# in City	# in Hazard Area	% in Hazard Area	$ in City	$ in Hazard Area	% in Hazard Area	# in City	# in Hazard Area	% in Hazard Area
Residential	2133	1066	50%	$110,843,858	$55,421,929	50%	5904	2952	50%
Commercial	122	61	50%	$17,018,799	$8,509399	50%			50%
Industrial	4	2	50%	$11,790,212	$5,895,106	50%	-	-	-
Agricultural	-	-	-	$483,580	$241,790	50%	-	-	-
Religious / Non-profit	15	7	50%						
Government	3	1	50%						
Education	12	6	50%						
Utilities	2	1	50%	-	-	-	-	-	-

Numa – Energy Failure

Type of Structure	Number of Structures			Value of Structures			Number of People		
	# in City	# in Hazard Area	% in Hazard Area	$ in City	$ in Hazard Area	% in Hazard Area	# in City	# in Hazard Area	% in Hazard Area
Residential	59	29	50%	$1,678,410	$839,205	50%	112	56	50%
Commercial	1	0	50%	$58,720	$29,360	50%			50%
Industrial	-	-	-	-	-	-	-	-	-
Agricultural	-	-	-	-	-	-	-	-	-
Religious / Non-profit	1	1	100%						
Government									

Education									
Utilities	-	-	-	-	-	-	-	-	-

Exline – Energy Failure

Type of Structure	Number of Structures			Value of Structures			Number of People		
	# in City	# in Hazard Area	% in Hazard Area	$ in City	$ in Hazard Area	% in Hazard Area	# in City	# in Hazard Area	% in Hazard Area
Residential	77	31	40%	$2,451,760	$980,704	40%	197	197	40%
Commercial	8	3	40%	$670,220	$268,088	40%			40%
Industrial	-	-	-	-	-	-	-	-	-
Agricultural	-	-	-	-		-	-	-	-
Religious / Non-profit	1	1	100%						
Government	2	2	50%						
Education									
Utilities	-	-	-	-	-	-	-	-	-

MOULTON – Energy Failure

Type of Structure	Number of Structures			Value of Structures			Number of People		
	# in City	# in Hazard Area	% in Hazard Area	$ in City	$ in Hazard Area	% in Hazard Area	# in City	# in Hazard Area	% in Hazard Area
Residential	269	164	61%	$11,240,353	$6,856,615	61%	631	385	61%
Commercial	15	7	50%	$1,517,240	$758,620	50%			
Industrial	-	-	-	-	-	-	-	-	-
Agricultural	-	-	-	-		-	-	-	-
Religious / Non-profit	3	1	50%						
Government	3	1	10%						
Education	1	0	0%						
Utilities	-	-	-	-	-	-	-	-	-

UNIONVILLE – Energy Failure

Type of Structure	Number of Structures			Value of Structures			Number of People		
	# in City	# in Hazard Area	% in Hazard Area	$ in City	$ in Hazard Area	% in Hazard Area	# in City	# in Hazard Area	% in Hazard Area
Residential	58	58	62%	$1,728,350	$1,071,577	62%	124	77	62%
Commercial			0%						
Industrial	-	-	-	-	-	-	-	-	-
Agricultural	-	-	-	-	-	-	-	-	-
Religious / Non-profit	2	1	50%						
Government	1	0	0%						

Education									
Utilities	-	-							

Mystic –Energy Failure

Type of Structure	Number of Structures			Value of Structures			Number of People		
	# in City	# in Hazard Area	% in Hazard Area	$ in City	$ in Hazard Area	% in Hazard Area	# in City	# in Hazard Area	% in Hazard Area
Residential	227	170	15%	$6,445,315	$966,797	15%	588	88	15%
Commercial	3	1	50%	$640,280	$320,140	50%	25	12	50%
Industrial	-	-	-	-	-	-	-	-	-
Agricultural	-	-	-	-	-	-	-	-	-
Religious / Non-profit	1	1	0%						
Government	4	2	50%						
Education	1	0	0%						
Utilities	-	-	-	-	-	-	-	-	-

UDELL – Energy Failure

Type of Structure	Number of Structures			Value of Structures			Number of People		
	# in City	# in Hazard Area	% in Hazard Area	$ in City	$ in Hazard Area	% in Hazard Area	# in City	# in Hazard Area	% in Hazard Area
Residential	24	21	86%	$596,200	$512,732	86%	65	56	86%
Commercial	1	1	100%	$5,670	$567	100%			
Industrial	-	-	-	-	-	-	-	-	-
Agricultural	-	-	-	-		-	-	-	-
Religious / Non-profit	1	1	100%						
Government									
Education									
Utilities	-	-	-	-	-	-	-	-	-

MORAVIA – Energy Failure

Type of Structure	Number of Structures			Value of Structures			Number of People		
	# in City	# in Hazard Area	% in Hazard Area	$ in City	$ in Hazard Area	% in Hazard Area	# in City	# in Hazard Area	% in Hazard Area
Residential	291	180	62%	$15,560,965	$9,647,798	62%	721	447	62%
Commercial	8	5	62%	$2,041,640	$1,265,817	62%			
Industrial	3	1	50%	-	-	-	-	-	-
Agricultural	-	-	-	-	-	-	-	-	-
Religious / Non-profit	2	1	50%						
Government	3	1	50%						
Education	1	0	0%						

Utilities	-	-	-	-	-	-	-	-	-

UNINCORPORATED COUNTY AREA – Energy Failure

Type of Structure	Number of Structures			Value of Structures			Number of People		
	# in region	# in Hazard Area	% in Hazard Area	$ in City	$ in Hazard Area	% in Hazard Area	# in region	# in Hazard Area	% in Hazard Area
Residential	2432			$194,641,377	$3,892,828		4,805		
Commercial	122			$17,018,799	$340,376				
Industrial	2			$558,259	$11,165		-	-	-
Agricultural	-			$133,392,847	$133,392,847	100%	-	-	-
Religious / Non-profit	4								
Government									
Education									
Utilities	-	-	-	-	-	-	-	-	-

Centerville Public School – Energy Failure

Type of Structure	Number of Structures			Value of Structures			Number of People		
	# in City	# in Hazard Area	% in Hazard Area	$ in City	$ in Hazard Area	% in Hazard Area	# in City	# in Hazard Area	% in Hazard Area
Residential	291	180	62%	$15,560,965	$9,647,798	62%	721	447	62%
Commercial	8	5	62%	$2,041,640	$1,265,817	62%			
Industrial	3	1	50%	-	-	-	-	-	-
Agricultural	-	-	-	-	-	-	-	-	-
Religious / Non-profit	2	1	50%						
Government	3	1	50%						
Education	1	0	0%						
Utilities	-	-	-	-	-	-	-	-	-

Moravia Public School – Energy Failure

Type of Structure	Number of Structures			Value of Structures			Number of People		
	# in City	# in Hazard Area	% in Hazard Area	$ in City	$ in Hazard Area	% in Hazard Area	# in City	# in Hazard Area	% in Hazard Area
Residential	291	180	62%	$15,560,965	$9,647,798	62%	721	447	62%
Commercial	8	5	62%	$2,041,640	$1,265,817	62%			
Industrial	3	1	50%	-	-	-	-	-	-
Agricultural	-	-	-	-	-	-	-	-	-
Religious / Non-profit	2	1	50%						
Government	3	1	50%						
Education	1	0	0%						

Utilities	-	-	-	-	-	-	-	-	-

Lake Rathbun – Energy Failure

Type of Structure	Number of Structures			Value of Structures			Number of People		
	# in City	# in Hazard Area	% in Hazard Area	$ in City	$ in Hazard Area	% in Hazard Area	# in City	# in Hazard Area	% in Hazard Area
Residential	291	180	62%	$15,560,965	$9,647,798	62%	721	447	62%
Commercial	8	5	62%	$2,041,640	$1,265,817	62%			
Industrial	3	1	50%	-	-	-	-	-	-
Agricultural	-	-	-	-	-	-	-	-	-
Religious / Non-profit	2	1	50%						
Government	3	1	50%						
Education	1	0	0%						
Utilities	-	-	-	-	-	-	-	-	-

CINCINNATI – Human Disease Pandemic

Type of Structure	Number of Structures			Value of Structures			Number of People		
	# in City	# in Hazard Area	% in Hazard Area	$ in City	$ in Hazard Area	% in Hazard Area	# in City	# in Hazard Area	% in Hazard Area
Residential	197	99	50%	$6,011,450	$3,005,725	50%	421	211	50%
Commercial	3	2	50%	$292,650	$146,325	50%			
Industrial	-	-	-	-	-	-	-	-	-
Agricultural	-	-	-	$482,065	-	0%	-	-	-
Religious / Non-profit	2	1	50%						
Government	2	1	50%						
Education	1	0	0%						
Utilities	-	-	-	-	-	-	-	-	-

Centerville - Human Disease Pandemic

Type of Structure	Number of Structures			Value of Structures			Number of People		
	# in City	# in Hazard Area	% in Hazard Area	$ in City	$ in Hazard Area	% in Hazard Area	# in City	# in Hazard Area	% in Hazard Area
Residential	2133	1066	50%	$110,843,858	$55,421,929	50%	5904	2952	50%
Commercial	122	61	50%	$17,018,799	$8,509399	50%			50%
Industrial	4	2	50%	$11,790,212	$5,895,106	50%	-	-	-
Agricultural	-	-	-	$483,580	$241,790	50%	-	-	-
Religious / Non-profit	15	7	50%						
Government	3	1	50%						
Education	12	6	50%						
Utilities	2	1	50%	-	-	-	-	-	-

Numa – Human Disease Pandemic

Type of Structure	Number of Structures			Value of Structures			Number of People		
	# in City	# in Hazard Area	% in Hazard Area	$ in City	$ in Hazard Area	% in Hazard Area	# in City	# in Hazard Area	% in Hazard Area
Residential	59	29	50%	$1,678,410	$839,205	50%	112	56	50%
Commercial	1	0	50%	$58,720	$29,360	50%			50%
Industrial	-	-	-	-	-	-	-	-	-
Agricultural	-	-	-	-	-	-	-	-	-
Religious / Non-profit	1	1	100%						
Government									
Education									
Utilities	-	-	-	-	-	-	-	-	-

Exline – Human Disease Pandemic

Type of Structure	Number of Structures			Value of Structures			Number of People		
	# in City	# in Hazard Area	% in Hazard Area	$ in City	$ in Hazard Area	% in Hazard Area	# in City	# in Hazard Area	% in Hazard Area
Residential	77	31	40%	$2,451,760	$980,704	40%	197	197	40%
Commercial	8	3	40%	$670,220	$268,088	40%			40%
Industrial	-	-	-	-	-	-	-	-	-
Agricultural	-	-	-	-		-	-	-	-
Religious / Non-profit	1	1	100%						
Government	2	2	50%						
Education									
Utilities	-	-	-	-	-	-	-	-	-

MOULTON – Human Disease Pandemic

Type of Structure	Number of Structures			Value of Structures			Number of People		
	# in City	# in Hazard Area	% in Hazard Area	$ in City	$ in Hazard Area	% in Hazard Area	# in City	# in Hazard Area	% in Hazard Area
Residential	269	164	61%	$11,240,353	$6,856,615	61%	631	385	61%
Commercial	15	7	50%	$1,517,240	$758,620	50%			
Industrial	-	-	-	-	-	-	-	-	-
Agricultural	-	-	-	-		-	-	-	-
Religious / Non-profit	3	1	50%						
Government	3	1	10%						
Education	1	0	0%						
Utilities	-	-	-	-	-	-	-	-	-

UNIONVILLE – Human Disease Pandemic

Type of Structure	Number of Structures			Value of Structures			Number of People		
	# in City	# in Hazard Area	% in Hazard Area	$ in City	$ in Hazard Area	% in Hazard Area	# in City	# in Hazard Area	% in Hazard Area
Residential	58	58	62%	$1,728,350	$1,071,577	62%	124	77	62%
Commercial			0%						
Industrial	-	-	-	-	-	-	-	-	-
Agricultural	-	-	-	-	-	-	-	-	-
Religious / Non-profit	2	1	50%						
Government	1	0	0%						
Education									
Utilities	-	-							

Mystic – Human Disease Pandemic

Type of Structure	Number of Structures			Value of Structures			Number of People		
	# in City	# in Hazard Area	% in Hazard Area	$ in City	$ in Hazard Area	% in Hazard Area	# in City	# in Hazard Area	% in Hazard Area
Residential	227	170	15%	$6,445,315	$966,797	15%	588	88	15%
Commercial	3	1	50%	$640,280	$320,140	50%	25	12	50%
Industrial	-	-	-	-	-	-	-	-	-
Agricultural	-	-	-	-	-	-	-	-	-
Religious / Non-profit	1	1	0%						
Government	4	2	50%						
Education	1	0	0%						
Utilities	-	-	-	-	-	-	-	-	-

UDELL – Human Disease Pandemic

Type of Structure	Number of Structures			Value of Structures			Number of People		
	# in City	# in Hazard Area	% in Hazard Area	$ in City	$ in Hazard Area	% in Hazard Area	# in City	# in Hazard Area	% in Hazard Area
Residential	24	21	86%	$596,200	$512,732	86%	65	56	86%
Commercial	1	1	100%	$5,670	$567	100%			
Industrial	-	-	-	-	-	-	-	-	-
Agricultural	-	-	-	-		-	-	-	-
Religious / Non-profit	1	1	100%						
Government									
Education									
Utilities	-	-	-	-	-	-	-	-	-

MORAVIA – Human Disease Pandemic

Type of Structure	Number of Structures			Value of Structures			Number of People		
	# in City	# in Hazard Area	% in Hazard Area	$ in City	$ in Hazard Area	% in Hazard Area	# in City	# in Hazard Area	% in Hazard Area
Residential	291	180	62%	$15,560,965	$9,647,798	62%	721	447	62%
Commercial	8	5	62%	$2,041,640	$1,265,817	62%			
Industrial	3	1	50%	-	-	-	-	-	-
Agricultural	-	-	-	-	-	-	-	-	-
Religious / Non-profit	2	1	50%						
Government	3	1	50%						
Education	1	0	0%						
Utilities	-	-	-	-	-	-	-	-	-

UNINCORPORATED COUNTY AREA – Human Disease Pandemic

Type of Structure	Number of Structures			Value of Structures			Number of People		
	# in region	# in Hazard Area	% in Hazard Area	$ in City	$ in Hazard Area	% in Hazard Area	# in region	# in Hazard Area	% in Hazard Area
Residential	2432			$194,641,377	$3,892,828		4,805		
Commercial	122			$17,018,799	$340,376				
Industrial	2			$558,259	$11,165		-	-	-
Agricultural	-			$133,392,847	$133,392,847	100%	-	-	-
Religious / Non-profit	4								
Government									
Education									
Utilities	-	-	-	-	-	-	-	-	-

Centerville Public School - Human Disease Pandemic

Type of Structure	Number of Structures			Value of Structures			Number of People		
	# in City	# in Hazard Area	% in Hazard Area	$ in City	$ in Hazard Area	% in Hazard Area	# in City	# in Hazard Area	% in Hazard Area
Residential	2133	1066	50%	$110,843,858	$55,421,929	50%	5904	2952	50%
Commercial	122	61	50%	$17,018,799	$8,509399	50%			50%
Industrial	4	2	50%	$11,790,212	$5,895,106	50%	-	-	-
Agricultural	-	-	-	$483,580	$241,790	50%	-	-	-
Religious / Non-profit	15	7	50%						
Government	3	1	50%						
Education	12	6	50%						
Utilities	2	1	50%	-	-	-	-	-	-

Moravia Public School - Human Disease Pandemic

Type of	Number of Structures	Value of Structures	Number of People

Structure	# in City	# in Hazard Area	% in Hazard Area	$ in City	$ in Hazard Area	% in Hazard Area	# in City	# in Hazard Area	% in Hazard Area
Residential	2133	1066	50%	$110,843,858	$55,421,929	50%	5904	2952	50%
Commercial	122	61	50%	$17,018,799	$8,509399	50%			50%
Industrial	4	2	50%	$11,790,212	$5,895,106	50%	-	-	-
Agricultural	-	-	-	$483,580	$241,790	50%	-	-	-
Religious / Non-profit	15	7	50%						
Government	3	1	50%						
Education	12	6	50%						
Utilities	2	1	50%	-	-	-	-	-	-

CINCINNATI – Human Disease Incident

Type of Structure	Number of Structures			Value of Structures			Number of People		
	# in City	# in Hazard Area	% in Hazard Area	$ in City	$ in Hazard Area	% in Hazard Area	# in City	# in Hazard Area	% in Hazard Area
Residential	197	99	50%	$6,011,450	$3,005,725	50%	421	211	50%
Commercial	3	2	50%	$292,650	$146,325	50%			
Industrial	-	-	-	-	-	-	-	-	-
Agricultural	-	-	-	$482,065	-	0%	-	-	-
Religious / Non-profit	2	1	50%						
Government	2	1	50%						
Education	1	0	0%						
Utilities	-	-	-	-	-	-	-	-	-

Centerville - Human Disease Incident

Type of Structure	Number of Structures			Value of Structures			Number of People		
	# in City	# in Hazard Area	% in Hazard Area	$ in City	$ in Hazard Area	% in Hazard Area	# in City	# in Hazard Area	% in Hazard Area
Residential	2133	1066	50%	$110,843,858	$55,421,929	50%	5904	2952	50%
Commercial	122	61	50%	$17,018,799	$8,509399	50%			50%
Industrial	4	2	50%	$11,790,212	$5,895,106	50%	-	-	-
Agricultural	-	-	-	$483,580	$241,790	50%	-	-	-
Religious / Non-profit	15	7	50%						
Government	3	1	50%						
Education	12	6	50%						
Utilities	2	1	50%	-	-	-	-	-	-

Numa – Human Disease Incident

Type of Structure	Number of Structures			Value of Structures			Number of People		
	# in City	# in Hazard Area	% in Hazard Area	$ in City	$ in Hazard Area	% in Hazard Area	# in City	# in Hazard Area	% in Hazard Area
Residential	59	29	50%	$1,678,410	$839,205	50%	112	56	50%
Commercial	1	0	50%	$58,720	$29,360	50%			50%
Industrial	-	-	-	-	-	-	-	-	-
Agricultural	-	-	-	-	-	-	-	-	-
Religious / Non-profit	1	1	100%						
Government									
Education									
Utilities	-	-	-	-	-	-	-	-	-

Exline – Human Disease Incident

Type of Structure	Number of Structures			Value of Structures			Number of People		
	# in City	# in Hazard Area	% in Hazard Area	$ in City	$ in Hazard Area	% in Hazard Area	# in City	# in Hazard Area	% in Hazard Area
Residential	77	31	40%	$2,451,760	$980,704	40%	197	197	40%
Commercial	8	3	40%	$670,220	$268,088	40%			40%
Industrial	-	-	-	-	-	-	-	-	-
Agricultural	-	-	-	-		-	-	-	-
Religious / Non-profit	1	1	100%						
Government	2	2	50%						
Education									
Utilities	-	-	-	-	-	-	-	-	-

MOULTON – Human Disease Incident

Type of Structure	Number of Structures			Value of Structures			Number of People		
	# in City	# in Hazard Area	% in Hazard Area	$ in City	$ in Hazard Area	% in Hazard Area	# in City	# in Hazard Area	% in Hazard Area
Residential	269	164	61%	$11,240,353	$6,856,615	61%	631	385	61%
Commercial	15	7	50%	$1,517,240	$758,620	50%			
Industrial	-	-	-	-	-	-	-	-	-
Agricultural	-	-	-	-		-	-	-	-
Religious / Non-profit	3	1	50%						
Government	3	1	10%						
Education	1	0	0%						
Utilities	-	-	-	-	-	-	-	-	-

UNIONVILLE – Human Disease Incident

Type of Structure	Number of Structures			Value of Structures			Number of People		
	# in City	# in Hazard Area	% in Hazard Area	$ in City	$ in Hazard Area	% in Hazard Area	# in City	# in Hazard Area	% in Hazard Area
Residential	58	58	62%	$1,728,350	$1,071,577	62%	124	77	62%
Commercial			0%						
Industrial	-	-	-	-	-	-	-	-	-
Agricultural	-	-	-	-	-	-	-	-	-
Religious / Non-profit	2	1	50%						
Government	1	0	0%						
Education									
Utilities	-	-							

Mystic – Human Disease Incident

Type of Structure	Number of Structures			Value of Structures			Number of People		
	# in City	# in Hazard Area	% in Hazard Area	$ in City	$ in Hazard Area	% in Hazard Area	# in City	# in Hazard Area	% in Hazard Area
Residential	227	170	15%	$6,445,315	$966,797	15%	588	88	15%
Commercial	3	1	50%	$640,280	$320,140	50%	25	12	50%
Industrial	-	-	-	-	-	-	-	-	-
Agricultural	-	-	-	-	-	-	-	-	-
Religious / Non-profit	1	1	0%						
Government	4	2	50%						
Education	1	0	0%						
Utilities	-	-	-	-	-	-	-	-	-

UDELL – Human Disease Incident

Type of Structure	Number of Structures			Value of Structures			Number of People		
	# in City	# in Hazard Area	% in Hazard Area	$ in City	$ in Hazard Area	% in Hazard Area	# in City	# in Hazard Area	% in Hazard Area
Residential	24	21	86%	$596,200	$512,732	86%	65	56	86%
Commercial	1	1	100%	$5,670	$567	100%			
Industrial	-	-	-	-	-	-	-	-	-
Agricultural	-	-	-	-		-	-	-	-
Religious / Non-profit	1	1	100%						
Government									
Education									
Utilities	-	-	-	-	-	-	-	-	-

MORAVIA – Human Disease Incident

Type of	Number of Structures	Value of Structures	Number of People

Structure	# in City	# in Hazard Area	% in Hazard Area	$ in City	$ in Hazard Area	% in Hazard Area	# in City	# in Hazard Area	% in Hazard Area
Residential	291	180	62%	$15,560,965	$9,647,798	62%	721	447	62%
Commercial	8	5	62%	$2,041,640	$1,265,817	62%			
Industrial	3	1	50%	-	-	-	-	-	-
Agricultural	-	-	-	-	-	-	-	-	-
Religious / Non-profit	2	1	50%						
Government	3	1	50%						
Education	1	0	0%						
Utilities	-	-	-	-	-	-	-	-	-

UNINCORPORATED COUNTY AREA – Human Disease Incident

Type of Structure	Number of Structures			Value of Structures			Number of People		
	# in region	# in Hazard Area	% in Hazard Area	$ in City	$ in Hazard Area	% in Hazard Area	# in region	# in Hazard Area	% in Hazard Area
Residential	2432			$194,641,377	$3,892,828		4,805		
Commercial	122			$17,018,799	$340,376				
Industrial	2			$558,259	$11,165		-	-	-
Agricultural	-			$133,392,847	$133,392,847	100%	-	-	-
Religious / Non-profit	4								
Government									
Education									
Utilities	-	-	-	-	-	-	-	-	-

Centerville Public School - Human Disease Incident

Type of Structure	Number of Structures			Value of Structures			Number of People		
	# in City	# in Hazard Area	% in Hazard Area	$ in City	$ in Hazard Area	% in Hazard Area	# in City	# in Hazard Area	% in Hazard Area
Residential	2133	1066	50%	$110,843,858	$55,421,929	50%	5904	2952	50%
Commercial	122	61	50%	$17,018,799	$8,509399	50%			50%
Industrial	4	2	50%	$11,790,212	$5,895,106	50%	-	-	-
Agricultural	-	-	-	$483,580	$241,790	50%	-	-	-
Religious / Non-profit	15	7	50%						
Government	3	1	50%						
Education	12	6	50%						
Utilities	2	1	50%	-	-	-	-	-	-

Moravia Public School - Human Disease Incident

Type of Structure	Number of Structures			Value of Structures			Number of People		
	# in	# in	% in	$ in City	$ in Hazard	% in	# in	# in	% in

	City	Hazard Area	Hazard Area		Area	Hazard Area	City	Hazard Area	Hazard Area
Residential	2133	1066	50%	$110,843,858	$55,421,929	50%	5904	2952	50%
Commercial	122	61	50%	$17,018,799	$8,509399	50%			50%
Industrial	4	2	50%	$11,790,212	$5,895,106	50%	-	-	-
Agricultural	-	-	-	$483,580	$241,790	50%	-	-	-
Religious / Non-profit	15	7	50%						
Government	3	1	50%						
Education	12	6	50%						
Utilities	2	1	50%	-	-	-	-	-	-

7. Goals and Objectives

Once the Planning Committee had a sense for what threats face their jurisdictions based on research and prioritized hazards, the Committee considered what should be done. Three broad goals were decided on and then detailed with more specific objectives which can be measured by actions and projects designed to address them. Specific actions and projects are discussed in the next chapter along with alternatives discussed but set aside due to feasibility of completing them.

Goal 1: Protect critical facilities, infrastructure, and other community assets from the impacts of hazards

Objective 1.1 Seek mitigation projects that provide the highest degree of hazard protection at the least cost.

Objective 1.2 Strengthen partnerships and collaboration of jurisdictions and local businesses for emergency planning and recovery.

Objective 1.3 Utilize public funds/grant opportunities to protect critical facilities, public services & transportation entities.

Goal 2: Protect the health, safety & quality of life for Appanoose County residents by minimizing the vulnerability of people and property in Lucas County.

Objective 2.1 Ensure that property owners can maintain & improve their properties.

Objective 2.2 Ensure that disaster recovery can proceed promptly following a disaster.

Objective 2.3 Provide back-up energy supplies in all vital assets identified in this plan.

Objective 2.4 Promote improving zoning codes, building codes, nuisance abatement, and health codes, especially in relation to areas with older buildings.

Objective 2.5 Review the protocol, education & necessary medications/interventions to deal with airborne & human transmitted hazards that directly deal with impact of health & life.

Goal 3: Reduce losses due to natural and man-made hazards.

Objective 3.1 Educate members of the county about hazards, how to be prepared, & shelter locations.

Objective 3.2 Review & upgrade warning systems and communications for sufficient coverage

Objective 3.3 Provide certified shelters/safe rooms

Objective 3.4 Provide adequate training, equipment and exercises to train responding emergency personnel.

Objective 3.5 Maintain current & create new planning and exercises related to any terrorism event.

Objective 3.6 Identify and map locations of accidents in an annual public report in order to determine locations where improvements are necessary.

8. Analysis of Mitigation Activities

After a comprehensive and quantitative analysis of the hazards was completed it became possible to begin deciding on mitigation strategies. In order for the committee to evaluate would needs they have, it was critical to acknowledge the existing strategies communities currently have implemented to assist them in handling an emergency event. The only community with an approve Mitigation Plan is the city of Mystic (See Appendix II). A more specific list of details of existing ordinances and plans for each jurisdiction is given in Appendix HH. Below identifies strategies that the committee members, the city clerk and/or local fire departments for each jurisdiction provided:

A. Current Mitigation Activities

1. . Un-incorporated County

- Law Center (in Centerville) provides service to entire county
- Mobile communication trailer(s) located at Law Center; about 5-6 hours are needed to mobilize
- Many 28E agreements in place with neighboring jurisdictions for fire protection and hazardous materials containment.
- Hydro Clean, based in Des Moines, is the designated hazardous materials clean-up agent; local fire fighters perform containment actions.
- County-wide Emergency Operations Plan (EOP) is in place and maintained by ADLM Emergency Management; a copy of the plan is present in the Appanoose County Supervisors' office.
- Tree trimming or management is currently handled by utility services provided throughout the county.
- Centerville emergency personnel are certified in waterway rescue.

2. Centerville

- Fire Station has a storm warning system
- Law Center for City & county police in the city limits
- Mobile communication trailer(s) located at Law Center; about 5-6 hours are needed to mobilize
- Sand or blade trucks are / can be used to clear paths for first responders in the event of road blockage (debris or heavy snow)
- Designated emergency Red Cross shelter sites established.
- 28E agreements in place with surrounding jurisdictions for fire protection and hazardous materials containment.

- Hydro Clean, based in Des Moines, is the designated hazardous materials clean-up agent; local fire fighters perform containment actions.
- County-wide Emergency Operations Plan (EOP) is in place and maintained by ADLM Emergency Management; a copy of the plan is present in the Appanoose County Supervisors' office.
- The City participates in the National Flood Insurance Program (NFIP) with a Flood Insurance Rate Map dated 7/1/1987
- Tree trimming or management is currently handled by utility services
- Fire fighters & emergency personnel have hand held radios
- Rescue personnel are trained in emergency water search & rescue

3. Cincinnati

- Fire Station has a storm warning system
- Law Center (in Centerville) has contact information for firefighters
- Mobile communication trailer(s) located at Law Center; about 5-6 hours are needed to mobilize
- Sand or blade trucks are / can be used to clear paths for first responders in the event of road blockage (debris or heavy snow)
- 28E agreements in place with surrounding jurisdictions for fire protection and hazardous materials containment
- Hydro Clean, based in Des Moines, is the designated hazardous materials clean-up agent; local fire fighters perform containment actions
- County-wide Emergency Operations Plan (EOP) is in place and maintained by ADLM Emergency Management; a copy of the plan is present in the Appanoose County Supervisors' office.
- Tree trimming or management is currently handled to an extent by utility services

4. Exline

- Law Center (in Centerville) has contact information for firefighters
- Mobile communication trailer(s) located at Law Center; about 5-6 hours are needed to mobilize
- Sand or blade trucks are / can be used to clear paths for first responders in the event of road blockage (debris or heavy snow)
- 28E agreements in place with surrounding jurisdictions for fire protection and hazardous materials containment
- Hydro Clean, based in Des Moines, is the designated hazardous materials clean-up agent; local fire fighters perform containment actions
- County-wide Emergency Operations Plan (EOP) is in place and maintained by ADLM Emergency Management; a copy of the plan is present in the Appanoose County Supervisors' office.

5. Moulton

- Fire Station has a storm warning system
- Law Center (in Centerville) has contact information for firefighters
- Mobile communication trailer(s) located at Law Center; about 5-6 hours are needed to mobilize
- Sand or blade trucks are / can be used to clear paths for first responders in the event of road blockage (debris or heavy snow).
- 28E agreements in place with surrounding jurisdictions for fire protection and hazardous materials containment.

- Hydro Clean, based in Des Moines, is the designated hazardous materials clean-up agent; local fire fighters perform containment actions.
- County-wide Emergency Operations Plan (EOP) is in place and maintained by ADLM Emergency Management; a copy of the plan is present in the Appanoose County Supervisors' office.
- The City participates in the National Flood Insurance Program (NFIP) with a Flood Insurance Rate Map dated 1/1/1950.
- Tree trimming or management is currently handled to an extent by utility services.

6. Mystic

Current activities were discussed in conjunction with brainstorming potential actions, below is a list of actions that were identified in the city's approved FEMA plan (See Appendix II). An additional explanation of the current updates and status of the Single Jurisdiction plan are provided in the community profile on page 49 or further mitigation intentions for the future begin on page 248.

- Fire Station has a storm warning system.
- Law Center (in Centerville) has contact information for Mystic firefighters.
- Mobile communication trailer(s) located at Law Center; about 5-6 hours are needed to mobilize.
- Sand or blade trucks are / can be used to clear paths for first responders in the event of road blockage (debris or heavy snow).
- Legion Hall, Mystic Community Church, and Community Center can / have been utilized as temporary shelters and gathering places in the event of disasters
- There is a yard clean-up ordinance, but it is very difficult to enforce (affects tornado and high-wind debris hazards).
- Railroad works well and promptly with the City of Mystic on railroad incidents
- 28E agreements in place with surrounding jurisdictions for fire protection and hazardous materials containment.
- Hydro Clean, based in Des Moines, is the designated hazardous materials clean-up agent; local fire fighters perform containment actions.
- Firefighters and mayor have spread the word of impending hazard events, such as flooding, including going door-to-door.
- The City participates in the National Flood Insurance Program (NFIP) with a Flood Insurance Rate Map dated 1/30/1978; however few residents have purchased flood insurance (NFIP Compliance date: 10/15/1976).
- The City requires mobile home tie-downs.
- Tree trimming or management is currently handled to an extent by utility services in Mystic.
- County-wide Emergency Operations Plan (EOP) is in place and maintained by ADLM Emergency Management; a copy of the plan is present in the Appanoose County Supervisors' office.
- The city has released the water from the City Reservoir that had an eroding dam, but has not been able to locate funds to assist with re-building it.
- The City is in the final stages of completing a voluntary Acquisition and Demolition project funded by FEMA and Iowa's Homeland Security to mitigate 8 structures.
- The City has improved the Community Center/Emergency Shelter site by replacing the roof and making modifications to the restrooms.

- The following chart also displays the Mitigation Strategies selected by the Mystic Hazard Mitigation Committee. The char also shows any progress made by the city:

2011 MYSTIC HAZARD MITIGATION PLAN - UPDATE		
MITIGATION ACTION	***PROGRESS***	***COMMENTS***
Weather Radios	Ongoing goal	Encouraging voluntary purchasing by citizens
Storm Warning System	No change due to funding	
Improve Storm Sewer System	Currently Testing & collecting data with intentions to apply for additional funds	Conflicting responses if city qualified for FEMA assistance so need clarification
Community Building Upgrades	Completed new roofing & repairs to restroom	More repairs needed
Generators	No change due to funding	Continue to new plan
More Fire Hydrants	No change due to funding	Continue to new plan
Local Hazardous Materials Capabilities	No Progress	Continue to new plan
Hazardous Materials Protection for church, community center, legion hall, city hall & school	No Progress	Continue to new plan
New Storm Shelter	No change due to funding	Continue to new plan
Review Floodplain Ordinance for Effectiveness	No progress	Continue to new plan
Consider CRS Participation	No Progress	Continue to new plan
Community Emergency Response Team	County is currently establishing a team	Team hopes to have all communities represented & implement in cities
Continuity of Operations Planning	No Progress	Continue to new plan
Flood proofing (wet or dry)	Ongoing goal	Encouraging voluntary participation by citizens
Acquisition of Properties or Relocation of Buildings	Near completion of FEMA/Homeland Security Property Acquisition & Demolition project	Continue to new plan
Storm water Management Ordinance	No Progress	Continue to new plan
Flood Insurance	Continued participation of NFIP	Continue to new plan

Storm water Drainage System	Currently Testing & collecting data with intentions to apply for additional funds	Conflicting responses if city qualified for FEMA assistance so need clarification
Wetland Protection/Restoration	Ongoing	Continue to new plan
Drainage Easements	No Progress	Continue to new plan
Sensitive Areas Ordinance	No Progress	Continue to new plan
Surge Protection/Lightning Protection	Ongoing goal	Encouraging voluntary participation by citizens
Burying Power Lines	No change due to funding	Continue to new plan
Temporary Debris Disposal Policy	No progress	Continue to new plan
Snow Fences/ Barriers	Temporary artificial fences installed for winter months	Continue to new plan
Maintenance of Older Buildings	No change on city behalf, but ongoing encouragement for private homeowners	City intends to watch for grant funds to assist with aging structures owned by city
Expanded Hazard Area mapping & Mine Evaluation	County was awarded grant to research, explore & map abandon mines in entire county (including Mystic)	Grant funded 6/2011
Public Education & Outreach	Ongoing goal	Continue to new plan
Water Storage or Savings Plan	Ongoing goal	Encouraging voluntary purchasing by citizens
Evaluate, Reinforce, Restore Mystic Reservoir Dam	No progress due to lack of funding	Reservoir has been drained to prevent breech but needs re-built
Burning Restrictions	Have current burning restriction but needs reviewed and enforced	Continue to new plan
Smoke/Fire/Carbon Monoxide Detector & Sprinkler Systems	Ongoing goal	Encouraging voluntary purchasing by citizens
Evacuation Plans	No Progress	Continue to new plan
Maintenance of Heating/Cooling Systems	Ongoing goal	Encouraging voluntary purchasing by citizens
Fireplace Maintenance	Ongoing goal	Encouraging voluntary purchasing by citizens
Meth Lab Prevention	Public Health Dept currently offers presentation	Continue to new plan

Hazardous Materials Disposal	No Progress	Continue to new plan
Search & Rescue Training	Ongoing goal to provide EMT & first responder training or certification	Continue to new plan
Mass Casualty Preparation	No progress	Continue to new plan
Immunization	Regular immunizations offered by Health dept	Continue to new plan
Waste Disposal Enforcement	No progress	Continue to new plan
Pest Management	No progress	Continue to new plan
Radon Mitigation	Ongoing goal	Encouraging voluntary purchasing by citizens
Hazard Occurrence Data Collection	Current events recorded at specific corresponding locations – ongoing goal	i.e. – health issues collected by health dept, weather @ Emergency mang, etc
Vital Information Management	Ongoing goal	Encouraging voluntary participation

7. Moravia

- Fire Station has a storm warning system.
- Law Center (in Centerville) has contact information for firefighters.
- Mobile communication trailer(s) located at Law Center; about 5-6 hours are needed to mobilize.
- Sand or blade trucks are / can be used to clear paths for first responders in the event of road blockage (debris or heavy snow).
- Designated Red Cross shelters at the Nazarene church, which also has a backup generator.
- 28E agreements in place with surrounding jurisdictions for fire protection and hazardous materials containment.
- Hydro Clean, based in Des Moines, is the designated hazardous materials clean-up agent; local fire fighters perform containment actions.
- County-wide Emergency Operations Plan (EOP) is in place and maintained by ADLM Emergency Management; a copy of the plan is present in the Appanoose County Supervisors' office.
- The City participates in the National Flood Insurance Program (NFIP) with a Flood Insurance Rate Map dated 7/1/1987.
- Tree trimming or management is currently handled to an extent by utility services.
- Emergency shelter site established at Nazarene church and is equipped the large generator.

8. Numa

- Law Center (in Centerville) has contact information for firefighters.
- Mobile communication trailer(s) located at Law Center; about 5-6 hours are needed to mobilize.

- 28E agreements in place with surrounding jurisdictions for fire protection and hazardous materials containment.
- Hydro Clean, based in Des Moines, is the designated hazardous materials clean-up agent; local fire fighters perform containment actions.
- County-wide Emergency Operations Plan (EOP) is in place and maintained by ADLM Emergency Management; a copy of the plan is present in the Appanoose County Supervisors' office.

9. Plano

- Law Center (in Centerville) has contact information of elected officials.
- Mobile communication trailer(s) located at Law Center; about 5-6 hours are needed to mobilize.
- 28E agreements in place with surrounding jurisdictions for fire protection (Seymour) and hazardous materials containment.
- Emergency storm shelter site & Defibrillator paddles housed at church.
- All private homes were given weather radios within past couple years.
- County-wide Emergency Operations Plan (EOP) is in place and maintained by ADLM Emergency Management; a copy of the plan is present in the Appanoose County Supervisors' office.

10. Rathbun

- Law Center (in Centerville) has contact information for elected officials.
- County Sheriff's office patrols.
- Fire and rescue services are provided through Centerville.
- Mobile communication trailer(s) located at Law Center; about 5-6 hours are needed to mobilize.
- 28E agreements in place with surrounding jurisdictions for fire protection and hazardous materials containment.
- County-wide Emergency Operations Plan (EOP) is in place and maintained by ADLM Emergency Management; a copy of the plan is present in the Appanoose County Supervisors' office.

11. Udell

- Law Center (in Centerville) has contact information for elected officials.
- Mobile communication trailer(s) located at Law Center; about 5-6 hours are needed to mobilize.
- 28E agreements in place with surrounding jurisdictions for fire protection and hazardous materials containment with Moulton.
- Hydro Clean, based in Des Moines, is the designated hazardous materials clean-up agent; local fire fighters perform containment actions.
- County-wide Emergency Operations Plan (EOP) is in place and maintained by ADLM Emergency Management; a copy of the plan is present in the Appanoose County Supervisors' office.

12. Unionville

- Fire Station has a storm warning system.
- Law Center (in Centerville) has contact information for firefighters.
- Mobile communication trailer(s) located at Law Center; about 5-6 hours are needed to mobilize.
- 28E agreements in place with surrounding jurisdictions for fire protection and hazardous materials containment.

- Hydro Clean, based in Des Moines, is the designated hazardous materials clean-up agent; local fire fighters perform containment actions.
- County-wide Emergency Operations Plan (EOP) is in place and maintained by ADLM Emergency Management; a copy of the plan is present in the Appanoose County Supervisors' office.
- The City participates in the National Flood Insurance Program (NFIP) with a Flood Insurance Rate Map dated 7/1/1988.
- Tree trimming or management is currently handled to an extent by utility services.

B. Mitigation Actions

The Planning Committee focused mitigation strategies on the high-risk hazards where investments of time and other resources would be expected to make the greatest impact on protecting each jurisdiction. Some strategies are applicable to more than one hazard and may be applicable to the moderate- and acceptable-risk hazards as well. Mitigation alternatives began in a brainstorming activity during a meeting and then further supplemented by discussing alternatives listed in the FEMA publication *Mitigation Ideas: Possible Mitigation Measures by Hazard Type, FEMA-R5, 9/02*. This document was briefly presented in an early meeting to stimulate conversation.

Select ideas from the FEMA document were proposed to the committee for mitigation selection, excluding actions that would require large changes to local culture (including developing a zoning ordinance, development rights, or taxes/fees) or would be particularly costly and not fit with smaller cities. The previously mentioned actions were briefly discussed and ultimately excluded from the Appanoose County plan.

Each of the identified mitigation alternatives were considered and evaluated through the FEMA tool, STAPLEE. This acronym indicates the various factors that should be considered in planning decisions standing for Social, Technical, Administrative, Political, and Legal, Economic, and Environmental elements. Each mitigation alternative was evaluated simply with plus signs, minus signs, or left blank during committee meetings. Plus signs indicate no adverse impact or positive impacts anticipated, minus signs indicate the anticipation of resistance, high cost, or conflict, and blank elements are not anticipated to have either positive or negative impacts or may be unknown.

These ratings, once compiled, where then quantified with 1 for a plus sign, 0 for a blank or neutral score and a -1 for a minus sign and then the elements of each action were summed up for a numerical rating. See *Appendix 30: STAPLEE Worksheet* for a summary of the STAPLEE ratings.

Explanation of STAPLEE

Social: Mitigation Actions are acceptable to the community if they do not adversely affect a segment of the population, do not cause relocation of lower income people, and if they are compatible with the community's social and cultural values.

Technical: Mitigation actions are technically most effective if they provide long-term reduction of losses and have minimal secondary adverse impacts.

Administrative: Mitigation actions are easier to implement if the jurisdiction has the necessary staffing and funding.

Political: Mitigation actions can truly be successful if all stakeholders have been offered an opportunity to participate in the planning process and if there is public support of the action.

Legal: It is critical that the jurisdiction or implementing agency have the legal authority to implement and enforce a mitigation action.

Economical: Budget constraints can significantly deter the implementation of mitigations actions. Hence, it is important to evaluate whether an action is cost effective, as determined by a cost-benefit review, and possible to fund.

Environmental: Sustainable mitigation actions that do not have an adverse effect on the environment, that comply with Federal, State, and local environmental regulations, and that are consistent with the community's environmental goals, have mitigation benefits while being environmentally sound.

1. Mitigation Strategies and Implementation

Mitigation actions were then prioritized based on several criteria, whether or not they address a high risk hazard, how many hazards they address, how many objectives they address, the estimated timeline, the estimated cost, and the STAPLEE rating. The logic of this was much like ranking the hazards, the actions with the broadest positive impact would be naturally raised to the top of the list while those that would be costly or be limited in impact would naturally fall to the bottom.

This would mean that the actions toward the top of the list should be where the County's mitigation efforts should be directed, however where opportunities to pursue lower ranked actions arise, they should be taken so long as they do not preclude taking an action with a more broad positive impact is possible. For example, if grant funds for a project are available that would address an action ranked near the middle of the spectrum then the County or any jurisdiction should pursue the grant opportunity. If such a grant opportunity is presented and it could be used for two or more identified actions, then it should be directed toward the highest ranked of the potential projects where practicable.

Each action is profiled along similar lines as the hazards. Each action profile contains a description of the action, estimated cost with either an approximate dollar amount or listed as voluntary, minimal, moderate, or high. These categories are loosely defined as follows;

- Voluntary – reliant on donated time or resources
- Minimal – little or no cost, may be a nominal increase in day-to-day activities
- Moderate – would likely require outside funds potentially from multiple sources or potential tax / fee increases
- High – would require outside funds such as in the form of grant programs through State or Federal agencies

The timeframe in which mitigation actions are to be pursued have not been detailed in depth, however based on their relative complexity, cost, and whether or not they are dependent on outside funds, estimated timelines were suggested. These estimated timeframes are listed as follows;

- Ongoing – activities that are currently in practice or are suspected to have been implemented previously
- Short Term – relatively low cost, low complexity activities that may be implemented in the next year
- Medium Term – low to modest cost activities that may require more effort and / or time to properly implement such as review of regulatory measures for effectiveness or development of new regulations or programs, implementable within a period of 5 years and likely within 2-3 years
- Long Term – high cost and time-intensive activities that require outside funds, significant administrative investment (temporary or permanent), and generally involve construction, anticipated to take 5 years or more from time of initial planning to securing funding to completion of activity

Mitigation Actions can be grouped into six different categories as indicated in the State Plan and in FEMA guidance;

Prevention: Government administrative or regulatory measures or processes that influence the way land and buildings are developed and built. These measures also include public actions to reduce hazard losses to property and human health impacts. Examples include:

- Hazard mapping
- Studies/data collection and analysis to support prevention measures
- Floodplain regulations
- Multi-jurisdictional agreements that reduce hazard risks
- Other regulatory measures or processes that reduce hazard risks

Property Protection: Measures that involve modifying existing buildings or structures to protect them from a hazard, or removing buildings or structures from the hazard area, or providing insurance to cover potential losses. Examples include:

- Acquisition, elevation, or relocation of hazard-prone property
- Safe room/storm shelter retrofits
- Critical facility protection
- Risk reduction retrofits (modifications) to hazard prone properties
- Studies/data collection and analysis to develop property protection measures
- Continued National Flood Insurance Program (NFIP) participation

Public Education and Awareness: Measures to inform and educate citizens, elected officials, and property owners about the hazards and potential ways to mitigate them. Examples include:

- Programs to improve awareness of hazard risk
- Programs to improve awareness of hazard risk prevention and reduction
- Education programs directed toward specialized audience, i.e. buildings, developers, and hazard prone neighborhoods

Natural Resource Protection: Measures that, in addition to minimizing hazard losses, preserve or restore the functions of natural systems. Examples include:

- Sensitive areas ordinance (development restrictions)
- Stream corridor restoration, watershed management
- Forest and vegetation management
- Wetland restoration and preservation

Emergency Services: Measures taken before, during and after a hazard event to protect people, and property; although these measures are not typically considered “mitigation, they significantly minimize the events impact and preserve the community’s health and safety. Examples include:

- Emergency response facilities and personnel
- Hazard warning systems and equipment
- Health, safety, environmental risk prevention or reduction
- Emergency response infrastructure, equipment, planning, or training
- Emergency response services studies and data collection
- Emergency response communication systems

Structural Projects: These are measures that involve the construction and maintenance of structures and infrastructure that will reduce the impact of a hazard or redirect the impact away from people and property. Examples include:

- Channel modification/maintenance
- Dam and reservoir construction/maintenance
- Levee and floodwall construction and maintenance
- Safe room or storm shelter construction
- Infrastructure construction and maintenance
- Studies and data collection to develop structural projects

Prioritized Mitigation Activities

Mitigation actions were evaluated by various factors as previously mentioned; each of the factors was assigned a numerical value to aid in ranking the actions according to their anticipated positive impacts and drawbacks. The numerical values that were substituted in for estimated cost and timelines are as follows;

Cost:

- Voluntary – 1
- Minimal – 0
- Moderate – minus one (-1)
- High – minus two (-2)

Timeline:

- Ongoing – 1
- Short Term – 0
- Medium Term – minus one (-1)
- Long Term – minus two (-2)

Where a cost or timeline spanned between two different ratings, the average of the two scores was used. For example an action that has a moderate to high cost and a medium to long term timeline would have -1.5 inserted for both categories. This ranking system is crude, but it helps to organize the actions in a way that begins to show a prioritization of what can provide the biggest positive impact for the effort required to implement them. A more sophisticated ranking system may include weighting for various factors depending on community priorities and concerns. A limited degree of weighting is present for cost as cost is one of the STAPLEE elements however. Additional weighting was not conducted for Appanoose at this point as simply beginning to take mitigation actions as resources were identified was of more concern. The composite ranking of mitigation actions is as follows;

Appanoose County Mitigation Action Ranking

Appanoose County Mitigation Action Ranking		
Address High Risk Hazards	Public Outreach and Education	60
	Community Emergency Response Team	58
	Weather Radios	57
	Continuity of Operations Planning	54
	Hazard Occurrence data collection	54

Collection and protection of vital records	43
Maintenance of Older Buildings	31.5
Search & Rescue training for first responders	30.5
Safe Rooms	30
Surge protectors/ Lighting protection	30
Snow Fence/ Barriers	30
Generators	29
Flood Insurance	29
Evacuation Plans	28.5
Hazardous material disposal	28.5
Smoke/Fire/CO Detectors/sprinkler Systems	28
Fireplace maintenance	28
Maintenance of heating/cooling systems	27.5
Meth Lab Prevention	27
Assess/improve Fire Hydrant systems	26
Manufactured homes tie-downs	26
Mass Casualty preparation	24.5
Expanded hazard area mapping/mine evaluation	24
Storm Warning systems	23.5
Temporary Debris disposal plan	23
Tree management/trimming	23
New Storm Shelter	22.5
HazMat protection of storm shelters	22.5
Radon Mitigation	21
Local HazMat Capabilities	20
Storm water / storm sewer management	18
Water storage or saving plans	18
Evaluate/reinforce/restore Appanoose county dams	13.5
wetland protection/restoration	13.5
Immunizations	13
Burying power lines	13
Burning restrictions	10
Waste disposal enforcement	9.5
Consider CRS participation	9
Pest management	7
Flood proofing (wet or dry)	6
Review Floodplain ordinances for effectiveness	5
Purchase of drainage easements	4
NFIP Participation	3
Acquisition or relocation of buildings	1.5
Sensitive Areas Ordinance	0

2. Mitigation Alternatives

Each of the identified mitigation alternatives were considered and evaluated through the FEMA tool, STAPLEE. This acronym indicates the various factors that should be considered in planning decisions standing for Social, Technical, Administrative, Political, and Legal, Economic, and Environmental elements. See *Appendix Z: STAPLEE Worksheets* for details on how the alternatives were evaluated.

Constraints

In the planning committee's discussion of mitigation alternatives, certain constraints exist to the implementation of the various alternative strategies. One of the major constraints is availability of funding as the communities of Appanoose County are small and lack the resources available in other areas of Iowa.

This and other constraints were taken into consideration through the STAPLEE process which helped to limit the list of alternatives to those that were deemed most likely to have a positive impact. The criteria for a positive impact includes greater overall benefits than the costs of the alternative, local capabilities to fund, administer, or obtain funds for the alternative, and public acceptance of the alternative.

3. Mitigation Strategies Selected

The committee reviewed the FEMA-R5 document, "Mitigation Ideas: Possible Mitigation Measures by Hazard Type" to begin selecting mitigation proposals. Members also reviewed the existing and approved Mystic Hazard Mitigation plan.

Members proposed primarily utilizing the same Mitigation strategies they had selected and held discussions of how their identified mitigations strategies applied to all other jurisdictions in the county. Bishop spoke of knowledge of the Centerville fire hydrants aging and that the other smaller communities were incorporated about the same era therefore could experience similar problems. Schultz said that would be an accurate statement for aging buildings and infrastructure of communities throughout the county. Bishop also commented that he supported the strategy of natural snow fences along highways, particularly J5T from Moravia to Honey Creek Resort on Lake Rathbun.

ADDITIONS - John Pasa proposed adding the mitigation strategy of "Safe Rooms" in the interest of campgrounds at Lake Rathbun and previous comments of the intentions of local school. All members supported the addition of encouragement to have all manufactured homes being tied-down or secured, however, Schultz mentioned concern of financial burden this could have of low-income families. Committee members selected "pest management" as a mitigation strategy for the Human Disease Incident hazard that the county has included but Mystic did not. The committee also voted to include the mitigation strategy of Tree Management/trimming to be better prepared in the event of a severe winter storm. Committee members discussed historical occurrence of major power outages due to broke tree limbs landing on power lines.

MODIFICATIONS - The committee evaluated 3 mitigation strategies that were included in the FEMA approve Mystic plan being: "Improve storm sewer system; Storm water drainage system; and Storm water management ordinance". Bishop suggested that all three accomplished the same thing – improvement to storm water/sewer system and perhaps they could be combined to one strategy. Moore explained that the City of Mystic has one drainage system that accommodates both the storm water and storm sewer. Mystic is currently looking for financial assistance to repair this dilapidated system. Members unanimously voted o

combine to one strategy of "Storm Water/Storm Sewer System Management". CVPD will notify the committee member of change to have their approval. The last modification to a mitigation strategy from Mystic's plan was to remove "Community Building Upgrade" as it was of the committee's opinion that this would be an element of the strategy "Maintenance of Older buildings". This will, as well, be shared with Mystic committee members. At a later time, Mystic committee members agreed to the changes.

Members voted to accept the motion and then altered the STAPLEE ratings to better reflect the priorities of the entire county. Representatives from each of the communities selected priority strategies that were the most feasible based on local considerations and resources. Their proposals were also later discussed with entire City Councils for their additional approval. The selected alternatives are detailed in the following action profiles;

I. All Hazards / General strategies

Acquisition or relocation of buildings	
Program/Project Description	Utilize disaster recovery funds or pre-disaster mitigation funds to acquire properties in floodplains or relocation of buildings outside of floodplains
Anticipated Cost	Moderate to high
Timeline/Schedule	Ongoing
Responsible Entity	City Councils, County Board of Supervisors, Emergency Management
Mitigation Category	Prevention, property protection
Related Goals/Objectives	1.1, 1.3, 2.2, 2.3, 2.4
Related Hazard(s)	Flash flood, river flood
Jurisdiction(s) Priority	Mystic, IA
Staplee Rating	**-6**

Safe Rooms	
Program/Project Description	Risk to lives can be improved through construction and use of concrete safe rooms in homes and shelter areas of mobile home parks, fairgrounds, shopping malls, & other vulnerable public areas.
Anticipated Cost	Moderate to high – grant dependent
Timeline/Schedule	Long term
Responsible Agency	School Boards, Army Corp of Engineers at Lake Rathbun,
Mitigation Category	Structural project
Related Goals/Objectives	1.1, 1.3, 2.2, 3.1, 3.3
Related Hazard(s)	Flash flood, thunderstorm / lightning, structural failure, severe winter storm, transportation of hazardous materials, energy failure, windstorm / high wind event, tornado, hailstorm, sink hole, earthquake
Jurisdiction(s) Priority	Lake Rathbun Campground; Centerville Public School; Moravia Public Schools,
Staplee Rating	6

Generators	
Program/Project Description	Acquisition of mobile and / or fixed generators for use at community buildings used for temporary storm shelters and / or for public facilities
Anticipated Cost	Moderate
Timeline/Schedule	Medium term

Responsible Entity	City council & critical facility property owners
Mitigation Category	Emergency services, Prevention, Property Protection
Related Goals/Objectives	1.1, 1.2, 1.3, 2.2, 2.3, 2.6, 3.1, 3.3, 3.4
Related Hazard(s)	Flash Flood, Thunderstorm/Lighting, Communication failure, Severe winter storm, Energy Failure, Rail Transportation incident, Windstorms/High Wind events, River flooding, Tornado, Hailstorm, climate change, Extreme heat, Human disease incident, drought
Jurisdiction(s) Priority	Cincinnati, IA; Exline, IA; Moravia, IA; Udell, IA
Staplee Rating	9

New Storm Shelter/ cooling or heating shelter	
Program/Project Description	Construction of comprehensive storm shelter to Tornado Safe Room standards to serve as a temporary shelter for multiple hazards as often a Church, Community Center, Legion Hall, City Hall, and School are currently utilized as needed
Anticipated Cost	Moderate to high – grant dependent
Timeline/Schedule	Long term
Responsible Entity	City Councils, Emergency Management
Mitigation Category	Structural project
Related Goals/Objectives	1.1, 1.3, 2.2, 3.1, 3.3
Related Hazard(s)	Flash flood, thunderstorm / lightning, structural failure, severe winter storm, transportation of hazardous materials, energy failure, windstorm / high wind event, tornado, hailstorm, sink hole, earthquake
Jurisdiction(s) Priority	Cincinnati, IA;
Staplee Rating	10

Note: new storm shelter should be located outside of hazard areas to maximize potential as a safe location and should include hazardous materials protection measures, independent power source (generator, solar system with battery storage, multiple sources, etc.), accessible to disabled people, and located close to where most people may be clustered to reduce time and distance.

Continuity of Operations Planning	
Program/Project Description	City and City Departments work to develop procedures of what do when hazards occur including who has keys to shelters, contact list for city and emergency response personnel, priorities for what facilities to restore following disasters, how to direct residents to minimize injuries, as well as (off-site) backups of important City documents and files
Anticipated Cost	Minimal
Timeline/Schedule	Medium term
Responsible Entity	Emergency Management, Fire Departments, City Clerks, Centerville Community School, Moravia School
Mitigation Category	Property protection
Related Goals/Objectives	1.1, 1.2, 2.2, 2.3, 2.4, 3.2, 3.4, 3.5
Related Hazard(s)	Flash flood, thunderstorm / lightning, communication failure, structural failure, severe winter storm, transportation of hazardous materials incident, energy failure, rail transportation incident, highway transportation incident, structural fire, windstorm / high wind event, climate change, fixed hazardous materials incident, river flooding,

	tornado, hailstorm, air transportation incident, dam failure, sink hole, human disease incident, earthquake,
Jurisdiction(s) Priority	All Jurisdictions
Staplee Rating	6

Public Education and Outreach	
Program/Project Description	Develop hazard education and outreach program to help residents understand meaning of hazard warnings and self-protection measures
Estimated Cost	Minimal
Timeline/Schedule	Medium Term
Responsible Entity	School Boards, Emergency Management, Fire Departments
Hazards Addressed	All
Mitigation Category	Public Education and Awareness
Related Goals/Objectives	1.1, 1.2, 1.3, 2.1, 2.2, 2.3, 2.4, 2.5, 2.6, 3.1, 3.2, 3.3, 3.4, 3.5, 3.6
Addresses High Risk Hazards?	Yes
Jurisdiction(s) Priority	Entire County
STAPLEE Rating	14

Community Emergency Response Team	
Program/Project Description	Encourage and support development of volunteer community emergency response team of residents who have access to equipment and training to respond if emergency services are unable to meet all of the immediate needs following disasters as well as checking in on elderly or disabled residents to ensure their safety
Estimated Cost	Volunteer
Timeline/Schedule	Short Term
Responsible Entity	Emergency Management, Fire Department, and Residents
Hazards Addressed	Flash flood, thunderstorm / lightning, communication failure, structural failure, severe winter storm, transportation of hazardous materials incident, energy failure, rail transportation incident, highway transportation incident, structural fire, windstorm / high wind event, grass / wildfire, fixed hazardous materials incident, river flooding, tornado, hailstorm, air transportation incident, dam failure, sink hole, extreme heat, human disease incident, earthquake, drought
Mitigation Category	Public Education and Awareness, Emergency Services
Related Goals/Objectives	1.1, 1.2, 2.1, 2.2, 2.3, 2.4, 2.6, 3.1, 3.2, 3.4, 3.5
Addresses High Risk Hazards?	Yes
Jurisdiction (s) Priority	Moulton, IA;
STAPLEE Rating	16

Storm Warning System	
Program/Project Description	Acquisition and installation of community early warning system to compliment system at fire station
Estimated Cost	Moderate to high
Timeline/Schedule	Long Term
Responsible Entity	Fire Department, Emergency Management
Hazards Addressed	Flash flood, thunderstorm / lightning, severe winter storm, windstorm / high wind event, river flooding, tornado, hailstorm, may address

	other hazards as well
Mitigation Category	Structural Project
Related Goals/Objectives	1.1, 1.3, 2.2, 2.3, 3.2
Addresses High Risk Hazards?	Yes
Jurisdiction(s) Priority	Moulton, IA; Moravia, IA; Centerville, IA
STAPLEE Rating	10

Weather Radios	
Program/Project Description	Encouragement of residents and businesses to obtain NOAA weather radios
Estimated Cost	Voluntary program; approximately $30 per radio
Timeline/Schedule	Short Term
Responsible Entity	city residents
Hazards Addressed	Flash flood, thunderstorm / lightning, severe winter storm, windstorm / high wind event, river flooding, tornado, hailstorm, extreme heat, may address other hazards as well
Mitigation Category	Prevention and Public Awareness
Related Goals/Objectives	1.1, 1.3, 2.2, 3.1, 3.2, 3.3, 3.4
Addresses High Risk Hazards?	Yes
Jurisdiction(s) Priority	Unincorporated County; Udell, IA; Unionville, IA
STAPLEE Rating	18

Local Hazardous Materials Capabilities	
Program/Project Description	Encourage establishment of local hazardous materials team and / or support training for local first responders
Estimated Cost	Moderate to high
Timeline/Schedule	Medium to Long Term
Responsible Entity	Fire departments (in partnership with Emergency Mng and / or County)
Hazards Addressed	Transportation of hazardous materials, rail transportation incident, structural fire, fixed hazardous materials, air transportation incident, human disease incident
Mitigation Category	Emergency Services
Related Goals/Objectives	1.1, 1.2, 1.3, 2.1, 2.2, 3.1, 3.5
Addresses High Risk Hazards?	Yes
Jurisdiction(s) priority	All Jurisdictions
STAPLEE Rating	9

Hazardous Materials Protection for storm shelters	
Program/Project Description	Develop HazMat policies (shutting off air conditioning, closing windows, etc.), prepare kits for sealing off rooms including duct tape and plastic sheeting (see FEMA guidance; http://www.fema.gov/hazard/hazmat/hz_during.shtm)
Estimated Cost	Minimal or Voluntary
Timeline/Schedule	Short Term
Responsible Entity	City Councils and Property Owners
Hazards Addressed	Transportation of hazardous materials, rail transportation incident, highway transportation incident
Mitigation Category	Public Education and Awareness, Emergency Services

Related Goals/Objectives	1.1, 1.2, 1.3, 2.1, 2.2, 2.3, 3.3, 3.4
Addresses High Risk Hazards?	Yes
Jurisdiction(s) Priority	Entire County
STAPLEE Rating	11

Review Floodplain Management and Enforcement for Effectiveness	
Program/Project Description	Review city policies and procedures for enforcing floodplain ordinance and methods, if any, to ensure flooding is primarily limited to floodplains
Estimated Cost	Minimal
Timeline/Schedule	Medium Term
Responsible Entity	City Councils, county Board of Supervisors
Hazards Addressed	Flash flood, river flood
Mitigation Category	Property Protection, Prevention
Related Goals/Objectives	1.1, 1.2, 2.1, 2.3
Addresses High Risk Hazards?	Yes
Jurisdiction(s) Priority	All Jurisdictions
STAPLEE Rating	-1

Consider CRS Participation	
Program/Project Description	Explore feasibility of City participating in Community Rating System for enhanced flood protection
Estimated Cost	Minimal
Timeline/Schedule	Medium Term
Responsible Entity	City Councils, County Board of Supervisors
Hazards Addressed	Flash flood, river flood
Mitigation Category	Property Protection, Prevention
Related Goals/Objectives	1.1, 1.2, 2.1, 2.2, 2.3, 2.4, 3.1
Addresses High Risk Hazards?	Yes
Jurisdiction(s) Priority	All Jurisdictions
STAPLEE Rating	4

Drainage Easements	
Description	Purchase of drainage easements for temporary water retention and drainage and potential storage of heavy snow cleared from city streets/roads
Estimated Cost	Moderate
Timeline/Schedule	Medium Term
Responsible Entity	City councils, Board of Supervisors
Hazards Addressed	Flash Flood, Thunderstorm / Lightning, Severe Winter Storm, River Flooding, Sink Holes, Climate Change
Mitigation Category	Property Protection, Prevention
Related Goals/Objectives	1.1, 1.2, 2.1, 2.3
Addresses High Risk Hazards?	Yes
Jurisdiction(s) Priority	Mystic
STAPLEE Rating	4

Flood proofing (wet or dry)	
Program/Project Description	Encourage property owner use of flood proofing techniques to reduce potential flood-related damages such as water-proofing basement walls, structural modifications allowing flood waters to pass through or around structures without causing damage (as part of remodeling or disaster related repairs), use of water- / mold-resistant paints, etc.
Estimated Cost	Minimal to high depending on structure and techniques
Timeline/Schedule	Short Term
Responsible Entity	City Council (encouragement or in use of disaster recovery funds) and Property Owners (execution), County Board of Supervisors
Hazards Addressed	Flash Flood, River Flooding
Mitigation Category	Public Education and Awareness, Structural Projects, Prevention
Related Goals/Objectives	1.1, 1.3, 2.2, 2.3, 2.4,
Addresses High Risk Hazards?	Yes
Jurisdiction(s) Priority	Entire County
STAPLEE Rating	-1

Sensitive Areas Ordinance	
Description	Develop city ordinance restricting construction or type of construction in hazard / sensitive areas such as steep slopes, over mines, wetlands, near floodplains, etc.
Estimated Cost	Minimal
Timeline/Schedule	Medium Term
Responsible Entity	City Councils
Hazards Addressed	Flash Flood, Grass / Wildfire, River Flooding, Climate Change, Dam Failure, Sink Holes,
Mitigation Category	Prevention, Natural Resource Protection
Related Goals/Objectives	1.1, 1.2, 2.3
Addresses High Risk Hazards?	Yes
Jurisdiction(s) Priority	Mystic, IA
STAPLEE Rating	0

Storm water/sewer System Management	
Program/Project Description	Develop a storm water management to minimize impacts on storm water system, to minimize flash flooding impacts; may include artificial erosion control, creek bank stabilization, erosion resistant planting on steep slopes (deep root plants) to slow and help infiltrate storm water, terracing hillsides, grading techniques; also improve or repair deteriorating storm water/sewer systems
Estimated Cost	Minimal
Timeline/Schedule	Medium Term
Responsible Entity	City Council
Hazards Addressed	Flash Flood, Thunderstorm / Lightning, Severe Winter Storm, River Flooding, Sink Holes
Mitigation Category	Prevention, Natural Resource Protection
Related Goals/Objectives	1.1, 2.2, 2.3, 2.4, 3.1
Addresses High Risk Hazards?	Yes
Jurisdiction(s) Priority	Moravia, IA; Centerville, IA; Mystic, IA; Cincinnati, IA; Moulton, IA
STAPLEE Rating	8

Flood Insurance	
Program/Project Description	Encourage property owner purchase of flood insurance
Estimated Cost	Volunteer
Timeline/Schedule	Ongoing
Responsible Entity	Property Owners
Hazards Addressed	Flash Flood, River Flooding
Mitigation Category	Property Protection
Related Goals/Objectives	1.1, 2.1, 2.2, 2.3, 2.4, 3.1
Addresses High Risk Hazards?	Yes
Jurisdiction(s) Priority	All residents at risk
STAPLEE Rating	19

Surge Protection / Lightning Protection	
Program/Project Description	Encourage property owners to use surge protectors to protect computers and other sensitive electrical appliances from lightning strikes and power surges; purchase, use, and maintenance of surge protectors for City facilities as needed
Estimated Cost	Minimal , Voluntary
Timeline/Schedule	Ongoing / Short Term
Responsible Entity	Residents & City Maintenance
Hazards Addressed	Thunderstorm / Lightning, Communications Failure, Energy Failure
Mitigation Category	Prevention, Public Education and Awareness
Related Goals/Objectives	1.1, 1.3, 2.1, 2.2, 2.3, 2.4, 3.1
Addresses High Risk Hazards?	Yes
Jurisdiction(s) Priority	All residents
STAPLEE Rating	18

Burying Power Lines	
Program/Project Description	Encourage burying of power lines to new construction and upon significant maintenance or upgrades of existing power supply
Estimated Cost	Minimal (for City), Moderate to High (for power companies)
Timeline/Schedule	Long Term
Responsible Entity	City councils, Power Companies, Board of Supervisors
Hazards Addressed	Thunderstorm / Lightning, Communications Failure, Transportation of Hazardous Materials, Energy Failure, Rail Transportation Incident, Highway Transportation Incident
Mitigation Category	Property Protection, Structural Projects
Related Goals/Objectives	1.1, 1.3, 2.3
Addresses High Risk Hazards?	Yes
Jurisdiction(s) Priority	Unincorporated County
STAPLEE Rating	7

Temporary Debris Disposal Plan	
Program/Project Description	Develop policy for temporary debris disposal for city and private property owners for post-disaster clean-up
Estimated Cost	Minimal

Timeline/Schedule	Medium Term
Responsible Entity	City councils, County Board of Supervisors, Emergency Management
Hazards Addressed	Flash Flood, Thunderstorm / Lightning, Structural Failure, Severe Winter Storm, Transportation of Hazardous Materials, Rail Transportation Incident, Highway Transportation Incident, Structural Fire, Windstorm / High Windstorm Events, Grass / Wildfires, Fixed Hazardous Materials Incident, River Flooding, Tornado, Air Transportation Incident, Dam Failure, Sink Holes, Earthquake, Landslide
Mitigation Category	Emergency Services
Related Goals/Objectives	1.1, 2.2, 2.3, 2.4, 3.1, 3.6
Addresses High Risk Hazards?	Yes
Jurisdiction(s) Priority	Unincorporated County & all jurisdictions
STAPLEE Rating	1

Snow Fences / Barriers	
Program/Project Description	Encourage development of snow fences or barriers to block drifting snow from blocking critical access routes or from building entrances ranging from artificial to vegetative barriers
Estimated Cost	Voluntary
Timeline/Schedule	Short Term
Responsible Entity	Property Owners, County Board of Supervisors
Hazards Addressed	Severe Winter Storms, Windstorm / High Wind Events, Climate Change (vegetative barriers)
Mitigation Category	Prevention, Natural Resource Protection
Related Goals/Objectives	1.1, 1.3, 2.1, 2.2, 2.3, 2.4, 3.1
Addresses High Risk Hazards?	Yes
Jurisdiction(s) Priority	Unincorporated County
STAPLEE Rating	19

Maintenance of Older Buildings	
Program/Project Description	Encourage property maintenance and help leverage funds for property owners unable to afford more significant structural maintenance/demolish
Estimated Cost	Minimal to moderate
Timeline/Schedule	Ongoing
Responsible Entity	City Councils, Property Owners
Hazards Addressed	Thunderstorm / Lightning, Communication Failure, Structural Failure, Severe Winter Storm, Energy Failure, Structural Fire, Windstorm / High Wind Events, Fixed Hazardous Materials (especially lead paint), Tornado, Hailstorm, Climate Change, Sink Holes, Human Disease Incident (especially mold related), Earthquake, Radon
Mitigation Category	Property Protection, Prevention, Public Education and Awareness
Related Goals/Objectives	1.1, 1.3, 2.1, 2.2, 2.3, 2.4, 3.3
Addresses High Risk Hazards?	Yes
Jurisdiction(s) Priority	Cincinnati, IA; Exline, IA; Mystic, IA; Centerville, IA; Moulton, IA; Moravia, IA
STAPLEE Rating	8

Expanded Hazard Area Mapping and Mine Evaluation	
Program/Project Description	Record areas where hazards occur to aid in hazard mapping, encourage detailed evaluation of the structural integrity of mines under communities, encourage detailed floodplain mapping, seek funds to develop more detailed multi-hazard area maps
Estimated Cost	Minimal to moderate
Timeline/Schedule	Short Term (hazard recording) to Long Term (mine evaluation)
Responsible Entity	Emergency Management, Fire Departments, First Responders
Hazards Addressed	Flash Flood, Transportation of Hazardous Materials Incident, Rail Transportation Incident, Highway Transportation Incident, Grass / Wildfires, Fixed Hazardous Materials Incident, River Flooding, Dam Failure, Sink Holes, Expansive Soils
Mitigation Category	Prevention
Related Goals/Objectives	1.1, 1.2, 2.2, 2.3, 2.4, 3.1, 3.6
Addresses High Risk Hazards?	Yes
Jurisdiction(s) Priority	Unincorporated County; Mystic, IA; Numa, IA Centerville, IA; Cincinnati, IA; Plano, IA; Exline, IA; Rathbun, IA;
STAPLEE Rating	7

Water Storage or Saving Plans	
Program/Project Description	Develop plan for water storage for back-up and to supplement Rathbun Rural Water, develop policy or program for helping residents reduce water demand using measures such as low-flow toilets and showerheads and landscaping
Estimated Cost	Minimal
Timeline/Schedule	Medium Term
Responsible Entity	Residents
Hazards Addressed	Structural Fire, Grass / Wildfire, Climate Change, Drought
Mitigation Category	Prevention, Public Education and Awareness
Related Goals/Objectives	1.1, 1.3, 2.2, 2.5, 3.1, 3.3, 3.5
Addresses High Risk Hazards?	Yes
Jurisdiction(s) Priority	All Residents
STAPLEE Rating	7

Evaluate/maintain/repair area dams/levees	
Program/Project Description	Establish an inspection, maintenance & enforcement program to help continue structural integrity of Appanoose County Dams and levees. Plan would also include emergency plans to develop access roads, pumping, etc.
Estimated Cost	Moderate to High
Timeline/Schedule	Medium Term
Responsible Entity	Iowa Dept of Natural Resources, County Board of Supervisors
Hazards Addressed	Flash Flood, Structural Failure, River Flooding, Dam Failure
Mitigation Category	Prevention, Natural Resource Protection, Structural Project
Related Goals/Objectives	1.1, 1.3, 2.1, 2.4, 2.5, 3.5
Addresses High Risk Hazards?	Yes
Jurisdiction(s) Priority	Unincorporated County
STAPLEE Rating	3

Burning Restrictions	
Program/Project Description	Develop, implement, and enforce burning restrictions for trash and yard waste
Estimated Cost	Minimal
Timeline/Schedule	Medium Term
Responsible Entity	City Councils and Fire Departments
Hazards Addressed	Energy Failure, Structural Fire, Grass / Wildfire, Fixed Hazardous Materials
Mitigation Category	Prevention
Related Goals/Objectives	1.1, 1.2, 2.1, 2.2, 2.3, 2.4, 3.5
Addresses High Risk Hazards?	Yes
Jurisdiction(s) Priority	All Jurisdictions
STAPLEE Rating	1

Note: Burning restrictions should address controlled burning for prairie maintenance as fire is an integral part of prairie ecosystems, this does not mean that burning restrictions must permit such controlled burns. For example, burning permits may be required as well as potentially the presence of trained burning professionals. Prairie stands in incorporated areas may be maintained through mowing as a second best maintenance strategy.

Smoke / Fire / Carbon Monoxide Detector and Sprinkler Systems	
Program/Project Description	Encourage use and maintenance of smoke / fire / carbon monoxide detectors and fire suppression (aka sprinkler) systems in private buildings; use and maintain smoke / fire / carbon monoxide detectors in City-owned buildings and install sprinkler systems as funds are available and as needed
Estimated Cost	Minimal
Timeline/Schedule	Short Term
Responsible Entity	City Maintenance and Property Owners
Hazards Addressed	Structural Failure, Structural Fire, Grass / Wildfire
Mitigation Category	Prevention, Property Protection
Related Goals/Objectives	1.1, 1.3, 2.1, 2.2, 2.3, 2.4, 3.1, 3.2, 3.5
Addresses High Risk Hazards?	Yes
Jurisdiction(s) Priority	All jurisdictions
STAPLEE Rating	16

Evacuation Plans	
Program/Project Description	Develop evacuation plans for school, community buildings, and for town (Schools have some measures in place)
Estimated Cost	Minimal to moderate
Timeline/Schedule	Medium Term
Responsible Entity	Fire departments, School Boards, Emergency Management
Hazards Addressed	Flash Flood, Communications Failure, Structural Failure, Transportation Hazardous Materials Incident, Energy Failure, Rail Transportation Incident, Structural Fire, Grass / Wildfire, River Flooding, Fixed Hazardous Materials, Air Transportation Incident, Dam Failure, Sink Holes
Mitigation Category	Prevention, Emergency Services

Related Goals/Objectives	1.1, 1.2, 2.1, 2.2, 2.3, 3.1, 3.2, 3.4, 3.5, 3.6
Addresses High Risk Hazards?	Yes
Jurisdiction(s) Priority	All jurisdictions;
STAPLEE Rating	5

Maintenance of Heating / Cooling Systems	
Program/Project Description	Encourage property owner maintenance of heating and cooling systems and maintenance of heating and cooling systems in community buildings
Estimated Cost	Minimal to moderate
Timeline/Schedule	Short Term
Responsible Entity	City Maintenance workers and Property Owners
Hazards Addressed	Severe Winter Storm, Energy Failure, Climate Change, Extreme Heat
Mitigation Category	Prevention, Public Education and Awareness
Related Goals/Objectives	1.1, 1.3, 2.1, 2.2, 2.3, 2.4, 3.3, 3.5
Addresses High Risk Hazards?	Yes
Jurisdiction(s) Priority	All residents
STAPLEE Rating	16

Fireplace Maintenance	
Program/Project Description	Encourage property owners with fireplaces to keep chimneys clean and in good structural repair
Estimated Cost	Minimal
Timeline/Schedule	Short Term
Responsible Entity	Property Owners
Hazards Addressed	Structural Failure, Structural Fire, Windstorm / High Wind Events, Grass / Wildfire, Tornado, Earthquake
Mitigation Category	Property Protection, Public Education and Awareness
Related Goals/Objectives	1.1, 2.1, 2.2, 2.3, 2.4, 3.5
Addresses High Risk Hazards?	Yes
Jurisdiction(s) Priority	All residents with chimneys
STAPLEE Rating	16

Hazardous Material Disposal	
Program/Project Description	Develop hazardous materials disposal program incorporating public education, community clean-up days, and household hazardous waste exchange
Estimated Cost	Minimal to moderate
Timeline/Schedule	Medium Term
Responsible Entity	Fire Department and Volunteers
Hazards Addressed	Transportation of Hazardous Materials Incident, Fixed Hazardous Materials Incident, Structural Fire, Fixed Hazardous Materials Incident, Human Disease Incident
Mitigation Category	Prevention, Natural Resource Protection, Public Education and Awareness
Related Goals/Objectives	1.1, 1.3, 2.2, 2.3, 2.4 2.5, 3.5, 3.6
Addresses High Risk Hazards?	Yes
Jurisdiction(s) Priority	All jurisdictions

STAPLEE Rating	11

Note: Household hazardous waste exchange may be available through recycling center in Centerville likewise community clean-up days are currently in place. Household hazardous waste exchanges allow community residents to drop off and pick up common household cleaners, paints, and stains rather than disposing of them properly or improperly.

Search and Rescue Training for First Responders	
Program/Project Description	Training Firefighters and other local emergency responders best practices in search and rescue operations
Estimated Cost	Minimal to moderate
Timeline/Schedule	Medium Term
Responsible Entity	Fire Departments, emergency management, emergency services
Hazards Addressed	Flash Flood, Structural Failure, Severe Winter Storm, Transportation of Hazardous Materials Incident, Rail Transportation Incident, Structural Fire, Grass / Wildfire, Fixed Hazardous Materials Incident, River Flooding, Tornado, Windstorm / High Wind Events, Air Transportation Incident, Dam Failure, Sink Holes, Earthquake, Landslide
Mitigation Category	Emergency Services
Related Goals/Objectives	1.1, 1.2, 1.3, 2.2, 2.3, 3.1, 3.4, 3.5, 3.6
Addresses High Risk Hazards?	Yes
Jurisdiction(s) Priority	All Jurisdictions
STAPLEE Rating	6

Mass Casualty Preparation	
Program/Project Description	Develop plan for how to handle mass casualties resulting from hazard events in any jurisdiction
Estimated Cost	Minimal to moderate
Timeline/Schedule	Medium Term
Responsible Entity	First Responders, Emergency Management
Hazards Addressed	Flash Flood, Structural Failure, Severe Winter Storm, Transportation of Hazardous Materials Incident, Rail Transportation Incident, Structural Fire, Grass / Wildfire, Fixed Hazardous Materials Incident, River Flooding, Tornado, Human Disease Incident, Air Transportation Incident, Dam Failure, Sink Holes, Earthquake, Landslide
Mitigation Category	Emergency Services
Related Goals/Objectives	1.1, 1.2, 2.2, 3.5
Addresses High Risk Hazards?	Yes
Jurisdiction(s) Priority	All jurisdictions
STAPLEE Rating	3

Immunization	
Program/Project Description	Encourage periodic immunizations, especially for children and elderly residents, review mass immunization plan with school for emergency immunizations
Estimated Cost	Minimal
Timeline/Schedule	Short Term
Responsible Entity	school district, and County Public Health Department

Hazards Addressed	Human Disease Incident
Mitigation Category	Prevention, Public Education and Awareness
Related Goals/Objectives	1.1, 2.2, 2.3, 2.5, 3.1, 3.5
Addresses High Risk Hazards?	No
Jurisdiction(s) Priority	Centerville Community School, Moravia School, entire county
STAPLEE Rating	5

Waste Disposal Enforcement	
Program/Project Description	Develop or update waste disposal policies and enforce, review for effectiveness
Estimated Cost	Minimal
Timeline/Schedule	Short to Medium Term
Responsible Entity	City Councils, County Board of Supervisors
Hazards Addressed	Windstorm / High Wind Events, Fixed Hazardous Materials Incident, Tornado, Human Disease Incident
Mitigation Category	Prevention
Related Goals/Objectives	1.1, 1.3, 2.1, 2.2, 2.3, 2.4, 3.1, 3.5
Addresses High Risk Hazards?	Yes
Jurisdiction(s) Priority	County
STAPLEE Rating	-3

Pest Management	
Program/Project Description	Review policies for effectiveness governing mowing and maintaining properties to discourage infestations by pests within jurisdictions, consider or update as needed other polices to control pests
Estimated Cost	Minimal
Timeline/Schedule	Short Term
Responsible Entity	City councils
Hazards Addressed	Human Disease Incident
Mitigation Category	Prevention, Natural Resource Protection
Related Goals/Objectives	1.1, 1.3, 2.1, 2.4, 3.1, 3.5
Addresses High Risk Hazards?	No
Jurisdiction(s) Priority	All jurisdictions
STAPLEE Rating	-2

Radon Mitigation	
Program/Project Description	Encourage property owner radon testing and mitigation, explore feasibility of City leveraging funds to help property owners test and / or mitigation unsafe radon levels
Estimated Cost	Minimal
Timeline/Schedule	Short Term
Responsible Entity	Property Owners, City Councils, ADLM-Environmental Management
Hazards Addressed	Human Disease Incident, Radon
Mitigation Category	Public Education and Awareness, Prevention
Related Goals/Objectives	1.1, 1.3, 2.5, 3.5
Addresses High Risk Hazards?	No
Jurisdiction(s) Priority	All residents

STAPLEE Rating	15

Hazard Occurrence Data Collection	
Program/Project Description	Record occurrences of hazards, loss estimates, populations impacted, amount of area impacted, and other relevant information for updates to this plan and for improved emergency response information
Estimated Cost	Minimal
Timeline/Schedule	Short Term
Responsible Entity	City Clerks, First Responders, ADLM, County Public Health Department
Hazards Addressed	All
Mitigation Category	Prevention, Public Education and Awareness
Related Goals/Objectives	1.1, 1.3, 2.2, 2.3, 2.4, 2.5, 3.1, 3.5, 3.6
Addresses High Risk Hazards?	Yes
Jurisdiction(s) Priority	All jurisdictions
STAPLEE Rating	12

Collection & Protection of Vital Records	
Program/Project Description	Encourage property owners to inventory and protect critical information for improved disaster recovery and minimize disruptions to lives following disaster events; critical information includes titles to property, bank information, insurance documents, wills, copies of prescription medications, family contact information, social security cards, passports, marriage licenses, birth certificates, and other forms of information that may be difficult to replace or needed to document eligibility for disaster aid
Estimated Cost	Voluntary
Timeline/Schedule	Short Term
Responsible Entity	Residents
Hazards Addressed	Flash Flood, Thunderstorm / Lightning, Communications Failure, Structural Failure, Severe Winter Storm, Transportation of Hazardous Materials Incident, Energy Failure, Rail Transportation Incident, Highway Transportation Incident, Structural Fire, Windstorm / High Wind events, Grass / Wildfire, Fixed Hazardous Materials Incident, River Flooding, Tornado, Hailstorm, Climate Change, Air Transportation Incident, Dam Failure, Sink Hole, Extreme Heat, Human Disease Incident, Earthquake, Landslide
Mitigation Category	Public Education and Awareness
Related Goals/Objectives	1.1, 3.1, 3.5, 3.6
Addresses High Risk Hazards?	Yes
Jurisdiction(s) Priority	All residents
STAPLEE Rating	17

Digging hotline/pipeline safety regulations of pipelines	
Program/Project Description	Communities must insure that they are in compliance with industry safety regulations and standards. One component that is to be well advertised is the digging hotline for residents to call before digging on

	their property.
Estimated Cost	Minimal
Timeline/Schedule	Short Term
Responsible Entity	County Board of Supervisors, ADLM, private pipeline owners
Hazards Addressed	Flash flood, tornado, grass/wildfire, sinkholes, pipeline,
Mitigation Category	Prevention, Public Education and Awareness
Related Goals/Objectives	1.1, 1.2, 2.1, 2.2, 2.4, 3.4
Addresses High Risk Hazards?	Yes
Jurisdiction(s) Priority	All Jurisdictions
STAPLEE Rating	12

Tree Management/Trimming	
Program/Project Description	Encourage private home owners, businesses, and jurisdictions to regularly perform tree trimming and maintenance to prevent limb breakage and for safeguarding nearby utility lines.
Estimated Cost	Minimal
Timeline/Schedule	Short Term
Responsible Entity	Cities Maintenance, property home owners, utility companies, County engineer
Hazards Addressed	Communications Failure, Severe winter storm, energy failure, windstorm/high wind events, structural failure,
Mitigation Category	Prevention, Public Education and Awareness
Related Goals/Objectives	1.1, 2.1, 2.3, 3.1
Addresses High Risk Hazards?	Yes
Jurisdiction(s) Priority	Moravia, IA; Unincorporated County
STAPLEE Rating	12

Manufactured Home Tie-Downs	
Program/Project Description	Encourage incorporated and rural manufactured homes to be secured by tie-downs to the ground. This anchoring can prevent damage and injuries.
Estimated Cost	Minimal
Timeline/Schedule	Short Term
Responsible Entity	City Councils, property owners
Hazards Addressed	Communications failure, river flooding, tornado, windstorms/high wind events,
Mitigation Category	Prevention, Public Education and Awareness
Related Goals/Objectives	11, 1.3, 2.1, 2.4, 3.1
Addresses High Risk Hazards?	Yes
Related Jurisdiction (s)	All Jurisdictions
STAPLEE Rating	12

Assess/Improve Fire Hydrant systems	
Program/Project Description	Encourage property owner purchase of flood insurance
Estimated Cost	Moderate
Timeline/Schedule	Ongoing
Responsible Entity	Fire Departments, emergency management
Hazards Addressed	Structural fire, Thunderstorms/Lighting, Transportation of Hazardous

	Material, Highway transportation incident, Transportation of Radiological material, grass/wild fire, Rail Transportation incident, fixed hazardous materials, Extreme heat, air Transportation incident, drought
Mitigation Category	Emergency services
Related Goals/Objectives	1.1, 2.1, 2.2, 2.3, 2.4, 3.1
Addresses High Risk Hazards?	Yes
Jurisdiction(s) Priority	Moravia, IA;
STAPLEE Rating	12

Meth Lab Prevention/Education	
Program/Project Description	Develop public education campaign to help the public understand dangers of meth use and production.
Estimated Cost	Minimal
Timeline/Schedule	Ongoing
Responsible Entity	School Boards, Fire Departments, Public Health Dept, Emergency mang.
Hazards Addressed	Structural fire, Transportation of Hazardous Material, Transportation of Radiological material, grass/wild fire, fixed hazardous materials
Mitigation Category	Education
Related Goals/Objectives	1.1, 1.2, 1.3, 2.1, 2.2, 2.3, 2.4, 3.1, 3.5
Addresses High Risk Hazards?	No
Jurisdiction(s) Priority	All Jurisdictions & county; Mystic, IA
STAPLEE Rating	12

Wetland Restoration/Protection	
Program/Project Description	Discourage wetland destruction and encourage restoration of wetlands in low-lying areas to help slow flood water and infiltrate storm water to minimize flooding and maintain wildlife habitat.
Estimated Cost	Moderate
Timeline/Schedule	Ongoing
Responsible Entity	County Board of Supervisors
Hazards Addressed	Flash flooding, Thunderstorm/Lighting, Severe Winter Storm, River Flooding, grass/wildfire, climate change.
Mitigation Category	Prevention
Related Goals/Objectives	1.1, 1.3, 2.2, 2.3, 2.4,
Addresses High Risk Hazards?	Yes
Jurisdiction(s) Priority	Unincorporated County
STAPLEE Rating	3

NFIP Participation	
Program/Project Description	Communities will consider or continue participating with the National Flood Insurance Program (NFIP).
Estimated Cost	Minimal
Timeline/Schedule	Ongoing
Responsible Entity	City Councils
Hazards Addressed	Flash flooding, Thunderstorm/Lighting, Severe Winter Storm, River Flooding
Mitigation Category	Prevention

Related Goals/Objectives	1.1, 1.3, 2.2, 2.3, 2.4,
Addresses High Risk Hazards?	Yes
Jurisdiction(s) Priority	Centerville, Moravia, Mystic, Unionville
STAPLEE Rating	3

9. Plan Maintenance

Hazard Mitigation Plans are not one-time documents or processes; they are intended to develop as the respective jurisdictions face actual hazard events and as actions are taken. FEMA requires periodic updates, but reviews of the plan more frequently than FEMA's requirement is a prudent idea as well.

A. Update Cycle

FEMA requires that the Hazard Mitigation Plan be updated, approved by FEMA and the State of Iowa, and readopted by each jurisdiction within 5 years of the previous update or initial plan. Thankfully, the initial plan is the most time-consuming and challenging step. Updates to this plan should include three elements; 1. A new timeline for the next update, 2. Evaluation of the implementation of the current plan, and 3. Updates to plan contents that may have changed.

For updates to this plan, the following tasks will need to be addressed.

Procedures and Techniques

Task A. Evaluate the effectiveness of the planning process.

1. Reconvene the Planning Team.
2. Review the Planning Process.
   Items to Discuss:
   a. Building the Planning Team
   b. Engaging the Public
   c. Data Gathering and Analysis
   d. Coordinating with other Agencies

Task B. Evaluate the effectiveness of your actions.

1. What were the results of the implemented action? Did the results achieve the goals/objectives outlined in the plan? Did the actions have the intended results?
2. Were the actions cost-effective? Did (or would) the project result in the reduction of potential losses?
3. Document actions which were slow to get started or not implemented.

Task C. Determine why the actions worked (or did not work).

1. Lack of available resources
2. The political or popular support for or against the action.
3. The availability of funds
4. The workloads of the responsible parties
5. The actual time necessary to implement the actions.

Task D. Update dated plan contents with current and/or more complete information.

1. Update community profiles with most recent demographics (with information from
2. Update hazard profiles with events, damages, and other relevant information that have occurred since the current version of the plan
3. Determine whether hazards should be added or removed
4. Determine whether goals, objectives, and/or mitigation actions should be modified

Timeline & Evaluation

This plan is projected to be FEMA and State approved and adopted by local jurisdictions by no later than January 1, 2011. The Planning Team should reconvene approximately 12 months after to this date to allow for an annual review with the members of the Emergency Management personnel. Any adjustments to the plan will adhere to the required 30 day public review of the updated plan. In order to determine if the desired effects on each jurisdiction has been made, FEMA's how-to guide 386-4, "Bringing the Plan to Life; Implementing the Hazard Mitigation Plan," (downloadable from www.fema.gov). It will provide examples, ideas, and funding information that can guide the communities in the evaluation process. Any changes will also adhere to the required 30 day public review of the updated plan then is submitted for FEMA and State review in addition to the update work. The updated plan will be submitted to FEMA and the State for approval by October 2015. The draft of the updated plan will be made available for public review by September 1, 2015.

At the end of the five year grant period, the committee will reconvene to reflect accomplishments and changes to the plan. The FEMA approved plans expire five years after the date the first jurisdiction adopts the mitigation plan (See Appendix A). A new plan should be created and submitted to FEMA prior to that date. Because it takes considerable time for a multi-jurisdictional plan to be updated, the communities should start this process by 2013.

Incorporation into Existing and Future Planning Mechanisms

One jurisdiction, Mystic, has a FEMA approved Hazard Mitigation Plan that was created by Chariton Valley Planning & Development. This was a guiding document provided extensive information and formatting in the Appanoose County Multi-Jurisdictional Hazard Mitigation Plan.

The hazard mitigation planning team was created to develop the mitigation plan and guide the plan preparer in its writing. The planning team should not formally end with the approval of the plan. The planning team can evolve into one of a watch dog over the practices of land developers and public officials. Members can help remind public officials of that particular year's mitigation strategy and possible funding options and can volunteer in the implementation process for certain actions. The team and local governments may participate in the process and engage regional organizations, state agencies, state universities, schools and church via memorandums of agreement.

Finally, the planning team is partly responsible to ensure that the public officials are incorporating mitigation actions into relevant plans and planning mechanisms, such as zoning, annexation plans, and boding proposals. Communities should also include mitigation initiatives as regular line items in community capital or operational budgets to ensure ongoing funding for hazard mitigation initiatives. The following matrix shows the types of planning mechanisms available and how the plan should be incorporated into them.

Current Planning Mechanisms	*Jurisdictions Currently in Place*	*Method of Incorporation*	*Who Responsible or Lead*
Comprehensive Land Use plan	County & Centerville	Review Each, develop in other jurisdictions	Zoning Commissions & staff, BOS
Capital improvement plan	Centerville	Modernize each, develop plans if they are outdated	City of Centerville
Economic Development plan	Regional – CEDS	Add a mitigation section to annual regional plan	CVPD, city of Centerville, Appanoose Economic Dev Corp
Open space/ conservation plan	Rural county	Incorporate mitigation projects affecting open spaces into plans	Conservation board/staff, city parks
Watershed Protection plan	County	Address mitigation actions in watershed areas	Emergency management Coordinator
Zoning Ordinance	25% of County, Centerville, Moravia, Moulton, Plano	Review zoning code concerning applicable hazards	Zoning commissions & staff, BOS
Building Codes	Centerville	Update building codes for fire & wind standards	City councils, BOS
Tree Maintenance Codes	Centerville, but limited in all other areas	Consult with utilities	City of Centerville Utilities Dept, County Maintenance Dept
Soil erosion/ water control ordinance	Limited in all areas	Consult with RRWA	Emergency management coordinator
Solid/hazardous waste regulations	Limited	Review regulations as to what can be landfilled, add hazard maps	Landfill owner, Emergency Management Coordinator
Public Health Regulations	All of region covered through Public Health Dept	Collaborate with PH agencies to incorporate new protocols	Emergency Management Coordinator, Public Health Board, & staff
Historic District Programs	Centerville, County	Provide data to assist in protecting properties	Development of groups with state IDED assistance
Long-Range Transportation Plan	Regional coverage – plan is in progress	Incorporate hazard maps & transportation improvement ideas	County engineer, CVTPA, IDOT, BOS
Water source plan	All of county through inter-	Include mitigation actions	RRWA

	government agreement	related to relevant hazards	
Storm water Management program	Centerville, Moravia	Include mitigation actions related to flash flooding	City Councils, Emergency Management coord,
Housing & Special Needs plan	Centerville, Mystic, Exline	Consider mitigation recommendations in housing plans & funding requests for improvements	City Councils, CVPD, hospitals, Emergency Management Coord
Administrative Operations processes- departments & boards	All Jurisdictions	Convene meetings where possible, realignment of tasks, new or improved tasks & processes, & board goals are updated.	Emergency Management Coord, elected officials, clerks & board chairs

At this time, it is not recommended that any jurisdiction adopt a formal policy that requires each jurisdiction to include relevant parts of the plan in each planning mechanism. However, it is strongly recommended that staff and elected/appointed officials become aware of the mitigation strategy's practical applications. An annual review of the local planning mechanisms is warranted, simply to give the local leaders the opportunity to think about how mitigation actions affect the local planning mechanisms and to ensure local plans are current.

Public Participation

Obtaining public participation for planning can be difficult in both rural areas and in larger urban areas, sometimes there is significant interest, but this is not always the case. Public participation for planning exercises is particularly difficult when the public is not interested in the plan or is not clear on what the plan means to them. An advantage in small communities though, is the capacity for word-of-mouth and informal discussion, especially with the community's elected officials. The Appanoose County Hazard Mitigation Committee has expressed interest in having a standing mitigation committee or a C.O.A.D. to answer community questions, reach out to the community, or to review proposed projects. The public shall be presented the opportunity to take part in this committee if it can be formed and also participate in plan reviews and updates. The opportunity for the public to take part in updates and reviews of this plan will comply with Iowa's Open Meeting Law (Iowa Code, Chapter 21). For each plan update (the five year period), the plan will be presented to the public for a 30 day comment and review period prior to being submitted to the State and FEMA. For each annual review, public notices should be announced as city council meetings are in order to permit members of the public to attend planning team meetings. This document shall be available through each jurisdiction's City Hall to any party who requests to see it where and when practicable. However portions intended for internal use may be withheld for confidentiality purposes (such as where private individual information is disclosed) or where legitimate safety concerns are present (such as the exact location and contents of sensitive facilities, hazardous chemical storage and composition, or mine

12. Appendices

Appendix A: Resolutions Adopting Appanoose County Multi-Jurisdictional Hazard Mitigation Plan

RESOLUTION #_____

Purpose: A Resolution to approve and adopt the Appanoose County Multi-Jurisdictional Hazard Mitigation Plan.

WHEREAS, Appanoose County Multi-Jurisdictional Hazard Mitigation Plan was presented to the Appanoose County Board of Supervisor's on June 20, 2011; and

WHEREAS, Appanoose County Multi-Jurisdictional Hazard Mitigation Plan was prepared in compliance with the Hazard Mitigation Planning Requirements of the Disaster Mitigation Act of 2000 provided by the Iowa Homeland Security and Emergency Management Division; and

WHEREAS, Appanoose County Multi-Jurisdictional Hazard Mitigation Plan identifies the county and all **jurisdiction's potential hazards; and**

WHEREAS, Appanoose County Multi-Jurisdictional Hazard Mitigation Plan includes a profile of hazard events, vulnerability assessment, evaluation of mitigation goals and a plan maintenance process.

NOW THEREFORE BE IT RESOLVED that Appanoose County does hereby approve and adopt the Appanoose County Multi-Jurisdictional Hazard Mitigation Plan this 20 day of June, 2011.

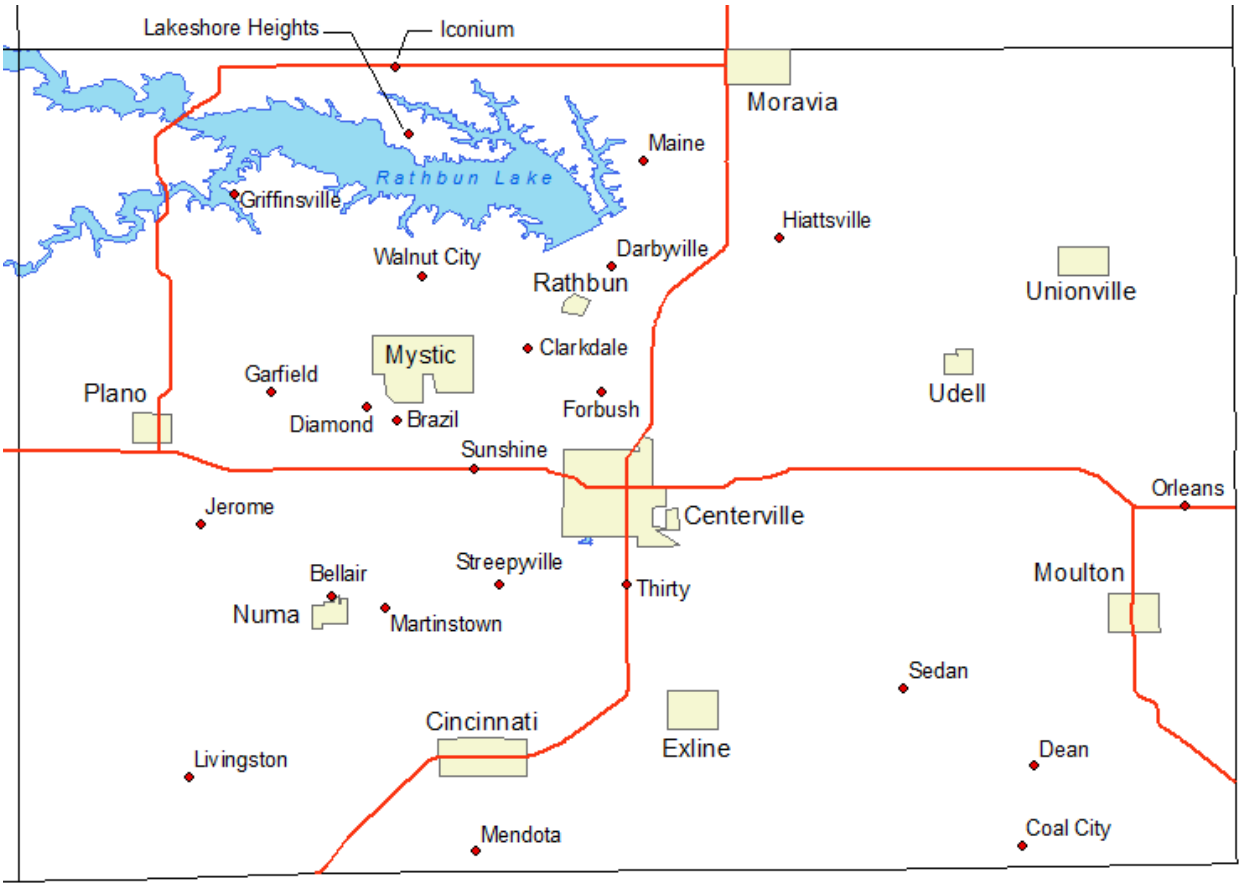
Dean Koster
Contact name, Appanoose County Board of Supervisor's

6-20-11
Date of Signature

Linda Demuth
Attest:

6-20-11
Date of Signature

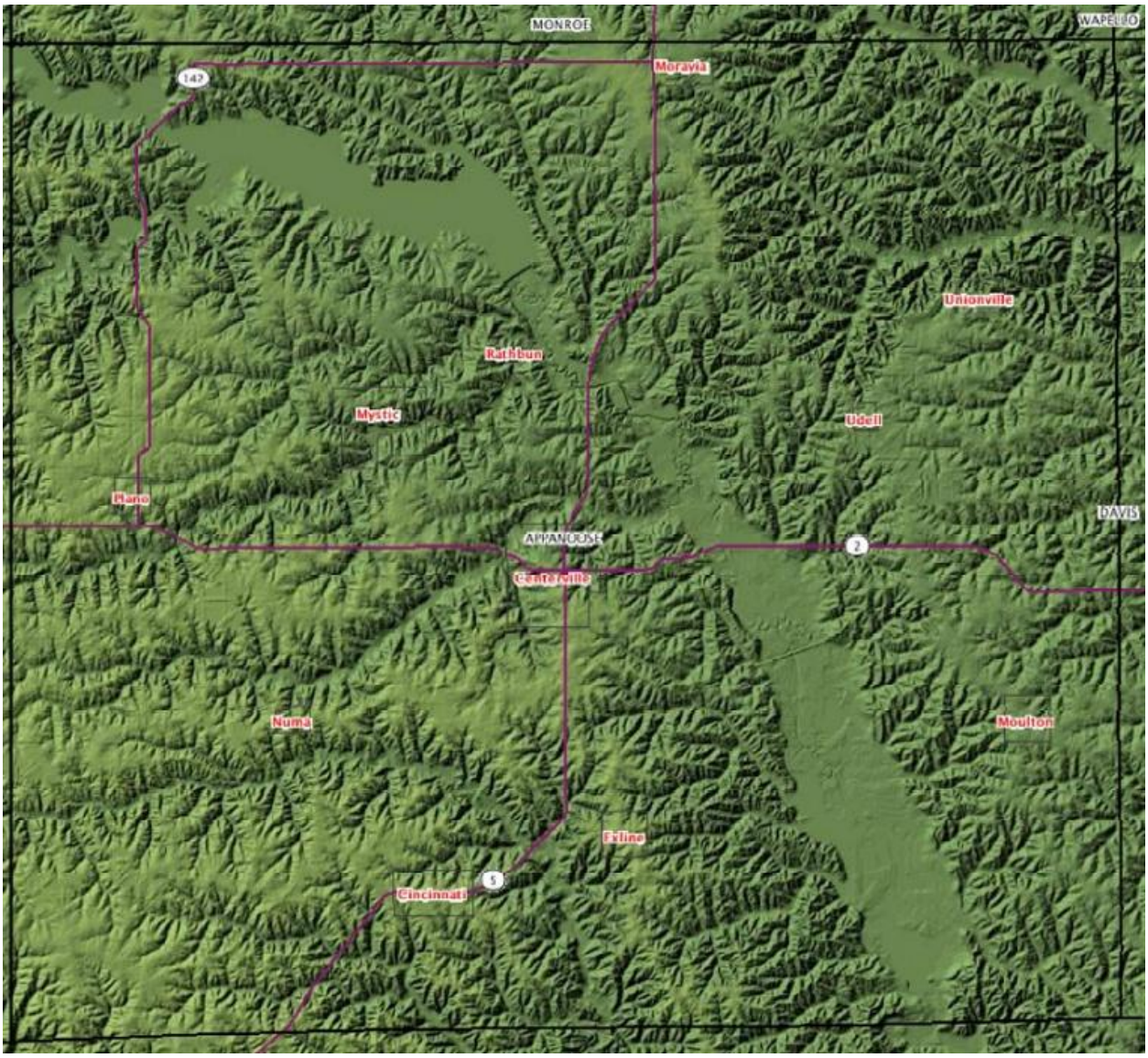
Appendix B: Communities of Appanoose County



There are twenty-four unincorporated communities and eleven incorporated cities in Appanoose County. These communities reflect the entire body of Census-recognized named places in the county, though there may be others that are locally recognized such as named subdivisions in the unincorporated county. One such example is Golfview which is located north-west of Centerville.

