

2026

MUSCATINE COUNTY MULTI-JURISDICTIONAL HAZARD MITIGATION PLAN

This document was prepared by:



**MUSCATINE COUNTY
MULTI-JURISDICTIONAL
HAZARD MITIGATION PLAN**

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1. INTRODUCTION AND PREREQUISITES

Hazard Mitigation Planning

Hazard mitigation is a sustainable action that reduces or eliminates long-term risk to people and property from future disasters. Planning for hazard mitigation activities reduces loss of life and property by minimizing the impacts of disasters. Participation from local jurisdictions is a crucial part of the planning process in order to identify the most common natural hazards that are likely to impact certain areas and vulnerable groups.

Hazard mitigation plans (HMP) are developed as a prerequisite for securing non-emergency disaster assistance funding through the Federal Emergency Management Agency (FEMA). Plans must meet the requirements of the Disaster Mitigation Act of 2000. Hazard mitigation planning provisions are found in the Code of Federal Regulations, Stafford Act Title 44, Chapter 1, Part 201 (44CFR Part 201).

Local hazard mitigation plans are the foundation of a community's strategy to reduce disaster losses and interrupt the cycle of damage, reconstruction, and repetitive loss. Mitigation planning builds community resilience, which is defined as "*the ability of a community to prepare for and adapt to anticipated hazards and withstand and recover rapidly from disruptions.*" FEMA supports local mitigation planning to achieve the following:

- Foster partnerships among all levels of government
- Develop and strengthen non-governmental and private partnerships
- Promote disaster-resilient and sustainable communities
- Reduce costs associated with disaster response and recovery

The following grant programs require an *approved and adopted* hazard mitigation plan:

- Hazard Mitigation Grant Program (HMGP)
- Public Assistance Grant Program (PA)
- Building Resilient Infrastructure and Communities (BRIC)
- Pre-Disaster Mitigation Grant Program (PDM)
- Fire Management Assistance Grant Program (FMAG)
- Rehabilitation of High Hazard Potential Dam Grant Program (HHPD)

Federal & State Guidance

The process for this plan update began under the guidelines set forth by FEMA in the *Local Mitigation Planning Handbook (June, 2025)*. Local hazard mitigation plans in Iowa must also be reviewed and approved by Iowa Homeland Security and Emergency Management (IHSEM). The *State of Iowa 2023 Hazard Mitigation Plan* was utilized as a reference in assessing risk at the state and county level. This multi-jurisdictional plan presents additional information from national databases and local sources to identify applicable hazards and inform mitigation strategies.

Plan Update and Adoption

Muscatine County's previous plan was adopted in April 2020 and expired in 2025. Muscatine County, through its Emergency Management Commission, served as the lead jurisdiction for the plan update and contracted with Bi-State Regional Commission (Bi-State) to prepare the plan.

Muscatine County adopted the plan on March 9, 2026. A copy of the signed resolution is included in Appendix 1-3.

Approval by FEMA

FEMA's approval pending adoption (APA) by local governing bodies is included in Appendix 1-1. The Local Mitigation Plan Review Tool, which evaluates the components of the plan, is available in Appendix 1-2.

Approval and Adoption by Local Governing Bodies

The incorporated municipalities listed below participated in the planning process and will subsequently adopt the plan. School districts within Muscatine County participating in the plan included Muscatine Community School District (CSD), West Liberty CSD, and Wilton CSD. The Eastern Iowa Community College (EICC) also participated.

See Appendix 1-3 for a copy of the draft resolution that was provided to all participating jurisdictions and school districts.

Participating Jurisdiction	Date of Plan Adoption
Muscatine County	
City of Atalissa	
City of Conesville	
City of Fruitland	
City of Muscatine	
City of Nichols	
City of West Liberty	
City of Wilton	
Eastern Iowa Community College	
Muscatine CSD	

Participating Jurisdiction	Date of Plan Adoption
West Liberty CSD	
Wilton CSD	

The City of Stockton elected not to participate in the plan. The Cities of Durant and Blue Grass reside in Muscatine and Scott Counties and participated in the *Scott County Hazard Mitigation Plan*.

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2. PLAN PROCESS

The *Muscatine County Multi-Jurisdictional Hazard Mitigation Plan* is an updated version of the plan adopted in 2020. The Muscatine County Emergency Management Commission was awarded a grant from FEMA through the Iowa Homeland Security and Emergency Management Agency to fund preparation of the plan. The planning process involved the meeting of a Steering Committee, a Planning Committee, and an Advisory Committee. This process was supplemented with opportunities for public feedback, along with reviewing of existing plans, technical reports, and studies.

Steering Committee

The Steering Committee included staff from the Muscatine County Emergency Management Commission (EMC) and Bi-State Regional Commission (BSRC). Muscatine County EMC served as the lead jurisdiction for the multi-jurisdictional plan process and contracted with BSRC to prepare the plan. Muscatine County EMC works with all jurisdictions in the plan to coordinate emergency management efforts throughout Muscatine County. Muscatine County EMC made initial contact with constituent municipalities and community school districts in the county to invite participation. Each participating jurisdiction designated a point of contact for the planning process.

BSRC provided planning and technical assistance to participating jurisdictions throughout the planning process. BSRC also coordinated meetings, prepared meeting agendas, distributed meeting summaries, conducted research, and drafted the plan document. Steering Committee meetings were held as needed via phone, email, and video to discuss upcoming meetings and overall plan development.

Planning Committee

The core Planning Committee was comprised of officials and staff from seven different municipalities in addition to Muscatine County, the Muscatine CSD, West Liberty CSD, and Eastern Iowa Community College. Participating jurisdictions designated at least one primary contact for all correspondence. This follows the direct representation model as suggested in FEMA guidance for multi-jurisdictional plans. The primary contact(s) for each jurisdiction attended planning meetings and formed the core Planning Committee.

The Planning Committee members carried out the following tasks as a representative for their respective jurisdictions: attended planning meetings, identified critical facilities and vulnerable populations, reviewed hazards, reported on development trends since the prior plan, reviewed relevant local technical and planning reports, reported on progress toward previous mitigation actions, submitted priority mitigation actions, reviewed the plan draft, and adopted the plan pending FEMA's approval.

Steering Committee members worked closely with the Planning Committee to guide decisions about the content of the plan and worked with other community stakeholders to provide updates and determine necessary mitigation actions. Jurisdiction representatives

unable to attend the Planning Committee meetings reviewed materials from the meetings and provided feedback to the Steering Committee outside of meetings. In-person Planning Committee meetings were duplicated at two locations in the county (Cities of West Liberty and Muscatine) to foster greater participation and convenience for committee members. Planning Meeting business was also conducted via email, phone calls, and video calls. Planning Committee documentation is listed in Appendix 2-1.

Advisory Group

In addition to the Planning Committee, a broader list of stakeholders, community groups and agencies were developed using FEMA guidance to solicit additional participation and provide valuable expertise to the planning process. Representatives were invited to participate in the planning process in an advisory capacity. The Advisory Group served as a resource in their respective areas of interest and provided an additional layer of review in development of drafts.

The Cities of Stockton and Durant were included on the Advisory Group as neighboring communities, since they were not actively participating in the plan process. School districts not participating in the plan, but offering input where requested, were also included in the Advisory Group. A copy of the invitation letter and list of agencies contacted is included as Appendix 2-1. Media contacts were included in the Advisory Group invitation, which provided another opportunity for public information and participation.

Public Participation

All scheduled meetings were open to the public, and participating jurisdictions were encouraged to invite discussion about the planning process during respective council meetings for additional public involvement. Muscatine County used its website to provide information about the planning process, including meeting information and schedules, links to related mitigation information and plan guidance, and draft document sections for review and comment. Participating jurisdictions were encouraged to make use of their own websites to share information. BSRC also posted meeting agendas on its website.

A public hearing was conducted on March 9, 2026 for review of the draft plan prior to adoption by Muscatine County. The draft plan was made available on the BSRC and the Muscatine County websites during the public comment period that began on February 20, 2026. A hard copy was made available at the Muscatine County EMA. Notices were published in the Muscatine Journal, a daily newspaper with countywide circulation. A copy of the notices and certificates of publication are included in Appendix 2-2. Formal comments received at the hearing and any responses are included in Appendix 2-3. Additionally, participating jurisdictions were encouraged to hold and promote their own public meetings, and BSRC staff were made available to facilitate presentations and engage the public. In order to create more opportunities for public participation, the committee utilized Zoom and also duplicated meetings in the eastern and western areas of the county, as described earlier.

Plan Process

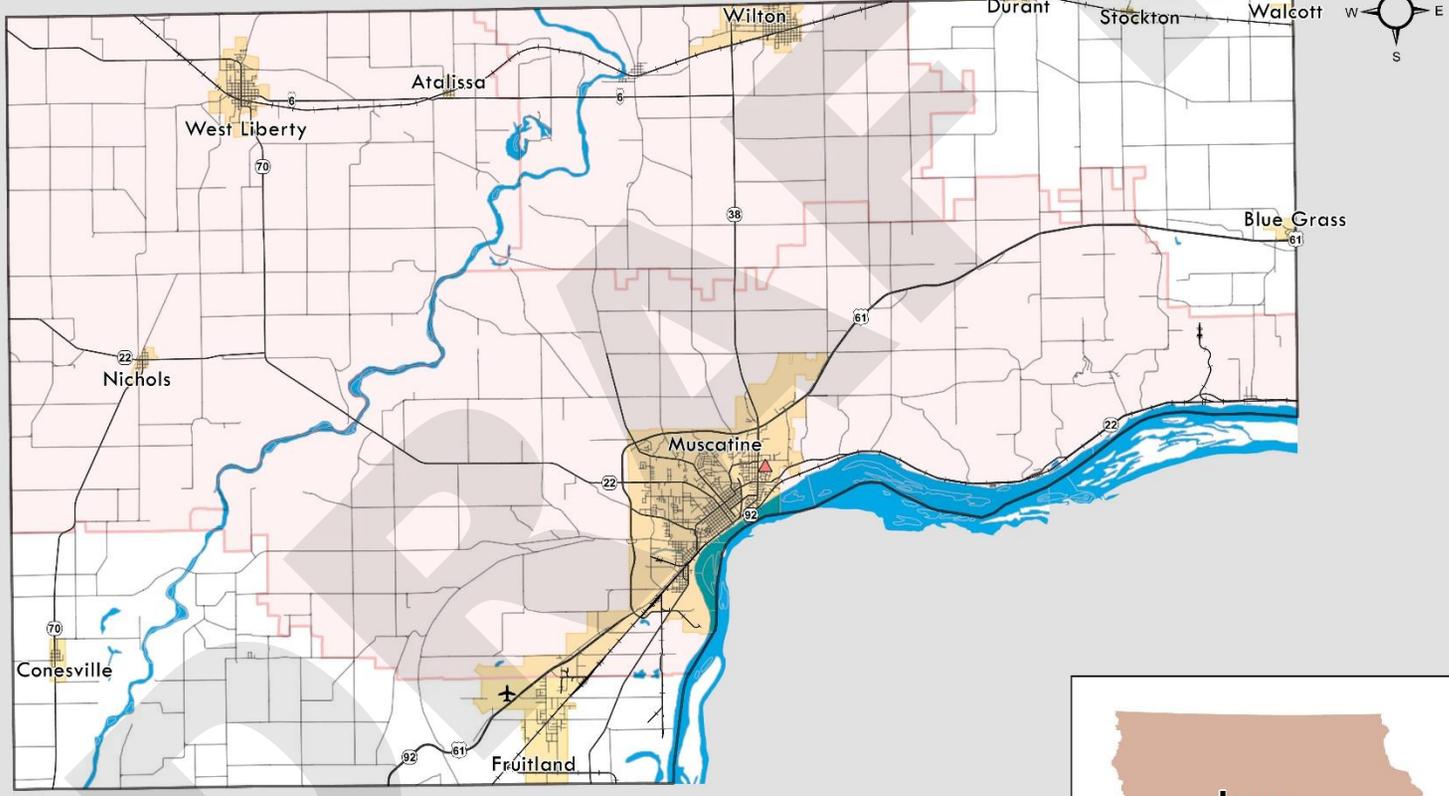
Planning Area and Map

The planning area includes all of Muscatine County with participation of constituent municipalities as described in Chapter 1. A base map of the planning area was developed (Map 2-1) showing jurisdictional boundaries to indicate which are participating in the plan process. The base map includes rivers and water bodies; highways, major roadways, railroads; and streams and creeks. This map was subsequently used to overlay identified hazard areas, vulnerable facilities, and other features with a geographic reference in sections of the plan document that follow.

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Muscatine County Hazard Mitigation Plan Map 2-1: Planning Area

- Participating Communities
- Roads
- Railroad
- Water Features
- Airport
- Muscatine County
- Participating Schools & School Districts**
- Participating Community School Districts (CSD)
- Eastern Iowa Community College



Sources:
 School Districts - Iowa Department of Education (2023-2024)
 Water Features - Bi-State Regional Commission (2019)
 Roads - IA DOT (2019)
 Counties - U.S. Census Bureau (2019)
 Other features - Bi-State Regional Commission

Disclaimer: This map is for reference only. Data provided are derived from multiple sources with varying levels of accuracy. Bi-State Regional Commission disclaims all responsibility for the accuracy or completeness of the data shown hereon.



Incorporation of Existing Plans, Studies, Reports and Technical Information

Many written resources, existing plans, studies, reports, and technical information were reviewed and incorporated into the plan process, as appropriate. This review included references to local codes that intersect with various hazard mitigation strategies, such as building, emergency services, floodplain regulations, and zoning. In addition, technical reports and land-use plans were included in this review, such as comprehensive plans, emergency response plans, and long-range transportation plans. Participating jurisdictions were asked to inventory and review existing planning and technical documents within their own communities that could be incorporated into the plan. Table 2-1 summarizes documents reviewed in this process.

In addition to local documents that supplement this plan, the *2023 Statewide Iowa Hazard Mitigation Plan* served as a valuable reference to inform overall planning efforts and further refine mitigation strategies.

Table 2-1 Record of Review

MUSCATINE COUNTY	
Document	Reference
Muscatine County Code of Ordinances	https://www.muscatinecountyiowa.gov/459/Muscatine-County-Code-of-Ordinances (Floodplain Management / Regulation of Burning / Special Events / Construction / Mobile Home & Trailer Park/ Subdivision / Water Wells / Zoning.
Comprehensive Plan 2025	https://www.muscatinecountyiowa.gov/DocumentCenter/View/10039/Muscatine-County-Comp-Plan-2025?bidId=
Comprehensive Solid Waste Management Plan 2023	https://www.wastecom.com/wp-content/uploads/2024/04/IA-Solid-Waste-Plan-Update-2023-FINAL.pdf
Floodplain Management Ord.	https://www.muscatinecountyiowa.gov/DocumentCenter/View/5762/Ordinance-01-10-22-02-Floodplain-Management
Iowa Region 9 Long Range Transportation Plan	https://bistateonline.org/transportation-and-mobility/iowa-region-9-area/lrtp-region-9
2021 Comprehensive Economic Development Strategy	https://bistateonline.org/documents/economic-development/4050-2021-ceds/file

CITY OF CONESVILLE	
Document	Reference
Code of Ordinances	https://conesville.org/city-services.php
Burn Bans Interactive Map	https://iowa.maps.arcgis.com/apps/dashboards/c22956334fd8435080ed851f549c5263

CITY OF FRUITLAND	
Document	Reference
Code of Ordinances Update 2024	https://fruitlandia.com/city-ordinances/ (Building Code, Community Protection, Railroad Regulation, Fire Protection, Fireworks Ordinance, Mobile Home Regulations, Nuisances, Planning and Zoning, Traffic, Subdivision)

CITY OF MUSCATINE	
Document	Reference
City of Muscatine Municipal Code	https://muscatine.municipalcodeonline.com/book?type=ordinances#name=CHARTER (Title 3 Public Ways and Property, Title 6 Police and Public Safety, Title 7 Vehicles and Traffic, Title 8 Building Regulations, Title 9 Health and Sanitary Regulations, Title 10 Zoning, Title 11 Subdivision Regulations, Title 12 Public Works Improvements, Title 13 Public Utilities, Title 14 Business Regulations, Title 15 Fire Regulations, Title 16 Rental Housing and Property Maintenance)
City of Muscatine Comprehensive Plan 2017 / Make It Muscatine, Comprehensive Plan 2025-2045 (draft not yet available)	https://www.muscatineiowa.gov/DocumentCenter/View/391/comprehensive-plan?bidId= https://www.muscatineiowa.gov/1761/Updating-the-Comprehensive-Plan
Riverfront Strategic Growth Plan 2014	https://www.muscatineiowa.gov/DocumentCenter/View/10735/ Riverfront-Condensed-Plan?bidId=
Riverside Park Master Plan Update 2017	https://www.muscatineiowa.gov/DocumentCenter/View/15537/EJF-1122017-Council-Meeting?bidId=
Capital Improvement Plan 2024-2028	https://www.muscatineiowa.gov/DocumentCenter/View/28287/FY-2024-2028-Capital-Improvement-Plan-PDF?bidId=
Levee Breach Study 2013	https://www.muscatineiowa.gov/745/Levee-Breach-Study
City of Muscatine Disaster Plan	https://muscatineiowa.gov/548/Disaster-Plan
Region 9 Long Range Transportation Plan	https://bistateonline.org/transportation-and-mobility/iowa-region-9-area/lrtp-region-9

CITY OF WEST LIBERTY	
Document	Reference
Code of Ordinances	https://codelibrary.amlegal.com/codes/westlibertyia/latest/westliberty_ia/0-0-0-1 (Title 3 Business Regulations, Title 4 Fire Regulations, Title 5 Police Regulations, Title 6 Health and Sanitation, Title 7 Public Ways and Property, Title 8 Motor Vehicles and Traffic, Title 9 Building Regulations, Title 10 Zoning Regulations, Title 11 Subdivision Regulations).
Comprehensive Plan Update 2016	https://cityofwestlibertyia.org/wp-content/uploads/2018/08/Comprehensive-Plan-Update.pdf
Strategic Planning and Goal Setting	https://cityofwestlibertyia.org/strategic-planning-goal-setting/
Annexation Study	https://cityofwestlibertyia.org/wp-content/uploads/2018/08/Annexation-Study.pdf

CITY OF WILTON	
Document	Reference
Municipal Code	https://library.municode.com/ia/wilton/codes/code_of_ordinances (Title 7 Health & Sanitation, Title 9, Public Peace, Safety and Morals, Title 10 Vehicles and Traffic, Title 11 Streets and Sidewalks, Title 13 Gas Works and Electric Power, Title 13 Water and Cable Television, Title 15 Sewers, Title 16 Buildings and Construction, Title 18, Subdivisions, Title 19 Zoning)
Highway 38 Development Study	https://www.wiltoniowa.org/sites/wiltoniowa.org/files/2021-3/Wilton%20Hwy%2038%20Corridor%20Development%20Study%20Draft%2002082021.pdf
Comprehensive Plan Update	https://www.wiltoniowa.gov/media/2131

3. RISK ASSESSMENT

The Risk Assessment compiles facts considered in identifying the natural hazards impacting the planning area. This chapter provides information in each of the following areas:

- Identification of Hazards
- Community Assets and Vulnerability Assessment
- Development Trends
- Jurisdiction Profiles

Identification of Hazards

Natural hazards are defined by FEMA as “a source of harm or difficulty created by a meteorological, environmental or geological event” (FEMA 2025 Local Mitigation Planning Handbook). Muscatine County is subject to several types of natural hazards, as listed in Table 3-1. For the 2025 plan, the Planning Committee began by reviewing the hazard events previously included in the 2020 plan and collected natural hazard events and hazardous spills from the intervening years. Finding no changes in natural hazard risks, the planning committee elected to use the list of 16 “Natural Hazards” and 1 “Human-Caused Hazard” for Muscatine County. These hazards are listed in Table 3-1 and profiled in further detail in the next section.

Table 3-1 Comparison of Potential Natural Hazards

FEMA Identified Natural Hazards	STATE OF IOWA Identified Natural Hazards 2023	MUSCATINE COUNTY Identified Natural Hazards 2025
Avalanche	—	—
Coastal Erosion	—	—
Coastal Storm	—	—
Dam Failure	Dam/Levee Failure	Dam Failure
Drought	Drought	Drought
Earthquake	Earthquake	Earthquake
Expansive Soils	Expansive Soils	Expansive Soils
Extreme Heat	Excessive Heat	Extreme Heat
Flood	Flooding (Flash)	Flash Flood
--	Flooding (River)	River Flooding
Hailstorm	Hail and Lightning	Hailstorm, Thunderstorm, Lightning
Hurricane	—	—
Land Subsidence	Sink holes	Land Subsidence, Sinkholes,
Landslide	Landslide	Landslide
Severe Winter Storm	Severe Winter Storms	Severe Winter Storm
Tornado	Tornado	Tornado
Tsunami	—	—
Volcano	—	—
Wildfire	Wildland or Grass Fire	Wildland or Grass Fire
Windstorm	Windstorm	Windstorm

While not a natural hazard, the committee decided to include Hazardous Materials incident in the plan update due to its potential to impact the natural area, the prevalence of manufacturing, and increase in rail traffic.

Prioritizing Hazards

The Planning Committee used multiple tools to understand the significance of natural hazards that impact their community. These included a review of FEMA’s Natural Risk Index that provided an overview of risk for the entire county and prioritizing of hazards by participating jurisdictions.

FEMA Natural Risk Index: To evaluate the potential severity of identified hazards, the Planning Committee was presented with data collected from FEMA’s Natural Risk Index for Muscatine County. In addition to the FEMA Natural Risk Index, data on hazardous events occurring since 2020 and local supplemental information was gathered and presented to the committee. This data was used to update and refine the hazard profiles and was presented to the planning and advisory committee.

Prioritizing High/Med/Low/NA Hazards: After a review of the hazard profiles, participating jurisdictions were asked to prioritize each hazard relative to its impact on their community. Each hazard was assigned a priority, as described below. If a particular hazard did not impact their jurisdiction, communities indicated it was not applicable in their ratings. Hazards identified by participating Community School Districts (CSD) aligned with their participating governmental jurisdiction.

PRIORITY	DESCRIPTION
High	These hazards have a higher likelihood of occurrence and unacceptable consequences. They are candidates for immediate focus in mitigation planning and for eliminating unacceptable risk factors.
Medium	These hazards should be addressed, but have a lower priority or are longer term in focus. Emphasis is on risk reduction.
Low	These hazards have a less significant level of risk, for which baseline protection is adequate, or that are considered to be largely beyond the scope of local mitigation efforts.
NA	These hazards do not apply or do not impact the jurisdiction.

There were few changes in prioritizing hazards from the 2020 to the 2025 plan. Levee failure was moved from a high to a medium hazard. Hazardous material incident was moved from a medium to a high priority. Hazard priorities are listed following, with any changes from the 2020 to 2025 plan noted.

High priority hazards for 2025 include tornado; thunderstorm, lightning, and hailstorms; windstorms; grass and wildland fires; flash flood; and hazardous materials. Levee failure was identified as high priority in the 2020 plan. However, this hazard was moved from a high to medium priority, due to the recent completion of the Muscatine Island Levee Improvement project that strengthened and raised the levee by three feet. Hazardous

materials incident was moved from a medium priority in 2020 to a high priority in the 2025 plan. While not a natural hazard, the planning committee felt it was important to identify preparedness and mitigation actions due to the absence of other community wide plans that document mitigation actions for this hazard.

Medium priority hazards for 2025 were identified as severe winter storms, drought, grass and wildland fire, extreme heat, levee failure, and river flood. While data from individual jurisdiction ranking indicates severe winter storms should be a higher priority, the Planning Committee kept this as a medium priority hazard as impacts of such events were not of the same magnitude as tornadoes or flooding events. Similarly, grass and wild-land fires were designated as Medium Priority hazards despite a higher combined ranking, on the basis that such events are more likely to occur within the rural parts of the county and be quickly contained, impact a comparatively smaller proportion of the population within Muscatine County, and are likely to be of a short duration.

Low priority hazards for 2025 did not change and included earthquake, sinkholes and land subsidence, dam failure, landslides, and expansive soils. Low priority hazards did not change from 2020 to 2025.

Table 3-2 Muscatine County Hazard Priorities

Priority	2020 Plan	2025 Plan
High	<ul style="list-style-type: none"> • Tornado • Thunderstorm, Lighting, Hailstorm • Flash Flood • Levee Failure • Windstorm 	<ul style="list-style-type: none"> • Tornado • Thunderstorm, Lightning Hailstorm • Flash Flood • Windstorm • Hazardous Materials
Medium	<ul style="list-style-type: none"> • Grass and Wildland Fire • Flash Flood • Extreme Heat • Drought • River Flood • Levee Failure • Severe Winter Storm 	<ul style="list-style-type: none"> • Grass and Wildland Fire • Extreme Heat • Drought • River Flood • Levee Failure • Severe Winter Storms
Low	<ul style="list-style-type: none"> • Earthquake • Sinkholes and Land Subsidence • Dam Failure • Landslide • Expansive Soils 	<ul style="list-style-type: none"> • Earthquake • Sinkholes and Land Subsidence • Dam Failure • Landslide • Expansive Soils

The Planning Committee agreed to focus on High Priority hazards while developing the mitigation strategy for the countywide planning area, since High Priority hazards pose the greatest immediate threat to the planning area. However, individual participating jurisdictions may have scored the hazards differently from the planning area based on local knowledge of community characteristics and vulnerabilities. Grass and wildland fires

are generally of more concern to the rural communities surrounded by more open land than the larger metropolitan area of Muscatine, for example. Where applicable, such considerations are noted in the “Multi-Jurisdictional Assessment” section.

Hazard priorities are noted in each jurisdiction profile, and the resulting countywide priorities are summarized below. Priorities were assigned a number (High = 3; Medium = 2; Low = 1; NA =0) to arrive at an overall value that aided in assessing the county priorities.

Table 3-3 Countywide and Individual Jurisdiction Priorities

Countywide Priority		Atalissa	Conesville	Fruitland	Muscatine	Nichols	Muscatine County	West Liberty	Wilton	TOTAL	AVG
HIGH	Tornado	3	3	3	3	2	3	3	3	23	2.875
HIGH	Thunderstorm, Hailstorm, and Lightning	3	2	2	1	3	2	3	3	19	2.375
HIGH	Windstorm	2	3	1	2	3	2	3	3	19	2.375
HIGH	Flash Flood	3	0	1	2	2	1	3	1	13	1.625
HIGH	Hazardous Materials	1	1	3	2	3	1	3	2	16	2
MED	Severe Winter Storm	2	2	1	1	3	2	3	3	17	2.125
MED	Grass & Wildland Fire	1	2	1	1	3	2	2	2	14	1.75
MED	Extreme Heat	2	1	1	1	2	1	2	2	12	1.5
MED	Drought	0	2	2	1	2	1	2	2	12	1.5
MED	River Flood	1	0	3	1	1	2	3	0	11	1.375
MED	Levee Failure	0	0	3	3	2	2	1	0	11	1.375
LOW	Earthquake	0	1	1	1	2	1	1	1	8	1
LOW	Sinkholes & Land Subsidence	1	1	1	1	1	1	1	1	8	1
LOW	Dam Failure	0	0	2	0	1	1	1	0	5	0.625
LOW	Landslide	0	0	1	1	1	1	1	0	5	0.625
LOW	Expansive Soils	0	0	1	1	1	1	1	0	5	0.625

Profiling Hazards

The format of this document reflects the 2020 Muscatine County Hazard Mitigation Plan, with guidance from the FEMA 2025 Hazard Mitigation Planning Guide (June 2025). Each hazard as identified by the planning committee includes a narrative description of the categories as noted below.

General Description	Definition of the hazard and general description
Previous Occurrence	Listing and narrative of previous events
Probability	The likelihood of future events.
Extent	The magnitude, severity and duration of the event
Warning Time/Duration	Length of time to prepare in response to a natural hazard and how long the hazard may last.
Location/Vulnerability	The geographic area(s) affected by the hazard and a summary of vulnerable assets or groups

The hazard profiles are provided for the entire Muscatine County planning area, though certain hazards (such as levee failure) will impact some jurisdictions more directly than others. As part of the multi-jurisdictional participation of this plan, additions or exceptions from the planning area are noted and are also highlighted in each jurisdiction's community profile.

Dam Failure

General Description. A dam is a barrier constructed across a watercourse in order to store, control, or divert water. Dams are constructed for a variety of uses, including flood control, erosion control, water supply impoundment, hydroelectric power generation, and recreation. Dams are usually constructed of earth, rock, concrete, or mine tailings. The water impounded behind a dam is referred to as the reservoir and is measured in acre-feet, with one acre-foot being the volume of water that covers one acre of land to a depth of one foot. Due to topography, even a small dam may have a reservoir containing many acre-feet of water.

A dam failure is a collapse, breach, or other failure that causes downstream flooding. Both overtopping or erosion dam failure result in a high velocity of debris-heavy water that rushes downstream, causing damage within its path. Causes of dam failures include natural events, improper design, poor maintenance, improper operation, or failure of upstream dams. Flooding, earthquakes, blockages, landslides, poor construction, vandalism, or terrorism can also cause dam failures.

The Iowa Department of Natural Resources (IDNR) tracks all dams in the State of Iowa with a height of at least 25 feet or a total storage of at least 50-acre feet of water. The inventory excludes all dams less than 6 feet high regardless of storage capacity and dams less than 15-acre feet of storage regardless of height. In Iowa, the hazard potential of dams is classified according to the downstream damage that could occur if they fail. The Iowa Department of Natural Resources defines hazard classifications as high hazard, moderate hazard, and low hazard.

Table 3-4 Iowa DNR Dam Hazard Classifications

High Hazard	Located in an area where failure may create a serious threat causing loss of human life.
Moderate (Significant) Hazard	Located in an area where failure may damage isolated homes or cabins, industrial or commercial buildings, or moderately traveled roads or railroads. Failure may also interrupt major utility services without substantial risk of loss of human life. Structures where the dam and its impoundment are of public importance, such as dams associated with public water supply systems, industrial water supply, public recreation, or dams that serve as an integral feature of a private development complex are also classified as a moderate hazard dam.
Low Hazard	Located in an area where damages from a failure would be limited to loss of the dam, livestock, farm outbuildings, agricultural lands, and lesser-used roads; locations where loss of human life is considered unlikely.

Dam locations in Muscatine County appear in Map 3-1. Of the 15 dams identified by IDNR and USACE in Muscatine County:

- No dams are classified as **High Hazard** in the planning area.

- Six dams are identified as **Moderate/Significant Hazard**. One of these includes the U.S. Army Corps of Engineers (USACE) Lock and Dam #16, which is listed on the National Inventory of Dams. USACE Lock and Dam #16 is a roller dam where rollers are raised or lowered to maintain the river water needed for navigation. Generally, the flood wave caused by a catastrophic breach of a navigation dam would be contained in the existing floodway channel.
- Nine dams are listed as **Low Hazard**. These dams are generally for small and privately-owned ponds used for fishponds or recreation and are located in undeveloped or agricultural areas.

Previous Occurrences. There are no historical incidents of dam failure reported within the planning area, according to the National Performance of Dams Incident database.

Probability. The absence of previous occurrences of dam failure in the planning area make the probability of future occurrence very low. While a dam failure is unlikely, the maintenance of this critical infrastructure is key. Dam failure probability can be further reduced with sound design, quality construction, and continued maintenance and inspection. In Iowa, 41% of dams were more than 50 years old in 2020. Aging dams may be under increased pressure from frequent or extreme precipitation events. This is further discussed in the “Location/Vulnerability” section following. Development of dam failure emergency action plans, for significant hazard dams, is an important consideration to have in place for mitigating this hazard.

Extent. The magnitude and severity of impacts depends in part, on the classification of the dam’s hazard potential as high, moderate, or low potential. Depending on the size and volume of the impoundment as well as the channel characteristics, a flash flood created by a dam failure can travel a significant distance. Operations could be affected by communications loss, critical facility damage/destruction, etc.

The Mississippi River Lock and Dam #16 is operated by the U.S. Army Corp of Engineers (USACE). This structure maintains a nine-foot navigation channel that is critical for transporting commodities. During times of high river levels along the Mississippi River, the U.S. Army Corps of Engineers will temporarily close locks, causing river traffic to come to a halt and impacting operations of commerce and industry.

Warning Time/Duration. A dam failure can be immediate and catastrophic leaving little or no time to warn those downstream of the imminent hazard. Most dams are only inspected periodically, thus allowing problems to go undetected until a failure occurs. With maintenance and monitoring, possible failure points can be identified allowing time for evacuation and securing of the dam. The duration of response to dam failure effects will vary, depending on the classification of the dam.

Location/Vulnerability. People and property along streams and in the floodplain are most vulnerable. In general terms, jurisdictions potentially affected by dam failure are those downstream of the floodplain. Map 3-1 identifies dams in the planning area. As earlier

noted, dams are classified into three categories, based on the potential risk to people and property, should a failure occur. The classification may change over time due to downstream development. Older dams may not have been built to the standards of new classifications. Classifications only consider the potential for death or destruction due to the size of the dam, the size of the impoundment, and the characteristics of the area downstream of the dam.

Since the 2020 Muscatine County Hazard Mitigation Plan was published, the Southlawn Dam was recategorized as a low hazard dam, and Mississippi River Lock & Dam #16 was recategorized as a moderate-significant risk dam.

The IDNR Dam Safety Program Management Tool reports on the condition of high hazard and moderate/significant hazard dams. These periodic inspections consider the “major” dams that include those having a permanent storage volume exceeding 100 acre-feet or a total water storage volume to the top of the dam exceeding 250 acre-feet. Federally owned dams such as USACE Dam #16 are not subject to state regulation, but do undergo inspection. Dams listed in poor condition are considered more likely to fail than dams in satisfactory condition. The following table identifies the most recent assessment of moderate hazard dams in the planning area.

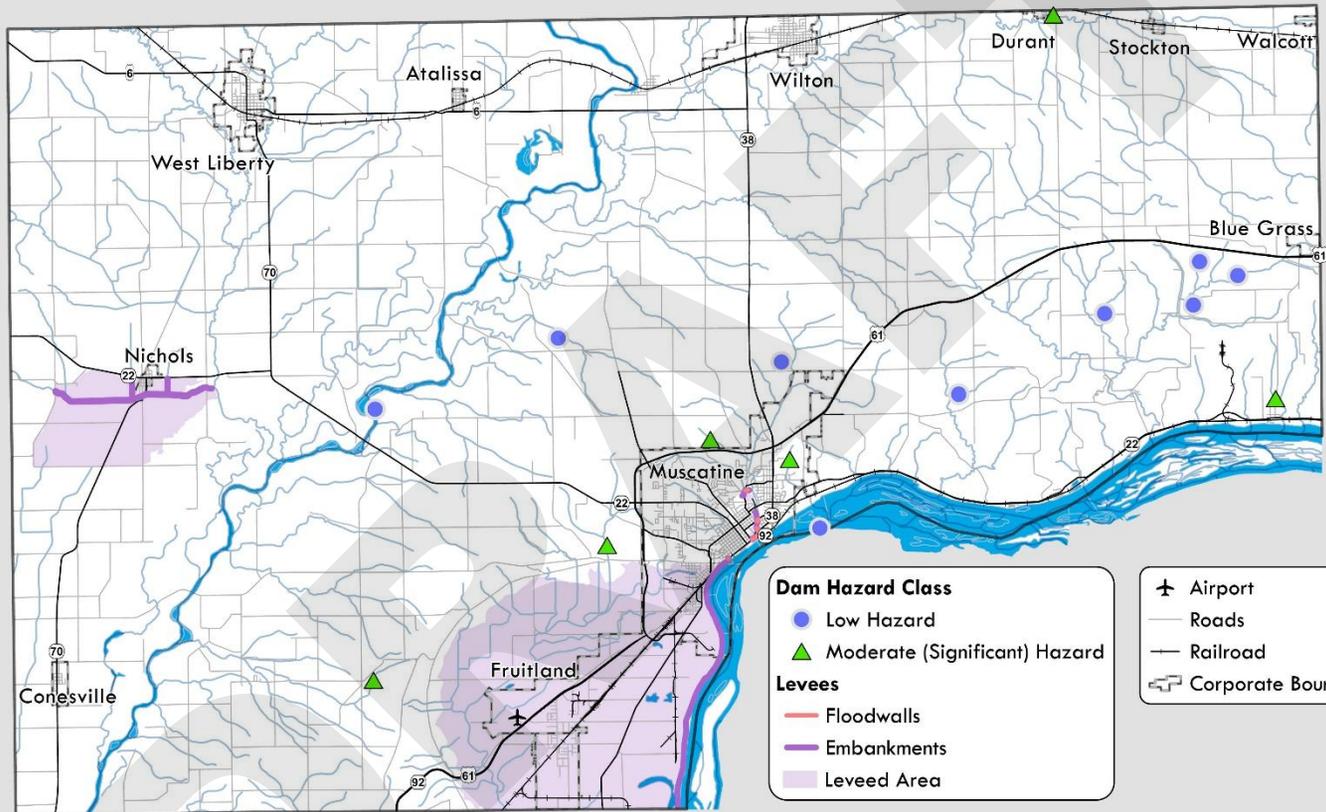
Table 3-5 IOWA DNR Dam Inventory Condition Assessment

Moderate/Significant Dams in Muscatine County	Condition Assessment
HON Dam (City of Muscatine)	Fair
Leutinger-Lowe Watershed Site M-1	Satisfactory
Muscatine County Roadgrade Dam 14-77-1E (Montpelier)	Fair
Muscatine Power & Water Dam	Satisfactory
Whispering Pines Dam	Fair
Mississippi River Lock & Dam No. 16	USACE Inspected*

Sources	
Association of State Dam Safety Officials	Case Study - Lake Delhi Dam Breach - Two Perspectives
Iowa Department of Natural Resources	Dam Safety Program, Jan. 2013
Iowa Department of Natural Resources/Iowa DNR Dam Inventory	https://www.iowadnr.gov/environmental-protection/land-quality/flood-plain-managemenEt/dam-safety
Iowa Flood Center	https://ifis.iowafloodcenter.org/ifis/newmaps/hazard/
Local sources	USACE, Rock Island District
Muscatine County	Muscatine County Multi-Jurisdictional Hazard Mitigation Plan 2015& 2020
State of Iowa	Iowa Hazard Mitigation Plan, 2018, 2023

Muscatine County Hazard Mitigation Plan

Map 3-1: Dams & Levees



Sources:
 Flood Hazards - FEMA (2022)
 Levees - USACE National Levee Database
 Roads - IA DOT (2019)
 Counties - U.S. Census Bureau (2019)
 Other features - Bi-State Regional Commission

Disclaimer: This map is for reference only. Data provided are derived from multiple sources with varying levels of accuracy. Bi-State Regional Commission disclaims all responsibility for the accuracy or completeness of the data shown hereon.



Levee Failure

General Description. The Federal Emergency Management Agency (FEMA) defines a levee as “a manmade structure, usually an earthen embankment, designed and constructed in accordance with sound engineering practices to contain, control, or divert the flow of water in order to reduce the risk from temporary flooding.” Levees and floodwalls are constructed from the earth, compacted soil, or artificial materials, such as concrete or steel. To protect against erosion and scouring, earthen levees can be covered with grass and gravel or hard surfaces like stone, asphalt, or concrete.

Levees reduce the risk of flooding, but do not eliminate the risk. A levee system comprises one or more levee segments and other features that collectively provide flood risk reduction to a defined area. These levee features may consist of embankment sections, floodwall sections, closure structures, pumping stations, and interior drainage works. Highway and railroad embankments or other non-levee features that are integral to the performance of excluding flood water from the leveed area will be considered part of a levee system for evaluation purposes. Embankments that function as levees also exist in water conveyance systems, navigation channels, recreation areas, and habitat restoration projects.

Levees typically function in keeping the leveed area free from inundation. In technical terms, levees can “non-perform” through four principal modes:

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

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

Levees can be described as a Corps levee, an accredited levee, or a certified levee. Non-levee embankments are addressed below.

- **Corps/Accredited/Certified Levees:** these levees include those owned and operated by the U.S. Army Corps of Engineers (USACE) or levees that receive regular inspections under the Levee Safety Program to remain eligible for the PL 84-99 Rehabilitation Program. Levee systems that are accredited meet the design, data, and documentation requirements of 44 CFR 65.110 and can be shown on a Flood Insurance Rate Map as reducing the base flood hazard.

Levees accredited by FEMA can allow for lower insurance rates if the levee is shown to have sufficient capability to resist nonperformance. Levees that have a minimum performance at the 100-year flood flow frequency can be accredited by FEMA.

- **Non-levee embankments** are not inspected or tied to USACE or any other qualified professional.

Previous Occurrences. While the Department of Natural Resources does not keep records of levees and levee failure, there are historical accounts of note:

- **1993:** The Eichelberger Levee failed during the Great Flood of 1993, causing significant damage. However, since it is a private levee, it was not eligible for assistance under U.S. Army Corps of Engineers (USACE) programs.
- **June 22, 2007:** The levee between Nichols and West Liberty topped during a rain event, according to the National Climatic Data Center.
- **June 2008:** Levee District No. 17, which had not been maintained, was overtopped by record-level floodwaters on the Cedar River. This inundated area was mostly farmland.

Probability. The rate of failure of a levee or floodwall is difficult to predict, and sudden failure is a possibility. Proper design and construction can limit the probability of a levee failure. Development in the watershed can raise flood levels and make a levee designed and constructed under previous characteristics inadequate for current runoff conditions. The *2022 Iowa Statewide Levee Districts* study reviewed recent USACE reports of levees listed in the National Levee Database (NLD). The study inspected 89 levee systems and assigned a rating of acceptable, minimally acceptable, and unacceptable. Levees with unacceptable ratings are generally more likely to fail than those rated with unacceptable. Of the levees inspected in Muscatine, one received an unacceptable rating, three had no rating, and one was listed as minimally acceptable. The probability of levee failure is very low, given few historical events and the recent improvements to the existing levee system.

Extent. Levees in Muscatine County that are not rated or are rated as unacceptable protect a combined \$93,362,155 in property value with 446 people at risk. To identify the most vulnerable effects of levee disaster, the *2023 Iowa Hazard Mitigation Plan* reports levees with unacceptable inspections or no recent inspection and considers the estimated value of property value and people protected by these levees. These are identified in the “Location/Vulnerability” section following.

The effects of a levee failure and its association with river flooding are extensive and require substantial response efforts. The breach allows large volumes of water to enter formerly dry areas, forming temporary lakes. Such lakes do not go away immediately because the lake is blocked from returning to the main channel by levee segments that were not destroyed. Consequently, the water level drops along the main river days before it

drops behind breached levees. Often, pumps behind the levees are used to remove floodwaters that breach the levees and alleviates some of the effects. A levee breach or overtopping occurring along one segment may drop the level of water along other segments of the stream. For initial overtopping, the overriding concern is choosing the least hazardous location for initial inundation of the interior. The least hazardous location could be a golf course, an oxbow lake, a ponding area, undeveloped area (such as agricultural land), or a downstream reach.

Warning Time/Duration. The amount of warning time depends on the type of levee failure. Local flood warning systems can help in determining the maximum water surface and the timing of a flood situation. Hours or days of warning may be available for high water that may overtop levees, but this does not provide complete security from a rupture in the levee. A sudden failure of a portion of the levee may send floodwaters gushing within seconds. Normally, occupants of the floodplain can be warned about potential levee breaches or breaks when high water encroaches upon the levee. A failed levee continues to cause damage long after it breaks. In an urban setting, the severity and duration may cause health-related concerns to the public, while the main impact of a levee failure in agricultural areas is economic.

Location/Vulnerability. Muscatine Island is protected from flooding by a 560-foot-high levee system that runs along the bank of the Mississippi River from Muscatine. Recent \$6M improvements to the Levee System in Muscatine significantly reduced the risk of levee failure. A three-mile stretch of the Muscatine Island Levee was raised and strengthened as part of the Muscatine Levee Improvement project. As part of the project, the lowest point in the levee was improved, and a hardening structure at the far end of the levee was created, so that when an overtop situation occurred, it would overflow at the site of the hardening structure and avoid eroding the levee.

The Cedar River also has smaller levees that protect farm land along the banks of the river. Known levees within Muscatine County are listed in the National Levee Database (NLD) and supplemented below, with local information. The performance and condition of each levee is reported below, according to the NLD report. Locations of levees are illustrated in Map 3-1.

The Muscatine Island Levee District 17 and the Muscatine-Louisa County Drainage District No. 13	
Description	This levee system forms a joint drainage and flood control system protecting 26,478 acres of bottomland. The Levee District consists of approximately 14 miles of earthen embankment, mainstem, and tie-back levees. The area is located immediately downstream of the City of Muscatine in Muscatine and Louisa Counties.
Protection	2,230 buildings/4,873 People/\$850M Property/7,949 Acres of Farmland/22 Critical Structures/3 Communities
Performance/Condition	The USACE rated Muscatine Island Levee District as <i>unacceptable</i> in a 2023 report. However, improvements to raise a three-mile stretch of the levee are underway as part of the Muscatine Levee Improvement Project. The Levee Senior Oversight Group (LSOG) considers the risk associated with the Muscatine, Iowa, Muscatine Island Segment (LST# 4825) to be Moderate (LSAC 3) for Breach Prior to Overtopping and low (LSAC 4) for Overtopping with Breach.
Reference	National Levee Database

Hockey's Slough Levee Left Bank C	
Description	1.287 miles of levee along Hockey Slough from its mouth at Wapsipinicon Creek to about 4,500 feet upstream of the City of Nichols
Protection	232 Acres of Farmland/1 Community
Performance/Condition	Not reported
Reference	National Levee Database

Geneva Creek Levee System	
Description	Geneva Creek is about 2.8 miles long, draining an area of approximately 2.9 square miles into Mad Creek.
Protection	14 Buildings/198 People/\$42 Million/1 community
Performance/Condition	The USACE inspection rated Geneva Creek (North) as unacceptable in a 2022 Report of Iowa Statewide Levee Districts. The LSOG classifies the risk associated with Muscatine, IA – Geneva Creek (North) (LST ID 3721) to be Low (LSAC 4) for both prior to overtopping and with overtopping.
Reference	National Levee Database/Iowa Statewide Levee Districts Study

Mad Creek	
Description	0.994 miles constructed in 1982. Federal urban levee at City of Muscatine for Mad Creek and the Mississippi River (Level of Protection 100-500-year flood). The Mad Creek Levee protects against flash floods on Mad Creek that flows south through Muscatine into the Mississippi River, east of downtown Muscatine.
Protection	33 buildings/112 People/\$24 M property
Performance/Condition	The USACE rated Mad Creek Levee (South) as Minimally Acceptable. The LSOG classifies the overall risk associated with Muscatine, IA – Mad Creek (South) (LST ID 3786) to be Low due to high likelihood of inundation with very low average life loss. The embankment and floodwall are expected to perform well under full loading conditions.
Reference	National Levee Database

Other Federal Agricultural/Residential Levees	
Description	<ul style="list-style-type: none"> • Levee between Nichols and West Liberty Muscatine Island Levee District (Agricultural and Residential/Urban) • Eichelberger Levee (Agricultural) • Holcomb Levee (Agricultural) • King Levee (Agricultural)
Protection	These levees provide some protection against floods of less than 10-year frequency.
Performance/Condition	Not reported.

Sources	
State of Iowa	Iowa Hazard Mitigation Plan 2018, 2023
Muscatine County	Muscatine County Multi-Jurisdictional Hazard Mitigation Plan 2010, 2020
City of Muscatine/Corps of Engineers 2013 Levee Breach Study	https://muscatineiowa.gov/745/Levee-Breach-Study
U.S. Army Corps of Engineers (USACE) National Levee Database	https://levees.sec.usace.army.mil/search
Bi-State Regional Commission	Long-Range Flood Recovery Plan for the Bi-State Region: 1994
Iowa Department of Natural Resources	http://www.iowadnr.com
FEMA Flood Insurance Study	Muscatine County Unincorporated, 1986
FEMA Fact Sheet	What Is A Levee? https://www.fema.gov/sites/default/files/2020-08/fema_what-is-a-levee_fact-sheet_0512.pdf
US Army Corps of Engineers – EDA Funded Levee Superiority- Muscatine, IA Funded Hardened Controlled Overtopping Structure	https://bit.ly/4mhzlgc
Iowa Statewide Levee Districts Study 2022	https://www.legis.iowa.gov/docs/publications/DF/1366026.pdf
The Army Corp of Engineers Modeling Urban Levee Study	https://muscatineiowa.gov/DocumentCenter/View/9411/Muscatine-Urban-Levee-modeling-presentation-May-2013-with-USACE-Logo?bidId=
Geohydrology of Muscatine Island	https://pubs.usgs.gov/publication/70168651

Drought

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

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

Unlike other hazards, which are defined by the presence of an event, drought is unique in that it is the absence of an event (precipitation). As such, drought is described as a “creeping phenomenon” with slower impacts than other hazards and with impacts happening on varying timescales. Iowa experiences mainly agricultural and meteorological drought because of low soil moisture or decline in recorded precipitation. Droughts can be spotty or widespread and last from weeks to a period of years.

One measure of the magnitude of drought is provided by the Palmer Drought Severity Index (PDSI), which provides a scale of differences from the standard soil moisture conditions as follows:

Table 3-6 Palmer Drought Severity Index

Index	Definition
4.0 or more	Extremely wet
3.0 to 3.99	Very wet
2.0 to 2.99	Moderately wet
1.0 to 1.99	Slightly wet
0.5 to 0.99	Incipient wet spell
0.49 to -0.49	Near normal
-0.5 to -0.99	Incipient dry spell
-1.0 to -1.99	Mild drought
-2.0 to -2.99	Moderate drought
-3.0 to -3.99	Severe drought
-4.0 or less	Extreme drought

A prolonged drought can have a serious economic impact on a community. Increased demand for water and electricity may result in shortages of resources. Moreover, food shortages may occur if agricultural production is damaged or destroyed by a loss of crops or livestock. While droughts are generally associated with extreme heat, droughts can

occur during cooler months. Drought impacts in Iowa are categorized and described in Table 3-7.

Table 3-7 Drought Impacts in Iowa

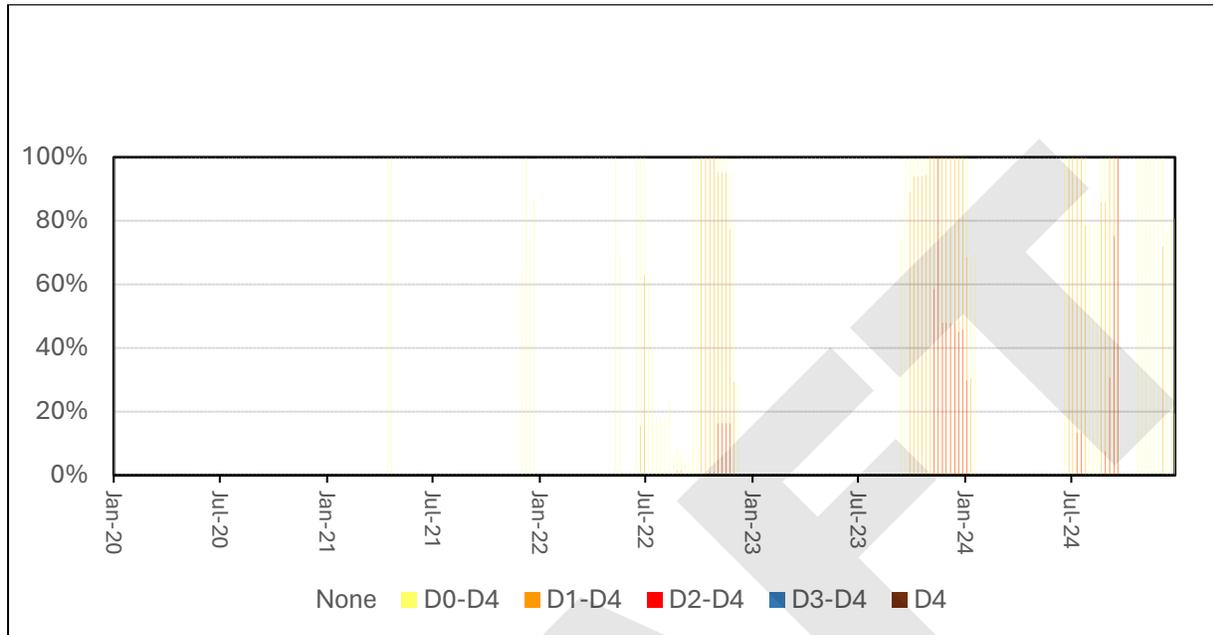
Category	Description
D0	Corn shows drought stress; soil is dry
D1	Soybeans abort pods; corn test weights are struggling
	Grasses are brown; more grass fires occur; burn bans are issued
	Pond levels decline
D2	Dryland corn has extremely low yields; commodity shortages are noted; livestock is stressed
	Fire danger is high
	Fewer mosquitoes are observed
	Surface water levels are low; algae blooms increase; voluntary water conservation is requested
D3	Pastures are dry; producers sell cattle; crops are tested for toxins; crops have pest infestation
	Seasonal allergies are worse; farmers are stressed about high feed prices
	Trees drop leaves; acorns are underdeveloped
	Warm water leads to fish kills; streambeds are low to dry
D4	Row crop yields and forage production have significant impacts
	Extreme measures are taken to conserve water
	Aquatic invertebrates in waterways increase

The National Drought Mitigation Center has a Drought Severity Classification system that considers the Palmer Drought Index, CPC Soil Moisture, USGS Weekly Streamflow, Standardized Precipitation Index and duration of drought. Table 3-8 explains the classification system.

Table 3-8 Drought Severity Classification System

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

Previous Occurrences. From 2015-2019 an abnormally dry period or periods have occurred each year. No drought conditions were reported in 2020, but in subsequent years, drought conditions became more frequent and sustained. Figure 3-1 illustrates the historical drought severity and coverage for the periods of January 2020 through December 2024 in Muscatine County, as reported in the U.S. Drought Monitor.

Figure 3-1 Muscatine County Drought Severity & Percent Coverage 2020-2024

According to the National Centers for Environmental Information and the U.S. Drought Monitor, notable drought periods reported for Muscatine County between 01/01/1995 and 12/31/2024 include:

August 1995: A statewide drought, the dry weather conditions combined with well-above-normal temperatures produced the fourth warmest August in Iowa's history. Yield losses were greatest over southern Iowa where plantings were delayed by excessive spring rainfall. The dry conditions resulted in deterioration of corn and soybean crops.

August 2003: A moderate to severe drought developed in August 2003. According to the Iowa State Climatologist, August 2003 was the driest on record with a statewide average of only 0.96 inches of rainfall (3.23 inches below the normal). These weather conditions placed extreme stress on corn and soybeans, which are in their main development stage of growing in August. Crop yields were reduced by 10% for corn and 30% for soybeans.

July 2005 – March 2006: The drought of 2005-2006 began with below normal precipitation in June 2005, creating an official drought by July 2005. The drought conditions combined with high heat created unfavorable growing conditions for crops. By August 2005, Iowa's governor declared most of eastern Iowa an Agricultural Disaster Area. November 2005 marked the 10th consecutive month with below normal precipitation with the eastern 2/3 of Iowa in the Extreme Drought category. By March 2006, the drought began to shrink in size and scope, and by April 2006, precipitation was near normal. Total precipitation for 2005 was 17.86 inches (normal is 38.04 inches).

Summer 2012 - March 2013: The drought of 2012 was a result of above average temperatures and little to no precipitation. The average precipitation for June 1-August 16 was 5.68 inches, or -5.22 inches from the normal amount (normal is 10.90 inches at the Davenport Station). On August 7, 2012, Muscatine County was listed as a D3–Extreme Drought condition by the National Drought Mitigation Center. By the beginning of 2013, Muscatine County's drought condition had improved. On March 19, 2013, the county was listed as D0–Abnormally Dry conditions.

August 2013 - June 2014: After a wet start to summer 2013, a change in atmospheric conditions lead to less precipitation falling across the region from July through September. This lack of precipitation caused severe drought conditions to develop that were not fully alleviated until the middle of June 2014.

2015-2019: Muscatine County experienced several periods of dry weather during these years. In early July 2016, a period of no rain lead to reports of potential reduction in crop yields and the need to supplement water to livestock. In 2017, it was reported that grass was brown, and temporary burn bans were in place in the county.

December 2021 – Abnormally dry periods ended the year with 87% of the county experiencing dry conditions. Top and sub-soil profiles did not drop below 32 degrees until the end of the month, and the precipitation that did cover the area was able to infiltrate into soil profiles and sustain conditions

October 27, 2022 - December 6, 2022 – October began with 100% of the county experiencing abnormally dry conditions. This progressed to moderate and severe drought conditions that sustained throughout the county until mid-December.

September 5, 2023 – January 23, 2024 – The county entered into drought with 100% of the area experiencing drought conditions that were sustained through the new year. Muscatine was among several counties declared by the USDA as a disaster area due to drought.

June 25, 2024 – September 2024 – Fourteen weeks of abnormally dry and drought conditions covered the county. September 2024 ended as the driest in 152 years of record in the state of Iowa, and 100% of the county experienced abnormally dry to severe drought.

October 2024 – December 2024 – The dry weather conditions continued to close the year with 100% of the county in abnormally dry conditions from October 29 – December 10, 2024.

Probability. Dry periods and drought are part of normal climate fluctuations in Iowa. Climatic variability can bring dry conditions to the region for up to years at a time. According to the National Drought Mitigation Center, periods of severe to extreme drought in the Upper Mississippi Basin occur cyclically, about once every ten years. The 2023 *Iowa Hazard Mitigation Plan* identifies the previous occurrence of droughts by region according

to the U.S. Drought Mitigation Center, with Muscatine County located in Region 3. On any given week, it is estimated that about 5% of this region could be in severe drought or worse. D4 Drought has not been previously reported in Region 3, since the U.S. Drought Monitor (USDM) began in 2000.

Extent. The impacts of drought are mostly economic, primarily in the agricultural sector with additional impacts in the recreational sector and some negative effects on other businesses. The Environmental Working Group's Farm Subsidy Database for 2020-2024 reports disaster subsidies made to Muscatine County totaled \$2,357,835. Disaster payments help communities recoup large losses due to natural causes, such as drought. USDA cause of loss records show that indemnity amounts for crops lost to drought from 2020-2025 in Muscatine County covered 21,789 acres at \$2.5 million.

