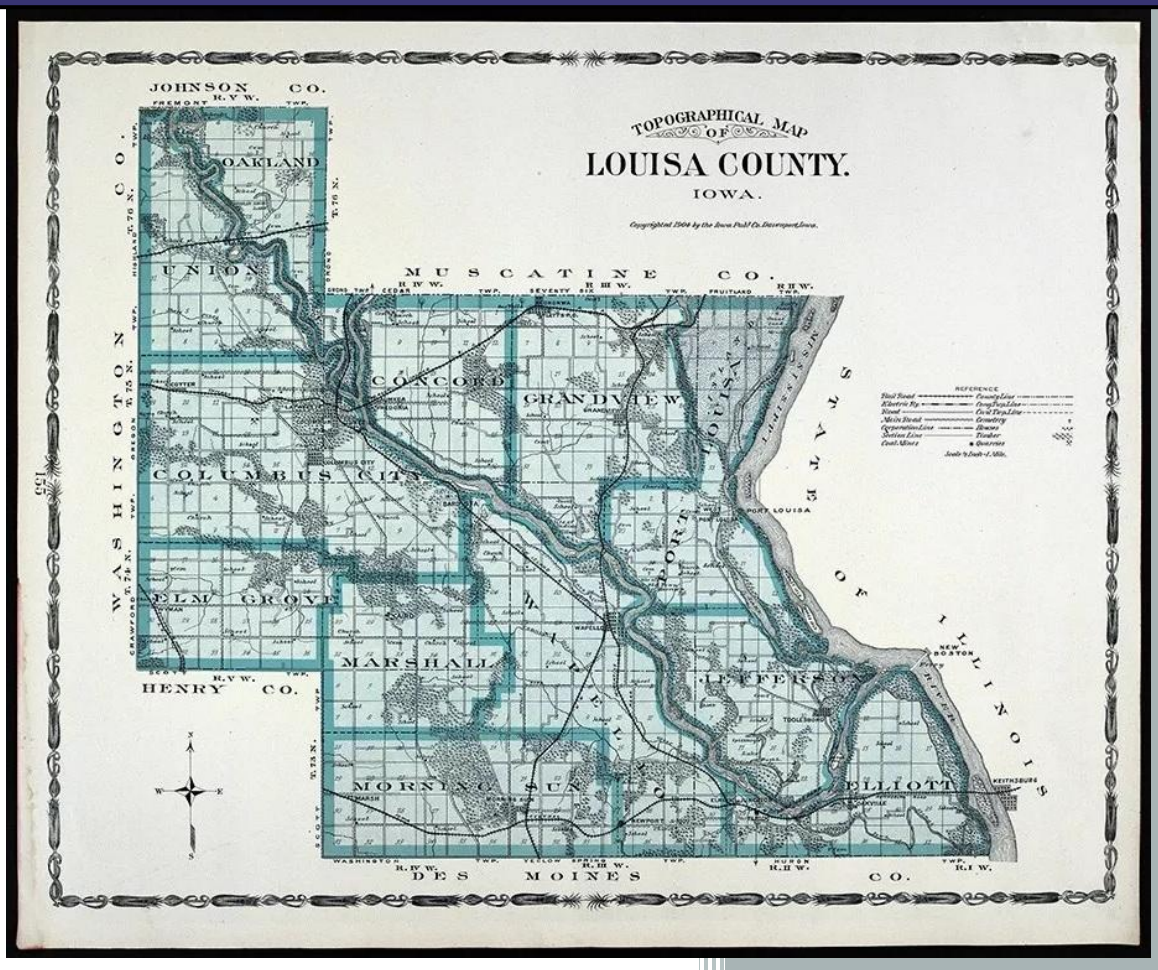
2026

Multi-Jurisdictional Hazard Mitigation Plan



11/11/2026

Louisa County Iowa

A Multi-jurisdictional

Hazard Mitigation Plan

The purpose of Hazard Mitigation Planning is to improve the health, safety and welfare of the citizens of Louisa County through development of effective strategies that can be implemented to mitigate the negative effects of known hazards.

This Plan was produced by Southeast Iowa Regional Planning Commission (SEIRPC) with the combined efforts of the Federal Emergency Management Agency (FEMA), the Iowa Department of Homeland Security and Emergency Management (HSEM), the Citizens of Louisa County, Louisa County Emergency Management, the Louisa County Supervisors, Cities of Columbus City, Columbus Junction, Cotter, Fredonia, Grandview, Letts, Morning Sun, Oakville, and Wapello. Participating schools are Columbus Junction Community School District, Louisa-Muscatine Community Schools, Morning Sun Community Schools and Wapello Community Schools.

Thank you to all who participated.

US Census Facts:

For Planning purposes, we rely on two types of data produced by the US Census Bureau.

The standard for Total Population is the Decennial Census, taken at ten year intervals, such as years 2010 and 2020.

The second type of Census data we use is the American Community Survey (ACS), which is a more detailed count for a variety of subjects and is produced at 1 and 5 year intervals.

Most statistics relevant to planning topics were transferred to the ACS in 2005, when it replaced the decennial census long form (US CensusB, 2022).

2025 Census estimates are not yet available. Therefore, we use 2024 ACS 5-year estimates for consistency within this document. This creates a situation where numbers may not perfectly match. General demographic conclusions remain valid.

For questions about this or other sources of information used in this plan, please refer to the bibliography or call Gail Thomas at the planning office:
(641) 233-8942.

Cover Photo:
1904 Huebinger Iowa Map
Louisa County

Table of Contents

Table of Contents 1
Hazard Mitigation Planning 3
Introduction 4
Brief History 4
Louisa County Comprehensive Plan 5
Geography 5
Transportation 12
Louisa County Statistics 16
Section A: The Planning Process 22
Plan Structure 22
A1. How the plan was prepared 22
A3. Public Participation and Feedback 27
A4. Other plans and references 28
Section B: Risk Assessment 29
B1. Identified Hazards 29
B1-a-f Profiled Hazards 33
Drought 33
Flood 40
B2-c Repetitive Loss Properties 58
Severe Thunderstorms 62
Hail 62
High wind 66
Lightning 70
Tornado 74
Wildfire 79
Winter Weather 86
Dam or Levee Failure 92
Landslide 105
Animal, Crop, Plant Disease 107
Hazardous Materials Incident 114
Human Epidemic or Pandemic 123
Terrorism 128

Section C: Mitigation Strategy 132
C1. Municipal Capability Assessment 132
C1. School district Capability Assessment 138
C3.a Mitigation Goals 140
C4. Analysis of a comprehensive range of actions/projects 140
C5 Action Plan Method 141
Mitigation Action Plan Tables 143
Section D: Plan Maintenance 153
Section E: Plan Update 156
Section F: Plan adoption 158
Section G: Community profiles 158
Schools 181
Public Opinion 190
References 192
Appendices 198
Appendix A – Hazards profiled for Iowa 198
Appendix B – Flood Index, Communities in Louisa County 199
Appendix C – Hazard Impacts on Agriculture 202
Appendix D – Port Louisa Wildlife Refuge 204
Appendix E – Muscatine Louisa Levee 2025 207
Appendix F – Public Survey Instrument 209
Appendix G – Plan Review Worksheets 212
Appendix H – Adoption Resolutions 216
Appendix I – Compliance, Scoring, Mitigation Actions 217
Appendix J – Summary Action Plan 220

Hazard Mitigation Planning

What is Hazard Mitigation Planning?

A hazard is a situation that poses a threat to life, health, prosperity, or the environment of a community. Hazard Mitigation is any sustained action taken to eliminate or reduce the long-term risk to human life and property from natural and technological hazards.

The purpose of a Hazard Mitigation Plan (HMP) is different from an Emergency Operations Plan (EOP). An HMP is intended to reduce the harmful effects of hazards before they happen, while an EOP is designed to be a guide on how to respond to a disaster or emergency.

Disaster Mitigation Act of 2000

According to the Disaster Mitigation Act of 2000, local governments must prepare, adopt, and update a Hazard Mitigation Plan to be eligible for post-disaster FEMA assistance. This plan works to assess risk, decrease impact, and prevent future damage. The organization and contents of this plan are guided by the requirements of the FEMA and input of Louisa County residents.

The development and update of the Louisa County Hazard Mitigation Plan (HMP) is a response to the passage of the Disaster Mitigation Act of 2000 (DMA), which was signed into law on October 30, 2000, with the goal of reducing losses and future public and private expenditures and improving response and recovery from disasters. This act, Public Law 106-390, amended the Robert T. Stafford Relief and Emergency Assistance Act. The following is a summary of the portions of the DMA that apply to local governments:

- ✓ Local governments and tribal organizations must prepare a multi-hazard mitigation plan to be eligible for funding from the FEMA Pre-Disaster Mitigation Assistance Program and Hazard Mitigation Program.
- ✓ Natural hazards need to be addressed in a risk assessment and vulnerability analysis sections of the multi-hazard mitigation plan. Assessment of human-caused hazards such as hazardous waste spills is encouraged but not required.
- ✓ Authorizes up to seven percent of Hazard Mitigation Grant Program funds available to a state following a federal disaster declaration to be used for development of state, local, and tribal organization multi-hazard mitigation plans.
- ✓ Without an up-to-date multi-hazard mitigation plan, local governments and tribal organizations cannot obtain funds from the Pre-Disaster Mitigation Grant Program

To comply with Section 322 of the Disaster Mitigation Act of 2000 and qualify for future hazard mitigation grant awards, Louisa County must develop a county-wide hazard mitigation plan. The following grant programs require an approved and adopted hazard mitigation plan:

- Hazard Mitigation Grant Program (HMGP)
- Public Assistance Grant Program (PA)
- Pre-Disaster Mitigation Grant Program (PDM)
- Fire Management Assistance Grant Program (FMAG)
- Safeguarding Tomorrow Revolving Loan Fund Program
- Rehabilitation of High Hazard Potential Dam Grant Program (HHPD) (Stafford, 2023)

Introduction

Brief History

Louisa County is in southeastern Iowa. It is bordered by the Mississippi River on the east, Des Moines County to the south, Muscatine County and Johnson County to the north and Henry County and Washington County on the west.

From the 2020 Louisa County HMP:

> The land area now known as Louisa County Iowa was initially in the Keokuk reserve portion of the Black Hawk Purchase in the Treaty of 1832. The Keokuk reserve was then ceded to the U.S. by a treaty made on the banks of the Mississippi River on September 28, 1836. Representatives of the Sac and Fox Indians were in attendance, and the treaty was signed by Chief Wapella, Powasheek, Keokuck, and Pashapahoo.
>
> The first log cabin in the county is said to have been constructed in 1832. When the county was established December 7, 1836, it was still part of the Wisconsin Territory. November 17, 1836 Des Moines County was divided into six counties of which Louisa County was one. There is some controversy over the origination of Louisa County's name. One story has the county being given the name in honor of Louisa Massey. Louisa Massey was a 16-year-old girl from Dubuque who came to Louisa County to avenge the murder of her brother. She killed her brother's murderer and was seen as a heroine. A second story has the county being given the name Louisa in honor of Louisa County, Virginia due to the influence of Wisconsin legislators who were from Virginia.
>
> The population of Louisa County was 4,939 in 1850, 10,805 in 1860, and 12,855 in 1910. Early commerce and transportation involved navigation on the Cedar and Iowa Rivers. In July 1855 the Mississippi & Missouri Railroad Company completed an east west route through Lettsville, Fredonia, Columbus Junction and Cotter. Other railroads soon followed including the Cedar Rapids and Burlington Railway Company with a north south route through Morning Sun, Wapello, Bard, and Columbus Junction. The rise of rail in Louisa County slowly took over the river navigation.

National Register of Historic Places

There are 10 properties listed on the National Register of Historic Places in the county.

Historic Places in Louisa County	Date listed	Location
Bethel Church	February 22, 1979	Northeast of Morning Sun off US 61
Community Building	August 14, 1973	122 E. Maple St. Columbus Junction
Fairview Church and Cemetery	November 28, 2023	11501 Co Rd H22 Wapello vicinity
Commercial Hotel	August 30, 2001	227 N. Main St. Wapello
County Line Bridge	May 15, 1998	140th block of County Line Rd. over Long Creek, Columbus Junction
Florence Council On the Iowa Site	December 27, 1978	At the former site of the village of Florence Oakville
Gipple's Quarry Bridge	May 15, 1998	100 block of V Ave. over Buffington Creek Columbus Junction
Louisa County Courthouse	July 2, 1981	Main St., Wapello

Mellinger Memorial Library	September 16, 2024	11 East Division Street, Morning Sun
Toolesboro Mound Group	October 15, 1966	6568 Toolesboro Rd., Toolesboro

Louisa County Comprehensive Plan

Louisa County adopted a Comprehensive Plan in 2022, developed by Southeast Iowa Regional Planning Commission (SEIRPC). The reader is referred to that Plan for more detail on topics such as: Current and Projected Land Use, Housing, Economic Development, Education, Transportation, Quality of Life, County Facilities, Utilities and Infrastructure, Natural Environment & Agriculture.

Some of the information in this document is replicated from that plan with permission. That material is indicated by reference. A print copy of the Louisa County 2040 Comprehensive Plan is available at the county offices, while a digital copy may be found on the county website at:

https://louisacountyia.gov/wp-content/uploads/2022/06/Louisa-County-Comprehensive-Plan-6.24.2022.pdf

Geography

According to the U.S. Census Bureau, the county has a total area of 418 square miles, of which 402 square miles is land and 16 square miles (3.8%) is water. The Mississippi River forms its eastern border.

Southeast Iowa lies in the Great Plains. Louisa County is located in the southeastern quadrant of Iowa that is known as Southern Iowa Drift Plain. The region covers most of the southern half of Iowa and was created over 500,000 years ago by ice sheets. The landscape is composed of steeply rolling hills and valleys formed by a network of rivers, rills, and creeks branching across the terrain.

Soils

Louisa County is located on loess-covered glacial till plains. Most of the soils on the uplands were formed in loess under prairie and forest vegetation. In the steeper areas, the soil formed in glacial till under the native tree vegetation. Soils on the nearly level to gently sloping stream terraces and bottom land along the Mississippi and Iowa Rivers formed in alluvium (NRCS, 2024).

Climate

According to the Köppen Climate Classification system, Louisa County has a hot-summer humid continental climate, abbreviated "Dfa" on climate maps. This climate zone has warm to hot humid summers with cold winters. There is no dry season and precipitation is evenly distributed throughout the year.

Temperatures in Louisa County are cold in the winter and hot in the summer. Winters are cold, with January temperatures averaging about 22F, with an average low of 16 degrees F. Summers are warm and humid, with daytime temperatures averaging about 74F (23C) in July. The average maximum is 85 degrees F. Annual precipitation is 37.31 inches, of which 70% occurs during the month of April to September; this is also the annual growing season.

Although most of the annual precipitation falls in the warm months, snowstorms, ice storms and occasional blizzards occur during the winter. Thunderstorms are common in summer. Droughts severe enough to cause widespread crop losses have a 5% chance of occurring in a given year (Iowa, 2023).

Precipitation falls in the form of snow in the winter. Severe winter storms happen regularly each winter, and ice storms less frequently. These storms present risk for power outages caused by falling tree limbs and ice covered power lines. Outages can be localized or widespread; they can be short term or last for

several days or even weeks. During the warm months, rain showers are common and are sometimes heavy. Thunderstorms are of short duration and cause localized damage, while tornadoes can cause a great deal of damage over a large area.

Tornado Alley. Supercell thunderstorms, which can cause violent tornadoes, are common in the Great Plains where warm air from the Gulf of Mexico tends to meet cooler air coming from Canada, creating peak tornado conditions. The region known as Tornado Alley generally encompasses parts of Kansas, Nebraska, Iowa, Oklahoma, and northern Texas.

Landforms

The Southern Iowa Drift Plain covers roughly the lower half of Iowa. There are numerous glacial deposits remaining from the passage of ice sheets. The land surface is characterized by steep rolling hills, level alluvial lowlands, and table-like upland divides created by streams eroding the glacial deposits. There are areas where loess is present primarily found in the uplands and upper portions of hill slopes. Louisa County's landscape is continually evolving with a significant amount of erosion and weathering.

"Southern Iowa Drift Plain summits always seem to return to a uniform elevation, a clue to their geologic origins. These even-topped uplands disclose the approximate level of the original, once-continuous land surface constructed by the last ice sheet to pass this way. Every hillslope and valley floor mark the extent of erosion into the old glacial plain. The space between hills emphasizes the great amount of material that has been removed and the hundreds of thousands of years this process has taken" (Prior, 1991).

For more information of the formation of the Southern Iowa Drift Plains over time, see the Iowa Geological survey at:
https://iowageologicalsurvey.uiowa.edu/iowa-geology/landforms-iowa/southern-iowa-drift-plain

Land Use

The county has excellent soil for a variety of agricultural uses. Corn and Soybeans are the chief crops with some truck crops of tomatoes, melons, potatoes, and sweet corn grown in the northeast and northwest parts of the county. Hogs are the main livestock.

Approximately 72% of the county's acreage is used for agricultural purposes (188,748 acres), 85% of which is cropland, 2% is pasture and 7% is forested. Conservation and recreational land uses are about 25% of the county and retain natural functions, in the form of forests, wetlands, or wooded stream corridors. Housing occupies less than 2% of total land surface in the county (SEIRPC, 2022) & (AG Census, 2022).

Land use in Louisa County is managed through zoning and subdivision ordinances to regulate land use.

Surface Water

Rivers in Louisa County: Cedar River, Iowa River, Mississippi River

Louisa County contains a variety of surface water features, mostly in the form of creeks, recreational lakes, and soil conservation structures. The Iowa River bisects the county and the Cedar River joins it just north of Columbus junction. The Mississippi River forms the eastern boundary of the county.

Creeks in Louisa County: Tributaries of the Iowa River: Goose Creek, Indian Creek, Long Creek, Otter Creek, Short Creek, Smith Creek.

Lakes: Lake Odessa

Flooding is a common occurrence along the Iowa River, which courses near or through the cities of Columbus Junction, Fredonia, Oakville, and Wapello. There are also floodplain areas along the Cedar River, the Mississippi River and numerous other tributaries and streams.

Levee Systems and Drainage Districts

Louisa County contains several areas that fall under the jurisdiction of Levee and Drainage Districts. Levee Districts are responsible for the maintenance of man-made levee systems, for the purpose of protecting life and property (land, buildings, etc.) in the low lying areas that the levees protect from river flooding. Drainage Districts are responsible for maintaining an efficient drainage system that collects and empties surface drainage and storm water within the area protected by the levees. This is accomplished by a series of formal drainage channels that circulate the water toward a pump station along the levee, where it is pumped out and discharged into the river.

Several of the levee and drainage districts cover a comparatively small area, involving levees that are not accredited by FEMA, and which primarily serve to protect farmland in flat, low-lying areas along the Iowa River and its tributaries. Two large areas of the county are protected by accredited levee systems along the Mississippi River – Two Rivers Levee & Drainage District and Muscatine Island Levee District

Recreational areas

Louisa County Conservation manages 18 parks, natural areas, historic sites and water recreation accesses encompassing some 2,589 acres across the county. According to the 2040 Comprehensive Plan, among all 99 counties in Iowa, Louisa County has the 7th highest acreage of public conservation land, at 25,310 acres. This accounts for 10% of the County's total land area, although this includes the surface area of the Mississippi River.

There are two state designated water trails: the Odessa and Iowa River Water Trails.

Port Louisa National Wildlife Refuge

The 24,149 acre Port Louisa National Wildlife Refuge was established for the protection of migratory birds and other wildlife. It is located in Iowa and Illinois along the Mississippi River Flyway, a major route for migrating waterfowl.

Home to more than 270 species of birds, 35 species of amphibians, 60 species of reptiles, 100 species of fishes, 50 species of mammals and hundreds, if not thousands, of species of plants, fungi and insects.

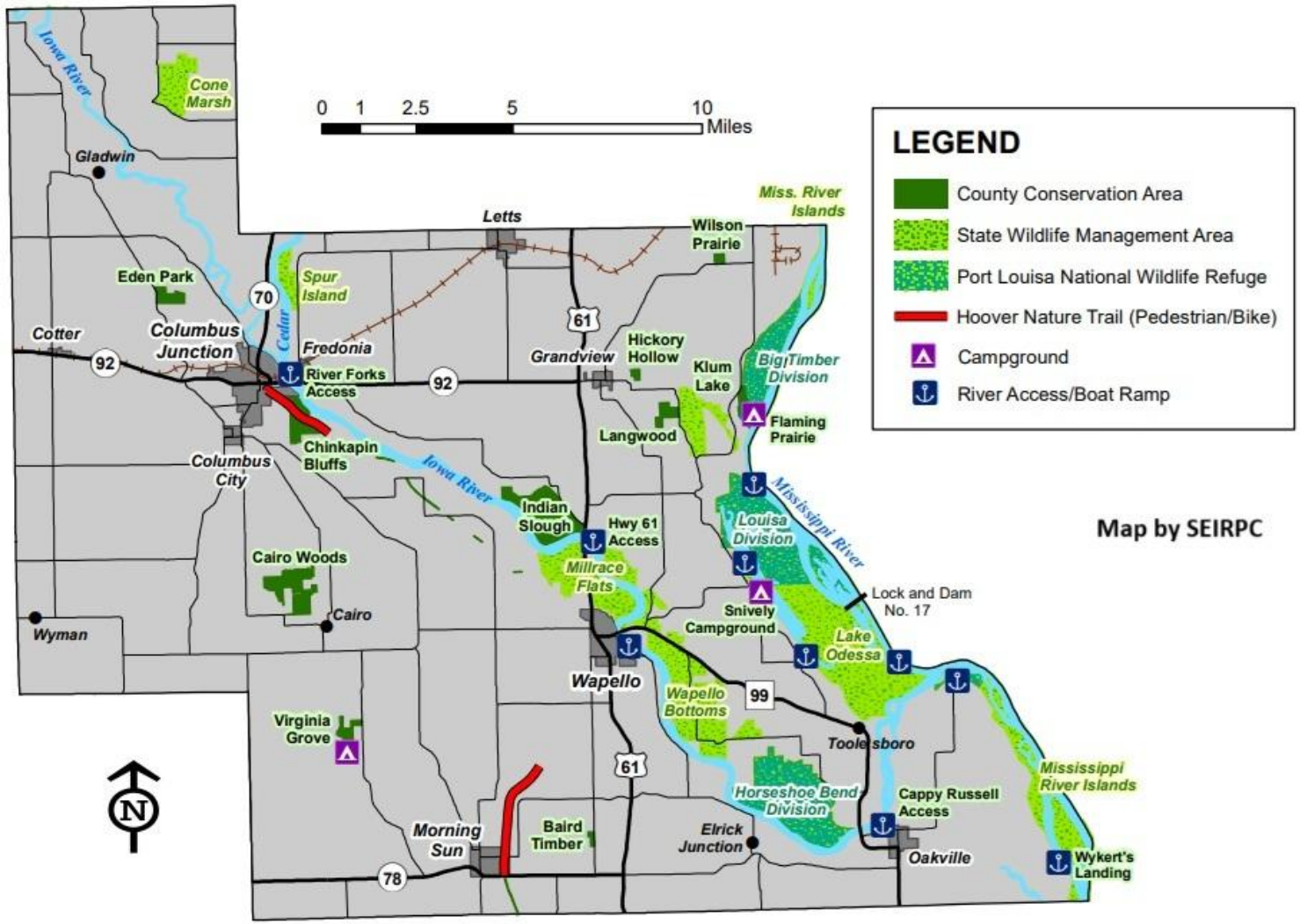
Lake Odessa Wildlife Management Area

The Lake Odessa Wildlife Management Area is a 4,139-acre, Iowa DNR-managed site within a 6,465-acre backwater complex near Wapello, IA, part of the Odessa Wildlife Complex. Renowned for waterfowl hunting and fishing (crappie, catfish), it serves as a major migratory bird habitat along the Mississippi River (Iowa DNR 2025).



Roosting monarch butterflies at Port Louisa National Wildlife Refuge in Iowa, Jessica Bolser/USFWS, Public Domain, https://www.fws.gov/media/roosting-monarch-butterflies-port-louisa-national-wildlife-refuge-iowa

Louisa County Public Conservation Areas



https://louisacountyia.gov/wp-content/uploads/2022/06/Louisa-County-Comprehensive-Plan-6.24.2022.pdf

Odessa Water trail

The Odessa Water Trail is located in the Lake Odessa Wildlife Management Area and extends from the northern part of the Port Louisa National Wildlife Refuge to Toolesboro at the southern end of the Lake Odessa area.

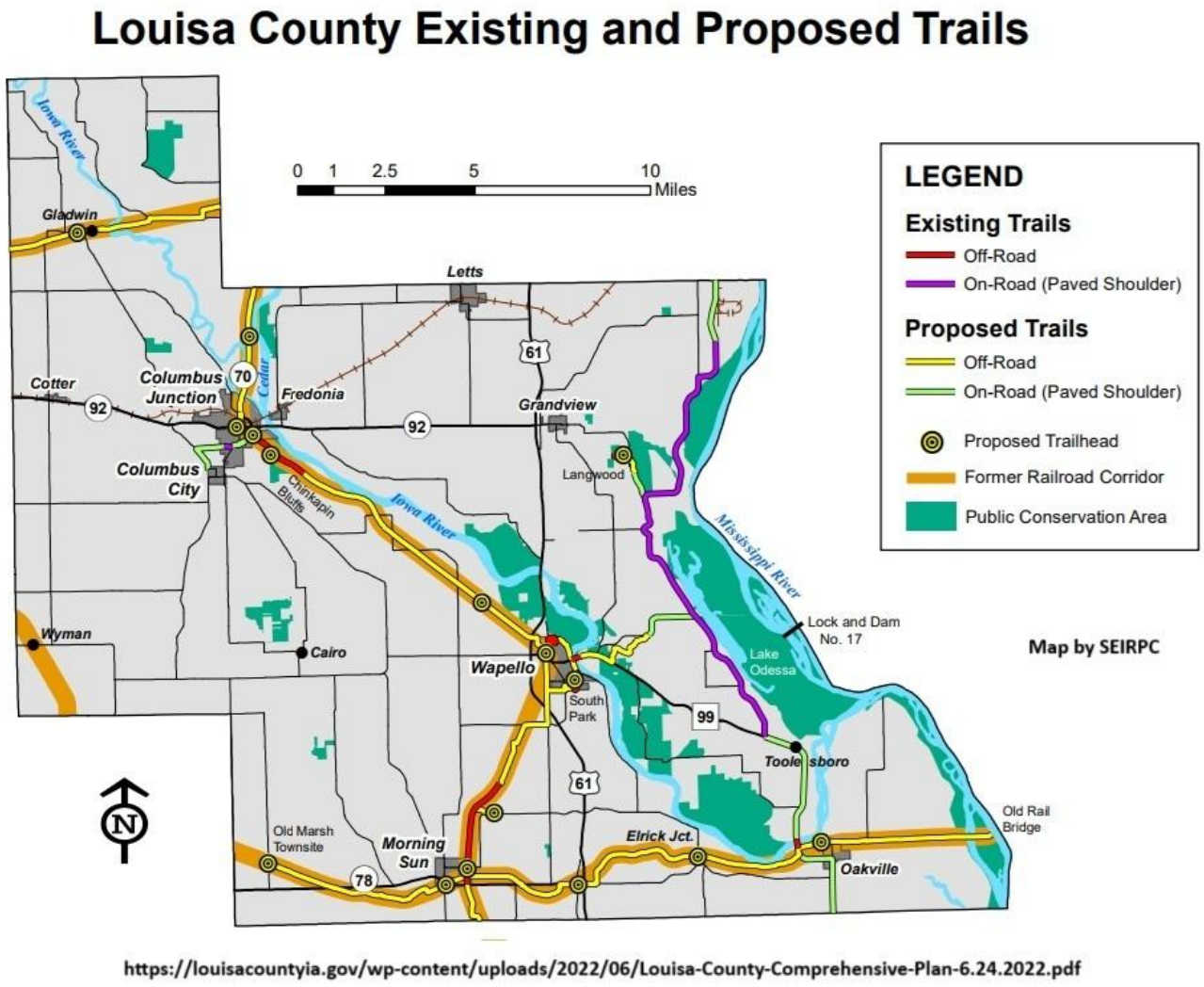


https://www.iowadnr.gov/Things-to-Do/Canoeing-Kayaking/Water-Trail-Maps-Brochures

Iowa River Water Trail

The Iowa River from Iowa City to the Mississippi includes 72 miles of unobstructed paddling, beautiful scenery, wildlife and access points with amenities. taking you from bustling Iowa City and through the small towns of Hills, Columbus Junction, Wapello and Oakville before ending at the Mississippi River. The trail begins at Sturgis Ferry Park in Iowa City (Travel Iowa, 2025).





https://louisacountyia.gov/wp-content/uploads/2022/06/Louisa-County-Comprehensive-Plan-6.24.2022.pdf

Transportation

Primary transportation routes in Louisa County include U.S. Hwy 61 and State Highways 99 & 78. Road maintenance is provided by the Iowa Department of Transportation (DOT) along the major roads in Louisa County.

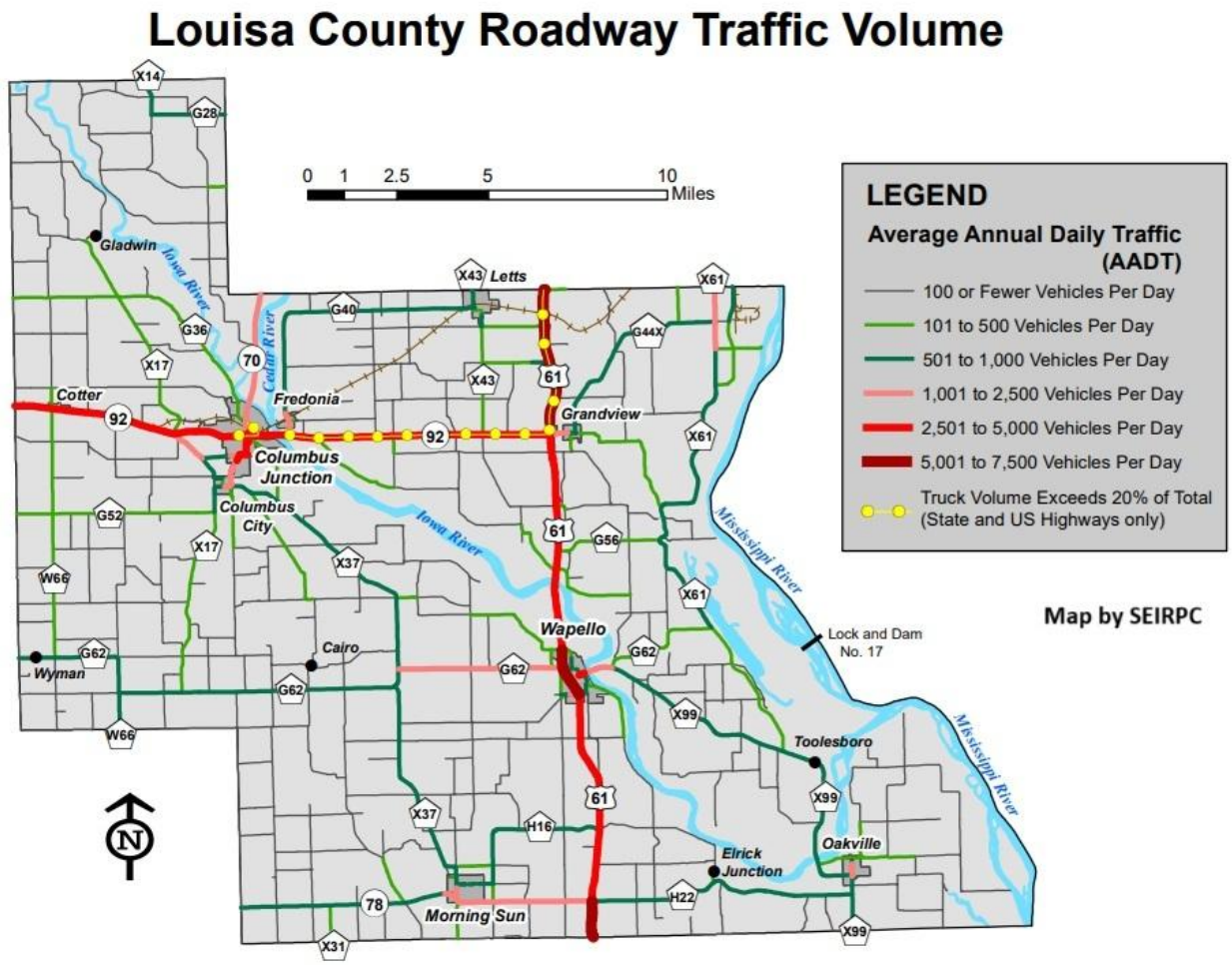
Major highways

- 61 U.S. Highway 61
- 70 Iowa Highway 70
- 78 Iowa Highway 78

County Roads. Louisa County Secondary Roads maintains a total of 590 miles of roadway in the County and 122 bridges in the unincorporated areas of the county. Former highway 92 has become a county road.

Streets. There are an additional 57 miles of roadway that are maintained by the 9 municipalities as city streets.

Bridges. Louisa County has a total of 151 bridges on its public roadway system. Of these, 25 are located on a State or US Highway maintained by the Iowa DOT, 4 are on streets and maintained by a city, and the remaining 122 are maintained by the County Secondary Roads Department (including 2 that are within or adjacent to a city). There are 85 bridges located on roadways designated as an Arterial, Collector, and/or Farm-to-Market road (about 55% of the total) while the remaining 66 bridges are on designated Local Roads.



https://louisacountyia.gov/wp-content/uploads/2022/06/Louisa-County-Comprehensive-Plan-6.24.2022.pdf

Sidewalks & Bicycle Trails

Louisa County has two existing segments of off-road recreational trails in the county, one near Columbus Junction (2 miles) and the other at Morning Sun (3 miles). The Louisa County Trails Master Plan was developed in 2012 to guide expanded recreational trail development.

A map included in the 2022 Louisa County Comprehensive Plan illustrates existing trails, along with a series of proposed on and off-road trail segments from the 2012 Trail Plan. Desirable locations for future trailhead facilities are also identified in that plan.

Public Transportation

SEIBUS (Southeast Iowa BUS) is the regional transit provider for Southeast Iowa, with weekday service provided throughout Des Moines, Henry, Lee, and Louisa Counties. Rides are also offered to medical appointments or shopping in Iowa City. Operated by the Southeast Iowa Regional Planning Commission, scheduling and management are based at the SEIRPC office in West Burlington.

SEIBUS does not have fixed routes. Rides are available to the general public on an on-demand basis, with different schedules for the cities in which buses are stationed. One-way and round-trip fares are offered, along with a monthly pass within individual counties. Buses are equipped with wheelchair lifts.

Airports

The nearest commercial airport service is the Southeast Iowa Regional Airport in Burlington, about 40 miles south of Wapello. A major regional airport is about an hour away in Cedar Rapids (CID), where non-stop flights are available to 14 US destinations. An international airport is in the Quad Cities, also about an hour's drive.

Rail

Freight. According to the Iowa DOT, while rail accounts for only 3 percent of Iowa's 130,000 mile intermodal freight system, it carries 43 percent of Iowa's freight tonnage. The Dakota, Minnesota & Eastern (DME) RR hauls freight through the northern part of Louisa County. Transloading and Interchanges are available at Mount Pleasant, within 30 miles of Wapello.

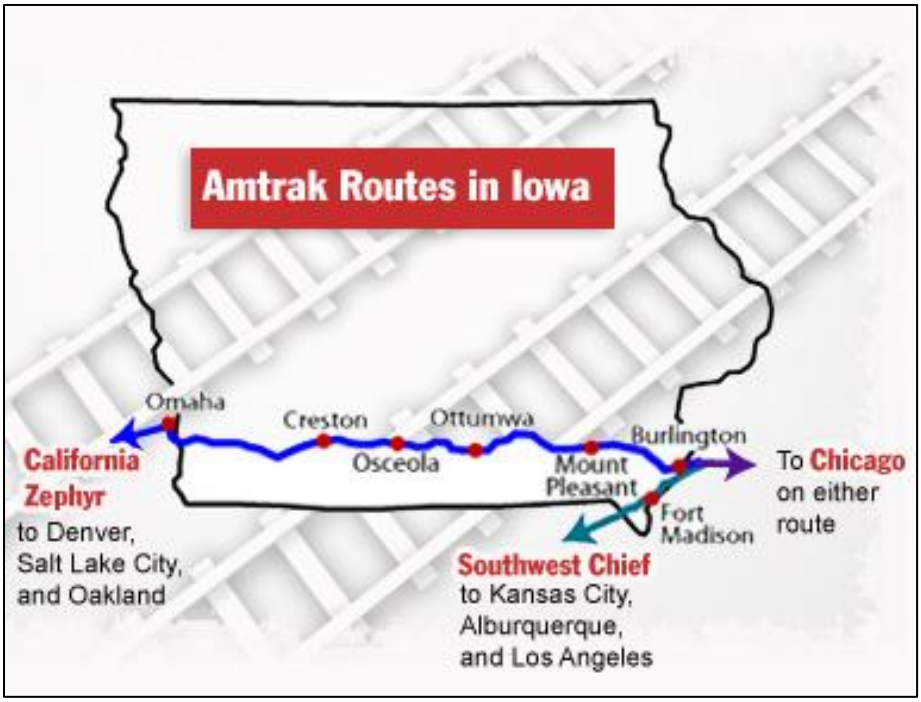
Owned by Canadian Pacific Railway Ltd, the DME is the primary operator on a route from Missouri, through Ottumwa, through the Louisa County Communities of Cotter, Columbus Junction, Fredonia, and Letts, then to Muscatine and on into Illinois.

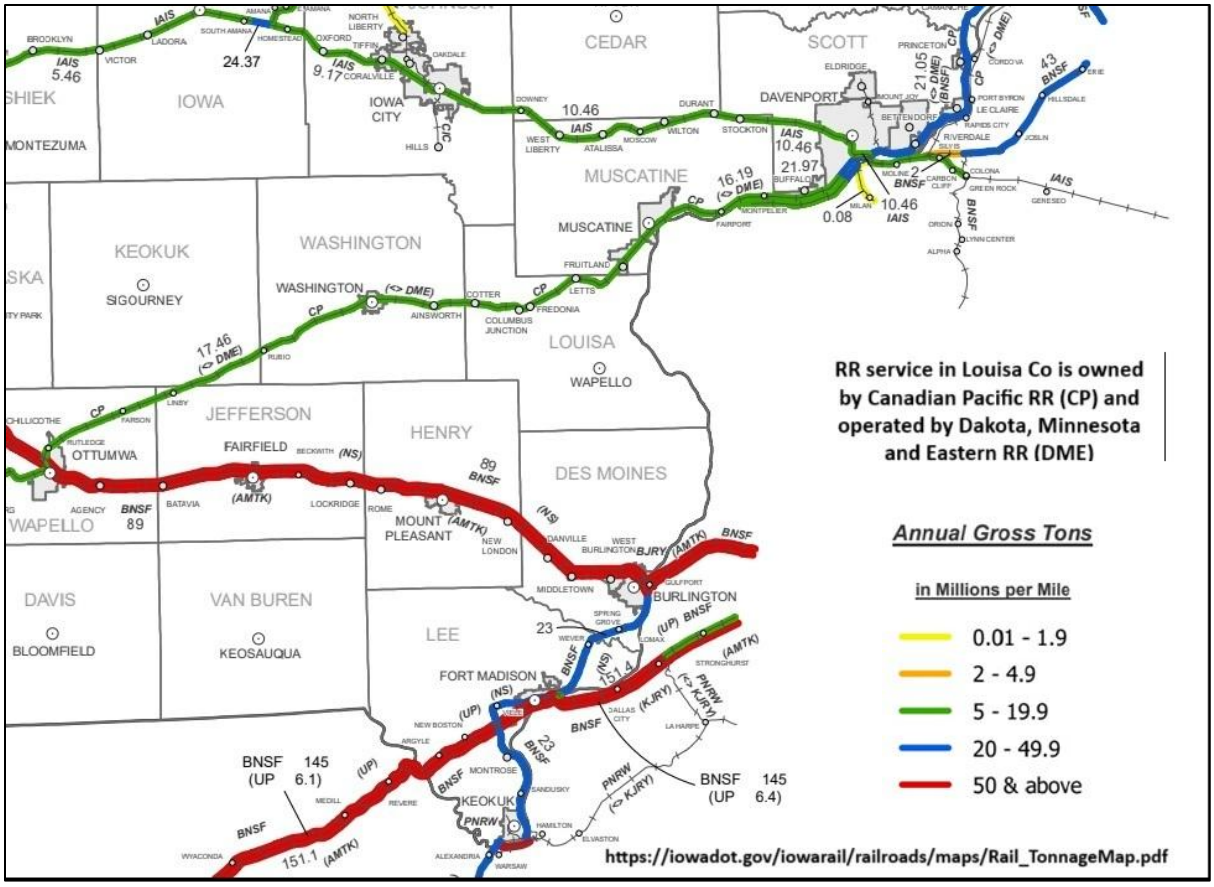
Passenger Rail. There are Amtrak stations available in Mount Pleasant, Burlington and Fort Madison. The Amtrak California Zephyr passes through Henry and Des Moines Counties daily in both directions between Chicago, Illinois and the San Francisco Bay Area serving local and regional destinations along the way. This passenger train carried more than 400,000 passengers in 2025.

Passengers can board the Amtrak Southwest Chief in Fort Madison about an hour south of Wapello. It takes a more southerly route from Chicago through Albuqurque NM to Los Angeles CA. During fiscal year 2025, the Southwest Chief carried 294,359 passengers.

Amtrak 2025	Ridership	Change from previous year
California Zephyr	403,142	+14.8
Southwest Chief	294,359	+12.6

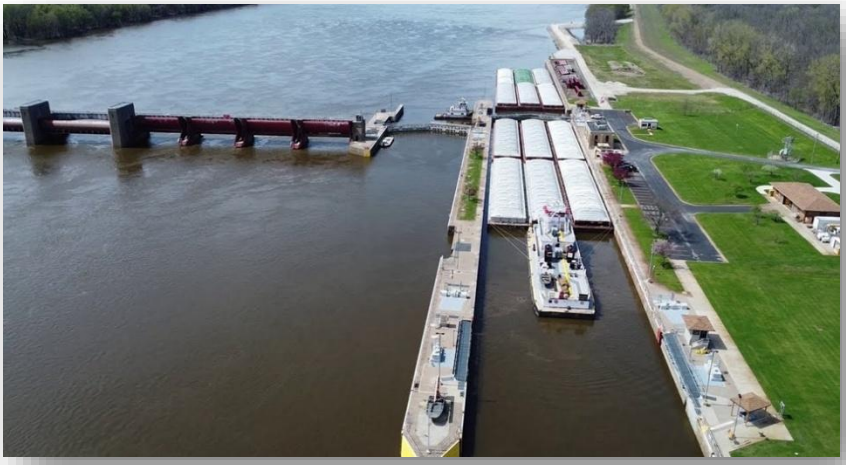
(FY25, 2026)





Water Transportation, Freight

Louisa County is bordered on the east by the Mississippi River. In September 2024, six Eastern Iowa counties jointly signed a resolution to form the Ports of Eastern Iowa Authority. This authority will operate within the Mississippi River Ports of Eastern Iowa and Western Illinois region and will serve six Iowa Counties including Dubuque, Clinton, Jackson, Louisa, Muscatine and Scott. Recognition of the new Authority by the federal government highlights the strategic importance of the region, which now ranks as one of the top 100 U.S. ports by freight tonnage (Roiland, 2024).



The authority focuses on supporting multi-modal transportation (river, rail, road) in partnership with regional manufacturing and logistics industries.

Pipelines

Pipelines are another form of transportation in the county. According to the National Pipeline Mapping Service (NPMS) there are about 146 miles of active gas transmission operated by eligible parties. No hazardous liquid pipelines are listed in the database.

Louisa County Statistics

Population

According to the U.S. Census Bureau, the 1850 population of Louisa County was 4,939. Louisa County grew rapidly until 1880, when it had a peak population of 13,142. It has remained relatively stable since about 1910. The 2000 decennial census estimated the countywide population at 12,183, which represented a 5.1% increase from its 1990 population. That gain was reversed by 2010.

As of the 2020 Decennial US Census, the estimated population of Louisa County was 10,837, a decrease of about 4.8% for the decade.

Historic population		Louisa Co
Census	Pop.	%±
1850	4,939	—
1860	10,370	110.0%
1870	12,877	24.2%
1880	13,142	2.1%
1890	11,873	−9.7%
1900	13,516	13.8%
1910	12,855	−4.9%
1920	12,179	−5.3%
1930	11,575	−5.0%
1940	11,384	−1.7%
1950	11,101	−2.5%
1960	10,290	−7.3%
1970	10,682	3.8%
1980	12,055	12.9%
1990	11,592	−3.8%
2000	12,183	5.1%
2010	11,387	−6.5%
2020	10,837	−4.8%
U.S. Decennial Census		

US Census (ACS 2024 estimates)	
Population	10,678
Hispanic or Latino	16.4%
Race: White	79%
Black or African American	1%
American Indian, Alaska Native	0.6%
Asian	2%
Some Other Race	9%
Two or more races	8%

In 2024, median household income for Louisa County was a bit higher than the state household median, and 9.8% of residents were living below the poverty level.

Households	Median household income	Poverty level (all people)
State of Iowa	$ 75,059	11%
Louisa County	$ 77,354	9.8%

Housing

Owner-occupied homes account for 80% of the total occupied housing units in Louisa County, and 20% are renter-occupied. Mobile homes represent a greater share of housing in Louisa County than in the State as a whole.

Total Housing Units	4,739	% Louisa County	% State of Iowa
Occupied	4,237	89%	92%
Vacant	502	10%	9%

Owner Occupied	3,401	80%	72%
Renter Occupied	836	20%	28%
Mobile homes	449	11%	3%

Resources: Zero-Vehicle Households

Two hundred thirty-one households (about 531 people) do not have a personal vehicle available at home. Most of these are in Columbus City or Wapello. The total represents 5.5% of the county population, similar to the rest of the state.

Year built

The table at right shows the percentage of housing built in Louisa County and in Iowa by era. Of the estimated 4,739 housing units in the county, a quarter were built before 1940, more than 80 years ago.

Year built	Louisa	Iowa
Built since 2000	15%	22%
Built 1970 to 1999	31%	31%
Built 1940 to 1969	26%	24%
Built before 1939	30%	24%

New housing development

In recent decades, new housing construction has lagged behind state and national averages. According to Census data, the number of housing units built since 2000 in the county is 15% of total housing, compared to 22% for the state and 25% in the nation.

Median year structure built

The median year-built shows that Louisa County housing units in general are older than the state and national averages.

Geography	Median
Louisa Co	1966
State of Iowa	1972
USA	1980

Home Values

Housing in Louisa County is more affordable than in much of the nation. The average value of owner-occupied homes in 2024 was $150,100, about 72% of the statewide average of $208,000, and less than half the national average cost of homes.

Owner-occupied home values	Median home value	% of homes below $100,000	% between $100,000 & $200,000	% over $200,000
Louisa County	$150,100	28%	38%	33%
Iowa	$208,000	18%	30%	52%
USA	$332,700	11%	16%	73%

Population of Louisa County Cities

Population of cities (US Census 2020)			
Wapello	2,084	**Columbus City**	392
Columbus Junction	1,830	**Fredonia**	222
Morning Sun	752	**Oakville**	200
Grandview	437	**Cotter**	39
Letts	363		

Columbus City, Columbus Junction and Fredonia are adjacent cities, forming the largest population cluster in the county.

Economy

Manufacturing has been a chief source of employment for residents of Louisa County. Major occupations in the county today include manufacturing (29%), educational services, health care and social assistance (20%), retail trade (8%), construction (8%) and the agricultural sector employs 7% of the population (US Census ACS 2024 5-yr tables).

Workforce

About 63% of the population over age 16 is actively engaged in the workforce. That compares to about 66% in the State of Iowa as a whole. The average commute time to work is about 27 minutes.

Civilian employed population 16 years and over	**5,291**	
Occupation	**Estimate**	**Percent**
Agriculture, forestry, fishing and hunting, and mining	415	8%
Construction	434	8%
Manufacturing	1,506	29%
Wholesale trade	124	2%
Retail trade	493	9%
Transportation and warehousing, and utilities	314	6%
Information	90	2%
Finance, insurance, real estate, rental	138	3%
Professional, scientific, management, admin, waste mngmnt	272	5%
Educational, health care, social assistance	1,071	20%
Arts, entertainment, recreation, accommodation, food services	203	4%
Public administration	69	1%
Other services	162	3%

Louisa County Education

Four public school districts serve students in Louisa County. Three Community Colleges are located less than an hour's drive of Wapello Iowa. The University of Iowa in Iowa City is the nearest public university.

Public Schools	**College and University**	**Estimated driving time**
Columbus Junction CSD	Muscatine Community College	35 minutes
Louisa-Muscatine CSD	Southeastern Community College	40 minutes
Morning Sun CSD	Kirkwood Community College	45 minutes
Wapello CSD	University of Iowa	57 minutes

Critical facilities

Critical facilities are structures and institutions necessary for a community's response to and recovery from emergencies. These are assets that are vital to protection of public health and safety before, during and after a hazard event.

FEMA defines a critical facility as follows: Facilities and infrastructure that are critical to the health and welfare of the population and that are especially important following hazard events. Shelters, communications, emergency operation centers, hospitals, public health, public drinking water and wastewater facilities are examples of critical facilities.

Communications

The State of Iowa has 128 public safety answering points (PSAPs) that are the first line of response to a 911 call, with at least one PSAP in each county. All 99 Iowa counties have the capability of accepting wireless enhanced 9-1-1 Phase II service, which provides the person at the public safety answering point with latitude and longitude coordinates so they can more readily locate the person who has placed the 9-1-1 call.

The Communications Network (ICN) is a state agency that administers a statewide fiber optic network. The capacity of the Network enables authorized users such hospitals, state and federal government, public defense armories, libraries, schools and higher education institutions to communicate via high quality, full-motion video; high-speed internet connections; and telephones.

Telecommunications Infrastructure.

Telecom and Internet	Provider
Telecommunications	Windstream Iowa Communications, Inc
	Mutual Telephone Company of Morning Sun
	Qwest Corporation
Internet service	Mediacom Communications Corp
	Mutual Telephone Company of Morning Sun
	Windstream Holdings
	ViaSat, Inc
	Hughes Network Systems, LLC
Broadband internet	Mediacom Communications Corp
	Mutual Telephone Company of Morning Sun
	Windstream Holdings
Fiber optic cable internet	Mutual Telephone Company of Morning Sun

Local Media

The table below lists local and/or regional television, radio and newspaper sources serving Louisa County. The county is served by major television stations from Cedar Rapids, Iowa City, the Quad Cities and other eastern Iowa sources, including Public Television (PBS). Local FM radio stations are listed below.

Local Media Serving Louisa County, Iowa			
Radio	KCII	1380 AM	Washington
	KCII-FM	106.1 FM	Washington
	KILJ	105.5 FM	Mt Pleasant
	KILJ	1130 AM	Mt Pleasant
	KWPC	860 AM	Muscatine
	KBUR	99.3 FM	Burlington
	KBUR	1490 AM	Burlington
	NWR WXJ73 (162.400 MHz)	NOAA Weather Radio	Quad Cities area
Print	Wapello Morning Sun	Louisa Publishing Co	Wapello, Morning Sun
	Columbus Junction Gazette	Louisa Publishing Co	Columbus Junction
	The Hawkeye	Local newspaper	Burlington
	Muscatine Journal	Local newspaper	Muscatine
	The Des Moines Register	Statewide paper	Des Moines

Local TV	KGAN	CBS & FOX	Cedar Rapids
	KFXA	FOX	Cedar Rapids
	KCRG	ABC	Iowa City
	KWWL	NBC	Eastern Iowa
	KWQC	NBC	Quad Cities
	KIIN	PBS	Eastern Iowa
Cable TV	Louisa Communications	Cable TV	Morning Sun

Utility Systems

Louisa County	
Water	Columbus Junction Waterworks
	Muscatine Power and Light (proposed)
	Wapello Waterworks
Electric Service	Eastern Iowa Power
	Interstate Power & Light (Alliant Energy)
	Access Energy
Solar	CIPCO-Clenera
Gas Service	Interstate Power and Light/Alliant Energy
	Natural Gas Pipeline Company of America
	ANR Pipeline Company
	Morning Sun Municipal Gas Utility

Solar Power. Louisa County is home to the Idaho-based solar energy company Clenera which operates the Wapello Solar Project. 318,000 Risen Energy bifacial solar panels occupy nearly 800 acres of land and produce 127 megawatts of energy annually. It is currently the largest solar project in the State of Iowa, and although the energy is sold to the Central Iowa Power Cooperative (CIPCO) in a 25-year exclusive power purchase agreement, Louisa County anticipates $5.2 million in tax revenue from the CIPCO-Clenera deal according to press reports.

Infrastructure. Critical infrastructure must continue to operate during and following a disaster to reduce the severity of impacts and accelerate recovery, such as water and sewer infrastructure, communications and public safety operations. Losses of these functions have the ability to further threaten a community and can significantly add to the economic impacts a particular hazard can cause.

Critical services. Each community was asked to identify critical facilities within their jurisdiction. These facilities, if impacted by a hazard, could have significant adverse effects on the county and its communities. These include City Halls, Law centers, Emergency response, Fire departments, public utilities and communication infrastructure. Each was evaluated as part of the risk assessment, and mitigation alternatives were considered where vulnerabilities were identified.

There are no schools located in floodplain, dam inundation areas or levee inundation areas. Water treatment and wastewater treatment plants were affected in Oakville in 2008 by the flooding caused by levee breaches in Wapello and Oakville. Repairs were made after the event, but these facilities weren't relocated because they are in a 500-year flood plain. Columbus Junction moved its water treatment plant after the flood of 2008 when it was affected by high water.

Essential Facilities	**Hazardous Materials Facilities**
Louisa County Law Enforcement Center	Verizon Wireless Tower (Columbus Junction)
Local Fire Stations	Verizon Wireless Tower (Wapello)

Police/Sheriff/State Patrol Offices	Fredonia Sand Plant
Churches (may be used as shelters)	Columbus Junction Quarry & Mine
City Halls	TriOak Foods
County Courthouse	Tyson Fresh Meats, Inc
Schools	Farmers Elevator& Exchange, Inc
Community Schools	Natural Gas Pipeline
Grocery Stores	Agriland FS
Transportation Facilities	Liqui Grow Tri Oak, LLC
Canadian Pacific Railroad	Louisa Generating Station
Highway Bridges	O'Toole Corporation
Primary/Secondary/Municipal Roads	Fertilizer Dealer
Trucking Companies	Farms with large quantities of fertilizer
Contractors	**Lifeline Utility Systems**
Transit and School Buses	Gas Stations
High Potential Loss Facilities	Pumping Stations
Municipal Water Systems	Pipeline
Municipal Wastewater Systems	Convenience Stores

Other Sites of special concern

People and places that may be especially vulnerable when disaster strikes include:

- Preschool and daycare centers
- Nursing Homes/Assisted Living Center
- Apartment complexes
- Mobile home communities
- RV parks
- Campgrounds

Section A: The Planning Process

Plan Structure

This Multijurisdictional Hazard Mitigation Plan is designed to reflect first, conditions in the County as a whole, then address specific differences that may be present in each community. Issues specific to each community are noted in the Vulnerability and Impact section of each Hazard Profile in Section B. A brief summary for each community is included in Section G.

A1. How the plan was prepared

All the following activities are outlined in the tables below.

The Louisa County HMP was developed through a cooperative effort. The Louisa County Emergency Manager led the project and Planning staff conducted research on hazard data, documented the needs and goals of the community and organized the material into this report. The Hazard Mitigation Planning Committee (HMPC) was formed to provide guidance and oversight during the preparation of this Plan.

Members of the HMPC include all those that attended planning meetings in person or virtual meetings. Each participating community was represented by representatives at planning meetings. Individuals who participated in the development of this plan come from a wide range of backgrounds including local officials, community and business leaders, educators, nonprofits, the interested public, emergency management professionals and volunteers, firefighters and law enforcement.

All public meetings were held in accordance with Iowa Open Meeting law. Local public participation provided valuable insight on the challenges and needs of individual jurisdictions. Other Public engagement strategies applied during the planning process served to identify the goals and aspirations of the community and to guide the development of actions that should be taken to mitigate known hazards. Public opinion surveys and personal conversations were used to solicit comments throughout the planning process.

Staff conducted research on potential mitigation activities by reviewing the previous Louisa County HMP, FEMA approved mitigation actions, the State of Iowa Hazard Mitigation Plan and other planning documents. Capability and Risk assessments for local governments were completed. Specific vulnerability and impacts were discussed for every jurisdiction.

This work resulted in additional meetings that offered the opportunity for each jurisdiction to discuss the mitigation strategies that had been included in the previous plan, which action items had been completed and which should be carried forward to the 2026 plan. Options for other mitigation activities were presented by planning staff. Public suggestions were considered and incorporated. Local preferences for mitigation actions were compared to FEMA guidelines and participants prioritized the preferred action items for each community.

When the draft plan was complete, the draft was distributed to each jurisdiction for a final review during a 15-day public comment period. Additional digital copies were sent by email to adjacent jurisdictions and other interested individuals.

Comments were received and incorporated into the document. Recommended action steps were refined. The HMP was submitted to the Iowa Department of Homeland Security and Emergency Management (HSEMD) for review, who then referred it to FEMA.

A1-a. Schedule, time frame and activities

Work structure	Timeline for Louisa County Iowa
March 2026 Prep work	Letters of participation from each jurisdiction
	Review previous local planning documents
	Review HM Plans adjacent Counties and State
	Fill in generic info and online information, statistics
April	Planner & EM meet, discuss schedule, concerns and priorities
	Attend local City Council meetings to inform them of the process
	Draft first two sections of the document
	Data collection, begin draft of hazard profiles
	Public Survey out, Press release
May	Continue data collection, draft hazard profiles, NFIP
	Review previous plan Action steps
	Public Survey summary & tabulation
	Document editing, check first half for compliance
June	**Planner Interview with each jurisdiction:**
	Capability assessment
	Risk assessment, vulnerability and impact
	Changes in Jurisdictional development and priorities
	Identify critical infrastructure
	Draft Individual community profiles
PC Meeting 1 Hazard ID	**Risk assessment in general**
	Review previous goals, objectives and actions to carry forward
	Identify hazard vulnerability & impacts
July	Develop potential mitigation strategies
PC Meeting 2 Mitigation	**Review action steps from 2020 plan**
	Review implementation of previous plan actions
	Mitigation strategy alternatives, development and review
August	Draft Action Steps, cross check for compliance with FEMA
PC Meeting 3 Action Steps	**Review Draft Action Steps, make and receive comments**
	Proofread entire draft, edit, make comments
	Complete the Plan Maintenance & update sections
September	Proofread entire draft, edit, check compliance w PRT
PC & Jurisdiction Review	**Provide PC & Jurisdictions w Draft Action Steps, seek comments**
October	Final draft to PC, jurisdictions & stakeholders, Attend CC Meetings
November	Initiate a Public Comment period
	Incorporate final comments and edits into the plan
	Submit Plan to Iowa HSEM and FEMA

A1-b Participating Jurisdictions

In addition to unincorporated Louisa County, the following nine communities and four educational institutions within the county are officially represented in this plan.

Representatives of participating jurisdictions performed each of the following tasks: Capability assessment, risk assessment, local vulnerabilities and impacts, review drafts. Recommend, review and approve mitigation actions.

Jurisdictions	Primary contact	Community Involvement	How they were contacted
Columbus City	Dave Kauffman	Mayor	Email, Personal contact
Columbus Junction	Todd Salazar	Public Works Director	Phone, Personal contact
Cotter	Julie Heindel	Former Clerk	Email, Phone
Fredonia	Kristen Clark	City Clerk	Email, Phone
Grandview	Jason Garrison	Mayor	Email, Phone
Letts	Jerry Kirk	Mayor	Email, Phone
Morning Sun	Misty Rambo	City Council Member	Phone, Personal contact
Oakville	Allison Alameda	City Council Member	Phone, Personal contact
Wapello	Brett Shafer	Mayor	Phone, Personal contact
Columbus Community	Paul Kissell	HS principal	Email, Phone
Louisa-Muscatine CSD	Anthony Ryan	Superintendent	Email, Phone
Morning Sun CSD	Mike Peterson	Superintendent	Phone, Personal contact
Wapello CSD	Mike Peterson	Superintendent	Phone, Personal contact

Planning Committee

The primary point of contact for the 2026 Louisa County Hazard Mitigation Plan (HMP) is Louisa County Emergency Manager Ken Marlette.