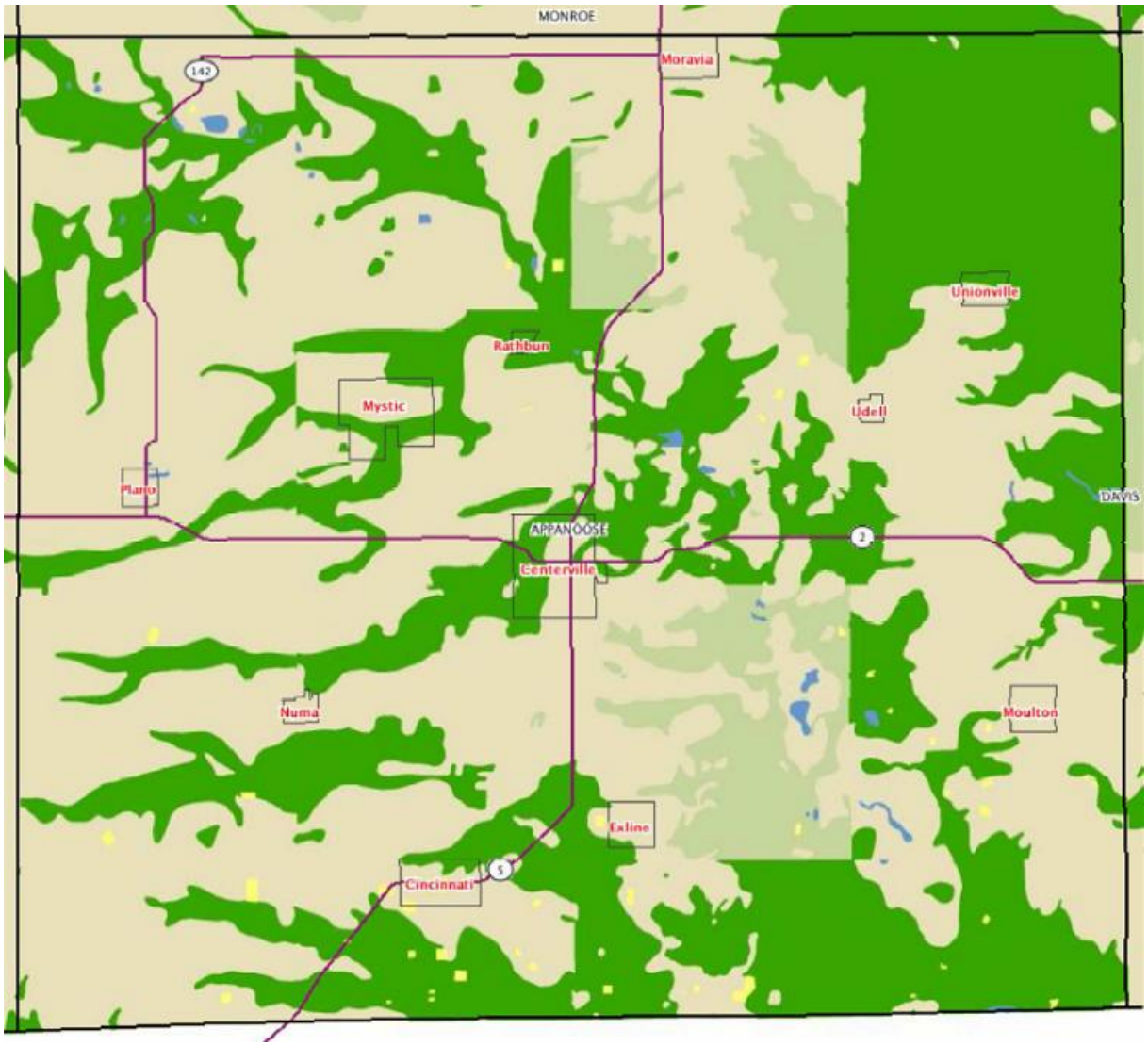
Source: IA DNR GIS data compiled by Chariton Valley Planning and Development

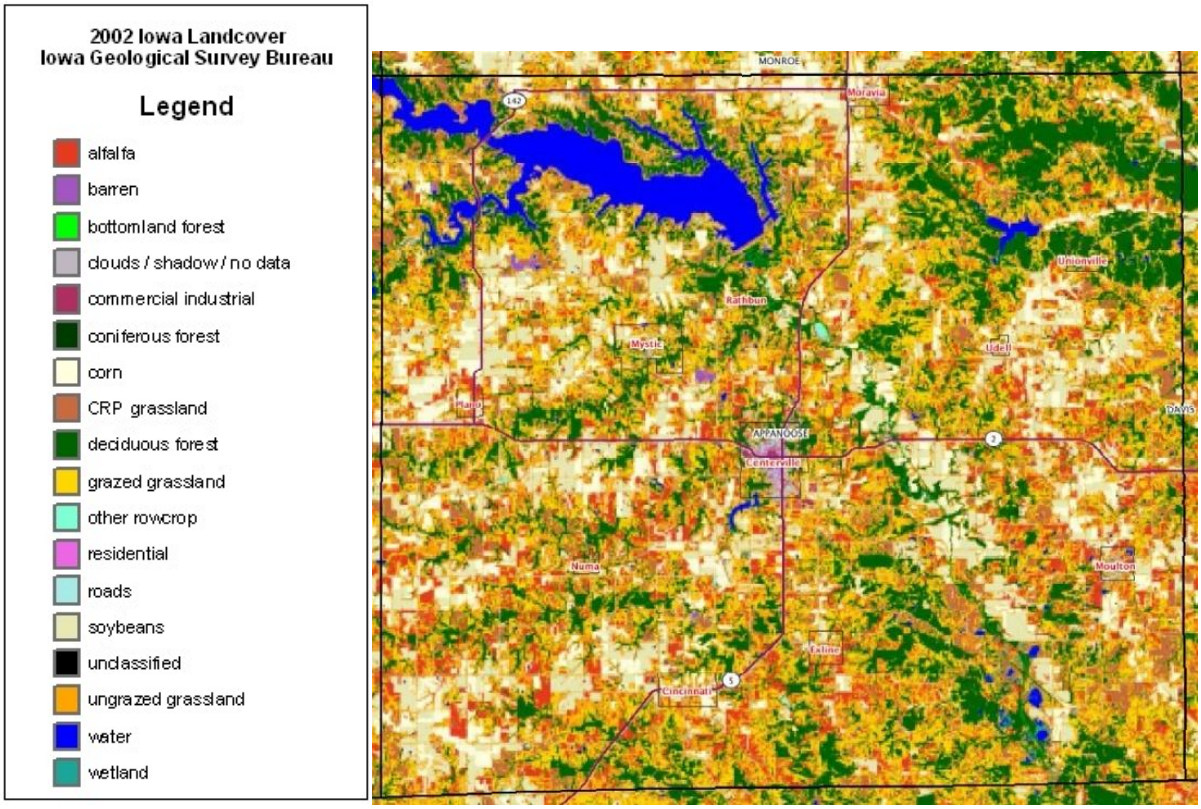
Appendix C: Hill shade Image of Appanoose County



This image shows a representation of the topography in Appanoose County. The solid mass in the top left corner is Rathbun Lake where the surface topography is effectively level. The top right corner shows much steeper slopes roughly bounded by Moravia, Udell, and Unionville. The interactive mapping site where this image can be generated and manipulated can be found on the ISU GIS Facility Iowa Geographic Map Server website; http://ortho.gis.iastate.edu/map.html (30-meter DEM).

Appendix D: Change in Vegetative Cover





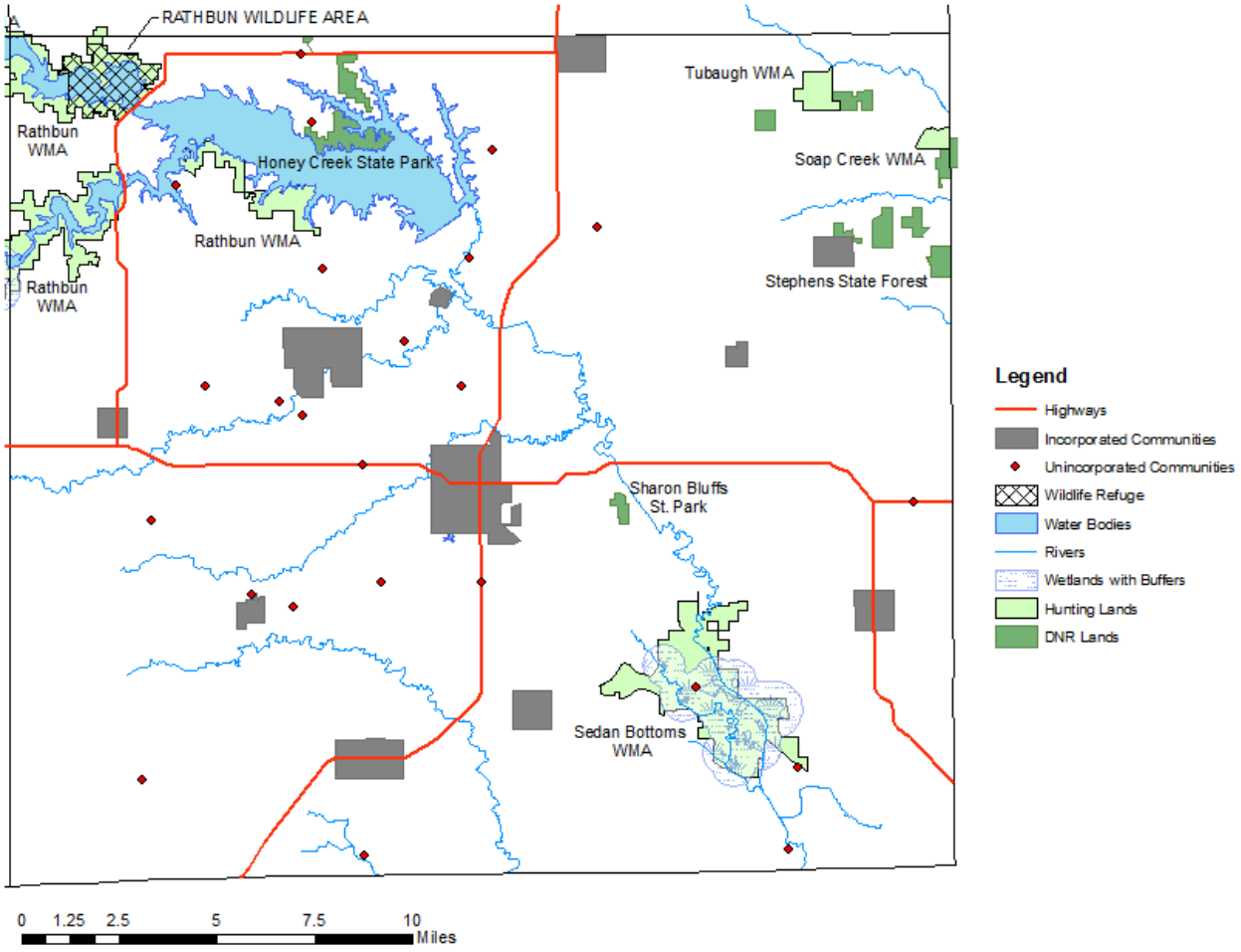
These two comparison maps show dramatic changes have occurred in Appanoose County since the county was formed. Initially the county was predominantly forest and prairie land with a scattering of wetlands and fields. This land cover has been transformed into various cropland uses but also perhaps more substantial stands of deciduous forest than may be found elsewhere in Iowa. The interactive mapping site where this image can be generated and manipulated can be found on the ISU GIS Facility Iowa Geographic Map Server website; http://ortho.gis.iastate.edu/map.html (1800s Historic Vegetation and 2002 Landcover).

Appendix E: Waste Water Permits

FACILITY NAME	RIVER BASIN	NEAREST CITY	TYPE OF TREATMENT	DESIGN PE	DESIGN BOD	DESIGN ADW FLOW (MGD)	DESIGN AWW FLOW (MGD)	OPERATOR CERTIFICATION FACILITY TYPE	OPERATOR CERTIFICATION FACILITY GRADE
CENTERVILLE CITY OF STP (EAST)	CHARITON RIVER	CENTERVILLE	ROTATING BIOLOGICAL CONTACTOR	10,425.00	1,741.00	1.15	1.50	WW	III
CENTERVILLE CITY OF STP (WEST)	CHARITON RIVER	CENTERVILLE	ROTATING BIOLOGICAL CONTACTOR	4,383.00	732.00	0.18	0.41	WW	II
RATHBUN REGIONAL WATER ASSN.	CHARITON RIVER	CENTERVILLE	PRIMARY TREATMENT			0.00	0.04		
CINCINNATI CITY OF STP	CHARITON RIVER	CINCINNATI	AERATED LAGOON	629.00	105.00	0.06	0.06	WL	I
EXLINE, CITY OF, STP	CHARITON RIVER	EXLINE	WASTE STABILIZATION LAGOON	190.00	32.00	0.02	0.02	WL	I
DNR HONEY CREEK RESORT STATE PARK	DES MOINES RIVER BELOW WHITEBREAST CREEK	ICONIUM	WASTE STABILIZATION LAGOON	623.00	104.00	0.03	0.04		
DNR HONEY CREEK STATE PARK-(IA.OP.PERMIT)	CHARITON RIVER	MORAVIA	LAND APPLICATION	150.00	25.00	0.01	0.01		
DNR RATHBUN FISH HATCHERY	CHARITON RIVER	MORAVIA	WASTE STABILIZATION LAGOON	180.00	30.00	0.00	0.01		
MORAVIA CITY OF STP	DES MOINES RIVER BELOW WHITEBREAST CREEK	MORAVIA	AERATED LAGOON	750.00	143.00	0.09	0.21	WL	I
MOULTON CITY OF STP	FOX AND WYACONDA RIVERS	MOULTON	WASTE STABILIZATION LAGOON	677.00	113.00	0.07	0.17	WL	I
MYSTIC CITY OF STP	CHARITON RIVER	MYSTIC	WASTE STABILIZATION LAGOON	725.00	121.00	0.07	0.07	WL	
PLANO, IOWA-ADLM-FMS	CHARITON RIVER	PLANO	WASTE STABILIZATION LAGOON	61.00	10.00	0.00	0.01	WL	

UNIONVILLE, CITY OF STP	FOX AND WYACONDA RIVERS	UNIONVILLE	WASTE STABILIZATION LAGOON	138.00	23.00	0.00	0.01	WL	I

Appendix F: Public Lands



The Rathbun Wildlife Area is the one "Inviolate Wildlife Management Area Refuge" in Appanoose County encompassing a portion of the Rathbun Wildlife Management Area and Rathbun Lake. Sedan Bottoms Wildlife Management Area in the southeastern quadrant of the County contains a number of wetlands and wetland buffers as well as the unincorporated community of Sedan. Stephens State Forest is comprised of several unconnected patches of DNR lands in the northeastern portion of the county with two wildlife management areas interspersed; Tubaugh WMA and Soap Creek WMA. Honey Creek Park is located on the northern side of Rathbun Lake.

Appendix G: Community Assets and Critical Facilities

MUSEUMS

APPANOOSE COUNTY HISTORICAL MUSEUM
100 W MAPLE ST, CENTERVILLE, IA - (641) 856-8040
MORAVIA WABASH DEPOT MUSEUM
800 W NORTH ST, MORAVIA, IA - (641) 724-3777
EXLINE MUSEUM
EXLINE, IA (641)

COLLEGES

INDIAN HILLS COMMUNITY COLLEGE
700 N 1ST ST, CENTERVILLE, IA - (641) 856-2143

SCHOOLS

MORAVIA HIGH SCHOOL
505 N TRUSSELL AVE MORAVIA, IA 52571 (641) 724-3241
MYSTIC ELEMENTARY SCHOOL
500 CLARKDALE ROAD MYSTIC, IA 52574 (641) 856-0729
FOX VALLEY JUNIOR HIGH & HIGH SCHOOL
202 N UNION ST MOULTON, IA 52572 (641) 656-4976
CENTERVILLE EARLY CHILDHOOD
722 N 1ST ST CENTERVILLE, IA 52544 (641) 856-0628
HERITAGE CHRISTIAN SCHOOL
914 N PARK CENTERVILLE, IA 52544 (641) 856-6868
CENTERVILLE SUPERINTENDENT
634 N MAIN ST CENTERVILLE, IA 52544 (641) 856-0601
LINCOLN ELEMENTARY SCHOOL
603 N 10TH ST CENTERVILLE, IA 52544 (641) 856-0749
CENTRAL WARD ELEMENTARY SCHOOL
320 DRAKE AVE CENTERVILLE, IA 52544 (641) 856-0709
CENTERVILLE HIGH SCHOOL
600 CHS DR CENTERVILLE, IA 52544 (641) 856-0813
HOWAR JUNIOR HIGH SCHOOL
850 S PARK AVE CENTERVILLE, IA 52544 (641) 856-0760
ST MARY'S CATHOLIC SCHOOL
838 S 18TH ST CENTERVILLE, IA 52544 (641) 437-1117

GARFIELD ELEMENTARY SCHOOL
505 E WALSH ST CENTERVILLE, IA 52544 (641) 856-0759
LAKEVIEW ELEMENTARY SCHOOL
1800 S 11TH ST CENTERVILLE, IA 52544 (641) 856-0637
APPANOOSE COUNTY HIGH SCHOOL
400 E. GREEN STREET CENTERVILLE, IA 52544 (641) 856-0890
CINCINNATI ELEMENTARY SCHOOL
105 ALPINE ST CINCINNATI, IA 52549 (641) 658-2730
MOULTON-UDELL COMMUNITY SCHOOL
305 E 8TH ST MOULTON, IA 52572 (641) 642-8131

LIBRARIES

DRAKE PUBLIC LIBRARY
115 DRAKE AVE, CENTERVILLE, IA - (641) 856-6676
CENTERVILLE CENTER LIBRARY
721 N 1ST ST, CENTERVILLE, IA - (641) 856-2143
GARRETT MEMORIAL LIBRARY
123 S MAIN ST, MOULTON, IA - (641) 642-3664
MORAVIA PUBLIC LIBRARY
100 E CHARITON ST, MORAVIA, IA - (641) 724-3440

COMMUNITY CENTERS

MILTON SENIOR CENTER / AMERICAN LEGION
320 N MAIN ST MOULTON, IA 52572 (641) 656-4979
EXLINE COMMUNITY CENTER
112 W MAIN ST EXLINE, IA 52555 (641) 658-2642
EIGHTEEN EIGHTY CLUB
308 N 12TH ST CENTERVILLE, IA 52544 (641) 856-8627

PLACES OF WORSHIP	NUMBER
UNINCORPORATED COUNTY	4
CENTERVILLE	15
CINCINNATI	3
EXLINE	1
MORAVIA	2
MOULTON	3
MYSTIC	1
NUMA	0
PLANO	1
RATHBUN	0

UDELL	1
UNIONVILLE	2

NURSING / RETIREMENT HOMES - VULNERABLE POPULATION

GOLDEN AGE CARE CENTER
1915 S 18TH ST CENTERVILLE, IA 52544 (641) 856-2757
CENTERVILLE NURSING & REHAB
1208 E CROSS ST CENTERVILLE, IA 52544 (641) 856-8651
THE CONTINENTAL AT ST JOSEPH'S
19999 SAINT JOSEPH DR CENTERVILLE, IA 52544 (641) 437-1999
MAPLE GROVE SENIOR LIVING
1917 S 18TH ST CENTERVILLE, IA 52544 (641) 856-6601
NEW FOCUS
102 WEST WASHINGTON, CENTERVILLE, IA 52544
LIL RASCAL'S DAYCARE
1004 SOUTH DRAKE ST, CENTERVILLE, IA 52544
APPANOOSE COUNTY DAY CARE, INC
722 NORTH 1ST STREET, CENTERVILLE, IA 52544
PROFFITT'S RESIDENTIAL CARE HOME
615 WEST WASHINGTON, CENTERVILLE, IA 52544
SENECA AREA AGENCY ON AGING
308 NORTH 12TH STREET, CENTERVILLE, IA 52544
HOSPICE OF CENTRAL IOWA
118 EAST JACKSON STREET, CENTERVILLE, IA 52544
CENTER FOR BEHAVIORAL SERVICES
221 EAST STATE STREET, CENTERVILLE, IA 52544
LOW RENT HOUSING AGENCY OF CENTERVILLE
317 EAST OAK STREET, CENTERVILLE, IA 52544

HOSPITALS & MEDICAL CENTERS

MERCY MEDICAL CENTER – CENTERVILLE
1 SAINT JOSEPH DR CENTERVILLE, IA 52544 (641) 437-4111
UIHC CENTERVILLE MEDICAL CLINIC
19876 SAINT JOSEPH DR, CENTERVILLE, IA - (641) 856-8684
CHARITON VALLEY MEDICAL CENTER
707 SOUTH MAIN STREET, CENTERVILLE, IA (641
CENTERVILLE FAMILY CARE CLINIC
236 WEST MAPLE, CENTERVILLE, IA (641)
NEW HOPE COUNSELING CENTER
303 WEST STATE STREET, CENTERVILLE, IA (641)
CENTERVILLE MEDICAL CLINIC INC
19876 ST JOSEPH STREET, CENTERVILLE, IA (641)
CORNERSTONE COUNSELING CENTER
526 NORTH MAIN STREET, CENTERVILLE, IA 52544

PEDIATRIC CLINIC
707 SOUTH MAIN STREET, CENTERVILLE, IA 52544
RIVER HILLS MEDICAL CENTER
, CENTERVILLE, IA 52544

AMBULANCE SERVICES

MERCY MEDICAL CENTER: AMBULANCE
1 SAINT JOSEPH DR, CENTERVILLE, IA - (641) 437-4111
MOULTON VOLUNTEER AMBULANCE
109 MAIN ST, MOULTON, IA - (641) 642-3959

FIRE DEPARTMENTS / STATIONS

CENTERVILLE FIRE DEPARTMENT
312 E MAPLE ST, CENTERVILLE, IA - (641) 856-2314
CINCINNATI FIRE DEPARTMENT
CINCINNATI, IA (641)
MYSTIC FIRE STATION
505 N 1ST ST, MYSTIC, IA - (641) 647-2698
MOULTON FIRE DEPARTMENT
105 E 3RD ST, MOULTON, IA
MORAVIA FIRE STATION
116 S WILLIAM ST, MORAVIA, IA - (641) 724-3222
EXLINE FIRST RESPONDERS
EXLINE, IA (641)

POLICE / LAW ENFORCEMENT FACILITIES

CENTERVILLE POLICE DEPARTMENT
1125 W VAN BUREN ST, CENTERVILLE, IA
MOULTON POLICE DEPARTMENT
MOULTON, IA

COURTHOUSES

APPANOOSE COUNTY COURTHOUSE
201 N 12TH ST, CENTERVILLE, IA

GROCERY STORES

HY-VEE FOOD STORE
609 N 18TH ST, CENTERVILLE, IA - (641) 856-3277
SPENCER GROCERY

107 E CHARITON ST, MORAVIA, IA - (641) 724-3414

ALDI

215 S MAIN ST, CENTERVILLE, IA

ANGEL'S SMALL MART

308 N. FRONTAGE ROAD, MORAVIA, IA - (641) 724-3130

FAREWAY STORES INC

217 S 18TH ST, CENTERVILLE, IA - (641) 437-7064

ELLIOTT'S GENERAL STORES INC

23828 HIGHWAY J18, MORAVIA, IA 52571

KONVENIENCE KORNER III

101 SOUTH MAIN STREET, MOULTON, IA 52572

J & K MARKET

113 WEST VAN BUREN STREET, CENTERVILLE, IA 52544

COMMUNICATIONS

FARMERS MUTUAL TELEPHONE CO-OP

101 N MAIN ST, MOULTON, IA - (641) 642-3249

OTHER FACILITIES

ADLM EMERGENCY MANAGEMENT AGENCY

12307 HIGHWAY 5, MORAVIA, IA - (641) 724-3223

ALLIANT ENERGY

719 N 18TH ST, CENTERVILLE, IA

RATHBUN RURAL WATER ASSOCIATION INC.

16166 HIGHWAY J29, CENTERVILLE, IA - (641) 647-2416

CHARITON VALLEY ELECTRIC CO-OP INC

2090 HWY 5 SOUTH, ALBIA, IA

INDIAN HILLS COMMUNITY COLLEGE DORM

721 N 1ST ST, CENTERVILLE, IA - (641) 856-2168

MIDAMERICAN ENERGY COMPANY

INTERSTATE POWER LIGHT POWER

310 EAST GREEN STREET, CENTERVILLE, IA

RATHBUN AREA SOLID WASTE COMMISSION

1209 SOUTH 18TH STREET, CENTERVILLE, IA

HILLS SANITARY SERVICE

111 NORTH 13TH STREET, CENTERVILLE, IA

APPANOOSE COUNTY COMMUNITY RAILROAD

1303 SOUTH 21ST STREET, CENTERVILLE, IA 52544

Gas Stations & other sites containing possible Hazardous Materials

MFA Oil & propane Company, 21694 Highway J46, Centerville, IA 52544

Quick Shop
1023 Main Street, Centerville, IA 52544
Kum & Go
401 W Maple Street, Centerville, IA 52544
Bratz Texaco
102 South Drake Ave, Centerville, IA 52544
Elliott Oil Company
104 South 18th Street, Centerville, IA 52544
Casey's General Store
708 East Van Buren St, Centerville, IA 52544
Kum & Go
830 North 18th Street, Centerville, IA 52544
Rathbun Marina
21646 Marina PL, Moravia, IA 52571
Elliott's General Store Inc
23828 Hwy J18, Moravia, IA 52571
Moulton Gas & Wash
109 North Main St, Moulton, IA 52572
Daniel's Gas Station
107 South Main St, Moulton, IA 52572
Konvenience Korner
Cincinnati, IA
Country Store
Exline, IA

Critical Bridges/Overpasses

Bridge on North Highway 5
Crossing Cooper Creek
Bridge north of Centerville on Highway 5
Crossing Chariton River
Overpass of IMRL Rail line
West of Centerville on Hwy 2
Bridge over Walnut Creek on
Hwy 2 west of Centerville
Bridge over ICE Railroad
North Highway 5, Appanoose County
Bridge over Dosset Creek
Highway 2 east of Centerville
Bridge over Chariton River
Highway 2 east of Centerville
Bridge over Doggett Creek
East of Centerville on Highway 2
Bridge over Branch Fox Creek
Highway 2 east of Centerville
3 Bridges over wetlands

South Highway 5 – all in close proximity

Drainage Tile

South Highway 5, over a small natural spring

Bridge over Little Shoal Creek

South Highway 5 near State Border

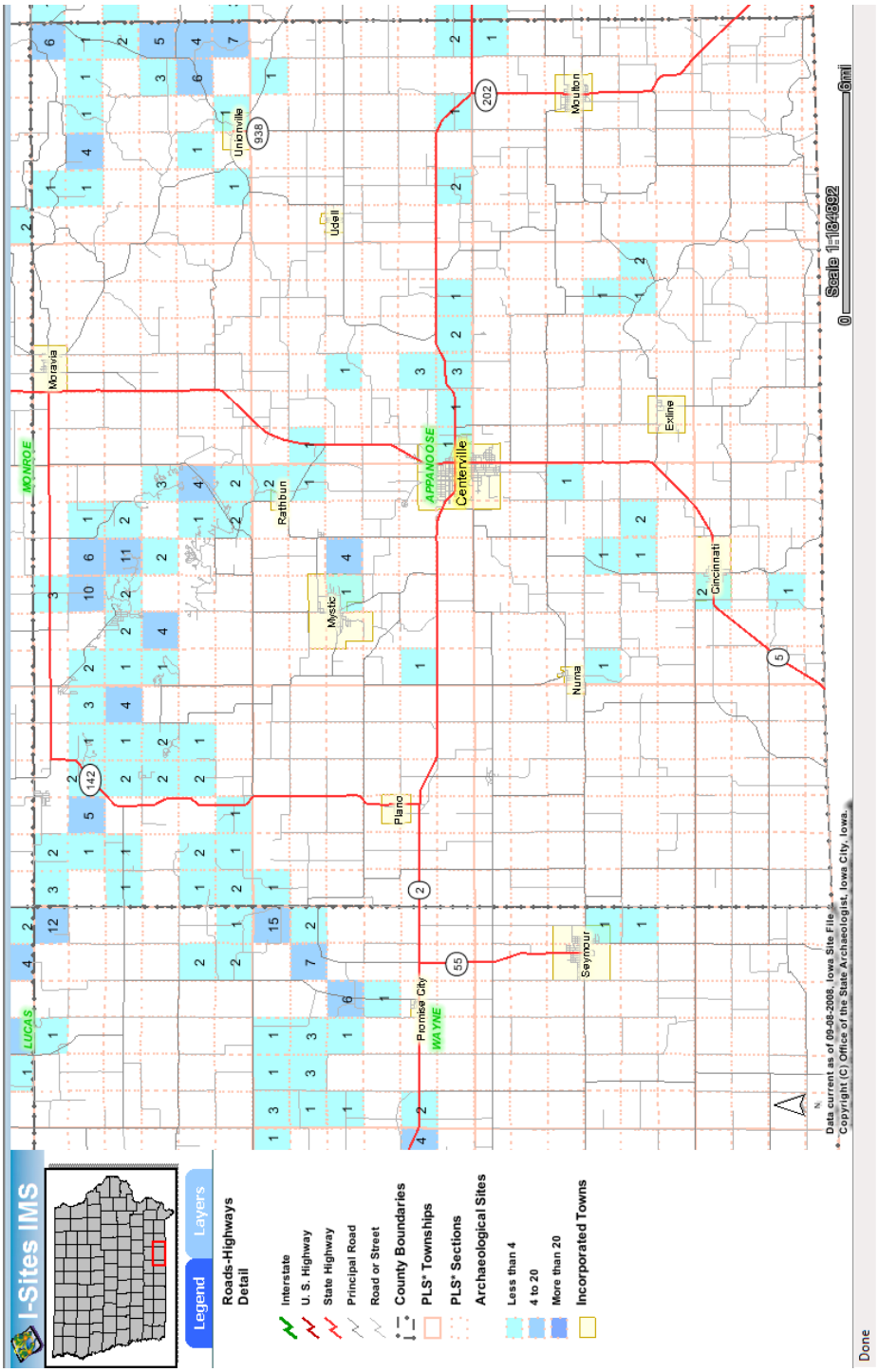
Appanoose County Engineer estimates there are 50 critical bridges that allow access to communities in the county. It is acknowledged that the 240+ bridges all serve an important role to residents in the incorporated & unincorporated regions of the county.

SHELTERS / FOOD PANTRIES/OTHER

LORD'S CUPBOARD

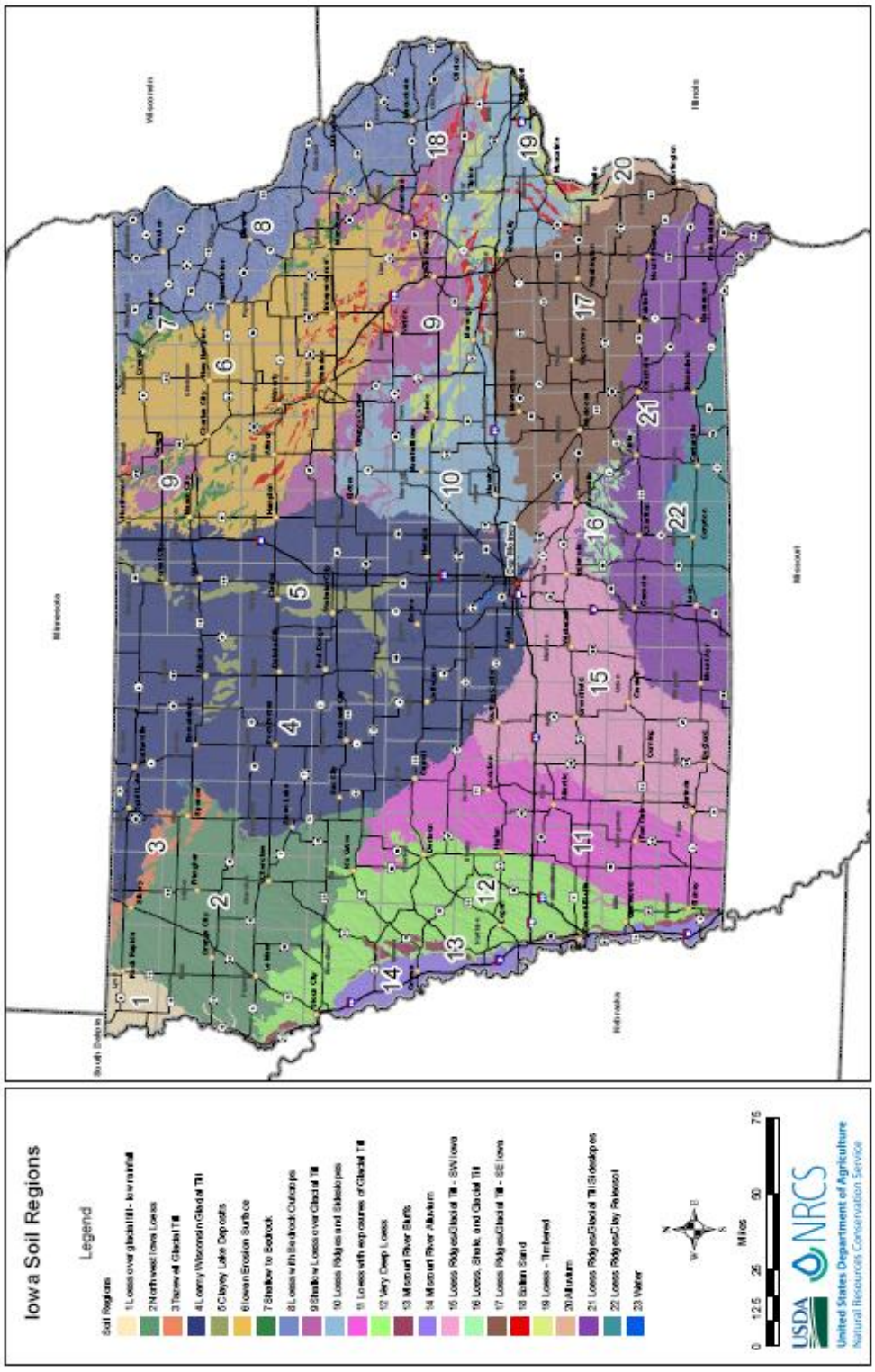
1011 S 15TH STREET, CENTERVILLE, IA 52544 - (515) 856-2148

Appendix H: Historic Sites in Appanoose County



This map from the State Archeologist at the University of Iowa shows the number of historic sites per Public Land Survey section in Appanoose County. The online interactive mapping tool can be found at the following website; http://www2.uiowa.edu/i-sites/public.htm.

Appendix I: NRCS Iowa Soil Regions map



Source: NRCS, ftp://ftp-fc.sc.egov.usda.gov/IA/technical/soilregionsmap.pdf

Appendix J: TORRO Hailstorm Intensity Scale

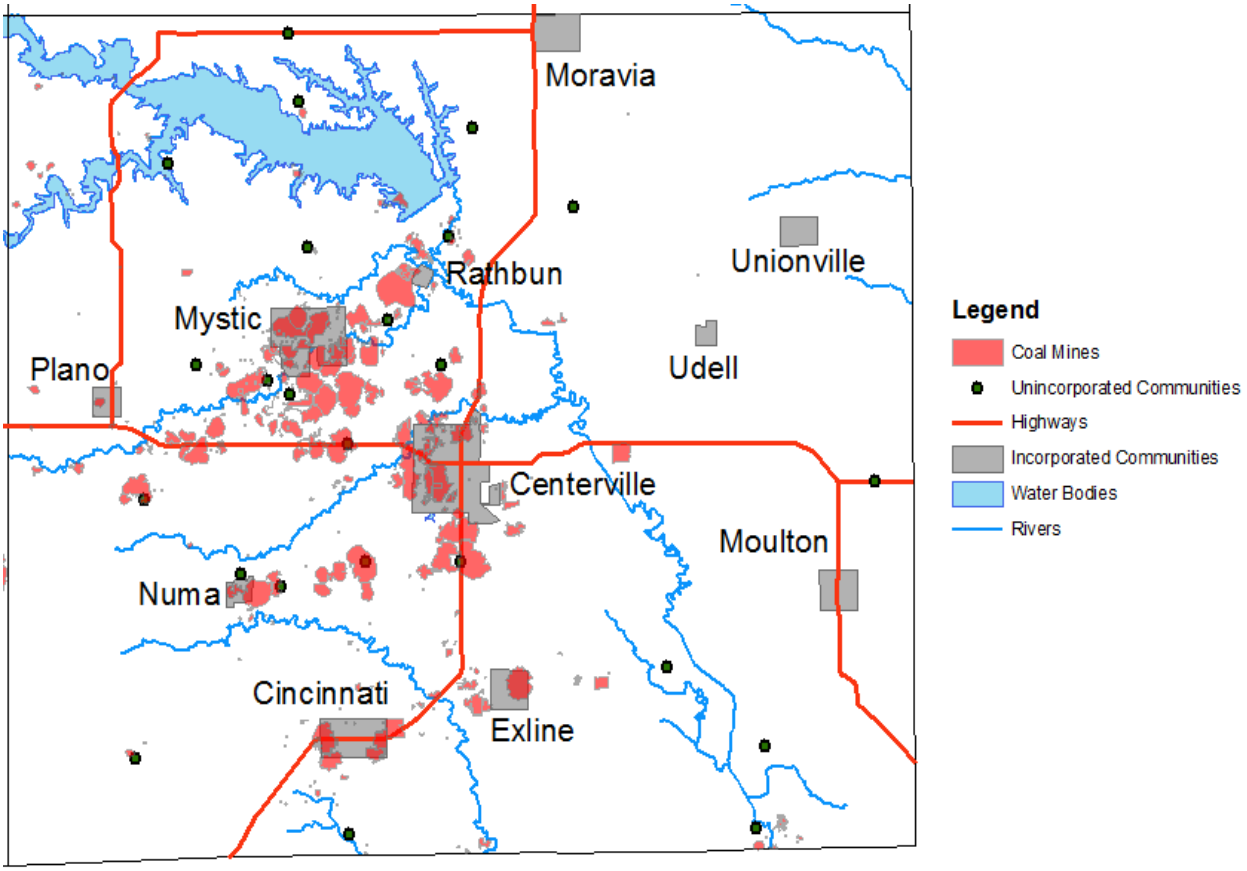
	Intensity Category	Typical Hail Diameter (mm)*	Probable Kinetic Energy, J-m^2	Typical Damage Impacts
H0	Hard Hail	5	0-20	No damage
H1	Potentially Damaging	10-**15**	>20	Slight general damage to plants, crops
H2	Significant	10-**20**	>100	Significant damage to fruit, crops, vegetation
H3	Severe	20-**30**	>300	Severe damage to fruit and crops, damage to glass and plastic structures, paint and wood scored
H4	Severe	25-**40**	>500	Widespread glass damage, vehicle bodywork damage
H5	Destructive	30-**50**	>800	Wholesale destruction of glass, damage to tiled roofs, significant risk of injuries
H6	Destructive	40-**60**		Bodywork of grounded aircraft dented, brick walls pitted
H7	Destructive	50-**75**		Severe roof damage, risk of serious injuries
H8	Destructive	60-**90**		(Severest recorded in the British Isles) Severe damage to aircraft bodywork
H9	Super Hailstorms	75-**100**		Extensive structural damage. Risk of severe or even fatal injuries to persons caught in the open
H10	Super Hailstorms	>100		Extensive structural damage. Risk of severe or even fatal injuries to persons caught in the open

* Approximate range (typical maximum size in bold), since other factors (e.g. number and density of hailstones, hail fall speed and surface wind speeds) affect severity.

Maximum Diameter (mm)	Description
5-9	Pea
10-15	Mothball
16-20	Marble, grape
21-30	Walnut
31-40	Pigeon's egg > squash ball
41-50	Golf ball > Pullet's egg
51-60	Hen's egg
61-75	Tennis ball > cricket ball
76-90	Large orange > Soft ball
91-100	Grapefruit
>100	Melon

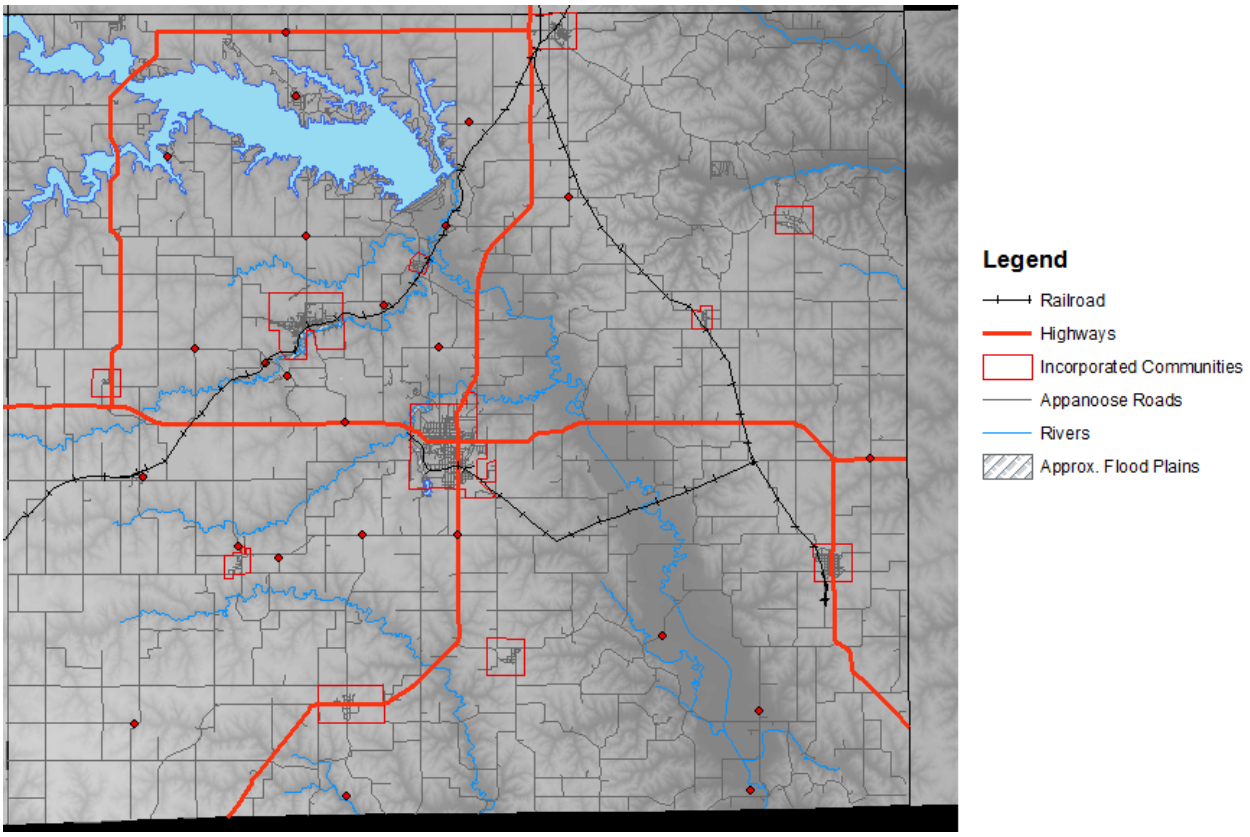
Source: FEMA and Tornado and Storm Research Organization
(http://www.torro.org.uk/TORRO/severeweather/hailscale.php)

Appendix K: Coal mining locations in Appanoose County

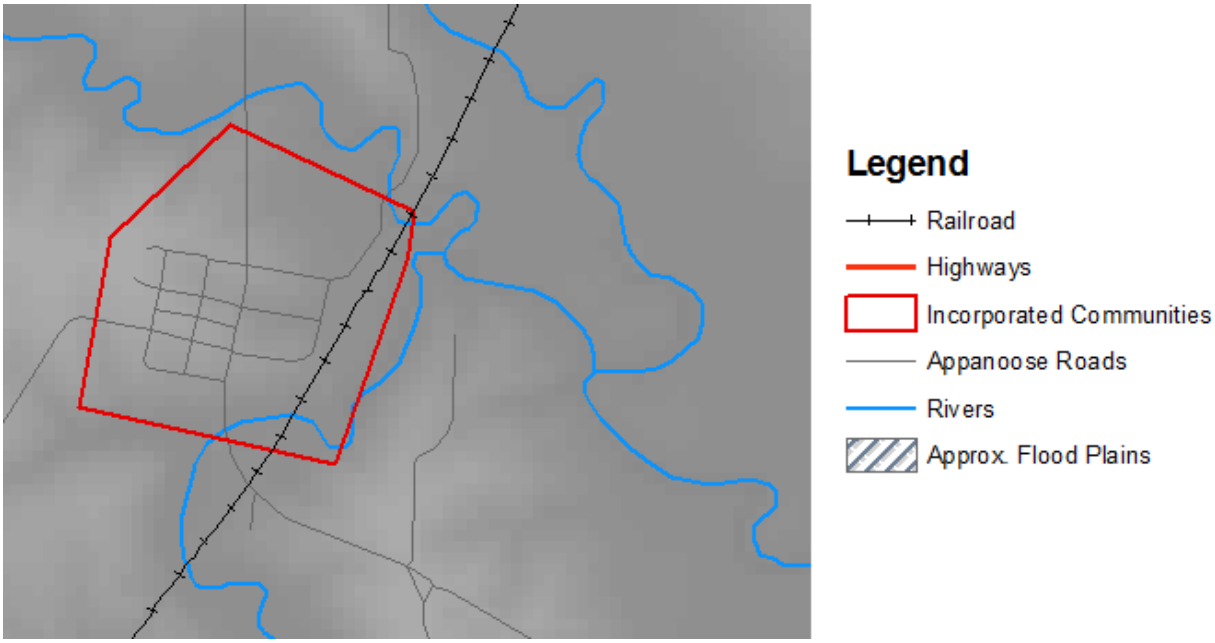


Many of the mines shown in this image are not fully mapped and presumably, the condition and full extent is unknown to the DNR who provided the data for this map to be produced. Mine entrances are not shown in this map in an attempt to limit unauthorized entry which could place individuals at bodily risk. Planning committee members were presented with more detailed information in order to evaluate the risk of mine subsidence during planning meetings.

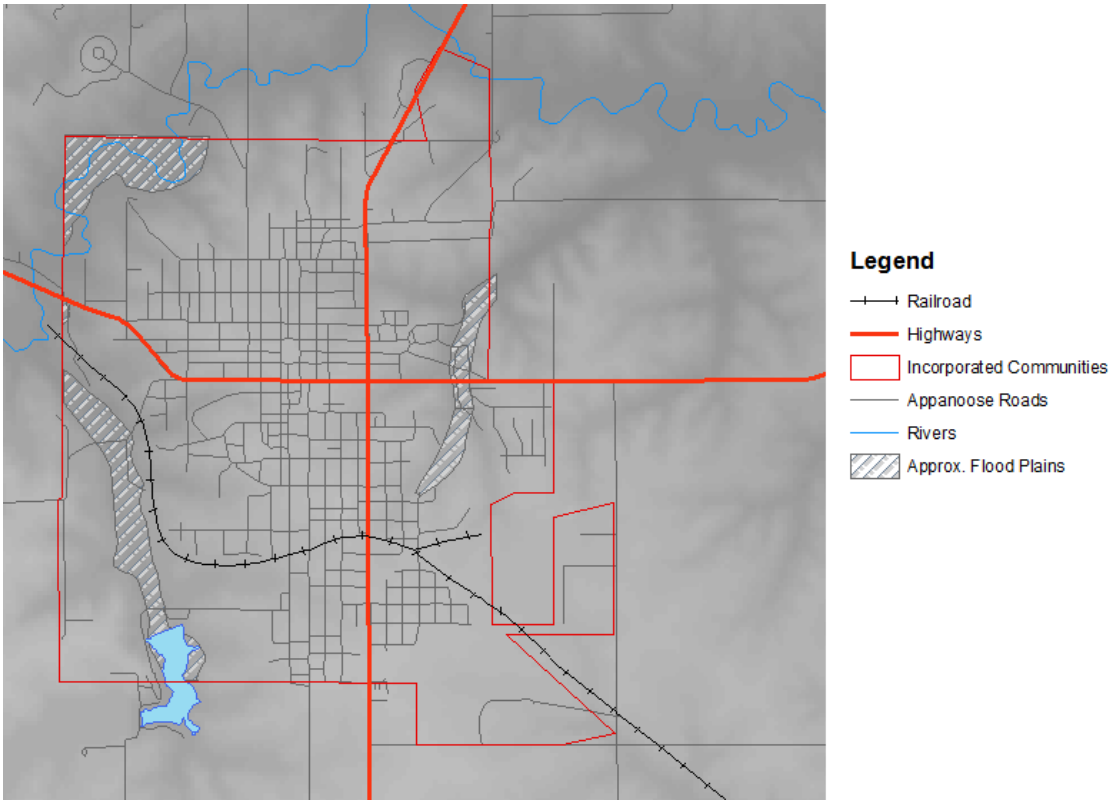
Appendix L: Appanoose County River Flooding Threats



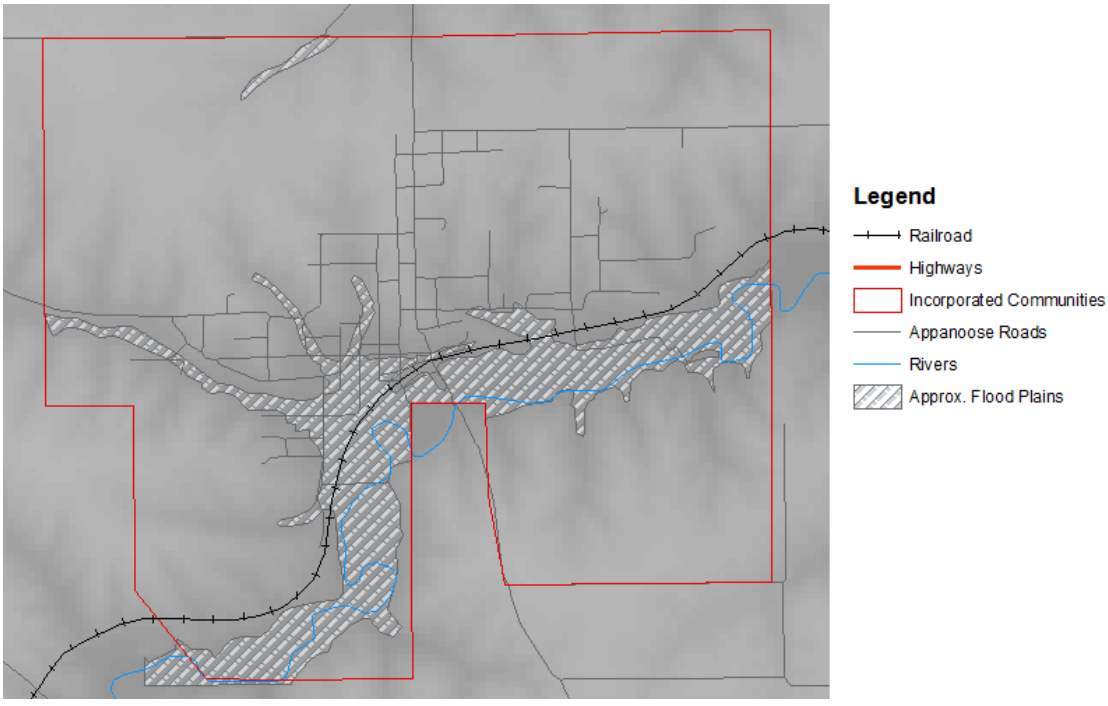
Rathbun



Centerville

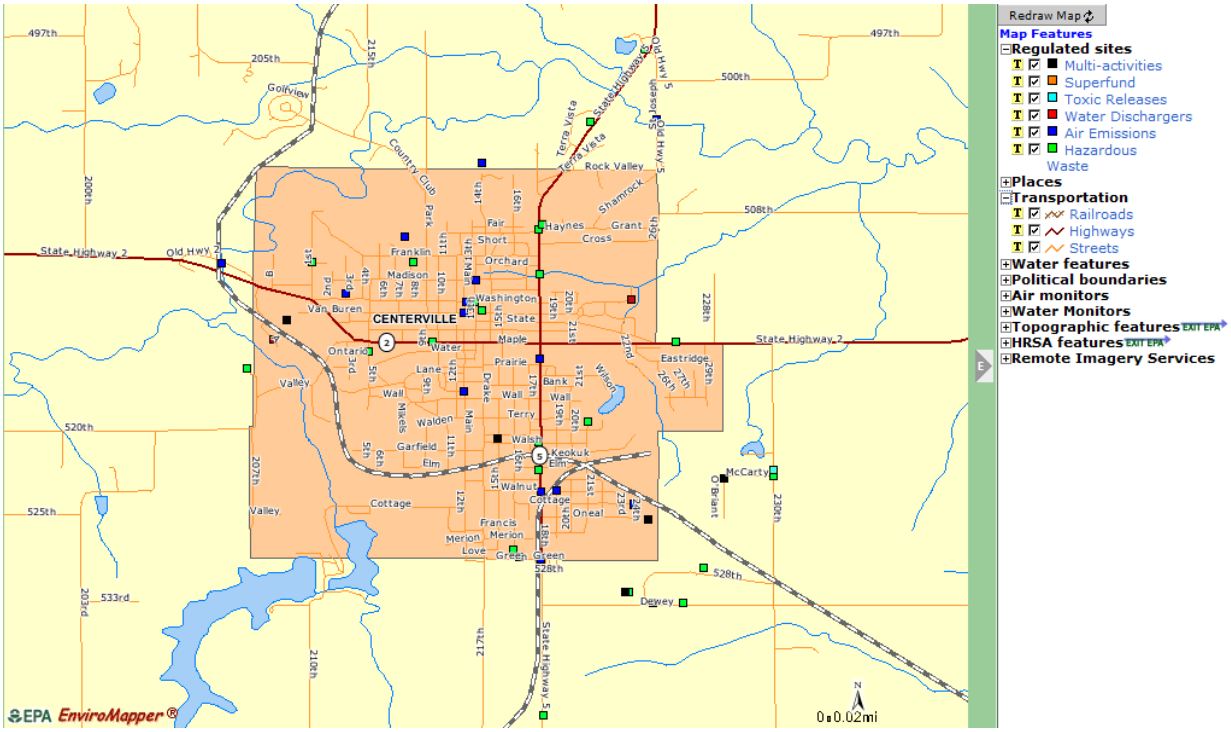


Mystic

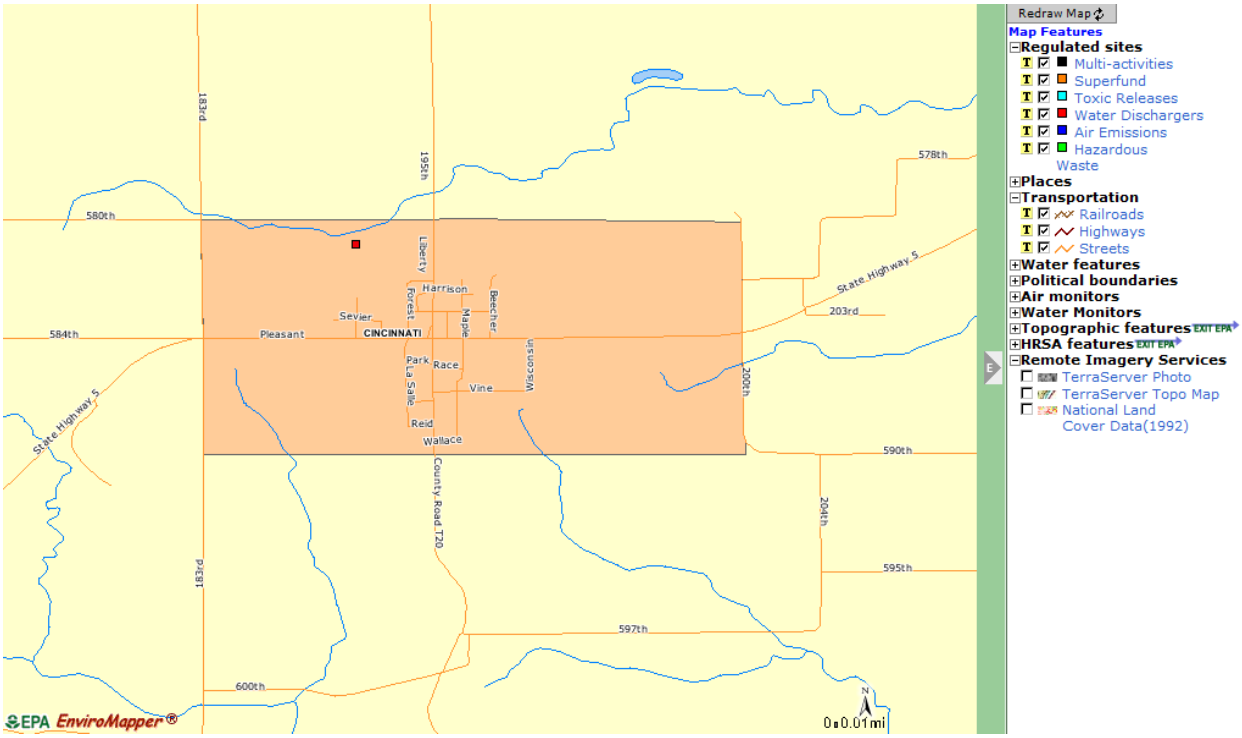


Appendix M: Hazardous Materials Releases

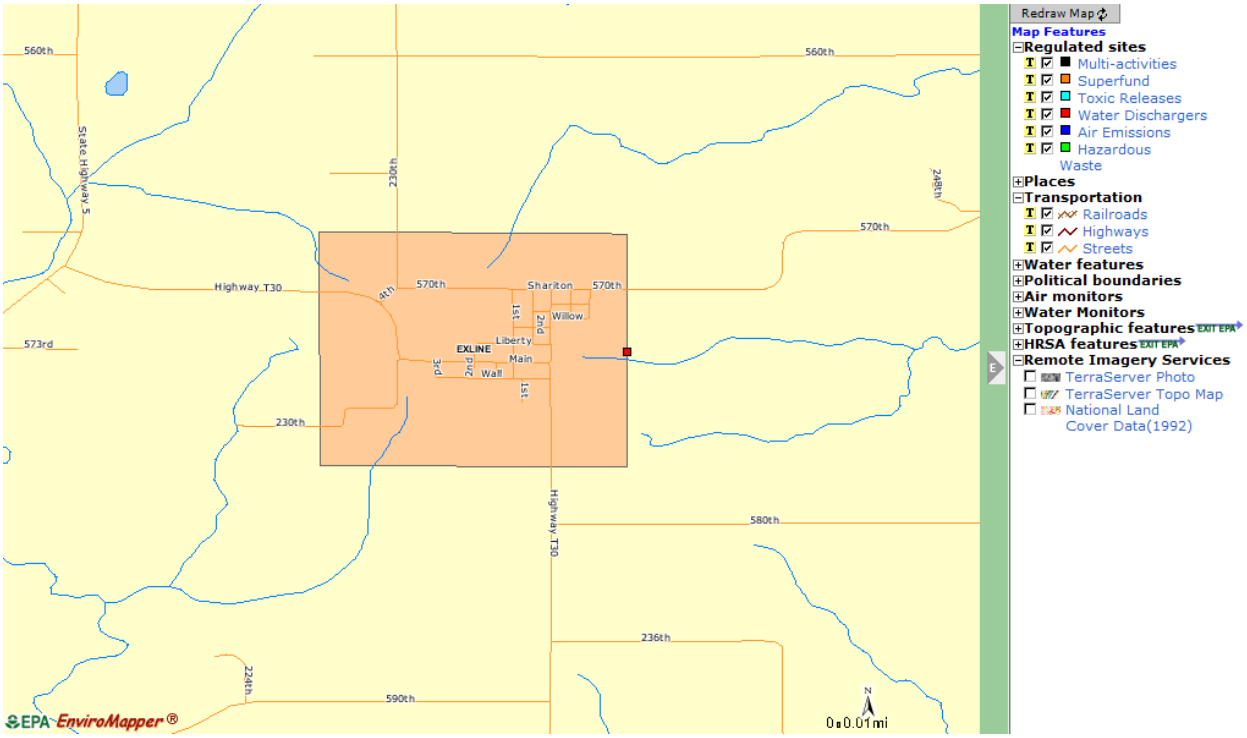
Centerville



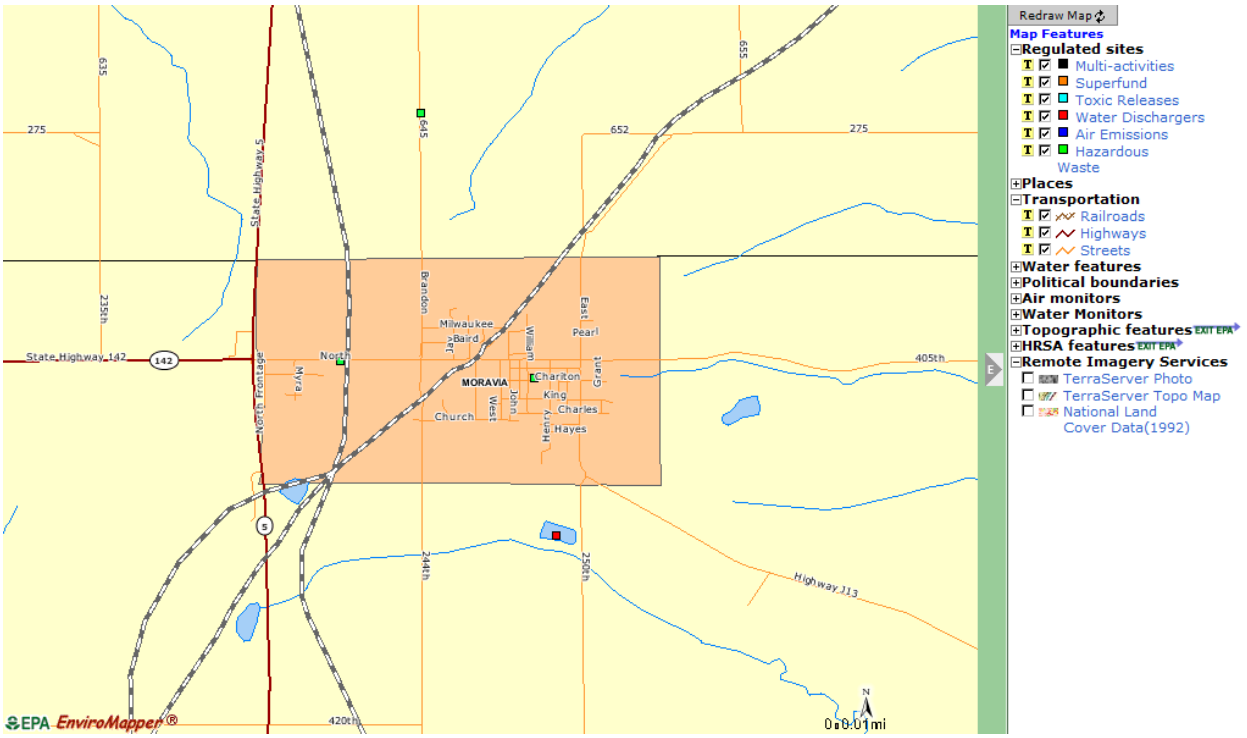
Cincinnati



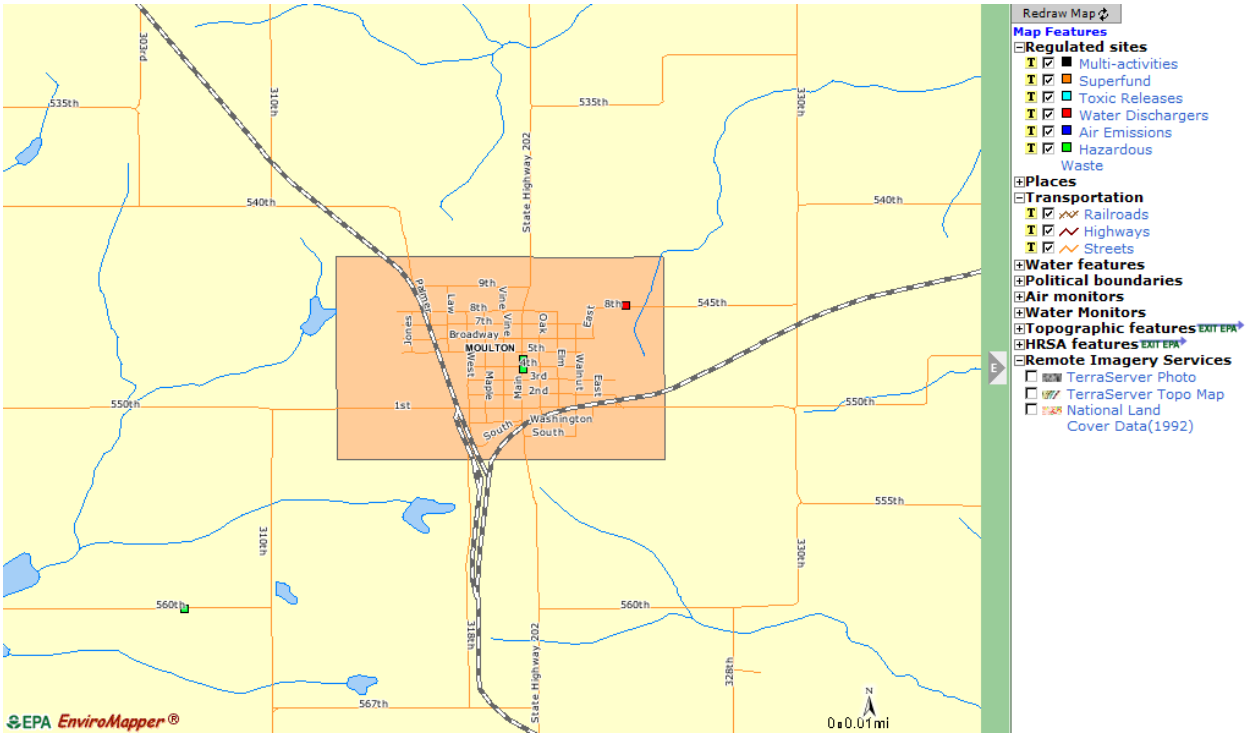
Exline



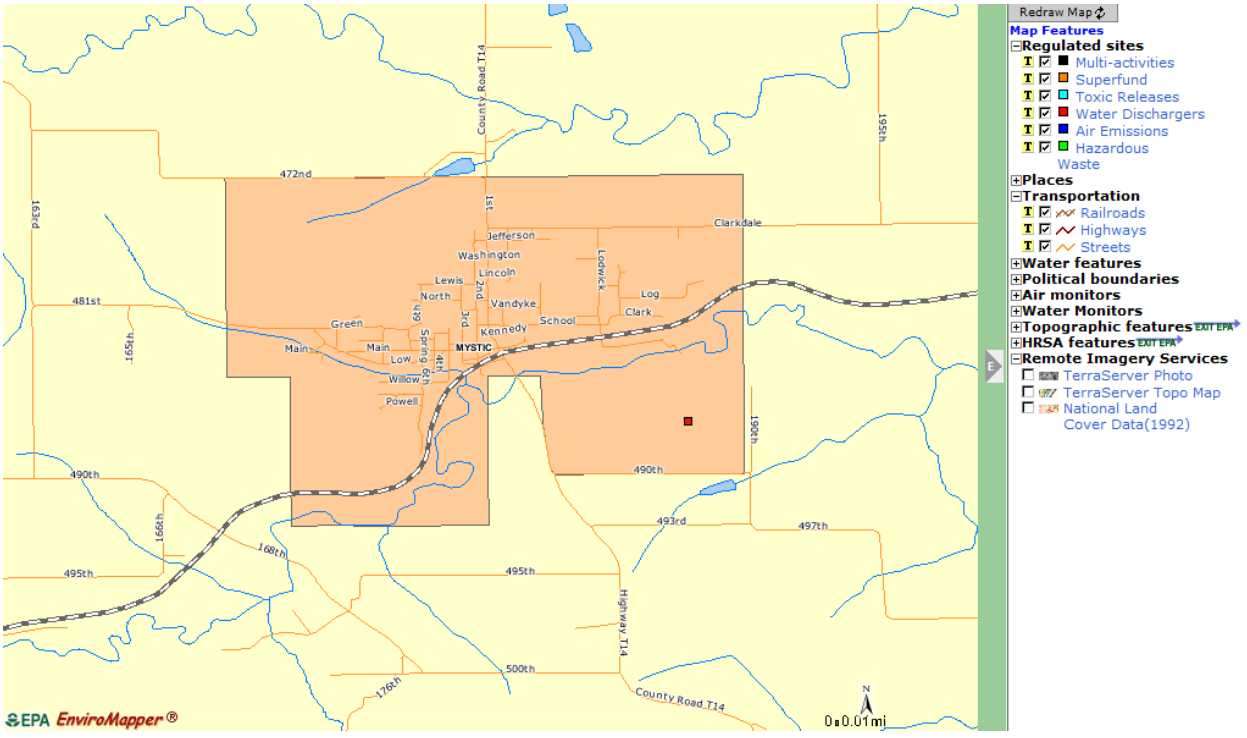
Moravia



Moulton



Mystic



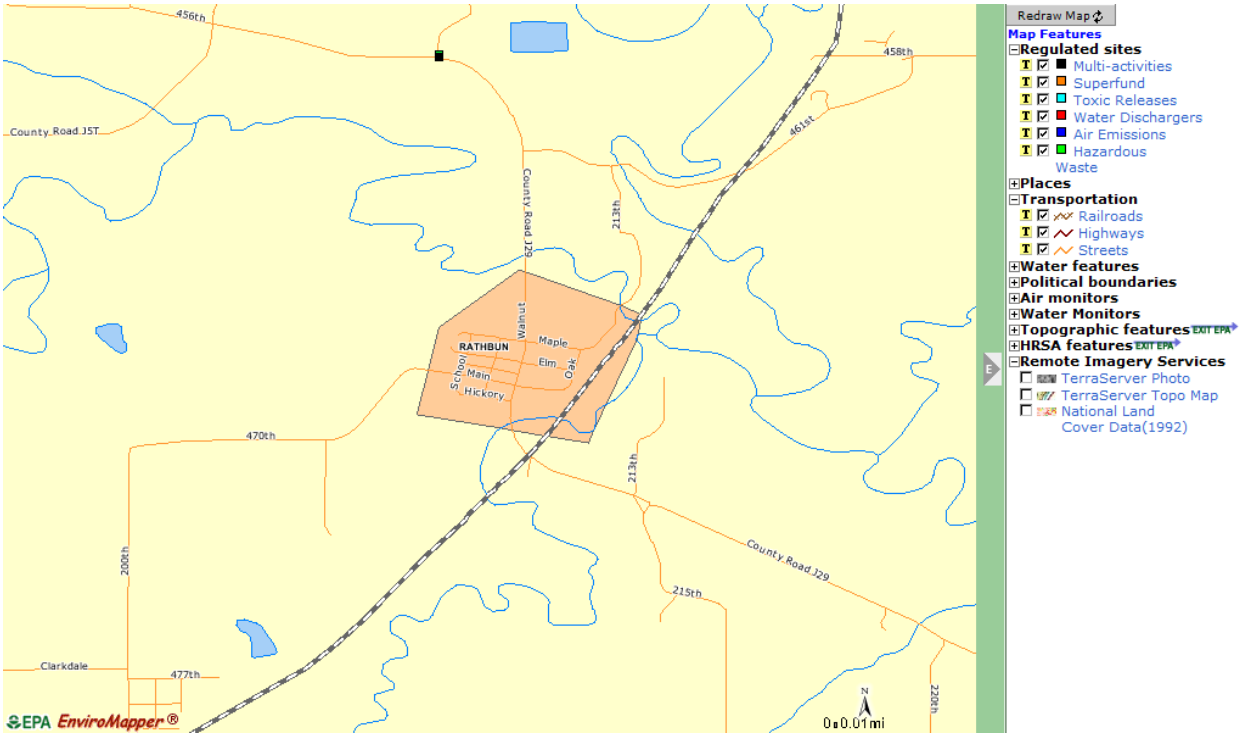
Numa

No sites on EPA's EnviroMapper data mapping website for Numa.

Plano

No sites on EPA's EnviroMapper data mapping website for Plano.

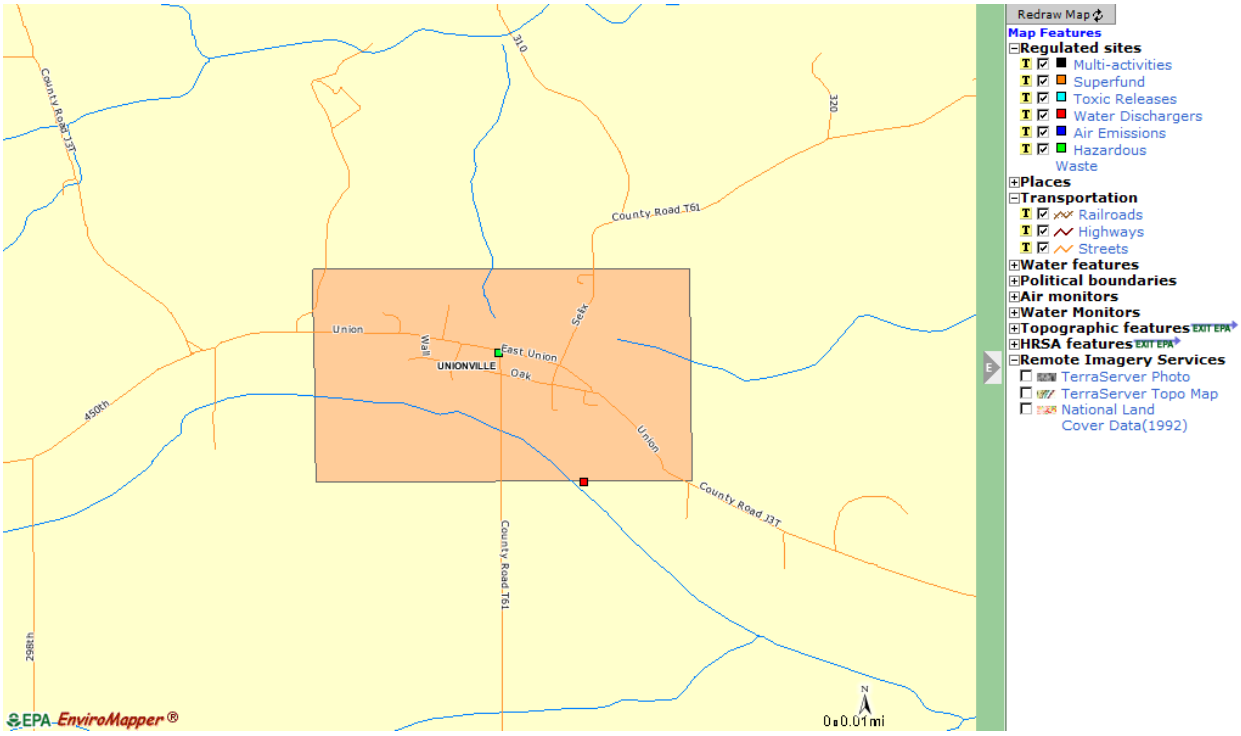
Rathbun



Udell

No sites on EPA's EnviroMapper data mapping website for Udell.

Unionville



Source: US EPA EnviroMapper website; http://www.epa.gov/enviro/html/em/index.html

Appendix N: NCDC Storm Events

Iowa

Location or County	Date	Time	Type	Mag	Dth	Inj	PrD	CrD
1 IAZ026>030 - 035>042 - 045>054 - 056>064 - 070>079 - 080>099 -	03/02/1993	1200	Flooding	N/A	0	0	50K	0
2 IAZ002>011 - 013>054 - 056>064 - 070>079 - 080>099	03/22/1993	0600	Major Flood	N/A	0	0	50.0M	0
3 IAZ002>011 - 013>054 - 056>064 - 070>079 - 080>099	04/01/1993	0000	Major Flood	N/A	0	0	50.0M	0
4 IAZ002>011 - 013>054 - 058>064 - 071>078 - 083>089 - 093>099	04/20/1993	0600	Major Flood	N/A	0	0	5.0M	0
5 APPANOOSE	05/02/1993	1500	Flash Flood	N/A	0	0	5K	0
6 IAZ002>011 - 013>054 - 056>064 - 070>074 - 080>084 - 090>096	05/07/1993	1800	Flood	N/A	0	0	5.0M	5.0M
7 IAZ002>005 - 013>015 - 022>026 - 033>037 - 045>050 - 058>064 - 071>078 - 083>088 - 095>099	08/16/1993	0600	Flood	N/A	0	0	5.0M	5.0M
8 IAZ002>011 - 013>054 - 056>064 - 070>078 - 080>099	08/29/1993	0300	Flood	N/A	0	0	5.0M	5.0M
9 All Of Iowa	09/01/1993	0000	Flood	N/A	0	0	500K	500K
10 Southern Iowa	09/06/1993	0600	Flood	N/A	0	0	500K	500K
11 IAZ034>040 - 046>052 - 058>064 - 072>078 - 083>089 - 095>099	09/14/1993	0600	Flood	N/A	0	0	500K	500K
12 IAZ028>030 - 040>054 - 056>064 - 070>078 - 080>099	09/25/1993	1400	Flood	N/A	0	0	5.0M	500K
13 Central And	10/01/1993	0000	Flooding	N/A	0	0	50K	50K
14 Much Of Iowa	02/19/1994	0600	Flooding	N/A	0	0	500K	0
15 Much Of Iowa	03/03/1994	1200	Flooding	N/A	0	0	500K	0
16 IAZ001>099	06/22/1994	2330	Flooding	N/A	0	0	500K	500K

17 IAZ004>006 - 015 - 048>050 - 061>064 - 074>078 - 082>089 - 094>099	04/10/1995	0900	Flooding	N/A	0	0	10K	0
18 IAZ033 - 034 - 045>052 - 057>068 - 070>078 - 081>089 - 092>099	05/07/1995	1200	Flooding	N/A	0	0	200K	10K
19 IAZ070>076 - 081>084 - 092>096	05/23/1995	0000	Flooding	N/A	0	0	50K	0
20 IAZ004>011 - 015>019 - 023>030 - 035>042 - 047>054 - 060>068 - 074>078 - 084>089 - 095>099	06/06/1995	2300	Flood	N/A	0	0	50K	100K
21 IAZ017>019 - 026>029 - 038>042 - 051>053 - 082>085 - 092>096	06/28/1995	0600	Flood	N/A	0	0	25K	30K
22 Central Into South	07/04/1995	2100	Flood	N/A	0	0	25K	10K
23 IAZ060>062 - 072>075 - 081>086 - 092>097	05/09/1996	06:00 AM	Flood	N/A	0	0	100K	50K
24 IAZ057>062 - 070>075 - 081>086 - 092>097	05/23/1996	03:00 PM	Flood	N/A	0	0	250K	75K
25 IAZ057>062 - 070>075 - 081>086 - 092>097	05/26/1996	12:00 PM	Flood	N/A	0	0	400K	100K
26 IAZ034>039 - 044>050 - 057>062 - 070>075 - 081>086 - 092>097	02/18/1997	06:00 PM	Flood	N/A	0	0	750K	0
27 Centerville	07/24/1997	02:00 AM	Urban/sml Stream Fld	N/A	0	0	25K	15K
28 IAZ075 - 083>086 - 094>097	03/30/1998	06:00 PM	Flood	N/A	0	0	90K	0
29 IAZ061 - 074>075 - 083>084 - 095>096	05/07/1998	01:00 AM	Flood	N/A	0	0	175K	70K
30 Monrovia	05/23/1998	07:00 PM	Urban/sml Stream Fld	N/A	0	0	50K	5K
31 IAZ027 - 074>075 - 083>085 - 095>096	10/17/1998	06:00 AM	Flood	N/A	0	0	560K	80K

32 IAZ083>084 - 094>096	03/16/1999	06:00 AM	Flood	N/A	0	0	5K	0
33 Countywide	06/25/2000	07:00 PM	Flash Flood	N/A	0	0	200K	50K
34 IAZ083>084 - 095>096	02/24/2001	12:00 PM	Flood	N/A	0	0	30K	0
35 IAZ046>050 - 057>062 - 070>075 - 081>086 - 092>097	03/15/2001	03:00 PM	Flood	N/A	0	0	260K	0
36 IAZ004>007 - 015>017 - 023>028 - 033>039 - 044>050 - 057>062 - 070>075 - 081>086 - 092>097	03/23/2001	06:00 PM	Flood	N/A	0	0	383K	0
37 North Portion	08/03/2001	06:00 AM	Flash Flood	N/A	0	0	15K	15K
38 IAZ083>085 - 095>096	10/23/2001	03:00 AM	Flood	N/A	0	0	25K	0
39 IAZ004>007 - 015>017 - 023>028 - 033>039 - 044>050 - 057>062 - 070>075 - 081>086 - 092>097	05/22/2004	06:00 PM	Flood	N/A	0	0	5.1M	15.2M
40 IAZ004>006 - 015>016 - 023>025 - 033>036 - 044>047 - 057>061 - 071>075 - 083>086 - 096>097	05/13/2005	02:00 AM	Flood	N/A	0	0	960K	0
41 Centerville	04/26/2007	06:00 AM	Flood	N/A	0	0	250K	0K
42 Udell	08/23/2007	22:34 PM	Flash Flood	N/A	0	0	100K	50K
43 Thirty	08/23/2007	22:36 PM	Flash Flood	N/A	0	0	250K	10K
44 Rathbun	08/23/2007	23:45 PM	Flash Flood	N/A	0	0	500K	75K
45 Streepy	08/24/2007	03:55 AM	Flash Flood	N/A	0	0	500K	100K
46 Moulton Arpt	08/24/2007	04:30 AM	Flood	N/A	0	0	25K	50K
47 Clarkdale	06/03/2008	05:00 AM	Flash Flood	N/A	0	0	50K	0K
48 Mystic	06/12/2008	18:21 PM	Flash Flood	N/A	0	0	25K	0K

49 Numa	06/13/2008	00:06 AM	Flash Flood	N/A	0	0	25K	0K
50 Moulton Arpt	06/13/2008	11:00 AM	Flood	N/A	0	0	10K	10K
51 Numa	07/06/2008	07:00 AM	Flash Flood	N/A	0	0	25K	25K
52 Centerville	07/07/2008	23:35 PM	Flash Flood	N/A	0	0	25K	0K
53 Sharon	07/08/2008	00:00 AM	Flash Flood	N/A	0	0	25K	0K
54 Moulton Arpt	07/08/2008	03:39 AM	Flood	N/A	0	0	5K	0K
55 Centerville	07/28/2008	00:20 AM	Flash Flood	N/A	0	0	25K	5K
56 Moulton Arpt	07/28/2008	01:54 AM	Flood	N/A	0	0	10K	5K
				TOTALS:	0	0	139.693M	33.690M

NOAA Satellite and Information Service
National Environmental Satellite, Data, and Information Service (NESDIS)

National Climatic Data Center
U.S. Department of Commerce

DOC >NOAA >NESDIS >NCDC Search Field: Search NCDC

Query Results

56 FLOOD event(s) were reported in **Appanoose County, Iowa** between **01/01/1950** and **10/31/2008**.

*Click on **Location** or **County** to display Details.*

Mag: Magnitude
Dth: Deaths
Inj: Injuries
PrD: Property Damage
CrD: Crop Damage

18 TORNADO(s) were reported in **Appanoose County, Iowa** between **01/01/1950** and **10/31/2008**.

*Click on **Location or County** to display Details.*

Mag: Magnitude
Dth: Deaths
Inj: Injuries
PrD: Property Damage
CrD: Crop Damage

Iowa

Location or County	Date	Time	Type	Mag	Dth	Inj	PrD	CrD
1 APPANOOSE	09/01/1961	1800	Tornado	F2	0	0	250K	0
2 APPANOOSE	06/14/1964	1430	Tornado	F2	0	0	250K	0
3 APPANOOSE	06/12/1967	1815	Tornado	F1	0	0	25K	0
4 APPANOOSE	10/08/1970	1740	Tornado	F2	0	0	25K	0
5 APPANOOSE	06/02/1980	0700	Tornado	F1	0	3	2.5M	0
6 APPANOOSE	06/02/1980	0705	Tornado	F2	0	5	2.5M	0
7 APPANOOSE	05/08/1988	1234	Tornado	F2	0	0	250K	0
8 APPANOOSE	11/15/1988	1610	Tornado	F0	0	0	0K	0
9 APPANOOSE	06/16/1990	1959	Tornado	F0	0	0	3K	0
10 APPANOOSE	06/16/1990	2017	Tornado	F0	0	0	3K	0
11 APPANOOSE	07/15/1992	2035	Tornado	F2	0	0	250K	0
12 Rathbun	05/27/1995	2350	Tornado	F0	0	0	1K	0
13 Moravia	05/09/1996	12:50 AM	Tornado	F1	0	0	70K	0
14 Udell	09/20/2001	05:09 PM	Tornado	F1	0	0	5K	5K
15 Centerville	05/24/2004	06:53 PM	Tornado	F0	0	0	2K	0
16 Plano	06/07/2007	13:35 PM	Tornado	F0	0	0	0K	0K
17 Jerome	04/10/2008	15:57 PM	Tornado	F1	0	0	75K	0K
18 Griffinsville	04/10/2008	16:10 PM	Tornado	F1	0	0	75K	0K
				TOTALS:	0	8	6.283M	5K

Iowa

Location or County	Date	Time	Type	Mag	Dth	Inj	PrD	CrD
1 APPANOOSE	09/18/1965	1500	Tstm Wind	0 kts.	0	0	0	0
2 APPANOOSE	10/14/1966	1500	Tstm Wind	0 kts.	0	0	0	0
3 APPANOOSE	06/28/1969	1600	Tstm Wind	74 kts.	0	0	0	0
4 APPANOOSE	05/18/1971	1630	Tstm Wind	0 kts.	0	0	0	0
5 APPANOOSE	05/18/1971	1710	Tstm Wind	0 kts.	0	0	0	0
6 APPANOOSE	06/03/1973	2245	Tstm Wind	0 kts.	0	0	0	0
7 APPANOOSE	06/16/1973	1730	Tstm Wind	60 kts.	0	0	0	0
8 APPANOOSE	06/16/1973	1730	Tstm Wind	68 kts.	0	0	0	0
9 APPANOOSE	08/09/1973	1525	Tstm Wind	0 kts.	0	0	0	0
10 APPANOOSE	08/11/1973	1130	Tstm Wind	50 kts.	0	0	0	0
11 APPANOOSE	06/09/1974	0100	Tstm Wind	0 kts.	0	0	0	0
12 APPANOOSE	06/02/1980	0700	Tstm Wind	0 kts.	0	0	0	0
13 APPANOOSE	06/21/1985	1740	Tstm Wind	0 kts.	0	0	0	0
14 APPANOOSE	05/08/1986	1425	Tstm Wind	52 kts.	0	0	0	0
15 APPANOOSE	07/28/1986	2315	Tstm Wind	52 kts.	0	0	0	0
16 APPANOOSE	06/18/1987	1350	Tstm Wind	59 kts.	0	0	0	0
17 APPANOOSE	05/08/1988	1250	Tstm Wind	65 kts.	0	0	0	0
18 APPANOOSE	07/14/1988	0300	Tstm Wind	50 kts.	0	0	0	0
19 APPANOOSE	12/19/1988	2343	Tstm Wind	50 kts.	0	0	0	0

20 APPANOOSE	05/24/1989	1930	Tstm Wind	52 kts.	0	0	0	0
21 APPANOOSE	05/24/1989	1950	Tstm Wind	52 kts.	0	0	0	0
22 APPANOOSE	05/24/1989	2012	Tstm Wind	50 kts.	0	1	0	0
23 APPANOOSE	05/31/1989	1730	Tstm Wind	50 kts.	0	0	0	0
24 APPANOOSE	07/09/1990	1840	Tstm Wind	63 kts.	0	0	0	0
25 APPANOOSE	07/15/1992	2016	Tstm Wind	50 kts.	0	0	0	0
26 IAZ002>009 - 013>019 - 022>028 - 031>039 - 043>051 - 056>063 - 070>076 - 081>087 - 093>099 -	03/09/1993	2230	High Winds	0 kts.	0	0	500K	0
27 IAZ001 - 012 - 020 - 021 - 031 - 032 - 043>046 - 055>060 - 069>075 - 079>086 - 090>098	12/05/1993	1500	High Winds	0 kts.	0	0	500K	0
28 All Of Iowa	04/14/1994	2200	High Winds	0 kts.	0	0	500K	0
29 Most Of Iowa	04/26/1994	0900	High Winds	0 kts.	0	3	5.0M	0
30 Moulton	06/11/1994	1700	Thunderstorm Winds	61 kts.	0	0	50K	5K
31 Unionville	06/18/1994	1300	Thunderstorm Winds	50 kts.	0	0	5K	0K
32 All Of Iowa	02/10/1995	0000	High Winds	0 kts.	0	0	100K	0
33 All Of Iowa	02/10/1995	2200	Extreme Wind Chill	N/A	0	0	50K	0
34 IAZ004>011 - 015>019 - 023>030 - 033>042 - 044>054 - 057>068 - 070>078 - 081>089 - 092>099	04/03/1995	1300	High Winds	0 kts.	0	0	125K	0
35 IAZ004>011 - 015>019 - 023>030 - 033>042 - 044>054 -	04/18/1995	0700	High Winds	0 kts.	0	0	500K	0

057>068 - 070>078 - 081>089 - 092>099								
36 Much Of Iowa	10/23/1995	1300	High Winds	0 kts.	0	0	100K	0
37 IAZ004>011 - 015>019 - 023>030 - 033>039 - 044>050>057 - 062 - 070>075 - 081>086 - 092>097	12/08/1995	1300	Extreme Wind Chill	N/A	0	0	0	0
38 IAZ004>011 - 015>019 - 023>029 - 033>039 - 044>050 - 057>062 - 070>075 - 081>086 - 092>097	01/17/1996	09:00 PM	High Wind	55 kts.	0	0	250K	0
39 IAZ004>011 - 015>019 - 023>029 - 033>039 - 044>050 - 057>062 - 070>075 - 081>086 - 092>096	01/18/1996	02:00 AM	Extreme Windchill	N/A	0	0	0	0
40 IAZ004>011 - 015>019 - 023>029 - 033>039 - 044>050 - 057>062 - 070>075 - 081>086 - 092>097	02/01/1996	04:00 PM	Extreme Windchill	N/A	0	0	0	0
41 IAZ004>011 - 015>019 - 023>029 - 033>039 - 044>050 - 057>062 - 070>075 - 081>086 - 092>097	02/10/1996	12:00 PM	High Wind	56 kts.	0	0	350K	0
42 IAZ004>011 - 015>019 - 023>029 - 033>039 - 044>050 - 057>062 - 070>075 - 081>086 - 092>097	03/24/1996	05:00 PM	High Wind	54 kts.	0	0	300K	0
43 IAZ004>011 - 015>019 - 023>029 - 033>039 - 044>050 - 057>062 - 070>075 - 081>086 - 092>097	04/25/1996	09:30 AM	High Wind	59 kts.	0	0	750K	0
44 IAZ004>007 - 015>017 - 023>028 - 033>039 - 044>050 - 057>062 - 070>075 - 081>086 - 092>097	10/29/1996	11:00 AM	High Wind	57 kts.	0	0	500K	100K

45 IAZ004>007 - 015>017 - 023>028 - 033>039 - 044>050 - 057>062 - 070>075 - 081>086 - 092>097	01/09/1997	09:00 PM	Extreme Windchill	N/A	0	0	0	0
46 IAZ004>007 - 015>017 - 023>028 - 033>039 - 044>050 - 057>062 - 070>075 - 081>086 - 092>097	01/15/1997	09:00 PM	Extreme Windchill	N/A	0	0	750K	0
47 Moulton	04/05/1997	01:00 PM	Tstm Wind	56 kts.	0	0	40K	0
48 IAZ004>007 - 015>017 - 023>028 - 033>039 - 044>050 - 057>062 - 070>075 - 081>086 - 092>097	04/06/1997	09:00 AM	High Wind	55 kts.	0	0	1.8M	0
49 IAZ049>050 - 061>062 - 074>075 - 084>086 - 095>097	04/30/1997	12:00 PM	High Wind	52 kts.	0	0	100K	0
50 IAZ004>007 - 015>017 - 023>028 - 033>039 - 044>050 - 057>062 - 070>075 - 081>086 - 092>097	04/12/1998	08:00 AM	High Wind	54 kts.	0	0	2.6M	0
51 Centerville	05/21/1998	11:15 PM	Tstm Wind	50 kts.	0	0	2K	0
52 Moulton	05/21/1998	11:40 PM	Tstm Wind	52 kts.	0	0	3K	0
53 Centerville	06/29/1998	02:00 PM	Tstm Wind	50 kts.	0	0	3K	0
54 IAZ004>007 - 015>017 - 023>028 - 033>039 - 044>050 - 057>062 - 070>075 - 081>086 - 092>097	11/10/1998	02:00 AM	High Wind	61 kts.	1	0	17.3M	260K
55 Moravia	04/08/1999	04:35 PM	Tstm Wind	70 kts.	0	0	75K	0
56 IAZ028 - 038>039 - 049>050 - 061>062 - 072>075 - 081>086 - 092>097	03/08/2000	11:00 AM	High Wind	52 kts.	0	0	230K	0
57 Plano	06/04/2000	05:40 AM	Tstm Wind	61 kts.	0	0	40K	1K

58 Plano	06/23/2000	01:45 PM	Tstm Wind	56 kts.	0	0	10K	1K
59 Moulton	06/23/2000	01:50 PM	Tstm Wind	56 kts.	0	0	10K	0
60 Unionville	06/23/2000	01:55 PM	Tstm Wind	56 kts.	0	0	10K	1K
61 IAZ004>007 - 015>017 - 023>028 - 033>039 - 044>050 - 057>062 - 070>075 - 081>086 - 092>097	04/07/2001	04:00 AM	High Wind	72 kts.	0	4	3.2M	0
62 Moulton	06/14/2001	03:10 PM	Tstm Wind	61 kts.	0	0	10K	0
63 Numa	09/07/2001	09:40 PM	Tstm Wind	78 kts.	0	0	100K	20K
64 Centerville	09/07/2001	09:45 PM	Tstm Wind	75 kts.	0	1	100K	5K
65 Centerville	09/20/2001	05:23 PM	Tstm Wind	61 kts.	0	0	5K	3K
66 Udell	09/20/2001	05:49 PM	Tstm Wind	70 kts.	0	0	50K	10K
67 Moulton	09/20/2001	05:56 PM	Tstm Wind	52 kts.	0	0	5K	0
68 IAZ004>007 - 015>017 - 023>028 - 033>039 - 044>050 - 057>062 - 070>075 - 081>086 - 092>097	03/09/2002	06:00 AM	High Wind	54 kts.	0	0	2.6M	0
69 Plano	03/09/2002	12:00 AM	Tstm Wind	56 kts.	0	0	5K	0
70 Moravia	04/24/2002	09:55 AM	Tstm Wind	50 kts.	0	0	5K	0
71 Centerville	08/27/2003	02:05 PM	Tstm Wind	52 kts.	0	0	5K	1K
72 Numa	05/24/2004	07:44 PM	Tstm Wind	69 kts.	0	0	100K	5K
73 Centerville	05/24/2004	07:45 PM	Tstm Wind	52 kts.	0	0	5K	0
74 Moravia	08/25/2004	01:08 PM	Tstm Wind	52 kts.	0	0	15K	1K

75 Moravia	08/26/2004	10:25 PM	Tstm Wind	57 kts.	0	0	15K	2K
76 IAZ004>007 - 015>017 - 023>028 - 033>039 - 044>050 - 057>062 - 070>075 - 084>086 - 096>097	01/22/2005	12:15 AM	High Wind	56 kts.	0	0	440K	0
77 Centerville	06/04/2005	08:40 PM	Tstm Wind	57 kts.	0	0	10K	0
78 IAZ004>007 - 015>017 - 023>028 - 033>039 - 044>050 - 057>062 - 070>075 - 081>086 - 092>097	01/24/2006	09:30 AM	High Wind	60 kts.	0	2	550K	0
79 Cincinnati	09/17/2006	02:00 AM	Tstm Wind	52 kts.	0	0	5K	0
80 Numa	03/21/2007	23:53 PM	Thunderstorm Wind	70 kts.	0	0	25K	0K
81 Numa	04/10/2008	15:53 PM	Thunderstorm Wind	65 kts.	0	0	10K	0K
82 Moravia	05/25/2008	21:42 PM	Thunderstorm Wind	57 kts.	0	0	20K	0K
83 Centerville	05/25/2008	21:44 PM	Thunderstorm Wind	52 kts.	0	0	15K	0K
84 Exline	06/08/2008	18:05 PM	Thunderstorm Wind	52 kts.	0	0	5K	0K
85 Cincinnati	06/15/2008	10:52 AM	Thunderstorm Wind	52 kts.	0	0	1K	0K
86 Moulton	06/15/2008	11:12 AM	Thunderstorm Wind	52 kts.	0	0	1K	0K
87 Centerville	07/27/2008	17:00 PM	Thunderstorm Wind	52 kts.	0	0	5K	0K
88 Monrovia	07/27/2008	17:00 PM	Thunderstorm Wind	52 kts.	0	0	3K	0K
89 Forbush	07/27/2008	20:17 PM	Thunderstorm Wind	52 kts.	0	0	5K	50K
				TOTALS:	1	11	39.768M	465K

89 THUNDERSTORM & HIGH WIND event(s) were reported in **Appanoose County, Iowa** between **01/01/1950** and **10/31/2008**.

*Click on **Location** or **County** to display Details.*

Mag: Magnitude
Dth: Deaths
Inj: Injuries
PrD: Property Damage
CrD: Crop Damage

Iowa

Location or County	Date	Time	Type	Mag	Dth	Inj	PrD	CrD
1 All Of Iowa	01/14/1994	0300	Extreme Cold	N/A	1	0	500K	0
2 All Of Iowa	01/17/1994	0600	Extreme Cold	N/A	0	0	500K	0
3 All Of Iowa	02/10/1995	2200	Extreme Wind Chill	N/A	0	0	50K	0
4 IAZ004>011 - 015>019 - 023>030 - 033>042 - 044>054 - 057>068 - 070>078 - 081>089 - 092>099	05/01/1995	0000	Cold And Wet Conditions	N/A	0	0	0	66.0M
5 All Of Iowa	07/12/1995	1100	Heat Wave	N/A	3	0	3.8M	0
6 Much Of Iowa	09/21/1995	2300	Freeze	N/A	0	0	0	0.2B
7 IAZ004>011 - 015>019 - 023>030 - 033>039 - 044>050>057 - 062 - 070>075 - 081>086 - 092>097	12/08/1995	1300	Extreme Wind Chill	N/A	0	0	0	0
8 IAZ004>011 - 015>019 - 023>029 - 033>039 - 044>050 - 057>062 - 070>075 - 081>086 - 092>096	01/18/1996	02:00 AM	Extreme Windchill	N/A	0	0	0	0
9 IAZ004>011 - 015>019 - 023>029 - 033>039 - 044>050 - 057>062 - 070>075 - 081>086 - 092>097	02/01/1996	04:00 PM	Extreme Windchill	N/A	0	0	0	0
10 IAZ004>007 - 015>017 - 023>028 - 033>039 - 044>050 - 057>062 - 070>075 - 081>086 - 092>097	01/09/1997	09:00 PM	Extreme Windchill	N/A	0	0	0	0
11 IAZ004>007 - 015>017 - 023>028 - 033>039 - 044>050 - 057>062 - 070>075 - 081>086 - 092>097	01/15/1997	09:00 PM	Extreme Windchill	N/A	0	0	750K	0
12 IAZ004>007 - 015>017 - 023>028 - 033>039 - 044>050 - 057>062 - 070>075 -	09/21/1999	01:00 AM	Extreme Cold	N/A	0	0	0	15.0M

081>086 - 092>097								
13 IAZ004>007 - 015>017 - 023>028 - 033>039 - 044>050 - 057>062 - 070>075 - 081>086 - 092>097	08/05/2001	10:00 AM	Excessive Heat	N/A	1	0	0	0
				TOTALS:	5	0	5.600M	281.000M

13 TEMPERATURE EXTREMES event(s) were reported in **Appanoose County, Iowa** between **01/01/1950** and **10/31/2008**.

*Click on **Location** or **County** to display Details.*

Mag: Magnitude
Dth: Deaths
Inj: Injuries
PrD: Property Damage
CrD: Crop Damage

Iowa

Location or County	Date	Time	Type	Mag	Dth	Inj	PrD	CrD
1 APPANOOSE	04/23/1961	0630	Hail	3.00 in.	0	0	0	0
2 APPANOOSE	08/03/1962	1600	Hail	1.50 in.	0	0	0	0
3 APPANOOSE	04/21/1967	1310	Hail	1.50 in.	0	0	0	0
4 APPANOOSE	05/05/1971	2100	Hail	2.00 in.	0	0	0	0
5 APPANOOSE	05/18/1971	1650	Hail	3.00 in.	0	0	0	0
6 APPANOOSE	06/03/1973	2245	Hail	1.00 in.	0	0	0	0
7 APPANOOSE	06/14/1974	1715	Hail	1.75 in.	0	0	0	0
8 APPANOOSE	06/14/1974	1730	Hail	1.75 in.	0	0	0	0
9 APPANOOSE	06/14/1974	1900	Hail	1.75 in.	0	0	0	0
10 APPANOOSE	05/15/1976	2100	Hail	1.75 in.	0	0	0	0
11 APPANOOSE	07/20/1980	1740	Hail	1.75 in.	0	0	0	0
12 APPANOOSE	03/27/1985	2030	Hail	1.75 in.	0	0	0	0
13 APPANOOSE	09/28/1986	1415	Hail	1.50 in.	0	0	0	0
14 APPANOOSE	05/26/1987	1710	Hail	0.75 in.	0	0	0	0
15 APPANOOSE	05/31/1987	1938	Hail	0.88 in.	0	0	0	0
16 APPANOOSE	05/24/1989	1935	Hail	1.50 in.	0	0	0	0
17 APPANOOSE	05/27/1989	2205	Hail	0.75 in.	0	0	0	0
18 APPANOOSE	03/12/1990	2323	Hail	1.75 in.	0	0	0	0
19 APPANOOSE	05/14/1991	1027	Hail	0.75 in.	0	0	0	0
20 Moravia	06/11/1994	1645	Hail	1.00 in.	0	0	5K	50K
21 Unionville	06/11/1994	1655	Hail	1.75 in.	0	0	50K	50K
22 Rathbun	07/22/1995	2010	Hail	0.75 in.	0	0	2K	5K
23 Plano	05/09/1996	10:30 AM	Hail	1.00 in.	0	0	5K	0
24 Centerville	05/09/1996	10:43 AM	Hail	1.50 in.	0	0	10K	0
25 Moulton	05/09/1996	10:49 AM	Hail	2.00 in.	0	0	15K	0
26 Moulton	05/09/1996	10:54 AM	Hail	1.00 in.	0	0	5K	0
27 Centerville	05/02/1997	07:30 PM	Hail	0.75 in.	0	0	1K	0
28 Moravia	05/23/1998	07:17 PM	Hail	1.00 in.	0	0	3K	5K
29 Centerville	06/16/2001	10:52 PM	Hail	0.88 in.	0	0	2K	5K
30 Udell	09/20/2001	05:49 PM	Hail	1.75 in.	0	0	25K	5K
31 Cincinnati	10/22/2001	04:05 PM	Hail	1.00 in.	0	0	5K	5K
32 Moulton	04/30/2003	06:30 PM	Hail	0.75 in.	0	0	0	0

33 Numa	04/30/2003	07:30 PM	Hail	1.75 in.	0	0	10K	0
34 Moulton	04/30/2003	08:08 PM	Hail	1.00 in.	0	0	5K	0
35 Centerville	05/08/2003	06:05 PM	Hail	2.75 in.	0	0	100K	0
36 Plano	05/08/2003	06:06 PM	Hail	1.75 in.	0	0	25K	0
37 Moravia	05/30/2004	01:10 PM	Hail	0.75 in.	0	0	0	5K
38 Centerville	05/30/2004	01:15 AM	Hail	0.88 in.	0	0	2K	0
39 Moulton	05/30/2004	12:33 PM	Hail	0.75 in.	0	0	0	5K
40 Moravia	06/08/2005	09:20 AM	Hail	0.75 in.	0	0	0	5K
41 Centerville	09/13/2005	06:52 PM	Hail	1.00 in.	0	0	5K	10K
42 Plano	03/08/2006	06:00 PM	Hail	0.75 in.	0	0	0	0
43 Centerville	03/12/2006	01:10 PM	Hail	1.00 in.	0	0	3K	0
44 Centerville	03/12/2006	01:13 PM	Hail	0.88 in.	0	0	1K	0
45 Moulton	03/12/2006	08:03 PM	Hail	1.00 in.	0	0	4K	0
46 Moravia	03/12/2006	08:25 PM	Hail	0.88 in.	0	0	3K	0
47 Centerville	04/02/2006	02:10 PM	Hail	0.75 in.	0	0	0	0
48 Unionville	04/06/2006	09:10 AM	Hail	0.75 in.	0	0	0	0
49 Unionville	05/03/2006	05:45 AM	Hail	1.75 in.	0	0	10K	0
50 Sunshine	04/10/2008	17:24 PM	Hail	1.00 in.	0	0	1K	0K
51 Rathbun	04/10/2008	17:34 PM	Hail	0.88 in.	0	0	0K	0K
52 Iconium	07/27/2008	19:15 PM	Hail	1.00 in.	0	0	2K	10K
53 Darbyville	07/27/2008	19:24 PM	Hail	1.75 in.	0	0	15K	10K
54 Forbush	07/27/2008	19:30 PM	Hail	1.25 in.	0	0	5K	10K
55 Moulton	07/27/2008	19:44 PM	Hail	1.75 in.	0	0	10K	10K
				TOTALS:	0	0	329K	190K

55 HAIL event(s) were reported in **Appanoose County, Iowa** between **01/01/1950** and **10/31/2008**.

*Click on **Location** or **County** to display Details.*

Mag: Magnitude
Dth: Deaths
Inj: Injuries
PrD: Property Damage
CrD: Crop Damage

Query Results

0 WILD & FOREST FIRE event(s) were reported in **Appanoose County, Iowa** between **01/01/1950** and **10/31/2008**.

Iowa

Location or County	Date	Time	Type	Mag	Dth	Inj	PrD	CrD
1 IAZ002>011 - 013>054 - 056>064 - 070>078 - 080>099	01/20/1993	0430	Ice Storm	N/A	0	0	50K	0
2 IAZ002>011 - 013>054 - 056>064 - 070>076 - 080>086 - 090>096	02/08/1993	2230	Freezing Rain	N/A	0	0	1K	0
3 IAZ002>011 - 013>054 - 056>064 - 070>078 - 080>099	02/10/1993	2100	Freezing Rain	N/A	1	0	50K	0
4 IAZ056>064 - 070>078 - 080>099 -	02/20/1993	1400	Freezing Rain	N/A	0	0	5K	0
5 IAZ043>049 - 056>064 - 070>078 - 080>099 -	02/25/1993	0500	Snow	N/A	0	0	1K	0
6 IAZ041 - 042 - 051>054 - 061>099	01/26/1994	1300	Freezing Rain	N/A	0	0	500K	0
7 Southeast Third Of Io	02/22/1994	1000	Snow	N/A	0	0	5K	0
8 IAZ001>004 - 012>015 - 020>028 - 031>099	01/26/1995	2300	Freezing Rain	N/A	0	0	100K	0
9 Southern Iowa	11/10/1995	1200	Snow	N/A	0	0	10K	0
10 Much Of Iowa	11/27/1995	0500	Snow	N/A	0	0	50K	0
11 IAZ004>011 - 015>019 - 023>030 - 033>039 - 044>050>057 - 062 - 070>075 - 081>086 - 092>097	12/08/1995	0200	Snow	N/A	0	0	20K	0
12 IAZ007>011 - 016>019 - 024>029 - 033>039 - 044>050 - 057>062 - 070>075 - 081>086 - 092>097	01/26/1996	12:00 AM	Heavy Snow	N/A	2	0	600K	0
13 IAZ004>007 - 015>017 - 023>028 - 033>036 - 038>039 - 044>050 - 057>060 - 062 - 070>075 - 081>086 - 092>097	11/14/1996	04:00 PM	Ice Storm	N/A	0	0	150K	0
14 IAZ074>075 - 083>086 - 092>097	04/10/1997	05:00 AM	Heavy Snow	N/A	0	0	1.6M	0
15 IAZ084>085 - 095>096	12/04/1997	07:00 AM	Heavy Snow	N/A	0	0	10K	0
16 IAZ023>028 - 033>039 - 044>050 - 057>062 -	12/21/1997	02:00 PM	Ice Storm	N/A	0	0	88K	0

070>075 - 081>086 - 092>097								
17 IAZ074>075 - 084>086 - 093>097	12/24/1997	09:00 AM	Heavy Snow	N/A	0	0	56K	0
18 IAZ004>007 - 015>017 - 023>028 - 033>039 - 044>050 - 057>062 - 070>075 - 081>086 - 092>097	01/04/1998	06:30 AM	Ice Storm	N/A	0	0	1.0M	0
19 IAZ070>072 - 081>086 - 092>097	01/14/1998	01:30 AM	Ice Storm	N/A	0	0	30K	0
20 IAZ024>028 - 033>039 - 044>050 - 057>062 - 070>075 - 081>085 - 092>096	03/07/1998	09:00 PM	Heavy Snow	N/A	1	0	2.0M	0
21 IAZ004>007 - 015>017 - 023>028 - 033>039 - 044>050 - 057>062 - 070>075 - 081>086 - 092>097	03/17/1998	02:00 AM	Ice Storm	N/A	0	0	300K	0
22 IAZ004>007 - 015>017 - 023>028 - 033>039 - 045>050 - 058>062 - 070>075 - 082>086 - 096>097	01/01/1999	03:00 PM	Winter Storm	N/A	2	0	440K	0
23 IAZ086 - 096>097	03/05/1999	01:00 PM	Heavy Snow	N/A	0	0	3K	0
24 IAZ005 - 015>017 - 023>024 - 033>037 - 044>050 - 057>062 - 070>075 - 081>086 - 092>097	03/08/1999	12:00 AM	Winter Storm	N/A	0	0	450K	0
25 IAZ082>086 - 092>097	02/17/2000	08:00 PM	Ice Storm	N/A	0	0	550K	0
26 IAZ004>007 - 015>017 - 023>028 - 033>039 - 044>050 - 057>062 - 070>075 - 081>086 - 092>097	12/10/2000	09:00 PM	Winter Storm	N/A	0	0	1.3M	0
27 IAZ026>028 - 036>039 - 046>050 - 057>062 - 070>075 - 081>086 - 092>097	02/08/2001	04:00 PM	Ice Storm	N/A	0	0	2.7M	0

28 IAZ026>028 - 036>039 - 046>050 - 057>062 - 070>075 - 081>086 - 092>097	02/08/2001	11:00 PM	Winter Storm	N/A	0	0	1.8M	0
29 IAZ059>062 - 071>075 - 081>086 - 092>097	03/15/2001	03:00 PM	Heavy Snow	N/A	0	0	650K	0
30 IAZ075 - 083>086 - 093>097	01/30/2002	06:00 AM	Heavy Snow	N/A	0	0	500K	0
31 IAZ023 - 033>035 - 044>050 - 057>062 - 070>075 - 081>086 - 093>097	02/14/2003	11:00 AM	Winter Storm	N/A	0	0	170K	0
32 IAZ059>062 - 070>075 - 081>086 - 092>097	01/04/2004	05:00 AM	Heavy Snow	N/A	0	0	110K	0
33 IAZ033 - 044>046 - 057>061 - 070>074 - 081>085 - 092>097	02/05/2004	02:00 PM	Heavy Snow	N/A	0	0	0	0
34 IAZ044>050 - 057>062 - 070>075 - 081>086 - 092>097	03/15/2004	07:00 AM	Heavy Snow	N/A	0	0	310K	0
35 IAZ075 - 082>086 - 092>097	01/03/2005	01:00 AM	Ice Storm	N/A	0	0	300K	0
36 IAZ004>007 - 015>017 - 023>028 - 033>039 - 044>050 - 057>062 - 070>075 - 081>086 - 092>097	01/04/2005	05:00 PM	Heavy Snow	N/A	0	0	510K	0
37 IAZ004>007 - 015>017 - 023>028 - 033>039 - 044>050 - 057>062 - 070>075 - 081>082 - 085>086 - 092 - 096	02/24/2007	03:00 AM	Winter Storm	N/A	0	0	250K	0K
38 IAZ046 - 059>061 - 073>075 - 085>086 - 096	12/11/2007	00:00 AM	Ice Storm	N/A	0	0	150K	0K
39 IAZ096 - 097	12/31/2007	09:00 AM	Heavy Snow	N/A	0	0	0K	0K
40 IAZ059>061 - 073>075 - 084>086 - 096	02/05/2008	11:00 AM	Winter Storm	N/A	0	0	10K	0K
				TOTALS:	6	0	16.818M	0

40 SNOW & ICE event(s) were reported in **Appanoose County, Iowa** between **01/01/1950** and **10/31/2008**.

*Click on **Location** or **County** to display Details.*

Mag: Magnitude
Dth: Deaths
Inj: Injuries
PrD: Property Damage
CrD: Crop Damage

6 DROUGHT event(s) were reported in **Appanoose County, Iowa** between **01/01/1950** and **10/31/2008**.

*Click on **Location or County** to display Details.*

Mag: Magnitude
Dth: Deaths
Inj: Injuries
PrD: Property Damage
CrD: Crop Damage

Iowa

Location or County	Date	Time	Type	Mag	Dth	Inj	PrD	CrD
1 All Of Iowa	08/01/1995	0000	Drought	N/A	0	0	0	0.5B
2 IAZ057>062 - 070>075 - 081>086 - 092>097	07/20/1999	12:00 PM	Drought	N/A	0	0	0	109.9M
3 IAZ033 - 044>050 - 057>062 - 070>075 - 081>086 - 092>097	08/14/2000	12:00 AM	Drought	N/A	0	0	0	150.1M
4 IAZ033 - 044>050 - 057>062 - 070>075 - 081>086 - 092>097	09/01/2000	12:00 AM	Drought	N/A	0	0	0	161.0M
5 IAZ004>007 - 015>017 - 023>028 - 033>039 - 044>050 - 057>062 - 070>075 - 081>086 - 092>097	08/01/2001	12:00 AM	Drought	N/A	0	0	0	578.9M
6 IAZ004>007 - 015>017 - 023>028 - 033>039 - 044>050 - 057>062 - 070>075 - 081>086 - 092>097	08/01/2003	12:00 AM	Drought	N/A	0	0	645.2M	0
				TOTALS:	0	0	645.150M	1.500B

3 LIGHTNING event(s) were reported in **Appanoose County, Iowa** between **01/01/1950** and **10/31/2008**.

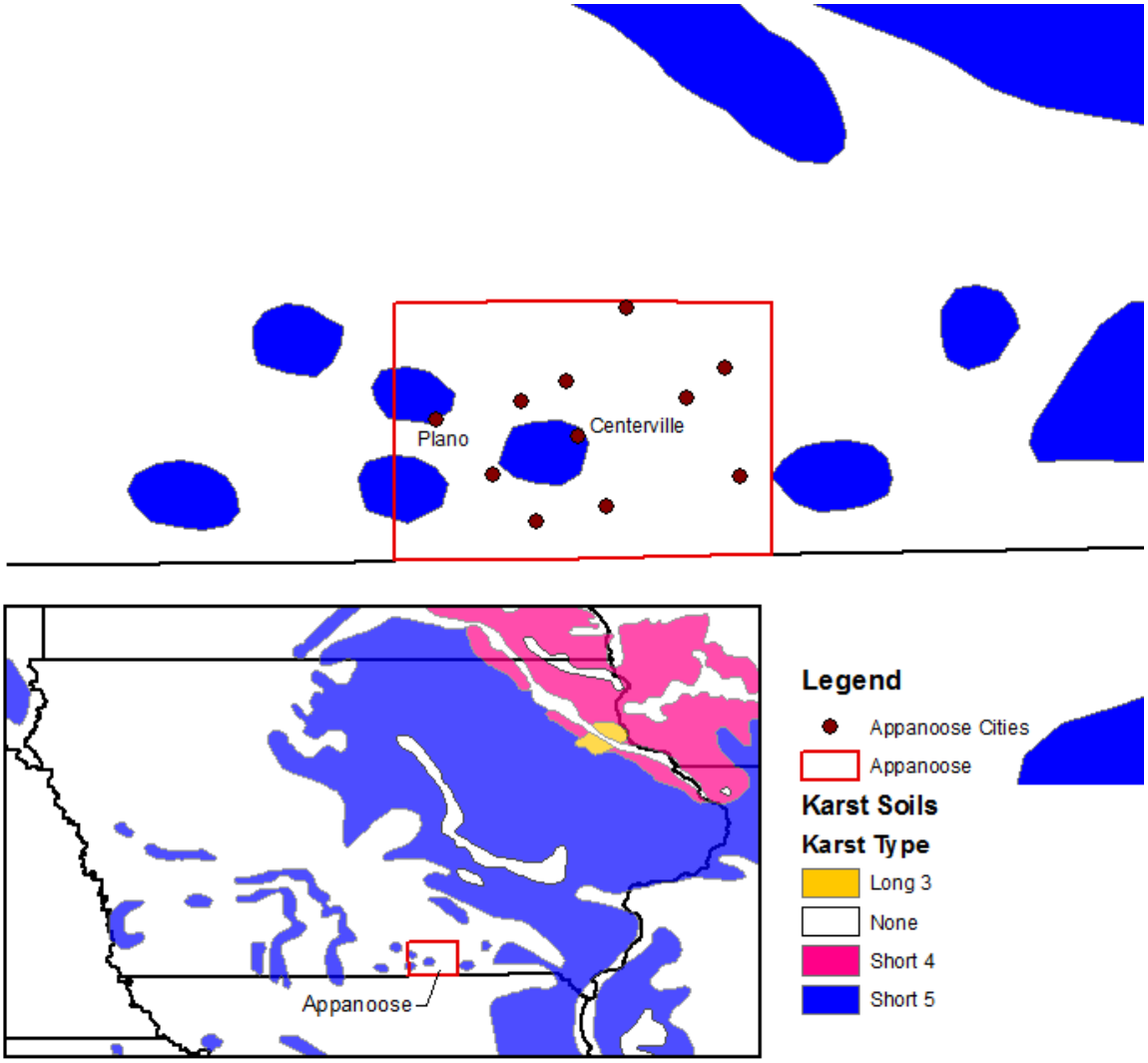
*Click on **Location or County** to display Details.*

Mag: Magnitude
Dth: Deaths
Inj: Injuries
PrD: Property Damage
CrD: Crop Damage

Iowa

Location or County	Date	Time	Type	Mag	Dth	Inj	PrD	CrD
1 Centerville	05/26/1996	11:23 PM	Lightning	N/A	0	0	2K	0
2 Moulton	04/30/2003	08:10 PM	Lightning	N/A	0	0	75K	0
3 Centerville	08/22/2007	14:00 PM	Lightning	N/A	0	1	5K	0K
				TOTALS:	0	1	82K	0

Appendix O: Karst Soils Map



The Karst Soils that are in Appanoose County are defined as "Short 5" which means that gaps in the soil, which may include caves, tubes, and fissures, are generally less than 1,000 feet long. Generally such gaps are not more than 50 feet in vertical depth and covered by noncarbonated material between 10 feet and 200 feet thick.