During prolonged periods of drought, secondary economic impacts may also occur for businesses and communities reliant on spending from the primary affected sectors. Fire suppression can also become a problem due to the possible lack of water.

Farmers are usually the first to feel the effects of drought due to effects on crops and livestock. Farmers also rely on wells for their water supply. Wells are vulnerable to droughts and may cause farmers to have limited water supplies or to dig deeper wells. Public water supplies are typically more robust to the effects of droughts, but are not immune to long-term drought conditions. Health effects would be more significant on livestock and wildlife without auxiliary water supplies. Property losses would be limited to livestock and crops in the agricultural community.

Droughts also have a negative impact on recreational activities including golf courses, parks, wilderness, and surface waters. Wildlife become stressed as vegetation for foraging becomes scarce and deer may die of disease. Fish become stressed, and fish kills may occur on surface waters. Surface water quality may also be reduced.

In addition to the economic impact on businesses related to agriculture and recreation, droughts have historically been difficult for landscaping businesses. Other businesses specialized in sealing and water-proofing roofs and basements may also see fewer clients during droughts due to less immediate need for their services.

Drought is unlikely to have a severe impact on personal health and safety, buildings, infrastructure, and critical facilities considering that the communities in the planning area do not rely on surface waters for their water supplies.

Warning Time/Duration. Drought warnings are directly related to the ability to predict the occurrence of atmospheric conditions that produce the physical aspects of drought, primarily precipitation and temperature. Many variables affect the outcome of climatic interactions. This makes it difficult to predict a drought in advance. In fact, an area may already be in a drought before it is recognized. While the warning of the drought may not come in advance, the secondary effects of a drought may be predicted and forewarned weeks ahead.

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

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

Drought in the U.S. seldom results in loss of life, and more directly affects agricultural crops, livestock, natural vegetation wildlife, and stream flows (fish and aquatic vegetation). Effects are costly economically, environmentally, and socially. Many areas could be affected by drought within Muscatine County.

According to the 2023 *Iowa Hazard Mitigation Plan*, Northeast Iowa is the least drought-vulnerable area in the state; however, it is still subject to the drought impacts. With most of the farmland in the region not irrigated, crops are especially vulnerable. Non-agricultural industry is at an especially high risk to loss.

Sources	
American Red Cross	https://www.redcross.org/get-help/how-to-prepare-for-emergencies/types-of-emergencies/drought.html
Environmental Working Group Farm Subsidy Database	https://farm.ewg.org/
FEMA	http://www.ready.gov/drought
Iowa Department of Agriculture & Land Stewardship/Monthly Weather Summary	Iowa Department of Agriculture & Land Stewardship/Monthly Weather Summary
State of Iowa	<i>Iowa Hazard Mitigation Plan, 2013, 2018, 2023</i>
National Climatic Data Center	http://www.ncdc.noaa.gov/stormevents/
National Drought Mitigation Center - University of Nebraska/Lincoln	http://drought.unl.edu/Home.aspx
National Integrated Drought Information System	http://www.drought.gov
Natural Resources Defense Council	http://www.nrdc.org/water/your-soil-matters/
National Weather Service, Quad Cities	https://www.weather.gov/dvn/
NOAA, NWS Climate Prediction Center	https://www.cpc.ncep.noaa.gov/products/Drought/
U.S. Drought Monitor	http://droughtmonitor.unl.edu/
USDA Farm Service Agency, U.S. Department of Agriculture	https://www.fsa.usda.gov/news-events/news/09-11-2023/usda-designates-21-counties-disaster-areas-due-drought
	USDA Designates 42 Counties as Disaster Areas Due to Drought Farm Service Agency
USDA Cause of Loss Records	https://www.rma.usda.gov/tools-reports/summary-of-business/cause-loss

Earthquake

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

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

Table 3-9 Modified Mercalli Intensity Scale

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

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

Previous Occurrences. According to the State of Iowa Geological Survey, there have been 13 earthquakes in the state between 1867 and 2024, and none have occurred in Muscatine County. The largest earthquake in the State of Iowa occurred in neighboring Scott County in the city of Davenport on November 12, 1934. That earthquake registered as a VI on the Modified Mercalli Intensity Scale.

Muscatine County is likely to experience vibrations from earthquakes with epicenters in Illinois or from the New Madrid seismic zone. The most recent of these occurred April 18, 2008 when a magnitude 5.2 earthquake occurred in the Wabash Valley Seismic Zone, located to the north of the New Madrid seismic zone. The earthquake and subsequent aftershocks were widely felt as a Mercalli Magnitude IV, throughout the central United States, to Illinois and surrounding states to the east.

Probability. Muscatine County is located in seismic risk zone 0, which has very low probability of damaging ground motion. This does not mean that the area is not vulnerable to earthquake effects. Map 3-3 for Iowa indicates a low seismic hazard. Iowa is located in a low-risk zone on the Peak Ground Acceleration (PGA) Map for the New Madrid Fault, meaning there is a low chance of significant ground shaking. The 2% PGA value for Iowa means that ground shaking as illustrated on the map has a 2% chance of being exceeded within the next 50 years. The USGS 2018 Seismic Hazard Map (3-2) for Iowa shows additional detail.

Seismologists attempt to forecast earthquake size and frequency based on data from previous events. In the New Madrid seismic zone, this analysis is difficult because there are few historic moderate-to-large earthquakes. The active faults are too deeply buried to effectively monitor. According to the USGS, the chance of a magnitude 6 or higher earthquake in the next 50 years is 25-40% based on the history of past earthquakes in the New Madrid fault zone. The 2023 *Iowa Hazard Mitigation Plan* analysis estimated the probability of future earthquakes as very low probability.

Extent. Most structures built in Muscatine County and in the State of Iowa are not built to earthquake standards, although the effect of a possible earthquake will most likely be of low intensity resulting in mainly foundational damage. Muscatine County could experience vibrations similar to the passing of a heavy truck—rattling of dishes, creaking of walls, and swinging of suspended objects. Fatalities would be very rare, with likely injuries including falls and injury from unsecured objects. The 2023 *Iowa Hazard Mitigation Plan* ranks Muscatine as number nine out of ten counties most vulnerable to earthquakes, based on Expected Annual Loss (EAL) of \$29,935. The EAL for the State is \$1,024,407 and considers the calculations of exposure, annualized frequency and historic loss ratios.

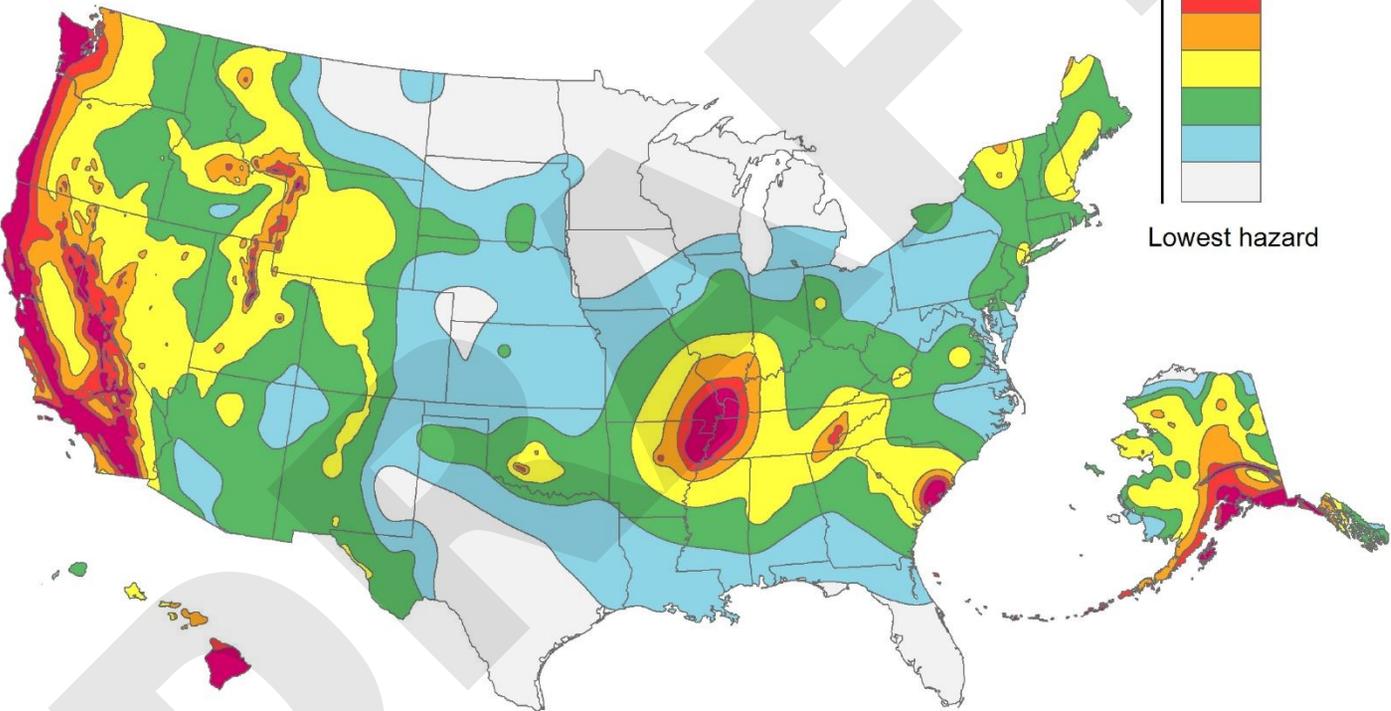
Warning Time/Duration. Earthquake prediction is an inexact science, and even in well-monitored areas with scientific instruments, scientists very rarely predict earthquakes.

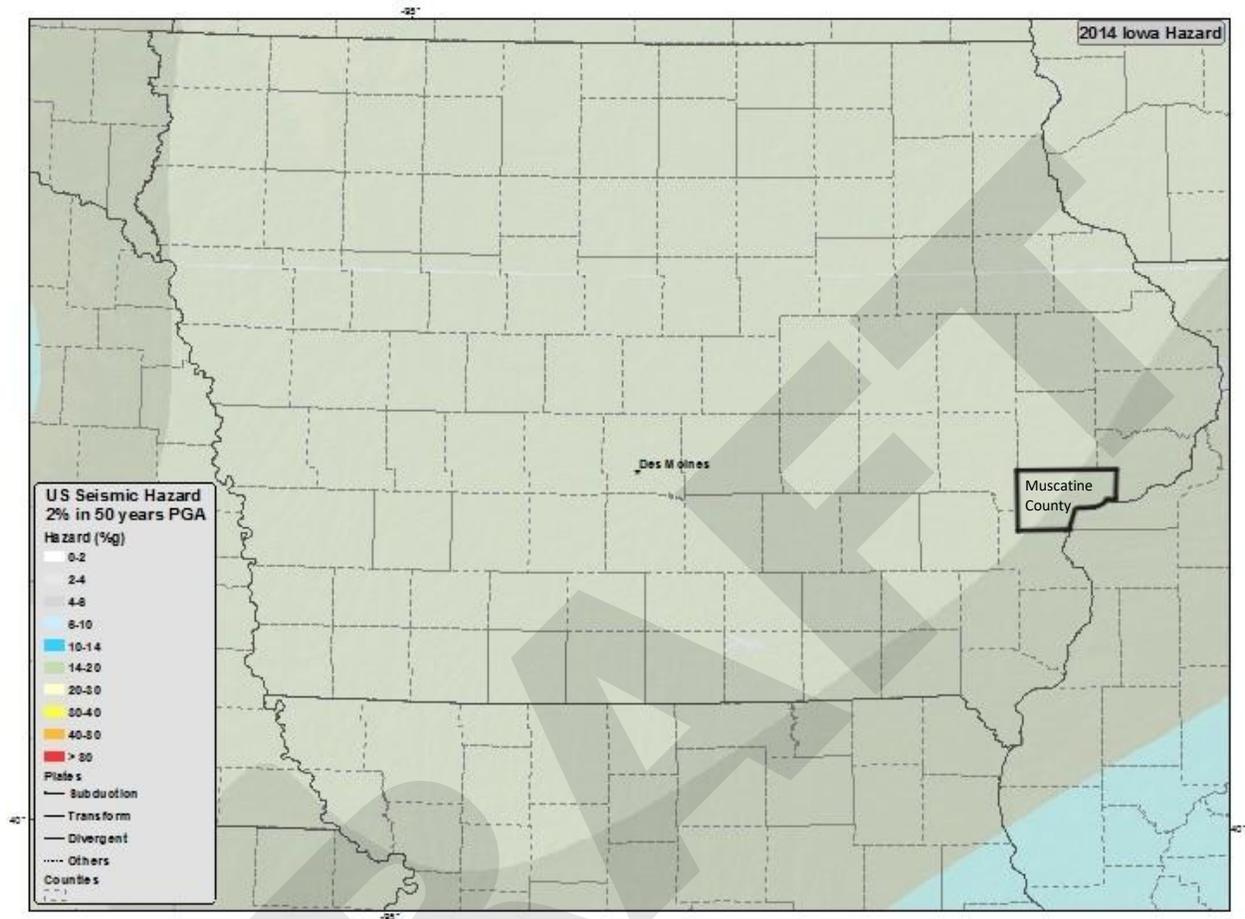
Due to the limited effects to Iowa, response to the occurrence of an earthquake would likely be to support nearby states through mutual aid agreements. In-state response would likely be very limited.

Location/Vulnerability: Given that Muscatine County is in Seismic Risk Zone 0, there is very low probability of damaging ground motion. Most structures in Iowa are not built to earthquake standards, but because of the relatively low magnitude of the possible quake, property damage would likely be minor foundational damage. The most vulnerable structures built on poorly consolidated substrate, particularly floodplain materials.

Sources	
State of Iowa	Iowa Hazard Mitigation Plan, 2018, 2023
Iowa Geological Survey Bureau	https://iowageologicalsurvey.uiowa.edu/iowa-geology/popular-interest/iowa-perspective-earthquakes
U.S. Geological Survey	https://www.usgs.gov/media/images/2018-long-term-national-seismic-hazard-map
U.S. Geological Survey	https://www.usgs.gov/media/images/2014-seismic-hazard-map-iowa

Muscataine County Hazard Mitigation Plan
Map 3-2: USGS National Seismic Hazard Map



Map 3-3 USGS Seismic Hazards - Iowa

Source: USGS 2014 Seismic Hazard Map of state of Iowa.

Expansive Soils

General Description. Expansive soils are soils and soft rock that tend to swell or shrink excessively due to changes in moisture content. Expansive soils contain minerals, such as clays that are capable of absorbing water. When they absorb water, they increase in volume, and the more water they absorb, the more their volume increases. Expansions of ten percent or more are uncommon. This change in volume can exert enough force on a building or other structure to cause damage.

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

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

Probability. When expansive soils are present, they will generally not cause a problem if their water content remains constant. The situation where greatest damage occurs is when there are significant or repeated moisture content changes. The *2023 Iowa Hazard Mitigation Plan* states that occurrence of this hazard is rare and, as consistent with other geologic hazards, occurs slowly over time. While the overall risk of the hazard itself to the planning area is considered low, the probability of expansive soils is likely to occur.

Extent. The American Society of Civil Engineers estimates that half of all homes in United States are built on expansive soils, and half of these will have some damage caused by expansive soils. The group claims that these soils are responsible for more home damage every year than floods, tornados, and hurricanes combined. Effects commonly involve swelling clays beneath areas covered by buildings and slabs of concrete and asphalt, such as those used in construction of highways, walkways, and airport runways. Utilities could be affected because of constant pushing and pulling resulting in cracks, breaks, and severing of underground infrastructure.

Houses and one-story commercial buildings are more apt to be damaged by soil expansion than are multi-story buildings, which usually are heavy enough to counter expansion pressures. Likely damage includes sticking doors, uneven floors, and cracked foundations, floors, walls, ceilings, and windows. Building code requirements may impose undue burden on construction to ensure proper performance of buildings and utilities in areas with expansive soils. Since this is a naturally occurring phenomenon, environmental effects would be limited to spills and leaks of containment facilities. Individual owners of buildings and facilities would feel economic and financial effects. These would occur over time and would not be a one-time impact.

Recent estimates put the annual damage from expansive soils as high as \$7 billion. However, because the hazard develops gradually and seldom presents a threat to life, expansive soils have received limited attention, despite their costly effects. In most cases, individual property owners, local governments, and businesses pay for repairs to damages caused by this hazard.

Warning Time/Duration. This is consistent with other geologic hazards that occur slowly over time. Duration of the impacts caused by expansive soils depends largely on the extent of the damage and when the damage is first noticed. Damage can be mitigated on new construction with proper building techniques for the soil type and moisture level. Damage can be mitigated on existing buildings by incorporating some of the same types of techniques used in new construction. This may take longer and cost more than new construction.

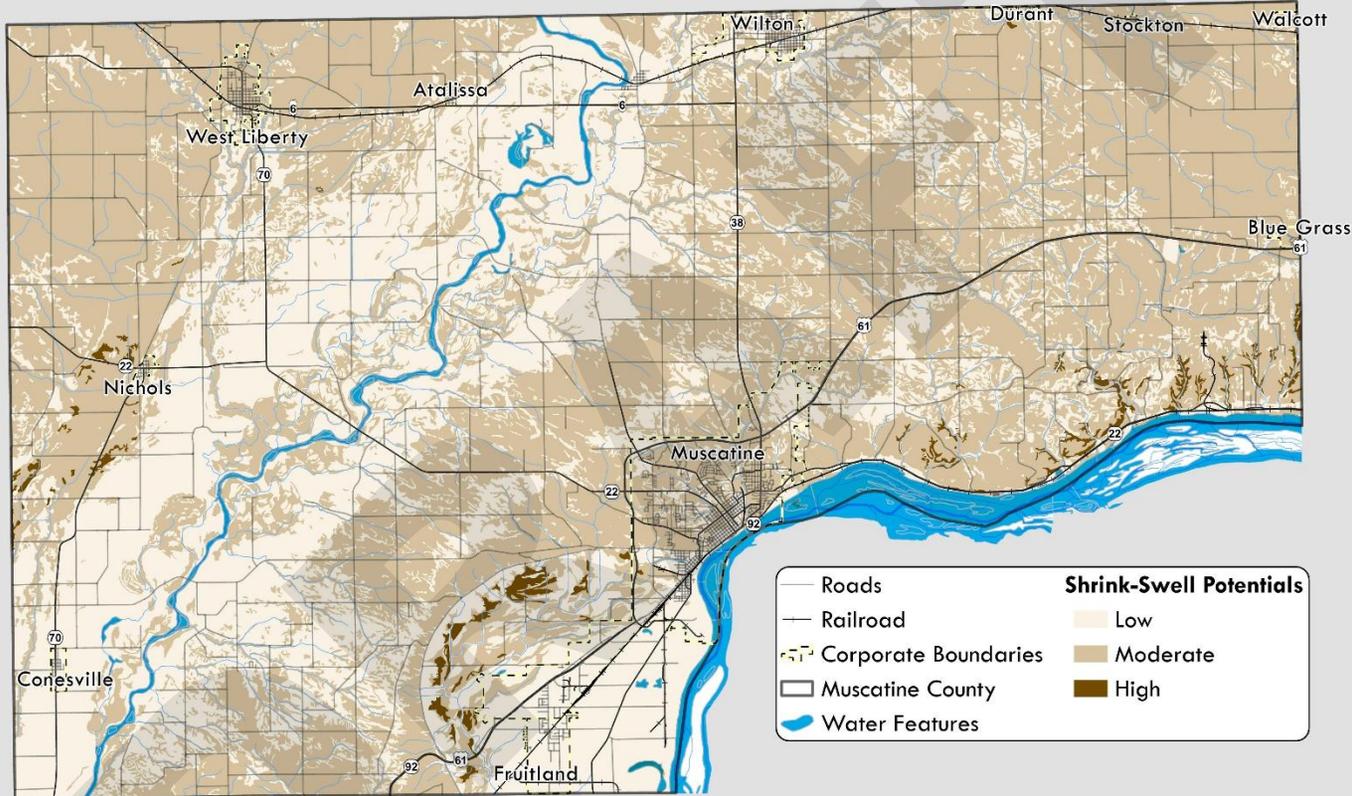
Location/Vulnerability. Generally, the soils that have the higher shrink-swell potential in Muscatine County tend to be located upland of the major river floodplain areas and largely in undeveloped agricultural open space. Map 3-4 was prepared from soil data from the USDA NRCS Soil Data Mart. The map shows soils in Muscatine County with color gradation according to shrink-swell potential. Shrink-swell potentials are determined by the percentage of linear extensibility. Linear extensibility of less than 3% has low potential, and 3% to 6% has moderate potential. These are shown by the lighter colors on the map. A linear extensibility of 6% to 9% has high shrink-swell potential, and the map shows this in the orange and brown colors. Various soils have different degrees of shrink-swell potential dependent on depth, which cannot be shown on a two-dimensional map.

An exception is the area shown in orange, which is in the northwest portion of the Muscatine Island area. In addition, the Wilton area appears to have a concentration of soils with low to high shrink-swell potential. Due to the slow occurrence of this geological hazard, no specific shrink-swell event that caused damage has been documented in Muscatine County; however, it has been noted that expansive soils may be a factor in the damage to roads, underground piping, and conduits that occurs over time.

Sources	
State of Iowa	Iowa Hazard Mitigation Plan, 2018, 2023
Natural Resources Conservation Service (NRCS)	http://soils.usda.gov
NRCS	http://websoilsurvey.nrcs.usda.gov/app
NRCS	Using Soil Survey to Identify Areas with Risks and Hazards to Human Life and Property Expanding - Soils and Shrink-Swell Potential- 2004 By Phil Camp, State Soil Scientist, Arizona, USDA, NRCS
Geology.com	Expansive Soil and Expansive Clay - The hidden force behind basement and foundation problems

Muscatine County Hazard Mitigation Plan

Map 3-4: Expansive Soils



— Roads	Shrink-Swell Potentials
— Railroad	Low
Corporate Boundaries	Moderate
Muscatine County	High
Water Features	



Sources:
 Soil Data - USDA NRCS (2025)
 Roads - IA DOT (2019)
 Counties - U.S. Census Bureau (2019)
 Other features - Bi-State Regional Commission

Disclaimer: This map is for reference only. Data provided are derived from multiple sources with varying levels of accuracy. Bi-State Regional Commission disclaims all responsibility for the accuracy or completeness of the data shown hereon.



Shrink-Swell Potentials are determined by the Linear Extensibility Percent. Linear Extensibility Percent is the linear expression of the volume difference of natural soil fabric at 1/3 - bar or 1/10 - bar water content and oven dryness. The volume change is reported as percent change for the whole soil. (USDA NRCS) Linear Extensibility of less than 3% has low potential, 3%-6% has moderate potential, 6%-9% has high potential. More than 9% has very high potential. Various soils have different potentials dependent upon depth. For more detailed information please refer to the Physical Soil Properties Report for Muscatine County, IA.

Extreme Heat

General Description. Extreme heat occurs when temperatures exceed 10°F above the average high temperature for several days. Heat waves are usually periods above 90°F for three consecutive days. An extreme heat event is characterized as a prolonged period of excessive heat and humidity.

Heat Index. The heat index incorporates both air temperature and relative humidity to show how hot it really feels and the danger of injury under prolonged exposure or strenuous activity. Other variables, such as wind and cloud cover, are not accounted for by the heat index. A windless, clear day with full exposure to the sun can additionally increase the heat a person experiences and the dangers of stress on the body. Urban areas are particularly at risk because of air stagnation and large quantities of heat-absorbing materials, such as streets and buildings.

Heat Advisory. A heat advisory is when an index of 100°F or higher is expected for a period of 8 hours or more. A heat advisory shall be continued through the overnight hours, following a day with excessive heat, if the heat index is not expected to fall below 75°F. A heat advisory can be issued for a heat index less than 100°F when the cumulative effect of successive days of near advisory-level heat leads to potentially life-threatening conditions.

Excessive Heat Warning. An excessive heat warning is when a heat index of 105°F or higher is expected for a period of 3 hours or more. An excessive heat warning shall be continued through the overnight hours, following a day with excessive heat, if the heat index is not expected to fall below 75°F. An excessive heat warning can be issued for a heat index less than 105°F when the cumulative effect of successive days of near warning-level heat leads to life threatening conditions.

Table 3-10 Heat Index Chart

		Air Temperature (°F)															
		80	82	84	86	88	90	92	94	96	98	100	102	104	106	108	110
Relative Humidity (%)	40	80	81	83	85	88	91	94	97	101	105	109	114	119	124	130	136
	45	80	82	84	87	89	93	96	100	104	109	114	119	124	130	137	
	50	81	83	85	88	91	95	99	103	108	113	118	124	131	137		
	55	81	84	86	89	93	97	101	106	112	117	124	130	137			
	60	82	84	88	91	95	100	105	110	116	123	129	137				
	65	82	85	89	93	98	103	108	114	121	128	136					
	70	83	86	90	95	100	105	112	119	126	134						
	75	84	88	92	97	103	109	116	124	132							
	80	84	89	94	100	106	113	121	129								
	85	85	90	96	102	110	117	126	135								
90	86	91	98	105	113	122	131										
95	86	93	100	108	117	127											
100	87	95	103	112	121	132											

Source: NWS, Heat Safety.

Table 3-11 Heat Index Effects on the Body

Classification	Heat Index	Effects on Body
Caution	80-90°F	Fatigue possible with prolonged exposure and/or physical activity
Extreme Caution	90-103°F	Heat stroke, heat cramps, or heat exhaustion possible with prolonged exposure and/or physical activity
Danger	103-124°F	Heat cramps or heat exhaustion likely, and heat stroke possible with prolonged exposure and/or physical activity
Extreme Danger	125+°F	Heat stroke highly likely

Previous Occurrences. Incidents of extreme heat are likely to cover a large area. Urban areas pose additional risks in these occurrences when stagnant atmospheric conditions of the heat wave trap pollutants, adding to the stresses of hot weather.

The following information from the National Centers for Environmental Information (NCEI) and National Weather Service give an indication of the magnitude and variety of such events. There have been five notable excessive heat events in Muscatine County since 1950; however, 1936 is still the all-time warmest July on record with 11 days in a row with temperatures over 100° F and an average monthly temperature of 85.0° F (monthly average for July is 75.4°F, per readings at the Quad Cities International Airport station).

July 1995: This event covered all of Iowa from July 12 through the evening of July 14, causing three fatalities and \$3.8 million in damage. Dew points ranged from the upper 70s to the middle 80s for much of the time, with the highest dew points in the eastern half of the state. High temperatures were between 98° and 108°F, and the highest temperature of 109°F was recorded in Council Bluffs. Most weather stations across the state broke the century record over the two-day period. The three fatalities were reported in Des Moines, Marshalltown, and Burlington. Two of the fatalities were elderly people. The majority of property damage losses were in the form of livestock.

July 1997: Excessive heat indices of 105 to 110 were reached in the eastern half of the state during this event, which lasted through July 27. The highest temperatures were recorded on July 26 when record-setting high minimum temperatures were also experienced. The Quad Cities Bix 7 Run was also on July 26, and the heat caused 12 injuries and 1 fatality. Minimum property damage was experienced in the form of livestock.

July 1999: This event lasted July 19-31. Many heat advisories and warnings were issued for portions of eastern Iowa during this period. Temperatures around 100°F combined with dew points in the 70s produced heat indices of 105° to 125°F. Although no fatalities were reported in Iowa, 19 people in Illinois and 27 people in Missouri died from heat-related factors over this period.

August 2000: No injuries, fatalities, or property damage were reported with this event that spread over middle and eastern Iowa. Temperatures topped out in the lower to

middle 90s. These hot temperatures combined with high humidity resulted in dangerous heat indices of 105° to 115°F during the afternoon.

July 2012: The average temperature was 80.7°F, which makes this the sixth warmest July on record. There were 22 days with temperatures at or above 90°F, with five of those days at or above 100°F. The hottest day reported was on July 7 with a temperature of 104°F and heat indexes of 105-115°F.

August 2013: This heat event lasted August 26-30 and marked the hottest weather of the entire summer. Dew points pushed the heat index values to 100-105°F in some locations. Schools without air-conditioning were canceled or schools dismissed early. Cooling centers were opened in cities and towns.

The NCEI storm events database no longer reports extreme heat, and the closest substitute was excessive heat. Excessive heat event documentation covers a much shorter time series, but is the best data available. The latest event reported is the 2013 event listed above.

Probability. Based on trends over the last century, Iowa will likely continue to see more multi-day heat advisories and excessive heat warnings. FEMA's National Risk Index indicates that approximately 1.5 heat wave events per year could happen in Muscatine County. According to the 2023 *Iowa Hazard Mitigation Plan*, the likelihood of days with temperatures projected above 90°F, 100°F, and 105°F will continue to increase by 2050.

Extent. Extreme heat can impose stress to humans and animals. Heatstroke, sunstroke, cramps, exhaustion, and fatigue are possible with prolonged exposure or physical activity due to the body's inability to dissipate the heat. Urban areas are particularly at risk because of air stagnation and large quantities of heat absorbing materials, such as streets and buildings. People without access to air-conditioned spaces are more susceptible to heat risks. NWS notes that fatalities may still occur days after the meteorological end of extreme heat events. Heat-related injuries and deaths are under-recorded, since heat is typically an underlying cause rather than a primary cause due to vulnerable populations having other health conditions. Table 3-12 describes the risks that are possible at each heat index level.

Table 3-12 Heat Disorders at Extreme Temperatures

Heat Index/Apparent Temperature (°F)	Possible Heat Disorders for People in High-Risk Groups
130°F or Higher	Heat/Sunstroke HIGHLY LIKELY with continued exposure
105°F - 130°F	Sunstroke, heat cramps, or heat exhaustion LIKELY, and heatstroke POSSIBLE with prolonged exposure and/or physical activity
90°F - 105°F	Sunstroke, heat cramps, or heat exhaustion POSSIBLE with prolonged exposure and/or physical activity
80°F - 90°F	Fatigue POSSIBLE with prolonged exposure and/or physical activity

According to the 2023 *Iowa Hazard Mitigation Plan*, extreme heat can pose a threat to livestock and crops. High temperatures have been shown to reduce summer milk production, impair immunological and digestive function of animals, and increase mortality of livestock. In July 2011, according to The Iowa Cattlemen’s Association, approximately 4,000 cattle died due to extreme heat. In 1995, livestock-related economic losses due to heat stress were estimated to be \$31 million in Iowa.

Extreme heat can also lead to blackouts and brownouts as electrical usage increases as people try to cool homes, businesses, and other buildings through air conditioning. The resulting blackouts and brownouts can leave residents and other occupants of these buildings at risk of heat-related illnesses. Extreme heat can also result in distortion and failure of structures and surfaces, such as roadways and railroad tracks.

Warning Time/Duration. Although the severity of impact of extreme heat can be deadly, advances in warning and progress in public education have limited the hazard’s effects to an extent. Widespread deaths, illness, and other damages are not expected from extreme heat events within the planning area. As with other weather phenomena, periods of extreme heat are predictable within a few degrees within approximately 3 days. Variations in local conditions can affect the actual temperature within a matter of hours. The National Weather Service initiates alert procedures when the heat index is expected to exceed 105°F for at least two consecutive days.

Extreme heat events last usually two or more days, with temperatures above the historical averages.

Location/Vulnerability. The entire planning area is equally at risk for extreme heat. Special attention should be given to people residing in nursing homes, senior housing facilities, K-12 schools, preschool facilities, and hospitals in the county during extreme heat conditions.

Populations vulnerable to extreme heat include athletes, individuals with chronic medical conditions, infants and children, low-income households, older adults aged 65 and over, outdoor workers, and those who are pregnant. Healthy individuals working outdoors in the sun and heat are vulnerable as well. Low-income individuals and families are also

susceptible and those in rural areas due to poor access to air-conditioning and cooling centers.

Sources	
Federal Emergency Management Agency	https://hazards.fema.gov/nri/map
Muscatine County, Iowa	Muscatine County Comprehensive Plan – County Profile
National Climatic Data Center	http://www.ncdc.noaa.gov/stormevents/
National Weather Service - Quad Cities, IA/IL Office	http://www.crh.noaa.gov/dvn/
State of Iowa	Iowa Hazard Mitigation Plan 2018, 2023

Flash Flood

General Description. A flash flood is an event occurring with little to no warning where water levels rise at an extremely fast rate. Flash flooding results from intense rainfall over a brief period, sometimes combined with rapid snowmelt, ice jam release, frozen ground, saturated soil, or impermeable surfaces. Most flash flooding is caused by slow-moving thunderstorms or thunderstorms repeatedly moving over the same area. Flash flooding is an extremely dangerous form of flooding that can reach full peak in only a few minutes and allows little time or no time for protective measures to be taken by those in its path. Waters move at very fast speeds and can roll boulders, tear out trees, scour channels, destroy buildings, and obliterate bridges. Flash flooding often results in higher loss of life, both human and animal, than slower-developing river and stream flooding.

Previous Occurrences. The following are selected events from the NCEI *Storm Events Database* and supplemental local reports that represent the hazard of flash flooding.

May 9-10, 1996: Urban flooding and county road washouts occurred across a large area of eastern Iowa.

August 16, 1997: Rainfall of 0.91 inches in 15 minutes was reported. Highway 61 bypass was impassible.

October 17, 1998: Heavy rainfall across eastern Iowa sent creeks, rivers, and streams to near or slightly above bank full. Total rainfall for the day was recorded as 3.50 inches at Muscatine. State marching band competitions at Muscatine High School were cancelled.

February 24, 2001: Rainfall amounts commonly recorded between 1 to 1.5 inches across the county fell on frozen ground. The quick runoff led to numerous reports of street and small stream flooding. Several rivers across the region, including the Cedar River, were out of their banks.

June 22, 2007: Several rounds of heavy rain-producing showers across eastern Iowa covered and/or closed roads in western Muscatine County, including Highway 6. Water also topped part of the levee between Nichols and West Liberty.

June 23, 2010: Heavy rains resulted in flash flooding in Muscatine County during the late afternoon and evening. Some vehicles were stalled out in over a foot of floodwater in downtown Muscatine. In Nichols, some streets were temporarily closed due to flooding. Parts of Highway 6 between West Liberty and Atalissa, and County Road F58 between Durant and Stockton were closed due to flooding.

May 3, 2012: Multiple streets in the City of Muscatine were reported to be flooded with up to two feet of water on the northeast side of Muscatine. Widespread ponding of water was also reported.

June 30, 2014: The entire town of Atalissa in Muscatine County was flooded with water one-foot deep in places. Highway 6 was closed west of town.

May 4, 2015: Heavy rains resulted in Muscatine having water one-foot deep over Mississippi River Drive.

July 7, 2015: Heavy rains closed local roads in Muscatine, including Highway 22 and several streets downtown. Flash flooding was reported around the City Hall.

June 21, 2018: Thunderstorms produced water that was quickly flowing over roads up to three feet deep. Several vehicles were stalled. One person was swept off their feet and barely escaped being swept into a drainage ditch full of fast-moving water.

September 1, 2018: Flash flooding with 3-6 inches of rain. The dispatch center reported multiple roads with high water in Muscatine. Multiple vehicles were reported stalled with water several feet deep in some locations. Local estimate was for three inches of rain in town.

May 29, 2019: Heavy rains fell on completely saturated soils causing significant flash flooding. Water was over Highway 22 at Fairport in Muscatine County closing the road.

June 3-5, 2020: An extended period of showers and thunderstorms affected the area at Wildcat Den State Park and Sweetland Center June 3-5. An isolated supercell thunderstorm produced nickel to golf ball sized hail and rain that caused flash flooding. On June 4, 2020 water was reported as flowing over Highway 38.

July 8, 2022: Heavy rain of 3 to 5 inches fell across the area, leading to flash flooding in Muscatine County. Multiple cars were stalled in standing water near the Dick Drake Way intersection. Mississippi River Drive in the downtown area was also flooded.

August 19, 2022: A slow-moving storm produced flash flooding in Conesville. The storms anchored over locations producing other hazards including hail and damaging winds.

July 2025: Throughout the month of July, there were prolonged humid conditions with active severe weather and flooding. With 11.81 inches of precipitation in July, flash flooding was prevalent in certain areas of the county.

- **July 11, 2025:** Flash flooding occurred after heavy and sustained rainfall, causing streets and roads to be flooded in southern parts of the county.
- **July 25, 2025:** Dangerous flash flooding conditions were prevalent in the city of Muscatine near Mad Creek. Roads were flooded impeding vehicle and pedestrian traffic.
- **July 28, 2025:** The City of Muscatine experienced a 200-year rainfall event after 3.83 inches of rain fell within an hour, overwhelming city storm sewers. Storm sewers were backed up to curb levels with most low-lying areas flooded above

tire level. City staff and police closed off deeply flooded roads, and several cars stalled in the flooded roadways.

Probability. According to the National Centers for Environmental Information, 25 flash flood events have been reported between February 1997 and August 2022. Of the 25 recorded events, 16 have occurred since 2010. This data is supplemented by local reports of flash flooding events as noted above. The State Hazard Mitigation Team (SHMT) evaluation in the 2018 *Iowa Hazard Mitigation Plan* noted that data to illustrate the probability of flash flooding is not available. However, considering past events, many minor flood events are very likely in any given year. The Muscatine EMA has indicated a high probability for flash flooding. Unless measures are taken to reduce the amount of runoff (or slow its movement), flash floods will continue to occur and possibly increase.

Extent. The magnitude and severity of damages from flash flooding events vary by watershed based on the effects of amounts of rain over time. Flash floods are the number one weather-related killer in the United States. Nearly half of all flash flood fatalities are auto-related. Motorists that attempt to traverse water-covered roads and bridges can be swept away by the strong current. Six inches of swiftly moving water can float a full-sized automobile. Recreational vehicles and mobile homes located in low-lying areas can also be swept away by water. Streets can become swift-moving rivers, and basements can become filled with water in a matter of minutes. Magnitude, severity, and cost of flooding events is further discussed in the “River Flooding” section.

Warning Time/Duration. Flash floods may be unpredictable, but historical factors can allow for people to be warned about the likelihood of flash flooding in the area. Flash floods occur within a few minutes or hours of excessive rainfall, a dam or levee failure, or a sudden release of water held by an ice jam. Weather surveillance radar is being used to improve monitoring capabilities of intense rainfall. Knowledge of the watershed characteristics, modeling, monitoring, and warning systems increase the predictability of flash floods. Depending on the location in the watershed, warning times can be increased. The National Weather Service forecasts the height of flood crests, the data, and the time the flow is expected to occur at a particular location.

The effects of flash flooding events in Iowa are relatively short in duration due to the nature of the hazard. However, the longer-term impacts of note are areas that experience frequent and repeated flash flooding that can damage infrastructure over time.

Location/Vulnerability. Particularly at-risk are people and property in low-lying areas; close to dry creek beds or drainage ditches; or near water or downstream from a dam, levee, or storage basin. Those near insufficient storm sewers and poor drainage infrastructure are at risk because the drains cannot rid the area of the runoff quickly enough. People and property located in areas with narrow stream channels, saturated soil, in areas with impermeable surfaces, or areas of steep slope are likely to be affected.

When land is converted from fields or woodlands to roads and parking lots, it loses its ability to absorb rainfall. Urbanization increases runoff two-to-six times over what would

occur on natural terrain. Portions of the land within Muscatine County are developed with significant amounts of impervious surfaces. As more development occurs in the watersheds, the amount of runoff produced also increases. In certain areas, aging storm sewer systems were not designed to carry the capacity currently needed to handle the increased storm runoff.

Unlike areas affected by a river/stream flood, flash floods can affect areas a good distance from the stream itself. The City of Muscatine, *Iowa Comprehensive Plan*, and *Muscatine County Comprehensive Plan (2024)* all encourage sensitivity to development of woodlands and along steep slopes, as such developments that can contribute to flash flooding in certain areas. Waterways identified by the City of Muscatine as being particularly susceptible to flash flooding include various intersections at Mad Creek, including Tenth & Sycamore and Eighth & Cedar.

Sources	
American Red Cross	http://www.Redcross.org
Federal Emergency Management Agency (FEMA)	https://www.fema.gov/flood-maps/national-flood-hazard-layer
FEMA RAPT Resource Center	https://rapt-fema.hub.arcgis.com/
Iowa Flood Center	IFIS - Flood Condition and Map Communities in Iowa https://ifis.iowafloodcenter.org/ifis/community.php
Local Sources: City of Muscatine	Comprehensive Plan 2002 & 2024
Muscatine County	Muscatine County Comprehensive Plan 2024
National Climatic Data Center	https://www.ncei.noaa.gov/cdo-web/
National Weather Service	https://www.weather.gov/dvn/summary_081920_2022
Quad City Times	https://qctimes.com/news/local/article_378f4df5-0644-503e-91eb-d99a368176f2.html
State of Iowa	Iowa Hazard Mitigation Plan, 2018, 2023

Grass or Wildland Fire/Cropland Fire

General Description. A grass or wild-land fire is an uncontrolled fire that threatens life and property in either a rural or wooded area. Grass and wildland fires can occur when conditions are favorable, such as during periods of drought when natural vegetation would be drier and subject to combustibility. While cropland is prevalent in the planning area it is not considered “wildland.” Due to the historical incidents of cropland fires in the area, the Planning Committee considers cropland fires in this section.

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

Table 3-13 Keetch-Byram Drought Index (KBDI) Scale

KBDI = 0-200	Typical of spring dormant season following winter precipitation. Soil moisture and large class fuel moistures are high and do not contribute to fire intensity.
KBDI = 200-400	Typical of late spring, early growing season. Lower litter and duff layers are drying and beginning to contribute to fire intensity.
KBDI = 400-600	Typical of late summer, early fall. Lower litter and duff layers contribute to fire intensity and actively burn.
KBDI = 600-800	Often associated with more severe drought with increased wildfire occurrence. Intense, deep burning fires with significant downwind spotting can be expected. Live fuels can also be expected to burn actively at these levels.

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

Previous Occurrences. Most fires in Iowa have been limited to one county; from 2020-2024 there were 688 wildland fires spanning 14,087 acres. This number is likely much greater when considering grass fires. Muscatine County Joint Communications (MUSCOM) reported 659 grass fires in the county between 2006 and December 31, 2019, many of which began as controlled burns. Since the 2020 plan update, there have been nearly 500

grass or wildland fires. Table 3-14 details how many fires have occurred in the county since 2020.

Members of the Planning Committee commented that grassfires are a common occurrence in the county in the spring when people attempt to burn off the dried vegetation from the previous season. The data bears this out: the majority of the recorded fires occurred in the spring and fall months and are listed as grass/field fires.

Table 3-14 Number of Grass & Wildland Fires in Muscatine County (2020-2025)

Year	Number of Fires (Grass or Wildland)
2020	62
2021	74
2022	93
2023	90
2024	78
2025	102

Probability. The 2018 *Iowa Hazard Mitigation Plan* notes that Iowa and Illinois have the smallest percentage of wildlands in the U.S. No grass or wildland fires have been reported in the National Climatic Data Center Storm Event Database. Grass and wildland fires will occur in areas where conditions are dry. The U.S. Forest Service Wildfire Hazard Potential notes the entire state of Iowa has a very low wildfire potential for experiencing torching, crowning or extreme fire behavior. Using the MUSCOM report of grassfire incidents, there was an average of 50.7 grass fires per year in the county over the total 13-year reporting period. This gives a probability of a 100% chance that there will be grass fires in Muscatine County in any given year. The Muscatine County EMA lists the probability that a grass or wildland fire will occur as moderate.

Extent. The 2023 *Iowa Hazard Mitigation Plan* states that no event in the state has been a historically significant wildfire, according to the National Interagency Fire Center. While wildfires have proven to be most destructive in the western states, they have become an increasingly frequent and damaging phenomenon nationwide. High winds can turn a small flame into a multi-acre grassfire within a matter of minutes. The extent is dependent upon conditions, such as land use/land cover, moisture, and wind. People choosing to live in wild-land settings are more vulnerable to wildfires, and the value of exposed property is increasing at a faster rate than the population. Iowa is less vulnerable to wild-land fire because of the extremely large percentage of land that is farmland.

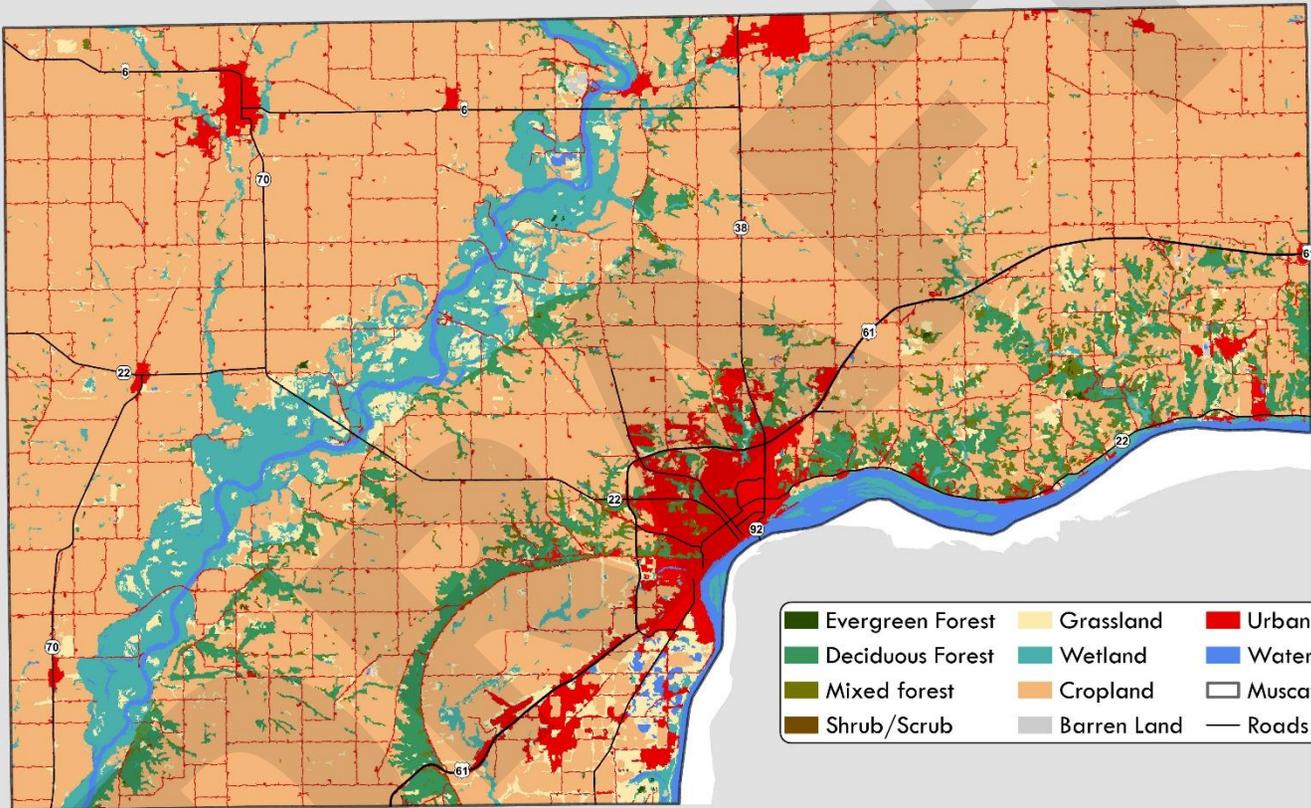
Grass fires are often more easily contained and extinguished before there is damage to people or developed property. Fires often burn large portions of field crops in the fall when the crops are dry and the harvesting equipment overheats or throws sparks. This can be quite costly to the farmer in terms of lost production. Most grass fires are contained to highway right-of-way and rail right-of-way ditches and are less than a few acres in size.

Warning Time/Duration. As mentioned earlier, most grassfires occur without warning and travel at a rate dependent on fuel type and wind speed at the time of ignition. The situation depends on conditions at the time, such as moisture, wind, and land cover. However, methods for forecasting the probability of occurrence of conditions most suitable for wildfires to occur has increased with the use of the national wildland significant fire potential outlook issued by the National Interagency Fire Center and the National Oceanic and Atmospheric Administration (NOAA) Storm Prediction Center. The majority of Iowa wildfires occur in short duration.

Location/Vulnerability. The *2023 Iowa Hazard Mitigation Plan* notes that Iowa has relatively few locations with potential for wildfire. As shown on Map 3-5, 90.94% of the county's existing land use is classified as combined agricultural land use, and areas otherwise not classified, such as vacant property, farmsteads, roadways, mining, utilities or rights-of-way, and undeveloped or farmed land. Such areas have a very low probability of experiencing torching, crowning, or other forms of extreme fire behavior. The Muscatine County EMA indicates that while there has been an overall low impact to people, property, or business due to grass or wildland fires, the occurrence is becoming more frequent. For this reason, the Planning Committee maintains this as a moderate priority.

Sources	
State of Iowa	Iowa Hazard Mitigation Plan, 2018, 2023
Muscatine County	Muscatine County Multi-Jurisdictional Hazard Mitigation Plan 2020
National Interagency Fire Center	http://www.nifc.gov/fireInfo/fireInfo_statistics.html
Local Sources:	Muscatine County Emergency Management (MUSCOM) City of Muscatine Fire Department Conesville Fire District
Muscatine County	Comprehensive Plan 2024

Muscatine County Hazard Mitigation Plan Map 3-5: Land Cover

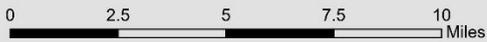


- | | | |
|------------------|-------------|------------------|
| Evergreen Forest | Grassland | Urban Area |
| Deciduous Forest | Wetland | Water |
| Mixed forest | Cropland | Muscatine County |
| Shrub/Scrub | Barren Land | Roads |



Sources:
 Land Cover - USGS NLCD (2020)
 Roads - IA DOT (2019)
 Counties - U.S. Census Bureau (2019)
 Other features - Bi-State Regional Commission

Disclaimer: This map is for reference only. Data provided are derived from multiple sources with varying levels of accuracy. Bi-State Regional Commission disclaims all responsibility for the accuracy or completeness of the data shown hereon.



Landslides, Land Subsidence, and Sinkholes

General Description. Due to the inter-related profile characteristics of landslides, land subsidence, and sinkholes, these hazards are addressed together.

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

Land subsidence is a gradual settling or sudden sinking of the Earth's surface because of subsurface movement of earth materials that may impose a direct threat to life and property. Land subsidence can range from broad, regional lowering of the land surface to localized collapse, such as a sinkhole. More than 80 percent of the identified land subsidence in the U.S. is induced by human activity on subsurface water. Examples include aquifer-system compaction from excessive groundwater withdrawal and drainage and subsequent oxidation of organic soils. Other human-related effects include underground mining of coal or rock, petroleum withdraw, natural compaction, and broken water or sewer mains in a localized area. Sudden and sometimes catastrophic subsidence is associated with localized collapse of subsurface cavities forming sinkholes. This type of subsidence is commonly triggered by ground water level declines from pumping.

Sinkholes are formed due to the dissolution of the susceptible subsurface rocks, such as limestone, dolomite, anhydrite, salt, or gypsum by constant water action resulting in collapse of the ground surface. This dissolution process can take many years in the areas of limestone or dolomite and can happen in hours or days in areas of anhydrite, salt, and gypsum

Previous Occurrences.

Sinkholes and Land Subsidence: Historic inventories estimate 2,596 sinkholes in the Upper Iowa River Watershed. However, there is no central collection point for this information. The Iowa Department of Natural Resources has no known records of land subsidence or sinkholes in Muscatine County.

According to the *2023 Iowa Hazard Mitigation Plan*, reporting of landslide events in Iowa is sporadic, and no state agency maintains reports of landslides. However, several historical accounts of landslides, sinkholes, and land subsidence have been reported, as summarized below.

- A residence located at 1995 Sweetland Road in Muscatine is situated near the edge of a steep ravine. The property has experienced landslide issues since it had been constructed, particularly during extended periods of heavy rainfall. In

- 2010, as a result of increasing landslide activity, the owners at the time secured foundation repair and stabilization specialists to diagnose issues and prescribe stabilization of the foundation. Nineteen concrete piers were installed under the foundation with additional work occurring two years later. In spring 2019, the homeowners noted new severe foundation cracks, major cracks in drywall, nonfunctional doors, slanted walls and floors, and loss of foundational support. Numerous cracks and depressions in the soil throughout the entire property were also noted. Staff from the Muscatine County Building and Zoning Office inspected the property on June 24, 2019. Due to the apparent lack of structural integrity as a result of shifting soils, the structure was deemed a dangerous building, and Muscatine County ordered that the owners of the property vacate. Since June, additional landslide activity has occurred, and county staff estimate the structure to be damaged beyond repair.
- In 1982, the Iowa Department of Transportation (IDOT) condemned a portion of private property in conjunction with a plan to alter Highway 22 in Muscatine County. The condemnation was to prevent massive landslides that the IDOT feared would cover the highway. The amount of land taken was increased because, after construction began, unexpected difficulties were encountered in stabilizing the roadway. With the historic rains of 1993, the area had substantial movement of rock and soil onto Highway 22, and by September 1993, a new road project was being discussed, and a second condemnation proceeding began. Owners of the property appealed the condemnation and claimed to be entitled to an award for the loss of lateral support of their land adjacent to the IDOT project. A written statement from the owners' attorney was introduced into evidence stating "...research uncovered the fact that an extension of the fault that runs through New Madrid, Missouri extends through the edge off the...property." Experts testified to the presence of a fault causing landslides on the property in question.
 - In January 2020, the City of Muscatine closed off traffic to Fletcher Avenue in an area known as Miller's Hill, after a landslide was discovered encroaching a driveway. The area had been previously closed in April 2013 and was the subject of a 1973 study on land movement. When the city attempted to remove the encroaching soil, the hillside began to move, and work was abandoned.
 - The IDOT survey of reconnaissance trips to over 50 active and repaired landslides in Iowa suggest that, in general, landslides in Iowa are relatively shallow (i.e. failure surfaces less than 6 feet (2 m) deep). Most of the counties in the eastern part of Iowa had a significant number of landslides from 1993 to 2001, ranging from six to more than 15. Most of the landslides in the northeastern and eastern part of Iowa occurred on backslopes (cuts); however, most of the landslides in southeastern part of Iowa are in fore slopes

(embankments). Statewide, 37% of slides are on fore slopes, 32% on back slopes, 26% along streams and riverbanks, and 5% on natural slopes.

- Seventy-eight percent of the landslides identified by county engineers that occurred in Iowa during this time period occurred in the spring with the remaining happening in the summer. Fifty percent of the failures were associated with water, when slope failures occurred after heavy rainfall, and 22% were associated with high ground water table conditions. Twenty-one percent of the slope failures occurred due to design issues. In addition, maintenance or construction activities accounted for 1.4% of the stability problems while loading at the crest of slope and other causes account for 5% and 10%, respectively. Statewide, 25% of the slides occurred in slopes between 1'-10' high, 41% occurred in slopes 11'- 20' high, 21% occurred in slopes 21'-30' high, and 13% occurred in slopes greater than 30' high. Slope was 3:1 on 96% of slopes prior to slope failure. See Map 3-6 – Slope.

Probability. In Muscatine County, the current risk of landslides, and general land subsidence or formation of sinkholes is very low, overall.

Sinkholes & Land Subsidence: Per the *Iowa Hazard Mitigation Plan 2013* Depressions or sinks are identified on the *City of Muscatine, Iowa Comprehensive Plan (2002)* map of Development Constraints, although they are not mentioned in the 2013 plan. Within the corporate limits, several depressions or sinks are mapped in the northwest corner. Others are mapped to the north outside corporate limits. According to the Iowa DNR/IGS, these areas, which are mostly in sandy or alluvial areas, are not likely sinkholes. Karst areas located within Muscatine County are shown on Map 3-7 – Potential Karst Areas. According to the Iowa DNR, a few small coal mines near Wyoming Hill in Montpelier Township operated before 1900. These mines are not in the IDNR database, but are discussed in the Muscatine County report and the Annual Report articles that deal with coal mining. Based on the minimal location information provided by these sources, the mines were likely drifts located near the bluffs above the river (e.g. Wyoming Hill) and could contribute to instability of those slopes.

Landslides: Muscatine County has steep terrain adjacent to the Mississippi River that is susceptible to landslides. The IDOT survey of landslides determined that southeast and western Iowa were high-risk areas for landslides. On a statewide basis, the soil most frequently associated with slope failures is undifferentiated fill with 28% of the failures. Glacial till and loess account for 24% and 21 %, respectively, of the landslides. Alluvium is the soil associated with 13% of the slides, and shale is the material in 7% of the slides. The 2013 *Iowa Hazard Mitigation Plan* SHMT evaluated the probability of a significant landslide event in Iowa and indicated it was between 10% and 19% in any given year.