Name	Entity	Contribution to the plan
Ken Marlette	Louisa County Emergency Management KMarlette@louisacountyia.gov	Led the project, provided guidance, recruited committee members, organized meetings, provided local knowledge and previous planning history, hazard data, and local insight
Gail Thomas	SEIRPC Staff Planner grthomasplans@gmail.com	Conducted research, public engagement, led meetings, drafted documents, incorporated public comments, submit drafts and revisions, discussed vulnerabilities and impacts with individual jurisdictions, organized potential mitigation actions, updated plan document
Dave Kauffman	City of Columbus City Business owner	Attended Meeting 1, 2, Capability & Risk Assessment, Goals, Mitigation solutions, HMP review

Allison Alameda	Oakville City Council	Attended Meeting 1, 2 & 3, Capability & Risk Assessment, Goals, Mitigation solutions, HMP review
Mike Peterson	Wapello CSD & Morning Sun CSD	Attended Meeting 1, 2 & 3, Capability & Risk Assessment, Goals, Mitigation solutions, HMP review
Jacob Ewart	Louisa County Conservation	Attended Meeting 1, 2 & 3, Capability & Risk Assessment, Goals, Mitigation solutions, HMP review
Todd Salazar	City of Columbus Junction	Attended Meeting 1, 2 & 3, Capability & Risk Assessment, Goals, Mitigation solutions, HMP review
Adam Shutt	Louisa County Engineer	Attended Meeting 1, 2 & 3, Capability & Risk Assessment, Goals, Mitigation solutions, HMP review
Shawn Maine	Louisa County Supervisor Business owner	Attended Meeting 1, 2 & 3, Capability & Risk Assessment, Goals, Mitigation solutions, HMP review
Brandon Marquardt	Louisa County Sheriff	Attended Meeting 1, 2 & 3, Capability & Risk Assessment, Goals, Mitigation solutions, HMP review
Misty Rambo	Morning Sun City Council	Attended Meeting 1 & 3, Capability & Risk Assessment, Goals, Mitigation solutions, HMP review
Benita Grooms	Oakville Mayor	Attended Meeting 2 & 3, Risk Assessment, Goals, Mitigation solutions, HMP review
Leah McElhinney	Louisa Co Public Health	Attended Meeting 2 & 3, Risk Assessment, Goals, Mitigation solutions, HMP review
Other Community representatives		
Brett Shafer	Wapello Mayor Business owner	Capability & Risk Assessment, Mitigation solutions, review draft HMP
Jason Garrison	Grandview Mayor	Capability & Risk Assessment, Mitigation solutions, HMP review
Tony Ryan	Louisa Muscatine CSD	Capability & Risk Assessment, Mitigation solutions, HMP review
Paul Kissell	Columbus Comm CSD	Capability & Risk Assessment, Mitigation solutions, HMP review
Jerry Kirk	Letts Mayor Recreation management	Capability & Risk Assessment, Mitigation solutions, HMP review
Kristen Clark	Fredonia Clerk	Capability & Risk Assessment, Mitigation solutions, HMP review
Donna Mincer	Columbus City Clerk	Capability & Risk Assessment, Mitigation solutions, HMP review
Julie Heindel	Former Clerk Cotter Farming	Capability & Risk Assessment, Mitigation solutions, HMP review

A2. Other Stakeholders

The table below is a record of other stakeholders; organizations and agencies that made contributions to this HMP about specific topics. Each of these participants provided information, comments, suggested mitigation strategies and/or reviewed the plan. Some also served on the Planning Committee (PC).

Contacts, Neighbors & Agencies

Other Stakeholders; assisted with vulnerability and impacts, mitigation solutions		
Contact person	**Represents**	**How contact was made**
Jacob Ewart	Louisa County Conservation	PC & Phone interview
Adam Shutt	Louisa County Engineer	PC & Phone interview
Leah McElhinney	Louisa Co Public Health	PC & Phone interview
Cyndi Mears	Louisa County Community Services	Email, Phone interview

Neighboring Communities Contacted

Community	**Contact person**	**How contact was made**
Henry County	Walt Jackson, Coordinator	Email, Personal Contact
Des Moines County	Shannon Prado, Coordinator	Email, Phone
Muscatine County	Chris Jasper, Coordinator	Email, Phone

Local and Regional Agencies Contacted

Agency	**Contact person**	**How contact was made**
Iowa HSEMD	Zachary Slocum	Email
Iowa Floodplain and Stormwater Mngmnt	Teresa Stadelmann	Email
Iowa DNR (Wildfire)	Jason Walker	Email
Iowa DNR (Flood)	Jason Conn	Email

Underserved Communities and Socially Vulnerable Populations

In an effort to reach underserved and socially vulnerable populations, the following organizations were contacted directly and invited to distribute the Public Survey and submit comments. Comments received were incorporated into the Vulnerability, Impact and Mitigation Action Plan sections of this document.

Outreach to Underserved Communities and Socially Vulnerable Populations		
Organization	**Contact**	**How contacted**
Salvation Army	Cyndi Mears	Personal contact, Phone
Veteran Services – Louisa County	Curt Hartlieb	Phone
Community Action of Southeast Iowa	319-xxx-2314	Phone
Louisa County Public Health	Leah McElhinney	Personal contact, phone

Limited English Proficiency (LEP)

An estimated 15% of the population (2,038 people) in the county speak a language other than English at home. Of those, about 839 people (8% of the population) have limited English proficiency. The table below shows that among the languages spoken at home, fewer than two percent of the population needs assistance in any specific language, therefore no special LEP measures were taken.

Limited English Proficiency Louisa County	# of People over age 5	% of Pop
Total Language at home other than English	1542	15%
Total Speak English less than "very well"	839	8%
Spanish at home	1290	13%
Speak English less than "very well"	681	7%
Asian or Pacific Islander	157	2%
Speak English less than "very well"	95	1%
Indo-European	95	1%
Speak English less than "very well"	63	.6%

A3. Public Participation and Feedback

Public input is essential to Planning. With direct engagement, valuable and diverse local perspectives can be factored into mitigation of hazards. Everyone that lives or works in the county is a stakeholder in the outcomes of hazard mitigation planning in Louisa County.

Public comments were requested by press release, posted notices, personal interviews and distribution of a survey through local governments. These methods of soliciting public comments ensured that the invitation to participate reached a representative sample of the community.

General Public Participation Opportunities

The public was invited to attend the County Supervisor, City Council and HMPC meetings. Notice of Public meetings were posted at the County Courthouse, City Hall buildings and other public places. Public comments were requested by Press release in the Columbus Junction Gazette & Wapello Morning Sun newspapers, postings on social media, personal interviews and distribution of a survey through the County website, SEIRPC website and City Halls.

Ways in which the general public was informed and invited to participate in the planning process:

Event	Date	Event	Date
Press release	4/6/2026	**Columbus City City Council**	3/19/2026
Public Survey	4/13/2026	**Columbus Jct City Council**	6/10/2026
Social media postings	4/13/2026	**City of Cotter**	9/10/2026
County & SEIRPC websites	5/1/2026	**Fredonia City Council**	3/19/2026
County Supervisors meeting	5/11/2026	**Grandview City Council**	3/19/2026
County Supervisors meeting	9/15/2026	**Grandview City Council**	4/23/2026
Posted Notice Comment period	11/03/2026	**City of Letts**	8/5/2026
County Supervisors meeting	11/11/2026	**Morning Sun City Council**	7/08/2026
Personal conversations	Throughout	**Oakville City Council**	8/05/2026
		Wapello City Council	5/21/2026

The Public was also informed by City Council meeting agendas during the Adoption process of the 2026 HMP Update, after FEMA approval of the plan.

How public feedback was included in the plan:

The public was involved throughout the planning process. Survey results and public comments were organized and recorded. These were provided to the HMPC and discussed during planning meetings.

Public feedback was incorporated into the vulnerability and impact sections for each hazard in Section B Risk Assessment, and all comments were considered during the development of the mitigation action plan. The final draft was edited to reflect comments made during the final public comment period.

A4. Other plans and references

Plans, studies, reports and technical information were reviewed and incorporated into the plan

Plans, Studies, Reports Reviewed or Incorporated	Section of this document
Iowa Comprehensive Emergency Plan (Ch. 5 – Hazard Mitigation) 2018 & 2023	Hazard Risk assessment, goals, objectives, mitigation strategies, climate trends
Iowa Comprehensive Emergency Plan (Ch. 3 – Hazard Mitigation) 2018 & 2023	Hazard Risk assessment, mitigation strategies, climate trends
Climate Change Trends: Iowa HMP 2023	Climate trends in Iowa, probability
Jefferson County Hazard Mitigation Plan 2025	Hazard risk assessment, goals, objectives mitigation strategies
Louisa County Hazard Mitigation Plan 2020	Hazard risk assessment, goals, objectives mitigation strategies
Henry County Hazard Mitigation Plan 2024	Hazard risk assessment, goals, objectives mitigation strategies
Des Moines County Mitigation Plan 2025	Hazard risk assessment, goals, objectives mitigation strategies
Marion County Iowa Hazard Mitigation Plan 2023	Risk assessment, Vulnerability, Impact, Funding guidebook
Dallas County Iowa HMP 2023	Hazard Risk assessment, doc organization
Iowa's Groundwater Basics 2003 (IDNR)	Risk assessment, vulnerability, impacts
Louisa County NFIP Flood Maps	Risk Assessment
FEMA Mitigation Ideas 2013	Hazard Mitigation strategies, actions
Building Community Resilience with Nature based Solutions (FEMA 2021)	Hazard Mitigation strategies, actions
Kansas State Hazard Mitigation Plan 2018	Climate trends, effects on agriculture
Oklahoma, OEM Approved Action Items	Hazard Mitigation strategies, actions
State Mitigation Planning Key Topics Bulletin: Risk Assessment FEMA October 2022	Risk assessment, vulnerability, impacts
FEMA Local Mitigation Planning Policy Guide 2022	Planning process, Document organization, Climate trends
FEMA Community Safe Rooms Fact Sheet 2016	Mitigation strategies

Section B: Risk Assessment

B1. Identified Hazards

The 2023 Iowa State Hazard Mitigation Plan is the guiding document for the hazards considered for the 2026 Louisa County HMP. Hazards that are profiled in this update are listed below in alphabetical order. Two categories of hazard were reviewed: Natural Hazards and Other Hazards.

Planning Committee members and other stakeholders discussed the frequency and severity of past hazard events. Presidential disaster declarations, weather events, climate trends, flood conditions, fire data, and soil types were evaluated, and that data was incorporated into this plan. Sources of all data may be found in the bibliography.

Staff provided information to the committee about hazards included in the 2020 Louisa County HMP, the 2024 Henry County HMP, the 2025 Des Moines County HMP, the 2023 State of Iowa Hazard Mitigation Plan and current FEMA guidance. Hazards of concern prioritized by public survey were also considered.

See excerpts from Iowa HMP – Appendix A.

Potential Hazards not addressed. The Planning Committee determined that the following hazards were not of sufficient risk to require mitigation in Louisa County. Omitted hazards include:

1. Earthquake: Earthquakes are not as urgent a concern as other hazards in Iowa. While more than 20 earthquakes have occurred in or around Iowa over the past 175 years, they have not seriously impacted the state. Earthquakes with epicenters far away are occasionally felt in Iowa but cause no damage. The strongest earthquake in Iowa, one that occurred near Davenport in 1934, only resulted in slight damage (Iowa, 2023).
2. Expansive soils: According to Web Soils Survey (WSS), expansive soils are present in the planning area, however, no damages from this hazard have ever been recorded or tracked. The Planning Committee believes that the risks from expansive soils are not of sufficient severity to warrant mitigation at this time. This hazard will be reevaluated in five years when the HMP is updated.
3. Extreme heat: The Planning committee discussed potential problems with extreme heat and found that for people, there is sufficient shelter capacity and social support systems in place. No critical facilities are likely to fail due to extended periods of heat.
4. Infrastructure failure: The two largest cities in the county have populations of about 2,000 people. Most are fewer than 500 people. This places personnel and revenue limitations on the capability of municipalities to mitigate the challenge of a serious infrastructure failure and cities must rely on state or federal resources to prevent or respond to this hazard. Local structure fires were previously included here, but sufficient mitigation actions are in place. May be reconsidered in the next update.
5. Radiological Incident OR Radiological Terrorism: No fixed radiological facilities, transfer stations, or receiving stations for radiological material are located in or near Louisa County. Therefore, the committee has decided these hazards do not currently require mitigation measures.
6. Major Transportation incident. The two largest cities in the county have populations of about 2,000 people. Most are fewer than 500 people. This places personnel and revenue limitations on

the capability of the county or municipalities to mitigate the challenge of a serious transportation incident and the community must rely on state or federal resources to mitigate this potential hazard. For Louisa County, transportation incidents of greatest concern fall under the category of Hazardous Materials Incidents and are included in that profile.

Hazards addressed in the 2020 Louisa County HMPU:

Most of the hazards profiled in 2020 were retained with exceptions as noted. Some previously identified hazards were combined while new headings were applied in some cases.

2020 Hazards	
Active Shooter/School Violence (Combined)	Infrastructure Failure (Deleted)
Animal/Plant/Crop Disease	Levee Failure (Combined w Dams)
Dam Failure (Combined w Levees)	River Flood (Combined)
Drought	Severe Winter Storm
Flash Flood (Combined)	Structure Fire (Deleted)
Grass or Wildland Fire (New heading)	Terrorism (Combined with school violence)
Hailstorm (Combined w severe storms)	Tornado, High winds
Hazardous Materials Incident (& Transportation)	Transportation Incident (Combined w HazMat)
Human Disease	Thunderstorm & Lightning (Combined w Storms)

Hazards Profiled for the 2026 Louisa County HMP

The planning committee applied a three-step assessment process to identify threats and hazards and what they need to do to address those risks by answering the following questions:

- ✓ What are the hazards that affect our community?
- ✓ When they occur, what specific impacts do those hazards have on our community?
- ✓ What can be done in the next five years to improve safety and mitigate hazard risk?

This assessment was used as a tool to understand threats and hazards, assess risks, evaluate and improve capabilities, reduce vulnerability, and identify ways to increase resilience. Risk assessment is Section B of this document, Capability assessment and Mitigation strategy are addressed in Section C.

The Planning Committee and public surveys both named Severe thunderstorms and Winter weather as the most common hazards. Tornado is viewed as the most dangerous hazard. While public surveys refer to Severe storms in general, Hail, High winds and Lightning were each profiled in detail as components of severe storms.

2026 Weather hazards	**Other Hazards**
Drought	Dam or Levee Failure
Flood (River, Flash, Stormwater)	Landslide
Severe storms (Hail, High wind, Lightning)	Animal/Plant/Crop Disease
Tornado	Hazardous Materials Incident
Wildfire	Human Disease Epidemic or Pandemic
Winter Weather	Terrorism (incl cyber security & school violence)

Disaster History

Study period. In order to give a more accurate representation of risk, we chose to evaluate a study period of ten years (2016-2025), rather than a five-year history (2021-2025). Therefore, some incidents from the 2020 HMP are replicated in this update. Each hazard profiled below includes event data.

There were three Federal declarations of disaster in Louisa County during the years 2016 through 2025, for two events. One was in response to severe storms and flooding and two declarations were related to the COVID-19 pandemic.

Federally Declared Disasters in Louisa County 2016-2025			
Event	**Number**	**Incident period**	**Date Declared**
Iowa Covid-19 Pandemic	DR 4483	Mar 17, 2020 - May 11, 2023	3/23/2020
Iowa Covid-19 Pandemic	EM 3480	Jan 20, 2020 - May 11, 2023	3/13/2020
Iowa Severe Storms and Flooding	DR 4421	March 12, 2019-June 15, 2019	3/23/2019

The Iowa Governor made four weather disaster proclamations for Louisa County during the study period.

State Declared Disasters in Louisa County 2016-2025			
Event	**Proclamation**	**Incident period**	**Date Declared**
Severe Storm System	2016-09	Sept. 21 2016, continuing	9/27/2016
Flooding and Flash Flooding	2019-11	March 13, 2019, continuing	4/12/2019
Severe Storms and Flooding	2019-17	May 17,2019, continuing	5/29/2019
Mississippi River flooding	2023-11	April 24, 2023, continuing	4/24/2023

Hazard Probability Rating

The word "probability" is used here to mean the chance that a particular event (or set of events) will occur expressed on a linear scale from 0 (impossibility) to 1 (certainty), also expressed as a percentage between 0 and 100% (Wolfram, 2023).

To determine the probability of future hazard events, the number of events of each type was documented and divided by the number of years being considered, giving the percent chance of an event occurring in any given year. For this analysis, probability is categorized as follows:

Total number of events/Total number of years = Probability as a percentage.

Unlikely = < 10%
Moderate chance = 10% to 44%
Even chance = 45% to 59%
Likely = 60 - 89%
Very likely = 90 - 100%

HAZARD	EVENTS/TIME	PROBABILITY
Drought	Occurrences in 9 of 10 years = 90%	Very Likely
Flood (Flash, River, Stormwater)	7 events/10 years = 70%	Likely
Hail	9 events/10 years = 90%	Very likely
High winds	9 events/10 years = 90%	Very likely
Lightning	22 events/10 years = >100%	Very likely

Tornado	3 event/10 years = 30%	Moderate chance
Wildfire	2 to 4 events/10 years = 40%	Moderate chance
Winter weather	21 events/10 years = >100%	Very likely
Dam or Levee Failure	0 events/10 years = 0%	Unlikely
Landslide	2 events/10 years = 20%	Moderate chance
Animal/Crop/Plant Disease	6 in 10 years = 60%	Likely
Hazardous material incident	28 events/10 years = >100%	Very likely
Human epidemic, pandemic	1 event/10 years = 10%	Moderate chance
Terrorism	0 events/10 years = 0%	Unlikely

Probability and Climate Change

Data indicates that Iowa's climate is growing warmer with more precipitation and more frequent severe weather events. Trends show small increases in average temperatures, but nighttime temperatures in Iowa have been increasing at a much higher rate over the last 100 years. Seasonal cycles and ranges of species have been observed to be shifting. For example, cold-water species of fish populations have been dropping due to groundwater temperatures and sedimentation.

Because it is impractical to limit a discussion of climate change to the scale of local government, we rely on the *2023 State of Iowa Hazard Mitigation Plan: Summary of Climate Change in Iowa and Effects upon Hazards* to assess the probable effects of climate trends on the SE Iowa region. From there, we can infer likely impacts on specific hazards in the county.

Significant trends and their effects on hazards in Iowa can be summarized as follows (Iowa B, 2023)

- An increase of 8 percent more precipitation from 1873-2008
- An increase in extreme heavy precipitation in summer in the last 40 years, with more precipitation coming in the first half of the year and less in the second
- A larger increase in precipitation in eastern Iowa than in western Iowa
- Long-term winter temperatures have increased six times more than summer temperatures.
- Nighttime temperatures have increased more than daytime temperatures since 1970.
- A substantial rise in humidity, especially in summer, providing more water to fuel convective Thunderstorms that provide more summer precipitation
- The increase in precipitation has contributed to a rise in streamflow levels and the potential for more frequent and greater flooding. The changes in precipitation patterns and higher winter and spring temperatures contribute to summertime becoming the new seasonal flood norm
- The rise in the number of large summertime rainfall events increases the probability of summertime floods, while higher winter and spring temperatures result in snow melting earlier and more slowly, reducing springtime flooding

Increased floods also pose health hazards in addition to death from rising water, including:

- Disbursement of hazardous chemicals into flood waters
- Dissemination of microbial pathogens from livestock facilities and sewage treatment plants
- Carbon monoxide poisonings from use of gasoline-operated tools after floods
- Molds contaminating flooded homes and businesses

Potential impacts on infrastructure and emergency services include:

- Stresses on infrastructure due to warmer temperatures, such as a roadway buckling

- Increased risk of extensive damage to water supply and waste treatment systems
- Greater demand for disaster-response services, including monitoring disaster potential, identifying vulnerabilities, and procuring governmental resources for recovery assistance
- A need for enhanced emergency management training and technical assistance to respond to a changing range of disaster consequences
- Increased Flood mitigation efforts reflecting warmer winters, greater annual stream flows, and more frequent severe precipitation events

Tornado patterns. Over the past decade, researchers have identified a decrease in tornadoes throughout Tornado Alley, which typically includes the central Great Plains states including Iowa, and an increase in Dixie Alley, which includes parts of eastern Texas, Arkansas, Louisiana, Mississippi, and Alabama (USA Facts, 2023).

Projected climate conditions were addressed in the Probability section under each hazard profile below.

B1-a-f Profiled Hazards

Hazards. Each hazard listed in the plan has been profiled and includes the following sections: Description, Location, Extent, Previous Occurrences, Probability of future events, Vulnerability and Impact. Hazards are essentially consistent across all jurisdictions because of the limited geographic extent of the study area. In general, the communities are similar enough that the elements of the hazard risk assessment need not be repeated for each participating jurisdiction in order to avoid redundancy.

Vulnerability, Impacts. While the effects of each hazard are similar among jurisdictions there are some exceptions. Vulnerabilities specific to a particular jurisdiction are described in more detail in the Vulnerability and Impacts elements of the hazard profiles.

Drought

A drought is a period of drier-than-normal conditions. If dry weather persists and water supply problems develop, the dry period can become a drought. Drought follows a slow, accumulating process, different from other natural hazards such as flood or wildfire where negative impacts are observed more quickly. Three types of drought are recognized: Meteorological, Agricultural and Hydrological. Together, these contribute to the social and economic effects of drought.

Meteorological drought is when lower precipitation occurs than is typical for a specific area and precedes the other types. The terms Agricultural drought and Hydrological drought are most pertinent to this assessment. Agricultural drought depends not only on precipitation, but soil conditions, groundwater or surface water as well. Crops are more susceptible to insufficient moisture at certain stages of development. Hydrological drought refers to the impact of precipitation deficiency on water levels in streams, lakes, reservoirs and groundwater. This is a long-term type of drought that can have an impact on wells, public water supplies and wildlife.

Location

The planning area is affected by drought.

Affected Jurisdictions County, Cities.

Extent

The Palmer Drought Severity Index (PDSI) is used to classify a deficiency of precipitation. Values in Louisa County could be expected to fall at any point on the scale. All participating jurisdictions have experienced drought conditions ranging from 0 to <-5.0 on the scale and may expect such conditions to occur in the future.

The National Weather Service Drought scale (NOAA, 2026) provides the descriptive definitions below:

- D0 – Minor Drought: Going into drought; short term dryness slowing growth of crops or pastures; fire risk above average. Coming out of drought: lingering water deficits, pastures or crops not fully recovered.
- D1 – Moderate Drought: Some damage to crops or pastures; fire risk high, streams, reservoirs or wells low, water shortages developing, voluntary water use restrictions requested.
- D2 – Severe Drought: Crop or pasture losses; fire risk very high; water shortages common; water use restrictions imposed.
- D3 – Extreme Drought – Major crop and pasture losses, extreme fire danger; widespread water shortages and use restrictions.
- D4 – Exceptional Drought – Exceptional and widespread crop and pasture losses; exceptional fire risk; shortages of water in reservoirs, streams and wells, creating water emergencies.

Palmer Drought Severity Index		Drought Category
D4	< -5.00	Exceptional Drought
D3	-4.99 to -4.00	Extreme Drought
D2	-3.99 to -3.0	Severe Drought
D1	-2.99 to -2.0	Moderate Drought
D0	-1.99 to -1.0	Mild Drought
D0	-0.99 to -0.5	Incipient Drought
-	-0.49 to 0.49	Near Normal

Previous Occurrences

The U.S. Drought Monitor, published by the National Drought Mitigation Center University of Nebraska-Lincoln, records instances of drought throughout the US; periods of at least two weeks during which drought was recorded. Louisa County experienced 10 periods of drought from January 2016 through December 2025 (US Drought, 2026).

The Drought Monitor records 321 weeks of drought during the 10 year period 2016 through 2025.

Of the total weeks of drought during the study period, 174 weeks were in the D1 category, 84 were of D2 severity and 33 weeks reached the level D3. No periods of D4 drought were recorded in the National Drought Monitor for Louisa County during those years.

Drought data for each category includes all lesser categories. For example, if we look at event 3, drought conditions occurred starting 6/13/2017 and persisted until 10/2/2018, a total of 69 weeks. During that time, conditions reached D1 intensity for 62 consecutive weeks, D2 for 8 weeks in August and September 2017 and again in July and August of 2018 for 6 weeks. The August 2017 portion of that drought event reached D3 intensity for 3 weeks. Events 6, 7 and 9 were limited to mild (D0) dry conditions.

Louisa County Drought

The table below illustrates 10 periods of drought over 10 years.

LOUISA		NOTE: D4 drought did not occur during the study period.										
EVENT	**DROUGHT 1/1/2016 THROUGH 12/31/2025**			**Category D1**			**Category D2**			**Category D3**		
	Start Date	End Date	Wks D0	StartDate	EndDate	Wks D1	StartDate	EndDate	Wks D2	StartDate	EndDate	Wks D3
1	6/14/2016	8/9/2016	9	6/21/2016	7/19/2016	5						
2	11/1/2016	4/25/2017	26	3/7/2017	3/28/2017	4						
3	6/13/2017	to:		7/4/2017	to:		8/1/2017	9/19/2017	8	8/15/2017	8/29/2017	3
		10/2/2018	69		9/4/2018	62	7/24/2018	8/28/2018	6			
4	8/6/2019	9/24/2019	8	9/3/2019	9/17/2019	3						
5	8/25/2020	10/20/2020	9	9/1/2020	9/8/2020	2						
6	6/15/2021	6/22/2021	2									
7	8/24/2021	10/19/2021	9									
8	11/30/2021			2/15/2022	3/22/2022	6						
		to:		7/19/2022	2/21/2023	32	8/9/2022	2/14/2023	28			
		5/13/2024	129	5/23/2023	4/8/2024	47	6/20/2023	4/1/2024	42	6/27/2023	1/15/2024	30
9	9/10/2024	7/14/2025	44									
10	9/16/2025	1/5/2026	16	10/7/2025	1/5/2026	13						
	Ten year totals	**D0**	**321**		**D1**	**174**		**D2**	**84**		**D3**	**33**

Probability

Evaluating the county over the ten-year study period 2016-2025, data from the U.S. Drought Monitor shows that some portion of Louisa County experienced moderate drought (D1) for periods of two weeks or longer in 9 of 10 years, indicating similar drought conditions are likely to occur in future years.

Annual probability that drought of D1 level or greater will occur = 90%, Very Likely probability.

Climate Trends

Drought is a normal part of climate fluctuation. The highest occurrences of drought conditions with recorded events in Iowa are associated with agricultural and meteorological drought as a result of either low soil moisture or a decline in recorded precipitation.

Southeast Iowa counties may be affected by drought more often than they are now. Precipitation could be expected to vary more both temporally and spatially, with one area experiencing record heat and drought while nearby areas experience heavy precipitation. Drought may take on a seasonal aspect, with excessive moisture in spring and insufficient moisture in summer. Iowa already sees wetter spring and fall and drier summers than in its previous climate decade. Higher temperatures will increase evaporation rates, intensifying naturally occurring droughts (Iowa, 2023).

Water supply in Louisa County

Municipal and rural water supply in Louisa County is sourced from a combination of bedrock and alluvial aquifers.

Two primary bedrock water sources in southeast Iowa are the Mississippian aquifer, closer to the surface, and the deep bedrock Cambrian-Ordovician Aquifer also known as the Jordan Aquifer, a primary source of water for all uses in the state.

The Mississippian aquifer underlies about 60 percent of Iowa, where it forms the upper bedrock surface and is generally overlain by the surficial (alluvial) aquifer system. The Cambrian/Ordovician Jordan aquifer is a deep bedrock water body that underlies virtually the entire state of Iowa.

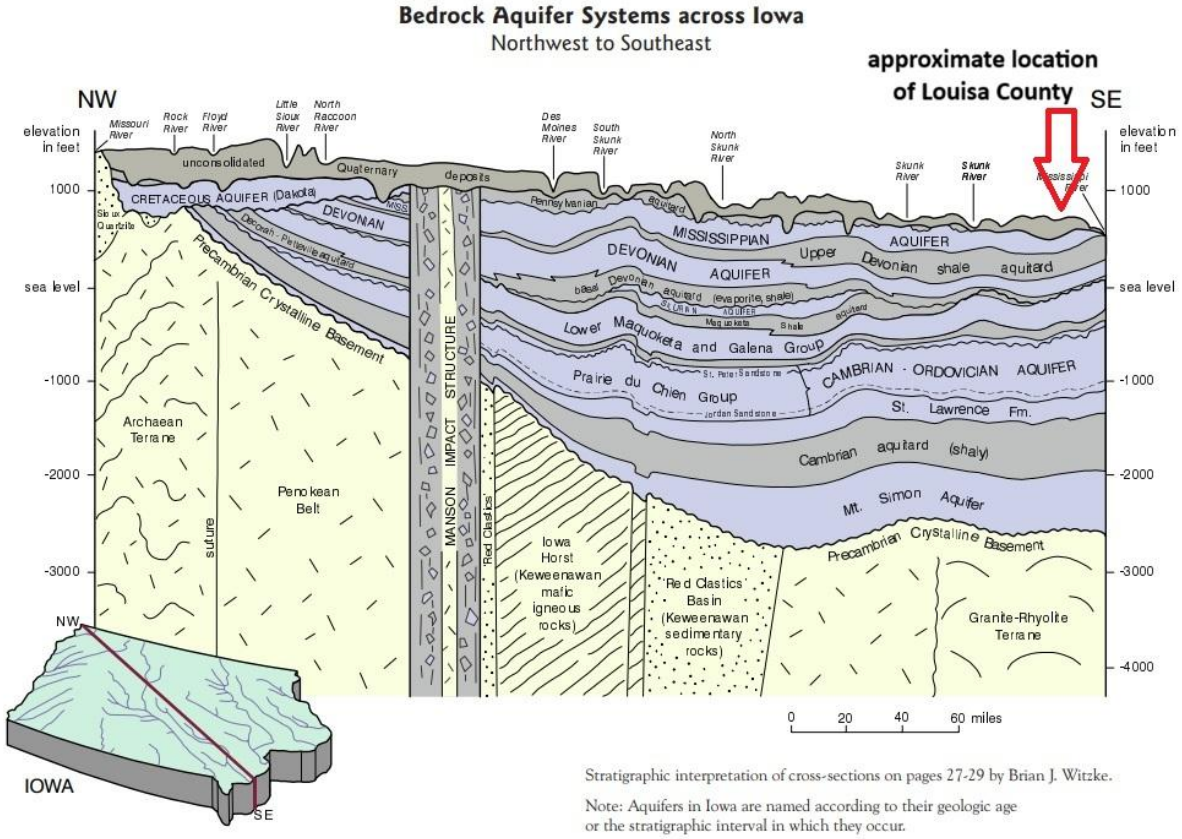
Drought Regions. Iowa is divided into five drought regions based, in part, on the landform regions of Iowa delineated in *Landforms of Iowa* by Jean C Prior, University of Iowa Press, 1991. The landform regions reflect the diversity of geologic landscapes shaped by Quaternary age glacial deposition and post-glacial erosion over the last two million years or so. Each landform region has similar topography, soils, geology and hydrology, making landform regions appropriate for classifying drought regions in the state. The landform regions have irregular boundaries, but the drought regions follow county boundaries for planning and administrative purposes.

Louisa County is in drought region 5, which is characterized by shallow geology consisting of loess over glacial till, except the loess thickness thins to the eastern part of the state. The area is characterized by steeply rolling hills and a well-developed dendritic drainage system. Water resources are poor in the south-central portion of the region but improve to the east where shallow carbonate rock and deeply buried rocks are used for water supply (Prior, 1991).

Aquifer depletion. From an article in the Des Moines Register:

> Rapidly growing industrial and residential use of the Jordan aquifer is prompting Iowa environmental leaders to consider new restrictions to better protect the massive underground water source.
>
> The Jordan aquifer provides drinking water to about a half-million Iowans, as well as water that is critical to industries that range from data centers to food processing and ethanol production.
>
> The recommendations are designed to warn users that Iowa's now-rich water levels could decline enough in the years ahead that they could hinder job creation and economic development efforts if not managed carefully.

"We know at some point we can't keep pumping it down and pumping it down," said Todd Steigerwaldt, manager of the Marion Water Department and leader of the task force looking at the issue. "We know there is additional cost — it's more energy, which is money; and at some point, the lower we pump that water, the poorer the water quality would become." (Eller D. , 2014)



Stratigraphic interpretation of cross-sections on pages 27-29 by Brian J. Witzke.

Note: Aquifers in Iowa are named according to their geologic age or the stratigraphic interval in which they occur.

https://s-iihr34.iihr.uiowa.edu/publications/uploads/2014-08-24_08-08-21_es-06.pdf

B2-a,b Vulnerability and Impacts

Affected Jurisdictions

X	Unincorporated Louisa County	X	Morning Sun
X	Columbus City	X	Oakville
X	Columbus Junction	X	Wapello
X	Cotter		Columbus Junction Community Schools
X	Fredonia		Louisa-Muscatine Schools
X	Grandview		Morning Sun Community Schools
X	Letts		Wapello Community Schools

People in cities and towns benefit from water utilities that are intended to smooth out variations in natural water supply. Drought intensifies these variations in quality and available water may be reduced.

Affected jurisdictions: County & Cities. Impacts on agricultural economy. Schools do not report any direct impacts from drought. See Appendix C for an example of effects of drought on agriculture.

Vulnerability to drought is driven by three factors:

Exposure - the frequency of drought, the population, and the freshwater ecosystems that could be affected.

Sensitivity – the county's likelihood of being negatively impacted by drought, considering industries such as agriculture, water recreation and hydropower.

Adaptive capacity - a county's preparedness for drought and ability to recover, looking at the state's drought plan, irrigation infrastructure and economic strength.

The population of Louisa County relies on 20 active groundwater wells. All communities are vulnerable to the effects of drought on water supplies. Drought can devastate crops, dry out forests, reduce food and water available for people, wildlife and livestock, restrict recreational activities, and place stress on businesses and economies.

The table below provides information about the active wells in the county.

Public Water Supply Name	City	PWS Type	Active Date	Population Served
COLUMBUS CITY PUBLIC WATER SUPPLY	COLUMBUS CITY	C	06/01/1975	392
COLUMBUS JUNCTION WATER SUPPLY	COLUMBUS JUNCTION	C	06/01/1975	1830
GRANDVIEW MUNI WATER DEPT	GRANDVIEW	C	06/01/1975	437
MORNING SUN WATER DEPARTMENT	MORNING SUN	C	06/01/1975	752
OAKVILLE WATER SUPPLY	OAKVILLE	C	06/01/1975	200
WAPELLO MUNICIPAL WATER WORKS	WAPELLO	C	06/01/1975	2096
LOUISA CO LAW ENFORCEMENT CTR	WAPELLO	C	10/23/2007	46
WOODLAND WAPELLO MOBILE HOME PARK	WAPELLO	C	09/01/1979	126
WIELE MOTOR	COLUMBUS JUNCTION	NC	06/26/2009	31
CEDARCREST GOLF & COUNTRY CLUB	COLUMBUS JUNCTION	NC	12/01/1975	146
NATURAL GAS PIPELINE STATION # 204	COLUMBUS JUNCTION	NC	07/29/1997	25
LETTS COMMUNITY BUILDING	LETTS	NC	10/05/2016	27
CASEYS #3449	MORNING SUN	NC	07/23/2004	715
PAPAS PARADISE CAMPGROUND	WAPELLO	NC	03/28/2014	27
SHIP'S PLACE	WAPELLO	NC	04/09/2025	136
LAKE ODESSA CABIN OWNERS ASSOC.	WAPELLO	NC	11/01/1975	31
HERITAGE OAKS GOLF & COUNTRY CLUB	WAPELLO	NC	06/01/1977	60
ODESSA DELLS	WAPELLO	NC	11/01/1975	25
TYSON FRESH MEATS INC (COLUMBUS JCT)	COLUMBUS JUNCTION	NTNC	08/01/1986	1300
LOUISA-MUSCATINE COMMUNITY SCHOOL	LETTS	NTNC	11/01/1975	1190

A Non-Community Transient Water System (NC) is a public water system that serves at least 25 people (but not the same 25 people) for at least 60 days per year, typically found in locations with high visitor turnover. Examples include gas stations, campgrounds, restaurants, and parks.

Public Water Supply (PWS) Type Key:
C - Community
NC - Non community transient
NTNC - Non transient, non community

A Non-Transient Non-Community (NTNC) water system is a public water system that serves at least 25 of the same people over six months of the year, but not year-round. Examples include schools, factories, and office buildings.

Bedrock Aquifers

Drought reduces the availability of fresh water for aquifer recharge. Bedrock aquifers are a regional groundwater supply and cannot be placed under local control. Industrial, agricultural and rural uses intensify depletion during periods of drought. The Jordan Aquifer is expected to undergo significant depletion by 2060. Long term depletion of the Jordan Aquifer is a hazard to the sustainability of business and public health throughout Louisa County.

Alluvial Aquifers

Lack of precipitation prevents recharge of alluvial aquifers, at the same time water is drawn more heavily from those sources. The quantity and quality of fresh water for municipal use is reduced. Depletion of alluvial groundwater is intensified, reducing the supply of fresh water for residential, agricultural and industrial uses. Private well owners may need to restrict water use, dig deeper wells or monitor water quality more frequently during drought.

Surface water, ponds, streams, rivers, reservoirs

Livestock and wildlife depend on surface water, while quantity and quality are reduced during periods of drought. Health of livestock and wildlife are negatively impacted by deteriorating freshwater conditions.

Unincorporated Louisa County

Drought reduces quantity and quality of water for residential, agricultural and business purposes. Rural households may have to reduce residential water uses; wells may go dry. Agricultural production is important to the local economy. Agricultural crop production relies on sufficient water supplies and precipitation at key points in the growing cycle. Agricultural uses draw heavily from both underground sources and surface waters.

Loss of agricultural production and resulting economic stress can result in reduced business activity, jobs and lower tax revenue to local governments. Drought impacts livestock feed supply.

Natural vegetation, wildlife, stream flows, fish and aquatic vegetation all rely on good quality fresh water. Environmental impacts of drought include direct damage to plant and animal species, loss of wildlife habitat (wetlands, lakes, and vegetation) and biodiversity.

Risk of fire increases with drought and low humidity. There is an increased risk of fire at the same time as a reduced availability of water for fire suppression.

All Cities: Water supply

Public water suppliers are responsible for the health of residents and business needs during drought. Quantity and quality of potable water may be reduced. Shortages in available water can lead to increased operating costs and difficulty meeting regulations for water supply and water treatment systems. Impacts of drought can be reduced by increased reliance on regional water providers.

Climate Change Impacts: The intensity of future droughts is projected to increase even if precipitation increases. Rising temperatures will increase evaporation rates and the rate of soil moisture loss. Thus, periodic summer droughts, a natural part of Iowa's climate, are likely to be more intense in the future (Frankson, 2022).

Land use development: Intensified agriculture and urbanization will place aquifers at risk of accelerated depletion from both increased demand and reduced infiltration.

Population patterns: Increased population would place additional stress on diminishing water resources.

Flood

Two types of floods are tracked by the NOAA Storm Events Database: flash floods and river floods. Flash floods generally cause greater loss of life and river floods generally cause greater loss of property. Stormwater can also cause temporary flooding of streets, buildings and basements. While FEMA recognizes all of these flood types, stormwater problems in local communities are not tracked at the State or Federal levels.

Flash flooding occurs when too much rain falls too fast for the ground to absorb all the water. Flash flooding occurs in streams, gullies and other low elevations. If a storm stalls over one area, the intensity of rainfall can lead to dangerous flash flooding that threatens life and property. Sudden rising water can overwhelm retention capacity and wash out roads.

River flooding occurs when river levels rise and overflow their banks or the edges of the main channel and inundate areas that are usually dry. Most river floods can be linked to a storm of some kind, although floods can also be caused by dam failures, rapid snowmelt or ice jams.

Stormwater. Surface runoff occurs when the soil is saturated or there is inadequate drainage capacity for the volume of water. Without sufficient infiltration or drainage paths, the water will flow overland and find the lowest elevations, sometimes flooding a street or a basement. Surface runoff is intensified where impervious areas such as roofs and pavement do not allow water to soak into the ground. Stormwater runoff can be a significant cause of erosion and non-point water pollution.

NFIP. The National Flood Insurance Program (NFIP), established in 1968 provides flood insurance to property owners, renters and businesses. Private insurance companies do not cover flood damage. The NFIP defines Special Flood Hazard Areas (SFHAs), which are FEMA-designated floodplains. Homes and businesses in SFHA areas with mortgages from government-backed lenders are required to have flood insurance (FEMA, 2025).

Federal flood insurance is not a disaster assistance program. It is an insurance program established to help property owners to recover more quickly at a lower cost than waiting for disaster aid. Because floods can happen outside of the special flood hazard area (SFHA), flood insurance is available to cover any property in participating NFIP communities.

Base flood. The terms “base flood,” “100 year flood,” and “one-percent annual chance flood” are often used interchangeably. The boundary of the Base Flood is equivalent to the Special Flood Hazard Area (SFHA) on FEMA’s NFIP Maps.

NOTE: Positive effects of flooding: Floods can be damaging, but for the natural world the effects are not always negative. Floods transport vital nutrients, such as nitrogen, phosphorus, and organic material, to the surrounding land. When the water recedes, it leaves sediment and nutrients behind on the floodplain. This rich, natural fertilizer improves soil quality and has a positive effect on plant growth, thus increasing productivity in the ecosystem.

Floods can replenish underground water sources. Floodwater gets absorbed into the ground then percolates through layers of soil and rock, eventually reaching underground aquifers. These aquifers supply clean freshwater to springs, wells, lakes, and rivers (NatGeo, 2024).

Location

Two rivers and numerous streams meander through Louisa County. The Cedar River drains the northeastern part of the county and joins the Iowa River near Columbus Junction and Fredonia. The Mississippi River forms the eastern boundary of the county.

Affected jurisdictions: County and Cities.

River/Stream flooding: Unincorporated Louisa County, Columbus Junction, Fredonia, Letts, Morning Sun, Wapello are in the special flood hazard area (SFHA).

Flash floods: Rural Louisa County

Stormwater: The county and all cities have the potential to be affected by localized flooding from stormwater. All schools report that stormwater problems are not currently impacting structures on their properties.

NFIP Communities

FEMA NFIP Flood Insurance Rate Maps (FIRMs) were updated for Louisa County and Letts with an effective date of 10/16/2015. Remaining community maps were updated as of 7/18/2011. Individual FIRM panels for the entire county are available at the FEMA Map Service Center website when you enter the community name.

Six jurisdictions have areas that intersect with Special Flood Hazard Areas (SFHAs): Unincorporated Louisa County, Columbus Junction, Fredonia, Letts, Morning Sun and Wapello. Morning Sun does not participate in the NFIP. Maps depicting SFHA areas in or near communities in Louisa County are reproduced below.

Jurisdictions outside of NFIP Floodplains

The Cities of Cotter, Columbus City, Grandview and Oakville are communities with no special flood hazard areas identified, although Oakville is protected by a levee. While neither Columbus City nor Oakville have an identified SFHA, those communities do choose to participate in the NFIP. For more information about NFIP participation see Section C2-a.

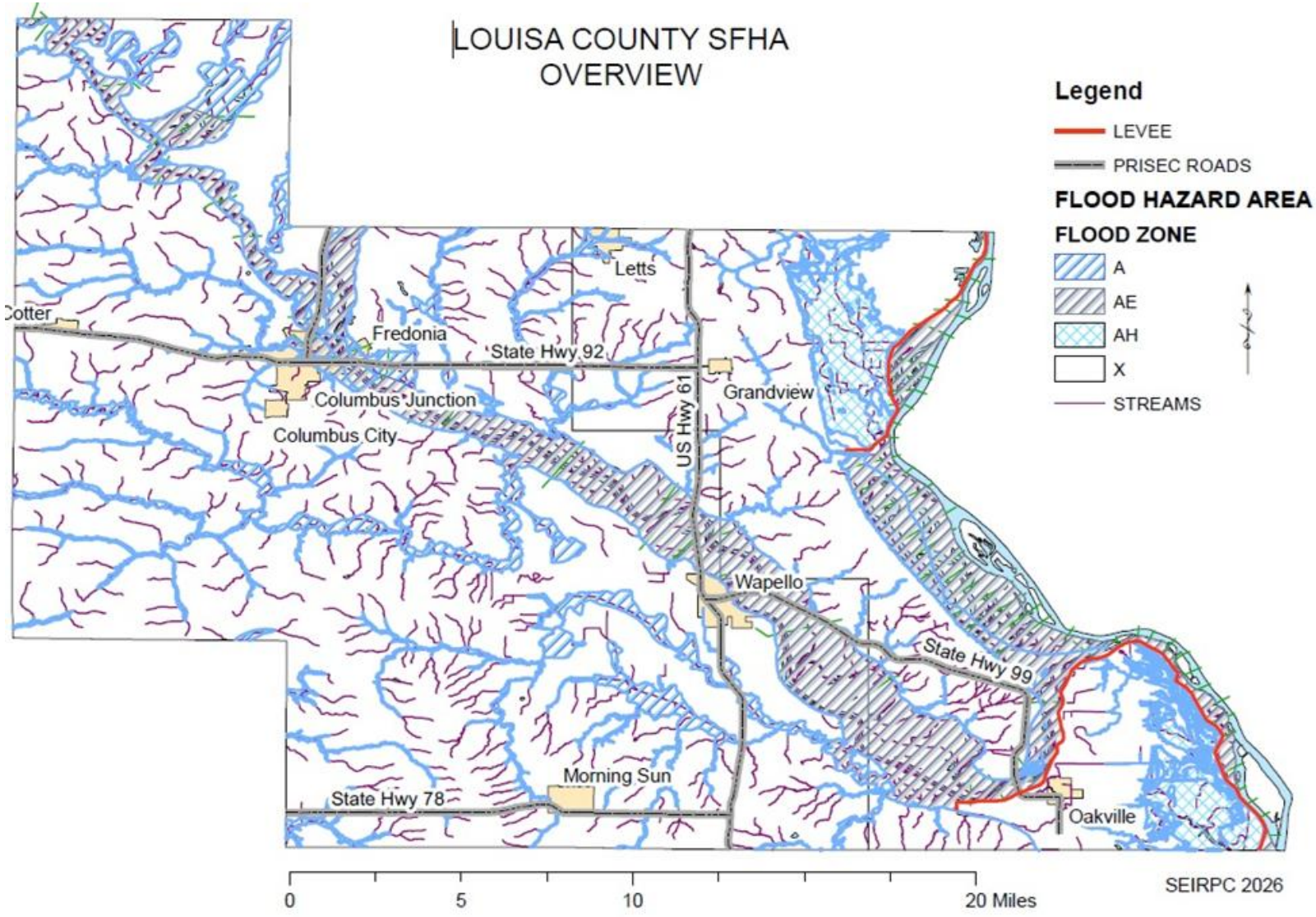
NFIP STATUS BOOK	https://www.fema.gov/cis/IA.html				2026
NFIP Participating Communities Louisa County Iowa					
CID	Community Name	Init FHBM	Init FIRM	Curr EffMap Date	Reg-EmerDate
190720#	COLUMBUS CITY	10/29/1976	2/6/1991	(NSFHA)	7/28/2023
190307#	COLUMBUS JUNCTION	1/9/1974	2/6/1991	7/18/2011	2/6/1991
190308#	FREDONIA	2/14/1975	6/4/1993	7/18/2011	2/6/1991
190311B	LETTS	12/27/1974	9/2/1993	10/16/2015	2/6/1991
190193B	LOUISA COUNTY	12/27/1974	6/1/1987	10/16/2015	2/6/1991
190313B	OAKVILLE	5/2/1975	8/1/1986	(NSFHA)	8/1/1986
190194#	WAPELLO	1/16/1974	9/1/1986	7/18/2011	9/1/1986
Non Participating Communities					Sanction date
190312#	MORNING SUN	1/17/1975	2/6/1991	7/18/2011	1/17/1976

Extent

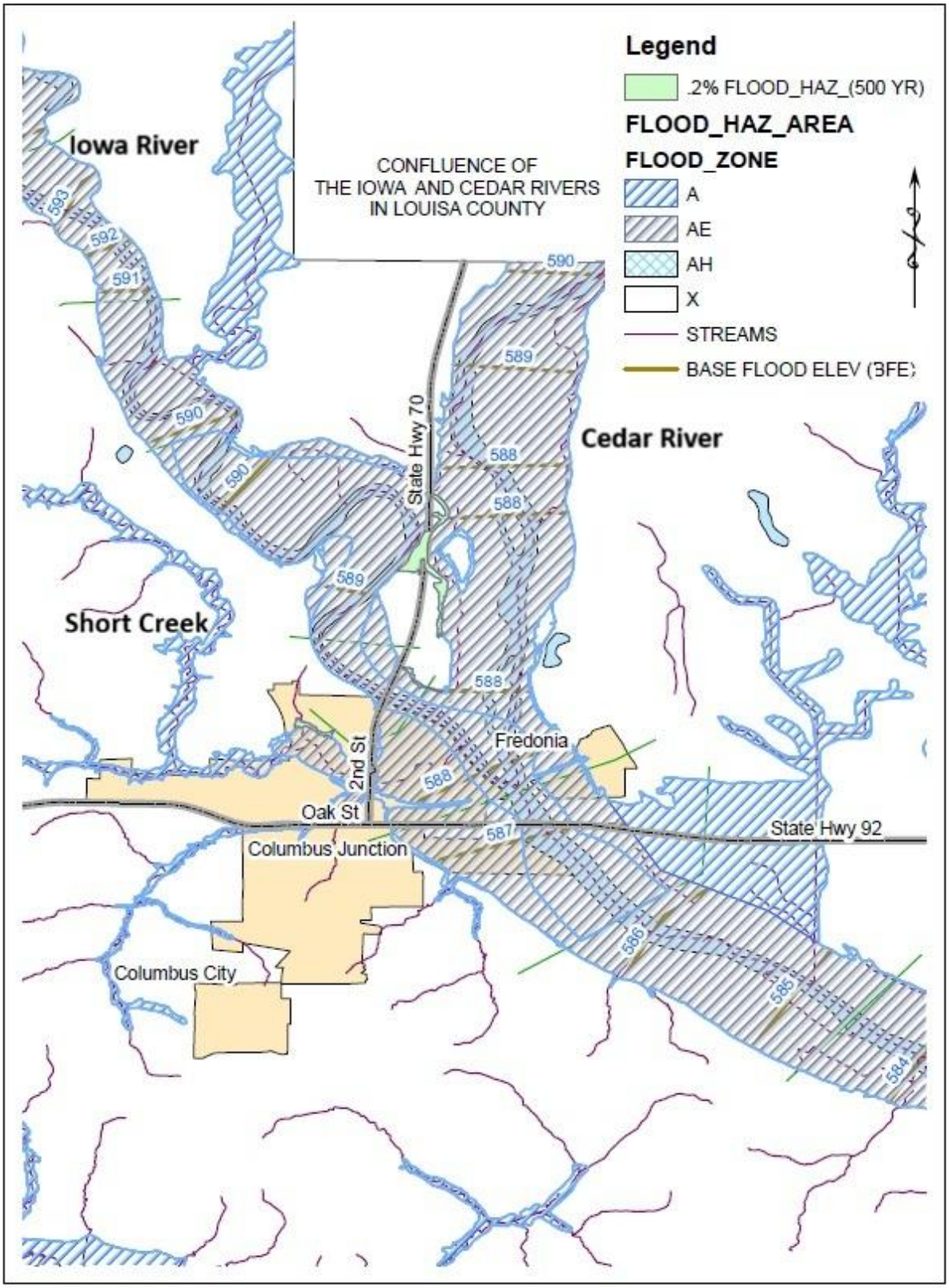
SFHAs in Louisa County are Zone A, Zone AE, AH and X.

FEMA definitions:

Zone A	Areas with a 1% annual chance of flooding and a 26% chance of flooding over the life of a 30-year mortgage. Because detailed analyses are not performed for such areas; no depths or base flood elevations are shown within these zones
Zone AE	The base floodplain where base flood elevations are provided
Zone AH	Areas with a 1% annual chance of shallow flooding, usually in the form of a pond, with an average depth ranging from 1 to 3 feet. These areas have a 26% chance of flooding over the life of a 30-year mortgage. Base flood elevations derived from detailed analyses are shown at selected intervals within these zones.
Zone X (shaded)	Area of moderate flood hazard, usually the area between the limits of the 100-year (1% chance) and 500-year (.2% annual chance) floods
Zone X (unshaded)	Area of minimal flood hazard. Zone X is the area determined to be outside the 500-year (.2% annual chance) flood


LOUISA COUNTY SFHA
OVERVIEW
Legend
LEVEE
PRISEC ROADS
FLOOD HAZARD AREA
FLOOD ZONE
A
AE
AH
X
STREAMS
Letts
Cotter
Fredonia
State Hwy 92
Columbus Junction
Columbus City
US Hwy 61
Grandview
Wapello
State Hwy 99
Morning Sun
State Hwy 78
Oakville
0
5
10
20 Miles
SEIRPC 2026

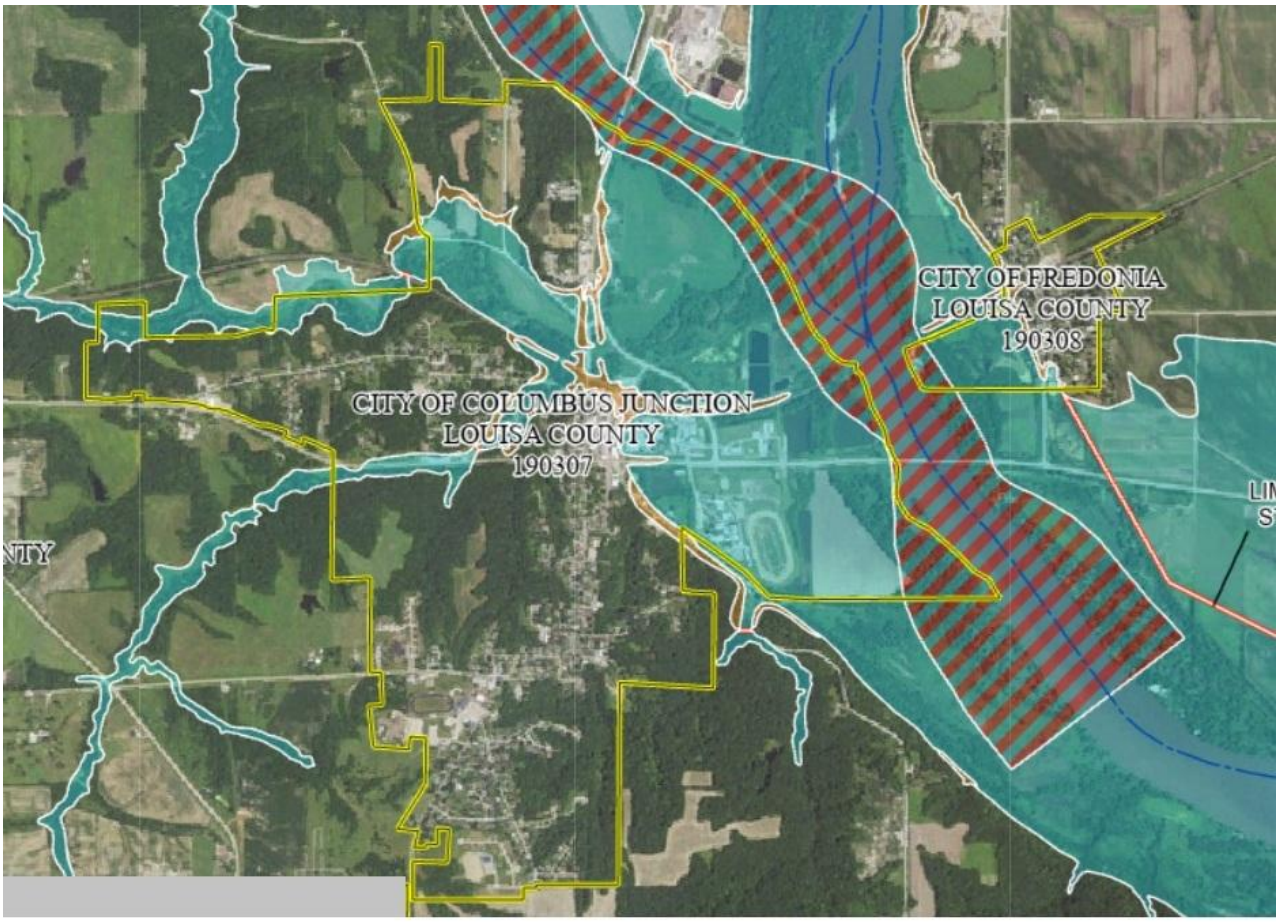
LOUISA COUNTY FLOOD DETAIL



SCALE: 1:60,000

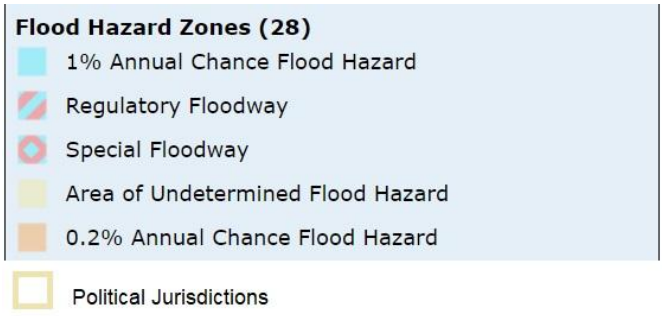
SEIRPC 2026

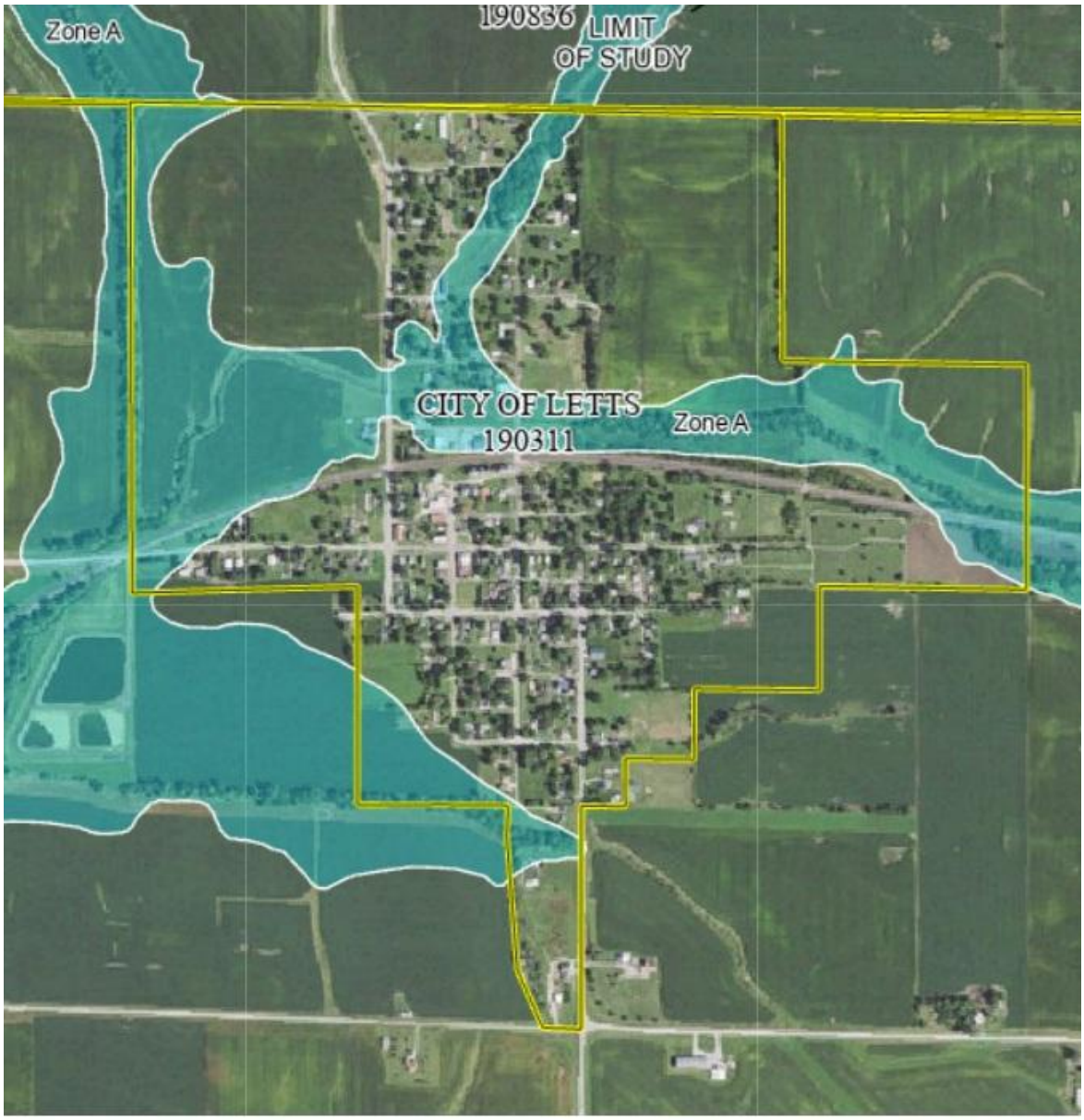
Jurisdictions with Zone A & AE SFHAs



COLUMBUS JUNCTION AND FREDONIA ARE AT THE CONFLUENCE OF THE IOWA AND CEDAR RIVERS

Both cities participate in the NFIP





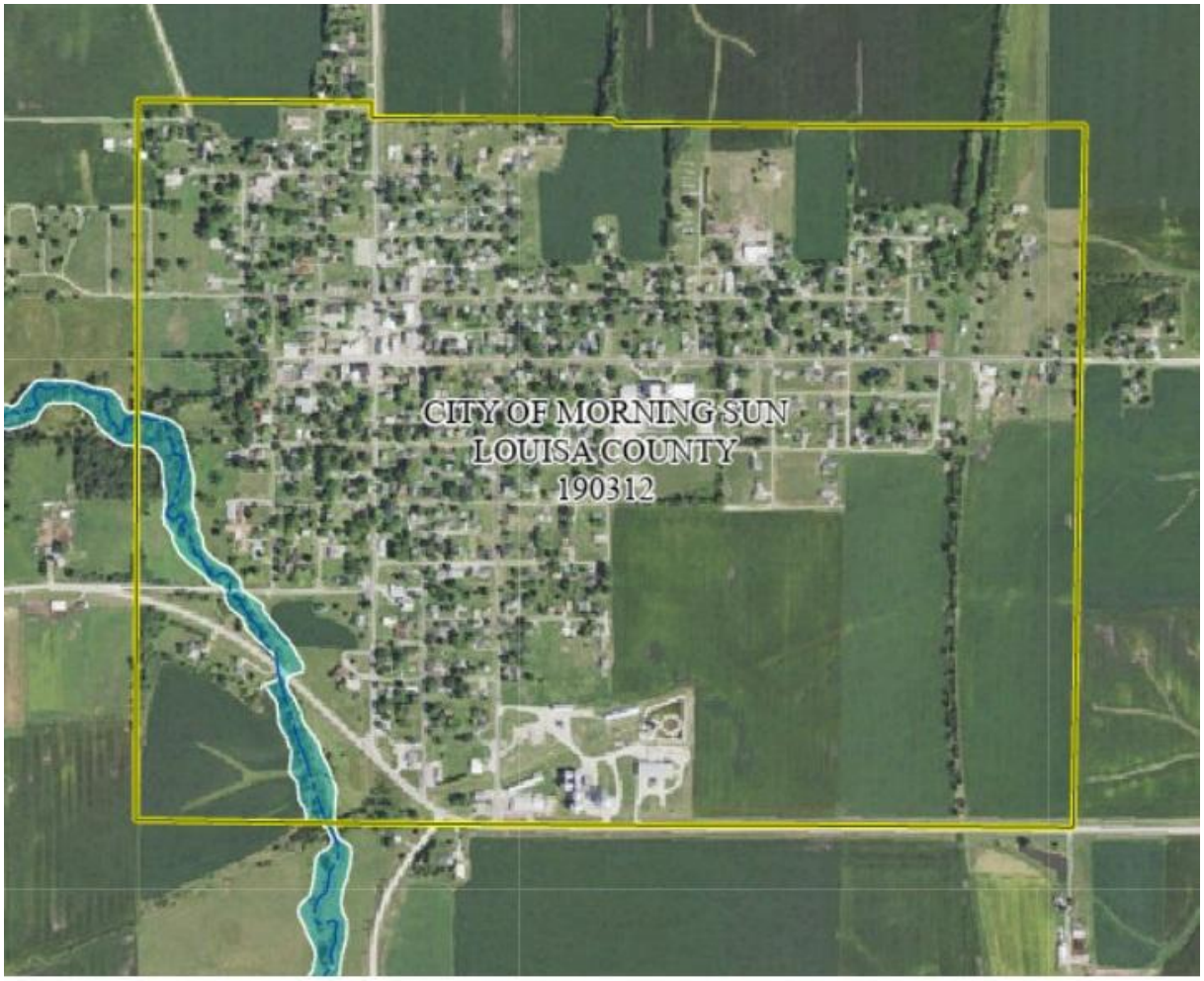
LETTS IS IN THE SFHA

Letts participates in the NFIP

Flood Hazard Zones (28)

- 1% Annual Chance Flood Hazard
- Regulatory Floodway
- Special Floodway
- Area of Undetermined Flood Hazard
- 0.2% Annual Chance Flood Hazard

Political Jurisdictions



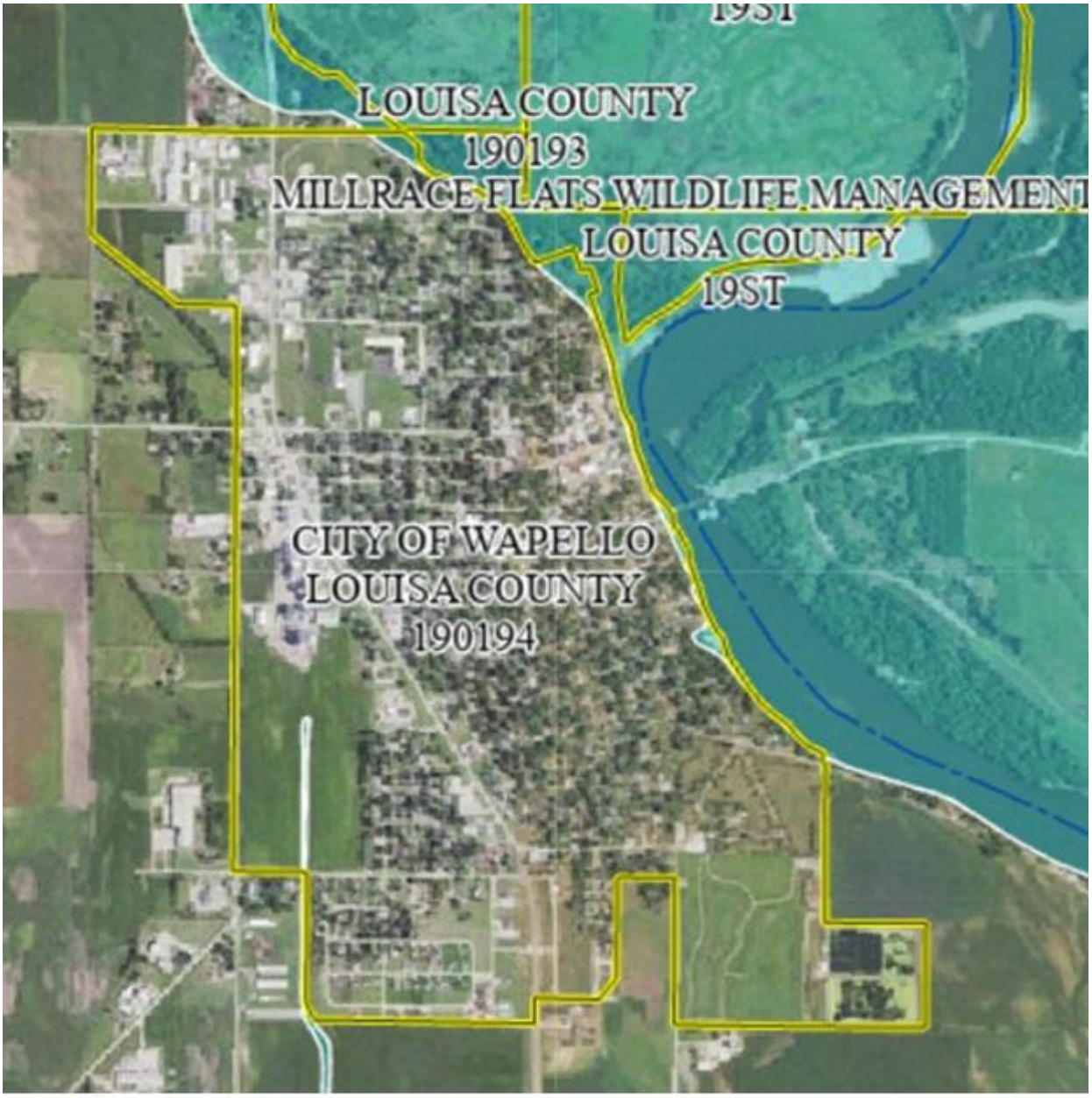
MORNING SUN IS IN THE SFHA OF ROFF CREEK

Morning Sun DOES NOT participate in the NFIP

Flood Hazard Zones (28)

- 1% Annual Chance Flood Hazard
- Regulatory Floodway
- Special Floodway
- Area of Undetermined Flood Hazard
- 0.2% Annual Chance Flood Hazard

Political Jurisdictions



THE NE EDGE OF WAPELLO IS IN THE SFHA OF THE IOWA RIVER

Flood Hazard Zones (28)

- 1% Annual Chance Flood Hazard
- Regulatory Floodway
- Special Floodway
- Area of Undetermined Flood Hazard
- 0.2% Annual Chance Flood Hazard

Political Jurisdictions

Wapello participates in the NFIP.