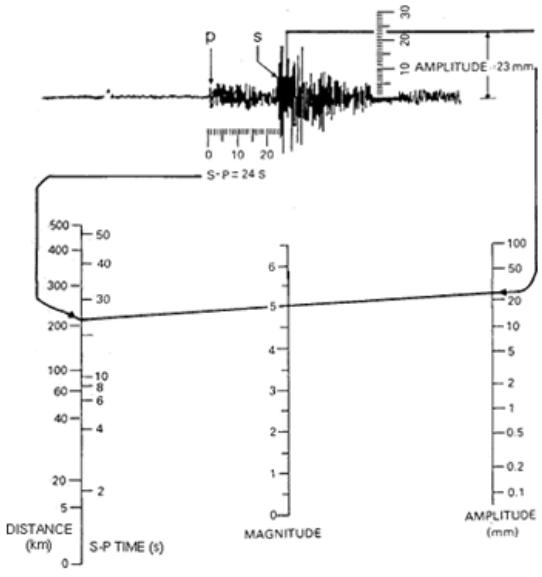
Source: National Atlas GIS data compiled by Chariton Valley Planning and Development

Appendix P: Richter Scale

The Richter Scale is a mathematical model for evaluating earthquake magnitudes on a logarithmic scale. This means that for each one point step upward, the magnitude is ten times stronger.

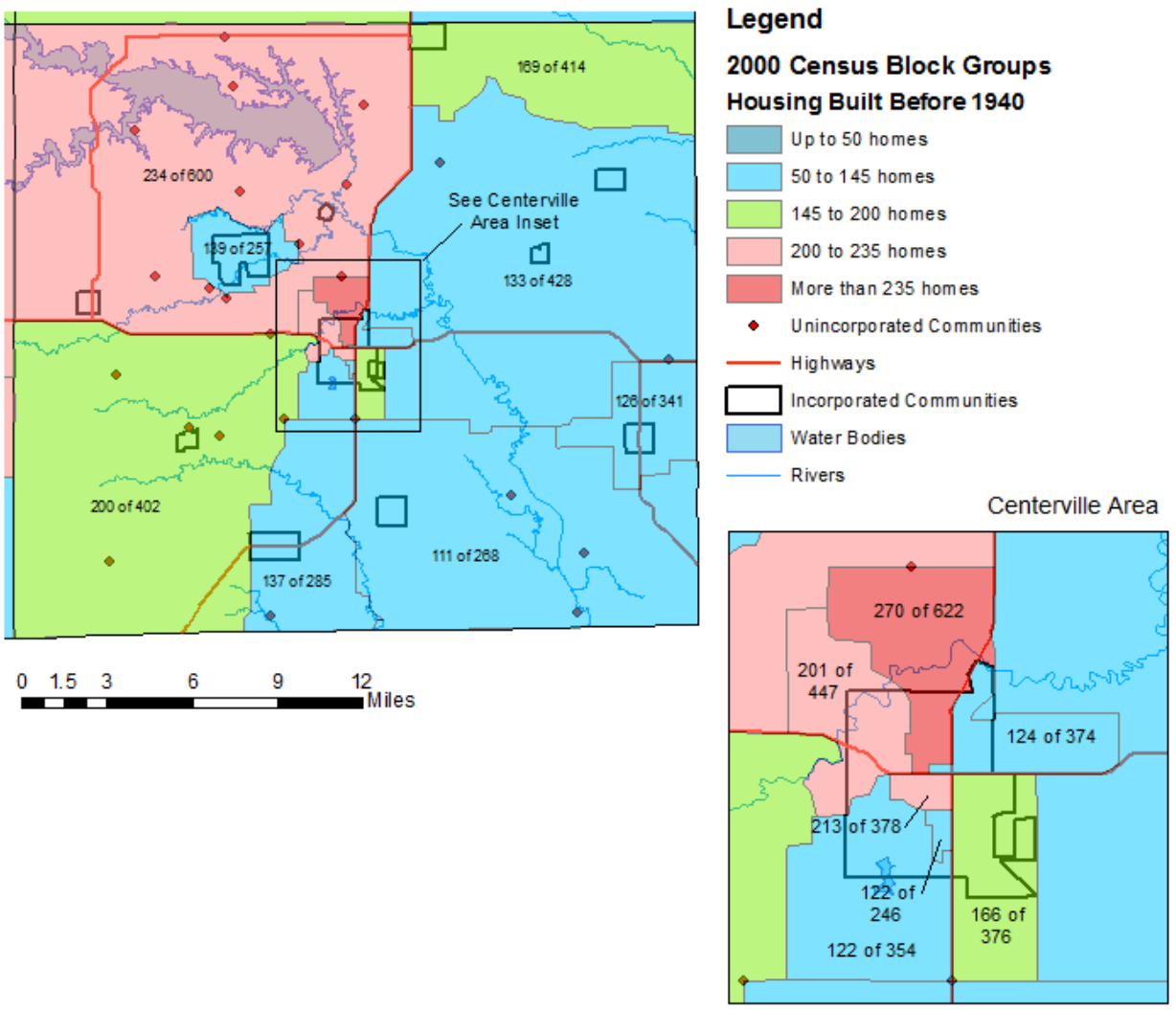
Richter Magnitude	Description	Earthquake Effects	Frequency (global average)
Less than 2.0	Micro	Micro earthquakes, not felt	About 8,000 per day
2.0 – 2.9	Minor	Generally not felt, but recorded	About 1,000 per day
3.0 – 3.9		Often felt, but rarely causes damage	About 49,000 per yr.
4.0 – 4.9	Light	Noticeable shaking of indoor items, rattling noises. Significant damage unlikely	About 6,200 per yr.
5.0 – 5.9	Moderate	Can cause major damage to poorly constructed buildings over small regions. At most, slight damage to well-designed buildings	800 per year
6.0 – 6.9	Strong	Can be destructive in areas up to about 100 miles across in populated areas	120 per year
7.0 – 7.9	Major	Can cause serious damage over large areas	18 per year
8.0 – 8.9	Great	Can cause serious damage in areas several hundred miles across	1 per year
9.0 – 9.9		Devastating in areas several thousand miles across	1 per 20 years
10.0 +	Epic	Never recorded	unknown

Source: Wikipedia http://en.wikipedia.org/wiki/Richter_magnitude_scale



USGS http://earthquake.usgs.gov/learning/glossary.php?termID=149

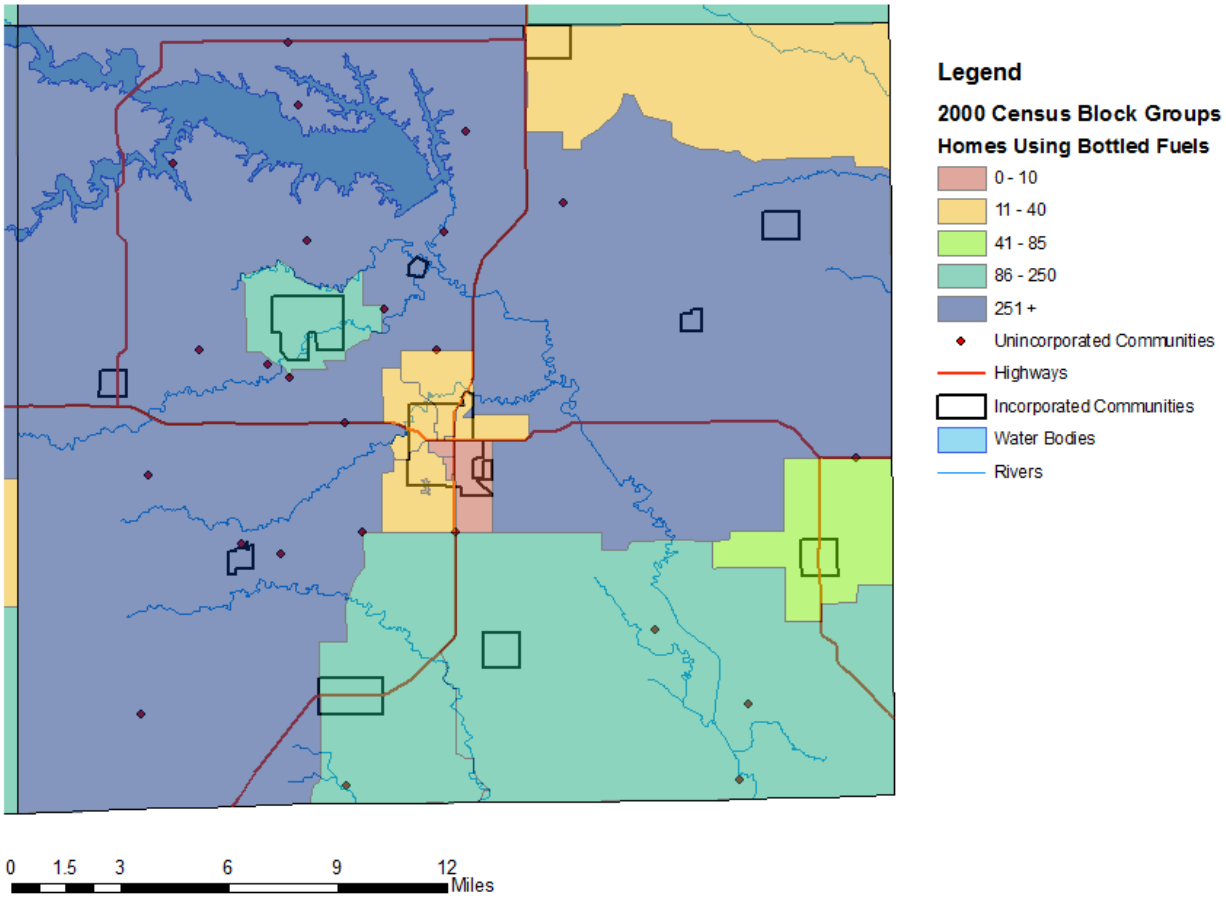
Appendix Q: Housing Built Before 1940 by Block Group



Note: The US Census breaks down data, such as years houses were built, by Census Tract, Block, and Block Group (the smallest Census designation based on population) or by incorporated area. Each incorporated community in this plan has similar information provided; however an accurate estimate of how many homes in a block group containing a community were built before 1940 and in the community may be difficult to determine for some areas. For example; Numa is the only incorporated community in its block group, figuring the number of homes built before 1940 would simply be a matter of subtracting the total for Numa from the block group to determine the number of homes built before 1940 in the unincorporated portion. Several block groups extend into Centerville, so estimating the number of homes built before 1940 between the incorporated and unincorporated portions of those block groups would be very difficult to do accurately.

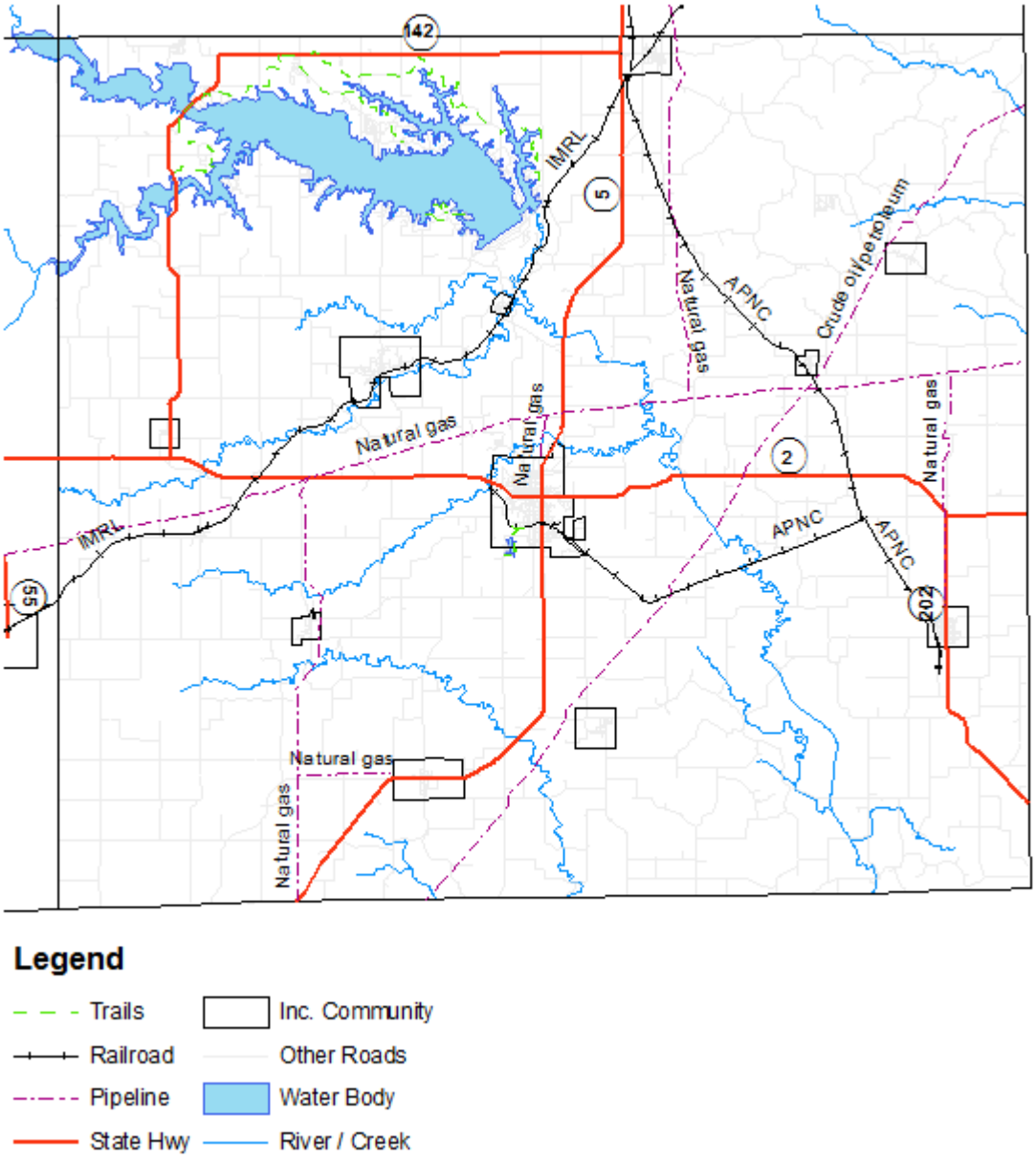
Source: IA DNR GIS data compiled by Chariton Valley Planning and Development

Appendix R: Homes Heated with Bottled Fuel by Block Group



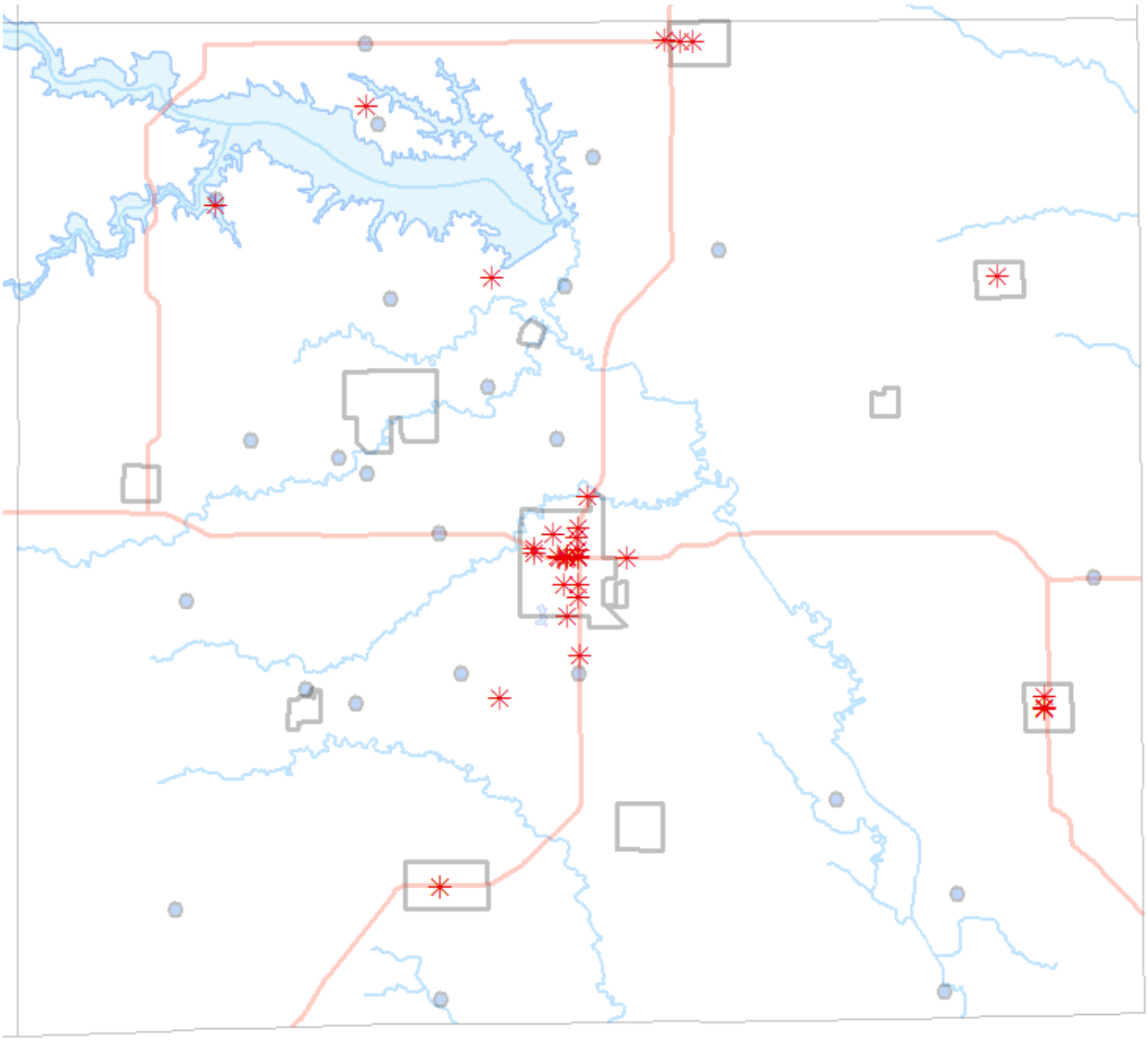
Source: IA DNR GIS data compiled by Chariton Valley Planning and Development

Appendix S: Transportation Routes in Appanoose County



Source: IA DNR GIS data compiled by Chariton Valley Planning and Development

Appendix T: Leaking Underground Storage Tank (LUST) Sites in Appanoose County



The Iowa Department of Natural Resources keeps track of leaking underground storage tanks (LUST) which often include underground gasoline storage. Not all of the sites that the DNR maps are currently leaking but have been known to leak in the past or are at risk for potentially leaking. LUST sites pose a potential threat to drinking water resources and may be hazardous to people digging or otherwise in contact with soil that may be contaminated by plumes of leaking substances from the tanks.

There are three clusters of LUST sites in Appanoose County and scattered sites throughout the county. The clusters are primarily located in Centerville, Moravia, and Moulton and single sites are located in Cincinnati and Unionville.

Source: Iowa Department of Natural Resources GIS data maintained at the University of Iowa, ftp://ftp.igsb.uiowa.edu/gis_library/ia_state/Environmental_Regulation/LUST_sites.html

LEAK NUMBER	FACILITY NAME	FACILITY ADDRESS	FACILITY CITY	CURRENT STATUS	COMMENT
8LTN43	CENTERVILLE MUNICIPAL AIRPORT	20320 545TH STREET	CENTERVILLE	NO ACTION REQUIRED	POINT AT ENTRANCE TO AIRPORT BUILDINGS
7LTS95	CONVENIENCE & MORE	HWY 5 SOUTH	CENTERVILLE	NO ACTION REQUIRED	0
8LTJ08	IOWA SOUTHERN UTIL CO	300 GREEN STREET	CENTERVILLE	NO ACTION REQUIRED	TANKS S OF SE CORNER OF MAINT. BLDG
7LTW98	KONVENIENCE KORNER	1508 S 18TH	CENTERVILLE	NO ACTION REQUIRED	FORMER TANKS LOCATED E OF KONVENIENCE KORNER BLDG AND PUMPS
7LTS93	JOES QUICK SHOP JOES QUICK SHOP	1023 S MAIN	CENTERVILLE	NO ACTION REQUIRED	2 FORMER USTS LOCATED SW OF SW CORNER OF QUICK SHOP BLDG
8LTN29	FINE OIL CO INC	1020 SOUTH 18TH	CENTERVILLE	NO ACTION REQUIRED	2 USTS S OF FINE OIL CO.
7LTW52	BRATZ OIL CORP	102 DRAKE	CENTERVILLE	NO ACTION REQUIRED	TANKS E OF S END OF TEXACO
8LTW13	UNITED FED SAVINGS ASSOC	200 WEST MAPLE	CENTERVILLE	NO ACTION REQUIRED	POINT INDICATING MW-1
7LTB84	AMOCO ELLIOTT OIL	104 SOUTH 18 STREET	CENTERVILLE	NO ACTION REQUIRED	TANKS S OF AMOCO STATION
8LTW68	FORMER SVC STA	220 E MAPLE	CENTERVILLE	NO ACTION REQUIRED	POINT AT MW-1
8LTR80	FORMER MAXS SVC	HWY 2	CENTERVILLE	HIGH RISK	0
7LTB67	KUM & GO #653	401 WEST MAPLE	CENTERVILLE	HIGH RISK	LUST FILE MAP
7LTB82	CLARKS SINCLAIR	N 18TH & E MAPLE STREETS	CENTERVILLE	NO ACTION REQUIRED	POINT ON 1 OF 2 TANKS SW OF BLDG
9LTH71	FORMER IRELAN OIL CO	NW CORNER OF HAYNES & MAPLE	CENTERVILLE	NO ACTION REQUIRED	POINT INDICATING TANK PIT E OF LUMBER BLDG
9LTM66	FORMER IRELAN OIL CO	NW CORNER OF HAYNES & MAPLE	CENTERVILLE	NO ACTION REQUIRED	0
7LTB83	FORMER CLARK STA #840	615 E MAPLE ST	CENTERVILLE	HIGH RISK	MAP FROM LUST FILE
9LTD69	APPANOOSE CNTY SECONDARY ROADS	1211 W STATE STREET	CENTERVILLE	NO ACTION REQUIRED	POINT INDICATING 4 USTS NEAR NE CORNER OF SHED
7LTO51	CASEYS GNRL STORE #2473	708 E VAN BUREN	CENTERVILLE	HIGH RISK	USTS NW OF CASEY'S BLDG
9LTH31	LAW CTR	1125 WEST VAN BUREN	CENTERVILLE	NO ACTION REQUIRED	USTS NEAR HWY 2, W OF LAW CENTER
8LTR28	MCCARTHY TIRE SVC	680 N 18TH	CENTERVILLE	NO ACTION REQUIRED	FORMER TANK AREA N OF NE CORNER OF TIRE SHOP
8LTN36	CITY OF CENTERVILLE	NORTH 8TH STREET	CENTERVILLE	NO ACTION REQUIRED	UST AREA JUST W OF CITY SHOP BLDG

7LTU66	LAKESIDE CONOCO	18TH & HAYNES	CENTERVILLE	NO ACTION REQUIRED	2 USTS E OF FORMER CONOCO, CLOSE TO N 18TH ST.
7LTH68	CENTERVILLE FORD	HWY 5 N	CENTERVILLE	NO ACTION REQUIRED	FORMER 500 GAL TANK W OF NW CORNER OF MAIN BLDG
7LTG86	US ARMY CORPS OF ENGINEERS	RTE 3	CENTERVILLE	LOW RISK	FORMER UST NE OF BLDG.
9LTG13	STEVEN C MORIARTY	SOUTH LIBERTY STREET	CINCINNATI	NO ACTION REQUIRED	FORMER TANK SITE JUST E OFF LIBERTY ST.
7LTF67	WEST GROCERY	103 SO LIBERTY	CINCINNATI	NO ACTION REQUIRED	TANK AREA W OF BLDGS
8LTN44	LITEHOUSE CORP	RR 2	MORAVIA	NO ACTION REQUIRED	FORMER UST LOCATION E OF SE CORNER OF BLEG
9LTC15	NEW ALLNCE FS	802 WEST NORTH ST	MORAVIA	HIGH RISK	4 USTS NE CORNER OF BLDG
7LTD75	OEHLER BROS	203 BRANDON AVE	MORAVIA	NO ACTION REQUIRED	2 TANKS NW OF OEHLER BROS BLDG
7LTN67	ELLIOTTS GNRL STORE	23828 HWY J18	MORAVIA	NO ACTION REQUIRED	3 USTS S OF WILSON'S AMOCO
7LTI06	MOULTON GAS & WASH	109 N MAIN	MOULTON	NO ACTION REQUIRED	OLD TANKS - S OF BLDG.
9LTD09	MOULTON GAS & WASH	109 N MAIN	MOULTON	NO ACTION REQUIRED	SAME AS 8LTQ55, NEW TANKS-E OF BLDG.
8LTQ55	MOULTON GAS & WASH	109 N MAIN	MOULTON	NO ACTION REQUIRED	NEW TANKS-E OF BLDG.
7LTS96	GAS N MOR	501 NORTH MAIN	MOULTON	NO ACTION REQUIRED	LUST FILE MAP
8LTJ07	SOUTHFORK MARINA		MYSTIC	HIGH RISK	EXCAVATION AREA NE OF STORAGE BLDG
9LTH72	MOORES MFA	COUNTY ROAD T61 & J35	UNIONVILLE	NO ACTION REQUIRED	UST W OF NW CORNER OF BLDG

Appendix U: Hazard Mitigation Planning Meeting Summaries

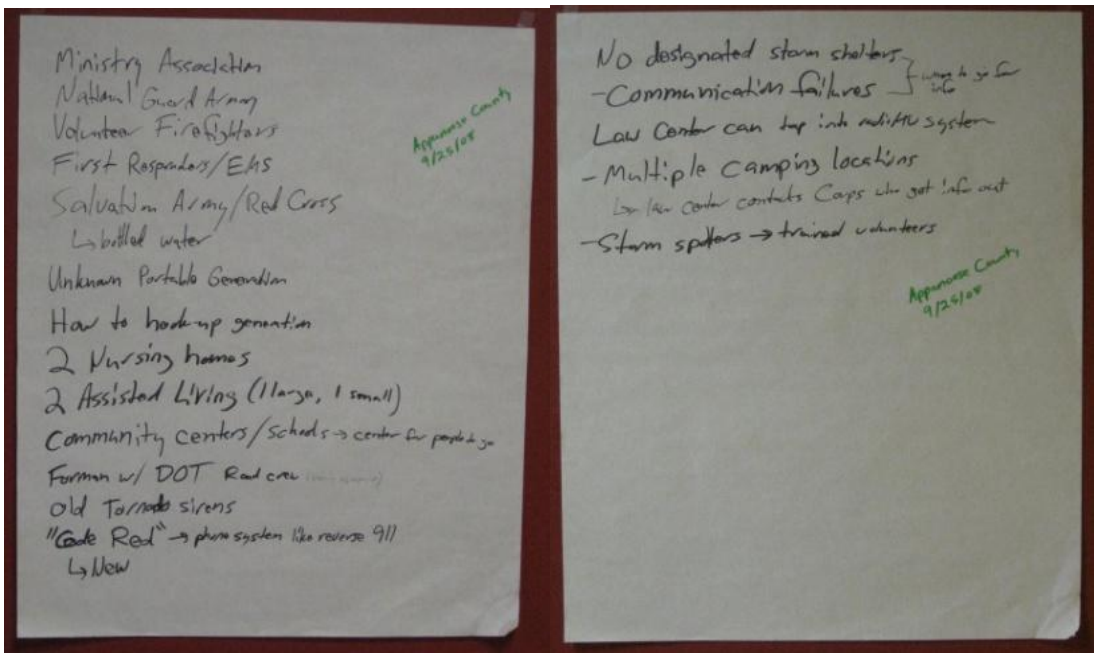
This appendix contains summaries of the planning meetings. Planner's notes and sign in sheets are kept with the original copies of this plan and are not available in the public copies of this plan to protect personal information pertaining to meeting attendees.

Orientation / Update Meeting

Name	Organization / Agency
Patsy Seals	City of Mystic
Frankie Belzer	City of Mystic, Mayor
Karen Poolman	City of Mystic, City Clerk
Chris Chester	City of Mystic
Kathy Hudson	City of Mystic
Jeremy Hudson	Centerville / Mystic Fire Department
Phil Hudson	Mystic Fire Department
Richard Gorden	City of Plano, Mayor
Bill Ursta	Centerville Water Department
Jody McDanel	Appanoose County Supervisor
Richard Brooke	City of Numa
Dennis Sturms	Mercy Ambulance – Centerville
George Johnson	Centerville Building Inspector
John Arnold	Appanoose County Supervisor
Gary Harris	City of Moulton, Mayor
Steve Tucker	ISP
Bill Milani	ADLM Environmental Health
Vern (illegible)	Centerville Fire Department
Tracy Daugherty Miller	Chariton Valley Planning and Development
John Dawson	Chariton Valley Planning and Development

This meeting was the first face-to-face meeting with the Mystic Planning Committee and Chariton Valley Planning and Development. The meeting was set up as a break-out session within the broader Appanoose County Multi-Jurisdictional Hazard Mitigation Plan orientation meeting. The purpose of the broader meeting was to start determining who should be involved in the planning process and who might be on a planning committee in addition to getting information out and begin some discussion on the topic. Brochures were distributed and hazard perception surveys were conducted, written response was not substantial though some discussion and brainstorming did take place. Photos of the brainstorming sheets are included below.

The break-out session was to discuss the progress of the Mystic Plan so far, predominantly on the data collection and the necessary process. Questions were taken and copies of the plan to date were distributed so that committee members could start thinking about the risk and possible mitigation strategies.



Orientation meeting adjourned early at 8:30pm rather than 9:00pm as scheduled.

APPANOOSE COUNTY HAZARD MITIGATION MEETING ATTENDANCE

NAME	REPRESENTING	9/25/08	3/26/09	4/30/10	5/20/09	8/29/09	10/13/09	11/17/09	1/19/10	5/4/10
Robert Boswell	Centerville Fire Dept	x	x	X						
Tom Demry	Chief of Police/ Centerville school board		X							
Jean Morrison	City of Cincinnati									
Deb Henkle	City of Cincinnati									
Jim Casteel	City of Exline			x			X			
Jim Burns	City of Exline						x			
Charles Turner	City of Moravia	x	x	X						
Gary Harris	City of Moulton	X	x	x	X					
John Replogle	City of Moulton	X	X							
Phil Hudson	City of Mystic	x	x	X						
Kristina Kieltyka	City of Mystic	x	x		X					
Richard Brooke	City of Numa	X								
Richard Gorden	City of Plano	X	x							
Tom Anderson	City of Rathbun	X	x							
David Coffin	City of Rathbun	X	x		X					
Eric Pace	City of Udell									
Cori Ballanger	City of Udell									
Roger Selix	City of Unionville									
Henry Herman	City of Unionville									
Pat Tresmer	Centerville, Moulton/Udell Schools		x	x	X				x	x
Ryan Kayler	Moravia Schools		X							
Kathy Carr							X		x	X
Jody McDanel	Appanoose County	x	x	x	X		X	x	x	
Regina Shultz	SEIDA		x	x	x	X		x	x	x

Gary Bishop	Appanoose County Engineer		x	x	X			x	x	
John Pasa	Army Corp of Eng				x	x				
Marsha Mitchell	City of Centerville									
Mike Bain	Midwest Environmental Services		X							
Clete Swackhamer	ISU Extension office		X							
Patsy Seals	City of Mystic	X								
Frankie Belzer	City of Mystic	x								
John Arnold	ADLM	X								
Bill Milani	ADLM Environmental	X								
Allen Sharp			x		x	X			x	x

CHARITON VALLEY PLANNING AND DEVELOPMENT

APPANOOSE COUNTY HAZARD MITIGATION PLANNING COMMITTEE MEETING #1

MINUTES

MARCH 26, 2009 | 3 PM | CENTERVILLE CITY COUNCIL CHAMBERS

Dawson called the first Appanoose County Hazard Mitigation Planning Committee meeting to order at 3:00 PM on March 26, 2009. Present were; Pat Tresmer, Ryan Kayler, Regina Shulz, Gary Anderson, Jody McDanel, Gary Bishop, Dennis Sturms, Allen Sharp, Michael Bain, Bob Bozwell, Charles Turner, Gary Harris, John Replogle, Phil Hudson, Kristina Kieltyka, Richard Gorden, Tom Anderson, Dave Coffin, Sherry Middlebrook, Clete Swackhammer (ISU), John Pasa (Army Corps), John Dawson (CVPD) Julie Pribyl (CVPD), John Arnold (ADLM-EMA).

Dawson started with a brief summary of work completed to date then continued to a brief overview of this plan and this process for any attendees that have not had a chance to hear previous overviews. There were no questions regarding current progress.

As a locally driven plan, chairs and vice-chairs of each committee were needed. Dawson briefly explained the rational for the two sub-committee structure modeled on the regional transportation planning group.

Jody McDanel was appointed chair of the Policy Sub-committee (PS) and John Arnold of ADLM was appointed vice-chair due to his familiarity with this process and with emergency management. John Pasa with the Army Corps of Engineers volunteered to serve as chair of the Technical Advisory Sub-committee (TAS) following no recommendations. Regina Shultz was appointed chair of the TAS and Mike Bain was appointed vice-chair as local representatives without other governmental affiliation.

Dawson presented a draft mission and a draft vision statement for the committee for consideration modeled on similar mission and vision statements from other hazard mitigation plans. Both were adopted as presented; Shultz motioned, McDanel seconded the mission statement and Gorden motioned and Swackhammer seconded the vision statement.

Ground rules were discussed; Dawson will be responsible for setting the meetings and publishing notices in the local paper. Chairs of each sub-committee may reschedule meetings if there is a conflict or other considerations. Approximately 6 committee meetings are anticipated over the next 12 to 18 months; the absolute deadline for this plan to be approved and adopted is January 1, 2011. City, county, and school representatives will be responsible for posting flyers advertising each meeting that Dawson will prepare and distribute. "Homework" will be employed to keep the process moving and to help keep meetings concise and productive. This work will be detailed on each agenda distributed in advance of each meeting in the "Next Steps" section at the bottom of the page. FEMA has a timesheet that committee members can record their time on to ensure that time spent on "homework" is counted toward the County's match requirement.

The Committee conducted a preliminary selection of hazards for county-wide consideration using a hand-out from Dawson. Dawson indicated that the list corresponds to the hazards addressed in the State of Iowa plan and that locally only the natural hazards are required for consideration. Dawson recommended that all be considered and then narrowed down to reflect actual local concern and

3/26/09 meeting minutes con't:

impacts. Dawson also proposed three hazards that have been addressed in other plans or that may have distinct local concern; Radon, Climate Change; and Economic Disruption / Decline.

McDanel pointed out that conceivably all of these hazards could occur in Appanoose County, so why not say yes to all of them? Dawson responded that the City of Mystic took this more inclusive approach initially and then received comments from FEMA that they should consider narrowing the focus of the plan to hazards that can be locally addressed. In addition, this plan should focus not on what could happen here, but on those hazards that 1) originate or directly impact Appanoose County and 2) those that the local expertise and resources can reasonably address (including seeking grants for projects)

Considering From the list of natural hazards, only one was eliminated due to lack of local concern and lack of known damages or risk; landslides. Middlebrook recommended that the Radon hazard be complimented with Lead both as environmental human health risks. Pasa offered to look into dams and levees in Appanoose County since there was some discussion about each.

McDanel pointed out that some of these hazards lead other ones so why not address just those that lead to other ones? Dawson responded that there is a tool from FEMA that takes into consideration the interactions between hazards that will be used to help prioritize them based on this interaction. However those hazards that are addressed by others should still be addressed separately as well, the relative rank of them will be more apparent following future scoring of them based on the forthcoming research.

Gorden raised a concern over whether cities would be held accountable for not acting on hazards identified due to lack of resources, lack of expertise, or other factors faced by small cities. Dawson responded that there would not be repercussions from FEMA or the State for not acting on every hazard acknowledged. The act of recognizing a hazard in this plan demonstrates that we are seriously looking at our threats and prioritizing actions based on our resources. Dawson emphasized that this is a local plan using local priorities to address threats within the means of local jurisdictions.

There was limited discussion on the Human-caused and Combination Hazards until terrorism was considered. Several attendees indicated that like other hazards, terrorism could potentially impact Appanoose County. Anderson emphasized the understanding that we should be selecting hazards based on what can originate in Appanoose County. Dawson also indicated that based on population size, size of farms, relative economic prosperity, and similar considerations probably make the County a low-priority target for various terrorism acts. Criminal law would address the actions that would be more likely, eliminating the need for addressing terrorism locally.

Terrorism hazards were ultimately eliminated from this preliminary list as were enemy attack, fixed radiological incidents, public disorder, and economic disruption / decline.

Dawson emphasized that this preliminary list is intended to guide research used to profile the hazards for more detailed consideration at a future meeting. Dawson spoke to FEMA representatives and understands that of the hazards identified at this meeting, they can be scored and ranked according to relative risk and then separated out into high risk, moderate risk, and acceptable risk hazards. Action steps then are directed at the high-risk hazards with the acceptable risk hazards set aside.

Also emphasized is that this list is for county-wide consideration. Cities are asked to consider this list in their up-coming meetings to select hazards that are of local concern while looking at local capabilities and resources. One significant benefit of having this plan enables cities to seek grants for projects and mitigation strategies that the jurisdiction would not otherwise be able to afford.

Bishop motioned to approve the "Next Steps" seconded by Replogle with the addition of Dawson sending a reminder to cities to select hazards at their next council meeting led by the appointed city representative.

The next Committee meeting will be on April 30th at 3 PM at the Centerville City Council Chambers, unless otherwise notified. Reminders will be sent to all committee members and the meeting will be published in the paper as well.

The Appanoose County Hazard Mitigation Planning Committee meeting adjourned at 4:10 PM and was immediately followed by the Appanoose County LEPC meeting.

Meeting Length: 1 hour 10 minutes.

App ose County Hazard Mitigation Planning Committee & Appar · County LEPC meeting

Name	Title	Role	Representing	email	Address 1	Address 2	City	State	Zip	Phone	Fax	Signature
William Milani	(LEPC)	TAS	ADLM Environmental	adlmenv@sirisonline.com	101 East Van Buren		Centerville	IA	52544	641-437-1909	641-437-1706	
Sherry Middlebrook	Administrator (LEPC)	TAS	Appanoose County Public Health	smiddlebrook@appanoosecounty.net	Attn: Public Health Nurse Office	201 North 12th	Centerville	IA	52544	641-437-4332	641-856-5575	Sherry Middlebrook
Dan Barnthouse	(LEPC)	TAS	Iowa DOT		IA DOT Maintenance Garage	23619 Hwy 5 South	Centerville	IA	52544	641-856-2670		
Clete Swackhamer	(LEPC)	TAS	ISU Extension Office	swack@iastate.edu	US Agriculture Dept of FSA	12th and Washington Street	Centerville	IA	52544	641-856-3885		Clete Swackhamer
Mike Bogle	CFD Captain (LEPC)	TAS	Centerville Fire Department	cntrfire@sirisonline.com	15th & Maple Street		Centerville	IA	52544	641-856-2314	641-437-7364	
Marsha Mitchell	Centerville Mayor (LEPC)	TAS	Centerville	mayor@sirisonline.com	Centerville City Hall	312 Maple Street	Centerville	IA	52544	641-437-4339	641-437-1498	
Paul Mihalovich	Moravia Mayor (LEPC)	TAS	Moravia		116 South Williams Street	P.O. Box 246	Moravia	IA	52571	(641) 724-9811		
Frankie Belzer	Mystic Mayor (LEPC)	TAS	Mystic	cityofmystic@iowatelecom.net	PO Box 69		Mystic	IA	52574	(641) 647-2243		
John Pasa		TAS	Army Corps of Engineers	John.P.Pasa@usace.army.mil	20112 HWY 5 ST	Centerville				641-647-2464 X 3114		
Jody McMANUS												
Julie Pusey												
Tracy D Anderson			Appanoose Co. Sheriff									
John Arnold			ADLM-EMA									

Start Time: 3:00pm (HMP) / 4:15 (LEPC)

End Time: 4:40 (HMP) / 4:40 (LEPC)

Total Meeting Time: 1hr (HMP) / 30min. (LEPC)

App. ose County Hazard Mitigation Planning Committee & Appanoose County LEPC meeting

Name	Title	Role	Representing	email	Address 1	Address 2	City	State	Zip	Phone	Fax	Signature
Roger Selix	Mayor	PS	Unionville	ssnowcityclerk@iowatelecom.net	PO Box 56		Unionville	IA	52594	(641) 452-6763		
Henry Herman	Councilperson	PS	Unionville	ssnowcityclerk@iowatelecom.net	PO Box 56		Unionville	IA	52594	(641) 452-6763		
Pat Tresmer	School Nurse	PS	Cntvll & Moulton-Udell CSDs	pat.tresemer@gpaea.k12.ia.us	Centerville High School	600 CHS Drive	Centerville	IA	52544	641-856-0843		Pat Tresmer
Ryan Kayler	janitor	PS	Moravia CSD	brad.breon@moravia.k12.ia.us				IA				
Jody McDanel	Supervisor	PS	Appanoose County	supervisors@appanoosecounty.net	Courthouse	201 North 12th	Centerville	IA	52544	641-856-5512	641-437-8023	
Regina Shultz	Executive Director	TAS	SIEDA	reginas@iowatelecom.net	111 N Main	St # 2	Centerville	IA	52544	(641) 856-8437		Regina L Shultz
David Welch	Pastor (LEPC)	TAS	Red Cross		316 School Street	P.O. Box 38	Plano	IA	52581	641-895-6056		
Bill Ursta		TAS	Centerville Waterworks	centervillewater@sirisonline.com			Centerville	IA	52544			
Marty Braster	(LEPC)	TAS	Rathbun Regional Water Association,	mbraster@rrwa.net	16166 Hwy J29		Centerville	IA	52544	641-647-2416	641-647-2217	
Gary Anderson	Sherrif (LEPC)	TAS	Appanoose County	sheriff@sirisonline.com	1125 W Van Buren		Centerville	IA	52544	641-437-7100	641-437-7107	Gary D. Anderson
Gary Bishop	County Engineer (LEPC)	TAS	Appanoose County	gbishop@appanoosecounty.net	Attn: County Engineer	201 North 12th	Centerville	IA	52544	641-856-6193	641-437-4665	Gary L Bishop
Dennis Sturms	EMS (LEPC)	TAS	Mercy Medical Center	dsturms@mercydesmoines.org	1 St Joseph's Dr		Centerville	IA	52544	641-437-3422		
Rick Butler	First Responder (LEPC)	TAS	ACEMSC	rbutler@dia.state.ia.us	22674 230th Ave		Exline	IA	52555	641-658-2321		
John Houser	Fire Fighter (LEPC)	TAS	MVFD	johnhouser@alliantenergy.com	26386 Highway J3T		Moravia	IA	52571	641-437-5215	641-437-5119	
Lewis (Gene) Horn	First Responder (LEPC)	TAS	FD / FR		Attn: Fire Dept / First Resp.	111 South Main	Moulton	IA	52572	641-642-8126		
Allen Sharp	Chief (LEPC)	TAS	SACFR	2sharps@iowatelecom.net	503 East Elm Street		Centerville	IA	52544	641-856-7541		Allen W. Sharp
Vic Senter	(LEPC)	TAS	Alliant Energy Service Center	Vicsenter@alliantenergy.com	Hwy 5 North		Centerville	IA	52544	641-437-5299		
Fred Jedkins	(LEPC)	TAS	KCOG Radio	kmgofm@lisco.net	402 N. 12th		Centerville	IA	52544	641-437-4242		
Michael Bain	(LEPC)	TAS	Midwest Environmental	mustang67@iowatelecom.net	Rt 1 PO Box 338		Centerville	IA	52544	641-437-7023	641-437-7040	
Reg Higginbottom	(LEPC)	TAS	Ministrial Assoc.	w0reg@netins.net	105 N. Vine		Moulton	IA	52572	641-642-3905	641-642-3924	

Start Time: 3:00 pm (HMP) 4:15 pm (LEPC)

End Time: 4:10 (HMP) 4:40 (LEPC)

Total Meeting Time: 1 hr (HMP) 30 min (LEPC)

App. ose County Hazard Mitigation Planning Committee + Appa se County LEPC meeting

Location: Centerville City Hall Date: 3/26/09 Committee Meeting #: 1

Name	Title	Role	Representing	email	Address 1	Address 2	City	State	Zip	Phone	Fax	Signature
Robert Bozwell	Fire Chief	PS	Centerville	cntrfire@sirisonline.com	15th & Maple Street		Centerville	IA	52544	641-856-2314	641-437-7364	
Tom Demry	Chief of Police	PS	Centerville	tdemrycpd@hotmail.com	Appanoose County Law Ctr	1125 W Van Buren	Centerville	IA	52544	641-437-7100	641-437-7107	
Jean Morrison	Councilperson	PS	Cincinnati		PO Box 194	105 W Pleasant	Cincinnati	IA	52549	(641) 658-2666		
Deb Henkle	Mayor	PS	Cincinnati		PO Box 194	105 W Pleasant	Cincinnati	IA	52549	(641) 658-2666		
Jim Casteel	Mayor	PS	Exline		City Hall		Exline	IA	52555	(641) 658-2655		
Jim Burns	Councilperson	PS	Exline		City Hall		Exline	IA	52555	(641) 658-2655		
Charles Turner		PS	Moravia	joandchas@iowatelecom.net	116 South Willliams Street	P.O. Box 246	Moravia	IA	52571	(641) 724-9811		
Gary Dhority		PS	Moravia		116 South Willliams Street	P.O. Box 246	Moravia	IA	52571	(641) 724-9811		
Gary Harris	Mayor	PS	Moulton	moucity@sirisonline.com	111 S Main Street		Moulton	IA	52572	(641) 642-3328		
John Replogle	Mayor-Pro-Tem	PS	Moulton	moucity@sirisonline.com	111 S Main Street		Moulton	IA	52572	(641) 642-3328		
Phil Hudson	Fire Chief	PS	Mystic	kathy744@iowatelecom.net	608 Lewis		Mystic	IA	52574	(641) 647-2243		
Kristina Kieltyka	Councilperson	PS	Mystic	cityofmystic@iowatelecom.net	PO Box 69		Mystic	IA	52574	(641) 647-2243		
Richard Brooke	Mayor	PS	Numa		303 Main Street W		Numa	IA	52544	(641) 437-4641		
Jolene Fadiga	Councilperson	PS	Numa		303 Main Street W		Numa	IA	52544	(641) 437-4641		
Richard Gorden	Mayor	PS	Plano	rmgorden@iowatelecom.net	City Hall		Plano	IA	52581	(641) 649-2449		
Wendell DeVore	Councilperson	PS	Plano	rmgorden@iowatelecom.net	City Hall		Plano	IA	52581	(641) 649-2449		
Tom Anderson		PS	Rathbun	Teenuckle@yahoo.com			Rathbun	IA		6418959796		
Dave Coffin	Mayor	PS	Rathbun					IA		(641-895-3574)		
Eric Pace	Mayor	PS	Udell	cori@iowatelecom.net	PO Box 55	211 Wall Street	Udell	IA	52593	(641) 452-6726		
Cori Ballanger	City Clerk	PS	Udell	cori@iowatelecom.net	PO Box 55	211 Wall Street	Udell	IA	52593	(641) 452-6726		

Start Time: 3:00 pm (HMP) 4:15pm (LEPC)

End Time: 4:10 (HMP) 4:40 (LEPC)

Total Meeting Time: 1 hr (HMP) 30 min (LEPC)

CHARITON VALLEY PLANNING AND DEVELOPMENT

APPANOOSE COUNTY HAZARD MITIGATION PLANNING COMMITTEE MEETING #2

MINUTES

APRIL 30, 2009 | 3 PM | CENTERVILLE CITY COUNCIL CHAMBERS

Dawson called the second Appanoose County Hazard Mitigation Planning Committee meeting to order at 3:00 PM on April 30, 2009. Present were; Charles Turner, Gary Bishop, Gary Harris, Jim Casteel, Jody McDanel, Michael Bain, Pat Tresemer, Phil Hudson, Regina Shultz, Bob Bozwell, and John Dawson (CVPD).

Dawson started by explaining work completed since the March 26th meeting; Dawson has been in communication with FEMA technical assistance personnel and Iowa Homeland Security grant officers both who have provided some additional guidance. Dawson finished research on natural hazards and has been working on human-caused and combination hazards since March 26th.

In conversations with State grant officers, Dawson learned that documenting the "homework" concept would be a lot of additional work for committee members and would not be worth the extra work for everyone. Therefore, Dawson is advising that we add a couple more meetings to the roughly six mentioned in the last meeting and do the work in meetings. Dawson explained that he would prepare a handout with detailed guidance for policy-subcommittee members on how to document work that they do in their respective city council or board meetings. This information will be emailed to everyone and also posted on the website; http://sites.google.com/site/appanoosecountyhmp.

Dawson asked the members present to look over the minutes from the March 26th meeting for approval or changes. Shultz moved to approve and Bishop seconded.

Bain asked what his role is on the technical advisory subcommittee (TAS) to make sure that he was not neglecting anything. Dawson responded that the role of the TAS is to help fill in any gaps or for more specialized or technical information. So far, Dawson has not asked anything specifically of the TAS but will take any input from TAS or any committee members at any time along this process.

Dawson explained that draft community profiles were distributed to all committee members so that they could review the information for their respective jurisdictions. Dawson pointed out that the only feedback he received prior to this meeting was from McDanel and that he had followed-up on McDanel's comments. McDanel questioned the mention of George Johnson as the county's building inspector. Dawson responded that he had heard that from others too, but that this is what cities had listed in response to surveys sent out earlier this year. Bain pointed out that he was not sure about the tables that listed him as a HazMat contact/specialist. Bain mentioned that he used to serve this role when he had different insurance; now cities would need to have a contract with him.

The tables McDanel and Bain were referring to were part of a survey sent to each city and the county several months ago as part of the required step to "assess capabilities." Dawson mentioned that he would ask each jurisdiction to review these tables again for accuracy. Dawson also mentioned that since only four of eleven cities were represented at this meeting, he did not feel comfortable approving the community profiles without having additional feedback from the

App ose County Hazard Mitigation Planning Committee

Location: Centerville City Hall Date: 4/30/09 Committee Meeting #: 2

Name	Title	Role	Representing	email	Address 1	Address 2	City	State	Zip	Phone	Fax	Signature
Allen Sharp	Chief (LEPC)	TAS	SACFR	2sharps@iowatelecom.net	503 East Elm Street		Centerville	IA	52544	641-856-7541	641-437-7364	
Bill Ursta		TAS	Centerville Waterworks	centervillewater@sirisonline.com			Centerville	IA	52544		641-437-7107	
Charles Turner		PS	Moravia	joandchas@iowatelecom.net	116 South Willliams Street	P.O. Box 246	Moravia	IA	52571	(641) 724-9811		Charles R. Turner
Christina Kieltyka	Councilperson	PS	Mystic	cityofmystic@iowatelecom.net ckieltyka@yahoo.com	PO Box 69		Mystic	IA	52574	(641) 647-2243		
Clete Swackhamer	(LEPC)	TAS	ISU Extension Office	swack@iastate.edu	US Agriculture Dept of FSA	12th and Washington Street	Centerville	IA	52544	641-856-3885		
Cori Ballanger	City Clerk	PS	Udell	cori@iowatelecom.net	PO Box 55	211 Wall Street	Udell	IA	52593	(641) 452-6726		
Dan Barnthouse	(LEPC)	TAS	Iowa DOT		IA DOT Maintenance Garage	23619 Hwy 5 South	Centerville	IA	52544	641-856-2670		
Dave Coffin	Mayor	PS	Rathbun					IA		(641-895-3574)		
David Welch	Pastor (LEPC)	TAS	Red Cross		316 School Street	P.O. Box 38	Plano	IA	52581	641-895-6056		
Deb Henkle	Mayor	PS	Cincinnati		PO Box 194	105 W Pleasant	Cincinnati	IA	52549	(641) 658-2666		
Dennis Sturms	EMS (LEPC)	TAS	Mercy Medical Center	dsturms@mercydesmoines.org	1 St Joseph's Dr		Centerville	IA	52544	641-437-3422		
Eric Pace	Mayor	PS	Udell	cori@iowatelecom.net	PO Box 55	211 Wall Street	Udell	IA	52593	(641) 452-6726		
Frankie Belzer	Mystic Mayor (LEPC)	TAS	Mystic	cityofmystic@iowatelecom.net	PO Box 69		Mystic	IA	52574	(641) 647-2243		
Fred Jedkins	(LEPC)	TAS	KCOG Radio	kmgofm@lisco.net	402 N. 12th		Centerville	IA	52544	641-437-4242		
Gary Anderson	Sherrif (LEPC)	TAS	Appanoose County	sheriff@sirisonline.com	1125 W Van Buren		Centerville	IA	52544	641-437-7100	641-437-7107	
Gary Bishop	County Engineer (LEPC)	TAS	Appanoose County	gbishop@appanoosecounty.net	Attn: County Engineer	201 North 12th	Centerville	IA	52544	641-856-6193	641-437-4665	
Gary Dhority		PS	Moravia		116 South Willliams Street	P.O. Box 246	Moravia	IA	52571	(641) 724-9811		
Gary Harris	Mayor	PS	Moulton	moucity@sirisonline.com	111 S Main Street		Moulton	IA	52572	(641) 642-3328		
Henry Herman	Councilperson	PS	Unionville	ssnowcityclerk@iowatelecom.net	PO Box 56		Unionville	IA	52594	(641) 452-6763		
Jean Morrison	Councilperson	PS	Cincinnati		PO Box 194	105 W Pleasant	Cincinnati	IA	52549	(641) 658-2666		

Start Time: 3:00 PM End Time: 4:30 PM Total Meeting Time: 1.5 hrs

App ose County Hazard Mitigation Planning Committee

Name	Title	Role	Representing	email	Address 1	Address 2	City	State	Zip	Phone	Fax	Signature
Robert Bozwell	Fire Chief	PS	Centerville	cntrfire@sirisonline.com	15th & Maple Street		Centerville	IA	52544	641-856-2314	641-437-7364	Bob Bozwell
Roger Selix	Mayor	PS	Unionville	ssnowcityclerk@iowatelecom.net	PO Box 56		Unionville	IA	52594	(641) 452-6763		
Ryan Kayler	janitor	PS	Moravia CSD	brad.breon@moravia.k12.ia.us				IA				
Sherry Middlebrook	Administrator (LEPC)	TAS	Appanoose County Public Health	smiddlebrook@appanoosecounty.net	Attn: Public Health Nurse Office	201 North 12th	Centerville	IA	52544	641-437-4332	641-856-5575	
Tom Anderson		PS	Rathbun	toenuckle@yahoo.com				IA				
Tom Demry	Chief of Police	PS	Centerville	tdemrycpd@hotmail.com	Appanoose County Law Ctr	1125 W Van Buren	Centerville	IA	52544	641-437-7100	641-437-7107	
Vic Senter	(LEPC)	TAS	Alliant Energy Service Center	Vicsenter@alliantenergy.com	Hwy 5 North		Centerville	IA	52544	641-437-5299		
Wendell DeVore	Councilperson	PS	Plano	rmgorden@iowatelecom.net	City Hall		Plano	IA	52581	(641) 649-2449		
William Milani	(LEPC)	TAS	ADLM Environmental	adlmenv@sirisonline.com	101 East Van Buren		Centerville	IA	52544	641-437-1909	641-437-1706	
John Arnold and Dien Judge			ADLM and LEPC	adlmema@iowatelecom.net								
Andy Loonan			IDOT	Andy.Loonan@dot.iowa.gov								
Cathy Mallard			Homeland Security	Cathy.Mallard@dhs.gov								

Start Time: _____ End Time: _____ Total Meeting Time: _____

App ose County Hazard Mitigation Planning Committee

Name	Title	Role	Representing	email	Address 1	Address 2	City	State	Zip	Phone	Fax	Signature
Jim Burns	Councilperson	PS	Exline		City Hall		Exline	IA	52555	(641) 658-2655		
Jim Casteel	Mayor	PS	Exline		City Hall		Exline	IA	52555	(641) 658-2655		
Jody McDanel	Supervisor	PS	Appanoose County	supervisors@appanoosecounty.net	Courthouse	201 North 12th	Centerville	IA	52544	641-856-5512	641-437-8023	
John Houser	Fire Fighter (LEPC)	TAS	MVFD	johnhouser@alliantenergy.com	26386 Highway J3T		Moravia	IA	52571	641-437-5215	641-437-5119	
John Pasa		TAS	Army Corps of Engineers	John.P.Pasa@usace.army.mil								
John Replogle	Mayor-Pro-Tem	PS	Moulton	moucity@sirisonline.com	111 S Main Street		Moulton	IA	52572	(641) 642-3328		
Jolene Fadiga	Councilperson	PS	Numa		303 Main Street W		Numa	IA	52544	(641) 437-4641		
Lewis (Gene) Horn	First Responder (LEPC)	TAS	FD / FR		Attn: Fire Dept / First Resp.	111 South Main	Moulton	IA	52572	641-642-8126		
Marsha Mitchell	Centerville Mayor (LEPC)	TAS	Centerville	mayor@sirisonline.com	Centerville City Hall	312 Maple Street	Centerville	IA	52544	641-437-4339	641-437-1498	
Marty Braster	(LEPC)	TAS	Rathbun Regional Water Association,	mbraster@rrwa.net	16166 Hwy J29		Centerville	IA	52544	641-647-2416	641-647-2217	
Michael Bain	(LEPC)	TAS	Midwest Environmental	mustang67@iowatelecom.net	Rt 1 PO Box 338		Centerville	IA	52544	641-437-7023	641-437-7040	
Mike Bogle	CFD Captain (LEPC)	TAS	Centerville Fire Department	cntrfire@sirisonline.com	15th & Maple Street		Centerville	IA	52544	641-856-2314	641-437-7364	
Pat Tresmer	School Nurse	PS	Cntvil & Moulton-Udell CSDs	pat.tresemer@gpaea.k12.ia.us	Centerville High School	600 CHS Drive	Centerville	IA	52544	641-856-0843		
Paul Mihalovich	Moravia Mayor (LEPC)	TAS	Moravia		116 South Williams Street	P.O. Box 246	Moravia	IA	52571	(641) 724-9811		
Phil Hudson	Fire Chief	PS	Mystic	kathy744@iowatelecom.net	608 Lewis		Mystic	IA	52574	(641) 647-2243		
Reg Higginbottom	(LEPC)	TAS	Ministrial Assoc.	w0reg@netins.net	105 N. Vine		Moulton	IA	52572	641-642-3905	641-642-3924	
Regina Shultz	Executive Director	TAS	SIEDA	reginas@iowatelecom.net	111 N Main	St # 2	Centerville	IA	52544	(641) 856-8437		
Richard Brooke	Mayor	PS	Numa		303 Main Street W		Numa	IA	52544	(641) 437-4641		
Richard Gorden	Mayor	PS	Plano	rmgorden@iowatelecom.net	City Hall		Plano	IA	52581	(641) 649-2449		
Rick Butler	First Responder (LEPC)	TAS	ACEMSC	rbutlerpghp@hughes.net	22674 230th Ave		Exline	IA	52555	641-658-2321		

Start Time: _____ End Time: _____ Total Meeting Time: _____

APPANOOSE COUNTY HAZARD MITIGATION PLANNING COMMITTEE MEETING #3

MINUTES

MAY 20, 2009 | 2 PM | CENTERVILLE CITY COUNCIL CHAMBERS

Dawson called the third Appanoose County Hazard Mitigation Planning Committee meeting to order at 2 PM on May 26, 2009. Present were; Allen Sharp, Christina Kieltyka, David Coffin, Gary Bishop, Gary Harris, Jody McDanel, John Pasa (USACE), Pat Tresemer, Regina Shultz, Lacey Miles (USACE), and John Dawson (CVPD).

Dawson began with a brief update of progress since the last meeting. Dawson explained that he was not able to finish all of the remaining hazard research, but that there is plenty of material to cover in this meeting. One of the reasons for the delay is mixed guidance from State grant officers whom Dawson reports to on in-kind contribution documentation. As a result, Dawson has been advising the other counties he is working with to delay holding the next meeting until August to allow time for any necessary backtracking.

Dawson asked meeting attendees to take a look at the minutes from the April 30, 2009 meeting. McDanel moved to approve the minutes and Sharp seconded; there was no objection. Dawson pointed out that he attempts to include minutes and various other forms of information for and from the hazard mitigation plans on the website; http://sites.google.com/site/appanoosecountyhmp.

Dawson moved the group on to continue scoring hazards from where the committee left off in April. Fourteen more hazards were scored according to their county-wide impacts; four hazards were postponed for the next meeting to allow additional information from Pasa and Michael Bain on dam and levee failure and hazardous materials hazards. Including the postponed hazards, the committee has eleven more hazards to score.

Some discussion occurred on the tornado hazard previously scored; Pasa pointed out that at certain peak times of the year, the impacts of a tornado at campgrounds and at Rathbun Lake would be potentially catastrophic. The scores decided on at the previous meeting for tornadoes was not ultimately changed.

During discussion on the air transportation incident hazard Dawson noted that his research did not show many occurrences, however one attendee pointed out that a 707 went down between Cincinnati and the Missouri line in 1962 leaving 8 dead. Another attendee pointed out that a small plane crashed in Rathbun Lake. Dawson mentioned that he found some information indicating a private airfield near Rathbun, but other sources that excluded it. Several attendees mentioned that there was one there but that it has apparently been closed. McDanel thought that there was a private airfield west of Centerville too which did not show up in Dawson's map.

Dawson pointed out that each city is being asked to score the hazards they select but that so far not all cities have returned their hazard selections. Dawson mentioned that he may try to set up

meetings with each city representative and their respective councils to finish the selection and to help the cities score the hazards in coming months.

Dawson mentioned that some discussion has occurred outside of the committee meetings where individuals would recommend including or removing hazards between the three counties he is working with. Dawson has recommended that such discussion take place in the meetings. Shultz brought up that she had discussed including the Public Disorder hazard previously excluded based on the stresses on many area residents suffering from economic factors.

According to Shultz many younger low income people are feeling and/or expressing anger over their situation and without a positive change to their situations, public disorder may come about. Dawson added that during the selection process, he used the State's considerations based on large gatherings such as sporting or concert events, especially where alcohol is served. However Shultz's concern appears very legitimate given the added pressures locally from national and global economic decline combined with mass layoffs in recent years. The meeting attendees agreed that this hazard should be re-included and Dawson will prepare some research for the next meeting; this brings the total hazards still to be scored to twelve.

Dawson turned to the next steps and asked, as usual, that each of the city representatives attend at least one of their city council meetings before the next meeting to provide the council an update on the committee's progress. Dawson had prepared guidance on how to document these meetings prior to learning of the revised interpretations of guidance from the state and so what Dawson sent out may need to be altered. Dawson asked that city representatives also complete the hazard selection with their cities if they have not already done so. Dawson will check with Bain on hazardous materials hazards prior to the next meeting to ensure that relevant information is included and correct.

Several attendees discussed whether to hold the next meeting sooner than August as Dawson recommended since there is not much remaining for hazard scoring. Dawson pointed out that Bain had reported that his schedule is pretty full for the next couple months and that some attendees may need to work on Ragbrai over this period as well. In addition, if documentation methods for meetings and committee contributions need to be changed, it is better to have one fewer meeting to have to backtrack on. The committee agreed to wait until August for the next meeting; Dawson will survey the people on his contact list for these meetings as to the best and second best times/days for meetings and then schedule the next one by email. Shultz moved to approve the next steps with this revision and Kieltyka seconded; there was no opposition.

The meeting adjourned at 3:30 though some attendees remained to discuss other business.

App ose County Hazard Mitigation Planning Committee

Name	Title	Role	Representing	email	Address 1	Address 2	City	State	Zip	Phone	Fax	Signature
Robert Bozwell	Fire Chief	PS	Centerville	cntrfire@sirisonline.com	15th & Maple Street		Centerville	IA	52544	641-856-2314	641-437-7364	
Roger Selix	Mayor	PS	Unionville	ssnowcityclerk@iowatelecom.net	PO Box 56		Unionville	IA	52594	(641) 452-6763		
Ryan Kayler	janitor	PS	Moravia CSD	brad.breon@moravia.k12.ia.us				IA				
	Administrator (LEPC)	TAS	Appanoose County Public Health		Attn: Public Health Nurse Office	201 North 12th	Centerville	IA	52544	641-437-4332	641-856-5575	
Tom Anderson		PS	Rathbun	toenuckle@yahoo.com				IA				
Tom Demry	Chief of Police	PS	Centerville	tdemrycpd@hotmail.com	Appanoose County Law Ctr	1125 W Van Buren	Centerville	IA	52544	641-437-7100	641-437-7107	
Vic Senter	(LEPC)	TAS	Alliant Energy Service Center	Vicsenter@alliantenergy.com	Hwy 5 North		Centerville	IA	52544	641-437-5299		
Wendell DeVore	Councilperson	PS	Plano	rmgorden@iowatelecom.net	City Hall		Plano	IA	52581	(641) 649-2449		
William Milani	(LEPC)	TAS	ADLM Environmental	adlmenv@sirisonline.com	101 East Van Buren		Centerville	IA	52544	641-437-1909	641-437-1706	
John Arnold and Dien Judge			ADLM and LEPC	adlmema@iowatelecom.net								
Andy Loonan			IDOT	Andy.Loonan@dot.iowa.gov								
Cathy Mallard			Homeland Security	Cathy.Mallard@dhs.gov								
Lacey Miles	Park Ranger	Corps of Engrs	LD-Miles@wiu.edu	20112 Hwy 15T			Centerville IA			309-255 6934		Lacey Miles

Start Time: _____ End Time: _____ Total Meeting Time: _____

App ose County Hazard Mitigation Planning Committee

Name	Title	Role	Representing	email	Address 1	Address 2	City	State	Zip	Phone	Fax	Signature
Jim Burns	Councilperson	PS	Exline		City Hall		Exline	IA	52555	(641) 658-2655		
Jim Casteel	Mayor	PS	Exline		City Hall		Exline	IA	52555	(641) 658-2655		
Jody McDanel	Supervisor	PS	Appanoose County	supervisors@appanoosecounty.net	Courthouse	201 North 12th	Centerville	IA	52544	641-856-5512	641-437-8023	
John Houser	Fire Fighter (LEPC)	TAS	MVFD	johnhouser@alliantenergy.com	26386 Highway J3T		Moravia	IA	52571	641-437-5215	641-437-5119	
John Pasa	Natural Resource Specialist	TAS	Army Corps of Engineers	John.P.Pasa@usace.army.mil	20112 HWY 15T		Centerville	IA	641-2464X214			
John Replogle	Mayor-Pro-Tem	PS	Moulton	moultoncity@netins.net	111 S Main Street		Moulton	IA	52572	(641) 642-3328		
Jolene Fadiga	Councilperson	PS	Numa		303 Main Street W		Numa	IA	52544	(641) 437-4641		
Lewis (Gene) Horn	First Responder (LEPC)	TAS	FD / FR		Attn: Fire Dept / First Resp.	111 South Main	Moulton	IA	52572	641-642-8126		
Marsha Mitchell	Centerville Mayor (LEPC)	TAS	Centerville	mayor@sirisonline.com	Centerville City Hall	312 Maple Street	Centerville	IA	52544	641-437-4339	641-437-1498	
Marty Braster	(LEPC)	TAS	Rathbun Regional Water Association,	mbraster@rrwa.net	16166 Hwy J29		Centerville	IA	52544	641-647-2416	641-647-2217	
Michael Bain	(LEPC)	TAS	Midwest Environmental	mustang67@iowatelecom.net	Rt 1 PO Box 338		Centerville	IA	52544	641-437-7023	641-437-7040	
Mike Bogle	CFD Captain (LEPC)	TAS	Centerville Fire Department	cntrfire@sirisonline.com	15th & Maple Street		Centerville	IA	52544	641-856-2314	641-437-7364	
Pat Tresmer	School Nurse	PS	Cntvll & Moulton-Udell CSDs	ptresemer@iowatelecom.net pat.tresemer@gpaea.k12.ia.us	Centerville High School	600 CHS Drive	Centerville	IA	52544	641-856-0843		Pat Tresemer
Paul Mihalovich	Moravia Mayor (LEPC)	TAS	Moravia		116 South Williams Street	P.O. Box 246	Moravia	IA	52571	(641) 724-9811		
Phil Hudson	Fire Chief	PS	Mystic	kathy744@iowatelecom.net	608 Lewis		Mystic	IA	52574	(641) 647-2243		
Reg Higginbottom	(LEPC)	TAS	Ministrial Assoc.	w0reg@netins.net	105 N. Vine		Moulton	IA	52572	641-642-3905	641-642-3924	
Regina Shultz	Resource Center Executive Director	TAS	SIEDA	reginas@iowatelecom.net	111 N Main	St # 2	Centerville	IA	52544	(641) 856-8437		Regina M Shultz
Richard Brooke	Mayor	PS	Numa		303 Main Street W		Numa	IA	52544	(641) 437-4641		
Richard Gorden	Mayor	PS	Plano	rmgorden@iowatelecom.net	City Hall		Plano	IA	52581	(641) 649-2449		
Rick Butler	First Responder (LEPC)	TAS	ACEMSC	rbutlerpghp@hughes.net	22674 230th Ave		Exline	IA	52555	641-658-2321		

Start Time: _____ End Time: _____ Total Meeting Time: _____

App ose County Hazard Mitigation Planning Committee

Location: Centerville City Hall Date: 5/20/09 Committee Meeting #: 3

Name	Title	Role	Representing	email	Address 1	Address 2	City	State	Zip	Phone	Fax	Signature
Allen Sharp	Chief (LEPC)	TAS	SACFR	2sharps@iowatelecom.net	503 East Elm Street		Centerville	IA	52544	641-856-7541	641-437-7364	Allen W. Sharp
Bill Ursta		TAS	Centerville Waterworks	centervillewater@sirisonline.com			Centerville	IA	52544		641-437-7107	
Charles Turner		PS	Moravia	joandchas@iowatelecom.net	116 South Willliams Street	P.O. Box 246	Moravia	IA	52571	(641) 724-9811		
Christina Kieltyka	Councilperson	PS	Mystic	cityofmystic@iowatelecom.net cklieltyka@yahoo.com	PO Box 69		Mystic	IA	52574	(641) 647-2243		
Clete Swackhamer	(LEPC)	TAS	ISU Extension Office	swack@iastate.edu	US Agriculture Dept of FSA	12th and Washington Street	Centerville	IA	52544	641-856-3885		
Cori Ballanger	City Clerk	PS	Udell	cori@iowatelecom.net	PO Box 55	211 Wall Street	Udell	IA	52593	(641) 452-6726		
Dan Barnthouse	(LEPC)	TAS	Iowa DOT		IA DOT Maintenance Garage	23619 Hwy 5 South	Centerville	IA	52544	641-856-2670		
Dave Coffin	Mayor	PS	Rathbun	gatetolake@yahoo.com	PO Box 1043			IA		(641-895-3574)		Dave Coffin
David Welch	Pastor (LEPC)	TAS	Red Cross		316 School Street	P.O. Box 38	Plano	IA	52581	641-895-6056		
Deb Henkle	Mayor	PS	Cincinnati		PO Box 194	105 W Pleasant	Cincinnati	IA	52549	(641) 658-2666		
Dennis Sturms	EMS (LEPC)	TAS	Mercy Medical Center	dsturms@mercydesmoines.org	1 St Joseph's Dr		Centerville	IA	52544	641-437-3422		
Eric Pace	Mayor	PS	Udell	cori@iowatelecom.net	PO Box 55	211 Wall Street	Udell	IA	52593	(641) 452-6726		
Frankie Belzer	Mystic Mayor (LEPC)	TAS	Mystic	cityofmystic@iowatelecom.net	PO Box 69		Mystic	IA	52574	(641) 647-2243		
Fred Jedkins	(LEPC)	TAS	KCOG Radio	kmgofm@lisco.net	402 N. 12th		Centerville	IA	52544	641-437-4242		
Gary Anderson	Sherrif (LEPC)	TAS	Appanoose County	sheriff@sirisonline.com	1125 W Van Buren		Centerville	IA	52544	641-437-7100	641-437-7107	
Gary Bishop	County Engineer (LEPC)	TAS	Appanoose County	gbishop@appanoosecounty.net	Attn: County Engineer	201 North 12th	Centerville	IA	52544	641-856-6193	641-437-4665	
Gary Dhority		PS	Moravia		116 South Williams Street	P.O. Box 246	Moravia	IA	52571	(641) 724-9811		
Gary Harris	Mayor	PS	Moulton	moultoncity@netins.net	111 S Main Street		Moulton	IA	52572	(641) 642-3328		Gary Harris
Henry Herman	Councilperson	PS	Unionville	ssnowcityclerk@iowatelecom.net	PO Box 56		Unionville	IA	52594	(641) 452-6763		
Jean Morrison	Councilperson	PS	Cincinnati		PO Box 194	105 W Pleasant	Cincinnati	IA	52549	(641) 658-2666		

Start Time: 2 PM End Time: 3:30 PM Total Meeting Time: 1.5 hrs.

County-wide Hazard Scores

Natural Hazards	Historic	Probability	Vulnerability	Max Threat	Severity	Speed
Flash Floods	4	4	2	2	3	4
Tornadoes	4	3	3	2	3	4
Windstorms / High Wind Events	4	4	3	3	3	4
Extreme Heat	4	4	3	4	3	2
Hailstorms	4	4	2	2	2	4
Grass or Wildland Fires	3	4	1	1	2	4
Sinkholes	2	3	1	1	1	4
River Floods	4	4	2	2	2	2
Severe Winterstorms	4	4	4	4	3	3
Drought	2	2	3	4	3	1
Earthquakes	1	1	2	4	2	4
Dam Failure						
Levee Failure						
Expansive Soils	2	2	1	1	1	1
Thunderstorms & Lightning	4	4	2	2	3	3
Radon / Lead	4	4	3	3	3	1
Human Caused / Accidental						
Air Transportation Incident	1	3	1	1	4	4
Rail Transportation Incident						
Pipeline Incident						
Highway Transportation Incident	4	4	2	1	3	4
Transportation Hazardous Materials Incident	3	3	2	2	2	4
Transportation Radiological Materials Incident						
Waterway Incident						
Fixed Hazardous Materials						
Energy Failure	3	4	3	3	2	4
Communications Failure	1	2	2	2	2	4
Other / Combination Hazards						
Climate Change	1	3	3	4	3	1
Human Disease Pandemic	2	3	3	3	3	1
Human Disease Incident	2	2	2	3	3	1
Animal / Plant / Crop Disease	1	3	3	4	2	1
Structural Failure						
Structural Fire						

Summary of scoring evaluation tool:

1 = negligible/unlikely 2 = limited/possible 3 = critical/likely 4 = catastrophic/very likely

APPANOOSE COUNTY HAZARD MITIGATION PLANNING COMMITTEE MEETING #4

MINUTES

August 27, 2009 - 3 PM - CENTERVILLE CITY COUCIL CHAMBERS

PRESENT: Allen Sharp, Regina Shultz, John Pasa, Tracy Daugherty, Julie Pribyl, Linda Northouse (FEMA) and Jim Woodworth (FEMA).

Tracy Daugherty, from Chariton Valley Planning & Development, introduced herself and fellow staff member Julie Pribyl as additions to the committee. Daugherty & Pribyl will now be the lead contacts for the completion of the Appanoose Hazard Mitigation Plan.

Linda Northouse & Jim Woodworth were introduced as Voluntary Agency Specialists for FEMA. They gave a presentation on the assistance that FEMA can provide to communities to help them establish a C.O.A.D. (Community Organization Active in Disaster). It is strongly encouraged that each community work with the local Emergency Management director to create a plan of coordinated effort with local volunteers to offer organized assistance in the event of a disaster. Jim explained that other "usual" support organizations that help in the time of a disaster are about to be exhausted and that is why FEMA is pushing for local communities to have the capability to cope with disaster demands. Linda explained the response time of FEMA/Red Cross will be 48-72hrs after the event and that the community must be able to take care of themselves until that time - as well as after they leave. They shared a packet of information and offered extensive technical support to develop this organization within Appanoose County.

The minutes from the May 20th, 2009 meeting were reviewed and approved. CVPD will begin doing outreach work with the smaller communities in order to have their participation, confirm information, and gather vital components to allow them to be familiar with how to implement the plan. This outreach will also occur with other community clubs/organizations to gather the necessary In Kind hours for this process. HMGP Committee members no longer need to be concerned with documenting their time as In Kind hours, but rather continue with the valued input their currently are providing with the plan.

Tracy worked with John Pasa to confirm that the Appanoose Hazard Mitigation Plan is in compliance with the existing disaster plan that the Corp of Engineers offers with Lake Rathbun. Julie made arrangements with Regina to speak about HMGP to a SIEDA group of volunteers.

It was a consensus that the next meeting be held after the large local celebration when community members are already busy volunteering. The next meeting will be held the 2nd week of October during the 5 o'clock hour with a specific date to be announced at a later time.

Appanoose County HMP — 3pm Aug. 27, 2009
Centerville City Hall

Sign In:

1. Tracy Daugherty - Chariton Valley Planning
2. Ellen Sharp — Vol
3. Rogene Shultz - SIEDA - Appanoose Co. — Vol
4. John Pasa - Corps of Engineers — Vol
5. Julie Knabyl - CVPD — PD

INKIND

3 participants Volunteering
x 1.5 hrs each
4.5 hrs
x 25.34/HR
$114.03

MINUTES FROM 10/13/09

5:30-6:45 PM

PRESENT: Jody McDanel (BOS), Regina Shultz (SEIDA), Jim Burns & Jim Casteel (both City of Exline). Staff members of Tracy Daugherty and Julie Pribyl.

Committee members reviewed the Hazard Scoring that had been completed in previous meetings and confirmed those still to be accurate. Scorings were then assigned to the remaining hazards that were incomplete. Staff members discussed how those scorings will now allow subsequent charts and graphs to now be completed. CVPD will compile the information for the next meeting so that the hazard rankings will be ready for committee members to begin considering mitigation strategies for each of them.

Staff members provided forms to request participation from members and provide details about critical facilities throughout communities. There were certain structures/buildings identified but it was consensus that contact need to be made with individual communities to gather their perspectives. Jim B & Jim C were able to complete the critical facilities throughout the community of Exline.

Members briefly glanced over the goals that were established in the FEMA approved Mystic plan in this county. It was agreed that further discussion will be held at the next meeting.

Meeting was adjourned at 6:45pm. The next meeting will be held at 5:30pm on 11/17/09 at the CVPD office.

APPANOOSE HMGP
10/13/09
5:30-7PM

NAME		VOL	EMAIL	PHONE #
Jody McDaniel	(PD)			895-1391
Regina Shultz		1.5hr	reginas@iowatelecom.net	856-8437
Jim Burns		1.5hr	xlburns@live.com	856-7117
Jim Cattell		1.5hr	N/A	895-2835
John Arnold	(PD)		ADLM	

IN KIND

3 Volunteers x 1.5hr/each x $25.34/hr = $114.03

11/17/09 5:30-7:00pm @ CVPD office

PRESENT: John Pasa, Regina Schultz, Gary Bishop and staff member Julie Pribyl

Meeting was called to order at 5:35pm. Members reviewed the minutes from 2 previous meetings. The only addition made to the 10/13/09 meeting was that John Arnold from ADLM was also in attendance at that meeting.

Pribyl provided the handout that showed the hazard scores & rankings. She explained that the score was computed by the hazard scores participants gave it and a cascading total for each was also added to reach a sum that was used to rank them. Members were comfortable in how the results turned out. There was just some brief discussion that dam failure was rated as a "low risk hazard". Pasa and Pribyl discussed that there is not as much the general public can do to prepare for that other than not building in floodplains. The Corp of Engineers has established their own plan to address all concerns of the Lake Rathbun dam.

Members were provided with the publication of "Mitigation ideas: Possible Mitigation Measures by Hazard Type" (FEMA- R5, 9/02) as a guide to suggest possible mitigation strategies for each hazard. The specific hazards Mystic's plan chose to pursue were highlighted and member suggested that we follow the same measures. Specific details about individual mitigations were:

- Bishop hopes to see more SNOW FENCES along highway J5T that leads from Moravia to Honey Creek Resort. That stretch is known to drift and all emergency rescue vehicles to the resort will travel that highway.
- - can be complicated by the cooperation of farmers/right a way's/etc
- SAFE ROOMS for school systems need to be included with input from the schools. Pasa also stated that Lake Rathbun is in need of a shelter b/c on a holiday weekend 35,000+ people can be staying at the lake and currently there is little space to take cover in severe weather.
- Pribyl shared that the City of Centerville has expressed concern about the aging condition of the FIRE HYDRANTS throughout the community.
- MANUFACTURED HOME requirements and the tie-downs for safety could vary throughout the county and that needs to be consistent. Regina commented on the problems such enforcement could create for low-income residents.
- Pribyl mentioned the concern that Tracy Daugherty has about the sub-standard conditions of many of the BRIDGES throughout the county and that it should be states somewhere in the plan. Bishop state that he estimates over ½ the bridges in the county are in sub-standard condition. Tracy will be in touch with Gary about where that could best be included in the plan. (It is included in the plan under "Highway Transportation Incident")
- There was a few questions to which we were not sure of the answer:
    - "Are the turbines outside of Centerville considered as a back plan for energy for the City if there is a large outage? When would it kick in?"
    - "There are concerns about the visibility at the main intersection of Hwy 5 and J5T in Moravia does that need to be noted in the plan?
    - "Is a COAD & a CERT team the same thing?"
- BURYING POWER LINES is given as a mitigation strategy for several hazards. Bishop noted that it is a strategy but is it really a feasible one for this area? There are few intersections around the county and at the lake with buried power lines but it is a long, lengthy and expensive process to do that. He wasn't suggesting that it be removed but rather a discussion point.

Members agreed to use the mitigation strategies suggested at this point. CVPD will continue to assemble more information in the plan with these strategies and will allow further discussion with other committee members at subsequent meetings. CVPD will contact the school systems throughout the county to allow input about the safe room proposals. Contact will also be made with the small communities to confirm information about their individual critical facilities and to review the proposed mitigation strategies. Each jurisdiction will be asked to prioritize mitigation strategies for their specific community. (See attached letter that was sent out in December)

Pribyl wrapped up the meeting by reminding committee members that the plan will also need GOALS & OBJECTIVES established. It was suggested that we wait for the guidance of Tracy Daugherty and more committee members.

The next meeting will be held after the holiday season. CVPD will make arrangements for it mid-January and emails will be made to all committee members. Meeting was adjourned at 6:50pm.

County Appanoose Co.

HAZARD MITIGATION PLANNING IN-KIND

DATE 11/17/09 TIME 5:30-7:00pm LOCATION CVB office Centerville, IA

NAME	ADDRESS or EMAIL	Are you being paid to be here?	HRS VOLUN-TEERED	SIGNATURE
GARY BISHOP	gbishop@appanoose county.net	Yes	—	Gary L Bishop
John PASA	John.P.Pasa@usace.army.mil	NO	1.5	
Regina Shultz	reginas@iowatelecom.ne	NO	1.5	Regina L Shultz

Total hrs 3 x $25.34 = $ 76.02

Appanoose County HMG Planning meeting

1/19/10 @ 5:30pm

CVPD office, Centerville, IA

Members present: Jody McDanel, Pat Tresemer, Gary Bishop, Regina Shultz, John Pasa, John Arnold, and staff members Nichole Moore and Julie Pribyl.

Committee members reviewed the minutes from the 11/17/09 meeting. No changes or adjustments were made and so it was approved.

Pribyl discussed the In Kind match dollars & that CVPD staff needs to continue to make presentations. Committee members offered the suggestions of: Cross lines in Moulton, Economic Development Corps, staff members of the schools in Moulton, Moravia, & Centerville, Hospital Auxiliary members and Moore mentioned that we already intend to present to high school students, which could meet our match quickly.

All members reviewed the Mitigation strategies that had been previously selected. Bishop asked about how mines are evaluated since it was noted as mitigation. There was not any detailed information from anyone on what that involves. Pribyl & Moore noted that the mitigation strategy of "evaluate/reinforce/restore Mystic Reservoir Dam" needs to be broadening to include all dams in Appanoose County (including Sundown, Centerville, Soap Creek, Moulton, and Rathbun). With that change, all members agreed to the Mitigation strategies the committee had selected at the previous meeting.

Members then reviewed the chart of "Hazards addressed by proposed Mitigation Actions". Shultz noted that the columns of "Tree Management/Trimming and Manufactured home Tie-downs" both need to be charted. Pribyl apologized and said that there must have been an error & it will be repaired according to the state plan guide. McDanel questioned why "burning restrictions" and that it was marked to apply to "utility failure". The committee members agreed that it should be removed. Bishop noted that Floodplains are not modeled for this county and that could become a complication in the Mitigation process. Pribyl & Moore stated those changes will be made to the document and presented the next meeting.

The STAPLEE process was explained to the group. Handouts were supplied from the State & Local Mitigation Planning how-to guide to illustrate what the STAPLEE is. The mitigation strategies selected were the same that were chosen by the private jurisdiction of Mystic, within Appanoose County. Mystic's HMG plan was approved by FEMA in October 2009. The committee members reviewed the STAPLEE chart that was completed by the Mystic committee members. The majority of the information was stated to be an accurate reflection of the entire county. Tresemer also served on the Mystic planning committee & suggested we review the social acceptance b/c she felt that Mystic's choices may not be accurate for the rest of the county. The majority of concern was in the category of "Social: Community Acceptance & Effect on population". The committee proposed the following changes of negative marks to positive for these strategies:

*Review Floodplain Management	*Evaluate/reinforce/restore Appanoose County dams
*Acquisition or relocation of buildings	*Waste disposal enforcement
*Drainage easements	*Pest Management
*Sensitive Areas Ordinance	

Shultz proposed changing "evacuation plans" to be noted as a negative community acceptance b/c often people refuse to leave there properties. All members agreed to make that change. Bishop proposed changing the mitigation of "snow fences" to be a negative under the "Economic: Cost of Action" b/c he has looked into this for safety concerns near Honey Creek Resort. McDanel supported that change as well and all members then agreed. Moore suggested that "Temporary Debris Disposal Plan" possibly scored as a negative on the "Environmental: Effect on Endangered species" depending on where the site is located. Members agreed that could be a possibility & could be scored as a negative. Pribyl stated that these changes will be made to reflect the committee's wishes and presented next meeting. She also explained that the positive/negative scores will be turned into numerical values of +1, -1 or 0 in order to rank each of them.

Pribyl discussed that one of the huge complications in wrapping up the work in this document is that City's are taking more time than expected to provide us with necessary information. Moore explained that the CVPD office will be attending City council meetings throughout the county for several purposes and will also include HMG plans for their city. Our discussion will have specific City Council members reviewing the narratives about their communities, confirming critical facilities identified, and specific mitigation strategies prioritized. Pribyl also pointed out that it has been suggested at other counties that Fuel/Gas Stations be identified as Critical facilities in each community. Appanoose committee members also agreed that would be important for generators, transportation, etc in an emergency situation so it should be noted in this plan as well.

Members then looked over a list of proposed Goals & Objectives. Pribyl had reviewed 4-5 other approved Hazard Mitigation plans to compile a list that would be comprehensive of all the information that members have approved. The specific objective of 1.2 (see attachment) was included in the Mystic plan, however, committee members voted to exclude it from the Appanoose County Plan. That was the only change made before committee members approved the remaining Goals & Objectives as stated.

There was also a brief discussion about potential landing strips throughout the county. McDanel noted on at Bill Felkner's property but a phone call confirmed it has been sold and changed to crop land. Arnold mentioned that there is still a landing strip on Oaks road that is approximately 2500ft in length. Members also remember one being near Lake Rathbun by the Country Music center. Pribyl said that she will look into which ones still exist to make sure it is mentioned in the plan.

The next meeting was not set at this time and members will be notified by email when the next date is arranged. Pribyl explained that she would like to have all the information for the smaller communities before we host the next meeting. The length time could be 1-2 months depending on the response time from city council. At the next meeting, we would hope to have members review the existing document for content & grammar, approve the changes made to documents at this meeting, and have the plan proofread so that it is ready to begin its 30 day public review.

County Appanoose

HAZARD MITIGATION PLANNING IN-KIND

DATE 1/19/2010 **TIME** 5:30 pm. **LOCATION** Centerville (Appanoose), **IA** 52544

NAME PRINT	ADDRESS or EMAIL	Are you being paid to be here?	HRS VOLUN-TEERED	SIGNATURE
Jody McClane	24010 470ST C'ville 52544	NO.	2	Jody McClane
PAT Tresemer	1110 W. Ontario Centerville 52544	NO	2	Pat Tresemer
GARY BISHOP	1200 ~~Hwy~~ 2 West Centerville, IA 52544	No	2	GaryLeBishop
Regina Shultz	reginas@iowatelecom.net	NO	2	Regina Shultz
John PASA	John.P.PASA@USACE.Army.mil	NO	2	
John Arnold	adlmemc courthouse.net	NO	2	

Total hrs 12 **x $25.34 = $** $304.08

Meeting adjourned at 6:50pm

Appanoose County Hazard Mitigation Planning

5/4/10 @ 5:30pm

CVPD office – Centerville, IA

Meeting notes:

Committee members present: John Arnold, Gary Bishop, Jody McDanel, Pat Tresemer and CVPD staff member Julie Pribyl

Members reviewed previous meeting notes and asked a few questions about what the results were on confirming if there was an actual air landing strip at Lake Rathbun. Pribyl explained that it had been an oversight and not completed but would find out the details this week. Bishop offered information that he believes it is a heli-pad on private property.

All members reviewed sections of the Appanoose Co HMG Plan. Corrections were made on the draft documents and there were also following up discussions in regards to the following information:

*Adding preschool statistics to the Centerville Public schools profile.

*Adding nursing staff to the faculty of Centerville school

*Including the Amish population in the "Unincorporated" portion of the county. Information possibly could be found at ADLM Environmental.

*Pertinent information to the history of any waterway incidents in the county.

*Bishop was also concerned about the information regarding communities participating in the NFIP when he understands that there are no floodplains mapped out. He and Pribyl will do some follow to confirm the previous research that resulted in this information.

Pribyl explained that she will make the corrections/suggestions provided on the forms tonight and will follow-up on their suggestions. CVPD will be reviewing this document using the scoring utensil in the next week or so before it is submitted to the state for a draft review. The committee will be contact about the results from the review so that appropriate changes will be made before submittal to the Federal level.

Meeting adjourned at 6:30pm.

County Appanoose

HAZARD MITIGATION PLANNING IN-KIND

DATE 5/4/10 **TIME** 5:30 PM **LOCATION** CUPD , **IA** 52544

NAME	ADDRESS or EMAIL	Are you being paid to be here?	HRS VOLUN-TEERED	SIGNATURE
GARY A. Bishop	gbishop@appanoose county.net	No		Gary A Bishop
John Arnold	ardlmanor [illegible] net	NO		John Arnold
Jody McDaniel	JANDSMcDaniel@ Hotmail.com	NO		Jody McDaniel
Pat Tiesemer	pat.tiesemer@spaea.k12.ia.us tiesemer@iowatelecom.net	— after June 10 NO		Pat Tiesemer

Total hrs_____ **x $25.34 = $**_____

Appanoose County Hazard Mitigation Planning Committee Meeting

Date: May 20, 2009

Time: 2 PM

Location: Centerville City Council Chambers

Primary Purpose:

Complete the scoring of identified hazards.

This is an open public meeting and all are welcome!

Chariton Valley
PLANNING & DEVELOPMENT
Meeting and Managing Change

205 1/2 N 13th Street
Centerville IA 52544
Phone: 641-437-4359
Fax: 641-437-1161
E-mail:
jdawson@charitonvalleyplanning.com

Appanoose County Hazard Mitigation Planning Committee Meeting

Date: May 4, 2010

Time: 5:30 PM

Location: Chariton Valley Planning & Dev office

205 North 13th Street, Centerville, IA 52544

Primary Purpose:

Review of complete document for input or changes.

This is an open public meeting and all are welcome!

Chariton Valley
PLANNING & DEVELOPMENT
Meeting and Managing Change

205 1/2 N 13th Street
Centerville IA 52544
Phone: 641-437-4359
Fax: 641-437-1161
E-mail:
jdawson@charitonvalleyplanning.com

Appanoose County Hazard Mitigation Planning Committee Meeting

Date: Tuesday, November 17, 2009

Time: 5:30 PM

Location: Centerville City Council Chambers

Primary Purpose:

Select mitigation strategies for identified hazards.

This is an open public meeting and all are welcome!

Chariton Valley
PLANNING & DEVELOPMENT
Meeting and Managing Change

205 1/2 N 13th Street
Centerville IA 52544
Phone: 641-437-4359
Fax: 641-437-1161
E-mail:
jdawson@charitonvalleyplanning.com

Appanoose County Hazard Mitigation Planning Committee Meeting

Date: Tuesday, October 13, 2009

Time: 5:30 PM

Location: Centerville City Council Chambers

Primary Purpose:

The committee will be clarifying risks, assign score, and corresponding ranking.

This is an open public meeting and all are welcome!

Chariton Valley
PLANNING & DEVELOPMENT
Meeting and Managing Change

205 1/2 N 13th Street
Centerville IA 52544
Phone: 641-437-4359
Fax: 641-437-1161
E-mail:
jdawson@charitonvalleyplanning.com

Appanoose County Hazard Mitigation Planning Committee Meeting

Date: March 26, 2009

Time: 3 PM

Location: Centerville City Council Chambers

Primary Purpose:

To discuss the role of the committee and process of developing the hazard mitigation plan.

This is an open public meeting and all are welcome!

Chariton Valley
PLANNING & DEVELOPMENT
Meeting and Managing Change

205 1/2 N 13th Street
Centerville IA 52544
Phone: 641-437-4359
Fax: 641-437-1161
E-mail:
jdawson@charitonvalleyplanning.com

Appanoose County Hazard Mitigation Planning Committee Meeting

Date: Thursday, April 30, 2009

Time: 3 PM

Location: Centerville City Council Chambers

Primary Purpose:

The committee will discuss draft community profiles, "critical facilities" and evaluate preliminary hazard research.

This is an open public meeting and all are welcome!

Chariton Valley
PLANNING & DEVELOPMENT
Meeting and Managing Change

205 1/2 N 13th Street
Centerville IA 52544
Phone: 641-437-4359
Fax: 641-437-1161
E-mail:
jdawson@charitonvalleyplanning.com

Appanoose County Hazard Mitigation Planning Committee Meeting

Date: Tuesday, January 19, 2010

Time: 5:30 PM

Location: Chariton Valley Planning & Dev office
205 North 13th Street, Centerville, IA 52544

Primary Purpose:

Score mitigation strategies. Approve proposed Goals & Objectives.

This is an open public meeting and all are welcome!

Chariton Valley
PLANNING & DEVELOPMENT
Meeting and Managing Change

205 1/2 N 13th Street
Centerville IA 52544
Phone: 641-437-4359
Fax: 641-437-1161
E-mail:
jdawson@charitonvalleyplanning.com

Appanoose County Hazard Mitigation Planning Committee Meeting

Date: Tuesday, August 27, 2009

Time: 3 PM

Location: Centerville City Council Chambers

Primary Purpose:

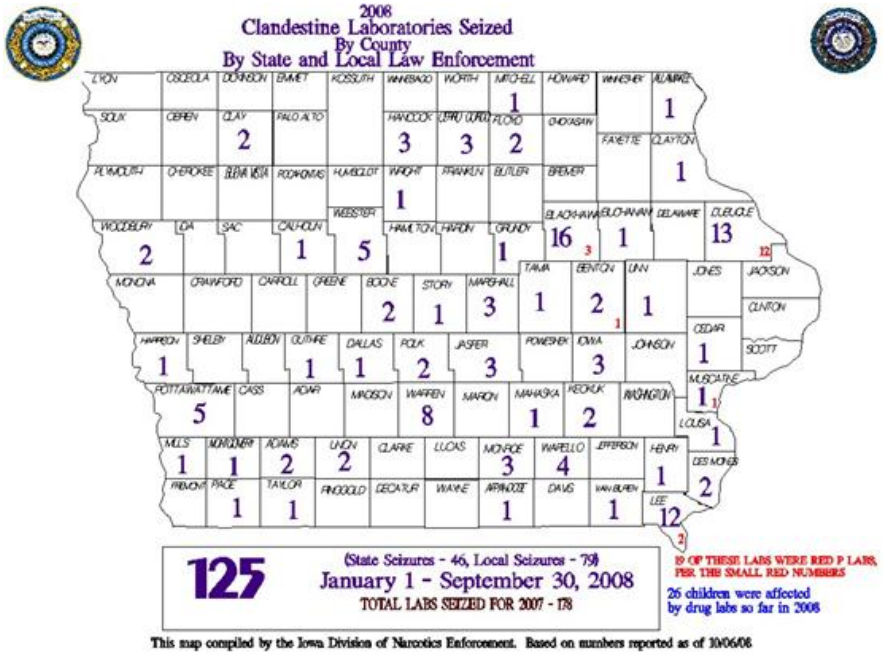
Meet with FEMA representatives about how to develop & partner volunteers to form a Community Organization Active in Disaster (COAD).