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

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

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

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

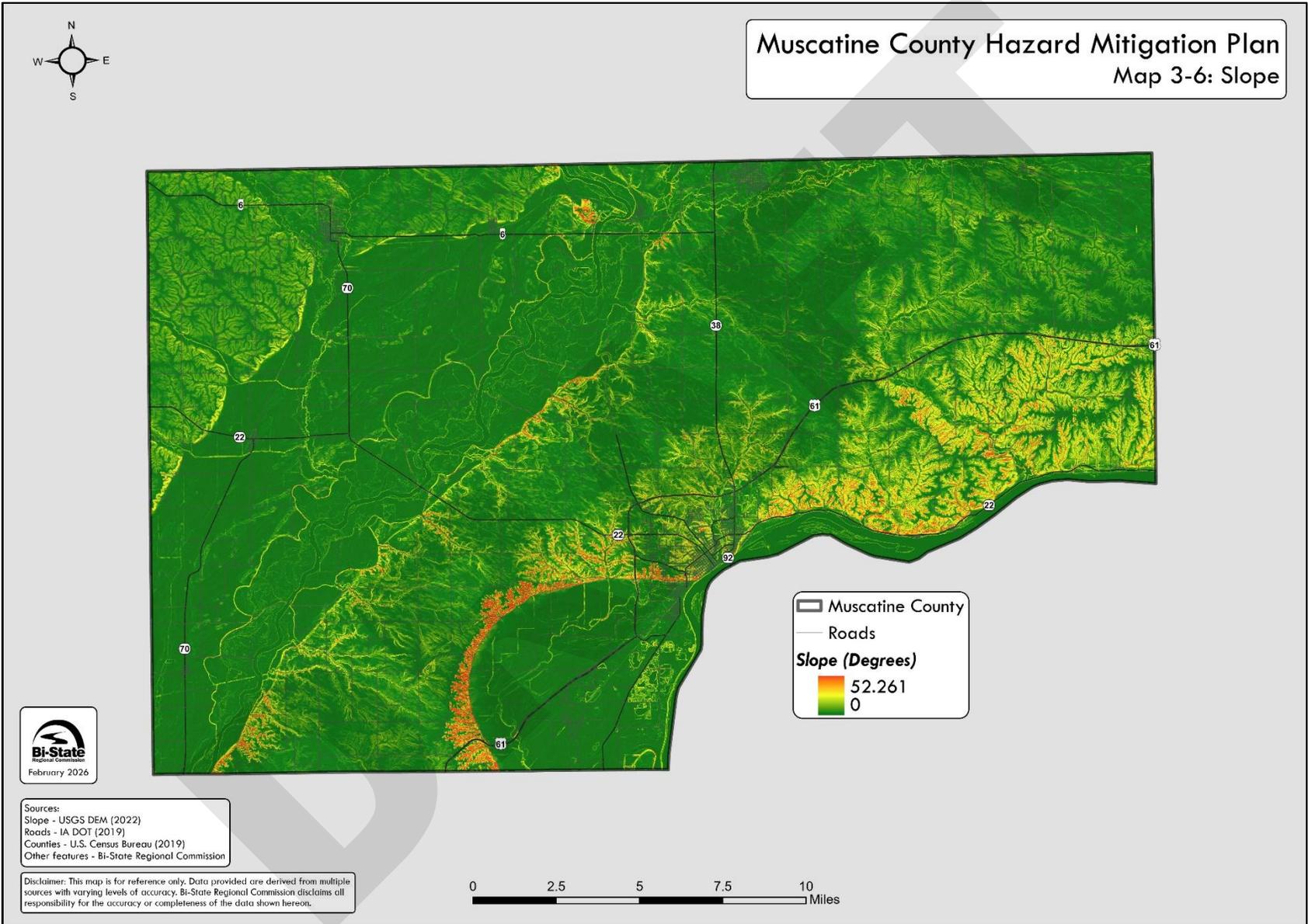
The response tied to landslides is related to securing the immediate threat to life and property including immediate reroute of traffic from the affected infrastructure and search and rescue in the case of structural collapse. Return to use of facilities and roads could

take hours to many days depending on the severity of the landslide and the actions needed to secure the slope.

Location/Vulnerability. In Muscatine County, areas of greater than 15% slope may be at a high risk of landslides, and if disturbed, they become saturated or top loaded. These high-risk areas contain deep to moderately deep loess (loess is the layer of fine, mineral rich covering the land that ranges in thickness and is loosely packed). The loess ranges in Muscatine County range from a few feet deep along the crests of the ridges in the county to greater than 40 feet thick on the bluffs at Muscatine. The loess in Muscatine County is often described as plastic loess. Plastic loess has the tendency to be transformed from a solid state to putty-like and ultimately fluid-like with the addition of water. Increasing the moisture content of a plastic soil reduces the soil's shear resistance to sliding. Paleosols (buried soil profiles) occur in this region and could cause localized slope instability.

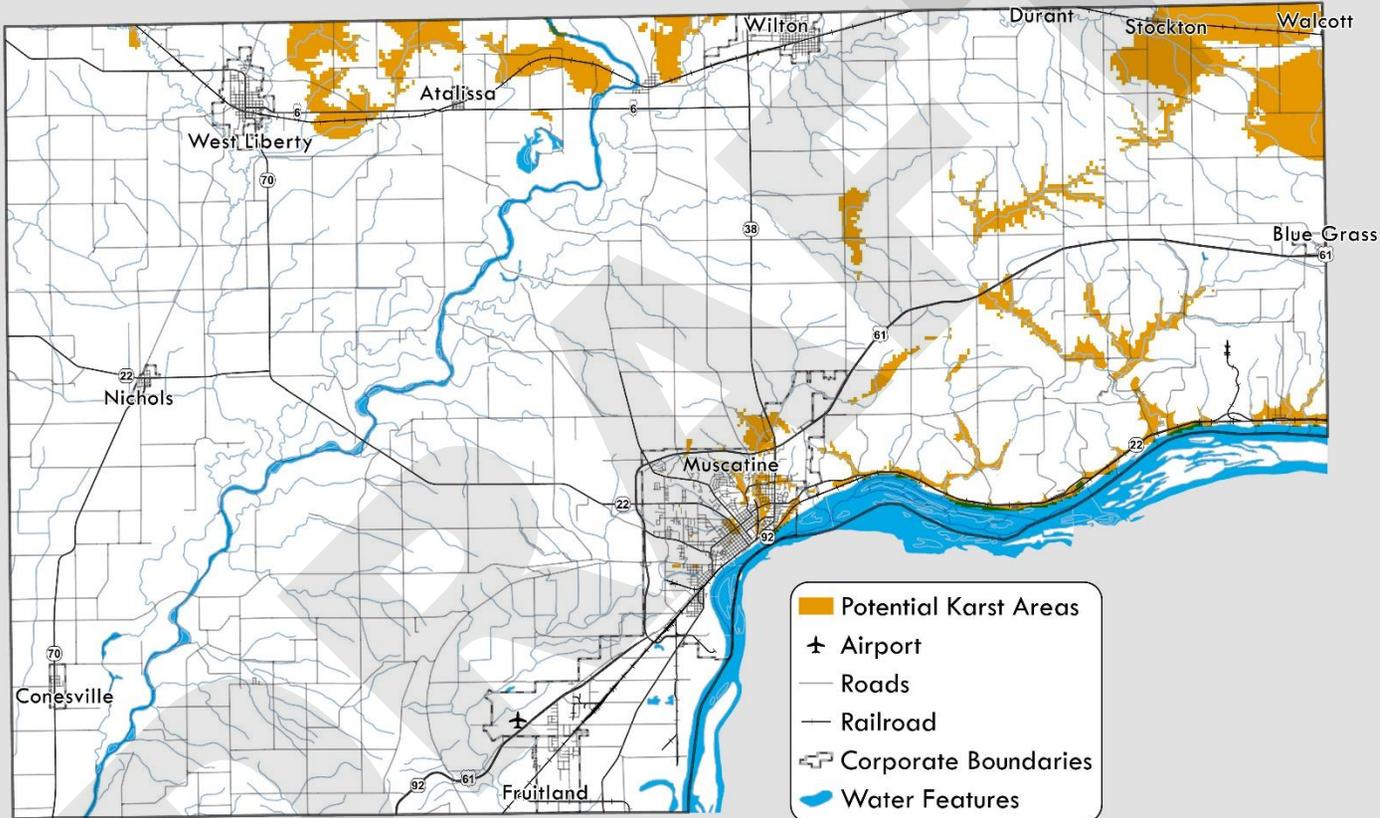
The *2023 Iowa Hazard Mitigation Plan* identified Muscatine County as having a Low incidence of landslide susceptibility when compared to other areas of the state. Previous plans, including the *2007 Iowa Hazard Mitigation Plan*, noted the area between Montpelier and Fairport as having high susceptibility. This plan also identified an area in southwest Muscatine County that has a moderate risk of landslides.

Sources	
FEMA	"A Cornerstone of National Mitigation Strategy." July, 1997
Iowa DOT and Iowa State University of Science and Technology – Dept. of Civil & Construction Engineering	Regional Approach to Landslide Interpretation and Repair (2001); Iowa DOT Project TR 430
Iowa DNR Geological Survey Bureau	http://www.igsb.uiowa.edu/service/hazards.htm
Panel on Land Subsidence, Committee on Ground Failure Hazards Mitigation Research, Division of Natural Hazard Mitigation, National Research Council Commission on Engineering and Technical Systems (CETS)	Mitigating Losses from Land Subsidence in the United States (1991)
State of Iowa	Iowa Hazard Mitigation Plan, 2007, 2010, 2013, 2023
Iowa Judicial Branch	Appeal No. 205/99-0204 filed December 20, 2000 in the Supreme Court of Iowa
J. A Udden	Geology of Muscatine County, 1914
FORREX - British Columbia's Watershed Technical Bulletin	Streamlines Vol.2, No. 2 Article 2, What is Soil Plasticity? How does it allow you to prevent slope failure? By Hardy Bartle
National Geographic	https://education.nationalgeographic.org/resource/loess/
Local News/KWQC	https://www.kwqc.com/content/news/Massive-landslide-potential-could-result-in-loss-of-life-in-Muscatine-512181242.html
U. S. Geological Survey Landslides Hazards Program	http://landslides.usgs.gov/
U.S. Geological Survey Circular 1244 Online Version 1.0	National Landslide Hazards Mitigation Strategy -- A Framework for Loss Reduction - http://pubs.usgs.gov/circ/c1244/



Muscatine County Hazard Mitigation Plan

Map 3-7: Potential Karst Areas



Sources:
Karsts - IA DNR (2025)
Roads - IA DOT (2019)
Counties - U.S. Census Bureau (2019)
Other features - Bi-State Regional Commission

Disclaimer: This map is for reference only. Data provided are derived from multiple sources with varying levels of accuracy. Bi-State Regional Commission disclaims all responsibility for the accuracy or completeness of the data shown hereon.



River Flooding

General Description: River flooding is a rising or overflowing of a tributary or body of water that covers adjacent land not usually covered by water. Floods are the most common and widespread of all natural disasters, except fire. Most communities in the United States can experience some kind of flooding after spring rains, heavy thunderstorms, winter snow thaws, waterway obstructions, or levee and dam failures. Often a combination of these elements causes damaging floods.

Floodwaters can be extremely dangerous. The force of just six inches of swiftly moving water can knock people off their feet, and two feet of water can float a car. Floods can be slow or fast rising, but generally develop over a period of days. Flooding is a natural and expected phenomenon that occurs annually, usually restricted to specific streams, rivers, or watershed areas. Riverine flooding can also be caused by ice jams. Ice jam flooding generally occurs when warm weather and rain break up frozen rivers or any time there is a rapid cycle of freezing and thawing. The broken ice floats downriver until it is blocked by a bridge or shallow area, and an ice jam forms. The ice jam then blocks the channel and causes upstream flooding.

The *2023 Iowa Hazard Mitigation Plan* recognizes flooding as the most common and widespread of all natural disasters in Iowa. In the past 35 years, every county in the state of Iowa has received at least four Presidential Disaster Declarations from flooding. Since 2000, there have been five Presidential Disaster Declarations issued for Muscatine County for river flooding. A full list of both state and federal disaster declarations can be found in the Appendices.

Flood stages at the National Weather Service gage point for the Mississippi and Cedar River within Muscatine County are identified in the table below. Impacts of the various flood stages are described later in this profile.

Table 3-15 Flood Stages at Mississippi River and Cedar River

Flood Stages	Mississippi River at Muscatine	Cedar River at Conesville
Major Flood Stage (ft)	20	16.5
Moderate Flood Stage (ft)	18	15
Flood Stage (ft)	16	13
Action Stage (ft)	15	12

Previous Occurrences: The listed historic events that follow document flooding on the major rivers in Muscatine County—the Mississippi River and its tributary, the Cedar River. The National Climatic Data Center reported 46 flood events between January 1, 2000 and July 4, 2024. FEMA National Risk Index (NRI) reports the annualized frequency of riverine flooding be 2.75. Two of the most recent events (April 26, 2023 and July 4, 2024) occurred at the Mississippi River.

The highest crest on record for the Mississippi River occurred in 1993. The Mississippi River and tributaries remained above flood stage for as long as five months in some places. Damage from the 1993 flooding in Muscatine County was sustained by approximately 643 residential structures at a cost of \$6,580,191. An additional \$647,300 was spent in the county to address infrastructure damage and flood control.

Historic crests at National Weather Service gage points as of July 2024 are listed in the table below. Additional detail on flooding events follows.

Table 3-16 Historic River Crests

Mississippi River at Muscatine: Historic Crests		
#	Ft	Date
1	25.61	07-09-1993
2	24.81	04-29-1965
3	24.52	06-02-2019
4	24.42	06-17-2008
5	24.33	05-03-2019 (P)
6	23.75	07-05-2014
7	23.50	04-25-2001
8	22.31	05-02-2023 (P)
9	21.95	04-10-2019 (P)
10	21.87	04-23-2011

Source: <https://water.noaa.gov/gauges/cnei4>

Cedar River near Conesville Historic Crests		
#	Ft	Date
1	23.40	06-15-2008
2	18.06	09-29-2016
3	17.88	07-02-2014
4	17.38	10-01-2016
5	17.11	04-06-1993
6	17.00	05-29-2004
7	16.90	06-03-2013
8	16.87	06-08-1990
9	16.85	04-12-1965
10	16.80	07-28-1999

Source: <https://water.noaa.gov/gauges/cnei4>

- October 1, 2016:** Record to near record heavy rainfall in north central and northeast Iowa from September 21-23 with 4 to 10+ inches of rain contributed to major river flooding on the Iowa tributaries of the Wapsipinicon, Cedar, lower Iowa, and Maquoketa rivers from late September through early October. Major river flooding then occurred downstream on the Mississippi River from the Iowa River and Mississippi River convergence and south. Heavy rainfall of four to over ten inches covered a significant area from September 21-23 in extreme north central and northeast Iowa. The resulting rainfall moved downstream causing the Cedar River to rise above major flood stage levels. The Cedar River at Conesville rose above its major flood stage level of 16.5 feet on September 28, 2016. It crested around 18.2 feet at approximately 9 a.m. CST on September 29, 2016. It fell below major flood stage on October 1 around 11 p.m. CST.
- October 15, 2018:** A prolonged and exceptionally wet fall combined with successive flash flood events in eastern Iowa and northwest Illinois to bring widespread minor to moderate river flooding to nearly all rivers in this area. This major flood event stretched through much of mid-October. Major flooding on the Mississippi River at the Muscatine, Iowa gage began at midnight, October 12, when it exceeded 18 feet. It crested at 20.8 feet at 4:45 p.m., October 13, before falling below 20 feet, which is major flood stage, at 6 a.m., October 15.

- **2008 Flood:** Major flooding occurred along the Cedar River in Muscatine County during the month of June 2008 due to prolific heavy rain from late May into early June. This was part of a statewide disaster declaration. The Cedar River reached its record height on June 15, 2008. Many roads in eastern Iowa sustained severe damage from the flooding. The flooding forced closure of many roads including I-80 between interchanges #265 and #267 between Iowa City, IA and Davenport, IA. The detour route was designated as U.S. 61 to U.S. 20 to I-35. This detour added 115 miles to the normal route. The 2008 flood event received state and federal disaster declaration designations (FEMA-1763-DR; May 27, 2008/Iowa 2008-21; June 11, 2008).

Damage estimates for eastern Iowa alone were approximately \$1 billion. The levee protecting levee district 17 on the Cedar River in Muscatine County breached. The cost to repair the levee was estimated to be \$200,000. In addition, several houses were destroyed. Through both FEMA Hazard Mitigation Grant Program funds and HUD Community Development Block Grant funds, 12 houses were bought out and removed from the floodplain. An additional 14 structures were demolished with disaster funds. According to Muscatine County, 40 structures were affected by the 2008 flood. The State of Iowa also created a state-funded recovery called Jumpstart Housing Assistance Program that disbursed a total of \$381,549.18 to assist 16 homeowners repair their homes within Muscatine County.

- **2019 Flood**

March 31, 2019: Significant flooding occurred across eastern Iowa and northwest Illinois during spring 2019. Heavy rain and snowmelt across the region caused the Mississippi River to rise above its major flood stage of 20.0 feet on March 22, and remain above major flood stage through the end of the month. Moderate to major flooding was observed on the Mississippi River due to snowmelt, frozen ground, ice jams, saturated soils, and rainfall that started in mid-March and continued into April and May. Both state and federal disaster declarations were issued (FEMA-4421-DR; March 23, 2019/Iowa 2019-13; April 16, 2019).

April 30, 2019: The Mississippi River remained high through the month of April due to a combination of snowmelt and several rounds of heavy rain. Rain in the second half of the month caused the Mississippi River to rise back above major flood stage during the last week of April. The major flooding would continue into May. Heavy rain across the area caused the Mississippi River at Illinois City Lock and Dam 16 to rise above its major flood stage of 18.0 feet late in the evening of April 25, and it remained above its major flood stage into the month of May. The river continued to rise through the end of the month with no crest during this period.

May 1, 2019: The Mississippi River at Illinois City Lock and Dam 16 began the month above major flood stage of 18 feet. The river would rise to a crest of 24.33 feet on May 3. This crest is the fifth highest crest for the Mississippi River at Illinois City Lock and Dam 16. The river fell below major flood stage the evening of May 12.

May 31, 2019: Extensive flooding occurred late May and into June across eastern Iowa, northwest Illinois, and northeast Missouri. The last half of May was very wet with 5-8 inches of rain falling over the region. This combined with saturated soils, brought many rivers above moderate to major flood levels. The Mississippi River at Illinois City Lock and Dam 16 rose above its major flood stage of 18 feet during the afternoon of May 27 and continued into June. The river crested in June, with the stage rising to 21.45 feet at the end of May 31.

June 1-June 13, 2019: The Mississippi River remained high during the month of May, and heavy rains that fell in the later part of the month resulted in the river rising back above major flood stage in late May south of Clinton, Iowa. The river remained above major flood level up to the middle of the month. The Mississippi River at Illinois City began the month of June above its major flood stage of 18 feet and crested at 1 a.m. on June 2 at 22.81 feet. This is preliminarily the fifth highest crest on record. It fell back below major flood stage around 7 a.m. on June 13. The Mississippi River at Muscatine began June above its major flood stage of 20 feet and crested around 4 a.m. on June 2 at 24.52 feet. This is preliminarily the third highest crest on record. The river fell back below major flood stage on June 12 around 5 p.m.

- **April 26, 2023.** Muscatine was one of ten counties included in the State's Disaster Proclamation for this flood event. This flood was the 10th highest on record and caused largely due to the record snowfall in Minnesota and Wisconsin, the frozen ground, and rapid snowmelt during the middle of April. This flooding had numerous impacts, with many roads, businesses, homes, and people impacted. State Highway 35 was overtaken by floodwaters. A state disaster declaration was issued making individual assistance and state resources available (Iowa 2023-11 and 2023-14; April 24, 2023 and April 28, 2023).
- **July 4, 2024:** The second recent flooding event occurred July 4, 2024. This event was caused by rain that fell during the month of June across Minnesota and Wisconsin causing downstream rises to the Mississippi river. Additionally, heavy rain that fell locally in July helped to prolong the crest and delay the river falling below flood stage.

Probability. The 2023 Iowa Hazard Mitigation Plan stated that the probability of a flood event in Iowa in any given year is high. Areas delineated on Flood Insurance Rate Maps as Special Flood Hazard Areas (SFHA) indicate floodplains where there is a 1% and 0.5%

probability of flooding in any given year. Given that the list of flood events for Muscatine County includes more than one event in some years, it might be estimated that at least minor flooding could occur every year somewhere in the county.

Extent. Flood impacts include damage to critical facilities, infrastructure, and property and potential loss of life. Water treatment and wastewater treatment facilities located in or near the floodplain are at high risk of flooding, and will eventually be taken offline. Personal property can be extensively damaged and destroyed. Facilities and infrastructure can be scoured around, degrading its structural integrity. Damage and disruption of communications, transportation, electric service, and community services are likely during severe flooding. Damage to crops in the floodplain can be extensive and costly. The City of Muscatine Island Levee District consists of 15 miles of levee protecting 30,000 acres of developed industrial, agricultural, and residential land. The Expected Annual Loss from riverine flooding is \$1,193,210, according to the FEMA NRI.

In addition to the general impacts of flooding in the planning area, breach impacts due to flooding are illustrated in the Muscatine Levee breach study. The extent of flood impacts is also delineated in the NOAA's National Water Prediction Service. The flood impacts for the Mississippi River at Muscatine and Cedar River at Conesville at various levels, according to the NOAA, are identified below:

Table 3-17 Flood Impacts for the Mississippi River at Muscatine

FT.	IMPACT
27.5	Water reaches the top of the Muscatine flood wall.
25	Water reaches the top of the Bay Island and Drury levees.
24	Water is at the front steps of the Hotel Muscatine and on Mississippi Drive at Pine Street.
23.5	Water affects Mississippi Drive at Chestnut Street, as well as industries in New Boston.
22.5	Water affects Mississippi Drive at Iowa Street.
22	Water affects lowest downtown businesses, Miss. Dr. at Sycamore St, 5th St at Mad Creek.
21.5	Water affects Mississippi Drive at Cedar Street
21	Riverside Park is entirely under water.
20.5	Water affects Mississippi Drive at Mulberry Street.
20	Water affects 5th Street at the Mad Creek bridge as well as the Pearl Street Station.
19.5	Water affects industries just north of the flood wall along Mad Creek.
19	Water affects marina buildings in Muscatine, Mississippi Drive at Walnut Street.
18	Water affects most of the Riverside Park parking lot.
16	Water affects the lower portion of the Riverside Park parking lot.

Table 3-18 Flood Impacts for the Cedar River at Conesville

FT.	IMPACT
23.5	Water is at the bottom of the County Road X40 and F36 bridge near Cedar Valley
23	Water is at the bottom of the U.S. Highway 6 bridge near Moscow
22.5	Water is at the bottom of the I-80 bridge
22	Water affects several residences near Moscow and is at the bottom of the Iowa Highway 22 and County Road G28 bridges
21.5	Water affects the lowest sections of County Road F44 near the river at Rochester
21	Water is at the bottom of the Iowa Highway 22 and County Road G28 bridges
20	Water affects the lowest sections of County Road F70 near the river
19	Water affects the lowest sections of U.S. Highway 6 near the river and is at the bottom of the County Road F70 bridge.
18	Water affects several residences in the Rochester area and is at the bottom of the County Road F44 bridge. Water also affects the lowest areas of West Rochester Avenue and affects residences in Moscow
17	Water affects permanent structures and roads in campgrounds just north of I-80 along the river. Water is also on the lowest areas of Atalissa Road.
16.5	Water affects County Road G28
15.5	Water affects residences along County Road G28 and affects several gravel roads
15	Water affects Saulsbury Road
14.5	Water affects residences along Iowa Highway 22. Water affects Hoot Owl Jct and Elder Avenue south of Iowa Highway 22.
14.2	Water affects Lindle Avenue and Keokuk Avenue, both near Saulsbury Park.
14	Water affects residences along County Road F70.
13.5	Water affects yards and access roads of residences along Iowa Highway 22.
13	Water affects Edgewater Road and 245th Street near Conesville

Flooding causes costly damage to residential and commercial properties. According to FEMA's Resilience and Planning Tool (RAPT), 84.51-100% of residential structures in the county that are located in a SFHA are protected with flood insurance. The NFIP maintains lists of repetitive loss and severe repetitive loss properties. Reducing future losses through buyout programs, mitigation strategies, and enforcement of flood plain development and ordinances are critical ways to address this hazard.

Repetitive Loss (RL) properties are any NFIP insured buildings that (1) have incurred flood-related damage on two occasions, in which the cost of repair, on average, equaled or exceeded 25% of the value of the structure at that time of the flood event; and (2) at the time of the second incidence of flood damage, the contract for flood insurance contains increased cost of compliance coverage.

Severe Repetitive Loss (SRL) properties are structures covered by an NFIP flood insurance policy that have incurred flood-related damage (1) for which four or more separate claims of more than \$5,000 each (including building and contents); or (2) for which two or more separate claims (building payments only) have been made where the total of the payments exceed the current market value of the insured property.

The October 2025 report provided by Iowa Homeland Security and Emergency Management identifies a total of 56 properties that are considered repetitive or severe repetitive loss. These are identified by jurisdiction, in the following table.

**Table 3-19 Repetitive Loss and Severe Repetitive Loss Properties
Muscatine County**

Jurisdiction	Residential	Non-Residential	Mitigated	FMA* Repetitive Loss	FMA Severe Repetitive Loss	NFIP** Repetitive Loss	NFIP Severe Repetitive Loss
Atalissa	2	0	0			2	0
Muscatine County (Unincorp)	31	2	5	1	4	27	3
City of Muscatine	8	11	0	0	1	15	0
West Liberty	1	1	0	0	0	1	0
TOTAL	42	14	5	1	5	45	3

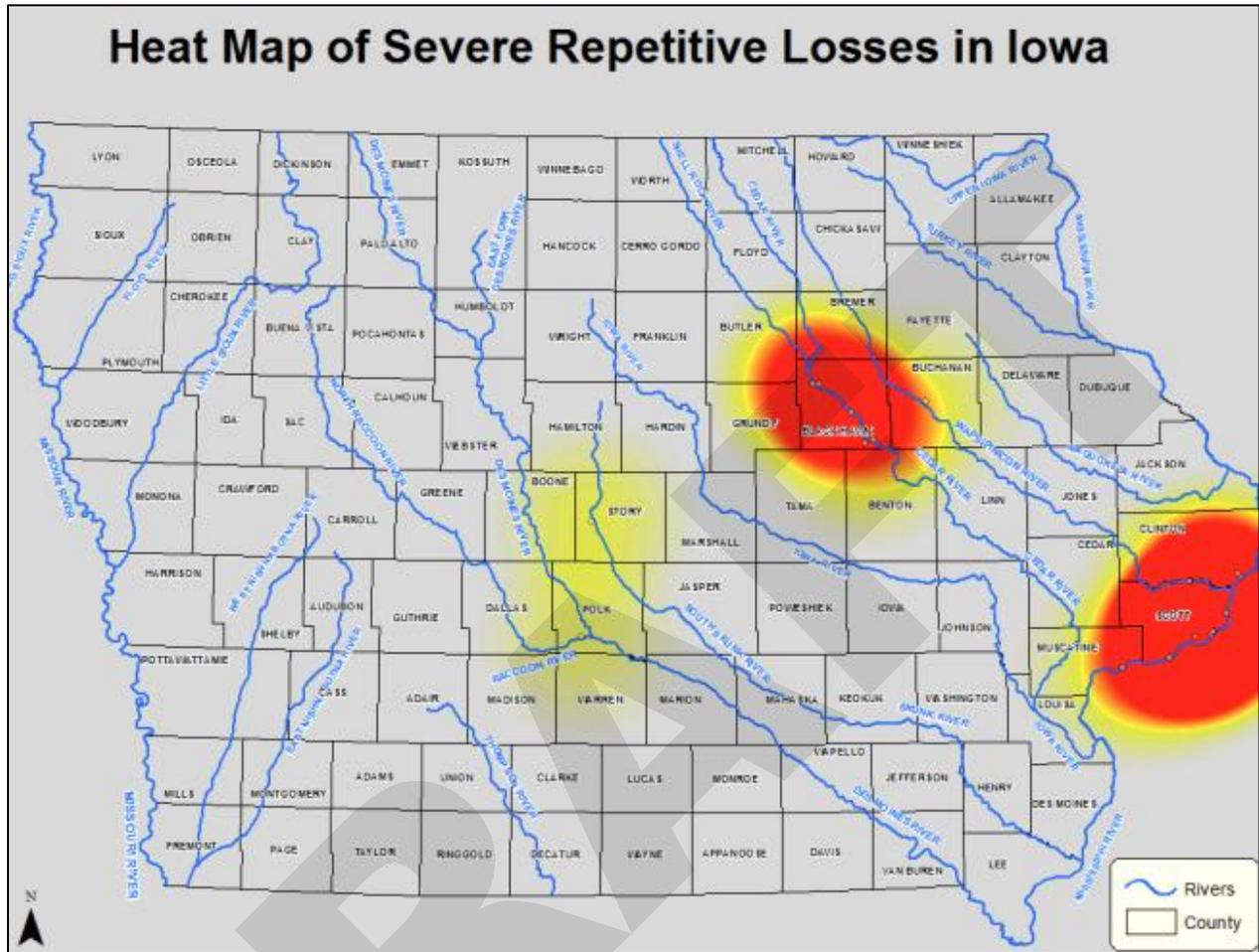
*FMA – Flood Mitigation Assistance Program

** NFIP – National Flood Insurance Program

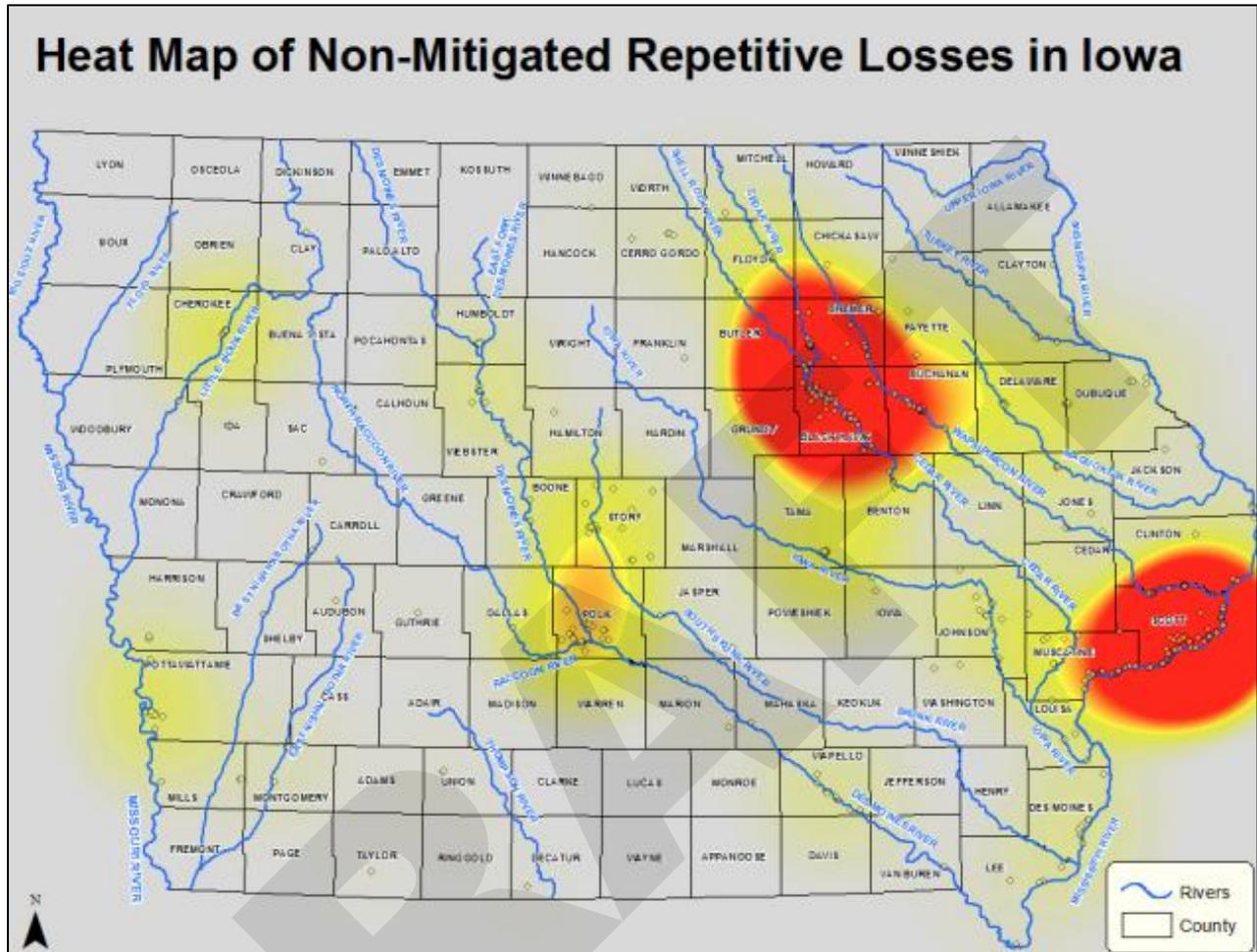
Source: Iowa Homeland Security Emergency Management

The *2023 Iowa Hazard Mitigation Plan* identified general locations of severe repetitive loss properties throughout the state. Portions of Muscatine County have higher concentrations of SRL properties and also non-mitigated repetitive losses, as compared to the rest of the state. Refer to following maps from the recent *2023 Iowa Hazard Mitigation Plan*.

Map 3-8 Heat Map of Severe Repetitive Losses in Iowa



Map 3-9 Heat Map of Non-Mitigated Repetitive Losses in Iowa



Warning Time/Duration. River flooding usually develops over the course of several hours or even days, depending on the basin characteristics and the position of the particular reach of the stream. Monitoring river levels allows communities to respond proactively to mitigate damages.

Gages along streams and rain gages throughout the state provide for an early flood warning system. Information from the NOAA, National Weather Service, and the U.S. Army Corps of Engineers provide important information in monitoring river levels to inform warning times. Creeks in the City of Muscatine are also monitored at two locations (Geneva Creek at Bidwell Road and Mad Creek at Hwy 61/Hwy 22 and at 180th Street County/G14).

The City of Muscatine implements its *Flood Plan Action Plan* when the river reaches 10 feet. The National Weather Service provides flood forecasts for Iowa. Flood warnings are issued over emergency radio and TV messages as well as the NOAA Weather Radio. People

in the paths of river floods may have time to take appropriate actions to limit harm to themselves and their property.

The responses to the effect of river flooding in Iowa are extensive and require many days to adequately respond to the needs of the county, cities, school districts, and citizens. It can take weeks to months for riverine flooding to return to normal levels. In 2019, for example, the Mississippi River rose above flood stage at Muscatine in March and remained above flood stage through June. These extended durations of flooding exacerbate the economic impacts of flooding.

Location/Vulnerability. Vulnerability to flood impacts is quite delineated. The Federal Emergency Management Agency (FEMA) has developed Flood Insurance Studies and identified Special Flood Hazard Areas in Flood Insurance Rate Maps (FIRMs). The FIRMs show areas where there is a 1% chance of flooding occurring in any given year. Generally, these areas are along streams and rivers. Map 3-10 also illustrates special flood hazard areas within Muscatine County. More detailed FIRMs for each participating jurisdiction can be viewed in the maps in Appendix 3-1.

The National Flood Insurance Program (NFIP) Repetitive Loss Properties (RLP) report identifies properties vulnerable to multiple flood losses. NFIP was established in 1968 to mitigate future flood losses nationwide, through sound, community-enforced building, and zoning ordinances, and to provide access to affordable, federally-backed flood insurance protection for property owners. Participation in the NFIP is based on an agreement between local communities and the Federal Government that states if a community will adopt and enforce a floodplain ordinance to reduce future flood risks to new construction in SFHAs, the Federal Government will make flood insurance available within the community, as well as provide financial protection against flood losses. Flood hazard mapping has allowed many communities to restrict development in hazardous areas.

Muscatine County has adopted a floodplain ordinance for unincorporated areas of the county. Communities participating in the NFIP, as of April 2025 and their most recent effective map dates are listed below.

Table 3-20 Communities Participating in the National Flood Insurance Program

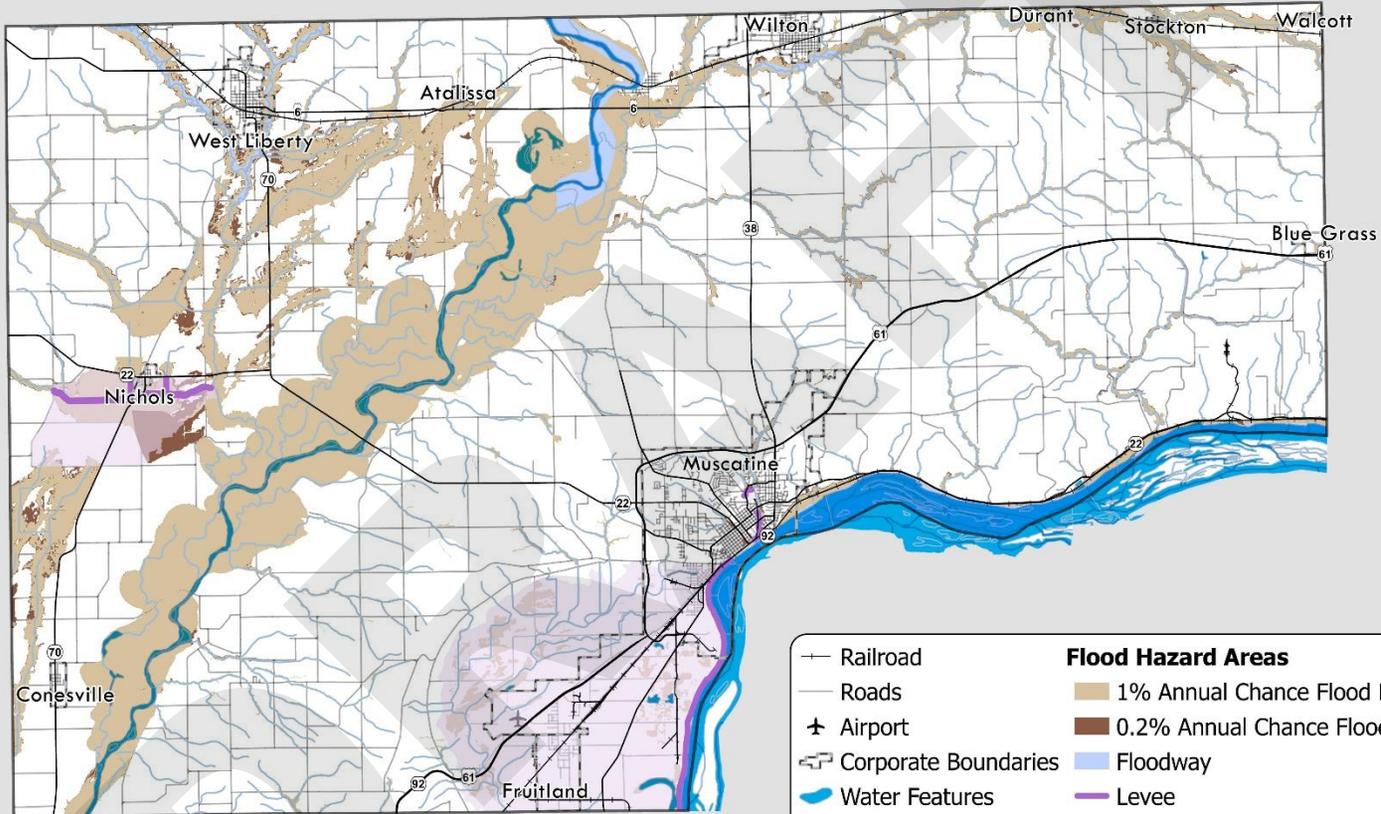
Jurisdiction	Effective Map Date
Muscatine County - Unincorporated	01-28-22
Atalissa	01-28-22
Conesville	(NSFHA)
City of Muscatine	01-28-22
Fruitland	(NSFHA)
Nichols	01-28-22
West Liberty	01-28-22
Wilton	01-28-22

*NSFHA = No Special Flood Hazard Area, All Zone C

Sources	
Iowa Homeland Security and Emergency Management Division (HSEMD)	Iowa Hazard Mitigation Plan, 2018, 2023
National Climatic Data Center	https://www.ncdc.noaa.gov/stormevents/
Iowa Department of Natural Resources	https://www.iowadnr.gov/environmental-protection/land-quality/flood-plain-management
Water NOAA	https://water.noaa.gov/gauges
2020 Muscatine County Code of Ordinances	https://www.muscatinecountyiowa.gov/DocumentCenter/View/2443/2020-Code-of-Ordinances?bidId=
FEMA Community Status Book	https://www.fema.gov/cis/IA.pdf
2020 City of Muscatine Public Works Flood Action Plan	https://www.muscatineiowa.gov/DocumentCenter/View/21209/Flood-Plan-Action-Items-1-PDF
Muscatine Urban Levee System Evaluation of Flooding Scenarios	https://www.muscatineiowa.gov/DocumentCenter/View/9411/Muscatine-Urban-Levee-modeling-presentation-May-2013-with-USACE-Logo?bidId=

Muscatine County Hazard Mitigation Plan

Map 3-10: Flood Hazard Areas



—+— Railroad	Flood Hazard Areas
— Roads	■ 1% Annual Chance Flood Hazard
✈ Airport	■ 0.2% Annual Chance Flood Hazard
⬭ Corporate Boundaries	■ Floodway
— Water Features	— Levee
	■ Area Protected by Levee



Sources:
 Flood Hazards - FEMA (2022)
 Levees - USACE National Levee Database
 Roads - IA DOT (2019)
 Counties - U.S. Census Bureau (2019)
 Other features - Bi-State Regional Commission

Disclaimer: This map is for reference only. Data provided are derived from multiple sources with varying levels of accuracy. Bi-State Regional Commission disclaims all responsibility for the accuracy or completeness of the data shown hereon.



Severe Winter Storms

General Description. Severe winter weather events include blizzards, heavy snow, ice storms, sleet, winter storms, other winter weather events, and extreme cold as defined by NWS *Directive 10-1605*. Accumulation criteria for precipitation events and temperature criteria for extreme cold are defined locally or regionally and may differ outside of the planning area.

Blizzards are winter storms that produce sustained winds or frequent gusts of at least 35 mph and snow that frequently reduces visibility to less than a quarter mile for at least three hours. Heavy snow is accumulation of at least six inches within twelve hours. Loose snow begins to drift when wind speed reaches 9 to 10 mph under freezing conditions. The potential for some drifting is substantially higher in open country than in urban areas where buildings, trees, and other features obstruct the wind. Ice storms occur when freezing rain creates ice accretion of at least a quarter inch. Sleet is recorded as significant when accumulations reach at least a quarter inch. Winter storms have more than one significant hazard and meet the warning criteria for at least one precipitation hazard. Winter weather events are used to define other winter precipitation events that do not meet warning criteria, but result in death, injury, or a significant economic or transportation impact.

Extreme cold events occur when low temperatures or wind chills reach a point where conditions could cause a human or economic impact. Wind chill is a function of air temperature and wind speed to calculate a wind chill temperature value as shown in Figure 3-2. Events are recorded as cold when temperatures or wind chills reach advisory criteria of at least -18° F and as extreme cold when temperatures or wind chills reach warning criteria of at least -35° F.

Figure 3-2 Wind Chill Chart

		Air Temperature (° F)																	
		40	35	30	25	20	15	10	5	0	-5	-10	-15	-20	-25	-30	-35	-40	-45
Wind Speed (mph)	5	36	31	25	19	13	7	1	-5	-11	-16	-22	-28	-34	-40	-46	-52	-57	-63
	10	34	27	21	15	9	3	-4	-10	-16	-22	-28	-35	-41	-47	-53	-59	-66	-72
	15	32	25	19	13	6	0	-7	-13	-19	-26	-32	-39	-45	-51	-58	-64	-71	-77
	20	30	24	17	11	4	-2	-9	-15	-22	-29	-35	-42	-48	-55	-61	-68	-74	-81
	25	29	23	16	9	3	-4	-11	-17	-24	-31	-37	-44	-51	-58	-64	-71	-78	-84
	30	28	22	15	8	1	-5	-12	-19	-26	-33	-39	-46	-53	-60	-67	-73	-80	-87
	35	28	21	14	7	0	-7	-14	-21	-27	-34	-41	-48	-55	-62	-69	-76	-82	-89
	40	27	20	13	6	-1	-8	-15	-22	-29	-36	-43	-50	-57	-64	-71	-78	-84	-91
	45	26	19	12	5	-2	-9	-16	-23	-30	-37	-44	-51	-58	-65	-72	-79	-86	-93
	50	26	19	12	4	-3	-10	-17	-24	-31	-38	-45	-52	-60	-67	-74	-81	-88	-95
	55	25	18	11	4	-3	-11	-18	-25	-32	-39	-46	-54	-61	-68	-75	-82	-89	-97
	60	25	17	10	3	-4	-11	-19	-26	-33	-40	-48	-55	-62	-69	-76	-84	-91	-98

Frostbite Times:	30 minutes	10 minutes	5 minutes
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Source: NWS, Wind Chill Chart

The NOAA Weather Prediction Center issues a Winter Storm Severity Index (WSSI) which accounts for many elements: blowing snow, flash freeze, ground blizzard, ice accumulation, snow amount, and snow load. The WSSI is available as a three-day outlook with an experimental four-day outlook.

Table 3-21 Winter Storm Severity Index

Impact Category	Description
None	Impacts not expected.
Limited	Rarely a direct threat to life and property. Typically results in little inconveniences.
Minor	Rarely a direct threat to life and property. Typically results in an inconvenience to daily life.
Moderate	Often threatening to life and property. Some damage unavoidable. Typically results in disruptions to daily life.
Major	Extensive property damage likely, life-saving actions needed. Will likely result in major disruptions to daily life.
Extreme	Extensive and widespread severe property damage, life-saving actions will be needed. Results in extreme disruptions to daily life.

Source: NOAA, Weather Prediction Center

Previous Occurrences. There have been 167 winter storm events recorded in Muscatine County between January 1, 1996 and February 11, 2025 – equivalent to nearly six winter storm events a year. Data collected from the NCEI Storm Events Database and winter storm events include blizzards, ice storms, heavy snow, winter weather, extreme cold/wind chill, and cold/wind chill. Events included were heavy snowfalls, extreme cold temperatures, blizzard conditions, freezing rain or glazing, blowing snow, frost, and sleet. The following are significant events that have occurred in Muscatine County from February 2007 to February 2025. Disaster declarations are noted, as applicable.

February 24, 2007: A widespread and crippling ice/snow storm affected eastern Iowa, northwest and western Illinois, and extreme northeast Missouri. This ice storm was the worst to affect the region since January 1965. Ice accumulations of around one inch were common, with some reports to near two inches. East winds gusting over 50 MPH, combined with the heavy ice accumulation, brought down numerous tree branches and power lines, along with several thousand power poles. Widespread power outages occurred, affecting over 180,000 people, which lasted more than a week in some of the rural areas. Muscatine County was part of the declared disaster area and included in the Presidential Disaster Declaration (FEMA -1688-DR; March 14, 2007).

January 13-16, 2009: Heavy snow fell January 13-14 (6-8 inches), and then extreme cold temperatures set in on January 14-16. Actual air temperatures were $\sim 10^{\circ}$ to $\sim 20^{\circ}$ F (wind chills $\sim 30^{\circ}$ to $\sim 50^{\circ}$ F). Cedar Rapids set a record low of $\sim 29^{\circ}$ F.

January 31-February 2, 2011: A tremendous blizzard affected the region, with snowfall totals ranging from 10-20 inches and snow drifts as high as 7 feet. Many roads and interstates were closed. Blizzard conditions were widespread, and visibility was near zero with 55-65 MPH wind gusts (Davenport recorded one of the strongest wind gusts of

56 MPH). At the height of the blizzard, snowfall rates were as high as 1-3 inches per hour. Muscatine County received 15.0 inches of snowfall.

February 1, 2015: A prolonged snow event from the mid-afternoon on January 31 to late February 1 created widespread snow across the region. The heaviest snowfall of 9-15" fell along the Interstate 80 corridor. Gusty northwest winds developed behind the system resulting in considerable blowing and drifting snow. Several areas experienced prolonged power outages and downed tree limbs due to heavy snow.

February 25 -26, 2015: A fast-moving storm system occurred from the mid-morning on February 25 to the early morning on February 26. An area of low pressure moved across the Plains and into Missouri spreading widespread snow across the region. Widespread snowfall totals between 3 and 6 inches were common. The heaviest snowfall of 6-7.5" fell generally along and southwest of a line from Cedar Rapids, to Muscatine, to Macomb, IL. Northerly winds of 10-20 MPH resulted in some snowdrifts of 1-2' in parts of southeast Iowa. A storm spotter reported 6" snow in Muscatine, and 3-6" of snow was reported elsewhere in the county.

November 20-21, 2015: A potent low-pressure system moved across Missouri and southern Illinois November 20 and 21, bringing the season's first snowfall to much of the area. Widespread snowfall totals of 6-12" were found across northern Iowa and the Wisconsin-Illinois border. Isolated higher amounts of 14-16" were reported. Strong northerly winds developed as the system moved off to the northeast, which created patchy blowing and drifting snow. A storm spotter reported 6.2" of snow in Muscatine.

December 28-29, 2015: A potent low-pressure system tracked from eastern Oklahoma and Missouri into northern Illinois and the Great Lakes region, from December 28 to the early morning hours of the 29th. Thundersnow was reported in some areas, as well as heavy snow, sleet accumulations up to 2-4 inches, and glaze ice amounts over a quarter inch. The ice and strong winds gusting to 50 MPH resulted in widespread downed trees and powerlines, and power outages. The hardest hit areas, with glaze ice amounts of ¼-½ inch, were located in southeastern Iowa. The highest amounts of combined snow and sleet, in the 5-7" range, occurred west and north of a line from Brighton, IA in Washington County, to Cedar Rapids, Anamosa, and Dubuque, Iowa. Trained spotters reported 1.5-3" of sleet across Muscatine County.

December 4, 2016: A storm system moved from the eastern Dakotas and Nebraska across Minnesota and Iowa on December 4. This brought mainly light to moderate snow across the region through the day with periods of heavy snow. The heaviest snow fell across Cedar, Clinton, Muscatine, and Scott Counties where 6-8" were reported. Elsewhere across eastern Iowa, snowfall totals ranged from 3-5 inches. Trained spotter reports ranged from 5" two miles east-southeast of Muscatine to 8" three miles east-northeast of Muscatine.

December 29, 2017: A winter storm moved across the region on December 29, bringing snow along, and north of a line from Fairfield to Burlington, Iowa. The heaviest snow fell

in counties along the Interstate 80 corridor where 4-7" of snow was reported. One-fourth inches of snow was reported to the south and north of that line with the lightest amounts along the U.S. Highway 20 corridor and along a line from Fairfield to Burlington. Snowfall reports ranged from an estimate of 6" one mile east-northeast of Muscatine to 6.5" southwest of Muscatine.

January 1-2, 2019: A strong area of low pressure tracked across the lower Mississippi River Valley, bringing heavy snow from central Missouri and southern Illinois up to northwest Illinois January 11-12. The heaviest snow amounts fell from Missouri into Ohio, where amounts over a foot were common. Further north, snowfall totals ranged from 1-3" along the Highway 20 corridor, to 4" near the I-80 corridor, and 8-12" along and south of Highway 34. Trained spotters' reports ranged from 6.5" three miles north northeast of Muscatine to 7.8" in Muscatine.

January 18-19, 2019: A significant winter storm system brought accumulating snow and hazardous travel conditions to the region Friday afternoon (January 18) through much of the day Saturday (January 19). Total snowfall accumulations of 3-6" fell across the area, with the higher amounts of 7-9" in the Freeport, IL area. In addition, strong winds resulted in some blowing and drifting snow and hazardous travel conditions. A trained spotter reported 4.8" in Muscatine. Wind gusts of 20 to 30 MPH caused blowing and drifting snow.

January 22-23, 2019: A significant winter storm system brought hazardous travel conditions to the region the afternoon and evening of Tuesday, January 22, through the morning of Wednesday, January 23. Freezing drizzle and rain fell for much of the morning and afternoon on Tuesday causing slick roads. Precipitation quickly changed to snow mainly north of a line from Keosauqua to Burlington. Snowfall totals of 2-6" were common over much of eastern Iowa and northwest Illinois. Rainfall totals over three quarters of an inch were seen over west central and north central Illinois. Snowfall reports ranged from 5.5" two miles north of Muscatine to 7.2" from a trained spotter in Muscatine.

February 11-12, 2019: A winter storm moved in on Monday, February 11th into Tuesday, February 12th, bringing snow, freezing rain, and some sleet to the area. Significant snow accumulations of 6-9" fell across portions of northeast Iowa and far northwest Illinois. Ice accumulations from freezing rain ranged from a light glaze to around two tenths of an inch, especially in parts of northwest Illinois. This storm was preceded by two other icing events, on February 5th and 7th. The storm on the 12th combined with pre-existing ice and strong west winds between 40-50 MPH caused widespread tree limb, power pole, and power line damage across eastern Iowa and northwest Illinois. A trained spotter reported 3.5" of snow in Muscatine, Iowa along with one fourth of an inch in ice accumulation. Significant blowing and drifting snow were widespread over the area with white out conditions at times lingering through the day of February 12. Power outages from down power lines, power poles, and tree branch damage were widespread.

December 29, 2020: A potent winter storm produced widespread heavy snow, along with freezing rain and sleet, across the region in the afternoon and into the early morning of the 30th. Eight to 12 inches of snow fell in the heaviest band between Interstate 80 and U.S. Highway 20. The highest freezing rain accumulations occurred along the U.S. Highway 34 corridor from Fairfield, IA to Oquawka, IL, where 0.2 to 0.3 inches of glaze ice was reported. Thunderstorms also occurred in eastern Iowa Tuesday evening, and resulted in extreme snowfall rates of 2 to 3 inches per hour.

January 30, 2021: A strong storm system moved into the Midwest when initially, rain that began as a layer of warm air was present. Over time, temperatures began to cool due to the falling rain, and precipitation changed to snow during the evening. Snow was widespread across the area during the morning of January 31, 2021, and all of eastern Iowa, northwest Illinois, and far northeast Missouri saw some form of accumulating snow. Totals were highest in parts of east central Iowa and in north central Illinois, where locally heavy banding at times on the morning of January 31 produced higher snowfall rates. Overall, totals ranged from around 4 to 6 inches.

February 4, 2021: A fast-moving arctic cold front brought dangerous conditions to portions of the area. Rain, mixed with freezing rain and sleet moved into eastern Iowa in the morning. Then, as a cold front moved in from the west during the mid-morning, the rain switched to snow. Strong winds and falling temperatures behind the front caused wet roads to quickly freeze. Snow fell for several hours and became heavy at times, with widespread 2 to 6 inches of snowfall. Winds behind the front were 25 to 35 MPH with gusts up to 45 MPH during the afternoon and evening causing blowing snow in open areas. Whiteout conditions were seen in open areas, and some areas experienced periods of near blizzard conditions, especially across east central and northeast Iowa. Significant drifting snow continued into Feb. 5. Wind chills dropped to 5 to -15 below zero late Thursday night and Friday morning along and north of I-80.

January 1, 2022: A strong winter storm impacted much of southeast Iowa, western Illinois, and northeast Missouri. Widespread snowfall ranging between 5 and 10 inches was reported in the hardest hit areas, with 1 to 4 inches surrounding and gusty winds to follow. This event started and ended as a snow event, as cold air was in place prior. With the gusty winds, blowing and drifting snow was observed, reducing visibilities and making it difficult to measure the snowfall. As the storm moved out, very cold temperatures moved in, with wind chills between -15 to -30 felt.

March 25, 2023: A strong winter storm brought moderate to heavy snow to portions of eastern Iowa and northwest Illinois late Friday night and early Saturday morning. Precipitation began as rain quickly changed over to snow early Saturday. Heavy, wet snow fell in most of eastern Iowa. The heaviest snowfall amounts between 8 and 12 inches fell from extreme eastern Iowa in Cedar, Scott, and Clinton Counties, to Carroll, Jo Daviess, and Stephenson Counties in Illinois. This heavy snow caused numerous accidents and downed several tree branches due to the weight of the snow.

December 14, 2024: During the daytime on December 14, widespread freezing rain occurred across eastern Iowa, northeast Missouri, and west central and northwest Illinois. Multiple jackknifed trucks on I-80 were reported through social media. Numerous branches were downed across the area due to icing. These along with ice on wires caused power outages, with some counties in southeast Iowa temporarily having 30% of customers without power. In McDonough County in west central Illinois, including the Macomb area, icing over 0.25 resulted in several large branches down.

Probability. A snowfall of six inches or more from one storm only occurs in 49% of Iowa winters, while a large winter storm event of 10 inches or more will occur about once every 3 years. The *2023 Iowa Hazard Mitigation Plan* reports that from 1996 to 2022, Muscatine County has experienced 154 winter storm events, which includes blizzards, ice storms, heavy snow, winter weather, extreme cold/wind chill, and cold/wind chill. That is equivalent to approximately six winter storm events a year. The probability of severe winter storms is very high.

Extent. The various types of extreme winter weather cause considerable damage. Heavy snows can cause immobilized transportation systems, downed trees and power lines, collapsed buildings, and loss of livestock and wildlife.

Winter weather can have significant impacts on transportation systems and structures. The impacts of winter weather on transportation can range from ice or snow buildup on roads and bridges, cold weather limiting a vehicle's ability to operate, downed trees and electrical wires, and limited visibility while driving. Hazardous driving conditions due to snow and ice on highways and bridges lead to many traffic accidents. About 70% of winter-related deaths occur in automobiles, and about 25% accounts for people caught out in a storm. Those at risk are primarily either engaged in outdoor activity (shoveling snow, digging out vehicles, or assisting stranded motorists), or are elderly or very young.

Freezing temperatures can burst water pipes, leading to loss of water and possible evacuations in dangerous temperatures. Ice coating at least one-fourth inch is heavy enough to damage trees, overhead wires, and similar objects that could produce widespread power outages. If a power outage occurs, the dropping temperature inside a structure can also put the integrity of a water pipe at risk. Another associated risk with cold weather is the use of kerosene, space, or alternative heaters. These warmers can create hazards, such as structural fires and carbon monoxide poisoning.

Indirect injuries and deaths can also occur while people clear snow or debris. Slips and falls can be common, and at-risk populations may suffer from the physical toll of activities, such as shoveling snow, that may lead to heart attacks and other health issues.

Colder temperatures in the early or late stages of the growing season for agriculture can also leave a significant impact on crop production. The cost of snow removal, repairing damage, and loss of business can have large economic effects on the community. The loss of revenue and economic impact due to property damage and crop damage could be significant if several severe storm events occur within a short period of time. FEMA's

National Risk Index expects the following annual losses in Muscatine County for cold wave, ice storm, and winter weather respectively: \$487,000, \$89,000, and \$33,000.

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

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

Location/Vulnerability. The entire planning area is equally at risk for severe winter storms. There is a particular risk for the elderly and young children in severe winter storms, especially in the event of loss of electricity or heat. Cold temperatures can cause frostbite and hypothermia, especially when combined with wind chills that further reduce the perceived air temperature. Engaging in outdoor activities for prolonged periods of time in freezing weather increases a person's vulnerability to frostbite and hypothermia.