Jurisdictions in (Shaded) Zone X



OAKVILLE IS IN SHADED ZONE X, AN AREA OF REDUCED FLOOD RISK DUE TO A LEVEE

Levee on the Iowa River

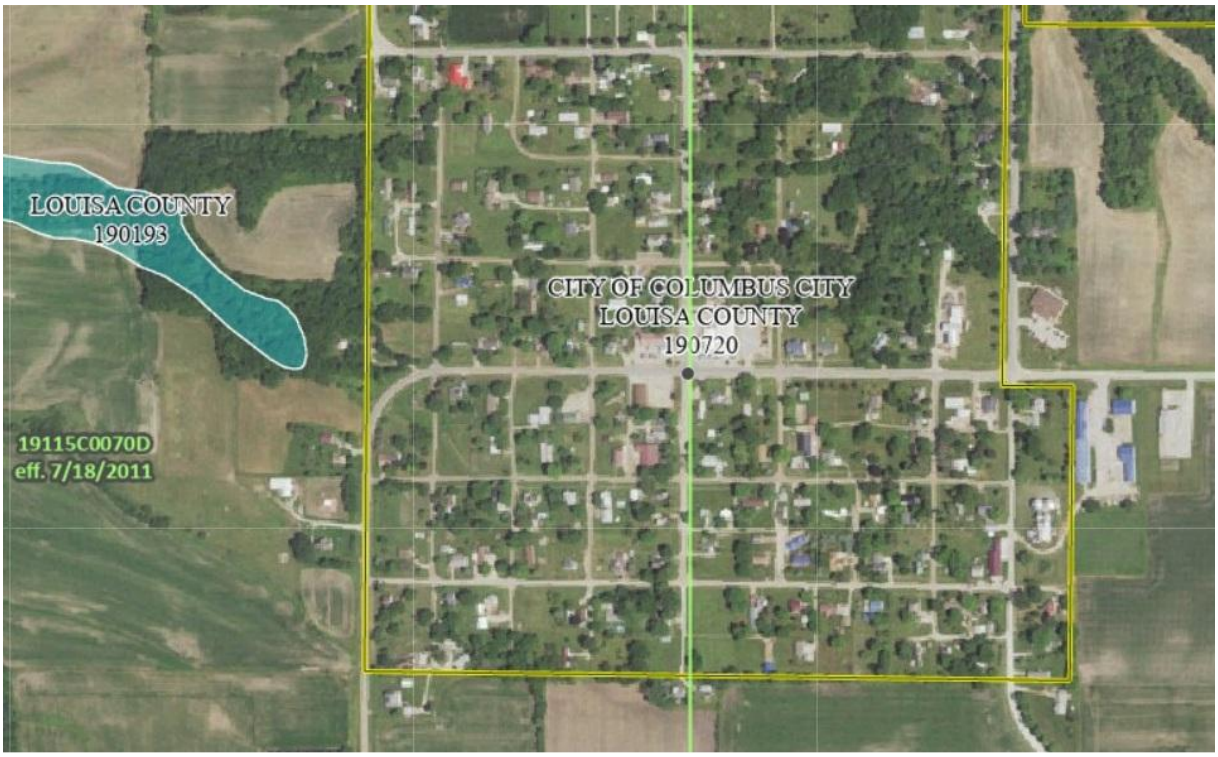
Oakville participates in the NFIP

Flood Hazard Zones (28)

- 1% Annual Chance Flood Hazard
- Regulatory Floodway
- Special Floodway
- Area of Undetermined Flood Hazard
- 0.2% Annual Chance Flood Hazard

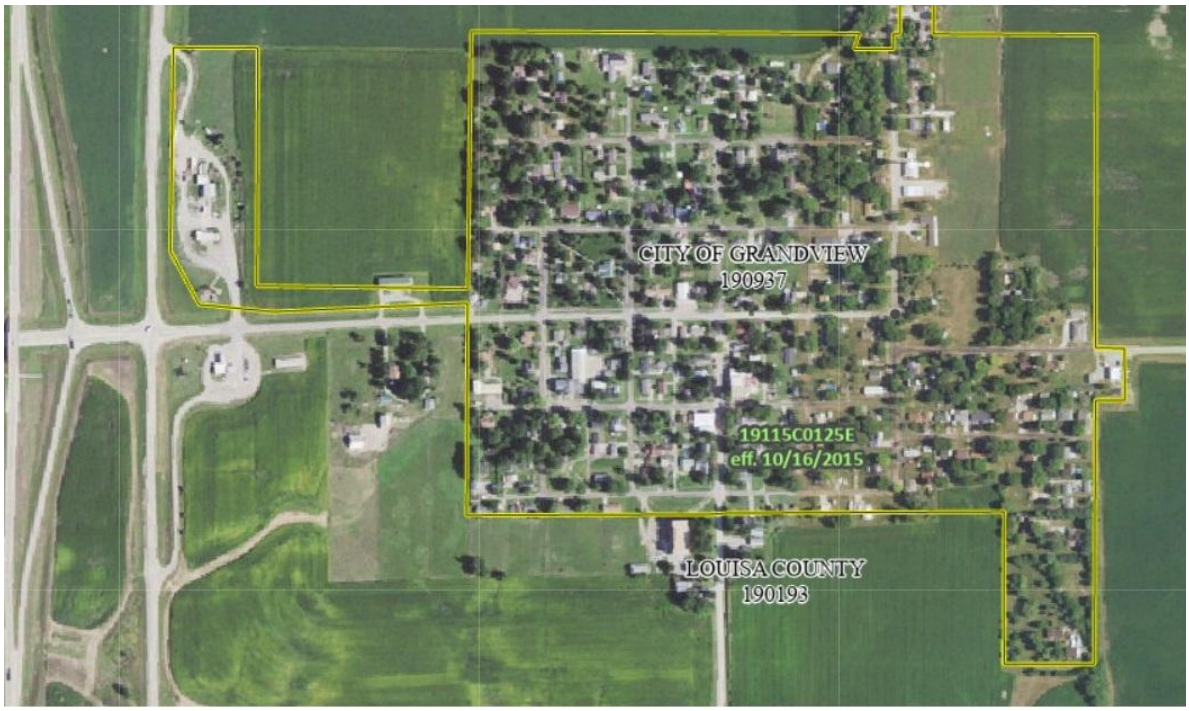
Political Jurisdictions

Jurisdictions in Zone X (No SFHA identified)



THERE IS NO SFHA WITHIN THE MUNICIPAL BOUNDARY OF COLUMBUS CITY

Columbus City participates in the NFIP.



THERE IS NO IDENTIFIED SFHA IN OR NEAR THE CITY OF GRANDVIEW

Grandview does not participate in the NFIP.



THERE IS NO SFHA WITHIN THE MUNICIPAL BOUNDARY OF COTTER

Cotter does not participate in the NFIP

Flood Hazard Zones (28)

- 1% Annual Chance Flood Hazard
- Regulatory Floodway
- Special Floodway
- Area of Undetermined Flood Hazard
- 0.2% Annual Chance Flood Hazard

Political Jurisdictions

Previous occurrences

Seven flash flood events were recorded in the NOAA Storm database during the study period. Flash floods all occurred in unincorporated locations.

FLASH FLOOD					
1	7/29/2016	7/29/2016	UNINCORP (GLADWIN)	Heavy Rain	Thunderstorms with heavy rain and an isolated flash flooding event. Heavy rains produced washed out locations on gravel roads in the area.
2	8/28/2016	8/29/2016	UNINCORP (GLADWIN)	Heavy Rain	A trained spotter reported that 3.25 inches of rain had fallen and that water was over the County Road at their location. Rainfall reported 3 to 6 inches.
3	5/28/2019	5/29/2019	COLUMBUS CITY	Heavy Rain / Snow Melt	Highway 92 was damaged by flash flooding just west of Columbus Junction. The highway was cracked and had to be closed.
4	7/11/2025	7/11/2025	COLUMBUS JCT	Heavy Rain	Severe thunderstorms moved across eastern Iowa and produced damaging straight-line winds, tornadoes and heavy rain. Rainfall totals of 2 to 4 inches fell in a few hours. Numerous rural roads closed within the county due to flash flooding and high water this evening.
5	7/20/2025	7/20/2025	COLUMBUS CITY	Heavy Rain	Showers and storms produced heavy rain with trained spotters reporting 1 to 3 inches. This led to flash flooding in parts of Washington, Louisa, and Muscatine Counties. Law Enforcement reported that 175th street is closed between G36 and X17 due to water over the road from Short Creek.
6	7/20/2025	7/20/2025	COLUMBUS JCT	Heavy Rain	These showers and storms produced 1 to 3 inches of heavy rain. Based on reports from social media, there is standing water that is several inches deep throughout out the county fairgrounds.
7	7/25/2025	7/26/2025	COLUMBUS JCT	Heavy Rain	Slow moving storms produced heavy rain across the area. This led to flash flooding in Louisa and Muscatine Counties. Rainfall amounts up to 3.25 inches. Report of high water in the town of Columbus Junction with local creeks overflowing their banks.

River floods

Six floods were recorded in the NOAA Storm Database between 2016 and 2025. Floods spanning several days or weeks have been counted as a single event, over multiple jurisdictions. Floods occurred in unincorporated Louisa County, Columbus Junction, Fredonia, Grandview, Letts, Oakville and Wapello.

FLOOD

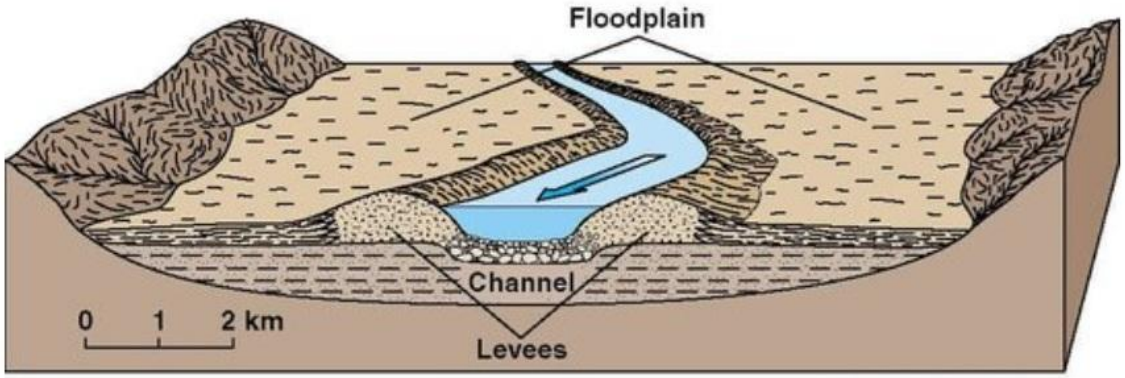
EVENT	BEGIN DATE	END DATE	LOCATION	CAUSE	NARRATIVE
1 **Sept 29 to Oct 2 2016**	9/28/2016	9/30/2016	UNINCORP (GLADWIN)	Heavy Rain	Heavy rainfall of 4 to over 10 inches in Northeast Iowa moved downstream causing the Iowa River to rise above major flood stage levels. Columbus Junction rose above its major flood stage level of 23.0 feet. It crested around 25.3 feet at approximately 2 AM CST on September 30th, 2016, Then major river flooding occurred downstream on the Mississippi River from the Iowa River and Mississippi River convergence and south.
	9/29/2016	9/30/2016	FREDONIA	Heavy Rain	Heavy rainfall of 4 to over 10 inches Iowa River to rise above major flood stage levels. Wapello rose above its major flood stage level of 25.0 feet on September 29th, 2016 at approximately 12 AM CST. It crested around 27.2 feet at approximately 9 AM CST on September 30th, 2016. Then major river flooding occurred downstream on the Mississippi River from the Iowa River and Mississippi River convergence and south.
	10/1/2016	10/2/2016	UNINCORP (GLADWIN)	Heavy Rain	Heavy rainfall of 4 to over 10 inches over significant areas from 21 to 23 September in Northeast Iowa moved downstream causing the Iowa River to rise above major flood stage. The Iowa River at Columbus Junction rose above its major flood stage level of 23.0 feet on September 28th, 2016 at approximately 12 PM CST. It crested around 25.3 feet at approximately 2 AM CST on September 30th, 2016. It fell below major flood stage on October 2nd around 8 AM CST.

	10/1/2016	10/2/2016	FREDONIA	Heavy Rain	Heavy rainfall of 4 to over 10 inches over significant areas from 21 to 23 September in extreme North Central and Northeast Iowa moved downstream causing the Iowa River to rise above major flood stage levels. The Iowa River at Wapello rose above its major flood stage level of 25.0 feet on September 29th, 2016 at approximately 12 AM CST. It crested around 27.2 feet at approximately 9 AM CST on September 30th, 2016.
2 **Oct 2018**	10/7/2018	10/13/2018	UNINCORP (GLADWIN)	Heavy Rain	The Iowa River near Lone Tree rose above the major flood stage of 18.0 feet during the morning hours of the 7th and fell back below the major flood stage very early on the 13th. The river crested at 20.4 feet around 430 AM on the 9th.
	10/7/2018	10/14/2018	COLUMBUS JCT	Heavy Rain	The Iowa River at Columbus Junction rose above the major flood stage of 23 feet during the late morning of the 7th and fell back below major flood stage very early in the morning of the 14th. The river crested at 24.3 feet around 1030 AM on the 9th and again at 24.3 feet around 1030 PM on the 12th.
	10/8/2018	10/14/2018	WAPELLO	Heavy Rain	The Iowa River at Wapello rose above the major flood stage of 25.0 feet around midnight on October 8th and fell back below major flood stage around 4 PM on the 14th. The river crested at 26.8 feet around 8 PM on the 11th.
	10/8/2018	10/23/2018	LETTS	Heavy Rain	Major flooding on the Mississippi River at New Boston LD17 began at 11 AM, October 8th, when it exceeded 18.5 feet. It crested at 21.3 feet, 430 PM, October 13th, before falling below 18.5 feet, which is major flood stage, at 9 PM, October 22nd. Upstream flooding affected the City of Letts.

3 **(March to June 2019)**	3/16/2019	3/31/2019	UNINCORP (TOOLESBORO)	Heavy Rain / Snow Melt	Moderate to major flooding was observed on the Mississippi River due to snowmelt, frozen ground, ice jams, saturated soils, and rainfall from mid March, through the end of the month and into April and May. An initial crest occurred during the third and fourth weeks of March. Heavy rain and snow melt across the region caused the Mississippi River to rise above major flood stages of 18.5 feet, on March 16th, and remain above flood stage through the end of the month. An initial crest of 20.8 feet occurred at New Boston the 24th into the 25th. An initial crest of 19.09 feet occurred at Keithsburg late in the day on the 24th.
	4/1/2019	4/23/2019	OAKVILLE	Heavy Rain / Snow Melt	The Mississippi River remained above the major flood stage from late March through early morning hours of March 24th. The Mississippi River at Keithsburg crested at 19.2 feet on April 10th.
	4/25/2019	4/30/2019	UNINCORP (TOOLESBORO)	Heavy Rain / Snow Melt	River levels continued to run high during the month of April. Heavy rain across the area caused the Mississippi River at New Boston, Illinois to rise above its major flood stage of 18.5 feet early in the evening of the 25th, and it remained above its major flood stage into the month of May.
	5/1/2019	5/14/2019	GRANDVIEW	Heavy Rain / Snow Melt	The Mississippi River at New Boston Lock and Dam 17 began the month above its major flood stage of 18.5 feet. The river stage at the beginning of the month was 22.39 feet. The river would rise to a crest of 23.59 feet beginning on May 3rd. This crest is preliminary the 4th highest crest. The river fell below major flood stage around 1 AM on May 14th.
	5/1/2019	5/14/2019	OAKVILLE	Heavy Rain / Snow Melt	The Mississippi River at Keithsburg (KHBI2) began the month above its major flood stage of 17 feet. The river stage at the beginning of the month was 20.6 feet. The river would rise to a crest of 21.97 feet May 3rd. This crest is preliminary, the 4th highest crest. The river fell below major flood stage around the morning of May 14th.

	5/21/2019	5/31/2019	UNINCORP (TOOLESBORO)	Heavy Rain / Snow Melt	The Mississippi River at New Boston Lock and Dam 17 hovered near major flood stage from around May 21st to the 24th, then rose above its major flood stage of 18.5 feet during the morning of May 25th and continued into June. The river crested in June, with the stage rising to 24.1 feet at the end of May 31st.
	6/1/2019	6/15/2019	OAKVILLE	Heavy Rain / Snow Melt	The Mississippi River at Keithsburg and New Boston began June above their respective major flood stages of 15.5 feet and 18.5 feet. The river at New Boston crested on June 2nd at 24.40 feet and fell below its major flood stage on June 14th around 7 AM. This is preliminarily the 4th highest crest on record. The river at Keithsburg fell back below major flood stage on June 15th around 10 PM. The river crested at 22.95 feet on June 2nd. This is preliminarily the 3rd highest crest on record.
4	10/13/2019	10/17/2019	TOOLESBORO	Heavy Rain	A wet fall pattern resulted in major flooding on a few sites along the Mississippi River in October, 2019. The Mississippi River at the KHBI2 gage rose above major flood stage of 17.0 feet on the 13th and crested at 17.12 feet at 1 AM CST on the 15th. It fell back below 17.0 feet on the 17th.
5	4/26/2023	4/30/2023	UNINCORP (TOOLESBORO)	Heavy Rain / Snow Melt	Significant flooding occurred on the mainstem Mississippi largely due to record snowfall this winter in Minnesota and Wisconsin, frozen ground, rapid snowmelt during the middle of April, and saturated soils. Major flooding was observed at all sites along the Mississippi north of Keokuk Iowa and most sites saw one of their top 10 crests on record. This flooding had numerous impacts, with many roads, businesses, homes, and people affected. The Mississippi River at New Boston rose above its major flood stage of 18.5 feet during the early morning hours of April 26th. The river continued to rise to 20.6 feet late in the day on April 30th. The Mississippi River rose above its major flood stage of 17.0 feet during the early morning hours of April 26th and continued to rise to 18.88 feet by the end of the month.

6	7/2/2024	7/20/2024	UNINCORP (TOOLESBORO)	Heavy Rain	Rain that fell during the month of June across Minnesota and Wisconsin caused rises on the Mississippi River along the Iowa and Illinois border. Additionally, heavy rain that fell locally in July helped to prolong the crest and delay the river falling below flood stage, especially south of the Wapsipinicon, Rock, and Iowa Rivers. The Mississippi River at New Boston rose above its major flood stage of 18.5 feet around 5 PM on July 2 and crested at 20.82 feet on July 11th. The river fell back below flood stage on July 20th.



https://rossettgeography.weebly.com/floodplains-levees--estuaries.html

B2-c Repetitive Loss Properties

NFIP. The National Flood Insurance Program (NFIP) Repetitive Loss Properties (REP) report provides information on structures that have had multiple NFIP claims during the history of the program. There were 8 identified Repetitive Loss (RL) properties in Louisa County three of which have been mitigated as of 2/25/2024.

Of the remaining five properties, one is in Wapello, two are east of Wapello near the Iowa River, one east of Letts, and one is in Eliot township in the southeast part of the county. No properties have been classified as Severe Repetitive Loss sites.

Occupancy type codes: 1=single family residence, 4 = non-residential building, 11 = single-family residential building with the exception of a mobile home.

LOUISA CO										
Repetitive Loss properties		As Of Date	2/25/2024							
community Id	community	nfip Rl	nfip Srl	Flood Zone	occ Type	construction Date	primary Residence	insured Indicator	total Losses	most Recent Date of Loss
190193	LOUISA COUNTY	1	0	AE	1	5/1/1970	Yes	Yes	2	8/30/2009
190193	LOUISA COUNTY	1	0	X	1	7/1/1950	Yes	Yes	3	6/16/2008
190193	ELIOT TWP LOU	1	0	AE	1	7/1/1977	No	No	2	7/7/1993
190194	WAPELLO, CITY	1	0	A	1	1/1/1960	No	No	2	6/30/1993
190311	LETTS, CITY OF	1	0	A	11	5/1/1900	Yes	Yes	2	6/30/2014
Mitigated RL Properties		As Of Date	2/25/2024							
community Id	community	nfip Rl	nfip Srl	floodZone	occ Type	construction Date	primary Residence	insured Indicator	total Losses	most Recent Date of Loss
190193	LOUISA COUNTY	0	0	A	4	3/1/1990	No	No	3	6/25/1993
190193	LOUISA COUNTY	0	0	AE	11	1/1/1978	Yes	No	2	6/14/2008
190193	LOUISA COUNTY	0	0	X	1	1/1/1993	Yes	No	3	4/28/2001

Probability

Flash Flood, seven events in ten years = 70%, Likely probability.

River Flood: Six events in 10 years = 60% Likely probability.

Stormwater flooding can happen almost anywhere for a variety of reasons. Since many of these incidents are on private property, tracking each occurrence is impractical. Therefore, we cannot include hard statistics for this hazard in flood data, but we do address the problem in the Mitigation Action Plan. See Appendix B for more information about stormwater management.

When all forms of flood are considered, there is a 70% chance or more that some flooding will occur in the unincorporated county and cities in any given year; the probability is Likely.

Climate trends

Floods are Increasing. Precipitation is expected to increase in volume and intensity, with average annual precipitation increasing 1" to 4" in any county by 2050. Because warmer air temperatures can hold more water, storms may be larger but less frequent. Eastern Iowa is seeing a greater increase in precipitation than western Iowa, which indicates a likelihood of more flooding in eastern Iowa in coming decades.

Climate changes already observed – Iowa 2023 HMP:

- ✓ Increased humidity, especially in summer, fueling thunderstorms
- ✓ Every 1°F increase in temperature allows the atmosphere to hold 4% more water vapor
- ✓ Higher temperatures
- ✓ Warmer nighttime temperatures (DNR)
- ✓ Winters are warming six times faster than summers (DNR)
- ✓ Increased precipitation (8 percent from 1873 to 2008)

B2-a,b Vulnerability and Impacts

SFHA Flood, Flash Flood: Affected Jurisdictions

X	Unincorporated Louisa County	X	Morning Sun
X	Columbus City	X	Oakville
X	Columbus Junction	X	Wapello
	Cotter		Columbus Junction Community Schools
X	Fredonia,		Louisa -Muscatine Schools
	Grandview		Morning Sun Community Schools
X	Letts		Wapello Community Schools

Stormwater Flood: Affected Jurisdictions

X	Unincorporated Louisa County	X	Morning Sun
X	Columbus City	X	Oakville
X	Columbus Junction	X	Wapello
X	Cotter	X	Columbus Junction Community Schools
X	Fredonia,	X	Louisa -Muscatine Schools
X	Grandview	X	Morning Sun Community Schools
X	Letts	X	Wapello Community Schools

Special impacts:

Flooding can result in emotional distress. The stress of dealing with ruined structures and personal items may be intensified by the discovery that flood damage is not covered by homeowners' insurance.

In 2022, over 330,000 hogs were recorded by Ag Statistics to be confined in Louisa County (NASS 2022). Flooding can result in manure spills at these facilities. During the historic 2008 flood event, hundreds of hogs escaped confinement, many of which had to be destroyed to prevent them rooting in earthen levees.

Louisa County & Cities, Floods and Stormwater

Infrastructure that can be subject to flood damage includes roads, bridges, electrical and gas utility lines, water treatment facilities, well houses, pump and lift stations and sewer treatment facilities. Flood proofing of critical facilities may be an option when they either cannot be moved, or it would not be cost effective to move the facility.

Runoff is the primary source of nonpoint pollution, as it can carry contaminants from the ground surface into a channel. Floodwater can be contaminated with pollutants such as agricultural pesticides, industrial chemicals, debris, and sewage. Excess chemicals and pollutants have negative impacts on water quality, including nutrient pollution that causes eutrophication.

Floods cause sedimentation and erosion. Surface runoff is the primary agent of soil erosion by water. Uptake and deposition of sediments alter the landscape by eroding riverbanks and causing them to collapse, affecting natural features and structures in the flooded area.

Flooding can have negative effects on wildlife, including drowning, disease proliferation and habitat destruction. Aquatic life and fish can be displaced, and nests destroyed.

Stormwater may overwhelm drainage capacity during heavy rains. Flooded roads and streets place drivers and pedestrians at risk. Surface flow seeks the lowest elevation and interacts with structures. Water enters buildings, homes and basements, damages mechanical systems and other property, and causes mold growth. Water near buildings triggers the pressure of expansive soils on foundations and slabs.

Columbus Junction

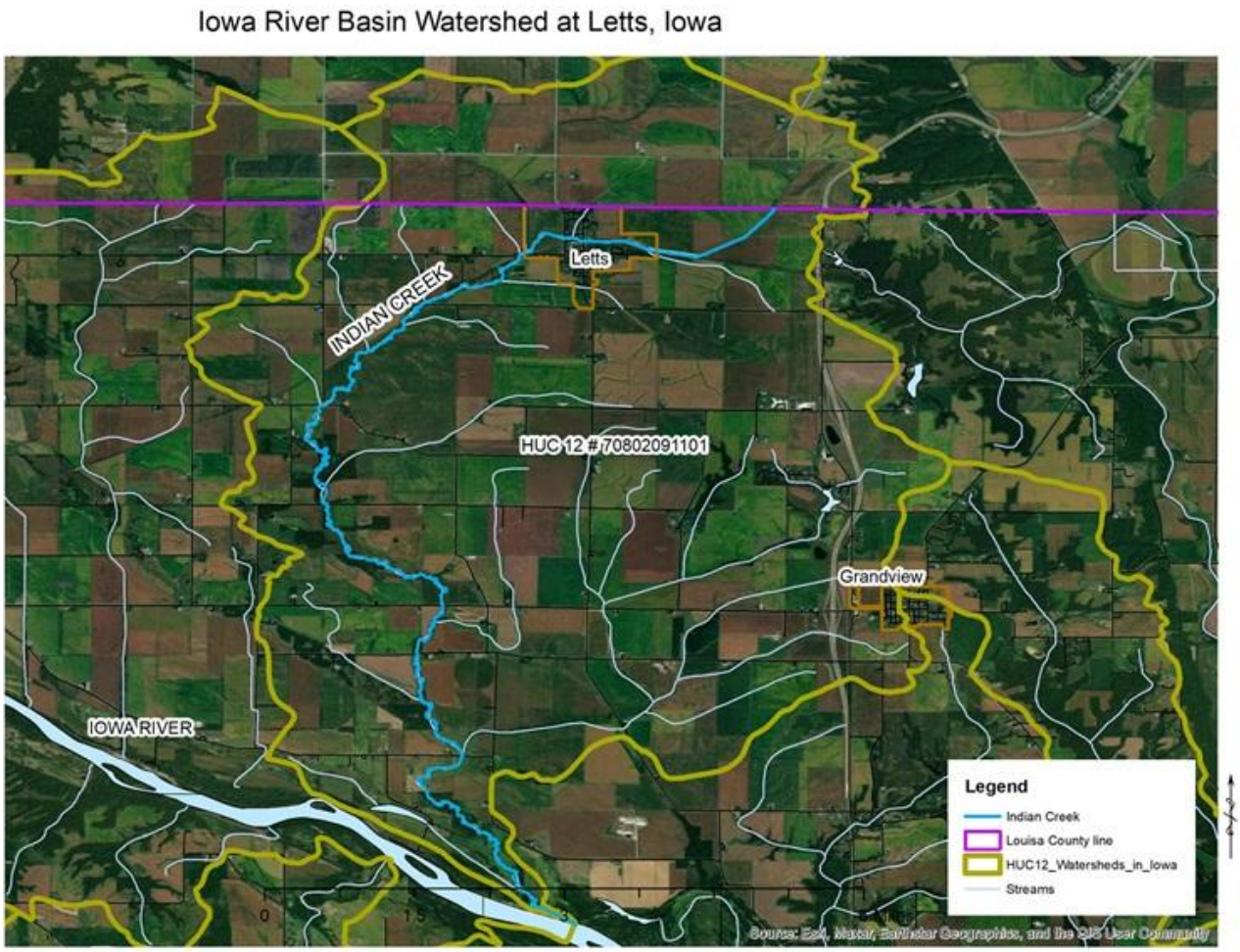
Building retention ponds to slow flooding on the Short Creek Watershed (HUC-12 # 070802090805) would be beneficial to the City of Columbus Junction. That creek runs north of the railroad tracks on 2nd St and under Hwy 70 and directly flows into the Iowa River. A watershed study on this stream has been completed with the Iowa Flood Center in Iowa City. One recent year when 12" of rain occurred in a week, a 6" water main was washed out, disrupting the supply of water to residents in unincorporated Toddtown. That study is available at The Iowa Flood Center (iowafloodcenter.uiowa.edu)

City of Letts

The city of Letts is a small town in northern Louisa County, in the downstream portion of the Iowa River-Flint River Basin, in the sub watershed Indian Creek (HUC 12 # 070802091101).

This Hydrologic Unit drains more than 20,000 acres and 81 square miles of Agricultural land, much of which is tiled to manage moisture and improve crop productivity. Runoff flows to Indian Creek, which drains into the Iowa River and ultimately, the Mississippi River.

Bisected by Indian Creek, areas of the City of Letts are frequently flooded. The impacts of flooding in this portion of the Iowa River Basin could be reduced by construction of additional retention ponds and improved stormwater management practices.



Letts is entirely surrounded by heavily tiled agricultural land that drains through Indian Creek to the Iowa River SEIRPC 2026

SFHAs & Flash Flood: Morning Sun

This community includes a special flood hazard area but does not participate in the NFIP. Property owners in non-participating communities are not able to purchase flood insurance. Development is not regulated in flood hazard areas, leading to increased risk.

Impacts of Climate trends. From the US EPA Publication on Climate change in Iowa: During the next century, spring rainfall and average precipitation are likely to increase, and severe rainstorms are likely to intensify. Each of these factors will tend to further increase the risk of flooding. Summer droughts are likely to become more severe, floods may also intensify (EPA, 2016).

Land use development. New development should occur well outside the base flood areas whenever possible. Natural systems should be supported and best practices for stormwater management should be applied to new and rehabilitated development sites.

Population patterns. Population growth should be directed to higher ground, while population decrease may provide opportunities to acquire and demolish structures vulnerable to flood.

Severe Thunderstorms

Hail, high winds and lightning are the three primary components of severe weather systems known as thunderstorms. Each of these hazards is profiled individually below.

Hail

Hail is a form of precipitation associated with thunderstorms that consists of solid lumps of ice, which are individually called hailstones. Hail formation requires an atmospheric environment of strong, upward moving air, called an updraft, within the subfreezing region of a thunderstorm cloud.

As described by the Department of Atmospheric Sciences at the University of Illinois, hail is produced by intense thunderstorms where snow and rain can coexist in the central updraft. "As snowflakes fall, liquid rain freezes to them forming ice pellets that continue to grow as more and more drops are accumulated.

Upon reaching the bottom of the cloud, some of the ice pellets are carried by the updraft back to the top of the storm. As the ice pellets once again fall through the cloud, another layer of ice is added, and the hail stone grows larger. Once a hail stone becomes too heavy to be supported by the updraft, it falls to the earth."

Location

Hail affects all locations in the planning area.

Affected Jurisdictions County, Cities, Schools

Extent

The planning area uses the Hail Diameter Scale to categorize Hail events. Hailstones of any size described on the chart can be expected to occur.

The severity of damage caused by hail varies with the hailstone size, number of hailstones by area, and associated winds. Another factor that affects the amount of damage that results from hail is the speed at which it falls. Velocity is affected by the height of a falling object due to the constant acceleration of gravity.

According to NOAA, for small hailstones produced at lower atmospheric heights, the expected fall speed is between 9 and 25 mph. For hailstones of 1 inch to 1.75-inch in diameter that fall in a severe thunderstorm, the expected fall speed is between 25 and 40 mph. In the strongest, upper level supercells which produce some of the largest hail, the expected fall speed can reach between 44 and 72 mph or more.

HAIL DIAMETER SCALE

Size (Inches)	Description
1/4"	Pea
1/2"	Marble
3/4"	Penny
7/8"	Nickel
1"	Quarter
1 1/4"	Half Dollar
1 1/2"	Ping Pong Ball
1 3/4"	Golf Ball
2"	Hen's Egg
2 1/2"	Tennis Ball
2 3/4"	Baseball
3"	Teacup Size
4"	Grapefruit
4 1/2"	Softball

While there is a degree of uncertainty in these estimates due to variability in a hailstone's shape, degree of melting, fall orientation, and environmental conditions such as wind (NOAA, 2020), 2 inch hailstones falling at 60 mph certainly have the potential to cause serious damage or injury.

Previous Occurrences

The NOAA Storm Database records hail events when hailstones are .75 inches (penny size) or greater. There were 9 such hail events recorded by NOAA during the 10 year period January 2016 through December 2025.

LOUISA	HAIL RECORD	2016-2025			
EVENT	**LOCATION**	**DATE**	**EVENT TYPE**	**WIND (MPH)**	**HAIL SIZE**
1	GRANDVIEW	3/6/2017	Thunderstorm	50	SMALL
	Widespread winds over 70 mph, small hail, and several tornadoes were reported. Damage from these storms included: downed trees, power poles, destroyed outbuildings, and roof damage to several homes.				
2	WAPELLO	7/10/2017	Thunderstorm	55	LARGE
	Severe storms with very heavy rain producing flash flooding, several reports of damaging winds of 60 to 70 mph, and isolated areas of large hail				
3	GLADWIN (UNINC)	8/10/2017	Thunderstorm	52	1.5 INCH
	Showers and thunderstorms developed and produced wind gusts up to 60 MPH and hail up to 1.50 inches in diameter.				
4	COLUMBUS CITY	5/28/2019	Flash Flood		SMALL
	Torrential rainfall, small hail, damaging wind gusts near 70 MPH and frequent lightning.				
5	MORNING SUN	6/18/2021	Thunderstorm	56	1.5 INCH
	Intense storms produced very large hail and damaging wind gusts. Hail around 1.5 inches in diameter. A large tree was blown down, blocking the road.				
6	WAPELLO	3/31/2023	Thunderstorm	103	LARGE
	Numerous tornadoes, many large hail and damaging wind reports. Maximum straight line thunderstorm winds were estimated at 80 to 90 mph. Thunderstorm snapped off two power poles.				
7	NEWPORT (UNINC)	4/16/2024	Thunderstorm	52	HAIL
	Reports of hail, damaging winds, and two tornadoes.				
8	LETTS	4/27/2024	Thunderstorm	51	HAIL
	Storms produced hail and damaging wind gusts as they moved across the area.				
9	OAKVILLE	6/13/2024	Thunderstorm	70	GOLF BALL
	Severe storms produced large hail and scattered damaging winds. Hail reports ranged in size from quarter to golf ball size hail. Roof blown off an unused hog shed from suspected microburst winds. 12-inch tree broken off about a foot above the base. Open farm outbuilding destroyed. The most widespread damage occurred near Oakville.				

Probability of Hail

Hail over .75 inches in size often falls in the planning area more than once a year. Overall, the probability of a damaging hail event is 9 in 10 years = 90%; Very likely.

Hail size	Number of Events
1 inch or less	4
1 to 1.75	4
1.75 to 2 inch	1
Total	**9**

Louisa County
2016-2025 Hail record

Year	Number of events
2017	3
2019	1
2021	1
2023	1
2024	3
Total	**9**

Climate Trends

Some of Iowa's natural hazards are expected to increase in frequency and intensity. The atmosphere acts like a sponge, and the warmer it is, the more moisture it can hold. The atmosphere's ability to hold more moisture also means that it takes more moisture to cause a precipitation event, which in turn means that the time between events is increased, and the potential for high-intensity precipitation is also increased (Iowa, 2023). Because of the way hail is formed, higher intensity storms can be expected to produce large hail.

B2-a,b Vulnerability and Impacts

Hail: Affected Jurisdictions

X	Unincorporated Louisa County	X	Morning Sun
X	Columbus City	X	Oakville
X	Columbus Junction	X	Wapello
X	Cotter	X	Columbus Junction Community Schools
X	Fredonia,	X	Louisa -Muscatine Schools
X	Grandview	X	Morning Sun Community Schools
X	Letts	X	Wapello Community Schools

Vulnerability is consistent across jurisdictions since hail occurs in random locations, and while most storms create relatively narrow paths of destruction, all geographic locations in the county are equally at risk.

Injuries to people or animals, damage to crops and structures vary with the size and velocity of hailstones and the duration of the event. Large hail poses a threat to people caught outside in a storm, but it seldom causes the loss of human life. No personal injuries are recorded in the Storm Data record (Storm, 2026).

Property damage from hail is the most severe in storms that produce high winds in addition to large hail, as winds blow hailstones into windows and siding that would not be impacted otherwise.

Louisa County

Rural residential and agricultural structures of all vintage and a variety of construction materials are scattered throughout the county. Some of those are more vulnerable due to age of construction, siding

materials or the type and age of roof. Roofs, siding and windows on residential and business properties are damaged.

Personal vehicles, farm equipment and larger trucks are often stored outdoors. Damage to vehicles ranges from minor dents to total loss of value. The cost of damages to agriculture, buildings, vehicles and infrastructure must be borne by owners or insurance companies.

Hail events cause crop damage that ranges from minor to total loss. The economic impacts of crop loss affect jobs, family quality of life and reduce tax revenues for local services. Crops are at greater risk during early spring and late fall when the peak period for hailstorms coincides with critical agricultural seasons. Livestock frequently graze open land, away from roofed structures. Unsheltered livestock are stressed or injured by hail.

City jurisdictions

City-owned and private vehicles, equipment, trucks and RVs are often stored outdoors. Damage to vehicles and equipment ranges from minor damage to total loss of value.

Municipal utility services such as electric power and communication systems vulnerable to hail are exposed to weather. Large hail can impact trees and power lines. Damage to electrical infrastructure from tree damage and hail causes loss of power, and secondary effects such as impaired emergency communication and failure of home medical equipment.

School Districts

Buildings, buses and other vehicles, and outdoor structures are exposed to the weather. Hail damages roofs, siding, windows, appurtenances and vehicles stored outside. Light fixtures and scoreboards on athletic fields are damaged by hail. Outdoor activities and sports events draw large crowds where people who are caught outdoors in a hail event may be injured.

Impacts of Climate trends. Frequency of hail events may be reduced. Storm severity is expected to increase, which can be expected to increase the size and quantity of hailstones that may be created by strong upper level winds.

Land use development. Changing land use or incidence of hail are not expected to influence each other.

Population patterns. This hazard is unlikely to be affected by population patterns.

High wind

High winds in Louisa County can result from strong cold front passages, gradient winds between high and low pressure, thunderstorms or tornadoes. High winds are referred to as “straight-line” winds to differentiate the damage they cause from the rotating winds of tornadoes.

Downdraft winds are a small-scale column of air that rapidly sinks toward the ground, usually accompanied by precipitation as in a shower or thunderstorm. A downburst is the result of a strong downdraft associated with a thunderstorm that causes damaging winds near the ground.

Location

High winds affect the entire planning area. Iowa is in the path of powerful cold fronts traveling down from Canada or the Rocky Mountains which collide with warm, moist air from the Gulf of Mexico. Average wind speed in Louisa County is estimated to be about 9 mph (IA Meso, 2024).

Affected Jurisdictions County, Cities, Schools

Extent

The Planning Area uses the Beaufort Wind Scale to categorize High Wind. The planning area can expect any range on the Beaufort scale from 0 – 12.

Beaufort Number	MPH		Terminology	Description
	Range	Average		
0	0	0	Calm	Calm. Smoke rises vertically.
1	1 -3	2	Light air	Wind motion visible in smoke.
2	4 - 7	6	Light breeze	Wind felt on exposed skin. Leaves rustle
3	8 - 12	11	Gentle breeze	Leaves and smaller twigs in constant motion.
4	13 - 18	15	Moderate breeze	Dust and loose paper is raised. Small branches begin to move.
5	19 - 24	22	Fresh breeze	Smaller trees sway.
6	25 - 31	27	Strong breeze	Large branches in motion. Whistling heard in overhead wires. Umbrella use becomes difficult.
7	32 - 38	35	Near gale	Whole trees in motion. Some difficulty when walking into the wind.
8	39 - 46	42	Gale	Twigs broken from trees. Can veer on road.
9	47 - 54	50	Severe gale	Light structure damage.
10	55 - 63	60	Storm	Trees uprooted. Considerable structural damage.
11	64 - 73	70	Violent storm	Widespread structural damage.
12	74 - 95	90	Hurricane	Considerable and widespread damage to structures.

Previous Occurrences; High winds

The NOAA Storm Events Database is a primary source of weather records for the nation. From January 2016 through December 2025, twenty-one thunderstorms occurred that had wind speeds of 50 mph or more. Nine of those were "Severe," having speeds of 58 mph or more (Level 10).

Severe wind events = 58 mph or more			
Location	Date	Event	mph
GRANDVIEW	10/6/2016	T-storm Wind	64
GRANDVIEW	8/20/2019	T-storm Wind	61
WAPELLO	11/26/2019	T-storm Wind	65
GRANDVIEW	12/15/2021	T-storm Wind	61
WAPELLO	3/31/2023	T-storm Wind	103
GLADWIN	5/21/2024	T-storm Wind	61
COLUMBUS JCT	5/24/2024	T-storm Wind	61
OAKVILLE	6/13/2024	T-storm Wind	70
NEWPORT	6/3/2025	T-storm Wind	65

Probability; High winds

Nine severe wind events were recorded during the study period, 9/10 years = the probability for damaging high winds is 90%, Very likely.

Climate trends

Temperature differentials drive winds. Wind patterns across the North American Continent may shift in ways not yet fully understood. Changes in temperature from one region to the next can be expected to have a dramatic influence on the direction and intensity of winds.

- ✓ Earth's average global temperature is rising, but the amount of warming is not equal in all areas of the world
- ✓ At high latitudes, especially in and near the Arctic, temperatures are warming faster than places closer to the equator. The Arctic is heating up about twice as quickly as the global average
- ✓ As the climate warms, the ocean is expected to warm more slowly than land because it takes much more heat to warm water than air and land. The air above ocean water is expected to warm more slowly than land too
- ✓ In general, the middles of continents are expected to warm more than coastal areas. Regional topography will influence this too (NSF NCAR, 2023)

JET STREAM WINDS WILL ACCELERATE WITH WARMING CLIMATE

New research by the University of Chicago and the U.S. National Science Foundation National Center for Atmospheric Research (NSF NCAR) finds that fast jet stream winds will get significantly faster by mid-century because of climate change.

The study, in Nature Climate Change, suggests that the fastest upper-level jet stream winds will accelerate by about 2% for every degree Celsius (1.8° Fahrenheit) that the world warms. Furthermore, the fastest winds will speed up 2.5 times faster than the average wind.

> Jet stream winds are powerful and narrow bands in the upper atmosphere that generally move from west to east, influencing weather patterns . . . Faster winds would likely increase the potential for severe weather.
>
> Jet streams form because of the contrast between the cold, dense air at the poles and the warm, light air in the tropics, in combination with the rotation of the Earth. The new study, by University of Chicago Professor Tiffany Shaw and NSF NCAR scientist Osamu Miyawaki, uses climate models to show that climate change intensifies this density contrast because moisture levels for air above the tropics will increase more than above the poles.
>
> "This may have implications for air travel," Miyawaki said. "The faster the jet stream winds, the more severe the impacts on turbulence. The faster winds may also lead to conditions that are favorable for stronger and more prolonged storms" (NSF NCAR, 2023).

From the 2023 Iowa State Hazard Mitigation Plan:

"The 2017 U.S. Climate Science Report notes that in a higher greenhouse gas (GHG) concentration scenario, within 80 years we would likely see average global temperatures at least 5°F warmer than the averages of the first half of the 20th century. Furthermore, even if the currently increasing rate of GHG concentrations begins decreasing significantly by 2050, we can expect average temperatures at least 2.4°F and as much as 5.9°F warmer. It is not, however, the average that affects us most, but the extremes. Weather extremes have already begun to worsen and are expected to continue" (Iowa, 2023).

B2 a,b Vulnerability and Impacts

High winds: Affected Jurisdictions

X	Unincorporated Louisa County	X	Morning Sun
X	Columbus City	X	Oakville
X	Columbus Junction	X	Wapello
X	Cotter	X	Columbus Junction Community Schools
X	Fredonia,	X	Louisa -Muscatine Schools
X	Grandview	X	Morning Sun Community Schools
X	Letts	X	Wapello Community Schools

Severe storms cause a significant amount of tree damage. The number of trees damaged, and total cost of damages is difficult to quantify because there is no central reporting mechanism for local tree loss among landowners, professional tree service companies, municipal clean-up crews and utility companies. The State does have the ability to interpolate loss estimates, which are reported through the Iowa DNR.

For example, according to the Iowa DNR, the state lost an estimated 7.2 million trees in cities and farms when a hurricane-force derecho struck the state on August 10, 2020. The state estimates the costs to Iowa at $20 million annually, with lost trees no longer able to capture and store carbon that contributes to climate change, reduce air pollution, or provide windbreaks and shade that cut energy use (Eller D. , Iowa DNR survey, 2021). Additional costs include tree removal, disposal, and replacement.

See Appendix C for an example of the impacts of High winds on Agriculture.

All Jurisdictions

Buildings, especially roofs are vulnerable to the effects of high wind. Depending on wind speed and direction, debris of various weight and material is torn apart and carried aloft. People, livestock, vehicles and structures are impacted by airborne debris. Windows are broken. Eye injuries occur from debris in the air.

Utility infrastructure: above ground power lines and poles are vulnerable to high wind. Trees are uprooted or broken; limbs take down utility lines. Power outages cause secondary impacts such as endangering the health of people who may be dependent on power for home medical devices or refrigeration of insulin. When electrical lines fall, it may be necessary to close roads or streets until power companies can ensure public safety.

Louisa County and Cities

Semi-trucks and other high profile vehicles travel local highways. Sustained winds of 30 mph or gusts of 45 mph or more make it difficult to drive high profile vehicles such as semi-trucks and RVs (NWS, 2020). Parked vehicles can be overturned at higher wind speeds depending on the weight of the load.

There are 449 mobile homes throughout the county. Mobile homes are less resilient to the effects of high winds than traditional homes, especially those built prior to modern building standards. People living in mobile homes are at risk of personal injury from damaging high wind events when alternative shelter is not readily available. See Community profiles in Section G for an estimate of mobile homes in each community.

RVs and campers are commonly in use and are vulnerable to damage or being blown over with sustained winds of 30 mph or gusts of 45 mph. People living or travelling in RVs and campers may be injured when alternative shelter is not readily available. RVs are stored outdoors on residential lots throughout the county. These lightweight, high profile vehicles may be blown over or impacted by debris.

Wind delivers additional oxygen to fires and it also lays over the flames toward the fire front, increases fire intensity by pre-heating and drying the fuel ahead of the fire, and carries sparks and embers ahead of the main fire, causing spot fires. In high winds, sparks become wildfires very quickly.

City Jurisdictions

Residential, commercial and governmental buildings and utility infrastructure are exposed to damaging wind events. Roofs, siding and appurtenances attached to walls or roofs can become detached, causing damage and debris.

Trees are uprooted or broken, pull down power lines, damage adjacent structures and block streets. Where vacant lots are unkempt, some of the trees that grow are less resilient species such as cottonwood, mulberry or poplar, are less likely to be maintained and are more vulnerable to breakage.

Schools

The schools are dependent on the municipal power system. These systems use above-ground power lines, which are susceptible to high wind damage. Power outages interrupt school operations and result in a loss of refrigerated food. High winds can move high profile vehicles such as school buses and create dangerous conditions for transport of students.

Impacts of Climate trends. Changing wind patterns and increased temperature differences among regions are likely to increase the occurrence of high wind events in coming decades.

Land use development. Land use development will not be affected by high winds in the foreseeable future.

Population patterns. Population patterns and high winds are unlikely to have any effect on each other in the foreseeable future.

Lightning

The National Weather Service defines a thunderstorm as "a rain-bearing cloud that produces lightning." Lightning is a discharge of intense atmospheric electricity, accompanied by a vivid flash of light, from one cloud to another or from a cloud to the ground. As lightning passes through the atmosphere, the air immediately surrounding it is heated, causing the air to expand rapidly, producing a sound wave we hear as thunder.

All thunderstorms are dangerous. In the United States, an average of 300 people are injured and 80 people are killed each year by lightning (NWS, 2024).

Positive, negative lightning. Lightning is formed by the separation of positive and negative charges that occur when ice crystals collide high up in a thunderstorm cloud. According to the National Weather Service (NWS), cloud-to-ground (CG) lightning is the most damaging and dangerous form of lightning. Most flashes originate near the lower-negative charge center and deliver negative charge to Earth. However, an appreciable minority of flashes carry positive charge to Earth. These positive flashes often occur during the dissipating stage of a thunderstorm's life.

> Positive lightning makes up less than 5% of all strikes. However, despite a significantly lower rate of occurrence, positive lightning is particularly dangerous for several reasons.
>
> Since it originates in the upper levels of a storm, the amount of air it must burn through to reach the ground is usually much greater. Therefore, electric fields associated with positive cloud-to-ground (CG) strikes are typically much stronger than those associated with negative strikes. The flash duration is also longer with peak charge and potential up to ten times greater as compared to negative CG strikes; as much as 300,000 amperes and one billion volts . . . Also, positive flashes are believed to be responsible for a large percentage of forest fires and power line damage. Thus, positive lightning is much more lethal and causes greater damage than negative lightning (NWS, 2024).

Location

All jurisdictions in the planning area are subject to Lightning hazard.

Affected Jurisdictions County, Cities, Schools

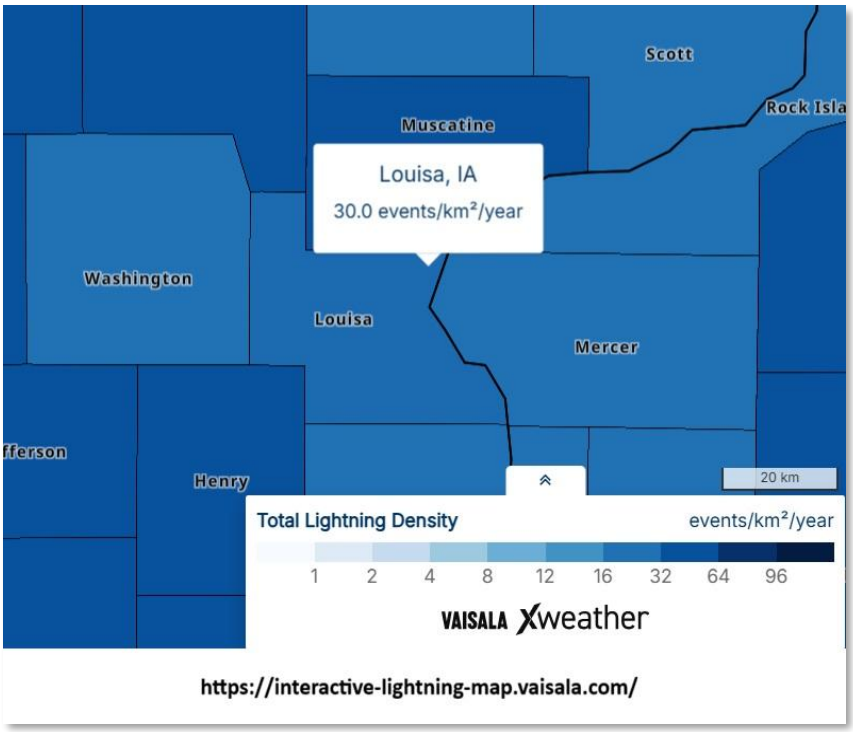
Extent

The planning area uses the Lightning Activity Level Scale (LAL Scale) to categorize lightning extent. Any level on the LAL Scale can be expected to occur.

Lightning Activity Level (LAL)	
A scale which describes lightning activity. Values are labeled 1-6:	
LAL 1	No thunderstorms
LAL 2	Isolated thunderstorms. Light rain will occasionally reach the ground. Lightning is very infrequent, 1 to 5 cloud-to-ground strikes in a five minute period.
LAL 3	Widely scattered thunderstorms. Light to moderate rain will reach the ground. Lightning is infrequent, 6 to 10 cloud-to-ground strikes in a 5 minute period.