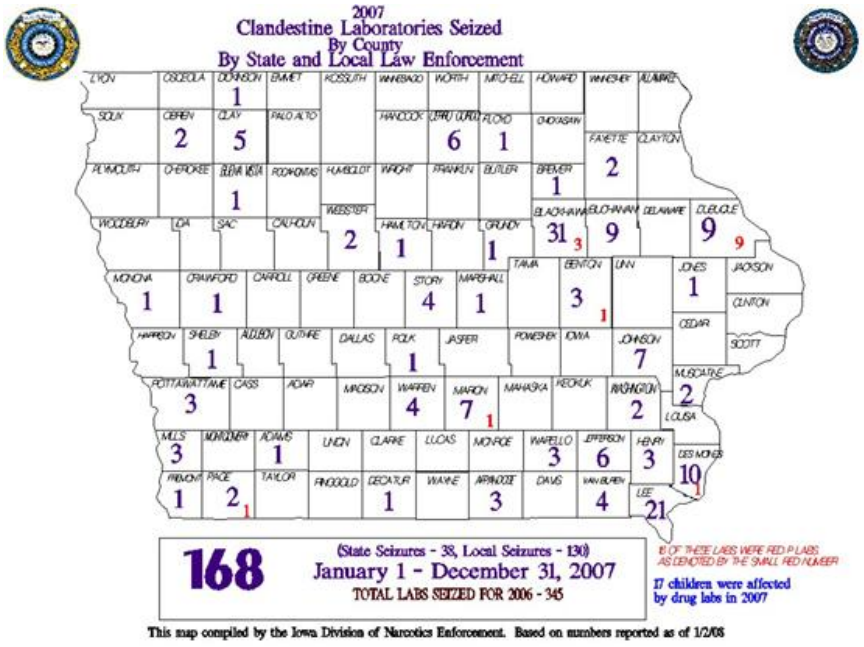
This is an open public meeting and all are welcome!

Chariton Valley
PLANNING & DEVELOPMENT
Meeting and Managing Change

205 1/2 N 13th Street
Centerville IA 52544
Phone: 641-437-4359
Fax: 641-437-1161
E-mail:
jdawson@charitonvalleyplanning.com

Appendix V: Iowa Meth Labs Seized by County





Source: Iowa Department of Public Safety, Division of Narcotics Enforcement; http://www.dps.state.ia.us/DNE/clanlab.shtml

IOWA EARTHQUAKES

HISTORIC EARTHQUAKES WITH EPICENTERS IN IOWA

Number	Date	Nearest Town	Mercalli Intensity
1.	Apr. 28, 1867	Sidney (IA) / Nebraska City (NE)	IV
2.	Dec. 09, 1875	Sidney (IA) / Nebraska City (NE)	III
3.	April 13, 1905 **	Wayland (MO) / Keokuk (IA)	IV-V
4.	Jan. 26, 1925	Waterloo (IA)	II
5.	**Nov. 12, 1934**	**Davenport (IA) / Rock Island (IL)**	**VI**
6.	Jan. 05, 1935 **	Rock Island (IL) / Davenport (IA)	IV
7.	Jan. 05, 1935 **	Rock Island (IL) / Davenport (IA)	III
8.	Feb. 26, 1935	Burlington (IA)	III
9.	Oct. 11, 1938	Inwood (IA)	V
10.	Nov. 08, 1938	Dubuque (IA) *	~II
11.	Nov. 24, 1939	Davenport (IA) / Rock Island (IL)	II-III
12.	Apr. 20, 1948	Oxford (IA)	IV
13.	July 16, 2004	Shenandoah (IA)	III

Red identifies Iowa's largest earthquake

* Dubuque experienced three shocks

** Epicenter probably just outside Iowa

Appendix x: Modified Mercalli Scale for Earthquake Intensity

I. Not felt except by a very few under especially favorable conditions. (Micro)

II. Felt only by a few persons at rest, especially on upper floors of buildings. (Micro)

III. Felt quite noticeably by persons indoors, especially on upper floors of buildings. Many people do not recognize it as an earthquake. Standing motor cars may rock slightly. Vibrations similar to the passing of a truck. Duration estimated. (Minor)

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. (Light)

V. Felt by nearly everyone; many awakened. Some dishes, windows broken. Unstable objects overturned. Pendulum clocks may stop. (Moderate)

VI. Felt by all, many frightened. Some heavy furniture moved; a few instances of fallen plaster. Damage slight. (Strong)

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. (Major)

VIII. Damage slight in specially designed structures; considerable damage in ordinary substantial buildings with partial collapse. Damage great in poorly built structures. Fall of chimneys, factory stacks, columns, monuments, walls. Heavy furniture overturned. (Great)

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. (Great)

X. Some well-built wooden structures destroyed; most masonry and frame structures destroyed with foundations. Rails bent. (Great)

XI. Few, if any (masonry) structures remain standing. Bridges destroyed. Rails bent greatly. (Great)

XII. Damage total. Lines of sight and level are distorted. Objects thrown into the air. (Great)

Source: Iowa Department of Natural Resources, Geological Survey. Modified Mercalli Intensity Scale from National Earthquake Information Center. <http://www.igsb.uiowa.edu/Browse/earthqua/ MERCALLI.HTM>.

Average Building Replacement Value per Square Foot

Occupancy Class	Total $/sq. ft.
Single Family Dwelling	77
Mobile Home	52
Multi-family Dwelling	98
Temporary Lodging	102
Institutional Dormitory	98
Nursing Home	89
Retail Trade	67
Wholesale Trade	53
Personal/Repair Services	92
Professional/Tech. Services	87
Banks	151
Hospital	145
Medical Office/Clinic	112
Entertainment & Recreation	131
Theaters	98
Parking	30
Heavy Industrial	69
Light Industrial	69
Food/Drugs/Chemicals	69
Metals/Minerals Processing	69
High Technology	69
Construction	69
Agriculture	26
Church/Non-Profit Offices	113
General Services	88
Emergency Response	130
Schools	91
Colleges/Universities	115

Contents Value as Percentage of Building Replacement Value

Occupancy Class	Contents Value (%)
Residential (including temporary lodging, dormitory, and nursing homes)	50
Commercial (including retail, wholesale, professional, services, financial, entertainment & recreation)	100
Commercial (including hospital and medical office/clinic)	150
Commercial Parking	50
Industrial (including heavy, light, technology)	150
Industrial Construction	100
Agriculture	100
Religion/Non-Profit	100
Government Emergency Response	150
Government General Services	100
Education Schools/Libraries	100
Education Colleges/Universities	150

Source: HAZUS

Example 1

To find the annual sales from a 15,000 square foot grocery store, you would multiply the structure size by $30 per square foot (from the table at right).

15,000 x $30

The annual sales would be $450,000.

Example 2

If a public library will be lost for three months due to damage from a 100-year flood, you could determine the damages from the loss of function by multiplying the monthly budget of the library (overhead, rent, staff salaries, etc.) by three months.

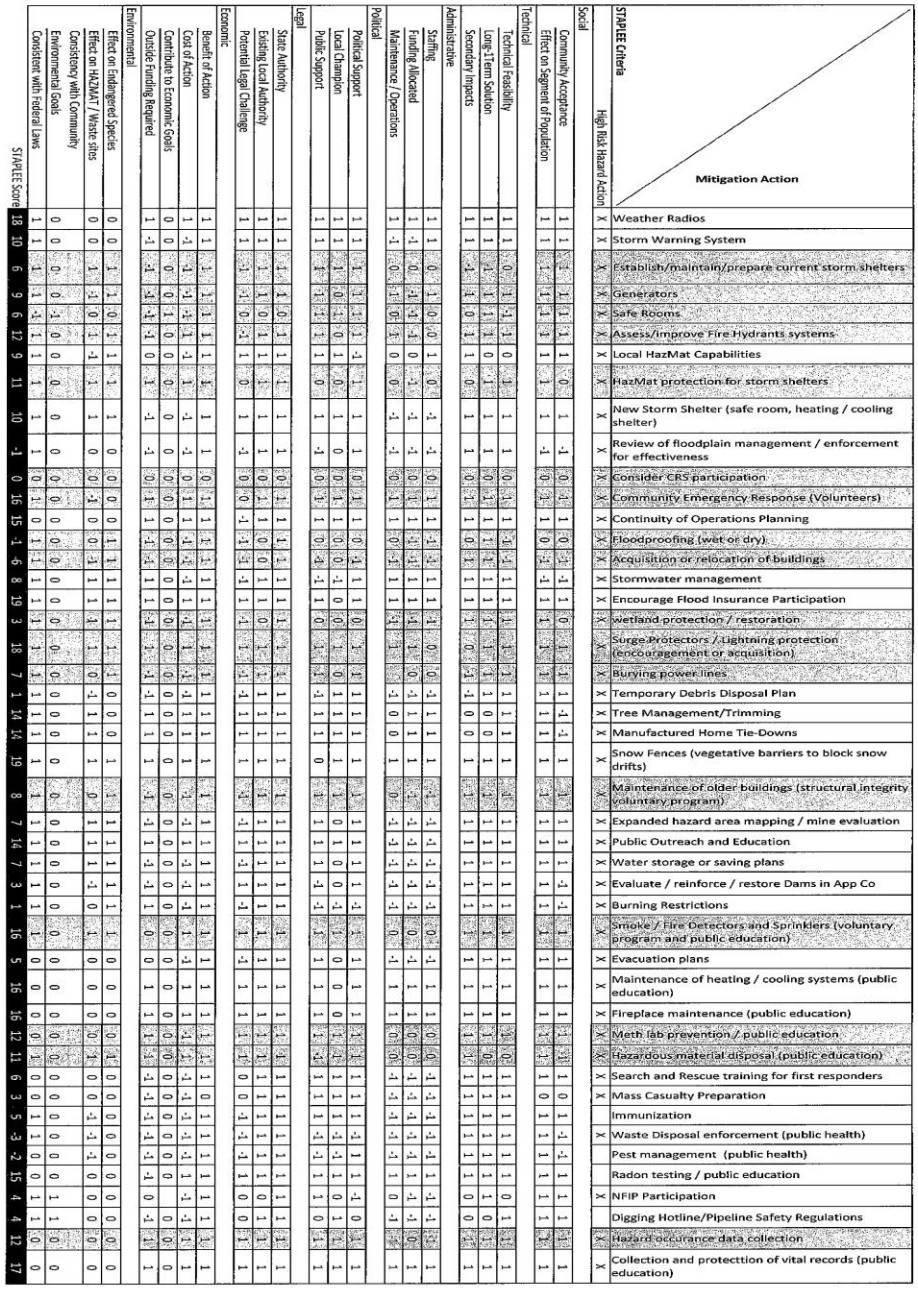
Annual Gross Sales or Production (Dollars per Square Foot)

Occupancy Class	Annual Sales ($ / ft²)
Commercial	
Retail Trade	30
Wholesale Trade	43
Industrial	
Heavy	400
Light	127
Food/Drugs/Chemicals	391
Metals/Minerals Processing	368
High Technology	245
Construction	431
Agriculture	
Agriculture	83

Source: HAZUS

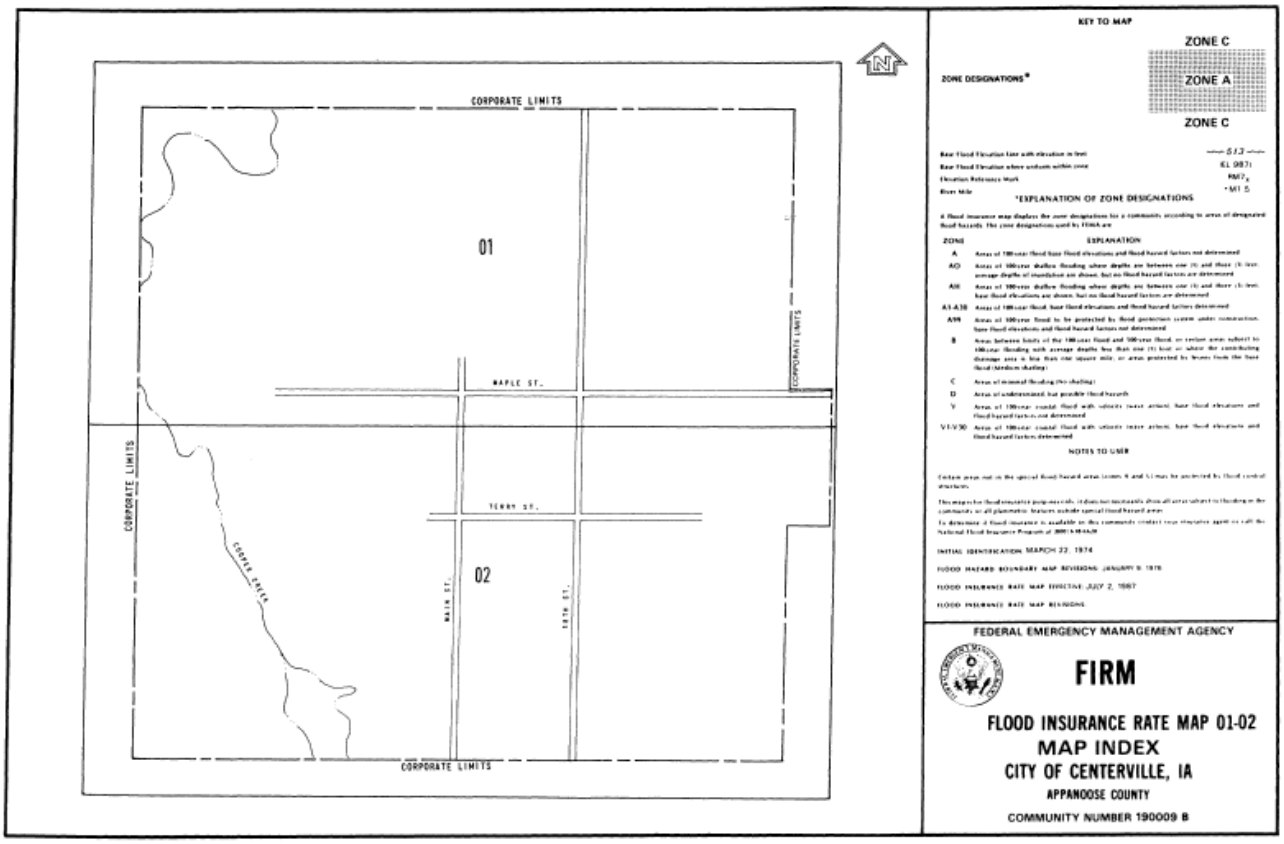
Appendix Z: Appanoose County STAPLEE

HazMat protection links
http://www.fema.gov/hazard/hazmat/hz_during.shtm
http://www.fema.gov/hazard/terrorism/chem/chem_during.shtm
http://www.fema.gov/hazard/terrorism/bio/bio_during.shtm

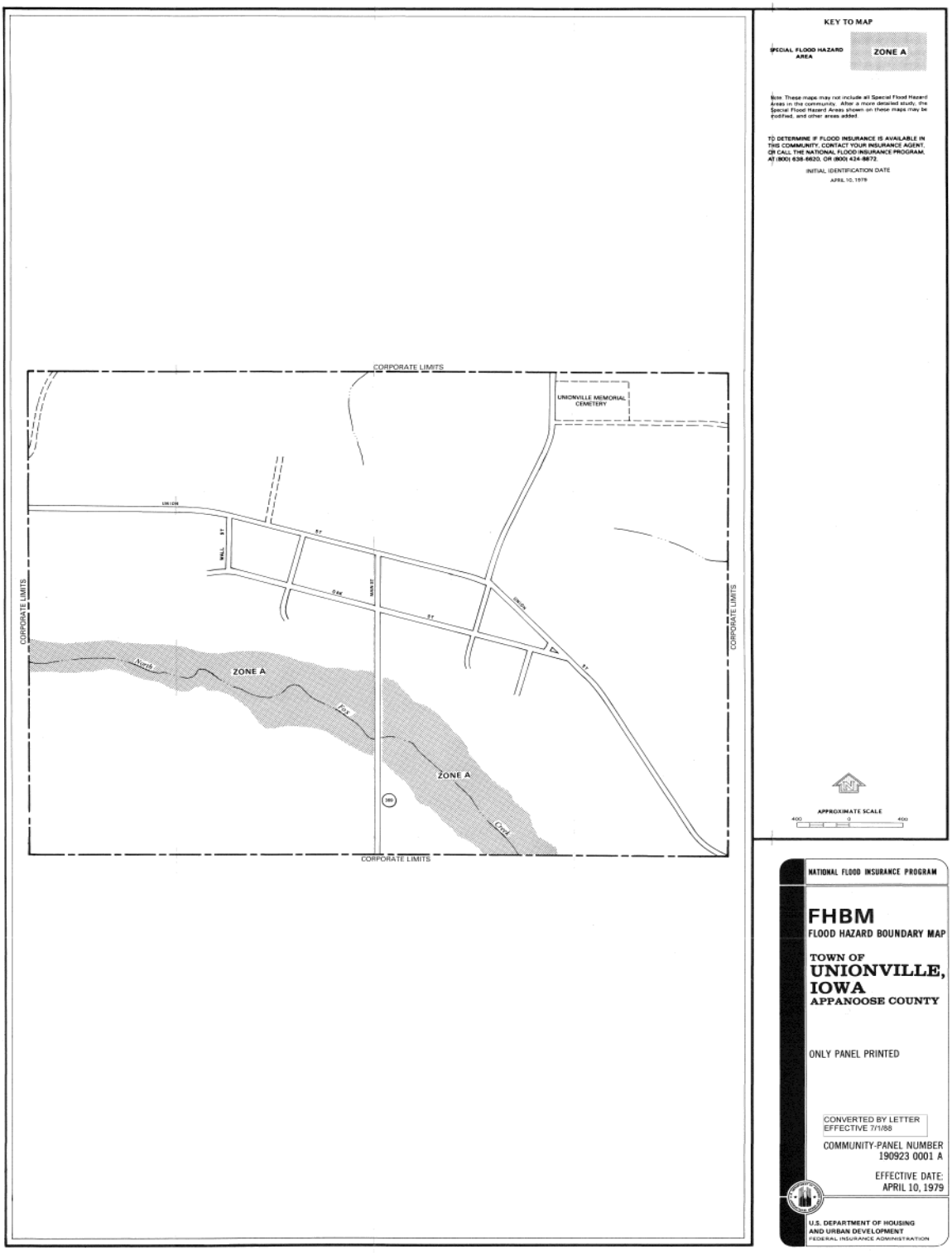


STAPLEE Criteria / Mitigation Action		Social		Technical			Administrative			Political			Legal			Economic				Environmental					
	High Risk Hazard Action	Community Acceptance	Effect on Segment of Population	Technical Feasibility	Long-1Term Solution	Secondary Impacts	Staffing	Funding Allocated	Maintenance / Operations	Political Support	Local Champion	Public Support	State Authority	Existing Local Authority	Potential Legal Challenge	Benefit of Action	Cost of Action	Contribute to Economic Goals	Outside Funding Required	Effect on Endangered Species	Effect on HAZMAT / Waste sites	Consistency with Community	Environmental Goals	Consistent with Federal Laws	STAPLEE Score
Weather Radios	X	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	0	1	0	0		0	1	18
Storm Warning System	X	1	1	1	1	1	1	-1	-1	1	1	1	1	1	1	1	-1	0	-1	0	0		0	1	10
Establish/maintain/prepare current storm shelters	X	1	1	0	1	-1	0	0	0	1	1	1	1	1	-1	1	-1	0	-1	1	1		0	1	6
Generators	X	1	1	1	1	1	1	-1	1	1	0	1	1	1	-1	1	-1	0	-1	1	-1		0	1	9
Safe Rooms	X	1	1	-1	1	0	0	-1	0	1	1	1	0	0	0	1	-1	1	-1	0	0		-1	-1	6
Assess/improve Fire Hydrants systems	X	1	1	1	1	1	0	-1	1	1	0	1	1	1	-1	1	1	0	-1	1	1		0	1	12
Local HazMat Capabilities	X	1	1	0	0	1	1	0	0	-1	1	1	1	1	1	1	-1	0	0	1	-1		0	1	9
HazMat protection for storm shelters	X	0	1	1	1	0	0	-1	0	1	0	0	1	1	0	1	1	0	1	1	1		0	1	11
New Storm Shelter (safe room, heating / cooling shelter)	X	1	1	1	1	1	-1	-1	-1	1	1	1	1	1	1	1	-1	0	-1	1	1		0	1	10
Review of floodplain management / enforcement for effectiveness	X	-1	-1	1	1	1	-1	-1	-1	1	0	-1	1	1	-1	1	-1	0	-1	0	0		0	1	-1
Consider CRS participation	X	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0		0	0	0
Community Emergency Response (Volunteers)	X	1	1	1	1	1	1	1	1	1	1	1	1	1	0	1	1	0	1	0	-1		0	1	16
Continuity of Operations Planning	X	1	1	1	1	1	1	1	1	1	1	1	1	1	-1	1	1	0	1	0	0		0	0	15
Floodproofing (wet or dry)	X	0	0	-1	1	0	-1	-1	0	0	0	0	1	0	-1	1	-1	0	-1	1	0		0	1	-1
Acquisition or relocation of buildings	X	-1	-1	-1	1	1	-1	-1	-1	-1	0	-1	1	0	-1	1	-1	0	-1	1	-1		0	1	-6
Stormwater management	X	-1	-1	1	1	1	1	1	1	1	-1	-1	1	1	-1	1	-1	0	1	1	1		0	1	8
Encourage Flood Insurance Participation	X	1	1	1	1	1	1	1	1	1	0	1	1	1	1	1	1	0	1	1	1		0	1	19
wetland protection / restoration	X	0	1	1	1	1	-1	-1	-1	0	0	0	1	0	-1	1	-1	0	-1	1	1		0	1	3
Surge Protectors / Lightning protection (encouragement or acquisition)	X	1	1	1	1	0	0	1	1	1	1	1	1	1	1	1	1	0	1	1	1		0	1	18
Burying power lines	X	1	1	1	1	-1	0	0		1	0	1	1	1	-1	1	-1	0	-1	1	0		0	1	7
Temporary Debris Disposal Plan	X	1	1	1	1	-1	-1	-1	-1	1	1	-1	1	1	-1	1	-1	0	-1	0	-1		0	1	1
Tree Management/Trimming	X	-1	1	1	0	0	1	1	0	1	1	1	1	1	1	1	1	0	1	0	1		0	1	14
Manufactured Home Tie-Downs	X	-1	1	1	0	0	1	1	0	1	1	1	1	1	1	1	1	0	1	0	1		0	1	14
Snow Fences (vegetative barriers to block snow drifts)	X	1	1	1	1	1	1	1	1	1	1	0	1	1	1	1	1	0	1	1	1		0	1	19
Maintenance of older buildings (structural integrity voluntary program)	X	1	1	1	1	1	-1	-1	0	1	1	1	1	1	-1	1	-1	0	-1	1	0		0	1	8
Expanded hazard area mapping / mine evaluation	X	1	1	1	1	1	-1	-1	-1	1	0	1	1	1	-1	1	-1	0	-1	1	1		0	1	7
Public Outreach and Education	X	1	1	1	1	1	-1	-1	-1	1	1	1	1	1	1	1	1	0	1	1	1		0	1	14
Water storage or saving plans	X	1	1	1	1	1	-1	-1	-1	1	0	1	1	1	-1	1	-1	0	-1	1	1		0	1	7
Evaluate / reinforce / restore Dams in App Co	X	-1	1	1	1	1	-1	-1	-1	1	0	-1	1	1	1	1	-1	0	-1	1	-1		0	1	3
Burning Restrictions	X	-1	1	1	1	1	-1	-1	-1	-1	-1	-1	1	1	-1	1	-1	0	1	1	0		0	1	1
Smoke / Fire Detectors and Sprinklers (voluntary program and public education)	X	1	1	1	1	1	0	0	0	1	1	1	1	1	1	1	1	0	0	1	1		0	1	16
Evacuation plans	X	1	1	1	1	1	-1	-1	-1	1	0	1	1	1	-1	1	-1	0	0	0	0		0	0	5
Maintenance of heating / cooling systems (public education)	X	1	1	1	1	1	1	1	1	1	0	1	1	1	1	1	1	0	1	0	0		0	0	16
Fireplace maintenance (public education)	X	1	1	1	1	1	1	1	1	1	0	1	1	1	1	1	1	0	1	0	0		0	0	16
Meth lab prevention / public education	X	1	1	1	1	1	0	0	0	1	1	1	1	1	1	1	-1	0	1	0	0		0	0	12
Hazardous material disposal (public education)	X	-1	1	0	0	1	0	0	0	1	1	-1	1	1	1	1	1	0	1	1	1		0	1	11
Search and Rescue training for first responders	X	1	1	1	1	1	-1	-1	-1	1	1	1	1	1	0	1	-1	0	-1	0	0		0	0	6
Mass Casualty Preparation	X	0	0	1	1	1	-1	-1	-1	1	1	1	1	1	0	0	-1	0	-1	0	0		0	0	3
Immunization		1	1	1	1	1	-1	-1	-1	1	1	1	1	1	-1	1	-1	0	-1	0	-1		0	1	5
Waste Disposal enforcement (public health)	X	-1	1	1	1	1	-1	-1	-1	-1	-1	-1	1	1	-1	1	-1	0	-1	0	-1		0	1	-3
Pest management (public health)		-1	1	1	1	1	-1	-1	-1	1	-1	-1	1	1	-1	1	-1	0	-1	0	-1		0	0	-2
Radon testing / public education		1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	0	-1	0	0		0	0	15
NFIP Participation	X	1	1	0	1	0	-1	-1	0	-1	0	1	1	0	0	1	-1		0	0	0		1	1	4
Digging Hotline/Pipeline Safety Regulations		1	1	1	0	0	-1	-1	-1	0	1	0	1	1	0	1	-1	0	-1	0	0		1	1	4
Hazard occurance data collection	X	1	1	1	1	1	-1	0	-1	1	1	1	1	1	1	1	1	0	1	0	0		0	0	12
Collection and protecttion of vital records (public education)	X	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	0	1	0	0		0	0	17

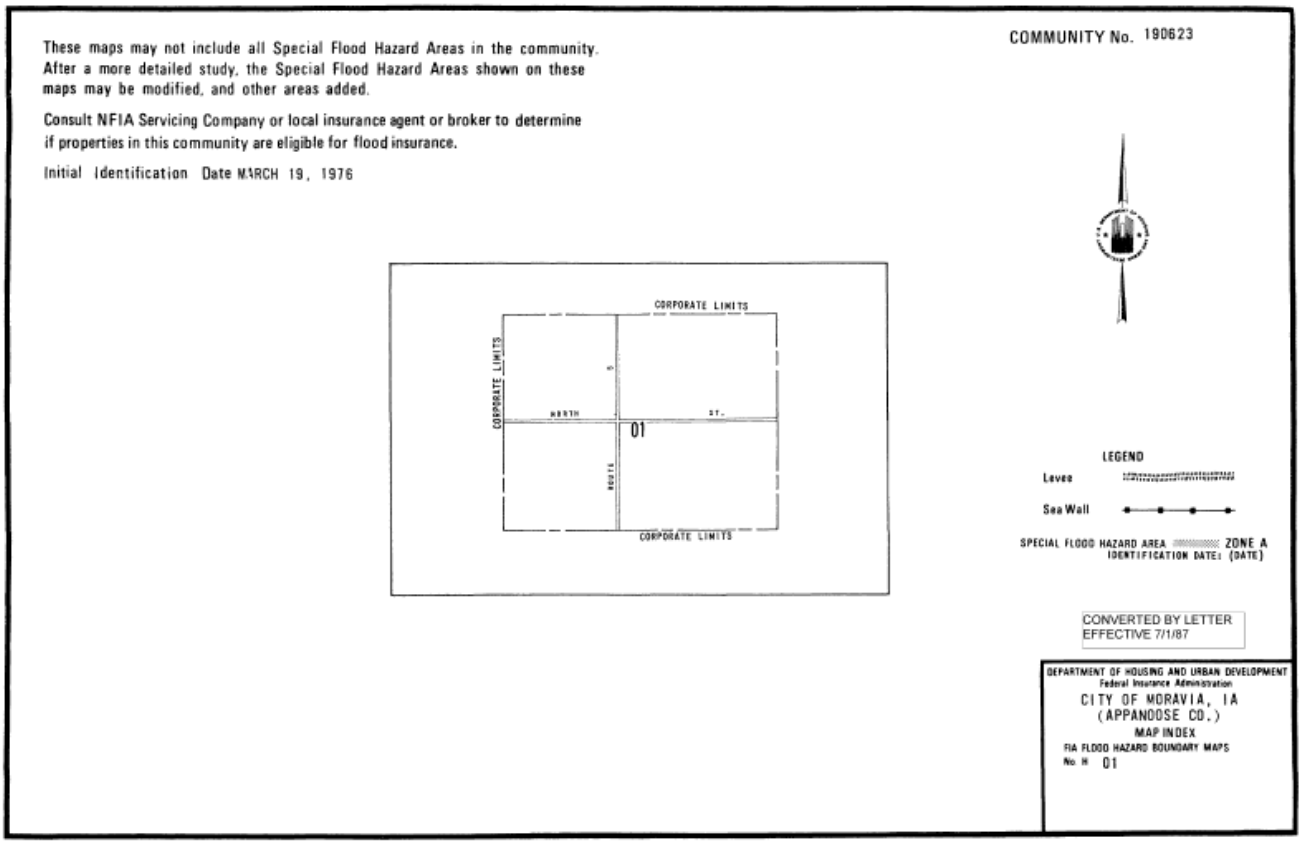
Appendix AA: Centerville, IA FIRM



Appendix BB: Unionville, IA FIRM


CORPORATE LIMITS
UNIONVILLE MEMORIAL CEMETERY
UNION
MILL ST
MAIN ST
DAVIS
ZONE A
North
Fox
ZONE A
Creek
CORPORATE LIMITS
CORPORATE LIMITS
KEY TO MAP
SPECIAL FLOOD HAZARD AREA
ZONE A
Note: These maps may not include all Special Flood Hazard Areas in the community. After a more detailed study, the Special Flood Hazard Areas shown on these maps may be modified, and other areas added.
TO DETERMINE IF FLOOD INSURANCE IS AVAILABLE IN THIS COMMUNITY, CONTACT YOUR INSURANCE AGENT, OR CALL THE NATIONAL FLOOD INSURANCE PROGRAM, AT (800) 638-6620, OR (800) 424-8872.
INITIAL IDENTIFICATION DATE
APRIL 10, 1979
APPROXIMATE SCALE
400
0
400
NATIONAL FLOOD INSURANCE PROGRAM
FHBM
FLOOD HAZARD BOUNDARY MAP
TOWN OF
UNIONVILLE, IOWA
APPANOOSE COUNTY
ONLY PANEL PRINTED
CONVERTED BY LETTER EFFECTIVE 7/1/88
COMMUNITY-PANEL NUMBER
190923 0001 A
EFFECTIVE DATE:
APRIL 10, 1979
U.S. DEPARTMENT OF HOUSING AND URBAN DEVELOPMENT
FEDERAL INSURANCE ADMINISTRATION

Appendix CC: Moravia, IA FIRM



These maps may not include all Special Flood Hazard Areas in the community. After a more detailed study, the Special Flood Hazard Areas shown on these maps may be modified, and other areas added.

Consult NFIA Servicing Company or local insurance agent or broker to determine if properties in this community are eligible for flood insurance.

Initial Identification Date MARCH 19, 1976

COMMUNITY No. 190623

CORPORATE LIMITS

CORPORATE LIMITS

NORTH

ST.

01

SOUTH

CORPORATE LIMITS

LEGEND

Levee

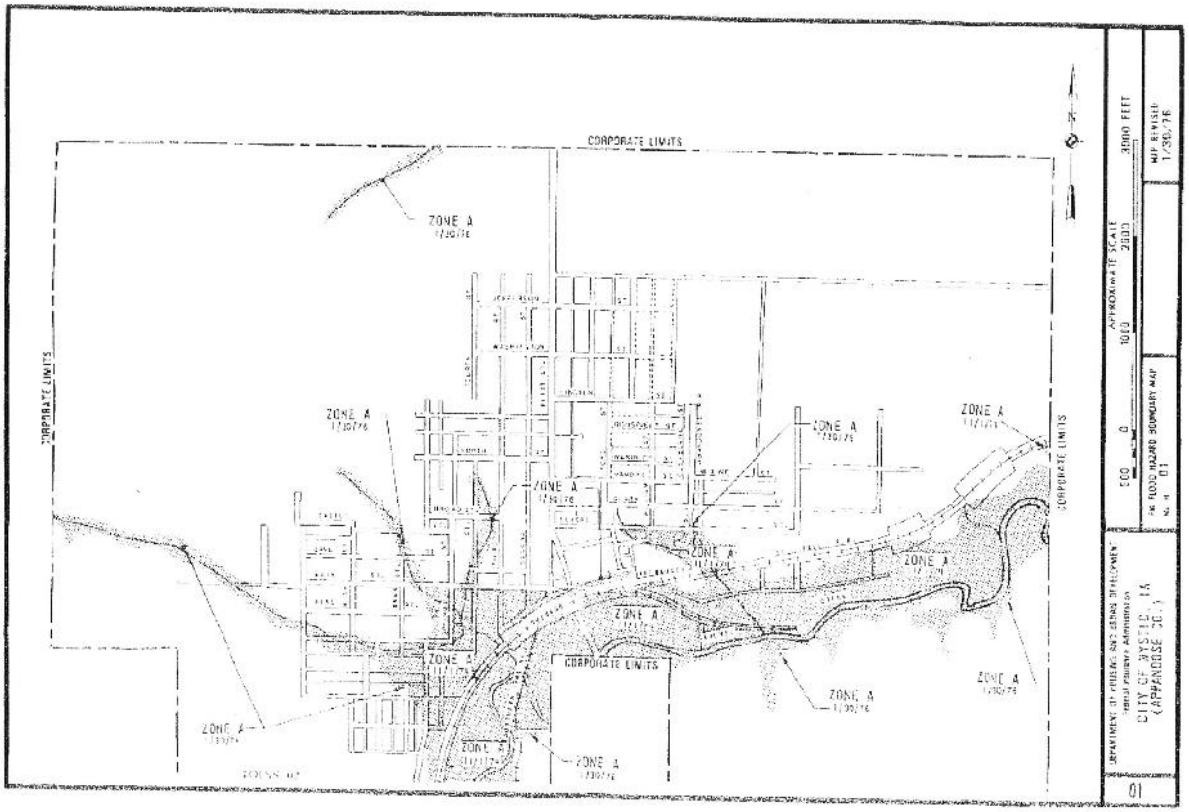
Sea Wall

SPECIAL FLOOD HAZARD AREA ZONE A
IDENTIFICATION DATE: (DATE)

CONVERTED BY LETTER
EFFECTIVE 7/1/87

DEPARTMENT OF HOUSING AND URBAN DEVELOPMENT
Federal Insurance Administration
CITY OF MORAVIA, IA
(APPANOOSE CO.)
MAP INDEX
FIA FLOOD HAZARD BOUNDARY MAPS
No H 01

Appendix DD: Mystic, IA FIRM


CORPORATE LIMITS
ZONE A
1/30/76
DEPARTMENT OF HOUSING AND URBAN DEVELOPMENT
FEDERAL INSURANCE ADMINISTRATION
CITY OF MYSTIC, IA
(APPANOOSE CO.)
FLOOD HAZARD BOUNDARY MAP
01
APPROXIMATE SCALE
500 0 1000 2000 3000 FEET
MAP REVISED
1/30/76
01

CITY OF CINCINNATI

105 W. Pleasant Street
P. O. Box 194
Cincinnati, Iowa 52549-0998

Jean Morrison, Mayor
David Owens, City Clerk
Phone & Fax: 641-658-2666

TO: Iowa Homeland Security and FEMA representatives

FROM: The City of Cincinnati

RE: Appanoose County Multi-Jurisdictional Hazard Mitigation Plan

The City of Cincinnati has recently become more informed of the purpose of the Appanoose County Multi-Jurisdictional Hazard Mitigation plan. Representatives from our community have now had contact with the office of Chariton Valley Planning & Development Council, who is responsible for the development of this document. We have had the opportunity review the Hazard Mitigation Plan and gained a better understanding of the intentions it will serve in this region.

The City of Cincinnati has recently provided critical information that is pertinent to our city. We have confirmed the accuracy of our community profile, documented our concerns for the most prominent hazard events, and have also selected what mitigation strategies will be most beneficial to our community.

We understand that our participation is crucial and apologize for our passive nature in the past. It is the City' s intentions to fully participate in obtaining state and Federal the approval for the Appanoose County Hazard Mitigation plan and the annual reviews subsequent to that.

Respectfully yours,

David Owens
Cincinnati City Clerk
Cincinnati, IA
641-658-2666

CITY OF UNIONVILLE

PO BOX 56

UNIONVILLE, IA 52594

TO: Iowa Homeland Security and FEMA representatives

FROM: The City of Unionville.

RE: Appanoose County Multi-Jurisdictional Hazard Mitigation Plan

The City of Unionville has recently become more informed of the purpose of the Appanoose County Multi-Jurisdictional Hazard Mitigation plan. Representatives from our community have now had contact with the office of Chariton Valley Planning & Development Council, who is responsible for the development of this document. We have had the opportunity review the Hazard Mitigation Plan and gained a better understanding of the intentions it will serve in this region.

The City of Unionville has recently provided critical information that is pertinent to our city. We have confirmed the accuracy of our community profile, documented our concerns for the most prominent hazard events, and have also selected what mitigation strategies will be most beneficial to our community.

We understand that our participation is crucial and apologize for our passive nature in the past. It is the City's intentions to fully participate in obtaining state and Federal the approval for the Appanoose County Hazard Mitigation plan and the annual reviews subsequent to that.

Respectfully yours,

Sandra Shaw
City Clerk

MORAVIA COMMUNITY SCHOOLS

505 North Trussell
Moravia, IA 52571

High School
(641)724-3241
Fax: 724-0629

Central Office
(641)724-3240
Fax: 724-9858

Elementary
(641)724-3311
Fax: 724-3591

TO: Iowa Homeland Security and FEMA representatives

FROM: Moravia Public Schools

RE: Appanoose County Multi-Jurisdictional Hazard Mitigation Plan

The public School District of Moravia has recently become more informed of the purpose of the Appanoose County Multi-Jurisdictional Hazard Mitigation plan. Representatives from our school have now had contact with the office of Chariton Valley Planning & Development Council, who is responsible for the development of this document. We have had the opportunity review the Hazard Mitigation Plan and gained a better understanding of the intentions it will serve in this region.

The Moravia School has recently provided critical information that is pertinent to our school. We have confirmed the accuracy of our school profile, documented our concerns for the most prominent hazard events, and have also indicated our interest in the mitigation strategy of the inclusion of a possible school safe room to our facilities.

We understand that our participation is crucial and apologize for our passive nature in the past. It is the school's intentions to fully participate in obtaining state and Federal the approval for the Appanoose County Hazard Mitigation plan and the annual reviews subsequent to that.

Respectfully yours,

Kathy Carr
7-12 principal
Moravia CSD
Moravia., IA 52571

*Double Attached Garage
Full Basement ready to finish
*Central heat and air
*Two full bathrooms upstairs
*Washer and Dryer upstairs
*Large Front Porch
*Three Bedrooms
ocated on a quite lot at he end of a cul-de-sac in
West View Acres
*The Moravia Community School is taking bids or this new home. Bids start at $115,000.
Bids must be submitted o the Superintendent of Schools by 12:00 (noon) on June 11, 2010.
*Bids will be opened on June 14th at 5:30 PM at the Moravia Community School Board Meeting held in the high school library.
*The Moravia Community School retains the right to accept or refuse any bid.
*For more information or to view the home call 724-3240 and ask for Brad Breon

HOUSE FOR SALE: 301 North 2nd Mystic. 5 bedroom, 2 bath, 2.5 car garage, 4 plus acres and 2 fenced in areas. Lots more. $66,000. Available June 1st 641-895-0257.

HOUSE FOR SALE: Nice 1828 Sq. Ft. home with 10x40 attached garage. 72x40 steel building. $150,000. 29200 Hwy T-30 Exline. Call 641-437-1200

FOR SALE: 3 bdrm, 2 bath home on 2 lots, 2 car garage/shop, nice neighborhood, Cincinnati, IA. $64,900 Call Sabrina Wells @ (641)895-3711-Doug Gilworth Real Estate, 13471 State Hwy 5, Unionville, MO 63565 (660)947-7738

Land/Acreage

ACREAGE FOR SALE: Great location! 2 bedroom home, 15 acres/with pond, 3 miles from Centerville/on hard surface road. $116,900. 641-856-6012.

HOUSE LOT FOR SALE IN MORAVIA Lot for building a home located on a quite cul-de-sac in West View Acres in Moravia. For more information call 724-3240.

LOT FOR SALE IN WESTVIEW ACRES, 641-724-3240 ask for Brad.

Townhomes/Condos

CUSTOM APPLICATIONZ

AgLime, Fertilizer & Gypsum
GPS Floatation Spreading
Call for Pricing
Call Zeb & Danielle Joiner
641-856-7775
641-895-5130

AC / Heating and Repair

MOORMAN HEATING AND COOLING
Furnace, A/C, and Ground Source Heat Pump Installation and Repairs.
Insured & Certified
Contact: Joe W. Moorman
Phone: 641-856-2228
Cell: 641-895-2560

Trucks

FOR SALE: 1994 L8000 Single Axle dump truck. Good condition. $12,500. OBO. 641-872-0401.

Autos

1999 MERCURY COUGAR, RED, Sharp Car, V6, 28mpg, leather interior, sunroof, excellent condition, runs great! $2800, call 641 799 7988 or 641 969 4022.

2000 FORD Contour, 73,000 miles, good condition, runs great, new tires, maroon color. $3,500/OBO Phone 641-216-3676.

Boat Accessories & Equipment

Ebbtide 1992 18' Inboard 4.3 Liter, all skis and accessories go with. $5500 641-799-4489 after 5:00pm

Drive away from the Classifieds with a

891 3867

Public Notices

NOTICE OF PUBLIC HEARING ON PROPOSAL TO FILE THE MULTI-JURISIDICTIONAL HAZARD MITIGATION PLAN FOR APPANOOSE COUNTY

TO WHOM IT MAY CONCERN:
Notice is hereby given that a Public Hearing has been set for the submittal of the Multi-Jurisdictional Hazard Mitigation Plan on behalf of Appanoose County. Said hearing will be held on Wednesday, May 19, 2010, at 1:00 p.m. to 2:00 p.m. at the office of Chariton Valley Planning & Development Council of Governments, 205 1/2 North 13th Street, Centerville, Iowa. The Multi-Jurisdictional Plan is a requirement for hazard preparedness, and disaster recovery funding assistance through the Federal Emergency Management Agency (FEMA).
At said public hearing, all persons who appear will be given an opportunity to express their opinion for and or against said proposal. In addition, written comments may be filed with Chariton Valley Planning & Development Council of Governments prior to said time and date for set hearing.
Published upon order of Chariton Valley Planning & Development Council of Governments, Centerville, Iowa on behalf of Appanoose County.

Chariton Valley Planning & Development Council of Governments

Runs 1x
May 18th, 2010

NOTICE OF SHERIFF'S LEVY AND SALE

IN THE IOWA DISTRICT COURT FOR APPANOOSE COUNTY

COURT CASE # EQEQ003420
APPANOOSE COUNTY SPECIAL EXECUTION

BAC HOME LOANS SERVICING L.P. FKA COUTRYWIDE HOME LOANS SERVICING,
Plaintiff(s)

VS.
BRADY RYUN THOMPSON

JENNIFER LYN NOBLE FKA JENNIFER L. THOMPSON

$102,312.07
Accrued Costs PLUS Costs: $1,191.77
Interest: $8,774.77
Sheriff's Fee's: Pending

Attorney:
BENJAMIN W. HOPKINS
1350 NW 138TH ST, STE 100
CLIVE, IA 50325
(515)222-9400

Date 5/10/2010

GARY D. ANDERSON
Appanoose County Sheriff

By Char Kirby

Runs 2x
May 18th, 2010
June 1st, 2010

NOTICE OF SHERIFF'S LEVY AND SALE

IN THE IOWA DISTRICT COURT FOR APPANOOSE COUNTY

COURT CASE # EQEQ003429
APPANOOSE COUNTY SPECIAL EXECUTION

WELLS FARGO BANK, N.A.,
Plaintiff(s)

VS.
SPOUSE OF SARA S. O'DELL AKA GRAHAM SARAH O'DELL AKA SARAH GRAHAM

BENEFICIAL IOWA,INC

Defendant(s)
As a result of the judgment rendered in the above referenced court case, an execution was issued by the court to the Sheriff of this county. The execution ordered the sale of defendant(s) Real Estate to satisfy the judgment. The property to be sold is described below:

Lots 10, 11, 12, 13 and 14 in. Block of J.J. Jennett's First Addition to the Town of Mystic, Appanoose County, Iowa and all of Block 2 of Fruitland Addtion to the Town of Mystic, Appanoose County, Iowa, except the following: Commencing at a point 350 feet East of the Northwest corner of Section 16, Township 69 North, Range 18, thence running South 535 feet to the place of beginning, thence South 280 feet, thence East 264 feet, thence North 280 feet, thence West 264 feet to the Place of Beginning.

The South 56 feet of Lot 2 and all of Lot 3, in Block 1 of Fruitland Addition to the City of Mystic, Appanoose, Iowa.

Location of Property: 408

April 21st, 2010:

You are hereby notified that on the 5th day of May, 2010, the undersigned was appointed administrator or the estate.

Notice is further given that all persons indebted to the estate are requested to make immediate payment to the undersigned, and creditors having claims against the estate shall file them with the clerk of the above named district court, as provided by law, duly authenticated, for allowance, and unless so filed by the later to occur of four months from the second publication of this notice or one month from the date of mailing of this notice (unless otherwise allowed or paid) a claim is thereafter forever barred.

Dated this 13th day of May, 2010.

April Jill Strickler
Administrator of the Estate
101 North Street Box 84
Promise City, IA 52583

Thomas L. Anders, ICIS PIN Number: 0000450
Attorney for the Administrator
508 Drake Avenue,
Centerville, IA 52544

Date of second publication
May 25th, 2010

Runs 2x
May 18th, 2010
May 25th, 2010

IT'S GOOD BUSINESS to read public notices

It makes good business sense to watch the way your government spends your money. No public official is apt to spend tax dollars foolishly if their business dealings are being made public in your local newspaper. The publication of these notices allow citizens to act on facts and itemized reports that otherwise wouldn't be as readily available to the public.

Public notice advertising acts as a safeguard for the pocketbooks of Iowa taxpayers with an effectiveness that can be accomplished in no other way. And it makes good business sense to watch the way your government

2005 Chrysler Sebring
$7,902
(877)433-5920

Txt 4RBF to 48696
2005 Ford Taurus
$5,782
(877)433-5920

Txt 4YWY to 48696
2007 Chevrolet Silverado 1500
$25,974
(877)433-5920

Txt 4RGX to 48696
2006 Chevrolet Silverado 1500
$18,992
(877)433-5920

Txt 4RGC to 48696
2007 Ford F-150
$24,870
(877)433-5920

Txt 4XTT to 48696
2006 Ford F-150
$17,979
(877)433-5920

Txt 4XTQ to 48696

Daily Iowegian, Centerville, IA Run on 5/18/10

Appendix GG: Hazard Risk by Jurisdiction

	Appanoose County Unincorp	Centerville	Cincinnati	Exline	Moravia	Moulton	Mystic	Numa	Plano	Rathbun	Udell	Union-ville	Lake Rathbun	Centerville Public Schools	Moravia Public Schools
Hazards ID															
Flash Flooding	X	X	X	X			X	X		X	X			X	
Tornado	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X
Windstorms / High wind event	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X
Extreme Heat	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X
Hailstorm	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X
Grass/Wildfire	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X
Sink Holes	X	X	X	X			X	X	X	X					
River Flooding	X	X					X								
Severe Winter Storm	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X
Drought	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X
Earthquake	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X
Levee Failure	X														
Dam Failure	X	X					X			X					
Expansion Soils	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X
Thunderstorm/ Lighting	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X
Radon/Lead	X	X	X	X	X	X	X	X	X	X	X	X			
Climate Change	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X
Air Transport Incident	X	X													

Rail Transpt Incident	X	X			X	X	X				X				X
Pipeline Incident	X	X	X	X	X			X			X	X			
Highway Transprt Incident	X	X	X		X										X
Transportation of Hazardous Materials	X	X	X	X	X	X	X	X	X	X	X	X			
Transportation of Radiological Materials	X	X			X										
Waterway Incident	X	X			X		X						X		
Human Disease Incident	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X
Human Disease Pandemic	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X
Fixed Hazardous Materials	X	X	X		X	X									
Animal/plant/ crop disease	X	X	X	X	X	X	X	X	X	X	X	X	X		
Energy Failure	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X
Communication Failure	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X
Structural Failure	X	X	X	X	X	X	X	X	X	X	X	X			
Structural Fire	X	X	X	X	X	X	X	X	X	X	X	X			

Appendix HH: Jurisdiction Plans/Ordinances/Departments/Organizations

Planning Capabilities/Ordinances/Programs	Jurisdictions with it Currently in Place	Method of Incorporation
Comprehensive Plan	County, Centerville	Reviewed during this plan to identify trends in jurisdictions

Builder's Plan	Centerville	Not directly incorporated
Capital Improvement Plan	Centerville	Not directly incorporated
Local Emergency Plan	Centerville	Reviewed & reference in plan
County Emergency Plan	All of County	Reviewed during meetings for existing procedures
Local Recovery Plan	None	Mitigation action proposed
County Recovery Plan	All of County	Identified as part of EOP
Local Mitigation Plan	Mystic	Many elements incorporated
County Mitigation Plan	None	This document
Local Mitigation Plan (PDM)	None	--
County Mitigation Plan (PDM)	None	--
Economic Development Plan	Yes, Regionally CEDS	Reviewed for the development of this plan, economic information incorporated in community profiles
Transportation Plan	Yes, Long Range Transportation Plan with RPA	Mapping data from LRTP update incorporated into this plan
Land-use Plan	County	Reviewed for this plan
Flood Mitigation Assistance (FMA) Plan	none	--
Watershed Plan	County	Not located
Firewise or other fire mitigation plan	None	--
School Mitigation Plan	Centerville has crisis plan only	Mitigation strategy develop
Critical Facilities Plan (Mitigation/Response/Recovery	None	Mitigation strategy proposed
Zoning Ordinance	Approx 25% of county, Centerville, Moravia, Moulton, Plano	Reviewed zoning codes concerning certain hazards
Building Code	Centerville	Not directly incorporated
Floodplain Ordinance	None	Floodplain mapping deficient
Subdivision Ordinance	County, Centerville	Not directly incorporated
Tree Trimming Ordinance	Centerville	Consulted with regional utility company
Nuisance Ordinance	Centerville, Cincinnati, Exline, Moravia, Moulton, Numa, Plano,	Not directly incorporated
Storm Water Ordinance	Centerville, Moravia,	Mitigation action proposed
Drainage Ordinance	Centerville	Reviewed when considering flash flooding hazard
Site Plan Review Requirements	County, Centerville	Not directly incorporated
Historic Preservation Ordinance	County, Centerville	Reviewed for specific hazard information of aging structures
Landscape Ordinance	None	Not directly incorporated
Iowa Wetlands and Riparian Areas Conservation Plan	County- Wetlands w/ DNR	Not reviewed
Debris Management Plan	County	Mitigation action proposed
Zoning/Land Use Restrictions	County, Centerville, Moravia,	Zone Code reviewed
Codes Building Site/Design	Centerville, Moravia,	Reviewed when considering specific hazards in these jurisdictions
National Flood Insurance Program (NFIP) Participant - Nondelegated	Centerville, Moravia, Mystic, Unionville	FIRM, repetitive loss properties & NFIP # included in plan
NFIP Participant - Delegated	None	--

NFIP Community Rating System (CRS) Participating Community	None	Mitigation strategy suggested
Hazard Awareness Program	Entire County	Enhance program through mitigation strategy
National Weather Service (NWS) Storm Ready	None	--
Building Code Effectiveness Grading (BCEGs)	none	--
ISO Fire Rating	Centerville, Cincinnati, Moravia, Moulton,	Numbers given in this plan
Economic Development Program	Entire County in CEDS	Recently approved & reviewed
Land Use Program	Centerville	
Public Education/Awareness	Entire county uses ADLM	Radon Literature reviewed
Property Acquisition	Mystic	Participation cited in plan
Planning/Zoning Boards	County, Centerville, Moravia,	Not directly incorporated
Stream Maintenance Program	To be determined	--
Tree Trimming Program	Entire County	Utility company's responsible
Engineering Studies for Streams (Local/County/Regional)	Entire County at USDA office	Not incorporated
Mutual Aid Agreements	Entire County	Fire dept & EMS participating
Hazard Analysis/Risk Assessment (Local)	In process	This plan
Hazard Analysis/Risk Assessment (County)	In process	This plan
Flood Insurance Maps	Portions of County, Mystic	Included in Appendix
FEMA Flood Insurance Study (Detailed)	None	--
Evacuation Route Map	Entire county	Given in E.O.P. and reviewed
Critical Facilities Inventory	In process with this plan, Mystic	Developed & included
Vulnerable Population Inventory	In process with this plan, Mystic	Developed & included
Land Use Map	County, Centerville	Not incorporated in this plan
Building Code Official	Centerville	Consulted during this plan
Building Inspector	Centerville	Not directly incorporated
Mapping Specialist (GIS)	County Engineer	Participated in development of this plan
Engineer	Entire county	Participated in development of this plan
Development Planner	Entire county	CVPD wrote this document
Public Works Official	Centerville, Mystic, Cincinnati, Moulton	Consulted for plan information in specific jurisdictions
Emergency Management Coordinator	Entire County at ADLM	Participated in development of this plan
NFIP Floodplain Administrator	All jurisdictions	Identified who held this capacity in jurisdictions
Bomb and/or Arson Squad	County through Sherriff's office	Not directly incorporated
Emergency Response Team	Entire County	LEPC involved in development of this plan.
Hazardous Materials Expert	Entire County	Not directly incorporated
Local Emergency Planning Committee	Entire County	Some members participated in development of this plan
County Emergency Management Commission	Entire County	Invited to attend meetings
Sanitation Department	Centerville, Cincinnati, Moravia,	Not directly incorporated

	Mystic, Moulton	
Transportation Department	Centerville	Not directly incorporated
Economic Development Department	Centerville	Not directly incorporated
Housing Department	Centerville	Confirm housing statistics
Planning Consultant	Centerville	
Regional Planning Agencies	Entire County through CVPD	CVPD developed this plan
Historic Preservation	Centerville	Not directly incorporated
American Red Cross	Entire county-regional coverage	Not directly incorporated
Salvation Army	Entire county-regional coverage	Not directly incorporated
Veterans Groups	Entire County	Not directly incorporated
Environmental Organization	Entire County	Invited to attend meetings
Utility Companies	Entire county-regional coverage, Centerville	Invited to attend meetings
Homeowner Associations	Centerville,	Not directly incorporated
Neighborhood Associations	Centerville	Not directly incorporated
Chamber of Commerce	Centerville, Moravia, Moulton	Not directly incorporated
Community Organizations (Lions, Kiwanis, etc.	Centerville, Exline, Moulton, Mystic	Not directly incorporated
Local Funding Availability	Community funds in Centerville,	Not directly incorporated

Appendix II: Mystic Hazard Mitigation Plan

2009

City of Mystic, IA Hazard Mitigation Plan

Funded by FEMA and Prepared by Chariton Valley Planning and Development Council of Governments

Chariton Valley
PLANNING & DEVELOPMENT

Table of Contents

Acknowledgments

Over the course of the planning process a number of individuals donated their time and efforts toward gathering information, attending meetings, and providing input for the successful completion of the plan. The following is a list of people who participated in preparation of the 2008 Mystic Hazard Mitigation Plan, in no particular order:

Jerald Ballenger – Former ADLM Emergency Management Coordinator

Frankie Belzer – Mayor of Mystic

Dean Kaster – Appanoose County Supervisor

John Arnold – Former Appanoose County Supervisor

Jody McDanel – Appanoose County Supervisor

Kathy Bratz – Centerville Municipal Airport

Shawn Oden – Mystic City Council

Gary Bishop – Appanoose County Engineer

Patsy Seals – Mystic City Council

George McCloud – Former Mystic City Council

Bill Milani – ADLM Co-Director

Tracy Daugherty – Chariton Valley Planning and Development

Christina Kieltyka – Mystic City Council

John Wageman – Iowa Hazard Mitigation Officer

Michael Clayton – IDOT District Planner

Jon Foster – Appanoose County

Richard Turner – Centerville Community School District

Karen Poolman – Mystic City Clerk

Dien Judge – ADLM Emergency Management Coordinator

Nichole Moore – Chariton Valley Planning and Development

Gene Ruby – Former Mayor of Mystic

Jim Armstrong – Former County Engineer, District 5 Local Systems Engineer

Martin Braster – Rathbun Rural Water

Lacey Johnson – Chariton Valley Planning and Development

Julie Pribyl – Chariton Valley Planning and Development

Rebecca Maxwell – Publisher, Daily Iowegian

Jason Oglesby – Alliant Energy, Strategic Account

Chris Chester – Mystic City Council

Gary Anderson – Sheriff, Appanoose County

Fred Jenkins – KCOG/KMGO Radio

Carl Rea – FEMA Technical Assistance

Sue Varnell – FEMA Technical Assistance

Danette Kobolt – FEMA Technical Assistance

Cathy Mallard – FEMA Technical Assistance

Pat Tresemer – Centerville Community School District

Adoption

Resolution # _____

RESOLUTION ADOPTING THE MYSTIC HAZARD MITIGATION PLAN

Whereas the City of Mystic has experienced natural and human-caused disasters in its history including devastating flooding in 2007;

Whereas the City of Mystic recognizes the threats posed by natural and human-caused hazards on Mystic residents and properties;

Whereas the City of Mystic intends to make a commitment to the protection of Mystic residents and properties;

Whereas a condition of the property acquisition grant funds received in 2009 requires the completion and adoption of a hazard mitigation plan;

The City of Mystic hereby officially adopts the Mystic Hazard Mitigation Plan:

Agreed to this _____ day of _____, 2009.

_____
Mayor

_____
Signature

_____
Attested by

_____
Signature

A draft resolution for the replacement of this document with the Appanoose County Multi Jurisdiction Hazard Mitigation Plan is also included in the appendix (*Appendix 1: Resolution Adopting the Appanoose County Multi Jurisdiction Hazard Mitigation Plan to Replace the Mystic Hazard Mitigation Plan)*.

Introduction

Purpose and Committee

The purpose of the Hazard Mitigation Plan is to identify steps to prevent or reduce the impact of disasters on the residents and property in the City of Mystic in Appanoose County. This is accomplished through compliance with the Federal Emergency Management Agency's (FEMA) Mitigation Planning Regulations under Code of Federal Regulations (CFR), Title 44, Part 201 (Standard 44 CFR 201.4, 44 CFR 201.5)Administrative Code 29C 605-7.3(4)(d)(1)(2).

The development of the Mystic Hazard Mitigation Plan is the result of the input from elected officials, emergency management and other governmental personnel, agency representatives, business people, interested citizens, and incorporates elements from the Appanoose County Multi-jurisdictional Plan presently being developed and the State of Iowa Hazard Mitigation Plan.

As the cost of disasters continue to rise, it became evident that more pre-disaster steps are necessary if we expected to reduce the damage that can affect the community we live in. Hazard mitigation plans are intended to break the cycle of losses from various disasters. The City Council of Mystic asked for the assistance of Chariton Valley Planning and Development Council of Governments, to write and aid in the development of their Hazard Mitigation Plan. An award for funding has been received from FEMA to develop the Appanoose County Multi-Jurisdictional Plan in 2008 in which the City of Mystic is included.

This plan identifies all of the natural hazards that affect and risks that pose a threat to the City of Mystic and the surrounding area. A hazard analysis, which is a part of this Plan, provides a better understanding of each hazard, knowledge of the impacts the hazard could have on the City of Mystic, and a prioritized list of actions for each hazard identified as a possible threat to the City. By assessing the current mitigation actions already in effect, evaluating alternatives, prioritizing and outlining a strategy for implementation the Hazard Mitigation has been developed and written. See Hazard Mitigation Committee and City Council List below;

Mystic City Council

Frankie Belzer – Mayor

Chris Chester – City Council

Christina Kieltyka – Mystic City Council

Shawn Oden – Mystic City Council

Chris Chester – Mystic City Council

Patsy Seals – Mayor Pro Tem

Mystic Hazard Mitigation Planning Committee

Karen Poolman – City Clerk

Chris Chester – City Council

Phil Hudson – Mystic Fire Department

Patsy Seals – City Council

Frankie Belzer – Mayor

Kathy Hudson – Mystic Fire Department

Jeremy Hudson – Mystic Fire Department

Justin Hudson – Mystic Fire Department

Pat Tresemer – Centerville Community School District

John Dawson – Community Development Planner, Chariton Valley Planning and Development

Dawson led the committee through the planning process by using FEMA guidance and planning best practices. Tresemer was appointed by the Centerville Community School District to the Mystic Planning Committee at the same time as her appointment to the Appanoose County Planning Committee; this occurred after the first two Mystic meetings took place. Phil Hudson served a very active role during the committee meetings with providing ideas and feedback, especially on current mitigation and emergency response actions. He was also appointed to the Appanoose County Planning Committee to represent Mystic for the City's incorporation into that plan as well. Poolman played a large role in keeping the process organized and with helping to set up meetings and keeping them on track.

While the contribution of these members have been more specifically identified, all of the committee members provided feedback and played integral roles in developing the plan. In addition to attending meetings, each member was asked to review drafts of the plan when presented, score hazards not completed during meetings, and provide ideas or feedback on research compiled for the plan. No specific roles were assigned to committee members other than Tresemer being appointed as the school district representative. There were not a chair of the committee or any other formal roles nor did the experience of the committee support the need for one during this initial planning process.

Aside from the individuals involved in the committee meetings, there were no other contributions from other sources directly. Information relevant to Mystic that was discussed during the Appanoose County committee meetings was discussed in Mystic meetings resulting in small modifications to the Mystic Plan on a couple of occasions. Incorporation of this plan with the Appanoose County Multi-Jurisdiction Hazard Mitigation Plan will afford additional opportunities for external contributions.

What is a Hazard Mitigation Plan?

Generally the first question asked when communities begin the process of preparing a Hazard Mitigation Plan is very simply "What is a Hazard Mitigation Plan and what is its intended purpose?" First, it is imperative to define what precisely the term mitigation entails. One definition of the term is stated perhaps most effectively by the Federal Emergency Management Agency (FEMA) and is as follows:

> "Mitigation is defined as any sustained action taken to reduce or eliminate long-term risk to human life and property from a hazard event. Mitigation, also known as prevention (when done before a disaster), encourages long-term reduction of hazard vulnerability. The goal of mitigation is to decrease the need for response as opposed to simply increasing the response capability." *(www.fema.gov)*.

A mitigation plan is a document that is intended to accomplish several things. First, through the planning process the hazards that pose a risk to the community are identified. Second, an assessment of the hazards is made that takes into account historic occurrence, the number of people impacted, the area of the community affected, potential costs that the City, individuals, and organization may incur, the likelihood of future occurrence, and the amount of warning time before an event occurs.

Once the assessment is completed, a list of current and historic mitigation efforts are evaluated. Through this discussion, areas that can be improved upon are identified and developed into "action steps". Every action step should, if implemented, work toward one or more of the goals of the plan. An action step may suggest continuing a current mitigation effort or propose a new project altogether.

Finally, once the hazards have been assessed, mitigation steps have been identified, and action steps have been prioritized, the plan makes some suggestions for implementation and makes estimates as to the costs of implementation. Some proposed projects are small in scope and thus relatively low cost. However, other projects are broad in nature and would require more funding than the local community can reasonably provide. Therefore, the final piece of the plan suggests methods to implement the plan, how to keep the public involved, and what steps should be taken by local government to ensure that the concept of hazard mitigation is always a priority.

When implemented appropriately, mitigation projects can save lives, reduce property damage, save public monies, and protect the environment. Mitigation can reduce the enormous cost of disasters to property owners and all levels of government. In addition, mitigation can protect critical community facilities, reduce exposure to liability, and minimize community disruption.

The Planning Process

The Mystic City Council and Hazard Mitigation Planning Committee developed the Hazard Mitigation Plan along with Chariton Valley Planning and Development Council of Governments. The Committee consisted of individuals that expressed interest in serving on the committee including elected officials, a school representative, and local firefighters.

The committee met six times between September 2008 and August 2009. All meetings complied with the Iowa Open Meetings Law. This simply means all sessions were open to the public. The initial Hazard Mitigation Planning Meeting took place on September 25, 2008. The Mystic Plan started initially as separate from the Appanoose County Multi-Jurisdictional Plan in order to meet the more aggressive timeline afforded by a FEMA waiver which enabled the city to proceed on a property acquisition program. Final approval of Mystic's property acquisition hazard mitigation grant proposal was received on January 26, 2009 beginning the one-year window in which this plan is required to be FEMA approved and locally adopted.

The first open meeting took place at the Centerville City Hall in Centerville, Iowa, with The Mystic Hazard Mitigation Committee, Appanoose County officials, neighboring communities, Towns and Cities that will be involved and included in the Appanoose County Multi-jurisdictional Plan. The development of this local plan will be an example of the development of the plan for the rest of the County and will be incorporated into the County Plan upon the latter's completion. The need for each town's profile information, listing of critical facilities, and identification of the natural hazards that Mystic and the surrounding areas and towns are most susceptible were points of discussion. The discussion by those present involved the level of impact, severity and probability; however, details were not explored at length largely out of limited familiarity with possible local hazards. As a result, research by Dawson revealed additional data and relevant information and submitted for review by the Planning Committee. This information was reviewed and comments and other input collected from the Planning Committee and incorporated in the draft of the Plan in preparation for the second meeting. In addition, informational brochures were distributed to help garner public interest in the disaster planning process and thinking about what does happen, what could happen, and how to respond (see *Appendix 2: Informational Brochure*).

The second meeting for the Mystic Hazard Mitigation Planning Committee took place on January 8, 2009. At this meeting the Committee reviewed the hazard profiles that they preliminarily chose to address in a previous questionnaire. Some of the hazards were eliminated once the data that had been collected for them failed to meet a "credible risk" test. To be a credible risk, agreement from each of the members that the past occurrences, probability of future occurrences, and background information be applicable to Mystic

such that a hazard event would be plausible and require city response. Some of the parallel considerations made included the city's role in addressing the hazard such as where the issue is generally handled at the county level in the case of public health and agricultural issues. Another consideration was the recommendation from a preliminary FEMA review of the plan to eliminate some of the hazards that were less plausible in terms of occurring in Mystic at a significant level.

On February 10, 2009 Dawson held an open house at Mystic City hall from 3 pm to 6pm to enable the public a chance to engage with Dawson about the plan. The purpose of this open house was to present portions of the plan and the research to anyone that was interested so that if there were questions or concerns, those could be addressed. Likewise, any additional information that people may have could also be included in the plan. Several handouts were available including a summary of the partial hazard scores, a handout with general information for the public, and a simple questionnaire to obtain feelings on possible mitigation strategies. Unfortunately, no members of the public showed up. However there was a city council meeting scheduled immediately following the open house and Dawson requested the opportunity to speak to the members of the public that were present for it. Dawson briefly covered the plan and its progress as well as distributed business cards and invited anyone with questions to contact him.

Dawson addressed the Mystic City Council on April 2, 2009 to introduce some of the next steps that the planning committee would be taking and to once again invite citizens to participate or contact Dawson with any questions or concerns they may have.

The Planning Committee met on May 14, 2009 to finalize the hazard ranking begun in January with the initial hazard scoring. Following this step, the discussion turned to brainstorming potential mitigation actions and draft goals and objectives. During this brainstorming some discussion on current mitigation activities was conducted.

On June 1, 2009 the committee gathered to finalize the goals and objectives proposed at an earlier meeting among other tasks. Dawson presented a map of Mystic for attendees to indicate locations of critical facilities previously discussed, Phil Hudson completed the most detailed map. Dawson used this copy to expand digital base maps so that hazard extents could be overlaid, especially flood plains. The committee then used a chart from Dawson to match up discussed and some proposed mitigation actions to the hazards list.

The committee met on June 16 primarily to evaluate the mitigation actions which Dawson organized into charts and compared to the goals and objectives the committee identified. Dawson presented an early version of an administrative section of the plan pertaining largely to plan updates.

The full plan draft was presented to the committee by Dawson on June 30, 2009 after compiling the various elements of the plans. Between June 16 and June 30, Dawson requested missing pieces of information from committee members as well as feedback on a revised administrative portion introduced at the last meeting. Following discussion of the plan draft and incorporation of comments, the plan was submitted for its 30 day public review. The plan was made available at the Mystic City Hall and at the Chariton Valley Planning and Development office in Centerville.

To insure the opportunity for participation a letter was sent to all communities in Appanoose County and letters were sent to surrounding counties prior to the orientation meeting. Similarly, announcements of public meetings were published in the Daily Iowegian which is distributed throughout the county and/or posted at Mystic City Hall. The public open house was held to allow anyone with an interest in what was

taking place in the process and the to-date results of the process to stop in, see the progress, and offer comments and ask questions. In addition, a website set up for the Appanoose County process included a sub-page on Mystic and included a calendar showing upcoming meetings and locations.

See *Appendix 3: Planning Process Invitations* for a list of parties invited to participate in the Appanoose County Multi-Jurisdictional and Mystic Local Hazard Mitigation Plans as well as sample letters. Meeting minutes, agendas, and sign-in sheets may be found in the amendments to this plan, public copies of this plan may omit the amendment at the City's discretion as personal contact information may be included.

Materials Reviewed

In the preparation of the Mystic Hazard Mitigation Plan, various materials were reviewed that provided which informed the development of this plan. Important documents among these include various FEMA 386 "How to" guidebooks, Iowa's *Hazard Analysis and Risk Assessment: 2007 Local Guide*, and *Iowa Hazard Mitigation Plan: Iowa Comprehensive Emergency Plan September 2007*.[11] Other sources of information include:

- Iowa Department of Natural Resources
- Iowa Department of Transportation
- U.S Census Bureau
- Environmental Protection Agency
- United States Geological Survey
- Federal Emergency Management Agency
- ADLM - Emergency Management
- National Weather Service
- National Climatic Data Center (NCDC)
- Iowa Homeland Security and Emergency Management Division

Wikipedia and Sperling's Best Places were used along with past newspaper clippings for an overview of the community and its history. Other materials were consulted and utilized in this plan as well, most of which indicated in the sections where they were used.

[11] This document can be found on either of the following websites; http://www.iowahomelandsecurity.org/AboutUs/SecuringCommunities/Mitigation/tabid/98/Default.aspx or http://www.iowahomelandsecurity.org/Partners/CountyCoordinators/Planning/tabid/108/Default.aspx

Community Profile

Geography

The City of Mystic is located in northwest quadrant of Appanoose County, Iowa in the south-central sector of Iowa at coordinates 40° 46′ 43.02″ N, 92° 56′ 41.76″ W., *see Appendix 4: Location of the City of Mystic, Iowa map*. Elevations in Mystic peak at 1,050 feet above sea level, with an average elevation of 899 feet, *see Appendix 5: Mystic Topographic Map*. Mystic has a total land area of 2.9 square miles and is primarily served by county highway T14.

The terrain on which Mystic is built is generally the undulating topography that characterizes the rolling hills of the Southern Iowa Drift Plain. A former coal mining community, the city has many steep hills and valleys with an underground labyrinth of abandoned mines and aquifers; see *Appendix 6: Location of Mines and Mine Entrances in and near Mystic*.

Major Rivers and Surface Water Systems

No major rivers run through or near Mystic, however Walnut Creek does and is located in the area where the August 2007 flood damage took place. Little Walnut Creek runs north of Mystic, both creeks feeding into the Chariton River which is about two miles north east of Mystic. Rathbun Lake is located a little over two miles north of Mystic and is the primary source of drinking water in the region. Rathbun Lake is also a significant recreational resource for the broader region. See *Appendix 7: Water bodies and Resources near Mystic*. Mystic is located in the Upper Chariton Watershed, see *Appendix 8: Appanoose County Watersheds*.

Climate

Mystic's climate is not unlike those of most cities in the Midwest. Mystic has a climate of continental character. Because Mystic is far away from the moderating influence of a large body of water, a wide variation is experienced in both temperature and precipitation during the four, distinct seasons. Temperatures for the Mystic area have been recorded as high as one hundred ten (110) degrees Fahrenheit in 1911 and as low as low as negative twenty eight (-28) degrees Fahrenheit in 1912. Precipitation also varies substantially in a climate such as Mystic's, however, the average annual precipitation of approximately 36.2 inches of rainfall. Most of this is May through September, generally over four inches per month.

Summer precipitation results primarily from thunderstorm activity, although longer less intense rains are not uncommon in the area. Other forms of precipitation recorded in the area include: snow, hail, ice pellets, and sleet. The most snow received in a single month was twenty four (24) inches in December 2000.

Vegetation

Originally the land surrounding and including Mystic was covered with deciduous forest; this vegetation is now predominant only along the banks and flood plains of watercourses. The original cover has been reduced to make room for additional cropland and construction of houses and businesses in suitable areas.

Tree cover can also be found throughout the community in residential areas, parks, and cemeteries. These remaining trees contribute to the aesthetics of the community and are viewed as an asset.

Soils Information

The majority of soils in the Mystic area are loams with the largest proportion being Kniffen Silt Loam with 2% to 5% slopes comprising 13.4% of the acres in and immediately around Mystic. Gullies and rocky outcroppings are found in and immediately around Mystic as well as steep slopes and areas of severe erosion. See *Appendix 9: NRCS Web Soil Survey for Mystic Area*.[12] Mystic is located in the Southern Iowa Drift Plain.

History / Development Trends

Mystic was founded in the mid-1800's and coal mining dominated the local economy and culture by the mid-1860's. Coal outcroppings near the Walnut or Little Walnut Creek were discovered and became the initial driver of mining activities. Homes and businesses grew up around these new mines and still sit above old mines and among mine shafts.

Once Mystic was connected to surrounding areas, the town thrived. In 1910, "the interurban" train connected Mystic and Centerville providing additional access to the town for workers and for coal shipments. By this time the town had several general stores, dentist offices, restaurants, and other shops and lodges.

Coal mining began to decline in Appanoose County with the advent of mechanized mining more suited to mines to the east. Following this railroad service declined and ultimately the mines in Mystic were closed. Between 1920 and 1930, the population of Mystic declined by 30%. The regional population and economic decline led to a civic movement in the county for a new economy which saw as a significant milestone in the 1971 dedication of the Rathbun dam and creation of Rathbun Lake to the north of Mystic. Significant development has not occurred since the area began to decline and based on population projections, is not anticipated to occur in the future without significant economic changes in the region.

[12] Natural Resource Conservation Service web soil survey interactive mapping can be found on the NRCS website; http://websoilsurvey.nrcs.usda.gov/app/

Population and Demographics

As of the 2000 Census, the total population of Mystic was 588 with a total of 207 households. This is up 43 persons since the 1990 Census count of 545 people; a total growth of 7.3%. In 1990 there were 202 households (*Table 1*). According to Iowa State University's Regional Capacity Analysis Program[13] (ReCAP), Appanoose County has faced consistent population decline since the 1930s with declines of 18-19% for three Census periods. This decline corresponds largely with the closure of coal mines which once were the primary economic driver in the region. There was slight growth between 1970 and 1980 of about 3% but then a drop of over 11% between 1980 and 1990. Given the population trends for the rest of the county, and in fact for surrounding counties as well, there is little reason to expect Mystic to differ significantly in the future should current and past trends continue.

Table 2: Mystic Population

Year	Total	Under 5	5 to 17	18 to 64	65+
2000	588	38	131	347	51
1990	545	21	151	286	83

Source: US Census Bureau

At Risk Groups

The elderly are often identified as an "at risk group" for various reasons including potential health frailties and mobility challenges. Likewise younger populations are at potential risk due to lack of familiarity with disasters and especially with actions to take in the event of a disaster. However, young people may have more preparation due to school drills that may not be as well known among populations over the age of 18. The elderly population of Mystic was about 9% of the total population as of the 2000 Census; young people comprised about 29% with only about 6% of young people under age 5 (*Table 2*).

Table 3: Mystic Potential At Risk Populations

Population 65+			
Male	Female	Total	Proportion 65+
25	26	51	8.67%

Youth Population			
Under 18	Under 18 Proportion	Under 5	Under 5 Proportion
169	28.74%	38	6.46%

Source: US Census Bureau

Population Projections

Population projections for areas with small populations are difficult to make accurately. In the absence of any reason to expect Mystic to differ from Appanoose County demographic trends and the challenges of small area projections, the County trends are extrapolated and applied to Mystic as a reasonable projection. Woods and Poole Economics, Inc. provided population projections for each of the counties in Iowa in 2007 for 2010 through 2030.[14] Appanoose County is projected to continue to lose population through 2030, but the losses are far more stable than in previous years (*Table 3*). Cumulative projected loss for Appanoose County and by extension, Mystic, is about 7% suggesting that by 2030 Mystic's population could be 665. See Table 3 for the Woods and Poole population projection for Appanoose County.

[13] Historic Population Census data is available for the State of Iowa through ReCAP at the following website; http://www.recap.iastate.edu/atlas/population/population-historical.php.

[14] The Iowa State Data Center has made these projections available to the public reprinted with permission from the document "2007 State Profile: Iowa"; http://www.iowadatacenter.org.

Table 4: Woods & Poole Population Projection for Appanoose County

Area	2000	2005	2010	2015	2020	2025	2030
Appanoose	13,704	13,584	13,268	13,081	12,928	12,811	12,739
Percent Change		-0.88%	-2.38%	-1.43%	-1.18%	-0.91%	-0.57%

Source: Iowa State Data Center, http://www.iowadatacenter.org

Income

In the 2000 Census, median household income for Mystic was $25,568, up from $12,500 in the 1990 Census. Nearly two-thirds of the households in Mystic (57%) had incomes under $30,000 annually (*Table 4*). Of the 588 residents of Mystic, 129 were determined to be under the Federal Poverty Guidelines in 1999 comprising about 22% of the population.

Table 5: Household Incomes in Mystic (2000)

	Total	> $15,000	$15,000 - $29,999	$30,000 - $49,999	$50,000 +
Households	207	55	63	56	33
Percentage	100.00%	26.57%	30.43%	27.05%	15.94%

Major Local Employers

Listed in the table below are the ten largest employers employing Mystic residents in Appanoose County according to the Iowa Department of Economic Development.

Table 6: Major Employers in and Around Mystic

Employer	Location
C & C Machining	Centerville
Curwood Inc	Centerville
Iowa Steel and Wire	Centerville
West Enterprises	
Centerville Community School District	Centerville & Mystic
Mystic Fire Department	Mystic
Rathbun Marina	Moravia
Young's Salvage and Trucking	Mystic
ZKO Enterprises	Mystic
Zaputil Trucking	Mystic

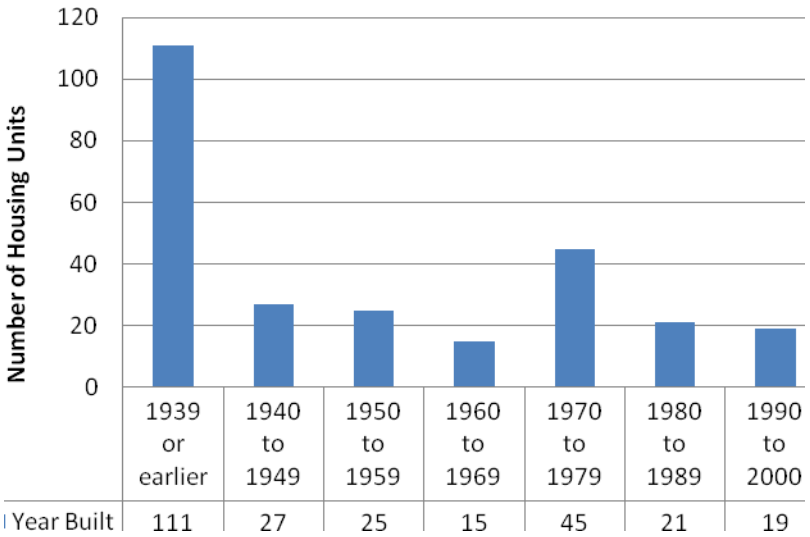
Source: Iowa Department of Economic Development, Location One Information Service, Hoovers

Housing Information

Age of Housing

Much of the housing stock (42%) in Mystic was constructed before 1940 suggesting that the structural integrity of the buildings likely does not met newer building codes designed to ensure the safety of residents (*Figure 1*). These structures are likely the most vulnerable to various hazards due to their age and the difference in construction techniques which have improved in many ways since they were built. Mystic does not enforce building codes at the time this plan was being developed. Median year built of the homes in Mystic is 1948, meaning that half of the homes were built before and half after this year. Another potential concern is the prevalence of LP gas used as heating fuel in the homes in Mystic; 74% of homes use LP gas as heating fuel (US Census Bureau). While LP tanks can be safe forms of fuel containment and transport, liquefied petroleum gas is flammable and can explode. LP gas is heavier than air and so it will sink to the lowest level possible; if inhaled it can cause asphyxiation through oxygen deprivation but is otherwise nontoxic.

Figure 27: Year Built of Housing Stock in Mystic (2000)



Source: US Census Bureau

Condition of Housing

While a comprehensive evaluation of the housing stock in Mystic has not yet been completed, preliminary conclusions can be drawn. Quality of housing in terms of state-of-repair and outwardly maintenance varies significantly. Some homes are clearly poorly maintained, some of which may well be ones damaged by the August 2007 floods, while others may lag due to limitations on financial resources of the inhabitants. Other homes, while often older, do appear to be in good repair.

Value of Housing

About one third (31.5%) of the housing stock in Mystic was valued at less than $20,000 as of the 2000 Census and no homes were valued above $125,000 (*Table 6*). Median housing valuation was $32,200 in 2000.

Table 7: Housing Values in Mystic (2000)

Mystic Housing Values: Owner-occupied Homes					
Value	> $20,000	$20,000 to $34,999	$35,000 to $49,999	$50,000 to $69,999	$70,000 +
Number of Homes	58	48	41	24	13

Source: US Census Bureau

Housing in Hazard Areas

There are eight known homes in proven flood hazard areas that are attempting to take part in a housing buy-out program following damage from flooding in August 2007. There may be other homes and other structures in flood hazard areas; however a full assessment has not yet been conducted.

Many other homes are located above known and estimated former coal mines. There are 33 mobile homes in Mystic as of the 2000 Census, also known as manufactured homes, comprising about one-sixth of the local housing units. These homes are subject to greater risk from high winds and tornadoes even when anchored to solid foundations comparable to those for site-built homes.

Transportation

Mystic is served by one primary county highway, T14; four local roads provide access into and out of Mystic. Most of the roads in Mystic are gravel though some areas are paved with brick. There is a railroad track that runs through town, see *Appendix 10: Transportation Routes in and around Mystic*.

Capabilities

In the process of developing this Hazard Mitigation Plan, an evaluation of the City's capabilities and assets was conducted. This evaluation was conducted through a survey distributed to the City in January 2009 consisting of the State's reporting form and requesting that the City indicate whether or not each of the "capabilities" are present and other information as applicable. The State of Iowa requires a list of these capabilities and how they are incorporated into the Hazard Mitigation Plan as well the converse, how the Hazard Mitigation Plan can be incorporated with them. One limitation to this reporting requirement is how the various "capabilities" are named by the State as part of their reporting form and how they may be known on the local level. As a result, some capabilities may be reported that may or may not fully satisfy the State's intended purpose.

As with many small, predominantly rural communities in Iowa, the planning culture is not prominent and many of the capabilities that larger cities may have are not present or are largely unknown locally. For example, Mystic does not have a zoning ordinance or comprehensive plan. Below is a list of the "Capabilities" present in the City of Mystic as reported by City Hall with some modifications based on inconsistent information found during plan research.

	Present / qualification	Method of Incorporation
Planning Capabilities		
Local Emergency Plan	yes county EOP	Reviewed during this plan's development
County Emergency Plan	yes county EOP	Reviewed during this plan's development
Local Recovery Plan	unknown	To be verified for plan update
County Recovery Plan	Presumably the EOP	EOP reviewed during this plan's development
Local Mitigation Plan	in process - hazard mitigation plan	This plan
County Mitigation Plan	in process - hazard mitigation plan	The contents of this plan are being incorporated in the Mystic section of the County Plan
Local Mitigation Plan (PDM)	No	
County Mitigation Plan (PDM)	no	
Economic Development Plan	in process - regional CEDS	N/A
Transportation Plan	yes regional plan	Mapping data from Long Range Transportation Plan update incorporated in this plan
Policies/Ordinance		
Floodplain Ordinance	Presumably yes	Mitigation action proposed
Nuisance Ordinance	unknown	To be verified for plan update
Storm Water Ordinance	unknown	To be verified for plan update
Iowa Wetlands and Riparian Areas Conservation Plan	unknown	To be verified for plan update
Debris Management Plan	in process - ADLM	Not incorporated
National Flood Insurance Program (NFIP) Participant - Nondelegated	yes	FIRM, repetitive loss properties, and NFIP number included in this plan
Hazard Awareness Program	in process - hazard mitigation plan	Public education mitigation actions identified
Program		
ISO Fire Rating	yes	Rating listed in this plan
Economic Development Program	in process - regional CEDS	N/A
Public Education/Awareness	yes ADLM	Radon literature available at ADLM facilities
Property Acquisition	yes - following 2007 flood	City is in the process of acquiring properties as of the completion of this plan
Engineering Studies for Streams (Local/County/Regional)	yes USDA	Not incorporated
Mutual Aid Agreements	yes	Utilized for fire protection and HazMat containment

Studies/Reports/Maps		
Hazard Analysis/Risk Assessment (Local)	in process - hazard mitigation plan	This plan
Hazard Analysis/Risk Assessment (County)	in process - hazard mitigation plan	See Appanoose County HMP, scheduled to be complete in 2010
Flood Insurance Maps	yes, 1/30/1976	Included in the appendix
Evacuation Route Map	unknown - may be in EOP	To be verified for plan update or be developed with ADLM's help
Critical Facilities Inventory	yes	Developed for and included in this plan
Staff/Department		
Development Planner	yes CVPD	CVPD wrote this plan with the City's help
Emergency Management Coordinator	yes ADLM	Has participated in some County-level HMP meetings
NFIP Floodplain Administrator	City Clerk	Has participated throughout the development of this plan
Bomb and/or Arson Squad	county PD	Not directly incorporated
Emergency Response Team	county PD/vol fire & rescue	Fire department participated in this plan process
Hazardous Materials Expert	regional coverage	Not directly incorporated
Local Emergency Planning Committee	yes, Appanoose County LEPC	LEPC invited to participate in planning process
County Emergency Management Commission	yes, Appanoose County LEPC	LEPC invited to participate in planning process
Sanitation Department	not municipal	Not directly incorporated
Planning Consultant	yes CVPD	CVPD wrote this plan with the City's help
Regional Planning Agencies	yes CVPD	CVPD undertakes projects throughout the region including Mystic
Non-Governmental Organizations (NGOs)		
American Red Cross	yes regional coverage	Not directly incorporated
Salvation Army	yes regional coverage	Not directly incorporated
Veterans Groups	yes county coverage	Not directly incorporated
Environmental Organization	unknown	To be verified for plan update
Utility Companies	yes county coverage	Invited to participate at county level, meeting notices published in newspaper
Community Organizations (Lions, Kiwanis, etc.	yes Masons	Not directly incorporated, meeting notices published in newspaper

Source: City of Mystic and research by Chariton Valley Planning and Development

Since there are not conventional planning mechanisms currently in place in Mystic, any future development of such mechanisms should consider the goals and objectives detailed in this plan as well as the mitigation actions evaluated here. For example, if Mystic determines that there is a need for a comprehensive plan, this document and process would need to review this hazard mitigation plan for any and all relevant elements. Likewise, budgetary development should consider mitigation actions and incorporate them as applicable. The development of ordinances that restrict future development should consult the hazard areas identified in this plan and consider the goals and objectives in this plan.

Updates to regional or county-wide plans will be addressed in the Appanoose County Multi-Jurisdiction Hazard Mitigation into which this plan will be incorporated. To the extent practicable, updates to county-wide or regional plans will refer to the hazard mitigation plans in place and include elements from such plans where applicable.

Municipal Water Supply

Mystic's municipal water is supplied by Rathbun Rural Water Association.

Fire Insurance Rating

The City of Mystic has a fire insurance rating of 8 on a scale of 1 to 10 with 1 representing exemplary public protection. A rating of 10 indicates that a community's fire suppression program does not meet minimum requirements of ISO. ISO is an organization that provides data, analysis, and decision-making support for various professions about risk.

National Flood Insurance Program Information

The City of Mystic is a participant in the National Flood Insurance Program (NFIP); the city's NFIP number is 190010. The current effective map is dated 1987; Mystic was originally mapped in 1974. As with many of the small communities in the area, the flood plain manager is also the city clerk for participating communities according to the Iowa Local Flood Plains Program Contact, Bill Cappuccio, at the Iowa DNR. See *Appendix 11: FEMA Firmette for the City of Mystic*. There are no repetitive loss properties in Mystic according to Cappuccio. The City is currently engaged in a property acquisition program to purchase and demolish homes damaged in 2007 floods with FEMA's assistance. Only one homeowner participating in this program had purchased flood insurance.

Assets

The valuations for the City of Mystic are available through the Appanoose County Assessor's Office. The County Assessor was asked to provide valuations and number of buildings based on the Occupancy Classes in the below chart. Following the hazard profiling in this plan, this type of information is used for estimating potential losses. However the number of "government" structures following the hazard profiles is adjusted to reflect additional infrastructure noted and not captured by this chart.

Type of Structure (Occupancy Class)	Number of Structures	Total Valuation	Average Valuation
Residential	227	$6,445,315.00	$28,393.46
Commercial	3	$640,280.00	$213,426.67
Industrial	0	$0.00	
Agricultural	Not given	$600,136.00	

Religious / Non-profit	1	Not given	
Government	1	Not given	
Education	1	Not given	
Utilities	0	$0.00	
Total	233	$7,685,731.00	

Waste Water Collection and Treatment

There is a wastewater lagoon on a hill southeast of Mystic. About 30 to 35 homeowner and public pumping stations are present in town. Details of the system from the wastewater permit are as follows;

Design PE	Design BOD	Design ADW Flow (MGD)	Design AWW Flow (MGD)	Operator Certification Facility Type	Operator Certification Facility Grade
725.00	121.00	0.07	0.07	WL	I

Source: IA DNR, http://www.iowadnr.com/water/npdes/holders.html

Utilities

There are no other municipal utilities provided by the City of Mystic.

Cultural Resources

Cultural resources are buildings, places, and objects that have significance to an area's history and dominant culture. This could include historic buildings, the location of some event that impacted the area's history – in some areas of the country this could include Civil War battlegrounds, and sites of cultural events such as fairs or local festivals. It is important to address cultural resources as the loss of them may have devastating effects on an area. Historic buildings may be particularly expensive to replace or restore if damaged or lost due to a disaster. By addressing them in a hazard mitigation plan, steps can be taken to identify these resources and possibly to preserve them from such unexpected loss.

Historic Sites

Not all historic buildings are registered on the National Registry of Historic Places, sometimes due to a lack of initiative and sometimes out of concern over additional regulation on those who live or work in or own the buildings. Whether such buildings are registered or not, they are still of historic significance for the community and part of the community's identity.

Currently, there are no buildings in Mystic that are on the National Registry of Historic Places, though there are 13 sites in Appanoose County, most in Centerville.

Archeological Sites

Archeological sites are often and relatively easily overlooked in preparing plans, including hazard mitigation plans. These locations are more sensitive to some hazards such as flooding since if they are damaged; there are few options for recovering them. If they are lost, they may well be a resource that is lost forever with potential detrimental effects on the community.

There is one archeological site in the southeast portion of Mystic and adjacent to this section outside of town, there are four additional sites. The exact locations of the sites are not publically available in order to

protect them from intentional damage or looting. More information may be obtained from the State Archeologists Office. See *Appendix 12: Archeological Sites in and near Mystic*.

Endangered Species

Endangered or threatened animal species in Appanoose County are confined to the Indiana Bat (endangered; *figure 2*). Plant species on the endangered species list includes the Western Prairie Fringed Orchid (threatened; *figure 3*) and the Prairie Bush Clover (threatened; *figure 4*). See the *Iowa List of Federally Endangered, Threatened, Proposed, and Candidate Species – by County* list available through the U.S. Fish and Wildlife Service for more information (not included in this plan).

Figure 28: Indiana Bat

Source: US Fish and Wildlife Service, photo by Adam Mann, Environmental Solutions and innovations, http://www.fws.gov/midwest/Endangered/esday/index.html

Figure 29: Western Prairie Fringed Orchid

Source: Iowa Department of Natural Resources, http://www.iowadnr.com/other/images/platanthera.jp

Figure 30: Prairie Bush Clover

Photo by USFWS: Phil Delphey

Source: US Fish and Wildlife Service, photo by Phil Delphey http://www.fws.gov/midwest/endangered/plants/prairieb.html

Identifying and Profiling Hazards

In order to properly identify mitigation strategies and activities, the hazards that may affect the city must be identified. This section lists the potential hazards to the city that were identified by the planning committee. This section also discusses previous occurrences of the hazards, the areas of the city most at risk from each hazard, and the populations most at risk. By identifying the hazards and quantifying the risks, the city can better assess current mitigation strategies, develop future mitigation strategies, and identify needed mitigation projects.

The hazards addressed in this plan were identified by taking the list of hazards from the Iowa Hazard Mitigation Plan (*Figure 5*) which were evaluated in relation to local conditions. Descriptions of the hazards and preliminary data on the impacts and the vulnerable populations and structures were taken largely from the State Plan supplemented with local knowledge during the meeting where the hazards were selected initially. There were hazards that clearly apply to Mystic, some that may or may not, and a few that clearly do not apply. The ones that do not apply were removed from the list of hazards that were detailed in the hazard profiles.

Figure 31: Hazards Identified in State Plan

Natural Hazards	Human Caused/Combination Hazards
Flash Flood	Human Disease Pandemic
Tornadoes	Fixed Hazardous Materials
Windstorms	Transportation Hazardous Materials Incident
Extreme Heat	Structural Fire
Hailstorms	Cyber Terrorism
Grass or Wild land Fire	Highway Transportation Incident
Sink Holes	Air Transportation Incident
River Flooding	Rail Transportation Incident
Severe winter storms	Bioterrorism
Levee Failure	Radiological Terrorism
Drought	Enemy Attack
Earthquakes	Pipeline Transportation Incident
Landslide	Fixed Radiological Incident
Dam Failure	Chemical Terrorism
Expansive Soils	Agro-Terrorism
Thunderstorm & Lightning	Human Disease Incident
	Waterway Incident
	Energy Failure
	Conventional Terrorism
	Public Disorder
	Structural Failure
	Communications Failure
	Animal/ Plant/ Crop Disease
	Radiological Transportation

Source: Iowa Hazard Mitigation Plan: Iowa Comprehensive Emergency Plan September 2007

The hazards that may or may not apply were predominantly human caused or combination hazards; these were evaluated by the planning committee as far as their local relevance. This was done by distributing a

survey to the planning committee for them to identify which hazards *have a chance of occurring in Mystic*. The only hazard unanimously identified as not likely in Mystic is radiological transportation hazards. However, some responses indicated that committee members thought that due to the presence of the railroad through Mystic, there may be a chance of a radiological incident. It should be noted that the survey incorrectly indicated that the state *designates* radiological transport routes, rather the state determined *likely* radiological transportation routes in the state hazard mitigation plan. See *Appendix 13: Hazard Perception Survey Results* for a summary of survey results received.

Radon and climate change as hazards were not included in this survey and were included following a discussion during a meeting of them in the hazard mitigation planning context. The climate change hazard profile was included due to its significant and broad impacts on the community, the fact that near term effects cannot be averted, and the growing recognition among planners and government agencies that communities will need to mitigate the negative effects locally.

This initial list of hazards that were identified as having a chance of occurring in Mystic was further refined following the Appanoose County Hazard Mitigation Committee's selection (*Appendix 14: Appanoose County Hazard Selection*). Two representatives from Mystic also serve on this committee and contributed to this discussion and were able to bring insights from the broader discussion to the Mystic Plan. Determining what *hazards are likely to occur* in Mystic was based on preliminary research conducted following the initial hazard selection and on local knowledge conveyed during committee meetings. The preliminary research on what hazards are likely to occur in Mystic consisted of the Description, Historical Occurrence, and Probability elements in the hazard profiles. This method of incorporating the information to determine what hazards *are likely* into the profiles themselves was used to avoid repetition of hazard information.

The potential hazards identified for the City of Mystic and discussed in detail below correspond to hazards identified by FEMA and the Iowa Department of Homeland Security with additional hazards locally identified. The list of hazards addressed in this plan is as follows:

Natural Hazards

- Flash Floods
- Tornadoes
- Windstorms / High Wind Events
- Extreme Heat
- Hailstorms
- Grass or Wildfire
- Sink Holes
- Severe Winter Storms
- River Flooding
- Drought
- Earthquake
- Landslide
- Dam Failure
- Thunderstorm & Lightning
- Radon

Human Caused and Combination Hazards

- Climate Change
- Air Transport Incident
- Rail Transportation Incident
- Highway Transportation Incident
- Transportation Hazardous Materials
- Human Disease Incident
- Fixed Hazardous Materials
- Energy Failure
- Communications Failure
- Structural Failure
- Structural Fire

Documented historic events are not always specifically noted for Mystic or other similar communities so some information in the following hazard analysis includes the entire Appanoose County area. Appanoose County contains 11 communities in relatively close proximity to one another and share similar topography,

land uses, and land cover in addition to sharing other socio-economic characteristics. Events that impact neighboring communities, likely impact or could impact Mystic.

Some information in the following hazard analyses is drawn from Iowa's *Hazard Analysis and Risk Assessment: 2007 Local Guide* and the *Iowa Hazard Mitigation Plan: Iowa Comprehensive Emergency Plan September 2007.*

State and FEMA Recognized Hazards not Detailed

The State of Iowa and FEMA recognize a certain list of hazards that all hazard mitigation plans are to address initially. However, not all hazards impact all areas, this brief section indicates what hazards are not addressed and why. Likewise, not all hazards were determined by the Mystic Planning Committee to be significant enough to include in this plan, though some may be reconsidered in the Appanoose County Multi-Jurisdiction Hazard Mitigation Plan which this one will be incorporated into.

Levees – There are no levees in Mystic as of the writing of this plan

Expansive Soils – The Mystic Planning Committee determined after some discussion to exclude this hazard in part due to the relatively slow speed of onset and to the fact that it is addressed in the State Plan. This hazard will be reconsidered in the Appanoose County Multi-Jurisdiction Hazard Mitigation Plan unless the respective planning committee excludes it as well.

Pipeline Transportation Incident – The Mystic Planning Committee determined that while a natural gas pipeline passes Mystic to the south, it is not within city limits and thus excluded from this plan. Pipeline incidents, including this particular line are anticipated to be addressed in the Appanoose County Plan.

Waterway Incident – There are no navigable waterways in Mystic. The nearest water body where boating can take place is Rathbun Lake to the north of town which does supply Mystic's potable water. Rathbun Lake will be addressed in the Appanoose County Multi-Jurisdictional Hazard Mitigation Plan rather than in the Mystic Plan.

Radiological Transportation – The state has identified likely routes that radioactive materials may be transported on, none of these routes pass through or near Mystic. The nearest of the potential routes passes through Monroe County, north of Mystic on the Burlington Northern Santa Fe rail line.

Human Disease Pandemic – The Mystic Planning Committee decided to exclude this hazard from this plan due to its inclusion in the State Plan and in anticipation of its inclusion in the Appanoose County Plan. Mystic does not have its own public health office or personnel.

Animal / Plant / Crop Disease – The Mystic Planning Committee decided to exclude this hazard from this plan due to its inclusion in the State Plan and in anticipation of its inclusion in the Appanoose County Plan. Mystic does include agricultural land within its municipal boundary, though it was not determined to be significant enough to be considered in this plan.

Agro-Terrorism – The Mystic Planning Committee decided to exclude this hazard from this plan due to its inclusion in the State Plan and in anticipation of its consideration for the Appanoose County Plan. The Planning Committee determined that Mystic is a sufficiently low priority target for terrorist activities to exclude this hazard.

Biological Terrorism – The Mystic Planning Committee decided to exclude this hazard from this plan due to its inclusion in the State Plan and in anticipation of its consideration for the Appanoose County Plan. The Planning Committee determined that Mystic is a sufficiently low priority target for terrorist activities to exclude this hazard.

Chemical Terrorism – The Mystic Planning Committee decided to exclude this hazard from this plan due to its inclusion in the State Plan and in anticipation of its consideration for the Appanoose County Plan. The Planning Committee determined that Mystic is a sufficiently low priority target for terrorist activities to exclude this hazard.

Conventional Terrorism – The Mystic Planning Committee decided to exclude this hazard from this plan due to its inclusion in the State Plan and in anticipation of its consideration for the Appanoose County Plan. The Planning Committee determined that Mystic is a sufficiently low priority target for terrorist activities to exclude this hazard.

Cyber Terrorism – The Mystic Planning Committee decided to exclude this hazard from this plan due to its inclusion in the State Plan and in anticipation of its consideration for the Appanoose County Plan. The Planning Committee determined that Mystic is a sufficiently low priority target for terrorist activities to exclude this hazard. This hazard was initially selected by the Committee based on the presence of personal computers in town; however following input from the Appanoose County discussion, it was removed from the Mystic list.

Radiological Terrorism – The Mystic Planning Committee decided to exclude this hazard from this plan due to its inclusion in the State Plan and in anticipation of its consideration for the Appanoose County Plan. The Planning Committee determined that Mystic is a sufficiently low priority target for terrorist activities to exclude this hazard.

Enemy Attack – The Mystic Planning Committee decided to exclude this hazard from this plan due to the consideration that Mystic is very unlikely to be a target in the event of an attack.

Fixed Radiological Incident – There are no radiological facilities (power plant, hospital, etc.) in Mystic, the nearest hospital is 2-3 miles away in Centerville.

Public Disorder – The Mystic Planning Committee decided to exclude this hazard from this plan due to the relatively small population of Mystic and the relative low likelihood of any significant public disorder event taking place in town.

Risk Assessment

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

In making their hazard analysis and risk assessment, the Mystic Planning Committee considered the following:

- Historical Occurrence

- Probability
- Vulnerability
- Maximum Threat
- Severity of Impact
- Speed of Onset

The following tables define each factor and the rating scale the Planning Committee used to assess the hazards risk to the community.

Historical Occurrence: Number of times that a hazard has occurred in the community in the past.

Rating	Number of Historical Occurrences
1	Fewer than 4 occurrences
2	4 to 7 occurrences
3	8 to 12 occurrences
4	More than 12 occurrences

Probability: Likelihood of the hazard occurrence, sometimes without regard to hazard history.

Rating	Likelihood	Frequency of Occurrence
1	Unlikely	Less than 1% probability in the next 100 years
2	Possible	Between 1 and 10% probability in next year, or at least one chance in the next 100 years
3	Likely	Between 10 and 100% probability in next year, or at least one chance in next 10 years
4	Very Likely	Near 100% chance in the next year

Vulnerability: Measure of the percentage of people and property that would be affected by the hazard event.

Rating	Magnitude	Percentage of people and property affected
1	Negligible	Less than 10%
2	Limited	10 to 25%
3	Critical	25 to 50%
4	Catastrophic	More than 50%

Maximum Threat: Spatial extent of the community that might be impacted.

Rating	Magnitude	Percentage of jurisdiction that can be affected
1	Negligible	Less than 10%
2	Limited	10 to 25%
3	Critical	25 to 50%
4	Catastrophic	More than 50%

Severity of Impact: Assessment of the severity in terms of fatalities, injuries, property losses, and economic losses.

Rating	Level	Characteristics
1	Negligible	Few if any injuries or illness. Minor quality of life lost with little or no property damage. Brief interruption of essential facilities and services for less than four hours.
2	Limited	Minor injuries and illness. Minor or short term property damage which does not threaten structural stability. Shutdown of essential facilities and services for 4 to 24 hours.
3	Critical	Serious injury and illness. Major or long term property damage, which threatens structural stability. Shutdown of essential facilities and services for 24 to 72 hours.
4	Catastrophic	Multiple deaths. Property destroyed or damaged beyond repair. Complete shutdown of essential facilities and services for 3 days or more.

The State of Iowa expands this evaluation element by specifically addressing nine factors of any given hazard's impacts. These factors are as follows;

J) Health and Safety of persons in the affected area at the time of the incident (injury and death)
K) Health and Safety of persons responding to the incident
L) Continuity of operations
M) Property, facilities, and infrastructure
N) Delivery of services
O) The environment
P) Economic and financial conditions
Q) Regulatory and contractual obligations
R) Reputation of the entity

Speed of Onset: Potential amount of warning time available before the hazard occurs.

Rating	Probable amount of warning time
1	More than 24 hours warning time.
2	12 to 24 hours warning time.
3	5 to 12 hours warning time.
4	Minimal or no warning time.

Hazard Analysis Summary

	Historical	Probability	Vulnerability	Threat	Impact	Onset	Comb.
Natural Hazards							
Flash Flood	3	3	2	3	3	4	18
Tornado	1	2	2	3	3	4	15
Windstorms / High Wind Events	4	4	2	3	3	4	20
Extreme Heat	1	3	3	3	2	2	14
Hailstorm	4	4	2	4	3	3	20
Grass / Wildfire	3	4	3	2	2	4	18
Sink Holes	1	2	1	1	1	4	10
River Flooding	1	2	2	2	3	1	11
Severe Winter Storm	4	4	4	4	4	3	23
Drought	2	2	1	1	1	1	8

Earthquake	1	1	1	1	1	1	6
Landslide	1	1	1	1	1	1	6
Dam Failure	1	2	3	2	4	4	16
Thunderstorm / Lightning	4	4	3	4	2	2	19
Radon	1	2	2	2	2	1	10
Human Caused and Combination Hazards							
Climate Change	2	4	3	3	1	1	14
Air Transport. Incident	1	1	1	1	1	4	9
Rail Transport. Incident	1	2	1	3	3	4	14
Highway Transport. Incident	1	3	1	1	1	4	11
Transport. Haz. Materials	1	2	2	2	3	4	14
Human Disease Incident	1	2	2	3	2	3	13
Cyber Terrorism	1	1	2	2	2	4	12
Fixed Hazardous Materials	1	3	2	3	3	4	16
Energy Failure	1	3	3	3	2	1	13
Communications Failure	1	2	2	4	2	4	15
Structural Failure	1	3	2	1	3	4	14
Structural Fire	1	3	2	2	3	4	15

Composite Scoring

FEMA and Iowa Emergency Management Department provides communities with a Cascading Event Matrix tool. This matrix analyzes each hazard and how each hazard has the potential to cause and affect other hazards. Based on the matrix scores and the scoring process for the risk assessment, each Mystic hazard was given a composite score. These composite scores are listed below.