Schools often close during extreme cold or heavy snow to protect children and bus drivers. Hazardous driving conditions due to snow and ice on highways and bridges can lead to traffic accidents. Emergency services, such as police, fire, and ambulance may be unable to respond due to road conditions. Emergency needs of remote or isolated residents for food or fuel, as well as feed, water, and shelter for livestock, are unable to be met.

Sources	
American Red Cross	http://www.redcross.org/prepare/disaster/winter-storm
FEMA	http://www.ready.gov/winter-weather
National Weather Service, Quad Cities	http://www.crh.noaa.gov/dvn/
National Risk Index	https://hazards.fema.gov/nri/map
National Climatic Data Center	http://www.ncdc.noaa.gov/stormevents/
State of Iowa	Iowa Hazard Mitigation Plan, 2023

Thunderstorm, Hailstorm, and Lightning

General Description. Thunderstorm, hailstorm, and lightning hazards are addressed together, due to their regularly combined occurrence.

Thunderstorms are common in Iowa and can occur singly, in clusters, or in lines. Thunderstorms typically include thunder caused by lightning, heavy rains (which may cause flash flooding), and strong winds reaching or exceeding 57.5 MPH producing tornados, and also may include surface hail of at least 1.00 inch in diameter. They are created from a combination of moisture, rapidly raising warm air, and a lifting mechanism, such as clashing warm and cold air masses. Most thunderstorms produce only thunder, lightning, and rain. Severe storms, however, can produce tornados, straight-line winds, and microbursts above 58 MPH, hailstorms, and flooding.

Hail is a form of precipitation that forms when raindrops are carried upward by thunderstorm updrafts into extremely cold areas and freeze. Hail falls to the earth when it becomes heavy enough to withstand the thunderstorm updraft. Hail is produced in many strong thunderstorms by strong rising currents of air carrying water droplets to a height where freezing occurs. Hail can be smaller than a pea or as large as a softball and can be very destructive to plants and crops. Pets and livestock are particularly vulnerable to hail.

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

Table 3-22 TORRO Hail Size Damage

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

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

Previous Occurrences. Data from the National Centers for Environment Information (NCEI) Storm Events Database records 268 thunderstorm, lightning, and hail events in the past 24 years in Muscatine County (January 2000 to December 2024). Lightning events are only reported in the NCEI database when causing significant damage, and no lightning events have been reported during this period.

Table 3-23 Historical Storm Events, 2000-2024

Year	Thunderstorm Events	Lighting Events	Hail Events
2000-2004	30	1	20
2005-2009	36	1	27
2010-2014	20	1	29
2015-2019	22	1	17
2020-2024	34	0	29
TOTAL	142	4	122

Source: NCEI Storm Events Database

Recent notable from the NCEI Storm Events Database are listed below, supplemented with additional sources.

June 21, 2001: A storm came through Muscatine and brought hail ranging in size from penny, nickel, and quarter (one-inch wide).

July 8, 2001: Hot and humid conditions were found over the region with temperatures generally in the 90s and heat indices ranging from 100 to 110 degrees. A stationary boundary extended along the Interstate 80 corridor. This convection produced an outflow boundary that served as the focus for additional thunderstorm development by early afternoon. Wind speeds reached 65 MPH in Muscatine near the noon hour.

April 18, 2002: A second round of severe weather plagued portions of Eastern Iowa. Scattered severe thunderstorms developed over North Central Iowa during the late afternoon, and moved back across some of the same areas along and north of Interstate 80. The severe thunderstorms produced damaging winds, large hail, and a few funnel clouds. In Atalissa, lightning struck a 100-year-old Cottonwood tree. Witnesses said the sound was so loud it sounded like an explosive. Pieces of the tree were found as far away as 200 feet.

July 6, 2003: A strong thunderstorm travelled across Southern Cedar and Northern Muscatine counties during the early afternoon. A microburst about a mile in diameter

occurred along the Cedar/Muscatine line between Wilton and Durant, Iowa. Several trees were downed along highway 927 just east of Little Elkhorn Creek and at the Wahkonsa Country Club. A vehicle travelling on highway 927 was reported to be pushed backwards and then sideways by the wind. South of the golf course on Trail Avenue in Northern Muscatine County, numerous trees were downed on two farms with an outbuilding leveled. Just north of Durant on 1st Avenue, a 10-foot limb was downed just east of the Scott/Cedar County line. Wilton had reports of winds reaching 65 MPH.

April 13, 2006: An upper-level disturbance combined with a strong low-level jet of 35 to 45 MPH initiated thunderstorms in a semi-moist atmosphere across eastern Iowa and northwest Illinois. This low-level jet strengthened to 58 to 63 MPH across eastern Iowa and northwest Illinois around sunset. Favorable shear profiles allowed supercells to develop that were prolific large hail producers. Hail size in Atalissa, Muscatine, and West Liberty was one inch. Additionally, numerous tornadoes were produced causing considerable damage. Winds over 60 MPH in Nichols and Muscatine caused downed power lines and semi-trucks blown over on Highway 70.

June 14, 2008: A few isolated thunderstorms moved across parts of eastern Iowa into portions of northwest Illinois during the late afternoon and early evening of June 14 producing large hail and damaging winds. Wind gusts surpassing 70 MPH in Muscatine caused a tree 3-feet in diameter to be blown down.

July 21, 2008: A bowing line of severe thunderstorms, known as a Derecho, raced across Iowa and Illinois during the early morning hours of July 21 producing widespread wind damage in about a 60-mile-wide swath just south of Interstate 80. Winds gusting over 70 miles an hour toppled trees, ripped siding and shingles off homes and businesses, and left much of the region without power. Wind gusts were estimated near 70 MPH in Montpelier and in Muscatine. Trees were downed across Mulberry Avenue causing home damage and some power outages. Damages were also reported along Highway 61.

June 19, 2009: A cold front pushed through Iowa and Illinois during the afternoon and evening of June 19, bringing severe thunderstorms and flooding to much of the area. After seeing generally sunny skies for much of the day, thunderstorms developed and raced east across the area during the late afternoon and early evening hours. Winds in excess of 70 mph were reported with some of the storms as they sped through the area toppling trees and causing some structural damage. In addition to the high winds, torrential downpours were common with the storms as they dumped anywhere from three-quarters of an inch to over 3 inches of rain in only an hour or two. Temperatures topped out in the middle 80s and lower 90s. Wind gusts surpassed 70 MPH in Nichols. Tree damage was reported in Fruitland, Muscatine, and Nichols.

April 4, 2010: Skies were mostly cloudy as an upper-level disturbance crossed the region during the afternoon and early evening hours. The system triggered several

severe thunderstorms with hail up to the size of a golf ball reported in Cordova, IL, with several reports of 1-inch diameter hail across Muscatine and Conesville.

March 19, 2012: A lightning strike caused some electrical damage to the HON plant in Muscatine, IA during the evening of March 19. Power to the plant was knocked out, and smoke was observed.

May 4, 2015: A slow-moving cold front produced areas of thunderstorms with large hail up to the size of quarters and frequent lightning. One person was killed, and another was injured by lightning in Muscatine County. Heavy rain also was common.

May 17, 2017: A fast-moving complex of severe thunderstorms developed and tracked over much of eastern Iowa, northwest Illinois, and northeast Missouri, as an area of low pressure lifted northeast into northwest Iowa. Widespread damaging winds, large hail, frequent lightning, and a few brief tornadoes were reported. The size of hail in Muscatine and Fruitland was one inch in diameter. In Stockton, reports indicated some hail at 1.75 inches in diameter.

June 17, 2017: Supercell thunderstorms developed in Iowa, near Muscatine County the afternoon of June 17th. They produced large hail, heavy rain, and very high winds that caused damage to trees and some structures. As the storms moved into Illinois, they increased in number and produced a few more areas of damage. Winds were estimated over 65 MPH in Ardon and Muscatine resulting in damage to trees and some structures. The size of hail reported in Muscatine was 1.25 inches in diameter.

April 7, 2020: Severe thunderstorms developed along a cold front that dropped south across eastern Iowa and northwest Illinois Tuesday evening. Heavy downpours and very large hail were reported. The hardest hit areas were the northeast side of Cedar Rapids and the Iowa side of the Quad Cities, where ping pong ball to baseball-sized hail fell. This was the 1st of back-to-back severe hail events, as another significant event occurred April 8, 2020, impacting the city of Conesville.

July 11, 2020: Severe thunderstorms developed across eastern Iowa and northwest Illinois on Saturday, July 11, producing widespread wind damage and very large hail. The first line of storms came through during the morning, producing damaging wind gusts and reports of quarter to ping pong ball size hail from Independence to Tipton, Iowa. The second round of thunderstorms developed as a result of an upper-level disturbance interacting with an atmosphere characterized by extremely high instability with modest vertical wind shear. These storms continued producing additional reports of wind damage and winds of 70 to 90 MPH. Numerous power outages were reported.

August 19, 2022: The storms were slow moving, which allowed some storms to anchor over locations for an extended period of time, resulting in flash flooding. Some repeated storms over the same area also led to similar results. Severe weather reports were mostly in the form of hail, as these storms produced hail very efficiently. The

largest hail reported was 1.5 inches, and there were some isolated reports of damaging winds.

April 4, 2023: There were two rounds of severe thunderstorms on April 4, 2023. Round 1 of activity began during the early morning hours, as elevated thunderstorms developed across southeast Iowa. These storms quickly intensified and became severe as they moved into eastern Iowa, and produced very large hail from golf ball to tea cup size hail.

May 7, 2023: Several rounds of severe thunderstorms impacted the county with hail reported in West Liberty, Stockton, Nichols, Atalissa, and Fruitland. Two areas of storms were present during the mid to late afternoon. The first was the most severe, producing hail up to baseball size in Koszta, Iowa and widespread wind damage, especially around West Liberty, Iowa. This storm, and storms to the west, eventually merged into a cluster of severe thunderstorms, producing large hail and destructive winds around 70-75 MPH. An EF-1 tornado also touched down in West Liberty as a result of this storm, causing damage to buildings and trees. The state issued a disaster declaration for this event making state resources available.

July 28, 2023: As storms arrived across east central Iowa, they began producing winds around 70 MPH across the Hwy 20 corridor. A tree downed on powerlines was a likely cause for a local house fire. Another storm to the south further intensified, and began producing winds of 80+ MPH as it tracked along the Hwy 30 corridor.

May 21, 2024: Many areas in the county were impacted by this severe storm system including Nichols, Muscatine, Atalissa, and West Liberty. The bulk of the severe weather occurred during the late afternoon and evening time frame. Straight-line winds were the main hazard with the storms, and impressive wind gusts up to 100MPH were recorded. A disaster proclamation including Muscatine County was issued, activating the Iowa Individual Assistance Grant Program and Iowa Disaster Case Advocacy program.

June 25, 2024: Numerous slow-moving storms occurred on the afternoon of June 25, lasting into the evening. These storms impacted the City of Muscatine, Atalissa, Sweetland Center, and Wilton. They quickly became strong to severe, with multiple becoming supercells producing locally heavy rainfall, damaging winds, large hail, and four tornadoes that were generally weak, but still capable of damage. Winds were generally 60 MPH or greater with the stronger storms, with a corridor of winds greater than 65 MPH. These thunderstorms remained nearly stationary in areas, resulting in nearly 2 to 4 inches of quick rainfall and flash flooding.

July 2, 2024: A line of organized storms surged into eastern Iowa late in Atalissa and Fruitland, producing severe winds and heavy rainfall. Trees were downed with thunderstorm wind gusts of 60 to 80 MPH. Rainfall totals were recorded at amounts of 2 to 3.5 inches. The additional local rainfall during this time contributed to prolonging the crest of the Wapsipinicon and Mississippi rivers.

Probability. There is a high probability of future events for thunderstorms, hailstorms, and lightning for Muscatine County. With a total of 268 thunderstorm, lightning, and hail events recorded in the past 24 years in Muscatine County, this averages to 11.16 events each year. The *2023 Iowa Hazard Mitigation Plan* notes lightning and hail events can occur in any county in the state, with an average of two-to-four hailstorms a year.

With Iowa's location in the interior of the U.S., there is a very high likelihood that summer storms will continue to become severe and cause damage. Due to the humid continental climate that Iowa experiences, conditions for the development of severe thunderstorms are prevalent.

Extent. The NCEI Storm Events database reported property damage from all events in this category at \$3,368,700, and crop damage totaled \$199,050. Many events also resulted in insurance claims that are not included in these damage losses.

Thunderstorms, hail, and lightning can cause death, serious injury, and substantial property damage. Those in unprotected areas, mobile homes, or vehicles during a storm are at risk. Sudden strong winds often accompany a severe thunderstorm and are capable of blowing down trees across roads and power lines. High winds from storms can damage trees, homes, mobile homes, and businesses and blow vehicles off the road. Straight-line winds are responsible for most thunderstorm damage. One or more severe thunderstorms occurring over a short period (especially on saturated ground) can lead to flooding and cause extensive power and communication outages as well as agricultural damage.

Lightning presents the greatest immediate danger to people and livestock during a thunderstorm. The power of lightning's electrical charge and intense heat can electrocute people and livestock on contact, split trees, ignite fires, and cause electrical failures. Livestock and people who are outdoors, especially under a tree or other natural lightning rods, in or on water, or on or near hilltops are at risk from lightning.

Hail can be very dangerous to people, pets, and livestock if shelter is not available. Hailstorms cause nearly \$1 billion annually in property and crop damage in the United States. The peak hail activity coincides with the Midwest's peak agricultural season. Financial effects resulting from damage to property is in the millions of dollars every year, much of which is covered by crop and hazard insurance. The *2023 Iowa Hazard Mitigation Plan* identifies inflation-adjusted crop insurance losses due to hail at \$2,000,001 to \$7,000,000 between 1989-2022 for Muscatine County.

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

Forecasting hailstorms as with their parent thunderstorms, and forecasting the conditions suitable for developing storms with the potential to create hail is becoming quite accurate due to the advancement in Doppler Radar and other technologies operated by the National Weather Service. Warnings in the 20 to 30-minute range are usually available prior to the occurrence of the storm.

Severe thunderstorms can be quite expansive with areas of localized severe conditions. Most severe thunderstorm cells are 5 to 25 miles wide with a larger area of heavy rain and strong winds around the main cell. Most severe thunderstorms last from 20 to 30 minutes, while some severe thunderstorms last longer than 30 minutes. The occurrence of hailstorms is short-term in nature and usually limited to less than 6 hours per event.

Location/Vulnerability. The entire planning area is equally at risk for thunderstorm, hailstorm, and lightning. The NOAA Storm Events Database Explore maps the locations of storm events throughout the planning area. Thunderstorms, lightning, and hail hazards will all continue to impact a large majority of the population and area of Muscatine County. Those in unprotected areas in the outdoors are especially vulnerable to these hazards. Severe storm events are more likely to occur during months in which people are gathered for outdoor activities including festivals, sports, and other events.

Farmers are also particularly vulnerable to severe storms by crop damage as well as damage to buildings and agricultural equipment. The historical record also shows loss of livestock due to the damage caused by severe storms being a possibility.

Severe wind gusts of over 80 mph can severely damage even anchored mobile homes; people living in mobile homes are vulnerable to injury and death in severe wind events. Elderly and children under 18 can be more adversely affected by impacts, such as power failures that can be life threatening in the summer and winter months.

Sources	
State of Iowa	Iowa Hazard Mitigation Plan, 2018, 2023
NOAA National Centers for Environmental Information	https://www.ncdc.noaa.gov/stormevents/
National Climatic Data Center	National Centers for Environmental Information (NCEI)
TORRO Hailstorm Intensity Scale	https://www.torro.org.uk/research/hail/hscale
NOAA National Severe Storms Laboratory	https://www.nssl.noaa.gov/education/svrwx101/hail/types/
National Weather Service	https://www.weather.gov/hazsat/

Tornado

General Description. While tornadoes are produced by severe storms, they are not as common and present unique risks. Tornadoes form during thunderstorms when warm, humid air collides with colder air to form a vortex downwards from the clouds. Tornadoes that reach the ground may cause extensive damage. Tornadoes can have rotating wind speeds exceeding 300 miles per hour (MPH) and travel across the ground at average speeds of 25 to 30 MPH. A tornado can be a few yards to a mile wide where it touches the ground; an average tornado is a few hundred yards wide. It can move over land for distances ranging from short hops to many miles, causing great damage wherever it descends. The tornado is made visible by the dust sucked up and by condensation of water droplets in the center of the funnel. The size and shape of a tornado does not give an indication of tornado strength. Wedge shaped and rope shaped tornadoes can both cause EF 4-5 damage.

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

Table 3-24 The Enhanced Fujita (EF) Scale

Fujita Scale F Number	Fastest ¼ mile (MPH)	3-Second Gust (MPH)	Operational EF Scale	
			EF Number	3-Second Gust (MPH)
0	40-72	45-78	0	65-85
1	73-112	79-117	1	86-110
2	113-157	118-161	2	111-135
3	158-206	162-209	3	136-165
4	207-260	210-261	4	166-200
5	261-318	262-317	5	Over 200

Between 1980 and 2022, Iowa averaged approximately 49 tornadoes per year. In Iowa, most tornadoes occur in the spring and summer months, but can and have occurred in the fall and winter. Tornadoes are most common in late afternoon to evening hours, but can occur at any time of the day.

Historical tornado intensity for Muscatine County from 1950 to 2024 according to the EF Scale is below. A majority of tornadoes in the planning area have been EF 0 and EF1 Tornadoes.

Table 3-25 Muscatine County Tornado Intensity, 1950-2024

Fujita Scale F Number	# or Tornadoes
0	15
1	16
2	5
3	2
4	0
5	0

Source: <https://www.tornadopath.com/iowa/muscatine>

Previous Occurrences. According to the NCEI *Storm Events Database*, there were 40 tornado reports for Muscatine County between November 17, 1952 and July 15, 2024. This number does not clearly represent individual tornado events, since there are duplicate reports for the same event or, in one case, multiple tornadoes on the same day. By analyzing the reports and including the most recent tornadoes, there appears to be 22 separate tornado events with an average interval of three years over the reporting period. The majority of reports are of F0 or F1 tornadoes. Notable events include:

May 23, 1966 and May 07, 1967: F2 tornadoes were reported for both of these dates with \$250,000 and \$25,000 in property damage respectively.

May 09, 1995: Numerous small and brief tornadoes of F0 and F1 intensity touched down west of Muscatine and south of Wilton with most of the damage from hail. One of the tornadoes occurring on this date is reported as F3 traveling 10 miles between Stockton and New Liberty. Property damage from this one tornado reported at \$650,000.

June 14, 2001: An F2 tornado touched down east northeast of Montpelier near Highway 22 and the Muscatine/Scott County line.

August 21, 2002: An F1 tornado touched down north of Muscatine near Highway 38. Extensive damage to a machine shed was reported. Corn was flattened in spots, and trees were blown down starting at the Municipal Golf Course and along its path.

April 13, 2006: A tornado developed 4.2 miles west southwest of Muscatine and moved across the U.S. 61 bypass and Highways 92 and 61 across the south edge of Muscatine. The tornado moved into the Mississippi River and crossed over into Rock Island County, Illinois. Intermittent F0 damage to trees and outbuildings was noted while in Iowa.

June 01, 2007: A tornado entered into Muscatine County from Louisa County just south of Fruitland. It progressed through the center of Fruitland destroying the post office and city hall buildings, numerous homes, and overturning some railroad cars. In Muscatine, the western sections of the city had varying degrees of damage, mainly confined to roof damage. At a car dealership, some cars were displaced. The tornado eventually lifted on the northeast side of Muscatine near the junction of Highways 22 and 61. Debris from Muscatine and Fruitland fell in Lowden, IA. The super cell re-intensified as it

entered the southeast part of Cedar County producing a brief tornado near Wilton. The EF3 tornado traveled 10 miles with property damage of \$15 million.

April 25, 2008: A tornado touched down 5.2 miles northeast of Nichols and tracked to the northeast before lifting 2 miles west of Moscow. The EF2 tornado was on the ground for 6.5 miles, had maximum winds to 115 MPH, and was 150 yards wide. Five farmsteads were hit by the tornado, but no injuries were reported. Property damage was reported at \$200,000.

May 30, 2013: An EF1 tornado near Todd's Ferry Road and 260th Street occurred at 3:10 p.m. This tornado travelled 2.43 miles with its highest windspeed around 95 MPH.

June 24, 2013: An EF1 tornado was spotted along Highway 61 in Muscatine's business district just after 2:00 p.m. The tornado hit Krieger's Collision Center causing one fatality. The storm also caused damage to a church, hotel, and several other businesses. Damage continued down New Era Road where several farmsteads were also damaged. Damage estimate was over \$500,000.

October 6, 2016: An EF1 tornado touched down northwest of the intersection of N Mulberry Road and Bayfield Road at 9:07 p.m. The tornado travelled 9.52 miles and was 30 yards wide. There were no injuries reported.

March 6, 2017: An EF2 tornado touched down in Kent Stein Park at about 10:05 p.m. This tornado traveled 1.78 miles to the northeast to downtown Muscatine. This tornado caused three injuries, and \$100,000 in damage was reported. A state disaster declaration was published on March 8, 2017 (Iowa 2017-01).

March 6, 2017: An EF0 tornado began in Muscatine County and then tracked into Scott County as an EF2 where power poles were snapped, roof damage occurred and numerous farm buildings and trees were damaged. A state disaster declaration was published on March 8, 2017 (Iowa 2017-01).

May 7, 2023: An EF1 tornado touched down northwest of West Liberty and traveled 4.95 miles, crossing Highway 6 towards Atalissa. No injuries were reported, and damages reported were mainly to outbuildings, with several walls and roofs collapsed. A state disaster declaration for the county was issued (Iowa 2023-15; May 8, 2023).

May 24, 2024: Beginning in south Johnson County, an EF1 tornado headed northeast near Nichols along Highway 22 and continued through open farm land before lifting between West Liberty and Atalissa. The tornado traveled nearly 11 miles with max winds around 90 MPH. No injuries were reported. Reported damage was to farm outbuildings near Nichols. A federal disaster declaration was issued concerning this event and others occurring in the previous and following days (FEMA-4784-DR; May 24, 2024).

July 15, 2024: A tornado touched down near the shore of the Mississippi River in Muscatine County before crossing the river and reaching land in Rock Island County

west of Loud Thunder Forest Preserve. No rating was assigned while the tornado was over the Mississippi, but once onshore in Illinois, it was rated EF0 with winds around 75 MPH. Trees were damaged. No injuries were reported.

Probability. The *2023 Iowa Hazard Mitigation Plan* notes that most places in Iowa have had the same rate of reported tornadoes of any magnitude over the past 40 years. Data from the NCEI from 1952-2024 reported 40 tornado events in Muscatine County, over the past 72 years. Based on this information, future tornado events are likely to occur in any part of the planning area.

Extent. Generally, the destructive path of a tornado is approximately two-hundred feet in width, but stronger tornadoes can leave a path of destruction up to a mile wide. Large hail, strong straight-line winds, heavy rains, flash flooding, and lightning are associated with severe storms and may cause significant damage to a wider area.

Impacts vary from broken tree branches, shingle damage to roofs, and some broken windows to complete destruction and disintegration of well-constructed structures, infrastructure, and trees. Tornadoes can affect many critical services, such as gas and water, but mainly electrical power. Buried services are not as vulnerable, but can be affected by system components that are above ground. A tornado would be devastating to any structure, regardless of whether it was a critical structure, and can affect its ability to function. Damage from flying debris could injure people, shatter windows, and further damage structures. With stronger tornadoes, entire towns have been destroyed. Economic effects can result from direct damage to facilities or business disruption from the lack of critical services.

According to the NCEI Storm Event Database, \$18,809,500 in property damage and \$5,000 in crop damage were estimated to have occurred within Muscatine County from 1950-2024. The expected annual loss due to tornados is \$1,223,637, according to FEMA's National Risk Index

Warning Time/Duration. When tornadoes do occur, they strike with an incredible velocity. Wind speed may exceed 300 MPH, and the storm can travel across the ground at more than 70 mph. Thankfully, the advancement in weather forecasting has allowed watches to be delivered up to hours in advance for those in the storm's path. The best lead-time for a specific severe storm and tornado is about 30 minutes. Tornadoes have been known to change paths rapidly, thus limiting the time in which to take shelter. Tornadoes may not be visible on the ground due to darkness, blowing dust, driving rain, and hail. Tornado alerts are issued by the National Weather Service in the Quad Cities, and sirens are activated according to the Muscatine County-Wide Outdoor Warning System guidance.

The National Severe Storms Laboratory indicates that the average tornado is on the ground for five minutes, but can vary from a moment to an hour. The response to a tornado event is tied to responding to the immediate threat to life and property immediately following the tornado event and in the shelter of affected families and individuals.

Location/Vulnerability. The entire planning area is equally at risk for tornadoes. Those most at risk include people living in mobile homes, campgrounds, and other dwellings without secure foundations or basements. People in automobiles and trucks are also very vulnerable to tornadoes. The elderly, the very young, and the physically and mentally handicapped are most vulnerable because of the lack of mobility to escape the path of destruction. People who may not understand the tornado watches and warnings due to language barriers are also at risk. Paths of previous tornado events are illustrated below.

Figure 3-3 Muscatine County Tornado Tracks, 1950-2024



Source: Midwestern Regional Climate Center, <https://mrcc.purdue.edu>

Mobile home parks in the county are of particular concern as they are home to a high density of residents with structures not built to withstand high windspeeds. Other places with high densities of people such as schools, nursing homes, and large apartment buildings are also vulnerable.

Sources	
State of Iowa	Iowa Hazard Mitigation Plan 2023
Muscatine County	Muscatine County Multi-Jurisdictional Hazard Mitigation Plan 2020
National Centers for Environmental Information	https://www.ncei.noaa.gov/stormevents/
National Severe Storms Laboratory	https://www.nssl.noaa.gov/education/svrwx101/tornadoes/faq/
National Weather Service	https://www.weather.gov/oun/efscale

Sources	
Muscatine County Warning Sirens	https://www.muscatineiowa.gov/DocumentCenter/View/23482/2021-Siren-Policy-PDF
Midwestern Regional Climate Center	https://mrcc.purdue.edu

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Windstorms

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

Damaging winds are often called “straight-line” winds to differentiate the damage caused from tornadoes. Strong thunderstorm winds can come from a number of different processes. Most thunderstorm winds that cause damage at the ground are a result of outflow generated by a thunderstorm downdraft. Damaging winds are classified as those exceeding 50-60 MPH. Damaging wind events can produce straight-line winds in excess of 64 knots causing some power outages, property damage, impaired visibility, and crop damage. The Beaufort Wind Scale below identifies winds above 73 MPH as hurricane force winds.

Table 3-26 Beaufort Wind Scale

Windspeed in MPH	Description - Visible Condition
0	Calm smoke rises vertically
1-4	Light air direction of wind shown by smoke but not by wind vanes
4-7	Light breeze wind felt on face; leaves rustle; ordinary wind vane moved by wind
8-12	Gentle breeze leaves and small twigs in constant motion; wind extends light flag
13-18	Moderate breeze raises dust and loose paper; small branches are moved
19-24	Fresh breeze, small trees/leaves begin to sway; crested wavelets form on inland water
25-31	Strong breeze, large branches in motion; telephone wires whistle; umbrellas used with difficulty
32-38	Moderate gale whole trees in motion; inconvenience in walking against wind
39-46	Fresh gale breaks twigs off trees; generally, impedes progress
47-54	Strong gale slight structural damage occurs; chimney pots and slates removed
55-63	Whole gale trees uprooted; considerable structural damage occurs
64-72	Storm very rarely experienced; accompanied by widespread damage
73+	Hurricane-like devastation occurs

A derecho is a widespread, long-lived windstorm that is associated with a band of rapidly moving showers or thunderstorms. A typical derecho consists of numerous microbursts, downbursts, and downburst clusters. By definition, if the wind damage swath extends more than 240 miles (about 400 kilometers) and includes wind gusts of at least 58 MPH (93 km/h) or greater along most of its length, then the event may be classified as a derecho. Muscatine County, along with much of the state, experienced a derecho event on August 10, 2020, which will be described following.

Previous Occurrences. Since 1979, Muscatine County has experienced 63 wind event days where wind speeds exceeded 57 MPH, according to the National Center for Environmental Information storm events database.

June 29, 1998: Super-cell thunderstorms developed over Central Iowa and rapidly intensified into the southeast over Eastern Iowa into Central Illinois. Numerous funnel clouds were sighted along the leading edge of the storm, and a few non-super-cell tornadoes were masked within a large area of damaging winds. Straight-line winds from 60 to over 120 MPH produced the most serious damage, and eight counties in Eastern Iowa, including Muscatine County, were declared disaster areas. Across Muscatine County, Kimberly Park, Wapsi Park, and the Oakridge Cemetery all lost several large trees. About 30 percent of large trees were destroyed at Weed Park in Muscatine. Of those remaining, 80 percent were damaged. Preliminary figures had 65 homes suffering \$150,000 in damage, while seven businesses sustained \$900,000 in losses. The roof at Muscatine High School received \$75,000 worth of damage, and the rain damaged the gym floor. Several people were treated at Muscatine General Hospital for cuts and other minor weather-related injuries. In the Conesville and Nichols areas, some farms lost 90 percent or more of their corn crops. Wind speed reported at 78 knots (90 MPH) is highest for Muscatine County for the reporting period starting from 1/1/1950.

July 8, 2001: Thunderstorms moved over eastern Iowa and redeveloped for a second time later the same day, producing heavy rain of 1 to 2 inches per hour. Numerous trees down and debris in the streets were reported in the City of Muscatine by emergency management. There were many reports of strong winds with gusts as high as 75 to 80 MPH.

July 6, 2003: A strong thunderstorm travelled across Southern Cedar and Northern Muscatine counties during the early afternoon. A microburst about a mile in diameter occurred along the Cedar/Muscatine line between Wilton and Durant. Wind was reported at 65 knots (75 MPH).

June 8, 2008: Wind gusts estimated to be 75 MPH (65 knots) were observed about 3 miles south of Nichols. Thunderstorms produced widespread wind damage with winds between 60 and 90 MPH with nickel-sized hail and very heavy rain.

June 14, 2008: A trained spotter reported a large 3-foot diameter tree blown down about two miles northwest of Muscatine. The thunderstorm system produced large hail and damaging winds across parts of eastern Iowa into northwest Illinois. Wind magnitude was reported at 70 knots (80 MPH).

June 19, 2009: A cold front pushed through Iowa and Illinois during the afternoon and evening of June 19 bringing severe thunderstorms and flooding to much of the area. Winds in excess of 70 MPH were reported with some of the storms as they passed through the areas toppling trees and causing structural damage. In addition to the high winds, torrential downpours were common with the storms with 1-3 inches of rain in

one to two hours. Wind gusts estimated to be 85 MPH blew down several 20-inch diameter tree limbs in Nichols. A fence was also blown away.

May 19, 2013: Winds of 53 knots were recorded by ASOS at the Muscatine Municipal Airport. A very unstable air mass on May 19, 2013 led to the development of severe thunderstorms that produced large hail and damaging winds. Temperatures were in the 80s with dew points around 70 with a mid-level speed maximum rotating around the base of a developing upper low in the Plains states. This increased the deep layer shear during the afternoon and evening hours. Some of the storms produced golf to baseball size hail and 70 to 80 MPH winds.

May 30, 2013: A trained spotter four miles north-northwest of Muscatine reported 65-knot winds. A cold front pushing into a very moist and unstable air mass triggered numerous severe thunderstorms. Deep layer shear was moderate to strong, and freezing levels were in the 11-12k foot level, which was ideal for large hail. The storms produced damaging winds, large hail, and several weak tornadoes. An EF1 tornado touched down in Andalusia, IL around 4:45 p.m. CDT and traveled due north. This weak tornado crossed the Mississippi River and moved through eastern sections of Buffalo, IA. Wind speeds were estimated to be 95 mph. Some large trees were snapped and uprooted along the path. Some of the trees fell onto houses. A trained spotter estimated winds of 65 to 75 MPH.

June 24, 2013: A trained spotter two miles north-northeast of Muscatine reported 65-knot winds. A disturbance moving northeastward from northern Missouri into eastern Iowa led to the development of a severe squall line with bowing segments that produced widespread wind damage across eastern Iowa north of a line from Jefferson to Louisa County. An EF-1 tornado touched down in the city of Muscatine with damage in the business district and one fatality. A trained spotter estimated a thunderstorm wind gust of 75 MPH.

May 21, 2014: A trained spotter recorded 52-knot winds at Stockton, IA. Warm and muggy conditions were found across the region on May 20 as a cold front tracked east across Iowa. A strong line of showers and thunderstorms developed ahead of the front and affected areas mainly between Highway 20 and Highway 30 in Iowa as well as Carroll and Jo Daviess Counties in Illinois. Very large hail fell with the stronger storms with hail sizes as large as golf balls over Dubuque, Jackson, and Jones Counties in Iowa. Torrential rains were also common with these storms. Elsewhere, dry and warm conditions were found. High temperatures were in the mid to upper 80s. Wind gusts estimated to be 60 MPH were observed about 2 miles west of Walcott, IA on May 21.

June 17, 2014: Winds of 50 knots were recorded at Stockton, IA by a trained spotter. Strengthening midlevel winds along with a strong low-level jet in place later in the evening and overnight on June 17 produced widespread damaging winds of 60 to 70 MPH. Strong warm air advection triggered more severe thunderstorms during the late

evening of June 17. A trained spotter reported several 5-to-6-inch diameter tree limbs down.

July 6, 2015: Winds of 65 knots were recorded at Fruitland, IA. A cold front passing late in the afternoon spawned scattered thunderstorms that produced a few severe storms and localized heavy rains that resulted in a couple of flash flooding events. Utility poles and several trees were down near Fruitland Road and Spitz Drive. The time of the event was estimated from radar. Damages of \$2,000 were reported.

July 6, 2015: The Muscatine Municipal Airport recorded 59-knot winds. A cold front passing late in the afternoon spawned scattered thunderstorms that produced a few severe storms and localized heavy rains that resulted in a couple of flash flooding events.

February 19, 2016: A strong low-pressure system moving just north of Iowa brought a very strong cold front through Iowa and Illinois. Behind this cold front, sustained west winds of 35 to 40 MPH gusted frequently to 60 to 63 MPH over all of eastern Iowa and northern Illinois generally along and north of Interstate 80. AWOS observations from eastern Iowa airports along and north of Interstate 80 began reporting winds gusts of 50 to 60 MPH around 11 a.m. and continued until around 3 p.m. The peak winds occurred around 1 p.m.

June 22, 2016: The Muscatine Municipal Airport recorded 57-knot winds. The afternoon of June 22 saw strong to severe thunderstorms form over eastern Iowa, and moved into northern Illinois. The storms became supercell thunderstorms as they moved into Illinois and produced tornadoes over portions of northern Illinois, along with wind damage and hail. Iowa DOT AWOS observations at Muscatine airport reported 66 MPH.

July 13, 2016: Winds of 52 knots were recorded one mile west of Muscatine, IA. A cold front moved across the area spawning numerous severe thunderstorms with damaging winds during the afternoon hours. A trained spotter reported several branches were down varying in size from two to 18.5 inches in diameter along Peartree Lane. A trained spotter reported a single 16.5-inch diameter tree branch was down near the Wildcat Den State Park.

October 6, 2016: Winds of 64 knots were recorded at Fairport, IA. Low pressure brought strong thunderstorms over Iowa and Illinois the evening of October 6, 2016. Just ahead of the low's path, a warm front was positioned over Iowa and Illinois near Interstate 80. This allowed for winds supporting tornadoes to develop with the strongest storms. A cluster of strong to severe storms moved from near Ottumwa, Iowa, northeast through Scott County, with several areas of damaging winds and tornadoes along the path from Louisa and Muscatine Counties, through Scott County, and into portions of Rock Island County, Illinois before ending. A storm survey team found broken off hardwood tree branches between 1 and 3 inches in diameter and uprooted hardwood trees due to straight-line winds.

March 6, 2017: Winds of 59 knots were recorded at the Muscatine Municipal Airport and in other locations in Muscatine County. A line of severe storms tracked east over eastern Iowa, northwest Illinois, and northeast Missouri during the evening of March 6. 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. Some damage was reported to a local residence's carport. A tree was damaged, and power lines were down. A tree fell on a roof, near the vicinity of Schiller and Taylor Streets in Muscatine. A state disaster was declared for this event triggering individual assistance and state resources for those affected (Iowa 2017-01; March 8, 2017).

June 17, 2017: Winds of 56 knots were reported one mile west of Muscatine, IA, and 78 knot winds were reported two miles north-northeast of Ardon. Supercell thunderstorms developed in Iowa, near Muscatine County the afternoon of June 17. They produced large hail, heavy rain, and very high winds that caused damage to trees and some structures. As the storms moved into Illinois, they increased in number, and produced a few more areas of damage. A small tree was blown over west of Muscatine. In the area of Ardon, the National Weather Service storm survey concluded that straight-line winds caused widespread damage to trees, along with a roof blown off a structure that then hit a house. Damage to roofing of several structures was noted.

July 10, 2017: Winds of 61 knots were reported at Conesville, IA. A stalled boundary produced a couple of rounds of severe storms with very heavy rain producing flash flooding, several reports of damaging winds of 60 to 70 MPH, and isolated, large hail in the afternoon and lasting into the overnight hours. Wind damage was estimated at \$3,000.

July 21, 2017: Winds of 50 knots were reported one mile west of Muscatine. Another round of convective storms fired along a stalled boundary and lasted overnight resulting in a major heavy rain and flooding event from three to over 8 inches of rain falling. Some storms become severe with damaging winds over 60 MPH and isolated large hail. A trained spotter reported a few 2-to-4-inch diameter branches were down within the city of Muscatine. In addition, two 5-to-8-inch diameter tree limbs were down from soft wood trees.

July 13, 2018: Winds of 52 knots were reported one mile southeast of West Liberty, IA. A weak low-pressure system produced scattered thunderstorms in eastern Iowa and northwestern Illinois in the late afternoon into early evening hours. These storms produced damaging winds of 60 to over 70 MPH. A public report was received via social media of 5 to 6 inch in diameter tree limbs down. The time was estimated by radar.

August 28, 2018: Winds of 50 knots were reported at Muscatine Municipal Airport. A powerful line of thunderstorms developed ahead of a cold front that moved across eastern Iowa during the late afternoon and evening hours of August 28. The line of thunderstorms produced damaging winds mainly south of a line from Cedar Rapids to

Clinton Iowa. This line of storms also produced a tornado that traveled across Scott and Clinton Counties. There were also swaths of more intense damaging winds in Clinton, Henry, Iowa, and Scott Counties. The heaviest rain fell south of Interstate 80, where 2-to-4-inch amounts were reported.

September 18, 2018: Nichols, IA had winds reports at 50 knots. A slow moving cool front and moist air produced scattered thunderstorms with isolated damaging winds of 60 MPH or more. Law enforcement reported large trees down, blocking the road.

February 24, 2019: A strong storm system brought heavy rain and strong winds to all of eastern Iowa, northwest Illinois, and northeast Missouri. On the backside of this storm, high winds swept through the region, with wind gusts over 60 MPH common over locations generally along and north of Interstate 80 in Iowa and Illinois. A wind gust of 55 MPH was reported as part of a long duration high wind event.

June 30, 2019: A line of thunderstorms tracked southeast across northeast Iowa into eastern Iowa and northwest Illinois during the afternoon and evening of Sunday, June 30, 2019, bringing widespread downed trees and power lines as 50-70 MPH winds rolled through. Wind speed was recorded as 56 knots one mile west of Muscatine.

August 10, 2020: Widespread straight-line winds produced extensive damage reported throughout Muscatine County, associated with a derecho. These winds lasted around an hour in total at any one location, even though the initial line of storms moved out quickly. Maximum wind speeds were estimated to be 60 to 70 MPH for much of the county with 80 MPH or higher over the northern half. These estimates were determined based off damage reports and photos submitted through social media. The duration of strong winds caused extensive damage to most trees, powerlines, crops, and structures in their path. The peak wind gust measured at the Muscatine Airport was 58 MPH before power was lost. The widespread damage also resulted in long duration power outages. Both state and federal disaster declarations were issued in response to the derecho (Iowa 2020-26; August 11, 2020/FEM-4557-DR; August 17, 2020).

December 15, 2021: An intense storm system brought record warmth, high winds, and a serial derecho through Iowa and the Upper Midwest on December 15th. This storm system produced a line of severe storms that continually produced damaging strong winds occurred through the day along with record high temperatures. After the storms moved through, winds in Muscatine reached 60 MPH.

Probability. Large-scale extreme wind phenomena are experienced over every region of the United States. Historically, high wind events are associated with severe thunderstorms and blizzards. It is often difficult to separate windstorms and tornado damage when winds are above 64 knots (74 MPH). The *2023 Iowa Hazard Mitigation Plan* stated that between 1955 and November 2022, Muscatine County experienced 226 wind events. The 2023 plan also indicated that Muscatine County could experience 5-6 windstorm event days (winds greater than 57 MPH) per year. The probability of future windstorm events is highly likely.

Magnitude and Severity. Unlike tornadoes, straight-line winds may have a destructive path that is tens of miles wide and several hundred miles long. Large hail, heavy rains, flash flooding, and lightning are also associated with severe storms and may cause significant damage to a wider area. Effects can range from broken tree branches, shingle damage to roofs, and some broken windows all the way to the complete destruction of well-constructed structures, infrastructure, and trees. Crop damage is often associated with straight-line winds, laying down crops, breaking stalks, twisting plants, reducing yield, and making it difficult to harvest. FEMA's National Risk Index expects annual loss from strong wind events in Muscatine County to be approximately \$2,500,000.

Damaging straight-line winds can affect many critical services and operations that rely on electrical power if the transmission system is damaged and power is disrupted. Economic effects can result from damages to facilities or business disruption from the lack of critical services, such as electrical power. People may be affected and unable to get to or attend work and school.

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

Wind speeds can reach up to 100 MPH and can produce a damage path extending for hundreds of miles. These winds can uproot trees and structures and turn harmless objects into serious threats in a matter of seconds. The advancement in weather forecasting has allowed watches to be delivered to those in the path of these storms up to hours in advance. The best warning lead-time for a specific storm is about 30 minutes. Response time is limited to event duration and immediate impact.

Location/Vulnerability. The entire planning area is equally at risk for windstorms. Since most thunderstorms produce some straight-line winds because of outflow generated by the thunderstorm downdraft, anyone living in thunderstorm-prone areas is at risk for experiencing this hazard. Windstorms are primarily a public safety and economic concern, and the planning area is located in a region with very high frequency of occurrence.

People living in mobile homes are especially at risk from injury and death. Even anchored mobile homes can be seriously damaged when wind gusts are over 80 MPH. People in high profile vehicles such as semi and delivery trucks are very vulnerable to high winds. The elderly, the very young and the physically and mentally handicapped are most vulnerable due to their lack of mobility required to escape the path of destruction. People who may not understand the tornado watches and warnings due to language barriers are also at risk. Visitors to the county may be unfamiliar with various types of high winds and the procedures to follow when warnings are given.

Sources	
Federal Emergency Management Agency	https://hazards.fema.gov/nri/map#
Muscatine County	Muscatine County Hazard Mitigation Plan 2020
National Centers for Environmental Information	https://www.ncei.noaa.gov/stormevents/
State of Iowa	Iowa Hazard Mitigation Plan, 2010, 2013, 2023

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Hazardous Materials Incident

General Description. This hazard profile addresses incidents of fixed hazardous materials and incidents of the transportation of hazardous materials. A hazardous materials incident is an accidental release of chemical substances or mixtures that present a danger to public health or safety during production or handling. A hazardous substance is one that may cause damage to persons, property, or the environment when released to soil, water, or air. Chemicals are manufactured and used in increasing types and quantities. As many as 500,000 products pose physical or health hazards and can be defined as “hazardous chemicals.” Each year, over 1,000 new synthetic chemicals are introduced. These and other existing chemicals may be transported across the country via semi-truck and train. Hazardous materials incidents generally affect a localized area, and the use of planning and zoning can minimize the area of impact.

Previous Occurrences. According to the Iowa Department of Natural Resources Chemical Spills Report Database, 324 incidents were reported in Muscatine County between 2000 and October of 2025. Of those spills, 243 were during production or handling off at a facility, while 81 spills occurred while in transit.

Table 3-27 Hazardous Material Spills by Incident in Muscatine County (2000-2025)

Year	Transportation Incidents	Non-Transportation Incidents	Total Incidents
2000	1	14	15
2001	3	10	13
2002	6	4	10
2003	2	5	7
2004	4	7	11
2005	3	6	9
2006	5	4	9
2007	3	12	15
2008	2	13	15
2009	6	11	17
2010	5	16	21
2011	1	7	8
2012	2	16	18
2013	7	13	20
2014	3	8	11
2015	3	13	16
2016	5	16	21
2017	3	13	16
2018	8	5	13
2019	1	6	7
2020	0	9	9
2021	4	6	10
2022	2	8	10
2023	1	8	9
2024	0	7	7
2025	1	6	7
TOTAL	81	243	324

Source: Iowa DNR, Hazardous Spills Database

Table 3-28 Hazardous Spills by Jurisdiction in Muscatine County (2000-2025)

Location	Number of Incidents
Atalissa	8
Conesville	3
Fruitland	6
Muscatine	208
Nichols	5
Unincorporated Muscatine County	12
West Liberty	32
Wilton	31

Total Hazardous Materials incidents in Muscatine County also include the following jurisdictions:

Blue Grass – 2; Columbus Junction – 1; Durant – 2; Letts – 6; Montpelier – 5; Moscow – 1;

Robins – 2; Stockton – 1

Source: Iowa DNR, Hazardous Spills Database

Hazardous spill incidents over the past five years have been most likely to occur during the months of April, May, and June. Fewer incidents have occurred during the fall and winter months.

Table 3-29 Hazardous Spills by Month, Muscatine County (2000-2025)

Month	Incidents	Annualized	% of Total
January	23	0.88	7.10%
February	18	0.69	5.56%
March	25	0.96	7.72%
April	38	1.46	11.73%
May	37	1.42	11.42%
June	41	1.58	12.65%
July	31	1.19	9.57%
August	26	1.00	8.02%
September	32	1.23	9.88%
October	26	1.00	8.02%
November	13	0.50	4.01%
December	14	0.54	4.32%
Total	324	12.46	100.00%

Source: Iowa DNR, Hazardous Spills Database

Select previous occurrences of reported chemical spills include:

Chemical Spills at Fixed Facilities:

January 30, 2016: A pipe conveying sodium hydroxide failed and discharged approximately 300 gallons. It was unknown how much reached the storm drain and the Mississippi River, but no impact to the river was observed.

July 5, 2022: Heavy rain melted a cardboard container of corn syrup left outdoors. Corn syrup leaked from the container and moved down-gradient to a storm water drain that discharges into Mad Creek and eventually into the Mississippi.

Chemical Spills as a Result of Transportation:

June 29, 2024: A train derailment of two engines and multiple cars hauling scrap steel occurred on SSAB property. One of the engine's fuel tanks ruptured, and an estimated 3,000 gallons of diesel was lost to the soil in the Rail Right of Way on SSAB property.

June 6, 2025: A semi-truck located at the Love's Truck Stop in Muscatine leaked chicken fat in a parking lot. The leak started near the Heinz plant and traveled through Muscatine to the truck stop.

The Muscatine County Emergency Management Plan identified 17 facilities that have Extremely Hazardous Substances (EHS) on premise and are located on Map 3-11. The majority of all reported chemical spills have occurred within the City of Muscatine. The remaining reports are spread throughout the county. For towns that may have addresses in another county, only the incidents that were located in Muscatine County were counted. Transportation-related hazardous material incidents can occur anywhere in the county, including the two railroad lines. Although there are no interstate highways within the boundaries of the county, there are other highly-trafficked roadways where transportation incidents may occur. Fertilizer and pesticides are common chemicals used in the agricultural industry and are transported through Muscatine County.

Probability. According to the *2010 Iowa Hazard Mitigation Plan*, the SHMT analysis evaluated the probability that a high impact occurrence of a fixed hazardous materials incident has a 10-20% probability to occur in any given year. A high impact occurrence is defined as an environmental emergency by the Environmental Protection Agency. An environmental emergency is a sudden threat to the public health or the wellbeing of the environment, arising from the release or potential release of oil, radioactive materials, or hazardous chemicals into the air, land, or water.

Using the information provided by the Iowa DNR chemical spills report database, Muscatine County has an average of 12 chemical spills in any given year. Of the chemical spills reported to the Iowa DNR from 2000 to October 2025, 75% were located at fixed facilities, while 25% were reported as chemical spills because of transportation. Large quantities of hazardous materials are transported daily on Iowa streets, highways, interstates, and railways. The U.S. DOT estimates that 7% of all trucks are carrying hazardous material; however, hazardous material crashes are under-represented in the overall crash picture.

Magnitude and Severity. Depending on the characteristics of the substance released, a larger area may be in danger from explosion, absorption, injections, ingestion, or inhalation. Occupants of areas previously contaminated by a persistent material may also be harmed either directly or through consumption of contaminated food and water. Fixed facilities are required to have an off-site consequence plan that addresses the population of the surrounding area. Responding personnel are required to be trained to HAZMAT Operation Level to respond to the scene. Those personnel that come into direct contact with substances released are required to have HAZMAT Technician level training. The

Muscatine Fire Department provides hazardous material response services for Muscatine County and a few neighboring counties as well.

Most of the hazardous materials incidents are localized and are quickly contained or stabilized. Depending on the characteristics of the hazardous materials or the volume of product involved, the affected area can be as small as a room in a building or as large as 5 square miles or more. Many times, additional regions outside the immediately affected area are evacuated for precautionary reasons. Effects that are more widespread occur when the product contaminates the municipal water supply or water system, such as a river, lake, or aquifer.

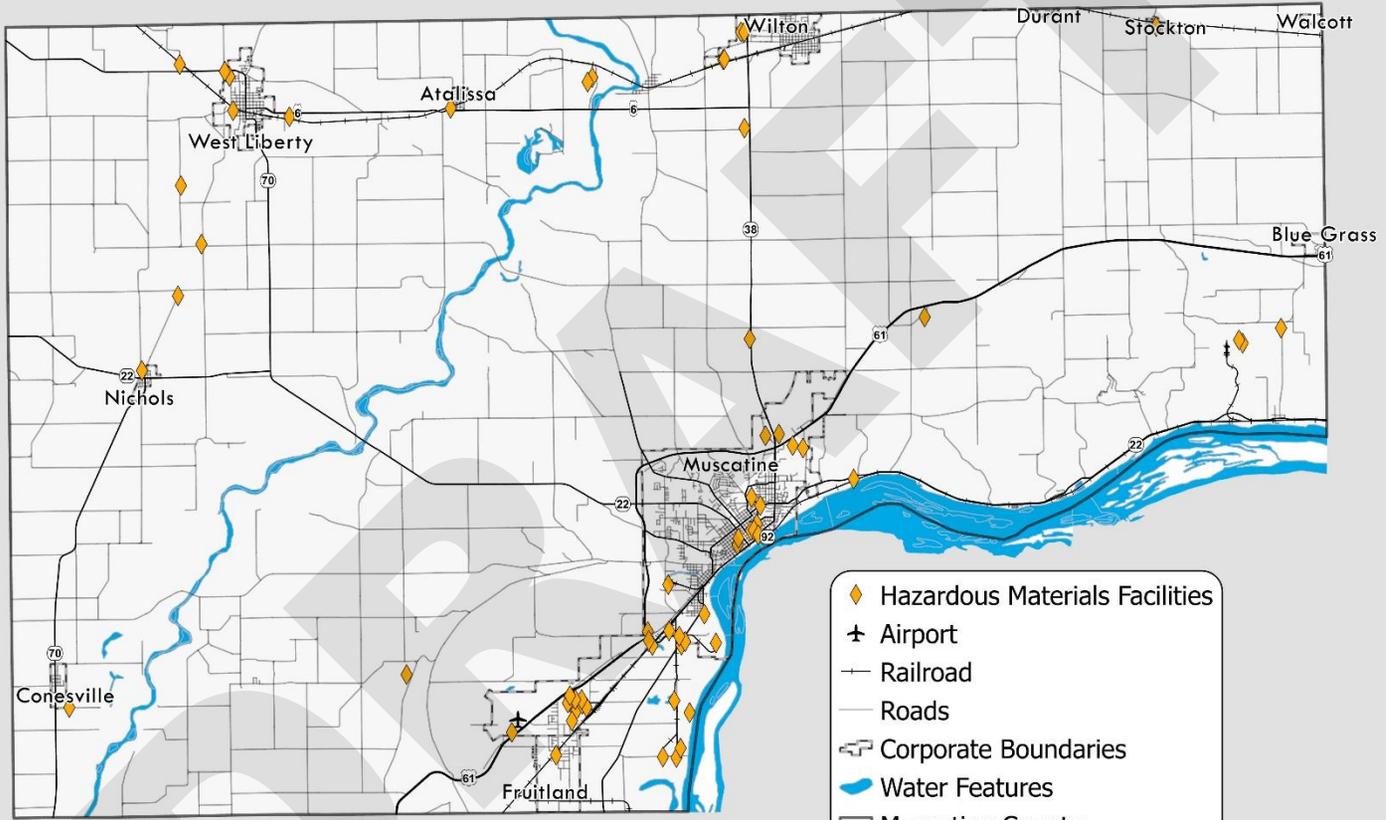
Warning Time/Duration. When managed properly under current regulations, hazardous materials pose little risk. However, when handled improperly or in the event of an accident, hazardous materials can pose a significant risk to the population. Hazardous materials incidents usually occur very rapidly with little or no warning. Even if reported immediately, people in the area of release have very little time to be warned and evacuated. During some events, sheltering in place is the best alternative to evacuation because the material has already affected the area, and there is no time to evacuate safely. Public address systems, television, radio, and the NOAA Weather Alert Radios are used to disseminate emergency messages about hazardous materials incidents.

Response to a hazardous materials release is generally limited to the immediate effects of a release of dangerous materials and their threat to life and property. However, due to the laws surrounding hazardous materials and the duty to the public to inform and protect citizens from the effects of hazardous materials in their vicinity, response is expanded for environmental emergencies.

Location/ Vulnerability. Roadways are a common site for the release of hazardous materials. Railways are another source for hazardous materials releases. The Department of Transportation (DOT) regulates routes and speed limits used by carriers and monitor the types of hazardous materials crossing state lines. Despite increasing safeguards, more and more potentially hazardous materials are being used in commercial, agricultural, and domestic activities and are being transported on Iowa roads and railways. A hazardous materials accident can occur almost anywhere, so any area is considered vulnerable to an accident. Pets, livestock, and vegetation in close proximity to facilities producing, storing, or transporting hazardous substances are at high risk. Populations near transportation corridors or downstream, downwind, and downhill of a released substance are also vulnerable. The release of some toxic gases may cause immediate death, disablement, or sickness if absorbed through the skin, injected, ingested, or inhaled. Some chemicals may cause painful and damaging burns to skin if they come in direct contact with the body.

Sources	
Iowa Dept. of Natural Resources (DNR) Emergency Response & Security Unit Spill Data	https://programs.iowadnr.gov/focomp/Search/Sites
Muscatine County	Muscatine County Hazard Mitigation Plan 2020
State of Iowa	Iowa Hazard Mitigation Plan, 2010, 2013, 2023

Muscatine County Hazard Mitigation Plan Map 3-11: Muscatine County Hazardous Materials Facilities



- ◆ Hazardous Materials Facilities
- ✈ Airport
- ⊕ Railroad
- Roads
- - - Corporate Boundaries
- Water Features
- ▭ Muscatine County



Sources:
 Hazardous Materials Facilities - Muscatine County Emergency Management (2026)
 Roads - IA DOT (2019)
 Counties - U.S. Census Bureau (2019)
 Other features - Bi-State Regional Commission

Disclaimer: This map is for reference only. Data provided are derived from multiple sources with varying levels of accuracy. Bi-State Regional Commission disclaims all responsibility for the accuracy or completeness of the data shown herein.



Vulnerability Assessment

With an understanding of the hazards and their impact to the planning area, this section provides a summary of the community assets that are most vulnerable to loss during a disaster. A Community Profile is first provided for Muscatine County, followed by a description of Community Assets, and Development Trends.

Community Profile: Muscatine County, Iowa

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

Geography and Land Use

Muscatine County is located in east-central Iowa. The county is bounded by Cedar County to the north, Scott County on the northeast, the Mississippi River and Rock Island County, Illinois, on the east, Louisa County on the south, and Johnson County on the west. Muscatine is the largest city and the county seat. Other cities include Atalissa, Conesville, Durant, Fruitland, Nichols, Stockton, West Liberty, and Wilton.

The soils in Muscatine County are nearly level, gently sloping (zero to five percent) prairie-derived soils developed from alluvium along the Cedar River and Wapsinonoc Creek valleys. The Mississippi River Valley soils are gently sloping to steep (2-25 percent) forest-derived soils developed from loess or pre-Wisconsin till. Separating these two valley soils are gently to strongly sloping (1-14 percent) prairie to forest-derived soils developed from loess. Predominantly, these soils are moderately well to well-drained soils and do not contribute to the flooding conditions.

The Cedar River travels across the western half of Muscatine County in a southwesterly direction where it joins the Iowa River just southwest of Muscatine County. The topography of Muscatine County is a predominantly broad expanse of relatively flat land along the Cedar and Mississippi Rivers. Between these two river floodplains lies a small hilly area. In the Muscatine Island area, the valley of the Mississippi River reaches a maximum width of 8.5 miles, although a width of 2 miles is more typical of the region. The Cedar River flows through a valley reaching up to two miles in width.