LAL 4	Scattered thunderstorms. Moderate rain is commonly produced Lightning is frequent, 11 to 15 cloud-to-ground to ground strikes in a 5 minute period.
LAL 5	Numerous thunderstorms. Rainfall is moderate to heavy. Lightning is frequent and intense, greater than 15 cloud-to-ground strikes in a 5 minute period.
LAL 6	Dry lightning (same as LAL 3 but without rain). This type of lightning has the potential for extreme fire activity and is normally highlighted in fire weather forecasts with a Red Flag Warning.

Dry lightning. Lightning often strikes outside of the rain in the thunderstorm and may occur as far as 10 miles away from any rainfall. As noted in the scale above, Lightning Activity Level 6, lightning often occurs in apparently dry conditions. A dry thunderstorm is a thunderstorm that produces thunder and lightning, but where most of the precipitation evaporates before reaching the ground. Dry lightning refers to lightning strikes occurring in this situation. The terms are sometimes used interchangeably.



Lightning density.

Vaisala is a company that has become a leading resource for lightning data, tracking lightning density across the globe. Density is the number of lightning strikes or flashes per chosen spatial area (e.g. km²) and time interval. Vaisala has produced an interactive map that shows yearly lightning density data, averaged from 2016 to 2025.

According to this data, Louisa County averages about 30 lightning flashes per square kilometer each year (Vaisala, 2025). That data includes all flashes, including cloud to cloud lightning and cloud-to-ground strikes.

The US Census Bureau estimates the county has a total area of 1,080 square kilometers (418 square miles).

Cloud to Ground Lightning Strikes. Vaisala estimates cloud-to-ground strikes in southeast Iowa to be about 1 to 5 strikes per square kilometer per year.

Previous Occurrences

For the period January 2016 through December 2025, there were 22 thunderstorms recorded in the NOAA storm data record. Several thousand cloud-to-ground strikes are known to occur each year.

Many more thunderstorms occur that do not meet the criteria to be included in the database. Individuals report that during the study period lightning events have damaged equipment, structures and caused loss

of power. There is no practical way to document all damage caused by lightning, which impacts all types of structures, public and private. Therefore, we rely on the frequency data to evaluate the probability.

Probability

All thunderstorms produce lightning (NWS, 2024). During the study period, there were 22 documented thunderstorms = greater than 100%; probability of lightning is Very likely.

Climate trends

Expected increase in thunderstorm intensity will likely increase the incidence of cloud-to-ground lightning per storm. Reduced frequency of storms can be expected to reduce lightning density.

B2-a,b Vulnerability and Impacts

High winds: Affected Jurisdictions

X	Unincorporated Louisa County	X	Morning Sun
X	Columbus City	X	Oakville
X	Columbus Junction	X	Wapello
X	Cotter	X	Columbus Junction Community Schools
X	Fredonia,	X	Louisa -Muscatine Schools
X	Grandview	X	Morning Sun Community Schools
X	Letts	X	Wapello Community Schools

All jurisdictions are vulnerable to Lightning.

From the National Weather Service: Facts About Lightning

- Lightning's unpredictability increases the risk to individuals and property.
- "Heat lightning" is actually lightning from a thunderstorm too far away for thunder to be heard. However, the storm may be moving in your direction
- Most lightning deaths and injuries occur when people are caught outdoors in the summer months during the afternoon and evening.
- The chance of being struck by lightning is estimated to be 1 in 600,000 but could be reduced by following safety precautions (NWS, 2023).

Unincorporated Louisa County

Louisa County is a rural community where people commonly work with machinery outdoors and animals graze on open land. Both are at risk for bodily injury or loss of life due to lightning strikes. People and livestock caught outside during a thunderstorm—particularly those on hills, under trees, in open areas, or on the water—are at higher risk from lightning.

People or animals struck by lightning need immediate lifesaving medical attention. The low density of the rural population means that emergency responders may have to travel some distance in response to life-threatening events.

All jurisdictions

Periods of drought are very likely to occur, which makes conditions dry. Lightning strikes start fires more readily during drought conditions when any spark can ignite ready tinder.

Most residential, commercial, municipal and school structures lack lightning rods or lightning suppression devices. Electronics inside buildings are destroyed by the power surge of a lightning strike passing through the electrical grid, which can disable critical information systems.

Utility infrastructure is exposed to weather, and components are vulnerable to lightning damage, particularly electrical transformers or substations. Power loss puts the health of individuals at risk when electricity to home medical equipment fails or extreme temperatures threaten health.

Cities are dependent on municipal water wells. Lightning strikes or power failure can disable well pumps and interrupt service.

Impacts of Climate trends. Frequency of thunderstorms may be reduced while storm severity is expected to increase, which will likely increase the intensity and severity of lightning incidents.

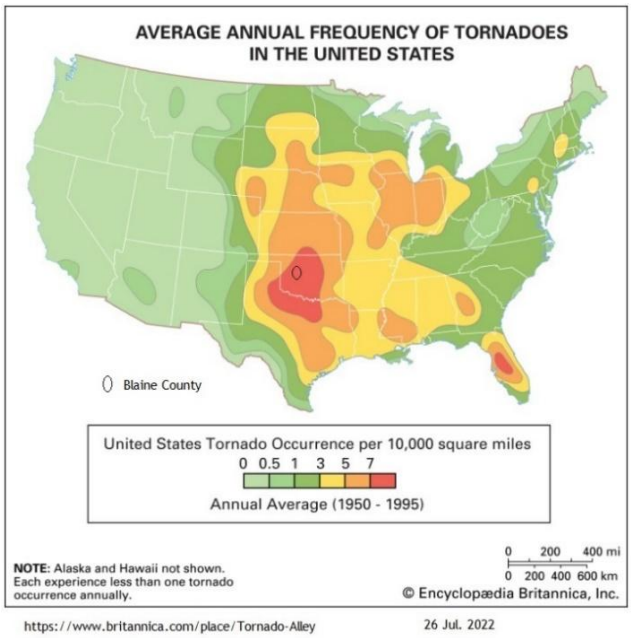
Land use development. Property owners and developers should be aware of the risk and install proper lightning protection devices when performing major rehabilitation or new construction.

Population patterns. Additional population does put more people at risk. This hazard is unlikely to be affected by population patterns in Louisa County in the near future.

Tornado

Tornadoes are violently rotating columns of air that reach from the bottom of a cumulonimbus cloud to the ground. Tornadoes are found in severe thunderstorms, but not all severe thunderstorms produce tornadoes. While all tornadoes touch both the ground and the bottom of a cloud, it is possible for only part of the tornado to be visible.

A tornado may be on the ground for only a few seconds, or last for over an hour. They can appear in a variety of shapes and sizes, ranging from thin, rope-like circulations to large, wedge-shapes greater than one mile in width. However, a tornado's size is not necessarily related to its wind speed. The strongest tornadoes can have wind speeds in excess of 200 mph.



More than half of Iowa's tornadoes occur during the months of May and June but may occur anytime the necessary atmospheric conditions are present. June is the most active month of the year with 28.8 percent of all tornado reports, closely followed by May with 24.3 percent (MWC, 2023). Most tornadoes occur between 2pm and 9pm. The state of Iowa averages 48 tornadoes each year. The record number of tornadoes in one year was 2021 when 146 tornadoes were documented in the state (NWS, 2025).

Louisa County lies in the weather region often referred to as Tornado Alley, where cool, dry air from Canada collides with warm, moist air from the Gulf of Mexico (IA Meso, 2024). Meteorologically, the region is ideally situated for the formation of supercell thunderstorms, often the producers of violent (EF-2 or greater) Tornadoes (NOAA, 2022).

Wind roses are used to illustrate wind speed and direction for a particular locality over time. Below, a wind rose for the CID Airport at Cedar Rapids, Iowa shows the long term patterns for wind direction and speed in the region, with dominant winds evident from both the south and northwest over a 52 year period. See Illustration below.

Location

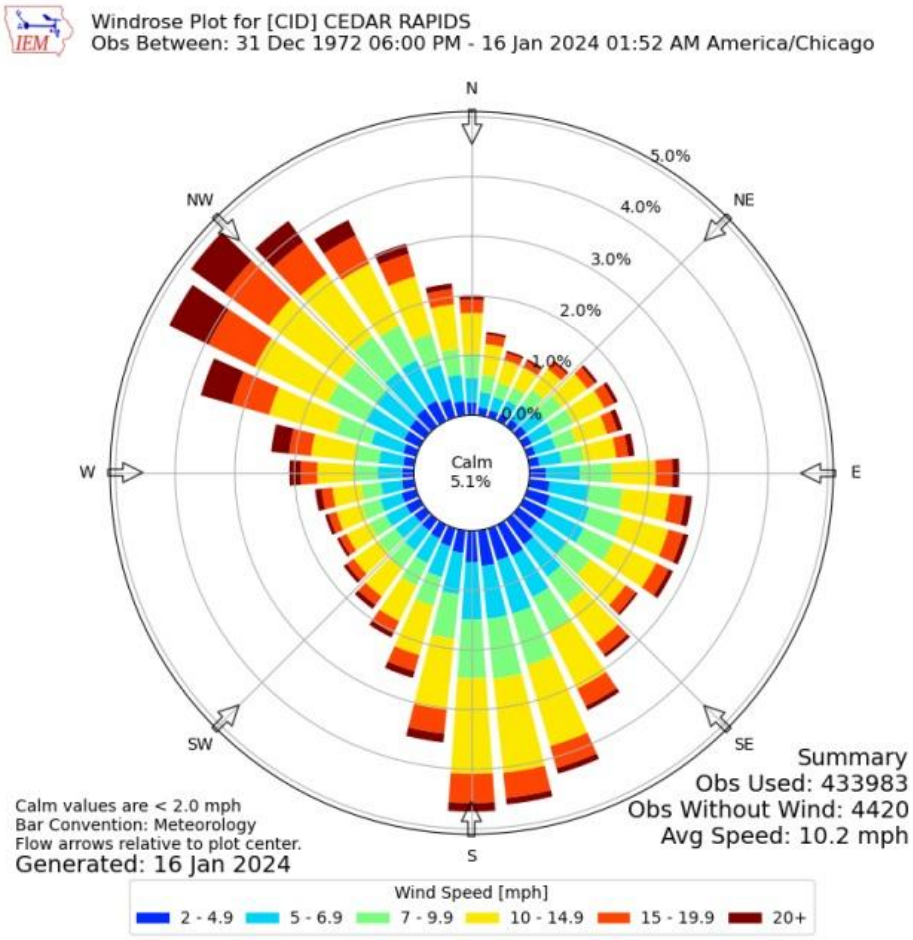
Tornadoes affect the entire planning area.

Affected Jurisdictions County, Cities, Schools

Extent

The scale of intensity for Tornadoes in Louisa County is measured by the Enhanced Fujita Scale as illustrated below. The planning area can expect tornadoes of any magnitude on the scale to occur.

The Enhanced Fujita Scale or EF Scale is used to assign a tornado a rating based on estimated wind speeds and related damage. When tornado-related damage is surveyed, it is compared to a list of Damage Indicators (DIs) and Degrees of Damage (DoD) which help estimate better the range of wind speeds the tornado likely produced. From that, a rating (from EF0 to EF5) is assigned.



https://mesonet.agron.iastate.edu/sites/windrose.phtml?station=CID&network=IA_ASOS

Enhanced Fujita Scale

Rating	Wind speed	Expected Damage
EF0	**65-85 mph**	Minor damage. Shingles or parts of roof peeled off; damage to gutters and siding; branches broken off; shallow rooted trees toppled.
EF1	**86-110 mph**	Moderate damage. More significant roof damage; windows broken; exterior doors damaged or lost; mobile homes badly damaged or overturned.
EF2	**111-135 mph**	Considerable damage. Roofs torn off well-constructed homes; homes shifted off their foundation; mobile homes completely destroyed; large trees snapped or uprooted; cars may be tossed.
EF3	**136-165 mph**	Severe damage. Entire stories of well-constructed homes destroyed; significant damage to large buildings; homes with weak foundations may be blown away; trees begin to lose bark.
EF4	**166-200 mph**	Extreme damage. Well-constructed homes leveled; cars thrown significant distances; top story exterior walls of masonry buildings likely collapse.
EF5	**> 200 mph**	Incredible damage. Well-constructed homes swept away; steel reinforced concrete structures critically damaged; high rise buildings sustain severe structural damage; trees usually completely debarked, stripped of branches and snapped.

https://www.weather.gov/hun/efscale_explanation

Previous occurrences

Three tornadoes occurred in the county during the years 2016 through 2025.

TORNADO RECORD						
LOCATION	DATE	EVENT	EF SCALE	WIND	LENGTH (miles)	WIDTH (yds)
Unincorporated WYMAN	5/9/2016	Tornado	EF0		0.09	10
There was a brief tornado touchdown with no damage.						
Near GRANDVIEW	3/6/2017	Tornado	EF2		0.31	150
A tornado touched down west of Grandview Iowa and broke off wooden power poles about 3 feet off the ground as well as uprooting a few trees and breaking tree limbs. A semi was blown into a ditch.						
Unincorporated NEWPORT	4/16/2024	Tornado	EF2	130 mph	10.75	600
An EF2 tornado caused damage to homes, trees, and outbuildings. Maximum winds were estimated around 130 mph. A vehicle was blown off the road just east of Morning Sun. The tornado then damaged trees near the Port Louisa National Wildlife refuge and finally lifted near the confluence of the Iowa and Mississippi Rivers. The tornado had a maximum path width around 600 yards.						

Probability

Three Tornadoes occurred during the study period. 3 per 10 years = 30% probability, Moderate chance that a tornado will occur in any given year.

Climate trends

Changing jet stream wind patterns can be expected to impact the location and intensity of tornadoes in coming decades, however, the patterns are not yet clear.

“Tornadoes, a source of many disasters in Iowa, do not appear to be increasing with climate change. That said, the spatial distribution of tornado occurrences appears to have moved eastward in the past 40 years, with most of Iowa seeing more days favorable to tornado formation, and there has been some variation in when tornadoes happen. Since these changes have not been directly tied to climate change, it is unclear whether or how long the trends will continue. Nevertheless, warming winters will likely extend tornado season (Iowa, 2023).”

B2-a,b Vulnerability and Impacts

Tornado: Affected Jurisdictions

X	Unincorporated Louisa County	X	Morning Sun
X	Columbus City	X	Oakville
X	Columbus Junction	X	Wapello
X	Cotter	X	Columbus Junction Community Schools
X	Fredonia,	X	Louisa -Muscatine Schools
X	Grandview	X	Morning Sun Community Schools
X	Letts	X	Wapello Community Schools

All jurisdictions are vulnerable to this hazard and aside from the soundness of building construction, all structures have a relatively equal risk of being impacted by this hazard. While it may be unlikely that a tornado will impact a specific location in any given year, the threat is always present.

General Impacts.

Tornadoes strike with incredible velocity. Wind speeds may approach 300 miles per hour, and the storm can travel across the ground at more than 70 mph. While advancements in weather forecasting have allowed watches to be delivered to those in the path of these storms up to hours in advance, tornadoes have been known to change paths very rapidly, thus limiting the time available to take shelter.

Rotating tornadic winds uproot trees and structures and turn airborne debris into deadly missiles. The level of damage can vary from high wind damage to roofs and siding, to a total collapse of the structure. Airborne debris puts lives at risk and causes damage to adjacent structures.

Cost as a vulnerability. It is very expensive to prepare for an event of tornadic magnitude when that event is statistically unlikely to strike any specific location. Public or community sized safe rooms or shelters must withstand tremendous forces, be accessible to all people, meet all manner of safety and regulatory requirements, while they may rarely be occupied for the intended purpose. Private shelters are an expensive improvement for homeowners to make. Therefore, programs that financially support these efforts are an important factor in public safety.

Louisa County

The 2022 Census of Agriculture, released by USDA National Agricultural Statistics Service (NASS) in 2024, provides comprehensive 2-page profiles for every U.S. County, featuring data on farm numbers, land in farms, market value of sales, and producer demographics. These reports represent the only source of uniform, detailed agricultural statistics at the county level, available at nass.usda.gov.

In 2022, NASS reported that there were 4,262 cattle and 330,842 hogs produced in Louisa County, a county with a human population of about 11,000.

Louisa County ranks 38th of 99 counties in hog production. Most of these are raised in confinement barns. When a tornado hits a confinement barn, thousands of animals can be killed and injured. If live animals are exposed to severe weather events or power outages, farmers have a significant challenge to contain and protect the health of livestock and humans in contact with injured animals. Severe weather events such as tornadoes can result in manure spills at confinement facilities.

County Conservation

Louisa County Conservation manages campgrounds for tents and RVs, but no tornado shelters are currently available. People may not know where to seek shelter in an emergency.

County and Cities

All structures including critical facilities are susceptible to tornado damage. If critical facilities are hit directly, necessary public services may cease. Some privately owned facilities are critical as well, such as gas stations, grocery stores and pharmacies.

It is difficult to locate, organize and transport vulnerable people to a safe place.

- Elderly Pop: 2,146 people age 65 and over live in the county (about 20% of the population)
- Children under age 10: 1,226 people, 11% of the population
- Disabled Pop: 1,750 people in the county are disabled, 826 of whom are age 65 or over

- Mobile homes are more susceptible to damage from a tornado; there are 449 mobile homes in the county, housing an estimated 1,033 people
- LEP Pop: An estimated 1542 people (15% of the population) live in homes where a language other than English is spoken; 839 (8%) report having Limited English Proficiency
- The uninformed: those who do not understand the difference between a Tornado Watch and a Warning or are not aware of a safe place to go.

Attempts to rescue others places additional lives at risk.
People may have to shelter in places that are structurally unsafe.

Impacts of Climate trends. Warming winters will likely extend tornado season. Changing wind patterns and intensification of wind differentials are likely to impact tornado occurrence in ways that are not yet fully understood.

Land use development. This hazard is unlikely to be affected by land development patterns.

Population patterns. Additional population does put more people at risk. This hazard is unlikely to be affected by population patterns because Louisa County is unlikely to have significant population growth in the near future.

Wildfire

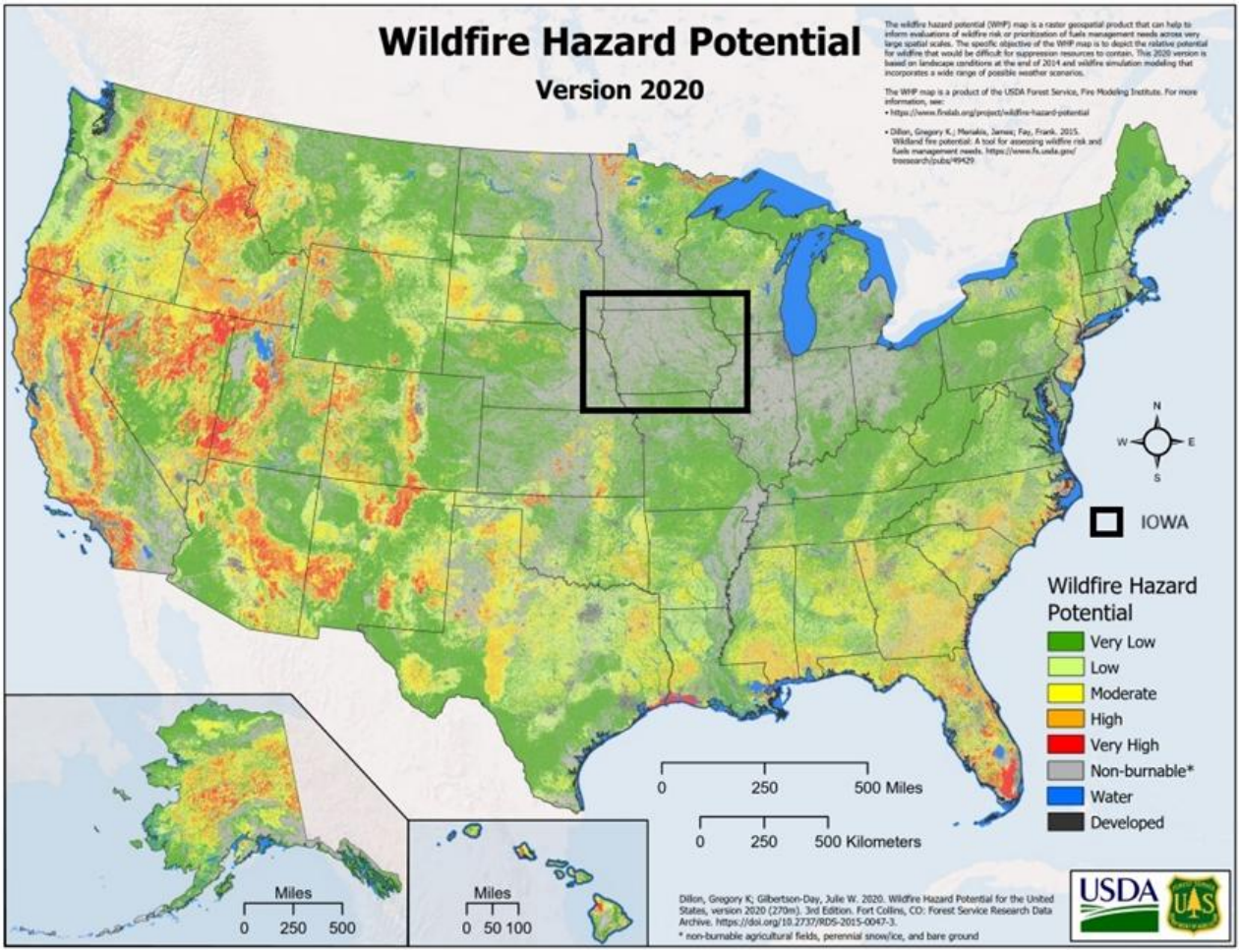
Wildfire conditions tend to be regional, therefore much of the narrative in this section is drawn from the State of Iowa Hazard Mitigation Plan published in 2023.

A grass fire or wildland fire is an uncontrolled fire that threatens life and property in a rural or wooded area. A grass fire or wildland fire is not a cropland fire. Damage to crops from fire are often covered by insurance on land that is not "wild." Wildland or grass fires occur in natural, wild areas. Wildland fires are more likely to occur when conditions are favorable, such as during periods of drought when natural vegetation is more combustible.

Location

Due to the high quality and quantity of agricultural soils, Iowa and Illinois have the smallest percentage of wild land in the United States. Consequently, there are fewer opportunities for wildfires in Iowa than in other states. Almost the entire state is mapped with a "Very Low" wildfire hazard potential. No event reported in the state has been a historically significant wildfire (Iowa B, 2023).

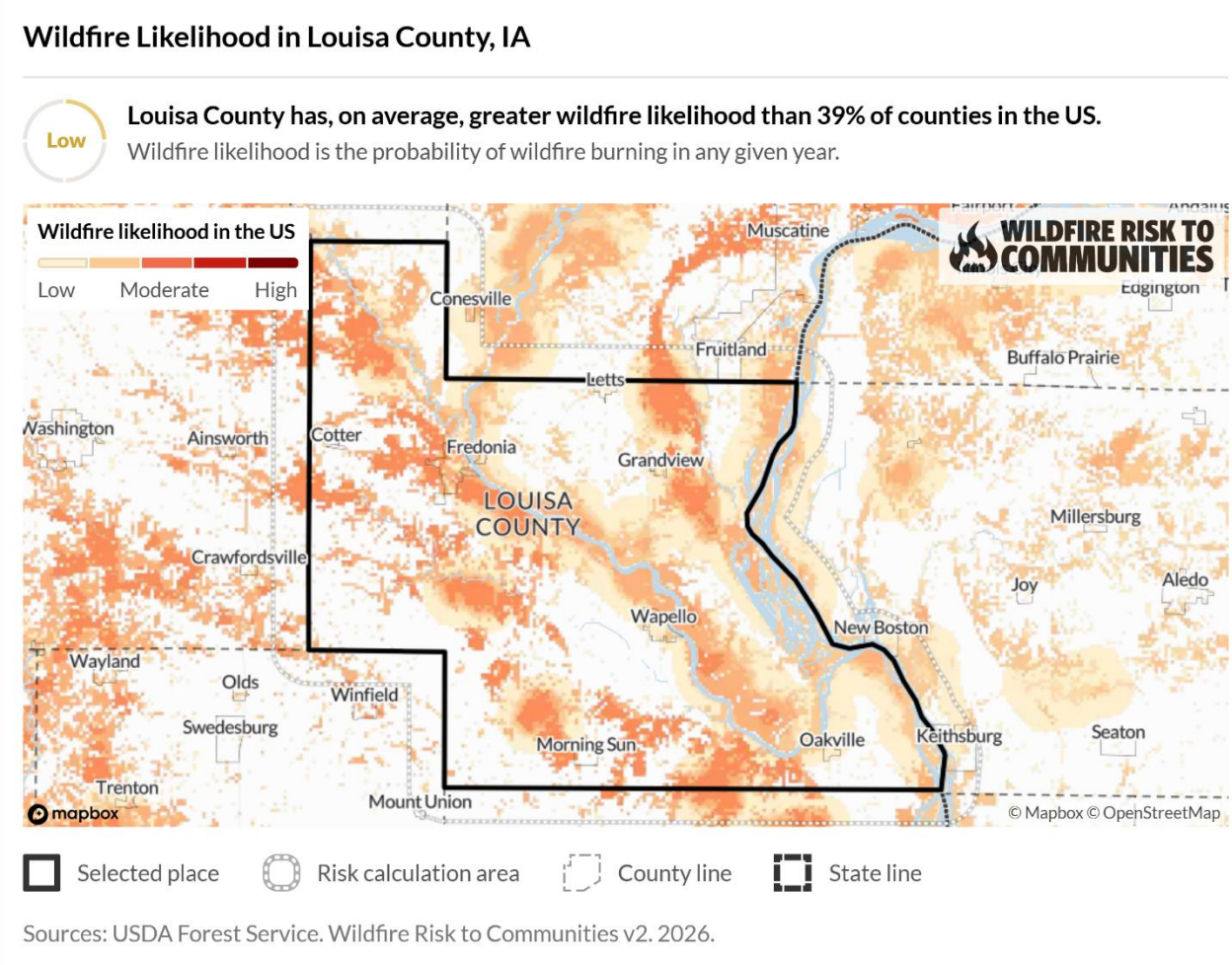
The map below shows the WHP assessed risk in the State of Iowa in context with other states. On its own, the WHP map is not an explicit map of wildfire threat or risk, it illustrates the locations where wildfire is most likely, or probable, to occur (Iowa, 2018).



Affected Jurisdictions Louisa County, Cities of Columbus City, Columbus Junction, Fredonia, Oakville, Wapello. Schools are unlikely to be impacted by wildfires in Louisa County because they are not adjacent to wild areas.

Extent

Two mapping models were used to evaluate the risk of wildfire for jurisdictions in Louisa County. The map below was generated from US Forest Service and USDA data made available online.



WUI. Another consideration for wildfire risk is the proximity of housing to wild land areas, called the Wildland Urban Interface (WUI).

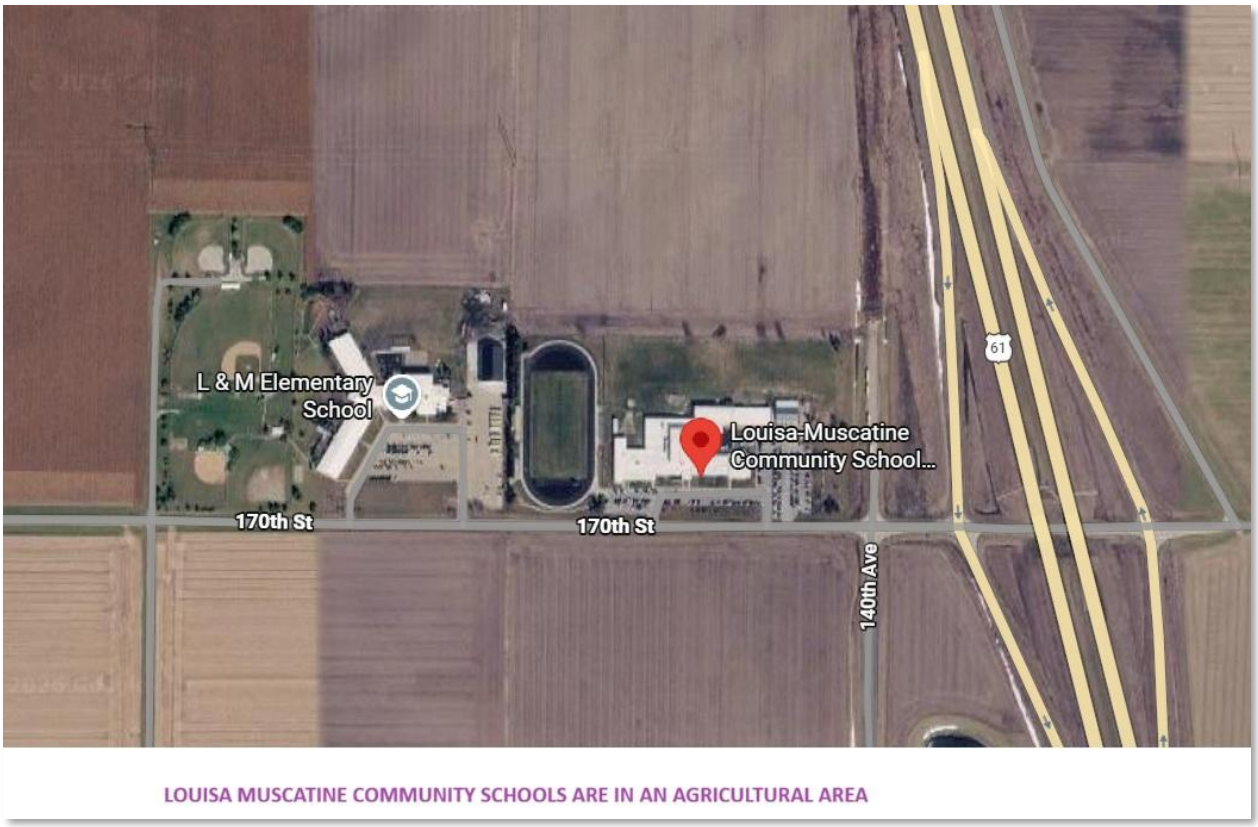
On the community maps below, yellow or orange indicates Interface or Intermix of wildland with housing or other development. Only the cities of Oakville and Wapello have some potential for intermix, shown in orange, where wooded areas are included within the city boundary.

Red indicates the medium or higher density housing of cities. Tan areas are non-vegetated or tilled agricultural land, considered non-burnable for wildfire purposes. For example, on the maps below, most towns are in non-burnable (agricultural) areas with medium density housing in town. Virtually the entire county has this pattern where no significant interface or intermix of wild land and housing occurs.

Schools

Columbus Junction Community School District, Morning Sun Community Schools and Wapello Community Schools are all in medium density residential areas, and not at risk from Wildfire.

Louisa-Muscatine Community School District is located in a non burnable agricultural area.



LOUISA MUSCATINE COMMUNITY SCHOOLS ARE IN AN AGRICULTURAL AREA

Intermix: Structures and wildland vegetation intermingle. It is often found in more remote, rural, or low-density settings where houses are surrounded by wildland vegetation.

Interface: A distinct boundary exists where urban or suburban development (housing density > 2/acre) meets wildland. This generally represents a dense cluster of homes adjoining an area of wildland



WUI CITY OF GRANDVIEW

Legend

Wildland Urban Interface: 2020

Wildland-Urban Interface (WUI)

- Interface
- Intermix

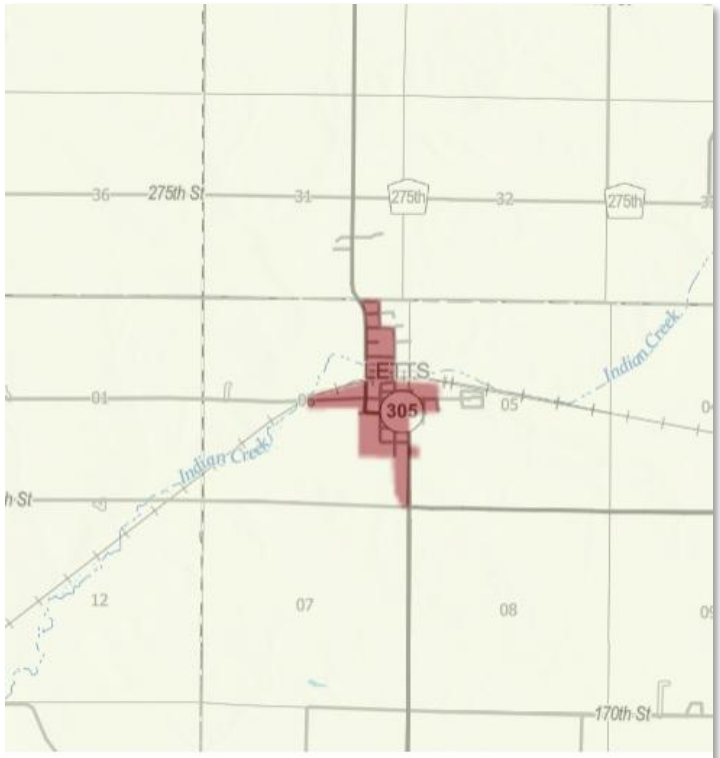
Non-WUI Vegetated

- No housing
- Very low housing density

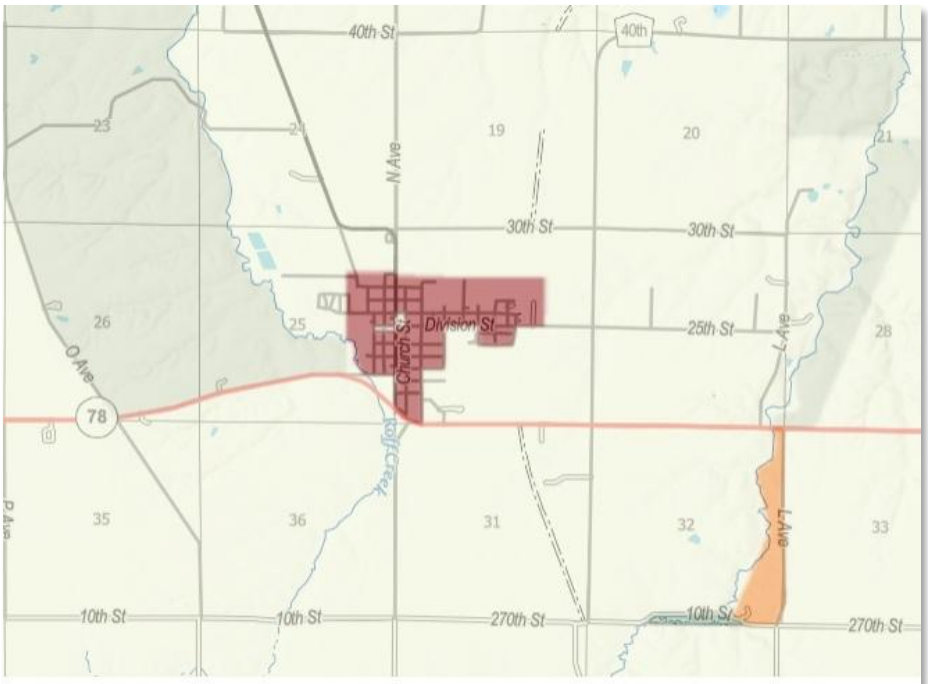
Non-vegetated or Agriculture

- Low and very low housing density
- Medium and high housing density
- Water

The cities of Grandview, Letts and Morning Sun are entirely surrounded by “non-burnable” agricultural areas.

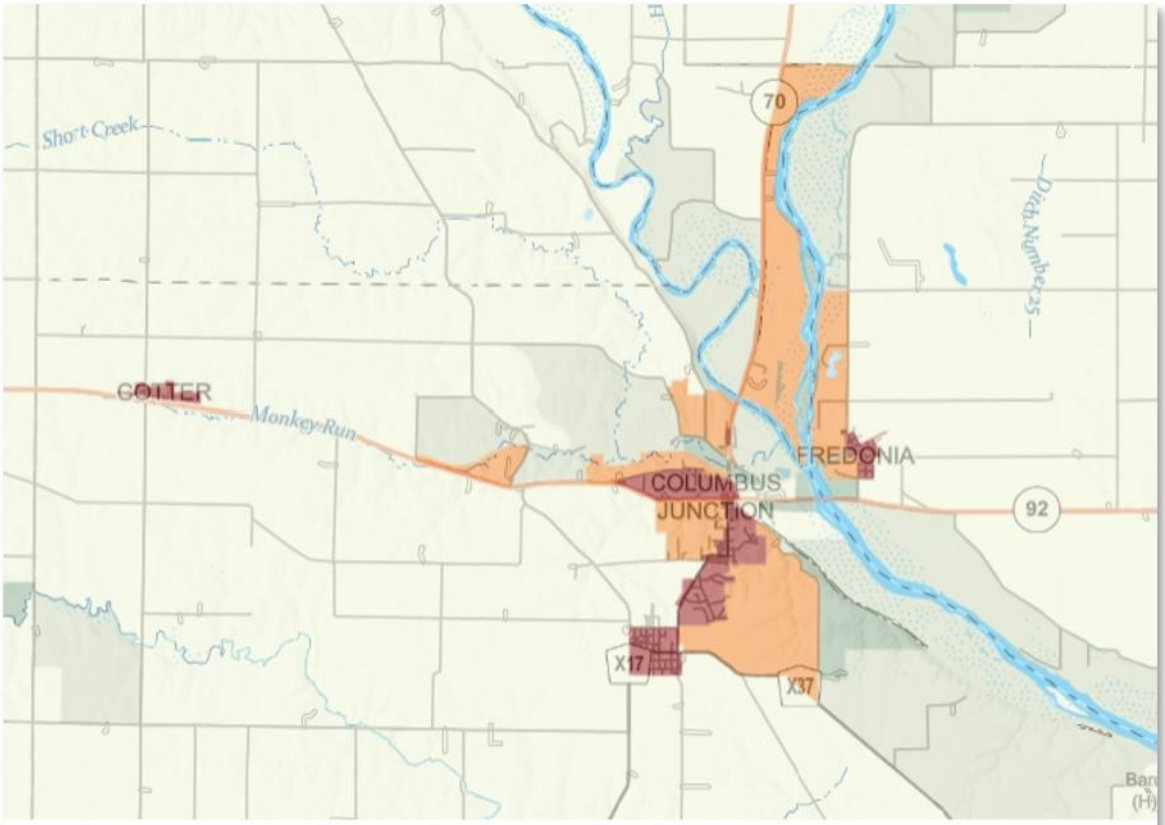


WUI CITY OF LETTS

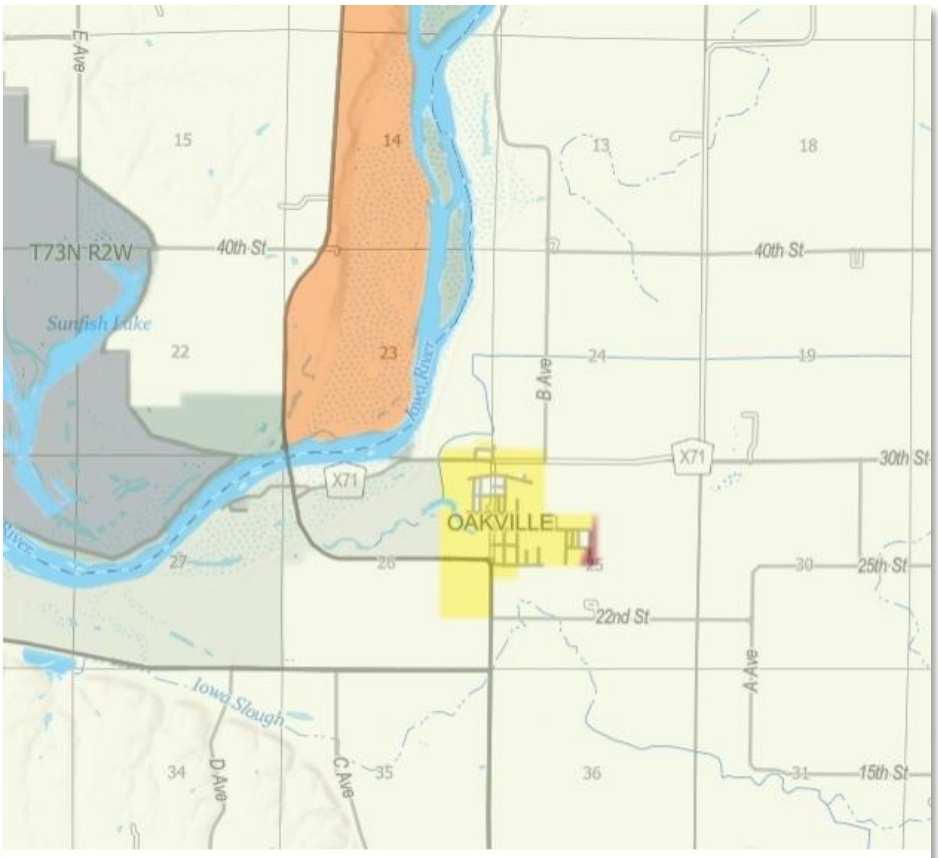


WUI MORNING SUN

There are some areas of Intermix in or around the towns of Columbus City, Columbus Junction and Fredonia, adjacent to medium density housing. Cotter is not affected by wildfire.



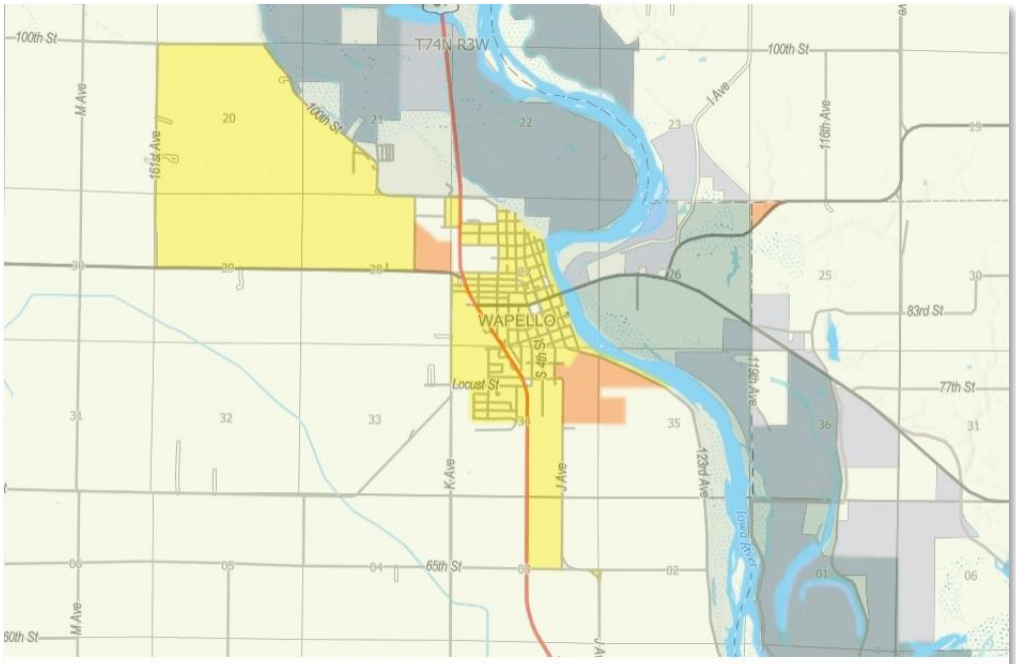
WUI COTTER, COLUMBUS CITY, COLUMBUS JUNCTION, FREDONIA



WUI CITY OF OAKVILLE

Oakville is a low density residential area with some potential for interface with wild land.

Wapello has some interface and intermix of housing with wild land areas.



WUI CITY OF WAPELLO

Previous Occurrences

Wildfire occurrence data is not currently available from the Iowa Department of Natural Resources. Local Fire Departments have not established a mechanism to track Wildfires as specific incidents; they are interspersed among hundreds of other fire runs in the county. Most towns report no incidents of Wildfire in recent memory. The exception is the City of Columbus Junction where wildfires occasionally have occurred in the rugged river bottoms.

Anecdotal comments indicate that these fires are limited to a few acres, and no residential structures are known to have been lost to wildfire. No loss of life has been reported. It should be noted that, while wildfires may occur during any year, the number of incidents and acres burned per fire are few.

Probability

There is a data deficiency. Probability was anecdotally determined to be 40% = Moderate Chance, based on known events in Columbus Junction and Louisa County. As data collection is improved this probability rating can be refined in the next HMP update.

Climate trends

Changes in precipitation are expected to increase periods of drought which can be expected to elevate wildfire risk. However, due to the extensive amount of agricultural land, Louisa County has very limited potential for wildfire and that is unlikely to change in the near future.

B2-a,b Vulnerability and Impacts

Wildfire: Affected Jurisdictions

X	Unincorporated Louisa County		Morning Sun
X	Columbus City	X	Oakville
X	Columbus Junction	X	Wapello
	Cotter		Columbus Junction Community Schools
X	Fredonia		Louisa -Muscatine Schools
	Grandview		Morning Sun Community Schools
	Letts		Wapello Community Schools

Louisa County

Where rivers and streams are present, there are more potential burnable acres than in most of the county. Housing is very low density in these areas. Wildfires can occur in more remote areas, where fire response may be delayed.

Columbus Junction

Columbus Junction has had some Wildfires in the river bottom, where rugged terrain restricts access. This does occur on the south side of town, but the north side can be worse near river. The number of incidents has not been well tracked. This is a data deficiency which will be addressed for the next HMP update.

Cities of Columbus City, Fredonia, Oakville and Wapello

Some risk of wildfire is present where timber and natural areas are adjacent to residential or commercial structures. While much of Louisa County is classified as non-burnable with no wildland-urban interface, these cities have a marginally higher potential for wildfire to intersect with development. Risk increases when natural debris is allowed to collect near homes, buildings, or wood piles, placing life and property at risk. None of these cities have been impacted by wildfire in recent years.

Impacts of Climate trends. Projected increase in length and intensity of drought would elevate Wildfire risk. Drought is a hazard with the greatest effect on wildfire.

Land use development. Development in wooded areas would increase risk from wildfire, however most wooded areas are conservation land and not available for development.

Population patterns. Louisa County is projected to have very little new development in the foreseeable future, however, new residential development in wooded areas would increase risk.

Winter Weather

Winter weather can refer to a combination of winter precipitation, including snow, sleet and freezing rain. A severe winter storm can range from freezing rain or sleet to moderate snow over a few hours, or to blizzard conditions and extremely cold temperatures that last several days.

Blowing snow is wind-driven snow that reduces visibility and causes significant drifting. Loose snow begins to drift when wind reaches a speed of 9 to 10 mph under freezing conditions.

Blizzards occur when falling and blowing snow combine with winds of 35 mph or greater, reduced visibility of 1/4 mile or less, and white out conditions.

Freezing rain is precipitation that falls onto a layer of freezing air near the surface. When the precipitation contacts the surface, it forms into a coating or glaze of ice and even a small accumulation can be a significant hazard.

Sleet is frozen precipitation that has melted by falling through a warm layer of the atmosphere and then refreezes into ice pellets before reaching the ground. Sleet usually bounces when hitting a surface and can accumulate like snow and become a hazard to motorists.

Ice storms are extended freezing rain events, lasting from several hours to days, when the freezing rain accumulates on surfaces and damages trees, utility lines, and roads. Ice loads on overhead power lines, combined with windy conditions, may cause the lines to "gallop." This forceful motion may cause lines to break away from the connectors and poles, resulting in widespread power failure.

Wind Chill is used to describe the relative discomfort and danger to people from the combination of cold temperatures and wind. The wind chill chart from the National Weather Service shows the apparent temperature derived from both wind speed and temperature.

Location

The entire planning area is at risk from winter storms several times each year. Ice and freezing rain, snowfall, cold temperatures and wind are hazardous to all residents and structures.

Affected Jurisdictions County, Cities, Schools

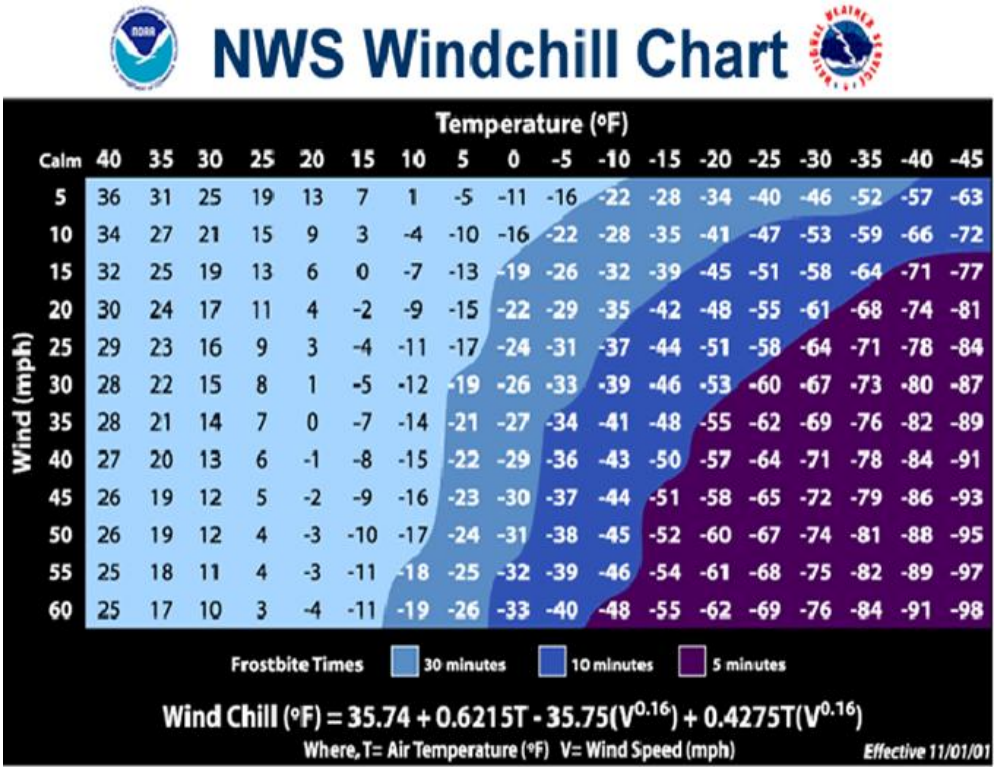
Extent

The Sperry-Piltz Ice Accumulation Index is used to categorize ice damage, as shown in the table below. Ice accumulation can be expected to occur at any level on the Sperry-Pilz Index.

The planning area also uses the National Weather Service (NWS) Windchill Chart to evaluate the potential for injury or loss of life due to low temperatures. Due to the unpredictable nature of winter storms, a wide variety of temperatures referenced on the Windchill Chart can occur in the planning area. It is expected that temperatures may fall to -20 F, with potential wind speeds at any level on the NWS chart below.

Sperry Piltz Ice Accumulation Index **2026**

Ice Damage Index	Damage and Impact Descriptions
0	Minimal risk of damage to exposed utility systems; no alerts or advisories needed for crews, few outages
1	Some isolated or localized utility interruptions are possible, typically lasting only a few hours. Roads and bridges may become slick or hazardous.
2	Scattered utility interruptions expected, typically lasting 12 to 24 hours. Roads and travel conditions may be extremely hazardous due to ice conditions.
3	Numerous utility interruptions with some damage to main feeder lines and equipment expected. Tree limb damage is extensive. Outages lasting 1-5 days.
4	Prolonged and widespread utility interruptions with extensive damage to main distribution feeder lines and some high voltage transmission lines and structures. Outages lasting 5 to 10 days.
5	Catastrophic damage to entire exposed utility systems, including both distribution and transmission networks. Outages could last several weeks in some areas. Shelters needed.



Previous Occurrences

During the years 2016 through 2025, twenty-one winter weather events are recorded for Louisa County in the NOAA Storm database. In some years, few severe winter events occur, while at other times, several events can be recorded in a single winter season.

WINTER WEATHER	
BEGIN DATE	NARRATIVE
12/24/2017	Snow moved into eastern Iowa. 1 to 2 inches of snow fell in Louisa County
12/29/2017	A winter storm moved across the region during on December 29th and brought 1 to 4 inches of snow
2/5/2018	A band of heavy snow fell on the south edge of a widespread snow event, only 20 to 30 miles wide, but generally stretched along a line from near Grinnell, Iowa, to near Wapello, Iowa, to just north of Galesburg, Illinois. In that narrow axis, 7 to 10 inches of snow was observed.
4/8/2018	A spring storm brought snow to the area the afternoon of April 8 through early morning hours of April 9th. A trained spotter reported 3.3 inches in Columbus Junction.
11/25/2018	Heavy snows of 4 to 13 inches. Strong north winds gusted to 40 to 50 mph and combined with the heavy snow to produce widespread blizzard conditions.
1/18/2019	Total snowfall accumulations of 3 to 6 inches. Wind gusts of 20 to 30 MPH caused blowing and drifting snow.
1/29/2019	A strong arctic high pressure system brought historic cold to much of the Midwest January 29th through January 31st. Numerous low temperature records were broken. In addition, life threatening wind chills were reported with values below -30 degrees for many hours. Numerous schools, churches, and businesses closed during the arctic outbreak.
10/30/2019	This system brought a long duration snow event to the region, with totals mainly between 2 and 6 inches. A trained spotter estimated 4 inches of snow in Columbus Junction.
1/17/2020	A winter storm spread light to moderate snow across the region. Snow changed over to sleet and freezing rain during the evening hours. Snowfall amounts were 2 to 4 inches. Freezing rain ranged from a tenth to a quarter of an inch.
4/16/2020	A late season snowstorm brought heavy wet snow to portions of southeast Iowa. With warm ground temperatures, there were not many impacts to travel other than reduced visibility at times, and minor slushy accumulations on roads. The COOP Observer in Columbus Junction estimated 2.5 inches of snow.
12/29/2020	A trained spotter in Columbus Junction reported 4.0 inches of snow, along with some freezing rain accumulations. Key impacts: transportation delays and traffic accidents, along with some isolated power outages.

1/1/2021	The COOP observer in Columbus Junction reported 1.5 inches of snow. Widespread ice accumulations of 0.10-0.25 with some downed tree limbs and power outages as a result.
1/25/2021	An observer 5.4 miles southeast of Wapello reported 4.8 inches of snow. In addition, a light ice glaze was also seen in parts of extreme southeast Iowa.
1/30/2021	Precipitation began as rain and changed to freezing rain then snow during the evening. The COOP observer in Columbus Junction reported 2.0 inches of snow.
2/4/2021	Rain and wintry mix started the day, leading to snow (heavy at times), where between 1 and 3 inches of snow fell throughout Louisa County. Strong winds were also noted in the afternoon, with peak gusts around 25 to 35 mph and gusts up to 45 mph causing whiteout conditions. Significant drifting snow continued overnight, and wind chills dropped to - 5 to 15 below zero. Key impacts: transportation delays, traffic accidents, and road closures.
1/1/2022	Spotter and public reports of 4-6 inches of snow fell across portions of Louisa County. Blowing and drifting snow continued to cause problems on roads after plowing, lasting into January 2nd. With gusty winds, blowing and drifting snow was observed, reducing visibilities. Very cold temperatures moved in, with wind chills between -15 to -30 felt.
1/14/2022	Spotter reports 4-6 inches of snow fell across portions of Louisa County. Winds between 20-30 mph led to blowing and drifting of snow, causing problems on roads after plowing. The highest snowfall report from the event was 5.5 inches in Oakville.
12/22/2022	An observer reported 1.5 inches of snow. Winds quickly increased with a gusts of 40 to 50 MPH which led to significant blowing and drifting snow across the area. Additionally, this also produced wind chills of -20 to -30.
1/8/2024	The COOP Observer reported 7.0 inches of snow. In addition, strong north winds over 30 mph were common with this storm. Several accidents occurred on area roads.
1/11/2024	Numerous reports of 10 to 13 inches of snow were received, with widespread significant drifting snow continuing into the evening hours. Numerous accidents occurred on area roads. In addition, strong northwest winds of 30 to 50 MPH were observed, leading to large drifts. Snow depths of over 20 inches were found in many places, resulting in long term rural road closures that lingered on as Artic cold winds continued drifting snow for several more days. This was the second major snowfall event in many locations in less than a week.
11/28/2025	A long duration winter storm tracked across the region Friday night through late Saturday night. Snowfall reports of 6 to 9 inches of snow fell in Louisa County.

Probability

Twenty-one events over a ten year period gives a probability greater than 100% that a severe winter event will occur, Very likely.

Impacts of Climate trends. Severe winter storms are decreasing. As winters warm faster than summers, winter weather is expected to cause less damage in coming decades. Overnight lows are increasing quickly relative to daytime temperatures, meaning there may be less than historical rates of re-freezing of snow and ice at some points in winter, and more at other points. Winters are becoming shorter as well (Iowa, 2023).

- ✓ Frost-free seasons increasing by up to 10 days by 2045 and 20 days by 2065, compared to the period of 1976-2005
- ✓ A shorter, less severe winter may permit the survival of more pests and pathogens.

Climate trends already observed by 2023.

- ✓ Winters warming six times faster than summers
- ✓ Increased precipitation (8 percent from 1873 to 2008)

B2-a,b Vulnerability and Impacts

Winter weather: Affected Jurisdictions

X	Unincorporated Louisa County	X	Morning Sun
X	Columbus City	X	Oakville
X	Columbus Junction	X	Wapello
X	Cotter	X	Columbus Junction Community Schools
X	Fredonia,	X	Louisa -Muscatine Schools
X	Grandview	X	Morning Sun Community Schools
X	Letts	X	Wapello Community Schools

Winter storms impact the entire county and present life-threatening conditions. All forms of travel are impacted by ice, snow, and frigid temperatures.

Heavy snow of more than six inches in a 12 hour period or freezing rain of greater than 1/4 inch accumulation can cause hazardous conditions in the community by slowing or stopping the flow of vital supplies as well as disrupting emergency and medical services. Ice accumulation of one-fourth inch thickness is heavy enough to damage trees and above ground electric lines leading to power outages, increasing the vulnerability of people in homes and businesses.

Louisa County

Thousands of people travel local highways each day. Five hundred ninety (590) miles of county roads carry thousands more. Each vehicle represents at least one person and often several, of all ages and abilities, who are at risk of life threatening exposure to the elements.

Roadways covered with ice and snow create problems; vehicles become stranded, and first responders are delayed providing emergency services to a large number of people in need of assistance in a short period of time. Emergency personnel mobilized to render assistance are additional lives placed at risk during the most hazardous conditions.

Cold temperatures affect agriculture and farm workers. Frost and freeze impacts are especially destructive to crops early or late in the growing season. Unprotected livestock suffer from cold, and it may be difficult for farmers to deliver sufficient hay and feed in bad weather.

County and Cities

Ice accumulation or winds take down power lines resulting in loss of heat sources, loss of refrigeration. Water pipes freeze, and people may experience hypothermia.

Elderly or disabled people may not be able to travel independently to a safe, temperature controlled place.

Power outages impact people who rely on home medical equipment to sustain health or refrigeration for insulin. Improper use of alternative heat sources can create other hazards such as carbon monoxide poisoning or fires.

Winter storms make structure fires more difficult and dangerous to fight due to extreme temperatures and heavy snow. Fires during winter storms present increased danger because water supplies may freeze, and firefighting equipment may not function effectively. Personnel and equipment may be unable to efficiently reach a fire on unsafe roads. Firefighters are exposed to water in severe low temperatures, life threatening conditions.

Heavy snow and winter cold: Costs of snow removal, repairing damage, and loss of business. Economic impacts due to property damage and agricultural production loss can be significant. Lost wages and interruptions to business affect tax revenue. Additional costs for employees needed to clear the snow can strain city budgets. Sidewalks and paths become obstructed and slippery. Ice covered paths and steps lead to falls, especially dangerous for the elderly.

Schools

Buses must travel all types of roads to transport hundreds of children to school in poor road conditions. Bus routes may be diverted to safer routes, impacting the families who must either transport the students to the nearest bus route or miss days of school.

Schools may have to close for staff and student safety. The closing or delay of schools has a secondary impact on families if parents must arrange last-minute childcare or miss work.

Impacts of Climate trends. Extreme cold and winter storms may come less frequently as winters warm.

Land use development. Developers should consider the travel challenges that will be faced by residents and businesses in severe winter weather. Gravel roads, steep driveways and proximity to highways are just a few of the potential factors that would increase or decrease risk from new development.

Population patterns. An increase in residential housing would increase the need for roads to be cleared promptly in those areas.

Dam or Levee Failure

The National Dam Safety Program defines a dam as an artificial barrier that has the ability to impound water, wastewater, or any liquid-borne material for the purpose of water control or storage. Dams are used to regulate the flow of water and usually contain a reservoir upstream. Dams are also used for erosion control, hydroelectric power generation, and recreation.