	Profile Scores	Cascading	Composite
Natural Hazards			
Flash Flood	18	17	35
Tornado	15	11	26
Windstorms / High Wind Events	20	11	31
Extreme Heat	14	5	19
Hailstorm	20	5	25
Grass / Wildfire	18	10	28
Sink Holes	10	10	20
River Flooding	11	16	27
Severe Winter Storm	23	11	34
Drought	8	4	12
Earthquake	6	11	17
Landslide	6	9	15
Dam Failure	16	4	20
Thunderstorm / Lightning	19	16	35

Radon	10	1	11
Human Caused and Combination Hazards			
Climate Change	14	10	24
Air Transport. Incident	9	12	21
Rail Transport. Incident	14	18	32
Highway Transport. Incident	11	21	32
Transport. Haz. Materials	14	19	33
Human Disease Incident	13	5	18
Fixed Hazardous Materials	16	11	27
Energy Failure	13	20	33
Communications Failure	15	19	34
Structural Failure	14	21	35
Structural Fire	15	18	33

The cascading matrix score is important as is shows how one hazard can quickly lead to a larger, more disastrous event or more significant combination hazards. When examining the above table, some hazards such as flash flooding or structural failure received the highest composite scores. This occurrence is due to the fact that so many other events can result from or contribute to the severity of these types of incidents. These are two examples of how cascading events can result in exponential consequences; see *Appendix 15: Mystic Cascading Events Matrix* for the detailed chart.

Hazard Prioritization

	Composite Score Ranking	
High Risk Hazards	Flash Flood	35
	Thunderstorm / Lightning	35
	Structural Failure	35
	Communications Failure	35
	Severe Winter Storm	34
	Transport Haz. Materials	33
	Energy Failure	33
	Structural Fire	33
	Highway Transport Incident	32
	Rail Transport Incident	32
	Windstorms / High Wind Events	31
ate Risk Hazard	Grass / Wildfire	28
	Fixed Hazardous Materials	27

Once the Mystic Hazard Mitigation Committee had identified and scored the hazards, they examined each hazard in relation to the risk that hazard presented to the community. All of the identified hazards were then given a priority state. The Committee defined high-risk hazards to be those hazards that caused the substantial damage to the community in the past, have a high probability of occurring in the future, contribute to other hazards happening, or have the potential to affect a large proportion of the community. High-risk hazards were also considered to be the hazards for which immediate planning and mitigation activities were to be focused.

	River Flooding	27
	Tornado	26
	Hailstorm	25
	Climate Change	24
Acceptable Risk Hazards	Air Transport Incident	21
	Dam Failure	20
	Sink Holes	20
	Extreme Heat	19
	Human Disease Incident	18
	Earthquake	17
	Landslide	15
	Drought	12
	Radon	11

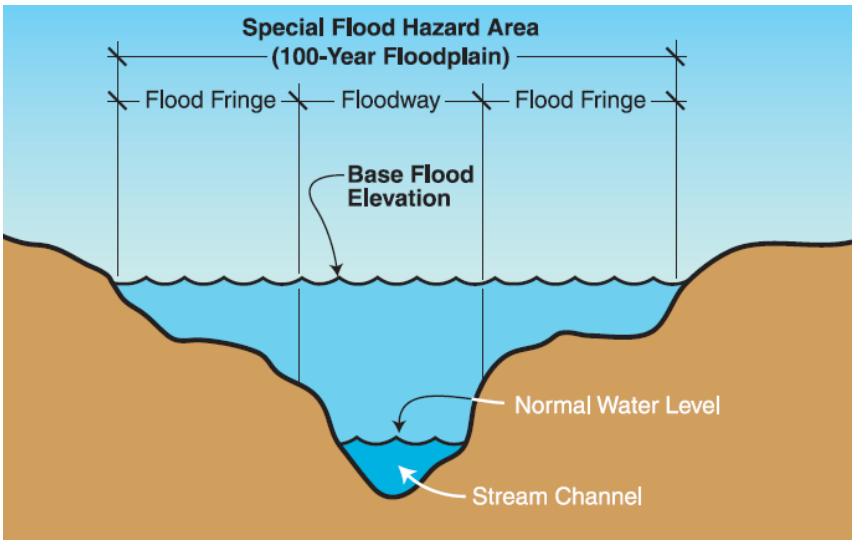
The Committee considered moderate-risk hazards to be those hazards that should be addressed by the community in the future, however the need for mitigation activities for these hazards was not considered to be as immediate. Finally, acceptable risk hazards were defined by the Committee as those hazards that, at the present time, have an acceptable level of risk. This does not mean that they are not of concern for the community. The hazards are listed below by priority.

Hazard	Flash Flood	
Definition	**Flash Flood**: A flood caused by heavy or excessive rainfall in a short period of time, generally less than 6 hours. Flash floods are usually characterized by raging torrents after heavy rains that rip through river beds, urban streets, or mountain canyons sweeping everything before them. They can occur within minutes or a few hours of excessive rainfall. They can also occur even if no rain has fallen, for instance after a levee or dam has failed, or after a sudden release of water by a debris or ice jam (National Weather Service).	
Description	Flooding causes more damage in the United States than any other severe weather related event, an average of $5 billion a year. Flooding can occur in any of the 50 states or U.S. territories at anytime of the year. Flash flooding can occur anywhere and is not confined to or near flood plains; once the soil is saturated, water will wash over it to lower lying areas. Damage is likely to be more severe in lower lying areas, but can occur at higher ground as well. The primary flood hazard in the City of Mystic is Walnut Creek which contributed to the damage incurred during the August 2007 flood. Flash flooding is an extremely dangerous form of flooding which can reach full peak in only a few minutes and allows little 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. Two common terms to describe areas that are prone to flooding are 100-year flood plain and 500-year flood plain. The meaning of these terms are often confused; though they sound like a flood in the designated areas only happens once every 100 or 500 years, this interpretation is incorrect. What the designation actually means is that for a 100-year flood plain, the chance of a flood occurring in any given year is 1% which is statistically about once every 100 years. Likewise, for the 500-year flood plain, the chance is .2% chance of a flood occurring in any given year. Floods may certainly occur more frequently in either flood plain designation, but these would be rare occurrences. Flash floods do not always occur in flood plains, during heavy downpours the capacity of the soil to absorb rain can be overwhelmed leading to water accumulating and running off of the surface of the land. Similarly with compaction of soil due to built infrastructure such as roads and buildings heavy rain is limited in its local soil infiltration capacity leading to runoff. This	Rating

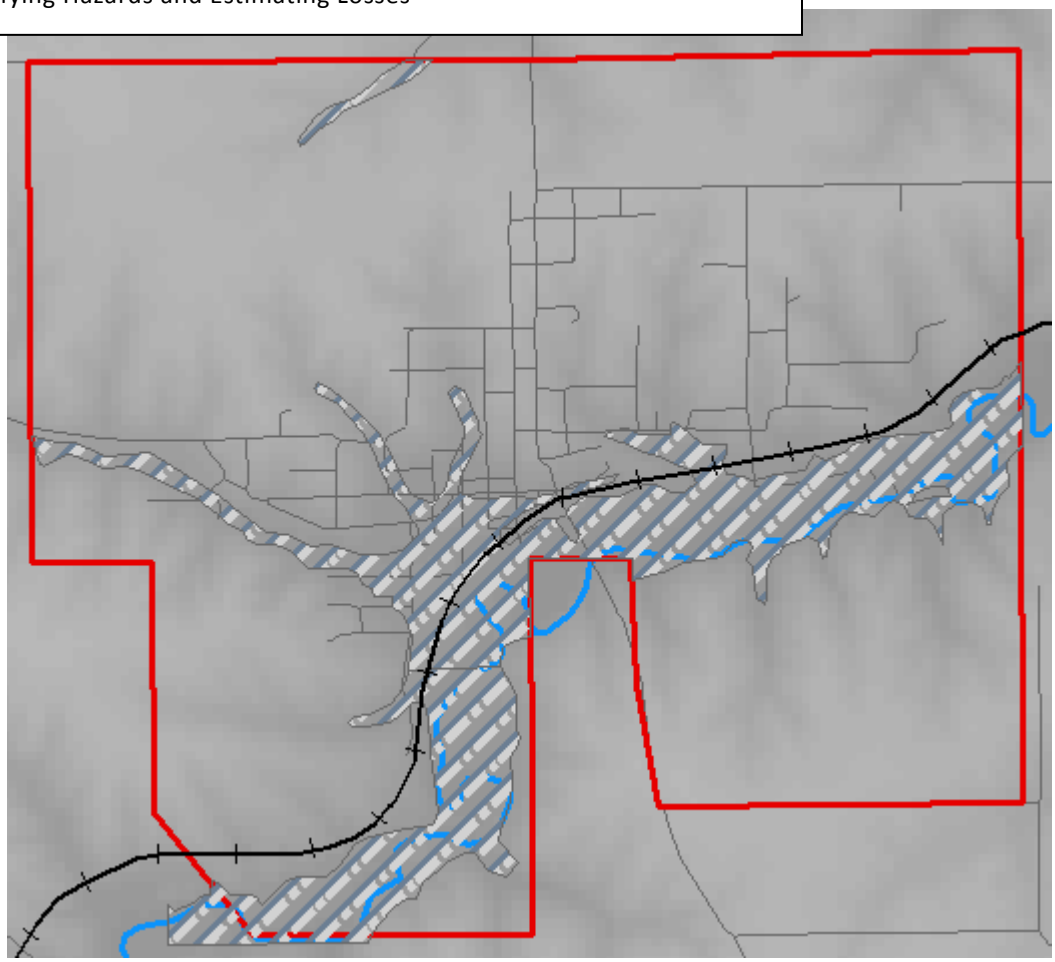
	runoff can accumulate very quickly resulting in flash flooding.	
Historical Occurrence	Since 1950, there have been ten recorded flash flood events in Appanoose County. All ten recorded events happened since 1993. These flash flood events caused $1.67 million in property damage with no injuries or loss of life reported. The events caused $300 thousand in crop damage; however this is more relevant to the county than Mystic specifically (NCDC). The flash floods in the NCDC database that specifically affected Mystic occurred in June 2008 and amounted to $25,000 in property damage. Other flash floods have impacted Mystic, but are not specifically designated as occurring in Mystic. See *Appendix 16: NCDC Storm Events* for a record of events that have impacted Appanoose County. The August 2007 flash flood that impacted Mystic inundated the southern portion of town leading to damage of multiple homes. As of September 2008, eight of these homes were partaking in a property acquisition program to prevent future damage to structures on those parcels. This flooding event was not listed specifically for Mystic on the National Climate Data Center database on storm events. However, Mystic was listed in the recorded events for Rathbun and Streepy. They property acquisition program is estimated to cost $301,260. The most recent flash flood occurred in June 2008.	**3**
Probability	With ten flash flooding events occurring in Appanoose County in the last fifteen years, the probability of future flash floods may be fairly high. There have been only three events recorded where Mystic is specifically cited indicating one event every five years which is still relatively high.	**3**
Vulnerability	The area along Walnut Creek and some of its tributaries are considered flood zones in and immediately around Mystic. The flood plain map is from 1974 and updated in 1987. See *Appendix 11: FEMA Firmette for the City of Mystic*. Since the majority of the working population of Mystic commutes to other communities for work, flood events that disrupt transportation between Mystic and surrounding communities impact Mystic negatively. Likewise, there are areas of Mystic that are outside of flood zones which could be inundated by very heavy rain resulting in flash flooding.	**2**
Maximum Threat	The most threat is to property and persons within flood plains, especially near streams and rivers and individuals in vehicles. More than half of all flash-flooding fatalities result from individuals misjudging the depth and strength of flood waters. Approximately 30% of Mystic is in Flood Zone A on the FIRM. Zone A indicates that the map was produced with approximate methods and thus the Base Flood Elevation is not determined. However, since flash flooding can occur anywhere and not just in flood plains, the entire city is considered a hazard area, see *Figure 6: Mystic Approximate Floodplain* following this hazard profile.	**3**

Severity of Impact	A. Flash floods can result in death and injury, typically to individuals caught either in vehicles swept off of roads or who may be in low-lying areas when fast moving water moves through B. Flash floods can present a challenge to first responders by limiting access to a site or by requiring alternative modes of access such as by boat or helicopter; special training is often necessary for such rescues C. Continuity of operations can be affected depending on the facilities impacted, transportation impacts, and delays in government responses D. Property can be impacted either by being damaged by the force of flowing water, water damage inside buildings, and compromises to structural integrity due to erosion E. Flash floods can quickly inundate areas thought to be out of flood-prone areas. Loss of life; property damage and destruction; damage and disruption of communications, transportation, electric service, and community services; crop and livestock damage and loss and interruption of business are common impacts from flash flooding. F. Hazards of fire, health and transportation accidents, and contamination of water supplies are likely effects of flash flooding situations. Materials swept away by flood waters can contaminate and leave a lasting impact on the environment. G. Most impacts are indirect due to disruption of business and damage to infrastructure on which industry and services rely upon. H. None directly. I. Flash floods can be damaging to the reputation of the community if proper notification and warning are not given. Often times the victim will blame development or other changes in the community as the cause of the flooding on their property.	**3**
Speed of Onset	Flash floods are somewhat unpredictable, but there are factors that can point to the likelihood of a flood's occurring in the area. Flash floods occur within a few minutes or hours of excessive rainfall, a dam or levee failure, or a sudden release of water held by an ice jam. Warnings may not always be possible for these sudden 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 time the flow is expected to occur at a particular location.	**4**
	Hazard Worksheet Score	**18**
	Composite Score	**35**

Figure 32: Cross Section of Floodplain



Source: FEMA 386-2 CD August 2001, Understanding Your Risks: Identifying Hazards and Estimating Losses



Source: Iowa DNR and Iowa DOT GIS data compiled by Chariton Valley Planning and Development with approximate digitized FIRM from Bill Cappuccio, State Flood Plain Coordinator

Note: Bill Cappuccio advises that the floodplains provided in GIS format not be used for regulatory purposes due to their approximate nature. However they do provide a general

Hazard	Tornado	
Definition	**Tornado**: A tornado is a violently rotating column of air extending from a thunderstorm to the ground. The most violent tornadoes are capable of tremendous destruction with wind speeds of 250 mph or more. Damage paths can be in excess of 1 mile wide and 50 miles long (FEMA 386-2 CD).	
Description	Tornadoes are among the most unpredictable of weather phenomena. While tornadoes can occur almost anywhere in the world, they are most prevalent in the United States. According to the National Weather Service, about 42 people are killed because of tornadoes each year. Tornadoes can occur in any state but are more frequent in the Midwest, Southeast, and Southwest. Tornado season runs ordinarily from March through August; however, tornadoes can strike at any time of the year if the essential conditions are present. Thunderstorms and hurricanes spawn tornadoes when cold air overrides a layer of warm air, causing the warm air to rise rapidly. The winds produced from hurricanes, earthquake-induced fires, and wildfires have also been known to produce tornadoes. The frequency of tornadoes in the nation's midsection is the result of the recurrent collision of moist, warm air moving north from the Gulf of Mexico with colder fronts moving east from the Rocky Mountains. Tornadoes were measured in intensity with the Fujita Scale which was then updated with the Enhanced Fujita Scale (EFS) in 2006. The EFS lowers the Fujita Scale threshold for each category ranging from 1 to 5 with 5 being the most intense with wind speeds in excess of 200 mph for at least 3 seconds (wind gusts). An additional scale is available called the Fujita-Pearson Scale which matches the Fujita Scale ratings and wind speeds with tornado path lengths and widths. All three scales follow this hazard profile in Figure 7 and Table 7; also see *Appendix 17: Enhanced Fujita Parameters and Damage Details* for more information.	Rating
Historical Occurrence	In the U.S., Iowa is ranked third in the number of strong-violent (F2-F5) tornadoes per 10,000 square miles. From 1950-95, Iowa averaged 31 twisters per year. In Iowa most tornadoes occur in the spring and summer months, but twisters can and have occurred in every month of the year. Late afternoon to evening hour tornadoes are the most common, but they can occur at any time of the day. Appanoose County has had 18 recorded tornadoes between 1961 and 2008. None of these tornadoes has exceeded F2 status. A total of eight injuries, $6.283 million in property damage, and $5,000 in crop damage. None of these tornadoes has occurred specifically in Mystic, but several have taken	**1**

	place within five miles. One funnel cloud is on record since 1950 occurring in 1995 in Rathbun, about 2 miles north east of Mystic. No damage or injuries are reported from this event. See *Appendix 16: NCDC Storm Events* for a record of events that have impacted Appanoose County.	
Probability	There have been 18 recorded tornadoes in Appanoose County in the past 47 years. This equates to approximately one event per 2.6 years. Because tornadoes are sporadic there cannot be a reliable long-term prediction made as to when they may occur. Likewise, the chance of a tornado occurring at an exact location is very low making forecasting of tornado paths or touch-downs impossible. If, however, the tornado events hold to their average, Appanoose County can expect approximately three tornadoes for any given decade.	**2**
Vulnerability	Everyone is vulnerable to the powerful forces that accompany a tornado. There are those who are more vulnerable than others. For example: 7. People in automobiles, 8. People in mobile homes, 9. People who may not understand warnings due to language barriers, 10. The elderly and very young, 11. People with physical or mental impairments. At the time of the 2000 Census in Mystic there were approximately 94 persons living in mobile homes/manufactured housing and approximately 18 persons living in multi-family units, each of which may not have adequate storm shelters available. In addition, there were 104 persons over the age of 64. There were 36 children under the age of five. There is one household that is considered "linguistically isolated" meaning that all members of the household age 14 and above have some difficulty with the English language. All of the aforementioned populations could be at additional risk in the event of a tornado. In the event of a tornado, the City of Mystic operates outdoor, early warning sirens that, given enough time, allow people to search for suitable shelter. The sirens are operable on a 24-hour basis.	**2**
Maximum Threat	Generally the destructive path of a tornado is only a couple hundred feet in width, but stronger tornadoes can leave a path of devastation up to a mile wide. Mystic is a relatively small town so even a path of a couple hundred feet could damage a substantial portion of the city. Mystic is about two miles across and about one and a half miles from north to south so a major tornado	**3**

	could affect more than 50% of the city. Following this profile is a chart showing the Fujita-Pearson Tornado Path Scale. 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.	
Severity of Impact	J. Injury or death related to tornadoes most often occurs when buildings collapse; people are hit by flying objects or are caught trying to escape the tornado in a vehicle. K. Response personnel are exposed to the same risk as the general public when caught in the storm without shelter. L. Tornadoes can destroy government facilities just as they could other property. Disruption of critical services can also affect operations. Employees may be affected and unable to attend work-related issues. M. Impacts can range from broken tree branches, shingle damage to roofs, and some broken windows; all the way to complete destruction and disintegration of well-constructed structures, infrastructure, and trees. N. Tornadoes can impact many critical services, mainly electrical power. Buried services are not as vulnerable, but can be affected by their system components that are above ground. O. Tornadoes are naturally occurring phenomena. Damages to the environment could result from spills and other contaminants from the built environment. P. Whole towns have been known to be "wiped off the map" such as Greensburg, KS in recent years. Economic impacts can result from direct damages to facilities or business disruption from the lack of critical services such as power, gas, or water. Q. Debris removal is a vital service that is often too vast for the jurisdiction to do without contractual assistance. These plans should be in place and monitored; a debris management plan is in progress including Appanoose County. R. Adequate warning is critical to the positive reputation of the jurisdiction. Responding in a timely manner and reconstructing the community is also important. Bringing critical services back on line quickly will ensure the residents can begin their personal recovery process sooner.	**3**
Speed of Onset	Tornado watches can warn of likely conditions hours in advance of an upcoming storm. Although significant advances in meteorological technology has allowed for much more effective forecasting, specific tornadoes cannot be predicted with any precision any more than minutes before they develop. The rapid change in direction a tornado can achieve makes it difficult to say with certainty the path the tornado will continue on even after it has been identified. Therefore warning time can sometimes be very short or occasionally non-existent.	**4**
	Hazard Worksheet Score	**15**
	Composite Score	**26**

Figure 34: Fujita Scale

ORIGINAL FUJITA SCALE		ENHANCED FUJITA SCALE	
F5	261-318 mph	EF5	+200 mph
F4	207-260 mph	EF4	166-200 mph
F3	158-206 mph	EF3	136-165 mph
F2	113-157 mph	EF2	111-135 mph
F1	73-112 mph	EF1	86-110 mph
F0	<73 mph	EF0	65-85 mph

Source: National Oceanic and Atmospheric Administration, http://www.srh.noaa.gov/lch/jamb/jambalaya0407-5.php

Table 8: Tornado Paths - LENGTH and Width

Fujita-Pearson Tornado Scale				
Pearson Rating	length	Width	Fujita Rating	Wind Speed
P0	0.3 - 0.9 miles	6-17 yards	F0	40-72 mph
P1	1.0-3.1 miles	18-55 yards	F1	73-112 mph
P2	3.2-9.9 miles	56-175 yards	F2	113-157 mph
P3	10.0-31.0 miles	176-566 yards	F3	158-206 mph
P4	32.0-99.0 miles	0.3-0.9 miles	F4	207-260 mph
P5	100.0-315.0 miles	1.0-3.1 miles	F5	261-318 mph

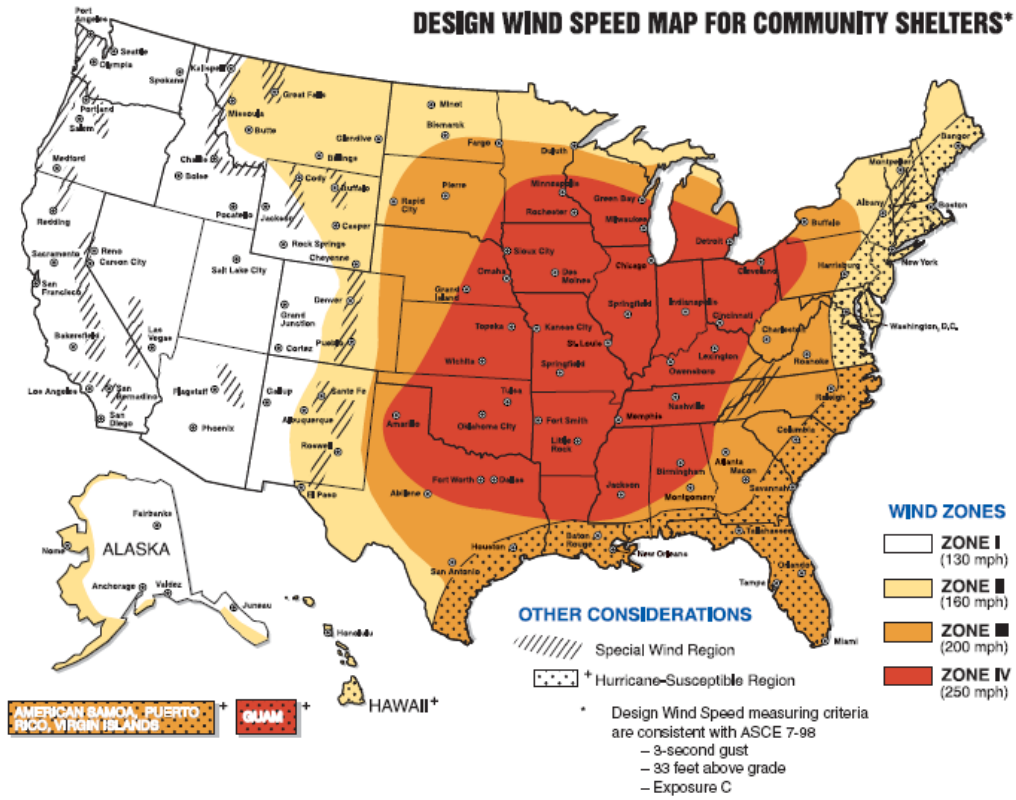
Source: http://www.stormfax.com/fujita.htm

Hazard	Wind Storms / High Wind Events	
Definition	**Windstorm**: A storm with high winds or violent gusts but little or no rain (American Heritage Dictionary). **High Wind Event**: An event where sustained winds of at least 40 mph or gusts are 58 mph or more (NOAA).	
Description	Damage from severe thunderstorm winds account for half of all severe reports in the lower 48 states and is more common than damage from tornadoes. Wind speeds can reach up to 100mph and can produce a damage path extending for hundreds of miles. These winds are often called "straight-line" winds to differentiate the damage they cause from tornado damage. Strong thunderstorm winds can come from a number of different processes. Damaging winds are classified as those exceeding 50-60mph. Since most thunderstorms produce some straight-line winds as a result of outflow generated by the thunderstorm downdraft, anyone living in thunderstorm-prone areas of the world is at risk for experiencing this phenomenon. High winds can result from thunderstorm inflow and outflow, or downburst winds when the storm cloud collapses, and can result from strong frontal systems, or gradient winds (high or low pressure systems) moving across a region. High winds are defined as speeds reaching 50 mph or greater, either sustaining (continuous) or gusting. Downdraft winds are from a strong thunderstorm downburst which causes damaging winds on or near the ground, and can extend to as little as 2 ½ miles or extend over a hundred miles. Downdraft wind speeds can be from 80 mph up to 168 mph, and occur quite suddenly as a thunderstorm cloud collapses. This is different from the winds associated with tornadoes. Winds associated with storms are convective. Non-convective winds are caused by fronts or gradient winds. These speeds can range from light breezes to sustained speeds of 80 to 100 mph. Windstorms can be with little or no rain. Mystic is located in the upper reaches of Zone IV in which wind speeds can reach up to 250 mph. A map showing extents of each wind speed follows this hazard profile.	Rating
Historical Occurrence	High winds have been responsible for 22 recorded events since 1993 in Iowa and Appanoose County. However, many other high wind events are on record combined with thunderstorms since 1965. High winds tend to affect a large area so there are few events that impacted Mystic or even Appanoose County alone. Of the high wind events alone that impacted Appanoose County, including events that affected broader areas of Iowa, there were $38.295 million in property damages, $360 thousand in crop damage, one death, and	**4**

	9 injuries. The highest recorded wind speed from a high wind event was 72 knots which is equivalent to almost 83 miles per hour. One of the most significant events was on November 10, 1998 which affected 52 counties and resulted in $17.3 million in property damage, $260 thousand in crop damages, and one death. This amounts to about $333 thousand in property damage on average per county, however it is unlikely that each of the affected counties were impacted equally. See *Appendix 16: NCDC Storm Events* for a record of events that have impacted Appanoose County.	
Probability	Based on the high wind events occurring since 1993, there is on average about 1.5 events each year. The State of Iowa estimates that throughout the state there will be 7-10 high wind events in excess of 70 knots (80.5 mph) annually.	**4**
Vulnerability	Vulnerability to windstorms is very similar to tornadoes as windstorms mimic tornadoes in their effects. Buildings may be damaged by debris picked up by the storm, windows could be potentially blown out, and vehicles may be overturned. Persons in mobile homes, outdoors, and in vehicles during windstorms are at the most risk. See the Tornado profile above for additional relevant information.	**2**
Maximum Threat	The maximum threat of a windstorm may be spread over a wider area than many tornadoes since the winds are not confined to a rotating form and therefore a concentrated area. A windstorm that strikes Mystic would likely impact most or the entire town in addition to surrounding towns.	**3**
Severity of Impact	J. Injury or death related to windstorms most often occur from building failure, or people struck by flying objects K. Response personnel are exposed to the same risk as the public when caught in storms without shelter. L. Windstorms can damage government facilities just as they could other property. Disruption of critical services can also affect operations. Employees may be affected and unable to attend work-related issues. M. Impacts can range from broken tree branches, shingle damage to roofs, and some broken windows; all the way to complete destruction of well constructed structures, infrastructure, and trees. N. Windstorms can affect many critical services, especially electrical power. Buried Services are not as vulnerable, but can be affected by their system components that are above ground. O. Windstorms are naturally occurring phenomena. Damages to the environment could result from hazardous materials spills and other contaminants from the built environment. P. Economic impacts can result from direct damages to facilities or business disruption from the lack of critical services such as power. Crop damage is often associated with windstorms; laying down crops, breaking stalks, and twisting plants, reducing the yield and making it difficult to harvest. Q. Debris removal is a vital service that is often too vast for the jurisdiction	**3**

	to do without contractual assistance. These plans should be in place and monitored. R. Adequate warning is critical to the positive reputation of the jurisdiction. Responding in a timely manner and reconstructing the community is also important. Bringing critical services back on line quickly will ensure the residents can begin their personal recovery process sooner.	
Speed of Onset	Although significant advances in meteorological technology has allowed for much more effective forecasting, windstorms are the hardest of storm events to predict due to the variety of conditions that create them. Doppler radar can help to identify windstorms and their strength but may not provide much warning for people in the affected area to seek shelter. Currently the best lead-time for a specific severe storm is about 30 minutes.	**4**
	Hazard Worksheet Score	**20**
	Composite Score	**31**

Figure 35: Wind Zones in the United States

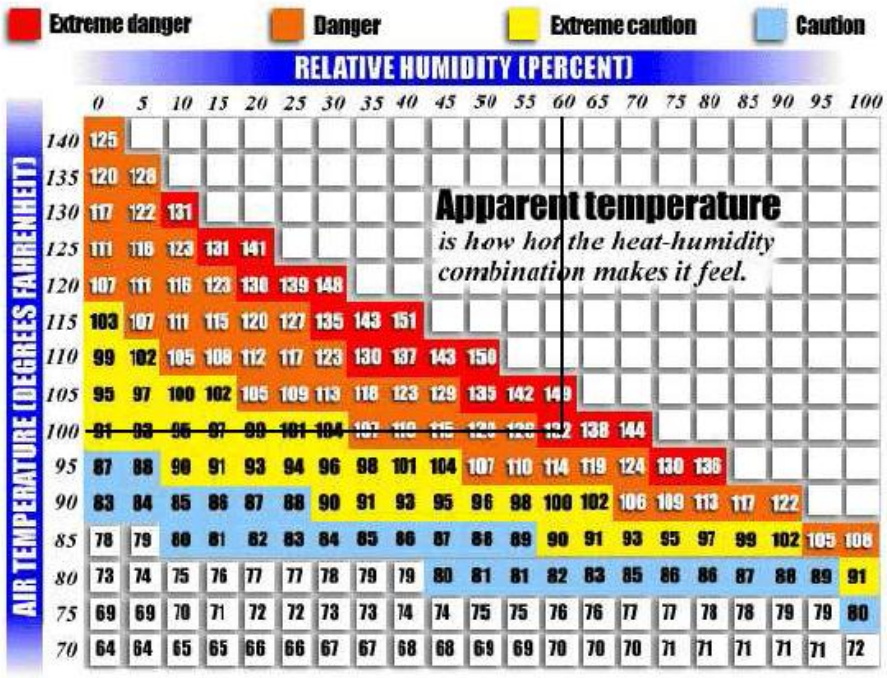


Source: FEMA 286-2 CD August 2001, Understanding Your Risks: Identifying Hazards and Estimating Losses

Hazard	Extreme Heat	
Definition	**Extreme Heat**: Temperatures (including heat index) in excess of 100 degrees Fahrenheit or 3 successive days of 90+ degrees Fahrenheit. A heat advisory is issued when temperatures reach 105 degrees and a warning is issued at 115 degrees.	
Description	A prolonged period of excessive heat and humidity. The heat index is a number in degrees Fahrenheit that tells how hot it really feels when relative humidity is added to the actual air temperature (*Figure 10*). Exposure to full sunshine can increase the heat index by at least 15 degrees. 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.	Rating
Historical Occurrence	Two periods of extreme heat between 1994 and 2001 resulted in 4 deaths and $3.8 million in property damage for the region including Mystic. See *Appendix 16: NCDC Storm Events* for a record of events that have impacted Appanoose County. During the summers of 1997 and 1998, there were a combined total of 31 days when the high temperature was 90 degrees Fahrenheit or higher. There were 3 periods when temperatures were 90 degrees or above for at least 3 consecutive days between 2001 and 2003.	**1**
Probability	Indicated in Iowa's *Hazard Analysis and Risk Assessment: 2007 Local Guide*, Iowa will likely experience about 26 days a year with temperatures above 90 degrees. There is a very good chance that there will also be a period of 3 consecutive days or more with temperatures in the 90s. It is also common for the temperature to hit 100 degrees or more once every three years during the summer months.	**3**
Vulnerability	The very young and the elderly are particularly vulnerable to extreme heat as are low income populations. Likewise, those on certain medications or drugs (especially tranquilizers and anticholinergics), and persons with weight and alcohol problems are particularly susceptible to heat reactions. Children are less likely to recognize the risk and therefore less likely to take precautionary measures. Likewise, the elderly may have more difficulty in sensing the extremities and may become over-exposed to the dangers. As of the 2000 Census there were 104 elderly persons over 64 and 36 children under the age of five. Nearly 60% of the population of Mystic earned	**3**

	less than $30,000 in 2000 and over 27% earned less than $15,000 annually.	
Maximum Threat	Most of the state would likely be impacted by extreme heat, but urban areas pose special risks. The stagnant atmospheric conditions of the heat wave trap pollutants in urban areas and add to the stresses of hot weather. Extreme heat events that impact Appanoose and surrounding counties would likely impact Mystic as well.	**3**
Severity of Impact	J. Nationally, over the last 30 years, excessive heat accounts for more reported deaths annually than hurricanes, floods, tornadoes, and lightning combined. K. Response personnel could suffer heat stroke and dehydration working in extreme heat conditions. L. None directly, see E. M. Transportation impacts include the loss of lift for aircrafts, softening of asphalt roads, buckling of highways and railways, and stress on automobiles and trucks (increase in mechanical failures). N. Electric transmission systems are impacted when power lines sag in high temperatures. High demand for electricity also outstrips supply, causing electric companies to have rolling black outs. The demand for water also increases sharply during periods of extreme heat. This can contribute to fire suppression problems for both urban and rural fire departments. O. Livestock and other animals are adversely impacted by extreme heat. High temperatures at the wrong time inhibit crop yields as well. P. Economic costs in transportation, agriculture, production, energy, and infrastructure. These direct costs could impact many other economic sectors indirectly. Q. None R. None if response is adequate and timely.	**2**
Speed of Onset	As with some other weather phenomena, periods of extreme heat are predictable within a few degrees within about 3 days. Variations in local conditions can affect the actual temperature within a matter of hours or even minutes. The National Weather Service will initiate alert procedures in the event of extreme heat.	**2**
	Hazard Worksheet Score	**14**
	Composite Score	**19**

Figure 36: Apparent Temperature; Heat-Humidity Combination



Source: National Oceanic and Atmospheric Administration

Hazard	Hailstorm	
Definition	**Hailstorm**: An outgrowth of a severe thunderstorm in which balls or irregularly shaped lumps of ice greater than 0.75 inches in diameter fall with rain.	
Description	Hail is frozen water droplets formed inside a thunderstorm cloud. They are formed during the strong updrafts of warm air and downdrafts of cold air, when the water droplets are carried well above the freezing level to temperatures below 32 deg F, and then the frozen droplet begins to fall, carried by cold downdrafts, and may begin to thaw as it moves into warmer air toward the bottom of the thunderstorm. This movement up and down inside the cloud, through cold then warmer temperatures, causes the droplet to add layers of ice and can become quite large, sometimes round or oval shaped and sometimes irregularly shaped, before it finally falls to the ground as hail. 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. Hailstorms impact an area about 15 miles in diameter on average. The vast majority of Appanoose County is within 15 miles of Mystic thus any hailstorm that impacts the county is likely to impact Mystic. See *Appendix 18: TORRO Hailstorm Intensity Scale* for charts indicating the impacts of hail based on size of hail.	Rating
Historical Occurrence	A total of 4,472 hail events have occurred in Iowa since 1993 according to the National Climatic Data Center. These have resulted in 11 injuries and 4 deaths in the state. Since 1961 there have been 51 recorded hail storms in Appanoose County, none of which occurring specifically in Mystic. The cumulative damage of these events on property amounted to $297 thousand and $150 thousand in crop losses. While none of the recorded hail storms occurred in Mystic, numerous ones occurred within 2-4 miles. See *Appendix 16: NCDC Storm Events* for a record of events that have impacted Appanoose County.	**4**
Probability	Data on probability and frequency of occurrence of hailstorms is limited, but research indicates that any given point in Iowa can expect on average two to three hailstorms in a year (Iowa's *Hazard Analysis and Risk Assessment: 2007Local Guide*). Based on the recorded events that have impacted Appanoose County, Mystic could expect about one hailstorm annually.	**4**

Vulnerability	Agricultural crops such as corn and beans are particularly vulnerable to hailstorms stripping the plant of its leaves. Hail can also do considerable damage to vehicles and buildings. Hail only rarely results in loss of life directly although injuries can occur.	**2**
Maximum Threat	There are many similarities between hailstorms and thunderstorms as they often occur together. Hail can cause debris to accumulate in roads along with the hail itself making travel more difficult, visibility can be reduced, and the hail can cause significant damage to vehicles and buildings. If there were a damaging hailstorm event in Mystic, it is likely that the entire town would be affected in terms of geography.	**4**
Severity of Impact	J. Exposure to hail larger than a nickel can be very dangerous and life threatening. K. Risk to response personnel is the same as the risk to others without shelter from the hail. L. Operations should not be affected to any significant degree. M. Damage to property, facilities, and infrastructure is usually limited to broken windows and damaged roofs. N. Delivery of services should not be affected to any significant degree. There may be minor disruptions, but they would likely come from high winds and lightning (usually associated with hailstorms). O. Hail can strip plants of their vegetation in very little time. If this occurs at a critical time in the life cycle of plants, it could have fatal consequences. P. Hailstorms cause nearly $1 billion dollars annually in property and crop damage in the United States. The peak hail activity coincides with the Midwest's peak agricultural season. Financial impacts resulting from damage to property is in the millions of dollars every year, most of which is covered by crop and hazard insurance. Q. None known. R. Timely and adequate response to the event is the key.	**3**
Speed of Onset	Forecasting hailstorms as with their parent thunderstorms, is becoming quite accurate due to the advancement in Doppler Radar and other technologies operated by the National Weather Service and local television weather departments. Warnings in the 20 to 30 minute range are usually available prior to the occurrence of the storm.	**3**
	Hazard Worksheet Score	**20**
	Composite Score	**25**

Hazard	Grass or Wildfire	
Definition	**Wildfire**: An uncontrolled fire spreading through vegetative fuels, exposing and possibly consuming structures (FEMA). **Grass Fire**: An uncontrolled fire in a grassy area	
Description	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. Fires may also occur as a secondary effect from an initial disaster, such as lightning, high winds, tornadoes, or transportation disasters. Grass and wildfires can occur when conditions are favorable such as during periods of drought when natural vegetation would be drier and subject to combustibility.	Rating
Historical Occurrence	There have been a number of fires that have occurred within the City of Mystic 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. Over 11,400 grass fires were reported in Iowa during the years 1994 to 1999. There have been no recorded grass or wildfires in Appanoose County; however the risk does exist especially if droughts affect the area. Most fires in the area in and around Mystic have resulted due to human influence. One of the most notable fires in Mystic occurred in 1911 that caused $100,000 in damage at the time; this amount of damage in terms of dollars would be catastrophic today. See the Structural Fire hazard profile in the Human Caused / Combination Hazards section for more information.	**3**
Probability	The State of Iowa indicates that there is nearly 100% chance that there will be a grass fire in each county in the state each year.	**4**
Vulnerability	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 Mystic condition of housing survey, there were 25 homes identified as being in seriously deteriorated condition. This housing survey was conducted by Area 15, Regional Planning Affiliation according to the Mystic Planning Committee.	**3**

	There are also vulnerable populations within Mystic, specifically children and the elderly. As of the 2000 Census there were 104 elderly persons over 64 and 36 children under the age of five. Nearly 60% of the population of Mystic earned less than $30,000 in 2000 and over 27% earned less than $15,000 annually. According to FEMA, fires kill 5,500 and injure 30,000 persons each year and most often the victims are children and the elderly. People with income restrictions are less capable of maintaining homes and keeping up with up-to-date fire protection. Similarly, low income people may not have or may not be able to afford insurance with fire protection.	
Maximum Threat	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. The maximum threat from fire in Mystic would be to those older buildings in a state of disrepair or with substandard electrical systems. Similarly, should any remaining coal in the numerous mines underneath Mystic catch fire, the impacts could be catastrophic and could potentially require the permanent evacuation of the town. Such mine fires and community abandonments are not without historical precedent; Centralia, Pennsylvania has had a coal mine fire burning underneath it for 46 years. The town had a population of about 1,000 until 1981 when a sinkhole suddenly opened and nearly killed a young boy. The population has declined to about 9 as of 2007 and much of the town has been condemned. In light of Mystic's relatively low fire insurance rating, fire should be a hazard of some concern for the community.	**2**
Severity of Impact	J. Grass and wildfires pose a threat to individuals ranging from smoke inhalation to severe burns and death. K. Risk to response personnel includes heart attack and smoke inhalation. L. Operations could be impacted if facilities are damaged by a grass or wildfire or if electrical transmission lines are damaged. M. Damage to property, facilities, and infrastructure can range from minor smoke damage to incineration. Grass and wildfires pose a threat to crops and livestock as well as structures. N. Delivery of services may not see major impacts though some delays may occur depending on where the fires occur. O. Grass and wildfires may be of particular concern in Appanoose County due to the presence of old coal mines. Not all of these mines were exhausted of coal, most abandoned as coal mining technology changed in the early part of the 20th Century. A fire spreading to coal mines could lead to mine collapse and the associated impacts.[15]	**2**

[15] Such mine fires and community abandonments are not without historical precedent; Centralia, Pennsylvania has had a coal mine fire burning underneath it for 46 years. The town had a population of about 1,000 until 1981 when a sinkhole suddenly opened and nearly killed a young boy. The population has declined to about 9 as of 2007 and much of the town has been condemned.

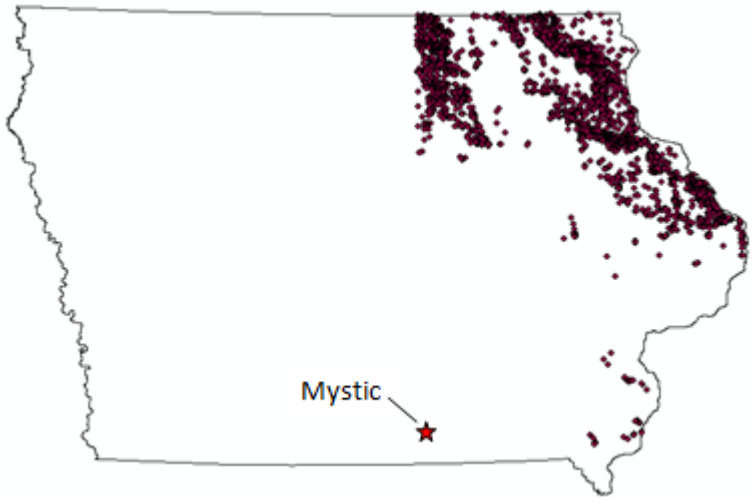
	P. Economic impacts would be most significant on the agricultural community unless such a fire were to spread into a settled community. Insurance policies may or may not cover grass or wildfire damage. Q. None known. R. Timely and adequate response to the event is critical.	
Speed of Onset	Fires can spread very rapidly in buildings. Improvements in technology have enabled the development of affordable early warning systems such as 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. Most grassfires occur without warning and travel at a moderate rate. This situation depends upon conditions at the time such as moisture, wind, and land cover.	**4**
	Hazard Worksheet Score	**18**
	Composite Score	**28**

Hazard	Sink Holes	Rating
Definition	**Sinkhole**: A natural depression in a land surface communicating with a subterranean passage, generally occurring in limestone regions and formed by solution or by collapse of a cavern roof (American Heritage Dictionary).	
Description	Sinkholes, also known as subsidence, come in two primary forms in Iowa, Karst subsidence and Mine subsidence. Mines subsidence occurs when a mine or part of a mine collapses causing surface land to create a basin or hole. Karst subsidence occurs as water dissolves underlying rock creating a gap that ultimately collapses. Most of Iowa's sinkholes occur in rural areas where their main impact is rendering some land unsuitable for row-crop agriculture. Sinkholes have also resulted in the failure of farm and other types of ponds, roads, and one sewage-treatment lagoon. As sinkholes sometimes allow surface runoff to directly enter bedrock aquifers, their presence has a potential impact on groundwater quality. Given the prevalence of mines under Mystic and in the surrounding area, subsidence may well be of concern for the town. See *Appendix 6: Locations of Mines and Mine Entrances In and near Mystic*.	
Historical Occurrence	There have been no recorded incidents of sinkholes opening in Mystic or Appanoose County. However, anecdotal evidence suggests that the railroads in the area have had some problems from sinkholes impacting their infrastructure. The Iowa Department of Natural Resources tracks sinkholes and provides Geographic Information Systems data on their locations. The vast majority of sinkholes in Iowa have occurred in the northeast quarter of the state. See Figure 6 for a map of Iowa sinkholes, following this hazard profile.	**1**
Probability	While there are no recorded sinkholes in or immediately surrounding Mystic, there is a possibility of subsidence occurring. The prevalence of mines under a large proportion of the town provides the potential of large areas of Mystic being damaged by mine cave ins. The Iowa Department of Natural Resources monitors and maps sinkholes and mines in Iowa. Not all of the mines under Mystic are fully mapped; the extents of some mines are estimated. Based on these mapping limitations, the condition of at least some of the mines is presumably not fully known.	**2**
Vulnerability	Anyone is vulnerable to sinkholes should they occur in a developed area. Buildings and infrastructure such as roads, underground pipes, and railroad lines face potentially severe damage from mine subsidence. In the Mystic area the potentially for damage from Karst subsidence is low given the soil composition of the area (i.e. a lack of Karst soils). Personal injury or even	**1**

	death is possible should a cave in happen suddenly; indirect injury or death is possible from building collapse or damage to infrastructure. Approximately 75% or more of Mystic has mines underlying it; since not all of the mines are surveyed, it is not known what the potential impact of mine subsidence on the town.	
Maximum Threat	The maximum threat of subsidence would be if one or more of the underlying mines were to collapse damaging homes, businesses, and infrastructure. The worst case scenario is if subsidence or a full cave-in were to happen on Main Street where a number of old, and presumably unreinforced (due to age), brick buildings are located. One building could lead to structural damage to adjacent structures as many buildings are attached.	**1**
Severity of Impact	J. Generally subsidence poses a greater risk to property than to people. However, should a depression or hole open or occur suddenly, people may be injured or killed. Likewise if a road were to collapse due to subsidence and it is not identified promptly, motorists may fall into the gap and be injured or killed.[16] K. Impacts on response personnel is minimal and would be most likely confined to falls or subsequent collapse in the event of a mine cave-in. L. Impacts on continuity depend on the structures or infrastructure damaged. M. Damage to structures and infrastructure depends on the severity of the subsidence ranging from foundation cracking to building collapse in the event of a mine-collapse. N. Delivery of services depends on the structures and infrastructure impacted. O. Most sinkholes are the result of naturally occurring events. However mine collapse can disturb harmful substances contained in the soil, in mines, and in structures located above. P. Depends on the affected area. Q. None known. R. Impacts to the reputation of the DNR, local government, and emergency management may occur if the threat of mine collapse is not addressed. Based on available data from the DNR, many mines in Appanoose County are not mapped and so condition and full extent of these mines may not be known.	**1**
Speed of Onset	The speed of onset can vary from a sudden collapse with little if any warning to more gradual "sinking" of the ground. Monitoring of the area mines could provide additional warning if signs of subsidence or structural stress in the mines are found.	**4**
	Hazard Worksheet Score	**10**
	Composite Score	**20**

[16] Resulting from flooding in 2007 a road northwest of Moulton washed out leading to a car falling into the hole entirely. While this is the result of a wash-out, similar events may occur from a mine collapse. Likewise, a sewer in Centerville collapsed leading to a large hole opening in the street.

Figure 37: Locations of Iowa Sinkholes in Relation to Mystic



Source: Iowa Department of Natural Resources GIS, compiled by Chariton Valley Planning and Development

Hazard	River Flooding	
Definition	**River Flood**: A rising or overflowing of a tributary or body of water that covers adjacent land not usually covered by water when the volume of water in a stream exceeds the channel's capacity.	
Description	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. Flooding is a natural and expected phenomenon that occurs annually, usually restricted to specific streams, rivers or watershed areas. The primary flood hazard in the City of Mystic is Walnut Creek which contributed to the damage incurred during the August 2007 flood. Two common terms to describe areas that are prone to flooding are 100-year flood plain and 500-year flood plain. The meaning of these terms are often confused; though they sound like a flood in the designated areas only happens once every 100 or 500 years, this interpretation is incorrect. What the designation actually means is that for a 100-year flood plain, the chance of a flood occurring in any given year is 1% which is statistically about once every 100 years. Likewise, for the 500-year flood plain, the chance is .2% chance of a flood occurring in any given year. Floods may certainly occur more frequently in either flood plain designation, but these would be rare occurrences.	Rating
Historical Occurrence	Since 1993 there have been forty flood events in Appanoose County in addition to the 10 flash floods previously detailed. There have been no deaths or injuries directly attributed to these events. The forty flood events impacting Mystic and the broader Appanoose County have incurred nearly $138 million in property damage and $33.4 million in crop damage since 1993. None of these flood events is specifically recorded for Mystic. See *Appendix 16: NCDC Storm Events* for a record of events that have impacted Appanoose County.	**1**
Probability	Flooding is a regular and frequent hazard in Iowa; in Appanoose County, the number of flooding events suggests that there can be 2-3 floods annually. While not all of these floods have directly impacted Mystic, it would not be much of a stretch to estimate that Mystic may be directly impacted at least	**2**

	once every ten years and quite possibly more frequently.	
Vulnerability	The area along Walnut Creek and some of its tributaries are considered flood zones in and immediately around Mystic. The flood plain map is from 1974 and updated in 1987. In river flooding events, the flood plains and flood zones are at the most risk, but this is not necessarily the case for flash floods as detailed previously. See *Appendix 11: FEMA Firmette for the City of Mystic*. Since the majority of the working population of Mystic commutes to other communities for work, flood events that disrupt transportation between Mystic and surrounding communities impact Mystic negatively.	**2**
Maximum Threat	The Flood Insurance Rate Map for Mystic indicates the most likely maximum extent of flood damage. The area contained in Flood Zone A amounts to approximately 25-35% of the area of Mystic. See *Appendix 11: FEMA Firmette for the City of Mystic* and *Figure 6: Mystic Approximate Floodplain* following the Flash Flood Hazard profile for more information. This area includes the area immediately south of Main Street where public buildings are located. However with the possible human actions that impact flood patterns since the FIRM was created and the fact that the BFE is not determined, more of Main Street may be functionally affected by a 100-year flood event.	**2**
Severity of Impact	J. Flooding impacts include potential loss of life. River flooding does not have as high of risk as does flash flooding because of the slower onset of the river flood. K. Responding to river flooding often includes sandbagging and working in floodwaters. Response personnel should have current tetanus and hepatitis shots. Rescuing victims often requires rescue from boat. Wearing personal protective gear such as life vests at all times can prevent most injuries related to river flooding. L. Operations could be disrupted from direct impacts if facilities are in the floodplain and indirectly from loss of critical services to maintain operations. Backup power and other services can eliminate the impact to operations. M. Personal property can be extensively damaged and destroyed by swift moving water. Facilities and infrastructure can be scoured around and degrading its structural integrity. N. Damage and disruption of communications, transportation, electric service, and community services are likely in severe cases. Wastewater treatment facilities may be located in the floodplain and thus at high risk of flooding; this is not uncommon around Iowa and eventually results in them being taken offline for a period of time. O. Hazards of fire, health and transportation accidents; and contamination of water supplies are likely affects of flooding situations as well. P. Crop and livestock losses and interruption of businesses either from direct flooding or loss of the delivery of critical services can have damaging impacts on the local economy. River flooding can last for weeks and the impacts can last for months and even years following the flood. Economic impacts can be felt with only a couple days of disruption. Q. None known.	**3**

	R. Jurisdictions should pay careful attention to disclosing flood risk in the community. Participation in the National Flood Insurance Program and providing accurate and up to date flood insurance rate maps will head off most allegations of poor service by the jurisdiction by the citizens.	
Speed of Onset	Gauges along streams and rain gages 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 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.	**1**
	Hazard Worksheet Score	**11**
	Composite Score	**27**

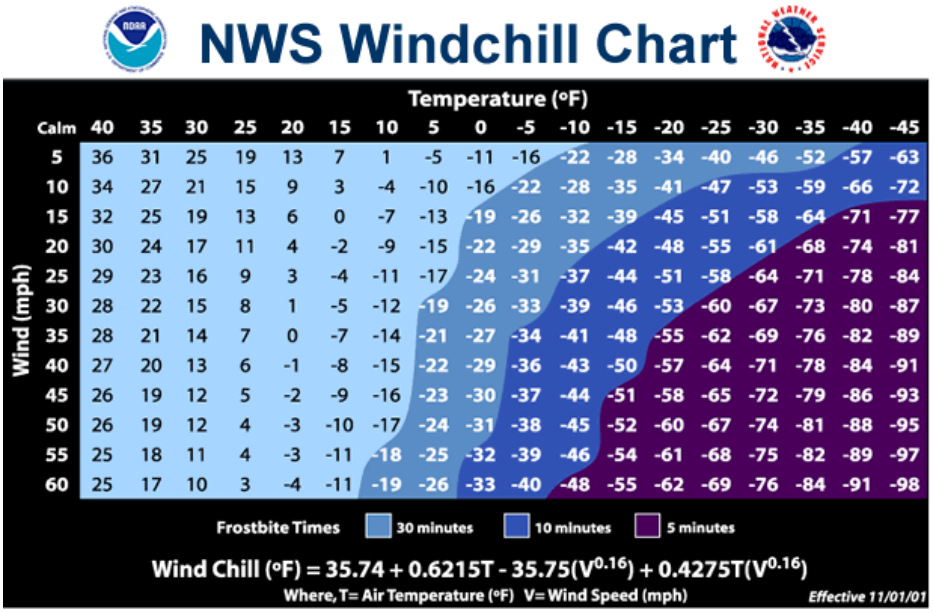
Hazard	Severe Winter Storm	
Definition	**Severe Winter Storm**: Severe winter weather conditions that affect day-to-day activities. These can include blizzard conditions, heavy snow, blowing snow, freezing rain, heavy sleet, and extreme cold.	
Description	Winter storms are common during the winter months of October through April. The various types of extreme winter weather cause considerable damage. Heavy snows cause immobilized transportation systems, downed trees and power lines, collapsed buildings, and loss of livestock and wildlife. Blizzard conditions are winter storms which last at least three hours with sustained wind speeds of 35 mph or more, reduced visibility of 1/4 mile or less, and white-out conditions. Heavy snows of more than six inches in a 12-hour period or freezing rain greater than 1/4 inch accumulation causing hazardous conditions in the community can slow or stop the flow of vital supplies as well as disrupting emergency and medical services. 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 result in fallen trees, broken tree limbs, downed power lines and utility poles, fallen communications 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.	Rating
Historical Occurrence	There have been 40 recorded snow and ice events in Appanoose County since 1993 including freezing rain, snow, ice storms, and winter storms. Six deaths are associated with these events and property damage totaling $16.818 million are recorded. In 1995 two snow events that affected Appanoose County, were recorded for a larger part, or all of Iowa totaling $60 thousand in property damage for all included areas. Between February 1995 and January 1997, there have been six recorded events of extreme wind chill that impacted Mystic and the surrounding area. These six events are attributed for $800 thousand in property damage, but no deaths or injuries. See *Appendix 11: NCDC Storm Events* for a record of events that have impacted Appanoose County.	**4**
Probability	Winter storms regularly move easterly and use both the southward plunge of arctic cold air from Canada and the northward flow of moisture from the Gulf of Mexico to produce heavy snow and sometimes blizzard conditions in Iowa	**4**

	and other parts of the Midwest. The cold temperatures, strong winds, and heavy precipitation are the ingredients of winter storms. Most counties can usually expect 2 or 3 winter storms a season with an extreme storm every 3 to 5 years on average (more in the northwest, fewer in the southeast). 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.	
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 for feed, water and shelter for livestock are unable to be met. People, pets, and livestock are also susceptible to frostbite and hypothermia during winter storms. Those at risk are primarily either engaged in outdoor activity (shoveling snow, digging out vehicles, or assisting stranded motorists), or are the elderly or very young. Schools often close during extreme cold or heavy snow conditions to protect the safety of children and bus drivers. Citizens' use of kerosene heaters and other alternative forms of heating may create other hazards such as structural fires and carbon monoxide poisoning. Winter storms are a particular challenge for Mystic and other small cities in southern Iowa. The strain they place on municipal budgets to clear transportation routes, on area utilities to repair damaged facilities, including power lines, and to homeowners and businesses to repair and maintain property can be significant. Approximately one-fifth of the population of Mystic is aged 65 and above. An additional challenge is that winter storms have the effect of isolating persons with mobility challenges, including the elderly whose mobility may not be on par with younger persons. This isolation puts such populations at risk if sufficient household supplies are not present in advance of winter storms.	**4**
Maximum Threat	Although the developments in technology have been very beneficial in reducing the long-term negative effects of winter storms, certain dangers still exist. The maximum threat of winter conditions would be realized if it was accompanied by power outages and elimination of travel due to hampered road conditions. This could result in the inability for some of the population to maintain temperatures necessary for the body. In addition long winter events that eliminate communication could result in the reduction of adequate medical response time. Due to the nature of winter storms, they will impact not only Mystic but also Appanoose County and surrounding counties. The Iowa Department of	**4**

	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 area.	
Severity of Impact	J. Severe winter storms can lead to injury and death through traffic accidents or to individuals that may be caught outdoors. Cold temperature impacts on agriculture are frequently discussed in terms of frost and freeze impacts early or late in growing seasons and unprotected livestock. K. Response personnel are exposed to cold temperatures and traffic accidents when responding to the victims needs. L. Operations can be limited or halted when critical services are not available. Staff may not be able to make it to the place of work, thus, limiting the continuity of operations. M. 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 impacts of a severe winter storm. Vehicle batteries and diesel engines are stressed and the fuel often gels in extreme cold weather. This impacts transportation, trucking, and rail traffic. N. 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. 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 of 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. O. Winter storms are a natural occurrence and there would be no direct significant impact on the environment beyond tree damage and the impacts related to ice dams. P. The cost of snow removal, repairing damage, and loss of business can have large economic impacts on the community. Also, the state estimated $76,159,000 in property damage, and $346,900,000 in lost crops due to heavy snow, ice storm, or extreme wind-chill events statewide. Q. Enforced snow ordinances allow the jurisdiction to more effectively open transportation routes. Delivery and adequate supplies of salt, sand, and saline are important inputs to the snow removal process. These contracts should be in place. Removal of debris and reinstatement of energy are vital to safety of the public as well. Agreements should be in place with the power company to ensure power is restored in an effective and timely manner following the storm. Severe winter storms can contribute to substantial damage to rural roads and place a strain on secondary roads departments in maintaining them and keeping rural roads safe for travel. R. Effective and timely response to the snowstorm is critical to maintaining a good reputation. Streets clear of snow and ice are important factors to the mobile public.	**4**

Speed of Onset	The National Weather Service (NWS) has developed effective weather advisories that are promptly and widely distributed. Radio, TV, and Weather Alert Radios provide the most immediate means to do this. Accurate information is made available to public officials and the public up to days in advance. Several notifications made by the National Weather Service include winter storm watch, winter storm warning, blizzard warning, winter weather advisory, and a frost/freeze advisory.	**3**
	Hazard Worksheet Score	**23**
	Composite Score	**34**

Figure 38: Windchill Chart



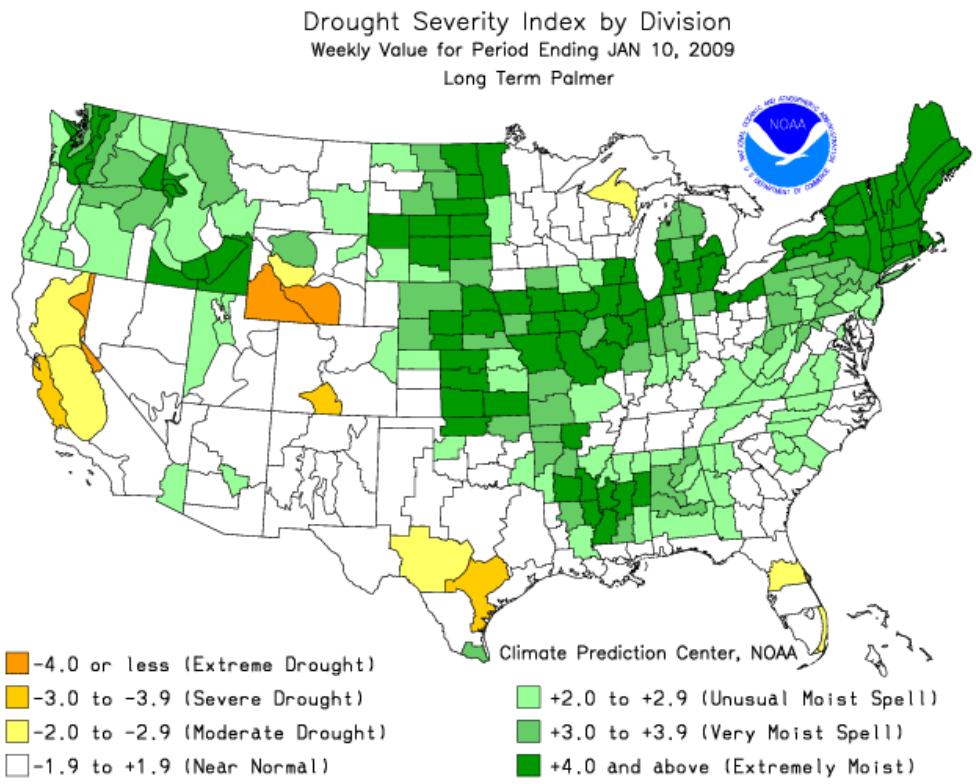
Source: National Oceanic and Atmospheric Administration, National Weather Service

Hazard	Drought	
Definition	**Drought**: A period of prolonged lack of precipitation for weeks at a time producing severe dry conditions.	
Description	There are three types of drought conditions that are relevant to Iowa: **Meteorlogic drought**, which refers to precipitation deficiency; **Hydrological drought**, which refers to declining surface water and groundwater supplies; and **Agricultural drought**, which refers to soil moisture deficiencies. 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. At a meeting in the preparation for a neighboring county's hazard mitigation plan, a representative from the Natural Resource Conservation Service indicated that the region is well on its way to handling floods. However it is not well situated to handle droughts. This passing comment is important as Iowa is generally considered to be "water rich" and is not known as an area that must prepare for droughts. This lack of preparedness places the state and the various jurisdictions within it at greater risk should a drought occur. See *Figure 13: Example of Palmer Index for Drought Severity* for a graphic representation of the Palmer Index.	Rating
Historical Occurrence	There have been six droughts affecting Mystic and the surrounding area since 1995 when the first recorded drought occurred. No deaths or injuries are associated with these events; however $645.15 million in property damage resulted from the most recent drought in August of 2003. A combined total of $1.5 billion in crop damage is recorded among the six events. All of these six recorded events included multiple counties thus the costs of damages are dispersed. According to the Palmer Drought Severity Index, a composite of evapotranspiration, recharge, runoff, loss, and precipitation, Iowa has suffered seven periods of drought conditions since 1910. These periods are 1910-1913, 1933-1935, 1955-1958, 1967-1969, 1976-1977, 1980-1982, and 1988-1990. While some may have been more severe than others, agricultural areas were impacted much more than the metropolitan areas where impacts	**2**

	were indirect.	
Probability	Drought is part of normal climate fluctuations. Climatic variability can bring dry conditions to the region for up to years at a time. Research and observations of the El Nino/La Nina climatic events are resulting in more predictable climatic forecasts.	**2**
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 impacted a large area) would be impacted. 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 impact 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. This would be most threatening to older buildings, especially those that are attached or are located very close to adjacent structures such as some of the buildings on Main Street. While the water supply for Mystic comes from Rathbun Lake, a prolonged, severe drought could compromise the best efforts of the Mystic Fire Department in fighting fires anywhere in town.	**1**
Maximum Threat	A drought would likely affect most of Iowa if not the Midwest as a whole; this would include the entire City of Mystic. Because of the dependence on precipitation and water, the agricultural community would be impacted the most. The agricultural areas would be most adversely impacted, but the entire state would likely feel at least some impact. Rathbun Lake is a significant resource in Appanoose County and surrounding counties that may well mitigate drought events. However, multiple counties draw from Rathbun Lake for water resources and so a prolonged, severe drought could negatively impact local water supplies. Likewise, the lake is an economic resource for the region including tourism; drought could have deep impacts on the local and regional economy.	**1**
Severity of Impact	J. Few if any health impacts to people in the affected area because of secondary sources of water. Drought in the U.S. seldom results directly in the loss of life. Health impacts would be more significant on livestock without auxiliary water supplies. K. Response personnel are at minimal risk. L. Continuity of operations would not be affected. M. Property losses would be limited to livestock and crops to the agricultural community. Facilities would not be impacted. Infrastructure could be affected in areas of expansive soils due to drying soils, lower water levels around dams, etc. N. Delivery of services would be limited to source water delivery and those services that consume large amounts of water. O. Drought is a naturally occurring hazard that occurs about every 20 years.	**1**

	The environmental impacts are usually short-term (resilient) and the natural environment is used to drought cycles. Drought more directly affects agricultural crops, livestock, natural vegetation, wildlife, and stream flows (fish and aquatic vegetation). P. Drought can lead to large and damaging impacts to the agricultural economy. Because of Iowa's reliance on the agricultural economy, the economic and financial impacts would certainly ripple out into other sectors. Rural areas can be especially affected by long-term drought. If restrictions are put on manufacturers that use large amounts of water, the local economy can be impacted that way as well. Q. Regulations in the agricultural sector can be and are often adjusted to provide some lenience for adverse conditions for livestock and crop loss. R. Drought is a naturally occurring hazard and is "out of the hands" of local and state officials. Local jurisdictions can have their reputation damaged if they do not provide source water to residents or respond in a satisfactory manner to provide an alternative supply.	
Speed of Onset	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, and 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.	**1**
	Hazard Worksheet Score	**8**
	Composite Score	**12**

Figure 39: Example of Palmer Index for Drought Severity



Source: National Oceanic and Atmospheric Administration, http://www.cpc.noaa.gov/products/analysis_monitoring/regional_monitoring/palmer.gif

Note: The Palmer Index ranges from -4 (or less) to +4 (or more) to indicate the severity of droughts with 0 indicating normal conditions.

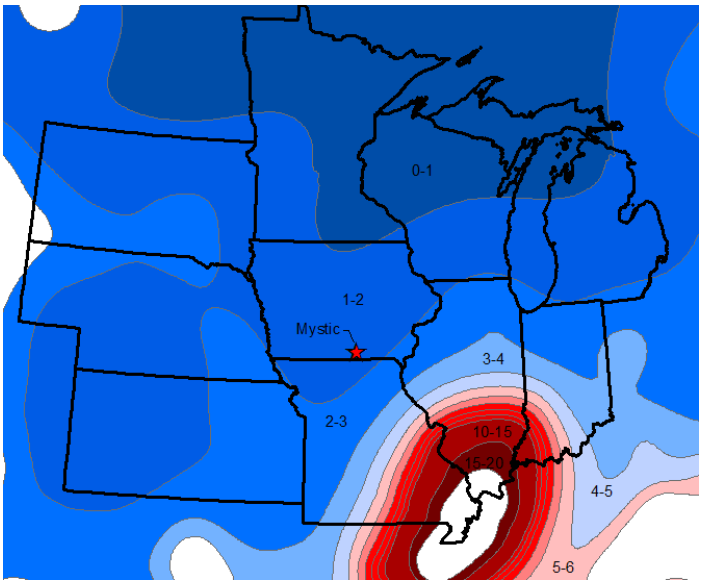
Hazard	Earthquake	
Definition	**Earthquake**: A sudden motion or trembling that is caused by a release of strain accumulated within or along the edge of earth's tectonic plates (FEMA). **Mercalli Intensity Scale**: The Mercalli Scale is based on observable damage which while is more subjective, is easier to comprehend for the general populace (USGS FAQ – Measuring Earthquakes). See *Appendix 19: Modified Mercalli Scale for Earthquake Intensity*. **Richter Scale**: The Richter Scale is a measure of size and power of earthquakes; "as an estimate of energy, each whole number step in the magnitude scale corresponds to the release of about 31 times more energy than the amount associated with the preceding whole number value" (USGS Visual Glossary – Richter Scale); see *Appendix 20: Richter Scale*.	Rating
Description	An earthquake is a sudden, rapid shaking of the earth caused by the breaking and shifting of rock beneath the Earth's surface. This shaking can cause buildings and bridges to collapse; disrupt gas, electric, and phone service; and sometimes trigger landslides, flash floods, and fires. The three general classes of earthquakes now recognized are: tectonic, volcanic, and artificially produced. While Iowa is not thought of as a state that can experience an earthquake, the New Madrid fault line is located where Missouri, Arkansas, Kentucky, and Tennessee meet. Additionally the Wabash Valley seismic zone is located along the south eastern boarder of Illinois and Indiana.	
Historical Occurrence	Iowa as a whole has experienced the effects of only a few earthquakes in the past 175 years. The epicenters of 12 earthquakes have been located in the state. The majority has been along the Mississippi River, and none have been in central Iowa. While more than 20 earthquakes have occurred in or impacted Iowa over the past 175 years, they have not seriously impacted the state. See *Appendix 21: Iowa Historic Earthquakes*. In 1811 and 1812 earthquakes struck the broader region with a magnitude of between 7.5 and 8.0 accompanied by accounts of the Mississippi River reversing direction. The damage was significant within many miles of the quake and could be felt throughout several states. The nature of the soils in the Midwest helps in transmitting tremors over longer distances than in areas	**1**

	where earthquakes are more commonly thought of. In the spring of 2008, slight tremors could be felt in parts of Iowa resulting from an earthquake originating in south eastern Illinois.[17]	
Probability	Mystic is in an area where the probability of exceeding horizontal peak gravity acceleration by 1-2% is 10% over a period of 50 years (see Figure 8). In other words, there is a 90% chance that any earthquake in the next 50 years affecting Mystic will not exceed an acceleration of 1-2% of the force of gravity. An intensity of 6-7 on the Mercalli Scale is approximately equal to 10% gravity acceleration, meaning the speed at which the ground shakes. This magnitude is roughly equivalent to a strong earthquake that would be very noticeable with some structural damage, especially to older or poorly built structures and movement of heavy furniture. Ground acceleration of 1-2%, the intensity applicable to the Mystic area, would be minor or negligible. Based on recurrence intervals for small earthquakes, scientists estimate a 90% chance of a Richter magnitude 6.0 earthquake in the New Madrid Fault Zone by 2040. A magnitude 6.5 in New Madrid would create a magnitude 4 effect in Iowa resulting in little or no damage.	**1**
Vulnerability	Vulnerability to earthquakes in Iowa is largely related to buildings and infrastructure. As Iowa is not known as an area at risk of earthquakes, buildings often do not incorporate the earthquake resistant features that those in California and other earthquake-prone regions do. Unreinforced structures face the risk of collapse or similar significant damage which poses a risk to the inhabitants and those that may be outside but near. Likewise, damage to infrastructure ranging from roadways, to buried pipelines, to structures could cripple a municipality's capacity to maintain services or recover following a significant earthquake. Buildings at most risk to earthquake damage in the Midwest are unreinforced brick buildings. Many of these structures are older and some may be historic buildings which if lost, would not likely be rebuilt to similar aesthetic or functional standards. This would be a loss to the community. Such buildings are located primarily on Main Street in Mystic, though other structures in town, such as older homes, may be structurally deficient and thus potentially vulnerable to even mild earthquake effects. At this time, these structures are not thoroughly evaluated or individually identified; the housing condition study conducted by Area 15 Regional Planning Affiliation is currently the best	**1**

[17] The Kalamazoo Gazette ran a story about the earthquake indicating that it could be felt as far into Iowa as Des Moines, Midwestern earthquake felt in southwestern Michigan by Sara Waisanen <http://www.mlive.com/news/index.ssf/2008/04/midwest_earthquake_felt_in_sou.html>, the Cedar Rapids Gazette had a number of reader accounts on their website about the earthquake <http://www.gazetteonline.com/apps/pbcs.dll/article?AID=/20080418/NEWS/718266055/1001/NEWS>.

	evaluation of structural integrity in Mystic.	
Maximum Threat	Estimated effects of a 6.5 Richter magnitude earthquake along the New Madrid Fault Zone suggest Iowans in four southeast counties could experience trembling buildings, some broken dishes and cracked windows. About 29 other counties, from Page to Polk to Muscatine, could experience vibrations similar to the passing of a heavy truck, rattling of dishes, creaking of walls, and swinging of suspended objects. This would include Appanoose County. Specific parts of Central Iowa could sustain different levels of damage based on the soundness of the structures; structures built after 1985 will likely have the greatest resistance to damage while those built prior to 1940 will have the greatest risk (USGS, definition of "%g"). Nearly 85% of the homes in Mystic were built prior to 1980 suggesting some damage may be seen from even minor earthquake effects felt in the area.	**1**
Severity of Impact	J. Few if any injuries would likely be seen in Iowa from an earthquake. However, the elderly and individuals with mobility or balance challenges may face some injuries from falls. K. Response personnel are at minimal risk in Iowa. L. Continuity of operations would not likely be affected. M. Property losses would likely be minimal generally confined to minor cracks in walls to potentially knocking pictures or other objects hung on walls down. Dams may be most at risk, though given the distance from the nearest known fault lines, the risk would likely be limited. N. Delivery of services is unlikely to be affected. O. Earthquakes are naturally occurring events though threats to the environment may occur through chemical spills or hazardous substances disturbed by an earthquake. P. Damage to infrastructure and buildings, while minor, could result in costs to repair damaged brick or utilities. Q. Earthquake coverage in Iowa insurance policies is not common, however the monetary impacts of an earthquake are likely minor given the distance to the nearest known fault lines. R. Since Iowa is not known for earthquakes, the reputation of local jurisdictions would likely not face much risk unless there is a significant event and lack of local response.	**1**
Speed of Onset	Earthquake prediction is an inexact science. Even in areas that are well monitored with instruments, such as California's San Andreas Fault Zone, scientists only very rarely predict earthquakes.	**1**
	Hazard Worksheet Score	**6**
	Composite Score	**17**

Figure 40: Earthquake Hazard Map for the Midwest



Note: The numbers indicated on the map are in percentage of gravity horizontal acceleration. The lower the percentage indicates the lower intensity of shaking and thus lower potential damage.

Source: Iowa Department of Natural Resources and USGS GIS data compiled by Chariton Valley Planning and

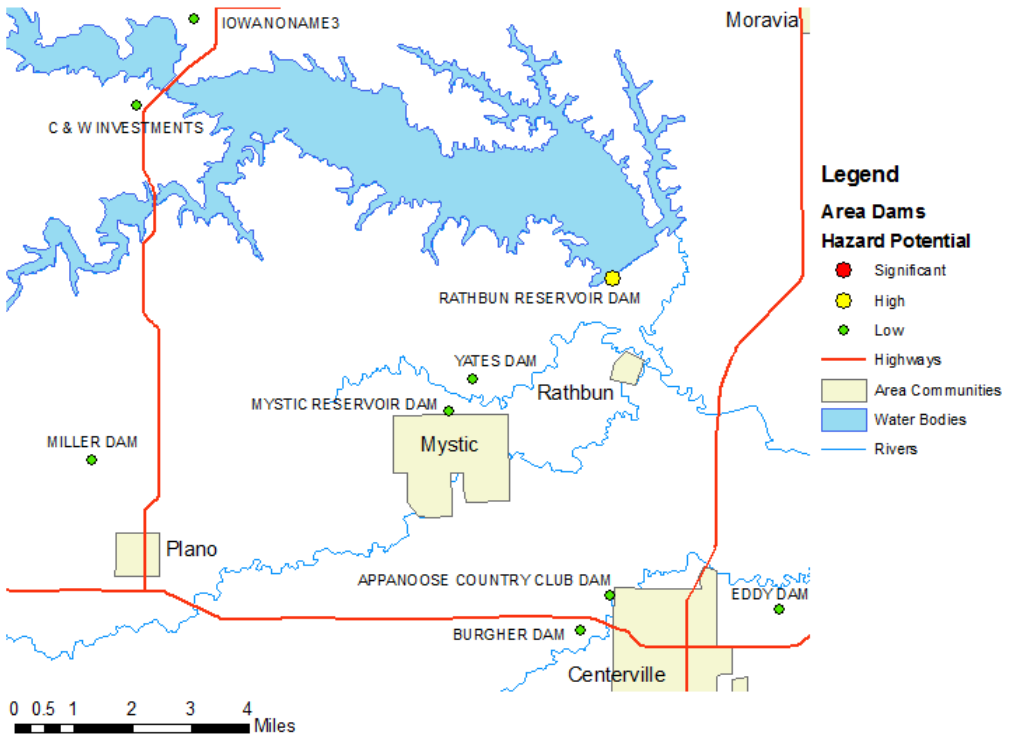
Hazard	Landslide	Rating
Definition	**Landslide**: Downward movement of a slope and materials under the force of gravity (FEMA).	
Description	Landslides occur when masses of rock, earth, or debris move down a slope. Landslides may be very small or very large, and can move at slow to very high speeds. Many landslides have been occurring over the same terrain since prehistoric times. They are activated by storms and fires and by human modification of the land. New landslides occur as a result of rainstorms, earthquakes, and various human activities.	
Historical Occurrence	There have been numerous small-scale landslide events in Iowa, but none of significance that have resulting in injury or death. There are no recorded landslides in the Appanoose County area.	**1**
Probability	Though there have been no recorded landslides in or around Mystic, there are steep slopes in the area. These areas may be susceptible to landslides on a minor scale, especially if the soils are disturbed by storms, other hazards, or development. The State of Iowa Hazard Mitigation Plan identifies Appanoose County as one of the areas that is moderately susceptible to landslides (see *Appendix 22: Iowa Landslide Susceptibility Map*).	**1**
Vulnerability	Structures on steep hills or overlooking ravines and area creek beds are subject to possible damage if the soils shift. Most of the structures in Mystic are located on relatively flat or on moderate slopes, though not all buildings are	**1**
Maximum Threat	Maximum threat of a landslide in Mystic would be confined to a few buildings given the "rolling hill" nature of the area. From the Soil Survey in the Appendix, steep slopes are limited in number and are and most buildings are located on flat land in the city limits. Landslides would likely impact roads most broadly. Generally speaking, slopes of greater than 15% should not be built upon as is the standard in Sensitive Areas Ordinances in some areas of Iowa. See *Appendix 9: NRCS Web Soil Survey for Mystic Area*. Most of the slopes in Mystic are no more than 14%.	**1**
Severity of Impact	Landslides have damaged homes and disrupted electricity, water service, communications, and transportation routes in Iowa. Injuries and deaths are very unlikely except in the case of undetected slope failure warning signs in structures overlooking steep slopes. In Mystic, most damage would likely occur to infrastructure or to homes located on or very close to steep slopes. A. Few if any injuries would likely be seen in Mystic. B. Response personnel are at minimal risk in Iowa. C. Continuity of operations would not likely be affected unless utility lines or pipes are damaged or roadways are blocked.	**1**

	D. Property losses would likely be similar to sinkholes. E. Delivery of services is unlikely to be affected for extended periods of time. F. Landslides could block water channels or introduce excess sediment or expose hazardous chemicals that may be in the soil. G. Damage to infrastructure and buildings could include partial collapse or compromise to the structural integrity of a structure. H. None known. I. The reputation of local jurisdictions would likely not face much risk unless there is a significant event and lack of local response.	
Speed of Onset	Landslides are often involved in or triggered by other natural hazards. Landsliding and flooding are often related because precipitation, runoff, and ground saturation combine to destabilize soil and rock. For this reason, landslides can be detected if high potential landslide areas are monitored.	**1**
	Hazard Worksheet Score	**6**
	Composite Score	**15**

Hazard	Dam Failure	Rating
Definition	**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.	
Description	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. There are a number of dams in Appanoose County, one approximately three miles north east of Mystic forming the south east boundary of Rathbun Lake where the Chariton River empties the lake. The one at Rathbun Lake is named Rathbun Dam, owned by Cenwk completed in 1972. Two other dams are located near Mystic, the Mystic Reservoir Dam owned by the city and Yates Dam owned by M Leon Yates. Both of these dams are considered low hazard dams (see *Figure 15: Mystic Area Dams*).	
Historical Occurrence	There are no incidents of dam failure in Appanoose County on record.	**1**
Probability	Since dams are present in the county, one near Mystic, there is a chance of failure occurring. The chance of a dam failure impacting Mystic may be low, but it may be possible. The dam north of Mystic was identified as at risk of failure by one committee member during a meeting. However this dam is listed as a "low risk" dam in Iowa DNR data, likely due to the relatively small population or area of potential impact from the DNR perspective. With increased attention to sound design, quality 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). Rathbun Dam was completed in 1972 and the 50 year design life will be reached in 2022. Rathbun Dam is considered a "high hazard" dam and does have an emergency action plan (http://rathbun.uslakes.info/DamInfo.asp?DamID=100199).	**2**
Vulnerability	People and property along streams are most vulnerable. Facilities and lives 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, a flash flood can travel a significant distance.	**3**

	Buildings located near the two creeks in and adjacent to Mystic would be the most likely impacted. The low-lying area along Main Street where City Hall and the community building would also is vulnerable to flooding resulting from dam failure.	
Maximum Threat	The area impacted following a dam failure would be limited to those areas in and near the floodplain. People and property outside the floodplain could also be impacted depending on the proximity to the dam and the height above the normal stream level. Mystic is approximately 2-3 miles from Rathbun Lake; the two nearest creeks (one running through Mystic) flow northwesterly. Chariton River which flows out of Rathbun Lake flows southeasterly. The most direct impact of a dam failure on Mystic would be one or both creeks flowing backward due to the influx of water into the Chariton River. The topography of the area between Mystic and the lake would likely preclude water flowing overland into town other than through these two creeks. As with the flooding hazard, the floodplain amounts to about 25-35% of the town, though a catastrophic dam failure would likely flood more areas than are identified in the FIRM.	**2**
Severity of Impact	J. The severity of damage could be similar to flash flooding impacts. K. None directly, but operations could be affected by communication loss, critical facility damage/destruction, etc. L. Depends upon the downstream property, facilities, and infrastructure. Worst case scenario could involve whole subdivisions being swept away by the fast flowing water. M. See flash flooding. N. See flash flooding. Much scouring would take place and erosion would be extensive. O. See flash flooding. P. See flash flooding. Q. See flash flooding. R. See flash flooding.	**4**
Speed of Onset	In the event of dam failure, advanced notice would likely be minimal and the onset of the event could occur very rapidly. With maintenance and monitoring, weak areas and possible failure points can be identified allowing time for evacuation and securing of the dam. Most dams are only inspected periodically thus allowing problems to go undetected until a failure occurs. Rathbun Dam is inspected every five years (http://rathbun.uslakes.info/DamInfo.asp?DamID=100199).	**4**
	Hazard Worksheet Score	**16**
	Composite Score	**20**

Figure 41: Mystic Area Dams



Source: Iowa Department of Natural Resources GIS data compiled by Chariton Valley Planning and Development

Hazard	Thunderstorm & Lightning	
Definition	**Thunderstorm**: A thunderstorm is formed from a combination of moisture, rapidly rising warm air and a force capable of lifting air such as a warm and cold front, a sea breeze or a mountain. All thunderstorms contain lightning. Thunderstorms may occur singly, in clusters or in lines. Thus, it is possible for several thunderstorms to affect one location in the course of a few hours. Some of the most severe weather occurs when a single thunderstorm affects one location for an extended time. **Lightning**: 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 a temperature approaching 50,000 degrees Fahrenheit in a split second. The rapid heating and cooling of air near the lightning causes thunder.	
Description	Thunderstorms are common in Iowa and can occur singly, in clusters, or in lines. They are formed 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 tornadoes, high straight-line winds above 58 mph, microbursts, lightning, hailstorms, and flooding. The NWS considers a thunderstorm severe if it produces hail at least 3/4-inch in diameter, wind 58 mph or higher, or tornadoes. High straight-line winds, which can often exceed 60 mph, are common occurrences and are often mistaken for tornadoes. 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 F in a split second. This rapid heating, expansion, and cooling of air near the lightning bolt creates thunder. Lightning associated with thunderstorms is itself a major hazard. In the United States, from 75 to 100 Americans are hit and killed each year by lightning. The power of lightning's electrical charge and intense heat can electrocute on contact, split trees, ignite fires and cause electrical failures.	Rating
Historical Occurrence	Since 1965 there has been 58 Thunderstorm events recorded in Appanoose County. Many of these storms affected the residents of Mystic and most have included high winds incorporating the risks that are detailed in the respective section of this plan. Since 1965, thunderstorms have caused approximately $760 thousand in property damage, $60 thousand in crop	**4**

	damage, and 1 injury. Since 1950 there have been three recorded Lightning events in Appanoose County, none of which occurring in Mystic specifically; two have occurred within four miles of Mystic, however. Each of the recorded events occurred between 1996 and 2007. Between these three events, $87 thousand in property damage and one injury were reported. One heavy rainstorm has occurred since 1950 in Rathbun in 2007, about two miles north east of Mystic. No damage or injuries were reported from this storm.	
Probability	Iowa experiences between 30 and 50 thunderstorm days per year on average. 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 a 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). Based on the events over the last 43 years, Appanoose County and Mystic may anticipate at least one thunderstorm per year.	**4**
Vulnerability	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 following flooding and flash flooding. 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 tornadoes 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 impacts of severe thunderstorms.	**3**
Maximum Threat	Although the developments in technology have been very beneficial in reducing the long-term negative effects of thunderstorms, certain dangers still exist. The maximum threat of a thunderstorm would be realized if it was accompanied by power outages and limitation of travel due to debris in the roadways. In addition lightning damage to communication centers could result in the reduction of adequate medical response time. 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-	**4**

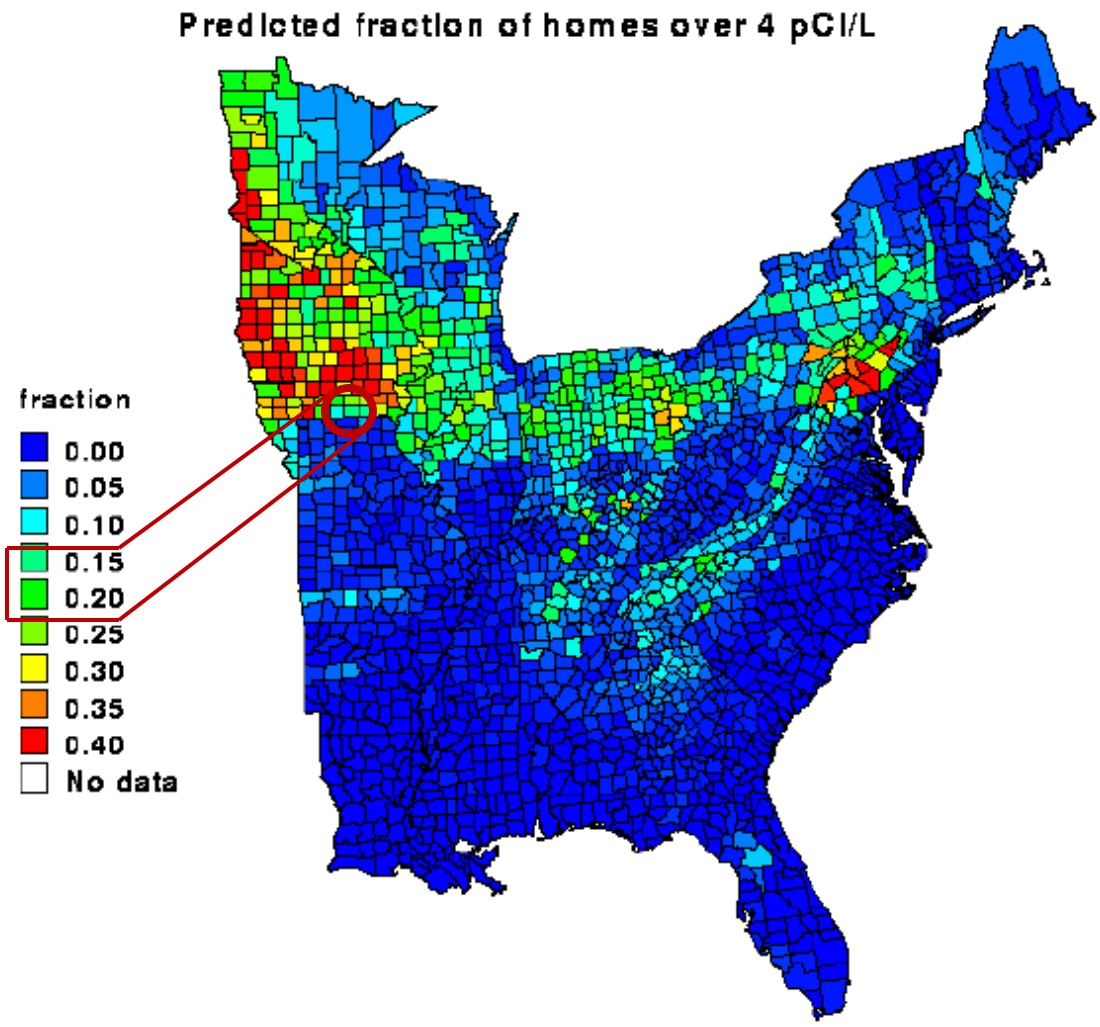
	severe thunderstorms have a lifespan of 20 to 30 minutes, while severe thunderstorms last longer than 30 minutes. The City of Mystic is less than 2 miles across north-to-south and east-to-west so a storm cell could easily cover the entire city.	
Severity of Impact	J. Like tornadoes, thunderstorms and 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. K. Response personnel are exposed to the same risk as the general public when caught in the storm without shelter. Work on ladders and other apparatus during lightning can expose responders to higher risk situations. L. Continuity of operations would be affected through indirect impacts such as loss of critical services. M. High winds can damage trees, homes (especially mobile homes), and businesses and can knock vehicles off of the road. Straight-line winds are responsible for most thunderstorm damage. N. 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. O. Thunderstorms and lightning can damage trees, but this is a naturally occurring hazard and the environment proves to be resilient following these and other natural hazards. P. Thunderstorms and lightning occur rapidly and do not persist. The aftermath may cause moderate economic impacts, but most will be related to cascading hazards such as flooding. Q. None known. R. Timely and adequate response will stave off any negative reputation that the jurisdiction could be exposed to. Clean up procedures should be established including a debris removal and disposal plan.	**2**
Speed of Onset	The National Weather Service has developed effective weather advisories, which are promptly and widely distributed. Radio, TV, and Weather Alert Radios provide the most immediate means to do this. Accurate information is made available to public officials and the public in advance of the storm. Again, weather prediction capabilities have made significant improvements in the past few years. There are several notifications made by the National Weather Service. These include severe thunderstorm watch, severe thunderstorm warning, tornado watch, tornado warning, flash flood watch, and flash flood warning.	**2**
	Hazard Worksheet Score	**19**
	Composite Score	**35**

Hazard	Radon	Rating
Definition	**Radon**: Radon is a colorless, odorless, and tasteless gas resulting from the radioactive decay of naturally occurring substances in many types of soil.	
Description	Radon percolates through the soil and can infiltrate homes through cracks in basements or lower-level floors. Radon is a problem inside enclosed spaces such as basements and the first two to three floors of buildings. Once it is outside of an enclosed space, radon disperses and dilutes quickly and thus is not a problem outdoors. Radon results from the radioactive decay of uranium and radium which are naturally occurring elements found in soil and ground water. Radon is measured in picocuries per liter (pCi/L); 4 pCi/L is a threshold set by the US EPA as the level where action should be taken to mitigate radon levels. However, no amount of radon exposure is safe. Radon levels tend to be higher during periods when homes and other buildings have windows and doors closed such as during the winter as the gas can build up greater concentrations. Fans and open windows can help to disperse the gas.	
Historical Occurrence	Radon can occur in any home and any building, but certain parts of the country are more susceptible than others due to soil composition and radium content in the soil. Iowa has some of the highest estimated rates of radon infiltration into homes in the western United States. Appanoose County has an estimated 15% to 20% of homes with elevated levels of radon. See *Figure 16: Predicted Proportion of Homes with High Radon Levels*.	**1**
Probability	Iowa State University Extension and the EPA found that 70% of homes in Iowa had radon levels exceeding 4 pCi/L. This study includes the entire state. Figure 16 suggests that for the Mystic area and the broader Appanoose County area, about one in five homes has elevated levels of radon. However, each home would need to be tested to be certain of radon levels since there is variation in soils and homes.	**2**
Vulnerability	People are most at risk in basements with radon levels equal to or exceeding 4 pCi/L. Following basements, risk exists in enclosed spaces in lower levels of buildings There is little risk to people outdoors and little if any risk to property.	**2**
Maximum Threat	Radon affects the entire state of Iowa though there are areas with greater and areas with lesser risk. Radon levels can vary from home to home, even between buildings located next to one another. An estimated 15% to 20% of homes in Appanoose County have elevated levels of radon so this estimate can be extrapolated to suggest the same proportion of homes in Mystic are affected as well. The presence of the mines under Mystic may also elevate this estimated proportion.	**2**
Severity of	J. Radon does not harm people immediately, the health impacts take time	**2**

Impact	to manifest. Despite this fact, radon is known as the second most prevalent cause of lung cancer deaths after tobacco smoke and causes more deaths than drunk drivers, drowning, home fires, and others. Tobacco smokers exposed to radon have ten times the risk of developing lung cancer than non-smokers as radon reacts to compounds found in tobacco smoke. K. Response personnel are generally health care professionals and are not generally exposed to the same health threats as the patients. L. None. M. Radon does not pose a threat to the built environment though renovations to structures containing lead can release this toxin. N. None. O. Radon is a naturally occurring gas that rapidly dissipates once outside of an enclosed space. P. Mitigation of radon is relatively inexpensive. Health costs for people poisoned by either substance could be significant. Q. None known. R. None known.	
Speed of Onset	As a naturally occurring pollutant, radon varies from location to location. Without testing a particular enclosed space, there is no way of knowing whether radon is present. Radon tests are available for purchase, many for less than $20 and can be mailed into a given laboratory for results. Mitigation of radon hazards are relatively simple and inexpensive, generally involving the installation of a pipe extending under the lowest level of a structure to the outside with a fan to draw the gas out of the structure.	**1**
	Hazard Worksheet Score	**10**
	Composite Score	**11**

Additional Resources:	
"Radon Facts"	Iowa State Extension Service - http://www.extension.iastate.edu/Publications/PM1336.pdf
"Radon"	US EPA - http://www.epa.gov/radon/
Air Quality: Radon	American Lung Association - http://www.lungusa.org/site/pp.asp?c=dvLUK9O0E&b=35395
Iowa | Where You Live | Indoor Air Quality | US EPA | Air	US EPA - http://www.epa.gov/iaq/states/iowa.html
"A Citizen's Guide to Radon"	US EPA - http://www.epa.gov/iaq/radon/pubs/citguide.html

Figure 42: Predicted Proportion of Homes with High Radon Levels



Source: E.O. Lawrence Berkeley National Laboratory (http://eetd.lbl.gov/IEP/high-radon/efrac4.htm)

Human Caused and Combination Hazards

Hazard	Climate Change	
Definition	**Climate Change**: significant change in measures of climate (such as temperature, precipitation, or wind) lasting for an extended period (decades or longer). Climate change may result from: • natural factors, such as changes in the sun's intensity or slow changes in the Earth's orbit around the sun; • natural processes within the climate system (e.g. changes in ocean circulation); • human activities that change the atmosphere's composition (e.g. through burning fossil fuels) and the land surface (e.g. deforestation, reforestation, urbanization, desertification, etc.) Source: US EPA (http://www.epa.gov/climatechange/basicinfo.html)	
Description	Climate Change is perhaps the ultimate combination hazard given its widespread impacts. Some of these impacts include less predictable weather patterns, more frequent and stronger storms, more and longer periods of localized droughts, more infiltration of invasive species as previously "safe" regions obtain more favorable conditions such as warmer and longer periods of warm temperatures allowing more tropical species to move northerly, and so on. More frequent and stronger storms can mean that there may be an increase in flash floods and erosion. This hazard is particularly insidious as the general trend can be predicted as the Intergovernmental Panel on Climate Change, the US EPA, the Union of Concerned Scientists, the USDA, and others have been doing, however no single storm event can be absolutely determined as caused by climate change, yet. Climate Change is associated with increased concentrations of carbon in the atmosphere which changes the dynamics of weather patterns through trapping solar heat in the atmosphere and also suppressing some of the solar energy from reaching the earth's surface. While atmospheric carbon is good for plants and can help them grow faster and larger, the potential positive impacts on agriculture are uncertain. This is for a number of reasons, 1) increases in severe weather can damage crops regardless of how fast or large they grow, 2) surface-level ozone, often called smog in larger urban areas, has been increasing in rural areas for the last 50 years and is projected to continue to increase, and 3) the growing benefits of carbon for crops is also gained by weeds and other invasive plants which have been found to become more resistant to common herbicides as they can establish deeper roots faster and thus recover from herbicidal applications. Ozone is the result of an atmospheric chemical reaction between sunlight, hydrocarbons, and nitrogen oxides, common ingredients in commercial fertilizers and pollutants resulting	Rating

	from combustion. Surface level ozone is toxic to many plants and harmful to human health. The majority of ozone occurring in rural areas comes from larger urban areas; ozone is very mobile. In addition to expanding areas of invasive species, the range of diseases may increase as insects and other pests that often act as carriers are able to spread into new areas. This would be due to potentially longer Iowa summers, shorter and warmer winters, and increased precipitation. These conditions are anticipated to be favorable to both the pests and to some diseases not currently found in Iowa. The US EPA anticipates diseases that are associated with warm and tropical climates spreading into Iowa including Malaria and California Encephalitis. Major flooding such as seen in 2008 and 1993 may occur roughly every ten years as the climate in Iowa continues to change. This has the potential of increasing mosquito habitat. The near-term impacts (25-50 years) of climate change are assured, what is not is the longer term impacts (100 years+). Adaptation to the induced effects will be required to minimize damage and injury and to maintain a quality of life we are most familiar with.	
Historical Occurrence	The earth's climate has changed in the past; however the speed of onset was generally over centuries. Since the Industrial Revolution in the mid-1800's, climatic changes have been occurring rapidly, especially in the last half of the 20th Century – over a period of decades. The difference in speed of onset has dramatic impacts on the capacity for flora and fauna to adapt. The more rapid climatic changes are attributed to carbon and other air pollutants resulting from human activities whereas slower changes are the result of natural factors.	**2**
Probability	The scientific consensus is that climate change is occurring now and will continue for at least a generation if concerted global efforts are made to mitigate it and longer if no mitigation is implemented. The induced hazards from climate change are difficult to predict given current technology, methods, and available data.	**4**
Vulnerability	Everyone is vulnerable to the multitude of induced hazards from climate change. Those at most risk however are the young, the elderly, and those without the financial resources to adapt. The last includes areas with weak economies and little economic development, such as rural areas in Iowa. Structures and populations at risk are more threatened by the induced effects of this hazard such as increased flooding, severe storms, drought, and so on. Most of these induced hazards threaten buildings and infrastructure as indicated in the respective profiles.	**3**
Maximum Threat	Maximum threat includes multiple severe weather events in all seasons along with the associated threats of each, overloading of existing and largely	**3**

	insufficient infrastructure, and growing strains on health care systems. The threat of climate change itself is widespread, but the induced effects can be localized such as increases in severe storms in a relatively small geographic area.	
Severity of Impact	Long term health impacts can become more widespread including asthma, infectious diseases carried by pests spreading into new areas, and drinking water contamination from spreading bacteria and invasive species. Deaths from extreme cold are likely to decline but may be replaced by increases in deaths from periods of extreme heat. Likewise, with increasingly severe storms deaths, injuries, and property / crop damage are likely to increase and require additional investment in mitigation strategies. Aside from severe storms, more intense, more frequent, and longer lasting droughts and more intense flooding are anticipated.	**1**
Speed of Onset	The speed of onset of climate change is slow in terms of a human life-span but very quick in relation to the ability of plants, animals, and cities to adapt to such changes. The effects of climate change, storms and other hazards, are variable. With regard to the atmospheric pollution associated with climate change, the US EPA provides daily air quality forecasts which may be seen on The Weather Channel for some areas or on the AirNow.org website.	**1**
	Hazard Worksheet Score	**14**
	Composite Score	**24**

Additional Resources:	
"The effects of climate change on agriculture, land resources, water resources, and biodiversity"	USDA - http://www.climatescience.gov/Library/sap/sap4-/default.php
Climate Change website	US EPA - http://www.epa.gov/climatechange/index.html
"How Climate Change Will Affect Iowa"	Des Moines Register - http://data.desmoinesregister.com/climatechange/climatechange.php
Extreme Events | Climate Change: Health and Environmental Effects	US EPA - http://www.epa.gov/climatechange/effects/extreme.html
"Climate Change in the Hawkeye State"	Union for Concerned Scientists - http://www.ucsusa.org/global_warming/science_and_impacts/impacts/climate-change-in-the-hawkeye.html

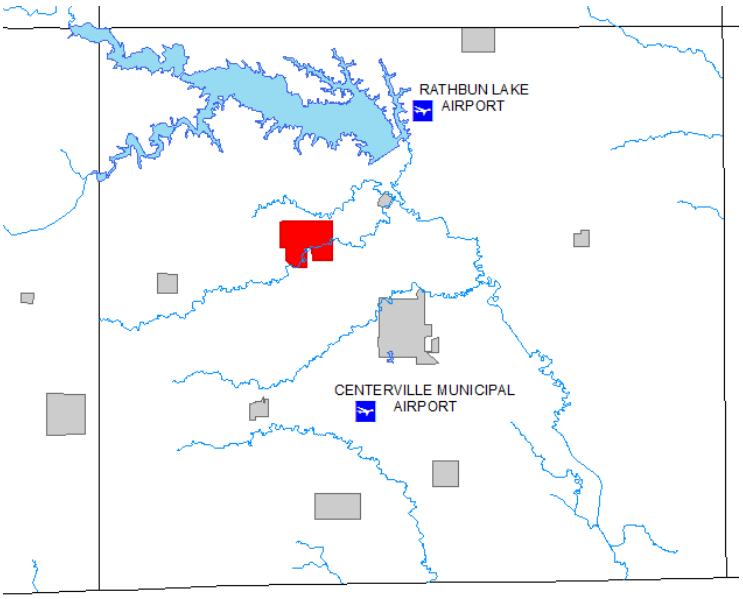
Hazard	Air Transportation Incident	
Definition	**Air Transportation Incident**: Any incident involving a military, commercial, or private aircraft.	
Description	An air transportation incident may involve a military, commercial, or private aircraft. Air transportation is playing a more prominent role in transportation as a whole; airplanes, helicopters, and other modes of air transportation are used to transport passengers for business and recreation as well as thousands of tons of cargo. A variety of circumstances can result in an air transportation incident; mechanical failure, pilot error, enemy attack, terrorism, weather conditions, and on-board fire can all lead to an incident at or near the airport. Air transportation incidents can occur in remote unpopulated areas, residential areas, or downtown business districts, incidents involving military, commercial, or private aircraft can also occur while the aircraft is on the ground.	Rating
Historical Occurrence	According to the National Transportation Safety Board (NTSB), there have been no aviation accidents or incidents in Appanoose County in the last ten years. Only a few major accidents have impacted Iowa since 1935 but numerous less severe accidents have occurred around the state in both large and small cities.	**1**
Probability	The lack of precedent does not mean that an air incidents and accidents cannot impact Mystic. There are airports in or near Centerville, Albia, and Chariton, as well as heliport a heliport in Corydon. Private airports are also in the area as well as major airports within 200 miles. See *Figure 17: Airports within 10-Miles of Mystic* for local airport locations.	**1**
Vulnerability	Despite the increase in the number of people using air travel, incidents that require response personnel and involve casualties are likely to continue to decrease in number due to increases in the quality of training, equipment, and safety. Proper land-use near the airport will also decrease the chance that people and property on the ground will suffer significant impacts in the event of an air transportation accident. Such land use controls generally consist of zoning ordinances. Most incidents involving airplanes takes place in or immediately near airports such as during take-offs and landings. However, planes can and do crash or need to make emergency landings, sometimes in populated places. One example is the October 6, 2008 incident of a small plane that crashed in an Iowa City residential neighborhood.[18] Ice or other debris may fall from planes flying overhead which may cause injuries or damage, although reports of such incidents are rare. Anything struck by	**1**

[18] Des Moines Register. *Iowa City plane crash injures one*. <http://www.desmoinesregister.com/article/20081006/NEWS/81006035/1001/>. October 6, 2008.

	falling debris is vulnerable to damage regardless of type of building. People aboard airplanes are the most vulnerable. Statistics from the National Transportation Safety Board and the airline industry show that the majority (over 75%) of airplane crashes and accidents occur during the takeoff or landing phases of a flight. As a result, developed areas adjacent to the airports and in airport flight paths are particularly vulnerable to this hazard. For areas away from the airport, a smaller percentage of the population would be directly in the area of impact. Because of the infrequency of aircraft in the skies above areas away from the airport, these areas would not be considered as vulnerable. The Mystic Planning Committee reported increased air traffic over and near the city in recent years, much of which from helicopters.	
Maximum Threat	As mentioned above, most accidents occur during takeoffs and landings. Accordingly, the spatial extent of the majority of incidents would occur on airport grounds or adjacent areas. Compared to many other hazards, an air transportation accident would occupy a relatively small area. The extent to which the impacts would be felt would depend on the materials involved. For example, if a plane is used to transport volatile or hazardous substances were involved in an accident, the area of concern would be significantly larger than the area for an accident involving a small personal aircraft carrying stable materials. The largest share of accidents would likely affect only a few city blocks.	**1**
Severity of Impact	The level of severity would depend on the type of aircraft involved, the type of cargo being transported, and the area on the ground on which the accident occurred. Passengers would likely be exposed to broken glass, but other personal injuries would depend on the details of the accident. If a plane were to simply run off of a runway while taking off, the injuries could be similar to a car or truck accident. Crash landings or falling out of the air would result in more severe injuries to passengers and could harm or even kill people on the ground that are struck by the plane or by debris caused by the crash.	**1**
Speed of Onset	The amount of warning time prior to an aircraft accident could vary from tens of minutes to a matter of seconds. Crew aboard a troubled aircraft can radio to ground crew to prepare for the incident, but little can be done to lessen the direct effects of the impact. Rarely is there adequate time to do more than position onsite response personnel and alert mass casualty care providers of the possible event.	**4**
	Hazard Worksheet Score	**9**
	Composite Score	**21**

Additional Resources:	
FAA Accident & Incident Data	http://www.faa.gov/data_statistics/accident_incident/
NTSB Aviation Accident Database Query	http://www.ntsb.gov/ntsb/query.asp