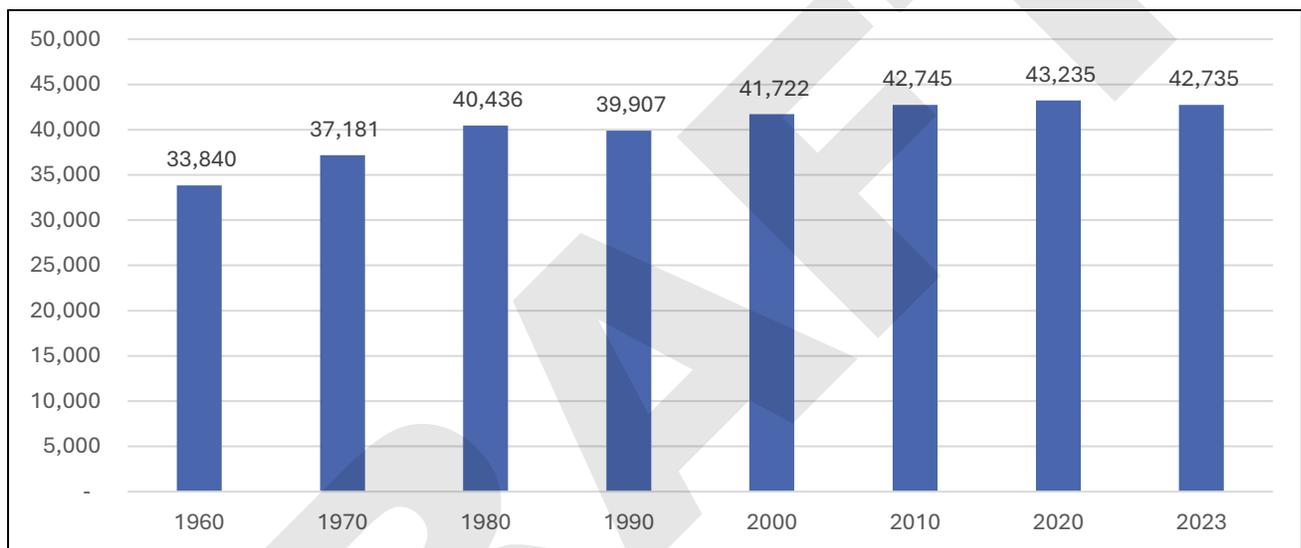
Muscatine County is predominantly zoned for agricultural with residential areas located in or near incorporated cities and along highways and county roads. Commercial and industrial areas are predominantly located within the City of Muscatine with additional industrial areas near West Liberty, Wilton, and along Highway 22 in southeastern Muscatine County. Recreational areas are located along the Cedar River and within incorporated areas.

Error! Reference source not found. illustrates existing land uses in Muscatine County as described.

Demographics

As of 2023 American Community Survey (ACS) 5-Year estimates, Muscatine County's population was 42,735. The 2023 population estimate is similar to the 2020 Census population, but shows a slight decline. Overall Muscatine County has trended in positive growth with respect to population. The figure below shows the historical population of Muscatine County dating back to 1960.

Figure 3-4 Historical Population of Muscatine County



Source: U.S. Census Bureau; American Community Survey, ACS 5-Year Estimates Data Profile (2019-2023).

The City of Muscatine is the largest municipality within Muscatine County; as of 2023 it makes up 55.1% of the county's population. There are four communities with borders located in Muscatine County and an adjacent county. Of the cities that are entirely located in Muscatine County, West Liberty and Fruitland have the next largest populations.

0 identifies the population of all municipal and Census Designated Places (CDP) with partial or complete boundaries within Muscatine County.

Table 3-30 Municipal & CDP populations within Muscatine County

	2000	2010	2020	2023
Muscatine County	41,722	42,745	43,235	42,735
Atalissa	290	311	296	297
Blue Grass (partial)	1,158	1,452	1,666	1,867
Conesville	432	432	352	440
Durant (partial)	1,669	1,832	1,871	1,904
Fruitland	723	977	963	1,107
Muscatine	22,518	22,886	23,797	23,567
Nichols	354	374	340	393
Stockton	174	197	176	127
Walcott (partial)	1,528	1,629	1,551	1,895
West Liberty	3,330	3,736	3,858	3,795
Wilton (partial)	2,856	2,802	2,924	2,939
Fairport (CDP)	—	—	204	200
Kent Estates (CDP)	—	—	2,074	1,863
Montpelier (CD)	—	—	186	228
Moscow (CDP)	—	—	290	494
Total Incorporated	35,032	36,628	40,548	41,120
Total Unincorporated	6,690	6,117	2,687	1,615
Percent Unincorporated	16.03%	14.31%	6.21%	3.78%

Source: U.S. Census Bureau; American Community Survey, ACS 5-Year Estimates Data Profile (2019-2023).

As of 2023 there were 17,170 households in Muscatine County. Of those households, 66.8% are considered family households, having children under the age of 18. The average household size for the county is 2.45 and the average family size is 2.96.

Climate and Weather

The climate in Muscatine County is sub-humid midcontinental with an average annual temperature of 50.0 degrees Fahrenheit. The average summer temperature is 70.8 degrees Fahrenheit and the winter average is 28.7 degrees Fahrenheit. The average annual precipitation in Muscatine County is 36.9 inches.

Table 3-31 Monthly Average Temperature and Precipitation in Muscatine County (1990-2024)

Month	Average Temperature (°F)	Precipitation (inches)
January	22.1	1.3
February	26.4	1.5
March	38.8	2.4
April	50.2	3.6
May	61.6	4.7
June	71.3	5.3
July	74.3	4.2
August	72.3	4.0
September	65.3	3.3
October	52.8	2.8
November	39.2	2.2
December	27.8	1.8

Source: NOAA National Centers for Environmental information, Climate at a Glance: County Time Series, September 2025.

Table 3-32 Seasonal Average Temperature and Precipitation in Muscatine County (1990-2024)

Month	Average Temperature (°F)	Precipitation (inches)
Winter	28.7	7.0
Spring	55.5	16.0
Summer	70.8	16.8
Fall	46.3	10.1

Source: NOAA National Centers for Environmental information, Climate at a Glance: County Time Series, September 2025.

Education

As of 2023, 90.5% of Muscatine County's residents aged 25 and older had a high school diploma or higher, and 22.7% of residents had a bachelor's degree or higher. Comparatively, 93.2% of Iowa residents aged 25 and older had a high school diploma or higher, and 30.9% of residents had a bachelor's degree or higher. The table below provides detailed educational attainment data.

Table 3-33 Educational Attainment Muscatine County

	Number	Percent
Population 25 years and over	28,863	
Less than 9th grade	891	3.1%
9th to 12th grade, no diploma	1,856	6.4%
High school graduate (includes equivalency)	10,147	35.2%
Some college, no degree	5,906	20.5%
Associate's degree	3,507	12.2%
Bachelor's degree	4,632	16.0%
Graduate or professional degree	1,924	6.7%

Source: U.S. Census Bureau. "Selected Social Characteristics in the United States." Community Survey, ACS 5-Year Estimates Data Profiles, 2019-2023.

There are three school districts located within the county, serving 6,241 students from pre-kindergarten through 12th grade as of the 2024-2025 school year. Of those students, there were 2,875 that qualified for a free or reduced-price lunch, or roughly 46% of the students in the three districts.

Table 3-34 Muscatine CSD Certified Enrollment 2024-2025

District Name	Certified Enrollment
Muscatine Community School District	4,105
West Liberty Community School District	1,219
Wilton Community School District	917

Source: Iowa Department of Education, 2024-2025 Certified Enrollment by District.

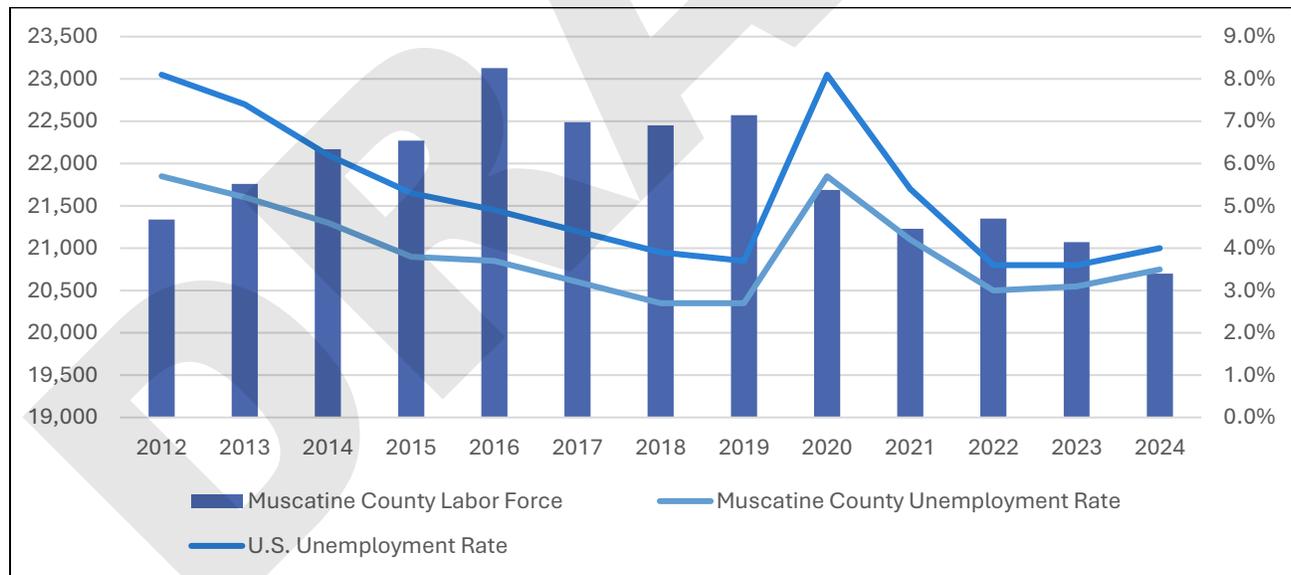
Residents of Muscatine County have access to post-secondary institutions. Muscatine Community College, a part of Eastern Iowa Community Colleges, operates several locations within the county and its main campus is located in the City of Muscatine. Other institutions in the region within a short commute include: Augustana College, Black Hawk College, additional Eastern Iowa Community College branches, Orion Technical College, Palmer College of Chiropractic, St. Ambrose University, Trinity College of Nursing, University of Iowa, and Western Illinois University (QC Campus).

Labor Force, Economy, Income, and Employment

According to Iowa Workforce Development, the total labor force in Muscatine County in 2024 was 20,700 (representative of the population aged 16 or older). This number is a decrease from the 2023 reported labor force of 21,070, and has yet to recover to pre-pandemic levels, which were reported at 22,570 in 2019.

Muscatine County’s unemployment rates have followed national trends, with the lowest unemployment rate of 2.7% in 2018. As of 2024, the unemployment rate was 3.5%, which was lower than the national average of 4.0%. Figure 3-5 shows the annual average unemployment rates and labor force over time.

Figure 3-5 Muscatine County Labor Force and Average Unemployment Rates in Muscatine County and the U.S.

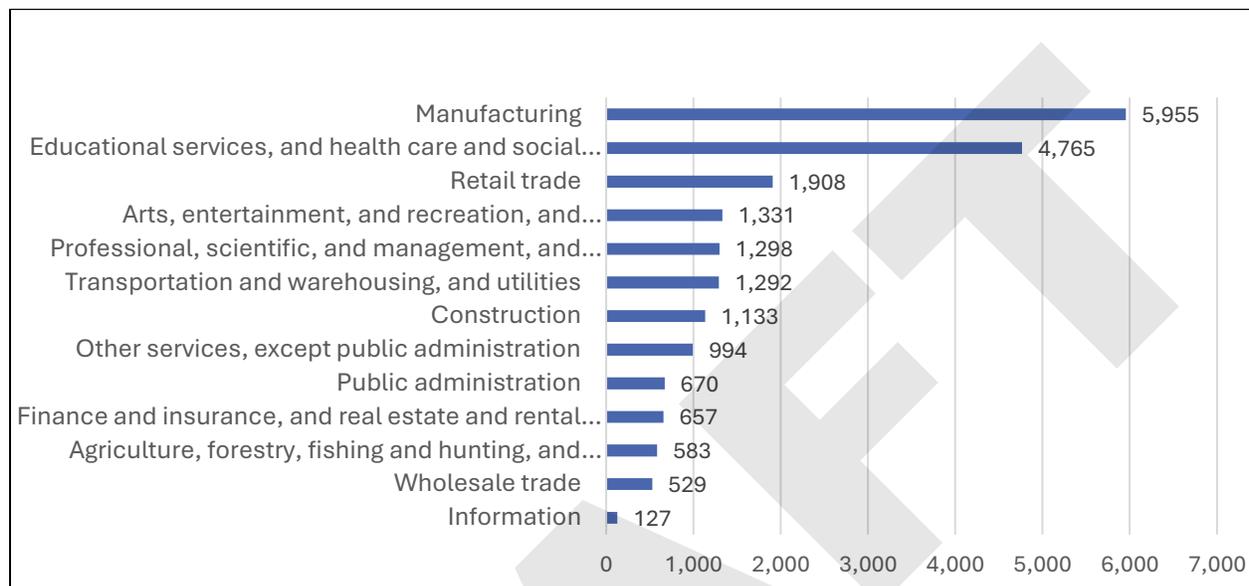


Source: Iowa Workforce Development, December 2025 & U.S. Bureau of Labor Statistics, Unemployment Rate [UNRATE], retrieved from FRED, Federal Reserve Bank of St. Louis; <https://fred.stlouisfed.org/series/UNRATE>, December 9, 2025.

Manufacturing is the largest industry sector in Muscatine County, representing 28% of the labor force in 2023. The next two largest industry sectors are educational services, health care and social assistance (22.4%), and retail trade (9.0%). A more complete look at

industry composition in Muscatine County can be found in Figure 3-6. The top employers in Muscatine County are in Table 3-35.

Figure 3-6 Employment Numbers by Industry within Muscatine County



Source: U.S. Census Bureau; "Selected Social Characteristics in the United States." American Community Survey, ACS 5-Year Estimates Data Profile (2019-2023).

Table 3-35 Largest Employers within Muscatine County

Company	Product/Service	Employees
West Liberty Foods LLC (All locations)	Food Processing	4,201
HNI Corporation	Office Manufacturers	3,100
Kent Corporation	Food Products & Manufacturers	993
Grain Processing Corp	Food Processing	700
Hy-Vee	Grocery Store	450
SSAB	Steel Processing	400
Bayer Cropscience	Agricultural Chemicals (Whls)	365
MPW	Utilities	301
Bridgestone Bandage	Tire-Retreading/Repair-Eqpt/Supls (Whls)	300
Musco Sports Lighting LLC	Lighting Equipment NEC (Mfrs)	300
Stanley Consultants Inc	Engineers-Consulting	300

Source: Data Axle, ReferenceUSA Gov, accessed 2025; individual businesses and organizations.

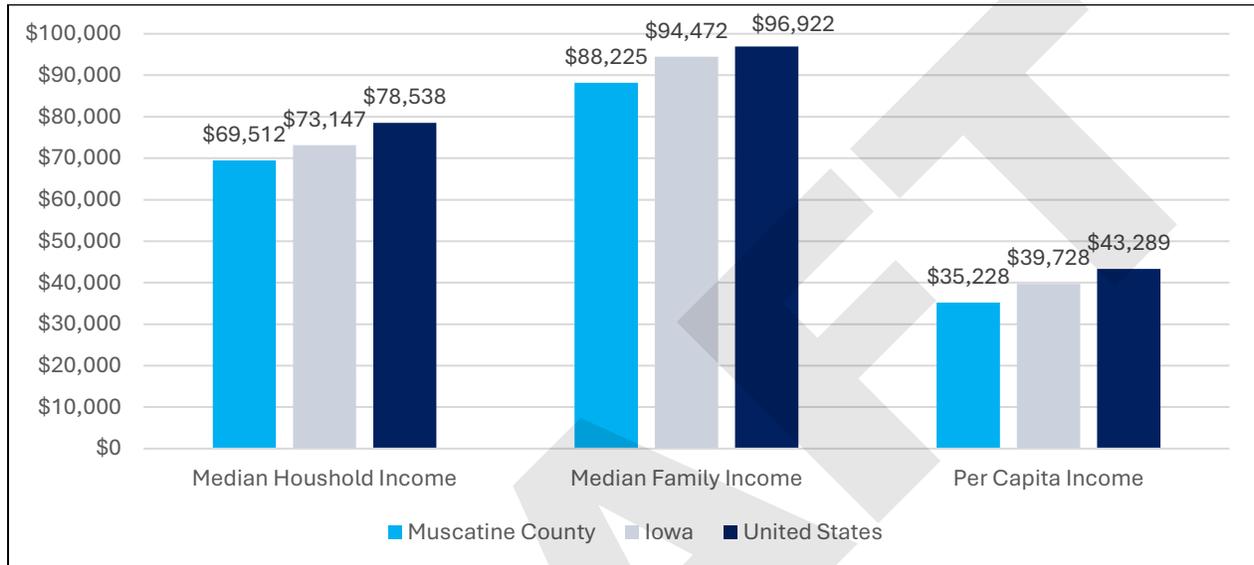
Note: Major employer data provided are derived from multiple sources with varying levels of accuracy.

Bi-State Regional Commission disclaims all responsibility for the accuracy of the data shown herein.

Median household income is a standard measure of prosperity in a community. In the 2023, Muscatine County's median household income was \$69,512, the median family

income was \$88,225 and the per capita income was \$35,228. Muscatine County's family and household median incomes are slightly lower than the Iowa median income. Both Iowa and Muscatine County are lower than U.S. averages. Figure 3-7 shows the income data in more detail.

Figure 3-7 Incomes for Muscatine County, Iowa, and US National Average



Source: U.S. Census Bureau. "Selected Social Characteristics in the United States." American Community Survey, ACS 5-Year Estimates Data Profiles, 2019-2023.

Housing

ACS 2023 estimates reported 18,429 housing units in Muscatine County, with a median housing value of \$172,400. The housing stock of Muscatine County is generally older, with approximately 30% of the housing stock built before 1939. Only 12.8% of the housing was built after 2000.

Approximately 17,170 (93%) of the housing units are occupied (7% vacant). A low vacancy rate indicates that a municipality or county is a desirable place to live. It should also be noted that if the rate falls too low, potential residents might be unable to find suitable living accommodations due to a limited supply of housing units. Out of the total occupied housing units, 75% are occupied by owners, and 25% are occupied by renters.

Table 3-36 Muscatine County Housing Units in Structure

Type of Unit	Number	Percent
1, detached	13,168	76.7%
1, attached	417	2.4%
2 apartments	736	4.3%
3 or 4 apartments	513	3.0%
5 to 9 apartments	335	2.0%
10 or more apartments	871	5.1%
Mobile home or other type of housing	1,130	6.6%
Total Occupied Housing Units	17,170	

Source: U.S. Census Bureau. "Selected Social Characteristics in the United States." Community Survey, ACS 5-Year Estimates Data Profiles, 2019-2023.

Table 3-37 Muscatine County Housing Unit Year Structure Built

Year	Housing Units	Percent
2020 or later	34	0.2%
2010 to 2019	519	2.8%
2000 to 2009	1,800	9.8%
1980 to 1999	3,872	21.0%
1960 to 1979	4,590	24.9%
1940 to 1959	2,191	11.9%
1939 or earlier	5,423	29.4%
Total Housing Units	18,429	

Source: U.S. Census Bureau. "Selected Social Characteristics in the United States." Community Survey, ACS 5-Year Estimates Data Profiles, 2019-2023.

Table 3-38 Muscatine County Housing Tenure

Housing Tenure	Number
Occupied housing units	17,170
Owner-occupied	12,854
Renter-occupied	4,316
Average household size of owner-occupied unit	2.57
Average household size of renter-occupied unit	2.08

Source: U.S. Census Bureau. "Selected Social Characteristics in the United States." Community Survey, ACS 5-Year Estimates Data Profiles, 2019-2023.

Table 3-39 Muscatine County House Heating Fuel Type

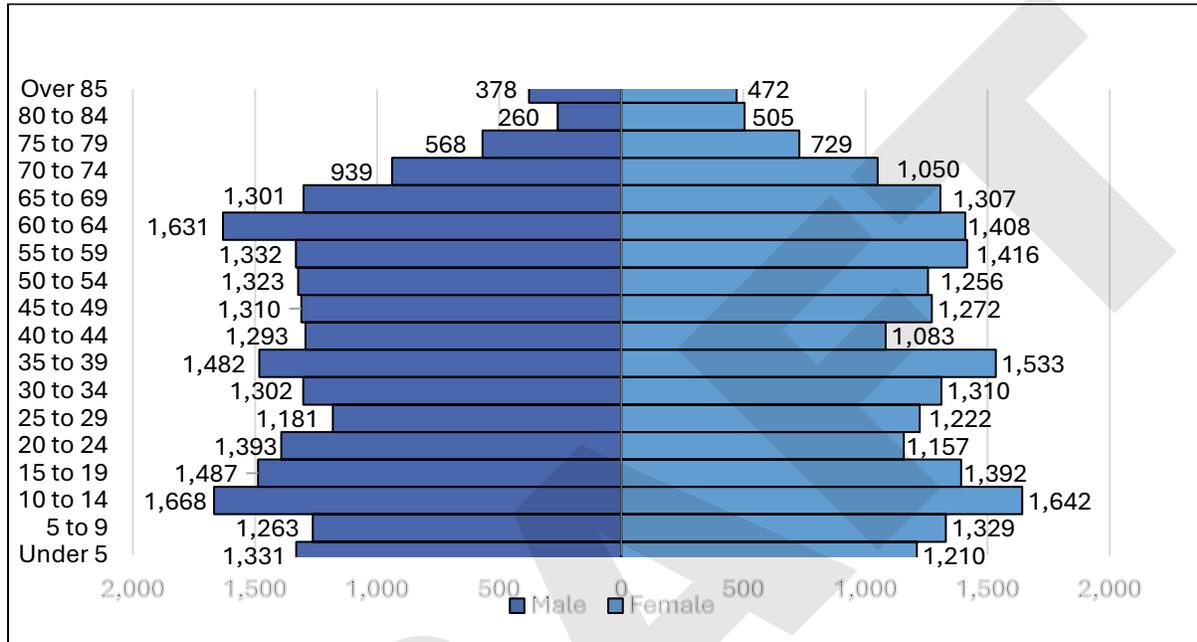
House Heating Fuel	Number	Percent
Utility gas	12,177	70.9%
Bottled, tank, or LP gas	1,949	11.4%
Electricity	2,736	15.9%
Fuel oil, kerosene, etc.	34	0.2%
Coal or coke	0	0.0%
All other fuels	157	0.9%
No fuel used	117	0.7%

Source: U.S. Census Bureau. "Selected Social Characteristics in the United States." Community Survey, ACS 5-Year Estimates Data Profiles, 2019-2023.

Age and Sex

As of the 2023 ACS 5-Year estimates, 50.2% of the population was male and 49.8% was female. Figure 3-8 shows the breakdown of the county’s population by age and sex.

Figure 3-8 Muscatine County Population by Age and Sex

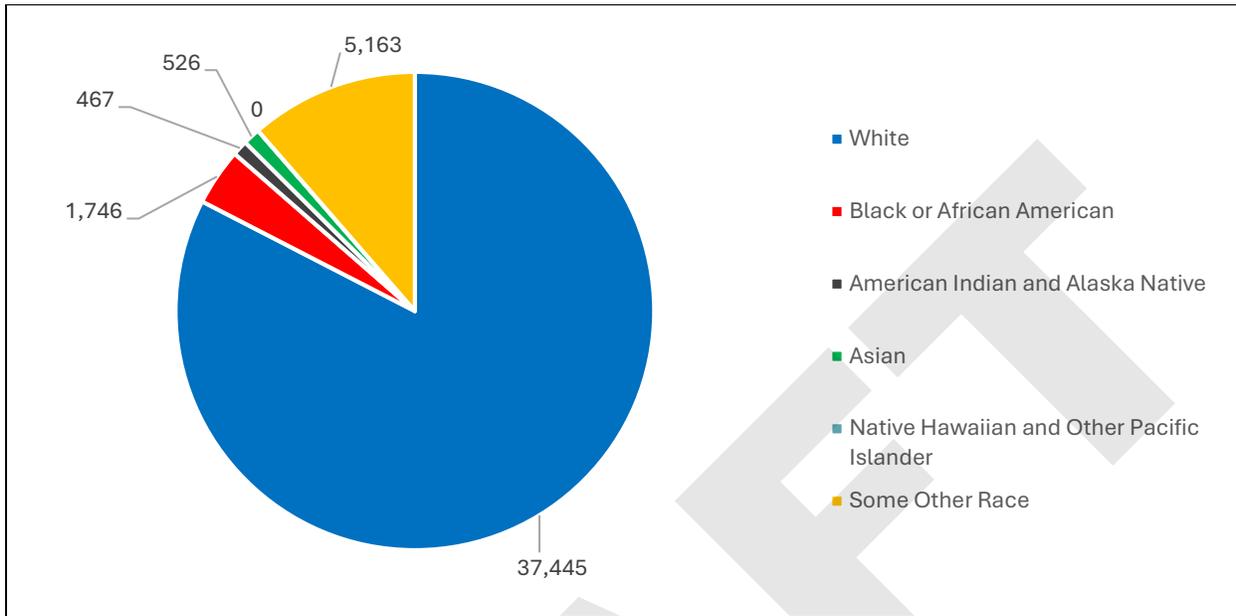


Source: U.S. Census Bureau. "Selected Social Characteristics in the United States." Community Survey, ACS 5-Year Estimates Data Profiles, 2019-2023.

Race & Ethnicity

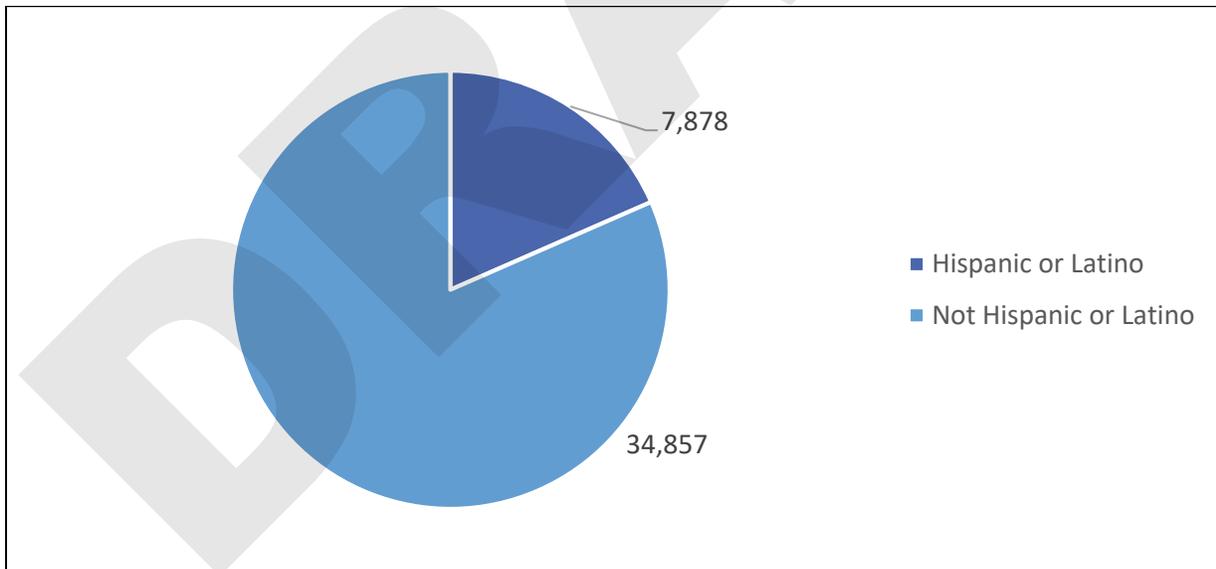
Muscatine County’s population as of 2023 shows that 87.6% of the population identified as white alone. The most common single racial minority is persons who identified as some other race (12.1%), followed by Black or African American (4.1%). The racial breakdown for the county can be found in Figure 3-9. Hispanic or Latino ethnicity is independent of race and in 2023, 18.4% of Muscatine County’s population identified as Hispanic or Latino (ACS 5-Year Estimates, 2023) and is illustrated in Figure 3-10.

Figure 3-9 Muscatine County Population by Race



Source: U.S. Census Bureau. "Selected Social Characteristics in the United States." Community Survey, ACS 5-Year Estimates Data Profiles, 2019-2023.

Figure 3-10 Muscatine County Population by Ethnicity



Source: U.S. Census Bureau. "Selected Social Characteristics in the United States." Community Survey, ACS 5-Year Estimates Data Profiles, 2019-2023.

Community Assets

Community assets provide distinct functions to the wellbeing of the community. FEMA's Local Planning Guide categorizes assets in five broad areas including: (1) people; (2) structures; (3) community lifelines and other critical facilities; (4) natural historic and cultural resources; and (5) economy. An overview of these critical assets within the planning area is provided below. More details are provided in the individual jurisdictional profiles, as applicable.

People

People are considered a community's most important asset. Vulnerable groups may not be able to access standard resources offered in emergencies. Vulnerable populations include small children, persons with disabilities, elderly persons, and non-English speaking residents who may require special response assistance or special medical care after a disaster. Certain groups of people may not be able to comfortably or safely access the standard resources offered in emergencies. Vulnerable populations are further identified in each Jurisdiction Profile.

Table 3-40 gives a broad overview of the county's vulnerable populations. In Muscatine County, nearly a quarter of the population is under 5 or over 65 years old (5.7% and 17.6% respectively).

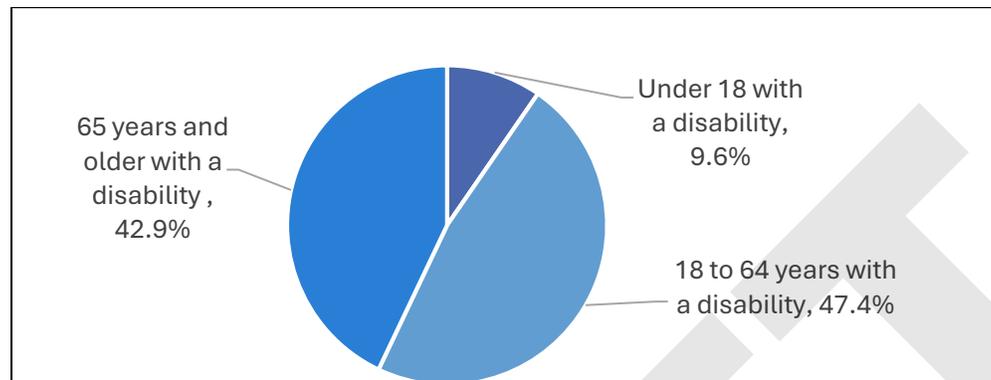
Table 3-40 Muscatine County Vulnerable Populations

Population	Number	Percent
Total Population Under 5 Years	2,451	5.7%
Total Population Over 65 Years	7,509	17.6%
Total Persons with a Disability (all age groups, noninstitutionalized)	5,605	13.4%
Total Population 5 years and Over that Speak English "less than very well"	1,838	4.6%

Source: U.S. Census Bureau. "Selected Social Characteristics in the United States." Community Survey, ACS 5-Year Estimates Data Profiles, 2019-2023.

Of the civilian non-institutionalized population in Muscatine County, 13.4% of the population have a disability. Figure 3-11 shows disability in detail, by age.

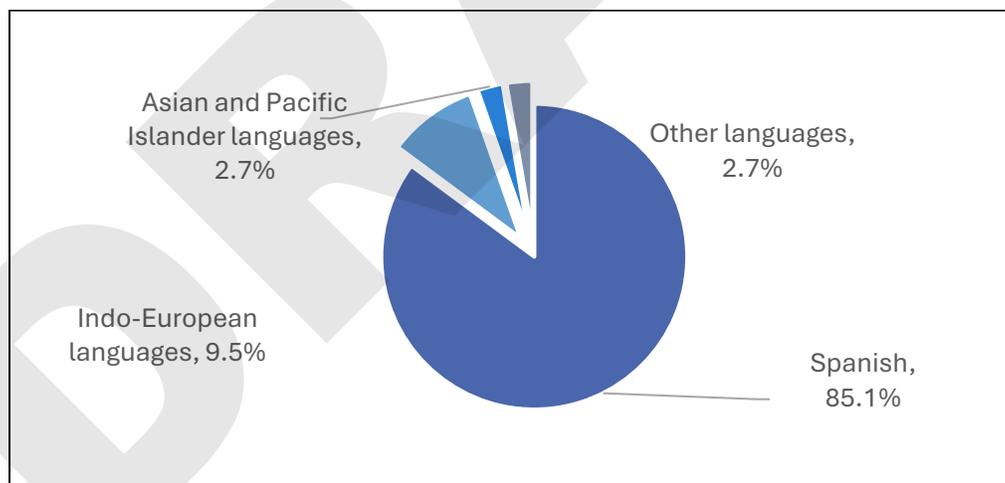
Figure 3-11 Disability Status by Age of the Civilian Non-Institutionalized Population in Muscatine County



Source: U.S. Census Bureau. "Selected Social Characteristics in the United States." Community Survey, ACS 5-Year Estimates Data Profiles, 2019-2023.

In Muscatine County, 95.4% of those 5 years and over speak English only or speak English "very well." Of the population who speak a language other than English, 30.5% speak English less than "very well." Figure 3-12 identifies the primary language spoken by populations who speak English less than "very well."

Figure 3-12 Language Spoken for the Population 5 years and Over Who Speak English Less Than "Very Well" in Muscatine County



Source: U.S. Census Bureau. "Selected Social Characteristics in the United States." Community Survey, ACS 5-Year Estimates Data Profiles, 2019-2023.

Structures

Identifying structures helps communities understand what existing buildings and infrastructure may be in harm's way during a hazard event. The FEMA hazard mitigation planning guide offers methodology for calculating potential losses due to hazards; however, this required a level of detail for individual structures not readily available for the county-wide planning area. Estimates of potential losses due to natural hazards is

included in each hazard risk profile and is further outlined here, relative to flood hazards. The following analysis is based on best available data for a flood hazard.

The Muscatine County Assessor's Office provides county-wide assessment information for residential, commercial, industrial, agricultural land, agricultural dwellings, and utilities land classifications. Data was collected for all the values of land, residential improvements, commercial improvements, yard items, and agricultural improvements. The total value of land/property for all of Muscatine County was estimated.

With the use of GIS mapping, the parcel shape files were matched with the Muscatine County Preliminary Digital Floodplain Insurance Rate Map using the intersect function. This function pulls parcels within and adjacent to the floodplain. Properties partially located within the floodplain were classified as completely within the floodplain. This yielded an indication of the quantity of land classifications located in the 1% hazard floodplain.

The value of the land/property within the floodplain was recalculated from the assessment data collected and compared with the total county-wide land/property value to give the following proportionate estimate of potential losses from flood hazard. This analysis was done prior to the adoption of the new FIRMs around the Muscatine Island Levee where areas were removed from the floodplain.

Table 3-41 Estimated Potential Exposure from Flood Hazard

Land Classification	Land Total (in acres)	Assessed Value (in millions)	Land Within & Adjacent to 1% Floodplain (in acres)	Assessed Value in 1% Floodplain (in millions)	Percentage of Land Classification in 1% Floodplain
Residential	16,466.5	\$3,222.64	4,726.8	\$184.78	29%
Commercial	6,468.8	\$877.98	3,056.9	\$52.86	43%
Industrial	2,873.4	\$399.06	869.4	\$97.06	30%
Agricultural Land	210,695.7	\$300.15	94,771.2	\$192.79	45%
Agricultural Dwelling	31,679.7	\$217.86	13,702.2	\$34.19	43%
Utility	1,580.2	\$7.20	901.9	\$0.00	57%
Total	269,782.4	\$4,964.89	118,028.5	\$561.68	—

Table 3-42 Assessed Value of Land & Structures in Muscatine County

Assessed Value of Land & Structures for County						
		Agriculture	Residential	Commercial	Industrial	Total
Atalissa	No. of Structures	0.77 Acres	118	22	0	
	Value of Structures	\$31,570.00	\$9,484,890.00	\$684,940.00	\$0.00	\$10,201,400.00
	Land Value	\$1,230.00	\$2,111,750.00	\$177,980.00	\$0.00	\$2,290,960.00
Conesville	No. of Structures	118.18 Acres	126	16	0	
	Value of Structures	\$315,950.00	\$6,343,790.00	\$747,680.00	\$0.00	\$7,407,420.00
	Land Value	\$129,030.00	\$1,705,550.00	\$177,250.00	\$0.00	\$2,011,830.00
Fruitland	No. of Structures	732.77 Acres	348	8	0	
	Value of Structures	\$204,590.00	\$65,434,590.00	\$1,425,230.00	\$0.00	\$67,064,410.00
	Land Value	\$502,520.00	\$8,035,580.00	\$282,210.00	\$0.00	\$8,820,310.00
Muscatine	No. of Structures	2,528.12 Acres	7,471	750	76	
	Value of Structures	\$2,984,210.00	\$880,847,400.00	\$562,457,345.00	\$1,059,524,790.00	\$2,505,813,745.00
	Land Value	\$2,672,640.00	\$182,740,900.00	\$111,855,200.00	\$200,350,110.00	\$497,618,850.00
Nichols	No. of Structures	35.14 Acres	142	30	0	
	Value of Structures	\$8,990.00	\$14,045,040.00	\$1,832,720.00	\$0.00	\$15,886,750.00
	Land Value	\$49,560.00	\$2,248,870.00	\$435,680.00	\$0.00	\$2,734,110.00
West Liberty	No. of Structures	76.71 Acres	948	149	12	
	Value of Structures	\$280.00	\$135,238,700.00	\$58,529,400.00	\$6,637,180.00	\$200,405,560.00
	Land Value	\$132,950.00	\$27,987,940.00	\$6,515,440.00	\$28,937,300.00	\$63,573,630.00
Wilton	No. of Structures	161.20 Acres	950	153	20	
	Value of Structures	\$1,635,180.00	\$136,328,550.00	\$67,709,820.00	\$18,592,655.00	\$224,266,205.00
	Land Value	\$330,840.00	\$28,597,040.00	\$7,177,120.00	\$31,528,750.00	\$67,633,750.00
Muscatine County	No. of Structures	238,740.50 Acres	3,279	131	53	
	Value of Structures	\$192,653,975.00	\$643,447,790.00	\$41,765,020.00	\$751,070,420.00	\$1,628,937,205.00
	Land Value	\$316,350,660.00	\$178,040,920.00	\$16,204,890.00	\$191,311,800.00	\$701,908,270.00

Table 3-43 Estimated Potential Exposure from Flood Hazard by Waterway in Muscatine County

Class	Acres	% of Total Within Inundation Area	Land Value	Building Value	Improved Value	Total Value	% of Total Value of Property Within Inundation Area
Geneva Creek (North)							
Commercial	1.6	3.64%	\$5,530	\$0.00	\$0.00	\$5,530	0.05%
Industrial	42.4	96.37%	\$761,800	\$0.00	\$10,709,790	\$11,471,590	99.95%
Mad Creek (South)							
Commercial	4.3	7.92%	\$278,080	\$0.00	\$65,490	\$343,570	1.08%
Industrial	48.5	88.55%	\$1,251,230	\$0.00	\$29,640,350	\$30,891,580.00	97.17%
Residential	1.9	3.54%	\$135,440	\$421,000	\$0.00	\$556,440.00	1.75%
Muscatine Island							
Agriculture	13,259.2	69.70%	\$14,857,730	\$5,092,280	\$959,130	\$20,909,140	3.98%
Commercial	2,512.5	13.21%	\$24,321,870	\$885,269	\$127,293,521	\$152,500,660	29.02%
Industrial	1,974.3	10.38%	\$18,257,610	\$244,910	\$137,012,530	\$155,515,050	29.59%
Residential	1,219.9	6.41%	\$28,364,100	\$161,688,730	\$45,580	\$190,098,410	36.17%
Multi-Family Residential	56.6	0.30%	\$1,631,680	\$4,904,010	\$0.00	\$6,535,690	1.24%

Table 3-44 Estimated Potential Exposure from 1% and 0.2% Annual Chance of Special Flood Hazard in Muscatine County

1% and 0.2% Annual Chance Special Flood Hazard						
Flood Zone/Property Class	Count	Total Acres	Land Value	Dwelling Value	Improved Value	Total Value
Agricultural	10	98,109.4	\$112,842,840	\$1,011,700	\$5,334,675	\$119,189,215
Agricultural/Ag Dwelling	378	14,018.7	\$15,512,260	\$60,490,060	\$4,846,160	\$80,848,480
Commercial	41	3,123.2	\$30,217,510	\$4,369,524	\$133,078,086	\$167,665,120
Industrial	0	1,904.1	\$12,763,570	\$0.00	\$87,788,210	\$100,551,780
Multi-Family Residential	7	41.3	\$605,320	\$4,165,740	\$0.00	\$4,771,060
Residential	964	4,880.1	\$46,579,740	\$133,451,730	\$340,350	\$180,371,820
Total	1,400.00	122,076.75	\$218,521,240	\$203,488,754	\$231,387,481	\$653,397,475

This methodology only provides for a worst-case estimate. Not every property and structure in the 1% hazard floodplain will be damaged or destroyed to the full amount of its value in any given flood event.

Community Lifelines and other Critical Facilities

Community lifelines and other critical facilities are essential for life safety and the economy. FEMA notes that the operations of these lifelines are critical during and after a disaster. This section identifies these resources in the planning area.

Participating jurisdictions were asked to inventory their local community assets that could be impaired by a hazard event. They individually determined which ones they considered critical facilities. These assets and critical facilities are described in general terms for each participating jurisdiction in their Jurisdiction Profiles.

While specific site addresses are not included in this document for security reasons, the selected critical facilities have been mapped for the planning area as a whole in relation to the special flood hazard areas as represented on **Error! Reference source not found..**

A total of 225 facilities were identified from the lists provided by the individual jurisdictions and Muscatine County EMA. Of these, 13 or 5.8% of the facilities were found to be located within the 1% floodplain as represented on Map 3-13. Since this has been an initial effort to identify critical facilities, the list may be further refined in future plan updates.

Further detail is provided in the jurisdiction profiles.

- **Safety and Security/Essential Facilities**

Safety and security facilities provide for the health and welfare of the whole population and are especially important following hazard events. Police stations, fire stations, emergency operations centers, evacuation shelters, and schools and colleges in the planning area are considered in this category and listed below.

Police Stations	Fire Stations	Emergency Operation Centers	Evacuation Shelters	Schools and Colleges
Atalissa Conesville Muscatine Nichols West Liberty Wilton	Atalissa Conesville Fruitland Montpelier Muscatine Nichols Stockton West Liberty Wilton	Muscatine Wilton	Various Locations	Muscatine CSD West Liberty CSD Wilton CSD Muscatine Comm College

- **Food, Hydration, and Shelter**

Food, hydration, and shelter resources in the county are noted below. Jurisdictions may have additional sites that open on an emergency basis – these are noted in the individual jurisdiction profiles.

Jurisdiction	Facilities
Muscatine	Muscatine Center for Social Action (Overnight Shelter, DV Shelter, Transitional Housing, Apartments), Salvation Army, American Red Cross
West Liberty	West Liberty Community Center

- **Communications**

The county operates a critical lane mobile radio (LMR) network that allows them to improve their communication across the state. The LMR system consists of seven radio towers to support reliable communications during day-to-day and larger-scale emergency events. Muscatine County area is included in the greater Quad Cities Area and is covered by NOAA Weather Radio call sign XXJ73 out of Rock Island, Illinois at frequency 162.55. There are multiple media communications within the county ranging from print media, radio, and television. The table below highlights the main media. Internet is provided by Muscatine Power & Water, Century Link, and Direct TV.

Muscatine County Media Services		
Newspapers	Radio Stations	Local TV Stations
Muscatine Journal	24 FM Stations	KWQC – TV 6
The Quad City Times	11 AM Stations	WHBF – TV 4
The River Cities Reader		WQAD – TV 8
West Liberty Index		
Wilton-Durant Advocate		

- **Water Systems**

Muscatine Power & Water (MPW) is the main provider of water, sourced from the Muscatine Island Aquifer. Source water for municipalities in the county comes from wells. The City of Muscatine operates 30 wells to provide its entire supply of water. Water treatment facilities are operated by individual municipalities and are located in the following communities: Atalissa, Conesville, Fruitland, Muscatine, Nichols, West Liberty, and Wilton. Wastewater is also treated by individual municipalities with treatment facilities located in Muscatine, West Liberty, and Wilton. Water systems in the county are listed below.

Jurisdiction	Water Supply	Wastewater
Atalissa	Municipal Water Supply	Activated Sludge
Conesville	Individual Wells	Waste Stabilization Lagoon
Fruitland	Municipal Water Supply	Private Septic
Muscatine	Muscatine Power & Water	Muscatine Power & Water
Nichols	Individual Wells	Waste Stabilization lagoon
Stockton	Municipal Water Supply	Waste Stabilization Lagoon
West Liberty	Municipal Water Supply	Activated Sludge
Wilton	Municipal Water Supply	Trickling Filter

- **Energy, Power, and Fuel**

Providers of natural gas and electric utilities serving Muscatine County are Alliant Energy, Eastern Iowa Power, Interstate Power and Light, Muscatine Power and Water, MidAmerican Energy, and Wilton Municipal. The providers in each jurisdiction are listed below.

Jurisdiction	Natural Gas	Electric Power
Atalissa	MidAmerican Energy	Interstate Power and Light Company
Conesville	Alliant Energy	Interstate Power and Light Company
Fruitland	Alliant Energy	Muscatine Municipal & Eastern Iowa Power Company
Muscatine	Alliant Energy	Muscatine Municipal & Eastern Iowa Power Company
Nichols	Alliant Energy	Interstate Power and Light Company
Stockton	Alliant Energy	Interstate Power and Light Company
West Liberty	MidAmerican Energy	West Liberty Municipal, Interstate Power and Light Company
Wilton	MidAmerican Energy	Wilton Municipal, MidAmerican Energy, Eastern Iowa Power Company, Interstate Power and Light Company
Muscatine County	MidAmerican Energy & Alliant Energy	Eastern Iowa Power Company

Source: <https://iowa.maps.arcgis.com/apps/webappviewer/index.html?id=d595a7d431bc4c789065348a8f454dbb>

- **Medical and Healthcare**

A majority of medical and healthcare services are located within the City of Muscatine. The county is serviced by one hospital in the City of Muscatine – UnityPoint Health Trinity Muscatine. A primary care clinic is also operated by University of Iowa Health Care within the City of Muscatine. A Community Health Care clinic will open in Muscatine, in 2026. The City of West Liberty is served by the University of Iowa Services Clinic. Long-term care and visiting nursing services are scattered throughout the county and include Accura HealthCare of Muscatine, Addington Place of Muscatine, Lutheran Living Senior Campus and Pinnacle Memory Care. Access to medical and healthcare for residents in outlying and unincorporated areas must rely on transportation networks.

- **Transportation**

Transportation systems include airways (airports, heliports), highways (bridges, tunnels, roadbeds, overpasses, transfer centers), railways (trackage, tunnels, bridges, rail yards, depots), and waterways (canals, locks, seaports, ferries, harbors, dry docks, and piers). Muscatine County is traversed by four state highways: 22, 38, 70, and 92. In addition, there are U.S. Highways 6 and 61. One automobile bridge spans the Mississippi River within Muscatine County’s limits: the Norbert F. Beckey Bridge (State Highway 92.)

The Muscatine Municipal Airport can accommodate large transport aircraft. The airport is considered by the Iowa Department of Transportation to be of regional significance.

Railways within the county include the Iowa Interstate Railroad and Canadian Pacific Kansas City. There are 72 public at-grade rail crossings throughout the county. There are a few instances throughout the county where railroads are situated next to large manufacturers or along bodies of water (Map 3-15).

Waterways within the county include the commercially navigable Mississippi River and the Cedar River (the Cedar River is a tributary of the Mississippi River). Lock and Dam 16 on the Mississippi River is located within the county borders and provides movement for barges carrying freight up and down the Mississippi River. Three active barge terminals are located within Muscatine County, two of which are served by rail and located within 20 minutes of Interstate 80. Refer to Map 3-16.

Airways	Highways	Railways	Waterways
Muscatine Municipal Airport (KMUT)	U.S. Highways - 6, 61	Canadian Pacific Kansas City (CPKC)	Cedar River
	State Highways - 22, 38, 70, 92	Iowa Interstate (IAIS)	Mississippi River (commercially navigable)
	Bridges - Norbert F. Beckey Bridge/ Highway 92 (Mississippi River)		Lock & Dam 16 (Mississippi River)

- **Hazardous Material Facilities**

These are facilities housing industrial/hazardous materials, such as corrosives, explosives, flammable materials, radioactive materials, and toxins. There are 26 identified facility sites within Muscatine County that house hazardous substances. The most common hazardous materials found in the county are fertilizers and pesticides. See “Hazardous Material Incident” hazard profile for more information.

Natural, Historic, and Cultural Resources

Muscatine County has an abundance of natural, historic, and cultural resources that add to the community’s quality of life and identity. These areas are protected from development that would damage their natural attributes. These areas also serve to aid in the mitigation of natural hazards and increase resiliency through functions, such as plantings that manage stormwater runoff, wetlands that absorb floodwater, and plantings that create shade in extreme heat.

The Muscatine County Conservation Board manages over ten sites and more than 13,000 acres of parks and public property throughout the county. These areas and facilities include an Environmental Learning Center; areas for camping, fishing, hunting, ice fishing, ice-skating, cross-country skiing, and canoeing; hiking and riding trails; a cemetery; playgrounds; and picnic areas. Areas managed by other agencies include five sites with more than 4,050 acres managed by the Iowa Department of Natural Resources. Two sites

are owned by the Army Corps of Engineers including Big Sand Mound Nature Preserve, which contains 510 acres of habitat along the Mississippi River near the City of Muscatine known for its diverse ecosystem of unusual plants and animals, native plant species, and 30 rare plants and animal inhabitants.

The scenic Great River Road passes through Muscatine County along the Mississippi River. The Great River Road is a series of roads in ten states and two Canadian Provinces along the course of the Mississippi River. Other attractions include Muscatine History & Industry Museum that displays a variety of memorabilia from the button factories, as well as the clam-shelling industry. Musser Public Library is home to the Oscar Grossheim collection of over 55,000 glass plate negatives. There also is the historic Musser Mansion, home to the Muscatine Art Center and the contemporary Stanley Gallery. Other attractions include the Fairport Fish Hatchery and the Pine Creek Grist Mill, one of the finest examples of mid-nineteenth century mills left in the country and listed on the National Register of Historic Places.

Muscatine County Fairgrounds are located in the City of West Liberty. The fairgrounds contain over 60 acres of tree-shaded concourse and campgrounds, a covered amphitheater, a half-mile dirt race track, and a community building used for many activities. The MUSCO Sports Center provides 122,000 square feet of space for a variety of sports and recreation activities.

In addition to regional attractions and facilities, Muscatine County's communities host a number of large events throughout the year that draw large numbers of people. These events include Eagles and Ivories Ragtime Weekend, Melon City Criterium bike race, Muscatine Boat Show, Wilton Smorgasbord, the Midwest Soccer Classic, Great River Days, Heritage Days, and several winter festivities. Refer to Map 3-16 for Recreation and Conservation areas.

Economy

Muscatine County's economy is closely tied to natural resources and location, which makes it vulnerable to several natural hazards, as noted throughout the risk profile for each hazard. Agriculture, manufacturing, and river-based commerce along the Mississippi River are key economic drivers, but they are highly sensitive to flooding. Riverine flooding can damage cropland, disrupt barge traffic, and impact industrial facilities located near the river, leading to production delays and financial losses. Flood events can also strain local infrastructure, such as roads, bridges, and utilities, increasing costs for businesses and local government.

Development Trends

Development trends to consider include land use, future growth, and potential demographic changes. These are discussed below for Muscatine County and summarized within each individual jurisdiction profile, as applicable.

Table 3-45 shows population change from 2010 to 2024 for Muscatine County. Measuring the population can be a way to indicate development that has occurred in an area and help plan for future developments. Between 2010 and 2020, growth has mainly occurred in Wilton (+4.4%), the City of Muscatine (+4.0%), West Liberty (+3.3%), and the county overall (+1.1%). Comparatively, other areas of the county have seen population decline ranging from -4.4% to -18.5%.

Table 3-45 Change in Population

Population	2010	2020	2024	Percent Change 2010-2020	Percent Change 2010-2024
Muscatine County	42,745	43,235	42,132	1.1%	-1.4%
City of Atalissa	311	296	287	-4.8%	-7.7%
City of Conesville	432	352	350	-18.5%	-19.0%
City of Fruitland	977	963	928	-1.4%	-5.0%
City of Muscatine	22,886	23,797	23,298	4.0%	1.8%
City of Nichols	374	340	317	-9.1%	-15.2%
City of Stockton	197	176	171	-10.7%	-13.2%
City of West Liberty	3,736	3,858	3,724	3.3%	-0.3%
City of Wilton	2,802	2,924	2,914	4.4%	4.0%
Unincorporated	11,030	10,529	10,143	-4.5%	-8.0%

Source: Annual Estimates of the Resident Population for Counties in Iowa: April 1, 2020 to July 1, 2024; U.S. Census Bureau. "RACE." Decennial Census, DEC Redistricting Data (PL 94-171)

Existing Land Use

Existing land use in Muscatine County is dominated by agriculture and open space, with farmland and rural land accounting for 78.1 percent of the county's total area in its unincorporated parts. Muscatine County has jurisdiction over land uses in the unincorporated area. Limited residential development in unincorporated areas is proposed, such as north of the City of Muscatine and along highways. See Map 3-12.

Future Land Use

Future land use noted in the *Muscatine County Comprehensive Land Use Plan* identifies the importance of preservation of farmland for future production as a continued priority for the county. Likewise, preservation of natural areas and resources is a high priority. Land development is considered carefully through utilization of Muscatine County's Land Evaluation and Site Assessment Evaluations System. Map 3-17 identifies future land use within Muscatine County. As the future land use map shows, a significant increase in county land is set aside for parks and conservation is expected. These areas correspond with important watershed and wildlife corridors, and particularly focus on the floodplains of the Cedar River Valley.

Population and Housing Trends

While housing development has emerged as a priority in recent years, driven by both demand and strategic planning related to economic growth, development is encouraged

within existing municipal boundaries or in unincorporated areas within 2 miles of municipal limits where public facilities and services can be provided or extended. Development outside of these areas is reviewed based on the quality of agricultural land and proximity to infrastructure.

Building permit data gathered by the county’s Zoning and Permit offices shows that there were 23 new building project permits issued for the fiscal year 2022-2023. This is up from the previous year 2021-2022, which only had 5 building project permits issued. The number of permits issued went down in fiscal year (FY) 2023-2024, but in the following year (FY 2024-2025), the county issued 34 permits for 34 new residences– more permits than in any of the past three fiscal years.

Table 3-46 Muscatine County Issued Building Permits

Year	YTD Receipts	YTD Fees	YTD New Residences	YTD Fees Waived
2021-2022	5	\$7,005.90	5	0
2022-2023	23	\$28,970.40	23	0
2023-2024	13	\$14,910.20	13	0
2024-2025	34	\$18,684.60	34	0

Source: Muscatine County Assessor’s Office, December 2025

Industry is an integral part of the county’s economy, accounting for approximately 30% of employment. Industrial development is encouraged to be located within municipalities where infrastructure needs can be accommodated readily or can be extended. Industrial development is also directed to areas where transportation is readily accessible. The Future Land Use Map 3-17 identifies these areas.

General development trends as applicable to each jurisdiction are further noted below.

Atalissa

In Atalissa, development activity noted in the 2025 *Muscatine County Comprehensive Plan* includes possible heavy industrial expansion.

Conesville

No development has occurred within the city since the 2020 plan was adopted. Currently, the city does not have any development plans within the next 5 years.

City of Fruitland

Based on trends for Muscatine County, the City of Fruitland’s population is expected to grow through 2039. The City of Fruitland’s 2023 *Comprehensive Land Use Plan* aims to continue its goal for retaining the city’s bedroom community image. The city aims to encourage commercial development along its primary roadway corridors, discourage industrial development, protect and conserve greenways, and maintain its quality water resources.

City of Muscatine

The City of Muscatine anticipates slight population growth at an annual 0.25% rate, according to its most recent comprehensive plan 2025-2045, with an anticipated population growth of at least 1,500 by 2045. The city is working to convert land for residential use to accommodate its anticipated growth and to attract businesses and industry to the area. A mix of low, medium and high-density housing is planned. The city aims to add 2,000 new housing units by 2033. Growth will include new development and redevelopment and will exclude areas where there are steep slopes, flooding, and wetlands.

Additional considerations for development noted in the city's comprehensive plan are to build around natural water flows, encourage landscaping that more slowly filters rainwater and reduces pollutants. Stormwater detention and retention areas are also identified as opportunities for plant diversity, neighborhood paths, and development features.

Five growth areas are identified in the city's future land use map including: 1) Infill as a priority; 2) West Growth – convenient to Highway 61 and the airport; 3) Northwest Growth; 4) Northeast Growth; and 5) East Growth. Rural subdivision areas are also identified within the city's 2-mile jurisdiction. Considerations to be made in future development of rural areas include limiting cul-de-sacs and improving access to emergency services. The City of Muscatine also identifies special districts for development including: downtown and riverfront, Park Avenue Area, Highway 61 Corridor, and historic districts.

City of Nichols

There has been no major development in the city since the hazard mitigation plan was adopted in 2020. Currently, the city does not have any development plans within the next 5 years.

City of West Liberty

West Liberty's population has generally trended in a positive direction since 2010. In order to accommodate the population growth and increase housing options, the community created two new subdivisions since the last plan update. In West Liberty's most recent comprehensive plan, the majority of land is classified as residential, but contains pockets of commercial and industrial that are crucial to the community's economy.

West Liberty aims to annex housing developments within its 2-mile boundary where city utilities are already in use. The city continues to see commercial expansion through the Highway 6 corridor. A top priority for the community is to improve industrial traffic flow through town. Currently, freight navigates through populated areas while traveling to and from major manufacturers.