A dam failure occurs when the structural integrity is compromised, and large volumes of water flow uncontrolled downstream into inundation areas. A dam failure can result from flooding, poor construction, poor maintenance, earthquakes, terrorism, vandalism, or burrowing animals.

Causes. Dam failure is usually attributed to one of five causes:

- Overtopping caused by water spilling over the top of a dam. Overtopping of a dam is often a precursor of dam failure. National statistics show that overtopping due to inadequate spillway design, debris blockage of spillways, or settlement of the dam crest account for approximately 34% of all U.S. dam failures
- Foundation defects, including settlement and slope instability, cause about 30% of all dam failures
- Cracking caused by movements like the natural settling of a dam or earthquake
- Inadequate maintenance and upkeep
- Piping is internal erosion caused by seepage. When seepage through a dam is not properly filtered and soil particles continue to progress, sink holes form in the dam. An estimated 20% of U.S. dam failures have been caused by piping. Seepage often occurs around hydraulic structures, such as pipes and spillways; through animal burrows; around roots of woody vegetation; and through cracks in dams, dam appurtenances, and dam foundations

Contributing factors. The Association of State Dam Safety Officials (ASDSO) Incident Database lists nine types of Incident Drivers, a dominant cause or contributing factor for an incident:

Dam Incident Drivers	
Deterioration or Poor Condition	Seepage/Internal Erosion
Hydrologic/Flooding	Seismic
Malfunction of Equipment/Gate	Structural Stability
Manmade action	Other, sabotage or unknown

Dams: Location

The Iowa DNR is responsible for tracking all dams that are greater than twenty-five feet high or have storage capacities of at least fifty acre-feet of water.

According to the National Inventory of Dams there are 25 dams in Louisa County that meet the DNR criteria for official tracking. All are Low hazard, earthen dams, regulated by the Iowa DNR, with uncontrolled spillways. None are adjacent to a city. Five are owned by Louisa County.

Local dams have an average age of 36 years, five built before 1980 (the oldest having been constructed in 1966), fifteen during the 1980's and 90's, and the remainder were built since 2000. Seventeen of these dams are for *Fire Protection, stock, or small fish pond*, four are road G*rade stabilization* dams, four are for *Recreation* (USACE, 2026).

Affected jurisdictions: Unincorporated Louisa County.

Extent

Dams are classified according to the downstream damages that would occur if that dam were to fail. The more risk, the higher the standards that have to be met when that dam is constructed or modified. The severity of damage could range from minor property damage, if a small subdivision impoundment failed, to multiple deaths, injuries, and extensive property damage if a large high hazard dam failed.

There are three dam classifications: High Hazard, Significant Hazard and Low Hazard. These classifications do not describe the current condition of the dam. The classification is based on development downstream from the dam and may change over time because of new development since initial construction. Older dams may not have been built to the standards of its new classification. Below are the hazard classifications defined by Iowa Department of Natural Resources (DNR):

- High Hazard – Dams are classified as High Hazard when it is located in an area where dam failure may create a serious threat of loss of human life.
- Significant Hazard – A Significant Hazard Dam is where failure may damage isolated homes or cabins, industrial or commercial buildings, moderately traveled roads, interrupt major utility services, but are without substantial risk of loss of human life. Dams are also classified as Significant Hazard where the dam and its impoundment are themselves of public importance, such as dams associated with public water supply systems, industrial water supply or public recreation or which are an integral feature of a private development complex.
- Low Hazard – Low Hazard dams are classified as those where damages from a failure would be limited to loss of the dam, livestock, farm outbuildings, agricultural lands and lesser used roads and where loss of human life is considered unlikely.

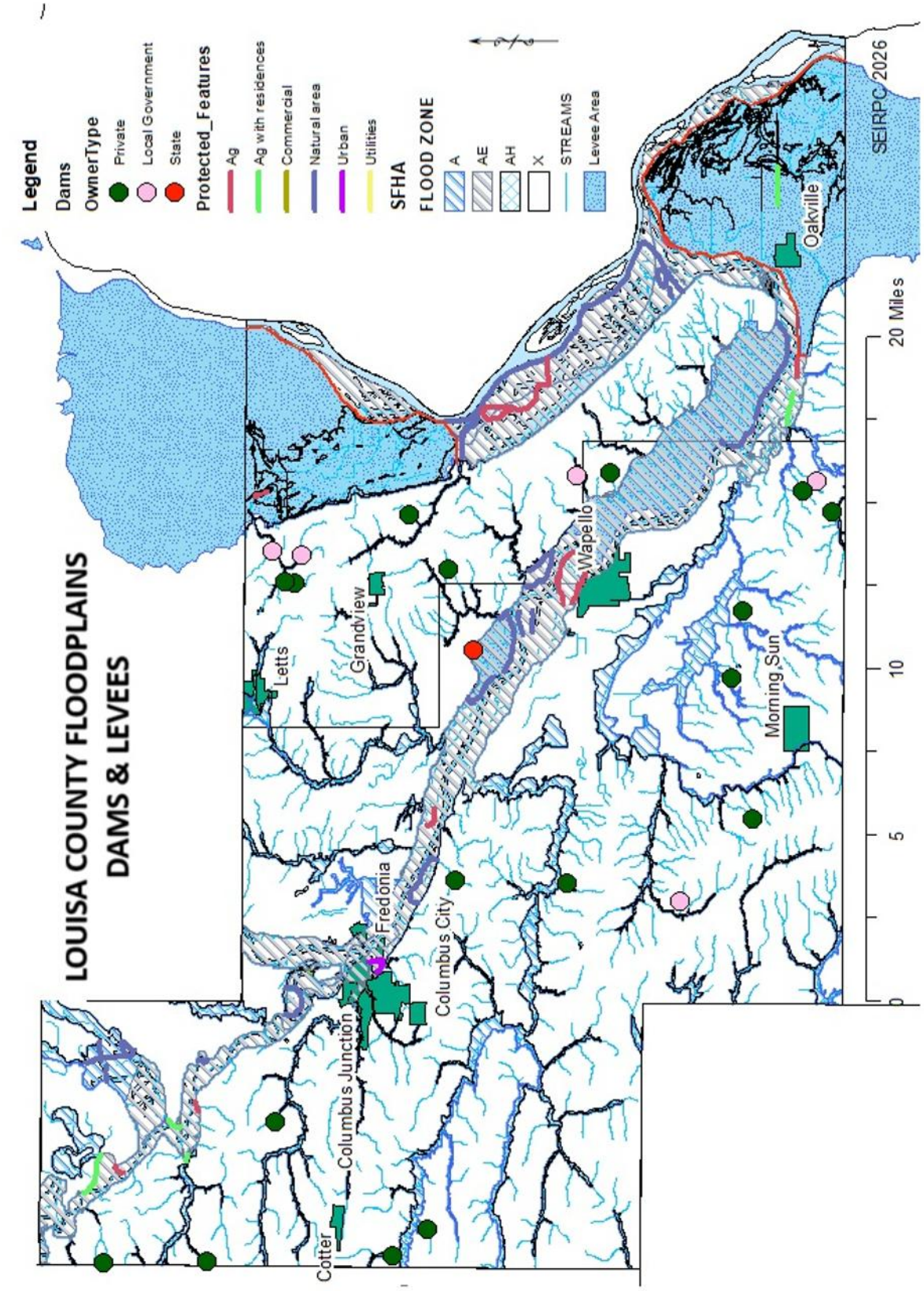
Dam Classification Chart

Hazard-Potential Classification	Risk Involved with Dam Failure	Inspection Frequency
High	probable loss of human life	annually, by a registered professional engineer
Significant	no probable loss of human life but can cause economic loss or disruption of lifeline facilities	every three years by a registered professional engineer
Low	no probable loss of human life and low economic loss	every five years

The designation of “high-hazard” reflects a dam’s potential for doing damage downstream if it were to fail and does not mean that a dam is in need of repair. The areas impacted are delineated using dam breach analysis. According to the US Army Corps of Engineers, only high hazard dams have inundation zone determinations.

Louisa County does not contain any high hazard dams. All dams are located in unincorporated portions of the county and are classified as low hazard dams. The dams are inspected as required by the Iowa Department of Natural Resources or Army Corps of Engineers.

Map: Floodplains Dams & Levees



Previous Occurrences; Dams

During the period covered in this plan (2016-2025) there have been no dam failures in Louisa County and only two within the state of Iowa.

Probability

There have been no reports of dam failure in Louisa County during the study period, or previously. The probability of future events is 0 events in 10 years = Unlikely.

Climate trends

One of the projected impacts of climate change is an increased frequency of severe storms. Changes in the intensity of precipitation events and flooding may have an effect on dams in Louisa County.

Already observed in Iowa: An 8 percent increase in precipitation from 1873 to 2008.

Flood: Increasing. Precipitation is expected to increase in intensity, though not necessarily frequency. With average annual precipitation increasing 1" to 4" in any county by 2050, heavy precipitation events are likely to become more common. Eastern Iowa has measured a greater increase in precipitation than western Iowa which indicates greater likelihood of flooding in eastern Iowa (Iowa, 2023).

Dams that were designed decades ago are unsuited to a warmer world and stronger storms. The American Society of Civil Engineers, in its report card on infrastructure in 2017, gave the nation's dams a "D" grade. Aging structures along with rising temperatures and storm intensity suggests that there may be an increase in dam failures.

B2-a,b Vulnerability and Impacts: Dams

Dam Failure: Affected Jurisdictions

X	Unincorporated Louisa County		Morning Sun
	Columbus City		Oakville
	Columbus Junction		Wapello
	Cotter		Columbus Junction Community Schools
	Fredonia,		Louisa -Muscatine Schools
	Grandview		Morning Sun Community Schools
	Letts		Wapello Community Schools

Unincorporated portions of Louisa County could be impacted by dam failure.

Not affected. Due to topography and distance from dams, Louisa County cities or schools are not in potential inundation areas.

According to the dam classification, loss of human life due to dam failure is unlikely. Property losses from low hazard dams are limited to crops and pasture.

There are no high hazard or significant hazard dams in Louisa County. Lock and Dam 17 on the Mississippi River is located to the northeast in Mercer County Illinois. Near that area, Louisa County is protected by levees.

Private Rural Dams in Louisa County

New development is unrestricted downstream from dams. The consequences of dam failure increase when new development occurs downstream. Individual decisions of area landowners can impact others in the watershed and increase hazard risk. Downstream development can change the status of a dam from low hazard to significant hazard even when dam conditions are unchanged.

Impacts of Climate trends. Increased volume of precipitation per storm would increase risk to aging dams.

Land use development. Development permitted below a dam increases risk and can potentially result in dam removal. Impacts include loss of the intended function and associated economic benefits of the dam.

Population patterns. An increase in residential housing or other development in potential inundation zones would elevate the hazard risk. Population in Louisa County is not expected to increase significantly in the near future.

Levees

The National Flood Insurance Program (NFIP) defines a levee in Title 44, Chapter 1, 59.1 of the Code of Federal Regulations (44 CFR 59.1) as "a man-made structure, usually an earthen embankment, designed and constructed in accordance with sound engineering practices to contain, control, or divert the flow of water in order to reduce risk from temporary flooding."

Although levees are a critical part of our nation's infrastructure, they do not eliminate the flood risk entirely. The millions of Americans, and trillions of dollars in assets located behind levees are still vulnerable to flooding. Though levees can reduce some flood risks, in some cases levees actually increase risks by creating a false sense of safety. Communities may permit development in a levee protected area that increases the number of people and amount of property potentially subject to loss. Flood risks associated with levees can change over time. If levees are not properly maintained, risk of failure of the levee may increase, resulting in catastrophic flooding.

Levees can be found in nearly one-quarter of the nation's counties, and roughly 43 percent of the U.S. population lives in counties with levees. It is important that community officials in communities with levees continually communicate the risk associated with them. Along with identifying and communicating the risk, they need to identify the steps needed to protect families, businesses, and the community from the threat of flooding due to levee overtopping, breaching, or seepage. Living with levees is a shared responsibility (Living with Levees, 2020).

An accredited levee is a flood-protection system officially recognized by the Federal Emergency Management Agency as reducing the risk from a 1% annual-chance (100-year) flood. Some local agricultural levees do not carry official FEMA accreditation, meaning official flood maps may not designate them as providing 100-year flood protection.

Rehabilitation and Inspection Program (RIP) status determines if it is an Active or Inactive structure under U.S. Army Corps of Engineers (USACE) Public Law 84-99 guidelines.

Active Status: The levee meets minimum standards, participates in the RIP, and receives an "Acceptable" or "Minimally Acceptable" inspection rating. Active systems qualify for federal rehabilitation funds if damaged by a flood.

Inactive Status: The system failed an inspection or has uncorrected deficiencies. It is ineligible for federal repair assistance, though the Corps may still provide emergency flood-fighting help to protect lives.

Levees: Location

On the National Levee Database, there are five levee systems located in Louisa County. Some historic levees are no longer actively maintained as flood control structures, although they may still serve a minimally protective function.

The database includes approximately 53 centerline miles of levees, 44 miles of which are accredited, while the remaining 9 are non-accredited. In total, levees protect approximately 51 square miles (or 32,700 acres) of land. Most of these directly protect property from the floodwaters of the Mississippi River and its immediate tributaries, while the remainder are along the Iowa River several miles upstream from the Mississippi. These systems manage agricultural flood risks and residential safety.

- Accredited levees are Muscatine Island Levee and Two Rivers Levee District
- Active levee: Levee District 11 – an active levee but not accredited
- Inactive levees: Levee Districts 8 & 14 are not accredited and not active in the RIP program

Active Levees

Muscatine Island / Louisa Levee:

The Muscatine Island/Louisa Levee & Drainage District 13 is a vital flood risk management and drainage network spanning parts of Muscatine and Louisa counties in Iowa. It manages interior drainage and protects both agricultural and urban lands along the Mississippi River.

Located near Fruitland and extending into Louisa County, this major system protects nearly 5,000 people and critical agricultural land. Due to reductions in pumping capacity, the US Army Corps of Engineers has set up emergency pumping operations to maintain flood mitigation. See news article, Appendix E.

Levee Name	USACE Levee Name: Muscatine Island L&DD, Muscatine - Louisa CO DD No 13
Location	Muscatine County, Louisa County, Iowa
People at Risk	4873
Structures at Risk	2230
Property Value	$851 M
Assessment Level	Moderate Risk
USACE District	Rock Island
Entity Maintaining Levee	Locally maintained
Recent Update	May 2019 local inspections with high MS River
USACE Rehabilitation Program Status	Active

The Muscatine Island Levee District contains a total of 14 miles of levees, with 8 miles located in Louisa County. The levee system protects nearly 50 square miles of land, with about 40% of this area in Louisa County, and the remaining 60% in Muscatine County. Its territory stretches about 12 miles from north to south along the Mississippi River, from the south side of Muscatine to Port Louisa. It does not contain any municipalities in Louisa County. A number of unincorporated residential areas are located within the Louisa County portion. Nearly all of the remaining land in Louisa County is farmland, with a few scattered homes in the agricultural areas.

From USACE National Levee Database: (Edited)

> Muscatine Island LD, & Muscatine-Louisa County DD No. 13 Flooding source: Mississippi River Summary: The original main stem levee for the Muscatine, IA (Muscatine Island) levee was constructed solely by private entities in the 1900s and the first federal project did not take place until 1935. The project levee system was raised to 100-year flood level of protection in 1960's. That remains in place and large portions were upgraded to a higher level of protection of 200-year return period flooding in the late 1990's with construction being completed in 2000 (USCAE, 2026).

Risk Characterization: The Levee Senior Oversight Group (LSOG) considers the risk associated with the Muscatine Island Segment (LST# 4825) to be Moderate (LSAC 3) for Breach Prior to Overtopping and low (LSAC 4) for Overtopping with Breach.

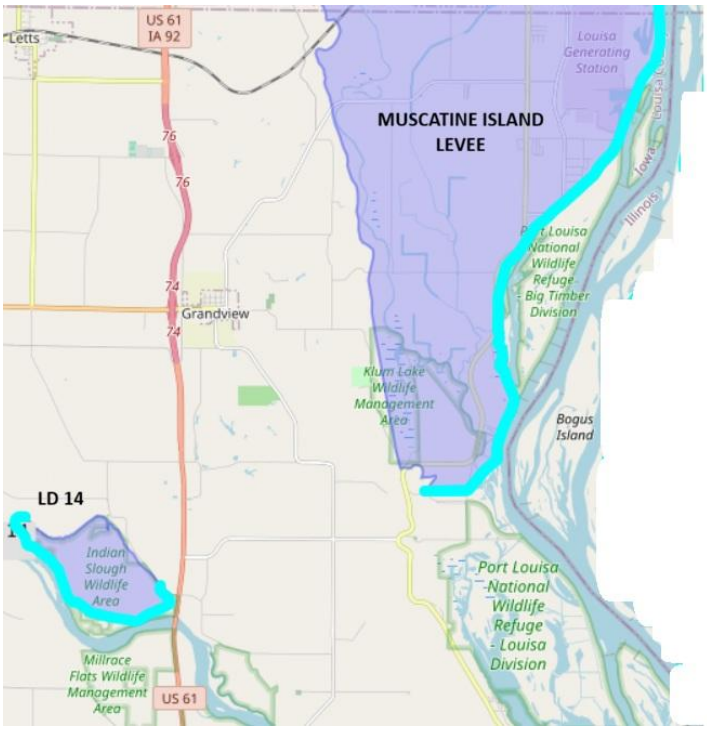
The risk for Breach Prior to Overtopping is related to lack of video inspections of culverts contributing to potential for excess underseepage and backwards erosion piping. Also unwanted vegetation and heavy industrial encroachments contribute to the rating. There is a potential for low to moderate loss of life and high economic damage. The risk for Overtopping is based on the overtopping risk of 2*10-4 and low loss of life consequences.

The Rock Island District has documented historic seepage areas during the 1965 and 1969 floods but these were mitigated with seepage controls installed in the 1990s. The screening identified unwanted vegetation on the levee section. The levee district's constituents benefit from acceptable flood awareness, evacuation planning, flood warning effectiveness and good evacuation routes. Regional consequences include impacts on oil and gas infrastructure which service Chicago and Detroit (USACE Levee, 2026).

Trustee Management: The drainage district is governed by a board of elected trustees responsible for maintenance, infrastructure (such as pump stations), and district financials.

County Oversight: The Muscatine County Auditor's Office and the Louisa County Elections Office oversee elections and maintain public records for district administration.

Temporary Pumping Support: Following the failure of two permanent pumps, the U.S. Army Corps of Engineers activated an Emergency Operations Center to supplement operations. Temporary 18-inch diesel pumps were deployed to assist with interior drainage while long-term repairs are planned.





The district has occasionally faced high maintenance and energy costs that threaten its cash flow. In the past, the City of Muscatine and Muscatine County intervened to mandate long-term financial planning and ensure pumping stations remain operational

Levee Upgrades: Local levee stakeholders and government agencies have collaborated on funding hardened overflow structures, allowing for controlled inflows during extreme flood events.

Two Rivers Levee & Drainage District

The Two Rivers Levee & Drainage District protects a total of 450 square miles of land, with about 1/3 of this area in Louisa County, and the remaining 2/3 in Des Moines County. Its territory stretches about 25 miles from north to south along the Mississippi River, between its confluence with the Iowa River and Burlington in Des Moines County.

There are 3 levees that make up the Two Rivers system. The Middle and Lower Units of the system are located in Des Moines County while the Upper unit is in Louisa County. The Hawkeye-Dolbee Diversion Channel, created to consolidate the flows of two creeks, splits the Middle and Upper Units, with the Upper Unit extending north of the Louisa County line to the Iowa River. Several smaller inland levees protect areas of farmland from backchannel flooding from the tributaries and drainage channels.

Much of the land protected by the Two Rivers levees is agricultural. Most of the residences are associated with farming operations, although there are a few exceptions. There are also several clusters of homes and river cabins built on the river side of these levees, most of which are elevated well above the land surface on piers or similar foundations to protect them from flood risk.

The district contains several pump stations, including one in Louisa County, to the northeast of Oakville. As with those in the Muscatine Island District, the 'shallow flooding areas' on FEMA's floodplain maps are concentrated within the lowest elevation areas of the district, branching out from the location of each pump station. The district contains a total of 51 miles of levees, with 15 miles located in Louisa County. At the confluence of the Iowa and Mississippi Rivers, the levee turns west to follow the Iowa River for 7 miles, before terminating near County Road H22 about 2 miles west of Oakville.

Oakville is the only incorporated city within the Two Rivers Levee &Drainage District, and the remainder of its territory in Louisa County is almost entirely crop farmland, with the exceptions being some wetland areas, a few scattered homes, and a handful of river cabins along the Iowa Slough.

USACE National Levee Database: (Edited)

> The Two Rivers Levee and Drainage District, Upper Unit levee system (Project) is located in Louisa and Des Moines Counties, Iowa on the right descending bank of the Mississippi River (Pool 18), the right descending bank of the Iowa River, and the left descending bank of the Hawkeye-Dolbee Diversion Ditch. The levee system is referred to as the Upper Unit of the Two Rivers Levee and Drainage District. The overall district includes three levee systems or units, called the Upper Unit, Middle Unit, and Lower Unit.
>
> The town of Oakville, Iowa is located within the Upper Unit levee system. The district office is located in Kingston, Iowa. The levee system is a Federally authorized and non-Federally operated and maintained rural flood damage reduction system (FDRS) in an agricultural setting. The original levee system completed in the early 1900's, around 1908, was constructed as a clay levee.
>
> The original levee system was authorized by Congress under the Flood Control Act of 1954, in House Document 281, and was completed from 1962 to 1967 to its current design. The levee system protects approximately 22,500 acres of agricultural land, the town of Oakville, Iowa, several residential and farming structures, County Highway 99, and other rural roads.
>
> The original design flood event for the levee system is the theoretical 1% chance event (100-year recurrence interval). with a freeboard for the levee system of 3 feet above that, with increased freeboard to 4 feet for the upstream reach of the mainstem levee and tieback (flank) levee. The crown of the levee system is up to 20 feet wide with varying crown elevations and varying slopes.

Most of the levee is constructed of earth, hydraulic sand and has an impervious clay core with the tieback levee embankment composed of semi-compacted land fill over and adjacent to an impervious clay core. The levee system is approximately 23.6 miles long. Two pump stations with discharge pipes cross the top of the levee.

Past sandbag closures at County Road H22, County Highway 99 and two railroad crossings were eliminated due to the raising of the county road and highway and the removal of the railroad, with permanent levee embankments constructed at the old railroad crossings.

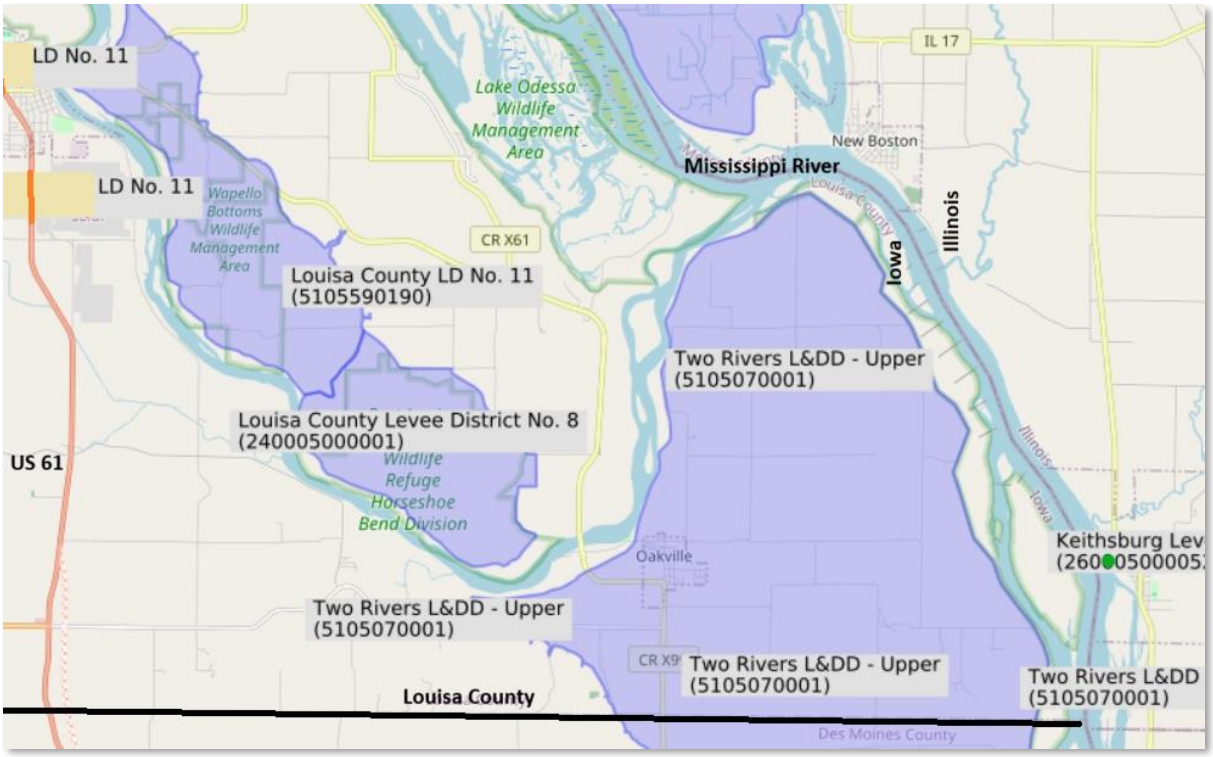
Pump Station No. 4 was built in 1908 prior to the 1960's Federal improvement project with the pump station discharge pipes altered, while Pump Station No. 2 was built in 1998 after the improvement project. PL84-99 rehabilitation assistance for the levee system was received due to the flood events of 1993 and 2008. As a result of the 2008 flood event, the levee system suffered an overtopping and then breached along the Iowa River portion.

The breach was repaired with a hydraulic sand fill levee embankment and no impervious clay core setback several hundred feet landward from the original alignment. Repairs also included the reconstruction of an intentional breach with hydraulic sand fill and no clay core at the downstream end of the levee system and placement of sand fill at wave wash and crown/slope erosion areas. Other minor modifications have been completed by the non-Federal Sponsor including the placement of additional sand along several sections of the landside levee slope, the installation of additional seepage berms, and the placement of erosion protection along the reconstructed riverside slope of the Iowa River levee that was setback after 2008.

By physical size, it is the second largest drainage district on the Upper Mississippi River. Approximately 49 square miles of its area is in Des Moines County, and 21 square miles in Louisa County (USACE Levee, 2026).

According to the National Levee Database USACE, approximately 700 people, 400 structures, and $113 million worth of property are protected by the levees in this system and would be at risk if a levee failure were to occur.

Levee Name	**Two Rivers L&DD - Upper Unit Location**
Location	Louisa County, Iowa
People at Risk	295
Structures at Risk	177
Property Value	$49.3 M
Assessment Level	Risk not assessed "In progress"
USACE District	Rock Island
Entity Maintaining Levee	Locally maintained
Recent Update	Withstood floods in June 2019 with help of sandbags
USACE Rehabilitation Program Status	Active



Levee District 11: Located along the Iowa River in Louisa County, this district has been subject to rehabilitation projects administered by the U.S. Army Corps of Engineers under PL 84-99 Authority.

Levee District 11 protects 21 buildings, 23 people and 315 acres of farmland. Property value is about $4 million. No critical facilities or endangered species are in the protected area.

Inactive Levees

Levee District 8

Levee District 8 protects 3 buildings, one person, and 80 acres of farmland. No critical facilities or endangered species are in the protected area.

Levee District 14

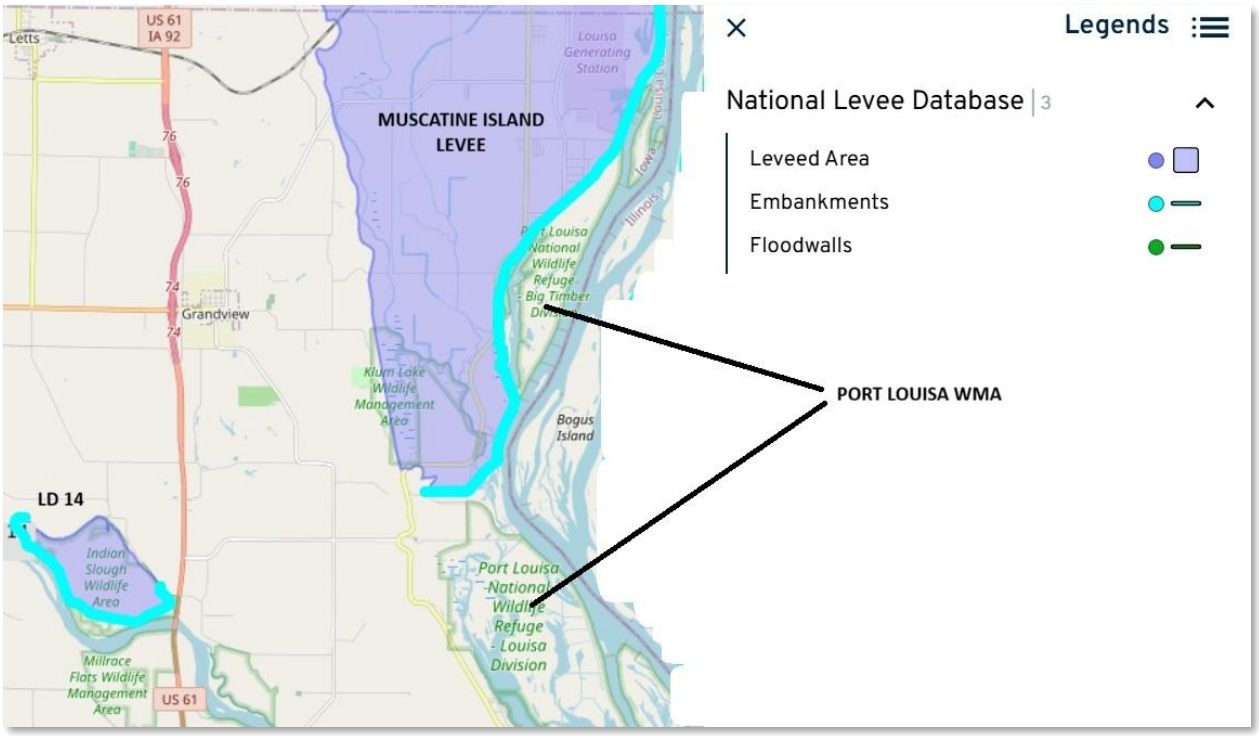
Protects 241 acres of agricultural land. No endangered species, critical facilities, structures or people are protected by this levee. See map below.

Wildlife Management Areas

Odessa Wildlife Management Area (WMA): Located near Toolesboro, this area utilizes road levee armoring and riprap placements to prevent erosion and stabilize habitats

The Port Louisa National Wildlife Refuge (*NWR):* The 2,609-acre Louisa Division of the US Fish and Wildlife Service is located just east of Wapello, Iowa in Louisa County. It is protected from moderate flooding by an Army Corps of Engineers levee stretching to Lock and Dam 17 on the Mississippi River, north of New Boston Illinois. The levee is integral to maintaining the nine-foot navigation channel in the Mississippi due to its proximity to the dam.

The Port Louisa NWR headquarters is located in an area that includes 48 acres of forest and a four-acre prairie restoration situated on a bluff overlooking the Mississippi River floodplain. For more information about Port Louisa Wildlife Refuge and other wildlife protected areas, see Appendix D.



Extent: Levees

While levees can help *reduce* the risk of flooding, it is important to remember that they do not *eliminate* the risk. Levees can and do deteriorate over time and must be maintained to retain their effectiveness. When levees fail, or are overtopped, the results can be catastrophic. In fact, the flood damage can be greater than if the levee had not been built (Living with Levees, 2020).

Levee certification: "Levee certification is the process that deals specifically with the design and physical condition of the levee and is the responsibility of the levee owner or community in charge of the levee's operations and maintenance. Certification must be completed for the levee to be eligible for accreditation by the Federal Emergency Management Agency (FEMA).

Accreditation: FEMA accredits a levee as providing adequate risk reduction on the FIRM if the certification and adopted operation and maintenance plan provided by the levee owner are confirmed to be adequate. An operations and maintenance plan specifies key operating parameters and limits, maintenance procedures and schedules, and documentation methods. FEMA's accreditation is not a health and safety standard – it only affects insurance and building requirements . . . Areas behind nonaccredited levees will be shown on FIRMs as a high-risk floodplain (Levee12, 2012)."

For FEMA to accredit a levee system on a FIRM as providing flood hazard reduction from the 1-percent-annual-chance flood, a Professional Engineer, or a Federal Agency that designs levees, must certify that the levee system is in compliance with the requirements outlined in Section 65.10 of the NFIP regulations and provide the appropriate data and documentation.

If FEMA does not receive the data and documentation required to show compliance with the NFIP regulations, FEMA will de-accredit the levee – that is, FEMA will map the levee impacted area as SFHA.

NOTE: When levee systems are mapped as accredited on the Flood Insurance Rate Map (FIRM), the area behind the levee is mapped as moderate-hazard and the federal requirement for lenders to require flood insurance is removed. Consequently, flood insurance becomes a choice rather than a requirement and many will wonder if they still need this coverage.

All areas near levees are still at risk for flooding because even when the base flood hazard is reduced; flood risk is not removed. More than 20 percent of all flood claims come from moderate-to-low hazard areas. Homeowners insurance will not cover flood losses.

The cost of Flood Insurance in moderate or low-hazard areas is offered at a much lower cost than if the property were in a high risk area. This makes NFIP one of the best ways to be financially prepared for flood damage (Living with Levees, 2020).

Previous Occurrences: Levees

The Two Rivers levees are certified as 100 yr levees. The highest recorded crest occurred in 2008, when the stream gauge measured the river level at 25.73 feet.

NOAA Stream gauge data at Burlington Iowa						
Normal Pool: 6.8 ft		Record: 25.7 ft				
Preliminary values subject to review (P)						
Recent Crests				**Historic Crests**		
1	20.48 ft	on 07-12-2024	(P)	1	25.73 ft	on 06-17-2008
2	16.57 ft	on 06-01-2024	(P)	2	25.10 ft	on 07-10-1993
3	20.00 ft	on 05-04-2023	(P)	3	24.47 ft	on 06-02-2019
4	18.21 ft	on 04-13-2020		4	23.65 ft	on 07-06-2014
5	18.36 ft	on 10-15-2019		5	23.54 ft	on 05-03-2019
https://water.noaa.gov/gauges/brli4						

During the last 10 years, 2016 to 2025, there have been no levee failures in Louisa County. In 2019, several levees in the Midwest were breached, raising concerns about the overall stability of such structures. Most were in the USACE category of Low-risk Levees. One of these was the North Bottoms Levee in Des Moines County.

According to the Environmental Law and Policy Center (ELPC) report on levees along the Mississippi River, other levees in the region failed that year. "(November 2019) . . . the flooding of Spring 2019 likely further weakened levee infrastructure across the region. Moreover, several low-risk levees breached during these floods, thereby raising concerns about the risk of all levees" (ELPC, 2019).

Probability: Levees

The probability of future events based on the ten year data is 0 events in 10 years = <10% "Unlikely."

Climate trends

Changes in the intensity of precipitation events and flooding may be expected to have an effect on levees in Louisa County.

> Scientists anticipate heavier rain events to affect the Midwest as global temperatures rise, which could exacerbate flooding and levee stress. Prudent decisionmakers should take climate resilience into account for long-term planning, prioritize which dams and levees are repaired given limited federal and state funds, and shift towards green infrastructure (ELPC, 2019).

Already observed in Iowa: An 8 percent increase in precipitation from 1873 to 2008.

Flood: Increasing. Precipitation is expected to increase in intensity, though not necessarily frequency. With average annual precipitation increasing 1" to 4" in any county by 2050, heavy precipitation events are likely to become more common. Eastern Iowa has measured a greater increase in precipitation than western Iowa which indicates greater likelihood of flooding in eastern Iowa (Iowa, 2023).

B2-a,b Vulnerability and Impacts: Levees

Levee Failure: Affected Jurisdictions

X	Unincorporated Louisa County		Morning Sun
	Columbus City	X	Oakville
	Columbus Junction		Wapello
	Cotter		Columbus Junction Community Schools
	Fredonia		Louisa -Muscatine Schools
	Grandview		Morning Sun Community Schools
	Letts		Wapello Community Schools

Affected jurisdictions. Louisa County, Oakville.

"Levees constructed of compacted clay with a high plasticity tend to crack during long dry spells. During heavy rainfall that follows dry periods, water fills the cracks and fissures. This increases hydrostatic forces, and the water also is slowly absorbed by the clay causing an increase in the unit weight of the clay as well as a decrease in its shear strength. This results in a simultaneous increase of the slide (driving) forces and a decrease of the resisting (shear strength) forces . . . It also results in the deepening of the cracked clay zone; cracks may reach a depth of 9 feet or more, especially for clays with a plasticity index greater than 40" (SEIRPC, 2020).

Louisa County, Oakville

Failure of the Muscatine Island Levee could impact rural areas and the Port Louisa National Wildlife Refuge. According to the USACE National Levee Database, a regional consequence of failure of the Muscatine-Louisa Levee includes a possible impact on oil and gas pipeline infrastructure which serves Chicago and Detroit. This system protects nearly 5,000 people and more than $850 Million in property.

Failure of the Two Rivers Levee could impact rural areas and the City of Oakville. According to the National Levee Database USACE, approximately 700 people, 400 structures, and $113 million worth of property are protected by the levees in this system and would be at risk if a levee failure were to occur.

Levee District 11 failure would affect rural areas east of Wapello. Levee District 11 protects 21 buildings, 23 people and 315 acres of farmland. Property value is about $4 million. No critical facilities or endangered species are in the protected area.

Impacts of Climate trends. Increased volume of precipitation per storm would increase risk to aging dams and levees.

Land use development. Development permitted in potential inundation zones would increase the hazard and potentially result in additional people and property at risk. Levees may lose accreditation or fail, resulting in increased flood risk and higher insurance cost. Structures may have to be raised or relocated.

Population patterns. An increase in residential housing in potential inundation zones would elevate the risk.

Landslide

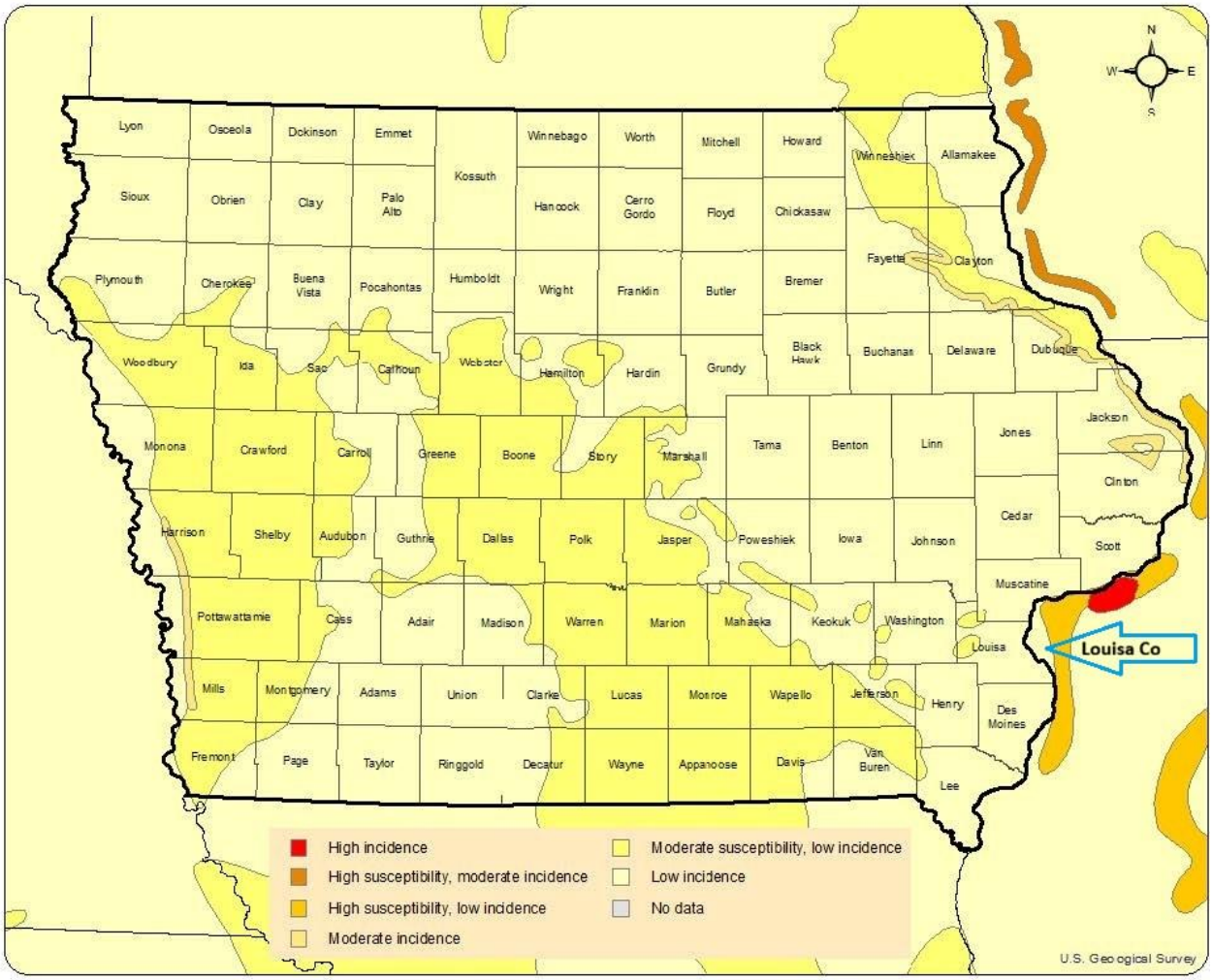
Description

Landslides occur when susceptible rock, earth, or debris moves down a slope under the force of gravity and water. Landslides may be very small or very large and can move at slow or high speeds. A natural phenomenon, landslides can occur due to geological processes, rainstorms, fires, or human activities that modify slope and drainage.

Location

A portion of the state is moderately susceptible to landslides. Susceptible areas are found along the steep terrain within the major river valleys such as the Mississippi, Missouri, Des Moines, and Iowa. The accompanying map shows the relative difference in landslide susceptibility and incidence for different areas of Iowa (Iowa, 2023).

Affected jurisdictions: Louisa County and Columbus Junction.



LANDSLIDE INCIDENCE AND SUSCEPTIBILITY USGS 2023

Extent

According to the 2023 State of Iowa Hazard Mitigation Plan, Landslides of record in Iowa are typically of 100 square yards of earth movement or less. Because no state agency officially documents data on landslides in Iowa, damage history is usually limited to local knowledge. There may be additional undocumented events, perhaps larger than those recorded by the state.

The USGS published and posted a national inventory of known landslides. The few Iowa events included in the U.S. Landslide Inventory included road or railroad closures from debris, with two involving train derailments and one a car crash. There have been no reported landslide events in Iowa resulting in death.

Previous Occurrences

In Louisa County, two events are known to have occurred in the Iowa River corridor during the study period. One event involved a slump of about 300 feet of roadbed near Columbus Junction. Another affected a quarter-mile stretch of road on G36 adjacent to the bluffs of the Iowa River.

Probability

Two events in ten years = 20% probability, Moderate chance.

Climate trends

Extreme rain events, which could trigger landslides, appear to be occurring more frequently in Iowa. Eastern Iowa is seeing a greater increase in precipitation than western Iowa. Precipitation is expected to increase in volume and intensity, with average annual precipitation increasing 1" to 4" in any county by 2050. Because warmer air temperatures can hold more water, storms may be larger but less frequent.

B2-a,b Vulnerability and Impacts

Landslide: Affected Jurisdictions

X	Unincorporated Louisa County		Morning Sun
	Columbus City		Oakville
	Columbus Junction		Wapello
	Cotter		Columbus Junction Community Schools
	Fredonia		Louisa -Muscatine Schools
	Grandview		Morning Sun Community Schools
	Letts		Wapello Community Schools

Unincorporated Louisa County

The Iowa River corridor has bluffs that are susceptible to landslides. This hazard currently impacts only county roads.

Impacts of Climate trends. Increased periods of drought followed by increased volume of precipitation per storm would increase risk of landslides in the bluffs of the Iowa River, especially where expansive clay soils may also be present.

Land use development. New development permitted in steep areas would increase the hazard and result in potential harm to people and damage to property.

Population patterns. Placement of residential housing in potential landslide zones would elevate the hazard risk.

Animal, Crop, Plant Disease

This hazard includes diseases that affect trees, crops, plants, livestock and wildlife such as deer, birds, rodents, fish, insects and other living things. Infectious diseases are caused by diverse living agents that replicate in their hosts. The agents that cause disease fall into five groups: viruses, bacteria, fungi, and parasites (protozoa and worms) (Janeway CA Jr, 2001).

Large-scale infestations of insects or rodents negatively impact other life and are often fueled by environmental drivers or by the weakened health of another species.

Overpopulation and the geographic movement of wildlife can contribute to the spread of disease. For example, according to the Center for Disease Control, while deer are not infected with Lyme disease, they are an important source of blood for ticks and are important to tick survival and movement of Lyme infected ticks to new areas (CDC Lyme, 2023).

International travel and the movement of goods in the global economy create conditions where contamination of native species is unavoidable. "Incidents of animal or plant disease are not solely natural occurrences. Human actions are extensively implicated in the spread and outbreak of disease. In turn, disease affects human interests widely, and much effort is spent in the control of disease (Wilkinson, 2011)."

The United States Department of Agriculture monitors reports submitted by veterinarians and labs to identify patterns. The Iowa Department of Agriculture and Land Stewardship (IDALS) conducts numerous animal disease investigations each year. The department is proactive in providing information to the agricultural community on medical concerns.

Location

The potential for Animal, Crop and Plant Disease is present throughout Louisa County and its cities.

Livestock and crop farms are prevalent throughout Louisa County and constitute a substantial portion of the local economy as part of the world food supply. Due to the agricultural production in the area, a high impact occurrence of disease would affect the entire county and beyond.

The rich landscape of southeast Iowa provides habitat for a great diversity of wildlife and plant species.

Affected jurisdictions: Louisa County and Cities

Extent

Different measures of severity apply to the various fields of study of disease, and a discussion of all of these is beyond the scope of this report. The US Department of Agriculture and the Department of Natural Resources both track and report plant and animal disease under different methods.

For this report, we define an animal, crop or plant disease as a hazard event if it would have widespread social, economic or public health impacts.

Previous occurrences

Trees

The emerald ash borer is an invasive insect known to be highly destructive to ash trees. By 2025, Emerald Ash Borer had been confirmed in all Iowa counties, according to the Iowa DNR. Emerald ash borer infestation became widespread, which significantly impacted residential trees and forested areas.

In 2023, the DNR website noted that Ash trees were a common and important component of Iowa's urban and community forests. At that time, inventories found that ash species made up approximately 17% of

total street tree canopy for the average Iowa community, with some communities seeing numbers over 50% (IDNR, 2023). Emma Hanigan, Iowa DNR urban forestry coordinator, reports that the U.S. Forest Service 2012 inventory indicates that there were 52 million woodland ash trees and 3.1 million urban ash trees in Iowa (Rodriguez, 2023). In 2026, damage is ongoing although most ash trees have been removed.

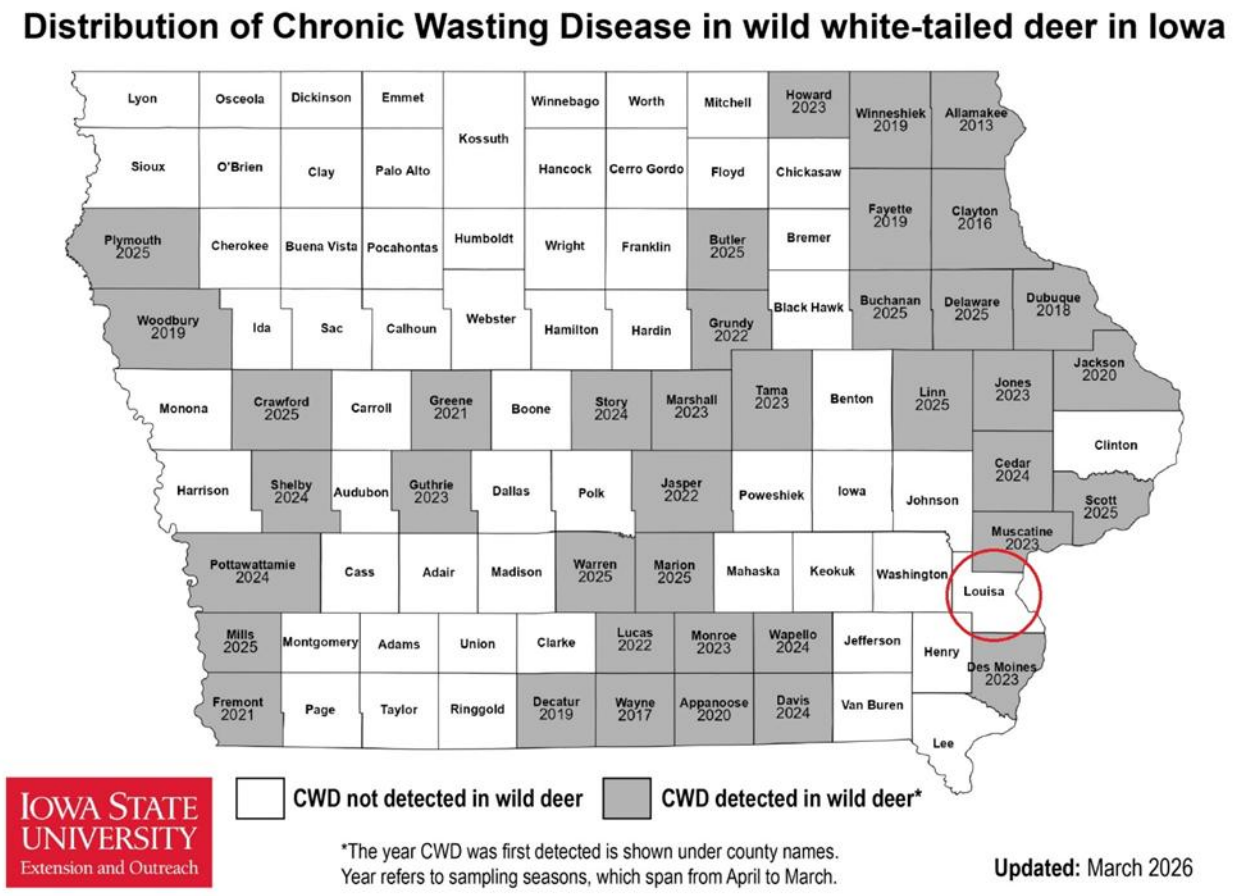
Diseases in local deer population

At least two deer diseases are of concern to the Louisa County community, Chronic Wasting Disease (CWD) and Epizootic Hemorrhagic Disease (EHD), also known as "blue tongue."

Chronic Wasting Disease (CWD)

Chronic Wasting Disease (CWD) is caused by a protein that deteriorates the brains of deer. It is always fatal. The disease is known to have been in Iowa for about 15 years and is spreading. Jace Elliott, a Department of Natural Resources deer biologist says he expects to see more chronic wasting disease in deer each year. "I would consider Chronic Wasting Disease to be the greatest threat that the Iowa deer herd faces" Elliott said (Markel, 2023). The first confirmed case of CWD in Iowa was reported in 2013.

While CWD has not yet been detected in Louisa County the community considers it a hazard.



Epizootic Hemorrhagic Disease (EHD)

EHD Outbreak in Iowa Deer Herd from the publication Western Iowa Today 2023:

> An outbreak of Epizootic hemorrhagic disease is occurring amongst Iowa's deer population, particularly in the eastern half of Iowa.
>
> Keith Ringler, Private Land Biologist for the Iowa Department of Natural Resources, says EHD is a native disease that causes significant morbidity and mortality among whitetail deer in North America. He says the virus is transmitted primarily by biting midges. Ringler says the incubation period for developing disease in deer is five to ten days. Ringler says the condition is also called blue tongue.
>
> Ringler encourages farmers harvesting crops or hunters finding dead deer near a water source to contact the DNR. Ringler says the first hard freeze will eliminate the midges, making this disease less prevalent through the fall and winter (Robinson, 2023).

In 2026, as of August 1, only 4 counties in Iowa reported EHD deer deaths. Scott, Clinton and Decatur County each had one report, while two carcasses were reported in Boone County. Most cases occur in late summer and early fall, therefore we should expect to see more by the end of the year.

Agriculture

A severe occurrence of infectious animal disease causes significant damage to agricultural markets. Since 2022, Avian influenza outbreaks reduced egg production, driving prices to record highs. U.S. egg inventories were 29 percent lower in the final week of December 2022 than at the beginning of the year. By the end of December, more than 43 million egg-laying hens were lost to the disease itself or to depopulation since the outbreak began in February 2022 (USDA, 2023). Another outbreak occurred in 2024.

Older events: In 2015 Iowa experienced impacts to avian populations when 18 counties and 77 sites across the state were affected by highly pathogenic avian influenza (HPAI). The 2018 Iowa State Hazard Mitigation Plan noted that more than 33 million birds had to be euthanized and disposed of with the cost of replacement estimated at $83.6 million. The replacement cost does not include economic impacts from unemployment and costs to euthanize birds and dispose of carcasses.

Wet soil conditions are cited as the cause for an epidemic of soybean sudden death syndrome that occurred in Iowa in 2010.

Ticks and Mosquitos

The 2025 Iowa Department of Public Health report on Vector-Borne Disease records instances of diseases transmitted to humans through the bites of vectors like mosquitoes, ticks, and fleas.

Disease	Vector	Number of human cases in Iowa 2024	Pathogen	In Louisa County
West Nile Virus	Mosquito	21	Virus	Not detected
Lyme Disease	Deer tick	162	Bacteria	Yes
Anaplasmosis	Deer tick	26	Bacteria	No
Ehrlichiosis	Lone star tick	18	Bacteria	No
Babesiosis	Deer tick	3	Parasite	No
Rocky Mountain Spotted Fever	Dog tick	5	Bacteria	No

Probability

Six hazard threats in the ten year period 2016-2025 are noted above – Ash borer, 2 Deer diseases, 2 cases of Avian flu, and Lyme disease. We include vector-borne illnesses in this hazard category because of the wildlife to human connection.

The probability for Animal, Crop and Plant Disease is determined to be 60% = Likely.

Climate trends

Changes in temperature, precipitation, water levels and a host of other environmental factors will affect the range and survival of many species of plants and animals. Winters are warming faster than summers; therefore, pest and pathogen survival may increase. Changes in the amount of moisture in the local environment will affect the health of plant and animal life.

From Iowa State University 2026: Climate Impacts on Hemorrhagic Disease in Deer

> Of the components, temperature plays an important role in the seasonality of EHD. Temperature can influence the amount of time the vector (midges) requires to reach the adult life stage where they can become infected with EHD. As temperatures increase in the summer, the time needed for midges to reach adulthood decreases. This means that more adult midges are available at a given time to contract the EHD virus. In contrast, EHD virus replication within the midge population increases as temperatures increase. As the amount of virus increases within the vectors, more vectors are capable of infecting deer. More infectious vectors on the landscape equate to more deer becoming infected at the same time, creating outbreaks of infection.
>
> These climate conditions are historically associated with drought, but drought is not a requirement for outbreaks of mortality associated with HD. Because moisture is a requirement for vector survival, long term drought conditions could become too warm and dry to maintain vector survival and virus transmission needed for HD outbreaks (ISU, 2026).

Other Wildlife. As one example of the effects of climate trends on wildlife, according to the National Audubon Society, "Scientists agree that we should take immediate action to hold warming at 1.5 degrees Celsius or else face increasingly dire consequences. If we do nothing, 1.5 degrees is imminent, 2 degrees could happen as soon as 2050, and 3 degrees could occur by 2080."

At an increase of 3 degrees Celsius, highly and moderately vulnerable birds may lose more than half of their current range as they are forced to search for suitable habitat and climate conditions elsewhere (Degrees, 2023). Fifty species of bird are classified as having Moderate (36) or High (14) vulnerability to climate change in Iowa.



Changes already observed in Iowa by 2023.

A shorter, less severe winter may permit the survival of more pests and pathogens.

- ✓ Winters are warming six times faster than summers

- ✓ Increased precipitation (8 percent from 1873 to 2008)
- ✓ Abnormal seasons
- ✓ Longer average growing season by two weeks (frost-free seasons increased by an average of nine days since 1901)
- ✓ Longer pollen season, exacerbating allergies, asthma, and sinusitis
- ✓ Plants leafing out and flowering sooner
- ✓ Migrating pollinators miss plants that bloom too early, endangering both
- ✓ Birds migrating earlier, sometimes missing seasonal waters and food sources
- ✓ Habitable ranges changing (some native plants and animals having a harder time in Iowa, some from warmer regions moving north)
- ✓ Favorable conditions for survival and spread of many unwanted pests and pathogens

Lower air quality

- ✓ Higher temperatures, sun, and stagnant air are generally more favorable to ozone formation. Rain, wind, humidity, clouds, and cool air limit ozone formation
- ✓ High ozone concentrations, which can be high in both rural and urban contexts may reduce soybean and corn yields by 5 and 10 percent, respectively
- ✓ Ozone also negatively impacts human and animal health

(Iowa, 2023)

B2-a,b Vulnerability and Impacts

Animal, Plant and Crop Disease: Affected Jurisdictions

X	Unincorporated Louisa County	X	Morning Sun
X	Columbus City	X	Oakville
X	Columbus Junction	X	Wapello
X	Cotter		Columbus Junction Community Schools
X	Fredonia,		Louisa -Muscatine Schools
X	Grandview		Morning Sun Community Schools
X	Letts		Wapello Community Schools

Unincorporated Louisa County

Rural areas with large agricultural economies are the most vulnerable to this hazard. Livestock animal disease or crop disease would impact agricultural production which affects individual, local and regional stakeholders.

County Conservation

Wildlife suffers from pest and pathogen infestations as well, from both human introduction of exotic species and natural environmental pressures. Intensified drought and flood cycles have a negative impact on wildlife. A reduced quantity and quality of fresh surface water during drought impacts the health of wild plants and animals, while too much water and additional flooding damages habitat. (IDNR, 2023). Temperature changes of even a few degrees can push species into new habitats, disrupting the balance of ecosystems.

Special Considerations

There are about 330,000 hogs in Louisa County (418 square miles); an average density of nearly 800 hogs per square mile. (The human population averages about 26 people per square mile.) This implies a significant amount of manure management in a county where a high volume of water flows through numerous streams toward the Mississippi River.

Vulnerabilities & Impacts on Agriculture

Most of the unincorporated county is in agricultural land use. It takes time to mobilize assistance from state or federal sources. Animal disease outbreaks could rapidly overwhelm the local animal care system.

Agriculture is vulnerable to the introduction of foreign plant and animal diseases. Contamination can occur through material carried by international travel and trade, by the importation of infected products, or carried by migratory wildlife.

With hundreds of thousands of livestock produced and transported in the state each year, Iowa could be a rich environment for a disease epidemic. An incident of high consequence disease will significantly limit the ability to move, slaughter, and export animals and animal products.

Iowa is the nation's number one producer of corn, soybeans, eggs, and hogs. A local outbreak of disease in agricultural products has widespread economic and social implications. Economic impacts of animal, crop or plant disease include not only loss of jobs and exports, but a reduction in the local and even global food supply. Rising prices due to shortages impact families. Lost tax revenues impact the ability of local governments to provide services.

Between 2022 and 2026, spikes in egg prices across the U.S. due to repeated outbreaks of Avian Flu not only affected the egg and poultry industry and household budgets but also had a powerful impact on the political dynamics of the entire country.

According to the World Organisation for Animal Health (WOAH), the animal health sector is vulnerable to threats posed by misinformation and disinformation.

Almost every animal disease outbreak from Bovine spongiform encephalopathy (BSE or mad cow disease) to Foot and mouth disease (FMD), African Swine Fever (ASF) and Avian influenza has been accompanied by misinformation and disinformation (WOAH, 2026).

Even rumors of an infectious animal disease can cause disruptions to the economy, often due to a lack of information or misunderstanding about food and health safety.

Misinformation is inaccurate information, usually spread without harmful intent.

Disinformation is inaccurate or misleading information, deliberately created and spread to cause harm.

In October 2022, viral online content about the spread and treatment of lumpy skin disease in cattle stirred up conspiracy theories, undermining cattle vaccination efforts and suggesting that milk was not safe to drink in the UK. This had a damaging effect on the dairy industry.

Louisa County; Deer

Louisa County is a rural county with a significant amount of wildlife. Climate trends affect habitat and range for traditional species. There is a rising incidence of blue tongue disease (EHD) among a prolific deer population and chronic wasting disease (CWD) in the state. Concerns about the health of deer reduces hunting, increasing the deer population. Overpopulation leads to increased disease transmission.