Figure 43: Airports within 10-Miles of Mystic



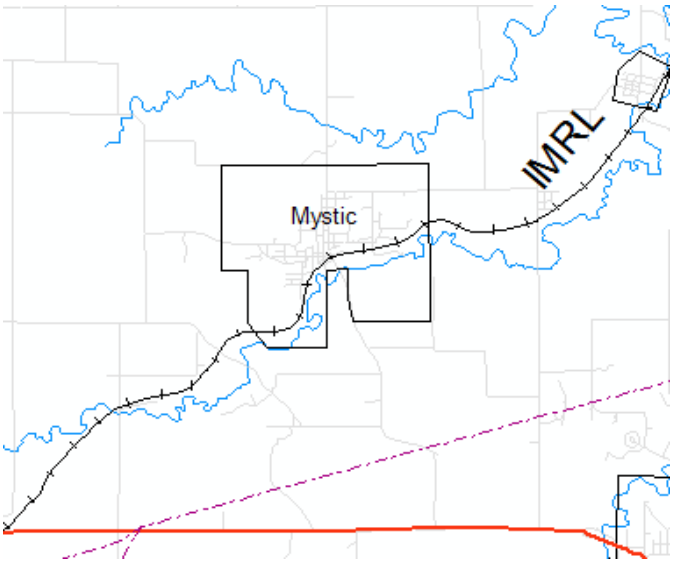
Source: IA DNR and IDOT GIS data compiled by Chariton Valley Planning and Development

Hazard	Rail Transportation Incident	
Definition	**Rail Transport Incident**: A derailment or a train accident which directly threatens life or property, or which adversely impacts a community's capabilities to provide emergency services.	
Description	A railway transportation incident is a train accident that directly threatens life and/or property, or adversely impacts a community's capabilities ability to provide emergency services. Railway incidents may include derailments, collisions, and highway/rail crossing incidents. Train incidents can result from a variety of causes. Human error, mechanical failure, faulty signals, and problems with the track can all lead to railway incidents. Results of an incident can be range from minor "track hops" to catastrophic hazardous materials incidents and even passenger casualties. With the many miles of track in Iowa, there are numerous at-grade crossings at which vehicles must cross the railroad tracks. See *Figure 18: Railroad Route Through Mystic* for location of rail line in and around Mystic.	Rating
Historical Occurrence	According to the National Transportation Safety Board, there have been eight railway accidents in Iowa since 1967. In 2001 there was a train derailment in Mystic involving 11 cars, two of which containing hazardous chemicals. The next closest railroad accident occurred in 1987 in Russell to the northwest of Mystic in Lucas County. This accident involved a collision and subsequent derailment on the Burlington Northern Line.	**1**
Probability	There are three railroad crossings in Mystic on the IMRL line now operated by Iowa, Chicago, and Eastern Railroad. These crossings present the opportunity for train-vehicle or pedestrian accidents. Derailments are also possible, while major derailments are less likely.	**2**
Vulnerability	People and property in close proximity to the railway lines, crossings, sidings, switching stations, and loading/unloading points are most at risk. Those away from railroad tracks and facilities are vulnerable only to large-scale incidents including those in which hazardous materials are involved. There are very few buildings located within 100 feet of the railroad track that runs through Mystic. The railroad passes part of Main Street but only the structures on the south side of the street are within about 500 feet of the line. This does include the community center.	**1**
Maximum Threat	Numerous railways crisscross Iowa. Vehicle-train collisions are usually limited to areas in and near intersections. Rarely, the incident will result in widespread effects. The direct area of impact is usually quite small, but depending on the products and materials involved, the area could become	**3**

	extensive. If hazardous materials are involved, the effects could reach areas up to 1.5 miles from the scene; this could encompass much or most of Mystic if it occurred in town. Harmful products may contaminate streams, rivers, water distribution systems, and storm water systems. If this occurs, a large portion of the community could be affected. The ability of response agencies to contain the product on-scene usually limits the area affected.	
Severity of Impact	Deaths and bodily injury can range from those on a train or in the crossing to persons in the vicinity where debris may scatter. Depending on the contents of the train, hazardous materials may be released with their related hazards. Debris may damage nearby property or block transportation routes beyond the railroad itself. Railway or road infrastructure could be damaged by debris or by derailed train cars.	**3**
Speed of Onset	Like other transportation incidents, a railway incident would occur with no warning. There may be a limited amount of time to warn those in the pathway of the harmful effects.	**4**
	Hazard Worksheet Score	**14**
	Composite Score	**32**

Additional Resources:	
NTSB Railroad Accidents	http://www.ntsb.gov/Publictn/R_Acc.htm

Figure 44: Railroad Route Through Mystic



Source: IA DNR and IDOT GIS data compiled by Chariton Valley Planning and Development

Hazard	Highway Transportation Incident	
Definition	**Transportation Hazard**: A hazard to the community resulting from an incident related to or caused by any vehicle used to transport persons or items, such as cars, trucks, airplanes, trains, boats, etc.	
Description	Transportation hazards can occur in any community at any time and may result in injury, loss of life, property damage, and hazardous chemical spills. The possibility of such a hazard is increase by the number of major transportation routes near the community. Three major transportation routes exist in or near the City of Mystic. Car and truck traffic is highest on County Highway T14, which runs north and south, bisecting the city. According to the Iowa Department of Transportation in 2006, daily averages of 1,250 vehicles travel in and out of Mystic on T14 to the south annually. This number drops to 460 on T14 on the north side of Mystic. See *Appendix 10: Transportation Routes in and around Mystic* and *Appendix 23: Average Annual Daily Traffic Count (2006)* for more information on traffic in the area. A highway transportation incident can be single or multi-vehicle requiring responses exceeding normal day-to-day capabilities. Hundreds of thousands of trips a day are made on the streets, roads, highways, and interstates in the state; if the designed capacity of the roadway is exceeded, the potential for a major highway incident increases. Weather conditions play a major factor in the ability of traffic to flow safely in and through the state as does the time of day (rush hour) and day of week. Numerous major and minor traffic accidents occur daily in Iowa and result in property damage and injury, major accidents involving multiple vehicles and serious injury are not uncommon. Although traffic engineering, inspection of traffic facilities, land use management of adjacent areas to roads and highways, and the readiness of local response agencies has increased, highway incidents continue to occur. As the volume of traffic on Iowa streets, highways, and interstates increase, the number of traffic accidents will increase. The combination of large numbers of people on the road, unpredictable weather conditions, potential mechanical problems, and human error create the potential for a transportation accident.	Rating
Historical Occurrence	The Department of Transportation does not make accident data available for cities under 5,000 residents online so obtaining an accurate number of traffic accidents is difficult. Presumably, accidents have happened in Mystic and likely occurred on County Highway T14 entering town from the south based	**1**

	on traffic counts.	
Probability	There exist a large number of streets and intersections in the city and any street or intersection could be the site of a traffic accident. Persons driving on Highway T14 may be more vulnerable to traffic accidents due to the larger number of drivers on this road and the increased road speed.	**3**
Vulnerability	Drivers and passengers may be the most vulnerable in traffic accidents occurring in Mystic. Pedestrians may also be vulnerable at intersections. Due to the relatively low speed limits of the roads within Mystic and the relatively low amount of traffic in town, damage to structures from vehicle accidents are likely negligible. See *Appendix 23: Annual Average Daily Traffic Count (2006)*.	**1**
Maximum Threat	There remains a moderate threat of a traffic accident occurring within the city limits as well as a moderate threat of a hazardous materials event occurring as a result of the accident. A particular threat exists where the railroad intersects with T14. An accident at this intersection may impact up to about 25% of the community.	**1**
Severity of Impact	The exact area that will be affected by a traffic accident will likely be small and have a minimal impact on the residents as a whole, unless a large or extremely dangerous hazardous material spill should result from the event.	**1**
Speed of Onset	Due to their nature, there is little or no way to predict when or where a traffic accident will occur. The same can be said for rail disasters and air disasters.	**4**
	Hazard Worksheet Score	**11**
	Composite Score	**32**

Additional Resources:	
Iowa DOT Crash Data by County	http://www.iowadot.gov/crashanalysis/county.htm
Iowa DOT Annual Average Daily Traffic	http://www.iowadotmaps.com/msp/traffic/aadtpdf.html

Hazard	Transportation Hazardous Materials	
Definition	**Transportation Hazardous Materials**: An accidental release of chemical substances or mixtures that present a danger to public health or safety as a result of transportation.	
Description	This hazard constitutes an accidental release of chemical substances or mixtures that presents a danger to public health or safety during transportation. A hazardous substance is one that may cause damage to person(s), property, or the environment when released to soil, water, or air. Chemicals are manufactured and used in ever increasing types and quantities, as many as 500,000 products pose physical or health hazards and can be defined as "hazardous chemicals." Hazardous substances are categorized as toxic, corrosive, flammable, irritant, or explosive and each year, over 1,000 new synthetic chemicals are introduced and transported across the county via semi-truck and train. Hazardous materials incidents generally affect a localized area and the use of planning and zoning can minimize the area of impact. Large quantities of hazardous materials are transported daily on Iowa streets, highways, interstates, and railways. Roadways are a common site for the release of hazardous materials, as are railways. The Department of Transportation (DOT) regulates the routes and speed limits used by carriers and monitor the types of hazardous materials crossing state lines. Despite increasing safeguards, more and more potentially hazardous materials are being used in commercial, agricultural, and domestic uses and are being transported on Iowa roads and railways.	Rating
Historical Occurrence	According to the Department of Natural Resources, there have been two chemical releases in Mystic since 2000, only one was a transportation-related release. In 2001 a train derailed and released octanol near School Street in the southeast corner of Mystic. Given the rural nature of the area around Mystic and the presence of the railroad it is likely that past occurrences have happened, but records of which are not readily available.	**1**
Probability	Large quantities of hazardous materials are transported daily on Iowa streets, highways, interstates, and railways. Roadways are a common site for the release of hazardous materials. Railways are another source for hazardous materials releases. The Department of Transportation regulates routes and speed limits used by carriers and monitor the types of hazardous materials crossing state lines. Despite increasing safeguards, more and more potentially hazardous materials are being used in commercial, agricultural, and domestic uses and are being transported on Iowa roads and railways. The SHMT evaluated the probability of a highway transportation incident	**2**

	occurring in Iowa as high, with more than a 60% chance in the next year.	
Vulnerability	A hazardous materials incident can occur almost anywhere, so any area is considered vulnerable to an accident. People, pets, livestock, and vegetation in close proximity to transportation corridors and populations downstream, downwind, and downhill of a released substance are particularly vulnerable. Depending on the characteristics of the substance released, a larger area may be in danger from explosion, absorption, injection, ingestion, or inhalation. Occupants of areas previously contaminated by a persistent material may also be harmed either directly or through consumption of contaminated food and water. Structures near the intersection of the railroad and Highway T14 would be most vulnerable given the relative risk of accidents happening in this area.	**2**
Maximum Threat	Most of the hazardous materials incidents are localized and are quickly contained or stabilized by the highly trained fire departments and hazardous materials teams. Depending on the characteristic of the hazardous material or the volume of product involved, the affected area can be as small as a room in a building or as large as 5 square miles or more. Many times, additional regions outside the immediately affected area are evacuated for precautionary reasons. More widespread effects occur when the product contaminates the municipal water supply or water system such as a river, lake, or aquifer.	**2**
Severity of Impact	Hazardous material releases can lead to soil, water, and air contamination that can pose health hazards to people, livestock, and wildlife. These impacts could pose significant economic burdens for clean up or recovery. Some chemicals can also cause fires if combustible and ignited. Chemical burns may affect persons that come in contact with the chemicals, most likely people directly involved in the incident as well as hazardous materials teams and emergency responders. If gaseous, chemical releases could pose more immediate health impacts on humans, livestock, and wildlife.	**3**
Speed of Onset	When managed properly under current regulations, hazardous materials pose little risk. However, when handled improperly or in the event of an accident, hazardous materials can pose a significant risk to the population. Hazardous materials incidents usually occur very rapidly with little or no warning. Even if reported immediately, people in the area of the release have very little time to be warned and evacuated. During some events, sheltering in-place is the best alternative to evacuation because the material has already affected the area and there is no time to evacuate safely. Public address systems, television, radio, and the NOAA Weather Alert Radios are used to disseminate emergency messages about hazardous materials incidents.	**4**
	Hazard Worksheet Score	**14**
	Composite Score	**33**

Additional Resources:	
Iowa DNR Spill Data	http://www.iowadnr.gov/spills/data.html
NTSB Hazardous Material Incidents	http://www.ntsb.gov/Publictn/Z_Acc.htm

Hazard	Human Disease Incident	
Definition	**Human Disease Incident**: A medical, health, or sanitation threat to the general public (such as contamination, epidemics, plagues, and insect infestation).	
Description	An incident related to human disease is defined as a medical, health, or sanitation threat to the general public (such as contamination, epidemics, plagues, and insect infestation). Public health action to control infectious diseases in the 21st century is based on the 19th century discovery of microorganisms as the cause of many serious diseases (e.g., cholera and TB). Disease control resulted from improvements in sanitation and hygiene, the discovery of antibiotics, and the implementation of universal childhood vaccination programs. Scientific and technological advances played a major role in each of these areas and are the foundation for today's disease surveillance and control systems. Scientific findings have contributed to a new understanding of the evolving relationship between humans and microbes. As of January 1, 2000, sixty (60) infectious diseases were designated as notifiable at the national level. A notifiable disease is one for which regular, frequent, and timely information regarding individual cases is considered necessary for the prevention and control of the disease. The Iowa Department of Public Health tracks epidemiological statistics in Iowa. Their data indicate no major incidents of diseases that have high percentages of loss of life or severe illness in the last 25 years. Public health agencies work to protect Iowans from infectious diseases and preserve the health and safety of Iowans through disease surveillance, investigation of suspect outbreaks, education and consultation to county, local, and health agencies. Public health agencies also work to reduce the impact of communicable diseases in Iowa and to eliminate the morbidity associated with these diseases. Programs guide community-based prevention planning, monitor current infectious disease trends, prevent transmission of infectious diseases, provide early detection and treatment for infected persons, and ensure access to health care for refugees in Iowa. While vaccines are available for many diseases, Iowans remain vulnerable to other diseases known and unknown. Recently the outbreak of H1N1 (aka “Swine Flu”) impacted parts of Iowa, but had relatively minor impacts.	Rating
Historical Occurrence	The Iowa Department of Public Health tracks epidemiological statistics in Iowa. Their data indicate no major incidents of diseases that have high percentages of loss of life or severe illness in the last 25 years.	**1**

Probability	Public health agencies work to protect Iowans from infectious diseases and preserve the health and safety of Iowans through disease surveillance, investigation of suspect outbreaks, education and consultation to county, local, public health agencies. Climatic changes are predicted to impact disease vectors by changing the range of habitat for pests such as mosquitoes that carry West Nile Virus, Lyme Disease, and even Malaria and California Encephalitis. The SHMT analysis evaluated the probability of a human disease incident between 10% and 25% in the next year.	**2**
Vulnerability	Public health agencies also work to reduce the impact of communicable diseases in Iowa and to eliminate the morbidity associated with these diseases. Programs guide community-based prevention planning, monitor current infectious disease trends, prevent transmission of infectious diseases, provide early detection and treatment for infected persons, and ensure access to health care for refugees in Iowa. While vaccines are available for many diseases, Iowans remain vulnerable to other diseases known and unknown.	**2**
Maximum Threat	Because of our highly mobile society, these diseases can move rapidly across the state and across the nation within days, weeks, or months.	**3**
Severity of Impact	As with a human disease pandemic, serious illness or even death may occur in those infected with the disease. Disease outbreaks have impacts on the economy as well as the capacity for a community to respond if key figures or critical mass of employees are infected.	**2**
Speed of Onset	The private practitioner is the first line of defense and will undoubtedly be the first to witness the symptoms of human disease incidents. The Iowa Department of Public Health and the U.S. Centers for Disease Control monitor reports submitted by doctors, hospitals, and labs to identify patterns. The Department and CDC are proactive in providing information to the health care community on medical concerns. Conditions related to scope and magnitude can escalate quickly and area resources can be drained of personnel, medications, and vaccinations rather quickly.	**3**
	Hazard Worksheet Score	**13**
	Composite Score	**18**

Hazard	Fixed Hazardous Materials	Rating
Definition	**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. **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.	
Description	A fixed hazardous materials incident is the accidental release of chemical substances or mixtures, which presents a danger to the public health or safety, during production or handling at a fixed facility. A hazardous substance is one that may cause damage to persons, property, or the environment when released to soil, water, or air. Chemicals are manufactured and used in ever-increasing types and quantities, each year, over 1,000 new synthetic chemicals are introduced, and as many as 500,000 products pose physical or health hazards and can be defined as “hazardous chemicals”. Hazardous substances are categorized as toxic, corrosive, flammable, irritant, or explosive. Hazardous material incidents generally affect a localized area and the use of planning and zoning can minimize the area of impact. During the period 2002-2005, fixed facilities experienced 1,888 incidents according to the Iowa Department Natural Resources (DNR). Fixed facility releases accounted for about 71% of total releases. Despite increasing safeguards, more and more potentially hazardous materials are being used in commercial, agricultural, and domestic activities. This situation is made worse by the density of people and hazardous materials in Iowa. 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. There are no Superfund Sites in Appanoose County. The nearest active sites are located in the Des Moines area and in Fairfield, IA. See *Appendix 24: Hazardous Material Releases in and around Mystic*.	
Historical Occurrence	One hazardous materials spill occurred in Mystic since 2000 according to the Department of Natural Resources. The incident involved presumed illegal dumping of petroleum in a stream. Meth labs may become a problem in the future given Mystic’s rural nature and currently are by anecdotal evidence. Four meth labs have been	**1**

	discovered in Appanoose County in the last two years (see *Appendix 25: Iowa Meth Labs Seized by County*). The railroad and highway that run through the city are also potential sites for hazardous materials spills.	
Probability	The rural character of Mystic and the relatively low cost of housing in the area may make Mystic attractive for meth labs. Anecdotal evidence suggests that meth use is not absent from Appanoose County. Chemical spills can occur anytime there is a traffic accident as oil, gasoline, and other fluids used in vehicles are released. Dumping of household cleaners, paints, and old oil can happen at any time and are more likely in areas where people do not understand hazardous materials laws. A number of homes (74%) in Mystic use LP Gas for heating fuel. Liquid petroleum is not by nature toxic, but can cause asphyxiation through oxygen deprivation. LP Gas is heavier than air so it will sink to the lowest places possible and is flammable.	**3**
Vulnerability	A hazardous materials accident can occur almost anywhere, so any area is considered vulnerable to an accident. People, pets, livestock, and vegetation in close proximity to facilities producing, storing, or transporting hazardous substances are at higher risk. Populations downstream, downwind, and downhill of a released substance are particularly vulnerable. Depending on the characteristics of the substance released, a larger area may be in danger from explosion, absorption, injection, ingestion, or inhalation. Occupants of areas previously contaminated by a persistent material may also be harmed either directly or through consumption of contaminated food and water. Facilities are required to have an off-site consequence plan that addresses the population of the surrounding area. Responding personnel are required to be trained to HAZMAT Operations Level to respond to the scene, and those personnel that come into direct contact with the substances released are required to have HAZMAT Technician level training. Most of the industrial sites in Appanoose County are located in Centerville and none are located in Mystic.	**2**
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. Most of the hazardous materials incidents are localized and are quickly contained or stabilized by the highly trained fire departments and hazardous materials teams. Depending on the characteristic of the hazardous material or the volume of product involved, the affected area can be as small as a room in a building or as large as 5 square miles or more. Many times,	**3**

	additional regions outside the immediately affected area are evacuated for precautionary reasons. More widespread effects occur when the product contaminates the municipal water supply or water system such as a river, lake, or aquifer. The presence of the mines under Mystic may pose an additional challenge to responding to hazardous material spills should the substances find their way into the mines. Conversely, hazardous substances such as gases may be contained within the mines and may be released as a result of other incidents or through construction activity as well as natural venting.	
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. The release of some toxic gases may cause immediate death, disablement, or sickness if absorbed through the skin, injected, ingested, or inhaled. Some chemicals may cause painful and damaging burns to skin if they come in direct contact with your body. Contamination of air, ground, or water may result in harm to fish, wildlife, livestock, and crops. The release of hazardous materials into the environment may cause debilitation, disease, or birth defects over a long period of time.	**3**
Speed of Onset	Most hazardous materials events happen suddenly and unexpectedly from transportation or other accidents. When managed properly under regulations, hazardous materials pose little risk. However, when handled improperly or in the event of an accident, hazardous materials can pose a significant risk to the population. Hazardous materials incidents usually occur very rapidly with little or no warning. Even if reported immediately, people in the area of the release have very little time to be warned and evacuated. During some events, sheltering in-place is the best alternative to evacuation because the material has already affected the area and there is no time to evacuate safely. Public address systems, television, radio, and the NOAA Weather Alert Radios are used to disseminate emergency messages about hazardous materials incidents.	**4**
	Hazard Worksheet Score	**16**
	Composite Score	**27**

Additional Resources:	
National Priority Sites in Iowa	http://www.epa.gov/superfund/sites/npl/ia.htm
US EPA Enviromapper	http://www.epa.gov/enviro/html/em/
IA DNR Spill Response	http://www.iowadnr.gov/spills/data.html

Hazard	Energy Failure	
Definition	**Energy Failure**: An extended interruption of electric, petroleum or natural gas service, which could create a potential health problem for the population and possibly mass panic.	
Description	An extended interruption of service either electric, petroleum or natural gas, which by an actual or impending acute shortage of usable energy could create a potential health problem for the population and possibly mass panic. International events could potentially affect supplies of energy producing products while local conditions could affect distribution of electricity, petroleum or natural gas. The magnitude and frequency of energy shortages are associated with international markets. Local and state events such as ice storms can disrupt transportation and distribution systems; if disruptions are long lasting, public shelters may need to be activated to provide shelter from extreme cold or extreme heat. Stockpiles of energy products eliminate short disruptions but can increase the level of risk to the safety of people and property near the storage site. With India and China rapidly industrializing and the surge in private vehicle ownership in both countries, the price of oil will increase as international demand for it also increases. This is at a time when global oil supplies are diminishing as acknowledged by several petroleum industries and numerous scientists, scientific organizations, and governments. The recent price fluctuations of gasoline, asphalt, and some other building products reflect some of this uncertainty and global occurrences. The state of Iowa has three strategies to limit the likelihood of an energy shortage. Through voluntary and mandatory demand reduction mechanisms; the substitution of alternative energy sources when possible; and state government programs to curtail excessive use, energy supply and demand can be kept in check. The federal government has a strategic petroleum reserve to supplement the fuel supply during energy emergencies. These reserves cannot last indefinitely and cannot completely mitigation price fluctuations such as in the event of a global oil shortage. Shortages, especially electrical shortages, can be unpredictable with immediate effects. Natural events, human destruction, price escalation, and national security energy emergencies can cause unavoidable energy shortages.	Rating
Historical Occurrence	The energy crisis of the 1970s had significant impacts on many consumers in Iowa. High inflation and unemployment were associated with the excessive dependence on foreign oil during the early and mid 1970s. In 2001 panic over access to gasoline was experienced throughout the United States and resulted in some of the longest lines at fuel pumps since the 1970's. Loss of power due to severe storms is not uncommon and is often regarded as	**1**

	merely a nuisance. However, extended periods without power are rare but more severe.	
Probability	Given the frequency of severe storms, the probability of short term energy failure is fairly high, likely occurring annually. International events are increasingly likely as the global demand for oil is increasing in India and China. Violence in countries such as Nigeria centered on oil production have occurred in the last five years and may well increase as global oil exploration continues to become more expensive and difficult. Likewise, pirate attacks on oil supply tankers off of the coast of Somalia in November 2008 may be setting a precedent for other groups that wish to disrupt oil supplies to the west, India, and China.	**3**
Vulnerability	Because Iowa is almost entirely dependent on out-of-state resources for energy, Iowans must purchase oil, coal, and natural gas from outside sources. World and regional fuel disruptions are felt in Iowa. It is likely that increasing prices will occur as market mechanisms are used to manage supply disruptions. This will disproportionately affect the low-income population because of their lower purchasing power. Agricultural, industrial, and transportation sectors are also vulnerable to supply, consumption, and price fluctuations. In Iowa, petroleum represents 97% of transportation fuel. Individual consumers such as commuters and businesses are also vulnerable.	**3**
Maximum Threat	The effects of an energy shortage would be felt throughout the state. Because the distribution systems are very well developed, local shortages can quickly be covered. Storm-related energy disruptions may impact a few homes or the entire community and surrounding areas. Response to such disruptions depends on the severity of the damage and the availability of staff to repair the system. During the holiday season, staff availability may be limited. Due to the relatively small population and the relative isolation of Mystic in relation to more urbanized parts of Iowa, Mystic residents may face longer periods without energy.	**3**
Severity of Impact	Injuries and fatalities would not be directly caused by an energy shortage. Injuries and fatalities could occur if energy was not available for heating during extreme cold periods or for cooling during extreme heat. Hospitals, shelters, emergency response vehicles and facilities, and other critical facilities would have priority during energy shortages. Effects could range from minor heating and air conditioning disruptions to transportation limitations all the way to civil unrest due to the high demand, low supply, and subsequent high price. Rotating blackouts, voluntary conservation measures, and possibly mandatory restrictions could be used to limit the severity of an energy shortage. Business disruption and increased cost of business would have far-	**2**

	reaching financial implications across many sectors of the economy.	
Speed of Onset	The Iowa Department of Natural Resources Energy Bureau monitors domestic and international energy situations and has developed a plan to deal with an energy crisis. Signs that an energy shortage may be developing can be recognized even months in advance, but energy shortages/emergencies can rise suddenly and unexpectedly. Supply distribution problems in other countries and local weather situations can lead to low supply coupled with high demand in a matter of a day or two.	**1**
	Hazard Worksheet Score	**13**
	Composite Score	**33**

Hazard	Communications Failure	Rating
Definition	**Communications Failure**: When the method of communication fails to deliver the required information as needed.	
Description	Communication failure is the widespread breakdown or disruption of normal communication capabilities. This could include major telephone outages, loss of local government radio facilities, long-term interruption of electronic broadcast services, emergency 911, law enforcement, fire, emergency medical services, public works, and emergency warning systems are just a few of the vital services which rely on communication systems to effectively protect citizens. Business and industry rely heavily on various communication media as well. Mechanical failure, traffic accidents, power failure, line severance, and weather can affect communication systems and disrupt service. Disruptions and failures can range from localized and temporary to widespread and long-term. If switching stations are affected, the outage could be more widespread	
Historical Occurrence	Communications failures have presumably occurred in Mystic's past, however documentation is not readily available. One incident that is available is a communications tower collapse at the Rathbun Rural Water Association Treatment Plant in 2005.	**1**
Probability	The Iowa Hazard Mitigation Plan indicates that communications failure has a 10% chance of occurring in the next year in Iowa. While massive failures are unlikely to occur or to last long due to redundancy measures, the possibility of such an event does exist. Weather events are the most likely cause of communications failures in Mystic.	**2**
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 or if the cell towers are damaged.	**2**
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.	**4**
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.	**2**

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.	**4**
	Hazard Worksheet Score	**15**
	Composite Score	**34**

Hazard	Structural Failure	
Definition	**Structural Failure**: The collapse (part or all) of any public or private structure including roads, bridges, towers, and buildings.	
Description	The collapse (part or all) of any public or private structure including roads, bridges, towers, and buildings is considered a structural failure. A road, bridge, or building may collapse due to the failure of the structural components or because the structure was overloaded. Natural events such as heavy snow may cause the roof of a building to collapse under the weight of snow. Heavy rains and flooding can undercut and washout a road or bridge. The age of the structure is sometimes independent of the cause of the failure. Enforcement of building codes can better guarantee that structures are designed to hold-up under normal conditions. Routine inspection of older structures may alert inspectors to "weak" points. The level of damage and severity of the failure is dependent on factors such as the size of the building or bridge, the number of occupants of the building, the time of day, day of week, amount of traffic on the road or bridge, and the type, and amount of products stored in the structure. Civil structures may fail in a variety of modes. The unprecedented growth in technology has resulted in a host of problems related to complex structures, special materials, and severe operational and environmental loads, such as fire, excessive vibrations, explosion, high-energy piping failures, and earthquakes. With the possible exception of misuse, accidental or environmental loads, the causes of failure may be found in deficiencies of design, detailing, material, workmanship, or inspection. With the aging structures in the country along with problems with new materials discussed above, structural failures will continue to occur. Efforts to inspect and maintain these structures will lessen the probability of a failure, but not guarantee that it will not happen in the future. Internal weaknesses can be hidden from inspectors and not be realized until it is too late. The I-35 bridge collapse in Minneapolis in August 2007 dramatically underscored the critical nature of the nation's infrastructure. Infrastructure such as roads, water and waste water systems, bridges, and civil buildings are aging, many are reaching or have reached their design capacity or intended lifespan. Most of these systems were designed to handle particular conditions but with population expansion in some areas, the capacity alone is under strain. In rural areas, the resources to maintain infrastructure is sparser than in more heavily populated areas due to tax base. With increasing environmental stresses such as increasingly severe and frequent storm and weather fluctuations, additional strains on infrastructure are being felt throughout the country.	Rating

	Sixty percent of Iowa's bridges are rated as "functionally obsolete" meaning that they were designed for very different and much less intense conditions than they are subjected to. This may also include the width of the bridge being insufficient for modern vehicles and farm machinery.	
Historical Occurrence	A communications Tower collapsed at the Rathbun Rural Water Association Treatment Plan in 2005. During the winter of 2007-2008, Appanoose County faced widespread damage and closure of roads and bridges placing strains on county engineering budgets. In December 2006 a section of road pavement collapsed in Centerville due to structural failure of the underlying brick sewer line. The sewer was estimated to have been installed in the 1920's or 1930's. Documentation of structural collapses in Mystic specifically are not readily available, however such events have occurred around the county.	**1**
Probability	Given the age of homes in Mystic, the presumed age of infrastructure based on when Appanoose County flourished, and nationwide concerns over aging infrastructure, the risk of structural failures may be relatively high. This risk is alongside the risk of mine collapses addressed in the sink hole hazard profile. Additionally, many of the buildings in Appanoose County were constructed in the late 1800's and early 1900's prior to the advent of building codes in the United States. Buildings are not currently inspected in Mystic but roads and bridges entering town are inspected by the county.	**3**
Vulnerability	There are many buildings in Mystic that are very old (about 40% of homes built prior to 1940) or which may become hazardous in the event of an earthquake, fire, high winds, or other natural events. All bridges are vulnerable to the effects of the elements and the deterioration that results. Increases in the amount and weight of traffic they are expected to support increase their vulnerability to failure.	**2**
Maximum Threat	The impacts of the failed structure would be contained to the immediate area and adjacent properties. This could be as small as the house and yard of a fallen chimney, or the area could be more extensive if a whole building were to collapse. Of particular concern would be if subsurface structures such as sewers were to collapse as the warning signs may not be observed until too late. Dam and levee failures would affect a much larger area and are discussed as separate hazards.	**1**
Severity of Impact	Personal injury, death, and property damage may occur in the collapse itself or by falling debris from nearby structures. Collapse of private homes would pose a heavy burden on many residents in Mystic given the relatively low incomes in town and in the broader region. Collapse of roads in town or of public infrastructure would pose a significant budgetary burden on the city given the small population of Mystic.	**3**
Speed of Onset	The actual failure of the structure would likely occur suddenly with little or no warning. There are several events that could lead up to the failure, and	**4**

	these have various warning times and are discussed in separate hazard worksheets. Causal hazards can include fire, explosion, overloading of ice and snow, vibration, earthquakes, flooding, high wind, erosion, chemical corrosion, subsidence, and lack of general upkeep.	
	Hazard Worksheet Score	**14**
	Composite Score	**35**

Hazard	Structural Fire	
Definition	**Structural Fire**: An uncontrolled fire in populated area that threatens life and property and is beyond normal day-to-day response capabilities.	
Description	A structural fire is an uncontrolled fire in populated areas that threatens life and property and is beyond normal day-to-day response capability. Structural fires present a far greater threat to life and property and the potential for much larger economic losses. Modern fire codes and fire suppression requirements in new construction and building renovations, coupled with improved firefighting equipment, training, and techniques lessen the chance and impact of a major urban fire. Most structural fires occur in residential structures, but the occurrence of a fire in a commercial or industrial facility could affect more people and pose a greater threat to those near the fire or fighting the fire because of the volume or type of the material involved. Structural fires are almost a daily occurrence in some communities. Nearly all are quickly extinguished by on-site personnel or local fire departments. There have been 1,535 deaths in Iowa from fires between the years 1974-2002 (this does not include the years 1978-79).	Rating
Historical Occurrence	In January 1911 a major fire broke out in Mystic causing $100,000 in damage in 1911 dollars, equivalent to over $2.2 million in 2008 dollars.[19] This fire damaged or destroyed 20 homes in the east portion of town and damaged or destroyed several general stores, the Egypt Coal Co. building, restaurants, dentist buildings, drug stores, and others. As mentioned in the wild or grass fire hazard profile, the presence of coal mines under much of Mystic poses an additional and unique risk to the town.	**1**
Probability	Much of the fire prevention efforts have gone into nonresidential fires and the results have been highly effective. Even with an increase in the prevention efforts in residential fires, both residential and nonresidential fires will continue to occur. During colder months, clogged chimneys and faulty furnaces and fire places can increase the probability of structural fires. The age of structures in Mystic may make put them at more risk of fires due to faulty or substandard wiring and obsolete building methods.	**3**
Vulnerability	Older structures with outdated electrical systems not built to current fire codes are particularly vulnerable to fire. Combustible building materials obviously are more vulnerable than structures constructed of steel or concrete. Structures without early detection devices are more likely to be completely destroyed before containment by response agencies. Structures in areas served by older, smaller, or otherwise inadequate water distribution	**2**

[19] Consumer Price Index and inflation calculators use data starting in 1913 so the amount is approximate. One inflation calculator can be found at http://www.coinnews.net/tools/cpi-inflation-calculator/.

	infrastructure such as water mains and hydrants are also at significant risk. Problems vary from region to region, often because of climate, poverty, education, and demographics. The fire death risk for the elderly and children under 5 years of age is more than two times that of the average population. In light of Mystic's relatively poor fire insurance rating, this hazard should be of higher concern for the community.	
Maximum Threat	With modern training, equipment, fire detection devices, and building regulations and inspections, most fires can be quickly contained and limited to the immediate structure involved. Certain circumstances, such as the involvement of highly combustible materials or high winds, can threaten a larger area. The age and density of a particular neighborhood can also make it more vulnerable to fire due to the spreading of fire from neighboring structures. The City of Mystic is relatively old indicating two things, 1) the wood and building materials used in its structures may be more flammable due to age and 2) structures may not meet more recent building and fire codes. Similarly, the absence of a zoning ordinance means that hazardous and flammable materials may be stored and used anywhere in town elevating the potential threat of fire spreading to homes that may not be otherwise subject to substantial fires.	**2**
Severity of Impact	Building occupants are at risk of asphyxiation from smoke inhalation and burns, structural failure can occur when structural elements are burned, and firefighters are at risk of injury in the course of duty. The severity of fires can range from smoke damage in a single room of a building to whole segments of a town catching fire.	**3**
Speed of Onset	While fires usually start with little or no warning time, alert devices can allow time for responders to contain the fire and allow occupants to evacuate the area.	**4**
	Hazard Worksheet Score	**15**
	Composite Score	**33**

Inventory of Assets and Critical Facilities

In order to identify the most appropriate mitigation techniques and projects, the city determined to identify the assets in the community. Included in this is a preliminary inventory of critical facilities, structures and infrastructure that is determined to be important to target for protection from hazard damage or that may serve a hazard response or mitigation purpose.

Critical Facilities

The Mystic Planning Committee named various buildings and infrastructure in a preliminary discussion of critical facilities. Committee members were advised to consider buildings and infrastructure that represent health and welfare of Mystic residents, high potential loss facilities, hazardous materials storage, emergency access, and lifeline facilities such as drinking water and power supply. This advice was derived from the FEMA guidance document Understanding Your Risk: Identifying Hazards and Estimating Losses (FEMA 386-2, August 2001). See *Appendix 26: Mystic Critical Facilities by Hazard* for maps showing location of critical facilities in relation to estimated hazard area.

A full assessment of the critical facilities has not been completed, but preliminary information is available. The following chart shows the types of information that would be useful in estimating potential losses and thus help in prioritizing mitigation actions.

Name	Location	building size	Occupancy / capacity	replacement value	content value	Function/use value	displacement cost
1. Lift Station	South of railroad in east-central Mystic			$166,192			
2. Mystic Community Church	1st Street between North and Lewis Streets						
3. Community Center	Main Street			$241,500			
4. City Hall	Main Street			$83,500			
5. South Bridge	T14 over Walnut Creek	N/A	N/A	$1.7 million	N/A	Not determined	Not determined
6. North Bridge	T14 over Little Walnut Creek	N/A	N/A	$800,000	N/A	Not determined	Not determined
7. Fire Station	1st Street between Jefferson and Washington Streets			$71,000			
8. City Shop	2nd Street by railroad						
9. School	Clarkdale Rd, northeast portion of Mystic			$1,117,839 building $14,588 playground	$138,074 personal property		
10. Post Office	Main Street						
11. Legion Hall	Main Street						

Community Assets by Hazard

The following table lists community assets that would be affected in the event of a large hazard that would affect the entire community. These hazards include: High Wind Events, Severe Winter Storms, Thunderstorms/Lightning, Hailstorms, Flash Floods, Drought, Excessive Heat, Climate Change, Radon, and Earthquakes among others. In these events, the entire Community is the "Hazard Area." This also includes events that do not have likely locations for potential occurrence such as Tornadoes, Structural Fire, or Air Transportation Incidents, among others. Government structures include City Hall, the post office, the City Shop, and the Lift Station; this differs from the feedback received from the County Assessor in order to account for the presence of these facilities which may be treated differently by the Assessor's Office. The numbers of structures within hazard areas are estimated based on the base and hazard maps, see *Appendix 26: Mystic Critical Facilities by Hazard* for these maps.

These estimates of structures and people within hazard areas are preliminary for this plan due to data limitations on the actual hazard areas and mapping data available. Valuations of tax exempt and utility properties are not readily separated by jurisdiction from data provided by the Appanoose County Assessor's office contributing to the lack of some value estimates. Alternate forms of estimating such valuations (as well as occupancy, square footage, replacement value, etc.) exist but were not employed for this version of the Mystic Plan due to challenges with obtaining the necessary information, see *Appendix 27: Alternate Facility Valuation Estimate Tools*. Obtaining this information will be important for updates to this plan and efforts will be made to obtain it for the Appanoose County Multi-Jurisdiction Hazard Mitigation Plan.

No significant changes to the number of buildings or infrastructure in hazard areas are expected based on population and development trends. However with improved hazard mapping, when undertaken, the estimates of vulnerable buildings and infrastructure may change; these changes will be addressed in future updates to this or the Appanoose County Multi-Jurisdiction Hazard Mitigation Plan.

Community-wide Hazards

Type of Structure	Number of Structures			Value of Structures			Number of People		
	# in City	# in Hazard Area	% in Hazard Area	$ in City	$ in Hazard Area	% in Hazard Area	# in City	# in Hazard Area	% in Hazard Area
Residential	227	227	100%	$6,445,315	$6,445,315	100%	588	588	100%
Commercial	3	3	100%	$640,280	$640,280	100%			100%
Industrial	-	-	-	-	-	-	-	-	-
Agricultural	-	-	-	-	-	-	-	-	-
Religious / Non-profit	1	1	100%						
Government	4	4	100%			100%			100%
Education	1	1	100%			100%			100%
Utilities	-	-	-	-	-	-	-	-	-

Some hazards impact a more constrained or fixed area of the community, these hazards are drawn out and evaluated separately in the table(s) below. For these hazards, the "Hazard Area" is estimated based on the hazard profiles and the base maps developed for this plan.

River Flooding

Type of Structure	Number of Structures			Value of Structures			Number of People		
	# in City	# in Hazard	% in Hazard	$ in City	$ in Hazard	% in Hazard	# in City	# in Hazard	% in Hazard

		Area	Area		Area	Area		Area	Area
Residential	227	23	10%	$6,445,315	$64,453	10%	588	58	10%
Commercial	3	2	66%	$640,280	$422,584	66%	25	16	%
Industrial	-	-	-	-	-	-	-	-	-
Agricultural	-	-	-	-	-	-	-	-	-
Religious / Non-profit	1	0	0%		$0	0%	0	0	0%
Government	4	2	50%			%			%
Education	1	0	0%		$0	%	0	0	0%
Utilities	-	-	-	-	-	-	-	-	-

Sink Holes (Mine Subsidence)

Type of Structure	Number of Structures			Value of Structures			Number of People		
	# in City	# in Hazard Area	% in Hazard Area	$ in City	$ in Hazard Area	% in Hazard Area	# in City	# in Hazard Area	% in Hazard Area
Residential	227	170	70%	$6,445,315	$4,833,986	70%	588	412	70%
Commercial	3	1	33%	$640,280	$211,292	33%	25	8	33%
Industrial	-	-	-	-	-	-	-	-	-
Agricultural	-	-	-	-	-	-	-	-	-
Religious / Non-profit	1	1	100%						
Government	4	2	50%			%			%
Education	1	1	100%			%			%
Utilities	-	-	-	-	-	-	-	-	-

Analysis of Mitigation Activities

Once a comprehensive and quantitative analysis of the hazards that actually do or may affect Mystic was completed, mitigation decision making becomes possible. This section takes the analysis of the hazards to address current activities that address hazard events, most of this is through emergency response, and then addresses options discussed by the planning committee to address hazards in other ways.

Current Mitigation Activities

Current mitigation activities were discussed in conjunction with brainstorming potential actions, below is a list of actions that were discussed;

- Fire Station has a storm warning system
- Law Center (in Centerville) has contact information for Mystic firefighters
- Mobile communication trailer(s) located at Law Center; about 5-6 hours are needed to mobilize
- Sand or blade trucks are / can be used to clear paths for first responders in the event of road blockage (debris or heavy snow)
- Legion Hall, Mystic Community Church, and Community Center can / have been utilized as temporary shelters and gathering places in the event of disasters
- There is a yard clean-up ordinance, but it is very difficult to enforce (affects tornado and high-wind debris hazards)
- Railroad works well and promptly with the City of Mystic on railroad incidents

- 28E agreements in place with surrounding jurisdictions for fire protection and hazardous materials containment
- HydroClean, based in Des Moines, is the designated hazardous materials clean-up agent; local fire fighters perform containment actions
- Firefighters and mayor have spread the word of impending hazard events, such as flooding, including going door-to-door
- The City participates in the National Flood Insurance Program (NFIP) with a Flood Insurance Rate Map dated 1/30/1978, however few residents have purchased flood insurance (NFIP Compliance date: 10/15/1976)
- The City requires mobile home tie-downs
- Tree trimming or management is currently handled to an extent by utility services in Mystic
- County-wide Emergency Operations Plan (EOP) is in place and maintained by ADLM Emergency Management; a copy of the plan is present in the Appanoose County Supervisors' office.

Hazard Mitigation Plan Goals

Once the Planning Committee had a sense for what threats face their jurisdictions based on research and prioritized hazards, the Committee considered what should be done. Three broad goals were decided on and then detailed with more specific objectives which can be measured by actions and projects designed to address them. Specific actions and projects are discussed in the next chapter along with alternatives discussed but set aside due to feasibility of completing them. The goals and objectives were developed using FEMA guidance, *Developing the Mitigation Plan: Identifying Mitigation Actions and Implementation Strategies* (FEMA 386-3 April 2003), examples from other local mitigation plans, and discussion over the applicability and acceptability of the goals and objectives locally.

Goal 1: Protect existing properties and infrastructure

Objective 1.1: Use the most effective approaches to protect buildings from flooding

Objective 1.2: Enact and enforce regulatory measures to ensure that new structures do not increase threats to existing properties

Objective 1.3: Pursue projects to reduce threat of potential damages or injuries to Mystic residents and properties

Goal 2: Protect the health, safety, and quality of life for City of Mystic residents

Objective 2.1: Ensure that property-owners can maintain and improve their properties

Objective 2.2: Ensure that disaster recovery can proceed promptly following a disaster

Objective 2.3: Prioritize mitigation projects, policies, and programs starting with those that address the greatest threats to health, safety, and properties

Goal 3: Ensure that public funds are used efficiently

Objective 3.1: Use public funds to protect critical facilities and public services

Objective 3.2: Use public funds for projects on private property where the benefits to the public exceed the costs

Objective 3.3: Maximize the use of outside sources of funding such as grant opportunities

Objective 3.4: Maximize owner participation in mitigation efforts to protect their own properties

Objective 3.5: Objective 3.6: Encourage property-owner self-protection measures

Mitigation Actions

The Planning Committee focused mitigation strategies on the high-risk hazards where investments of time and other resources would be expected to make the greatest impact on protecting each jurisdiction. Some strategies are applicable to more than one hazard and may be applicable to the moderate- and acceptable-risk hazards as well. Mitigation alternatives began in a brainstorming activity during a meeting and then further supplemented by discussing alternatives listed in the FEMA publication *Mitigation Ideas: Possible Mitigation Measures by Hazard Type, FEMA-R5, 9/02*. This document was briefly presented in an early meeting and also left at City Hall for review by committee members and the public.

Select ideas from the FEMA document were proposed to the committee for mitigation selection, excluding actions that would require large changes to local culture (such as developing a zoning ordinance, development rights, or taxes/fees, among others) or would be particularly costly and not fit with such a small city. Additional mitigation actions may be added in updates to this plan or when Mystic is incorporated into the Appanoose County Multi Jurisdiction Hazard Mitigation Plan.

See *Appendix 28: Hazards Addressed by Proposed Mitigation Action* and *Appendix 29: Mitigation Actions by Goals and Objectives* for more details on the alternatives considered and the relationship between actions, goals, objectives, and the hazards.

Each of the identified mitigation alternatives were considered and evaluated through the FEMA tool, STAPLEE. This acronym indicates the various factors that should be considered in planning decisions standing for Social, Technical, Administrative, Political, Legal, Economic, and Environmental elements. Each mitigation alternative was evaluated simply with plus signs, minus signs, or left blank during committee meetings. Plus signs indicate no adverse impact or positive impacts anticipated, minus signs indicate the anticipation of resistance, high cost, or conflict, and blank elements are not anticipated to have either positive or negative impacts or may be unknown.

These ratings, once compiled, where then quantified with 1 for a plus sign, 0 for a blank or neutral score and a -1 for a minus sign and then the elements of each action were summed up for a numerical rating. See *Appendix 30: STAPLEE Worksheet* for a summary of the STAPLEE ratings.

Explanation of STAPLEE

Social: Mitigation Actions are acceptable to the community if they do not adversely affect a segment of the population, do not cause relocation of lower income people, and if they are compatible with the community's social and cultural values.

Technical: Mitigation actions are technically most effective if they provide long-term reduction of losses and have minimal secondary adverse impacts.

Administrative: Mitigation actions are easier to implement if the jurisdiction has the necessary staffing and funding.

Political: Mitigation actions can truly be successful if all stakeholders have been offered an opportunity to participate in the planning process and if there is public support of the action.

Legal: It is critical that the jurisdiction or implementing agency have the legal authority to implement and enforce a mitigation action.

Economical: Budget constraints can significantly deter the implementation of mitigations actions. Hence, it is important to evaluate whether an action is cost effective, as determined by a cost-benefit review, and possible to fund.

Environmental: Sustainable mitigation actions that do not have an adverse effect on the environment, that comply with Federal, State, and local environmental regulations, and that are consistent with the community's environmental goals, have mitigation benefits while being environmentally sound.

Mitigation Strategies and Implementation

During the meeting where actions were being evaluated, two alternatives were excluded and not rated; Mobile Home Tie-downs – the City already requires this and the committee determined that it did not need to be rated.

Tree management / trimming – the committee determined that as an ordinance, the City would be unable to enforce this strategy but that the utility company already undertakes some tree management where power supply impacts are anticipated.

The remaining mitigation actions were then prioritized based on several criteria, whether or not they address a high risk hazard, how many hazards they address, how many objectives they address, the estimated timeline, the estimated cost, and the STAPLEE rating. The logic of this was much like ranking the hazards, the actions with the broadest positive impact would be naturally raised to the top of the list while those that would be costly or be limited in impact would naturally fall to the bottom.

This would mean that the actions toward the top of the list should be where the City's mitigation efforts should be directed, however where opportunities to pursue lower ranked actions arise, they should be taken so long as they do not preclude taking an action with a more broad positive impact is possible. For example, if grant funds for a project are available that would address an action ranked near the middle of the spectrum then the City should pursue the grant opportunity. If such a grant opportunity is presented and it could be used for two or more identified actions, then it should be directed toward the highest ranked of the potential projects where practicable.

Each action is profiled along similar lines as the hazards. Each action profile contains a description of the action, estimated cost with either an approximate dollar amount or listed as voluntary, minimal, moderate, or high. These categories are loosely defined as follows;

- Voluntary – reliant on donated time or resources
- Minimal – little or no cost, may be a nominal increase in day-to-day activities
- Moderate – would likely require outside funds potentially from multiple sources or potential tax / fee increases
- High – would require outside funds such as in the form of grant programs through State or Federal agencies

The timeframe in which mitigation actions are to be pursued have not been detailed in depth, however based on their relative complexity, cost, and whether or not they are dependent on outside funds, estimated timelines were suggested. These estimated timeframes are listed as follows;

- Ongoing – activities that are currently in practice or are suspected to have been implemented previously
- Short Term – relatively low cost, low complexity activities that may be implemented in the next year
- Medium Term – low to modest cost activities that may require more effort and / or time to properly implement such as review of regulatory measures for effectiveness or development of new regulations or programs, implementable within a period of 5 years and likely within 2-3 years
- Long Term – high cost and time-intensive activities that require outside funds, significant administrative investment (temporary or permanent), and generally involve construction, anticipated to take 5 years or more from time of initial planning to securing funding to completion of activity

Mitigation Actions can be grouped into six different categories as indicated in the State Plan and in FEMA guidance;

Prevention: Government administrative or regulatory measures or processes that influence the way land and buildings are developed and built. These measures also include public actions to reduce hazard losses to property and human health impacts. Examples include:

- Hazard mapping
- Studies/data collection and analysis to support prevention measures
- Floodplain regulations
- Multi-jurisdictional agreements that reduce hazard risks
- Other regulatory measures or processes that reduce hazard risks

Property Protection: Measures that involve modifying existing buildings or structures to protect them from a hazard, or removing buildings or structures from the hazard area, or providing insurance to cover potential losses. Examples include:

- Acquisition, elevation, or relocation of hazard-prone property
- Safe room/storm shelter retrofits
- Critical facility protection
- Risk reduction retrofits (modifications) to hazard prone properties
- Studies/data collection and analysis to develop property protection measures
- Continued National Flood Insurance Program (NFIP) participation

Public Education and Awareness: Measures to inform and educate citizens, elected officials, and property owners about the hazards and potential ways to mitigate them. Examples include:

- Programs to improve awareness of hazard risk
- Programs to improve awareness of hazard risk prevention and reduction
- Education programs directed toward specialized audience, i.e. buildings, developers, and hazard prone neighborhoods

Natural Resource Protection: Measures that, in addition to minimizing hazard losses, preserve or restore the functions of natural systems. Examples include:

- Sensitive areas ordinance (development restrictions)
- Stream corridor restoration, watershed management
- Forest and vegetation management
- Wetland restoration and preservation

Emergency Services: Measures taken before, during and after a hazard event to protect people, and property; although these measures are not typically considered "mitigation, they significantly minimize the events impact and preserve the community's health and safety. Examples include:

- Emergency response facilities and personnel
- Hazard warning systems and equipment
- Health, safety, environmental risk prevention or reduction
- Emergency response infrastructure, equipment, planning, or training
- Emergency response services studies and data collection
- Emergency response communication systems

Structural Projects: These are measures that involve the construction and maintenance of structures and infrastructure that will reduce the impact of a hazard or redirect the impact away from people and property. Examples include:

- Channel modification/maintenance
- Dam and reservoir construction/maintenance
- Levee and floodwall construction and maintenance
- Safe room or storm shelter construction
- Infrastructure construction and maintenance
- Studies and data collection to develop structural projects

Prioritized Mitigation Activities

Mitigation actions were evaluated by various factors as previously mentioned; each of the factors was assigned a numerical value to aid in ranking the actions according to their anticipated positive impacts and drawbacks. The numerical values that were substituted in for estimated cost and timelines are as follows;

Cost:

- Voluntary – 1
- Minimal – 0
- Moderate – minus one (-1)
- High – minus two (-2)

Timeline:

- Ongoing – 1
- Short Term – 0
- Medium Term – minus one (-1)
- Long Term – minus two (-2)

Where a cost or timeline spanned between two different ratings, the average of the two scores was used. For example an action that has a moderate to high cost and a medium to long term timeline would have -1.5 inserted for both categories. This ranking system is crude, but it helps to organize the actions in a way that

begins to show a prioritization of what can provide the biggest positive impact for the effort required to implement them. A more sophisticated ranking system may include weighting for various factors depending on community priorities and concerns. A limited degree of weighting is present for cost as cost is one of the STAPLEE elements however. Additional weighting was not conducted for Mystic at this point as simply beginning to take mitigation actions as resources were identified was of more concern. In addition to this, a shorter timeframe was allotted for the completion of the Mystic plan through the FEMA waiver tied to property acquisition funds received.

The full chart containing the various elements used to rank the mitigation actions may be found in *Appendix 31: Mitigation Action Scores*.

The composite ranking of mitigation actions is as follows;

Mitigation Action Ranking		
Address High Risk Hazards	Community Emergency Response Team	48
	Hazard occurrence data collection	46
	Public Outreach and Education	45
	Collection and protection of vital records	44
	Continuity of Operations Planning	42
	Community Building Upgrades	33
	Maintenance of older buildings	31.5
	Weather Radios	30
	Generators	29
	Surge Protectors / Lightning protection	29
	Snow Fences / Barriers	29
	Smoke / Fire / CO Detectors / Sprinkler Systems	28
	Fireplace maintenance	28
	Hazardous material disposal	27.5
	Search and Rescue training for first responders	27.5
	Flood Insurance	27
	Maintenance of heating / cooling systems	25.5
	More Fire Hydrants	25
	Meth lab prevention	25
	HazMat protection for church, community center, Legion Hall, and School	24.5
	Mass Casualty Preparation	23.5
	Temporary Debris Disposal Plan	22
	Evacuation plans	21.5

	New Storm Shelter	20.5
	Storm Warning System	18.5
	Expanded hazard area mapping / mine evaluation	18.5
	Local HazMat Capabilities	18
	wetland protection / restoration	17.5
	Storm water management ordinance	17
	Burying power lines	17
	Improve Existing Storm Sewer System	16.5
	Storm water Drainage system	14.5
	Review of floodplain ordinance for effectiveness	14
	Water storage or saving plans	14
	Drainage Easements	11
	Flood proofing (wet or dry)	10
	Sensitive Areas Ordinance	9
	Burning Restrictions	9
	Evaluate / reinforce / restore Mystic Reservoir Dam	8.5
	Consider CRS participation	8
	Waste Disposal enforcement	5.5
	Review of floodplain management / enforcement for effectiveness	4
	Acquisition or relocation of buildings	2.5
Not High Risk Hazards	Radon Mitigation	20
	Immunization	10
	Pest management	4

While the evaluation, reinforcement, and / or restoration of the Mystic Reservoir Dam action is ranked close to the bottom of the list, this action has been discussed as a city priority. Likewise, a New Community Storm Shelter is ranked roughly near the middle of the list, however with the State indicating these actions as a priority and making funds available for them, this action may be a priority for the city as well.

Mitigation Action Profiles

Weather Radios	
Description	Encouragement of Mystic residents and businesses to obtain NOAA weather radios
Estimated Cost	Voluntary program; approximately $30 per radio
Timeline/Schedule	Short Term
Responsible Entity	City and city residents
Hazards Addressed	Flash flood, thunderstorm / lightning, severe winter storm, windstorm / high wind event, river flooding, tornado, hailstorm, extreme heat,

	may address other hazards as well
Mitigation Category	Prevention and Public Awareness
Related Goals/Objectives	1.3, 2.3, 3.4, 3.5
Addresses High Risk Hazards?	Yes
STAPLEE Rating	18

Storm Warning System	
Description	Acquisition and installation of community early warning system to compliment system at fire station
Estimated Cost	Moderate to high
Timeline/Schedule	Long Term
Responsible Entity	City Councils
Hazards Addressed	Flash flood, thunderstorm / lightning, severe winter storm, windstorm / high wind event, river flooding, tornado, hailstorm, may address other hazards as well
Mitigation Category	Structural Project
Related Goals/Objectives	1.3, 2.3, 3.1, 3.2, 3.3
Addresses High Risk Hazards?	Yes
STAPLEE Rating	10

Improve Storm Sewer System	
Description	Repairs and upgrades to storm sewer system
Estimated Cost	Moderate to high
Timeline/Schedule	Long Term
Responsible Entity	City Councils
Hazards Addressed	Flash flood, structural failure, highway transportation incident, dam failure
Mitigation Category	Structural Project
Related Goals/Objectives	1.1, 1.3, 2.3, 3.1, 3.2, 3.3
Addresses High Risk Hazards?	Yes
STAPLEE Rating	10

Community Building Upgrades	
Description	Structural improvements and maintenance to make Legion Hall, Community Center, School, or Mystic Community Church better capable of serving as temporary shelter from storms or for post disaster services including disabled accessibility
Estimated Cost	Moderate to high
Timeline/Schedule	Medium to Long Term
Responsible Entity	City councils and property owners where applicable
Hazards Addressed	Flash flood, thunderstorm / lightning, structural failure, severe winter storm, transportation of hazardous materials, energy failure, rail transportation incident, structural fire, windstorm / high wind events, grass or wildfire, fixed hazardous materials, river flooding, tornado, hailstorm, air transportation incident, dam failure, sink holes, extreme heat, human disease incident, earthquake, landslide

Mitigation Category	Property Protection, Prevention, Emergency Services
Related Goals/Objectives	1.1, 1.3, 2.2, 2.3, 3.1, 3.2, 3.3, 3.4, 3.5
Addresses High Risk Hazards?	Yes
STAPLEE Rating	6

Generators	
Description	Acquisition of mobile and / or fixed generators for use at community buildings used for temporary storm shelters and / or for public facilities
Estimated Cost	Moderate
Timeline/Schedule	Medium Term
Responsible Entity	City Councils, fire departments, Emergency Management and critical facility property owners
Hazards Addressed	1.3, 2.2, 2.3, 3.1, 3.2, 3.3, 3.4, 3.5
Mitigation Category	Emergency Services, Prevention, Property Protection
Related Goals/Objectives	Flash flood, thunderstorm / lightning, communications failure, severe winter storm, energy failure, rail transportation incident, windstorm / high wind events, river flooding, tornado, hailstorm, climate change, extreme heat, human disease incident, drought
Addresses High Risk Hazards?	Yes
STAPLEE Rating	9

Expand/improve Fire Hydrants	
Description	Encourage and / or support grant applications to install additional fire hydrants in communities, repair aging hydrants and encourage installation of fire hydrants in unincorporated county
Estimated Cost	Moderate
Timeline/Schedule	Short Term
Responsible Entity	City Council, fire department, and Rathbun Rural Water
Hazards Addressed	Transportation of hazardous materials, rail transportation incident, structural fire, grass or wildfire, fixed hazardous materials, air transportation incident
Mitigation Category	Prevention, Property Protection, Emergency Services, Structural Project
Related Goals/Objectives	1.3, 2.2, 2.3,3.1, 3.2, 3.3, 3.4
Addresses High Risk Hazards?	Yes
STAPLEE Rating	12

Local Hazardous Materials Capabilities	
Description	Encourage establishment of local hazardous materials team and / or support training for local first responders
Estimated Cost	Moderate to high
Timeline/Schedule	Medium to Long Term
Responsible Entity	City councils, fire department, emergency management and / or County Board of Supervisor's)
Hazards Addressed	Transportation of hazardous materials, rail transportation incident, structural fire, fixed hazardous materials, air transportation incident, human disease incident
Mitigation Category	Emergency Services
Related Goals/Objectives	1.3, 2.2, 2.3, 3.1, 3.3

Addresses High Risk Hazards?	Yes
STAPLEE Rating	9

Hazardous Materials Protection for storm shelters	
Description	Develop HazMat policies (shutting off air conditioning, closing windows, etc.), prepare kits for sealing off rooms including duct tape and plastic sheeting (see FEMA guidance; http://www.fema.gov/hazard/hazmat/hz_during.shtm)
Estimated Cost	Minimal or Voluntary
Timeline/Schedule	Short Term
Responsible Entity	City Councils, Property Owners, Public Health Dept, and/or Fire Depart.
Hazards Addressed	Transportation of hazardous materials, rail transportation incident, highway transportation incident
Mitigation Category	Public Education and Awareness, Emergency Services
Related Goals/Objectives	1.2, 1.3, 2.1, 2.2, 2.3, 3.1, 3.2, 3.3, 3.4, 3.5
Addresses High Risk Hazards?	Yes
STAPLEE Rating	11

New Storm Shelter	
Description	Construction of comprehensive storm shelter to Tornado Safe Room standards to serve as a temporary shelter for multiple hazards as Church, Community Center, Legion Hall, City Hall, and School are currently utilized as needed
Estimated Cost	Moderate to high – grant dependent
Timeline/Schedule	Long Term
Responsible Entity	City Councils, Army Corp of Eng at Lake Rathbun, County Board of Supervisors
Hazards Addressed	Flash flood, thunderstorm / lightning, structural failure, severe winter storm, transportation of hazardous materials, energy failure, windstorm / high wind event, tornado, hailstorm, sink hole, earthquake
Mitigation Category	Structural Project
Related Goals/Objectives	2.2, 2.3, 3.3
Addresses High Risk Hazards?	Yes
STAPLEE Rating	10

Note: new storm shelter should be located outside of hazard areas to maximize potential as a safe location and should include hazardous materials protection measures, independent power source (generator, solar system with battery storage, multiple sources, etc.), accessible to disabled people, and located close to where most people may be clustered to reduce time and distance residents would need to travel for safety.

Review Floodplain Ordinance for Effectiveness	
Description	Verify existence of floodplain ordinance and review for effectiveness in limiting development in floodplains and protecting properties in floodplains or encouraging owner self-protection for properties currently in floodplains
Estimated Cost	Minimal
Timeline/Schedule	Medium Term
Responsible Entity	City Councils, County Board of Supervisors
Hazards Addressed	Flash flood, river flood
Mitigation Category	Property Protection, Prevention

Related Goals/Objectives	1.1, 1.2, 2.1, 2.3
Addresses High Risk Hazards?	Yes
STAPLEE Rating	9

Consider CRS Participation	
Description	Explore feasibility of City participating in Community Rating System for enhanced flood protection
Estimated Cost	Minimal
Timeline/Schedule	Medium Term
Responsible Entity	City Councils
Hazards Addressed	Flash flood, river flood
Mitigation Category	Property Protection, Prevention
Related Goals/Objectives	1.1, 1.2, 1.3, 2.1, 3.3, 3.1, 3.5
Addresses High Risk Hazards?	Yes
STAPLEE Rating	0

Community Emergency Response Team	
Description	Encourage and support development of volunteer community emergency response team of residents who have access to equipment and training to respond if emergency services are unable to meet all of the immediate needs following disasters as well as checking in on elderly or disabled residents to ensure their safety
Estimated Cost	Volunteer
Timeline/Schedule	Short Term
Responsible Entity	City councils, Fire Department, Emergency Management, and Residents
Hazards Addressed	Flash flood, thunderstorm / lightning, communication failure, structural failure, severe winter storm, transportation of hazardous materials incident, energy failure, rail transportation incident, highway transportation incident, structural fire, windstorm / high wind event, grass / wildfire, fixed hazardous materials incident, river flooding, tornado, hailstorm, air transportation incident, dam failure, sink hole, extreme heat, human disease incident, earthquake, landslide, drought
Mitigation Category	Public Education and Awareness, Emergency Services
Related Goals/Objectives	1.3, 2.1, 2.2, 2.3, 3.3, 3.4, 3.5
Addresses High Risk Hazards?	Yes
STAPLEE Rating	16

Continuity of Operations Planning	
Description	City and City Departments work to develop procedures of what do when hazards occur including who has keys to shelters, contact list for city and emergency response personnel, priorities for what facilities to restore following disasters, how to direct residents to minimize injuries, as well as (off-site) backups of important City documents and files
Estimated Cost	Minimal
Timeline/Schedule	Medium Term
Responsible Entity	Emergency Management, Red Cross, City Councils, County Board of

	Supervisors.
Hazards Addressed	Flash flood, thunderstorm / lightning, communication failure, structural failure, severe winter storm, transportation of hazardous materials incident, energy failure, rail transportation incident, highway transportation incident, structural fire, windstorm / high wind event, climate change, fixed hazardous materials incident, river flooding, tornado, hailstorm, air transportation incident, dam failure, sink hole, human disease incident, earthquake, landslide
Mitigation Category	Property Protection
Related Goals/Objectives	2.1, 2.2, 2.3, 3.3, 3.4, 3.5
Addresses High Risk Hazards?	Yes
STAPLEE Rating	15

Flood proofing (wet or dry)	
Description	Encourage property owner use of flood proofing techniques to reduce potential flood-related damages such as water-proofing basement walls, structural modifications allowing flood waters to pass through or around structures without causing damage (as part of remodeling or disaster related repairs), use of water- / mold-resistant paints, etc.
Estimated Cost	Minimal to high depending on structure and techniques
Timeline/Schedule	Short Term
Responsible Entity	City Councils(encouragement or in use of disaster recovery funds) and Property Owners (execution)
Hazards Addressed	Flash Flood, River Flooding
Mitigation Category	Public Education and Awareness, Structural Projects, Prevention
Related Goals/Objectives	1.1, 1.2, 1.3, 2.1, 2.2, 2.3, 3.1, 3.2, 3.3, 3.4, 3.5
Addresses High Risk Hazards?	Yes
STAPLEE Rating	-1

Acquisition of Properties or Relocation of Buildings	
Description	Utilize disaster recovery funds or pre-disaster mitigation funds to acquire properties in floodplains or relocation of buildings outside of floodplains
Estimated Cost	Moderate to high
Timeline/Schedule	Ongoing
Responsible Entity	City Councils, Board of Supervisors, Emergency Management.
Hazards Addressed	Flash Flood, River Flooding
Mitigation Category	Prevention, Property Protection
Related Goals/Objectives	1.1, 1.2, 1.3, 2.1, 2.3, 3.2, 3.3, 3.4
Addresses High Risk Hazards?	Yes
STAPLEE Rating	-6

Storm water Management Ordinance	
Description	Develop a storm water management ordinance to minimize impacts on storm water system and to minimize flash flooding impacts; may include artificial erosion control, creek bank stabilization, erosion resistant planting on steep slopes (deep root plants) to slow and help infiltrate storm water, terracing hillsides, grading techniques

Estimated Cost	Minimal
Timeline/Schedule	Medium Term
Responsible Entity	City Councils
Hazards Addressed	Flash Flood, Thunderstorm / Lightning, Severe Winter Storm, River Flooding, Sink Holes
Mitigation Category	Prevention, Natural Resource Protection
Related Goals/Objectives	1.1, 1.2, 1.3, 2.1, 2.3
Addresses High Risk Hazards?	Yes
STAPLEE Rating	8

Flood Insurance	
Description	Encourage property owner purchase of flood insurance
Estimated Cost	Volunteer
Timeline/Schedule	Ongoing
Responsible Entity	City Councils and Property Owners
Hazards Addressed	Flash Flood, River Flooding
Mitigation Category	Property Protection
Related Goals/Objectives	1.1, 1.3, 2.1, 3.4, 3.5
Addresses High Risk Hazards?	Yes
STAPLEE Rating	19

Storm water Drainage System	
Description	Repair and upgrade existing storm water drainage system
Estimated Cost	Moderate to high
Timeline/Schedule	Long Term
Responsible Entity	City Councils
Hazards Addressed	Flash Flood, Thunderstorm / Lightning, Severe Winter Storm, River Flooding, Sink Holes
Mitigation Category	Structural Projects
Related Goals/Objectives	1.1, 1.3, 2.3, 3.1, 3.2, 3.3
Addresses High Risk Hazards?	Yes
STAPLEE Rating	7

Wetland Protection / Restoration	
Description	Discourage wetland destruction and encourage restoration of wetlands in low-lying areas to help slow flood water and infiltrate storm water to minimize flooding and maintain wildlife habitat
Estimated Cost	Minimal
Timeline/Schedule	Short to Medium term
Responsible Entity	City Councils, Board of Supervisors,
Hazards Addressed	Flash Flood, Thunderstorm / Lightning, Severe Winter Storm, Grass / Wildfire, River Flooding, Climate Change
Mitigation Category	Natural Resource Protection
Related Goals/Objectives	1.1, 1.3, 2.1, 2.3, 3.1, 3.2, 3.3, 3.4, 3.5
Addresses High Risk Hazards?	Yes
STAPLEE Rating	3

Drainage Easements	
Description	Purchase of drainage easements for temporary water retention and drainage and potential storage of heavy snow cleared from city streets/roads
Estimated Cost	Moderate
Timeline/Schedule	Medium Term
Responsible Entity	City councils, Board of Supervisors
Hazards Addressed	Flash Flood, Thunderstorm / Lightning, Severe Winter Storm, River Flooding, Sink Holes, Climate Change
Mitigation Category	Property Protection, Prevention
Related Goals/Objectives	1.1, 1.2, 2.1, 2.3
Addresses High Risk Hazards?	Yes
STAPLEE Rating	4

Sensitive Areas Ordinance	
Description	Develop city ordinance restricting construction or type of construction in hazard / sensitive areas such as steep slopes, over mines, wetlands, near floodplains, etc.
Estimated Cost	Minimal
Timeline/Schedule	Medium Term
Responsible Entity	City Councils
Hazards Addressed	Flash Flood, Grass / Wildfire, River Flooding, Climate Change, Dam Failure, Sink Holes, Landslide
Mitigation Category	Prevention, Natural Resource Protection
Related Goals/Objectives	1.1, 1.2, 2.3
Addresses High Risk Hazards?	Yes
STAPLEE Rating	0

Surge Protection / Lightning Protection	
Description	Encourage property owners to use surge protectors to protect computers and other sensitive electrical appliances from lightning strikes and power surges; purchase, use, and maintenance of surge protectors for City facilities as needed
Estimated Cost	Minimal , Voluntary
Timeline/Schedule	Ongoing / Short Term
Responsible Entity	City Councils and home owners
Hazards Addressed	Thunderstorm / Lightning, Communications Failure, Energy Failure
Mitigation Category	Prevention, Public Education and Awareness
Related Goals/Objectives	1.3, 2.1, 2.2, 2.3, 3.1, 3.4, 3.5
Addresses High Risk Hazards?	Yes
STAPLEE Rating	18

Burying Power Lines	
Description	Encourage burying of power lines to new construction and upon significant maintenance or upgrades of existing power supply
Estimated Cost	Minimal (for City), Moderate to High (for power companies)
Timeline/Schedule	Long Term
Responsible Entity	City Councils, Power Companies

Hazards Addressed	Thunderstorm / Lightning, Communications Failure, Transportation of Hazardous Materials, Energy Failure, Rail Transportation Incident, Highway Transportation Incident
Mitigation Category	Property Protection, Structural Projects
Related Goals/Objectives	1.3, 2.2, 2.3, 3.1, 3.4, 3.5
Addresses High Risk Hazards?	Yes
STAPLEE Rating	7

Temporary Debris Disposal Policy	
Description	Develop policy for temporary debris disposal for city and private property owners for post-disaster clean-up
Estimated Cost	Minimal
Timeline/Schedule	Medium Term
Responsible Entity	City Council, Board of Supervisors, Emergency management
Hazards Addressed	Flash Flood, Thunderstorm / Lightning, Structural Failure, Severe Winter Storm, Transportation of Hazardous Materials, Rail Transportation Incident, Highway Transportation Incident, Structural Fire, Windstorm / High Windstorm Events, Grass / Wildfires, Fixed Hazardous Materials Incident, River Flooding, Tornado, Air Transportation Incident, Dam Failure, Sink Holes, Earthquake, Landslide
Mitigation Category	Emergency Services
Related Goals/Objectives	1.3, 2.2, 2.3, 3.1, 3.2, 3.3, 3.4
Addresses High Risk Hazards?	Yes
STAPLEE Rating	1

Snow Fences / Barriers	
Description	Encourage development of snow fences or barriers to block drifting snow from blocking critical access routes or from building entrances ranging from artificial to vegetative barriers
Estimated Cost	Voluntary
Timeline/Schedule	Short Term
Responsible Entity	Property Owners and County Engineer
Hazards Addressed	Severe Winter Storms, Windstorm / High Wind Events, Climate Change (vegetative barriers)
Mitigation Category	Prevention, Natural Resource Protection
Related Goals/Objectives	1.3, 2.1, 2.2, 2.3, 3.4, 3.5
Addresses High Risk Hazards?	Yes
STAPLEE Rating	19

Maintenance of Older Buildings	
Description	Encourage property maintenance and help leverage funds for property owners unable to afford more significant structural maintenance
Estimated Cost	Minimal to moderate
Timeline/Schedule	Ongoing
Responsible Entity	City Council, Property Owners, Historical Society
Hazards Addressed	Thunderstorm / Lightning, Communication Failure, Structural Failure, Severe Winter Storm, Energy Failure, Structural Fire, Windstorm / High Wind Events, Fixed Hazardous Materials (especially lead paint),

	Tornado, Hailstorm, Climate Change, Sink Holes, Human Disease Incident (especially mold related), Earthquake, Radon
Mitigation Category	Property Protection, Prevention, Public Education and Awareness
Related Goals/Objectives	1.3, 2.1, 2.3, 3.1, 3.2, 3.3, 3.4, 3.5
Addresses High Risk Hazards?	Yes
STAPLEE Rating	8

Expanded Hazard Area Mapping and Mine Evaluation	
Description	Record areas where hazards occur to aid in hazard mapping, encourage detailed evaluation of the structural integrity of mines under Communities in Appanoose County, encourage detailed floodplain mapping, seek funds to develop more detailed multi-hazard area maps
Estimated Cost	Minimal to moderate
Timeline/Schedule	Short Term (hazard recording) to Long Term (mine evaluation)
Responsible Entity	City Councils, First Responders, Emergency Management
Hazards Addressed	Flash Flood, Transportation of Hazardous Materials Incident, Rail Transportation Incident, Highway Transportation Incident, Grass / Wildfires, Fixed Hazardous Materials Incident, River Flooding, Dam Failure, Sink Holes
Mitigation Category	Prevention
Related Goals/Objectives	2.1, 2.2, 2.3, 3.3
Addresses High Risk Hazards?	Yes
STAPLEE Rating	7

Public Education and Outreach	
Description	Develop hazard education and outreach program to help Appanoose County residents understand meaning of hazard warnings and self-protection measures
Estimated Cost	Minimal
Timeline/Schedule	Medium Term
Responsible Entity	City Councils, Schools, Emergency Management, County Board of Supervisors
Hazards Addressed	All
Mitigation Category	Public Education and Awareness
Related Goals/Objectives	1.1, 1.3, 2.1, 2.2, 2.3, 3.3
Addresses High Risk Hazards?	Yes
STAPLEE Rating	14

Water Storage or Saving Plans	
Description	Develop plan for water storage for back-up and to supplement Rathbun Rural Water, develop policy or program for helping residents reduce water demand using measures such as low-flow toilets and showerheads and landscaping
Estimated Cost	Minimal
Timeline/Schedule	Medium Term
Responsible Entity	Emergency Management, Fire Departments
Hazards Addressed	Structural Fire, Grass / Wildfire, Climate Change, Drought
Mitigation Category	Prevention, Public Education and Awareness

Related Goals/Objectives	1.1, 1.3, 2.2, 2.3, 3.4, 3.5
Addresses High Risk Hazards?	Yes
STAPLEE Rating	7

Evaluate, Reinforce, and/or Restore Appanoose County Dams	
Description	Evaluate dam and reservoir capacity for supplemental water supply or emergency water storage, needs for restoration, and public safety
Estimated Cost	Moderate to High
Timeline/Schedule	Medium Term
Responsible Entity	County Board of Supervisors, City Councils,
Hazards Addressed	Flash Flood, Structural Failure, River Flooding, Dam Failure
Mitigation Category	Prevention, Natural Resource Protection, Structural Project
Related Goals/Objectives	1.3, 2.2, 2.3, 3.1, 3.3
Addresses High Risk Hazards?	Yes
STAPLEE Rating	3

Burning Restrictions	
Description	Develop, implement, and enforce burning restrictions for trash and yard waste for Cities and unincorporated County
Estimated Cost	Minimal
Timeline/Schedule	Medium Term
Responsible Entity	City Councils, County Board of Supervisors and Fire Departments
Hazards Addressed	Energy Failure, Structural Fire, Grass / Wildfire, Fixed Hazardous Materials
Mitigation Category	Prevention
Related Goals/Objectives	1.3, 2.1, 2.3, 3.4, 3.5
Addresses High Risk Hazards?	Yes
STAPLEE Rating	1

Note: Burning restrictions should address controlled burning for prairie maintenance as fire is an integral part of prairie ecosystems, this does not mean that burning restrictions must permit such controlled burns. For example, burning permits may be required as well as potentially the presence of trained burning professionals. Prairie stands in incorporated areas may be maintained through mowing as a second best maintenance strategy.

Smoke / Fire / Carbon Monoxide Detector and Sprinkler Systems	
Description	Encourage use and maintenance of smoke / fire / carbon monoxide detectors and fire suppression (aka sprinkler) systems in private buildings; use and maintain smoke / fire / carbon monoxide detectors in City-owned buildings and install sprinkler systems as funds are available and as needed
Estimated Cost	Minimal
Timeline/Schedule	Short Term
Responsible Entity	City councils and Property Owners
Hazards Addressed	Structural Failure, Structural Fire, Grass / Wildfire
Mitigation Category	Prevention, Property Protection
Related Goals/Objectives	1.2, 1.3, 2.1, 2.3, 3.1, 3.2, 3.3, 3.4, 3.5
Addresses High Risk Hazards?	Yes
STAPLEE Rating	16

Evacuation Plans	
Description	Develop evacuation plans for school, community buildings, and for town (School has some measures in place but no specific evacuation route or plan citing variability of hazard events and types)
Estimated Cost	Minimal to moderate
Timeline/Schedule	Medium Term
Responsible Entity	Fire Departments/Emergency personnel Emergency Management
Hazards Addressed	Flash Flood, Communications Failure, Structural Failure, Transportation Hazardous Materials Incident, Energy Failure, Rail Transportation Incident, Structural Fire, Grass / Wildfire, River Flooding, Fixed Hazardous Materials, Air Transportation Incident, Dam Failure, Sink Holes
Mitigation Category	Prevention, Emergency Services
Related Goals/Objectives	2.3, 3.1, 3.3, 3.4, 3.5
Addresses High Risk Hazards?	Yes
STAPLEE Rating	5

Maintenance of Heating / Cooling Systems	
Description	Encourage property owner maintenance of heating and cooling systems and maintenance of heating and cooling systems in community buildings/private homes
Estimated Cost	Minimal to moderate
Timeline/Schedule	Short Term
Responsible Entity	City Maintenance workers and Property Owners
Hazards Addressed	Severe Winter Storm, Energy Failure, Climate Change, Extreme Heat
Mitigation Category	Prevention, Public Education and Awareness
Related Goals/Objectives	1.3, 2.1, 2.3, 3.2, 3.4, 3.5
Addresses High Risk Hazards?	Yes
STAPLEE Rating	16

Fireplace Maintenance	
Description	Encourage property owners with fireplaces to keep chimneys clean and in good structural repair
Estimated Cost	Minimal
Timeline/Schedule	Short Term
Responsible Entity	Property Owners
Hazards Addressed	Structural Failure, Structural Fire, Windstorm / High Wind Events, Grass / Wildfire, Tornado, Earthquake
Mitigation Category	Property Protection, Public Education and Awareness
Related Goals/Objectives	1.3, 2.1, 2.3, 3.2, 3.4, 3.5
Addresses High Risk Hazards?	Yes
STAPLEE Rating	16

Meth Lab Prevention	
Description	Develop public education campaign to help public understand the dangers of meth use and production
Estimated Cost	Voluntary to Minimal
Timeline/Schedule	Short to Medium Term

Responsible Entity	Police Departments, Fire Departments, Emergency Management, & Schools
Hazards Addressed	Transportation of Hazardous Materials Incident, Highway Transportation Incident, Structural Fire, Grass / Wildfire, Fixed Hazardous Materials Incident, Human Disease Incident
Mitigation Category	Public Education and Awareness
Related Goals/Objectives	1.3, 2.1, 2.3, 3.2, 3.4, 3.5
Addresses High Risk Hazards?	Yes
STAPLEE Rating	12

Hazardous Material Disposal	
Description	Develop hazardous materials disposal program incorporating public education, community clean-up days, and household hazardous waste exchange
Estimated Cost	Minimal to moderate
Timeline/Schedule	Medium Term
Responsible Entity	City councils or Fire Department and Volunteers
Hazards Addressed	Transportation of Hazardous Materials Incident, Fixed Hazardous Materials Incident, Structural Fire, Fixed Hazardous Materials Incident, Human Disease Incident
Mitigation Category	Prevention, Natural Resource Protection, Public Education and Awareness
Related Goals/Objectives	1.3, 2.2, 2.3, 3.1, 3.2, 3.3, 3.4, 3.5
Addresses High Risk Hazards?	Yes
STAPLEE Rating	17

Note: Household hazardous waste exchange may be available through recycling center in Centerville likewise community clean-up days are currently in place. Household hazardous waste exchanges allow community residents to drop off and pick up common household cleaners, paints, and stains rather than disposing of them properly or improperly.

Search and Rescue Training	
Description	Training Firefighters and other local emergency responders best practices in search and rescue operations
Estimated Cost	Minimal to moderate
Timeline/Schedule	Medium Term
Responsible Entity	Fire Department
Hazards Addressed	Flash Flood, Structural Failure, Severe Winter Storm, Transportation of Hazardous Materials Incident, Rail Transportation Incident, Structural Fire, Grass / Wildfire, Fixed Hazardous Materials Incident, River Flooding, Tornado, Windstorm / High Wind Events, Air Transportation Incident, Dam Failure, Sink Holes, Earthquake, Landslide
Mitigation Category	Emergency Services
Related Goals/Objectives	1.3, 2.2, 2.3, 3.3, 3.4, 3.5
Addresses High Risk Hazards?	Yes
STAPLEE Rating	6

Mass Casualty Preparation	
Description	Develop plan for how to handle mass casualties resulting from hazard events in all communities in Appanoose County

Estimated Cost	Minimal to moderate
Timeline/Schedule	Medium Term
Responsible Entity	City councils, First Responders, ADLM-Emergency Management
Hazards Addressed	Flash Flood, Structural Failure, Severe Winter Storm, Transportation of Hazardous Materials Incident, Rail Transportation Incident, Structural Fire, Grass / Wildfire, Fixed Hazardous Materials Incident, River Flooding, Tornado, Human Disease Incident, Air Transportation Incident, Dam Failure, Sink Holes, Earthquake, Landslide
Mitigation Category	Emergency Services
Related Goals/Objectives	2.2, 2.3
Addresses High Risk Hazards?	Yes
STAPLEE Rating	6

Immunization	
Description	Encourage periodic immunizations, especially for children and elderly residents, review mass immunization plan with school for emergency immunizations
Estimated Cost	Minimal
Timeline/Schedule	Short Term
Responsible Entity	City Councils, school district, and County Public Health Department
Hazards Addressed	Human Disease Incident
Mitigation Category	Prevention, Public Education and Awareness
Related Goals/Objectives	2.3, 3.1, 3.3, 3.5
Addresses High Risk Hazards?	No
STAPLEE Rating	5

Waste Disposal Enforcement	
Description	Develop or update waste disposal policies and enforce, review for effectiveness
Estimated Cost	Minimal
Timeline/Schedule	Short to Medium Term
Responsible Entity	City Councils
Hazards Addressed	Windstorm / High Wind Events, Fixed Hazardous Materials Incident, Tornado, Human Disease Incident
Mitigation Category	Prevention
Related Goals/Objectives	1.3, 2.1, 2.3, 3.4, 3.5
Addresses High Risk Hazards?	Yes
STAPLEE Rating	-3

Pest Management	
Description	Review policies for effectiveness governing mowing and maintaining properties to discourage infestations by pests within city limits, consider or update as needed other polices to control pests
Estimated Cost	Minimal
Timeline/Schedule	Short Term
Responsible Entity	City councils
Hazards Addressed	Human Disease Incident
Mitigation Category	Prevention, Natural Resource Protection

Related Goals/Objectives	2.3, 3.2, 3.3, 3.4, 3.5
Addresses High Risk Hazards?	No
STAPLEE Rating	-2

Radon Mitigation	
Description	Encourage property owner radon testing and mitigation, explore feasibility of City leveraging funds to help property owners test and / or mitigation unsafe radon levels
Estimated Cost	Minimal
Timeline/Schedule	Short Term
Responsible Entity	Property Owners, City, ADLM-Environmental Management
Hazards Addressed	Human Disease Incident, Radon
Mitigation Category	Public Education and Awareness, Prevention
Related Goals/Objectives	3.3. 3.4. 3.5
Addresses High Risk Hazards?	No
STAPLEE Rating	15

Hazard Occurrence Data Collection	
Description	Record occurrences of hazards, loss estimates, populations impacted, amount of area impacted, and other relevant information for updates to this plan and for improved emergency response information
Estimated Cost	Minimal
Timeline/Schedule	Short Term
Responsible Entity	City Clerks, First Responders, ADLM, County Public Health Department
Hazards Addressed	All
Mitigation Category	Prevention, Public Education and Awareness
Related Goals/Objectives	1.3, 2.1, 2.2, 2.3, 3.1, 3.3, 3.4, 3.5
Addresses High Risk Hazards?	Yes
STAPLEE Rating	12

Vital Information Management	
Description	Encourage property owners to inventory and protect critical information for improved disaster recovery and minimize disruptions to lives following disaster events; critical information includes titles to property, bank information, insurance documents, wills, copies of prescription medications, family contact information, social security cards, passports, marriage licenses, birth certificates, and other forms of information that may be difficult to replace or needed to document eligibility for disaster aid
Estimated Cost	Voluntary
Timeline/Schedule	Short Term
Responsible Entity	Residents
Hazards Addressed	Flash Flood, Thunderstorm / Lightning, Communications Failure, Structural Failure, Severe Winter Storm, Transportation of Hazardous Materials Incident, Energy Failure, Rail Transportation Incident, Highway Transportation Incident, Structural Fire, Windstorm / High Wind events, Grass / Wildfire, Fixed Hazardous Materials Incident, River Flooding, Tornado, Hailstorm, Climate Change, Air Transportation

	Incident, Dam Failure, Sink Hole, Extreme Heat, Human Disease Incident, Earthquake, Landslide
Mitigation Category	Public Education and Awareness
Related Goals/Objectives	3.4, 3.5
Addresses High Risk Hazards?	Yes
STAPLEE Rating	17

Plan Maintenance and Updates

This plan is, as all plans are, intended to be a living document to be used in decision making and in new projects within the community. This first draft cannot anticipate all things that might happen eventually and so it will be necessary for the plan to be updated periodically. Updates to this plan shall be made no fewer than once every five years as is required by FEMA.

However, if this plan is integrated into the Appanoose County Multi-Jurisdiction Hazard Mitigation Plan as is intended, that plan will supersede this one. Thus the City of Mystic's role in monitoring and updating a plan will become part of the county-wide process and will follow the timeline and arrangements to be determined in the county plan. This will require the City of Mystic to adopt the Appanoose County Multi-Jurisdiction Hazard Mitigation Plan with a resolution indicating that the county plan will replace this document.

Much of the background data for Mystic is from the 2000 Decennial Census and thus is out of date. Upon release of 2010 Decennial Census data, the newer data shall replace what is in this plan or if Mystic is part of Appanoose County's plan, then in the respective community profile within that document. This may take place at the full update point or be integrated by amendment at review points.

Update and Review Cycle

If the Appanoose County Multi-Jurisdiction Hazard Mitigation Plan does not replace this one within one year of the Mystic Plan adoption date, then monitoring of this plan should take place annually. Likewise, if the Mystic Plan is not replaced by the county plan, then the plan will need to be updated and adopted as revised within five years of the previous adoption date.

In the suggested timeline below, the start and end times are given in number of months after the adoption date of this document. Annual reviews should include a narrative covering the tasks listed in Evaluating Mitigation Actions and Goals and any disasters that have occurred in the past year. If no action has progressed or there have been no disasters during this time, the narrative should still describe how the review took place and the fact that there have been no notable events or actions completed. The purpose of this is to maintain a record to aid in future updates and to aid in updating and revising the plan as needed.

Since it may not be reasonable to assume that the planning team will remain the same from year to year, it should consist of at least one city representative (mayor, elected official, or city clerk), at least one emergency responder, at least one representative of the school district, and anyone else that is interested in participating. The City of Mystic is responsible for reconvening the planning team unless this plan is superseded by the County Plan in which case the responsible party will be noted in that plan.

Suggested monitoring timeline;

	Start	End	Action

Annual Review #1	11 months	12 months	Addendum added to Plan
Annual Review #2	23 months	24 months	Addendum added to Plan
Annual Review #3	35 months	36 months	Addendum added to Plan
Annual Review #4	47 months	48 months	Addendum added to Plan
Plan Update	52 months	57 months	Submit updated plan to State and FEMA for approval and Adopt plan as revised (adoption must take place by the end of the 60th month to remain in compliance)

Plan Monitoring and Evaluation

For updates to this plan, the following tasks will need to be addressed by the agents if other than the City of Mystic charged with implementing actions in conjunction with the planning team;

Procedures and Techniques

Task A. Evaluate the effectiveness of the planning process.

3. Reconvene the Planning Team.
4. Review your Planning Process.
   Items to Discuss:

   a. Building the Planning Team
   b. Engaging the Public
   c. Data Gathering and Analysis
   d. Coordinating with other Agencies

Task B. Evaluate the effectiveness of your actions.

4. What were the results of the implemented action? Did the results achieve the goals/objectives outlined in the plan? Did the actions have the intended results?
5. Were the actions cost-effective? Did (or would) the project result in the reduction of potential losses?
6. Document actions which were slow to get started or not implemented.

Task C. Determine why the actions worked (or did not work).

6. Lack of available resources
7. The political or popular support for or against the action.
8. The availability of funds
9. The workloads of the responsible parties
10. The actual time necessary to implement the actions.

Task D. *Determine if there are Changes to Plan Contents*.

1. Have there been any hazard events in the past year (for annual review)? In the past 5 years (for plan updates)?

2. Have there been any changes to maximum threat, vulnerability, or probability of hazards?
3. Have there been significant changes to the demographics of Mystic? Is there new Census information for Mystic?
4. Has there been new construction in Mystic? If so, is it in a potential hazard area?
5. Has there been any change to the number of repetitive loss properties in Mystic?
6. Have there been any changes to maximum threat, vulnerability, or probability of hazards?
7. Should any hazards be added or removed?
8. Should any new mitigation actions be added?
9. Does the City have any new ordinances or plans? How has the hazard mitigation plan been used to develop new ordinances or plans? How have new ordinances or plans been incorporated into the hazard mitigation plan (if relevant)?

Incorporation into Existing Planning Mechanisms

The hazard mitigation planning team was created to develop the mitigation plan and guide the plan preparer in its writing. The planning team should not formally end with the approval of the plan. The planning team can evolve into one of a watch dog over the practices of land developers and public officials. Members can help remind public officials of that particular year's mitigation strategy and possible funding options and can volunteer in the implementation process for certain actions. The team and local governments may participate in the process and engage regional organizations, state agencies, state universities, schools and church via memorandums of agreement.

Finally, the planning team is partly responsible to ensure that the public officials are incorporating mitigation actions into relevant plans and planning mechanisms, such as zoning, annexation plans, and boding proposals. Communities should also include mitigation initiatives as regular line items in community capital or operational budgets to ensure ongoing funding for hazard mitigation initiatives. The following matrix shows the types of planning mechanisms available and how the plan should be incorporated into them.

Current Planning Mechanisms	***Jurisdictions Currently in Place***	***Method of Incorporation***	***Who Responsible or Lead***
Comprehensive Land Use plan	County & Centerville	Review Each, develop in other jurisdictions	Zoning Commissions & staff, BOS
Capital improvement plan	Centerville	Modernize each, develop plans if they are outdated	City of Centerville
Economic Development plan	Regional – CEDS	Add a mitigation section to annual regional plan	CVPD, city of Centerville, Appanoose Economic Dev Corp
Open space/ conservation plan	Rural county	Incorporate mitigation projects affecting open spaces into plans	Conservation board/staff, city parks
Watershed Protection plan	County	Address mitigation actions	Emergency management

		in watershed areas	Coordinator
Zoning Ordinance	25% of County, Centerville, Moravia, Moulton, Plano	Review zoning code concerning applicable hazards	Zoning commissions & staff, BOS
Building Codes	Centerville	Update building codes for fire & wind standards	City councils, BOS
Tree Maintenance Codes	Centerville, but limited in all other areas	Consult with utilities	City of Centerville Utilities Dept, County Maintenance Dept
Soil erosion/ water control ordinance	Limited in all areas	Consult with RRWA	Emergency management coordinator
Solid/hazardous waste regulations	Limited	Review regulations as to what can be landfilled, add hazard maps	Landfill owner, Emergency Management Coordinator
Public Health Regulations	All of region covered through Public Health Dept	Collaborate with PH agencies to incorporate new protocols	Emergency Management Coordinator, Public Health Board, & staff
Historic District Programs	Centerville, County	Provide data to assist in protecting properties	Development of groups with state IDED assistance
Long-Range Transportation Plan	Regional coverage – plan is in progress	Incorporate hazard maps & transportation improvement ideas	County engineer, CVTPA, IDOT, BOS
Water source plan	All of county through inter-government agreement	Include mitigation actions related to relevant hazards	RRWA
Storm water Management program	Centerville, Moravia	Include mitigation actions related to flash flooding	City Councils, Emergency Management coord,
Housing & Special Needs plan	Centerville, Mystic, Exline	Consider mitigation recommendations in housing plans & funding requests for improvements	City Councils, CVPD, hospitals, Emergency Management Coord
Administrative Operations processes- departments & boards	All Jurisdictions	Convene meetings where possible, realignment of tasks, new or improved tasks & processes, & board goals are updated.	Emergency Management Coord, elected officials, clerks & board chairs
FEMA approved HMGP	Mystic	Hazards & mitigations actions were a basis for the current committee to develop plan for MJP. Single plan will be replaced	City of Mystic

		by MJP.	

Single Jurisdiction Plan Updates for Mystic

City of Mystic is the only Appanoose County community that had completed a single jurisdiction HMGP plan with guidance of John Dawson of Chariton Valley Planning and Development. Research for the county and the city of Mystic overlapped as efforts were put forth on both documents at the same time. FEMA approved and the City of Mystic adopted their plan on September 2, 2009. The State of Iowa has now provided recommendations that Single Jurisdiction Plans be rolled into Multi-Jurisdiction plans. Mystic representatives believed that the information stated in that plan was very recent and accurate to be incorporated into the Appanoose County Multi-Jurisdictional plan. CVPD planners and committee members approved their participation in the county plan in a indirect capacity and will call for clarification if needed. The City does recognize that the Multi-Jurisdictional plan will supersede the single community plan once it is federally approved as indicated in the single jurisdiction plan.

There are several hazards that were not detailed in the Mystic Mitigation plan that the committee realized would be included in the county wide plan. Those anticipations were documented on page 23 of the city's plan and can be viewed in Appendix II. The excluded hazards were Levees, Expansive Soils, Pipeline Transportation Incident, Waterway Incident, Human Disease Pandemic, and Animal/Plant/Crop Disease. Although these are detailed in the Multi-Jurisdictional plan, Mystic has not identified them as a hazard of concern for their individual community.

The mitigation actions selected by the Mulit-Jurisdictional committee were primarily the same as the City of Mystic. There were additional mitigation strategies due to the inclusion of other hazards to be comprehensive of the entire county. The top ten Mitigation Action Rankings are identified to be the same for both committees but vary slightly in consecutive order. For example, Mystic ranked Community Emergency Response Team as one and the Mulit-Jursidictional committee ranked it as second.

The risk assessments and community profile remains the same for the community as what was presented in the FEMA approved 2009 plan.

The City of Mystic representatives (Patsy Seals, Chris Chester, Pat & Phil Hudson) were informed of the decisions the Appanoose County committee through minutes that were emailed to them after each meeting. There were no questions as the members received that information. The City council was presented with the draft plan of the Appanoose County Multi-Jurisdictional plan on January 25, 2011. They were also provided handouts illustrating the differences of the two plans and clear statements that the City's Plan would be superseded by the County's FEMA approved plan. There were no questions and all accepted the adjustments.

Mitigation Action Updates for Mystic

There has been a reduction to the repetitive loss properties through the mitigation actions of Acquisition and demolition of flooded properties. The project was accepted and began in 2008 and will be completed in 2011. These 8 residential structures and multiple out buildings were located within the estimated floodplain of Mystic. A Flash Flooding event in 2007 destroyed these structures and the acquisition/demolition was funded by FEMA, Iowa Homeland Security and Iowa Department of Economic

Development. There were other structures affected by this event identified but it was a voluntary program with homeowners and 3 opted not to participate. The FEMA approved Mystic City Plan also indicates that the City Maintenance shop, lift station and south bridge lie within the estimated floodplain.

The City has also indicated that the maintenance of the Mystic dam was a priority for to the City of Mystic. It has not been able to be restored due to lack of funding.

Mystic committee members stated that there has been some improvement to the community center. The building maintenance included installing a new roof and repairs to the restrooms.

The Mystic Mitigation Planning Committee is currently making arrangements to reconvene. It has been brought to their attention that the Multi-Jurisdictional plan has not yet replaced their City plan and the annual evaluation process for that plan must begin. Committee members reviewed all other Mitigation Strategies and do not have any other progress toward accomplishing other strategies.

Public Participation

Obtaining public participation for planning can be difficult in both rural areas and in larger urban areas, sometimes there is significant interest, but this is not always the case. Public participation for planning exercises is particularly difficult when the public is not interested in the plan or is not clear on what the plan means to them. An advantage in small communities though, is the capacity for word-of-mouth and informal discussion, especially with the community's elected officials. It may not be feasible in Mystic to have a standing mitigation committee to answer community questions, reach out to the community, or to review proposed projects. However, the public shall be presented the opportunity to take part in plan reviews and updates.

The opportunity for the public to take part in updates and reviews of this plan will comply with Iowa's Open Meeting Law (Iowa Code, Chapter 21). For each plan update (the five year period), the plan will be presented to the public for a 30 day comment and review period prior to being submitted to the State and FEMA. For each annual review, public notices should be announced as city council meetings are in order to permit members of the public to attend planning team meetings. This document shall be available through City Hall to any party who requests to see it where and when practicable. However portions intended for internal use may be withheld for confidentiality purposes (such as where private individual information is disclosed) or where legitimate safety concerns are present (such as the exact location and contents of sensitive facilities, hazardous chemical storage and composition, or mine entrances are identified).

Appendices

Appendix 1: Resolution Adopting the Appanoose County Multi Jurisdiction Hazard Mitigation Plan to Replace the Mystic Hazard Mitigation Plan

Resolution # _____

RESOLUTION ADOPTING THE APPANOOSE COUNTY MULTI JURISDICTION HAZARD MITIGATION PLAN TO REPLACE THE MYSTIC HAZARD MITIGATION PLAN

Whereas the Appanoose County has experienced various natural and human-caused disasters in its history including devastating flooding in Mystic in 2007;

Whereas the City of Mystic recognizes the threats posed by natural and human-caused hazards on Mystic residents and properties;

Whereas the City of Mystic has made a commitment to the protection of Mystic residents and properties with its Mystic Hazard Mitigation Plan;

Whereas the Appanoose County Multi Jurisdiction Hazard Mitigation Plan includes Mystic and the outcomes from the Mystic planning process;

Whereas Mystic expressed desire for the Mystic Plan to be incorporated into and replaced by the Appanoose County Multi Jurisdiction Hazard Mitigation Plan;

The City of Mystic hereby officially adopts the Appanoose County Multi Jurisdiction Hazard Mitigation Plan replacing the Mystic Hazard Mitigation Plan effective immediately:

Agreed to this _____ day of _____, 2009.

_____
Mayor

_____
Signature

_____
Attested by

_____
Signature

The "Short and Sweet" of it

Chariton Valley Planning and Development, an Iowa Council of Governments, is working on FEMA Multi-Jurisdictional Hazard Mitigation Plans for Lucas and Appanoose Counties including all cities in both counties.

These plans will allow Lucas and Appanoose County communities to receive aid in the future from FEMA in the event of a natural disaster. In addition, this is the way for communities to take steps to avoid suffering losses from various types of hazards and to more quickly recover after disaster strikes.

Chariton Valley
PLANNING & DEVELOPMENT

Chariton Valley Planning and Development

205 1/2 N 13th Street
Centerville, IA 52544

John Dawson
Phone: 641-437-4359
Fax: 641-437-1161
E-mail:
jdawson@charitonvalleyplanning.com

FEMA Multi-Jurisdictional Hazard Mitigation Plan

Disaster Planning in Southern Iowa

Chariton Valley
PLANNING & DEVELOPMENT

Disaster Planning in Southern Iowa

Chariton Valley Planning and Development is preparing Multi-Jurisdictional Hazard Mitigation Plans for Lucas and Appanoose Counties. These plans are documents that FEMA requires of communities in order to receive aid in the recovery following disasters. Having these plans also allows the counties and the communities to apply for grants for projects that might overlap between disaster preparation or prevention and other public uses. For example if a city needs to upgrade its sewer system, it may be eligible for these funds since the new sewer system may be able to minimize overflows caused by flooding. Another example might be a community center that could double as emergency housing following a tornado or fire or serve as a safe shelter from dangerous storms.

The planning process started in late September 2008 and is projected to conclude in December 2010. There will be a minimum of three public meetings; all citizens of the included communities as well as surrounding counties and cities are welcome to attend. Announcements for the public meetings will be made about two weeks prior to each but questions, concerns, and comments can be directed to John Dawson at Chariton Valley Planning and Development at any time, email is the easiest way to reach Dawson. In the final steps in this process, the plans will be submitted to FEMA and the Iowa Department of Homeland Security who will review the plans, make comment and maybe changes. Following this, each plan can then be officially adopted by each community and each county which will conclude the process.

Why are we planning for disasters?

Everyone makes plans, we plan on what we will make for dinner for our families, we plan on what we want to do on the weekend, and we plan on what we will do when we retire. Businesses make plans too and these plans are more detailed, often with financial strategies. Governments plan on how tax money will be used for projects like road repairs, new public buildings, and snow removal. Planning for disasters simply makes good sense, if you can prevent or avoid property damage or even loss of life, then those steps should be taken.

While we may think of tornados, ice storms, and flooding in our community, there are other threats to our homes and businesses too. These "disaster plans," officially called Hazard Mitigation Plans, look at all possible natural and many human-caused hazards and try to determine just how much of a threat they are. Natural disasters are not difficult to think of, there are tornados, floods, hail, severe thunderstorms, and so on. But what is a human-caused hazard? These include disasters that directly involve things that humans have built or that humans do. Some examples include perhaps what is on many peoples' minds, terrorism, but also bridge collapse, chemical spills, train derailment, and major traffic accidents.

These disaster plans will provide details about each of the hazards, past occurrences, severity, and probability of future events. The disasters are ranked to help prioritize which ones need the most attention and should be first in line for public investment projects that minimize damage and injuries. The plans will include some basic information about the community and goals related to disaster prevention.

Ideally, these plans can help families make their own household plans. For example, if there is a tornado or fire, where will everyone go to be safe, if there is a power outage, what does the family do, especially if power cannot be restored quickly, and there are other examples as well.

Some quick hazard facts

There is a lot of information on past disasters and their impacts, but it is not always easy to find this information, especially if you do not have a lot of time to spend. These disaster plans help to put some of this information into a single document for quick reference.

The National Oceanic and Atmospheric Administration (NOAA) has an online database containing information on recorded storms for each county in each state. In the following table you can see a sample of the dollar amounts of damage caused by a few different types of hazards for Lucas and Appanoose County.

Disaster Damage since 1950		
Appanoose County		
Disaster	Properties	Crops
Flood	$139.578 M	$33.655M
Tornado	$6.283M	$5K
Drought	$645.150 M	$1.500B
Snow & Ice	$16.818M	$0
Lightning	$82K	$0
Hail	$297K	$150K
Lucas County		
Disaster	Properties	Crops
Flood	$162.528 M	$42.395M
Tornado	$25.425M	$10K
Drought	$645.150 M	$1.500B
Snow & Ice	$42.340M	$65M
Lightning	$3K	$0
Hail	$341K	$323K

Appendix 3: Planning Process Invitations

In addition to publishing an article in the local newspaper indicating the kick-off of the planning process for the county and listing the date and time of the first meeting, many letters were directly mailed to parties that were deemed potentially valuable candidates for committee representation. The following chart shows the recipients of these direct invitations as well as the recipients of notice letters that Appanoose County and Mystic hazard mitigation plans were beginning. Following the chart are some sample letters that were used with some modification to specify individual entities or professions being invited.