City of Wilton

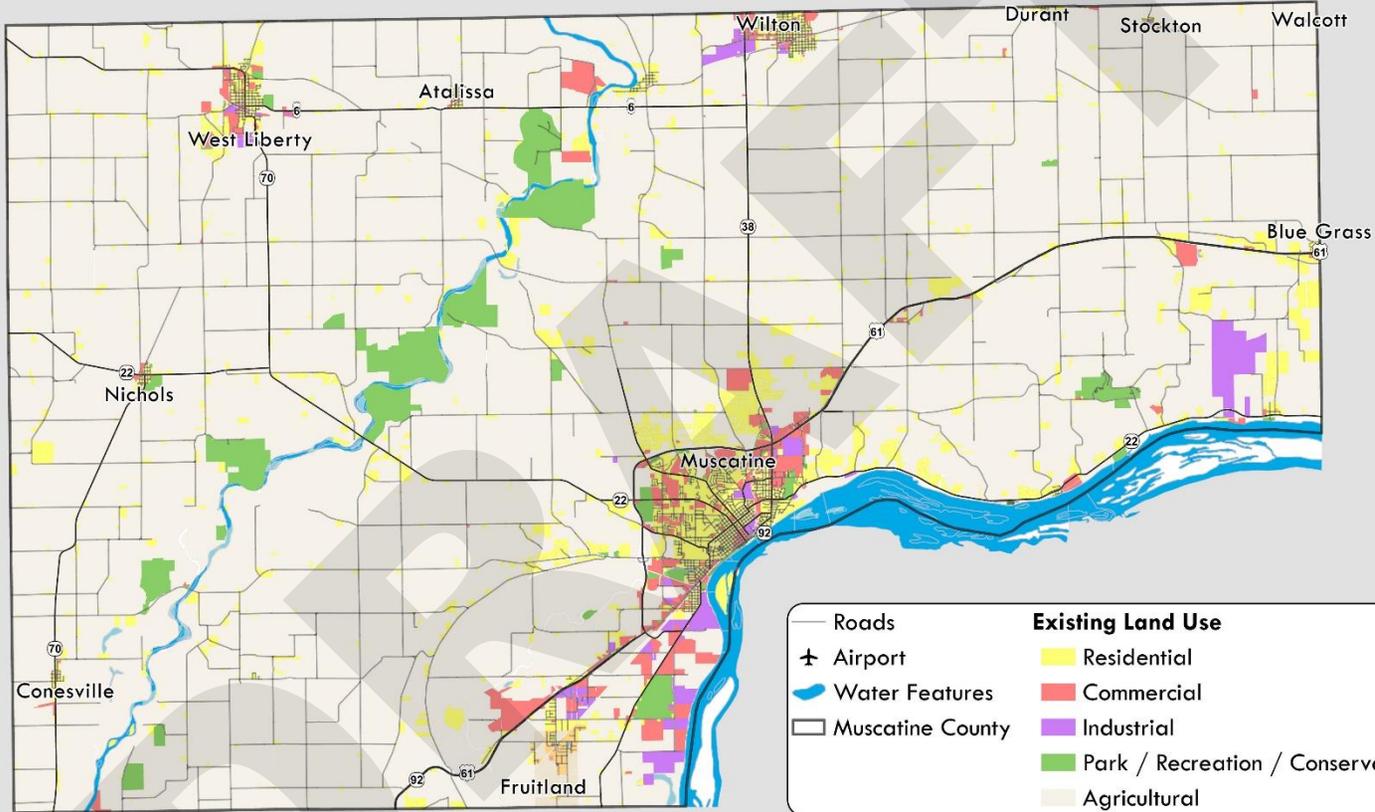
The City of Wilton's last comprehensive plan was completed in February 2003. As of 2003, agricultural and open lands made up the majority of the city's area at 42%. The second

largest land use is industrial at 26%, followed by residential (20.5%), commercial (4.5%), institutional (5%), and recreational (2%). Most of the industrial development is located west of U.S. Highway 6, while residential uses are focused in the eastern portion of the city.

The city is currently working on plans to develop a 50-acre site for industrial use in the north-west section of town just west of U.S. Hwy 6. That has been annexed into the city since the 2010 hazard mitigation plan was adopted. Additional residential use is a long-term plan on the north side of town, outside of Muscatine County's boundaries.

DRAFT

Muscatine County Hazard Mitigation Plan Map 3-12: Existing Land Use



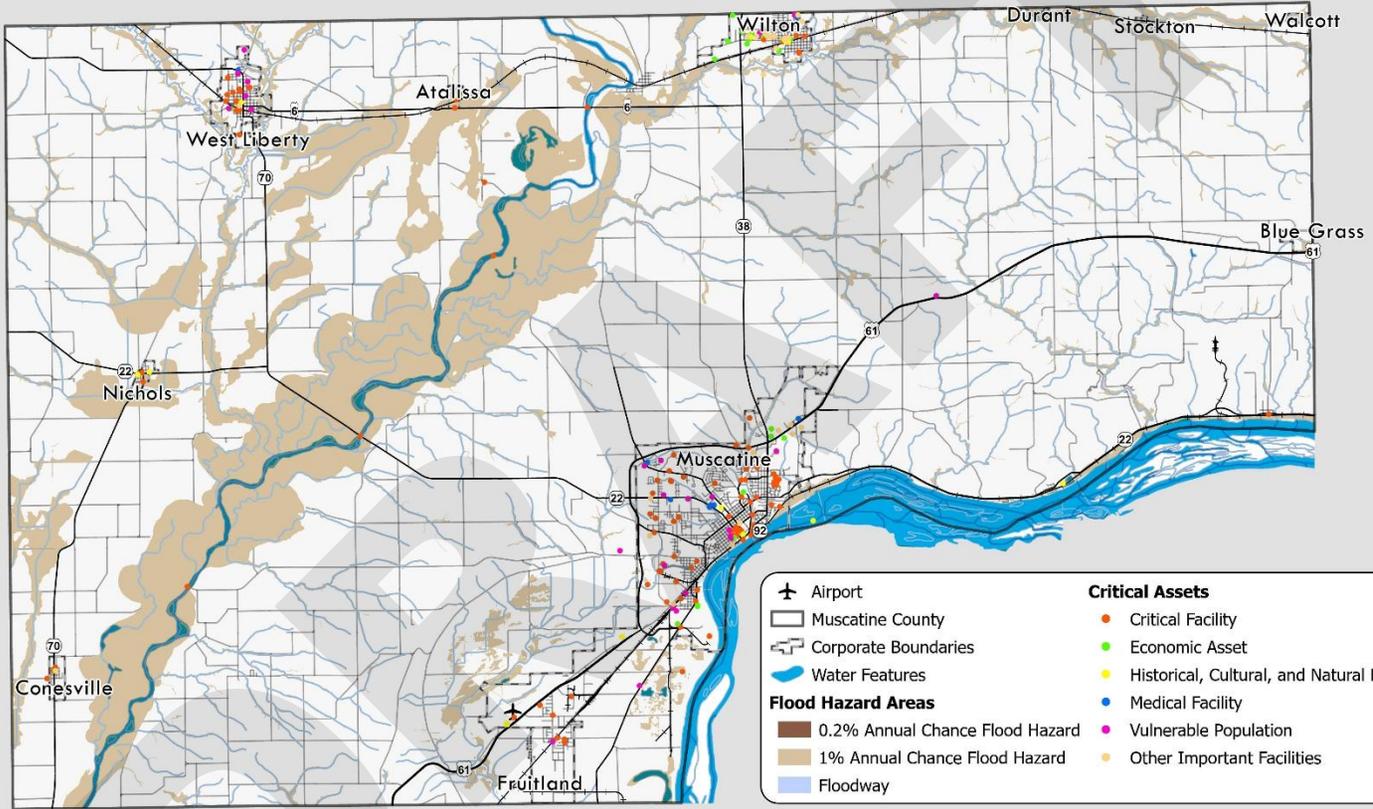
Sources:
 Existing Land Use: MAGIC (2024)
 Roads - IA DOT (2019)
 Counties - U.S. Census Bureau (2019)
 Other features - Bi-State Regional Commission

Disclaimer: This map is for reference only. Data provided are derived from multiple sources with varying levels of accuracy. Bi-State Regional Commission disclaims all responsibility for the accuracy or completeness of the data shown hereon.



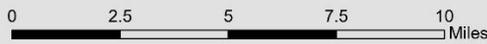
Muscatine County Hazard Mitigation Plan

Map 3-13: Flood Hazard Areas with Critical Assets

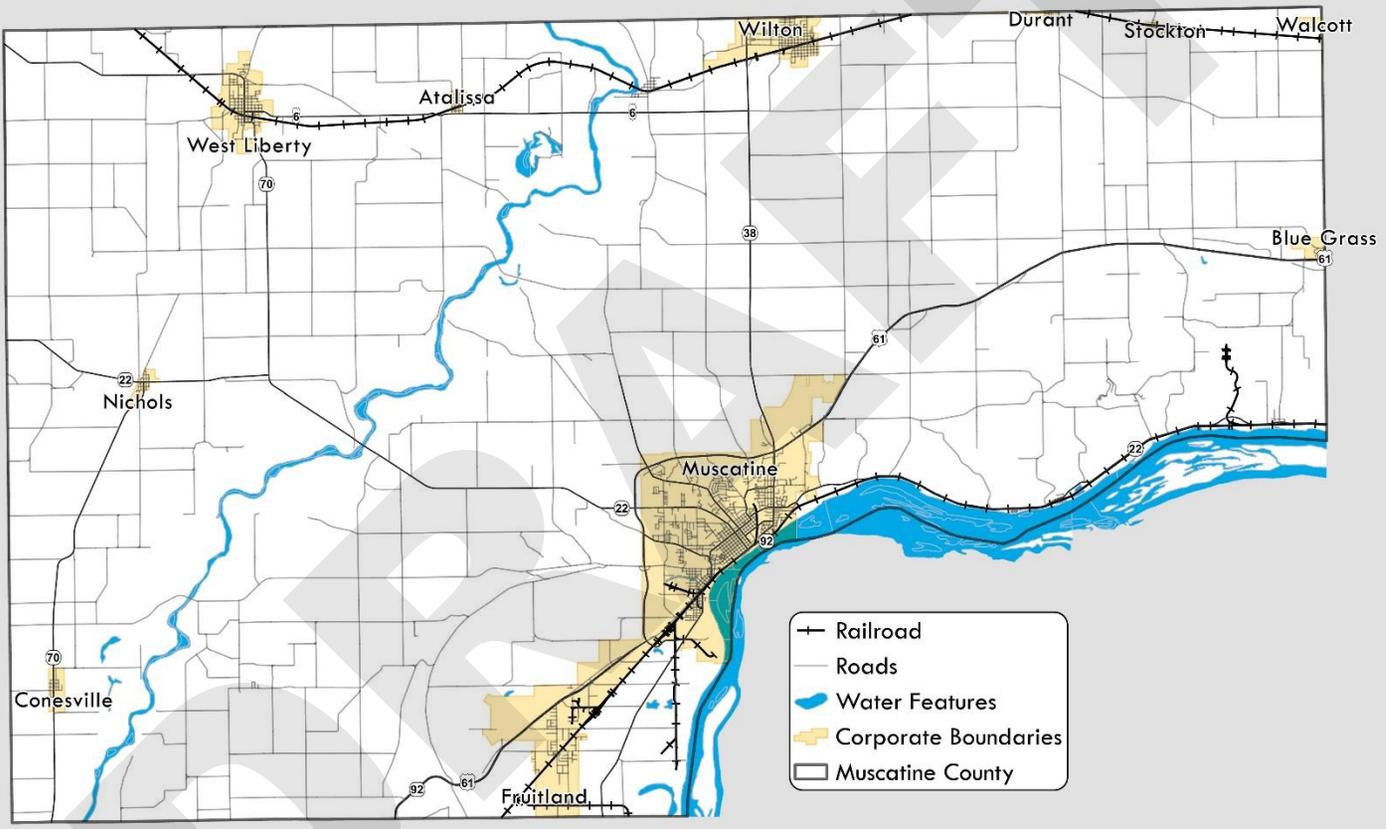


Sources:
 Critical Assets - Individual Jurisdictions (2025)
 Flood Hazards - FEMA (2022)
 Roads - IA DOT (2019)
 Counties - U.S. Census Bureau (2019)
 Other features - Bi-State Regional Commission

Disclaimer: This map is for reference only. Data provided are derived from multiple sources with varying levels of accuracy. Bi-State Regional Commission disclaims all responsibility for the accuracy or completeness of the data shown hereon.



Muscatine County Hazard Mitigation Plan Map 3-14: Railroad Network



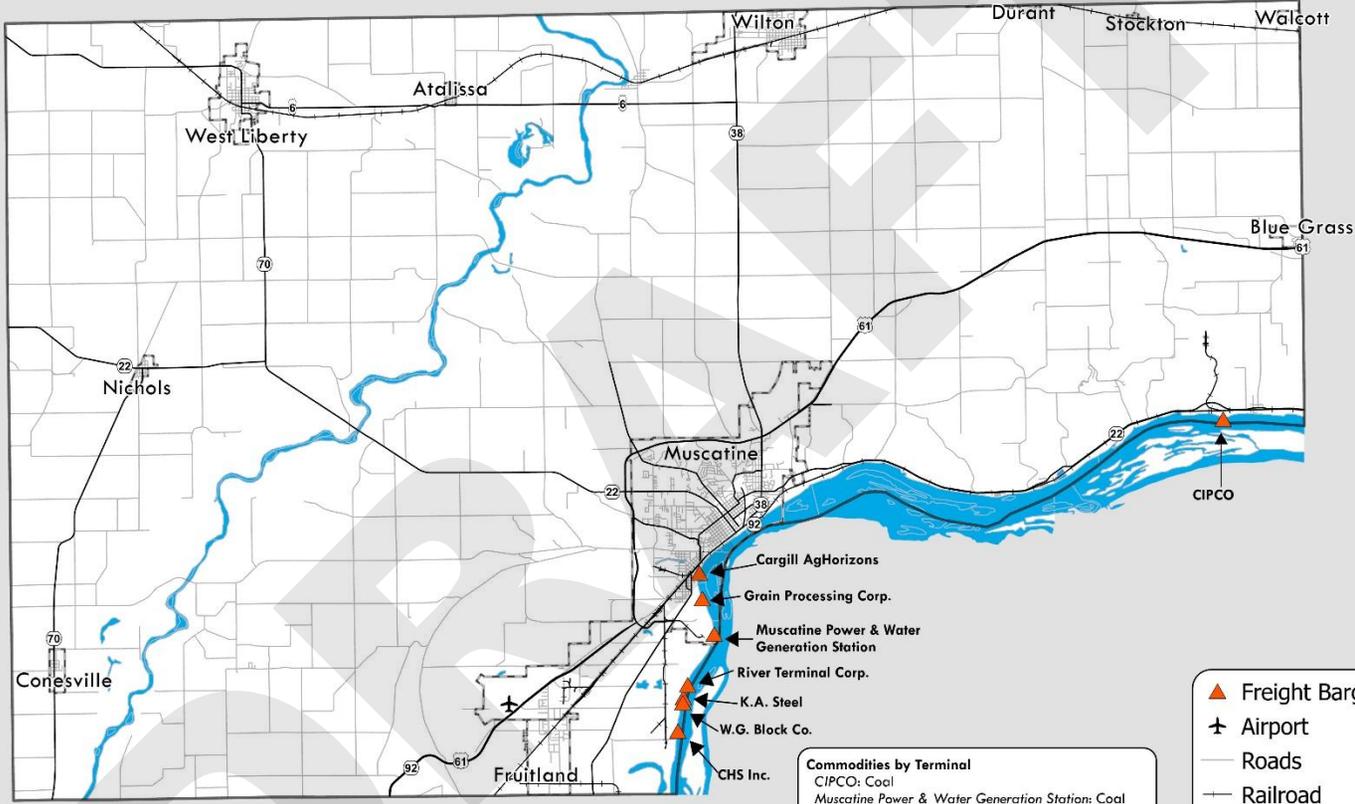
Sources:
 Railway - IA DOT (2029)
 Roads - IA DOT (2019)
 Counties - U.S. Census Bureau (2019)
 Other features - Bi-State Regional Commission

Disclaimer: This map is for reference only. Data provided are derived from multiple sources with varying levels of accuracy. Bi-State Regional Commission disclaims all responsibility for the accuracy or completeness of the data shown hereon.



Muscatine County Hazard Mitigation Plan

Map 3-15: Barge Terminals in Muscatine County



- ▲ Freight Barge Terminal
- ✈ Airport
- Roads
- +— Railroad
- - - Corporate Boundaries
- ~ Water Features
- Muscatine County

Commodities by Terminal

<i>CIPCO:</i>	Coal
<i>Muscatine Power & Water Generation Station:</i>	Coal
<i>Grain Processing Corp.:</i>	Corn
<i>Cargill AgHorizons:</i>	Corn, Soybeans
<i>CHS Inc.:</i>	Diamonium & Monoammonium Phosphate
<i>River Terminal Corp.:</i>	Liquid Fertilizer, Molasses, Lignin
<i>W.G. Block Company:</i>	Sand
<i>K.A. Steel:</i>	Sodium Hydroxide

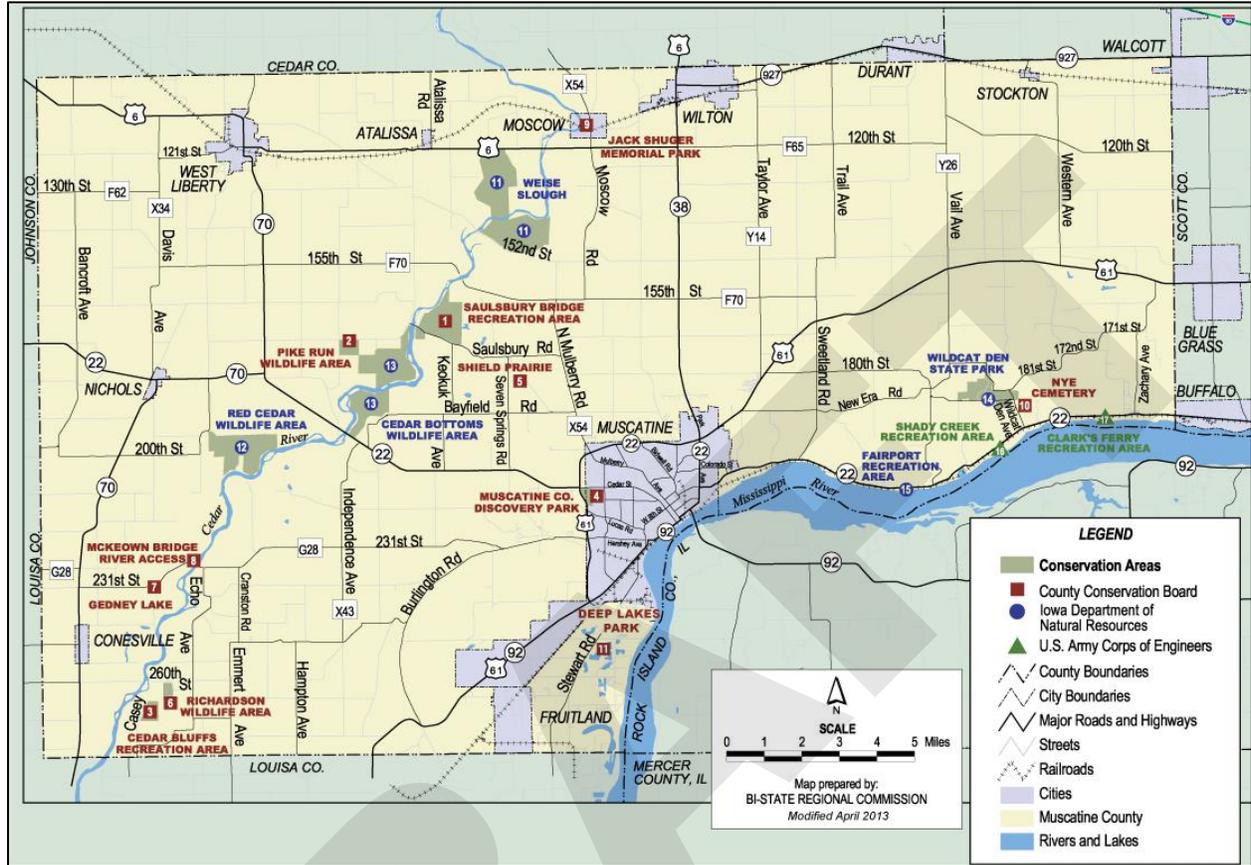


Sources:
 Freight Barge Terminals - Iowa DOT (2025)
 Roads - IA DOT (2019)
 Counties - U.S. Census Bureau (2019)
 Other features - Bi-State Regional Commission

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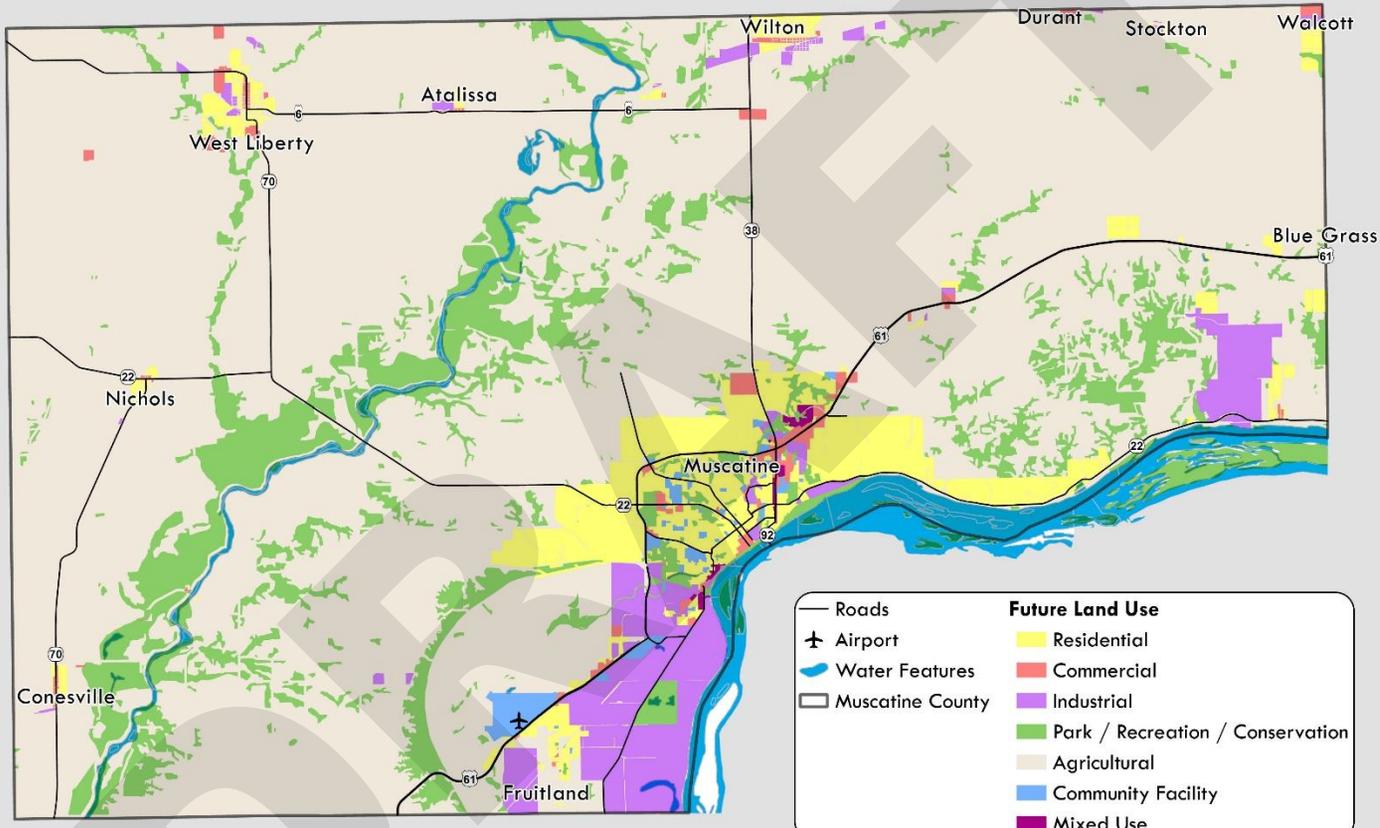


Map 3-16 Recreation and Conservation Areas in Muscatine County



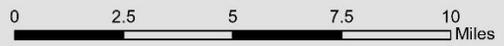
Muscatine County Hazard Mitigation Plan

Map 3-17: Future Land Use



Sources:
 Future Land Use - MAGIC (2024)
 Roads - IA DOT (2019)
 Counties - U.S. Census Bureau (2019)
 Other features - Bi-State Regional Commission

Disclaimer: This map is for reference only. Data provided are derived from multiple sources with varying levels of accuracy. Bi-State Regional Commission disclaims all responsibility for the accuracy or completeness of the data shown hereon.



Jurisdiction Profiles

As described in the previous section on profiling hazards, each of the participating jurisdictions evaluated the hazards identified for the planning area.

The following individual jurisdiction risk assessments provide comparable data regarding population and land area. A geographic summary notes specific features that distinguish the jurisdiction from the planning area as a whole. The hazard priority provides a list of the priority hazards for each community based on their local experience.

The section also explains any differences in hazard ranking compared to the planning area. Finally, the “Critical Facilities” section summarizes structures identified as important to the jurisdiction that may be vulnerable to hazards. The specific lists of critical facilities were mapped in relation to the 1% chance of annual flood hazard (also known as the 100-year floodplain) for the county-wide planning area as a whole and are shown in Map 3-13 on page 133. More detailed maps showing the special flood hazard areas for each jurisdiction can be found in Appendix 3-2.

Muscatine County Unincorporated

Overview

- Population (2020 Census): 5,441
- 12.6% of the total county's population
- Ranks 2nd of 8 jurisdictions in population
- Land area: 412.5 sq. miles
- 943.4% of the total county's land area
- Ranks 1st of 8 in land area
- NFIP status: participating

Geography and Land Use

Rural/Unincorporated Muscatine County is located in the south-eastern part of the state of Iowa. It is bordered to the north by Cedar County and a small part of Scott County; to the east by Scott County and the Mississippi River on the south-eastern part; to the south by Louisa County; and to the west by Johnson County and part of Louisa County. The slope of the county varies from 0-50% depending on the area, with the majority of the unincorporated areas in the 0-2% range. There are two major rivers that are located within the county: the Mississippi River that runs along the south-eastern boarder of the county, and the Cedar River that runs north-south through the western half of the county.

The existing land use is mainly agricultural, which covers approximately 90% of the county. The rest of the area contains small pockets of residential and park, recreation, and conservation areas. Transportation features include 4 major highways: U.S. Highway 61, U.S. Highway 70, U.S. Highway 6, and U.S. Highway 22. There are also two railroad lines, Iowa Interstate Railroad and Iowa Chicago & Eastern Railroad.

Government Structure

Muscatine County is governed by a Board of Supervisors who are elected to 4-year terms. The elected officials are elected at-large. In addition, the county attorney, auditor, recorder, sheriff, and treasurer are elected positions with 4-year terms. County departments include the following: Administration, Assessor, Attorney, Auditor, Health, Building, Community Services, Conservation, Emergency Management, Engineer, Environmental Health, Geographic Information Systems, Information Technology, Medical Examiner, Recorder, Sheriff, Treasurer, Veterans Affairs, and Zoning. Boards and commissions include Board of Adjustment, Board of Health, Zoning Commission, Veteran's Affairs Commission, and Conservation Board.

The county has a building code, floodplain ordinance, and zoning code, which are enforced by the Planning and Zoning Administrator. Muscatine County participates in the National Flood Insurance Program. Muscatine County updated their comprehensive plan in 2025 and has several additional plans, ordinances, and policies that can be utilized to mitigate hazards. Muscatine County prepares a budget annually and is a taxing body.

County Departments

- Alert Iowa
- Administration
- Assessor's Office
- Attorney's Office
- Auditor's Office
- Board of Health
- Building
- Community Services
- Conservation
- Emergency Management
- Engineer's Office
- Environmental Health
- Geographic Information Systems
- Information Technology
- Medical Examiner's Office
- Recorder's Office
- Veterans Affairs
- Zoning

County Boards and Commissions

- Board of Adjustment
- Board of Health
- Board of Supervisors
- Conservation Board
- Extension Council
- Historic Preservation Council
- Veteran's Affairs Commission
- Zoning Commission

Critical Facilities

In addition to all of the identified facilities within incorporated areas of Muscatine County, rural and unincorporated Muscatine County recognized one building (Montpelier Fire Department) and four bridges (all crossing the Cedar River) as critical facilities.

Vulnerable populations noted in the asset inventory included several modular home communities and a church. Muscatine County's facilities are primarily located within the City of Muscatine and include the jail, courthouse, and administration building.

Hazard Priorities

Threats to rural/unincorporated Muscatine County are similar to ones commonly experienced throughout the county. Exposure to grass and wild-land fire risks are higher in the unincorporated areas than in incorporated areas, but the hazard priorities align overall with Muscatine County as a whole.

2020 Ranking	Hazard Type	2025 Ranking (High/Medium/Low/NA)	Hazard Type
1	Thunderstorm & Lightning	High	Tornado
2	River Flood	Medium	Grass & Wildland Fire
3	Grass & Wild-land Fire	Medium	Thunderstorm, Hail & Lightning
4	Tornado	Medium	Levee Failure
5	Windstorm	Medium	River Flood
6	Severe Winter Storm	Medium	Severe Winter Storm
7	Hazardous Materials	Medium	Windstorm
8	Flash Flood	Low	Dam Failure
9	Hailstorm	Low	Drought
10	Extreme Heat	Low	Earthquake
11	Earthquake	Low	Expansive Soils
12	Levee Failure	Low	Extreme Heat
13	Dam Failure	Low	Flash Flood
14	Sinkholes & Land Subsidence	Low	Hazardous Materials
15	Landslide	Low	Landslide
16	Expansive Soils	Low	Sinkholes & Land Subsidence
17	Drought		

City of Atalissa

Overview

- Population (2020 Census): 296
- 0.68% of the total county's population
- Ranks 8th of 8 jurisdictions in population
- Land area: 0.14 sq. miles
- 0.03% of the total county's land area
- Ranks 8th of 8 in land area
- NFIP status: participating

Geography

Atalissa is located in the northwest part of Muscatine County; it is the smallest of the represented jurisdictions in both land and population. The existing land use in Atalissa includes residential; park, recreation, and conservation; and commercial. Transportation features along the southern border include U.S. Highway 6 and Iowa Interstate Railroad, which both run through the southern half of the town.

Government Structure

The City of Atalissa has a mayor-council form of local government. The mayor and five-member city council are elected to four-year, staggered terms. The city keeps an attorney on retainer. There are no boards or commissions for the city. Staff includes the city clerk/treasurer and the police chief. The city creates a budget annually, but does not have a capital improvement plan. Atalissa does participate in the National Flood Insurance Program and has a floodplain management ordinance. The city clerk is charged with enforcing the floodplain management within the city. The city is a taxing body and also assesses charges for sewer and solid waste management. Atalissa is covered by a volunteer fire department that has the ability to call additional personnel and resources from surrounding communities through a mutual aid agreement.

City Departments

- Fire Department
- Water and Sewer

Critical Assets

The City of Atalissa recognized six buildings in their list of critical facilities, including city hall, the fire department, water plant, waste water treatment plant, lift station, and city garage.

Hazard Priorities

Tornado, thunderstorms and lightning, and flash flooding were identified as high priority hazards. Mitigation actions include continuing compliance with NFIP and working with the Volunteer Fire Department to serve the community to address hazards related to

hazardous materials and grass and wildland fires. Mitigation actions are further identified in Chapter 4.

2020 Ranking	Hazard Type	2025 Ranking (High/Medium/Low/NA)	Hazard Type
1	Tornado	High	Flash Flood
2	Thunderstorm & Lightning	High	Thunderstorm, Hail & Lightning
3	Windstorm	High	Tornado
4	Flash Flood	Medium	Extreme Heat
5	Grass & Wild-land Fire	Medium	Severe Winter Storm
6	Severe Winter Storm	Medium	Windstorm
7	Hailstorm	Low	Grass and Wildland Fire
8	Extreme Heat	Low	Hazardous Materials
9	Drought	Low	River Flood
10	Earthquake	Low	Sinkholes & Land Subsidence
11	Sinkholes & Land Subsidence	NA	Dam Failure
12	Expansive Soils	NA	Drought
13	Hazardous Materials	NA	Earthquake
14	Landslide	NA	Expansive Soils
15	River Flood	NA	Landslide
16	Levee Failure	NA	Levee Failure
17	Dam Failure		

City of Conesville

Overview

- Population (2020 Census): 352
- 0.81% of the total county's population
- Ranks 6th of 8 jurisdictions in population
- Land area 0.36 sq. miles
- 0.08% of the total county's land area
- Ranks 6th of 8 in land area
- NFIP status: Participating (no SFHA within jurisdictional boundaries)

Geography

The City of Conesville is located in southwestern Muscatine County along Highway 70. Conesville and the surrounding area are flat with 0-2% slopes. Conesville, while located to the west of the Cedar River and Cone Lake, is not located within the floodplain. The city is primarily residential.

Government Structure

The City of Conesville has a mayor-council form of local government. The mayor and five-member city council are elected to four-year, staggered terms. The city keeps an attorney on retainer. There are no boards or commissions for the city. Staff includes the city clerk/treasurer and the police chief. The city creates an annual budget, but it does not have a capital improvement plan. The city has no identified special flood hazard areas but does participate in the National Flood Insurance Program. The city is a taxing body and also assesses charges for sewer and solid waste management. Conesville is covered by a volunteer fire department that can call additional personnel and resources from surrounding communities through a mutual aid agreement.

City Departments

- Fire Department
- Police Department
- Wastewater/Sewer

Critical Assets

The City of Conesville listed three critical facilities: city hall, the fire station, and the sewage treatment facility. In addition, the city recognizes a vulnerable population as T-Bell detasseling workforce housing. Economic assets include Bells Melons and other important facilities include diesel storage tanks.

Hazard Priorities

High priority hazards included tornados and windstorms. As a rural community, it has a somewhat higher exposure to grass and wild-land fire risks. Mitigation actions are further identified in Chapter 4.

2020 Ranking	Hazard Type	2025 Ranking (High/Medium/Low/NA)	Hazard Type
1	Thunderstorm & Lightning	High	Tornado
2	Windstorm	High	Windstorm
3	Grass & Wild-land Fire	Medium	Drought
4	Tornado	Medium	Thunderstorm, Hail & Lightning
5	Extreme Heat	Medium	Grass & Wildland Fire
6	Flash Flood	Medium	Severe Winter Storm
7	Hazardous Materials	Low	Earthquake
8	Severe Winter Storm	Low	Extreme Heat
9	Drought	Low	Hazardous Materials
10	Sinkholes & Land Subsidence	Low	Sinkholes & Land Subsidence
11	Hailstorm	NA	Dam Failure
12	Levee Failure	NA	Expansive Soils
13	Landslide	NA	Flash Flood
14	River Flood	NA	Landslide
15	Expansive Soils	NA	Levee Failure
16	Earthquake	NA	River Flood
17	Dam Failure		

City of Fruitland

Overview

- Population (2020 Census): 963
- 2.2% of the total county's population
- Ranks 5th of 8 jurisdictions in population
- Land area 1.8 sq. miles
- 0.4% of the total county's land area
- Ranks 4th of 8 in land area
- NFIP status: Participating

Geography and Land Use

Fruitland is located in the southeast portion of Muscatine County, within the Muscatine Island Levee District. Fruitland is part of Muscatine Island, which was at one time an island in the Mississippi River that became part of the state of Iowa when the river changed its course. Fruitland's eastern most border is now 2 miles from the Mississippi River. The slope of the area is flat with 0-2% grade within the town. Surrounding Fruitland are steeper grades of 10-20%. Fruitland is a bedroom community that is bordered by the City of Muscatine to the north, Fruitland Township to the east, Louisa County to the south, and U.S. Highway 61 to the west. Transportation features include U.S. Highway 61, the Iowa Chicago & Eastern Railroad that runs through the northwest corner of town, and nearby access to Muscatine Municipal Airport, which lies northwest of town.

Government Structure

The City of Fruitland has a mayor-council form of local government. The mayor is elected to two-year terms, and the five-member city council are elected to four-year, staggered terms. The city keeps an attorney on retainer. Staff includes the city clerk, superintendent of public works, maintenance assistant, and building official. Fruitland has a zoning ordinance and a building code, and as such, a Planning & Zoning Board and Board of Adjustments. The city also has a park board. Fruitland creates a budget annually, but it does not have a capital improvement plan. The city participates in the National Flood Insurance Program. The city is a taxing body and also assesses charges for road use, solid waste management, and other services. Fruitland is covered by a volunteer fire department that has the ability to call additional personnel and resources from surrounding communities through a mutual aid agreement.

City Departments

- Fire Department
- Inspections
- Parks and Recreation
- Public Works

City Boards and Commissions

- Board of Adjustments

- Parks and Recreation
- Planning and Zoning

Critical Facilities

The City of Fruitland recognized three locations as critical facilities: city hall, the fire station, and the post office. The city also recognized the mobile home community as a population vulnerable to natural hazards.

Hazard Priorities

Threats to Fruitland are similar to ones commonly experienced throughout the county, with the exception of levee failure, for which it is at a higher risk for direct impact. While the levee improvements recently completed are positioned to mitigate future breach impacts, the community desired to keep the priority as a high priority. Overall, the city's hazard priorities align with Muscatine County as a whole.

2020 Ranking	Hazard Type	2025 Ranking (High/Medium/Low/NA)	Hazard Type
1	Tornado	High	Hazardous Materials
2	River Flood	High	Levee Failure
3	Levee Failure	High	River Flood
4	Severe Winter Storm	High	Tornado
5	Drought	Medium	Dam Failure
6	Flash Flood	Medium	Drought
7	Hailstorm	Medium	Thunderstorm, Hail & Lightning
8	Extreme Heat	Low	Earthquake
9	Hazardous Materials	Low	Expansive Soils
10	Grass & Wildland Fire	Low	Extreme Heat
11	Thunderstorm & Lightening	Low	Flash Flood
12	Windstorm	Low	Grass & Wildland Fire
13	Earthquake	Low	Landslide
14	Dam Failure	Low	Severe Winter Storm
15	Sinkholes & Land Subsidence	Low	Sinkholes & Land Subsidence
16	Landslide	Low	Windstorm
17	Expansive Soils		

City of Muscatine

Overview

- Population (2020 Census): 23,797
- 55.0% of the total county's population
- Ranks 1st of 8 jurisdictions in population
- Land area 18.2 sq. miles
- 4.2% of the total county's land area
- Ranks 2nd of 8 in land area
- NFIP status: Participating

Geography and Land Use

The City of Muscatine is the largest municipality by population in the county. It is located along the Mississippi River where the river turns south in the south-central portion of Muscatine County. The City of Muscatine is bordered by Fruitland in the southwest, and the Mississippi River acts as this jurisdiction's southeastern border. Since the 2020 *Muscatine County Multi-Jurisdictional Hazard Mitigation Plan*, the City of Muscatine is in the process of annexing 160 acres into the city limits. This annexation is set to be completed by June 2026.

Transportation features include the Iowa Chicago & Eastern Railroad and Highway 22/92 along the southern border of the city, while U.S. 61 follows the city's northern and eastern city limits. Highway 38 provides for north/south transit movement, and connecting to Interstate 80. Due to the City of Muscatine's proximity to the Mississippi River, there are areas of steep slopes formed by the river bluffs found within city limits where portions of the residential population can be found; however, the land located within Muscatine Island is relatively flat, with slopes of 0%-2%.

Government Structure

The City of Muscatine has a mayor-council form of government with an appointed city administrator. The mayor is elected to 2-year terms, while the city council has 4-year, staggered terms. The city council has five ward representatives and two at-large representatives. The city administrator is an appointed position. The city adopts an annual budget, is a taxing body, and has a capital improvement plan for long-term projects.

Emergency management services are shared by the fire department, the police department, and public works. The fire department has two stations located within the city. The city has 13 boards and commissions including a New Construction Appeal & Advisory Board, Planning & Zoning Commission, and Zoning Board of Adjustment. The city has a full building and zoning ordinance enforced by staff in the public works department and community development department. The city participates in the National Flood Insurance Program with enforcement done by the Community Development Department. The city also has several other ordinances that could aid hazard reduction, such as the

stormwater management ordinance and hazardous waste regulations. The list of plans and policies for the city can be found in Table 2-1 in Chapter 2.

City Departments

- City Administration
- City Clerk
- City Attorney
- Community Development (Housing Division)
- Emergency Management
- Finance
- Fire & EMS
- Human Resources
- Information Technology
- Muscatine Art Center
- Musser Public Library & HNI Community Center
- Parking
- Parks and Recreation
- Police
- Public Transit
- Public Works
- Water & Resource Recovery Facility

City Boards and Commissions

- Administrative Review Panel
- Airport Advisory Commission
- Art Center Board of Trustees
- Civil Service Commission
- Historic Preservation Commission
- Library Board of Trustees
- Construction Appeal & Advisory Board
- Planning & Zoning Commission
- Public Art Advisory Commission
- Parks & Recreation Advisory Commission
- Water, Electric & Communications Trustees
- Zoning Board of Adjustments
- GMCCI Tourism & Hospitality Committee

Critical Facilities

The City of Muscatine listed 88 locations as a part of their community asset inventory with 48 of those listed as critical facilities. Among those listed were City Hall; the Public Safety Building; fire stations; power & water facilities; public works; the solid waste transfer station; the county jail; courthouse; other county operations; communication facilities; the bridges over the Mississippi River, Mad Creek, and Geneva Creek; and the sewer lift stations.

Hazard Priorities

Threats to Muscatine are similar to ones commonly experienced throughout the county, with the exception of levee failure, for which it is at a higher risk for direct impact. Its hazard priorities align with Muscatine County as a whole.

2020 Ranking	Hazard Type	2025 Ranking (High/Medium/Low/NA)	Hazard Type
1	Tornado	High	Levee Failure
2	Flash Flood	High	Tornado
3	Windstorm	Medium	Flash Flood
4	Hazardous Materials	Medium	Hazardous Materials
5	River Flood	Medium	Windstorm
6	Thunderstorm & Lightening	Low	Drought
7	Levee Failure	Low	Earthquake
8	Dam Failure	Low	Expansive Soils
9	Severe Winter Storm	Low	Extreme Heat
10	Hailstorm	Low	Grass & Wildland Fire
11	Earthquake	Low	Thunderstorm, Hail & Lightning
12	Extreme Heat	Low	Landslide
13	Landslide	Low	River Flood
14	Drought	Low	Severe Winter Storm
15	Grass & Wild-land Fire	Low	Sinkholes & Land Subsidence
16	Sinkholes & Land Subsidence	N/A	Dam Failure
17	Expansive Soils		

City of Nichols

Overview

- Population (2020 Census): 340
- 0.79% of the total county's population
- Ranks 7th of 8 jurisdictions in population
- Land area: 0.23 sq. miles
- 0.05% of the total county's land area
- Ranks 7th of 8 in land area
- NFIP status: Participating

Geography

Nichols is located within the west-central part of Muscatine County, close to the border of Johnson County. The slope of Nichols is flat with a 0-2% grade. The existing land use in town is mostly residential, with pockets of park, recreation, and conservation, as well as a commercial section located in the northwest end of town. Transportation features include U.S. Highway 70, which runs north-south through town, and U.S. Highway 22, which runs east-west through town.

Government Structure

The City of Nichols has a mayor-council form of local government. The mayor and five-member city council are elected to two-year, staggered terms. The city keeps an attorney on retainer. Staff includes the city clerk and city treasurer. Nichols has no boards or committees. The city creates a budget annually and is a taxing body, but it does not have a capital improvement plan. The city participates in the National Flood Insurance Program and has a floodplain management ordinance that is enforced by the city clerk. The city is a taxing body and also assesses charges for road use, solid waste management, and other services. Nichols is covered by a volunteer fire department that has the ability to call additional personnel and resources from surrounding communities through a mutual aid agreement.

Critical Assets

The City of Nichols listed six critical assets. Critical facilities include the fire station, City Hall, and sewer pumping station. Other important assets identified by the community included two city parks and electrical transmission lines.

Hazard Priorities

High priority hazards included thunderstorm and lightning, windstorm, severe winter storms, hazardous materials, and grass and wildland fires. Mitigation actions include continuing participation the NFIP, constructing a saferoom, establishing real-time emergency warning systems and working to implement power back-up generators at their critical facilities. Mitigation actions are further identified in Chapter 4.

2020 Ranking	Hazard Type	2025 Ranking (High/Medium/Low/NA)	Hazard Type
1	Thunderstorm & Lightning	High	Grass and Wildland Fire
2	Windstorm	High	Thunderstorm, Hail & Lightning
3	Severe Winter Storm	High	Hazardous Materials
4	Hazardous Materials	High	Severe Winter Storm
5	Grass & Wild-land Fire	High	Windstorm
6	Extreme Heat	Medium	Drought
7	Tornado	Medium	Earthquake
8	Flash Flood	Medium	Extreme Heat
9	Levee Failure	Medium	Flash Flood
10	Hailstorm	Medium	Levee Failure
11	Drought	Medium	Tornado
12	Earthquake	Low	Dam Failure
13	River Flood	Low	Expansive Soils
14	Dam Failure	Low	Landslide
15	Sinkholes & Land Subsidence	Low	River Flood
16	Landslide	Low	Sinkholes & Land Subsidence
17	Expansive Soils		

City of West Liberty

Overview

- Population (2020 Census): 3,858
- 8.92% of the total county's population
- Ranks 3rd of 8 jurisdictions in population
- Land area: 1.77 sq. miles
- 0.41% of the total county's land area
- Ranks 5th of 8 in land area
- NFIP status: Participating

Geography and Land Use

The City of West Liberty is located in northwestern Muscatine County between the Middle and West Branch of the Wapsinonoc Creek. West Liberty topography ranges from flatter land with 1-3% slopes to steeper areas of up to 9-14% slopes. Due to its proximity to the creeks, West Liberty can experience flooding. Transportation features include the Iowa Interstate Railroad and U.S. 6/IA 70. West Liberty's residential areas are primarily low-density. Other land uses include agricultural, commercial, institutional, and industrial. West Liberty has several recreational areas including the Muscatine County Fairgrounds.

Government Structure

The City of West Liberty has a mayor-council form of local government. The mayor is elected to a two-year term, and the five-member city council members are elected to four-year staggered terms with an appointed city manager. The city keeps an attorney on retainer. Staff includes the city clerk/finance officer; electric, water/sewer, and waste water treatment plant superintendents; police chief; fire chief; library director; and parks and recreation director. West Liberty has a zoning ordinance and a building code and, as such, has a Planning & Zoning Board and Board of Adjustments. The city also has a library board and park and recreation committee. The city participates in the National Flood Insurance Program and has a floodplain management ordinance enforced by the city manager. The city is a taxing body and also assesses charges for road use, solid waste management, and other services. West Liberty is covered by a volunteer fire department that has the ability to call additional personnel and resources from surrounding communities through a mutual aid agreement.

City Departments

- Administration
- City Communications
- Electric Department
- Parks and Recreation
- Police Department
- Public Library
- Streets/Public Works
- Volunteer Fire Department
- Waste/Recycling
- Waste & Sewer

City Boards and Commissions

- Board of Adjustments
- Library Board
- Planning and Zoning Commission
- Parks and Recreation Facility

Critical Assets

West Liberty listed eight structures as critical facilities. These are primarily local government facilities including the city hall, fire department, public works garage, and water treatment plant. Other critical facilities include the power plant and Liberty Communications.

Vulnerable populations in the area include several retirement homes, the schools, and a child care center. West Liberty also has a high population of residents that speak a language other than English. Vulnerable groups include residents in Golden Years and Sunny View Manor (Senior and Disability Community).

Hazard Priorities

Threats to West Liberty are similar to ones commonly experienced throughout the county. Its hazard priorities align overall with Muscatine County as a whole.

2020 Ranking	Hazard Type	2025 Ranking (High/Medium/Low/NA)	Hazard Type
1	Tornado	High	Flash Flood
2	Severe Winter Storm	High	Thunderstorm, Hail & Lightning
3	Windstorm	High	Hazardous Materials
4	Flash Flood	High	River Flood
5	River Flood	High	Severe Winter Storm
6	Thunderstorm & Lightening	High	Tornado
7	Grass & Wildland Fire	High	Windstorm
8	Drought	Medium	Drought
9	Earthquake	Medium	Extreme Heat
10	Hailstorm	Medium	Grass & Wildland Fire
11	Sinkholes & Land Subsidence	Low	Dam Failure
12	Extreme Heat	Low	Earthquake
13	Hazardous Materials	Low	Expansive Soils
14	Dam Failure	Low	Landslide
15	Levee Failure	Low	Levee Failure
16	Land Slide	Low	Sinkholes & Land Subsidence
17	Expansive Soils		

City of Wilton

Overview

- Population (2020 Census): 2,924
- 6.76% total county
- Ranks 4th of 8 jurisdictions in population
- Land area 2.06 sq. miles
- 0.47% total county area
- Rank 3rd of 8 jurisdictions in land area
- NFIP status: Participating

Geography and Land Use

The City of Wilton is located in northern Muscatine County, and a small portion of the city is located in Cedar County. U.S. 6/IA 38 runs north/south through the city, while the Iowa Interstate Railroad crosses the area in an east/west direction. Mudd Creek, a tributary of the Cedar River, flows to the south of Wilton creating a floodplain within Wilton's city limits. The land in and surrounding Wilton is flat with very few areas of steep slopes. Wilton consists primarily of agricultural or open land and low density residential with a corridor of commercial along 5th Street. Approximately 25% of Wilton is industrial with the larger industrial area located north of the Iowa Interstate Railroad and east of U.S. 6/IA 38. The City of Wilton's storm water is currently handled by drainage swales, ditches, and curb and gutter systems. A new storm water detention area was completed in 2022 along Highway 6/38 between 5th and Wate Streets.

Government Structure

The City of Wilton has a mayor-council form of local government. The mayor is elected to a two-year term, and the five-member city council are elected to four-year staggered terms with an appointed city administrator. The city keeps an attorney on retainer. Staff includes the city clerk/treasurer, police chief, public works director, and parks and recreation director. The Planning & Zoning Board and Board of Adjustments oversees the city's zoning ordinances and building code. The city also has a library board, municipal light board, and park board. The city creates a budget annually, is a taxing body, and has a capital improvement plan. The city participates in the National Flood Insurance Program and has a floodplain management ordinance enforced by the city administrator. The city is a taxing body and also assesses charges for road use, solid waste management, and other services. Wilton is covered by a volunteer fire department and EMS service that has the ability to call additional personnel and resources from surrounding communities through a mutual aid agreement.

City Departments

- City Administrator
- Clerk
- Fire Department
- Parks and Recreation
- Police Department
- Public Works
- Water & Wastewater

City Boards and Commissions

- Board of Adjustments
- Historic Preservation
- Library Board
- Light Board
- Park Board
- Planning and Zoning

Critical Facilities

The City of Wilton listed a total of 43 community assets. Five of those identified as facilities with vulnerable populations, such as the schools, a daycare, and senior housing. The 10 critical facilities include the water plant, sewer plant, public works, electric plant, city hall/library, and fire station.

Hazard Priorities

Threats to Wilton are similar to ones commonly experienced throughout the county. As a rural community, it has a somewhat higher exposure to grass and wild-land fire risks, but its hazard priorities align overall with Muscatine County as a whole.

2020 Ranking	Hazard Type	2025 Ranking (High/Medium/Low/NA)	Hazard Type
1	Tornado	High	Thunderstorm, Hail & Lightning
2	Severe Winter Storm	High	Severe Winter Storm
3	Thunderstorm & Lightning	High	Tornado
4	Windstorm	High	Windstorm
5	Flash Flood	Medium	Drought
6	River Flood	Medium	Extreme Heat
7	Hailstorm	Medium	Grass & Wildland Fire
8	Drought	Medium	Hazardous Materials
9	Hazardous Materials	Low	Earthquake
10	Extreme Heat	Low	Flash Flood
11	Levee Failure	Low	Sinkholes & Land Subsidence
12	Grass & Wildland Fire	N/A	Dam Failure
13	Earthquake	N/A	Expansive Soils
14	Dam Failure	N/A	Landslide
15	Sinkholes & Land Subsidence	N/A	Levee Failure
16	Landslide	N/A	River Flood
17	Expansive Soils		

Eastern Iowa Community of Colleges

Overview

Eastern Iowa Community Colleges (EICC) is one of the largest colleges in Iowa, with 12,000 students served annually. The City of Muscatine serves as one of the three EICC campus locations, with approximately 2,000 students enrolled. EICC provides additional sites throughout the planning area in West Liberty, Wilton, and at local high schools throughout the county. A list of campus facilities is below.

EICC Muscatine County	Location	Other
Muscatine Main Campus	Muscatine	Main Campus serving 2,000 students
Muscatine Agricultural Learning Center	Muscatine	Cooperative venture between MCC, Muscatine Friends of the FFA, Muscatine CSD and local businesses
The Button Factory	Muscatine	Home to a Culinary Arts Program
Muscatine Career Advancement Center	Muscatine	Center to build a pipeline of skilled workers to fill positions throughout the region
Muscatine Technology Center	Muscatine	Center to train in Machining, Welding, Engineering Technology and more.
West Liberty Center	West Liberty	Provides credit and non-credit courses to students, holds SBDC and ISU Extension Office.
Wilton Center	Wilton	Offers credit and continuing education classes. Provides classrooms, library, community room and college sites.

Geography

EICC district covers Clinton, Jackson, Muscatine, and Scott Counties as well as parts of Cedar and Louisa Counties. Campuses are located in Clinton, Muscatine, and Scott Counties. However, for the purposes of this plan, only Muscatine County is discussed. Reference for EICC District location in more detail. See **Error! Reference source not found..**

Critical Facilities

EICC's critical facilities include all buildings and facilities in the district. EICC's buildings are located throughout the entire county. The Culinary Arts Program, located at the Button Factory, is near the 1% and .2% annual flood hazard area.

Hazard Priorities

Eastern Iowa Community Colleges District (EICC) encompasses the entire county and other surrounding areas, which is why the district agreed to use the countywide hazard scoring. All countywide hazards affect EICC's commuting students, building maintenance, and business operations. Hazardous weather—including flash floods, thunderstorms and lightning, windstorms, severe winter storms, and hailstorms—poses risks to the safety of students, faculty, and staff. Education, emergency planning, and exercises will prepare the EICC community.

One of EICC’s most significant concerns regarding mitigation actions is energy failure. Classes cannot be in session when a building loses power, so installing backup generators for key facilities would ensure instructional continuity with minimal disruption. Early warning is also vital to life safety. By purchasing NOAA Weather Radios for each administrative location, the district can act before a hazard impacts the area, reducing threats to life and property. Additionally, providing multiple methods for sending alerts to students, faculty, and staff will reduce warning times and improve response.

This plan considers students and faculty within school buildings to be vulnerable populations due to the concentration of individuals—particularly youth—within these facilities. EICC intends to evaluate the need for tornado and severe weather safe rooms within district owned and operated buildings and proceed with construction as funding becomes available.

EICC’s full list of mitigation actions can be found in Chapter 4.

2020 Ranking	Hazard Type	2025 Ranking (High/Medium/Low/NA)	Hazard Type
NA	Tornado	High	Flash Flood
NA	Thunderstorm & Lightning	High	Thunderstorm, Hail & Lightning
NA	Windstorm	High	Tornado
NA	Flash Flood	High	Windstorm
NA	Grass & Wild-land Fire	Medium	Severe Winter Storm
NA	Severe Winter Storm	Low	Earthquake
NA	Hailstorm	Low	Expansive Soils
NA	Extreme Heat	Low	Extreme Heat
NA	Drought	Low	Grass & Wildland Fire
NA	Earthquake	Low	Hazardous Materials
NA	Sinkholes & Land Subsidence	Low	Landslide
NA	Expansive Soils	Low	Sinkholes & Land Subsidence
NA	Hazardous Materials	N/A	Dam Failure
NA	Landslide	N/A	Drought
NA	River Flood	N/A	Levee Failure
NA	Levee Failure	N/A	River Flood
NA	Dam Failure		

Muscatine Community School District

Overview

Muscatine Community School District includes one pre-kindergarten center, six elementary schools, one junior high school, and one high school. There are approximately 4,800 students served by the district. A list of buildings appears below.

School Buildings in Muscatine County
Muskie Early Learning Center (MELC)
Franklin Elementary
Grant Elementary
Jefferson Elementary
MCAP - MHS
Madison Elementary
McKinley Elementary
Mulberry Elementary
Susan Clark Junior High
Muscatine High School
Muscatine Community School District Administrative Center
MCSO Transportation
Central Production Kitchen
Maintenance

Geography and Land Use

Muscatine Community School District's boundaries cover the majority of the southern half of Muscatine County and serve the City of Muscatine, towns of Fairport and Montpelier, and portions of rural areas in Letts and Blue Grass. See **Error! Reference source not found..**

Critical Facilities

Muscatine Community School District's critical facilities include all 13 schools and administrative buildings. Franklin Elementary is considered at flood risk due to its proximity to the levee.

Hazard Priorities

Hazardous weather including floods (both flash and river), thunderstorm and lightning, windstorms, severe winter storm, and hailstorms affect the busing and safety of students. This plan considers the students and faculty within school buildings to be vulnerable populations due to the concentration of youth within the buildings. Energy failure is also a major issue within the Muscatine CSD. School cannot be in session when there is no power in a building. Having back-up generators at each school would ensure that classes can continue with little disturbance. Finally, having the knowledge of impending hazards is crucial to being proactive. By having NOAA weather radios at each school and sports field, the Muscatine CSD can act before a hazard affects the area and minimize the threat to life and property.

The Muscatine CSD's mitigation actions are listed in full in Chapter 4.