Reduced harvesting of game deer has secondary effects such as deer feeding on crops and significant costs to insurance companies from an excessive number of deer/vehicle collisions on Iowa roads.

Local hunting of Whitetail deer is not only an important cultural and recreational activity; deer meat is a low cost source of nutrition on which many families rely. Doubts about the health of local deer means that a greater percentage of game may not be harvested, and families have to purchase more protein.

Louisa County & All Cities

Wild and domestic trees, plants and animals lack resistance to introduced pests and pathogens, mutations of native pathogens and changing trends in moisture and temperature. Changes in moisture, temperature and habitat weaken species and force relocation.

International shipping of plants, animals, grains and containers makes the introduction of non-native lifeforms virtually unavoidable.

Ash trees throughout the region were infested in recent years with the Emerald Ash Borer, an exotic species fatal to Ash trees. Loss of shade and reduced benefits of evapotranspiration, cost of removal and disposal of diseased trees, cost to replace lost trees with a resilient species, and the extended time for new trees to reach maturity are some of the impacts of this hazard.

Cities

Cities are affected by diseases in domesticated animals, plants and trees, and wildlife that has adapted to a small town or urban environment. Towns can have a significant population of deer, racoons and opossums living within the city limits. Deer feed on residential plantings.

Plants and trees. Pest and pathogen infestations can cause widespread tree and plant loss. Once infestation occurs, a pest may become endemic, causing repeated losses in subsequent growing years, and may ultimately lead to species extinction. Two historic examples of this are the devastating effects of an imported fungus which destroyed the American Chestnut in the early 1900s, and Dutch Elm Disease in the 1920s. The Emerald Ash Borer is a recent threat to Ash trees in Iowa.

Community preparation. The Iowa DNR suggests that adequate preparation for widespread tree disease includes consideration of the following questions:

- ✓ Who will cut and haul away dead and dying trees?
- ✓ Is there an accessible, secure site big enough to store and sort hundreds or even thousands of trees and the associated brush and chips?
- ✓ How will the wood be disposed of or utilized?
- ✓ Do we possess equipment capable of handling the size and quantity of trees that will need to be removed

New concerns: Cities: Stray and Feral Cats

Stray and feral cats are becoming a permanent part of the wildlife ecosystem. Cats can reduce the availability of prey for native wildlife, changing the dynamics of the ecosystem with unknown consequences. Without spay/neuter programs for feral cats each female can produce up to 200 kittens during an 8-10 year lifetime, resulting in exponential population growth.

Feral cats in neighborhoods bring pathogens into contact with domestic cats and humans. Free-roaming cats present a particularly compelling case because of their large population sizes and their central role in the life cycle of the parasite Toxoplasma gondii (T. gondii) that infects both wildlife and humans. Rabies is another disease whose risk is increased by free-roaming cats. In the United States, cats are the most common rabies positive domestic species (PhysOrg, 2022).

According to the USDA “Free-ranging cats are more likely to be exposed to a variety of diseases including Feline Leukemia Virus (FLV), Feline Immunodeficiency Virus (FIV), and are 2.8 times more likely to be infected with parasites (and parasite-spread diseases) than indoor cats (Levy et al. 2006; Chalkowski et al.2019) . . . Cats are considered domestic animals and as such are governed by laws and regulations governing the treatment of pets and livestock, even though they often persist on the landscape as an

uncontained and uncontrolled feral population. Free-ranging cats present special legal challenges. Should they be considered invasive wildlife or domestic animals? The lack of clear-cut responsibility and jurisdiction complicates the management of free-ranging cats for landowners, conservationists, and management agencies" (USDA, 2021).

Impacts of Climate trends. Timing of precipitation or drought is likely to impact agricultural practices, with increased possibility of delayed plantings, and disease outbreaks (Kansas, 2018).

"The National Wildlife Federation . . . released a report stating that the effects of climate change will likely cause increases in populations of disease-bearing deer ticks and mosquitoes and the spread of more, and stronger, poison ivy (Rogers, 2018)."

Projected changes by 2050:

- ✓ Loss of plant and animal habitat, and ecosystems in flux
- ✓ Invasion by non-native species and tropical pests and diseases
- ✓ Decreased corn yields due to heat stress, despite longer growing season and higher CO2
- ✓ Increased soybean yield due to higher CO2, though potentially less so in southern Iowa

Recent trends indicate that surface wind speeds (stand measurement height of 32 feet) over Iowa have been declining, which means less crop ventilation and more heat stress for plants and animals. Reduced wind also creates favorable conditions for survival and spread of unwanted weeds, fungi, pests and pathogens. Waterlogged soil conditions during early plant growth often result in shallower root systems that are more prone to disease, nutrient deficiencies, and drought stress later in the season. Heavy spring rains, likely followed by summer droughts will tighten an already shortened planting window, exacerbating soil erosion and nutrient runoff (Iowa, 2023).

Land use development. Land use development is unlikely to increase or decrease risk from this hazard in the near future.

Population patterns. Population patterns are unlikely to increase or decrease risk from this hazard in the near future.

Hazardous Materials Incident

The accidental release of flammable, combustible, explosive, toxic, noxious, corrosive, oxidizable, irritant, or radioactive substances or mixtures can pose a risk to life, health or property that may require evacuation of the vicinity. As many as 500,000 products can be defined as hazardous chemicals that pose physical or health hazards.

For this plan, hazardous materials stored at fixed sites and transportation of hazardous materials including radiological waste were evaluated.

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. Fixed hazardous material incidents usually affect a localized area, and the use of planning and zoning can minimize the area of impact.

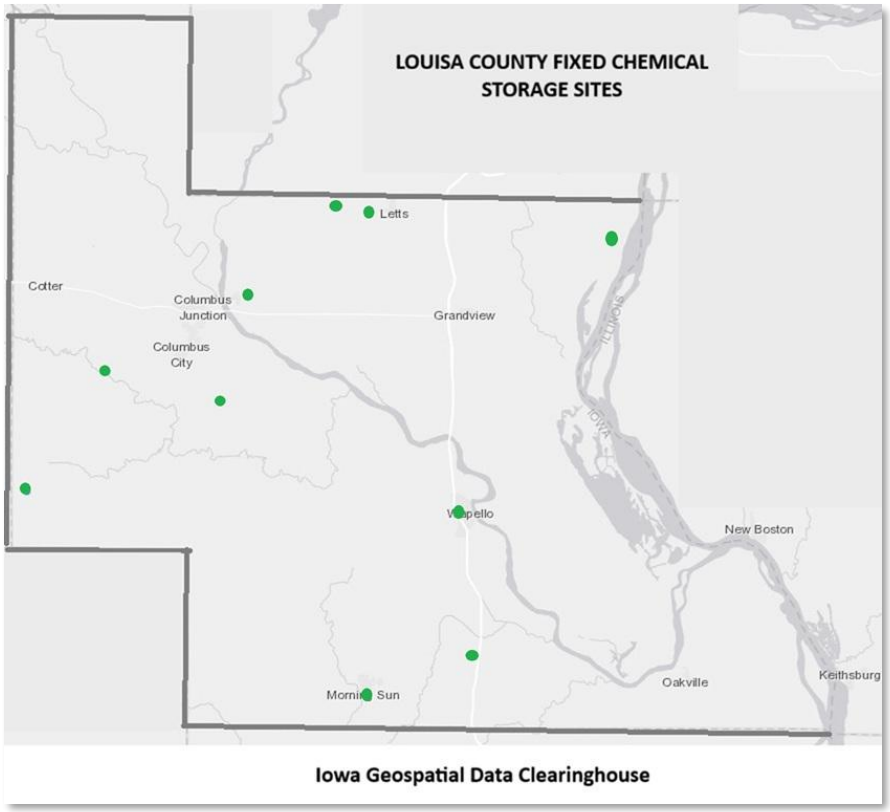
The Secretary of the Department of Transportation has the authority to regulate transportation of hazardous materials, including transport over highways, roads, rail and pipelines.

The Pipeline and Hazardous Materials Safety Administration (PHMSA) was delegated the responsibility to develop the hazardous materials regulations, found in Title 49 of Federal Regulations Parts 100-185. Shippers and carriers in Iowa are required to comply with those hazardous materials regulations (PHMSA, 2023).

Location

Hazardous materials may be spilled anywhere they are being stored or transported. In Louisa County, spills typically occur at storage sites or on roads and highways. There are 10 fixed chemical storage locations recorded in the Iowa Geospatial database. Pipeline and railroad incidents are infrequent.

Fixed Sites Chemical
Storage Facilities
Louisa County Iowa
Iowa Geospatial Data Clearinghouse



Rail freight routes.

Trains transport a variety of freight that can include hazardous material that could be released in the event of a collision or derailment.

Also see Railroad map on page 14 above, which shows the location of the Canadian Pacific RR, operated by the Dakota Minnesota & Eastern (DME) and carries 5 to 20 tons of freight annually through the northern part of Louisa County.

Transport of Radiological hazardous waste: From the Iowa State Plan 2023:

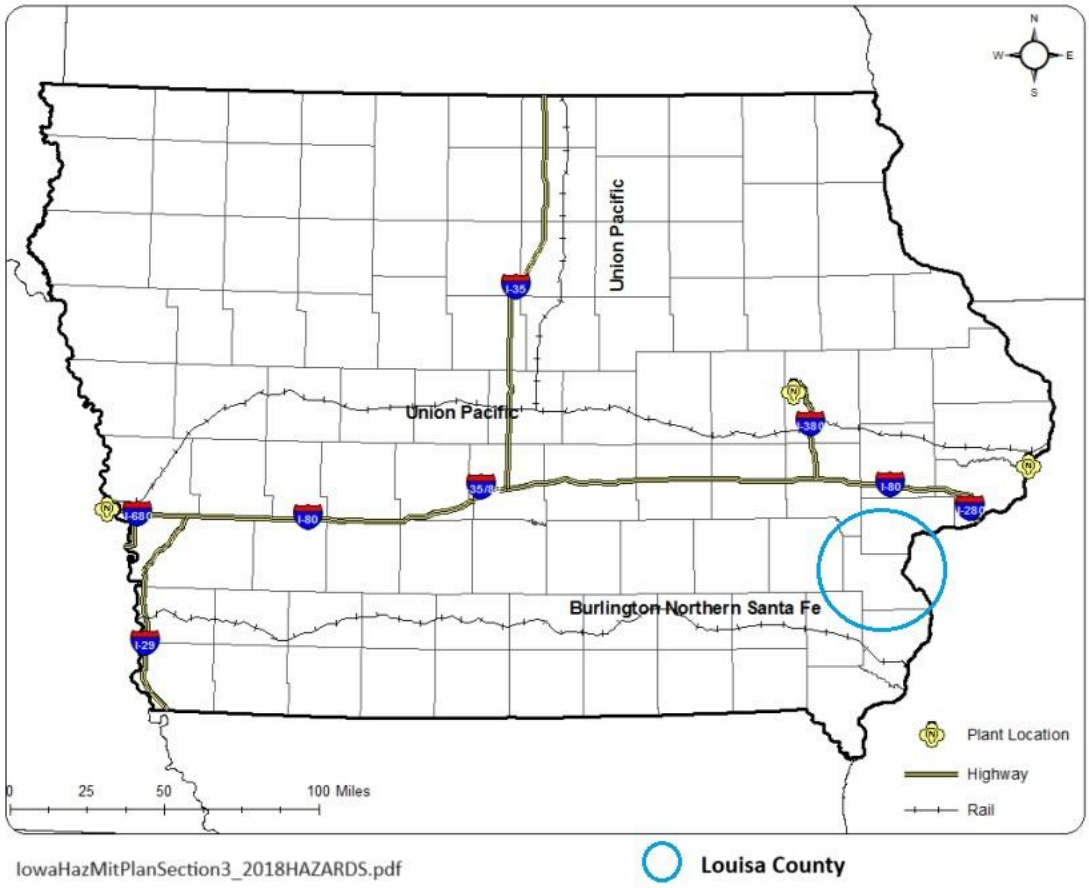
"Radiological incidents related to transportation are described as an incident resulting in a release of radioactive material during transit. The transportation of radioactive material by any means of transport is licensed and regulated by the federal government. When these materials are moved across Iowa highways, State officials are notified, and appropriate escorts are provided. As a rule, there are two categories of radioactive materials that are shipped over the interstate highways.

Low-level waste consists primarily of materials that have been contaminated by 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 that which exists from 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. Potential rail and highway routes for the shipment of radioactive waste have been identified and mapped below" (Iowa, 2023).

Potential Transportation Routes for Nuclear Waste. Source: Nevada Agency for Nuclear Projects



Affected Jurisdictions. All jurisdictions have the potential to be affected by Hazardous material spills.

Extent

As a standard, Hazardous materials have been grouped into nine classes. Each class includes several subclasses. Warning stickers are required on hazardous materials containers of transport vehicles to provide critical information about the potential dangers involved.

The National Fire Protection Association (NFPA) has developed a color-coded number system called NFPA 704. The system uses a color-coded diamond with four quadrants in which numbers are used in the upper three quadrants to signal the degree of health hazard (blue), flammability hazard (red), and reactivity hazard (yellow). The bottom quadrant is used to indicate special hazards.

The NFPA system is useful for alerting personnel to the degree of hazard of the chemical and draws attention to storage needs and the necessary emergency equipment needed. This system does not indicate chronic health hazards.

In addition to labels on hazardous materials containers, these markings may be posted on fences or doors to identify general hazards in storage areas.

- ✓ Red quadrant indicates flammability
- ✓ Blue indicates health hazard
- ✓ Yellow indicates instability
- ✓ White indicates a special hazard

Within the red, blue, and yellow quadrants is a hazard rating number. This number can range from 0 to 4, with 0 being no hazard to 4 being extremely hazardous.

Because the white quadrant indicates special hazards, the marking in this area will be either blank for no hazard or an abbreviation or symbol indicating a specific hazard.

Emergency Response Levels. Classifications of HAZMAT-related situations refer to the level of response needed.



Explanation of nfpa chemical hazard label

Hazardous Material Incident Classifications		
Level 1	Involves hazardous materials that can be contained, extinguished, and/or abated using immediately available public sector responders having jurisdiction	Level 1 incidents present little risk to the environment and to public health with containment and cleanup.
Level 2	Involves hazardous materials beyond the capabilities of the first responders on the scene and could be beyond the capabilities of the public sector responders having jurisdiction (State response)	These incidents can pose immediate and long-term risk to the environment and public health and may need state- or federal-level level emergency assistance
Level 3	Involves hazardous material incidents beyond the capabilities of a single state or regional response team and requires additional assistance (Federal response)	These incidents generally pose extreme, immediate, or long-term risk to the environment and public health

Class	***Material***
1	Explosives
2	Flammable Gas
3	Flammable Liquids
4	Flammable Solids
5	Oxidizing Agents, Organic Peroxides
6	Toxic & Infectious Substances
7	Radioactive Substances
8	Corrosive Substances
9	Miscellaneous

Previous Occurrences

The Iowa DNR Hazardous Substance Incident Tracking Database provides hazardous materials spill data, from both fixed sites and roads. Since the year 2016, 28 hazardous material spills have been recorded in Louisa County, from a single quart of motor oil to 7500 gallons of manure.

Transformer oil was the most commonly spilled material, with 9 events over 10 years. Next most common were 6 that involved diesel fuel, motor oil, gasoline and fuel oil. There were 9 transformer oil spills, 5 agricultural chemical (fertilizer/pesticide) events, and 4 manure spills during that time.

Date	Responsible Party Name	Location City	Medium	Material released	Quantity
5/3/2016	Private Property (rp Not Owner)	Wapello	Land	Transformer Oil (Non PCB)	1 Quart
7/5/2016	Road Surface	Wapello	Land	Gasoline non-ethanol	20 Gallons
3/7/2017	Alliant Energy	Letts	Land	non-PCB Oil	12 Gallons
11/10/2017	Kaylon Inc	Morning Sun	Land	Motor oil	5 Gallons
	One event, three products		Land	Antifreeze	1 Gallon
			Land	Diesel Fuel	5 Gallons
11/17/2017	Twinam Farms Ltd.	Crawfordsville	Land	Manure	7500 Gallons
11/20/2017	Tyson Fresh Meats Inc	Columbus Junction	Air	Chlorine	1 Pounds
2/14/2018	Road Ditch	Wapello	Land	non-PCB Oil	25 Gallons
4/18/2018	Road Surface	Conesville	Land	Manure	50 Gallons
4/29/2018	Row (not A Ditch)	Muscatine	Land	Transformer Oil (Non PCB)	5 Gallons
6/15/2018	Private Property (rp Not Owner)	Wapello	Land	trans-1,3-Dichloropropene	2 Gallons
8/5/2018	Row (not A Ditch)	Wapello	Land	Transformer Oil (Non PCB)	1 Gallons
8/12/2018	Rural	Columbus Junction	Air	Chlorine gas	150 Pounds
8/29/2018	Road Ditch	Wapello	Land	Diesel Fuel	100 Gallons
10/24/2018	Tyson Foods, Inc.	Columbus Junction	Air	Sulfur dioxide (SO2)	1 Pounds
11/25/2018	Tyson Foods Inc.	Columbus Junction	Air	Ammonia (anhydrous) - Industr	1 Pounds
12/29/2018	Tyson Foods	Columbus Junction	Air	Ammonia (NH3)	10 Pounds
4/6/2019	Surface Water	Columbus Junction	Surface Water	Manure	1 Gallon
11/12/2019	Farmers Elevator & Exchange	Wapello	Air	Ammonia (anhydrous) - Ag	1 unk
6/1/2020	Road Ditch	Conesville	Land	Transformer Oil (Non PCB)	3 Gallons
7/19/2020	Private Property (rp Not Owner)	Wapello	Land	Transformer Oil (Non PCB)	1 Gallons
12/15/2020	Rural	Columbus Junction	Air	Ammonia (anhydrous) - Indust	1 Pounds

5/24/2022	Road Ditch	Columbus Junction	Land	Hair Conditioner	1 Gallon
	One event, two products		Land	Fuel Oil	1 Gallon
4/12/2023	Kinder Morgan Energy Partners	Muscatine	Land	Compressor oil	32 Gallons
7/5/2023	Tyson Foods, Inc.	Columbus Junction	Air	Ammonia (anhydrous) - Indust	641 Pounds
8/16/2023	Road Ditch	Wapello	Land	Diesel Fuel	25 Gallons
9/5/2023	Road Ditch	Columbus Junction	Land	Motor oil	1 qt
7/17/2024	Eastern Iowa Light & Power Coop	Morning Sun	Land	non-PCB Oil	1 Gallons
10/16/2025	Catnip Ridge Manure Applicators		Surface Water	Manure	1000 Gallons

Pipeline incident

Louisa County. One pipeline incident was listed in the NPMS public database during the study period. No injuries or fatalities were reported.

REPORT NUMBER	YEAR	COMPANY NAME	DATE	COMMODITY RELEASED	CAUSE
20190035	2019	NATURAL GAS PIPELINE CO OF AMERICA (KMI)	1/25/2019	NATURAL GAS	NATURAL FORCE DAMAGE

Classification of Pipeline events.

A Serious Pipeline Event is defined by the Pipeline & Hazardous Materials Safety Administration (PHMSA) as those incidents that involve a fatality or injury requiring in-patient hospitalization. A Significant Pipeline Event is defined by the PHMSA as those incidents reported by pipeline operators when any of the following specifically defined consequences occur:

1. Fatality or injury requiring in-patient hospitalization
2. $50,000 or more in total costs, measured in 1984 dollars
3. Highly volatile liquid releases of 5 barrels or more or other liquid releases of 50 barrels or more
4. Liquid releases resulting in an unintentional fire or explosion (PHMSA, 2023)

PHMSA Pipeline Incidents: (2006-2025)
Incident Type: All Reported **System Type:** (All Column Values) **State:** IOWA **Cause:** (All Column Values)

Calendar Year	Number	Fatalities	Injuries	Total Cost As Reported
2006	8	0	0	$581,093
2007	5	0	0	$341,393
2008	14	0	0	$1,475,040
2009	10	0	0	$684,536
2010	12	0	3	$2,693,903
2011	12	0	0	$8,097,866
2012	14	0	2	$2,017,354
2013	14	0	0	$2,571,119
2014	8	0	0	$924,368
2015	4	0	1	$229,186
2016	6	0	0	$201,368
2017	5	0	0	$2,928,408
2018	4	0	0	$3,914,023
2019	8	0	0	$772,847
2020	9	0	0	$3,170,119
2021	11	0	0	$2,531,371
2022	8	0	0	$384,521
2023	3	0	0	$240,366
2024	3	0	0	$238,029
2025	6	0	0	$765,236
Grand Total	**164**	**0**	**6**	**$34,762,146**

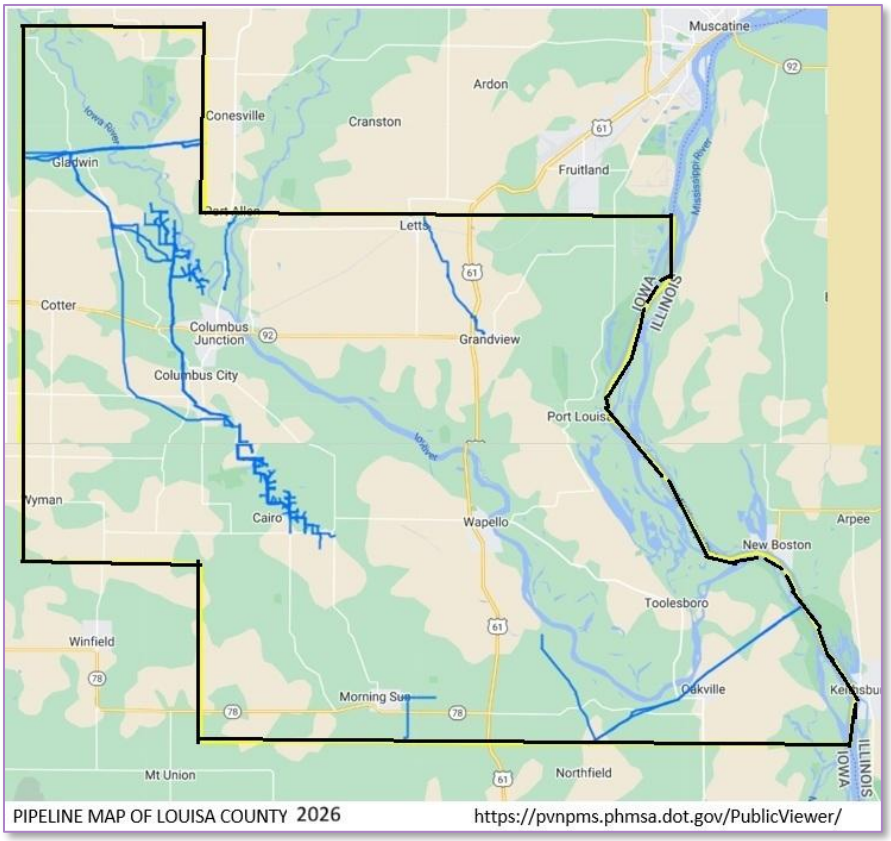
PHMSA Pipeline Incidents: Multi-Year Averages (2006-2025)
Incident Type: All Reported **System Type:** (All Column Values) **State:** IOWA **Cause:** (All Column Values)

Iowa. During the last 20 years, records indicate that six people were injured and none were killed in 164 pipeline incidents in Iowa. Of all events recorded, 80 were classified as Significant and one as Serious.

The events that occurred during the 10 year period from 2016 through 2025 and shown in the table above, represent only 38% of all incidents in the last two decades, an indication that safety has improved (PHMSA2, 2026).

Radiological incidents

"Since 1990, hundreds of shipments have been made through Iowa. There have been no occurrences of a radiological incident in Iowa. Transportation accidents are the most common type of incident involving radioactive materials because of the sheer number of radioactive shipments" (Iowa B, 2023).



This map was reproduced directly from the National Pipeline Mapping System (NPMS) Public Map Viewer

According to the NPMS there are about 146 miles of active gas transmission lines in the county.

Probability

During 28 incidents, 31 products were released. Probability for a hazardous materials incident in Louisa County is 28 events/10 years = > 100%, Very likely.

Climate trends

HazMat and weather: As temperatures rise, the length of tornado season may increase. Such an increase would statistically increase the risk that a tornado could impact a fixed chemical storage site or transportation vehicle. Evidence suggests that 'Tornado Alley' – an area most favorable to tornado formation – is moving east, but the greatest effect of this is in the South. The likelihood of a tornado in any given part of Iowa has not significantly shifted.

B2-a,b Vulnerability and Impact

Hazardous Materials Incidents: Affected Jurisdictions

X	Unincorporated Louisa County	X	Morning Sun
X	Columbus City	X	Oakville
X	Columbus Junction	X	Wapello
X	Cotter	X	Columbus Junction Community Schools
X	Fredonia	X	Louisa -Muscatine Schools
X	Grandview	X	Morning Sun Community Schools
X	Letts	X	Wapello Community Schools

Any jurisdiction can be impacted by a HazMat Incident. Locations affected during the study period 2016-2025 are: Rural Louisa County, Columbus Junction, Fredonia, Letts, Morning Sun and Wapello.

According to FEMA, there are six types of injury that humans experience as a result of a hazardous materials incident: Thermal Harm, Radiological Harm, Asphyxiation, Chemical Harm, Etiological (Biological) Harm, and Mechanical Harm. (Hazardous Materials, 2019). All of these threaten health and life, depending on the degree of exposure.

Hazardous materials incident response is provided from Muscatine County, and thus response times may in some cases be longer than might be ideal.

Transportation and HazMat. Hazardous materials incidents associated with highway or railroad transportation are a primary concern for Louisa County Emergency Management. The Dakota, Minnesota & Eastern Railroad (owned by Canadian Pacific Railway Ltd) passes through northern Louisa County. A derailment could lead to a HazMat Incident. Local emergency personnel are first on the scene of such incidents, while their authority is restricted under various regulatory agencies. Training for first responders is essential.

Pipelines. According to the USACE National Levee database, a potential regional consequence of failure of the Muscatine-Louisa Levee includes impact on oil and gas infrastructure which serves Chicago and Detroit. Rupture of these lines could result in a catastrophic release of hazardous material and interrupt service to those large cities.

Agricultural hazards. Farm chemicals are frequently transported on local roads and highways, often at slow speeds on narrow roads. Conflicts between vehicles on the road or driver error can result in spills of hazardous materials. Transportation accidents can result in chemical and manure spills from tanks and containers during transport contaminating the soil, air and water. Manure contains pathogens such as bacteria, viruses, and parasites that can infect humans or livestock, and enter groundwater.

Impacts of Climate trends. Increased or decreased tornado activity would impact the security of hazardous materials stored at fixed sites or the transportation of hazardous materials. An increase or decrease in winter storms would also have positive or negative impacts on risk. Additional precipitation intensity will likely result in higher levels of agricultural chemicals present in local streams and rivers.

Land use development. From FEMA regarding Land Use Policies and fixed chemical sites: “Proximity of these facilities to residential areas and businesses creates the potential for devastating impacts should a release or explosion occur. Jurisdictions should consider zoning and regulations to ensure that hazardous facilities are not located near residents, schools, and businesses and that future development is restricted within a certain distance of facilities that store hazardous materials” (HazMat, 2019) .

Population Patterns. An increase in population near HazMat storage sites or transportation routes would place more people at risk.

Human Epidemic or Pandemic

Epidemics are geographically localized, high occurrences of disease, while a Pandemic is an incidence of disease that is widely spread across a wide area including several countries.

Epidemic

The Centers for Disease Control and Prevention defines an epidemic as an unexpected increase in the number of disease cases in a specific geographical area. An epidemic disease doesn't have to be contagious. The term epidemic refers to a disease or health problem when cases are clearly above the expected occurrence in a community or region.

Pandemic

Pandemics are most often caused by viruses, such as influenza or Coronavirus Disease 2019 (COVID-19), which can easily spread from person to person. The World Health Organization declares a pandemic when disease growth is exponential.

From the CDC:

> Although pandemics occur infrequently, planning and preparing for a pandemic is important to ensure an effective response. Planning for and responding to a pandemic is complex and pandemics can affect everyone in a community. Therefore, public health officials, health care professionals, researchers and scientists in the United States and across the world are working together to plan and prepare for possible pandemics. Many resources are available to help international, national, state and local governments, public health and health care professionals, corporations, and communities develop pandemic preparedness plans and strengthen their capabilities to respond to different pandemic scenarios (CDC, 2023).

Location

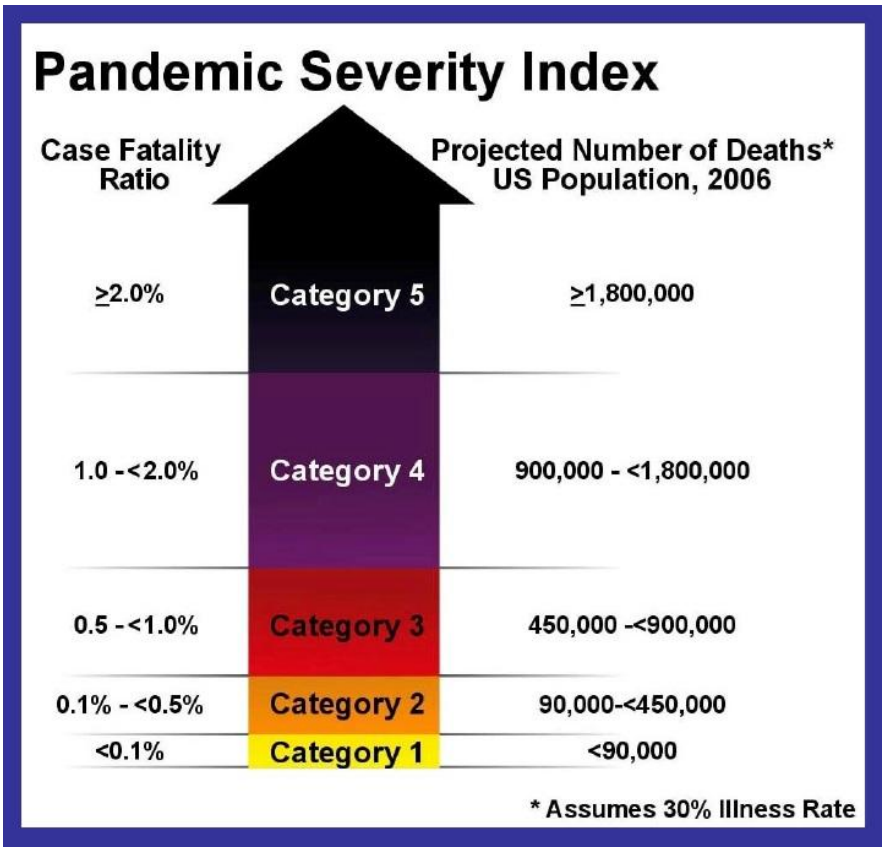
This is a county-wide Hazard.

Affected Jurisdictions. All Jurisdictions are at risk from a human epidemic or pandemic.

Extent

Public health programs guide community-based prevention planning, monitor current infectious disease trends, prevent transmission of infectious diseases, and provide early detection and treatment for infected persons. The Iowa Department of Public Health monitors diseases to identify patterns and provide information to the community on emerging medical concerns.

A Pandemic Severity Index chart from the Center for Disease Control shows fatality rates and projected deaths for each category. An example of the corresponding steps to take is given for each category (Reed, 2023).



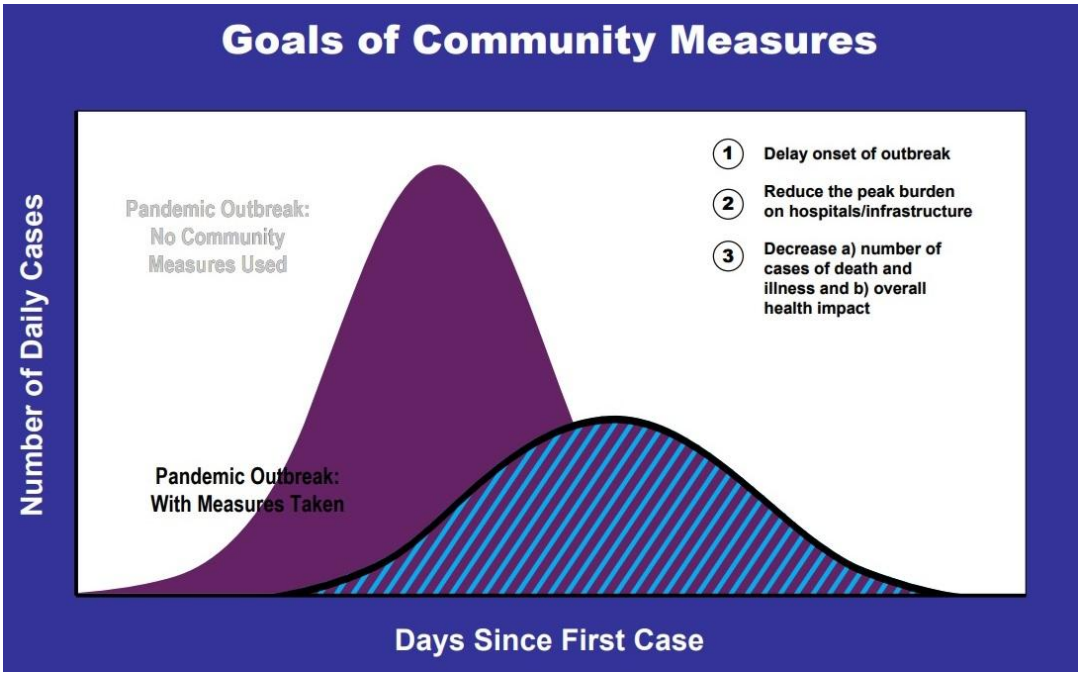
Community Strategies by Pandemic Flu Severity (1)

	Pandemic Severity Index		
Interventions by Setting	**1**	**2 and 3**	**4 and 5**
Home			
Voluntary isolation of ill at home (adults and children); combine with use of antiviral treatment as available and indicated	Recommend	Recommend	Recommend
Voluntary quarantine of household members in homes with ill persons (adults and children); consider combining with antiviral prophylaxis if effective, feasible, and quantities sufficient	Generally not recommended	Consider	Recommend
School			
Child social distancing –dismissal of students from schools and school-based activities, and closure of child care programs	Generally not recommended	Consider: ≤ 4 weeks	Recommend: ≤ 12 weeks
–reduce out-of-school contacts and community mixing	Generally not recommended	Consider: ≤ 4 weeks	Recommend: ≤ 12 weeks

Community Strategies by Pandemic Flu Severity (2)

Interventions by Setting	Pandemic Severity Index 1	2 and 3	4 and 5
Workplace/Community Adult social distancing			
–decrease number of social contacts (e.g., encourage teleconferences, alternatives to face-to-face meetings)	Generally not recommended	Consider	Recommend
–increase distance between persons (e.g., reduce density in public transit, workplace)	Generally not recommended	Consider	Recommend
–modify, postpone, or cancel selected public gatherings to promote social distance (e.g., stadium events, theater performances)	Generally not recommended	Consider	Recommend
–modify workplace schedules and practices (e.g., telework, staggered shifts)	Generally not recommended	Consider	Recommend

Community Measures. The purpose of community mitigation strategies in human disease transmission is to slow the spread of illness and reduce mortality. Unchecked outbreaks of disease result in additional injury or deaths when the healthcare system is overwhelmed with cases (CDC, 2023).



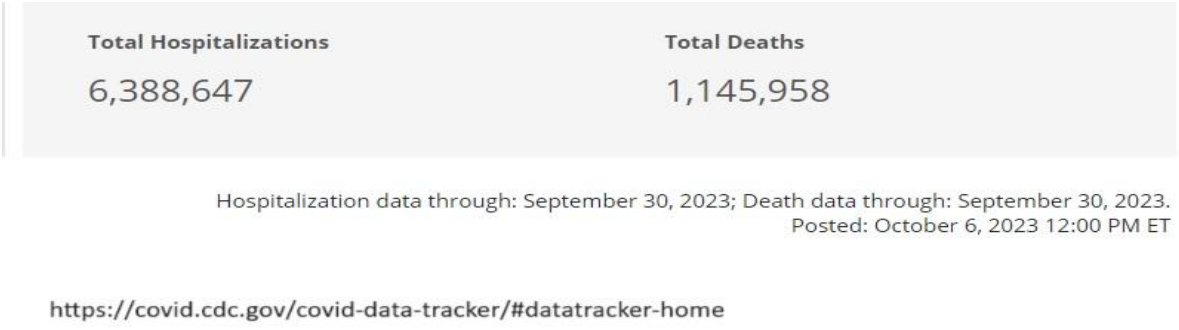
Previous Occurrences

Historical record. Many diseases throughout human history have been pandemic. In the 1918 Influenza pandemic which lasted about 2 years, about 28% of the US population of 105 million became infected, and 500,000 to 850,000 died (0.48 to 0.81 percent of the population). A Category 3 pandemic. As a result, in one calendar year average life expectancy dropped by 12 years. Influenza pandemics in 1957 and 1968 killed 70,000 and 34,000 people respectively worldwide.

COVID-19. There has been one significant pandemic in the study period 2016-2025. In the United States, more than six million people were hospitalized and 1.14 million people died from Covid-19 during the time from March of 2020 through September, 2023. More recent data is not currently available from the U.S. Center for Disease Control (CDC).

That level of mortality places the COVID-19 pandemic in Category 4 on the Severity Index.

In 2023, the CDC estimated that 77% of the US population over age 18 had been infected by Covid-19 since 2020. This does not mean that those people should not be vaccinated, because new variants continue to emerge, to which people are not immune.



Probability

There has been one event in ten years. 1/10 = 10%. The probability of a human epidemic or pandemic in Louisa County is Moderate chance in any given year.

Climate trends

Similar to animal and plant diseases, the observed and projected trend toward higher temperatures and humidity in Iowa is expected to increase the likelihood of epidemic diseases. More favorable conditions for survival and spread of many pests and pathogens (Iowa, 2023).

B2-a,b Vulnerability and Impacts

Human Epidemic or Pandemic: Affected Jurisdictions

X	Unincorporated Louisa County	X	Morning Sun
X	Columbus City	X	Oakville
X	Columbus Junction	X	Wapello
X	Cotter	X	Columbus Junction Community Schools
X	Fredonia,	X	Louisa -Muscatine Schools
X	Grandview	X	Morning Sun Community Schools
X	Letts	X	Wapello Community Schools

County and Cities

Louisa County is a rural community with no local hospital. Health care systems have a limited capacity to shelter or treat large numbers of very ill patients.

It takes some time for medical professionals to develop and distribute vaccinations against new diseases or new variants of known viruses, allowing disease to spread.

In rural communities, the scope and magnitude of a contagious disease can escalate quickly to overwhelm limited medical staff and supplies.

In the event of a virulent human pandemic, it is likely that many people would be exposed before the dangers are fully understood or any significant assistance could be provided by the State.

Disruption of business, social life and loss of jobs and tax revenue occur due to an epidemic or pandemic.

Misinformation, misunderstanding and mistrust can spread rapidly through modern social media, leaving the general population confused by conflicting information.

When the general public has a chaotic response to an epidemic or pandemic, there is a reduced effectiveness of efforts to contain or manage the situation, or to measure the results of various treatment methods.

Schools

Schools are a place where many vulnerable people are concentrated in a small space, facilitating disease transmission. Disruption of the school year and a switch to no-contact learning have serious and long term effects on education of young people, who may have long term difficulty overcoming these fundamental challenges.

Impacts of Climate trends. The effects of climate change will likely cause increases in the survival and spread of pests and pathogens.

Land use development. Land use development is unlikely to increase or decrease risk from this hazard in the near future.

Population patterns. Increased population density is not expected in the next few years, therefore population patterns are unlikely to increase or decrease risk from this hazard in the near future.

Terrorism

This hazard can include a wide variety of human caused threats including domestic or foreign enemy attack, biological terrorism, agro-terrorism, chemical terrorism, conventional terrorism, cyber terrorism, radiological terrorism, school violence and public disorder.

These include the use of unlawful force, violence, and/or threat against persons or property causing intentional harm for purposes of intimidation, coercion or ransom in violation of the criminal laws of the United States. These actions have the potential to cause massive destruction and/or extensive casualties.

Of these, public comments and national data indicate that terroristic threats in Louisa County are most likely to occur under the categories of enemy attack, agro terrorism, conventional terrorism, cyber terrorism, and violent attacks at schools.

Excerpts from the State of Iowa 2023 HMP:

Enemy attack is an incident that causes massive destruction and extensive casualties. An all-out war would affect the entire population. Some areas would experience direct weapons' effects of blast, heat, and nuclear radiation. Other areas could experience indirect weapons' effects, primarily radioactive fallout.

Agroterrorism. Causing intentional harm to an agricultural product or vandalism of an agricultural/animal related facility is classified as agroterrorism. Activities could include: intentional introduction of disease, animal rights activists who release animals; disgruntled employees who intentionally contaminate bulk milk tanks or poison animals; ecoterrorists who destroy crops/facilities; theft of agricultural products, machinery, or chemicals; or criminals who vandalize agricultural facilities. Depending upon the type of action taken, the implications will vary greatly.

Conventional terrorism. Use of conventional weapons and explosives against persons or property in violation of the criminal laws of the United States for purposes of intimidation, coercion, or ransom is conventional terrorism. Hazard effects are instantaneous; additional secondary devices may be used, lengthening the time duration of the hazard until the attack site is determined to be clear. The extent of damage is determined by the type and quantity of explosive. Effects are generally static other than cascading consequences, incremental structural failures, etc. Conventional terrorism can also include tactical assault or sniping from remote locations.

Iowa has not been immune to acts of terrorism or sabotage. The state has experienced many bomb threats . . . Recent national events have increased awareness pertaining to school safety, workplace safety, and vulnerability at public gatherings.

Cyber terrorism. Electronic attack using one computer system against another in order to intimidate people or disrupt other systems is a cyber attack.

. . . We are interested in the context of emergency management only in the type of terrorist attacks that cause disruption to other sectors, such as electrical or other utilities, or which attacks result in the deployment of rolling response equipment, such as police and fire vehicles. With that definition in mind, cyber terrorism may last from minutes to days depending upon the type of intrusion, disruption, or infection.

Other comments regarding Terroristic threat:

Enemy attack. War would affect residents of Louisa County. Critical facilities and critical infrastructure can be expected to be at some risk.

Agro terrorism. According to the Iowa Soybean Association:

> Considering recent agroterrorism events, U.S. Rep. Zach Nunn drafted the Preventing Lethal Agricultural and National Threats (PLANT) Act.
>
> The PLANT Act seeks to close a critical gap in the federal law that currently requires the U.S. government to prove intent to cause harm with biological agents to seek criminal prosecution. Presently, there is no statute that addresses the possession or importation of potentially dangerous agricultural pathogens without the required United States Department of Agriculture (USDA) permit.
>
> "The baseline of the PLANT Act is to make sure that if someone comes into the United States and knowingly attempts to bring something illegal and doesn't disclose it, we can hold them accountable at a federal level," Nunn says.
>
> The implementation of the PLANT Act would give agencies such as the USDA and the Department of Justice (DOJ) the ability to prosecute individuals and groups associated with the illegal possession or importation of pathogens. It provides another layer of protection for farmers, the U.S. food supply and national security against potential agroterrorism threats, Nunn says (Jordan, 2025).

Conventional terrorism. Critical facilities are potential targets of terrorist attack; however, due to the small size of Louisa County communities, there are fewer attractive targets than may be found in a place with higher population density, energy production facilities or government installations.

Mass shooting. There is no fixed definition of a mass shooting in the United States. Among the various definitions most use a minimum of 4 victims as a threshold, and exclude gang killings, domestic violence, or terrorist acts sponsored by an organization.

For the purposes of this hazard profile, we use that definition as articulated by the Gun Violence Archive (GVA): an act of public firearm violence in which a shooter kills or injures at least four victims, not including the shooter. According to the GVA, there were at least 407 mass shootings in the United States in 2025, leaving at least 359 people dead and 1838 injured.

> A dangerous pace of mass shootings escalated in 2020 during the Covid-19 pandemic and has persisted since then. Last year, the United States recorded 502 mass shootings, the lowest total in a year since 2019, before the pandemic began. 2021 remains the worst year for mass shootings in the US since GVA began tracking them in 2013, with 689 across 44 states and Washington, DC (Boschma, 2025).

Schools. Mass public shootings increasingly occur at schools, shopping malls, or other public places where people gather. An active shooter can inflict a substantial number of injuries and deaths in a short period of time. Following the tragedy at Columbine High School in 1999, incidents of gun violence perpetrated at schools have become increasingly common. All schools are now considered to be at risk for this category of terrorism.

Cyber terrorism. Inadequate security can facilitate access to critical computer systems, allowing them to be used to conduct attacks. Cybersecurity and critical infrastructure protection are among the most important national security issues facing our country today, and they will only become more challenging in the years to come (Iowa, 2023).

Location

General population, Critical Facilities, Schools.

Extent

The statistics below are from the Gun Violence Archive in 2026. They illustrate the rise in mass shootings that occurred during the COVID-19 pandemic. In 2025 Mass Shootings came down to pre COVID levels.

YEAR	2016	2017	2018	2019	2020	2021	2022	2023	2024	2025
# OF MASS SHOOTINGS	383	347	335	414	611	689	644	659	503	407

(GVA, 2026)

Previous occurrences

While the threat is real and ever present, there have been no incidents of terrorism to date in Louisa County.

Probability

Zero events in 10 years gives us a probability of less than 10%; “Unlikely.”

Climate trends

Climate trends are not expected to have an impact on this hazard.

B2-a,b Vulnerability and Impacts

Terrorism: Affected Jurisdictions

X	Unincorporated Louisa County	X	Morning Sun
X	Columbus City	X	Oakville
X	Columbus Junction	X	Wapello
X	Cotter	X	Columbus Junction Community Schools
X	Fredonia	X	Louisa -Muscatine Schools
X	Grandview	X	Morning Sun Community Schools
X	Letts	X	Wapello Community Schools

Because of the unpredictable nature of a terrorist attack, it is reasonable to assume that Louisa County is susceptible, but it is difficult to predict the severity and magnitude of an attack.

As a rural county there may be fewer potential targets for terrorist attack. Agro terrorism is a possible threat. The county does have critical infrastructure which supports life and health, and failure of these could cause significant damage and potential loss of life.

Other critical facilities such as schools, government offices, shopping centers, churches, and community events could also be targets of terrorism. Terrorists threaten people and facilities through "bomb threats" and other scare tactics. Precautions must then be taken to ensure the safety of the people and property involved, raising social tension and expending valuable resources.

The county has limited experience, equipment and training beyond the hazardous materials response team to handle extreme events, and the county’s geographic location in rural Iowa could result in delays of State teams arriving from the Des Moines or Cedar Rapids areas.

Rural sites would likely be at greater risk due to longer law enforcement response times. The Louisa County Sheriff's Department is the law enforcement agency for smaller communities, in addition to the rest of the county, which would likely result in longer response times than if an incident were to occur in Columbus Junction or Wapello.

Impacts of Climate trends. The effects of climate change are unlikely to cause increases in the local incidence of terrorism in the near future.

Land use development. Land use development is unlikely to increase or decrease risk from this hazard in the near future.

Population patterns. Increased population density is not expected in the next few years, and population patterns are unlikely to increase or decrease risk from this hazard in the near future.

Section C: Mitigation Strategy

C1. Municipal Capability Assessment

The ability of a community to respond and recover from disasters is a function of the capabilities and resources available. Each incorporated municipality has the authority to impose regulations on land development, manage floodplains, and may be a provider of critical utilities or functions such as water, sewer, gas or electric services and waste collection. In addition to reliance on the skills and abilities of staff, services may be acquired by contract for special skills such as grant writing or engineering.

Emergency Response Services

Louisa County Emergency Management is responsible for the development, implementation, and management of county-wide disaster prevention, preparedness, response, recovery and mitigation. A number of support agencies exist to respond to any of the hazards that could occur within the county. These agencies include Iowa State Patrol, the Louisa County Sheriff's Office, Louisa County Ambulance, one police department, and six public or volunteer fire departments. The Muscatine Fire Department operates a specialized hazardous materials (HAZMAT) response team that serves the City of Muscatine, Muscatine County, Louisa, Washington, Keokuk, and Henry counties.

Law Enforcement

The Louisa County Sheriff is the principal peace officer for the county. The Sheriff's Office serves as the primary law enforcement for unincorporated Louisa County. The City of Columbus Junction has a police department. The Louisa County Law Enforcement Center near Wapello houses the Louisa County Sheriff's Office, and the Louisa County Emergency Management office.

Ambulance & Hospital

The City of Columbus Junction owns Louisa County Ambulance which provides services to the residents of Louisa County. Louisa County does not have a general hospital within its immediate borders. For emergency care, major surgeries, and comprehensive medical services, residents rely on hospitals in adjacent counties. Washington County Hospital and Clinics (WCHC), Southeast Iowa Regional Medical Center in West Burlington and UnityPoint Health in Muscatine provide acute care.

Fire Departments

Six fire departments are based in Louisa County:

Louisa County Fire Departments
Columbus Junction Fire Department
Grandview Township Fire Department
Letts Volunteer Fire Department
Morning Sun Volunteer Fire Department
Oakville Fire & Rescue
Wapello Fire & Rescue

Each of the fire departments has mutual aid agreements with neighboring departments to assist in response efforts within their respective cities as well as those rural and unincorporated areas of the county. Several other fire departments respond to portions of Louisa County, though their operation centers are located in surrounding counties.

Building codes

Building codes in Iowa are mandatory statewide. However, local Iowa jurisdictions with a population of more than fifteen thousand, have the authority to adopt the prevailing state codes or adopt codes that are stricter, depending on the needs and preferences of the local community. If a small community does not adopt a building code or issue permits, State Codes still apply.

Current Iowa Building Codes 2026
Commercial Building Code: 2024 International Building Code (IBC).
Residential Code: 2024 International Residential Code (IRC).
Existing Buildings: 2024 International Existing Building Code (IEBC).
Fire Safety Code: 2024 International Fire Code (IFC).
Mechanical Code: 2021 International Mechanical Code (IMC).
Plumbing Code: 2021 Uniform Plumbing Code (UPC).
Energy Conservation Code: 2012 International Energy Conservation Code (IECC).
Electrical Code: 2023 National Electrical Code (NEC). Note: Per Iowa House File 2800 (enforced June 2, 2026), the state completely eliminated prior local amendments and reverted strictly to the baseline 2023 NEC standard.

Capability Table

The tables below provide a summary of the administrative and technical capabilities currently in place in each participating jurisdiction. A mark (X) indicates that the jurisdiction was reported to have the authority to implement the specified tool and that the tool is currently in use.

For additional information about communities, see Section G, Community Profiles.

C1-a Existing Institutions, Plans, and Ordinances

An X indicates the resource is available and in use. For more information on Louisa County towns, see detailed community profiles in Section G.

Jurisdiction	Columbus City	Columbus Junction	Cotter	Fredonia	Grandview	Letts	Morning Sun	Oakville	Wapello
Existing Institutions, Plans, and Ordinances									
Has your community adopted a Building Code?	X	X	State codes apply	State codes apply	State codes apply	State codes apply	X	State codes apply	2026
Building permits	X	X		No	X		X	X	X
Zoning Ordinance		X					X	X, minimal	X
Subdivision Ordinance									X
Site Plan Review									X
Historic Preservation Ordin									
Critical Facilities Inventory		X	X	X	X	X	X	X	X
Comprehensive Plan	X	X					X		X
Capital Improvement Plan									
Economic Developmnt Plan									2026
Emergency Operations Plan	Fire dept	X	Fire dept	Fire dept	X	X	Fire dept	X	X
Post-Disaster Recovery Plan		X			X				X
Financial Capabilities									
Capital Improvements Project Funding	X	X		Limited	X	X, limited resources	Limited	Limited	X
Authority to levy taxes for specific purposes		X	X	X	X	X	X	X	X
Water, Sewer, Gas, or Electric service Fees	Columbus Jct handles water & sewer	W,S	Private septic	W,S	W,S	W,S	W,S,G	W,S	W,S,G,E Trash
Fees for new development									

Incur debt through bonds or private activities	X	X	X	X	X	X	X	X	X
CDBG Grants	X	X	X	X	X	X	X	X	X
Other federal funding	X	X	X	X	X	X	X	X	X
Other state funding	X	X	X	X	X	X	X	X	X
Administrative and Technical Capability									
Public Works Official	X	X			X	Part time	X	X	X
Sanitation		Contract				Sewer is certified	Contract		X
Grant writers	Local, contract				Local & SEIRPC	Clerk & SEIRPC	SEIRPC, Local	X	Local & SERPC
Staff Planner						Clerk & SEIRPC			SEIRPC
Engineer						Contract by project	Contract		Contract
Personnel GIS or HAZUS		SEIRPC			SEIRPC	Louisa County	SEIRPC		SEIRPC
Emergency Manager	Mayor	County	County	County	County	Mayor, FD, Louisa Co	Mayor	County	County, FD

C1-b Jurisdictions Can Build Upon Capabilities

Small communities of fewer than 800 people have little to no ability to expand capabilities or revenue. The larger communities of Columbus Junction and Wapello have limited ability to expand capabilities due to relatively low population and revenue.

All jurisdictions can benefit from additional staff education in hazard vulnerability. Other educational and outreach capability could be improved with increased citizen involvement and ongoing public information programs.

Strategies that can be applied to improve capability include adoption of new regulations, evaluation of existing regulations, the development, update and adoption of local plans, such as Comprehensive Plans, Economic Development plans and Capital Improvement Plans that include the mitigation strategies recommended in this 2026 Louisa County Hazard Mitigation Plan for each locality. Participation in community programs such as StormReady and increased public private partnerships are other ways to build capability.

2020 Population

Columbus City	392
Columbus Junction	1,830
Cotter	39
Fredonia	222
Grandview	437
Letts	363
Morning Sun	752
Oakville	200
Wapello	2,084
uscensus 2020	

Review of recommended mitigation strategies during the annual budget process will improve implementation. An Action Plan Summary Table for each community is included in Section G to provide an easy reference for that purpose.

The following ideas were offered by various individuals during the development of the HMP:

Public comments: Ideas to Improve Capability	**Jurisdiction**
Additional training and resources for staff, fire departments and the public	All Jurisdictions
Stormwater management	All Jurisdictions: apply improved stormwater management whenever the opportunity arises
Planning	
Update or adopt a Comprehensive Plan	All Cities, for long term guidelines
Capital Improvement Plan	Map infrastructure and plan for long term fiscal needs
Financial Capabilities	
Plan for Local grant-matching funds	All cities: set aside funds annually to provide match $$
Federal and State funding programs	Establish an annual round of applications for grants
Physical capabilities	
Sirens, warning systems	Letts & Morning Sun need improved sirens
Shelters and safe room improvements	Evaluate needs of each jurisdiction and prioritize
Improve resilience	Inspect critical facilities for vulnerabilities & correct

C2. A Participation in NFIP

Louisa County has Special Flood Hazard Areas. Flood Insurance Rate Maps (FIRMs) show properties affected by floods that have at least a 1% chance of occurring in any given year. Generally, these areas are adjacent to larger streams such as the Cedar River, the Iowa River and the Mississippi River. Most of these floodplains are on agricultural or conservation land, but a few residential and commercial structures are in the flood hazard area. See digital maps in Section B1, Flood, above.

The Cities of Cotter, Grandview and are communities with no special flood hazard areas (SFHA) identified. While these cities are not required to adopt floodplain ordinances or issue permits, participation in the NFIP would be a benefit to local property owners who wish to purchase flood insurance for their property. Oakville is protected by a levee. Columbus City and Oakville do choose to participate in the NFIP, even though they have no identified SFHA.

Participating communities.

Community	Date of adoption of FP Ordinance	Effective date FIRM	Has ordinance, requires permit	Has FP Manager
LOUISA COUNTY	7/30/2015 Updated 2025	10/16/2015	Yes	Yes, Zoning & FP Admin
COLUMBUS CITY	2/18/1981	4/7/2021	Yes	Yes, City Planner
COLUMBUS JUNCTION	Updated 2026	7/18/2011	Yes	Yes, City Clerk
FREDONIA	10/13/2025	7/18/2011	Yes	Yes, City Clerk
LETTS	1/01/2026	10/16/2015	Yes	Yes, Mayor & City Clerk
OAKVILLE	Updated 2020	10/16/2015	Yes	Yes, City Clerk
WAPELLO	Updated 2025	7/18/2011	Yes	Yes, City Clerk

Implement substantial improvement or substantial damage provisions of the NFIP:

When structures in the Special Flood Hazard Area (SFHA) are damaged, National Flood Insurance Program (NFIP) participating communities have a responsibility to assess impacts before repairs can be made, no matter the cause of damage. If the cost to repair is 50% or more of the market value, the structure is considered Substantially Damaged and must be brought into compliance with current local floodplain management standards (NFIP, 2026).

Participating communities follow the method below to administer the Substantial Improvement and Substantial Damage regulations of the NFIP:

1. Determine Market value. The property tax assessment is used to determine the value of the structure before the damage or planned improvements. Adjustment to value may be made if there is evidence that the market value of the property would be significantly more or less than the assessed value.
2. Determine cost to repair or cost of improvements. Cost of work includes materials, labor, demolition, disposal, utility expenses, site prep, interior or exterior finishes and cost of elevation if applicable.
3. Substantial improvement. If the cost of repair or improvements equals or exceeds 51% of the pre-damage value, it is “substantial” and must comply with current regulations.

Nonparticipating cities. One local community that is in the NFIP mapped floodplain does not participate in the NFIP. Morning Sun has been sanctioned by FEMA for non-participation.

Morning Sun has chosen to not participate in the NFIP because the community does not have experience with flood problems in the designated special flood hazard area (SFHA). The city will consider NFIP participation and whether the benefits outweigh the costs for the community.

Community	Current Map effective date	Entered NFIP date	Sanction date
Morning Sun	7/18/2011	-NA	1/17/1976

What happens if a community does not participate in the NFIP?

Sanctions for Non-participation. A community that does not join the National Flood Insurance Program (NFIP), has withdrawn from the program, or is suspended from it faces the following sanctions:

- ✓ Flood insurance will not be available. Property owners will not be able to purchase a flood insurance policy
- ✓ If the community withdraws or is suspended, existing flood insurance policies will not be renewed
- ✓ No Federal grants or loans for the acquisition or construction of buildings may be made in identified flood hazard areas under programs administered by Federal agencies such as HUD, EPA, and SBA
- ✓ No Federal disaster assistance may be provided to repair insurable buildings located in identified flood hazard areas for damage caused by a flood
- ✓ No Federal mortgage insurance or loan guarantees may be provided in identified flood hazard areas. This includes policies written by FHA, VA, and others
- ✓ Federally insured or regulated lending institutions, such as banks and credit unions, must notify applicants seeking loans for insurable buildings in flood hazard areas that:
    - There is a flood hazard, and
    - The property is not eligible for Federal disaster relief

These sanctions can be severe on any community with a substantial number of buildings in the floodplain. Most communities with a flood problem have joined the NFIP and are in full compliance with their regulatory obligations (FEMA, 2025).

C1. School district Capability Assessment

For much of the year, schools are responsible for nearly every child in a community and employ many people. Schools, therefore, have a special interest in ensuring public safety from hazardous events. Other educational opportunities offered to a community can make pre-disaster planning and post-disaster management more effective.

Louisa County School Districts have limited revenue due to the fact that Louisa County has a low density population and therefore, a modest tax base.

C1-a School Districts Capability

The four public school districts in Louisa County share similar capabilities for implementation of hazard mitigation activities. An X indicates the resource is available and in use.

For more detailed information about school districts, see Section G Community Profiles.

Schools

Administrative Capability	Columbus Community	Louisa-Muscatine	Morning Sun CSD	Wapello CSD
Sufficient administrative staff	X	X	X	X

Designated emergency manager	X	X	X	X
Emergency Management Plan (EOP)	X	X	X	X
Post disaster recovery plan	X	X	X	X
PTO/PTA/Booster Club	X	X	X	X
Financial Capabilities				
Funding for Capital Improvements or Match	X	X	X	X
Authority to levy taxes	X	X	X	X
Incur debt or Bonds	X	X	X	X
Federal funding programs	X	X	X	X
State funding	X	X	X	X
Public/Private partnerships, Corp donations	X	X	X	X
Other questions				
Has your District had positive response to Bond issues in the past?	Yes	No	No Bonds attempted	No Bonds attempted
Is your District growing or declining in population?	Stable	Slight decline	Slight decline	Slight decline

Other School Capabilities

- School superintendents typically have the primary responsibility for grant writing but also use outside services.
- Districts are partially funded through the statewide penny sales tax, which can be applied to hazard mitigation activities
- Districts are eligible to acquire funding through FEMA's Hazard Mitigation Assistance (HMA) grant program

C1-b Schools Can Build Upon Capabilities

Due to small district populations and corresponding revenue, Louisa County school districts have a limited ability to build upon existing capabilities.