Title	First Name	Last Name	Organization	Address 1	Address 2	City	State	Zip
Mr.	Clark	Smith	AEDC	307 N 13th Street		Centerville	IA	52544
	Board of Supervisors		Appanoose County	201 N 12th Street		Centerville	IA	52544
City Clerk	Kris	May	Centerville	314 E Maple Street	City Hall	Centerville	IA	52544
	Joyce	Biber	Centerville Chamber of Commerce	128 N 12th Street		Centerville	IA	52544
Mayor	Deb	Henkle	Cincinnati	105 W Pleasant	PO Box 194	Cincinnati	IA	52549
Mayor	Jim	Casteel	Exline	City Hall		Exline	IA	52555
Mayor	Paul	Mihalovich	Moravia	116 S William	PO Box 246	Moravia	IA	52571
Mayor	Gary	Harris	Moulton	111 S Main Street		Moulton	IA	52572
Mayor	Frankie	Belzer	Mystic	PO Box 69		Mystic	IA	52574
Mayor	Richard	Brooke	Numa	303 Main Street W		Numa	IA	52544
Mayor	Richard	Gorden	Plano	City Hall		Plano	IA	52581
General Manager	Fred	Jenkins	KMGO-FM, KCOG-FM	402 N 12th Street		Centerville	IA	52544
Mayor	David	Coffin	Rathbun	PO Box 1043		Centerville	IA	52544
Mayor	Eric	Pace	Udell	211 Wall Street	PO Box 55	Udell	IA	52593
Mayor	Roger	Selix	Unionville	PO Box 56		Unionville	IA	52594
Ms.	Ruth	Comer	The Chariton Chamber and Development Corporation	104 North Grand Street		Chariton	IA	50049
City Manager	Nels	Christensen	Chariton	115 South Main Street		Chariton	IA	50049
Mayor	Chris	Chapman	Derby	294 Walnut Street		Derby	IA	5006

								8
Mayor	Radley	Seuferer	Lucas	PO Box 88		Lucas	IA	50151
	Board of Supervisors		Lucas County	Lucas County Courthouse	916 Braden Avenue	Chariton	IA	50049
Mr.	Sam	Felderman	KELR	215 North Main Street		Chariton	IA	50049
Mayor	Roger	Pierce	Russell	115 S Maple		Russell	IA	50238
Mayor	Kris	Dittmer	Williamson	PO Box 112		Williamson	IA	50272
Mr.	Jon	Miles	Chariton Valley Electric Cooperative Inc.	2090 Highway 5 South	P.O. Box 486	Albia	IA	52531
President	Jim	Lindenmayer	IHCC Centerville Campus	721 North First Street		Centerville	IA	52544
County Extension Education Director	Clete	Swackhammer	Iowa State Extension, Appanoose Extension	501 N. 12th Street	Suite #4	Centerville	IA	52544
County Extension Education Director	Pat	Swartzlander	Iowa State Extension, Lucas Extension	48293 Hy-Vee Rd		Chariton	IA	50049
Ms.	Veronica	Fuhs	Lucas County Health Center	1200 N. 7th Street		Chariton	IA	50049
CEO	Clint	Christianson	Mercy Medical Center	One St. Joseph's Drive		Centerville	IA	52544
Acting Director	Rodger	Kaster	Rathbun Area Solid Waste	3020 McCarty Street		Centerville	IA	52544
CEO	John	Glen	Rathbun Regional Water Assoc., Inc.	16166 Hwy J29		Centerville	IA	52544
Superintendent	Richard	Turner	Centerville Community School District	634 North Main	Box 370	Centerville	IA	52544
Superintendent	Paula	Wright	Chariton Community School District	140 E. Albia Rd	P.O. Box 738	Chariton	IA	50049
Superintendent	Brad	Breon	Moravia Community School District	505 N Trussell Street		Moravia	IA	52571

Superintendent	Richard	McCurdy	Russell Community School District	410 E Smith	Box 487	Russell	IA	50238
Ms.	Amber	Alley	South Central Iowa Solid Waste Agency	1736 Hwy T-17		Tracy	IA	50256
Ms.	Michelle	Moore	USDA Rural Development	1709 S. B Street		Albia	IA	52531
District Conservationist	Jeffrey	Matthias	Lucas SWCD	21792 490TH Street		Chariton	IA	50049
Regional Coordinator	Vince	Sitzmann	Appanoose SWCD	501 N 12TH Street		Centerville	IA	52544
Supervisor	Jim	Stricker	IA DNR District #5	401 SW 7th	Suite 1	Des Moines	IA	50309
Lieutenant	Tom	Lampe	Iowa State Patrol District #2	1619 Truro Pavement		Osceola	IA	50213
Lieutenant	Dean	DeKoter	Iowa State Patrol District #14	2331 Roemer Avenue		Ottumwa	IA	52501
Bureau Chief	Carmily	Stone	IA Bureau of Environmental Health Services	321 E. 12th Street		Des Moines	IA	50319
Bureau Chief	Harry	Hillaker	IA Climatology Bureau	Wallace State Office Building	502 E. 9th Street	Des Moines	IA	50319
Executive Director	Karla	Weeks	American Red Cross, Southern Prairie Chapter	408 East Main Street		Ottumwa	IA	52501
Preparedness Bureau Chief	Steve	Zimmermann	Iowa Homeland Security and Emergency Management	7105 N.W. 70th Avenue	Camp Dodge Building W-4	Johnston	IA	50131
Division Coordinator	Cali	Beals	IDED Community Development Division	200 East Grand Avenue		Des Moines	IA	50309
Division Coordinator	Amy	Johnson	IDED Business Development Division	200 East Grand Avenue		Des Moines	IA	50309
	Board of Supervisors		Warren County	County Courthouse	301 North Buxton, Suite 202	Indianola	IA	50125
	Board of Supervisors		Marion County	County Courthouse	214 East Main Street	Knoxville	IA	50138
	Board of Supervisors		Wapello County	County Courthouse	101 W. Fourth Street	Ottumwa	IA	52501
	Board of Supervisors		Clarke County	County Courthouse	100 South Main	Osceola	IA	5021

					Street			3
	Board of Supervisors		Monroe County	County Courthouse	10 Benton Avenue East	Albia	IA	52531
	Board of Supervisors		Davis County	County Courthouse	Courthouse Square	Bloomfield	IA	52537
	Board of Supervisors		Decatur County	County Courthouse	207 North Main	Leon	IA	50144
	Board of Supervisors		Wayne County	County Courthouse	P.O. Box 435	Corydon	IA	50060
	County Commissioners		Schuyler County	County Courthouse	Room 204, Main Street	Unionville	MO	63565
	County Commissioners		Putnam County	County Courthouse	P.O. Box 187	Lancaster	MO	63548
	Lois	Behrens	Salvation Army	521 Benton		Albia	IA	52531
Pastor	Terry	Chapman	Moravia Church of the Nazarene	405 Myra Lane		Moravia	IA	52571
Ms.	Janice	Bolger	Lord's Cupboard	1011 S 15th Street		Centerville	IA	52544
Director			Inter-Church Ministries Crisis Center	Auburn Ave		Chariton	IA	50049
Ms.	Sue	McCleary	South Central Iowa Community Action	1403 NW Church		Leon	IA	50144
Director			Helping Hands Pantry	710 Washington Ave E		Albia	IA	52531
Director			Methodist Church Food Pantry	Methodist Church		Humeston	IA	50123
Director			South Central Iowa Community Action Program	100 E Jefferson		Corydon	IA	50060
Adjutant General			Iowa National Guard	Joint Forces Headquarters	7105 NW 70th Avenue	Johnston	IA	50131
	Ray	Cummins	Appanoose Community Railroad	1303 S 21st Street		Centerville	IA	52544
Director, Government Affairs	Herb	Jones	Iowa, Chicago & Eastern Railroad Corporation	140 North Phillips Ave	PO Box 1260	Sioux Falls	SD	57101

Co-Director	Bill	Milani	ADLM	12307 HWY 5	PO Box 399	Moravia	IA	52571
Operations Manager			Army Corp of Engineers	20112 Hwy J5T		Centerville	IA	52544
State Conservationist	Richard	Simms	NRCS	210 Walnut Street	Room 693	Des Moines	IA	50309
Outreach Coordinator	Kaylene	Carney	Iowa Water Science Center, USGS	P.O. Box 1230		Iowa City	IA	52244
State Mitigation Planner	Susan	Dixon		7105 N.W. 70th Avenue	Camp Dodge Building W-4	Johnston	IA	50131
	Phil	Hudson	Mystic Fire Department	608 Lewis		Mystic	IA	52574
	David	Robinson	Mystic Fire Department	1101 W Main Street		Mystic	IA	52574
	Kathy	Hudson	Mystic Fire Department	608 Lewis		Mystic	IA	52574
	Jim	Hatfield	Mystic Fire Department	103 High Street		Mystic	IA	52574
	Jeremy	Hudson	Mystic Fire Department	608 Lewis		Mystic	IA	52574
	Justin	Hudson	Mystic Fire Department	608 Lewis		Mystic	IA	52574
	John	Lewis, Jr	Mystic Fire Department	302 N 2nd Street		Mystic	IA	52574
	Andy	Fenton	Mystic Fire Department	701 N 1st Street		Mystic	IA	52574
	Melissa	Haines	Mystic Fire Department	701 N 1st Street		Mystic	IA	52574
	Paige	Seddon	Mystic Fire Department	607 Lodwick Street		Mystic	IA	52574
	Sean	Squier	Mystic Fire Department	506 Lewis Street		Mystic	IA	52574
	Janice	Bolger	Lord's Cupboard	1011 S 15th Street		Centerville	IA	52544
	Chris	Chester	Mystic City Council	PO Box 52		Mystic	IA	52574
	Patsy	Seals	Mystic City Council	PO Box 162		Mystic	IA	5257

							4
	Shawn	Oden	Mystic City Council	500 N 1st Street	Mystic	IA	52574
	George	McCloud	Mystic City Council	600 N 1st Street	Mystic	IA	52574
	Christina	Kieltyka	Mystic City Council	PO Box 1	Mystic	IA	52574

Chariton Valley
PLANNING & DEVELOPMENT

Historic Courthouse District
205 ½ N. 13th Street, Suite A, Centerville, IA 52544-1707
Meeting and managing change

August 20, 2008

«AddressBlock»

«GreetingLine»

I am writing to inform you that Chariton Valley Planning and Development, an Iowa Council of Governments, will be working under Federal Emergency Management Agency (FEMA) guidelines to prepare a multi-jurisdictional Hazard Mitigation Plan for all cities in Appanoose County. **The plan is required of communities who receive FEMA assistance following a disaster event now or in the future.**

I have established a meeting for Thursday, September 25th, 2008, at 7 PM at the Centerville City Hall, Centerville, Iowa. I would like to invite you to attend this meeting as «profession/representative type» and as the representative of an entity that could be critical in disaster recovery and mitigation.

At this first meeting, I will explain the process and answer questions to the best of my ability. I hope to identify a core advisory committee and assign roles at this meeting as well. If you have any questions, please feel free to contact me via email, jdawson@charitonvalleyplanning.com or by phone, (641) 437-4359 ext. 4.

Thank you and I look forward to possibly working with you on this project.

Sincerely,

John Dawson

Community Development Planner

Phone: 641.437.4359 *Fax:* 641.437.1161 *Website:* charitonvalleyplanning.com

Chariton Valley
PLANNING & DEVELOPMENT

Historic Courthouse District
205 ½ N. 13th Street, Suite A, Centerville, IA 52544-1707
Meeting and managing change

January 13, 2009

«AddressBlock»

«GreetingLine»

Greetings! I am writing to inform you that the next Appanoose County Local Emergency Planning Committee meeting is scheduled for **2pm on Friday January 30**. This meeting will be held in the **Centerville City Hall Council Chambers**. From the responses that Dien Judge, John Arnold, and I have received from the previous letter, this day and time appeared to work the best for responders.

As a reminder, this meeting is intended to serve two purposes, 1) reconvene the Appanoose County LEPC following Jerald Ballanger's departure from ADLM and 2) to form the Appanoose County Hazard Mitigation Planning Committee. Your service on this Planning Committee is important for the county as it contributes to the local match requirement in the grant that Appanoose County received from FEMA. I will provide more information at the meeting on what would be expected of the committee as well as on the plan itself.

Sincerely,

John Dawson, Community Development Planner

Phone: 641.437.4359 *Fax:* 641.437.1161 *Website:* charitonvalleyplanning.com

Chariton Valley
PLANNING & DEVELOPMENT

Historic Courthouse District
205 ½ N. 13th Street, Suite A, Centerville, IA 52544-1707
Meeting and managing change

September 10, 2008

«AddressBlock»

«GreetingLine»

As you may know, Chariton Valley Planning and Development is working on a Hazard Mitigation Plan for the City of Mystic; this plan is being expedited in order to ensure that the FEMA buy-out program may proceed. One of the requirements of FEMA Hazard Mitigation Plans is to have a planning committee comprised of elected officials, non-profits, and other community interests. **I am writing to you directly to invite you to be part of this planning committee.**

Responsibilities of the planning committee members include reviewing the plan produced by Chariton Valley Planning and Development and providing input. While I am working on and can fill in all of the technical information, I need this committee to formulate goals and strategies based on the information to help protect Mystic in the future. Ultimately, this plan will need to be adopted by the committee and adopted by the City of Mystic before FEMA and the State of Iowa will fully approve it and provide all of the benefits attached to this type of plan, in this case, buy-out program funds.

Please RSVP once you have decided on being part of the planning committee so that I can proceed with the meetings required for this plan review. It is my intention to have this plan complete and hopefully approved by FEMA and the State of Iowa by the end of September, so I need to hear from you promptly. If you have any questions, please feel free to contact me via email, jdawson@charitonvalleyplanning.com or by phone, (641) 437-4359 ext. 4.

Thank you and I look forward to working with you on this project.

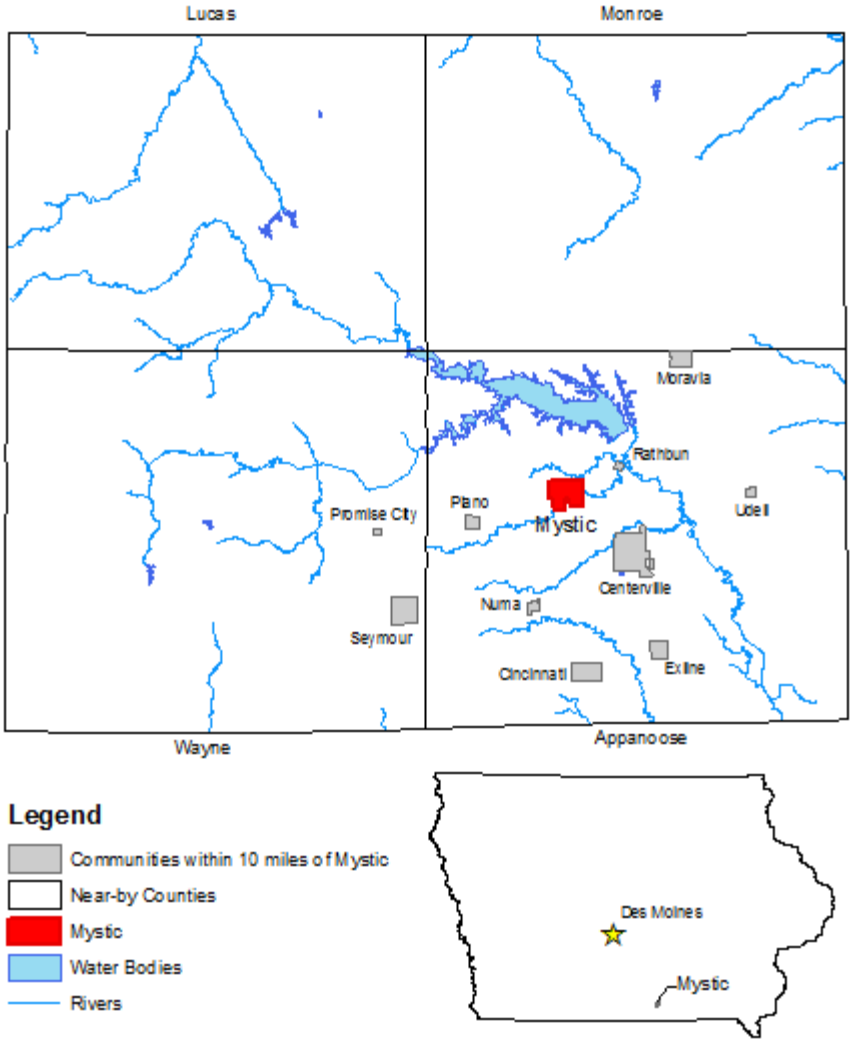
Sincerely,

John Dawson

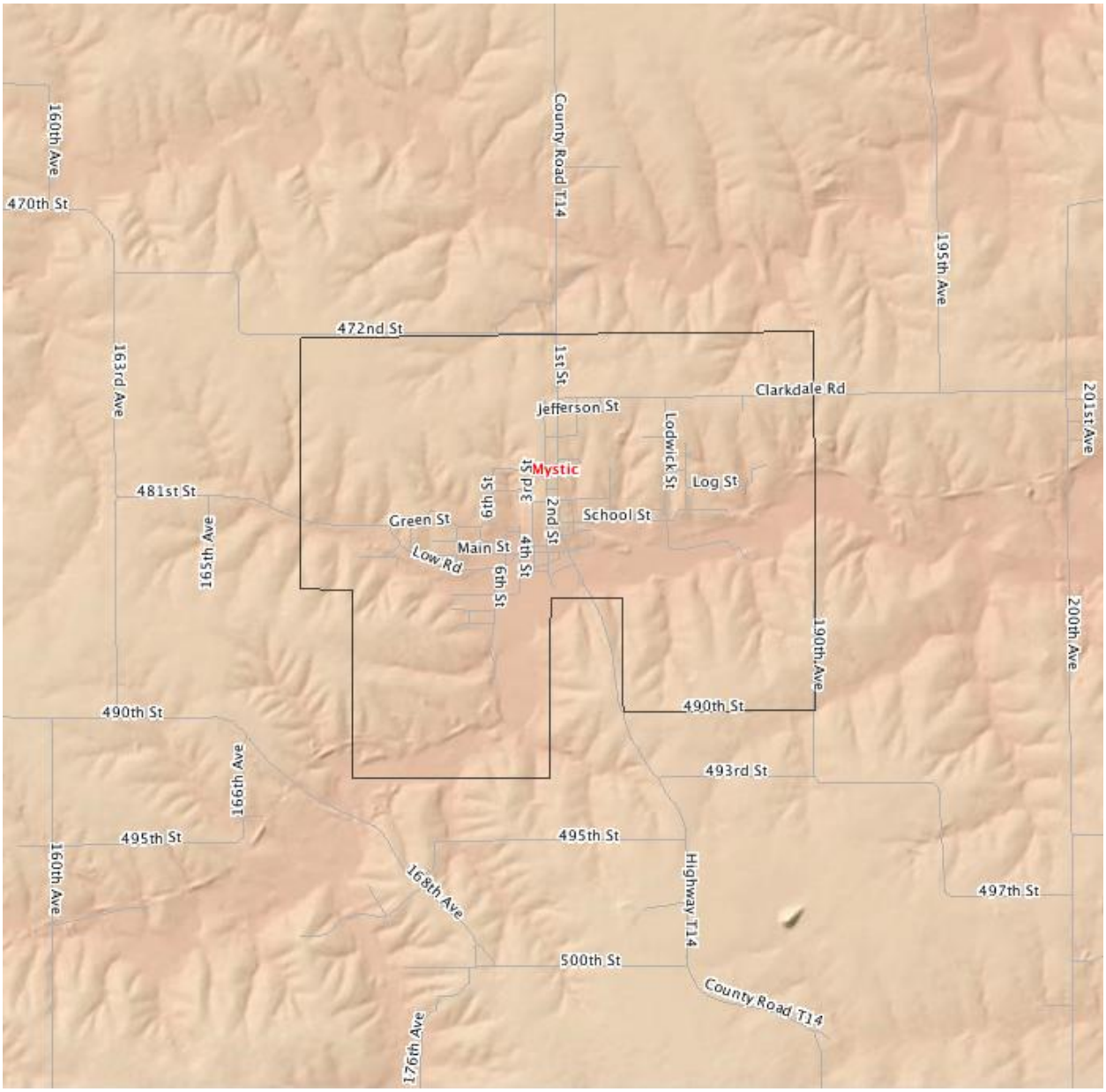
Community Development Planner

Phone: 641.437.4359 *Fax:* 641.437.1161 *Website:* charitonvalleyplanning.com

Appendix 4: Location of the City of Mystic, Iowa map

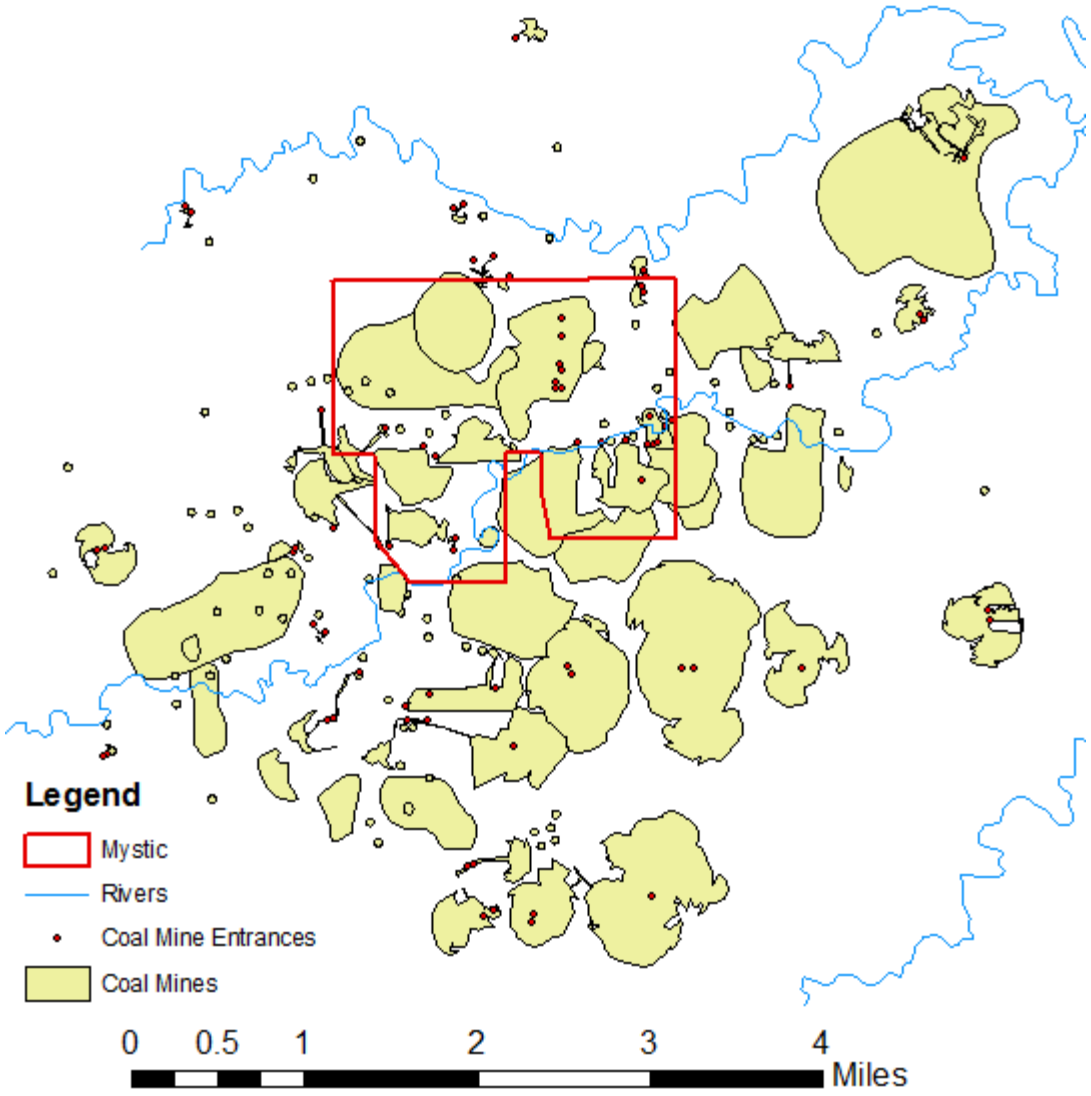


Appendix 5: Mystic Topographic Map



This image shows a representation of the topography Mystic. The darker portion that snakes through Mystic represents Walnut Creek and the low-lying area that is most prone to flooding. The interactive mapping site where this image can be generated and manipulated can be found on the ISU GIS Facility Iowa Geographic Map Server website; http://ortho.gis.iastate.edu/map.html (10-meter DEM).

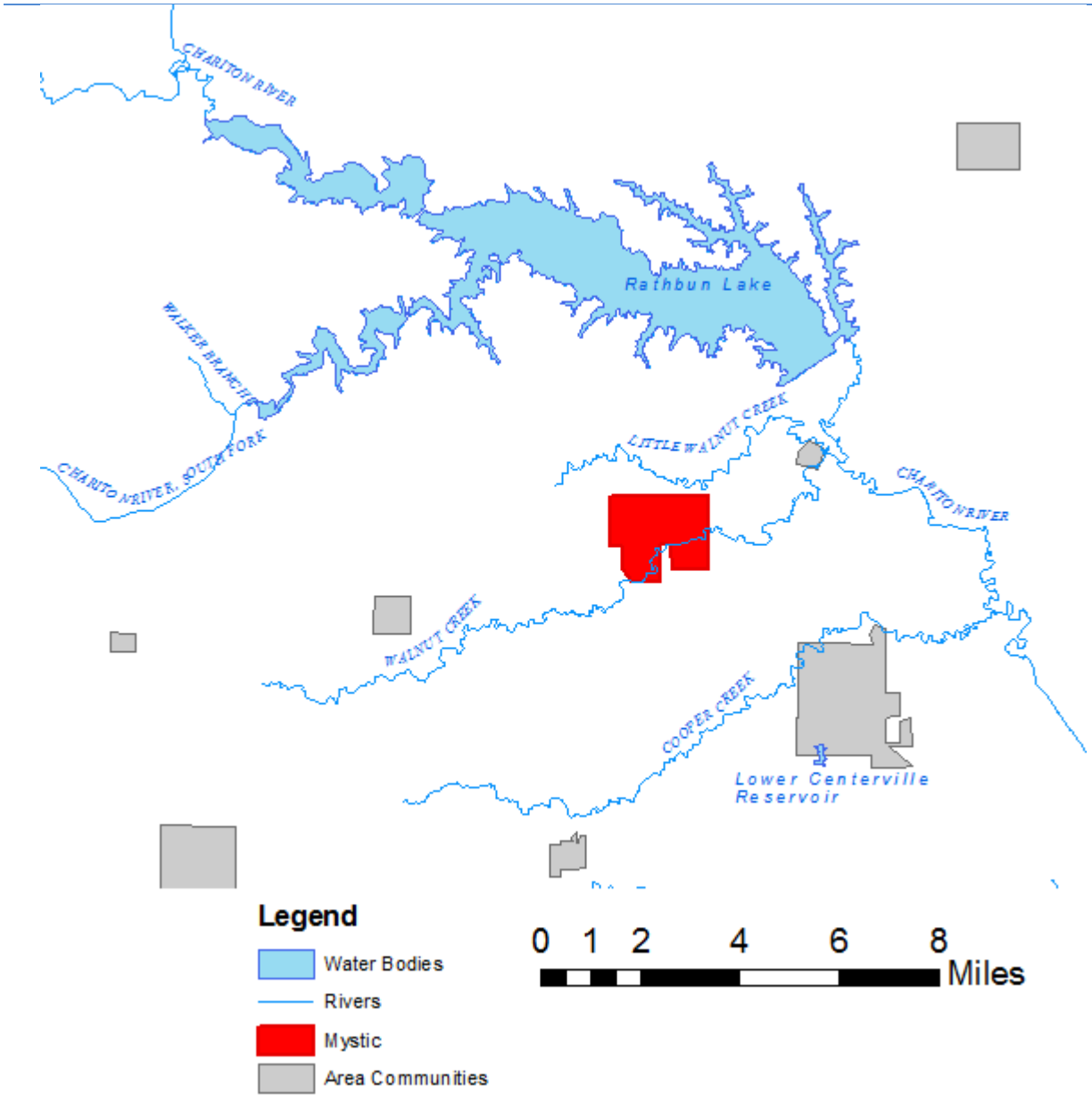
Appendix 6: Location of Mines and Mine Entrances in and near Mystic



Source: Iowa DNR GIS data compiled by Chariton Valley Planning and Development

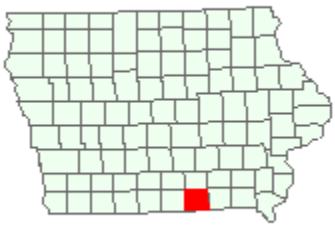
Comments raised during an Appanoose County Multi-Jurisdiction Hazard Mitigation Planning Committee meeting indicated that more detailed maps of the mines in the county exist. Recommended sources included Hall Engineering and the Coal Mining Museum in Centerville; these sources were not incorporated into this plan due to when they were identified.

Appendix 7: Water bodies and Resources near Mystic



Source: Iowa DNR GIS data compiled by Chariton Valley Planning and Development

Appendix 8: Appanoose County Watersheds



Current Population (2000 U.S., county) EXIT Disclaimer

This county crosses 5 watersheds.

Find environmental information for each of these watersheds:

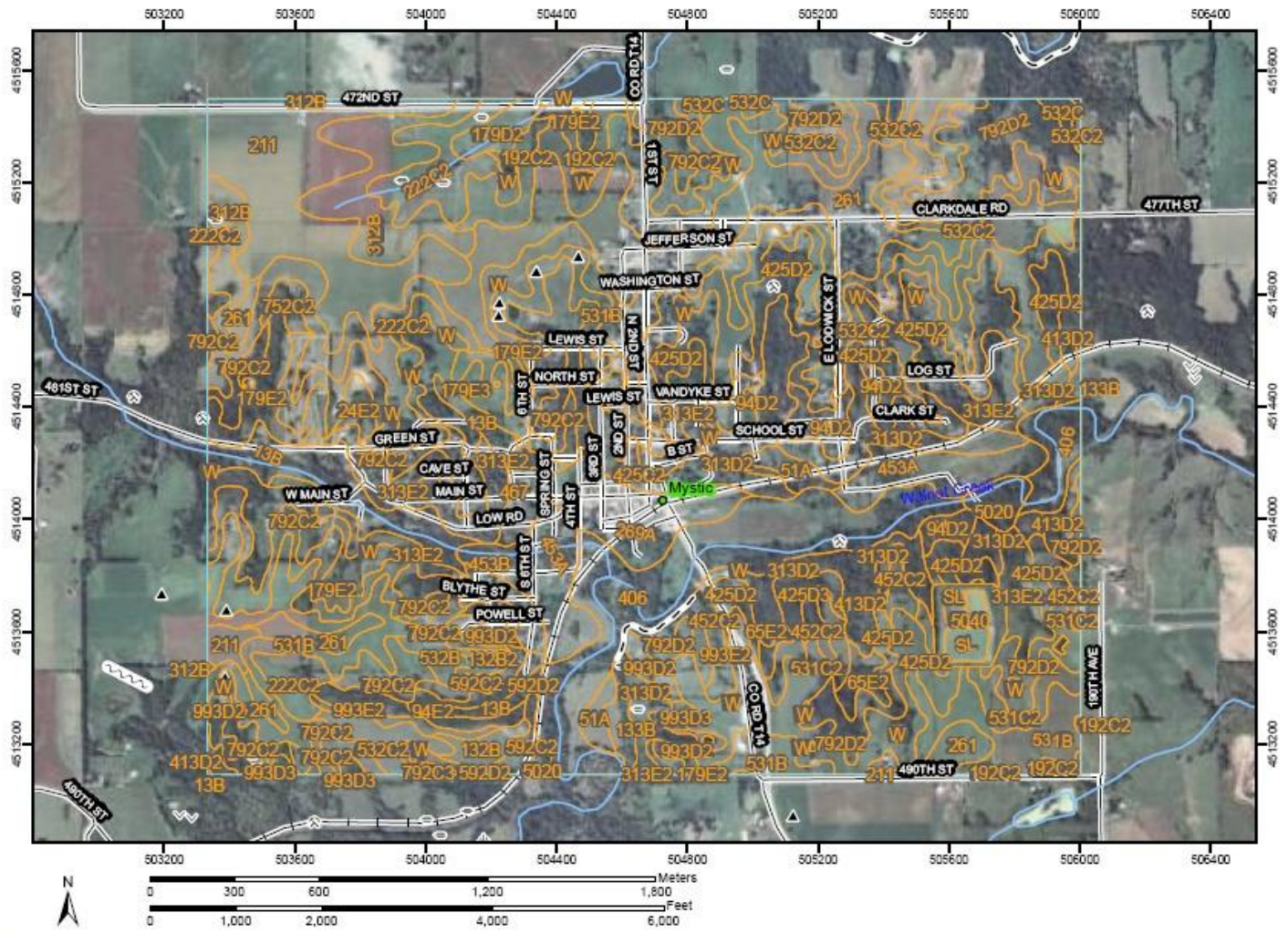
- 07100009 Lower Des Moines; state(s): IL, IA, MO
- 07110001 Bear-Wyaconda; state(s): IL, IA, MO
- 07110002 North Fabius; state(s): IA, MO
- 10280103 Lower Grand; state(s): IA, MO
- 10280201 Upper Chariton; state(s): IA, MO

Source: US EPA Surf Your Watershed, http://cfpub.epa.gov/surf/county.cfm?fips_code=19007

Note: Mystic is located wholly within the Upper Chariton watershed (10280201).

Appendix 9: NRCS Web Soil Survey for Mystic Area

Soil Map–Appanoose County, Iowa
(Mystic Area)



USDA Natural Resources Conservation Service

Web Soil Survey 2.0
National Cooperative Soil Survey

9/9/2008
Page 1 of 5

MAP LEGEND

Area of Interest (AOI)
- Area of Interest (AOI)

Soils
- Soil Map Units

Special Point Features
- Blowout
- Borrow Pit
- Clay Spot
- Closed Depression
- Gravel Pit
- Gravelly Spot
- Landfill
- Lava Flow
- Marsh
- Mine or Quarry
- Miscellaneous Water
- Perennial Water
- Rock Outcrop
- Saline Spot
- Sandy Spot
- Severely Eroded Spot
- Sinkhole
- Slide or Slip
- Sodic Spot
- Spoil Area
- Stony Spot
- Very Stony Spot
- Wet Spot
- Other

Special Line Features
- Gully
- Short Steep Slope
- Other

Political Features

Municipalities
- Cities
- Urban Areas

Water Features
- Oceans
- Streams and Canals

Transportation
- Rails

Roads
- Interstate Highways
- US Routes
- State Highways
- Local Roads
- Other Roads

MAP INFORMATION

Original soil survey map sheets were prepared at publication scale. Viewing scale and printing scale, however, may vary from the original. Please rely on the bar scale on each map sheet for proper map measurements.

Source of Map: Natural Resources Conservation Service
Web Soil Survey URL: http://websoilsurvey.nrcs.usda.gov
Coordinate System: UTM Zone 15N

This product is generated from the USDA-NRCS certified data as of the version date(s) listed below.

Soil Survey Area: Appanoose County, Iowa
Survey Area Data: Version 12, Apr 24, 2008

Date(s) aerial images were photographed: 1994

The orthophoto or other base map on which the soil lines were compiled and digitized probably differs from the background imagery displayed on these maps. As a result, some minor shifting of map unit boundaries may be evident.

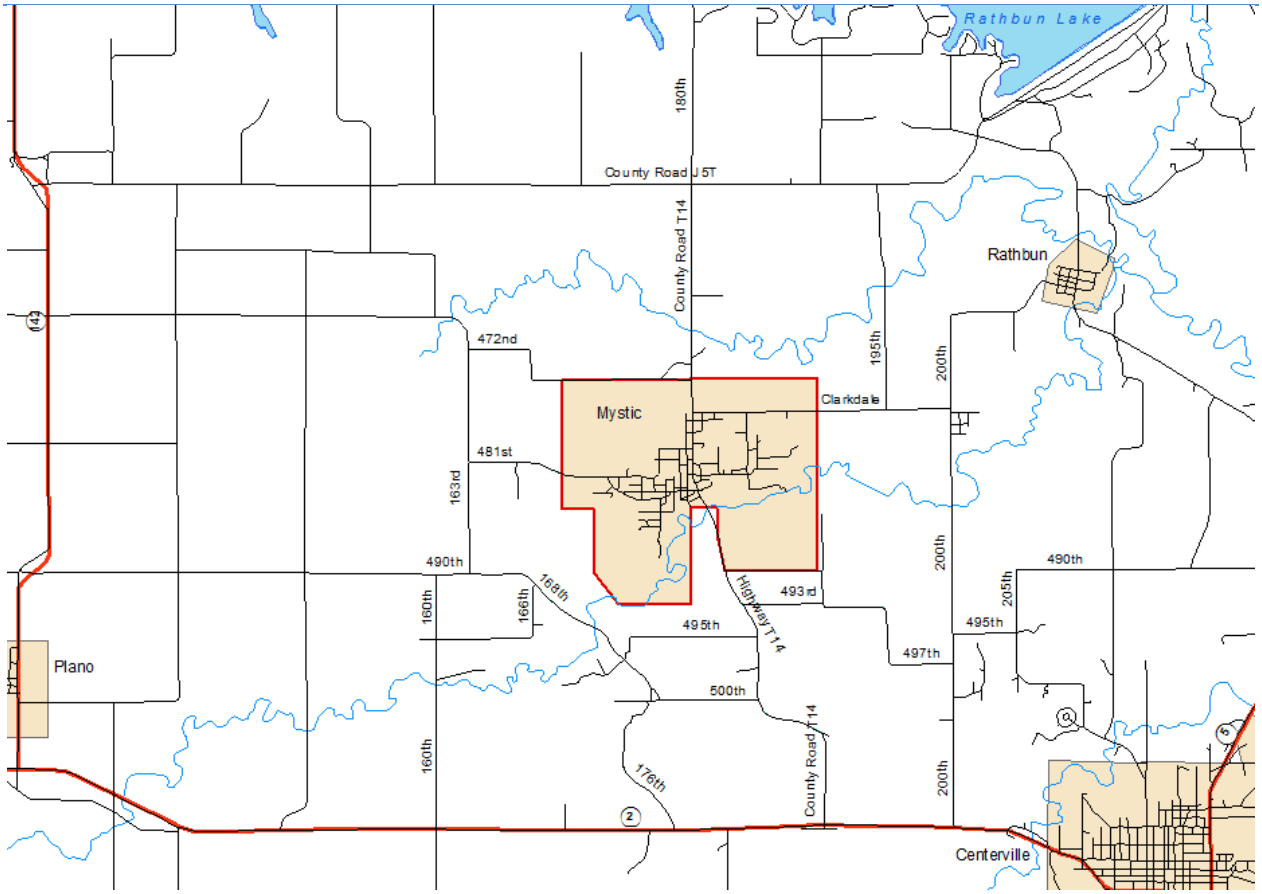
Map Unit Legend

Appanoose County, Iowa (IA007)			
Map Unit Symbol	Map Unit Name	Acres in AOI	Percent of AOI
13B	Olmitz-Vesser-Colo complex, 2 to 5 percent slopes	46.8	2.5%
24E2	Shelby loam, 14 to 18 percent slopes, moderately eroded	4.9	0.3%
51A	Vesser silt loam, 0 to 2 percent slopes	11.4	0.6%
54B	Zook silty clay loam, 2 to 5 percent slopes	0.0	0.0%
65E2	Lindley loam, 14 to 18 percent slopes, moderately eroded	8.5	0.5%
94D2	Mystic-Caleb complex, 9 to 14 percent slopes, moderately eroded	30.1	1.6%
94E2	Mystic-Caleb complex, 14 to 18 percent slopes, moderately eroded	6.3	0.3%
132B	Weller silt loam, 2 to 5 percent slopes	6.9	0.4%
132B2	Weller silt loam, 2 to 5 percent slopes, moderately eroded	3.4	0.2%
133B	Colo silty clay loam, 2 to 5 percent slopes	7.5	0.4%
179D2	Gara loam, 9 to 14 percent slopes, moderately eroded	8.3	0.5%
179E2	Gara loam, 14 to 18 percent slopes, moderately eroded	83.3	4.5%
179E3	Gara soils, 14 to 18 percent slopes, severely eroded	19.7	1.1%
192C2	Adair clay loam, 5 to 9 percent slopes, moderately eroded	12.1	0.7%
211	Edina silt loam	93.3	5.0%
222C2	Clarinda silty clay loam, 5 to 9 percent slopes, moderately eroded	44.1	2.4%
261	Appanoose silt loam	109.8	5.9%
269A	Humeston silt loam, 0 to 2 percent slopes	33.6	1.8%
312B	Seymour silt loam, 2 to 5 percent slopes	43.3	2.3%
313D2	Gosport-Clanton silt loams, 9 to 14 percent slopes, moderately eroded	62.8	3.4%
313E2	Gosport-Clanton silt loams, 14 to 18 percent slopes, moderately eroded	105.9	5.7%

Appanoose County, Iowa (IA007)			
Map Unit Symbol	Map Unit Name	Acres in AOI	Percent of AOI
406	Kennebec-Amana silt loams	108.5	5.9%
413D2	Sogn-Gosport-Clanton complex, 9 to 18 percent slopes, moderately eroded	45.1	2.4%
425C2	Keswick loam, 5 to 9 percent slopes, moderately eroded	4.1	0.2%
425D2	Keswick loam, 9 to 14 percent slopes, moderately eroded	92.7	5.0%
425D3	Keswick soils, 9 to 14 percent slopes, severely eroded	11.9	0.6%
452C2	Lineville silt loam, 5 to 9 percent slopes, moderately eroded	16.8	0.9%
453A	Tuskeego silt loam, 0 to 2 percent slopes	52.5	2.8%
453B	Tuskeego silt loam, 2 to 5 percent slopes	7.4	0.4%
467	Radford silt loam	9.2	0.5%
531B	Kniffin silt loam, 2 to 5 percent slopes	247.6	13.4%
531C2	Kniffin silt loam, 5 to 9 percent slopes, moderately eroded	64.7	3.5%
532B	Rathbun silt loam, 2 to 5 percent slopes	12.6	0.7%
532C	Rathbun silt loam, 5 to 9 percent slopes	2.9	0.2%
532C2	Rathbun silt loam, 5 to 9 percent slopes, moderately eroded	121.0	6.5%
592C2	Mystic silt loam, 5 to 9 percent slopes moderately eroded	11.4	0.6%
592D2	Mystic silt loam, 9 to 14 percent slopes, moderately eroded	4.9	0.3%
752C2	Lineville silt loam, dark variant, 5 to 9 percent slopes, moderately eroded	5.0	0.3%
792C2	Armstrong loam, 5 to 9 percent slopes, moderately eroded	136.5	7.4%
792C3	Armstrong soils, 5 to 9 percent slopes, severely eroded	3.3	0.2%
792D2	Armstrong loam, 9 to 14 percent slopes, moderately eroded	81.5	4.4%
993D2	Armstrong-Gara loams, 9 to 14 percent slopes, moderately eroded	18.6	1.0%
993D3	Armstrong-Gara complex, 9 to 14 percent slopes, severely eroded	5.1	0.3%
993E2	Armstrong-Gara loams, 14 to 18 percent slopes, moderately eroded	8.2	0.4%

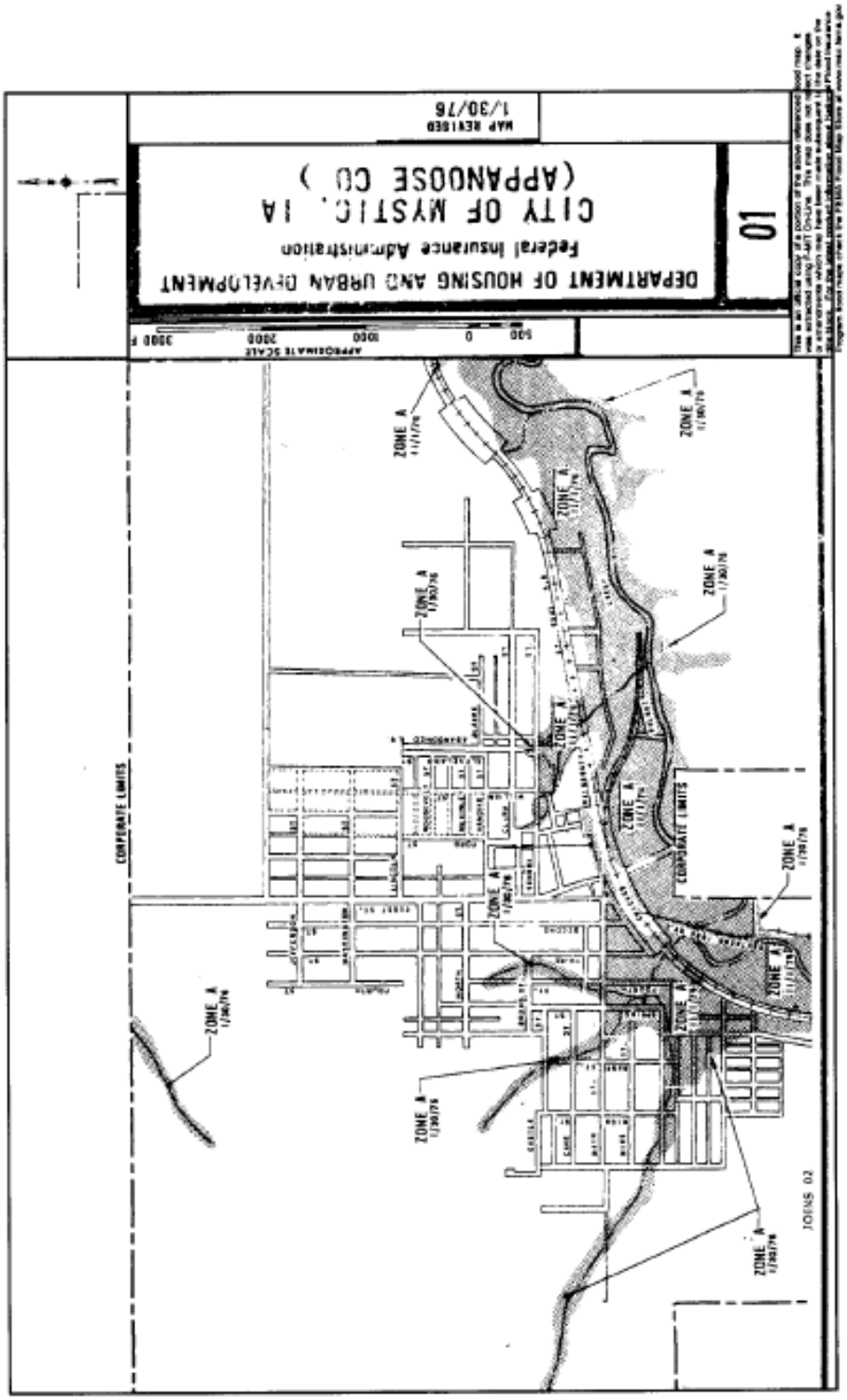
Appanoose County, Iowa (IA007)			
Map Unit Symbol	Map Unit Name	Acres in AOI	Percent of AOI
5020	STRIP MINES, DUMPS	9.0	0.5%
5040	UDORTHENTS, LOAMY	9.4	0.5%
SL	SEWAGE LAGOON	8.4	0.5%
W	WATER	11.5	0.6%
Totals for Area of Interest (AOI)		1,851.7	100.0%

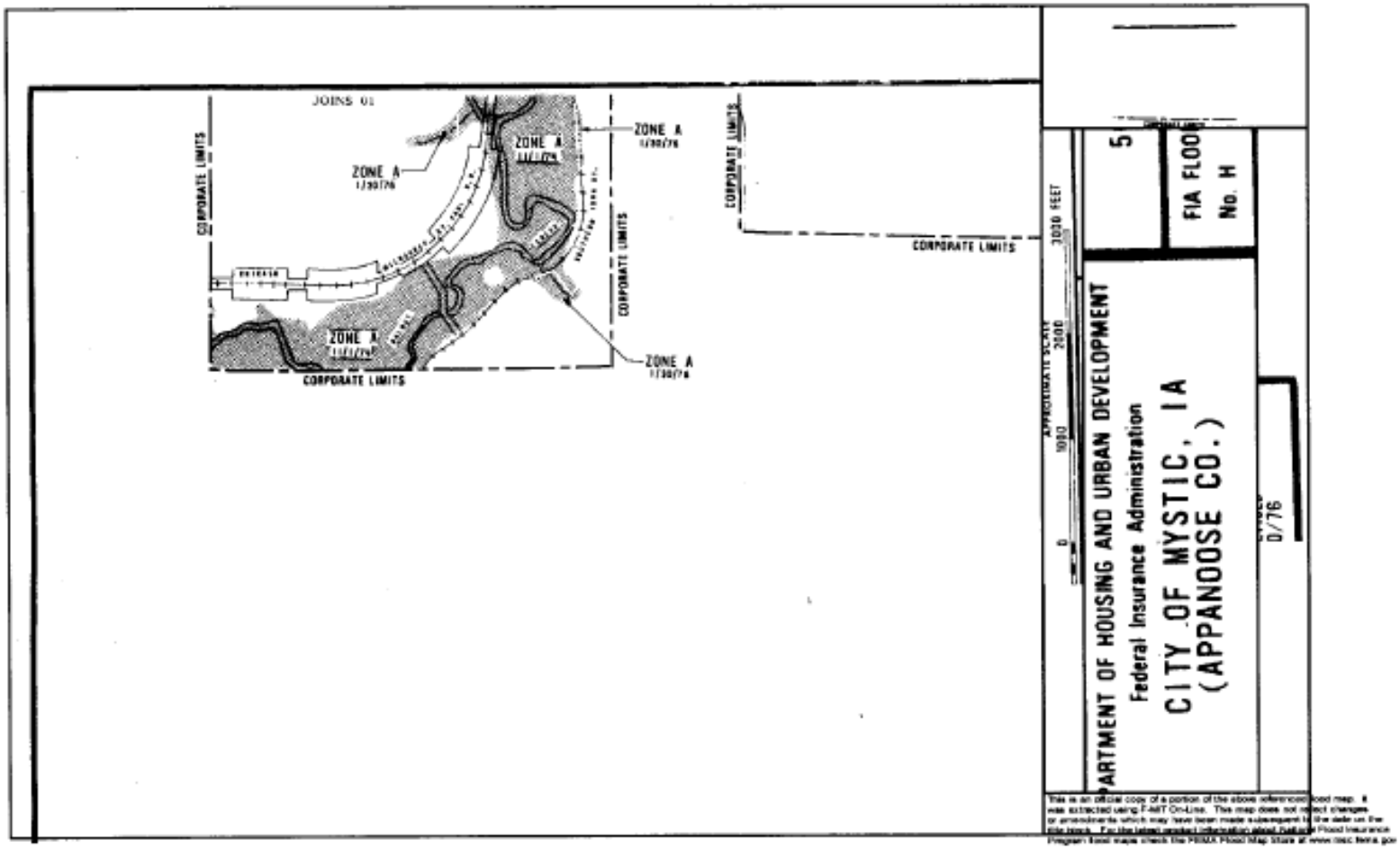
Appendix 10: Transportation routes in and around Mystic



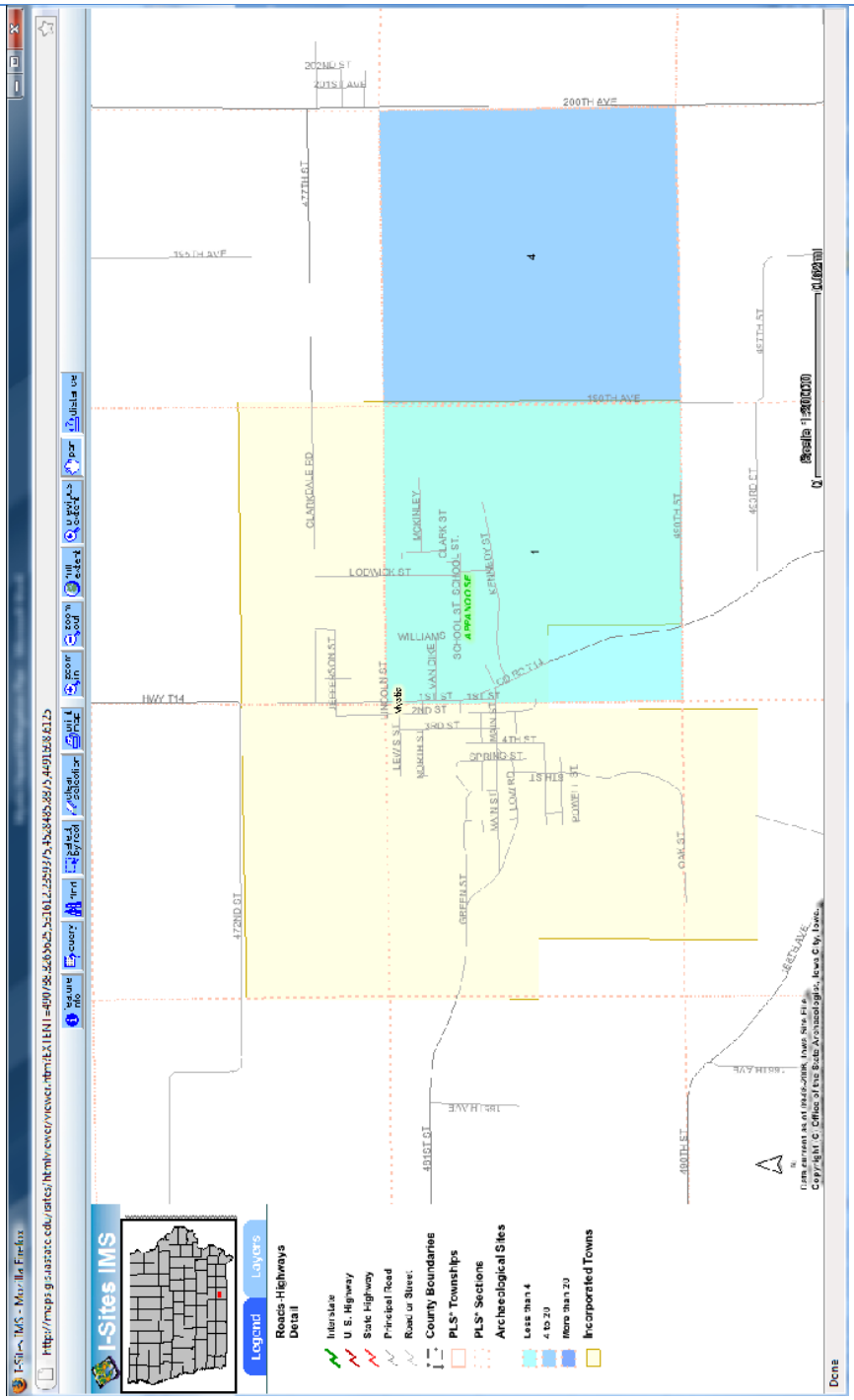
Source: Iowa DOT and Iowa DNR GIS data compiled by Chariton Valley Planning and Development

Appendix 11: FEMA Firmette for the City of Mystic




JOINS 01
ZONE A
1/30/76
ZONE A
ZONE A
ZONE A
ZONE A
1/30/76
CORPORATE LIMITS
CORPORATE LIMITS
CORPORATE LIMITS
CORPORATE LIMITS
CORPORATE LIMITS
APPROXIMATE SCALE
1" = 2000 FEET
0
1000
2000
3000 FEET
5
FIA FLOOD
No. H
DEPARTMENT OF HOUSING AND URBAN DEVELOPMENT
Federal Insurance Administration
CITY OF MYSTIC, IA
(APPANOOSE CO.)
0/76

Appendix 12: Archeological Sites in and Near Mystic



Source: Office of the State Archeologist, University of Iowa, http://www2.uiowa.edu/i-sites/public.htm

Human Caused and Combined Hazards

Hazards	Responses						Comments
Air Transportation Incident	Y	Y	Y	Y	Y	Y	
Rail Transportation Incident	Y	Y	Y	Y	Y	Y	LINE RUNS IN TOWN
Pipeline Transportation Incident	Y	Y	Y	Y	Y	Y	the only pipeline in this Appanoose County runs near Mystic
Highway Transportation Incident	Y	Y	Y	Y	Y	Y	
Transportation Hazardous Materials	Y	Y	Y	Y	Y	Y	
Radiological Transportation	N	N	N	N	N	N	unlikely since state designates routes for radioactive material transport
Waterway Incident	Y	Y	Y	Y	Y	Y	
Human Disease Pandemic	Y	Y	Y	Y	Y	Y	
Human Disease Incident	Y	Y	Y	Y	Y	Y	
Animal/Plant/Crop Disease	Y	Y	Y	Y	Y	Y	
Conventional Terrorism	Y	Y	Y	Y	Y	Y	
Cyber Terrorism	Y	Y	Y	Y	Y	Y	
Radiological Terrorism	Y	Y	Y	Y	Y	Y	SMALL
Chemical Terrorism	Y	Y	Y	Y	Y	Y	RAILROAD IN TOWN
Agro-Terrorism	Y	Y	Y	Y	Y	Y	
Bioterrorism	Y	Y	Y	Y	Y	Y	
Enemy Attack	N	N	N	N	Y	Y	
Fixed Radiological Incident	Y	Y	Y	N	N	N	RAIL LINE
Fixed Hazardous Materials	Y	Y	Y	Y	N	N	RAIL LINE
Energy Failure	Y	Y	Y	Y	Y	Y	RAIL LINE
Public Disorder	Y	Y	Y	Y	Y	Y	
Structural Failure	Y	Y	Y	Y	Y	Y	
Communications Failure	Y	Y	Y	Y	Y	Y	
Structural Fire	Y	Y	Y	Y	Y	Y	

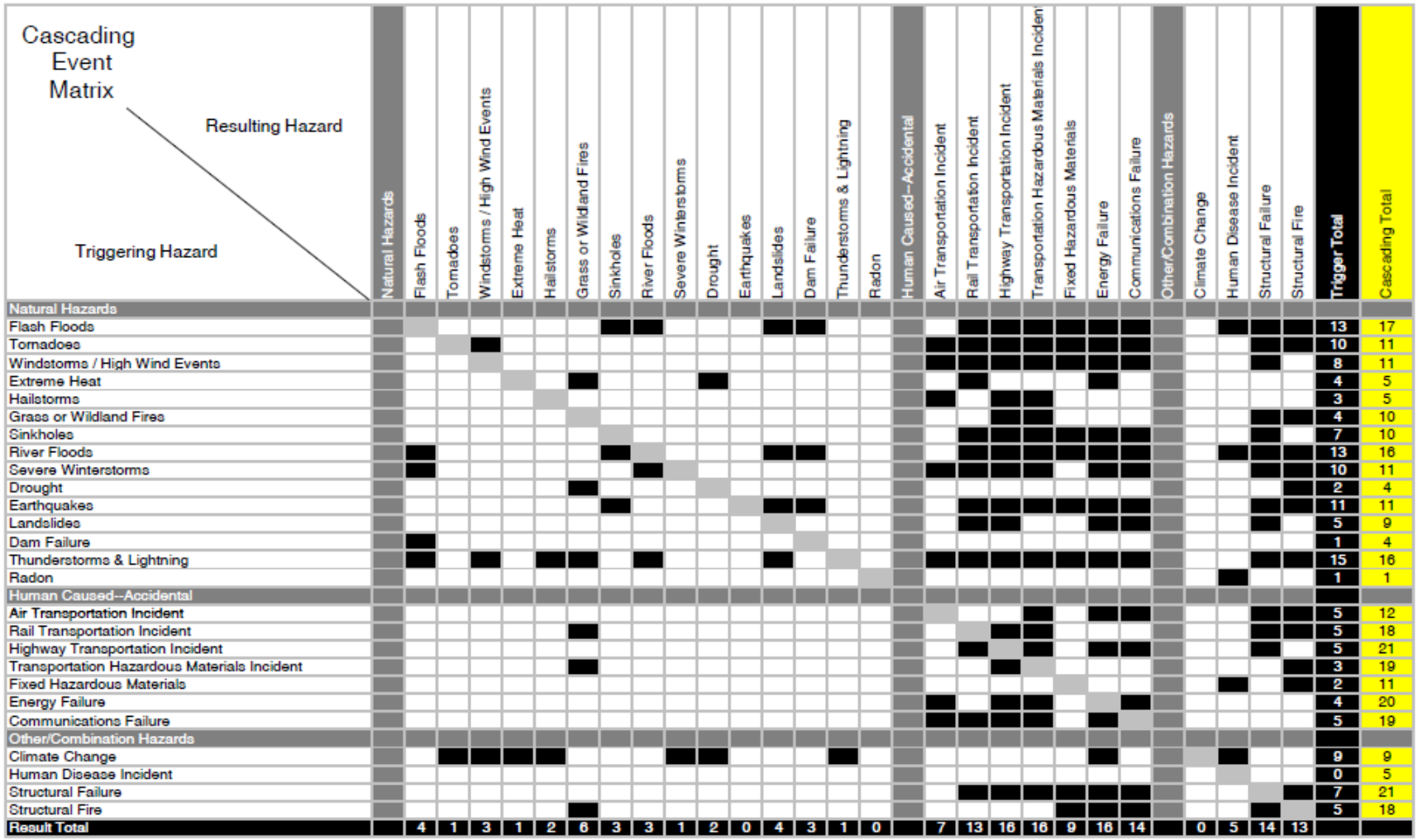
Please take about 5 minutes to indicate whether you think the listed hazards could impact Mystic. If you have comments, feel free to provide them as well. The purpose of this is to identify which of the Iowa recognized human related hazards should be addressed for the Mystic Hazard Mitigation Plan. A hazard should be addressed if there is a chance of it impacting the area.

Appendix 14: Appanoose County Hazard Selection

Preliminary County-wide Hazard Identification

Hazard	Yes	No	If "no", why / Notes
Natural Hazards			
Flash Flood	X		
Tornado	X		
Windstorm / High Wind Event	X		
River Flooding	X		
Severe Winter Storm	X		
Hailstorm	X		
Thunderstorm / Lightning	X		
Sink Hole	X		(mines and particular soils under Centerville, Plano, and Numa)
Dam Failure	X		
Levee Failure	X		
Grass / Wildfire	X		Sedan Bottoms was indicated as an area of concern
Extreme Heat	X		low risk, but susceptable populations are present
Drought	X		
Landslide		X	Appanoose County is considered low susceptability area in DNR data, no known events locally
Earthquake	X		
Expansive Soils	X		
Radon	X		Lead to be added to this hazard per Sherry Middlebrook
Human Caused and Combination Hazards			
Climate Change	X		
Structural Failure	X		
Structural Fire	X		
Energy Failure	X		
Communications Failure	X		
Highway Transport Incident	X		
Transport Haz. Materials	X		
Air Transport Incident	X		
Rail Transport Incident	X		
Pipeline Incident	X		
Transport Radiological Mat.	X		
Waterway Incident	X		boating incident could contaminate drinking water
Human Disease Pandemic	X		(world-wide effect)
Human Disease Incident	X		(local outbreak)
Animal / Plant / Crop Disease	X		
Agro-Terrorism		X	Appanoose County is a low-likelihood target
Biological Terrorism		X	Appanoose County is a low-likelihood target
Chemical Terrorism		X	Appanoose County is a low-likelihood target
Conventional Terrorism		X	Appanoose County is a low-likelihood target
Cyber Terrorism		X	Appanoose County is a low-likelihood target
Radiological Terrorism		X	Appanoose County is a low-likelihood target
Enemy Attack		X	Appanoose County is a low-likelihood target
Fixed Radiological Incident		X	no radiological materials in any significant quanties
Fixed Hazardous Materials	X		Meth labs as one specific concern
Public Disorder		X	small population and low likelihood
Economic Disruption / Decline		X	poor economy is not new here

Appendix 15: Mystic Cascading Events Matrix



Cascading Event Matrix (Triggering Hazard \ Resulting Hazard)	Natural Hazards	Flash Floods	Tornadoes	Windstorms / High Wind Events	Extreme Heat	Hailstorms	Grass or Wildland Fires	Sinkholes	River Floods	Severe Winterstorms	Drought	Earthquakes	Landslides	Dam Failure	Thunderstorms & Lightning	Radon	Human Caused--Accidental	Air Transportation Incident	Rail Transportation Incident	Highway Transportation Incident	Transportation Hazardous Materials Incident	Fixed Hazardous Materials	Energy Failure	Communications Failure	Other/Combination Hazards	Climate Change	Human Disease Incident	Structural Failure	Structural Fire	Trigger Total	Cascading Total
Natural Hazards																															
Flash Floods								■	■				■	■					■	■	■	■	■	■			■	■	■	13	17
Tornadoes				■														■	■	■	■	■	■	■				■	■	10	11
Windstorms / High Wind Events																		■	■	■	■	■	■	■				■		8	11
Extreme Heat							■				■								■				■							4	5
Hailstorms																		■		■	■									3	5
Grass or Wildland Fires																				■	■							■	■	4	10
Sinkholes																			■	■	■	■	■	■				■		7	10
River Floods		■						■					■	■					■	■	■	■	■	■			■	■	■	13	16
Severe Winterstorms		■							■									■	■	■	■		■	■				■	■	10	11
Drought							■																						■	2	4
Earthquakes								■					■	■					■	■	■	■	■	■				■	■	11	11
Landslides																			■	■			■	■				■		5	9
Dam Failure		■																												1	4
Thunderstorms & Lightning		■		■		■	■		■				■					■	■	■	■	■	■	■				■	■	15	16
Radon																											■			1	1
Human Caused--Accidental																															
Air Transportation Incident																					■		■	■				■	■	5	12
Rail Transportation Incident							■													■	■							■	■	5	18
Highway Transportation Incident																			■		■		■	■				■		5	21
Transportation Hazardous Materials Incident							■													■									■	3	19
Fixed Hazardous Materials																											■			2	11
Energy Failure																		■		■	■			■						4	20
Communications Failure																		■	■	■	■		■							5	19
Other/Combination Hazards																															
Climate Change			■	■	■	■				■	■				■								■				■			9	9
Human Disease Incident																														0	5
Structural Failure																			■	■	■	■	■	■					■	7	21
Structural Fire							■															■	■	■				■		5	18
Result Total		4	1	3	1	2	6	3	3	1	2	0	4	3	1	0		7	13	16	16	9	16	14		0	5	14	13		

Appendix 16: NCDC Storm Events

Iowa

Location or County	Date	Time	Type	Mag	Dth	Inj	PrD	CrD
1 IAZ026>030 - 035>042 - 045>054 - 056>064 - 070>079 - 080>099 -	03/02/1993	1200	Flooding	N/A	0	0	50K	0
2 IAZ002>011 - 013>054 - 056>064 - 070>079 - 080>099	03/22/1993	0600	Major Flood	N/A	0	0	50.0M	0
3 IAZ002>011 - 013>054 - 056>064 - 070>079 - 080>099	04/01/1993	0000	Major Flood	N/A	0	0	50.0M	0
4 IAZ002>011 - 013>054 - 058>064 - 071>078 - 083>089 - 093>099	04/20/1993	0600	Major Flood	N/A	0	0	5.0M	0
5 APPANOOSE	05/02/1993	1500	Flash Flood	N/A	0	0	5K	0
6 IAZ002>011 - 013>054 - 056>064 - 070>074 - 080>084 - 090>096	05/07/1993	1800	Flood	N/A	0	0	5.0M	5.0M
7 IAZ002>005 - 013>015 - 022>026 - 033>037 - 045>050 - 058>064 - 071>078 - 083>088 - 095>099	08/16/1993	0600	Flood	N/A	0	0	5.0M	5.0M
8 IAZ002>011 - 013>054 - 056>064 - 070>078 - 080>099	08/29/1993	0300	Flood	N/A	0	0	5.0M	5.0M
9 All Of Iowa	09/01/1993	0000	Flood	N/A	0	0	500K	500K
10 Southern Iowa	09/06/1993	0600	Flood	N/A	0	0	500K	500K
11 IAZ034>040 - 046>052 - 058>064 - 072>078 - 083>089 - 095>099	09/14/1993	0600	Flood	N/A	0	0	500K	500K
12 IAZ028>030 - 040>054 - 056>064 - 070>078 - 080>099	09/25/1993	1400	Flood	N/A	0	0	5.0M	500K
13 Central And	10/01/1993	0000	Flooding	N/A	0	0	50K	50K
14 Much Of Iowa	02/19/1994	0600	Flooding	N/A	0	0	500K	0
15 Much Of Iowa	03/03/1994	1200	Flooding	N/A	0	0	500K	0
16 IAZ001>099	06/22/1994	2330	Flooding	N/A	0	0	500K	500K

17 IAZ004>006 - 015 - 048>050 - 061>064 - 074>078 - 082>089 - 094>099	04/10/1995	0900	Flooding	N/A	0	0	10K	0
18 IAZ033 - 034 - 045>052 - 057>068 - 070>078 - 081>089 - 092>099	05/07/1995	1200	Flooding	N/A	0	0	200K	10K
19 IAZ070>076 - 081>084 - 092>096	05/23/1995	0000	Flooding	N/A	0	0	50K	0
20 IAZ004>011 - 015>019 - 023>030 - 035>042 - 047>054 - 060>068 - 074>078 - 084>089 - 095>099	06/06/1995	2300	Flood	N/A	0	0	50K	100K
21 IAZ017>019 - 026>029 - 038>042 - 051>053 - 082>085 - 092>096	06/28/1995	0600	Flood	N/A	0	0	25K	30K
22 Central Into South	07/04/1995	2100	Flood	N/A	0	0	25K	10K
23 IAZ060>062 - 072>075 - 081>086 - 092>097	05/09/1996	06:00 AM	Flood	N/A	0	0	100K	50K
24 IAZ057>062 - 070>075 - 081>086 - 092>097	05/23/1996	03:00 PM	Flood	N/A	0	0	250K	75K
25 IAZ057>062 - 070>075 - 081>086 - 092>097	05/26/1996	12:00 PM	Flood	N/A	0	0	400K	100K
26 IAZ034>039 - 044>050 - 057>062 - 070>075 - 081>086 - 092>097	02/18/1997	06:00 PM	Flood	N/A	0	0	750K	0
27 Centerville	07/24/1997	02:00 AM	Urban/sml Stream Fld	N/A	0	0	25K	15K
28 IAZ075 - 083>086 - 094>097	03/30/1998	06:00 PM	Flood	N/A	0	0	90K	0
29 IAZ061 - 074>075 - 083>084 - 095>096	05/07/1998	01:00 AM	Flood	N/A	0	0	175K	70K
30 Monrovia	05/23/1998	07:00 PM	Urban/sml Stream Fld	N/A	0	0	50K	5K
31 IAZ027 - 074>075 - 083>085 - 095>096	10/17/1998	06:00 AM	Flood	N/A	0	0	560K	80K

32 IAZ083>084 - 094>096	03/16/1999	06:00 AM	Flood	N/A	0	0	5K	0
33 Countywide	06/25/2000	07:00 PM	Flash Flood	N/A	0	0	200K	50K
34 IAZ083>084 - 095>096	02/24/2001	12:00 PM	Flood	N/A	0	0	30K	0
35 IAZ046>050 - 057>062 - 070>075 - 081>086 - 092>097	03/15/2001	03:00 PM	Flood	N/A	0	0	260K	0
36 IAZ004>007 - 015>017 - 023>028 - 033>039 - 044>050 - 057>062 - 070>075 - 081>086 - 092>097	03/23/2001	06:00 PM	Flood	N/A	0	0	383K	0
37 North Portion	08/03/2001	06:00 AM	Flash Flood	N/A	0	0	15K	15K
38 IAZ083>085 - 095>096	10/23/2001	03:00 AM	Flood	N/A	0	0	25K	0
39 IAZ004>007 - 015>017 - 023>028 - 033>039 - 044>050 - 057>062 - 070>075 - 081>086 - 092>097	05/22/2004	06:00 PM	Flood	N/A	0	0	5.1M	15.2M
40 IAZ004>006 - 015>016 - 023>025 - 033>036 - 044>047 - 057>061 - 071>075 - 083>086 - 096>097	05/13/2005	02:00 AM	Flood	N/A	0	0	960K	0
41 Centerville	04/26/2007	06:00 AM	Flood	N/A	0	0	250K	0K
42 Udell	08/23/2007	22:34 PM	Flash Flood	N/A	0	0	100K	50K
43 Thirty	08/23/2007	22:36 PM	Flash Flood	N/A	0	0	250K	10K
44 Rathbun	08/23/2007	23:45 PM	Flash Flood	N/A	0	0	500K	75K
45 Streepy	08/24/2007	03:55 AM	Flash Flood	N/A	0	0	500K	100K
46 Moulton Arpt	08/24/2007	04:30 AM	Flood	N/A	0	0	25K	50K
47 Clarkdale	06/03/2008	05:00 AM	Flash Flood	N/A	0	0	50K	0K
48 Mystic	06/12/2008	18:21 PM	Flash Flood	N/A	0	0	25K	0K

49 Numa	06/13/2008	00:06 AM	Flash Flood	N/A	0	0	25K	0K
50 Moulton Arpt	06/13/2008	11:00 AM	Flood	N/A	0	0	10K	10K
51 Numa	07/06/2008	07:00 AM	Flash Flood	N/A	0	0	25K	25K
52 Centerville	07/07/2008	23:35 PM	Flash Flood	N/A	0	0	25K	0K
53 Sharon	07/08/2008	00:00 AM	Flash Flood	N/A	0	0	25K	0K
54 Moulton Arpt	07/08/2008	03:39 AM	Flood	N/A	0	0	5K	0K
55 Centerville	07/28/2008	00:20 AM	Flash Flood	N/A	0	0	25K	5K
56 Moulton Arpt	07/28/2008	01:54 AM	Flood	N/A	0	0	10K	5K
				TOTALS:	0	0	139.693M	33.690M

Query Results

56 FLOOD event(s) were reported in **Appanoose County, Iowa** between **01/01/1950** and **10/31/2008**.

*Click on **Location** or **County** to display Details.*

Mag: Magnitude
Dth: Deaths
Inj: Injuries
PrD: Property Damage
CrD: Crop Damage

18 TORNADO(s) were reported in **Appanoose County, Iowa** between **01/01/1950** and **10/31/2008**.

*Click on **Location or County** to display Details.*

Mag: Magnitude
Dth: Deaths
Inj: Injuries
PrD: Property Damage
CrD: Crop Damage

Iowa

Location or County	Date	Time	Type	Mag	Dth	Inj	PrD	CrD
1 APPANOOSE	09/01/1961	1800	Tornado	F2	0	0	250K	0
2 APPANOOSE	06/14/1964	1430	Tornado	F2	0	0	250K	0
3 APPANOOSE	06/12/1967	1815	Tornado	F1	0	0	25K	0
4 APPANOOSE	10/08/1970	1740	Tornado	F2	0	0	25K	0
5 APPANOOSE	06/02/1980	0700	Tornado	F1	0	3	2.5M	0
6 APPANOOSE	06/02/1980	0705	Tornado	F2	0	5	2.5M	0
7 APPANOOSE	05/08/1988	1234	Tornado	F2	0	0	250K	0
8 APPANOOSE	11/15/1988	1610	Tornado	F0	0	0	0K	0
9 APPANOOSE	06/16/1990	1959	Tornado	F0	0	0	3K	0
10 APPANOOSE	06/16/1990	2017	Tornado	F0	0	0	3K	0
11 APPANOOSE	07/15/1992	2035	Tornado	F2	0	0	250K	0
12 Rathbun	05/27/1995	2350	Tornado	F0	0	0	1K	0
13 Moravia	05/09/1996	12:50 AM	Tornado	F1	0	0	70K	0
14 Udell	09/20/2001	05:09 PM	Tornado	F1	0	0	5K	5K
15 Centerville	05/24/2004	06:53 PM	Tornado	F0	0	0	2K	0
16 Plano	06/07/2007	13:35 PM	Tornado	F0	0	0	0K	0K
17 Jerome	04/10/2008	15:57 PM	Tornado	F1	0	0	75K	0K
18 Griffinsville	04/10/2008	16:10 PM	Tornado	F1	0	0	75K	0K
				TOTALS:	0	8	6.283M	5K

Iowa

Location or County	Date	Time	Type	Mag	Dth	Inj	PrD	CrD
1 APPANOOSE	09/18/1965	1500	Tstm Wind	0 kts.	0	0	0	0
2 APPANOOSE	10/14/1966	1500	Tstm Wind	0 kts.	0	0	0	0
3 APPANOOSE	06/28/1969	1600	Tstm Wind	74 kts.	0	0	0	0
4 APPANOOSE	05/18/1971	1630	Tstm Wind	0 kts.	0	0	0	0
5 APPANOOSE	05/18/1971	1710	Tstm Wind	0 kts.	0	0	0	0
6 APPANOOSE	06/03/1973	2245	Tstm Wind	0 kts.	0	0	0	0
7 APPANOOSE	06/16/1973	1730	Tstm Wind	60 kts.	0	0	0	0
8 APPANOOSE	06/16/1973	1730	Tstm Wind	68 kts.	0	0	0	0
9 APPANOOSE	08/09/1973	1525	Tstm Wind	0 kts.	0	0	0	0
10 APPANOOSE	08/11/1973	1130	Tstm Wind	50 kts.	0	0	0	0
11 APPANOOSE	06/09/1974	0100	Tstm Wind	0 kts.	0	0	0	0
12 APPANOOSE	06/02/1980	0700	Tstm Wind	0 kts.	0	0	0	0
13 APPANOOSE	06/21/1985	1740	Tstm Wind	0 kts.	0	0	0	0
14 APPANOOSE	05/08/1986	1425	Tstm Wind	52 kts.	0	0	0	0
15 APPANOOSE	07/28/1986	2315	Tstm Wind	52 kts.	0	0	0	0
16 APPANOOSE	06/18/1987	1350	Tstm Wind	59 kts.	0	0	0	0
17 APPANOOSE	05/08/1988	1250	Tstm Wind	65 kts.	0	0	0	0
18 APPANOOSE	07/14/1988	0300	Tstm Wind	50 kts.	0	0	0	0
19 APPANOOSE	12/19/1988	2343	Tstm Wind	50 kts.	0	0	0	0

20 APPANOOSE	05/24/1989	1930	Tstm Wind	52 kts.	0	0	0	0
21 APPANOOSE	05/24/1989	1950	Tstm Wind	52 kts.	0	0	0	0
22 APPANOOSE	05/24/1989	2012	Tstm Wind	50 kts.	0	1	0	0
23 APPANOOSE	05/31/1989	1730	Tstm Wind	50 kts.	0	0	0	0
24 APPANOOSE	07/09/1990	1840	Tstm Wind	63 kts.	0	0	0	0
25 APPANOOSE	07/15/1992	2016	Tstm Wind	50 kts.	0	0	0	0
26 IAZ002>009 - 013>019 - 022>028 - 031>039 - 043>051 - 056>063 - 070>076 - 081>087 - 093>099 -	03/09/1993	2230	High Winds	0 kts.	0	0	500K	0
27 IAZ001 - 012 - 020 - 021 - 031 - 032 - 043>046 - 055>060 - 069>075 - 079>086 - 090>098	12/05/1993	1500	High Winds	0 kts.	0	0	500K	0
28 All Of Iowa	04/14/1994	2200	High Winds	0 kts.	0	0	500K	0
29 Most Of Iowa	04/26/1994	0900	High Winds	0 kts.	0	3	5.0M	0
30 Moulton	06/11/1994	1700	Thunderstorm Winds	61 kts.	0	0	50K	5K
31 Unionville	06/18/1994	1300	Thunderstorm Winds	50 kts.	0	0	5K	0K
32 All Of Iowa	02/10/1995	0000	High Winds	0 kts.	0	0	100K	0
33 All Of Iowa	02/10/1995	2200	Extreme Wind Chill	N/A	0	0	50K	0
34 IAZ004>011 - 015>019 - 023>030 - 033>042 - 044>054 - 057>068 - 070>078 - 081>089 - 092>099	04/03/1995	1300	High Winds	0 kts.	0	0	125K	0
35 IAZ004>011 - 015>019 - 023>030 - 033>042 - 044>054 -	04/18/1995	0700	High Winds	0 kts.	0	0	500K	0

057>068 - 070>078 - 081>089 - 092>099								
36 Much Of Iowa	10/23/1995	1300	High Winds	0 kts.	0	0	100K	0
37 IAZ004>011 - 015>019 - 023>030 - 033>039 - 044>050>057 - 062 - 070>075 - 081>086 - 092>097	12/08/1995	1300	Extreme Wind Chill	N/A	0	0	0	0
38 IAZ004>011 - 015>019 - 023>029 - 033>039 - 044>050 - 057>062 - 070>075 - 081>086 - 092>097	01/17/1996	09:00 PM	High Wind	55 kts.	0	0	250K	0
39 IAZ004>011 - 015>019 - 023>029 - 033>039 - 044>050 - 057>062 - 070>075 - 081>086 - 092>096	01/18/1996	02:00 AM	Extreme Windchill	N/A	0	0	0	0
40 IAZ004>011 - 015>019 - 023>029 - 033>039 - 044>050 - 057>062 - 070>075 - 081>086 - 092>097	02/01/1996	04:00 PM	Extreme Windchill	N/A	0	0	0	0
41 IAZ004>011 - 015>019 - 023>029 - 033>039 - 044>050 - 057>062 - 070>075 - 081>086 - 092>097	02/10/1996	12:00 PM	High Wind	56 kts.	0	0	350K	0
42 IAZ004>011 - 015>019 - 023>029 - 033>039 - 044>050 - 057>062 - 070>075 - 081>086 - 092>097	03/24/1996	05:00 PM	High Wind	54 kts.	0	0	300K	0
43 IAZ004>011 - 015>019 - 023>029 - 033>039 - 044>050 - 057>062 - 070>075 - 081>086 - 092>097	04/25/1996	09:30 AM	High Wind	59 kts.	0	0	750K	0
44 IAZ004>007 - 015>017 - 023>028 - 033>039 - 044>050 - 057>062 - 070>075 - 081>086 - 092>097	10/29/1996	11:00 AM	High Wind	57 kts.	0	0	500K	100K

45 IAZ004>007 - 015>017 - 023>028 - 033>039 - 044>050 - 057>062 - 070>075 - 081>086 - 092>097	01/09/1997	09:00 PM	Extreme Windchill	N/A	0	0	0	0
46 IAZ004>007 - 015>017 - 023>028 - 033>039 - 044>050 - 057>062 - 070>075 - 081>086 - 092>097	01/15/1997	09:00 PM	Extreme Windchill	N/A	0	0	750K	0
47 Moulton	04/05/1997	01:00 PM	Tstm Wind	56 kts.	0	0	40K	0
48 IAZ004>007 - 015>017 - 023>028 - 033>039 - 044>050 - 057>062 - 070>075 - 081>086 - 092>097	04/06/1997	09:00 AM	High Wind	55 kts.	0	0	1.8M	0
49 IAZ049>050 - 061>062 - 074>075 - 084>086 - 095>097	04/30/1997	12:00 PM	High Wind	52 kts.	0	0	100K	0
50 IAZ004>007 - 015>017 - 023>028 - 033>039 - 044>050 - 057>062 - 070>075 - 081>086 - 092>097	04/12/1998	08:00 AM	High Wind	54 kts.	0	0	2.6M	0
51 Centerville	05/21/1998	11:15 PM	Tstm Wind	50 kts.	0	0	2K	0
52 Moulton	05/21/1998	11:40 PM	Tstm Wind	52 kts.	0	0	3K	0
53 Centerville	06/29/1998	02:00 PM	Tstm Wind	50 kts.	0	0	3K	0
54 IAZ004>007 - 015>017 - 023>028 - 033>039 - 044>050 - 057>062 - 070>075 - 081>086 - 092>097	11/10/1998	02:00 AM	High Wind	61 kts.	1	0	17.3M	260K
55 Moravia	04/08/1999	04:35 PM	Tstm Wind	70 kts.	0	0	75K	0
56 IAZ028 - 038>039 - 049>050 - 061>062 - 072>075 - 081>086 - 092>097	03/08/2000	11:00 AM	High Wind	52 kts.	0	0	230K	0
57 Plano	06/04/2000	05:40 AM	Tstm Wind	61 kts.	0	0	40K	1K

58 Plano	06/23/2000	01:45 PM	Tstm Wind	56 kts.	0	0	10K	1K
59 Moulton	06/23/2000	01:50 PM	Tstm Wind	56 kts.	0	0	10K	0
60 Unionville	06/23/2000	01:55 PM	Tstm Wind	56 kts.	0	0	10K	1K
61 IAZ004>007 - 015>017 - 023>028 - 033>039 - 044>050 - 057>062 - 070>075 - 081>086 - 092>097	04/07/2001	04:00 AM	High Wind	72 kts.	0	4	3.2M	0
62 Moulton	06/14/2001	03:10 PM	Tstm Wind	61 kts.	0	0	10K	0
63 Numa	09/07/2001	09:40 PM	Tstm Wind	78 kts.	0	0	100K	20K
64 Centerville	09/07/2001	09:45 PM	Tstm Wind	75 kts.	0	1	100K	5K
65 Centerville	09/20/2001	05:23 PM	Tstm Wind	61 kts.	0	0	5K	3K
66 Udell	09/20/2001	05:49 PM	Tstm Wind	70 kts.	0	0	50K	10K
67 Moulton	09/20/2001	05:56 PM	Tstm Wind	52 kts.	0	0	5K	0
68 IAZ004>007 - 015>017 - 023>028 - 033>039 - 044>050 - 057>062 - 070>075 - 081>086 - 092>097	03/09/2002	06:00 AM	High Wind	54 kts.	0	0	2.6M	0
69 Plano	03/09/2002	12:00 AM	Tstm Wind	56 kts.	0	0	5K	0
70 Moravia	04/24/2002	09:55 AM	Tstm Wind	50 kts.	0	0	5K	0
71 Centerville	08/27/2003	02:05 PM	Tstm Wind	52 kts.	0	0	5K	1K
72 Numa	05/24/2004	07:44 PM	Tstm Wind	69 kts.	0	0	100K	5K
73 Centerville	05/24/2004	07:45 PM	Tstm Wind	52 kts.	0	0	5K	0
74 Moravia	08/25/2004	01:08 PM	Tstm Wind	52 kts.	0	0	15K	1K

75 Moravia	08/26/2004	10:25 PM	Tstm Wind	57 kts.	0	0	15K	2K
76 IAZ004>007 - 015>017 - 023>028 - 033>039 - 044>050 - 057>062 - 070>075 - 084>086 - 096>097	01/22/2005	12:15 AM	High Wind	56 kts.	0	0	440K	0
77 Centerville	06/04/2005	08:40 PM	Tstm Wind	57 kts.	0	0	10K	0
78 IAZ004>007 - 015>017 - 023>028 - 033>039 - 044>050 - 057>062 - 070>075 - 081>086 - 092>097	01/24/2006	09:30 AM	High Wind	60 kts.	0	2	550K	0
79 Cincinnati	09/17/2006	02:00 AM	Tstm Wind	52 kts.	0	0	5K	0
80 Numa	03/21/2007	23:53 PM	Thunderstorm Wind	70 kts.	0	0	25K	0K
81 Numa	04/10/2008	15:53 PM	Thunderstorm Wind	65 kts.	0	0	10K	0K
82 Moravia	05/25/2008	21:42 PM	Thunderstorm Wind	57 kts.	0	0	20K	0K
83 Centerville	05/25/2008	21:44 PM	Thunderstorm Wind	52 kts.	0	0	15K	0K
84 Exline	06/08/2008	18:05 PM	Thunderstorm Wind	52 kts.	0	0	5K	0K
85 Cincinnati	06/15/2008	10:52 AM	Thunderstorm Wind	52 kts.	0	0	1K	0K
86 Moulton	06/15/2008	11:12 AM	Thunderstorm Wind	52 kts.	0	0	1K	0K
87 Centerville	07/27/2008	17:00 PM	Thunderstorm Wind	52 kts.	0	0	5K	0K
88 Monrovia	07/27/2008	17:00 PM	Thunderstorm Wind	52 kts.	0	0	3K	0K
89 Forbush	07/27/2008	20:17 PM	Thunderstorm Wind	52 kts.	0	0	5K	50K
				TOTALS:	1	11	39.768M	465K

89 THUNDERSTORM & HIGH WIND event(s) were reported in **Appanoose County, Iowa** between **01/01/1950** and **10/31/2008**.

*Click on **Location** or **County** to display Details.*

Mag: Magnitude
Dth: Deaths
Inj: Injuries
PrD: Property Damage
CrD: Crop Damage

Iowa

Location or County	Date	Time	Type	Mag	Dth	Inj	PrD	CrD
1 All Of Iowa	01/14/1994	0300	Extreme Cold	N/A	1	0	500K	0
2 All Of Iowa	01/17/1994	0600	Extreme Cold	N/A	0	0	500K	0
3 All Of Iowa	02/10/1995	2200	Extreme Wind Chill	N/A	0	0	50K	0
4 IAZ004>011 - 015>019 - 023>030 - 033>042 - 044>054 - 057>068 - 070>078 - 081>089 - 092>099	05/01/1995	0000	Cold And Wet Conditions	N/A	0	0	0	66.0M
5 All Of Iowa	07/12/1995	1100	Heat Wave	N/A	3	0	3.8M	0
6 Much Of Iowa	09/21/1995	2300	Freeze	N/A	0	0	0	0.2B
7 IAZ004>011 - 015>019 - 023>030 - 033>039 - 044>050>057 - 062 - 070>075 - 081>086 - 092>097	12/08/1995	1300	Extreme Wind Chill	N/A	0	0	0	0
8 IAZ004>011 - 015>019 - 023>029 - 033>039 - 044>050 - 057>062 - 070>075 - 081>086 - 092>096	01/18/1996	02:00 AM	Extreme Windchill	N/A	0	0	0	0
9 IAZ004>011 - 015>019 - 023>029 - 033>039 - 044>050 - 057>062 - 070>075 - 081>086 - 092>097	02/01/1996	04:00 PM	Extreme Windchill	N/A	0	0	0	0
10 IAZ004>007 - 015>017 - 023>028 - 033>039 - 044>050 - 057>062 - 070>075 - 081>086 - 092>097	01/09/1997	09:00 PM	Extreme Windchill	N/A	0	0	0	0
11 IAZ004>007 - 015>017 - 023>028 - 033>039 - 044>050 - 057>062 - 070>075 - 081>086 - 092>097	01/15/1997	09:00 PM	Extreme Windchill	N/A	0	0	750K	0
12 IAZ004>007 - 015>017 - 023>028 - 033>039 - 044>050 - 057>062 - 070>075 -	09/21/1999	01:00 AM	Extreme Cold	N/A	0	0	0	15.0M

081>086 - 092>097								
13 IAZ004>007 - 015>017 - 023>028 - 033>039 - 044>050 - 057>062 - 070>075 - 081>086 - 092>097	08/05/2001	10:00 AM	Excessive Heat	N/A	1	0	0	0
				TOTALS:	5	0	5.600M	281.000M

13 TEMPERATURE EXTREMES event(s) were reported in **Appanoose County, Iowa** between **01/01/1950** and **10/31/2008**.

*Click on **Location** or **County** to display Details.*

Mag: Magnitude
Dth: Deaths
Inj: Injuries
PrD: Property Damage
CrD: Crop Damage

Iowa

Location or County	Date	Time	Type	Mag	Dth	Inj	PrD	CrD
1 APPANOOSE	04/23/1961	0630	Hail	3.00 in.	0	0	0	0
2 APPANOOSE	08/03/1962	1600	Hail	1.50 in.	0	0	0	0
3 APPANOOSE	04/21/1967	1310	Hail	1.50 in.	0	0	0	0
4 APPANOOSE	05/05/1971	2100	Hail	2.00 in.	0	0	0	0
5 APPANOOSE	05/18/1971	1650	Hail	3.00 in.	0	0	0	0
6 APPANOOSE	06/03/1973	2245	Hail	1.00 in.	0	0	0	0
7 APPANOOSE	06/14/1974	1715	Hail	1.75 in.	0	0	0	0
8 APPANOOSE	06/14/1974	1730	Hail	1.75 in.	0	0	0	0
9 APPANOOSE	06/14/1974	1900	Hail	1.75 in.	0	0	0	0
10 APPANOOSE	05/15/1976	2100	Hail	1.75 in.	0	0	0	0
11 APPANOOSE	07/20/1980	1740	Hail	1.75 in.	0	0	0	0
12 APPANOOSE	03/27/1985	2030	Hail	1.75 in.	0	0	0	0
13 APPANOOSE	09/28/1986	1415	Hail	1.50 in.	0	0	0	0
14 APPANOOSE	05/26/1987	1710	Hail	0.75 in.	0	0	0	0
15 APPANOOSE	05/31/1987	1938	Hail	0.88 in.	0	0	0	0
16 APPANOOSE	05/24/1989	1935	Hail	1.50 in.	0	0	0	0
17 APPANOOSE	05/27/1989	2205	Hail	0.75 in.	0	0	0	0
18 APPANOOSE	03/12/1990	2323	Hail	1.75 in.	0	0	0	0
19 APPANOOSE	05/14/1991	1027	Hail	0.75 in.	0	0	0	0
20 Moravia	06/11/1994	1645	Hail	1.00 in.	0	0	5K	50K
21 Unionville	06/11/1994	1655	Hail	1.75 in.	0	0	50K	50K
22 Rathbun	07/22/1995	2010	Hail	0.75 in.	0	0	2K	5K
23 Plano	05/09/1996	10:30 AM	Hail	1.00 in.	0	0	5K	0
24 Centerville	05/09/1996	10:43 AM	Hail	1.50 in.	0	0	10K	0
25 Moulton	05/09/1996	10:49 AM	Hail	2.00 in.	0	0	15K	0
26 Moulton	05/09/1996	10:54 AM	Hail	1.00 in.	0	0	5K	0
27 Centerville	05/02/1997	07:30 PM	Hail	0.75 in.	0	0	1K	0
28 Moravia	05/23/1998	07:17 PM	Hail	1.00 in.	0	0	3K	5K
29 Centerville	06/16/2001	10:52 PM	Hail	0.88 in.	0	0	2K	5K
30 Udell	09/20/2001	05:49 PM	Hail	1.75 in.	0	0	25K	5K
31 Cincinnati	10/22/2001	04:05 PM	Hail	1.00 in.	0	0	5K	5K
32 Moulton	04/30/2003	06:30 PM	Hail	0.75 in.	0	0	0	0

33 Numa	04/30/2003	07:30 PM	Hail	1.75 in.	0	0	10K	0
34 Moulton	04/30/2003	08:08 PM	Hail	1.00 in.	0	0	5K	0
35 Centerville	05/08/2003	06:05 PM	Hail	2.75 in.	0	0	100K	0
36 Plano	05/08/2003	06:06 PM	Hail	1.75 in.	0	0	25K	0
37 Moravia	05/30/2004	01:10 PM	Hail	0.75 in.	0	0	0	5K
38 Centerville	05/30/2004	01:15 AM	Hail	0.88 in.	0	0	2K	0
39 Moulton	05/30/2004	12:33 PM	Hail	0.75 in.	0	0	0	5K
40 Moravia	06/08/2005	09:20 AM	Hail	0.75 in.	0	0	0	5K
41 Centerville	09/13/2005	06:52 PM	Hail	1.00 in.	0	0	5K	10K
42 Plano	03/08/2006	06:00 PM	Hail	0.75 in.	0	0	0	0
43 Centerville	03/12/2006	01:10 PM	Hail	1.00 in.	0	0	3K	0
44 Centerville	03/12/2006	01:13 PM	Hail	0.88 in.	0	0	1K	0
45 Moulton	03/12/2006	08:03 PM	Hail	1.00 in.	0	0	4K	0
46 Moravia	03/12/2006	08:25 PM	Hail	0.88 in.	0	0	3K	0
47 Centerville	04/02/2006	02:10 PM	Hail	0.75 in.	0	0	0	0
48 Unionville	04/06/2006	09:10 AM	Hail	0.75 in.	0	0	0	0
49 Unionville	05/03/2006	05:45 AM	Hail	1.75 in.	0	0	10K	0
50 Sunshine	04/10/2008	17:24 PM	Hail	1.00 in.	0	0	1K	0K
51 Rathbun	04/10/2008	17:34 PM	Hail	0.88 in.	0	0	0K	0K
52 Iconium	07/27/2008	19:15 PM	Hail	1.00 in.	0	0	2K	10K
53 Darbyville	07/27/2008	19:24 PM	Hail	1.75 in.	0	0	15K	10K
54 Forbush	07/27/2008	19:30 PM	Hail	1.25 in.	0	0	5K	10K
55 Moulton	07/27/2008	19:44 PM	Hail	1.75 in.	0	0	10K	10K
				TOTALS:	0	0	329K	190K

55 HAIL event(s) were reported in **Appanoose County, Iowa** between **01/01/1950** and **10/31/2008**.

*Click on **Location** or **County** to display Details.*

Mag: Magnitude
Dth: Deaths
Inj: Injuries
PrD: Property Damage
CrD: Crop Damage

Query Results

0 WILD & FOREST FIRE event(s) were reported in **Appanoose County, Iowa** between **01/01/1950** and **10/31/2008.**

Iowa

Location or County	Date	Time	Type	Mag	Dth	Inj	PrD	CrD
1 IAZ002>011 - 013>054 - 056>064 - 070>078 - 080>099	01/20/1993	0430	Ice Storm	N/A	0	0	50K	0
2 IAZ002>011 - 013>054 - 056>064 - 070>076 - 080>086 - 090>096	02/08/1993	2230	Freezing Rain	N/A	0	0	1K	0
3 IAZ002>011 - 013>054 - 056>064 - 070>078 - 080>099	02/10/1993	2100	Freezing Rain	N/A	1	0	50K	0
4 IAZ056>064 - 070>078 - 080>099 -	02/20/1993	1400	Freezing Rain	N/A	0	0	5K	0
5 IAZ043>049 - 056>064 - 070>078 - 080>099 -	02/25/1993	0500	Snow	N/A	0	0	1K	0
6 IAZ041 - 042 - 051>054 - 061>099	01/26/1994	1300	Freezing Rain	N/A	0	0	500K	0
7 Southeast Third Of Io	02/22/1994	1000	Snow	N/A	0	0	5K	0
8 IAZ001>004 - 012>015 - 020>028 - 031>099	01/26/1995	2300	Freezing Rain	N/A	0	0	100K	0
9 Southern Iowa	11/10/1995	1200	Snow	N/A	0	0	10K	0
10 Much Of Iowa	11/27/1995	0500	Snow	N/A	0	0	50K	0
11 IAZ004>011 - 015>019 - 023>030 - 033>039 - 044>050>057 - 062 - 070>075 - 081>086 - 092>097	12/08/1995	0200	Snow	N/A	0	0	20K	0
12 IAZ007>011 - 016>019 - 024>029 - 033>039 - 044>050 - 057>062 - 070>075 - 081>086 - 092>097	01/26/1996	12:00 AM	Heavy Snow	N/A	2	0	600K	0
13 IAZ004>007 - 015>017 - 023>028 - 033>036 - 038>039 - 044>050 - 057>060 - 062 - 070>075 - 081>086 - 092>097	11/14/1996	04:00 PM	Ice Storm	N/A	0	0	150K	0
14 IAZ074>075 - 083>086 - 092>097	04/10/1997	05:00 AM	Heavy Snow	N/A	0	0	1.6M	0
15 IAZ084>085 - 095>096	12/04/1997	07:00 AM	Heavy Snow	N/A	0	0	10K	0
16 IAZ023>028 - 033>039 - 044>050 - 057>062 -	12/21/1997	02:00 PM	Ice Storm	N/A	0	0	88K	0

070>075 - 081>086 - 092>097								
17 IAZ074>075 - 084>086 - 093>097	12/24/1997	09:00 AM	Heavy Snow	N/A	0	0	56K	0
18 IAZ004>007 - 015>017 - 023>028 - 033>039 - 044>050 - 057>062 - 070>075 - 081>086 - 092>097	01/04/1998	06:30 AM	Ice Storm	N/A	0	0	1.0M	0
19 IAZ070>072 - 081>086 - 092>097	01/14/1998	01:30 AM	Ice Storm	N/A	0	0	30K	0
20 IAZ024>028 - 033>039 - 044>050 - 057>062 - 070>075 - 081>085 - 092>096	03/07/1998	09:00 PM	Heavy Snow	N/A	1	0	2.0M	0
21 IAZ004>007 - 015>017 - 023>028 - 033>039 - 044>050 - 057>062 - 070>075 - 081>086 - 092>097	03/17/1998	02:00 AM	Ice Storm	N/A	0	0	300K	0
22 IAZ004>007 - 015>017 - 023>028 - 033>039 - 045>050 - 058>062 - 070>075 - 082>086 - 096>097	01/01/1999	03:00 PM	Winter Storm	N/A	2	0	440K	0
23 IAZ086 - 096>097	03/05/1999	01:00 PM	Heavy Snow	N/A	0	0	3K	0
24 IAZ005 - 015>017 - 023>024 - 033>037 - 044>050 - 057>062 - 070>075 - 081>086 - 092>097	03/08/1999	12:00 AM	Winter Storm	N/A	0	0	450K	0
25 IAZ082>086 - 092>097	02/17/2000	08:00 PM	Ice Storm	N/A	0	0	550K	0
26 IAZ004>007 - 015>017 - 023>028 - 033>039 - 044>050 - 057>062 - 070>075 - 081>086 - 092>097	12/10/2000	09:00 PM	Winter Storm	N/A	0	0	1.3M	0
27 IAZ026>028 - 036>039 - 046>050 - 057>062 - 070>075 - 081>086 - 092>097	02/08/2001	04:00 PM	Ice Storm	N/A	0	0	2.7M	0

28 IAZ026>028 - 036>039 - 046>050 - 057>062 - 070>075 - 081>086 - 092>097	02/08/2001	11:00 PM	Winter Storm	N/A	0	0	1.8M	0
29 IAZ059>062 - 071>075 - 081>086 - 092>097	03/15/2001	03:00 PM	Heavy Snow	N/A	0	0	650K	0
30 IAZ075 - 083>086 - 093>097	01/30/2002	06:00 AM	Heavy Snow	N/A	0	0	500K	0
31 IAZ023 - 033>035 - 044>050 - 057>062 - 070>075 - 081>086 - 093>097	02/14/2003	11:00 AM	Winter Storm	N/A	0	0	170K	0
32 IAZ059>062 - 070>075 - 081>086 - 092>097	01/04/2004	05:00 AM	Heavy Snow	N/A	0	0	110K	0
33 IAZ033 - 044>046 - 057>061 - 070>074 - 081>085 - 092>097	02/05/2004	02:00 PM	Heavy Snow	N/A	0	0	0	0
34 IAZ044>050 - 057>062 - 070>075 - 081>086 - 092>097	03/15/2004	07:00 AM	Heavy Snow	N/A	0	0	310K	0
35 IAZ075 - 082>086 - 092>097	01/03/2005	01:00 AM	Ice Storm	N/A	0	0	300K	0
36 IAZ004>007 - 015>017 - 023>028 - 033>039 - 044>050 - 057>062 - 070>075 - 081>086 - 092>097	01/04/2005	05:00 PM	Heavy Snow	N/A	0	0	510K	0
37 IAZ004>007 - 015>017 - 023>028 - 033>039 - 044>050 - 057>062 - 070>075 - 081>082 - 085>086 - 092 - 096	02/24/2007	03:00 AM	Winter Storm	N/A	0	0	250K	0K
38 IAZ046 - 059>061 - 073>075 - 085>086 - 096	12/11/2007	00:00 AM	Ice Storm	N/A	0	0	150K	0K
39 IAZ096 - 097	12/31/2007	09:00 AM	Heavy Snow	N/A	0	0	0K	0K
40 IAZ059>061 - 073>075 - 084>086 - 096	02/05/2008	11:00 AM	Winter Storm	N/A	0	0	10K	0K
				TOTALS:	6	0	16.818M	0

40 SNOW & ICE event(s) were reported in **Appanoose County, Iowa** between **01/01/1950** and **10/31/2008**.

*Click on **Location** or **County** to display Details.*

Mag: Magnitude
Dth: Deaths
Inj: Injuries
PrD: Property Damage
CrD: Crop Damage

6 DROUGHT event(s) were reported in **Appanoose County, Iowa** between **01/01/1950** and **10/31/2008**.

*Click on **Location or County** to display Details.*

Mag: Magnitude
Dth: Deaths
Inj: Injuries
PrD: Property Damage
CrD: Crop Damage

Iowa

Location or County	Date	Time	Type	Mag	Dth	Inj	PrD	CrD
1 All Of Iowa	08/01/1995	0000	Drought	N/A	0	0	0	0.5B
2 IAZ057>062 - 070>075 - 081>086 - 092>097	07/20/1999	12:00 PM	Drought	N/A	0	0	0	109.9M
3 IAZ033 - 044>050 - 057>062 - 070>075 - 081>086 - 092>097	08/14/2000	12:00 AM	Drought	N/A	0	0	0	150.1M
4 IAZ033 - 044>050 - 057>062 - 070>075 - 081>086 - 092>097	09/01/2000	12:00 AM	Drought	N/A	0	0	0	161.0M
5 IAZ004>007 - 015>017 - 023>028 - 033>039 - 044>050 - 057>062 - 070>075 - 081>086 - 092>097	08/01/2001	12:00 AM	Drought	N/A	0	0	0	578.9M
6 IAZ004>007 - 015>017 - 023>028 - 033>039 - 044>050 - 057>062 - 070>075 - 081>086 - 092>097	08/01/2003	12:00 AM	Drought	N/A	0	0	645.2M	0
				TOTALS:	0	0	645.150M	1.500B

3 LIGHTNING event(s) were reported in **Appanoose County, Iowa** between **01/01/1950** and **10/31/2008**.

*Click on **Location or County** to display Details.*

Mag: Magnitude
Dth: Deaths
Inj: Injuries
PrD: Property Damage
CrD: Crop Damage

Iowa

Location or County	Date	Time	Type	Mag	Dth	Inj	PrD	CrD
1 Centerville	05/26/1996	11:23 PM	Lightning	N/A	0	0	2K	0
2 Moulton	04/30/2003	08:10 PM	Lightning	N/A	0	0	75K	0
3 Centerville	08/22/2007	14:00 PM	Lightning	N/A	0	1	5K	0K
				TOTALS:	0	1	82K	0

Appendix 17: Enhanced Fujita Parameters and Damage Details

Parameters

The six categories for the EF Scale are listed below, in order of increasing intensity. Although the wind speeds and photographic damage examples are updated, the damage descriptions given are those from the Fujita scale, which are more or less still accurate. However, for the actual EF scale in practice, one must look up the damage indicator (the type of structure which has been damaged) and consult the degrees of damage associated for that particular indicator.

Scale	Wind speed		Relative frequency	Potential damage	
	mph	km/h			
EF0	65–85	105–137	53.5%	Light damage. Peels surface off some roofs; some damage to gutters or siding; branches broken off trees; shallow-rooted trees pushed over. Confirmed tornadoes with no reported damage (i.e. those that remain in open fields) are always rated EF0.	
EF1	86–110	138–178	31.6%	Moderate damage. Roofs severely stripped; mobile homes overturned or badly damaged; loss of exterior doors; windows and other glass broken.	
EF2	111–135	179–218	10.7%	Considerable damage. Roofs torn off well-constructed houses; foundations of frame homes shifted; mobile homes completely destroyed; large trees snapped or uprooted; light-object missiles generated; cars lifted off ground.	
EF3	136–165	219–266	3.4%	Severe damage. Entire stories of well-constructed houses destroyed; severe damage to large buildings such as shopping malls; trains overturned; trees debarked; heavy cars lifted off the ground and thrown; structures with weak foundations blown away some distance.	

EF4	166–200	267–322	0.7%	Devastating damage. Well-constructed houses and whole frame houses completely leveled; cars thrown and small missiles generated.	
EF5	>200	>322	<0.1%	Exploding damage. Strong frame houses leveled off foundations and swept away; automobile-sized missiles fly through the air in excess of 100 m (300 ft); steel reinforced concrete structure badly damaged; high-rise buildings have significant structural deformation; incredible phenomena will occur. So far there have been two EF5 tornadoes recorded since the Enhanced Fujita Scale was introduced on February 1, 2007. The most recent one occurred in Parkersburg, Iowa on May 25, 2008 and leveled half the city.	

Damage Indicators and Degrees of Damage

The EF Scale currently has 28 Damage Indicators (DI), or types of structures and vegetation, with a varying number of Degrees of Damage (DOD) for each.