2020 Ranking	Hazard Type	2025 Ranking (High/Medium/Low/NA)	Hazard Type
NA	Tornado	High	Tornado
NA	Thunderstorm & Lightning	High	Windstorm
NA	Windstorm	Medium	Thunderstorm, Hail & Lightning
NA	Flash Flood	Low	Severe Winter Storm
NA	Grass & Wild-land Fire	NA	Dam Failure
NA	Severe Winter Storm	NA	Drought
NA	Hailstorm	NA	Earthquake
NA	Extreme Heat	NA	Expansive Soils
NA	Drought	NA	Extreme Heat
NA	Earthquake	NA	Flash Flood
NA	Sinkholes & Land Subsidence	NA	Grass and Wildland Fire
NA	Expansive Soils	NA	Hazardous Materials
NA	Hazardous Materials	NA	Landslide
NA	Landslide	NA	Levee Failure
NA	River Flood	NA	River Flood
NA	Levee Failure	NA	Sinkholes and Land Subsidence
NA	Dam Failure		

West Liberty Community School District

Overview

West Liberty Community School District (CSD) serves the West Liberty, Atalissa, and Nichols communities, with an enrollment of approximately 1,286 students.

School Buildings in West Liberty
West Liberty Early Learning Center
West Liberty Elementary School
West Liberty Middle School
West Liberty High School
West Liberty Community School District Administrative Center
West Liberty Athletic Complex
West Liberty Bus Barn
Maintenance Building

Geography and Land Use

West Liberty Community School District's boundaries cover the northwest corner of Muscatine County. The district is near U.S. Highway 6, ten miles south of I-80. See **Error! Reference source not found..**

Critical Facilities

Critical facilities include all buildings listed above. None of the facilities are located in flood hazard areas.

Hazard Priorities

Hazardous weather including floods (both flash and river), thunderstorm and lightning, windstorms, severe winter storm, and hailstorms affect the busing and safety of students. This plan considers the students and faculty within school buildings to be vulnerable populations due to the concentration of youth within the buildings.

Energy failure is also a major issue within the West Liberty CSD. School cannot be in session when there is no power in a building. Having back-up generators at each school would ensure that classes can continue with little disturbance. Having the knowledge of impending hazards is crucial to being proactive. By having NOAA weather radios at each school and sports field, the West Liberty CSD can act before a hazard affects the area and minimize the threat to life and property.

The West Liberty CSD's mitigation actions are listed in full in Chapter 4.

2020 Ranking	Hazard Type	2025 Ranking (High/Medium/Low/NA)	Hazard Type
NA	Tornado	Medium	Tornado
NA	Thunderstorm & Lightning	Medium	Windstorm
NA	Windstorm	Medium	Severe Winter Storm
NA	Flash Flood	Low	Thunderstorm, Hail & Lightning
NA	Grass & Wild-land Fire	N/A	Dam Failure
NA	Severe Winter Storm	N/A	Drought
NA	Hailstorm	N/A	Earthquake
NA	Extreme Heat	N/A	Expansive Soils
NA	Drought	N/A	Extreme Heat
NA	Earthquake	N/A	Flash Flood
NA	Sinkholes & Land Subsidence	N/A	Grass and Wildland Fires
NA	Expansive Soils	N/A	Hazardous materials
NA	Hazardous Materials	N/A	Landslide
NA	Landslide	N/A	Levee Failure
NA	River Flood	N/A	River Flood
NA	Levee Failure	N/A	Sinkholes Land Subsidence
NA	Dam Failure		

Wilton Community School District

Overview

Wilton Community School District (CSD) serves the Wilton community with 524 students in grades Pk-6 and 441 students in grades 7-12.

School Buildings in Wilton

Wilton Elementary School
Wilton Jr-Sr High School

Geography and Land Use

Wilton Community Schools are located in the town of Wilton. School District boundaries cover then northern part of Muscatine County, near U.S. Highway 6. See **Error! Reference source not found..**

Critical Facilities

Critical facilities include all buildings listed above. None of the facilities are located in flood hazard areas.

Hazard Priorities

Hazardous weather including floods (both flash and river), thunderstorm and lightning, windstorms, severe winter storm, and hailstorms affect the bussing and safety of students. This plan considers the students and faculty within school buildings to be vulnerable populations due to the concentration of youth within the buildings.

Energy failure is also an issue within the Wilton CSD. School cannot be in session when there is no power in a building. Having back-up generators at each school would ensure that classes can continue with little disturbance.

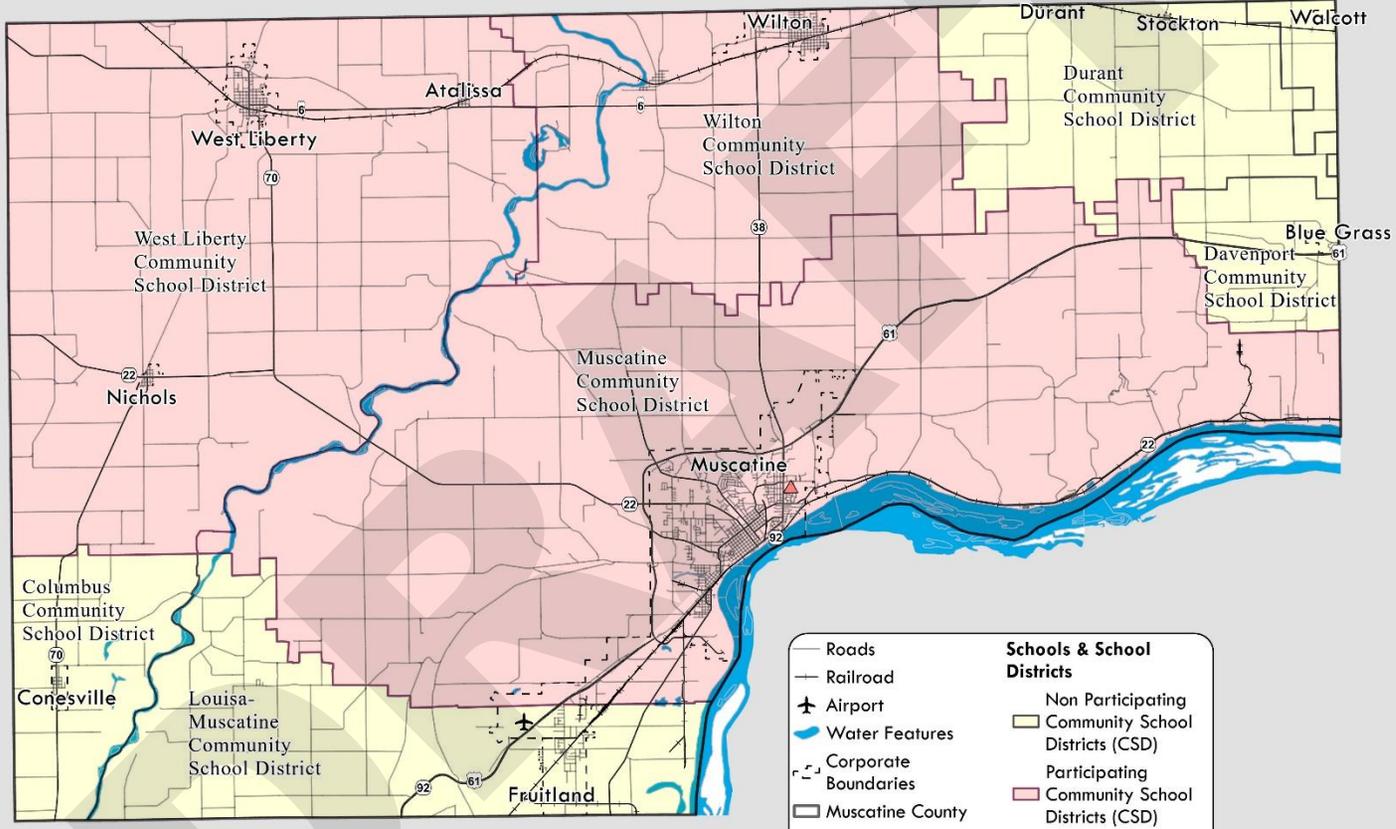
Having the knowledge of impending hazards is crucial to being proactive. By having NOAA weather radios at each school and sports field, the Wilton CSD can act before a hazard affects the area and minimize the threat to life and property.

The Wilton CSD's mitigation actions are listed in full in Chapter 4.

2020 Ranking	Hazard Type	2025 Ranking (High/Medium/Low/NA)	Hazard Type
NA	Tornado	High	Tornado
NA	Thunderstorm & Lightning	Medium	Windstorm
NA	Windstorm	Low	Dam Failure
NA	Flash Flood	Low	Drought
NA	Grass & Wild-land Fire	Low	Earthquake
NA	Severe Winter Storm	Low	Expansive Soils
NA	Hailstorm	Low	Extreme Heat
NA	Extreme Heat	Low	Flash Flood
NA	Drought	Low	Grass & Wildland Fire
NA	Earthquake	Low	Thunderstorm, Hail & Lightning
NA	Sinkholes & Land Subsidence	Low	Hazardous Materials
NA	Expansive Soils	Low	Landslide
NA	Hazardous Materials	Low	Levee Failure
NA	Landslide	Low	River Flood
NA	River Flood	Low	Severe Winter Storm
NA	Levee Failure	Low	Sinkholes & Land Subsidence
NA	Dam Failure		

Muscatine County Hazard Mitigation Plan

Map 3-18: School Districts



Sources:
 School Districts - Iowa Department of Education (2023-2024)
 Roads - IA DOT (2019)
 Counties - U.S. Census Bureau (2019)
 Other features - Bi-State Regional Commission

Disclaimer: This map is for reference only. Data provided are derived from multiple sources with varying levels of accuracy. Bi-State Regional Commission disclaims all responsibility for the accuracy or completeness of the data shown herein.



4. MITIGATION STRATEGY

This section presents the mitigation strategy developed in consultation with the Hazard Mitigation Planning Committee based on the risk assessment. The mitigation strategy was developed through a collaborative group process. The *Local Mitigation Planning Handbook* from June 2025 provided by Federal Emergency Management Agency (FEMA) states that goals are to be agreed upon by the planning team, elected officials, and the public and are to provide the basis for prioritizing mitigation actions. Goals are usually long-term, broad, policy-type statements. Mitigation actions are specific actions that help achieve goals and objectives.

Local Hazard Mitigation Goals

The Planning Committee made very minor changes to the goals from the 2020 plan for purposes of clarity. The adopted goals of the plan reflect the community's priority to protect human life and vulnerable populations, minimize losses and protect critical assets, improve services, provide education, and strengthen communication. As part of the update process for the 2025 plan, these goals were reviewed by the Planning Committee and affirmed as reflecting the current conditions and priorities for hazard mitigation planning in Muscatine County.

Table 4-1 2025 Muscatine County Hazard Mitigation Goals

1	Protect human life and property from the effects of hazards
2	Minimize losses to existing and future property, protect critical facilities, infrastructure, and other community assets
3	Improve local services and infrastructure to reduce community, economic, and environmental disruption during and after hazard events
4	Provide education and awareness of hazards and risks
5	Strengthen communication among communities and between communities and the public

Identification of Mitigation Actions

In 2020, the Planning Committee developed objectives based on six broad categories used in FEMA guidance documents to describe a range of mitigation measures to be undertaken. Updated FEMA guidance from June 2025 now identifies four categories of mitigation actions, as noted in section 6.3.1 of the FEMA 2025 Planning Handbook. In addition to mitigation activities, emergency management actions are included in this plan to provide a broad approach.

Table 4-2 Types of Mitigation Actions

Mitigation action	Description	Examples
Local Plans and Regulations (LPR)	Actions that include government authorities, policies, or codes that influence the way land and buildings are developed and built	Subdivision regulations, development review, building codes and enforcement, NFIP CRS, Capital Improvement Programs, Open Space preservation, Stormwater Management, regulations, and master plans
Structure and Infrastructure Projects (SIP)	Actions that involve modifying existing structures and infrastructure to protect them from a hazard or remove them from a hazard area – could apply to public or private structures as well as critical facilities and infrastructure	Acquisitions and elevations of structures in flood-prone areas, utility undergrounding, structural retrofits, floodwalls, retaining walls, detention and retention structures, culverts, and safe rooms
Natural Systems Protection and Nature-based Solutions	Actions that include green infrastructure and low impact development, nature-based solutions, engineering with nature and bioengineering to incorporate natural features or processes into the built environment	Sediment and erosion control, stream corridor restoration, forest management, conservation easements, wetland restoration and preservation, land conservation, greenways, rain gardens, and living shorelines
Education and Awareness Programs (EAP)	Actions that keep residents informed about potential natural disasters – many are eligible for funding through the FEMA HMA program	Radio or television spots, social media outreach, websites with maps and information, real estate disclosure, presentations to school groups or neighborhood organizations, and mailings to residents in hazard-prone areas
Miscellaneous Actions	Actions that reduce the impact that a hazard may have, but do not fit well within another category	Snow fences, generators, and warning sirens

Source: FEMA Local Handbook Update, June 2025

Identifying and Prioritizing Mitigation Actions

During the planning process, jurisdictions were provided information to aid them in working through the process of identifying mitigation actions to address identified hazards in their community (see Appendix). Individual meetings were also held with communities upon request. The Mitigation Strategy was developed for each jurisdiction and county with consideration of the following elements that identify the mitigation strategy for the county and participating jurisdictions.

Action ID	Reference identifier for the associated mitigation action.
Mitigation Action	Statement or description of the action to take place.
Goal	Community goals that the action addresses. Mitigation actions may advance more than one goal. See Table 4-1.
Objective	Objective addressed by the action. Mitigation actions may advance more than objective. Objectives are noted in table 4-2.
Responsible Party	The likely responsible party is noted. This position is responsible for initiating, carrying out, or overseeing the action.
Potential Funding Source	Funding sources are potential for mitigation actions that have not yet been started. Other sources are noted more generally when a program could not be initially identified.
Timeline	Ongoing; short-term (1-3 years); midterm (3-5 years); long-term (6-10 years); or complete
Status	Status of the existing action. These are identified as new, complete, ongoing, revised, or is to be removed for the 2026 plan. New actions are listed at the top of each jurisdiction table.
New for 2025	Indication that the mitigation action is newly proposed.
Cost/Benefit	A cost-benefit evaluation was considered to prioritize the mitigation action(s). For these purposes, “high cost” was defined as projects for which the cost was beyond the current capabilities of the community and for which financial assistance and/or a special bond issue would be required to fund the majority of the project. “Moderate to low cost” was defined as a project for which the cost was not prohibitive and/or could be incorporated into the normal operational budget for the individual jurisdiction with some or no financial assistance. Each mitigation action was also categorized by the jurisdiction as being “high benefit” or “moderate benefit.”
Priority	Jurisdictions assigned priorities based on its cost/benefit analysis and with consideration of overall impact. Guidance was provided for this assessment, as noted in Table 4-3.

Table 4-3 Prioritizing Mitigation Actions

Cost to Jurisdiction	Benefit to Jurisdiction	Priority
High	Moderate	Low
Low	Moderate	Medium
Moderate	Moderate	
High	High	High
Low	High	
Moderate	High	

Table 4-4 Jurisdictional Priority Actions

Muscatine County												
Action ID	Mitigation Action	Goal	Obj	Hazard(s) Mitigated	Resp Party	Potential Funding Source	Timeline	Status	New for 2025	Cost	Benefit	Priority
1.1	Build new pump house at Slough/Mississippi river as part of Louisa - Muscatine Drainage Levee District	1, 2, 3	PM, PP	Flash Flood, River Flood, Levee Failure, Dam Failure	LM Levee Drainage District/EMA	Grant, County, Private	3-5 Yrs	New	Yes	High	High	High
1.2	Install 2 new electronic 125,000 GPM pumps at the Louisa-Muscatine Levee Drainage District pump house	1, 2, 3	PM, PP	Flash Flood, River Flood, Levee Failure, Dam Failure	LM Levee Drainage District/EMA	Grant, County, Private	3-5 Yrs	New	Yes	High	High	High
1.3	Maintain Contract with Muscatine Fire Department for Hazardous Materials Education and Response	1,3,4	EAP, MA	Hazardous Materials	Muscatine County Emergency Management, Muscatine Fire Department	Local budget and grants	Ongoing	New	New	Mod	Mod	Med
1.4	Education of early warning systems and how to respond.	4,5	EAP	All Hazards*	Muscatine County EMA, non-profit partners, City Staff	Local budget and grants	Ongoing	Ongoing / In Progress	No	Low	Mod	Med
1.5	Implement additional uniform early warning systems throughout the county	1, 4	LPR	Tornado; Windstorm; Severe Winter Storm; Thunderstorm, Hailstorm & Lightning	County EMA	State Grants, DHS Grants, County Sources	Complete	Complete	No	Low	High	High

Muscatine County												
Action ID	Mitigation Action	Goal	Obj	Hazard(s) Mitigated	Resp Party	Potential Funding Source	Timeline	Status	New for 2025	Cost	Benefit	Priority
1.6	Construct a safe room for vulnerable populations without another source of shelter.	1, 2,	SIP	Tornado	EMA, Private	EMA, private, Grant	Short-Term	Ongoing / In Progress	No	High	High	High
1.7	Implement voluntary flood acquisition/demolition programs when financially feasible	1, 2, 3, 4	SIP	River Flood; Flash Flood	Zoning Administrator/ BOS	FEMA Grants, County	Ongoing	Ongoing / In Progress	No	Mod	Mod	Med
1.8	Update and enforce building codes to current International Code Series	1, 2	LPR	Tornado; Windstorm; Flash Flood; River Flood; Severe Winter Storm; Earthquakes	Planning and Zoning Commission	County	Ongoing	Ongoing / In Progress	No	Low	Mod	Med
1.9	Attend and participate in the Muscatine Levee Stakeholder group meetings with the end goal of determining the cost/benefit relationship to raise the levee to the 500-year flood level with 3 foot of freeboard.	3, 5	SIP	Levee Failure	Muscatine County / Levee Stakeholder Group, USACE	County	Complete	Complete	No	Low	High	High
1.10	Ensure that mobile homes have adequate tie downs	1, 2	LPR	Tornado; Windstorm; Thunderstorm, Hailstorm & Lightning	EMA	Private sources, County, Grants	Short-Term	Ongoing / In Progress	No	Low	Low	Low
1.11	Continue NFIP compliance by enforcing flood plain ordinances based on	1, 2, 4	SIP	River Flood; Flash Flood	BOS/Zoning	County	Ongoing	Ongoing / In Progress	No	Low	Low	Low

Muscatine County												
Action ID	Mitigation Action	Goal	Obj	Hazard(s) Mitigated	Resp Party	Potential Funding Source	Timeline	Status	New for 2025	Cost	Benefit	Priority
	the State of Iowa Model Code.											
1.12	Implement elevation regulations to reduce number of repetitive loss properties	1, 2	SIP	River Flood; Flash Flood	Planning and Zoning Commission	County, Grants FEMA HMGP	Ongoing	Ongoing / In Progress	No	Low	Low	Low
1.13	Pursue Community Rating System	1, 2	LPR	River Flood; Flash Flood	County Zoning Admin	County	Complete	Complete	No	Low	High	REMOVE FOR 2025
1.14	Identify critical facilities where secondary generators are needed and install back-up power generators	2	LPR	Tornado; Windstorm; Thunderstorm, Hailstorm & Lightning	EMA	County, Grant	Short-Term	Ongoing / In Progress	No	Mod	Mod	Med
1.15	Enforcement of the County Burn Ban Ordinance/Policy	1, 2	LPR, NSP	Grass and Wildland Fires	EMA/Law Enforcement/Fire	County	Ongoing	Ongoing / In Progress	Yes	Low	Mod	Med
1.16	Install additional outdoor warning sirens in areas of higher population/new subdivisions	1, 4	LPR	Tornado; Windstorm	EMA	FEMA HMGP, County	Short-Term	New	Yes	Mod	Mod	Med

* All hazards for Muscatine County include the following: Tornado; Grass & Wildland Fire; Thunderstorm, Hailstorm & Lightning; Levee Failure; River Flood; Sever Winter Storm; Windstorm; Dam Failure; Drought; Earthquake; Expansive Soils; Extreme Heat; Flash Flood; Hazardous Materials; Landslide; Sinkholes & Land Subsidence

Atalissa												
Action ID	Mitigation Action	Goal	Obj	Hazard(s) Mitigated	Resp Party	Potential Funding Source	Timeline	Status	New for 2025	Cost	Benefit	Priority
2.1	Enforcement of the County Burn Ban Ordinance/Policy	1, 2	LPR, NSP	Grass and Wildland Fires	Volunteer Fire Dept./ City	County	Ongoing	New	Yes	Low	Mod	Med
2.2	Create an action plan and training for the Volunteer Fire Department on how to handle hazardous materials incidents	1, 2, 3	LPR	Hazardous Materials	Volunteer Fire Dept.	Volunteer Fire Dept.	Ongoing	Ongoing	No	Low	Mod	Med
2.3	Continue payment of dues to the Volunteer Fire Department	1, 2	MA	Grass & Wildland Fire	Volunteer Fire Dept.	Local Sources	Ongoing	Ongoing	No	Low	Mod	Med
2.4	Continue NFIP compliance by enforcing flood plain ordinances based on the State of Iowa Model Code.	1, 2, 4	LPR, SIP	River Flood; Flash Flood; Sinkholes & Land Subsidence	City Clerk	N/A	Ongoing	Ongoing	No	Low	Low	Low
2.5	Identify accessible heating and cooling center locations and promote to community members	1	LPR	Severe Winter Storms; Extreme Heat	Volunteer Fire Dept.	Donations	Complete	Complete	No	High	Mod	REMOVE FOR 2025
2.6	Identify critical facilities where secondary generators are needed and install back-up power generators	1, 2	ES	Tornado; Windstorm; Thunderstorm, Hailstorm & Lightning	Mayor and City Council	Property Tax / Utility Funded / FEMA HMA Grants	Complete	Complete	No	High	Mod	Low

Conesville												
Action ID	Mitigation Action	Goal	Obj	Hazard(s) Mitigated	Resp Party	Potential Funding Source	Timeline	Status	New for 2025	Cost	Benefit	Priority
3.1	Enforcement of the County Burn Ban Ordinance/Policy	1, 2	LPR, NSP	Grass and Wildland Fires	Fire Dept./ City	County	Ongoing	New	Yes	Low	Mod	Med
3.2	Secure NOAA weather radios for City Hall and Fire Station	1,2,3,5	LPR	All Hazards*	County/City	County/ City/ Grants	Short-Term	Ongoing / In Progress	No	Mod	High	High
3.3	Work with Muscatine County Emergency Management to develop check-on-neighbor programs for seniors, disabled, and special needs citizens	4,5	LPR, EAP	All Hazards*	City, Muscatine County EM	Local Sources	Short-Term	Ongoing / In Progress	No	Low	Mod	Med
3.4	Identify accessible heating and cooling center locations and promote to community members	1,3	LPR	Severe Winter Storms; Extreme Heat	Fire Dept, City	Local Sources including donations, grants	Ongoing	Complete	No	Low	Mod	Med
3.5	Obtain generators for Fire Department	1	LPR	Tornado; Windstorm; Thunderstorm, Hailstorm & Lightning, Severe Winter Storm; Extreme Heat	City	City	Complete	Complete	No	Mod	High	REMOVE FOR 2025

* All hazards for Conesville include the following: Tornado; Windstorm; Drought; Thunderstorm, Hailstorm & Lightning; Grass & Wildland Fire; Severe Winter Storm; Earthquake; Extreme Heat Hazardous Materials; Sinkholes & Land Subsidence

Fruitland												
Action ID	Mitigation Action	Goal	Obj	Hazard(s) Mitigated	Resp Party	Potential Funding Source	Timeline	Status	New for 2025	Cost	Benefit	Priority
4.1	Find alternate routes for emergency responders/public around train intersection due to blockages	1,2,3	LPR	All Hazards*	Mayor/ Council / EMA	Grant/ City / IDOT	Long-Term	New	Yes	High	High	High
4.2	Designate the Fire Station as a Shelter for hazard and/or disaster response	1, 3	LPR	All Hazards*	Fire Chief/ EMA	Grant / Fire Department	Mid-Term	New	Yes	Mod	High	High
4.3	Enforcement of the County Burn Ban Ordinance/Policy	1, 2	LPR, NSP	Grass and Wildland Fires	Fire Dept./ City	County	Ongoing	New	Yes	Low	Mod	Med
4.4	Work with Muscatine County Emergency Management to develop check-on-neighbor programs for seniors, disabled, and special needs citizens	1, 5	LPR, EAP	Tornado; Severe Winter Storm; Thunderstorm, Hailstorm & Lightning; Windstorm	Mayor/ Council/ EMA	N/A	Ongoing	Ongoing / In Progress	No	Low	Mod	Med
4.5	Continue NFIP compliance by enforcing flood plain ordinances based on the State of Iowa Model Code.	2	SIP	River Flood; Flash Flood	Mayor/ Council	City / Local Sources	Ongoing	Ongoing / In Progress	No	Low	Mod	Low
4.6	Test Warning Systems integrated with MUSCOM	1, 4, 5	LPR	Windstorm; Thunderstorm, Hailstorm & Lightning; Severe Winter Storm; Tornado	EMA	N/A	Ongoing	Ongoing / In Progress	No	Low	Mod	High

* All hazards for Fruitland include the following: Hazardous Materials; Levee Failure; River Flood; Tornado; Dam Failure; Drought; Thunderstorm, Hailstorm & Lightning; Earthquake; Expansive Soils; Extreme Heat; Flash Flood; Grass & Wildland Fire; Landslide; Severe Winter Storm; Sinkholes & Land Subsidence; Windstorm

City of Muscatine

Action ID	Mitigation Action	Goal	Obj	Hazard(s) Mitigated	Resp Party	Potential Funding Source	Timeline	Status	New for 2025	Cost	Benefit	Priority
5.1	Attend meetings for the Muscatine Louisa Levee District and assist with any needs	1, 2, 5	LPR, MA	Levee Failure	City Council / Public Works	N/A	Short-Term	New	Yes	Low	High	High
5.2	Construct a "temporary" stormwater pumping station for Papoose Creek	1,2,3	SIP	Flash Flood	City Council /Public works	Local Sources & State / Fed Grant Programs FEMA PDM, BRIC, SRF, CDBG	Mid-Term	New	Yes	Mod	High	High
5.3	Hire a consultant and engineer to look at storm water runoff and flash flooding along Mad Creek	1,2,3	SIP	River Flood; Flash Flood	City Council /Public works	Local Sources & State / Fed Grant Programs FEMA PDM, BRIC, SRF, CDBG	Mid-Term	New	Yes	Mod	High	High
5.4	Hire a consultant and/or engineer to look at flash flooding at 10th/Sycamore and 8th/Cedar during large rain events	1,2,3	SIP	River Flood; Flash Flood	Council/public works	Local Sources & State / Fed Grant Programs FEMA PDM, BRIC, SRF, CDBG	Mid-Term	New	Yes	Mod	High	High
5.5	Implement the consultant's plan for flash Flooding at 10th/Sycamore and 8th/Cedar during large rain events	1,2,3	SIP	River Flood; Flash Flood	Council/public works	Local Sources & State / Fed Grant Programs	Mid-Term	New	Yes	Mod	High	High

City of Muscatine												
Action ID	Mitigation Action	Goal	Obj	Hazard(s) Mitigated	Resp Party	Potential Funding Source	Timeline	Status	New for 2025	Cost	Benefit	Priority
5.6	Construct a new pump station for Papoose creek along the "town side" of Mississippi Drive	1,2,3	SIP	River Flood; Flash Flood	City Council /Public works	Local Sources & State / Fed Grant Programs, FEMA PDM, BRIC, SRF, CDBG	Short-Term	New	Yes	High	High	High
5.7	Construct or identify a storm shelter area along Riverfront/Riverfront Park	1	SIP	Tornado; Windstorm; Thunderstorm, Hailstorm & Lightning	City Council /Public works	Local Sources & State / Fed Grant Programs FEMA PDM, BRIC	Short-Term	New	Yes	Mod	Mod	Med
5.8	Construct or identify a storm shelter area for mobile home parks that do not currently have one.	1	SIP	Tornado; Windstorm; Thunderstorm, Hailstorm & Lightning	City Council/ EMA	Local Sources & State / Fed Grant Programs FEMA PDM, BRIC	Short-Term	New	Yes	Low	High	Med
5.9	Construct a storm shelter area at Muscatine Municipal Golf Course	1	SIP	Tornado; Windstorm; Thunderstorm, Hailstorm & Lightning	City Council/ Parks and Rec	Local Sources & State / Fed Grant Programs, FEMA PDM, BRIC	TBD	New	Yes	Mod	Mod	Med
5.10	Construct or identify a storm shelter area at Fuller Park	1	SIP	Tornado; Windstorm; Thunderstorm, Hailstorm & Lightning	City Council/ Parks and Rec	Local Sources & State / Fed Grant Programs, FEMA PDM, BRIC	TBD	New	Yes	Mod	Mod	Med

City of Muscatine												
Action ID	Mitigation Action	Goal	Obj	Hazard(s) Mitigated	Resp Party	Potential Funding Source	Timeline	Status	New for 2025	Cost	Benefit	Priority
5.11	Enforcement of the City Burn Ban Ordinance/Policy	1, 2	LPR, NSP	Grass and Wildland Fires	Fire Dept./ City	County	Ongoing	New	Yes	Low	Mod	Med
5.12	Update and enforce building codes to current International Code Series	1,2,3	LPR	Tornado; Windstorm; Flash Flood; River Flood; Severe Winter Storm; Earthquakes	City Council /Code Enforcement	City / Local Sources	Ongoing	Ongoing / In Progress	No	Low	Mod	High
5.13	Enforce legal floodplain management regulations compliant with Title 44 CFR 60 to ensure Muscatine residents and businesses are eligible to participate in the NFIP	1,2,3	LPR	River Flood; Flash Flood	City Council/ City Engineer	City / Local Sources	Ongoing	Ongoing / In Progress	No	Low	High	Med
5.14	Identify critical facilities where secondary generators are needed and install back-up power generators	2, 3	SIP	Tornado; Windstorm; Thunderstorm, Hailstorm & Lightning	City Council /Public works	Grants / FEMA PDM, BRIC	Ongoing	Ongoing / In Progress	No	Mod	Mod	Med
5.15	Perform routine inspection and maintenance of levees	1,2,3	LPR	Levee Failure	City Council /Public works	City / Local Sources	Ongoing	Ongoing / In Progress	No	Low	High	Med

City of Muscatine												
Action ID	Mitigation Action	Goal	Obj	Hazard(s) Mitigated	Resp Party	Potential Funding Source	Timeline	Status	New for 2025	Cost	Benefit	Priority
5.16	Separate combined sewer systems at the Papoose Creek pumping station	1,2,3	SIP	River Flood; Flash Flood	City Council /Public works	Local Sources & State / Fed Grant Programs, FEMA PDM, BRIC, USDA	Mid-Term	Ongoing / In Progress	No	High	High	High
5.17	Attend and participate in the Muscatine Levee Stakeholder group meetings with the end goal of determining the cost/benefit relationship to raise the levee to the 500-year flood level with 3 foot of freeboard.	1,2,3	MA	Levee Failure	City Council	City/ County/ Private/ Grant	Complete	Complete	No	Low	High	High
5.18	Continue to enforce City Burn Ordinance/Fire Permit process	1, 2	LPR, NSP	Grass and Wildland Fire	City County/Fire Department	City	Ongoing	Ongoing	Yes	Low	Low	Low

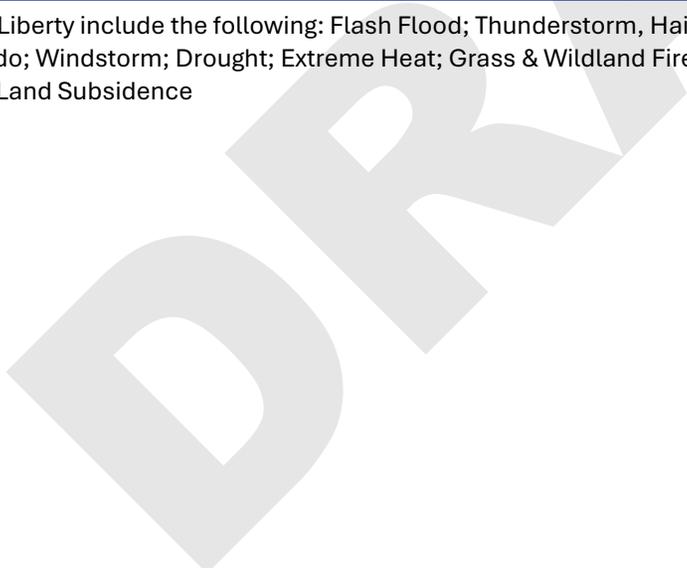
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Action ID	Mitigation Action	Goal	Obj	Hazard(s) Mitigated	Resp Party	Potential Funding Source	Timeline	Status	New for 2025	Cost	Benefit	Priority
6.1	Enforcement of the County Burn Ban policy	1, 2	LPR, NSP	Grass and Wildland	City/Fire Chief	City	Ongoing	New	Yes	Low	Mod	Med
6.2	Identify critical facilities where secondary generators are needed and install back-up power generators	1,2,3	LPR	Tornado; Windstorm; Thunderstorm, Hailstorm & Lightning	Mayor and City Council	Grants / FEMA PDM, BRIC	Short-Term	Ongoing / In Progress	No	High	High	High
6.3	Continue NFIP compliance by enforcing flood plain ordinances based on the State of Iowa Model Code.	1, 2, 4	SIP	River Flood; Flash Flood	Floodplain Mgr / City Clerk	n/a	Ongoing	Ongoing / In Progress	No	Low	High	High
6.4	Construct a safe room for vulnerable populations without another source of shelter.	1, 5	SIP	Tornado	Mayor	Grants / FEMA PDM, BRIC Programs	Mid-Term	Ongoing / In Progress	No	High	Mod	Med
6.5	Establish real-time notification systems for emergency responders and the public of road closings due to flash floods	1, 3, 4, 5	LPR	River Flood; Flash Flood	Fire Chief	FEMA HMA, Next Generation Warning System Grant Program	Complete	Ongoing / In Progress	No	Low	Mod	Med
6.6	Identify accessible heating and cooling center locations and promote to community members	1, 3	LPR	Severe Winter Storms; Extreme Heat	Fire Chief	State, County, Emergency Management	Complete	Complete	No	Low	High	High

West Liberty												
Action ID	Mitigation Action	Goal	Obj	Hazard(s) Mitigated	Resp Party	Potential Funding Source	Timeline	Status	New for 2025	Cost	Benefit	Priority
7.1	Create a Modular Home Park action plan with owners to create a shelter in place facility	1,3,5	LPR, SIP	Tornado; Windstorm; Thunderstorm, Hailstorm & Lightning	West Liberty Mayor Council Staff Private owners, state code	Grants and Financial Partners	TBD	New	Yes	Low	Low	Med
7.2	Build an additional community storm shelter (accessible 24/7) located at Kimberly Park	1,2,3	SIP	Tornado; Windstorm; Thunderstorm, Hailstorm & Lightning	West Liberty Mayor Council and Staff	FEMA HMGP, State Grants, local bonds	Mid-Term	New	Yes	High	High	High
7.3	Enforcement of the City Burn Ban Ordinance/Policy	1, 2	LPR, NSP	Grass and Wildland Fires	Fire Dept./ City	County	Ongoing	New	Yes	Low	Mod	Med
7.4	Develop and implement City Emergency SOP aligned with Muscatine County EOP	1,3,5	LPR	All Hazards*	West Liberty Mayor Council and Staff	Local budget and grants	Short-Term	Ongoing / In Progress	Yes	Low	High	High
7.5	Install generators at each lift station to maintain wastewater flow during power outages to prevent back up	1,2,3	LPR	Severe Winter Storm; Thunderstorm, Hailstorm & Lightning; Flash Flood; River Flood	West Liberty Mayor Council and Staff	Local budget and grants such as FEMA HMGP	Short-Term	Ongoing / In Progress	No	Low	Mod	High
7.6	Establish Real Time notification system for emergency events	1, 3, 4, 5	LPR	All Hazards*	West Liberty Essential Services and County	Local budget and grants such as FEMA HMGP, IEDA	Ongoing	Ongoing / In Progress	No	High	High	High
7.7	Bury Electric Transmission lines to minimize outages and reduce long-term costs to utility customers	2,3	SIP	Severe Winter Storm; Thunderstorm, Hailstorm & Lightning; Windstorm	West Liberty Mayor Council and staff	Local budget and grants such as FEMA HMGP, IEDA	Ongoing	Ongoing / In Progress	YES	Low	Mod	Med

West Liberty												
Action ID	Mitigation Action	Goal	Obj	Hazard(s) Mitigated	Resp Party	Potential Funding Source	Timeline	Status	New for 2025	Cost	Benefit	Priority
7.8	Upgrade and expand stormwater drainage capacity throughout the City	2,3	SIP	Flash Flood; Severe Winter Storm; Thunderstorm, Hailstorm & Lightning;	West Liberty Mayor Council and Staff	Local budget and grants such as FEMA HMGP, IEDA	Ongoing	Ongoing / In Progress	No	Low	Low	High
7.9	Launch Community Hazard Preparedness and Educational Program	4,5	EAP	All Hazards*	Muscatine County EMA, non-profit partners, City Staff	Local budget and grants	Ongoing	Ongoing / In Progress	No	Mod	Mod	Med
7.10	Safe Room construction at Dutton Park to provide shelter during sever weather for visitors to the park	1, 3, 5	SIP	Tornado; Windstorm; Thunderstorm, Hailstorm & Lightning	Removed / Modified	Removed / Modified	REMOVED - priority is a more central location	REMOVE	No	High	High	REMOVE

* All hazards for West Liberty include the following: Flash Flood; Thunderstorm, Hailstorm & Lightning; Hazardous Materials; River Flood; Severe Winter Storm; Tornado; Windstorm; Drought; Extreme Heat; Grass & Wildland Fire; Dam Failure; Earthquake; Expansive Soils; Landslide; Levee Failure; Sinkholes & Land Subsidence



Wilton												
Action ID	Mitigation Action	Goal	Obj	Hazard(s) Mitigated	Resp Party	Potential Funding Source	Timeline to Complete Activity	Status	New for 2025	Cost	Benefit	Priority
2.3	Enforcement of the City Burn Ban Ordinance/Policy	1, 2	LPR, NSP	Grass and Wildland Fires	Fire Dept./ City	County	Ongoing	New	Yes	Low	Mod	Med
8.1	Identify accessible heating and cooling center locations and promote to community members	1, 3	LPR	Severe Winter Storms; Extreme Heat; Drought	City Council / Muscatine County Emergency Mgt	Local, State, County, Emergency Management	Ongoing	Ongoing / In Progress	No	Low	Mod	Med
8.2	Update storm sewer system to mitigate flash flooding	3	SIP	Flash Flood	City, Public Works Director	CWSRF, CDBG, USDA	Ongoing	Ongoing / In Progress	No	Mod	Mod	Med
8.3	Continue NFIP compliance by enforcing flood plain ordinances based on the State of Iowa Model Code.	1,2,4	SIP	Flash Flood	City	Local	Ongoing	Ongoing / In Progress	No	Low	Low	Low
8.4	Identify critical facilities where secondary generators are needed and install back-up power generators	3	LPR	Tornado; Windstorm; Thunderstorm, Hailstorm & Lightning	City, Public Works Director	State Grants, City funds from water or sewer or sales tax	Ongoing	Ongoing / In Progress	No	Mod	Mod	Med

Wilton												
Action ID	Mitigation Action	Goal	Obj	Hazard(s) Mitigated	Resp Party	Potential Funding Source	Timeline to Complete Activity	Status	New for 2025	Cost	Benefit	Priority
8.5	Test Warning Systems	4, 5	LPR	Windstorm; Thunderstorm, Hailstorm & Lightning; Severe Winter Storm; Hazardous Materials; Tornado; Grass and Wildland Fire; Earthquake; Sinkhole and Land Subsidence	County Emergency Management	Local, County Emergency Management	Ongoing	Ongoing / In Progress	No	Low	Mod	Med

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Eastern Iowa Community College												
Action ID	Mitigation Action	Goal	Obj	Hazard(s) Mitigated	Resp Party	Potential Funding Source	Timeline	Status	New for 2025	Cost	Benefit	Priority
9.1	Maintain a planning team in support of hazard mitigation, preparedness, response and recovery. Plan and initiate at least one cross Dept.al exercise annually, and meet periodically in support of information sharing and process.	1,2,5	LPR	All Hazards*	Public Safety and Emergency Management (PSEM)	EICC Budget	Ongoing	Ongoing / In Progress	Yes	Low	High	High
9.2	Review existing emergency plans, policies, and procedures and amend as needed.	1,2,5	LPR	All Hazards*	PSEM	EICC Budget	Ongoing	Ongoing / In Progress	Yes	Low	High	High
9.3	Adopt a Continuity of Operations Plan to support response, recovery, and resilience to disasters	3,4,5	LPR	All Hazards*	PSEM/ Dept. heads	EICC Budget	Short Term	New	Yes	Low	High	High
9.4	Provide NOAA weather radios for all district properties	1, 5	LPR	All Hazards*	PSEM	Budget, grants, foundation	Short Term	New	Yes	Low	High	High
9.5	Install back-up generators at key district facilities as feasible.	2, 3	SIP	Tornado; Windstorm; Thunderstorm, Hailstorm & Lightning; Severe Winter Storm	Facilities	Budget, grants, foundation	Long Term	New	Yes	High	High	Med

Eastern Iowa Community College

Action ID	Mitigation Action	Goal	Obj	Hazard(s) Mitigated	Resp Party	Potential Funding Source	Timeline	Status	New for 2025	Cost	Benefit	Priority
9.6	Update and install additional security cameras at all locations as feasible.	1, 2	LPR	All Hazards / Safety and security before, during, and after response and recovery of all identified hazards.	IT	Budget	Short Term	Ongoing / In Progress	Yes	Mod	High	Med
9.7	Update and add overhead public address speakers in all district buildings to enhance emergency messaging.	1,2,3	LPR	All Hazards*	IT	Budget, grants, foundation	Short Term	Ongoing / In Progress	Yes	Low	High	High
9.8	Upgrade the ability to receive emergency messages on school computers, email, and cell phone.	1	LPR	All Hazards*	IT	Budget, grants, foundation	Ongoing	Ongoing / In Progress	Yes	Low	High	High
9.9	Educate students, faculty, and staff on the dangers of severe weather in all seasons, and what to do during severe weather warnings.	4	EAP	Tornado; Thunderstorm, Hailstorm & Lightning; Windstorm; Severe Winter Storm; Flash Flooding	PSEM	Budget	Short-Term	New	Yes	Low	High	High
9.10	Construct a safe room for vulnerable populations without another source of shelter.	1	SIP	Tornado; Thunderstorm, Hailstorm & Lightning; Windstorm	Facilities	Grants	Long Term	New	Yes	Low	High	High

* All hazards for Eastern Iowa Community College include the following: Flash Flood; Thunderstorm, Hailstorm & Lightning; Tornado; Windstorm; Severe Winter Storm; Earthquake; Expansive Soils; Extreme Heat; Grass & Wildland Fire; Hazardous Materials; Landslide; Sinkholes & Land Subsidence

Muscatine Community School District												
Action ID	Mitigation Action	Goal	Obj	Hazard(s) Mitigated	Resp Party	Potential Funding Source	Timeline to Complete Activity	Status	New for 2025	Cost	Benefit	Priority
10.1	Ensure safe rooms are properly identified and continue tornado drill trainings to inform occupants	1	SIP, EAP	Tornado	MCSD Facilities	FEMA HMA, Grants, MCSD	Ongoing	Ongoing / In Progress	Yes	Low	High	High
10.2	Inventory each school building for backup generators and install as needed	1,2	SIP	Thunderstorm, Hailstorm & Lightning; Windstorm	MCSD Facilities	FEMA HMA, Grants, MCSD	Short-Term	New	Yes	High	Low	Low
10.3	Improve and replace all existing roofing	1,2	LPR, SIP	Thunderstorm, Hailstorm & Lightning; Windstorm; Tornado	MCSD Facilities	MCSD	Mid-Term	Ongoing / In Progress	Yes	High	High	High
10.4	Obtain and upkeep proper equipment and training for severe snow storm to ensure buildings are safe to enter when appropriate	1,2	LPR, EAP	Severe Winter Storm	MCSD Facilities	MCSD	Ongoing	Ongoing / In Progress	Yes	Low	High	High
10.5	Install Bi Directional Antenna (BDA) and cell phone signal booster at Franklin School for increased communication	1, 3	LPR	All Hazards	EMA/MCSA	Grants, MCSA	Short-Term	New	Yes	Mod	Mod	Med

Muscatine Community School District												
Action ID	Mitigation Action	Goal	Obj	Hazard(s) Mitigated	Resp Party	Potential Funding Source	Timeline to Complete Activity	Status	New for 2025	Cost	Benefit	Priority
10.6	Install Bi Directional Antenna (BDA) and cell phone signal booster at Muscatine High School for increased communication	1, 3, 5	LPR	All Hazards	EMA/MCSA	Grants, MCSA	Short-Term	New	Yes	Mod	Mod	Med

* All hazards for Muscatine Community School District include the following: Tornado; Windstorm; Thunderstorm, Hailstorm & Lightning; Severe Winter Storm

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West Liberty Community School District												
Action ID	Mitigation Action	Goal	Obj	Hazard(s) Mitigated	Resp Party	Potential Funding Source	Timeline to Complete Activity	Status	New for 2025	Cost	Benefit	Priority
11.1	Tornado Drills, walkie talkies used by admin and secretaries, police coordinate with school on use of safe room located in high school. Coordinate with transportation department regarding hauling students.	1, 4	SIP, MA	Tornado	Superintendent, Transportation Director, Secretaries, Principals, Athletic Director, Maintenance Director	PPEL, SAVE, Insurance	Ongoing	Ongoing / In Progress	Yes	Low	Mod	Med
11.2	Coordinate with transportation department, use of weather maps and weather service, shelter in place drills. Use of walkie talkies by admin and secretaries. Possible safe room use, maintenance department check roofs/buildings for damage.	1,4	LPR, SIP	Thunderstorm, Hailstorm & Lightning, Windstorm	Superintendent, Transportation Director, Secretaries, Principals, Athletic Director, Maintenance Director	PPEL, SAVE, Insurance	Ongoing	Ongoing / In Progress	Yes	Low	Mod	Med
11.3	Review NWS updates, coordinate with transportation director, coordinate with athletic director, drive roads,	1,4,5	EAP	Severe Winter Storm, Thunderstorm, Hailstorm & Lightning	Superintendent, Transportation Director, Secretaries, Principals, Athletic Director,	PPEL, SAVE, Insurance	Ongoing	Ongoing / In Progress	Yes	Low	Mod	Med

West Liberty Community School District												
Action ID	Mitigation Action	Goal	Obj	Hazard(s) Mitigated	Resp Party	Potential Funding Source	Timeline to Complete Activity	Status	New for 2025	Cost	Benefit	Priority
	cancelations posted on several media sources, check roofs/buildings for damage.				Maintenance Director							

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Wilton Community School District												
Action ID	Mitigation Action	Goal	Obj	Hazard(s) Mitigated	Resp Party	Potential Funding Source	Timeline	Status	New for 2025	Cost	Benefit	Priority
12.1	Install Generator over cafeteria area of the school building	1, 2, 3	LPR	Tornado; Windstorm; Severe Winter Storm	School Board, Staff	FEMA HMA, Grants, WCSD	Short-Term	New	Yes	Mod	High	High
12.2	Install shutters over skylights and outside windows in storm shelter area	1, 2	LPR	Tornado; Windstorm; Thunderstorm, Hailstorm & Lightning	School Board, Staff	FEMA HMA, Grants, WCSD	Short-Term	New	Yes	Mod	Mod	Med
12.3	Construct a safe room for vulnerable populations without another source of shelter.	3, 5	LPR	Tornado; Windstorm; Severe Winter Storm	EMA, School Board, Staff	Grant, Local	Short-Term	New	Yes	Low	Low	Low
12.4	Upgrade intercom system within building for communication to staff and students	1, 2, 5	LPR	*All Hazards	School Board, Staff	Federal HSGP, DOE, NGWS SLCGP	Short-Term	New	Yes	Low	Mod	Med
12.5	Upgrade radio system for better communication between staff and bus drivers	1, 2, 5	LPR	*All Hazards	School Board, Staff	Federal HSGP, DOE, NGWS SLCGP	Short-Term	New	Yes	Low	Mod	Med
12.6	Build a transportation center on campus to double as shelter and safe room for disasters/active shooters	1, 2, 3	SIP	*All Hazards	School Board, Staff	Grant, Local	Mid-Term	New	Yes	High	High	Med

* All hazards for Wilton Community School District includes the following: Tornado; Windstorm; Dam Failure; Drought; Earthquake; Expansive Soils; Extreme Heat; Flash Flood; Grass & Wildland Fire; Thunderstorm, Hailstorm & Lightning; Hazardous Materials; Landslide; Levee Failure; River Flood; Severe Winter Storm; Sinkholes & Land Subsidence

5. PLAN MAINTENANCE PROCESS

Monitoring the Plan

Muscatine County will be the lead in the overall monitoring of the plan. The Planning Committee structure as described in the “Planning Process” section will be maintained to monitor jurisdiction participation and progress. Jurisdictions will be asked to fill vacancies to the Committee to maintain a primary contact. Whenever possible, two contacts for each participant will be maintained. Muscatine Emergency Management will schedule an annual meeting of the Planning Committee to track progress made on implementation of priority actions for both the planning area as a whole and to each individual jurisdiction.

Generally, jurisdictions with their own ordinances and enforcement procedures will be responsible for monitoring their individual mitigation actions. Community school districts that are participating will work with their local school boards and administration to report monitor and report progress. At the annual meeting, the Planning Committee will also review the plan and make recommendations whether plan amendments or updates are needed due to changing conditions. Individual jurisdictions will be encouraged to provide a summary of the monitoring activities to their respective boards and council.

Evaluating the Plan

Criteria used in evaluating the plan will be based on the success of carrying out priority mitigation actions as identified. As part of the annual meeting described above, the Planning Committee will also evaluate whether events of the previous year have changed the priority assigned to a various mitigation action. Muscatine Emergency Management will be responsible for preparing periodic progress reports of the plan. This report will be copied to the chief elected officials of the participating jurisdictions and other primary contacts, as appropriate. It will be shared with the EMA board in a public meeting with media notification.

Updating the Plan

The plan will be updated within five years of the date of FEMA’s approval of the plan, as required by part 201.6(c)(4)(i). The plan may be updated earlier at the discretion of the Planning Committee, or in the event of a Presidential Disaster Declaration, which requires an update by regulation. Muscatine County Emergency Management will be responsible for collecting and maintaining information pertinent to future plan updates based on recommendations of the Planning Committee. Any changes will be documented and appended to the plan document in a section titled “Amendments” until such time as a full update is scheduled.

If no earlier update is needed, the Planning Committee will evaluate the need for funding assistance for the next scheduled update. Muscatine County and Muscatine Emergency

Management will make an application for planning grant funds and identify whether a contract with a consultant will be necessary for the update process. Actions to undertake the plan update should be scheduled, so that there is continuity of FEMA approval for the applicable plan document.

Incorporation into Existing Planning Mechanisms

Early in the planning process, participating jurisdictions were asked to list their own existing local planning mechanisms and ordinances to evaluate what was already in place to incorporate the requirements of the mitigation plan. These lists are summarized in Chapter 2 of the plan.

Incorporating requirements of the mitigation plan will focus on existing planning mechanisms common among some of the participating jurisdictions. These include:

- Comprehensive/Land Use Plans
- Subdivision Regulations
- Zoning Ordinances
- Building Codes
- Flood Plain Management Ordinances

Comprehensive/land use plans, or subdivision regulations for communities without a current comprehensive plan, provide the guidance for a community's ongoing and future development. The remaining ordinances and regulations listed above provide the enforcement tool for those development plans. For communities that do not currently have these planning mechanisms in place, the mitigation plan will be considered in its annual budgeting process and other plans listed in Table 2-1, as appropriate. Larger communities with their own planning and ordinance enforcement officials will review their own existing planning mechanisms. Larger communities may communicate adjustments in their planning mechanisms through their representation on the Planning Committee as appropriate.

Existing planning mechanisms will be reviewed for consistency with the requirements of the Local Hazard Mitigation Plan in order to avoid duplication of efforts among jurisdictional departments or enforcement officials. Risk analysis and vulnerability data from the Local Hazard Mitigation Plan may be incorporated in the comprehensive/land use plans of each participating jurisdiction during regular review and update cycles as appropriate. Risk analysis and vulnerability data and mitigation actions will be incorporated into enforcement tools where appropriate. For example, references to the scale of earthquake intensity may be appropriate to building codes. Any adjustment or amendments to existing planning mechanisms will be made through the regular review cycle of the participating jurisdiction. Substantive inconsistencies found between existing planning mechanisms and the Local Hazard Mitigation Plan should be reported to Muscatine County Emergency Management for the annual plan review meeting.

Muscatine County Emergency Management will report at least annually on the progress of incorporating requirements of the mitigation plan through the meeting of the Planning Committee, as described in the “Monitoring the Plan” section.

Continued Public Involvement

Amendments to the plan will be adopted by the relevant local jurisdiction(s). For example, if a jurisdiction amends the plan to add a new mitigation action, that amendment will be publicly brought before the jurisdiction’s governing body for adoption. This process will allow the public to remain informed about changes to the plan and provide the opportunity comment on those changes.

Muscatine County intends to make use of its website for continued public involvement. The website has been used in the plan process to keep the public informed about the plan document drafts in progress and related public meetings. The website will continue to be used to post the final Local Hazard Mitigation Plan document as adopted and approved by FEMA. The website also contains related hazard mitigation resources and links. Annual meetings of the Planning Committee will be posted on the website as well as Muscatine County’s normal means of meeting posting. Progress reports will also be posted on the website, as issued. Public comments on the plan process or document will be recorded and reported at the annual meeting of the Planning Committee.

APPENDIX 1-1

FEMA APPROVAL

(TO BE INSERTED WHEN APPROVED)

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APPENDIX 1-2
PLAN REVIEW TOOL

DRAFT



APPENDIX 1-3
SAMPLE RESOLUTION

DRAFT



Resolution Number # _____

**APPROVAL AND ADOPTION OF THE MUSCATINE COUNTY MULTI-JURISDICTION
LOCAL HAZARD MITIGATION PLAN**

RESOLUTION

WHEREAS, the City of _____, with the assistance from Muscatine County and the Bi-State Regional Commission (BSRC) has gathered information and prepared the Muscatine County Multi-Jurisdictional Hazard Mitigation Plan; and,

WHEREAS, the Muscatine County Multi-Jurisdictional Hazard Mitigation Plan has been prepared in accordance with FEMA requirements at 44 C.F.R. 201.6; and,

WHEREAS, the Plan process has been subject to public review and comment during its development; and

WHEREAS, the Mayor and the City Council of the City of _____ have reviewed the Plan; and

NOW, THEREFORE BE IT RESOLVED by the Mayor and the City Council of the City of _____ that the City of _____ hereby approves and adopts the Muscatine County Multi-Jurisdiction Local Hazard Mitigation Plan as this jurisdictions Multi-Hazard Mitigation Plan pending FEMA approval of the Plan.

Adopted this ___ day of _____, 202_ at the meeting of the Mayor and City Council for the City of _____.