Capability can be improved through improvements in funding for storm shelters and safe rooms at school, increased emphasis on hazard awareness and education, public support for bond issues, the development and adoption of long term Capital Improvement Plans that include mitigation, public-private partnerships, implementation of Hazard Mitigation strategies, and post-disaster hazard analysis.

One newer program several communities have been able to benefit from is called a Community Oriented Policing Services (COPS) Grant. A COPS grant is a federal funding award from the U.S. Department of Justice's COPS Office to support law enforcement activities, such as hiring officers, purchasing equipment, or enhancing community policing initiatives. Iowa law enforcement agencies can apply for these grants to increase their capacity and effectiveness in their local communities.

Below are listed some suggestions from public surveys and general public comments that were received for leveraging increased capabilities for schools.

Ways to improve school capabilities
Improved access to funding for hazard mitigation and shelter spaces
More funding for Emergency response & SROs

Plan for grant-matching funds
Broadband availability for all staff & students throughout the community
Internet backup and cyber security
Ongoing hazard education and awareness for staff, students and the public

C3.a Mitigation Goals

The purpose of mitigation is to protect life and reduce property damage. Mitigation is defined as any sustained action taken to reduce or eliminate long-term risk to life and property from a hazard event. Those concepts were found by the HMPC to be appropriate for Louisa County.

Hazard Mitigation Goals	
Goal 1	Protect the health, safety and quality of life of citizens
Goal 2	Reduce or eliminate property loss, economic cost, and damage to the natural environment caused by a disaster
Goal 3	Ensure government operations, response, and recovery are not significantly disrupted by disaster events
Goal 4	Expand public awareness and support intergovernmental cooperation, coordination and communication to build a more resilient community

Development of Action Steps

Mitigation can protect critical community facilities, reduce exposure to liability, and minimize disruption of community services. Examples of mitigation actions include land use planning, adoption of building codes, acquisition and demolition of structures in hazard-prone areas or ensuring that appropriate shelters are available. Mitigation actions should be cost-effective and environmentally sound.

C4. Analysis of a comprehensive range of actions/projects

There are five mitigation action types:

- Structure/Infrastructure Projects: Modify or remove infrastructure to mitigate hazard
- Local Plans & Regulations: Using authorities, policies, codes to influence development
- Natural System Protection: Minimize damage by preserving natural system functions
- Education and Awareness Programs: Inform citizens on how to mitigate hazards
- 5% Projects: Actions not quantifiable by a Benefit Cost Analysis (sirens, generators, etc.)

Each jurisdiction considered options to reduce the impacts of hazards identified in the risk assessment including: take no action at this time or take an action in one of the five mitigation action categories.

C4-a. Mitigation Alternatives Considered

The Planning Committee evaluated mitigation alternatives. Actions recommended in this update include those that jurisdictions chose to keep or modify from the previous plan, new actions based on community needs and public comments, and suggestions selected or adapted from the State HMPs of Iowa, Missouri, Kansas and Oklahoma. Mitigation alternatives from adjacent counties were reviewed for consideration. Strategies suggested in the 2013 publication *FEMA Mitigation Ideas* provided useful guidance.

Committee members discussed the mitigation needs of their respective communities and strategies that could be implemented in a five year time frame. A scoring system was used to prioritize potential actions

that were then recommended to the Board of Supervisors, City Councils and School Boards, who have the final authority over which actions to adopt.

C4-b. Compliance

For each of the hazards identified within the plan's risk assessment, at least one mitigation action is recommended for each affected jurisdiction. A scoring table in Appendix I tracks compliance with this requirement. See also Community Profiles in Section G.

The Planning Committee chose to recommend some actions that may be considered "Preparedness." While those actions do enhance safety in the community, they may not qualify for Mitigation funding. Action types are noted in the full Action Tables in Section C5-b.

C5 Action Plan Method

Section C5-a, below, outlines the method applied to prioritize each adopted action item, while section C5-b displays a comprehensive action table that indicates how each activity meets FEMA requirements for hazard mitigation planning.

C5-a Prioritizing Mitigation Actions

The planning team agreed to use the scoring methodology described below to assist in prioritizing mitigation strategies. Costs and benefits were subjectively evaluated. The STAPLEE Method as shown in the table below was applied to each proposed action to help quantify benefits.

Local preference was given to the actions that mitigate hazards to new and existing buildings and infrastructure. Special consideration was also given to mitigation strategies that reduce hazards of greatest concern to the public. Surveys indicated that the top 3 concerns of the public are Stormwater management, Hazardous Materials Incidents and School safety. Land slide and Dam Failure were uniformly the hazards of least concern.

Cost and Benefit	
1 point	Benefit expected to be equal to OR greater than cost
2 points	AND ensure continuity of government
3 points	AND mitigate multiple hazards
4 points	AND the action benefits underserved communities or socially vulnerable populations
5 points	Benefit expected to be significantly greater than cost OR the action is expected to prevent deaths or injuries
STAPLEE = 1 point for each category, up to 7	
Social	Community acceptance, are the effects equitable across the population
Technical	Technical feasibility, long term solution, neutral or positive secondary impacts
Administrative	Staffing, funding is available, manageable maintenance & operations
Political	Political support, local leadership support, public support
Legal	Jurisdictional authority to execute the action
Economic	Benefits outweigh costs, contribution to economic goals
Environmental	Effects on land, water, species, are consistent with sound environmental goals
Local emphasis = 1 point each, up to 2	
1 point	Mitigates impacts on people from HazMat Incidents, Terrorism (school) or Storms
1 point	Mitigates hazards to buildings and infrastructure

Finally, each action was ranked in priority compared to the other mitigation actions by score.

Total score = Priority (14 possible points):	
10 or more	High priority
6-9 points	Medium priority
5 points or fewer	Low priority (Desirable if funding is available)

C5-b Implementation and Funding

Each proposed activity is given a targeted implementation timeline in the table, based on a five-year plan. Jurisdictions will review potential mitigation opportunities during the annual budget process.

Any activity may be pursued at any time depending on the needs of the community or as funds become available. The variety of actions recommended provides each jurisdiction with opportunities to improve safety at all levels of financial ability.

Funding for Mitigation

For a comprehensive list of funding opportunities in the State of Iowa: The reader is referred to the excellent list of funding resources found in the 2023 Marion County Iowa Hazard Mitigation Plan at https://www.jeo.com/marioncounty-hmp published by JEO Consulting, under Marion County Hazard Mitigation Plan - Upfront and County Profile pages 231-256 Funding Guidebook. The programs listed below are samples of potential funding sources for mitigation activities.

Mitigation Assistance Programs

Community Assistance Program – State Support Services Element
Cooperating Technical Partners Program
FEMA HMA For prefabricated residential safe room
Hazard Mitigation Grant Program (HMGP) project grant
Hazard Mitigation Grant Program Post Fire
Safeguarding Tomorrow Revolving Loan Fund Program
Flood Mitigation Assistance (FMA), FMA RL, FMA SRL
FMA – Socially Vulnerable Communities
Safeguarding Tomorrow Revolving Loan Fund Program
Pre-Disaster Mitigation Grant Program (PDM)
Public Assistance Grant Program (PA)
Rehabilitation of High Hazard Potential Dam Grant Program (HHPD)
Fire Management Assistance Grant Program (FMAG)

Funding for Community Safe Rooms

HSEMD coordinates applications for federal hazard mitigation & shelter grants for Iowa schools.
U.S. Department of Housing and Urban Development (HUD)
Community Development Block Grant (CDBG)
Federal Housing Administration (FHA) mortgage insured financing

For more information about safe room funding and initiatives, visit http://www.fema.gov/safe-rooms/public-and-community-safe-rooms

Mitigation Action Plan Tables

Structure & Infrastructure	
Action 1	**Purchase and install backup generators for critical facilities and shelters**
Action type	Mitigation
Action description	Purchase generators to ensure continued operation of critical facilities in the event of a power outage
Hazards addressed	Severe storms, Tornado, Winter weather
Affected Jurisdictions	Louisa County, Cities, Schools
Responsible party	Louisa County, City officials, School Administration
Goals	1,3
Score & Priority	10: High
Implementation timeline	1-60 months, ongoing until complete
Cost	Depends on capabilities
Potential funding sources	HMGP 5% Project
Action 2	**Facilitate the funding, installation and improvement of public and private storm shelters and safe rooms**
Action type	Mitigation
Action description	Improve community storm shelters, apply for FEMA & HSEM storm shelter assistance and School Safety Improvement Fund. County: Provide staff to assist with grant applications to assist homeowners who wish to construct a safe room. County & Cities: Facilitate development and funding of shelters and saferooms facilities for mobile home parks and campgrounds.
Hazards addressed	Severe storms (Hail, High wind, Lightning), Tornado, Winter weather, Terrorism
Jurisdiction affected	Louisa County, Cities of Columbus City, Columbus Junction, Grandview, Letts, Morning Sun, Wapello, Schools
Responsible party	Louisa County EM, County Conservation, City Administrators, Superintendents of Schools
Goals	1,3
Score & Priority	13: High
Implementation timeline	12-60 months
Cost	$5,000 to $100,000, Staff time; grant matching funds up to 25% of total project cost
Potential funding sources	HUD, CDBG, FHA, HMGP, Community Budget, Bonds, FEMA
Action 3	**Construct retention ponds. Iowa River basin in the vicinity of Letts & Short Creek Watershed Columbus Junction**
Action type	Mitigation
Action description	Louisa County and landowners cooperate to construct retention ponds to reduce flooding in the City of Letts and Columbus Junction

Hazards addressed	Flood
Jurisdiction affected	Unincorporated Louisa County, Letts,
Responsible party	Louisa County, Letts, Columbus Junction, IDNR, local landowners
Goals	2,4
Score & Priority	7: Medium
Implementation timeline	12-60 months
Cost	$5,000 to $100,000, Staff time; grant matching funds up to 25% of total project cost
Potential funding sources	HUD, CDBG, FHA, HMGP, Community Budget, Bonds, FEMA
Action 4	**Construct retention basins and apply stormwater management strategies to reduce flooding in and near the County Fairgrounds**
Action type	Mitigation
Action description	Install stormwater drainage structures and apply other strategies to manage stormwater near the fairgrounds
Hazards addressed	Flood, Levee Failure
Jurisdiction affected	Unincorporated Louisa County, Columbus Junction
Responsible party	Louisa County EM, County Conservation
Goals	2,4
Score & Priority	7: Medium
Implementation timeline	12-60 months
Cost	$5,000 to $100,000, Staff time; grant matching funds up to 25% of total project cost
Potential funding sources	HMGP, CDBG, Community Budget, Bonds, FEMA
Action 5	**Flood-proof Infrastructure & critical facilities**
Action type	Mitigation
Action description	Inspect and apply floodproofing to vulnerable infrastructure such as roads, bridges, utility lines, water & sewer treatment facilities. Techniques may include dry floodproofing (floodwalls, elevation of mechanical systems, or sealing walls), or wet flood-proofing which allows flow
Hazards addressed	Flood, Dam/Levee Failure, Landslide
Jurisdiction affected	Louisa County, Columbus Junction, Fredonia, Letts, Morning Sun, Oakville, Wapello
Responsible party	Louisa County, City Administrators, Superintendents
Goals	1,2,3
Score & Priority	9: Medium
Implementation timeline	12-60 months
Cost	$5,000 to $100,000, Staff time; grant matching funds up to 25% of total
Potential funding sources	HUD, CDBG, FHA, HMGP, Community Budget, Bonds, FEMA

Action 6	**Improve safety where railroads intersect with cities, roads & trails**
Action type	Mitigation
Action description	Improve safety at crossings. Ensure the railroad operators are aware that trains can block emergency vehicle access to parts of Letts
Hazards addressed	Hazardous Materials, Transportation incident
Jurisdiction affected	Louisa County, City of Letts
Responsible party	Des Moines County Emergency Management Coordinator, Fire Chiefs
Goals	1,2,4
Score & Priority	11: High
Implementation timeline	60 months
Cost	Lights/Gates: $150,000-$300,000
Potential funding sources	HUD, CDBG, FHA, HMGP, Community Budget, Bonds, FEMA
Plans & Regulations	
Action 7	**Ensure water supply networks have sufficient reserve capacity or develop alternative supply options**
Action type	Mitigation
Action description	Develop agreements for secondary water sources that may be used during drought conditions or contract with a regional water provider
Hazards addressed	Drought
Jurisdiction affected	Louisa County, Cities of Columbus City, Columbus Junction, Grandview, Letts, Morning Sun, Oakville, Wapello
Responsible party	Public works officials, City Councils
Goals	1,2
Score & Priority	6: Medium
Implementation timeline	60 months
Cost	Staff time
Potential funding sources	Current budget
Action 8	**Encourage utility companies to increase the percentage of cables that are underground**
Action type	Mitigation
Action description	Adopt a policy that requires underground lines when possible
Hazards addressed	Severe storms (Hail, High wind, Lightning), Tornado, Winter weather
Affected Jurisdictions	Louisa County, Cities of Columbus City, Columbus Junction, Grandview, Letts, Morning Sun, Wapello, Schools
Responsible party	Building permit officials
Goals	1,2,3
Score & Priority	6: Medium
Implementation timeline	12 months, ongoing
Cost	Staff time
Potential funding sources	Part of construction costs for new or substantially improved structures

Action 9	**Develop and implement a Continuity of Government plan**
Action type	Mitigation
Action description	Develop and adopt a plan to facilitate continuity of government during hazard events
Hazards addressed	Severe storms (Hail, High wind, Lightning), Tornado, Winter weather, Human pandemic
Jurisdiction affected	Louisa County, All Cities
Responsible party	Louisa County Supervisors, City Administration
Goals	1,3
Score & Priority	9: Medium
Implementation timeline	12-60 months
Cost	Staff time, Contractor up to $20,000
Potential funding sources	Annual budget
Action 10	**Join the National Flood Insurance Program (NFIP) and ensure compliance**
Action type	Mitigation
Action description	Prevent development in flood hazard areas
Hazards addressed	SFHA Flood
Affected Jurisdictions	Morning Sun
Responsible party	Louisa County EM, City Administrators
Goals	2,4
Score & Priority	5: Low
Implementation timeline	12 - 24 months
Cost	$500, Staff time
Potential funding sources	Current budget
Action 11	**Enact and enforce ordinances to minimize the risks associated with vacant and/or derelict structures**
Action type	Mitigation
Action description	Ensure that dilapidated properties are not creating increased risk in the community from loose materials, debris that can be carried aloft, and structures that harbor vermin
Hazards addressed	Hail, High wind, Lightning, Tornado, ACP Disease
Jurisdiction affected	Louisa County, Cities of Columbus City, Columbus Junction, Grandview, Letts, Morning Sun, Wapello
Responsible party	Supervisors, Administrators, Code enforcement
Goals	2
Score & Priority	11: High
Implementation timeline	12 Months, Ongoing
Cost	$2000 / year
Potential funding sources	Local Budget, staff time

Action 12	**Establish an annual round of applications to State agencies to improve access to grant funding. Implement those eligible projects**
Action type	Mitigation
Action description	All jurisdictions work together to develop and implement a strategy to track funding opportunities and apply for hazard mitigation grants on an annual basis. Implement all projects derived from such funding, to replace aging or inadequate infrastructure. Include levee improvements, any eligible mitigation projects, Safe Routes to Schools and Transportation Alternative Program to reduce hazard impacts.
Hazards addressed	Drought, Flood (River, Flash, Stormwater), Severe storms, Tornado, Wildfire Winter Weather, Dam or Levee Failure, Landslide, Animal/Plant/Crop Disease, Hazardous Materials Incident, Human Disease, Terrorism
Jurisdiction affected	Louisa County, All Cities, Schools
Responsible party	Louisa County EM, County Conservation, Supervisors, City Administration, SEIRPC, School Administrators
Goal	1,2,3,4
Score & Priority	12: High
Implementation timeline	12-24 months
Cost	SEIRPC support, Staff time, improved communication with HSEM
Potential funding sources	General fund
Action 13	**Updated Floodplain Mapping and Studies**
Action type	Mitigation
Description	All of the participating jurisdictions expressed concern that flooding occurs outside of the delineated floodplain on a regular basis. While some communities believed that areas that should be in the SFHA were not included, others noted that areas had been added to the SFHA that did not flood during the 500-year event in 2008. The jurisdictions would like to see another map update and flood study using more accurate terrain data.
Hazards addressed	Flood, Dam/Levee Failure
Affected Jurisdictions	Louisa County, Columbus Junction, Fredonia, Letts, Morning Sun, Oakville, Wapello
Responsible party	Local Governments with FEMA, Iowa DNR, USACE
Goals	2
Score & Priority	8: Medium
Implementation timeline	60 months
Cost	Unknown
Potential funding sources	Local government or FEMA

Action 14	**Maintain Adequate Emergency Response Personnel**
Action type	Mitigation and Preparedness
Description	Timely and accurate response to hazard situations can prevent situations from worsening. Additional personnel or additional training opportunities for response personnel would accomplish this action step. Training opportunities could include on-site workshops, off-site training at various federal institutes, tabletops or drills.
Hazards addressed	HazMat Incident, Wildfire
Affected Jurisdictions	Louisa County, All Cities, Schools
Responsible party	Louisa County, all emergency response entities
Goals	1,4
Score & Priority	9: Medium
Implementation timeline	12-60 months
Cost	Low for additional training, high for additional personnel
Potential funding sources	Local funds, HSEMD training courses, SAFER (Staffing for Adequate Fire and Emergency Response) Grants (offered through FEMA). Assistance to Firefighters Grants
Action 15	**Track occurrence and extent of Wildfires**
Action type	Correct data deficiency
Description	Develop a separate tracking mechanism to document Wildfires. Include location, number of acres burned, cause if known, other pertinent data
Hazards addressed	Wildfires
Affected Jurisdictions	Louisa County, Columbus City, Columbus Junction, Fredonia, Letts, Morning Sun, Oakville, Wapello
Responsible party	Louisa County EM, Fire Depts
Goals	2
Score & Priority	4: Low
Implementation timeline	Ongoing
Cost	0
Potential funding sources	Current budget
Natural Systems	
Action 16	**Acquire, elevate or relocate any structures that remain in the SFHA**
Action type	Mitigation
Action description	Identify any structures that remain in SFHA flood areas, acquire and demolish when the opportunity arises. As an alternative, buildings that are structurally viable may be elevated or relocated out of the floodplain to prevent future flood damages.
Hazards addressed	Flood, Dam/Levee Failure

Jurisdiction affected	Louisa County, Columbus Junction, Fredonia, Letts, Morning Sun, Oakville, Wapello
Responsible party	Louisa County Supervisors, City Councils
Goals	2
Score & Priority	9: Medium
Implementation timeline	Ongoing
Cost	Variable, depending on each structure $8000 to $100,000
Potential funding sources	FEMA, local funding
Action 17	**Implement best practices for stormwater management**
Action type	Mitigation
Action description	Monitor and correct stormwater surface flow problems in affected areas. Implement Best Practices and FEMA's Nature-based solutions.
Hazards addressed	Stormwater Flood, Landslide
Jurisdiction affected	Louisa County, All Cities, Schools
Responsible party	Louisa County Supervisors, City Public Works
Goals	2
Score & Priority	6: Medium
Implementation timeline	12-36 months
Cost	Variable depending on project
Potential funding sources	HMA, Building maintenance budget
Action 18	**Tree maintenance and post storm clean up**
Action type	Mitigation
Description	Maintenance of trees and post storm clean up mitigates the potential for future damage to power lines and prevents debris available for wildfires and can decrease the spread of tree disease carried by insects or blight.
Hazards addressed	High wind, Tornado, Wildfire, Winter storm, ACP Disease
Affected Jurisdictions	Louisa County, Cities
Responsible party	Public Works Officials
Goals	2
Score & Priority	7: Medium
Implementation timeline	12-24 months
Cost	$5-10,000 / year
Potential funding sources	Louisa County & City maintenance budgets

5% Projects	(a FEMA funding category)
Action 19	**Provide, maintain & upgrade communications systems**
Action type	Mitigation
Action description	Continue to upgrade and modernize communication equipment. Ensure students & staff have broadband access at home
Hazards addressed	Flood, Hail, Severe storms (High wind, Lightning), Tornado, Wildfire, Winter weather, Human epidemic, HazMat, Terrorism
Jurisdiction affected	Louisa County, Cities, Schools
Responsible party	Emergency Managers, City Administration, School Superintendents
Goals	1,2,3,4
Score & Priority	10: High
Implementation timeline	Ongoing
Cost	Varies by needs
Potential funding sources	5% Grants, Local budget, FEMA HSGP grants, State SHSP grants
Action 20	**Maintain Public Health Preparedness and Disease Surveillance**
Action type	Mitigation and Preparedness
Description	Improve public health response capabilities through increased supplies, training, drills, equipment and facilities
Hazards addressed	ACP Disease, Human Disease Epidemic/Pandemic
Affected Jurisdictions	Louisa County, Cities, Schools
Responsible party	Louisa County (Public Health)
Goals	1,3
Score & Priority	8: Medium
Implementation timeline	Ongoing
Cost	Variable depending on the situation
Potential funding sources	Public health funds, FEMA, HHS, CDC
Action 21	**Update current law enforcement and first responder equipment**
Action type	Preparedness
Action description	Acquire additional materials and equipment for local HazMat Response. Continue to equip & train local authorities to improve response capability
Hazards addressed	HazMat incident, Terrorism
Jurisdiction affected	Louisa County, All Cities, Schools
Responsible party	Louisa County EM, Fire Chiefs, Law enforcement, School Administration
Goals	1
Score & Priority	10: High
Implementation timeline	1-60 months, ongoing
Cost	10% to 25% of total project costs
Potential funding sources	HMPG 5% projects, Local budgets, HSEM, FEMA HSGP, EPA

Action 22	**School Terrorism prevention and response**
Action type	Mitigation and Preparedness
Description	Improve school emergency response capabilities through modification of facilities, increased supplies, training, drills and equipment
Hazards addressed	Terrorism
Affected Jurisdictions	All Schools
Responsible party	School administration, Law enforcement officers
Goals	1,4
Score & Priority	11: High
Implementation timeline	Ongoing
Cost	Variable, depending on project
Potential funding sources	STOP & COPS School violence prevention, FEMA TVPT, US Dept of Education
Education & Awareness	
Action 23	**Continue practice drills and train firefighters, responders, and community leaders on effective disaster response**
Action Type	Preparedness
Action description	Perform Tabletop exercises, attend training on disaster response
Hazards addressed	Severe storm (Hail, High wind, Lightning), Tornado, Wildfire, Winter weather, Dam/Levee Failure, Human disease, HazMat, Terrorism
Jurisdiction affected	Louisa County, Cities
Responsible party	Louisa County EM, Fire Depts
Goals	1,4
Score & Priority	9: Medium
Implementation timeline	Annually
Cost	$1,000 per year
Potential funding sources	Staff time, Local training budget
Action 24	**Ensure critical services and information is protected from cyber-attacks; educate local officials about cyber security**
Action type	Mitigation
Action description	Stay current with best practices in Cyber security by closely working with State agencies and updating equipment
Hazards addressed	Terrorism
Jurisdiction affected	Louisa County, All Cities, Schools
Responsible party	IT Managers, Administrators
Goals	1,3,4
Score & Priority	6: Medium
Implementation timeline	Ongoing
Cost	Possible training and travel costs $5,000, updated equipment Variable costs
Potential funding sources	Annual budget, FEMA HSGP, Iowa Cyber Resilience Initiative

Action 25	**Conduct hazard education and awareness programs**
Action type	A mix of Mitigation & Preparedness
Action description	Community outreach & emergency training for the general public and special needs populations Educate the public on a variety of Hazard topics. See list below
Hazards addressed	Flood, Severe storm, Tornado, Wildfire, Winter weather, Dam Levee failure, HazMat incident, Human disease epidemic, Terrorism
Jurisdiction affected	Louisa County, Cities, Schools
Responsible party	Louisa County EM, City Administrators, School Administrators, Fire Departments
Goals	1
Score & Priority	8: Medium
Implementation timeline	12-60 months
Cost	$1000 to $3000
Potential funding sources	Printing, Staff. Current operating budgets
Hazard	**Educational recommendations:**
Severe storms (Hail, High wind, Lightning), Tornado, Winter weather, HazMat Incident	Distribute public information on how to develop a family emergency plan and a disaster preparedness kit
Tornado, Wildfire, Winter weather, HazMat incident	Distribute public information regarding evacuation strategies and reunification after a disaster
Flood SFHA, Flash	Educate the public regarding a) Location of special flood hazard areas; b) Precautions due to flood waters; c) Best practices for water retention and infiltration
Flood Stormwater	Inform the public about best practices for stormwater management
Hail, High wind, Lightning, Tornado, Winter weather	a) Proper response to the sirens; b) Tornado safe room locations; c) Accessing watch and warning information; d) Weather advisories and warnings by the National Weather Service
Wildfire	Reduce the occurrence of wildfires by providing fire safety education for adults and children throughout the Louisa County
Winter weather	Educate the Public regarding a) information on precautions to take in the event of severe Winter weathers; b) dangerous routes and road closings
Winter weather	Educate the public on shelter locations and the potential dangers of alternative heat sources
HazMat Incident	Provide education about the safe storage and handling of hazardous materials and how to respond in the event of a hazardous materials spill.
Human Epidemic	Educate public regarding existing diseases and best practices for prevention and care; a) management of communicable diseases and outbreaks; b) immunization clinics and locations
Terrorism	Continue to conduct drills and provide safety education to students and school personnel, according to state guidelines

Section D: Plan Maintenance

Making the Plan Work

The Hazard Mitigation Plan is a guide for policy and decision-making regarding mitigation actions within Louisa County. The Plan considers community background information, local trends and projections, current and future mitigation measures. The goals and objectives have been developed to reflect the consensus of the Hazard Mitigation Planning Committee (HMPC), the City Councils, the Board of Supervisors, and the citizens of Louisa County.

Hazard Mitigation Planning Committee:

The Hazard Mitigation Planning Committee members will be responsible for promoting and encouraging the implementation of the Hazard Mitigation Plan. The Committee will also serve as a resource to city councils and public agencies involved in Hazard Mitigation measures.

Committee members will monitor the plan, review the mitigation goals and action plan, and speak with city leaders to discuss any change in risks posed by hazards and mitigation strategies that have been initiated or completed.

D1-a Continuing Public participation

The success of this Plan will require the support of the residents and staff from each of the participating communities. All jurisdictions will keep the public informed by announcing and approving projects and activities at City Council meetings as implementation of a specific action is initiated. For structure and infrastructure projects, a press release may be issued to inform the public and request comments. As the process for the next update begins, a new round of public participation will be implemented.

D2-a Track the progress

Progress made on mitigation activities will be documented by the participating jurisdictions. Each community will evaluate current resources being allocated to implement the plan, discuss the outcomes that have occurred from plan implementation, address any implementation problems that have occurred, and provide project reports to Louisa County Emergency Management when projects are completed or on an annual basis. The Emergency Manager will provide a list of completed projects on Worksheet 1 for the Hazard Mitigation Planning Committee annually.

The worksheets provided for that purpose are reproduced in Appendix F, *Worksheet 1 Progress Report,* and *Worksheet 2, Project Report.* The person responsible for project management will submit the worksheets to the Louisa County Emergency Manager upon completion of each project.

D2-b. Evaluate the plan for effectiveness

The Hazard Mitigation Planning Committee (HMPC) will monitor plan implementation, facilitate public input, and report to the governing bodies of each participating jurisdiction and the Louisa County Emergency Management Commission (JCEMC) on an annual basis. Worksheets 1 & 2 in Appendix F will be used to evaluate completed projects.

Once the review forms are completed, they will be presented to the Louisa County Emergency Management Commission, the Louisa County Board of Supervisors, the City Councils and Mayors and to the public for comment and attached to the Hazard Mitigation Plan as an addendum.

D2-c Process to update the plan

This update represents a five year plan. Progress reports will be attached to the plan on an annual basis and shall be considered an addendum to the current plan in place. Updates will occur prior to plan expiration, to reflect changes to mitigation needs or progress made in the county.

As the five year cycle progresses, the PC will follow the guidelines below. The Louisa County Emergency manager and HMPC members will report progress at local public meetings at intervals throughout the update process to keep citizens informed.

Proposed schedule for future updates	**Time**
Planning Committee meets to review Projects and Risks: Worksheets 2 and 3	Annually
Apply for Planning funds from the state. Notice of Intent	2 years prior to plan expiration
Evaluate Planning team: Worksheet 2	14 months prior to Plan expiration
Receive funding award or authorize cost. Planner in place	1 year prior to Plan expiration
Begin Plan update, review and update Introduction and planning process chapters	1 year prior to Plan expiration
Complete the Capability assessment for each jurisdiction	11 months prior to plan expiration
Data collection and Hazard profiles	10 months prior to plan expiration
Vulnerability and Impacts for each jurisdiction	9 months prior to plan expiration
Evaluate previous mitigation action plan with each jurisdiction	8 months prior to plan expiration
Initiate public survey for risk assessment	8 months prior to plan expiration
Record and organize all public and jurisdiction comments	7 months prior to plan expiration
Draft new mitigation strategies and action tables	6 months prior to plan expiration
HMPC reviews all data, comments and drafts	5 months prior to plan expiration
HMPC reviews new action plan	4 months prior to plan expiration
Staff drafts, HMPC reviews maintenance section for update	3 months prior to plan expiration
HMPC approves final draft, County adopts to send to state	60 days prior to plan expiration
Final draft complete, submit to Iowa HSEMD	60 days prior to plan expiration
Receive FEMA approval	30 days prior to plan expiration
All jurisdictions adopt	Prior to previous plan expiration

D3 Integrating the Plan:

In Louisa County, planning needs and capabilities of participating jurisdictions vary and hazard mitigation will be integrated by appropriate means.

The cities of Columbus City, Columbus Junction, Morning Sun and Wapello maintain Comprehensive Plans and Economic Development Plans. All these will incorporate Hazard Mitigation Goals and Strategies when the plans are updated.

The Cities of Columbus City, Cotter, Fredonia, Grandview, Letts and Oakville do not have other long term plans; however, when they choose to implement mitigation strategies, these are facilitated by resolution of the City Council.

The following steps describe ways in which this plan will be integrated into other planning mechanisms.

1. As part of the annual review and evaluation process, the Hazard Mitigation Planning Committee will meet and discuss opportunities to integrate this HMP into other planning mechanisms. Participating jurisdictions will be represented on this committee, including schools.
2. The annual assessment helps keep this Plan relevant as projects are completed, new needs become apparent and will be documented on the review and evaluation form Worksheet 1 in Appendix F.
3. Southeast Iowa Regional Planning Commission (SEIRPC) and other regional planners provide planning services to Louisa County communities that lack staffing and resources to produce local plans. Louisa County communities will proactively seek out opportunities for integrating hazard mitigation, as plans are updated. One such plan is the Comprehensive Economic Development Strategies (CEDS) plan.
4. All participating jurisdictions will review adopted mitigation measures during annual budgeting and dedicate funding as appropriate. The review and budgeting will be done as part of the City Council or School Board budgeting process.
5. Participating jurisdictions will review and consider ways to integrate this Mitigation Plan into Comprehensive Plans when those plans are being created or updated. Similarly, adopted hazard mitigation projects will be integrated into Capital Improvement Plans and other local plans as appropriate.
6. Integration of this Plan into other planning mechanisms will adhere to the public input process required for those planning mechanisms.

Section E: Plan Update

E1-a Changes that increase or decrease vulnerability

Increased vulnerability. One change that has occurred is an increase in rail freight passing through the county as a result of the merger of two railroad companies. This is perceived as additional risk under the category of Hazardous Materials Incident.

Increased volume of floodwater and more frequent occurrence of flood have negatively impacted the City of Letts. In previous decades, flooding would occur when rainfall exceeded 2 inches per hour while in recent years, streets often flood when rainfall exceeds one inch per hour. This may be a result of increased tiling in adjacent cropland which increases the volume of floodwater directed into Indian Creek. As a small community, fiscal resources to mitigate this hazard are quite limited.

Ongoing incidents of Terrorism at schools nationwide have increased concerns about school safety.

Climate trends do have the potential to increase vulnerability to some hazards as detailed in Section B, Hazard Profiles.

Decreased vulnerability and Progress in Mitigation efforts. Louisa County and cities have taken action to implement strategies recommended in the 2020 HMP to decrease vulnerability as noted in Sec E2-b.

Development. Louisa County has a new subdivision near Morning Sun. This is a new cluster of residential lots that is not expected to significantly alter the vulnerability to hazards. No other new developments or reductions in service have occurred that increased vulnerability.

E2. Changes in jurisdictional priorities

E2-a How the plan was revised due to changes in community priorities

Progress was made on Action items from the previous plan, but most were carried forward as ongoing activities or modified to reflect fresh strategies. Local officials expressed increased concerns about the potential for flood issues and increased HazMat risk.

Flooding frequency and intensity has risen due to increased agricultural tiling in the Iowa and Cedar River basins. This additional flooding may impact the quality of water downstream of municipal wastewater treatment, for which those cities are financially responsible.

Hazardous Materials Incidents. The perceived risk of Hazardous Materials incidents seems more likely since there is a significant increase in rail freight moving through the county. Therefore, additional equipment and training for first responders was given greater emphasis.

Animal, Crop & Plant Disease. Impacts of climate trends on the ecosystem raise new concerns about agricultural vulnerability, wildlife species range and an increase in pests and pathogens.

Public surveys: Respondents say they believe the hazard needs of the community are well met considering funding limitations. There is concern about the increased risk of HazMat incidents from additional rail freight moving through the county. The City of Letts needs relief from increased floodwater and the impact of flood borne pollutants on the municipal wastewater treatment system. Some residents believe that high cancer rates in Iowa may be tied to long term water quality. Increased incidents of Drought may drive additional wildfire risk. School safety was given more emphasis due to public concerns about Terrorism and quality of school storm shelters.

Conservation. Best practices have evolved faster than funding opportunities. Recreational areas would benefit from additional funding to implement fresh land management strategies and improve storm shelter capability at campgrounds.

E2-b Status update for mitigation actions identified in the previous mitigation plan

Progress was made on each of the actions recommended in the 2020 HMP. The planning committee chose to carry forward all 20 proposed mitigation actions from the previous plan with some updates and editing. The recommendations were scored and integrated into the new proposed Action Items (Sec C5-b) and reorganized into the five mitigation action categories.

Mitigation Actions from Previous Plan

Recommended Actions 2020 Louisa County HMP		**Status**
Action 1	Acquisition of Flood-prone Structures	Progress, Keep
Action 2	Backup Generators	Progress, Keep
Action 3	Bury or Harden Power Lines	Progress, Keep
Action 4	Community Outreach	Progress, Keep
Action 6	Elevation of Flood-prone Structures	Progress, Keep
Action 7	Emergency Operations Plans	Progress, Keep
Action 8	Floodplain Management	Progress, Keep
Action 9	Flood-proofing Infrastructure	Progress, Keep
Action 10	Hazardous Materials Response	Progress, Keep
Action 11	Relocation of Flood-prone Structures	Progress, Keep
Action 12	Maintaining Adequate Emergency Response Personnel	Progress, Keep
Action 13	Safe Rooms (Tornado)	Progress, Keep
Action 14	Interoperability of Communications Systems	Progress, Keep
Action 15	Updated Floodplain Mapping and Studies	Progress, Keep
Action 17	Property Maintenance/Rehabilitation	Progress, Keep
Action 18	Improved Fire Response Capabilities	Progress, Keep
Action 19	Maintain Public Health Preparedness & Disease Surveillance	Progress, Keep
Action 20	School Terrorism Preparedness	Progress, Keep

E2-c. How jurisdictions have integrated the mitigation plan

Louisa County communities have not updated Comprehensive Plans or adopted new plans since the previous HMP, therefore information from the previous plan has not been integrated into other planning mechanisms. The fact that progress was made on mitigation does indicate that communities have made use of the HMP in annual fiscal planning.

Section F: Plan adoption

All participating jurisdictions will adopt a FEMA approved plan. Resolutions for formal adoption will be placed in Appendix H.

Section G: Community profiles

Community Profiles contain information specific to jurisdictions participating in the Louisa County planning effort. Community Profiles were developed with the intention of highlighting each jurisdiction's unique characteristics that affect its risk to hazards.

There is a discrepancy between two US Census products, in some cases greater than the margin of error. The 2020 Decennial population is the official number, while the 2022 American Community Survey (ACS) is a 5-year estimate. We are using the official count here because it seems most consistent with local observations and previous census data. All other Census statistics below are from ACS 2024.

Racial profiles

Louisa County is composed of a population where about 82% of people selected a racial category of "White." In the entire county, only about 0.5% people selected Native American and fewer than 1% of people say they are black or African American. Other race and mixed race are about 15% of responses. People are more frequently choosing "some other race" than in previous decades. Some of these seem to overlap with Hispanic ethnicity (USCENS RACE, 2026).

Louisa County, Iowa	**2020 Decennial Census**	
Total Population	10,837	Percentage
White	8,834	82%
Black or African American	78	0.7%
American Indian/Alaska Native	54	0.5%
Asian	270	3%
Some Other Race	836	8%
Population of two or more races:	765	7%
Ethnicity		
Hispanic	1,754	16%

The most diverse populations are in the cities of Columbus City, Columbus Junction, Cotter and Fredonia. Among the other small towns, 81 to 92% of the population identified themselves as "White."

Demographics	**Columbus City**	**Columbus Junction**	**Cotter**	**Fredonia**
White	52%	50%	74%	56%
Asian	2%	10%	0%	15%
Some other race	25%	23%	8%	20%
Mixed race	20%	14%	18%	6%
Ethnicity				
Hispanic	54%	43%	32%	61%

Risk Assessment Summary, County

See also Vulnerabilities and Impacts under each Hazard Profile in Section B

Jurisdiction	Louisa County
Drought	No direct effect on county operations, does affect Ag, and Fire Departments. Ag industry economic impact affects tax base
Flooding – River, Flash, Stormwater	SFHA areas, Mississippi River, Iowa & Cedar Rivers can flood. Flash floods do occur. Stormwater drainage issues at Fairgrounds and other areas
Hail, High winds, Lightning	Tree damage, critical facilities may be vulnerable to lightning
Tornado	Potential for tornado damage anywhere
Wildfire	Small grass fires, especially springtime, no big fires
Winter weather	Ice, snow, high winds, financial impact of overtime for labor, Public safety
Animal, Crop, Plant Disease	County Conservation, livestock, disease in row crops may be increasing, changing climate w spread of pests and pathogens
Dam or Levee Failure	There are several Levee protected areas, Mississippi river. Potential risk of levee damage in non-accredited levees
Hazardous Materials Incident	Fixed chemical storage sites, CP/DME Rail, Highways, Farms
Human Disease Pandemic	Public health, vulnerable population
Terrorism	Limited Cyber-attack potential for critical facilities
Recent Hazard events	Flood, Winter weather, High wind
Do Power outages happen often?	No
Are there storm shelters for campers?	No campground shelters
Changes in development in the last 5 years: Water sewer extensions or land annexations	No
New housing, new industrial	One new residential addition near Morning Sun

Louisa County Public Health:	Concerns
Drought	Crops and income, food supply, in general and individual
Flooding	Access in and out for emergency response, stressed system when services are needed community wide, coordination of evacuation, disease spread
Severe storms	Power outages, Clean drinking water. Clean up help
Tornado	Shelter - are vulnerable people notified and safe. Clean up help, do a study on shelter locations and needs
Winter weather	Access in and out for emergencies. Isolation for many elderly. Supplies, medication, heat
Dam or Levee Failure	Tetanus vaccines were needed in 2008 flood

Animal, Crop, Plant Disease	Animal disease, bird flu, Zoonotic h1n1, Mosquito collection, West nile. Ticks, Lyme, Alpha gal syndrome. Need animal bites reports
HazMat Incident	Potential risk to health. Evacuation for individuals or families
Human Disease Pandemic	Awareness, slow the spread, safety education. Changes in medical care
Terrorism Cyber security, critical facilities	Potential exposure of private Home health records. Clean drinking water may be disrupted

Mitigation actions taken – County

The following general comments were made about mitigation actions taken in the last 5 years.

Mitigation taken – County	
In the last few years, has the county made any changes to reduce impacts of hazards and improve safety?	Yes. Made progress on all the Actions recommended in the 2020 HMP. See Sec E2-b
Have they updated building codes or building permits?	Yes, in accordance with State code updates
Have they adopted a new floodplain ordinance or regulations?	No, but these are updated as needed by SEIRPC
Have they updated any other local planning documents in the last 5 years?	Yes, SEIRPC assists with this
Did the jurisdiction use information from the previous mitigation plan in other planning mechanisms like Ordinances, Permits, Comprehensive Plans or Emergency Plans?	Yes, SEIRPC assists with this

County priorities for mitigation

Concerns most often mentioned	**Mitigation action priorities**
Community priorities: If funding were available, what would be the best things to do to improve safety in your community?	Flood and stormwater management improvements Ongoing improvements for Emergency response and school safety Rail safety & HazMat

Mitigation needed:

Most of the actions recommended in this plan apply to the Unincorporated County. There is at least one mitigation recommendation for each hazard of concern. Actions for preparedness and data deficiency are not included here.

See full Action Plan Tables: Section C5-b and Summary table in the final pages of this document.

One Mitigation Action for each Hazard per affected jurisdiction

County	**Action steps**
Drought	7,12
Flood (River, Flash, Stormwater)	3,4,5,13,16,17,19,25
Severe storms (Hail, High wind, Lightning)	1,2,8,9,11,12,18,19,25
Tornado	1,2,8,9,11,12,19,25
Wildfire	12,14,18,19,25
Winter Weather	1,2,8,9,12,18,19,25

Dam or Levee Failure	3,4,5,12,13,16,17,25
Landslide	5,12,17
Animal/Plant/Crop Disease	11,12,18,20
Hazardous Materials Incident	6,12,14,19,25
Human Disease Epidemic or Pandemic	9,12,19,20,25
Terrorism (incl cyber security & school violence)	12,19,22,24,25

Columbus City

Columbus City is located two miles southwest of Columbus Junction and the Iowa River. According to the US Census Bureau, the city has a total area of 0.24 square miles.

Columbus City			
2020 Population	392	Workforce	
Median Age	46.8	Population age 16 and over	265
65 Years and Over	21%	in Labor Force	68%
Households		Commute to Work	24 Mins
Median Household Income	$89,875	Employed population	170
Percent Poverty	6%	Manufacturing	47
Zero-vehicle households	14	Education, health care, social	45
Housing		Construction	22
Total Housing Units	135	Wholesale trade	16
Occupied Housing Units	133	Retail trade	14
Vacant Housing Units	2	Agri, forestry, fishing, hunting, mining	10
Mobile Homes	34	Transport, warehousing, utilities	4
Median home value	$111,600	Professional, scientific, management	4
Year built		Other services	4
Since 2000	36%	Public administration	3
1970-1999	31%	Arts, entertainment, recreation, accommodation, food services	1
1940-1969	19%		
Before 1940	32%		

Special considerations:

Columbus City may have special vulnerability in the following categories:

- ✓ 34 households live in mobile homes (about 78 people) for whom no storm shelter is readily available
- ✓ Of those over age 65, half are also disabled
- ✓ 23% of the population has Limited English Proficiency (speaks English less than “very well”

Notes:

No current problems with flooding or stormwater. The community reports that most needs are well met. Another generator is needed to back up water and sewer system connections to Columbus Junction. Wildlife in town does present challenges, especially an increasing population of stray and feral cats.

Risk Assessment Summary

	Columbus City	Comments or Concerns
X	Tornado	Mobile homes need a shelter plan
X	Wildfire	Some potential
X	Winter weather	Sufficient capacity
X	Animal, Crop, Plant Disease	City does not own any trees. Wildlife in town: deer, raccoons, possums, feral cats, snakes.
X	Hazardous Materials Incident	Tankers on county roads from S & E. Semis, Farm chemicals & manure on Farm to Market roads. Toxic smoke from local recycling
X	Human Disease Pandemic	COVID. All affected, but needs were met
X	Terrorism	Minimal computer system. No infrastructure vulnerability

For each hazard that affects cities, at least one Mitigation action is recommended.
See table on page 184. and in Appendix I. Full Action Tables are in Section C5-b.

Community priorities for Mitigation:

- ✓ Improved tornado shelter plan for mobile home residents
- ✓ Water & Sewer system pumping if there were a power outage
- ✓ Funding for infrastructure improvements and grant matching
- ✓ Funding for Wildlife Animal control
- ✓ Ongoing HazMat training & readiness

Columbus Junction

Columbus Junction is located between the cities of Columbus City and Fredonia. It lies on the west bank at the confluence of the Cedar and Iowa Rivers. Fredonia is on the east bank. According to the US Census Bureau, the city has 762 houses on a total land area of 2.19 square miles.

Columbus Junction			
2020 Population	1,830	Workforce	
Median Age	33	Population 16 years and over	1572
65 Years and Over	17%	In labor force	62%
Households		Commute to work	29
Median Household Income	$63,828	Employed population	
Percent Poverty	10%	Manufacturing	362
Zero-vehicle households	32	Education, health care, social	179
Housing		Construction	73
Total Housing Units	762	Professional, scientific, management	60
Occupied Housing Units	699	Arts, entertain, rec, accommodation, food	49
Vacant Housing Units	63	Retail trade	47
Mobile Homes	42	Agri, forestry, fishing, hunting, mining	43
Median home value	$125,800	Transport, warehousing, utilities	31
Year built		Finance, insurance, real estate	31
Since 2000	10%	Wholesale trade	21
1970-1999	36%	Information	18
1940-1969	34%	Other services	17
Before 1940	20%	Public administration	6

Special considerations:

Columbus Junction may have special vulnerability in the following categories:

- ✓ There are 42 mobile homes, housing about 97 people in the community for whom no storm shelter is readily available
- ✓ 503 people in town have Limited English Proficiency (LEP)
- ✓ 32 Households (74 people) have no transportation at home
- ✓ Columbus Junction has 2 water wells that are within 50 yards of the RR

Notes:

Flooding is the most frequent challenge, exacerbated by the risk of HazMat spills near the river and water supply wells. Columbus Junction is at the confluence of the Iowa and Cedar Rivers. The Iowa River has upstream water control structures, the Cedar does not. Short Creek flows into the city.

Increasing HazMat concerns. Hwy 92 runs E/W through town and connects major highways 218 & 61. Hwy 92 crosses the Iowa/Cedar Rivers. RR runs through town and rail traffic has doubled to 20 trains a day. Farm chemicals and manure are transported on local roads as well

Risk Assessment Summary

	Columbus Junction	Comments
X	Drought	Water utility, quality & quantity
X	Flooding – River, Flash, Stormwater	SFHA, Stormwater. On a major river system.
X	Severe storms	Lightning power surges at wells, equip at WW TX plant
X	Tornado	Damage to WW lagoons. Tree debris can block access routes for emergency response
X	Wildfire	Fires in river bottom, rugged terrain to access South side; North side is worse near the river
X	Winter weather	Personal safety. Snow removal labor, salt costs
X	Animal, Crop, Plant Disease	Tree disease. Deer, wild & feral animals in neighborhoods
X	Hazardous Materials Incident	RR & Hwy bisect town, increased traffic on both
X	Human Disease Pandemic	All affected but needs were met during COVID19
X	Terrorism	Critical facilities, Cyber security for Water, WW

For each hazard that affects cities, at least one Mitigation action is recommended.
See table on page 184. and in Appendix I. Full Action Tables are in Section C5-b.

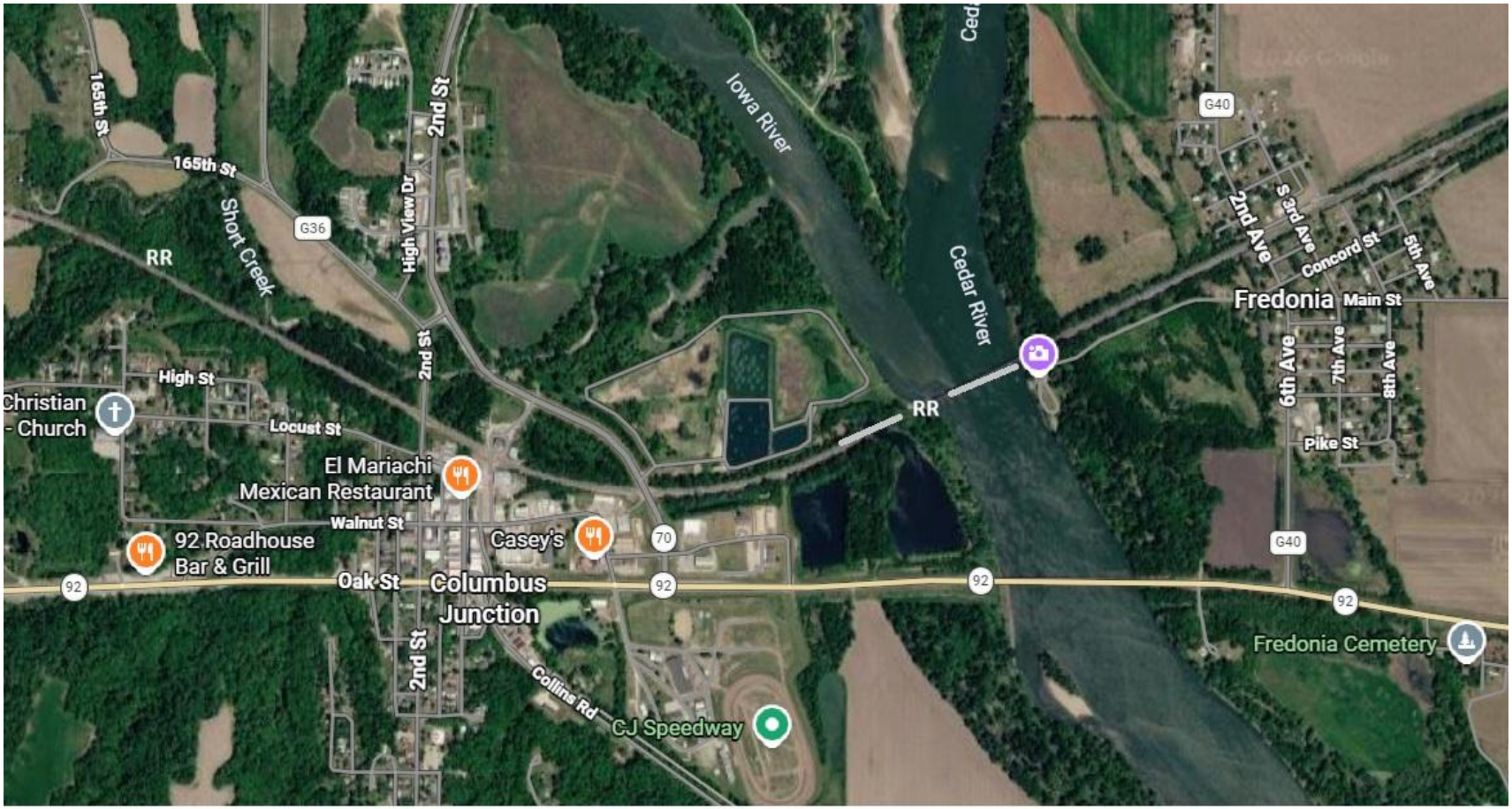
Community priorities for Mitigation:

- ✓ New generator
- ✓ Water & Wastewater system improvements
- ✓ Alternative sources for potable water
- ✓ Increased stormwater drainage capacity
- ✓ Building retention ponds to slow flooding in the Short Creek Watershed
- ✓ Funding for infrastructure improvements and grant matching

The Iowa Flood Center Study for the Short Creek Watershed is available at:

https://iowafloodcenter.uiowa.edu/sites/iowafloodcenter.uiowa.edu/files/2025-06/IFC_Columbus%20Junction_AFC_Cohort_TA_Final_Report.pdf

The map below illustrates the potential HazMat situation in Columbus Junction.



Columbus Junction and Fredonia are at the confluence of the Iowa and Cedar Rivers, The presence of the RR and Hwy 92 may pose extra risk for Hazardous Materials spills near the river and town water supply wells.

Cotter

Cotter is a small, incorporated city located on Iowa Highway 92 in Louisa County, Iowa about 5.5 miles west of Columbus Junction and one mile east of the Washington County border. It has a population of about 39 residents. The city has about 18 housing units on a total land area of roughly 0.25 square miles.

Cotter			
2020 Population	39	Workforce	
Median Age	60.7	Population age 16 and over	25
65 Years and Over	23%	in Labor Force	64%
Households		Commute to Work	
Median Household Income	$65,000	Employed population	16
Percent Poverty	35%	Manufacturing	10
Zero-vehicle households	0	Retail trade	4
Housing		Agri, forestry, fishing, hunting, mining	2
Total Housing Units	18	Construction	
Occupied Housing Units	14	Wholesale trade	
Vacant Housing Units	4	Transport, warehousing, utilities	
Mobile Homes	0	Information	
Median home value	$112,500	Finance, insurance, real estate	
Year built		Professional, scientific, management	
Since 2000	0%	Education, health care, social	
1970-1999	61%	Arts, entertain, rec, accommod, food	
1940-1969	0%	Other services	
Before 1940	39%	Public administration	

Special considerations:

Cotter may have special vulnerability in the following categories:

- ✓ Median age is over 60
- ✓ 10 people (36% of the population) say they speak English less than “very well” (LEP)
- ✓ Small population = low revenue for capacity building

Notes:

Cotter is a very small town with virtually no public services. They rely on the County for some needs such as snow removal on a single street.

Most needs of Cotter are met by volunteers in the community and assistance from Louisa County

Risk Assessment Summary

Hazards that affect Cotter		
X	Hail, High wind, Lightning	Can damage residential properties and City Hall
X	Tornado	All are vulnerable
X	Winter weather	County assists with snow removal
X	Human Disease Pandemic	Entire population is at risk
X	HazMat incident	Railroad & Hwy 92 run through Cotter

For each hazard that affects cities, at least one Mitigation action is recommended.
See table on page 184. and in Appendix I. Full Action Tables are in Section C5-b.

Community priorities for Mitigation:

- ✓ Resources for community improvement are quite limited, so funding is crucial

Fredonia

Fredonia is located on the east bank at the confluence of the Iowa River and the Cedar River. The community of Columbus Junction lies west across the river. According to the US Census Bureau, the city has 75 housing units on a total area of 0.17 square miles.

Fredonia			
2020 Population	222	Workforce	
Median Age	25.6	Population 16 years and over	208
65 Years and Over	6%	In labor force	81%
Households		Commute to work	22
Median Household Income	$85,625	Employed population	
Percent Poverty	33	Agri, forestry, fishing, hunting, mining	67
Zero-vehicle households	4	Manufacturing	21
Housing		Transport, warehousing, utilities	20
Total Housing Units	75	Education, health care, social	19
Occupied Housing Units	75	Information	12
Vacant Housing Units	0	Construction	10
Mobile Homes	30	Retail trade	7
Median home value	$71,700	Public administration	5
Year built		Arts, entertain, rec, accommod, food	3
Since 2000	41%	Professional, scientific, management	2
1970-1999	31%	Wholesale trade	1
1940-1969	5%	Finance, insurance, real estate	0
Before 1940	23%	Other services	0

Special Considerations:

Fredonia may have special vulnerability in the following category:

- ✓ 33% of households are in poverty

Notes: Interesting statistics:

- ✓ High median income
- ✓ High poverty rate
- ✓ Low median housing value

Risk Assessment Summary

Hazards that affect Fredonia		
X	Flood	At confluence of Iowa & Cedar Rivers
X	Hail, High wind, Lightning	Can damage residential properties and City Hall
X	Tornado	All are vulnerable
X	Winter weather	County assists with snow removal
X	Human Disease Pandemic	Entire population is at risk
X	HazMat incident	The Railroad runs through Fredonia

For each hazard that affects cities, at least one Mitigation action is recommended.

See table on page 184. and in Appendix I. Full Action Tables are in Section C5-b.

Priorities for Mitigation

- ✓ Improvements to Flood & Stormwater management
- ✓ Lightning protection for critical facilities
- ✓ HazMat resources and training

Grandview

Grandview is located half a mile east of the junction of US Route 61 and Iowa Highway 92. Wapello is six miles to the south and Muscatine is approximately 12 miles to the northeast. According to the US Census Bureau, the city has 243 houses on a total land area of 0.23 square miles.

Grandview was seriously affected by an EF3 tornado on June 1, 2007, which damaged or destroyed dozens of houses and impacted other parts of the city.

Grandview			
2020 Population	437	Workforce	
Median Age	60	Population age 16 and over	385
65 Years and Over	27%	in Labor Force	45%
Households		Commute (Mins)	30
Median Household Income	$57,625	Employed population	
Percent Poverty	10%	Manufacturing	64
Zero-vehicle households	7	Education, health care, social	27
Housing		Retail trade	20
Total Housing Units	243	Professional, scientific, management	14
Occupied Housing Units	233	Other services	14
Vacant Housing Units	10	Construction	9
Mobile Homes	20	Finance, insurance, real estate	9
Median home value	$142,400	Transport, warehousing, utilities	8
Year built		Wholesale trade	3
Since 2000	21%	Public administration	3
1970-1999	32%	Agri, forestry, fishing, hunting, mining	1
1940-1969	10%	Information	0
Before 1940	37%	Arts, entertain, rec, accommodation, food	0

Special considerations:

Grandview may have special vulnerability in the following category:

- ✓ 20 mobile homes house about 46 people that may be vulnerable to a tornado
- ✓ 47% of housing was built before 1970

Notes:

During severe weather, neighbors actively shelter neighbors.
People report a belief that their community is up to date and relatively safe from most hazards.
West end of town, new seed dealership underway

Risk Assessment Summary

Hazards affecting Grandview:		
X	Flooding – River, Flash, Stormwater	Stormwater drainage improvements needed
X	Tornado	Had a tornado in 2007
X	Winter weather	Adequate resources in place
X	Animal Crop, Plant disease	Tree maintenance would be beneficial
X	Human Disease Pandemic	Population is vulnerable
X	Terrorism	Cyber security is in place for critical facilities

For each hazard that affects cities, at least one Mitigation action is recommended.
See table on page 184. and in Appendix I. Full Action Tables are in Section C5-b.

Community priorities for Mitigation:

- ✓ Stormwater drainage improvements are needed
- ✓ Funding for long term infrastructure improvements

Letts

Letts is located one-half mile south of the Louisa-Muscatine county line and two miles west of US Route 61. The city has 134 houses on a total land area of 0.59 square miles.

Letts			
2020 Population	363	Workforce	
Median Age	33	Population 16 years and over	281
65 Years and Over	27%	In labor force	63%
Households		Commute to work (Mins)	24
Median Household Income	$76,538	Employed population	
Percent Poverty	3%	Manufacturing	55
Zero-vehicle households	5	Education, health care, social	39
Housing		Construction	21
Total Housing Units	134	Retail trade	11
Occupied Housing Units	122	Finance, insurance, real estate	11
Vacant Housing Units	12	Transport, warehousing, utilities	7
Mobile Homes	9	Public administration	7
Median home value	$122,400	Wholesale trade	3
Year built		Professional, scientific, management	3
Since 2000	5%	Arts, entertain, rec, accommodation, food	2
1970-1999	35%	Other services	1
1940-1969	9%	Agri, forestry, fishing, hunting, mining	0
Before 1940	51%	Information	0

Special considerations:

Letts may have special vulnerability in the following categories:

- ✓ Of people over age 65, 45% are also disabled
- ✓ 60% of housing was built before 1970
- ✓ Sewer fees have not supported long term maintenance
- ✓ Clay sewer lines are 50 years old with infiltration. Lagoons have slow discharge

Notes:

The City of Letts needs relief from increasing volume and frequency of floodwater and the impact of flood borne pollutants on the municipal wastewater treatment system.

Letts generator is at risk of flood.

RR derailment up to 60 mph could come. Rail freight patterns block emergency vehicle access at times.

Neighbors and local churches actively provide storm shelter and wellness checks for vulnerable members of the community. Local farmers assist with snow removal.

Stream channel is restricted. Clean out veg and dredge creek. Place silt on banks.

Risk Assessment Summary

Letts	Hazards:	Comments, concerns
X	Flooding – River, Flash, Stormwater	Flood frequency and severity have increased
X	Hail, High wind, Lightning	Annual occurrence
X	Tornado	Always a potential threat
X	Winter weather	Snow removal, street treatments
X	Animal, Crop, Plant Disease	Deer and farm animals live in town
X	Hazardous Materials Incident	Chemical plant within 2 miles of town, increased rail traffic on a line that passes through town
X	Human Disease Pandemic	Population is vulnerable to public health concerns
X	Terrorism	Cyber security for critical facilities is an ongoing need

For each hazard that affects cities, at least one Mitigation action is recommended.

See table on page 184. and in Appendix I. Full Action Tables are in Section C5-b.