DI No.	Damage Indicator (DI)	Degrees of Damage (DOD)
1	Small Barns or Farm Outbuildings (SBO)	8
2	One- or Two-Family Residences (FR12)	10
3	Manufactured Home – Single Wide (MHSW)	9
4	Manufactured Home – Double Wide (MHDW)	12
5	Apartments, Condos, Townhouses [3 stories or less] (ACT)	6
6	Motel (M)	10
7	Masonry Apartment or Motel Building (MAM)	7
8	Small Retail Building [Fast Food Restaurants] (SRB)	8
9	Small Professional Building [Doctor's Office, Branch Banks] (SPB)	9
10	Strip Mall (SM)	9

11	Large Shopping Mall (LSM)	9
12	Large, Isolated Retail Building [K-Mart, Wal-Mart] (LIRB)	7
13	Automobile Showroom (ASR)	8
14	Automobile Service Building (ASB)	8
15	Elementary School [Single Story; Interior or Exterior Hallways] (ES)	10
16	Junior or Senior High School (JHSH)	11
17	Low-Rise Building [1–4 Stories] (LRB)	7
18	Mid-Rise Building [5–20 Stories] (MRB)	10
19	High-Rise Building [More than 20 Stories] (HRB)	10
20	Institutional Building [Hospital, Government or University Building] (IB)	11
21	Metal Building System (MBS)	8
22	Service Station Canopy (SSC)	6
23	Warehouse Building [Tilt-up Walls or Heavy-Timber Construction] (WHB)	7
24	Electrical Transmission Lines (ETL)	6
25	Free-Standing Towers (FST)	3
26	Free-Standing Light Poles, Luminary Poles, Flag Poles (FSP)	3
27	Trees: Hardwood (TH)	5
28	Trees: Softwood (TS)	5

Source: Wikipedia, retrieved June 24, 2009 (http://en.wikipedia.org/wiki/Enhanced_Fujita_Scale)

Appendix 18: TORRO Hailstorm Intensity Scale

	Intensity Category	Typical Hail Diameter (mm)*	Probable Kinetic Energy, J-m^2	Typical Damage Impacts
H0	Hard Hail	5	0-20	No damage
H1	Potentially Damaging	10-**15**	>20	Slight general damage to plants, crops
H2	Significant	10-**20**	>100	Significant damage to fruit, crops, vegetation
H3	Severe	20-**30**	>300	Severe damage to fruit and crops, damage to glass and plastic structures, paint and wood scored
H4	Severe	25-**40**	>500	Widespread glass damage, vehicle bodywork damage
H5	Destructive	30-**50**	>800	Wholesale destruction of glass, damage to tiled roofs, significant risk of injuries
H6	Destructive	40-**60**		Bodywork of grounded aircraft dented, brick walls pitted
H7	Destructive	50-**75**		Severe roof damage, risk of serious injuries
H8	Destructive	60-**90**		(Severest recorded in the British Isles) Severe damage to aircraft bodywork
H9	Super Hailstorms	75-**100**		Extensive structural damage. Risk of severe or even fatal injuries to persons caught in the open
H10	Super Hailstorms	>100		Extensive structural damage. Risk of severe or even fatal injuries to persons caught in the open

* Approximate range (typical maximum size in bold), since other factors (e.g. number and density of hailstones, hail fall speed and surface wind speeds) affect severity.

Maximum Diameter (mm)	Description
5-9	Pea
10-15	Mothball
16-20	Marble, grape
21-30	Walnut
31-40	Pigeon's egg > squash ball
41-50	Golf ball > Pullet's egg
51-60	Hen's egg
61-75	Tennis ball > cricket ball
76-90	Large orange > Soft ball
91-100	Grapefruit
>100	Melon

Source: FEMA and Tornado and Storm Research Organization (http://www.torro.org.uk/TORRO/severeweather/hailscale.php)

Appendix 19: Modified Mercalli Scale for Earthquake Intensity

I. Not felt except by a very few under especially favorable conditions. (Micro)

II. Felt only by a few persons at rest, especially on upper floors of buildings. (Micro)

III. Felt quite noticeably by persons indoors, especially on upper floors of buildings. Many people do not recognize it as an earthquake. Standing motor cars may rock slightly. Vibrations similar to the passing of a truck. Duration estimated. (Minor)

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. (Light)

V. Felt by nearly everyone; many awakened. Some dishes, windows broken. Unstable objects overturned. Pendulum clocks may stop. (Moderate)

VI. Felt by all, many frightened. Some heavy furniture moved; a few instances of fallen plaster. Damage slight. (Strong)

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. (Major)

VIII. Damage slight in specially designed structures; considerable damage in ordinary substantial buildings with partial collapse. Damage great in poorly built structures. Fall of chimneys, factory stacks, columns, monuments, walls. Heavy furniture overturned. (Great)

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. (Great)

X. Some well-built wooden structures destroyed; most masonry and frame structures destroyed with foundations. Rails bent. (Great)

XI. Few, if any (masonry) structures remain standing. Bridges destroyed. Rails bent greatly. (Great)

XII. Damage total. Lines of sight and level are distorted. Objects thrown into the air. (Great)

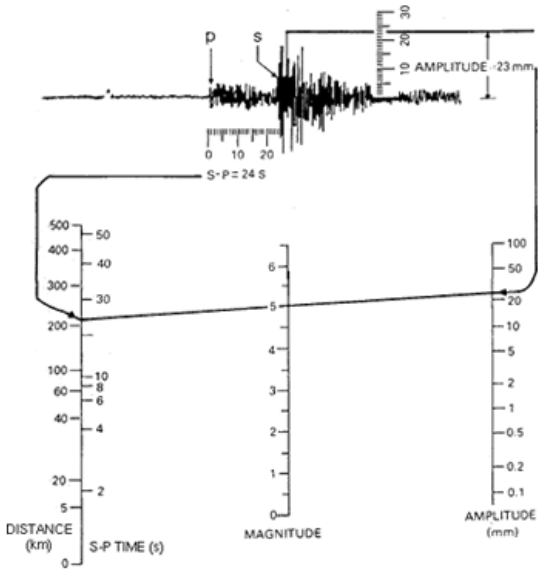
Source: Iowa Department of Natural Resources, Geological Survey. Modified Mercalli Intensity Scale from National Earthquake Information Center. <http://www.igsb.uiowa.edu/Browse/earthqua/ MERCALLI.HTM>.

Appendix 20: Richter Scale

The Richter Scale is a mathematical model for evaluating earthquake magnitudes on a logarithmic scale. This means that for each one point step upward, the magnitude is ten times stronger.

Richter Magnitude	Description	Earthquake Effects	Frequency (global average)
Less than 2.0	Micro	Microearthquakes, not felt	About 8,000 per day
2.0 – 2.9	Minor	Generally not felt, but recorded	About 1,000 per day
3.0 – 3.9		Often felt, but rarely causes damage	About 49,000 per yr.
4.0 – 4.9	Light	Noticeable shaking of indoor items, rattling noises. Significant damage unlikely	About 6,200 per yr.
5.0 – 5.9	Moderate	Can cause major damage to poorly constructed buildings over small regions. At most, slight damage to well-designed buildings	800 per year
6.0 – 6.9	Strong	Can be destructive in areas up to about 100 miles across in populated areas	120 per year
7.0 – 7.9	Major	Can cause serious damage over large areas	18 per year
8.0 – 8.9	Great	Can cause serious damage in areas several hundred miles across	1 per year
9.0 – 9.9		Devastating in areas several thousand miles across	1 per 20 years
10.0 +	Epic	Never recorded	unknown

Source: Wikipedia http://en.wikipedia.org/wiki/Richter_magnitude_scale



USGS http://earthquake.usgs.gov/learning/glossary.php?termID=149

Appendix 21: Iowa Historic Earthquakes

IOWA EARTHQUAKES

HISTORIC EARTHQUAKES WITH EPICENTERS IN IOWA

Number	Date	Nearest Town	Mercalli Intensity
1.	Apr. 28, 1867	Sidney (IA) / Nebraska City (NE)	IV
2.	Dec. 09, 1875	Sidney (IA) / Nebraska City (NE)	III
3.	April 13, 1905 **	Wayland (MO) / Keokuk (IA)	IV-V
4.	Jan. 26, 1925	Waterloo (IA)	II
5.	**Nov. 12, 1934**	**Davenport (IA) / Rock Island (IL)**	**VI**
6.	Jan. 05, 1935 **	Rock Island (IL) / Davenport (IA)	IV
7.	Jan. 05, 1935 **	Rock Island (IL) / Davenport (IA)	III
8.	Feb. 26, 1935	Burlington (IA)	III
9.	Oct. 11, 1938	Inwood (IA)	V
10.	Nov. 08, 1938	Dubuque (IA) *	~II
11.	Nov. 24, 1939	Davenport (IA) / Rock Island (IL)	II-III
12.	Apr. 20, 1948	Oxford (IA)	IV
13.	July 16, 2004	Shenandoah (IA)	III

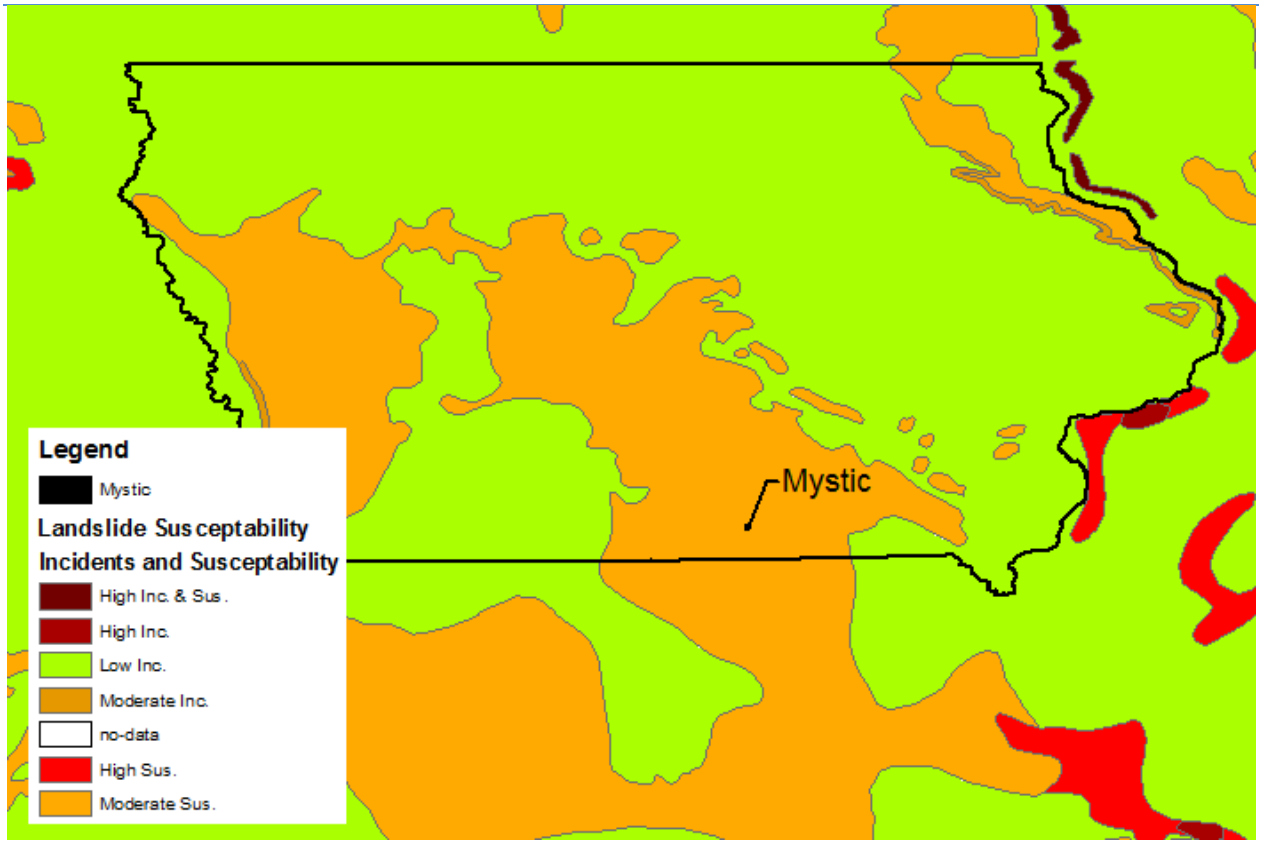
Red identifies Iowa's largest earthquake

* Dubuque experienced three shocks

** Epicenter probably just outside Iowa

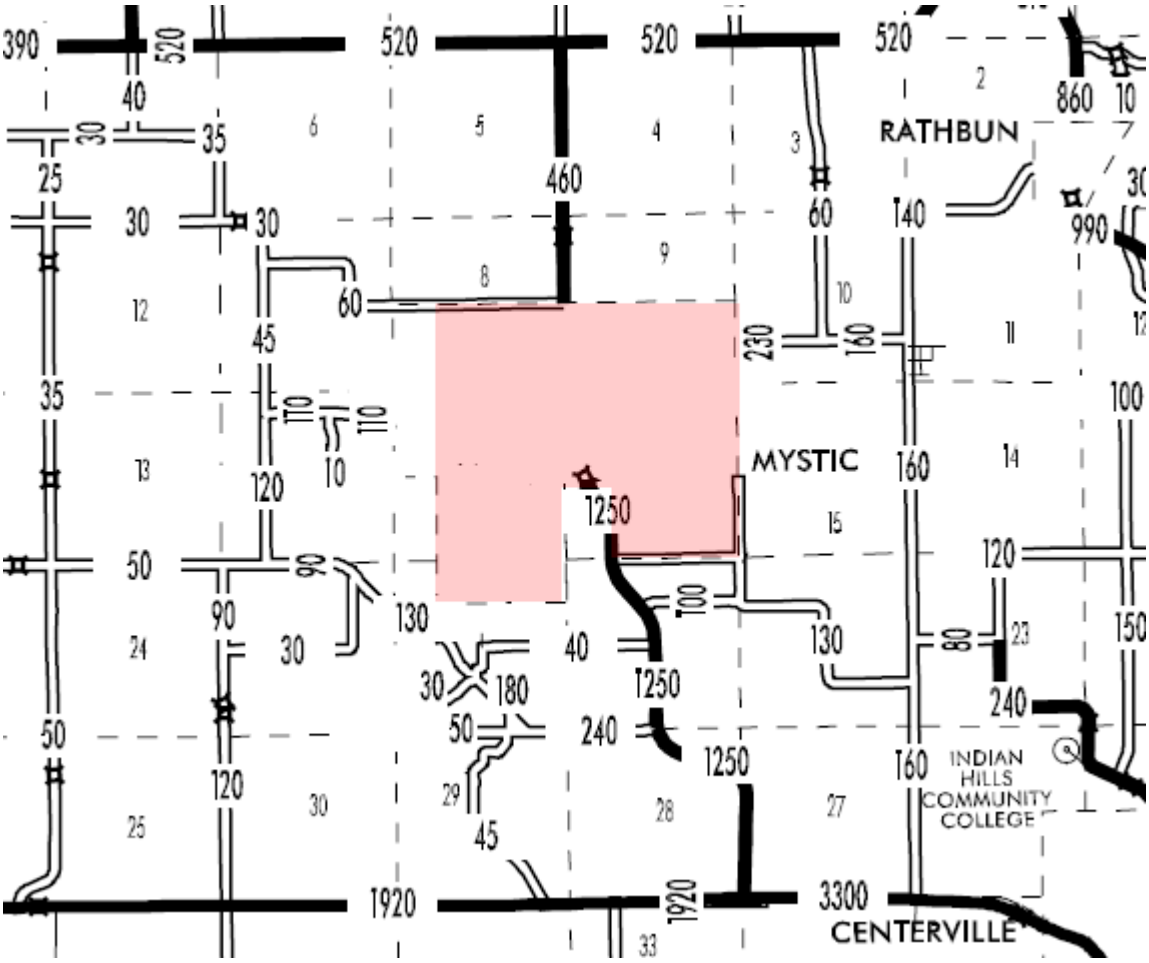
Source: Iowa Department of Natural Resources, Geological Survey. Iowa Earthquakes. <http://www.igsb.uiowa.edu/Browse/earthqua/iowa_quakes.htm>.

Appendix 22: Landslide Susceptibility Map

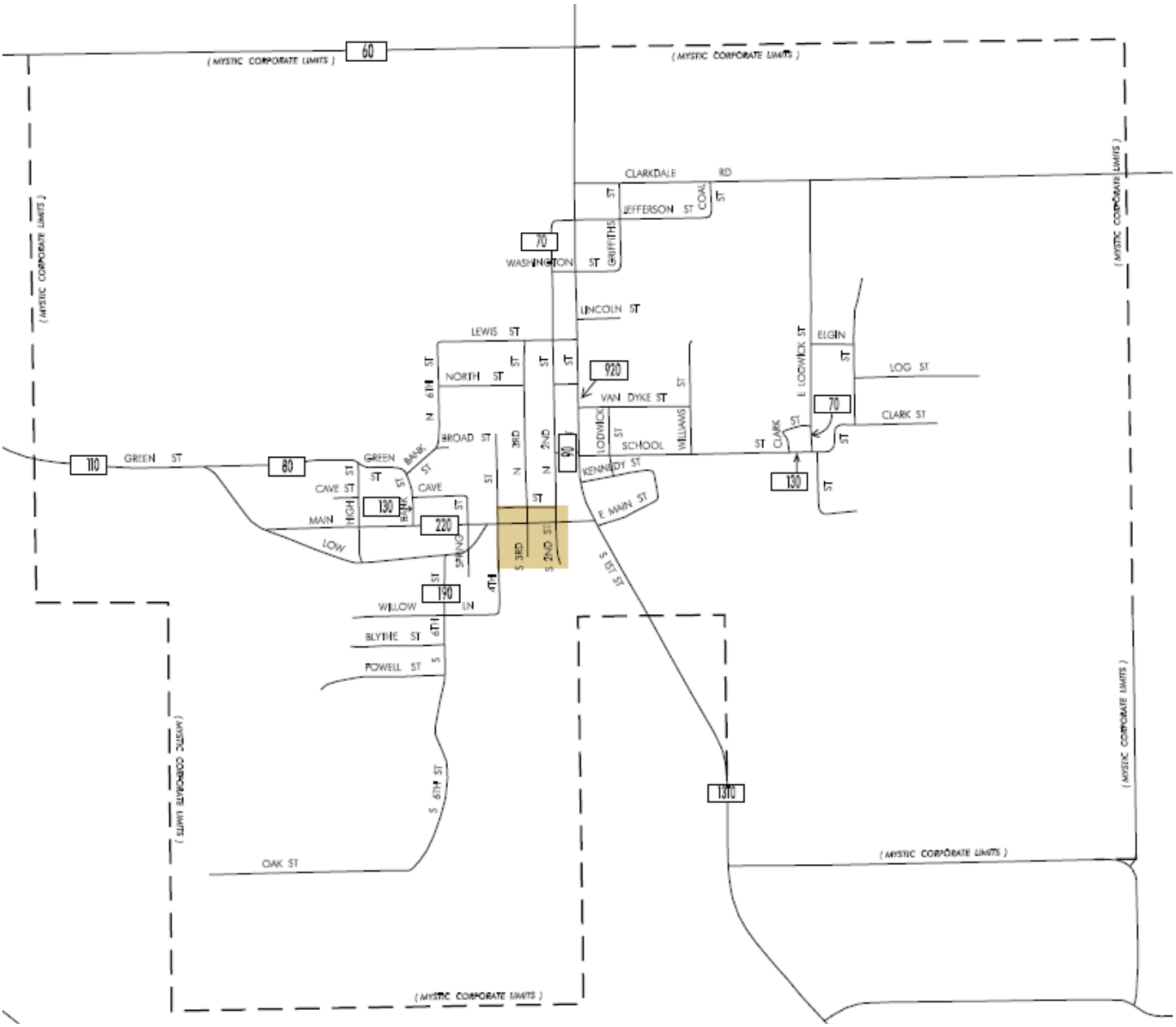


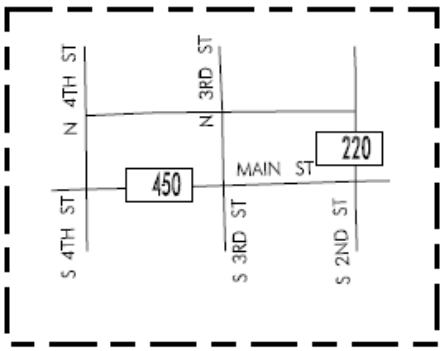
Source: National Atlas GIS data compiled by Chariton Valley Planning and Development

Appendix 23: Annual Average Daily Traffic Count (2006)

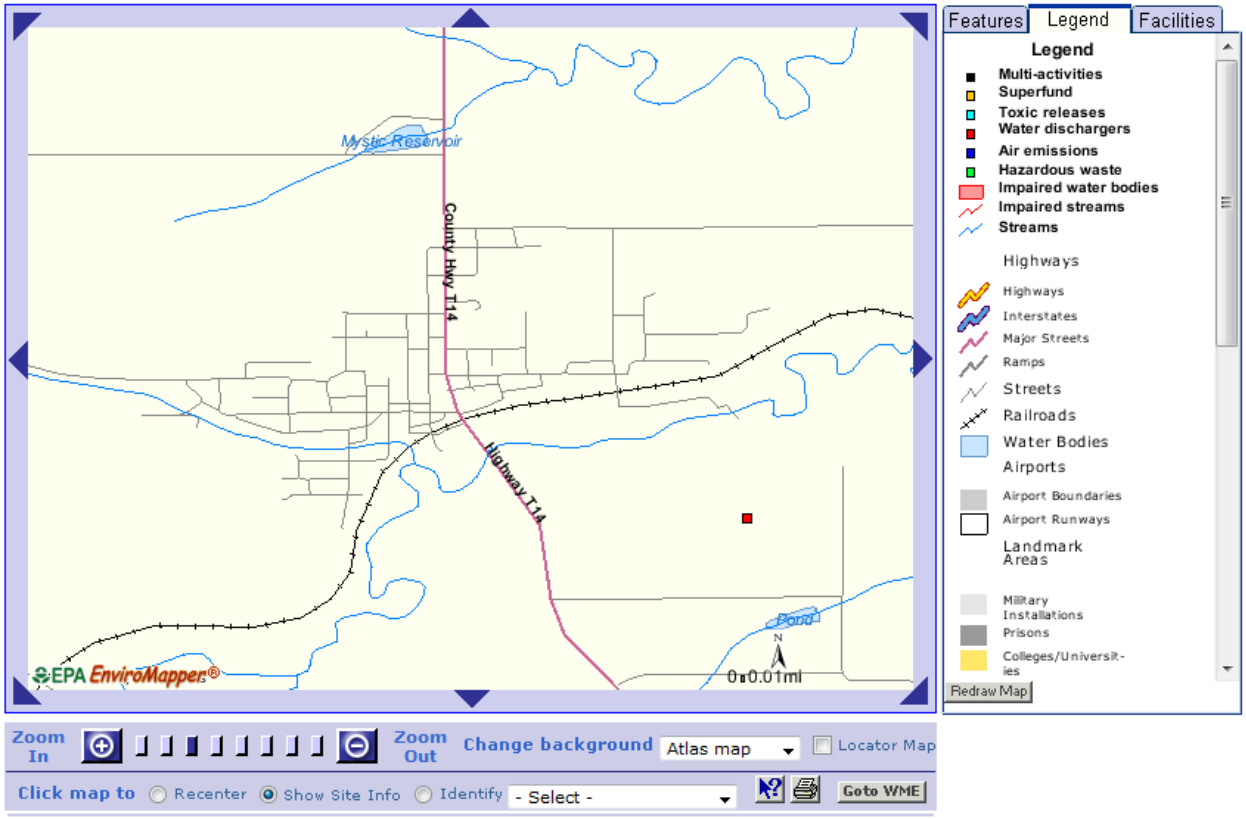


Significant traffic enters and exits Mystic from the south, much of it connecting to Centerville to the southeast. The numbers indicated are Iowa DOT traffic counts on county roads and highways surrounding Mystic per day on average. The full Appanoose County AADT map can be found online at http://www.iowadotmaps.com/msp/traffic/aadtpdf.html for 2006 and previous years. Traffic counts for the City of Mystic are on the following page.


(MYSTIC CORPORATE LIMITS)
60
CLARKDALE RD
JEFFERSON ST
COAL ST
GRIFFITHS ST
70
WASHINGTON ST
LINCOLN ST
LEWIS ST
NORTH ST
6TH ST
N
920
VAN DYKE ST
LODWICK ST
WILLIAMS ST
SCHOOL ST
KENNEDY ST
90
BROAD ST
3RD
2ND
E LODWICK ST
ELGIN ST
LOG ST
CLARK ST
70
CLARK ST
130
110
GREEN ST
80
GREEN ST
BANK ST
CAVE ST
CAVE
HIGH
130
MAIN
LOW
220
SPRING
S 3RD
S 2ND
E MAIN ST
S 1ST ST
4TH
190
WILLOW LN
BLYTHE ST
POWELL ST
S 6TH ST
OAK ST
1310
(MYSTIC CORPORATE LIMITS)

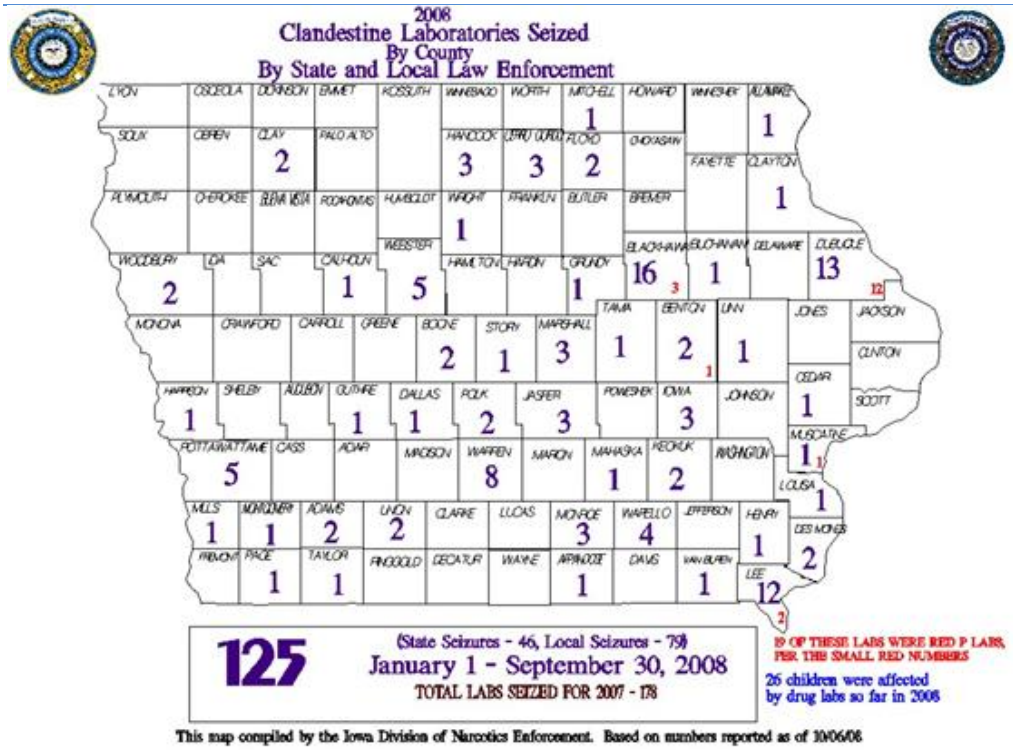

N 4TH ST
N 3RD ST
220
MAIN ST
450
S 4TH ST
S 3RD ST
S 2ND ST

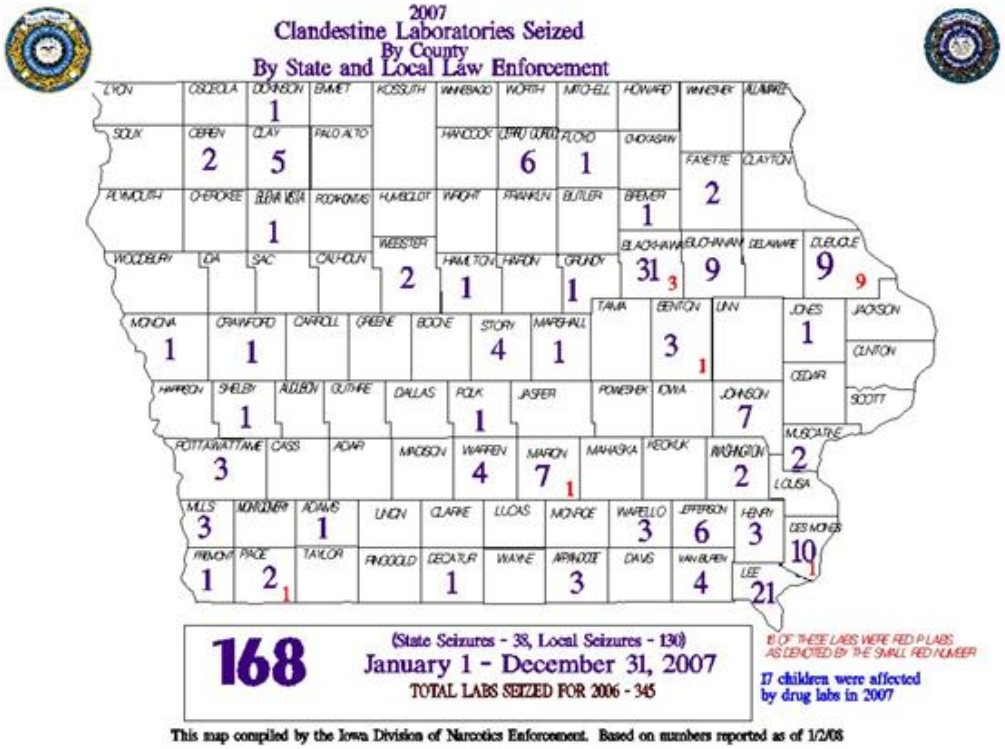
Appendix 24: Hazardous Material Releases in Mystic



The one water discharger in Mystic is the municipal waste water facility which has a discharge permit. See the US EPA Enviromapper site for more information; http://www.epa.gov/enviro/html/em/.

Appendix 25: Iowa Meth Labs Seized by County



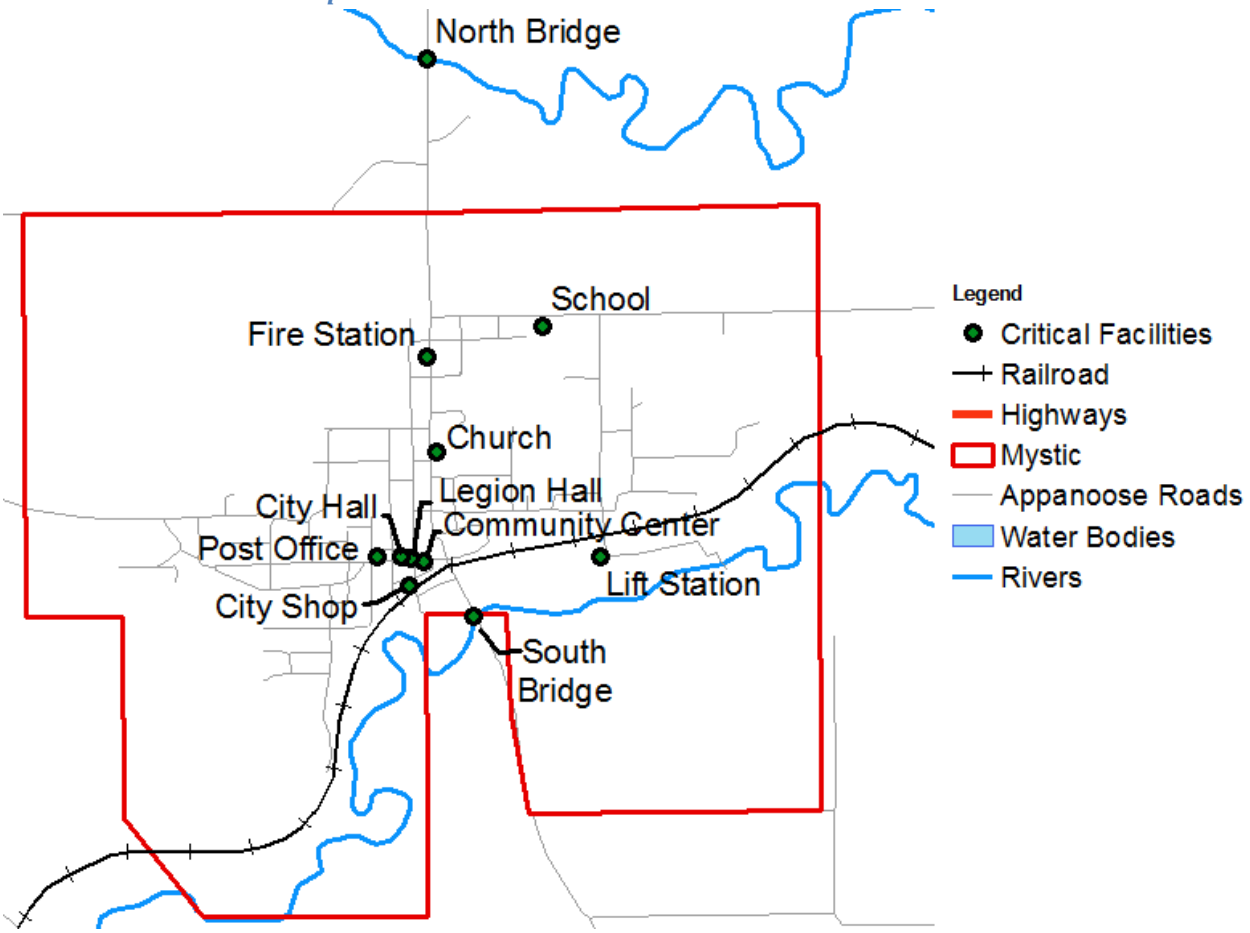


Source: Iowa Department of Public Safety, Division of Narcotics Enforcement; http://www.dps.state.ia.us/DNE/clanlab.shtml

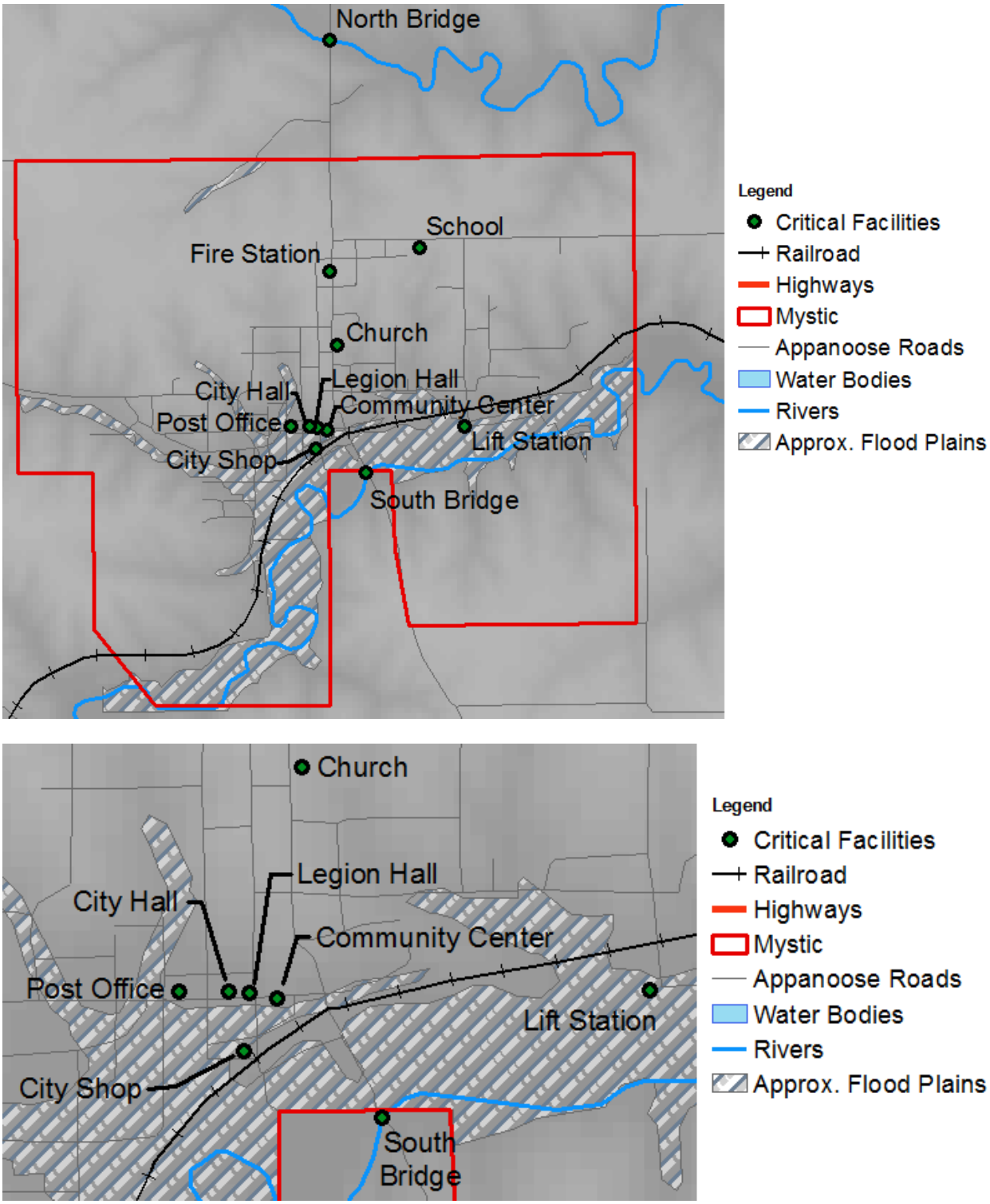
Appendix 26: Mystic Critical Facilities by Hazard

Not all hazards have well-defined hazard areas or their likely area of impact includes the entire City of Mystic. The following maps show the natural hazards that can be mapped with some confidence; these mapped areas consist of flooding hazards and sinkholes. The first map shows where the identified critical facilities are in relation to city boundaries, roads, and creeks.

Critical Facilities Base Map

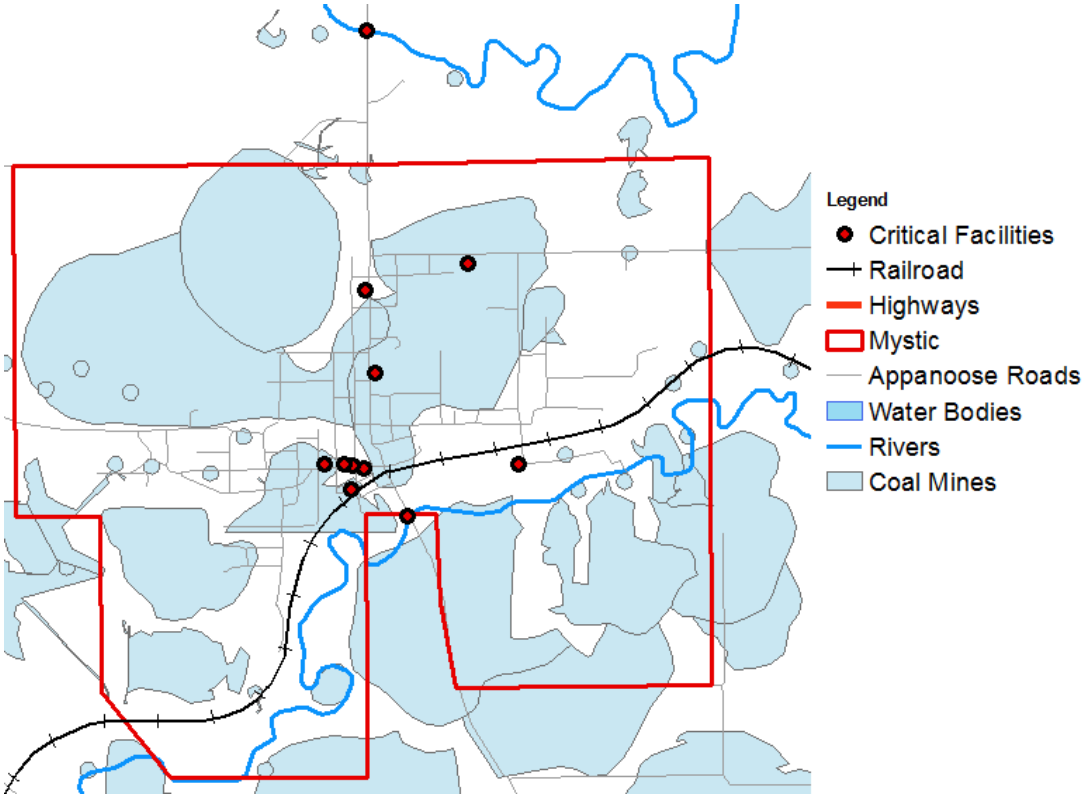


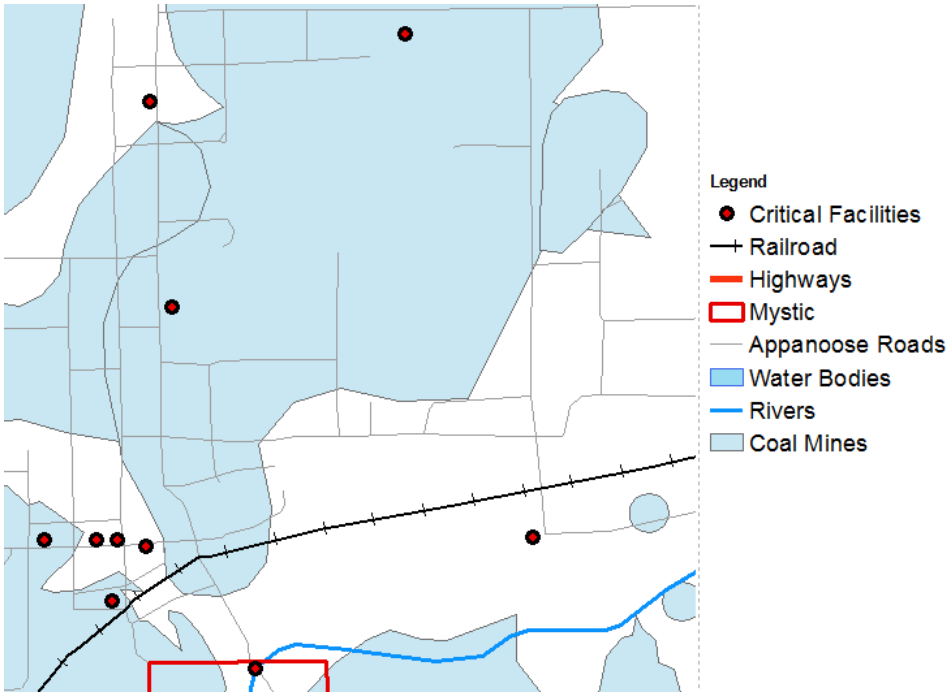
Flood and Flash Flood



Critical Facilities potentially within floodplains: City Shop, Lift Station, and South Bridge

Sinkholes (Mine Subsidence)





Critical Facilities potentially located over coal mines: City Shop, Church, School, and Post Office

Average Building Replacement Value per Square Foot

Occupancy Class	Total $/sq. ft.
Single Family Dwelling	77
Mobile Home	52
Multi-family Dwelling	98
Temporary Lodging	102
Institutional Dormitory	98
Nursing Home	89
Retail Trade	67
Wholesale Trade	53
Personal/Repair Services	92
Professional/Tech. Services	87
Banks	151
Hospital	145
Medical Office/Clinic	112
Entertainment & Recreation	131
Theaters	98
Parking	30
Heavy Industrial	69
Light Industrial	69
Food/Drugs/Chemicals	69
Metals/Minerals Processing	69
High Technology	69
Construction	69
Agriculture	26
Church/Non-Profit Offices	113
General Services	88
Emergency Response	130
Schools	91
Colleges/Universities	115

Source: HAZUS

Contents Value as Percentage of Building Replacement Value

Occupancy Class	Contents Value (%)
Residential (including temporary lodging, dormitory, and nursing homes)	50
Commercial (including retail, wholesale, professional, services, financial, entertainment & recreation)	100
Commercial (including hospital and medical office/clinic)	150
Commercial Parking	50
Industrial (including heavy, light, technology)	150
Industrial Construction	100
Agriculture	100
Religion/Non-Profit	100
Government Emergency Response	150
Government General Services	100
Education Schools/Libraries	100
Education Colleges/Universities	150

Source: HAZUS

Example 1

To find the annual sales from a 15,000 square foot grocery store, you would multiply the structure size by $30 per square foot (from the table at right).

15,000 x $30

The annual sales would be $450,000.

Example 2

If a public library will be lost for three months due to damage from a 100-year flood, you could determine the damages from the loss of function by multiplying the monthly budget of the library (overhead, rent, staff salaries, etc.) by three months.

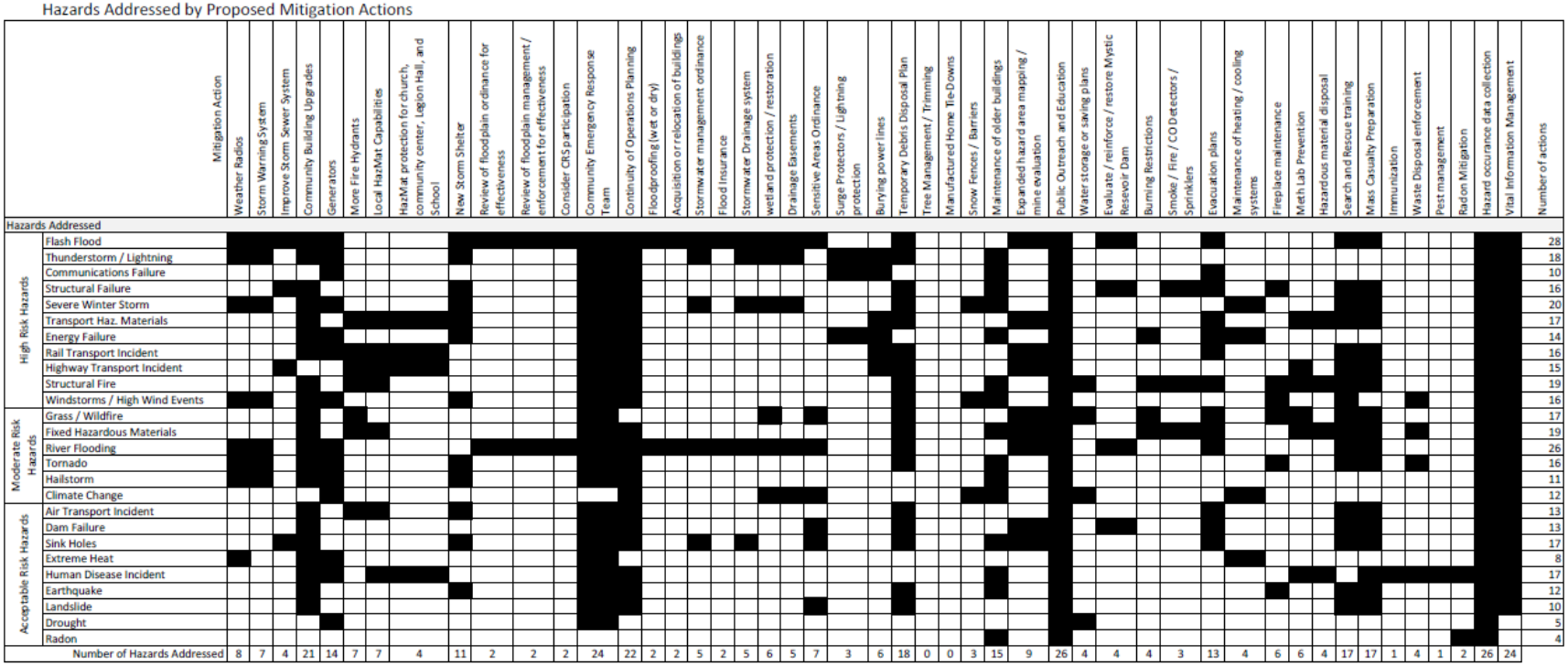
Annual Gross Sales or Production (Dollars per Square Foot)

Occupancy Class	Annual Sales ($ / ft²)
Commercial	
Retail Trade	30
Wholesale Trade	43
Industrial	
Heavy	400
Light	127
Food/Drugs/Chemicals	391
Metals/Minerals Processing	368
High Technology	245
Construction	431
Agriculture	
Agriculture	83

Source: HAZUS

Appendix 28: Hazards Addressed by Proposed Mitigation Action

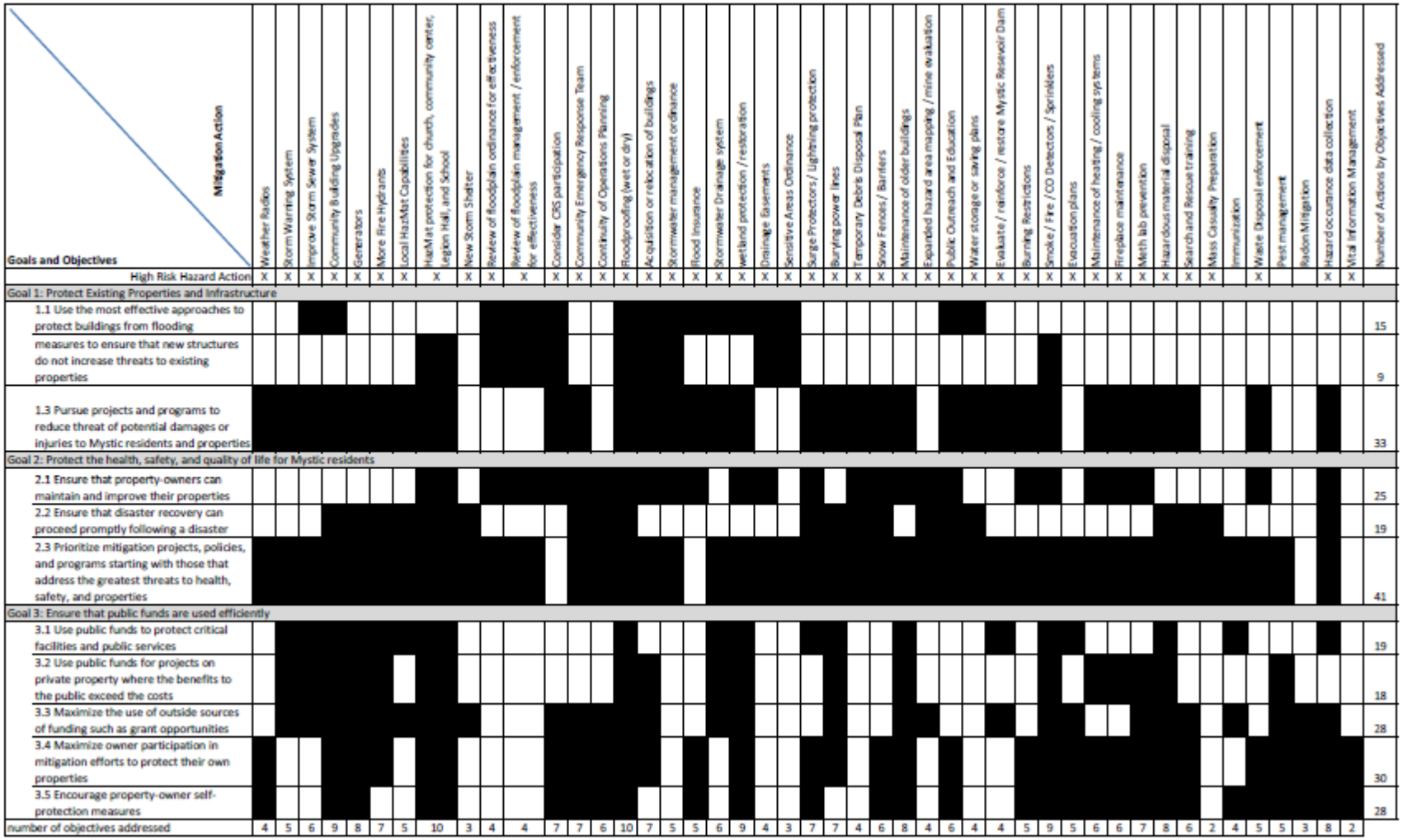
Hazards Addressed by Proposed Mitigation Actions



Hazards Addressed	Mitigation Action	Weather Radios	Storm Warning System	Improve Storm Sewer System	Community Building Upgrades	Generators	More Fire Hydrants	Local HazMat Capabilities	HazMat protection for church, community center, Legion Hall, and School	New Storm Shelter	Review of floodplain ordinance for effectiveness	Review of floodplain management / enforcement for effectiveness	Consider CRS participation	Community Emergency Response Team	Continuity of Operations Planning	Floodproofing (wet or dry)	Acquisition or relocation of buildings	Stormwater management ordinance	Flood Insurance	Stormwater Drainage system	wetland protection / restoration	Drainage Easements	Sensitive Areas Ordinance	Surge Protectors / Lightning protection	Burying powerlines	Temporary Debris Disposal Plan	Tree Management / Trimming	Manufactured Home Tie-Downs	Snow Fences / Barriers	Maintenance of older buildings	Expanded hazard area mapping / mine evaluation	Public Outreach and Education	Water storage or saving plans	Evaluate / reinforce / restore Mystic Resevoir Dam	Burning Restrictions	Smoke / Fire / CO Detectors / Sprinklers	Evacuation plans	Maintenance of heating / cooling systems	Fireplace maintenance	Meth Lab Prevention	Hazardous material disposal	Search and Rescue training	Mass Casualty Preparation	Immunization	Waste Disposal enforcement	Pest management	Radon Mitigation	Hazard occurance data collection	Vital Information Management	Number of actions
High Risk Hazards	Flash Flood	■	■			■				■					■				■		■	■		■	■	■					■	■		■			■					■	■				■	■	28
	Thunderstorm / Lightning	■	■			■				■					■									■	■	■				■	■						■											■	■	18
	Communications Failure														■									■	■						■		■				■											■	■	10
	Structural Failure			■	■					■					■										■						■		■						■		■			■	■				■	■	16
	Severe Winter Storm	■	■			■				■					■			■		■	■	■				■				■		■					■			■			■	■				■	■	20
	Transport Haz. Materials						■	■	■	■					■									■	■								■					■					■	■				■	■	17
	Energy Failure					■									■									■	■	■					■	■				■											■	■	14
	Rail Transport Incident					■	■	■	■						■									■	■						■	■	■				■											■	■	16
	Highway Transport Incident			■			■	■	■						■									■	■						■	■										■						■	■	15
	Structural Fire							■	■						■									■	■						■	■				■	■					■					■	■	19
	Windstorms / High Wind Events	■	■			■				■					■									■	■				■	■	■		■											■	■			■	■	16
Moderate Risk Hazards	Grass / Wildfire						■	■							■						■	■	■	■	■						■	■	■				■											■	■	17
	Fixed Hazardous Materials						■	■	■						■									■	■						■	■	■			■	■	■										■	■	19
	River Flooding	■	■			■					■	■	■	■	■	■	■	■	■	■	■	■	■	■	■						■	■	■				■											■	■	26
	Tornado	■	■			■				■					■									■	■						■	■	■				■					■						■	■	16
	Hailstorm	■	■			■				■					■									■	■						■	■	■				■											■	■	11
	Climate Change						■	■							■						■	■	■	■	■						■	■	■				■					■						■	■	12
Acceptable Risk Hazards	Air Transport Incident					■		■	■	■					■									■	■						■	■	■				■											■	■	13
	Dam Failure					■				■					■								■	■	■						■	■	■				■											■	■	13
	Sink Holes			■		■				■					■			■		■			■	■	■						■	■	■				■											■	■	17
	Extreme Heat	■				■				■					■									■	■						■	■	■				■					■						■	■	8
	Human Disease Incident					■		■	■	■					■									■	■						■	■	■				■											■	■	17
	Earthquake					■				■					■									■	■						■	■	■				■											■	■	12
	Landslide					■									■								■	■	■						■	■	■				■											■	■	10
	Drought				■										■	■								■	■						■	■	■				■											■	■	5
	Radon																												■																		■	■	4
	Number of Hazards Addressed	8	7	4	21	14	7	7	4	11	2	2	2	24	22	2	2	5	2	5	6	5	7	3	6	18	0	0	3	15	9	26	4	4	4	3	13	4	6	6	4	17	17	1	4	1	2	26	24	

Note: A full size copy of this chart may be found in the amendment to this plan.

Appendix 29: Mitigation Actions by Goals and Objectives



Goals and Objectives / Mitigation Action	Weather Radios	Storm Warning System	Improve Storm Sewer System	Community Building Upgrades	Generators	More Fire Hydrants	Local HazMat Capabilities	HazMat protection for church, community center, Legion Hall, and School	New Storm Shelter	Review of floodplain ordinance for effectiveness	Review of floodplain management / enforcement for effectiveness	Consider CRS participation	Community Emergency Response Team	Continuity of Operations Planning	Floodproofing (wet or dry)	Acquisition or relocation of buildings	Stormwater management ordinance	Flood Insurance	Stormwater Drainage system	Wetland protection / restoration	Drainage Easements	Sensitive Areas Ordinance	Surge Protectors / Lightning protection	Burying power lines	Temporary Debris Disposal Plan	Snow Fences / Barriers	Maintenance of older buildings	Expanded hazard area mapping / mine evaluation	Public Outreach and Education	Water storage or saving plans	Evaluate / reinforce / restore Mystic Reservoir Dam	Burning Restrictions	Smoke / Fire / CO Detectors / Sprinklers	Evacuation plans	Maintenance of heating / cooling systems	Fireplace maintenance	Meth lab prevention	Hazardous material disposal	Search and Rescue training	Mass Casualty Preparation	Immunization	Waste Disposal enforcement	Pest management	Radon Mitigation	Hazard occurance data collection	Vital Information Management	Number of Actions by Objectives Addressed
High Risk Hazard Action	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	
Goal 1: Protect Existing Properties and Infrastructure																																														
1.1 Use the most effective approaches to protect buildings from flooding			■	■						■	■	■			■	■	■	■	■	■	■	■							■	■																15
measures to ensure that new structures do not increase threats to existing properties								■		■	■	■						■	■	■		■																								9
1.3 Pursue projects and programs to reduce threat of potential damages or injuries to Mystic residents and properties	■	■	■	■	■	■	■	■				■		■		■	■	■	■	■			■	■	■	■	■		■	■	■	■			■	■	■	■				■			33
Goal 2: Protect the health, safety, and quality of life for Mystic residents																																													
2.1 Ensure that property-owners can maintain and improve their properties								■		■	■	■	■	■	■	■	■		■	■		■		■			■	■		■	■	■		■	■	■				■			■		25
2.2 Ensure that disaster recovery can proceed promptly following a disaster				■	■	■	■	■					■										■	■	■	■			■	■	■	■	■	■	■	■	■	■	■	■	■				19
2.3 Prioritize mitigation projects, policies, and programs starting with those that address the greatest threats to health, safety, and properties	■	■	■	■	■	■	■	■	■	■	■		■	■	■	■		■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■		■		41
Goal 3: Ensure that public funds are used efficiently																																													
3.1 Use public funds to protect critical facilities and public services		■	■	■	■	■	■	■							■			■	■	■			■	■			■				■		■		■	■	■			■					19
3.2 Use public funds for projects on private property where the benefits to the public exceed the costs		■	■	■	■	■		■							■			■	■	■			■	■			■				■		■	■	■	■	■	■	■	■	■	■	■		18
3.3 Maximize the use of outside sources of funding such as grant opportunities		■	■	■	■	■	■					■	■	■	■			■	■	■			■	■			■				■		■	■	■	■	■	■	■	■	■	■	■		28
3.4 Maximize owner participation in mitigation efforts to protect their own properties	■			■	■	■	■	■				■	■	■	■			■	■	■			■	■			■				■		■	■	■	■	■	■	■	■	■	■	■		30
3.5 Encourage property-owner self-protection measures	■			■	■			■				■	■	■				■	■	■			■				■				■		■	■	■	■	■	■	■	■	■	■	■		28
number of objectives addressed	4	5	6	9	8	7	5	10	3	4	4	7	7	6	10	7	5	5	6	9	4	3	7	7	4	6	8	4	6	4	4	5	9	5	6	6	7	8	6	2	4	5	5	3	8	2	

Note: A full size copy of this chart may be found in the amendment to this plan.

Appendix 30: STAPLEE Worksheet

STAPLEE Criteria / Mitigation Action	Weather Radios	Storm Warning System	Improve Existing Storm Sewer System	Community Building Upgrades (current storm shelters)	Generators	More Fire Hydrants in Town	Local HazMat Capabilities	HazMat protection for church, community center, Legion Hall, and School	New Storm Shelter (safe room, heating / cooling shelter)	Review of floodplain ordinance for effectiveness	Review of floodplain management / enforcement for effectiveness	Consider CRS participation	Community Emergency Response (Volunteers)	Continuity of Operations Planning	Floodproofing (wet or dry)	Acquisition or relocation of buildings	Stormwater management ordinance	Encourage Flood Insurance Participation	Stormwater Drainage system	wetland protection / restoration	Drainage Easements	Sensitive Areas Ordinance (construction restrictions)	Surge Protectors / Lightning protection (encourage ment or acquisition)	Burying power lines	Temporary Debris Disposal Plan	Snow Fences (vegetative barriers to block snow drifts)	Maintenance of older buildings (structural integrity voluntary program)	Expanded hazard area mapping / mine evaluation	Public Outreach and Education	Water storage or saving plans	Evaluate / reinforce / restore Mystic Reservoir Dam	Burning Restrictions	Smoke / Fire Detectors and Sprinklers (voluntary program and public education)	Evacuation plans	Maintenance of heating / cooling systems (public education)	Fireplace maintenance (public education)	Meth lab prevention / public education	Hazardous material disposal (public education)	Search and Rescue training for first responders	Mass Casualty Preparation	Immunization	Waste Disposal enforcement (public health)	Pest management (public health)	Radon testing / public education	Hazard occurance data collection	Collection and protection of vital records (public education)
High Risk Hazard Action	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X
Social																																																		
Community Acceptance	+	+	+	+	+	+	+		+	+	-		+	+		-	-	+	+		-	-	+	+	+	+	+	+	+	+	-	-	+	+	+	+	+	+	+	+	+	-	-	+	+	+
Effect on Segment of Population	+	+	+	+	+	+	+	+	+	+	-		+	+		-	-	+	+	+	-	-	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+
Technical																																																		
Technical Feasibility	+	+	+		+	+		+	+	+	+		+	+	-	-	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+
Long-Term Solution	+	+	+	-	+	+		+	+	+	+		+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+
Secondary Impacts	+	+	+	-	+	+	+		+	+	+		+	+		+	+	+	+	+	+	+		-	-	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+
Administrative																																																		
Staffing	+	+	-		+		+		-	-	-		+	+	-	-	+	+	-	-	-	-			-	+	-	-	-	-	-		-	+	-	+			-	-	-	-	+	-	+
Funding Allocated	+	-	-		-	-		-	-	-	-		+	+	-	-	+	+	-	-	-	-	+		-	+	-	-	-	-	-		-	+	-	+			-	-	-	-	+		+
Maintenance / Operations	+	-	-		+	+			-	+	-		+	+		-	+	+	-	-		-	+		-	+		-	-	-	-		-	+	-	+			-	-	-	-	+	-	+
Political																																																	
Political Support	+	+	+	+	+	+	-	+	+	+	+		+	+		-	+	+	+		+		+	+	+	+	+	+	+	+	+	-	+	+	+	+	+	+	+	+	-	+	+	+	+
Local Champion	+	+	+	+			+		+				+	+		-	-						+		+	+	+				-	+				+	+	+	+	+	-	-	+	+	+
Public Support	+	+	+	+	+	+	+		+	+	-		+	+		-	-	+	+		+	-	+	+	-		+	+	+	+	-	-	+	+	+	+	+	+	+	+	-	-	+	+	+
Legal																																																	
State Authority	+	+	+	+	+	+	+	+	+	+	+		+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+
Existing Local Authority	+	+	+	+	+	+	+	+	+	+	+		+	+			+	+			+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+
Potential Legal Challenge	+	+	+	-	-	-	+		+	+	-		-	-	-	-	-	+	-	-	-	-	+	-	-	+	-	-	+	-	+	-	+	-	+	+	+	+			-	-	+	+	+
Economic																																																	
Benefit of Action	+	+	+	+	+	+	+	+	+	+	+		+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+
Cost of Action	+	-	-	-	-	+	-	+	-	-	-		+	+	-	-	-	+	-	-	-	-	+	-	-	+	-	-	+	-	-	+	-	+	-	+	+	-	+	-	-	-	-	+	+	+
Contribute to Economic Goals																																																	
Outside Funding Required	+	-	-	-	-	-		+	-	-	-		+	+	-	-	+	+	-	-	-	-	+	-	-	+	-	-	+	-	-	+			+	+	+	+	-	-	-	-	-	+	+	+
Environmental																																																	
Effect on Endangered Species			+	+	+	+	+	+	+						+	+	+	+	+	+	+	+	+	+		+	+	+	+	+	+	+	+						+									
Effect on HAZMAT / Waste sites			+	+	-	+	-	+	+				-			-	+	+	+	+	+	+	+			+		+	+	+	-		+						+			-	-	-				
Consistency with Community Environmental Goals																																																	
Consistent with Federal Laws	+	+	+	+	+	+	+	+	+	+	+		+		+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+						+			+	+				

= Action that addresses a large number of goals and objectives (10+)

Instructions:

Place a plus sign (+) for all STAPLEE Criteria under a hazard for favorable considerations and a minus sign (-) for negative considerations. For example if Local HazMat Capabilities will require outside funding, this is a potential negative consideration but if the city council is fully committeed to this option, place a plus under Political Support.

STAPLEE Criteria / Mitigation Action	Weather Radios	Storm Warning System	Improve Existing Storm Sewer System	Community Building Upgrades (current storm shelters)	Generators	More Fire Hydrants in town	Local HazMat Capabilities	HazMat protection for church, community center, Legion Hall, and School	New Storm Shelter (safe room, heating / cooling shelter)	Review of floodplain ordinance for effectiveness	Review of floodplain management / enforcement for effectiveness	Consider CRS participation	Community Emergency Response (Volunteers)	Continuity of Operations Planning	Floodproofing (wet or dry)	Acquisition or relocation of buildings	Stormwater management ordinance	Encourage Flood Insurance Participation	Stormwater Drainage system	wetland protection / restoration	Drainage Easements	Sensitive Areas Ordinance (construction restrictions)	Surge Protectors / lightning protection (encouragement or acquisition)	Burying power lines	Temporary Debris Disposal Plan	Snow Fences (vegetative barriers to block snow drifts)	Maintenance of older buildings (structural integrity voluntary program)	Expanded hazard area mapping / mine evaluation	Public Outreach and Education	Water storage or saving plans	Evaluate / reinforce / restore Mystic Reservoir Dam	Burning Restrictions	Smoke / Fire Detectors and Sprinklers (voluntary program and public education)	Evacuation plans	Maintenance of heating / cooling systems (public education)	Fireplace maintenance (public education)	Meth lab prevention / public education	Hazardous material disposal (public education)	Search and Rescue training for first responders	Mass Casualty Preparation	Immunization	Waste Disposal enforcement (public health)	Pest management (public health)	Radon testing / public education	Hazard occurance data collection	Collection and protection of vital records (public education)
High Risk Hazard Action	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X
Social																																																	
Community Acceptance	1	1	1	1	1	1	1	0	1	1	-1	0	1	1	0	-1	-1	1	1	0	-1	-1	1	1	1	1	1	1	1	1	-1	-1	1	1	1	1	1	1	1	1	-1	-1	1	1	1	1	1	1
Effect on Segment of Population	1	1	1	1	1	1	1	1	1	1	-1	0	1	1	0	-1	-1	1	1	1	-1	-1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1
Technical																																																
Technical Feasibility	1	1	1	0	1	1	0	1	1	1	1	0	1	1	-1	-1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1
Long-1Term Solution	1	1	1	-1	1	1	0	1	1	1	1	0	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1
Secondary Impacts	1	1	1	-1	1	1	1	0	1	1	1	0	1	1	0	1	1	1	1	1	1	1	0	-1	-1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1
Administrative																																																
Staffing	1	1	-1	0	1	0	1	0	-1	-1	-1	0	1	1	-1	-1	1	1	-1	-1	-1	-1	0	0	-1	1	-1	-1	-1	-1	-1	-1	0	-1	1	1	0	0	-1	-1	-1	-1	-1	1	-1	1	1	1
Funding Allocated	1	-1	-1	0	-1	-1	0	-1	-1	-1	-1	0	1	1	-1	-1	1	1	-1	-1	-1	-1	1	0	-1	1	-1	-1	-1	-1	-1	-1	0	-1	1	1	0	0	-1	-1	-1	-1	-1	1	0	1	1	1
Maintenance / Operations	1	-1	-1	0	1	1	0	0	-1	1	-1	0	1	1	0	-1	1	1	-1	-1	0	-1	1		-1	1	0	-1	-1	-1	-1	-1	0	-1	1	1	0	0	-1	-1	-1	-1	-1	1	-1	1	1	1
Political																																																
Political Support	1	1	1	1	1	1	-1	1	1	1	1	0	1	1	0	-1	1	1	1	0	1	0	1	1	1	1	1	1	1	1	1	-1	1	1	1	1	1	1	1	1	1	-1	1	1	1	1	1	1
Local Champion	1	1	1	1	0	0	1	0	1	0	0	0	1	1	0	0	-1	0	0	0	0	0	1	0	1	1	1	0	1	0	0	-1	1	0	0	0	1	1	1	1	1	-1	-1	1	1	1	1	1
Public Support	1	1	1	1	1	1	1	0	1	1	-1	0	1	1	0	-1	-1	1	1	0	1	-1	1	1	-1	0	1	1	1	1	-1	-1	1	1	1	1	1	1	1	1	1	-1	-1	1	1	1	1	1
Legal																																																
State Authority	1	1	1	1	1	1	1	1	1	1	1	0	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1
Existing Local Authority	1	1	1	1	1	1	1	1	1	1	1	0	1	1	0	0	1	1	1	0	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1
Potential Legal Challenge	1	1	1	-1	-1	-1	1	0	1	1	-1	0	0	-1	-1	-1	-1	1	1	-1	-1	-1	1	-1	-1	1	-1	-1	1	-1	-1	1	1	1	1	1	1	1	0	0	-1	-1	-1	1	1	1	1	1
Economic																																																
Benefit of Action	1	1	1	1	1	1	1	1	1	1	1	0	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1
Cost of Action	1	-1	-1	-1	-1	1	-1	1	-1	-1	-1	0	1	1	-1	-1	-1	1	-1	-1	-1	-1	1	-1	-1	1	-1	-1	1	-1	-1	-1	1	-1	1	1	-1	1	-1	-1	-1	-1	-1	1	1	1	1	1
Contribute to Economic Goals	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Outside Funding Required	1	-1	-1	-1	-1	-1	0	1	-1	-1	-1	0	1	1	-1	-1	1	1	-1	-1	-1	-1	1	-1	-1	1	-1	-1	1	-1	-1	1	0	0	1	1	1	1	-1	-1	-1	-1	-1	1	1	1	1	1
Environmental																																																
Effect on Endangered Species	0	0	1	1	1	1	1	1	1	0	0	0	0	0	1	1	1	1	1	1	1	1	1	1	0	1	1	1	1	1	1	1	1	0	0	0	0	0	1	0	0	0	0	0	0	0	0	0
Effect on HAZMAT / Waste sites	0	0	1	1	-1	1	-1	1	1	0	0	0	-1	0	0	-1	1	1	1	1	1	1	1	0	-1	1	0	1	1	1	-1	0	1	0	0	0	0	1	0	0	-1	-1	-1	0	0	0	0	0
Consistency with Community Environmental Goals	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Consistent with Federal Laws	1	1	1	1	1	1	1	1	1	1	1	0	1	0	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	0	0	0	0	0	1	0	0	1	1	0	0	0	0	0
STAPLEE Score	18	10	10	6	9	12	9	11	10	9	-1	0	16	15	-1	-6	8	19	7	3	4	0	18	7	1	19	8	7	14	7	3	1	16	5	16	16	12	17	6	6	5	-3	-2	15	12	17		

Note: Full size copies of these charts may be found in the amendment to this plan.

Appendix 31: Mitigation Action Scores

Mitigation Action	High Risk Hazard?	# Hazards Addressed	# Objectives Addressed	Timeline	Cost	STAPLEE Rating	Action Ranking
Weather Radios	Y	8	4	0	0	18	30
Storm Warning System	Y	7	5	-2	-1.5	10	18.5
Improve Existing Storm Sewer System	Y	4	6	-2	-1.5	10	16.5
Community Building Upgrades	Y	21	9	-1.5	-1.5	6	33
Generators	Y	14	8	-1	-1	9	29
More Fire Hydrants	Y	7	7	0	-1	12	25
Local HazMat Capabilities	Y	7	5	-1.5	-1.5	9	18
HazMat protection for church, community center, Legion Hall, and School	Y	4	10	0	-0.5	11	24.5
New Storm Shelter	Y	11	3	-2	-1.5	10	20.5
Review of floodplain ordinance for effectiveness	Y	2	4	-1	0	9	14
Review of floodplain management / enforcement for effectiveness	Y	2	4	-1	0	-1	4
Consider CRS participation	Y	2	7	-1	0	0	8
Community Emergency Response Team	Y	24	7	0	1	16	48
Continuity of Operations Planning	Y	22	6	-1	0	15	42
Floodproofing (wet or dry)	Y	2	10	0	-1	-1	10
Acquisition or relocation of buildings	Y	2	7	1	-1.5	-6	2.5
Storm water management ordinance	Y	5	5	-1	0	8	17
Flood Insurance	Y	2	5	0	1	19	27
Storm water Drainage system	Y	5	6	-2	-1.5	7	14.5
wetland protection / restoration	Y	6	9	-0.5	0	3	17.5
Drainage Easements	Y	5	4	-1	-1	4	11
Sensitive Areas Ordinance	Y	7	3	-1	0	0	9
Surge Protectors / Lightning protection	Y	3	7	0.5	0.5	18	29
Burying power lines	Y	6	7	-2	-1	7	17
Temporary Debris Disposal Plan	Y	18	4	-1	0	1	22
Snow Fences / Barriers	Y	3	6	0	1	19	29
Maintenance of older buildings	Y	15	8	1	-0.5	8	31.5
Expanded hazard area mapping / mine evaluation	Y	9	4	-1	-0.5	7	18.5
Public Outreach and Education	Y	26	6	-1	0	14	45
Water storage or saving plans	Y	4	4	-1	0	7	14

Evaluate / reinforce / restore Mystic Reservoir Dam	Y	4	4	-1	-1.5	3	8.5
Burning Restrictions	Y	4	5	-1	0	1	9
Smoke / Fire / CO Detectors / Sprinkler Systems	Y	3	9	0	0	16	28
Evacuation plans	Y	13	5	-1	-0.5	5	21.5
Maintenance of heating / cooling systems	Y	4	6	0	-0.5	16	25.5
Fireplace maintenance	Y	6	6	0	0	16	28
Meth lab prevention	Y	6	7	-0.5	0.5	12	25
Hazardous material disposal	Y	4	8	-1	-0.5	17	27.5
Search and Rescue training for first responders	Y	17	6	-1	-0.5	6	27.5
Mass Casualty Preparation	Y	17	2	-1	-0.5	6	23.5
Immunization	N	1	4	0	0	5	10
Waste Disposal enforcement	Y	4	5	-0.5	0	-3	5.5
Pest management	N	1	5	0	0	-2	4
Radon Mitigation	N	2	3	0	0	15	20
Hazard occurrence data collection	Y	26	8	0	0	12	46
Collection and protection of vital records	Y	24	2	0	1	17	44

Appendix 32: Glossary

Note: most definitions contained here are derived from Dictionary.com and other internet searches; some are based on FEMA or Iowa Department of Homeland Security and Emergency Management information. Where exact language is used, the source is cited following the definition.

100-year flood plain – area in which the chance of a flood occurring in any given year is 1% independent of any other year; this is statistically about once every 100 years, this does not mean that if there is not a flood this year that next year the chance goes up to 2%

500-year flood plain – the area in which the chance is .2% chance of a flood occurring in any given year independent of any other year; this is statistically about once every 500 years this does not mean that if there is not a flood this year that next year the chance goes up to .4%

Acceptable risk hazards – hazards that have been determined by the Mystic Planning Committee to be low priority for mitigation strategies and projects to the point of no actions or steps are worth taking currently

Acute shortage (energy) – severe shortage in energy resources or supplies

ADLM – the local emergency Management agency that is a cooperative effort of Appanoose (A), Davis (D), Lucas (L), and Monroe (M) Counties.

Aerosol – a liquid or gas under compression to be dispensed as a spray or foam

Agricultural drought – drought which refers to soil moisture deficiencies

Anhydrous ammonia – a hazardous substance that is used for industrial and commercial purposes and as a fertilizer lacking water which separates it from ammonia hydroxide

Anticholinergics – a class of medications that blocks nerve sensations and treat a variety of conditions including asthma, muscle spasms, and gastrointestinal cramps among others

Appurtenant – legal term describing something that goes along with or belongs to something else

Aquifer – an underground layer of porous rock or soils such as sand or gravel from which water can be drawn from

Asphyxiation – suffocation, choking, smothering

Asthma – respiratory disorder characterized by wheezing, coughing, labored breathing

Atmospheric carbon – carbon monoxide; gaseous carbon in the air, some of which is naturally occurring while some is the result of fossil fuel and wood combustion

BFE – Base Flood Elevation; shown on the FIRM, is the elevation of the water surface resulting from a flood that has a 1% chance of occurring in any given year

Bio-Detection Systems (BDS) – a way to detect pollutants or organic compounds in the air or other substances

Bioterrorism – the use of biological agents against persons or property in violation of the criminal laws of the United States for purposes of intimidation, coercion or ransom

Blizzard conditions – heavy or prolonged snowstorm characterized by reduced visibility and strong winds

Bottled Fuels – this Census designation is being used in this plan to include the Census designation as well as Fuel Oil and Kerosene; the Census designation "bottled fuels" refers largely to LP gas

Block Group – the smallest census designated area other than for small incorporated areas; many cities contain multiple block groups, which are smaller delineations of blocks which comprise census tracts, some small cities may occupy a small part of a block group however

California Encephalitis – a strain of encephalitis first discovered in California characterized by dizziness, lethargy, headache, fever, seizures, and brain swelling that is transmitted by infected mosquitoes

Cascading Event Matrix – a tool provided by FEMA for ranking hazards in relation to one another including the impacts of one hazard on others or causal relationship between multiple hazards

Cell, storm – a storm cell is the smallest unit of a storm system characterized as an air mass formed by a convective loop

Clandestine – secret or concealed, also related to under-cover law enforcement operations

Coercion – use of force through intimidation or use of power to gain a certain behavior or outcome

Continental climate – a climate region that has cold enough temperatures in the winter to sustain snow and moderate precipitation mainly in the warmer months

Convective (loop or winds) – a meteorological term indicating the transfer of heat in the atmosphere such as by updrafts

Cumulonimbus – clouds that are characterized by large, dense "towers" that are associated with producing thunderstorms, also called Thunderheads or Thunderclouds

Deforestation – removal of a stand of trees

Delimit – marking or setting the outer limits or boundaries of something

Delineate – outline, mark, or define apart from something else, also see Delimit

Demographics – statistical data about a population including age, total population, income, housing status; information found in the US Census

Desertification – the process of an area converting to desert through depletion of vegetation, usually through over-exploitation by animals and / or humans and drought

Disease vector – in epidemiology a vector is a medium or species that carries or transmits diseases, a common disease vector may be mosquitoes

Doppler radar – radar that tracks the speed and direction of something measured

Downburst winds – strong winds that flow downward from cumulonimbus clouds usually associated with intense thunderstorms

Downdrafts – strong downward winds

El Nino – warm ocean currents that develop after December off of the coast of Peru and Ecuador that are sometimes associated with catastrophic storms

Emerald Ash Borer – an exotic invasive species that has been killing ash trees in Michigan, Illinois, Pennsylvania, Ohio, Indiana, and Maryland

Endangered (species) – a species that is determined to be in eminent threat of extinction throughout all or a significant portion of its habitat

Endemic – natural or characteristic, belonging to a particular location

EOP – Emergency Operations Plan

Epidemics – rapidly spreading or extensively found in a population

Epidemiology – branch of medicine dealing with how diseases spread

Erosion – the process of soil or rock being worn away through abrasion, corrosion, or other means

Essential Facility – Elements that are important to ensure a full recovery of a community or state following a hazard event. These would include: government functions, major employers, banks, schools, and certain commercial establishments, such as grocery stores, hardware stores, and gas stations (FEMA).

Evapotranspiration – the process of transferring moisture from the earth to the atmosphere through evaporation and plant transpiration

Event – the occurrence of a storm or hazard

Fauna – animal life

Flood hazard area – The area shown to be inundated by a flood of a given magnitude on a map; the land area covered by the floodwaters of the base flood is the Special Flood Hazard Area (SFHA) on NFIP maps. The SFHA is the area where the NFIP's floodplain management regulations must be enforced and the area where the mandatory purchase of flood insurance applies (FEMA).

FIRM – Flood Insurance Rate Map

FIS – Flood Insurance Study

Flood plain – area along a stream or river where flooding is a natural occurrence: flood plains can change over time based on changing conditions upstream such as urban development, dam or levee constructions, and other human actions

Flood zones – Flood hazard areas identified on the Flood Insurance Rate Map are identified as a Special Flood Hazard Area (SFHA). SFHA are defined as the area that will be inundated by the flood event having a 1-percent chance of being equaled or exceeded in any given year. The 1-percent annual chance flood is also

referred to as the base flood or 100-year flood. SFHAs are labeled as Zone A, Zone AO, Zone AH, Zones A1-A30, Zone AE, Zone A99, Zone AR, Zone AR/AE, Zone AR/AO, Zone AR/A1-A30, Zone AR/A, Zone V, Zone VE, and Zones V1-V30. Moderate flood hazard areas, labeled Zone B or Zone X (shaded) are also shown on the FIRM, and are the areas between the limits of the base flood and the 0.2-percent-annual-chance (or 500-year) flood. The areas of minimal flood hazard, which are the areas outside the SFHA and higher than the elevation of the 0.2-percent-annual-chance flood, are labeled Zone C or Zone X (unshaded) (FEMA).

Floodway – A "Regulatory Floodway" means the channel of a river or other watercourse and the adjacent land areas that must be reserved in order to discharge the base flood without cumulatively increasing the water surface elevation more than a designated height. Communities must regulate development in these floodways to ensure that there are no increases in upstream flood elevations. For streams and other watercourses where FEMA has provided Base Flood Elevations (BFEs), but no floodway has been designated, the community must review floodplain development on a case-by-case basis to ensure that increases in water surface elevations do not occur, or identify the need to adopt a floodway if adequate information is available (FEMA).

Floodway fringe – the area surrounding a floodway

Flora – plant life

Foot and Mouth Disease – a severe and contagious disease found in cows, sheep, hogs, and other hoofed animals “characterized by vesicular eruptions in the mouth and about the hoofs, teats, and udder” (Dictionary.com)

Frost/freeze advisory – National Oceanic and Atmospheric Administration convention of indicating when a frost or hard freeze is possible for an area

Frostbite – injury caused by extreme cold or frost

Fujita Scale – Rates tornadoes with numeric values from F0 to F5 based on tornado wind speed and damage sustained. An F0 indicates minimal damage such as broken tree limbs or signs, while and F5 indicated severe damage sustained (FEMA).

Functionally obsolete (bridges) – bridges that due to changing technology, lack of improvement, or deteriorating conditions are obsolete, this includes width of bridges

Funnel cloud – a rapidly rotating funnel-shaped cloud extending downward from the base of a cumulonimbus cloud, which, if it touches the surface of the earth, is a tornado or waterspout (Dictionary.com).

Gradient winds - horizontal wind velocity tangent to the contour line of a constant pressure surface (or to the isobar of a geopotential surface) at or above 2,500 feet (762 meters) (Allwords.com).

Half-life – the time it takes for one-half of the radioactive atoms of a substance to disintegrate

Hazardous substance – a substance that poses a threat to human, animal, or environmental health

Hazardous Materials – see Hazardous substance

HazMat – short-hand for Hazardous Materials, also used as HazMat Team to indicate the trained professionals that respond to release of hazardous substances

Heat index – a number in degrees Fahrenheit that tells how hot it really feels when relative humidity is added to the actual air temperature

High-risk hazards – hazards that are determined by the Mystic Planning Committee to pose the most risk to the community and of priority for developing projects or policies to address

Hijack – to forcefully take

Historical Occurrence – the number of times that a hazard has occurred in the community in the past

Horizontal peak gravity acceleration – a measure of how hard the earth shakes in a given area

Housing stock – the collective set of housing units in a given area, often a city or neighborhood

Housing unit – a single collection of rooms occupied by a family or household (conventional or unconventional) such as an apartment, a house, a mobile home, or a condo unit

Hydrocarbon – organic compounds composed of both hydrogen and carbon such as benzene or methane

Hydrological drought – drought which refers to declining surface water and groundwater supplies

Hypothermia – below normal body temperature

Ice jam – an obstruction of a waterway by pieces of ice

Impoundment – a body of water created by an obstruction such as a dam

Influenza – the common flu and variations of the flu

Infrastructure – Refers to the public services of a community that have a direct impact on the quality of life. Infrastructure includes communication technology such as phone lines or Internet access, vital services such as public water supplies and sewer treatment facilities, and includes an area's transportation system such as airports, heliports; highways, bridges, tunnels, roadbeds, overpasses, railways, bridges, rail yards, depots; and waterways, canals, locks, seaports, ferries, harbors, drydocks, piers and regional dams (FEMA).

Intrusion detection system – any one of various electronic means to detect or thwart hacking attempts not unlike antivirus programs

Invasive species – any species of insects, animals, plants and pathogens, including its seeds, eggs, spores, or other biological material capable of propagating that species, that is not native to that ecosystem (invasive.org)

Ionizing – adding an electrical charge to atoms; lightning ionizes the air

IDALS – Iowa Department of Agriculture and Land Stewardship

IDNR – Iowa Department of Natural Resources

Jet stream – fast flowing, narrow current of air located 6 to 9 miles above the earth's surface

Karst subsidence – the effect of water dissolving of particular soils that lead to surface depressions or sink holes

Kniffen Silt Loam – deep, poorly drained soils generally found in loess with varying slopes between 2 to 9%; a National Resource Conservation Service soil category

La Nina – A cooling of the ocean surface off the western coast of South America, occurring periodically every 4 to 12 years and affecting Pacific and other weather patterns (Dictionary.com)

Land cover – the composition of vegetation or human built environment that occupies horizontal space

Land uses – classifications of how land is used in a given space including farmland, forests, water bodies, or urban areas; also a system of classifications used in zoning ordinances

Linguistically isolated – census designation for households meaning that all members of the household age 14 and above have some difficulty with the English language

Loam – soils composed of a mixture of sand, clay, silt, and organic matter (Dictionary.com)

Logarithmically – mathematical indication that for each increment beyond a set point the number or magnitude increases or decreased significantly

Low-risk hazards – hazards that are determined by the Mystic Planning Committee to pose a low risk to the community and of low priority for developing projects or policies to address

Lyme Disease – an inflammatory disease caused by tick bites by infected ticks that leads to joint swelling, rash, fever, and sometimes more severe symptoms

Magnitude – size or extent

Malaria – part of a set of tropical diseases characterized by fever, sweating, and chills transmitted to humans by mosquitoes

Maximum Threat – the spatial extent of the community that might be impacted

Median – statistical convention of indicating that half of the data is higher and half of the data is lower than this number; the median number does not necessarily mean the average though it can be the same

Meteorlogic drought – drought which refers to precipitation deficiency

Methamphetamine – a central nervous system stimulant used to clinically treat certain conditions but largely known as an illegal drug produced from a variety of chemical inputs that can cause numerous health problems or even death from any given use, including the first

Microbursts – a sudden, violent downdraft of air over a small area. Microbursts are difficult to detect and predict with standard weather instruments and are especially hazardous to airplanes during landing or takeoff (Dictionary.com)

Micro-meteorological – meteorological conditions affecting a small area

Microorganisms – living organisms that require a microscope to view including bacteria and protozoan

Mine subsidence – mine collapses or cave-ins leading to depressions or sink holes on the surface

Mitigation – any sustained action taken to reduce or eliminate long-term risk to human life and property from a hazard event. Mitigation, also known as prevention (when done before a disaster), encourages long-term reduction of hazard vulnerability. The goal of mitigation is to decrease the need for response as opposed to simply increasing the response capability (FEMA).

Morbidity – the rate of incidence of a disease; proportion of disease in a particular geographic location (Dictionary.com)

NFIP – National Flood Insurance Program; Federal program created by Congress in 1968 that makes flood insurance available in communities that enact minimum floodplain management regulations in 44 CFR §60.3 (FEMA).

National Registry of Historic Places – listing of historic places including buildings and sites that meet the National Park Service's requirements for protection; historic places are proposed by the local community or private owners

Nitrogen oxides – form of nitrogen found in vehicle exhaust

Non-convective winds – winds that do not transfer heat

Notifiable disease – diseases that are required to be reported to public health authorities due to its danger to human or animal health

NWS - National Weather Service

Octanol – a substance composed of fatty alcohol and carbon atoms found in some essential oils and used in perfumes and flavor constituents

Outbreak – a sudden occurrence or manifestation of something; disease outbreaks are when a disease suddenly happens and spreads rapidly

Pandemic (disease) – a disease that is found through a large population, a widespread disease

Percolate – fluid moving through a porous substance such as water soaking into the soil, also indicating activity or movement

Perpetrator – person responsible for undertaking an action, generally a criminal action

Petroleum – flammable, oily, thick, dark-colored fluid from which various fuel substances are produced including gasoline and kerosene

Plume – a space in soil, water, or air containing pollutants spreading from a defined location

Precipitation – rain or snow

Probability (hazard occurrence) – Likelihood of the hazard event, sometimes without regard to hazard history

Proximity – location in relation to something else

Radioactive fallout – radioactive particles themselves or the settling of radioactive particles to the surface of the earth and other land covers

Reforestation – replanting of trees such as in an area that has been denuded

Rhetoric – use of language to influence others

Rotating blackout – an intentional power outage in order to meet electrical demand when supplies are insufficient

Section – a geographic subdivision under the Public Land Survey; a one-square mile subdivision of a township which is composed of 36 sections, a section can be further divided into "quarters" and "quarter-quarters"

Seismic zone – a designated area where earthquakes and other seismic activity may take place

Severity of Impact – assessment of the severity in terms of fatalities, injuries, property losses, and economic losses

SFHA – Special Flood Hazard Area, also known as the 100-year floodplain shown on FIRMs as a shaded area

SHMT – State Hazard Mitigation Team

Sniping – shooting a firearm from a hidden location

Socio-economic – pertaining to the interaction between economic and social conditions

Speed of Onset – potential amount of warning time available before the hazard occurs

Strong frontal system – a volatile boundary between two masses of air which may produce strong storms

Subsidence – sinking or lowering to a different level; also known as sink holes

Superfund Sites – a location designated by the Federal Government for toxic waste clean-up

Surface-level ozone – ozone found near the surface of the earth rather than in the upper atmosphere, also known as smog

Tectonic – pertaining to the structure of the earth

Threatened (species) – a species that is determined to be in threat of extinction throughout all or a significant portion of its habitat unless action is taken

Topography – detailed description of a specific place including the shape of the land, where the highs and lows are, and how hills are shaped

Tributary – a creek or stream that feeds into a larger creek or stream or a river

USDA – U.S. Department Agriculture

Updraft – upward current of warm, moist air which can form cumulonimbus clouds

Urbanization – the conversion of agricultural or wild lands to human developed, urban environment

Vaccination – a shot or other delivery method of incapacitated disease to boost immunity to the disease

Vandalism – deliberate or mischievous destruction or alterations of another's property

Vulnerability – measure of the percentage of people and property that would be affected by the hazard event

Watch vs. warning – The National Weather Service uses a watch to indicate that conditions are right for a given storm to develop while warning indicates that a given storm is in the area; these classifications are applied to tornadoes, winter storms, thunderstorms, and other weather events

West Nile Virus – a virus that is found mostly in birds but can be transmitted to humans by mosquitoes that manifests as flu-like symptoms, the virus can lead to meningitis or encephalitis; there is currently no known treatment

Wind chill – the apparent temperature experienced by the human body taking into account wind speed and actual air temperature

11. Glossary

Note: most definitions contained here are derived from Dictionary.com and other internet searches; some are based on FEMA or Iowa Department of Homeland Security and Emergency Management information. Where exact language is used, the source is cited following the definition.

100-year flood plain – area in which the chance of a flood occurring in any given year is 1% independent of any other year; this is statistically about once every 100 years, this does not mean that if there is not a flood this year that next year the chance goes up to 2%

500-year flood plain – the area in which the chance is .2% chance of a flood occurring in any given year independent of any other year; this is statistically about once every 500 years this does not mean that if there is not a flood this year that next year the chance goes up to .4%

Acceptable risk hazards – hazards that have been determined by the Mystic Planning Committee to be low priority for mitigation strategies and projects to the point of no actions or steps are worth taking currently

Acute shortage (energy) – severe shortage in energy resources or supplies

Aerosol – a liquid or gas under compression to be dispensed as a spray or foam

Agricultural drought – drought which refers to soil moisture deficiencies

Anhydrous ammonia – a hazardous substance that is used for industrial and commercial purposes and as a fertilizer lacking water which separates it from ammonia hydroxide

Anticholinergics – a class of medications that blocks nerve sensations and treat a variety of conditions including asthma, muscle spasms, and gastrointestinal cramps among others

Appurtenant – legal term describing something that goes along with or belongs to something else

Aquifer – an underground layer of porous rock or soils such as sand or gravel from which water can be drawn from

Asphyxiation – suffocation, choking, smothering

Asthma – respiratory disorder characterized by wheezing, coughing, labored breathing

Atmospheric carbon – carbon monoxide; gaseous carbon in the air, some of which is naturally occurring while some is the result of fossil fuel and wood combustion

Bio-Detection Systems (BDS) – a way to detect pollutants or organic compounds in the air or other substances

Bioterrorism – the use of biological agents against persons or property in violation of the criminal laws of the United States for purposes of intimidation, coercion or ransom

Blizzard conditions – heavy or prolonged snowstorm characterized by reduced visibility and strong winds

Bottled Fuels – this Census designation is being used in this plan to include the Census designation as well as Fuel Oil and Kerosene; the Census designation “bottled fuels” refers largely to LP gas

Block Group – the smallest census designated area other than for small incorporated areas; many cities contain multiple block groups, which are smaller delineations of blocks which comprise census tracts, some small cities may occupy a small part of a block group however

California Encephalitis – a strain of encephalitis first discovered in California characterized by dizziness, lethargy, headache, fever, seizures, and brain swelling that is transmitted by infected mosquitoes

Cascading Event Matrix – a tool provided by FEMA for ranking hazards in relation to one another including the impacts of one hazard on others or causal relationship between multiple hazards

Cell, storm – a storm cell is the smallest unit of a storm system characterized as an air mass formed by a convective loop

Clandestine – secret or concealed, also related to under-cover law enforcement operations

Coercion – use of force through intimidation or use of power to gain a certain behavior or outcome

Continental climate – a climate region that has cold enough temperatures in the winter to sustain snow and moderate precipitation mainly in the warmer months

Convective (loop or winds) – a meteorological term indicating the transfer of heat in the atmosphere such as by updrafts

Cumulonimbus – clouds that are characterized by large, dense “towers” that are associated with producing thunderstorms, also called Thunderheads or Thunderclouds

Deforestation – removal of a stand of trees

Delimit – marking or setting the outer limits or boundaries of something

Delineate – outline, mark, or define apart from something else, also see Delimit

Demographics – statistical data about a population including age, total population, income, housing status; information found in the US Census

Desertification – the process of an area converting to desert through depletion of vegetation, usually through over-exploitation by animals and / or humans and drought

Disease vector – in epidemiology a vector is a medium or species that carries or transmits diseases, a common disease vector may be mosquitoes

Doppler radar – radar that tracks the speed and direction of something measured

Downburst winds – strong winds that flow downward from cumulonimbus clouds usually associated with intense thunderstorms

Downdrafts – strong downward winds

El Nino – warm ocean currents that develop after December off of the coast of Peru and Ecuador that are sometimes associated with catastrophic storms

Emerald Ash Borer – an exotic invasive species that has been killing ash trees in Michigan, Illinois, Pennsylvania, Ohio, Indiana, and Maryland

Endangered (species) – a species that is determined to be in eminent threat of extinction throughout all or a significant portion of its habitat

Endemic – natural or characteristic, belonging to a particular location

Epidemics – rapidly spreading or extensively found in a population

Epidemiology – branch of medicine dealing with how diseases spread

Erosion – the process of soil or rock being worn away through abrasion, corrosion, or other means

Essential Facility – Elements that are important to ensure a full recovery of a community or state following a hazard event. These would include: government functions, major employers, banks, schools, and certain commercial establishments, such as grocery stores, hardware stores, and gas stations (FEMA).

Evapotranspiration – the process of transferring moisture from the earth to the atmosphere through evaporation and plant transpiration

Event – the occurrence of a storm or hazard

Fauna – animal life

Flood hazard area – The area shown to be inundated by a flood of a given magnitude on a map; the land area covered by the floodwaters of the base flood is the Special Flood Hazard Area (SFHA) on NFIP maps. The SFHA is the area where the NFIP's floodplain management regulations must be enforced and the area where the mandatory purchase of flood insurance applies (FEMA).

flood plain – area along a stream or river where flooding is a natural occurrence: flood plains can change over time based on changing conditions upstream such as urban development, dam or levee constructions, and other human actions

Flood zones – Flood hazard areas identified on the Flood Insurance Rate Map are identified as a Special Flood Hazard Area (SFHA). SFHA are defined as the area that will be inundated by the flood event having a 1-percent chance of being equaled or exceeded in any given year. The 1-percent annual chance flood is also referred to as the base flood or 100-year flood. SFHAs are labeled as Zone A, Zone AO, Zone AH, Zones A1-A30, Zone AE, Zone A99, Zone AR, Zone AR/AE, Zone AR/AO, Zone AR/A1-A30, Zone AR/A, Zone V, Zone VE, and Zones V1-V30. Moderate flood hazard areas, labeled Zone B or Zone X (shaded) are also shown on the FIRM, and are the areas between the limits of the base flood and the 0.2-percent-annual-chance (or 500-year) flood. The areas of minimal flood hazard, which are the areas outside the SFHA and higher than the elevation of the 0.2-percent-annual-chance flood, are labeled Zone C or Zone X (unshaded) (FEMA).

Floodway – A "Regulatory Floodway" means the channel of a river or other watercourse and the adjacent land areas that must be reserved in order to discharge the base flood without cumulatively increasing the water surface elevation more than a designated height. Communities must regulate development in these floodways to ensure that there are no increases in upstream flood elevations. For streams and other watercourses where FEMA has provided Base Flood Elevations (BFEs), but no floodway has been designated,

the community must review floodplain development on a case-by-case basis to ensure that increases in water surface elevations do not occur, or identify the need to adopt a floodway if adequate information is available (FEMA).

Floodway fringe – the area surrounding a floodway

Flora – plant life

Foot and Mouth Disease – a severe and contagious disease found in cows, sheep, hogs, and other hoofed animals "characterized by vesicular eruptions in the mouth and about the hoofs, teats, and udder" (Dictionary.com)

Frost/freeze advisory – National Oceanic and Atmospheric Administration convention of indicating when a frost or hard freeze is possible for an area

Frostbite – injury caused by extreme cold or frost

Fujita Scale – Rates Tornado with numeric values from F0 to F5 based on tornado wind speed and damage sustained. An F0 indicates minimal damage such as broken tree limbs or signs, while and F5 indicated severe damage sustained (FEMA).

Functionally obsolete (bridges) – bridges that due to changing technology, lack of improvement, or deteriorating conditions are obsolete, this includes width of bridges

Funnel cloud – a rapidly rotating funnel-shaped cloud extending downward from the base of a cumulonimbus cloud, which, if it touches the surface of the earth, is a tornado or waterspout (Dictionary.com).

Gradient winds - horizontal wind velocity tangent to the contour line of a constant pressure surface (or to the isobar of a geopotential surface) at or above 2,500 feet (762 meters) (Allwords.com).

Hacking – breaking into another's computer illegally, also to skillfully write or alter a computer program

Half-life – the time it takes for one-half of the radioactive atoms of a substance to disintegrate

Hazardous substance – a substance that poses a threat to human, animal, or environmental health

Hazardous Materials – see Hazardous substance

HazMat – short-hand for Hazardous Materials, also used as HazMat Team to indicate the trained professionals that respond to release of hazardous substances

Heat index – a number in degrees Fahrenheit that tells how hot it really feels when relative humidity is added to the actual air temperature

High-risk hazards – hazards that are determined by the Mystic Planning Committee to pose the most risk to the community and of priority for developing projects or policies to address

Hijack – to forcefully take

Historical Occurrence – the number of times that a hazard has occurred in the community in the past

Horizontal peak gravity acceleration – a measure of how hard the earth shakes in a given area

Housing stock – the collective set of housing units in a given area, often a city or neighborhood

Housing unit – a single collection of rooms occupied by a family or household (conventional or unconventional) such as an apartment, a house, a mobile home, or a condo unit

Hydrocarbon – organic compounds composed of both hydrogen and carbon such as benzene or methane

Hydrological drought – drought which refers to declining surface water and groundwater supplies

Hypothermia – below normal body temperature

Ice jam – an obstruction of a waterway by pieces of ice

Impoundment – a body of water created by an obstruction such as a dam

Influenza – the common flu and variations of the flu

Infrastructure – Refers to the public services of a community that have a direct impact on the quality of life. Infrastructure includes communication technology such as phone lines or Internet access, vital services such as public water supplies and sewer treatment facilities, and includes an area's transportation system such as airports, heliports; highways, bridges, tunnels, roadbeds, overpasses, railways, bridges, rail yards, depots; and waterways, canals, locks, seaports, ferries, harbors, dry-docks, piers and regional dams (FEMA).

Intrusion detection system – any one of various electronic means to detect or thwart hacking attempts not unlike antivirus programs

Invasive species – any species of insects, animals, plants and pathogens, including its seeds, eggs, spores, or other biological material capable of propagating that species, that is not native to that ecosystem (invasive.org)

Ionizing – adding an electrical charge to atoms; lightning ionizes the air

IDALS – Iowa Department of Agriculture and Land Stewardship

IDNR – Iowa Department of Natural Resources

Jet stream – fast flowing, narrow current of air located 6 to 9 miles above the earth's surface

Karst subsidence – the effect of water dissolving of particular soils that lead to surface depressions or sink holes

Kniffen Silt Loam – deep, poorly drained soils generally found in loess with varying slopes between 2 to 9%; a National Resource Conservation Service soil category

La Nina – A cooling of the ocean surface off the western coast of South America, occurring periodically every 4 to 12 years and affecting Pacific and other weather patterns (Dictionary.com)

Land cover – the composition of vegetation or human built environment that occupies horizontal space

Land uses – classifications of how land is used in a given space including farmland, forests, water bodies, or urban areas; also a system of classifications used in zoning ordinances

Linguistically isolated – census designation for households meaning that all members of the household age 14 and above have some difficulty with the English language

Loam – soils composed of a mixture of sand, clay, silt, and organic matter (Dictionary.com)

Logarithmically – mathematical indication that for each increment beyond a set point the number or magnitude increases or decreased significantly

Low-risk hazards – hazards that are determined by the Mystic Planning Committee to pose a low risk to the community and of low priority for developing projects or policies to address

Lyme Disease – an inflammatory disease caused by tick bites by infected ticks that leads to joint swelling, rash, fever, and sometimes more severe symptoms

Magnitude – size or extent

Malaria – part of a set of tropical diseases characterized by fever, sweating, and chills transmitted to humans by mosquitoes

Maximum Threat – the spatial extent of the community that might be impacted

Median – statistical convention of indicating that half of the data is higher and half of the data is lower than this number; the median number does not necessarily mean the average though it can be the same

Meteorlogic drought – drought which refers to precipitation deficiency

Methamphetamine – a central nervous system stimulant used to clinically treat certain conditions but largely known as an illegal drug produced from a variety of chemical inputs that can cause numerous health problems or even death from any given use, including the first

Microbursts – a sudden, violent downdraft of air over a small area. Microburst's are difficult to detect and predict with standard weather instruments and are especially hazardous to airplanes during landing or takeoff (Dictionary.com)

Micro-meteorological – meteorological conditions affecting a small area

Microorganisms – living organisms that require a microscope to view including bacteria and protozoan

Mine subsidence – mine collapses or cave-ins leading to depressions or sink holes on the surface

Mitigation – any sustained action taken to reduce or eliminate long-term risk to human life and property from a hazard event. Mitigation, also known as prevention (when done before a disaster), encourages long-term reduction of hazard vulnerability. The goal of mitigation is to decrease the need for response as opposed to simply increasing the response capability (FEMA).

Morbidity – the rate of incidence of a disease; proportion of disease in a particular geographic location (Dictionary.com)

Munitions – weapons and military material

NFIP – National Flood Insurance Program; Federal program created by Congress in 1968 that makes flood insurance available in communities that enact minimum floodplain management regulations in 44 CFR §60.3 (FEMA).

National Registry of Historic Places – listing of historic places including buildings and sites that meet the National Park Service's requirements for protection; historic places are proposed by the local community or private owners

Nitrogen oxides – form of nitrogen found in vehicle exhaust

Non-convective winds – winds that do not transfer heat

Notifiable disease – diseases that are required to be reported to public health authorities due to its danger to human or animal health

NWS - National Weather Service

Octanol – a substance composed of fatty alcohol and carbon atoms found in some essential oils and used in perfumes and flavor constituents

Outbreak – a sudden occurrence or manifestation of something; disease outbreaks are when a disease suddenly happens and spreads rapidly

Pandemic (disease) – a disease that is found through a large population, a widespread disease

Percolate – fluid moving through a porous substance such as water soaking into the soil, also indicating activity or movement

Perpetrators – person responsible for undertaking an action, generally a criminal action

Petroleum – flammable, oily, thick, dark-colored fluid from which various fuel substances are produced including gasoline and kerosene

Plume – a space in soil, water, or air containing pollutants spreading from a defined location

Precipitation – rain or snow

Probability (hazard occurrence) – Likelihood of the hazard event, sometimes without regard to hazard history

Proximity – location in relation to something else

Radioactive fallout – radioactive particles themselves or the settling of radioactive particles to the surface of the earth and other land covers

Reforestation – replanting of trees such as in an area that has been denuded

Rhetoric – use of language to influence others

Rotating blackout – an intentional power outage in order to meet electrical demand when supplies are insufficient

Section – a geographic subdivision under the Public Land Survey; a one-square mile subdivision of a township which is composed of 36 sections, a section can be further divided into "quarters" and "quarter-quarters"

Seismic zone – a designated area where earthquakes and other seismic activity may take place

Severity of Impact – assessment of the severity in terms of fatalities, injuries, property losses, and economic losses

SHMT – State Hazard Mitigation Team

Sniping – shooting a firearm from a hidden location

Socio-economic – pertaining to the interaction between economic and social conditions

Speed of Onset – potential amount of warning time available before the hazard occurs

Strong frontal system – a volatile boundary between two masses of air which may produce strong storms

Subsidence – sinking or lowering to a different level; also known as sink holes

Superfund Sites – a location designated by the Federal Government for toxic waste clean-up

Surface-level ozone – ozone found near the surface of the earth rather than in the upper atmosphere, also known as smog

Tectonic – pertaining to the structure of the earth

Threatened (species) – a species that is determined to be in threat of extinction throughout all or a significant portion of its habitat unless action is taken

Topography – detailed description of a specific place including the shape of the land, where the highs and lows are, and how hills are shaped

Tributary – a creek or stream that feeds into a larger creek or stream or a river

USDA – U.S. Department Agriculture

Updraft – upward current of warm, moist air which can form cumulonimbus clouds

Urbanization – the conversion of agricultural or wild lands to human developed, urban environment

Vaccination – a shot or other delivery method of incapacitated disease to boost immunity to the disease

Vandalism – deliberate or mischievous destruction or alterations of another's property

Vulnerability – measure of the percentage of people and property that would be affected by the hazard event

Watch vs. warning – The National Weather Service uses a watch to indicate that conditions are right for a given storm to develop while warning indicates that a given storm is in the area; these classifications are applied to tornados, winter storms, thunderstorms, and other weather events

West Nile Virus – a virus that is found mostly in birds but can be transmitted to humans by mosquitoes that manifests as flu-like symptoms, the virus can lead to meningitis or encephalitis; there is currently no known treatment

Wind chill – the apparent temperature experienced by the human body taking into account wind speed and actual air temperature