Community priorities for Mitigation:

- ✓ Wastewater system improvements
- ✓ Increased stormwater drainage capacity
- ✓ Improved Rail crossing safety
- ✓ Improved siren
- ✓ Need to replace a generator
- ✓ Funding for infrastructure improvements and grant matching

Morning Sun

Morning Sun is located on the north side of Iowa Highway 78 approximately 1.5 miles north of the Louisa-Des Moines county line. Wapello is about six miles north. According to the US Census Bureau,, the city has 354 houses on a total land area of 0.80 square miles.

Morning Sun			
2020 Population	752	Workforce	
Median Age	46.5	Population 16 years and over	655
65 Years and Over	25%	In labor force	60%
Households		Commute to work (Mins)	23
Median Household Income	$56,350	Employed population	
Percent Poverty	11%	Education, health care, social	131
Zero-vehicle households	0	Retail trade	90
Housing		Manufacturing	26
Total Housing Units	354	Construction	25
Occupied Housing Units	307	Transport, warehousing, utilities	25
Vacant Housing Units	39	Agri, forestry, fishing, hunting, mining	19
Mobile Homes	29	Wholesale trade	16
Median home value	$102,200	Arts, entertain, rec, accommodation, food	16
Year built		Public administration	11
Since 2000	11%	Professional, scientific, management	10
1970-1999	33%	Other services	9
1940-1969	24%	Finance, insurance, real estate	8
Before 1940	33%	Information	4

Morning Sun may have special vulnerability in the following categories:

- ✓ 57% of housing was built before 1970
- ✓ Median age is about 47, Senior population is 25%

Notes:

Power outages can disable water wells and lift stations and affect people who depend on medical equipment.

Morning Sun has awareness of the needs and safety of its Senior population. Older residents may need assistance with stormwater drainage issues and tree maintenance.

The community does not have experience with flood problems in the designated special flood hazard area (SFHA); therefore the city has chosen to not participate in the NFIP.

Risk Assessment Summary, City of Morning Sun

Morning Sun		Comments, concerns
X	Drought	Drought increases fire danger
X	Flooding – River, Flash, Stormwater	SFHA, Stormwater drainage issues
X	Hail, High wind, Lightning	High wind has affected power lines; Lightning has impacted water wells
X	Tornado	The town has been threatened by tornadoes twice in recent years. No direct hit.
X	Winter weather	Senior pop affected. Snow removal & equipment needs
X	Animal, Crop, Plant Disease	Racoons, Feral Cats. Agricultural economy.
X	Hazardous Materials Incident	Potential for Highway chem spills, Exposure to FD personnel
X	Human Disease Pandemic	Population is vulnerable to public health concerns
X	Terrorism	Cyber security is in place

For each hazard that affects cities, at least one Mitigation action is recommended.
See table on page 184. and in Appendix I. Full Action Tables are in Section C5-b.

Community priorities for mitigation:

- ✓ Wastewater lagoon improvements
- ✓ Increased stormwater drainage capacity & culvert maintenance
- ✓ Improved siren needed
- ✓ Need a backup generator for water pumps and lift stations

Oakville

Oakville is located just north of Iowa Route X99 and the Iowa River passes about one-half mile to the northwest. The Louisa-Des Moines county line is two miles to the south. Wapello is about six miles to the northwest. The city has 86 houses on a total land area of 0.42 square miles.

Oakville is protected from flooding of the Iowa River by a levee.

Oakville			
2020 Population	200	Workforce	
Median Age	47.6	Population age 16 and over	159
65 Years and Over	12%	in Labor Force	58%
Households		Commute to Work	26
Median Household Income	$63,750	Employed population	
Percent Poverty	22%	Manufacturing	19
Zero-vehicle households	2	Education, health care, social	16
Housing		Transport, warehousing, utilities	12
Total Housing Units	86	Agri, forestry, fishing, hunting, mining	10
Occupied Housing Units	85	Arts, entertain, rec, accommodation, food	9
Vacant Housing Units	1	Construction	8
Mobile Homes	16	Retail trade	5
Median home value	$77,500	Wholesale trade	3
Year built		Finance, insurance, real estate	3
Since 2000	13%	Public administration	3
1970-1999	34%	Professional, scientific, management	1
1940-1969	10%	Information	0
Before 1940	43%	Other services	0

Special considerations:

Oakville may have special vulnerability in the following categories:

- ✓ Oakville is in a levee protected area adjacent to the Iowa River
- ✓ Seepage through the levee and stormwater affect the north end of town
- ✓ More than half of people over age 65 are also disabled
- ✓ 53% of housing was built before 1970

Notes:

Oakville needs a generator at waterworks for water wells and E911 system for back up power.

Due to the low topography, Oakville has seven lift stations and a Booster Pump Station.

Seepage occurs through the levee affecting the north end of town, various other drainage problems cause areas of flooding on the north side.

Critical utilities are not computerized.

Risk Assessment Summary, City of Oakville

Hazards: Oakville		
X	Drought	Municipal Water utility
X	Flooding – River, Flash, Stormwater	Levee protected area, has stormwater problems
X	Severe storms	Have had lightning damage to Booster Pump station. Shelter needs are informally met
X	Tornado	All are potentially affected
X	Winter weather	Low temps, ice & snow affect everyone
X	Dam or Levee Failure	Potential risk. Seepage occurs through levee
X	Animal, Crop, Plant Disease	Trees, animals
X	Hazardous Materials Incident	Farm to Market Rd, some potential for spills
X	Human Disease Pandemic	All affected. COVID19 needs were met

For each hazard that affects cities, at least one Mitigation action is recommended.
See table on page 184. and in Appendix I. Full Action Tables are in Section C5-b.

Community priorities for Mitigation:

- ✓ Need a generator at waterworks to back up the water wells and E911 system
- ✓ Need a 3 phase electric service for Booster Pump Station
- ✓ Improved stormwater drainage capacity at north end of town
- ✓ Evaluate manholes on north end of town
- ✓ Funding for grant matching & Water and Wastewater system improvements
- ✓ Levee system improvements would mitigate risk, but require significant funding

Wapello

Wapello is the county seat of Louisa County. The city is located on US Route 61, on the west side of the Iowa River. According to the US Census Bureau,, the city has 862 homes and a total area of 1.34 square miles, of which 1.29 square miles is land and 0.05 square miles is water.

Wapello			
2020 Population	2,084	Workforce	
Median Age	49.6	Population 16 years and over	1558
65 Years and Over	32%	In labor force	59%
Households		Commute to work (Mins)	24
Median Household Income	$72,708	Employed population	
Percent Poverty	6%	Manufacturing	282
Zero-vehicle households	102	Education, health care, social	117
Housing		Retail trade	92
Total Housing Units	862	Construction	70
Occupied Housing Units	830	Transport, warehousing, utilities	70
Vacant Housing Units	32	Professional, scientific, management	70
Mobile Homes	0	Arts, entertain, rec, accommodation, food	43
Median home value	$143,900	Information	36
Year built		Finance, insurance, real estate	35
Since 2000	11%	Public administration	24
1970-1999	35%	Agri, forestry, fishing, hunting, mining	16
1940-1969	21%	Wholesale trade	16
Before 1940	32%	Other services	8

Special considerations:

- ✓ Wapello median age is nearly 50, 32% of population are over age 65
- ✓ There are 102 households (about 235 people) with no transportation available at home

Notes:

More public comments are needed from Wapello residents

Risk Assessment Summary, City of Wapello

Actions	Hazard	Comments
X	Drought	Agricultural Economy. No short term impact on bedrock aquifers
X	Flooding – River, Flash, Stormwater	Stormwater, mostly on sw side
X	Hail High winds, Lightning	Yes, Hail has affected roofs, lightning has afected wells, City Hall has lightning rods.
X	Tornado	Tornado a potential threat. Most homes have basements. Could use list of shelter locations for public info. Community support for neighbors
X	Wildfire	Interface & intermix areas. No recent fires
X	Winter weather	Old water lines ground shifting from frost heaving
X	Animal, Crop, Plant Disease	Tree maintenance. Ash borer was an issue, may have potential Oak wilt. Feral cats. Agricultural economy
X	Hazardous Materials Incident	Potential for highway spills. Farm chemicals & manure on farm to market roads. Ag chemical tanks at elevator
X	Human Disease Pandemic	All potentially affected, COVID needs were met
X	Terrorism	Critical facilities Cyber security contract

For each hazard that affects cities, at least one Mitigation action is recommended.
See table on page 184. and in Appendix I. Full Action Tables are in Section C5-b.

Community priorities for mitigation:

- ✓ Improved stormwater management
- ✓ New or updated storm sewers for areas that tend to overflow
- ✓ New generators for backup power to wells, City Hall & Briggs Community Center
- ✓ Improved community storm shelter capacity
- ✓ Funding for grant matching & infrastructure improvements

Mitigation needed, Cities

For each hazard that affects cities, at least one Mitigation action is recommended. See full Action Plan Tables in Section C5-b and the Action Plan Summary table in the final pages of this document.

One Mitigation Action for each Hazard per affected jurisdiction

Hazard	Action steps for Cities	Specific Cities
Drought	7,12	
Flood (River, Flash, Stormwater)	5,13,16,17,19,25	4 Columbus Junction; 6 Letts; 10 Morning Sun
Severe storms (Hail, High wind, Lightning)	1,8,9,11,12,18,19,25	
Tornado	1,8,9,11,12,19,25	
Wildfire	12,14,18,19,25	
Winter Weather	1,8,9,12,18,19,25	
Dam or Levee Failure	5,12,13,16,17,25	
Landslide	5,12,17	
Animal/Plant/Crop Disease	11,12,18,20	
Hazardous Materials Incident	12,14,19,25	
Human Disease Epidemic or Pandemic	9,12,19,20,25	
Terrorism (cyber security)	12,19,22,24,25	

Schools

2025-26 Certified Enrollment by District - December 18, 2025		
District #	**District Name**	**Certified Enrollment**
1368	Columbus Comm School District	765
3841	Louisa-Muscatine Comm School District	669
4509	Morning Sun Comm School District	108
6759	Wapello Comm School District	523

Primary concerns for Schools

Safety for people is the top concern for all hazards affecting schools. Funding for implementation of projects that improve safety and security such as storm shelters, safe rooms and building security are of high priority. Broadband internet access for all staff and students would mitigate the effects of Human Disease pandemics & Winter weather. Improvements to building roofs, windows and stormwater drainage are valuable but less urgent goals.

Hazard Mitigation and Security

All local K-12 Schools have engaged in mitigation activities including traditional exercises such as fire drills and moving to a storm safe area. At the same time, national trends in terrorist active shooter events have increased the need for heightened security, response drills and intensified school building safety measures such as video surveillance, restricted access, locked doors and bullet proofing of windows.

Risk Assessment Summary, Columbus Community School District

The Columbus Community School District (which serves Columbus Junction, Columbus City, Fredonia, Cotter, Conesville, and other surrounding townships) is based in Columbus Junction. The school's colors are blue and white and their mascot is a wildcat.

School	**Columbus Community CSD**
Person providing information	Paul Kissell, HS principal
Does the school have these?	
Administrative Capability, sufficient staff	Yes
Designated emergency manager	Yes
Emergency Management Plan (EOP)	Yes
Post disaster recovery plan	Yes
PTO/PTA/Booster Club	Yes
Financial Capabilities	
Authority to levy taxes	Yes
Incur debt or Bonds	Yes
Public/Private partnerships, Corp donations	Yes
Budget to raise match funds for mitigation grants	Yes
Has your District had positive response to Bond issues in the past?	No bonds proposed
Is your District growing or declining in population?	Slight decline
Hazards that affect your school district	
Flooding – River, Flash, Stormwater	Stormwater
Severe thunderstorms: Hail, High winds, Lightning	Buildings, bussing
Tornado	Move to designated area
Winter weather	Close school, adjust hours adjust bus routes
Human Disease Pandemic	Typical COVID experience
Terrorism (Cyber security, School violence)	Yes, this could affect school
Are the schools air conditioned?	Spot AC
Do Power outages happen often?	Not often
What problems happen when the power goes out?	Use a generator for emergency
Do the schools have generators?	Yes, portable
Do they need additional generators?	No
Updated any plans in the last 5 years?	Yes, conducted Safety analysis, update EOP annually
In the last 5 years, has the school made changes to reduce impacts of hazards and improve safety? What specific actions?	Upgrades to boiler & increased generator capacity, safety analysis

School priorities. If funding were available, what would be the best things to do to mitigate the effects of hazards and improve safety for your school?	Storm shelter improvements, Broadband internet at home for all students & staff, Ongoing building safety improvements, Air Conditioning for extreme heat,

Columbus Community	
Hazard events that have impacted your school in the last ten years	Lightning, Winter weather, Human disease Pandemic
Hazard mitigation activities in the past few years:	Regular IT updates, annual counterterrorism training, annual EOP review. Drills for Tornado, Fire, Threat, Evacuation. Training on blood borne pathogens

Columbus Community CSD	
Hazard	**Action Steps**
Flooding –Stormwater	17 (stormwater)
Severe storms: Hail, High winds, Lightning	1,12,22
Tornado	1,12,22
Winter weather	1,12,19,22
Human Disease Pandemic	19,25
Terrorism (Cyber security, School violence)	12,19,22

Risk Assessment Summary, Louisa Muscatine Community School District

The Louisa–Muscatine CSD is a rural public school district consisting of an elementary school and a high school located in a single complex along U.S. Highway 61 in unincorporated Louisa County, Iowa, with a Letts postal address.

The district is named Louisa–Muscatine because it is on the border of Louisa and Muscatine counties. The district, serves students of both counties, including the cities of Letts, Grandview, and Fruitland as well as a portion of the city limits of Muscatine. It also includes Cranston, an unincorporated area, as well as rural students and those from from various other local communities.

School	**Louisa-Muscatine CSD**
Person providing information	Anthony Ryan, Superintendent
Does the school have these?	
Administrative Capability, sufficient staff	Yes
Designated emergency manager	Superintendent
Emergency Management Plan (EOP)	Yes
Post disaster recovery plan	Yes
PTO/PTA/Booster Club	Yes
Financial Capabilities	
Authority to levy taxes	Yes
Incur debt or Bonds	Yes
Public/Private partnerships, Corp donations	Philanthropy
Budget to raise match funds for mitigation grants	Limited
Has your District had positive response to Bond issues in the past?	No bonds proposed
Is your District growing or declining in population?	Slightly Declining
Hazards that affect your school district	
Severe thunderstorms: Hail, High winds, Lightning	Buildings, bussing
Tornado	Move to designated area
Winter weather	Close school, adjust hours adjust bus routes
Human Disease Pandemic	Typical COVID experience
Terrorism (Cyber security, School violence)	Yes, this could affect school
Are the schools air conditioned?	No
Do Power outages happen often?	No
What problems happen when the power goes out?	NA
Do the schools have generators?	No
Do they need additional generators?	No
Updated any plans in the last 5 years?	Update EOP annually, Facility Plan every 5 years

In the last 5 years, has the school made changes to reduce impacts of hazards and improve safety? What specific actions?	Ongoing building safety improvements
School priorities. If funding were available, what would be the best things to do to mitigate the effects of hazards and improve safety for your school?	More funding and additional EMS coverage for rural schools and sports events
	Implement recommendations of the Governor's School Assessment Plan.

Louisa Muscatine CSD	
Hazard events that have impacted your school in the last ten years	Winter weather, Human disease Pandemic
Hazard mitigation activities in the past few years:	Improved facility safety, Training for staff & students

Louisa Muscatine CSD	
Hazards of concern	**Action Steps**
Severe storms: Hail, High winds, Lightning	1,12,22
Tornado	1,12,22
Winter weather	1,12,19,22
Human Disease Pandemic	19,25
Terrorism (Cyber security, School violence)	12,19,22

Risk Assessment Summary, Morning Sun Community School District

The Morning Sun CSD is a public school district headquartered in Morning Sun, Iowa. The district is mostly in southern Louisa County, with a smaller area in Des Moines County, and serves the town of Morning Sun and the surrounding rural areas. Morning Sun Elementary School District serves approximately 124 students in grades PK, K-6 with a student/teacher ratio of 11:1.

Once Morning Sun students complete the sixth grade, they have the option to continue their education at Winfield - Mt. Union Community School District or Wapello Community Schools.

School	**Morning Sun CSD**
Person providing information	Mike Peterson, Superintendent
Does the school have these?	
Administrative Capability, sufficient staff	Yes
Designated emergency manager	Yes
Emergency Management Plan (EOP)	Yes
Post disaster recovery plan	Yes
PTO/PTA/Booster Club	Yes
Financial Capabilities	
Authority to levy taxes	Yes
Incur debt or Bonds	Yes
Public/Private partnerships, Corp donations	Yes
Budget to raise match funds for mitigation grants	Yes
Has your District had positive response to Bond issues in the past?	No bonds proposed
Is your District growing or declining in population?	Slightly Declining
Hazards that affect your school district	
Flooding – River, Flash, Stormwater	Stormwater
Severe thunderstorms: Hail, High winds, Lightning	Buildings, bussing
Tornado	Move to designated area
Winter weather	Close school, adjust hours adjust bus routes
Human Disease Pandemic	Typical COVID experience
Terrorism (Cyber security, School violence)	Yes, this could affect school
Are the schools air conditioned?	Spot AC
Do Power outages happen often?	Not often
What problems happen when the power goes out?	Generator for emergency
Do the schools have generators?	Yes, portable
Do they need additional generators?	No

Updated any plans in the last 5 years?	Yes, conducted Safety analysis, update EOP annually
In the last 5 years, has the school made changes to reduce impacts of hazards and improve safety? What specific actions?	Upgrades to boiler & increased generator capacity, safety analysis
School priorities. If funding were available, what would be the best things to do to mitigate the effects of hazards and improve safety for your school?	Air Conditioning for extreme heat, Storm shelter improvements, Broadband internet at home for all students, Ongoing facility safety improvements

Morning Sun CSD	
Hazard events that have impacted your school in the last ten years	Severe storms, Winter weather, Human disease Pandemic
Hazard mitigation activities in the past few years:	Upgrades to mechanical systems & increased generator capacity. Safety analysis, annual drills and updates to EOP

Morning Sun CSD	
Hazards of concern	**Action Steps**
Flooding – Stormwater	17 (stormwater)
Severe storms: Hail, High winds, Lightning	1,12,22
Tornado	1,12,22
Winter weather	1,12,19,22
Human Disease Pandemic	19,25
Terrorism (Cyber security, School violence)	12,19,22

Risk Assessment Summary, Wapello Community Schools

The Wapello Community School District, or Wapello Community Schools, is a rural public school district headquartered in Wapello, Iowa. It is mostly within Louisa County, with a smaller area in Des Moines County, and serves the towns of Wapello and Oakville, and the surrounding rural areas.

In 2015, the district entered an agreement with the Morning Sun Community School District to share the services of superintendent Mike Peterson.

Jurisdiction	**Wapello CSD**
Person providing information	Mike Peterson, Superintendent
Does the school have these?	
Administrative Capability, sufficient staff	Yes
Designated emergency manager	Yes
Emergency Management Plan (EOP)	Yes
Post disaster recovery plan	Yes
PTO/PTA/Booster Club	Yes
Financial Capabilities	
Authority to levy taxes	Yes
Incur debt or Bonds	Yes
Public/Private partnerships, Corp donations	Yes
Budget to raise match funds for mitigation grants	Yes
Has your District had positive response to Bond issues in the past?	No bonds proposed
Is your District growing or declining in population?	Slightly Declining
Hazards that may affect your schools	
Flooding – River, Flash, Stormwater	Stormwater
Severe thunderstorms: Hail, High winds, Lightning	Buildings, bussing
Tornado	Move to designated area
Winter weather	May close school, adjust hours, adjust bus routes
Dam or Levee Failure	Levee, potential risk of flood
Human Disease Pandemic	Typical COVID
Terrorism (Cyber security, School violence)	Yes, a concern
Are the schools air conditioned?	Spot AC
Do Power outages happen often?	Not often
What problems happen when the power goes out?	
Do the schools have generators?	Yes, portable
Do they need additional generators?	No

Updated any plans in the last 5 years?	Yes, conducted Safety analysis, update EOP annually
In the last 5 years, has the school made changes to reduce impacts of hazards and improve safety? What specific actions?	Updated Fire suppression system, safety analysis, facility upgrade
School priorities. If funding were available, what would be the best things to do to mitigate the effects of hazards and improve safety for your school?	Broadband internet at home for all students, ongoing facility safety improvements, Air Conditioning for extreme heat

Wapello CSD	
Hazard events that have impacted your school in the last ten years	Severe storms, Winter weather, Human disease pandemic
Hazard mitigation activities in the past few years:	Updated fire suppression system, safety analysis, facility improvements, annual review of EOP

Wapello CSD	
Hazards of concern	**Action Steps**
Flooding – River, Flash, Stormwater	13,25
Severe storms: Hail, High winds, Lightning	1,12,22
Tornado	1,12,22
Winter weather	1,12,19,22
Levee failure	12,13,25
Human Disease Pandemic	19,25
Terrorism (Cyber security, School violence)	12,19,22

Special Populations, Vulnerable individuals

Outreach to Vulnerable Populations
Salvation Army Southeast Iowa
Veteran Services – Louisa County
Community Action of Southeast Iowa
Louisa County Public Health

Hazards of concern:
Severe storms
Tornados
Winter weather
HazMat Incident

Comments and Concerns
If trees are down, some people need help to clear the debris from their yard
In the event of evacuation, the nearest shelter for Veterans is in Muscatine
Drills for emergencies and evacuation must include plans for special populations
Ongoing Information and education to improve coping skills during hazard events

Public Opinion

Public concerns and mitigation solutions. On the whole, residents of Louisa County seem to feel that they are relatively safe from most natural hazards and that local leaders are meeting community needs effectively within budget constraints.

The most frequent problems citizens mentioned were stormwater drainage issues, severe storms and winter weather. The most dangerous were threats to life and health from tornadoes, and school safety.

Mitigation solutions most often proposed for cities were flood and stormwater mitigation and more funding for local emergency response personnel.

Tornadoes are viewed as a constant threat. The unpredictability, threat to life and the potential amount of property damage all raise concerns every year. The cost of constructing and maintaining shelters is prohibitive for small communities or individual households. In Louisa County, many homes have basements and neighbors actively shelter neighbors.

Schools have worked diligently to improve building security and storm shelter improvements. These are seen as top priorities for ongoing mitigation.

One question to respondents was “If funding were available, what would be the best things to do to improve safety in your schools and community?”

Public Opinion	School and Community Needs	Hazard
Cities	Stormwater improvements	Flood, Severe storm, Levee failure
Cities	More law enforcement funding. Morning Sun would benefit from a municipal Police force	Terrorism, Emergency response
Cities	Plan for Local grant-matching funds to implement Hazard Mitigation for critical facilities	Flood, Severe Storm, Tornado, Winter weather
Cities & Schools	Lightning protection, power supply backup	Lightning
Cities & Schools	Additional Hazard education for staff, students and the public	Many Hazards
Cities & Schools	Update cyber security practices as new information is available	Terrorism
Schools	Additional funding for LEO and First responders, SRO officers at schools	Terrorism
Schools	More funding, improved coverage of EMS services for rural schools and sports	General safety, HazMat, Terrorism
Schools	Stay current with Building security best practices	Terrorism
Schools	Improved storm shelter capability	Severe Storm , Tornado, Winter weather
Schools	Broadband access for all staff & students	Winter storm, Human Pandemic
Cities & Schools	Safe routes to schools, bike paths, trails for student safety and community resilience	Transportation alternatives (general safety and in the event of a disaster)

Conclusion

The Goals and Action Items detailed in this 2026 Hazard Mitigation Plan Update are intended to be a guide to officials and residents of Louisa County as they continue to make progress towards becoming a safer community. As new information and new technology become available, this plan will be updated accordingly.

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Appendices

Appendix A – Hazards profiled for Iowa

Hazards selected for this plan came from the 2023 State of Iowa HMP Section 3, pages 3-1 and 3-2.

To comply with 44 CFR 201.4 (c) (2), this plan must contain an "overview of the type and location of all natural hazards that can affect the state." Section 3.3 profiles each of the following natural hazards determined to affect the state of Iowa:

1. Drought
2. Tornadoes and other High Wind Events (including derechos)
3. Flooding-River
4. Flooding-Flash
5. Severe Winter Storms
6. Hail and Lightning storms
7. Excessive Heat
8. Dam and Levee failure (relates to natural hazard of flooding)
9. Landslides
10. Earthquake
11. Wildfire, including Grass Fire
12. Sinkholes
13. Expansive Soils

The natural hazard profiles include information on the nature of each natural hazard, the locations or areas where they are found, and information on previous occurrences of hazard events. Using best available information, the probability of future hazard events is also provided for each natural hazard profiled in section 3.3.

Section 3.4 includes a brief overview of several "non-natural" hazards that affect Iowa, namely:

1. Animal/Crop/Plant Disease
2. Pandemic Human Disease
3. Hazardous Materials
4. Infrastructure Failure
5. Radiological Incident
6. Terrorism
7. Transportation Incident

These seven hazards plus the thirteen natural hazards are the same 20 hazards used in the Threat and Hazard Identification and Risk Assessment (THIRA) for Iowa.

Appendix B – Flood Index, Communities in Louisa County

FLOOD INSURANCE STUDY



LOUISA COUNTY, IOWA
AND INCORPORATED AREAS

COMMUNITY NAME	COMMUNITY NUMBER
*COLUMBUS CITY, CITY OF	190720
COLUMBUS JUNCTION, CITY OF	190307
*COTTER, CITY OF	190925
FREDONIA, CITY OF	190308
*GRANDVIEW, CITY OF	190937
LETTS, CITY OF	190311
LOUISA COUNTY UNINCORPORATED AREAS	190193
MORNING SUN, CITY OF	190312
*OAKVILLE, CITY OF	190313
WAPELLO, CITY OF	190194

* No Special Flood Hazard Areas Identified.



Revised: October 16, 2015

Federal Emergency Management Agency

FLOOD INSURANCE STUDY NUMBER
19115CV000B

From the FIS for Louisa County

Principal Flood Problems

The history of flooding in Louisa County has indicated that flooding may occur during any non-winter month. Most floods have been in the spring or early summer as a result of heavy rainfall and/or snowmelt. However, locally heavy thunderstorms in late summer or autumn have also caused flooding problems.

Unprotected low-lying areas in Louisa County are subject to flooding caused by the overflow of the Mississippi River where the most severe flooding occurs generally during the spring. This flooding is a result of rapid snowmelt in conjunction with warm, heavy rains. The flood of record on the Mississippi River in the study area at the time of the previous FIS occurred on April 30, 1965 with an estimated peak discharge of 321,000 cubic feet per second (cfs).

The largest flood of record on the Cedar River at the time of the previous FIS occurred April 2, 1961. This flood had a peak discharge of 70,800 cfs at the Conesville gage (No. 05465000). The estimated recurrence interval of this flood is 25 years.

Prior to the construction of the Coralville Dam in 1958, the largest flood of record on the Iowa River occurred June 18, 1947. This flood had a peak discharge of 94,000 cfs at the Wapello gage (No. 05465500). A discharge of 92,000 cfs at the Wapello gage recorded April 22, 1973, was the flood of record at the time of the previous FIS since the Coralville Dam brought regulation of flows on the Iowa River.

The Mississippi River levees provide 1-percent-annual-chance protection from the Louisa / Des Moines County Boundary to the Iowa River, at river mile 433.5 and from river mile 441 upstream to the Muscatine / Louisa County Boundary.

The Mississippi River Lock and Dam No. 17 is adjacent to Louisa County but does not provide protection from major events such as the 1-percent-annual-chance flood.

Flood protection along the Muscatine Slough is provided by a pumping station located at the southernmost point of the slough.

There are no flood protection measures in place on the Cedar River within Louisa County. Since 1958, the Coralville Dam and reservoir has provided flood protection downstream of Coralville on the Iowa River.

Levees in the study area provide the community with some degree of protection against flooding. However, it has been ascertained that some of these levees may not protect the community from rare events such as the 1-percent-annual chance flood. The criteria used to evaluate protection against the 1-percent annual-chance flood are 1) adequate design, including freeboard, 2) structural stability, and 3) proper operation and maintenance. Levees that do not protect against the 1-percent-annual-chance flood are not considered in the hydraulic analysis of the 1-percent-annual-chance floodplain.

B.5.1.1.1. STORMWATER MANAGEMENT

Flood diversion and storage projects are climate resilient mitigation actions.

While there may be many different types of localized flood risk reduction projects, stormwater management projects are some of the most common to the HMA programs. Stormwater management is defined as efforts to reduce the impact of increased runoff that results from new development in a watershed. Stormwater management also encompasses many aspects of water quality and includes efforts to reduce erosion and the entry of sediment and pollutants into receiving streams.

The objective of this activity is to prevent future development from increasing flood hazards to existing development, to protect existing hydrologic functions within the watershed, and to maintain and improve water quality. Unmanaged stormwater runoff from new development and redevelopment throughout a watershed increases flood hazards by causing more frequent flooding, greater flood depths and longer-lasting floods.

As forests, fields and farms are covered by impermeable surfaces such as streets, rooftops and parking lots, more of the rain runs off, and at a faster rate. When an area is urbanized, the rate and volume of runoff can increase fivefold or more. Communities are affected by development that takes place upstream in their watershed, and the community's own development can have an impact on downstream communities. Communities are encouraged to cooperate with adjacent communities to manage stormwater.

Stormwater management regulations regulate development on a case-by-case basis to ensure the peak flow and volume of stormwater runoff from each site will be no greater than the runoff from the site before it was developed or redeveloped.

Stormwater management

Stormwater management practices can be grouped loosely into the following categories:

Infiltration: These approaches manage stormwater by infiltrating it into the ground. These methods are considered pollutant-reducing. Some examples include porous pavement, subsurface infiltration and bioinfiltration.

Slow release: These approaches detain and slowly release stormwater over time. An example is a detention/retention pond.

Pollutant-reducing: These approaches incorporate pollutant-reducing practices. They may include infiltration practices and some slow-release practices.

Vegetated: These approaches use vegetation as a significant component within the storage area. Examples include bioretention basins, ponds and wet basins, green roofs, and vegetated media filters.

Non-vegetated: These approaches do not have a significant vegetation component. They include but are not limited to porous pavements, blue roofs, media filters, cisterns, and subsurface storage and conveyance methods (Flood Risk Reduction, 2024).

Many flood diversion and storage projects are currently eligible for HMA as flood risk reduction activities. The HMA Guide focuses on flood diversion and storage projects implemented using green infrastructure methods as much as possible to address drought mitigation and climate change resilience in addition to reducing flood risk.

Appendix C – Hazard Impacts on Agriculture

The Des Moines Register
Published 8:04 a.m. CT July 27, 2021 Updated 12:16 p.m. CT July 27, 2021
By Donnelle Eller

Iowa farmers absorbed $243 million in losses from last year's devastating drought, derecho, new tally says

The derecho and drought that hammered Iowa last year destroyed $802 million in corn, soybeans and pastures, a new report shows, with farmers absorbing nearly one-third of the losses.

The American Farm Bureau Federation, which is lobbying congressional leaders to provide additional disaster aid for U.S. growers, says crop insurance covered nearly $560 million of the losses that Iowa farmers faced following the devastating drought and the derecho. The state's farmers were responsible for covering $243 million out of pocket.

Nationwide, natural disasters caused $6.5 billion in damage to crops, pasture and rangeland, according to the Farm Bureau. Federal crop insurance is covering $2.9 billion in losses, leaving U.S. growers to cover $3.6 billion of the total hit.

Damage from natural disasters, including hurricanes, wildfires and Tornadoes, drought and derechos, extended beyond just agricultural land: Nearly $99 billion in damages was reported to homes, businesses, farms and other property last year.

It was the fourth-most expensive year of natural disasters since 1980, according to the National Oceanic and Atmospheric Administration. The natural disasters killed 262 people last year, NOAA reported, including three Iowans who died in the derecho.

The derecho's straight-line winds reached 140 mph on Aug. 10 as it traveled 770 miles across eight states from South Dakota to Ohio. Total damages to homes, businesses and farms — much of it centered in Iowa and Illinois — reached $11.5 billion, NOAA reported, up from a $7.5 billion estimate made last fall.

It was the most costly thunderstorm in U.S. history, according to NOAA.

The storm ripped through cities and towns across Iowa, including Des Moines, Marshalltown and Cedar Rapids, leaving about 400,000 people without power. Many of Cedar Rapids' 132,000 residents were without power for days, stretching past two weeks for some.

The derecho's damage to Iowa corn, soybeans and other crops reached $490.8 million, with federal crop insurance covering $343.3 million of those losses and farmers picking up the remaining $147.5 million in costs, said Daniel Munch, the Farm Bureau associate economist who wrote the report, released earlier this month.

The drought caused $308.2 million in damage to Iowa crops, with $214.5 million covered by insurance, the report shows. An estimated $93.7 million in losses were uncovered.

Munch said last year's drought, which has continued this year, contributed to the derecho damage, potentially weakening plants. Experts also say the storm's timing — hitting shortly before crops were harvested — contributed to damage by snapping tall corn.

The storm damaged crops on an estimated 6 million farm acres as it swept across the central third of Iowa. Farm Bureau's crop damage estimate doesn't include other ag losses, such as twisted grain bins on farms and at elevators, loss of livestock or the additional equipment, time and other costs that farmers experienced when harvesting thousands of acres of fallen corn and soybeans, Munch said.

The report also indicated the drought and derecho damaged about $3.1 million of Iowa pasture and rangeland, with nearly $2 million of losses uncovered.

Last year, Iowa farmers insured about 95% of the state's total corn and soybean acres, U.S. Department of Agriculture data shows. The insured crops represented $12 billion of value. Taxpayers subsidized about half of the state's crop insurance costs; farmers paid the remainder.

Congress and the former Trump administration made about $4 billion available to farmers to help cover natural disaster costs in 2018 and 2019. It was part of a larger $19.1 billion disaster package for Americans.

U.S. Reps. Randy Feenstra, R-Iowa, and Cindy Axne, D-Iowa, voted to provide coverage for the derecho and other high wind-events in an $8.5 billion disaster bill that the House agriculture committee approved Tuesday. The bill would provide assistance to farmers and ranchers seeking natural disaster assistance for last year and 2021.

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Appendix D – Port Louisa Wildlife Refuge

US Fish and Wildlife Service

Louisa Division

The 2,609-acre Louisa Division is located just east of Wapello, Iowa in Louisa County. It is protected from moderate flooding by an Army Corps of Engineers levee stretching to Lock and Dam 17, approximately one mile south of the division border. The levee is integral to maintaining the nine-foot navigation channel due to its proximity to the dam. The Port Louisa Refuge headquarters is located on this division in an area that includes 48 acres of forest and a four-acre prairie restoration situated on a bluff overlooking the Mississippi River floodplain.

Traditional waterfowl management has been the primary objective on Louisa since its conversion from an agricultural levee district to a national wildlife refuge in the 1940's. Some cropping still occurs on the slightly higher elevations, but 800 acres are dedicated to promoting growth of wetland plants for use by waterfowl. Most of the wetland acres are managed as moist soil units which require properly timed water manipulations to provide the proper conditions for the growth of preferred plants and invertebrates for migrating waterfowl.

Other habitats include a 45-acre permanent body of water - Prairie Pocket - and bottomland forest. Existing hardwoods in the floodplain were devastated by prolonged flooding in 1993 and many have died, however the 18-acre pecan grove continues to thrive. A small 25-acre sand prairie was established on the highest ridge of Louisa Division in 1985. Even though this site was inundated by 1993 flood waters, some grasses and forbs survived and prescribed burning on the unit has helped invigorate the stand.

New Boston IL

New Boston is located on the western edge of Mercer County and the state of Illinois. It sits on the east bank of the Mississippi River, at the mouth of Boston Bay and its inflow, Eliza Creek. Across the river is the state of Iowa and the mouth of the Iowa River,[4] while 5 miles (8 km) upstream on the Mississippi is Lock and Dam No. 17.

Much of the natural area surrounding New Boston is part of the Port Louisa National Wildlife Refuge. The river valley at New Boston is surrounded on both sides by gently rolling bluffs interspersed with rich parcels of wetlands that provide critical wildlife habitat, especially for migratory birds

https://en.wikipedia.org/wiki/New_Boston,_Illinois#cite_note-5

Louisa Division is bordered to the south by Lake Odessa State Wildlife Management Area (WMA), managed by the Iowa Department of Natural Resources. Primary management on this area is for migratory waterfowl and fisheries. Lake Odessa and the Louisa Division share recently constructed water control structures at the north end (inlet from the river) of the Louisa Division, and south end of Lake Odessa (outlet). Water travels via gravity-flow through the inlet structure and is diverted into Louisa Division or sent on to Lake Odessa. The Refuge and Lake Odessa Unit coordinate water delivery to satisfy both management objectives. Both entities often need flow at the same time.

Louisa Division is a migratory bird sanctuary from September 15 until January 31 and is closed to public entry. No hunting is permitted on the division, however the adjacent Lake Odessa area is popular with hunters. A concrete boat ramp provides river access from the northern boundary of the Louisa Division. An accessible fishing pier allows anglers to cast their lines into the diversion ditch leading to Lake Odessa. Archived page: http://www.fws.gov/midwest/PortLouisa/louisa.html

May 16, 2026: https://www.fws.gov/refuge/port-louisa

The 24,149 acre Port Louisa National Wildlife Refuge was established for the protection of migratory birds and other wildlife. It is located in Iowa and Illinois along the Mississippi River Flyway, one of the major routes for migrating waterfowl. Each year in the spring and fall hundreds, if not thousands, of geese and ducks utilize the refuge to rest and refuel on their migration. Common species include Canada geese, mallards, trumpeter swans, wood ducks, blue and green-winged teals, northern shovelers, hooded mergansers and other waterfowl. The river floodplains are important sites not only for migrating birds but year-round residents as well.

This special place is home to more than 270 species of birds, 35 species of amphibians, 60 species of reptiles, 100 species of fishes, 50 species of mammals and hundreds, if not thousands, of species of plants, fungi and insects.

From Friends of Port Louisa National Wildlife Refuge:

Port Louisa National Wildlife Refuge is divided into four distinct divisions and is also a part of the Iowa River Corridor Project.

Louisa Division: The 2,609-acre Louisa Division is located just east of Wapello, Iowa in Louisa County. It is protected from moderate flooding by an Army Corps of Engineers levee stretching to Lock and Dam 17, approximately one mile south of the division border. The levee is integral to maintaining the nine-foot navigation channel due to its proximity to the dam. The Port Louisa Refuge headquarters is located on this division in an area that includes 48 acres of forest and a four-acre prairie restoration situated on a bluff overlooking the Mississippi River floodplain. Providing habitat for migrating waterfowl has been the primary objective on Louisa since its conversion from an agricultural levee district to a national wildlife refuge in the 1940's.

Keithsburg Division: The 1,400-acre Keithsburg Division is located in Mercer County, Illinois. The entire division lies within Pool 18, immediately north of Keithsburg, Illinois. Keithsburg Division averages 0.75 mile in width and has a three mile long levee separating it from the Mississippi River. The Division is a mosaic of wetland and bottomland forest habitat including sloughs surrounded by bottomland timber stands. The forested stands suffered from the Flood of 1993 and 2008, and many snags now exist. Dead and dying trees are used by woodpeckers, wood ducks, hooded mergansers and prothonotary warblers. Bald eagles also use the area for nesting.

Big Timber Division: The 1,758-acre Big Timber Division is located two miles south of Muscatine, Iowa, in Pool 17. The division is comprised of a 1,252-acre backwater area, as well as Turkey Island, Turkey Towhead, Otter Island, and Ramsey Island. The bulk of Big Timber Division is a backwater of the Mississippi river, consisting of sloughs surrounded by bottomland forests.

Horseshoe Bend Division: Horseshoe Bend Division is located in the Iowa River floodplain, Louisa County, Iowa, approximately four miles upstream from its confluence with the Mississippi River. The 2,606-acre tract was purchased fee title by the Service in response to the Flood of 1993. Horseshoe Bend is a unique mosaic of grassland, wet meadow, seasonal and semi-permanently flood emergent wetland habitat. The wetland complex provides flood storage, fish passage, and fish spawning. The unit receives considerable migratory bird usage, including shorebirds, waterfowl, wading birds and grassland bird species.

Iowa River Corridor Project: The Iowa River Corridor Project is an innovative floodplain management focus area that encompasses 50,000 acres of land stretching along 45 miles of river in Tama, Benton and Iowa counties. Within the project area, the U.S. Fish and Wildlife Service owns about 10,000 acres which are part of Port Louisa National Wildlife Refuge. These lands are managed by the Iowa Department of Natural Resources through a cooperative agreement with the Service. Most of the refuge land has reverted from cropland back to its former habitat of wet meadow, oxbow wetlands, grassland, and bottomland forest with a mixture of scrub/shrub openings.

https://portlouisafriends.org/about-the-refuge/



Appendix E – Muscatine Louisa Levee 2025

Corps Activates Emergency Operations Center for Muscatine Island Levee System

By James Finn September 23, 2025 Aerial View of Muscatine Pump Station

Citation, Entire Article: (Finn, 2025)



A view of the completed installation of emergency backup pumps and piping at the Muscatine Island Levee District-Louisa County Drainage District No. 13 Segment of the Muscatine, Iowa, Flood Risk Management System. (Photo Credit: James Finn)

The U.S. Army Corps of Engineers, Rock Island District, activated its Emergency Operations Center (EOC) on March 13, to provide supplemental pumping capacity for the Muscatine Island Levee District-Louisa County Drainage District No. 13 Segment of the Muscatine, Iowa, Flood Risk Management System. The activation follows a request from the State of Iowa due to a critical reduction in the levee system's pumping ability.

The system, protecting both urban and agricultural areas along the banks of the Mississippi River, is facing challenges after two pumps failed, leaving it operating at only 30% of its designed capacity. An initial pump failure occurred during the 2024 flood event, with the second pump failing more recently. The system relies entirely on pumping for interior drainage, making the reduced capacity a significant concern.

The Corps is deploying three 18-inch diesel pumps from its National Flood Fight Materiel Center (NFFMC) to supplement operations while the damaged pumps are repaired. This marks the first deployment of these larger pumps since their addition to the Corps' inventory a few years ago.

"While we have extensive experience with smaller pumps, deploying the 18-inch models presents unique challenges," explained Cory Haberman, National Flood Fight Materiel Center Program Manager. "These require substantial coordination for hose and fuel connections – the high-density polyethylene pipe (HDPE) hose needs to be fused on-site – and necessitate the use of heavy equipment like a crane for proper placement."

The decision to deploy three pumps, despite only two being inoperable, stems from capacity limitations within the Corps' inventory. "The two permanent pumps that are currently down provide a combined

capacity of 238,000 cubic feet per second (CFS)," Haberman stated. "Unfortunately, we don't have pumps readily available that can fully replace that. Each of our 18-inch pumps provides up to 9,500 CFS."

He added that the Corps anticipates one of the levee district's pumps will be back online soon, further improving capacity.

Providing this assistance offers several benefits to the Corps. "We own these pumps and maintain them internally, eliminating rental costs," Haberman said. "If a pump malfunctions while deployed, we can quickly mobilize our maintenance personnel to troubleshoot and restore operations." He also highlighted the Corps' ability to provide continued support while the permanent pump is repaired.

While both the Corps and the Muscatine Island Levee District-Louisa County Drainage District will incur costs, Haberman explained the situation is unusual. "This wasn't triggered by riverine flooding, but by the imminent threat of interior flooding due to the reduced pumping capacity. A moderate rainfall event could overwhelm the remaining pumps." He noted there is close collaboration between the Corps and the levee sponsor, as both are contributing labor and equipment.

The pumps are expected to remain onsite until permanent pumping operations are restored through the completion of the PL 84-99 rehabilitation project. During this time, the levee sponsor will be responsible for fueling and operating the pumps.

This deployment also presents a valuable learning opportunity for the Corps. "Since this is our first time deploying the 18-inch pumps and HDPE pipe, we're focused on capturing lessons learned and developing a checklist to streamline future deployments," Haberman said. "We're evaluating optimal pump placement, fueling procedures, hose routing, and discharge locations to ensure efficient and safe operations."

Personnel from Engineering, Operations, and Emergency Management Divisions were onsite to oversee installation and ensure proper anchoring of the hose. The levee sponsor's support has been crucial throughout the process.

"This is a coordinated effort, and we're committed to supporting the levee district in mitigating this risk," Haberman concluded. "We've also included temporary pumping in the cost estimate for the PL 84-99 rehabilitation project, as a Phase 2 option, in case we need to rent larger pumps for additional support."

Appendix F – Public Survey Instrument

Louisa County Hazard Mitigation Planning 2026

Public Opinion Survey

It is time to update the Louisa County Hazard Mitigation Plan!

We would like to hear your thoughts about the common hazards that can affect our community:

Natural Hazards	Other Hazards
Drought	Animal, crop or plant disease
Expansive soils	Dam or Levee failure
Extreme heat	Human disease epidemic
Flood (River, Stormwater)	Infrastructure failure
Severe storms (Hail, High Wind, Lightning)	Hazardous materials incident
Tornado	Terrorism (including school)
Wildfire	Transportation
Winter weather	Other: _____

What hazards affect your community most often? (Most frequent)

#1
#2
#3
#4

What Hazards are you most concerned about? (Most dangerous)

#1
#2
#3
#4

Return survey to your local city hall, or email comments to
Gail Thomas at grthomasplans@gmail.com

Louisa County Hazard Mitigation Planning 2026

When these things happen, what are the most serious effects?

Are some people more at risk?

Are there some places more at risk?

Do you have frequent power outages, and what problems does that cause?

What should be done to reduce the impacts of hazards on your community?

Return survey to your local city hall, or email comments to
Gail Thomas at grthomasplans@gmail.com

The Tally for the public survey is as follows: The top hazard concerns are Stormwater Flooding, Hazardous Materials incidents and School violence. Severe storms were considered the most frequent hazard, Tornadoes and Terrorism (school violence) the most dangerous.

Top 4	
1	Flood: Stormwater
2	Haz Mat incidents
3	Terrorism (school)
4	Severe storms, Tornadoes

The primary public concerns can be grouped under four categories

1. Public safety
2. Protection of property from stormwater drainage issues
3. Protect critical facilities & public infrastructure
4. Community resilience (continuity of government, critical facilities, neighbor support)

Appendix G – Plan Review Worksheets

The following worksheets are used to report and evaluate projects and guide plan revisions.

Hazard Mitigation Planning

Worksheet 1 – Annual Progress Report

To be filled out by Emergency manager and provided to Planning Committee

Date _____

Progress report period from Date: _____ to _____

Which Hazard Mitigation projects were initiated or completed in participating jurisdictions this year? Attach Project Report (Worksheet 2) for each project in the jurisdiction.

Project 1	Community
	Project
	Contact person
	Email or phone
Project 2	Community
	Project
	Contact person
	Email or phone
Project 3	Community
	Project
	Contact person
	Email or phone
Project 4	Community
	Project
	Contact person
	Email or phone

Comments:

Worksheet 2 – Project Report

To be filled out by local official and submitted to EMA when projects are complete

Community name: _____

Contact person: _____ Phone _____ Email _____

Project name: _____

Total project cost: _____

Funding sources: _____

Hazard(s) Mitigated: _____

Project Location and description:

Actual or expected date of completion _____-_

Which of the following Goals does the project support:

Check	Hazard Mitigation Goals	
	Goal 1	Protect the health, safety and quality of life of citizens
	Goal 2	Reduce or eliminate property loss, economic cost, and damage to the natural environment caused by a disaster
	Goal 3	Ensure government operations, response, and recovery are not significantly disrupted by disaster events
	Goal 4	Expand public awareness and support intergovernmental cooperation, coordination and communication to build a more resilient community

Was there public or political support for the project? _____

Was the project successfully completed? _____

Within the proposed budget? _____

Within the proposed timeframe? _____

Please attach any supporting photos or other pertinent information.

Comments:

Worksheet 3 – Risk Assessment

Community preparation for HMP Update 2032

Community name: _____

Contact person: _____ Phone _____ Email _____

Have there been any changes in development in the community since the last HMP Update??

Has the community adopted or updated any plans, codes or regulations?

Which recommended Mitigation Actions have been Implemented?

Has the community been impacted by hazards since the last HM Plan?

Are there new concerns?

Comments:

Worksheet 4 – Process to update the plan

As the five year cycle progresses, the Hazard Mitigation Planning Committee (HMPC) will follow the guidelines below.

Prep for 5 year Update:

Evaluate the Planning Team

Local staffing changes that require a new team member?

Unrepresented stakeholders that should be invited to the team?

Are there ways to gain more diverse and widespread participation?

Are there new or unused methods of funding that we should pursue?

Who will research funding by contacting State Emergency Management, FEMA, DNR, USDA, and other communities that have achieved successful projects?

NAME: _____

Check with all Jurisdictions for changes to Building codes, permits, comp plans, projects planned, completed or underway, school hazard mitigation activities, or other Hazard Mitigation measures taken since the adoption date of last HMP (use and attach worksheets 1 & 2).

Proposed schedule for future updates	Time
Apply for planning funds from the state. Notice of Intent	2 years prior to plan expiration
Evaluate Planning team: see above	14 months prior to Plan expiration
Receive funding award or authorize cost. Planner in place	1 year prior to Plan expiration
Begin Plan update, refresh community information	1 year prior to Plan expiration
Complete the capability assessment for each jurisdiction	11 months prior to plan expiration
Begin data collection and hazard profiles	10 months prior to plan expiration
Initiate public survey for risk assessment	9 months prior to plan expiration
Vulnerability and Impacts for each jurisdiction	8 months prior to plan expiration
Review previous mitigation action plan with each jurisdiction	8 months prior to plan expiration
Record and organize all public and jurisdiction comments	7 months prior to plan expiration
HMPC reviews all data, comments and drafts	6 months prior to plan expiration
Draft new mitigation strategies and action tables	5 months prior to plan expiration
HMPC reviews new action plan	4 months prior to plan expiration
Staff drafts, HMPC reviews maintenance section for update	3 months prior to plan expiration
HMPC approves final draft, county adopts to send to state	60 days prior to plan expiration
Final draft complete, submit to Iowa HSEMD	60 days prior to plan expiration
Receive FEMA approval	30 days prior to plan expiration
All jurisdictions adopt	Prior to previous plan expiration

Appendix H – Adoption Resolutions

Jurisdiction	Date of Adoption
Louisa County	11/11/2026
Columbus City	
Columbus Junction	
Cotter	
Fredonia	
Grandview	
Letts	
Morning Sun	
Oakville	
Wapello	
Columbus Community Schools	
Louisa Muscatine CSD	
Morning Sun CSD	
Wapello CSD	

Appendix I – Compliance, Scoring, Mitigation Actions

There is at least one Mitigation action per hazard for each affected jurisdiction. Actions for preparedness or data deficiency are not included.

One Mitigation Action for each Hazard per affected jurisdiction

County	Action steps	Cities	Action steps
Drought	7,12	Drought	7,12
Flood (River, Flash, Stormwater)	3,4,5,13,16,17,19,25	Flood (River, Flash, Stormwater)	5,13,16,17,19,25
Severe storms (Hail, High wind, Lightning)	1,2,8,9,11,12,18,19,25	Severe storms (Hail, High wind, Lightning)	1,8,9,11,12,18,19,25
Tornado	1,2,8,9,11,12,19,25	Tornado	1,8,9,11,12,19,25
Wildfire	12,14,18,19,25	Wildfire	12,14,18,19,25
Winter Weather	1,2,8,9,12,18,19,25	Winter Weather	1,8,9,12,18,19,25
Dam or Levee Failure	3,4,5,12,13,16,17,25	Dam or Levee Failure	5,12,13,16,17,25
Landslide	5,12,17	Landslide	5,12,17
Animal/Plant/Crop Disease	11,12,18,20	Animal/Plant/Crop Disease	11,12,18,20
Hazardous Materials Incident	6,12,14,19,25	Hazardous Materials Incident	12,14,19,25
Human Disease Epidemic/Pandemic	9,12,19,20,25	Human Disease Epidemic/Pandemic	9,12,19,20,25
Terrorism (cyber security)	12,19,22,24,25	Terrorism (cyber security)	12,19,22,24,25

Columbus Community CSD	
Hazard	**Action Steps**
Flooding – River, Flash, Stormwater	17 (stormwater)
Severe storms: Hail, High winds, Lightning	1,12,22
Tornado	1,12,22
Winter weather	1,12,19,22
Human Disease Pandemic	19,25
Terrorism (Cyber security, School violence)	12,19,22

Louisa Muscatine CSD	
Hazard	**Action Steps**
Severe storms: Hail, High winds, Lightning	1,12,22
Tornado	1,12,22
Winter weather	1,12,19,22
Human Disease Pandemic	19,25
Terrorism (Cyber security, School violence)	12,19,22

Morning Sun CSD	
Hazard	**Action Steps**
Flooding – River, Flash, Stormwater	17 (stormwater)
Severe storms: Hail, High winds, Lightning	1,12,22
Tornado	1,12,22
Winter weather	1,12,19,22
Human Disease Pandemic	19,25
Terrorism (Cyber security, School violence)	12,19,22

Wapello CSD	
Hazard	**Action Steps**
Flooding – River, Flash, Stormwater	13,25
Severe storms: Hail, High winds, Lightning	1,12,22
Tornado	1,12,22
Winter weather	1,12,19,22
Levee failure	12,13,25
Human Disease Pandemic	19,25
Terrorism (Cyber security, School violence)	12,19,22

Scoring Table

Scoring								
item	Activity	STAPLEE score		Cost benefit	Local Emphasis	TOTAL	Priority group	Supports Goals
Action 1	Purchase and install backup generators for criti	STAE	4	4	2	10	A	1,3
Action 2	Facilitate the funding, installation and improver	STAPLE	6	5	2	13	A	1,3
Action 3	Construct retention ponds in the Iowa River bas	TAPLEnv	5	1	1	7	B	2,4
Action 4	Construct retention basins and apply stormwate	TAPLEnv	5	1	1	7	B	2,4
Action 5	Flood-proof Infrastructure & critical facilities	TAPLEE	6	2	1	9	B	1,2,3
Action 6	Improve safety where railroads intersect with ci	STAPL	5	5	1	11	A	1,2,4
Action 7	Ensure water supply networks have sufficient re	TAEEnv	4	1	1	6	B	1,2
Action 8	Encourage utility companies to increase the per	TAE	4	1	1	6	B	1,2,3
Action 9	Develop and implement a Continuity of Governr	STAPLE	6	2	1	9	B	1,3
Action 10	Join the National Flood Insurance Program (NFIF	APLEnv	4	1	0	5	C	2,4
Action 11	Enact and enforce ordinances to minimize the ri	STAPLEnv	6	3	2	11	A	2
Action 12	Establish an annual round of applications to Sta	STAPLEE	7	3	2	12	A	1,2,3,4
Action 13	Updated Floodplain Mapping and Studies	TALEnv	4	3	1	8	B	2
Action 14	Maintain Adequate Emergency Response Perso	STA	3	5	1	9	B	1,4
Action 15	Track occurrence and extent of Wildfires	TA	2	1	1	4	C	2
Action 16	Acquire, elevate or relocate any structures that	STAPLEE	7	1	1	9	B	2
Action 17	Implement best practices for stormwater manag	TAEE	4	1	1	6	B	2
Action 18	Tree maintenance and post storm clean up	STAEE	5	1	1	7	B	2
Action 19	Provide, maintain & upgrade communications s	STAP	4	5	1	10	A	1,2,3,4
Action 20	Maintain Public Health Preparedness and Disea	STAP	4	4	0	8	B	1,3
Action 21	Update current law enforcement and first respo	STAP	4	5	1	10	A	1
Action 22	School Terrorism prevention and response	STAPLE	5	5	1	11	A	1,4
Action 23	Continue practice drills and train firefighters, re	TAP	3	5	1	9	B	1,4
Action 24	Ensure critical services and information is prote	TAP	3	2	1	6	B	1,3,4
Action 25	Conduct hazard education and awareness progr	STAP	4	3	1	8	B	1

Appendix J – Summary Action Plan **See full tables in Section C5-b.**

2026	Louisa County Action Summary	Hazards mitigated	Affected Jurisdictions	Priority
Structure & Infrastructure				
Action 1	Purchase and install backup generators for critical facilities and designated shelters	Severe storms (Hail, High wind, Lightning), Tornado, Winter weather	Louisa County, All Cities. Schools	High
Action 2	Facilitate the funding, installation and improvement of public and private storm shelters and safe rooms	**Severe storms (Hail, High wind,** Lightning),Tornado, Winter weather, Terrorism	Louisa County, Cities of Columbus City, Columbus Junction, Grandview, Letts, Morning Sun, Wapello, Schools	High
Action 3	Construct retention ponds. Iowa River basin in the vicinity of Letts & Short Creek Watershed Columbus Junction	Flood, Dam/Levee Failure	Louisa County EM, City of Letts, Iowa DNR, local landowners	Medium
Action 4	Construct retention basins and apply stormwater management strategies to reduce flooding in and near the County Fairgrounds	Flood, Dam/Levee Failure	Louisa County, Columbus Junction	Medium
Action 5	Flood-proof Infrastructure & critical facilities	Flood, Landslide, Dam/Levee Failure	Louisa County, Columbus Junction, Fredonia, Letts, Morning Sun, Oakville, Wapello	Medium
Action 6	Improve safety where railroads intersect with citites, roads and trails	HazMat Incident, Emergency response	Louisa County, City of Letts	High
Plans & Regulations				
Action 7	Ensure water supply networks have sufficient reserve capacity or develop alternative supply options	Drought	Louisa County, Columbus City, Columbus Junction, Grandview, Letts, Morning Sun, Oakville, Wapello	Medium
Action 8	Encourage utility companies to increase the percentage of cables that are underground	Severe storms (Hail, High wind, Lightning), Tornado, Winter weather	Louisa County, Cities of Columbus City, Columbus Junction, Grandview, Letts, Morning Sun, Wapello, Schools	Medium
Action 9	Develop and implement a Continuity of Government plan	Severe storms (Hail, High wind, Lightning), Tornado, Winter weather, Human disease	Louisa County, All Cities	Medium
Action 10	Join the National Flood Insurance Program (NFIP) and ensure compliance	SFHA Flood	Morning Sun	Low
Action 11	Enact and enforce ordinances to minimize the risks associated with vacant and/or derelict structures	Severe storms (Hail, High wind, Lightning), Tornado, ACP Disease	Louisa County, Cities of Columbus City, Columbus Junction, Grandview, Letts, Morning Sun, Wapello	High
Action 12	Establish an annual round of applications to State agencies to improve access to grant funding and implement those eligible projects to reduce hazard impacts	All hazards	Louisa County, All Cities, Schools	High
Action 13	Updated Floodplain Mapping and Studies	Flood, Dam/Levee Failure	Louisa County, Columbus Junction, Fredonia, Letts, Morning Sun, Oakville, Wapello	Medium
Action 14	Maintain Adequate Emergency Response Personnel	HazMat Incident, Wildfire	Louisa County, All Cities, Schools	Medium
Action 15	Track occurrence and extent of Wildfires	Wildfire	Louisa County, Columbus City, Columbus Junction, Fredonia, Letts, Morning Sun, Oakville, Wapello	Low

Natural Systems				
Action 16	Acquire, elevate or relocate any structures that remain in the SFHA	Flood, Dam/Levee Failure	Louisa County, Columbus Junction, Fredonia, Letts, Morning Sun, Oakville, Wapello	Medium
Action 17	Implement best practices for stormwater management	Flood, Dam/Levee Failure, Landslide	Louisa County, All Cities, Columbus CSD,Morning Sun CSD	Medium
Action 18	Tree maintenance and post storm clean up	High wind, Tornado, Wildfire, Winter storm, ACP Disease	Louisa County, All Cities	Medium
5% Projects				
Action 19	Provide, maintain & upgrade communications systems	Flood, Severe storms (Hail, High wind, Lightning), Tornado, Wildfire, Winter weather, Human disease, HazMat, Terrorism	Louisa County, All Cities, School/Home Broadband access	High
Action 20	Maintain Public Health Preparedness and Disease Surveillance	ACP Disease, Human disease	Louisa County	Medium
Action 21	Update current law enforcement and first responder equipment	HazMat incident, Terrorism	Louisa County, All Cities	High
Action 22	School Terrorism prevention and response	Terrorism	Schools	High
Education & Awareness				
Action 23	Continue practice drills and train firefighters, responders, and community leaders on effective disaster response	Severe storm (Hail, High wind, Lightning), Tornado, Wildfire, Winter weather, Dam/Levee Failure, Human disease, HazMat, Terrorism	Louisa County, Cities	Medium
Action 24	Ensure critical services and information is protected from cyber-attacks; educate local officials about cyber security.	Terrorism	Louisa County, Cities	Medium
Action 25	Conduct hazard education and awareness programs	Flood, Severe storm, Tornado, Wildfire, Winter weather, Dam/Levee failure, HazMat incident, Human disease, Terrorism	Louisa County, specific affected Cities & Schools	Medium

For more information refer to the full tables in Section C5-b.