_____, Mayor

Attest:

_____, Clerk



APPENDIX 1-4
ADOPTED RESOLUTION

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APPENDIX 2-1
PLANNING PROCESS

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STEERING COMMITTEE

Name	Title	Organization
Chris Jasper	Director	Muscatine County, Emergency Management
Denise Bulat	Executive Director	Bi-State Regional Commission
Lisa Ahern	Community & Economic Development Director	Bi-State Regional Commission
Natalie Murphy	Planner	Bi-State Regional Commission

PLANNING COMMITTEE

Jurisdiction	Name	Position
Muscatine Emergency Management	Chris Jasper	Director
Muscatine County, Planning and Zoning	Eric Furnas	Administrator*
Muscatine County, Conservation Board	Katie Hammond	Director
Muscatine County, Engineering	Bryan Horesowsky	Engineer
Muscatine County, Board of Supervisors	Nathan Mather	Board Member
Muscatine County, Board of Supervisors	Danny Chick	Board Member
Muscatine County, Board of Supervisors	Scott Sauer	Board Member
Muscatine County, Board of Supervisors	Jeff Sorenson	Board Member
Muscatine County, Board of Supervisors	Kurt Kirchner	Board Member
Atalissa	Angie Dickey	Mayor
Atalissa	Samantha Perry	Clerk*
Conesville	Thomas Van Auken	Mayor*
Conesville	Carol Zuniga	Clerk
Durant	Not participating	Not Participating
Fruitland	Marty Hills	Mayor
Fruitland	Torie Roenfeldt	Clerk
Fruitland	Donald Briggs	Zoning & Planning Chair*
Muscatine	Brad Bark	Mayor
Muscatine	Matt Mardesen	Administrator*
Nichols	Linsey Reimers	Mayor
Nichols	Aeneas Schmitz	Clerk*
Stockton - not participating		
Walcott - <i>Part of Scott County Plan</i>		
West Liberty	Mark Smith	Mayor
West Liberty	Lee Geertz	Manager*
West Liberty	Adam Reinhardt	Public Works Director
West Liberty	Josh Houser	Police Chief
Wilton	Keith Stanley	Mayor
Wilton	Jeff Horne	City Administrator*
Muscatine CSD	Clint Christopher	Superintendent

Jurisdiction	Name	Position
Muscatine CSD	Chris Nienhaus	Director of Operations
West Liberty CSD	Shaun Kruger	Superintendent
Wilton CSD	Joe Burnett	Superintendent
Wilton CSD	Jane Owens	At Risk
EICC – Muscatine Campus	Jim Hawkes	Assoc. Director for Public Safety and Emergency Management
EICC – Muscatine Campus	Naomi DeWinter	Superintendent

*Flood Plain Manager

ADVISORY GROUP

Jurisdiction	Name	Position
Neighboring Communities/ Non-Participating Communities		
City of Durant	Scott Spengler	Mayor
City of Stockton	Lance McConnell	Mayor
Cedar County EMA	Duane Brown	Director
Louisa County EMA	Kenny Marlette	Director
Scott County EMA	Brian Payne	Director
State, Regional and Local Government Representatives		
Muscatine County Sheriff	Quinn Riess	Sheriff
Iowa State Patrol District 12 Office	Lt. Brian Votroubek	Lieutenant
IHSEMD	Jim Marwedel	Hazard Mitigation Planner
IHSEMD	Kelly Simmons	Project Officer
Iowa NFIP Coordinator	Jason Conn	State Floodplain Manager
Iowa State Climatologist	Harry Hillaker	Climatologist
Iowa State Geologist	Dr. Keith Schilling	Geologist
Iowa State Extension	Heidi Hoffman	County Extension Director
Muscatine Soil and Water Cnsv District	Pam Coder	
Muscatine Power and Water	Brandy Olson	Director, Legal, Regulatory & People Services
Business and Developmental Agencies		
Muscatine Chamber of Commerce	Brad Bark	President & CEO
Wilton Chamber of Commerce	Becky Allgood	
West Liberty Chamber of Commerce/ WeLead	Philip Wiese	Executive Director
Kent Corporation	Rich Dwyer	Senior VP Corporate Affairs & Enterprise Risk Management
Federal Agency Representatives		
USACE	Jerry Skalak	Project Manager / Floodplain Manager
National Weather Service	Alex Gibbs	Meteorologist

Jurisdiction	Name	Position
Neighborhood Groups and Non-Profits		
Red Cross	Trish Burnett	Executive Director
United Way	Shane J. Orr	Executive Director
Muscatine County Conservation Board	Katie Hammond	Director
Community Foundation of Greater Muscatine	Charla Schafer	President
Unity Point - Muscatine County Health Dept.	Jen Craft	Director of Public Health
Council #371 LULAC	Nicholas Ray Salazar	President
Indigenous Coalition of Muscatine		
Rebuilding Together Muscatine County	Alan Millage	Executive Director
Stanley Center for Peace and Security	Keith Porter	President
Southend United Neighbors	Linda Hatfield	Chair
Muscatine Ministerial Association	Susan Bantz	Pastor
Muscatine Center For Social Action	Emily Harvey	Executive Director
School Districts		
Organization	Contact Name	Title
Muscatine CSD	Clint Christopher	Superintendent
West Liberty CSD	Shaun Kruger	Superintendent
Wilton CSD	Joe Burnett	Superintendent
EICC - Muscatine Campus	Naomi DeWinter	President
Louisa Muscatine School	Anthony Ryan	Superintendent
Media		
Organization		
KWQC-TV 6		
WHBF -TV 4		
WQAD-TV 8		
Muscatine Journal		
West Liberty Index		
Wilton-Durant Advocate		

PLANNING COMMITTEE / KICK OFF MEETING

September 11, 2025

DRAFT

From: [Jasper, Chris](#)
To: Eric.furnas@muscatinecountyiowa.gov; [Katie Hammond](#); Bryan.horesowsky@muscatinecountyiowa.gov; nathan.mather@muscatinecountyiowa.gov; [Danny Chick](#); scott.sauer@muscatinecountyiowa.gov; [IA Jeff Sorensen](#); [Kurt Kirchner](#); [Angie Dickey](#); atalissacity@yahoo.com; [Conesville City Hall](#); [City of Fruitland](#); [Matt Mardesen](#); [Anthony Kies](#); [City of Nichols](#); stockton@iowatelecom.net; [Lee Geertz](#); [Jeff Horne](#); [Clint Christopher](#); [Shaun Kruger](mailto:Shaun.Kruger@wiltoncsd.org); joeburnett@wiltoncsd.org; ndewinter@eicc.edu; [Brad Bark](#)
Cc: [Lisa Ahern](#); [Denise Bulat](#); [Chris Jasper](#)
Subject: Muscatine County Hazard Mitigation Plan Kickoff meeting
Date: Thursday, August 28, 2025 3:19:19 PM

All -

The Muscatine County Multi-Jurisdictional Hazard Mitigation Plan, adopted in September 2020, will expire this year. We have been working to procure a grant to fund the update and just received notice we could incur costs starting in September 2025. If any of you were planning on applying for FEMA funding for mitigation projects before we have an updated plan you may request a waiver due to the delay in FEMA's grant approval. The Bi-State Regional Commission will be working with the Muscatine County EMA, the County, participating communities, and school districts to prepare the update.

A kick-off meeting via Zoom to discuss the update process with potential participants, is planned for 11:00 a.m. on September 11, 2025. The meeting is expected to last 60 minutes. I will send a calendar invite in a separate email.

The purpose of the plan is to evaluate potential hazards, prioritize those hazards, and develop mitigation strategies to reduce further disaster losses in Muscatine County. The process will rely on your input and updated information for your jurisdiction related to hazard mitigation. The required number of planning committees will be held along with a public kickoff meeting. Bi-State anticipates turning the update over to FEMA to review for approval in the first half of 2026.

Attendance at this meeting is not a commitment to full participation; however, we hope you will plan to have a representative attend the meeting to discuss the update steps and timeline in more detail. If you have questions in the meantime, please contact Lisa Ahern at lahern@bistateonline.org (309)793-6300 x1122 or Denise Bulat dbulat@bistateonline.org (309)793-6300 x1140.

As always, you can reach out to me via email or phone below also.

Thanks,
Chris



Christopher J. Jasper, ENP, NREMT, CMCP
Director - Emergency Management/911,
Muscatine County Emergency Management

563-264-7142 | www.muscatinecountyiowa.gov

cjasper@muscatineiowa.gov | 312 E 5th St, Muscatine, IA 52761

Muscatine County Multi-Jurisdictional Hazard Mitigation Plan Update

AGENDA

September 11, 2025

11:00 a.m.

Join Zoom Meeting

<https://us02web.zoom.us/j/88974454217?pwd=tkvtsvY0SgbpHBqQUqBdj2Xv38134l.1>

Meeting ID: 889 7445 4217

Passcode: 601523

- I. Welcome – Chris Jasper
- II. Self-Introductions
- III. Meeting Purpose & Process Overview / Bi-State
- IV. Questions
- V. Adjourn

From: [Lisa Ahern](#)
To: "Eric.furnas@muscatinecountyiowa.gov"; "Katie.hammond@muscatinecountyiowa.gov"; "Bryan.horesowsky@muscatinecountyiowa.gov"; "nathan.mather@muscatinecountyiowa.gov"; "danny.chick@muscatinecountyiowa.gov"; "scott.sauer@muscatinecountyiowa.gov"; "jeff.sorensen@muscatinecountyiowa.gov"; "kurt.kirchner@muscatinecountyiowa.gov"; "angie_dickey@yahoo.com"; "atalissacity@yahoo.com"; "cityofconesville@gmail.com"; "cityoffruitland@fruitlandia.gov"; "mmardesen@muscatinecountyiowa.gov"; "cityofnichols@gmail.com"; "stockton@iowatelecom.net"; "lgeertz@cityofwestlibertyia.org"; "areinhardt@cityofwestlibertyia.org"; "jhouser@cityofwestlibertyia.org"; "jhome@wiltoniowa.gov"; "clint.christopher@mcsdonline.org"; "skruger@wl.k12.ia.us"; "joeburnett@wiltoncsd.org"; "ndewinter@eicc.edu"; "sspengler@cityofdurantiowa.com"; "stockton@iowatelcom.net"; "dbrown@cedarcounty.iowa.gov"; "ema@louisacountyia.gov"; "Brian.Payne@scottcountyiowa.gov"; "quinn.riess@muscatinecountyiowa.gov"; "votroube@dps.state.ia.us"; "jim.marwedel@iowa.gov"; "kelly.simmons1@iowa.gov"; "jason.conn@dnr.iowa.gov"; "climatology@iowaAgriculture.gov"; "Keith-Schilling@uiowa.edu"; "Hoffmanh@iastate.edu"; "hannah.howard@ia.nacdn.net"; "bolson@mpw.org"; "bbark@muscatine.com"; "wiltondev@netwct.net"; "weleadexec@gmail.com"; "rich.dwyer@kentww.com"; "jerry.a.skalak@usace.army.mil"; "alexander.gibbs@noaa.gov"; "Trish.Burnett@redcross.org"; "shane@unitedwaymuscatine.org"; "katie.hammond@muscatinecounty.iowa.gov"; "cschafer@givinggreater.org"; "jennifer.craft@unitypoint.org"; "nicksalazar62@gmail.com"; "IndigenousCoalitionMuscatine@outlook.com"; "rtmuscatine@gmail.com"; "kporter@stanleycenter.org"; "hatfield.gary@mcleodusa.net"; "gracefulpastor@machlink.com"; "eharvey@mcsaiowa.org"; "clint.christopher@mcsdonline.org"; "skruger@wl.k12.ia.us"; "joeburnett@wiltoncsd.org"; "ndewinter@eicc.edu"; "tryan@lmcsd.org"; "KWQC News"; "newsroom@cbs4qc.com"; "news@wgad.net"; "new@muscatinejournal.com"; "indexnews@lcom.com"; "anads@netwit.net"; "nstruss@prairierivers.org"; "mike.mcclure@noaa.gov"
Cc: [Denise Bulat](#); [Natalie Murphy](#); [Jasper, Chris](#)
Subject: Follow Up Items - Muscatine Co. Hazard Mitigation Meeting 9/30/25
Date: Wednesday, October 1, 2025 2:08:00 PM
Attachments: [Meeting 2 Presentation Public Kick off 9.30.25 Updated.pptx](#)
[Planning Meeting 1 Flier.jpg](#)

Good afternoon,

I have attached the presentation from Tuesday's meeting. The video is available for viewing at the link below.

- [Meeting Recording](#)
- Mark your Calendars for the next meeting of the Planning Committee! During this meeting, we will present initial hazard profiles and communities will receive guidance on how to rank their local hazards. To ensure the greatest participation, we will hold this meeting at two different locations / times.
 - **October 23rd 10:30 – Musser Public Library, Muscatine**
 - **October 23rd 1:00 – City Administration Building, West Liberty**

Please feel free to reach out with any questions.

Lisa

Lisa Ahern | Community & Economic Development Director
(309) 793-6300 Ext. 1122
Bi-State Regional Commission
1504 Third Avenue
Rock Island, IL 61201

From: Lisa Ahern

Sent: Monday, September 29, 2025 1:08 PM

Subject: REMINDER: Muscatine Co. Hazard Mitigation Kick-Off Meeting 9/30/25

Good afternoon,

This is a courtesy reminder of the Muscatine County Hazard Mitigation meeting on **Tuesday, September 30th at 10:00 a.m.**

This meeting is held via zoom. You can click on the link below to join. An agenda is also attached.

Join by Zoom

<https://us06web.zoom.us/j/83184290696?pwd=gcVkACAgcd3bhCCOUMvdEC9vplHBGu.1>

(Meeting ID: 831 8429 0696 / Passcode: 566492)

Join by Phone

Phone: 1-309-205-3325 / Meeting ID 83184290696# / Password 566492

We look forward to seeing you tomorrow.

Lisa

Lisa Ahern | Community & Economic Development Director

(309) 793-6300 Ext. 1122

Bi-State Regional Commission

1504 Third Avenue

Rock Island, IL 61201

www.bistateonline.org

Dear Planning Committee and Stakeholders,

You are invited to participate in a Public Kickoff Meeting for the **Muscatine County Multi-Jurisdictional Hazard Mitigation Plan**. This meeting will be held on **Tuesday, September 30th at 10:00 a.m. via Zoom**. A *draft* agenda is attached with the meeting information and

will also be posted on the Bi-State Regional Commission website at www.bistateonline.org. The intent of this kick-off meeting is to provide an overview of the project and planning process.

Muscatine County Emergency Management has contracted with Bi-State Regional Commission to update of the 2020 Muscatine County Hazard Mitigation Plan. In addition to Muscatine County, the EMA, schools, and the local jurisdiction representatives, **the planning process requires the opportunity for input from a broad range of stakeholders and neighboring jurisdictions.**

The plan will meet the requirements of the Local Mitigation Planning Policy Guide (the Guide) and Title 44 of the Code of Federal Regulations (CFR) for FEMA approval. An approved, adopted mitigation plan is a gateway to apply for FEMA Hazard Mitigation Assistance (HMA) and High Hazard Potential Dam (HHPD) grant programs. FEMA requires local governments develop and submit mitigation plans as a condition of receiving these grants and plans must be updated every 5 years in order to remain eligible. The primary legal authority for mitigation is derived from the Stafford Act, as amended by the Disaster Mitigation Act of 2000. Section 322 of the Stafford Act specifically addresses mitigation planning. This establishes the requirement that state and local governments prepare hazard mitigation plans as a precondition for receiving FEMA grants for mitigation projects.

If you know of other organizations that would be interested in attending this meeting, please forward this invitation. Bi-State Regional Commission will be assisting Muscatine County in the plan update; you may contact Lisa Ahern at lahern@bistateonline.org or 309-793-6300 Ext. 1122 with further questions regarding the project.

Lisa Ahern | Community & Economic Development Director
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1504 Third Avenue
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MORE INFORMATION ABOUT HAZARD MITIGATION:

Hazard mitigation planning reduces loss of life and property by minimizing the impact of disasters. It begins with identifying natural disaster risks and vulnerabilities that are common in communities. After identifying these risks, they develop long-term strategies for protecting people and property from similar events. Mitigation plans are key to breaking the cycle of disaster damage and reconstruction. For more information, visit: [Hazard Mitigation Planning](#)

From: [Lisa Ahern](#)
To: "cjasper@muscatineiaowa.gov"; "Eric.furnas@muscatinecountyiaowa.gov"; "Katie.hammond@muscatinecountyiaowa.gov"; "Bryan.horesowsky@muscatinecountyiaowa.gov"; "nathan.mather@muscatinecountyiaowa.gov"; "danny.chick@muscatinecountyiaowa.gov"; "scott.sauer@muscatinecountyiaowa.gov"; "jeff.sorensen@muscatinecountyiaowa.gov"; "kurt.kirchner@muscatinecountyiaowa.gov"; "angie_dickey@yahoo.com"; "atalissacity@yahoo.com"; "cityofconesville@gmail.com"; "cityoffruitland@fruitlandia.gov"; "mmardesen@muscatineiaowa.gov"; "cityofnichols@gmail.com"; "stockton@iowatelecom.net"; "lgeertz@cityofwestlibertyia.org"; "areinhardt@cityofwestlibertyia.org"; "jhouser@cityofwestlibertyia.org"; "jhome@wiltoniaowa.gov"; "clint.christopher@mcsdonline.org"; "skruger@wl.k12.ia.us"; "joeburnett@wiltoncsd.org"; "ndewinter@eicc.edu"; "sspengler@cityofdurantiowa.com"; "stockton@iowatelcom.net"; "dbrown@cedarcounty.iowa.gov"; "ema@louisacountyia.gov"; "Brian.Payne@scottcountyiaowa.gov"; "quinn.riess@muscatinecountyiaowa.gov"; "votroube@dps.state.ia.us"; "jim.marwedel@iowa.gov"; "kelly.simmons1@iowa.gov"; "jason.conn@dnr.iowa.gov"; "climatology@iowaAgriculture.gov"; "Keith-Schilling@uiowa.edu"; "Hoffmanh@iastate.edu"; "hannah.howard@ia.nacdn.net"; "bolson@mpw.org"; "bbark@muscatine.com"; "wiltonde@netwtc.net"; "weleadexec@gmail.com"; "rich.dwyer@kentww.com"; "jerry.a.skalak@usace.army.mil"; "alexander.gibbs@noaa.gov"; "Trish.Burnett@redcross.org"; "shane@unitedwaymuscatine.org"; "katie.hammond@muscatinecounty.iowa.gov"; "cschafer@givinggreater.org"; "jennifer.craft@unitypoint.org"; "nicksalazar62@gmail.com"; "IndigenousCoalitionMuscatine@outlook.com"; "rtmuscatine@gmail.com"; "kporter@stanleycenter.org"; "hatfield.gary@mcleodusa.net"; "gracefulpastor@machlink.com"; "eharvey@mcsaiowa.org"; "clint.christopher@mcsdonline.org"; "skruger@wl.k12.ia.us"; "joeburnett@wiltoncsd.org"; "ndewinter@eicc.edu"; "tryan@lmcsd.org"; [KWQC News](#); "newsroom@cbs4qc.com"; "news@wqad.net"; "new@muscatinejournal.com"; "indexnews@lcom.com"; "anads@netwit.net"; "nstruss@prairierivers.org"

Cc: [Denise Bulat](#); [Natalie Murphy](#)
Subject: REMINDER: Muscatine Co. Hazard Mitigation Kick-Off Meeting 9/30/25
Date: Monday, September 29, 2025 1:08:00 PM
Attachments: [Meeting 2 Agenda Public Kick off Meeting 9.30.25.pdf](#)

Good afternoon,

This is a courtesy reminder of the Muscatine County Hazard Mitigation meeting on **Tuesday, September 30th at 10:00 a.m.**

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Join by Zoom

<https://us06web.zoom.us/j/83184290696?pwd=gcVkACAgcd3bhCCOUMvdEC9vplHbGu.1>

(Meeting ID: 831 8429 0696 / Passcode: 566492)

Join by Phone

Phone: 1-309-205-3325 / Meeting ID 83184290696# / Password 566492

We look forward to seeing you tomorrow.

Lisa

Lisa Ahern | Community & Economic Development Director
(309) 793-6300 Ext. 1122
Bi-State Regional Commission
1504 Third Avenue
Rock Island, IL 61201
www.bistateonline.org

PUBLIC KICK-OFF MEETING

September 30, 2025

DRAFT

Dear Planning Committee and Stakeholders,

You are invited to participate in a Public Kickoff Meeting for the ***Muscatine County Multi-Jurisdictional Hazard Mitigation Plan***. This meeting will be held on **Tuesday, September 30th at 10:00 a.m. via Zoom**. A *draft* agenda is attached with the meeting information and will also be posted on the Bi-State Regional Commission website at www.bistateonline.org. The intent of this kick-off meeting is to provide an overview of the project and planning process.

Muscatine County Emergency Management has contracted with Bi-State Regional Commission to update of the 2020 Muscatine County Hazard Mitigation Plan. In addition to Muscatine County, the EMA, schools, and the local jurisdiction representatives, **the planning process requires the opportunity for input from a broad range of stakeholders and neighboring jurisdictions.**

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DRAFT

Muscatine County Multi-Jurisdictional Hazard Mitigation Plan Update

Public Kick-Off Meeting

Agenda
September 30, 2025
10:00 a.m.

Join by Zoom

<https://us06web.zoom.us/j/83184290696?pwd=gcVkACAqcd3bhCCOUMvdEC9vplHBGu.1>

Meeting ID: 831 8429 0696 / Passcode: 566492

Join by Phone

Phone: 1-309-205-3325 / Meeting ID 83184290696# / Password 566492#

1. Introductions

Chris Jasper – Director, Muscatine County Emergency Management

2. Presentation

Denise Bulat – Executive Director, Bi-State Regional Commission

- a. Hazard Mitigation Planning Overview
- b. Plan Update Process and Role of Participating Communities
- c. Project Timeline

3. Initial Feedback and Discussion - All Attendees

4. Public Comments

5. Adjournment

From: [Lisa Ahern](#)
To: cjasper@muscatineiowa.gov; Eric.furnas@muscatinecountyiowa.gov;
Katie.hammond@muscatinecountyiowa.gov; Bryan.horesowsky@muscatinecountyiowa.gov;
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scott.sauer@muscatinecountyiowa.gov; jeff.sorensen@muscatinecountyiowa.gov;
kurt.kirchner@muscatinecountyiowa.gov; angie_dickey@yahoo.com; atalissacity@yahoo.com;
cityofconesville@gmail.com; cityoffruitland@fruitlandia.gov; mmardesen@muscatineiowa.gov;
cityofnichols@gmail.com; stockton@iowatelecom.net; lgeertz@cityofwestlibertyia.org;
areinhardt@cityofwestlibertyia.org; jhouser@cityofwestlibertyia.org; jhorne@wiltoniowa.gov;
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climatology@iowaAgriculture.gov; Keith-Schilling@uiowa.edu; Hoffmanh@iastate.edu;
hannah.howard@ia.nacdn.net; bolson@mpw.org; bbark@muscatine.com; wiltondev@netwtc.net;
weleadexec@gmail.com; rich.dwyer@kentww.com; jerry.a.skalak@usace.army.mil; alexander.gibbs@noaa.gov;
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tryan@lmcsd.org; KWOC News; newsroom@cbs4qc.com; news@wqad.net; new@muscatinejournal.com;
indexnews@lcom.com; anads@netwit.net
Cc: [Denise Bulat](#); [Natalie Murphy](#)
Subject: Invitation - Muscatine County Hazard Mitigation Kick-Off Meeting 9/30/25
Date: Tuesday, September 16, 2025 10:51:00 AM
Attachments: [Meeting 2_Agenda_Public Kick off Meeting_9.30.25.pdf](#)

Dear Planning Committee and Stakeholders,

You are invited to participate in a Public Kickoff Meeting for the **Muscatine County Multi-Jurisdictional Hazard Mitigation Plan**. This meeting will be held on **Tuesday, September 30th at 10:00 a.m. via Zoom**. A *draft* agenda is attached with the meeting information and will also be posted on the Bi-State Regional Commission website at www.bistateonline.org/news. The intent of this kick-off meeting is to provide an overview of the project and planning process.

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Muscatine County Multi-Jurisdictional Hazard Mitigation Plan Update

**Public Kick-Off Meeting
9-30-2025**

1. Introductions

Chris Jasper – Director, Muscatine County Emergency Management

2. Presentation

Denise Bulat – Executive Director, Bi-State Regional Commission

- a. Hazard Mitigation Planning Overview
- b. Plan Update Process and Role of Participating Communities
- c. Project Timeline

3. Initial Feedback and Discussion - All Attendees

Notes

- A comment was brought up about a concern for rail derailment to be included in the hazard profile section. Bi-State staff shared that would be included in the hazardous materials chapter.
- The group discussed the importance of flash flood importance and its connection to overall storm water improvements going forward.
- Chris Jasper shared that he will be meeting with Wilton Community School District and Muscatine Community College about joining the plan update process.
- Carol Zuniga, City Clerk from Atalissa asked who should attend the planning meeting in late October. Bi-State staff recommended mayors, clerks, public works and water staff. Bi-State staff also shared that they will need contact information to updates on hazard rankings.

4. Public Comments

5. Adjournment

Muscatine County Multi-Jurisdictional Hazard Mitigation Plan

Kick Off Meeting

BI-STATE REGIONAL COMMISSION

SEPT. 30, 2025



Muscatine County Multi-Jurisdictional Hazard Mitigation Plan

Kick Off Meeting

BI-STATE REGIONAL COMMISSION
SEPT. 30, 2025



Agenda

1. Introductions – Chris Jasper, Muscatine County Emergency Management
2. Presentation – Denise Bulat, Executive Director, Bi-State Regional Commission
 - Hazard Mitigation Planning Overview
 - Plan Update Process and Role of Participating Communities
 - Project Timeline
3. Initial Feedback and Discussion
4. Public Comments
5. Adjournment

2

What is Hazard Mitigation?



"Any sustained action taken to reduce or eliminate long-term risk to human life and property from hazards." (44 CRF § 201.2)

3

What is Hazard Mitigation Planning?



A coordinated process used by state, local, tribal and territorial governments to identify their risks and vulnerabilities associated with natural disasters and to develop and implement strategies to reduce or eliminate long-term risk.

4

Why update a HazMit plan?

- Disaster Mitigation Act of 2000 provides the legal basis for FEMA mitigation planning requirements for State, local, and Tribal governments
- Keeping plan current allows communities to be eligible for FEMA Hazard Mitigation Assistance Grant Programs
- Plans must be updated every 5 years – current plan expires in September 2025

5

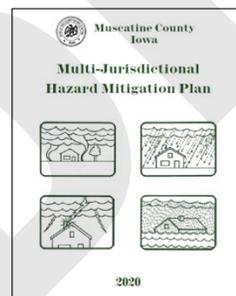
Benefits of Hazard Mitigation Planning

- Saves lives and reduces risk from future disasters.
- Aids risk-informed decision making for the whole community.
- Prepares states and communities to adapt to changing conditions.
- Helps direct mitigation resources to where they are most needed.
- Increases capacity to support faster disaster recovery.

6

2020 Muscatine County Plan

- Approved by FEMA April 16, 2020.
- Five Year Plan.
- Expired 2025.
- What does that mean?
 - ✓ Time to start updating!
 - ✓ Waivers for projects.



7

Grant Application & Funding

Muscatine County Emergency Management Agency applied for planning funds. Award was delayed. Final notification received September of 2025.



Contracted with Bi-State Regional Commission for planning services.



8

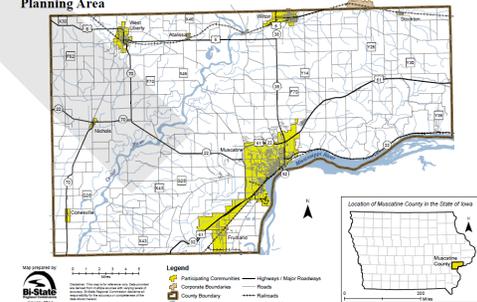
Updated Hazards

- River Flooding
- Severe Winter Storms
- Flash Flood
- Drought
- Hazardous Material
- Extreme Heat
- Dam/Levee Failure
- Earthquake
- Tornado
- Windstorm
- Grass or Wildland Fires
- Hailstorm/Lightning/Thunderstorms
- Sinkholes / Land Subsidence / Landslide
- Expansive Soils

2020 Participants

- Atalissa
 - Conesville
 - Fruitland
 - Muscatine
 - Muscatine County
 - Nichols
 - West Liberty
 - Wilton
- Potential Other Participants:
 Durant, Stockton, Wilton CSD, Muscatine CSD, L&M CSD, West Liberty CSD, Muscatine Community College

Map 2-1
Planning Area



Role of Participating Jurisdictions

- Participate in the planning process by:
 - Designate a primary contact
 - Attend Planning Committee Meetings (2)
 - Provide updated information as requested
 - Review and rank hazards
 - Develop Mitigation Strategies
 - Review planning documents and suggest edits
 - Assist with public input (Board / Council Agenda Item)
- Adoption of the Hazard Mitigation Plan

Hazard Ranking Tool

EVENT	PROBABILITY	SEVERITY = (MAGNITUDE - MITIGATION)					RISK	
		HUMAN IMPACT	PROPERTY IMPACT	BUSINESS IMPACT	PREPAREDNESS	INTERNAL RESPONSE		EXTERNAL RESPONSE
	Likelihood this will occur	Possibility of death or injury	Physical losses and damages	Interruption of services	Preplanning	Time, effectiveness, resources	Community/ Mutual Aid staff and supplies	Relative threat*
SCORE	0 = N/A 1 = Low 2 = Moderate 3 = High	0 = N/A 1 = Low 2 = Moderate 3 = High	0 = N/A 1 = Low 2 = Moderate 3 = High	0 = N/A 1 = Low 2 = Moderate 3 = High	0 = N/A 1 = High 2 = Moderate 3 = Low or none	0 = N/A 1 = High 2 = Moderate 3 = Low or none	0 = N/A 1 = High 2 = Moderate 3 = Low or none	0 - 100%
Dam/Levee Failure								0%
Drought								0%
Earthquake								0%
Expansive Soils								0%
Extreme Heat								0%
Flash Flood								0%
Grass or Wildland Fire								0%
Sinkholes/Land Subsidence/Landslide								0%
River Flooding								0%
Severe Winter Storm								0%
Hailstorm/Lightning/Thunderstorms								0%
Tornado								0%
Windstorm								0%
Hazardous Materials Incident								0%

*Threat increases with percentage.

Meetings & Process

DATE	ACTIVITY
9-30-25	Public Kickoff
10-23-25	Planning Meeting 1
	Musser Public Library, Muscatine 10:30 a.m. City Admin Building, West Liberty 1:00 p.m.
TBD	Planning Meeting 2
TBD	Adoption of Plan
* May include additional large group meetings to build consensus on plan changes	



All meetings are open to the public

13

Planning Process

Phase 1 (September 2025 – December 2025)

- Research Hazards
- Risk Assessment for each community
- Hazard Priorities

Phase 2 (January 2026 – February 2026)

- Goal Review
- Mitigation Actions
- Evaluate Mitigation Actions

Phase 3 (March-April 30, 2026)

- Finalize Draft
- Formal Public Review of Planning Document
- Public Comment Period

Phase 4 (May 2026)

- Submit to State and FEMA Review and Approval
- Community Adoption

14

Public Input

- Important part of the planning process
- All planning meetings public
- Participant City Council/Board meetings announcements, etc.
- 30-day comment period before submitted to FEMA



Image source: BLM

15

Advisory Committee Members

- Neighboring Counties – EMA
- Incorporated municipalities or school districts not wishing to otherwise participate
- Special districts and authorities
- Utilities
- State and Local Offices
- Colleges & Universities
- Neighborhood Groups
- Other stakeholders identified by the County or others on the Planning Committee

Advisory Committee Role:
Provide technical information related to field of experience
Review planning document
Stay apprised of the planning process

16

Online Resources

2020 Muscatine County Multi- Jurisdictional Hazard Mitigation Plan
<https://www.muscatinecountyiowa.gov/219/Emergency-Management>

FEMA – Mitigation Planning
<https://www.fema.gov/hazard-mitigation-planning>

IOWA Homeland Security & Emergency Management
<https://homelandsecurity.iowa.gov/disasters/hazard-mitigation>

17

Contacts

Lisa Ahern
Community & Economic Development Director
lahern@bistateonline.org
309-793-6300 x1122

Chris Jasper
Director – Emergency Management/911
cjasper@muscatineiowa.gov
563-264-7142



DRAFT

AFFIDAVIT OF PUBLICATION

State of Florida, County of Broward, ss:

Anjana Bhadoriya, being first duly sworn, deposes and says: That (s)he is a duly authorized signatory of Column Software, PBC, duly authorized agent of The Muscatine Journal, morning edition, a daily newspaper printed and published by Lee Enterprises, Incorporated, in the City of Muscatine, Muscatine County, Iowa, and that a notice, a printed copy of which is made part of this affidavit, was published in said The Muscatine Journal, on the dates listed below.
September. 18 2025

NOTICE ID: 9fwSNyFrROxbpu7kM8nR
PUBLISHER ID: COL-IA-400953
NOTICE NAME: HAZMIT PLAN PUBLIC MEETING
Publication Fee: \$49.11

The affiant further deposes and says that all of the facts set forth in the foregoing affidavit are true as he/she verily believes.

Anjana Bhadoriya

(Signed) _____



VERIFICATION

State of Florida
County of Broward

Subscribed in my presence and sworn to before me on this: 09/22/2025

S. Smith

Notary Public
Notarized remotely online using communication technology via Proof.

NOTICE OF PUBLIC KICKOFF MEETING FOR MUSCATINE COUNTY MULTI-JURISDICTIONAL HAZARD MITIGATION PLAN

This notice is to invite you or another representative of your organization to the public kickoff meeting for the update to the Muscatine County Multi-Jurisdictional Hazard Mitigation Plan. The Muscatine County EMA has contracted with Bi-State Regional Commission to update the 2020 Muscatine County Hazard Mitigation Plan. In addition to Muscatine County, the EMA, schools, and the local jurisdiction representatives, the planning process requires the opportunity for input from a broad range of stakeholders and neighboring jurisdictions.

The plan will meet the requirements of the Local Mitigation Planning Policy Guide (the Guide) and Title 44 of the Code of Federal Regulations (CFR) for FEMA approval. An approved, adopted mitigation plan is a gateway to apply for FEMA Hazard Mitigation Assistance (HMA) and High Hazard Potential Dam (HHPD) grant programs. FEMA requires local governments develop and submit mitigation plans as a condition of receiving these grants and plans must be updated every 5 years in order to remain eligible. The primary legal authority for mitigation is derived from the Stafford Act, as amended by the Disaster Mitigation Act of 2000. Section 322 of the Stafford Act specifically addresses mitigation planning. This establishes the requirement that state and local governments prepare hazard mitigation plans as a precondition for receiving FEMA grants for mitigation projects.

You are invited to attend this public kickoff of the plan development which will be held via Zoom at 10:00 a.m. on September 30, 2025. To secure a link or call-in information to participate in the meeting go to www.bistateonline.org/news or call Bi-State Regional Commission at the number below. Bi-State Regional Commission will be assisting Muscatine County with the plan update, and you may contact Lisa Ahern at lahern@bistateonline.org or 309-793-6300 Ext. 1122, or Chris Jasper, Muscatine County Emergency Manager at cjasper@muscatineiowa.gov or 563-264-7142 with questions regarding the project.
COL-IA-400953

PLANNING MEETINGS

October 23, 2025

DRAFT



HAZARD MITIGATION PLAN UPDATE

We will discuss:

- Hazards that impact our community
- Potential Hazard Mitigation actions
- Reduce risk to people and property



DATE

October 23, 2025

TIME/LOCATION

10:30AM - Musser Public Library,
408 E 2nd St, Muscatine/Room 301
OR

1PM - WL City Admin Building,
111 W 7th St, West Liberty /
Council Chambers



www.muscatinecountyiowa.gov

EMA Office 563-264-7142

Bi-State Regional Commission 309-793-6300

Muscatine County Hazard Mitigation Plan Update Planning Meeting 1

AGENDA

October 23, 2025

10:30-12:00 Musser Public Library / Rm 302 408 E. 2 nd St Muscatine	1:00 – 2:30 PM West Liberty Administrative Building 111 W. 7 th Street, West Liberty
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- I. Welcome / Introductions** (5 min)
 - *Chris Jasper / Muscatine County Emergency Management*
- II. Hazard Mitigation Plans & Review of Hazard Profiles** (25 min)
 - *Bi State Regional Commission*
- III. Countywide Hazard Rankings** (10 min)
- IV. 2025 Goals / Discussion** (10 min)
- V. Instructions for Jurisdictions** (20 min)
 - A. Review of Instruction Sheet
 - Updating Profiles*
 - Update Critical Facilities / Vulnerable Groups*
 - Identifying Hazards*
 - Mitigation Actions*
 - B. Updates due December 31, 2025
 - C. Assistance Needed?
- VI. Questions** (15 Min)
- VII. Public Comment** (5 min)
- VI. Next Meeting**
- VII. Adjourn**

2025 Muscatine County Hazard Mitigation Plan Update

Instructions for Jurisdictions

To complete the Hazard Mitigation Plan update, jurisdictions are asked to review and update information from previous plans. This includes the following four components. These instructions will guide you to completing each section.

1. Update Community Profile
2. Update Critical Assets & Identify Vulnerable Groups
3. Identify Hazards
4. Update Mitigation Actions

Please submit updates by email to all of the following contacts at the Bi-State Regional Commission. Please submit updates of your jurisdiction's information by **December 31, 2025**. Please contact Bi-State with questions on updating your jurisdictions' information:

- Lisa Ahern, lahern@bistateonline.org, (309) 793-6300 ext. 1122
- Natalie Murphy, nmurphy@bistateonline.org, (309) 793-6300 ext. 1139

1. UPDATE COMMUNITY PROFILE

- **Geography and Land Use:** Jurisdictions review and update. Consider land use and development trends within the next five years. Ex: "Housing growth to the north and commercial development to the south is anticipated."
- **Government Structure/Departments/Boards & Commissions:** Jurisdictions review and update.
- **Critical Facilities / Vulnerable Groups:** Jurisdictions should review and update any changes to your critical facilities (see #2 Below).
- **Hazard Priorities:** Once jurisdictions rank hazard priorities, Bi-State will incorporate those rankings into this section

2. UPDATE CRITICAL ASSETS & VULNERABLE GROUPS

- Identify critical assets within jurisdiction limits regardless of ownership. Include assets outside of jurisdiction limits if relevant to critical functions within jurisdiction (wastewater lagoons, etc).
- Include weather sirens and radio/phone towers, if known. If your jurisdiction has a list of radio/phone towers from issuing permits, you can submit that list as a separate document if more convenient.
- Use physical address (not mailing) and be specific (names of schools, medical centers, etc).
- Include any facilities for which you may be seeking a grant within the next five years.
- Identify vulnerable groups who may be subject to hazards, such as hospitals, day care centers, senior centers.
- For security reasons, these actual lists are not included in the plan, but information is presented in aggregate form or in a manner that reflects security concerns to meets FEMA guidelines.

- Example of Critical Assets List

1	A	B	C	D	E	F	G	H	I	J	K	L	M
2	NAME	ADDRESS	CITY	CRITICAL	VULPOP	MEDFAC	ECON	HIS_NAT	OTHER				
3	City Hall		C										
4	Public Works Building		C										
5	Public Safety Building (Fire, Police, Ambulance)		C		M								
6	Water Plant / Water Tower		C										
7	Sewage Lagoon		C										
8	Lift Station		C										
9	Bridge Overpass		C										
10	Elementary School			V									
11	Medical Center				M								

Critical = Critical Facilities
 VulPop = Vulnerable Populations
 Medfac = Medical Facility
 Econ = Economic Asset
 His_Nat = Historical or Natural Asset

3. IDENTIFY JURISDICTION HAZARDS

- Previous hazard listings are provided.
- Identify hazards as **Low, Medium, High or NA** based on their likelihood and significance of impact upon your jurisdiction. If the hazard is not relevant to your jurisdiction, then select “NA.”
- If hazards differ significantly from previous years or from the overall County hazards, please explain.
- Every hazard listed must have a mitigation action.

2025 Hazards	HAZARD TYPE
HIGH / MED / LOW / NA	
	Tornado
	Windstorm
	Flash Flood
	River Flood
	Hailstorm / Thunderstorm / Lightning
	Levee Failure
	Severe Winter Storm
	Hazardous Materials
	Drought
	Grass & Wildland Fire
	Extreme Heat
	Landslide
	Expansive Soils
	Sinkholes & Land Subsidence
	Dam Failure
	Earthquake

4. UPDATE and PRIORITIZE MITIGATION ACTIONS

- **Action ID:** Updated by Bi-State once lists are received back or by jurisdictions based on jurisdiction preference. Previous Action IDs are included in the materials sent for reference.
- **Mitigation Action:** Describe the Mitigation Action. Mitigation Actions from the previous plan are entered for

your reference. You should list mitigation actions from prior years and report on status. For each mitigation action, you must complete all requested information on the table.

- **Enter Mitigation Goals:** Enter the goal number that corresponds with the Action. The countywide goals are listed below.

Enter Goal #	Goal Statement
1	Protect human life and property from the effects of hazards.
2	Minimize losses to existing and future property, protect critical facilities, infrastructure and other community assets.
3	Improve local services and infrastructure to reduce community, economic and environmental disruption during and after hazard events.
4	Provide education and awareness of hazards and risks.
5	Strengthen communication among communities and between communities and the public.

- **Select Objective Type:** Enter the objective Type that corresponds with the Action. Objective codes and descriptions are listed below.

Enter Objective	Objective Description
PM	(Preventative Measure – PM) Develop and implement administrative or regulatory actions or processes to influence the way land and buildings are developed and built.
PP	(Property Protection-PP) Protect buildings and structures from hazards by modifying or removing them from hazard areas.
PE	(Public Education and Awareness-PE) Inform and educate citizens, elected officials, and property owners about hazards and ways of mitigating.
NR	(Natural Resource) Preserve or restore functions of natural systems while minimizing hazard losses.
SP	(Structural Projects-SP) Construct and maintain structural projects to reduce or redirect the impact of hazards away from at- risk populations and facilities.
ES	(Emergency Services – ES) Protect people and property during and after disaster event to minimize impact and preserve community health and safety.

- **Hazard(s) Mitigated:** List hazard(s) to be mitigated.
- **Responsible Party:** Enter the position, organization, jurisdiction responsible for implementing the action.
- **Potential Funding Source:** Identify the potential funding source or program. Avoid general terms

such as “Federal, State, Local.”

- **Timeline to Complete Activity:** Select from the drop down when the project will be completed.
- **Status:** Select most appropriate status for the mitigation action.

ENTER Status	Description
Complete	Project is finished.
In Progress	Project underway.
New	Project is newly proposed for 2025.
Revised	Project formerly included but has been modified.
Ongoing Project	Project is continuous or annual.
Remove	Project is no longer a part of the plan.

Priority: Enter the Priority based on the cost/benefit determination according to the following table. Cost/Benefit determinations according to the following table.

Cost to Jurisdiction	Benefit to Jurisdiction	ENTER Priority
High	Moderate	Low
Low	Moderate	Medium
Moderate	Moderate	
High	High	
Low	High	High
Moderate	High	

Muscatine County Hazard Mitigation Plan Update Meeting Minutes

Planning Meeting #1

10:30 AM on October 23, 2025

Musser Public Library, Room 302, Muscatine, IA

In attendance:

Name	Title/Representing	Email
Lisa Ahern	Community and Economic Development Director / Bi-State Regional Commission	lahern@bistateonline.org
Natalie Murphy	Planner / Bi-State Regional Commission	nmurphy@bistateonline.org
Chris Jasper	EMA / Muscatine County	cjasper@muscatineiowa.gov
Mike Hartman	Fire Chief / City of Muscatine	mhartman@muscatineiowa.gov
Tony Kies	Police Chief / City of Muscatine	akies@muscatineiowa.gov
Danny Chick	Board of Supervisors / Muscatine County	
Eric Furnas	P & Z & Development Administrator / Muscatine County	ericfurnas@muscatinecountyiowa.gov
Shane Orr	United Way of Muscatine County	shane@unitedwaymuscatine.org
Matt Mardesen	City Administrator / City of Muscatine	mmardesene@muscatineiowa.gov
Katie Hammond	Director / Muscatine County Conservation	katie.hammond@muscatinecountyiowa.gov
Nick Burns	Manager / Muscatine Power and Water	nburns@mpw.org
Brandy Olson	Director of Legal, Regulation, and People / Muscatine Power and Water	bolson@mpw.org
Chris Nienhaus	Director of Operations / Muscatine Community School District	chris.nienhaus@mcsdonline.org
Jeff Horne	City Administrator / Wilton	jhorne@wiltoniowa.gov
Marty Hills	Mayor / Fruitland	hillsmarty@gmail.com
Jim Hawkes	Associate Director of Public Safety and Emergency Management / Eastern Iowa Community College	jehawkes@eicc.edu
Carol Zuniga	City Clerk / Conesville	cityofconesville@gmail.com
Jim Garrison	Safety Manager / Muscatine Power and Water	jgarrison@mpw.org

I. Welcome / Introductions

- Chris Jasper, Director of Muscatine County Emergency Management opened the meeting and welcomed all in attendance. Introductions were carried out and participants stated whether or not they participated in the prior plan.

II. Hazard Mitigation Plans & Review of Hazard Profiles

- Lisa Ahern provided a general overview of hazard mitigation plans and reviewed data provided to date on each hazard. This included the FEMA National Risk index score for each hazard, along with how the hazard ranked in the prior plan.
- Multiple participants want to make sure grass and wildland fire includes crop and prairie fires. Within the past year there was a notable crop fire north of the City of Muscatine in the county.
- The general consensus among participants is that hazardous materials should stay in the plan. People in the area have seen rail traffic increase significantly, especially with the CP/KC merger. Participants also cited the proximity of the power plant as another reason to keep this profile. Muscatine Emergency Management stated the plan they have related to Hazardous Materials is a response plan vs. mitigation plan.
- A participant shared that although landslide/expansive soils is a low priority right now, there was an intense rain event that led to a landslide with substantial damage at Lake Okoboji over the summer. While this is outside of the planning area, it is a consideration as rainfall becomes more intense.
- A question was raised if this plan includes contingency planning for attacks or shutdowns on integral services such as drinking water. Bi-State noted the concern and that the plan was related to natural hazards and other plans may address this situation.

III. Countywide Hazard Rankings

- Bi State Staff explained that hazards do not need to be ranked; however each hazard should be carefully considered in the community. Jurisdictions should ensure that every hazard identified has a corresponding mitigation action – and the mitigation actions should be prioritized. A couple of participants preferred to go through a ranking process with their communities and asked for the prior plan's scoring method to help inform their process of assigning risks as high, medium or low.

IV. 2025 Goals / Discussion

- A concern was brought up concerning goal three about EMS communication and service provision not lining up with jurisdictional lines – noted that this was a concern, even if not covered in this plan.
- A comment about goal four concerned mitigation efforts aimed towards local property owners as well. Goals would be modified to add mitigation to Goal 4.

V. Instructions for Jurisdictions

- Bi-State staff reviewed the Instruction Sheet provided to all in attendance. Jurisdiction representatives were asked to update their jurisdiction profiles,

identify their hazards and update their Mitigation Actions. All items are requested by December 31, 2025. Jurisdictions wishing to have a separate meeting with Bi-State to review any of the information provided were invited to notify Lisa Ahern or Natalie Murphy.

VI. Questions / Public Comment

VII. Next Meeting

- Bi-State staff stated that the next meeting is planned for late January 2026 when a draft will be prepared. This meeting will be held via zoom.

DRAFT

Muscatine County Hazard Mitigation Plan Update Meeting Notes

Planning Meeting #1

1:00 PM on October 23, 2025

West Liberty Administrative Building, West Liberty, IA

Name	Title/Representing	Email
Lisa Ahern	Community and Economic Development Director / Bi-State Regional Commission	lahern@bistateonline.org
Natalie Murphy	Planner / Bi-State Regional Commission	nmurphy@bistateonline.org
Chris Jasper	EMA / Muscatine County	cjasper@muscatineiowa.gov
Kurt Kirchner	Board of Supervisors / Muscatine County	kurtkirchner76@gmail.com
Shaun Kruger	Superintendent / West Liberty Community School District	skruger@wl.k12.ia.us
Andrea Grubaugh	Advocate News	adnews@netwtc.net
Lee Geertz	Administrator, West liberty	lgeertz@cityofwestlibertyia.org
Josh Houser	Police Chief, West Liberty	jhouser@cityofwestlibertyia.org

I. Welcome / Introductions

- Chris Jasper, Director of Muscatine County Emergency Management opened the meeting and welcomed all in attendance. Introductions were carried out and participants stated whether or not they participated in the prior plan.

II. Hazard Mitigation Plans & Review of Hazard Profiles

- Lisa Ahern provided a general overview of hazard mitigation plans and reviewed data provided to date on each hazard. This included the FEMA National Risk index score for each hazard, along with how the hazard ranked in the prior plan.
- A concern was brought up about a possible hazard that deals with cyber-attacks or electrical outages. County EMA, Chris Jasper mentioned that the County has other response plans that focus on some of those items, such as the emergency operations plan for the County.
- It was noted that flash flooding is an issue in Atalissa and Nichols, especially on the south side of the levee.
- The Planning Committee agreed that hazardous materials incidents should remain in the plan, given the increased frequency of railroad traffic.

III. Countywide Hazard Rankings

- Bi State Staff explained that hazards do not need to be ranked; however each hazard should be carefully considered in the community. Jurisdictions should ensure that every hazard identified has a corresponding mitigation action – and the mitigation actions should be prioritized. A couple of participants preferred to go through a ranking process with their communities and asked for the prior plan’s scoring method to help inform their process of assigning risks as high, medium or low

IV. Instructions for Jurisdictions

- Bi-State staff reviewed the Instruction Sheet provided to all in attendance. Jurisdiction representatives were asked to update their jurisdiction profiles, identify their hazards and update their Mitigation Actions. All items are requested by December 31, 2025. Jurisdictions wishing to have a separate meeting with Bi-State to review any of the information provided were invited to notify Lisa Ahern or Natalie Murphy.
- Bi-State’s Lisa Ahern mentioned that communities should include an “inventory” of any local planning documents relevant to hazard mitigation.
- City administrator from West Liberty, Lee Geertz, offered to reach out to Atalissa and Nichols to assist with the hazard mitigation planning process.

V. Questions

VI. Public Comment

- A concern was brought up that the county fairgrounds in West Liberty is vulnerable to weather events and is need of a storm shelter.
- West Liberty has seen an increase in modular homes and they have to abide by new standards which include a safe structure for weather events.

VII. Next Meeting

- Bi-State staff stated that the next meeting is planned for late January 2026 when a draft will be prepared. This meeting will be held via zoom.

VIII. Adjourn

Muscatine County Multi-Jurisdictional Hazard Mitigation Plan

Planning Meeting 1

MUSSER PUBLIC LIBRARY – MUSCATINE (10:30 AM)

CITY ADMIN BUILDING = WEST LIBERTY (1:00 PM)



Muscatine County Multi-Jurisdictional Hazard Mitigation Plan

Planning Meeting 1

MUSSER PUBLIC LIBRARY – MUSCATINE (10:30 AM)
 CITY ADMIN BUILDING = WEST LIBERTY (1:00 PM)



Agenda

1. Introductions
2. Why HMP Planning is Important / Review of Hazard Profiles
3. Countywide Hazards (2020 / 2025)
4. 2025 Goals / Discussion
5. Instructions for Jurisdictions
 - Update Profiles
 - Update Critical Facilities / Vuln Groups
 - Identify Hazards
 - List Mitigation Actions
6. Questions
7. Public Comment
8. Next Meeting
9. Adjourn



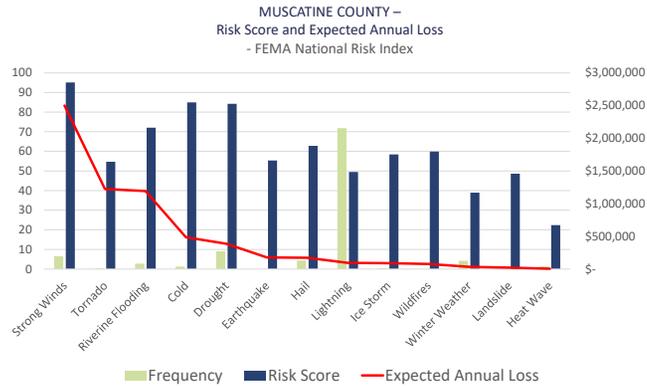
Why Mitigation Planning Matters

- Current plan expired 2025
- Keeping plan current allows communities to be eligible for FEMA Grant Programs
- Mitigation Planning
 - **Saves** lives
 - **Reduces** risk
 - **Helps** communities adapt to changing conditions
 - **Directs** mitigation resources to where they are most needed
 - **Increases** capacity to support faster recovery

2020 Hazard Rankings

HIGH	MEDIUM	LOW
Tornado	Severe Winter Storm	Landslide
Windstorm	Hazardous Materials	Expansive Soils
Flash Flood	Drought	Sinkholes & Land Subsidence
River Flood	Grass & Wildland Fire	Dam Failure
Thunderstorm/Lighting	Extreme Heat	Earthquake
Levee Failure	Hailstorm	

FEMA National Risk Index



5

Tornado / Windstorm

High Priority

- Muscatine County experiences 2.0-2.5 significant tornado days (EF2 or higher) a decade – IA HMP 2023
- Expected annual loss due to strong wind events each year is \$2,500,000 for Muscatine County – FEMA National Risk Index
- Muscatine County averages 6.6 days with winds greater than 57 MPH – IA HMP 2023

6

Flash Flood / River Flood

High Priority

- Increasing. Precipitation is expected to increase in intensity, though not necessarily with frequency. - IA HMP 2023
- Muscatine County has a high concentration of severe repetitive loss (SRL) single family properties covered by NFIP insurance – IA HMP 2023
- At least minor flooding could occur every year at some locations in Muscatine County – IA HMP 2023
- The expected annual loss from flooding is \$1,200,000 – FEMA National Risk Index

7

Thunderstorm / Lightning

High Priority

- Increasing. Warming summers and higher quantities of water in the atmosphere. - IA HMP 2023
- From January 2000 - March 2025, property damage reached \$3,368,6700 and crop damage is nearly \$200,000 – National Centers for Environmental Information
- Low expected annual loss due to lightning – FEMA National Risk Index

8

Levee Failure

High Priority

- Flooding is expected to increase, increasing strain on levees. Drought is also expected to increase which may cause levees, especially those containing clay, to crack. - IA HMP 2023
- Levees with unacceptable ratings are more likely to fail – 2022 IA Statewide Levee District Study
- Levees in Muscatine County not rated or rated unacceptable protect over \$93,000,000 in property value and 446 people – IA HMP 2023

9

Severe Winter Storm

Medium Priority

- Decreasing. As winters warm faster than summers, winter weather is expected to cause less damage. - IA HMP 2023
- Muscatine County averages six winter storm events, including blizzards, ice storms, heavy snow, winter weather, extreme cold/wind chill, and cold/wind chill, a year – National Centers for Environmental Information
- Expected annual loss for cold wave, ice storm, and winter weather respectively is \$487,000, \$89,000, and \$33,000 – FEMA National Risk Index

10

Drought / Extreme Heat / Grass & Wildland Fire

Medium Priority

- Increasing. Days with maximum temperatures above 90 are projected to occur 2 to 5 times more often by 2050. Straining energy systems and increasing chances of blackouts and brownouts. - IA HMP 2023
- Approximately drought events 9.14 annually / Expected Annual Loss \$385,574 – National Risk Index
- On any given week it is estimated that about 5% of the region could be in severe drought or worse. – IA HMP 2023
- From 2020-2024, Muscatine County has seen disaster subsidy totals at \$2,347,835. – IA HMP 2023
- The entire state of Iowa has a very low wildfire potential. – US Forest Service Wildfire Hazard Potential

11

Hailstorm

Medium Priority

- Increasing. Warmer summers and higher quantities of water in the atmosphere will likely fuel increased storm development.
- From 2020-2024 Muscatine County has experienced 29 hail events – NCEI
- Inflation-adjusted crop insurance losses due to hail at \$2,000,001 to \$7,000,000 between 1989-2022 for Muscatine County – IA HMP 2023
- The expected annual loss estimate for hail is \$173,717 – FEMA National Risk Index.

12

Landslide / Expansive Soils

Low Priority

- Landslide is not centrally recorded in Iowa and the planning area has few historical incidents.
- With increasing heavy precipitation events, landslides may become more common, but damage results are uncertain. The probability of a significant landslide event in Iowa is between 10-19% each year. - IA HMP 2023
- Muscatine County's steep terrain adjacent to the Mississippi River is susceptible to landslides
- The occurrence of expansive soils is rare and occurs slowly over time. – IA HMP 2023

13

Sinkholes & Land Subsidence

Low Priority

- Previous plans by participating jurisdictions have noted different areas of sinks or depressions.
- Historic inventories have nearly 2,600 sinkholes in the Upper Iowa River Watershed, but there is no central collection for this information

14

Earthquake

Low Priority

- No change in this hazard is expected.
- Muscatine County is located in seismic risk zone 0 – very low probability of damaging ground motion from an earthquake. – IA HMP 2023
- Ranked 9 out of 10 in the state, Muscatine County is vulnerable to property damage from earthquakes with an expected annual loss of \$29,935. – IA HMP 2023

15

Dam Failure

Low Priority

- Increasing precipitation may increase flooding intensity and weaken structures.
- Of the 15 dams identified in the county, none are listed as high hazard, and nine are listed as low hazard potential. – IA DNR Dam Hazard Classification

16

Proposed Mitigation Goals

2020 Goals

- Goal 1** – Protect human life, property conservation, and public health from the effects of hazards.
- Goal 2** – Minimize vulnerability of the people and property of Muscatine County to the effects of hazards.
- Goal 3** – Protect critical facilities, infrastructure, and other community assets from the effects of hazards.
- Goal 4** – Improve education and awareness regarding hazards and risk in Muscatine County.
- Goal 5** – Strengthen communication among communities and between communities and the public.



2025 Goals

- Goal 1** – Protect human life and property from the effects of hazards.
- Goal 2** – Minimize losses to property, protect critical facilities, infrastructure and other community assets.
- Goal 3** – Improve local services and infrastructure to reduce community, economic and environmental disruption during and after hazard events.
- Goal 4** – Provide education and awareness of hazards and risks.
- Goal 5** – Strengthen communication among communities and between communities and the public.

Instructions for Jurisdictions – What’s Next?

Update Profile

Identify Hazards

Update Actions

Instruction Sheet

- Refer to Instruction Sheet which will guide you through each of the four sections to be updated by jurisdictions.
- Bi-State will send each jurisdiction a file to update.

2025 Muscatine County Hazard Mitigation Plan Update Instructions for Jurisdictions

To complete the Hazard Mitigation Plan update, jurisdictions are asked to review and update information from previous plans. This includes the following four components. These instructions will guide you to completing each section.

1. Updated Community Profile
2. Update Critical Assets
3. Rank Hazards
4. Update Mitigation Strategies

Please submit updates by email to all of the following accounts at the Bi-State Regional Commission. Please submit updates of your jurisdiction's information by December 31, 2025. Please contact Bi-State with questions on updating your jurisdiction's information.

- Lisa Alton, lalton@bi-state.org, (509) 793-4300 ext. 1122
- Karla Murphy, kmurphy@bi-state.org, (509) 793-4300 ext. 1139

1. UPDATE COMMUNITY PROFILE

- Geography and Land Use: Jurisdictions review and update. Consider land use and development trends within the next five years for "strong growth to the north and commercial development to the south as anticipated"
- Government Structure/Department/Head & Contact: Jurisdictions review and update.
- Critical Facilities: Jurisdictions should review and update any changes to your critical facilities here in Bi-State.
- Hazard Priorities: Once jurisdictions rank hazard priorities, Bi-State will incorporate these rankings into this section.

2. UPDATE CRITICAL ASSETS

- Identify critical assets within jurisdiction limits regardless of ownership (County, State, Federal, private, etc.) Also in rare circumstances, include assets within jurisdiction limits if relevant to critical facilities within jurisdiction boundaries (e.g., dam)
- Use physical address (not mailing) and be specific (names of schools, medical centers, etc.)
- Include any facilities for which you may be seeking a grant within the next five years.
- NEW: Include weather assets and radionuclide towers, if known. If your jurisdiction has a list of radionuclide towers from mapping permits, you are advised that list as a separate document if more convenient.
- For security reasons, these actual lists are not included in the plan, but information is presented in aggregate form or in a manner that reflects security concerns to meet FEMA guidelines.

Update Community Profile



- Word Document to be sent to point of contact at each participating Jurisdiction.
- What has changed?
 - New committees, new critical facilities, new development?
- Who are your vulnerable groups (daycares, elderly populations, assisted living)?
- Hazards – how is your community specifically impacted? (i.e. flash flooding)

West Liberty
 Population (2020 Census): 3,858
 8.02% of the total county's population
 Rank: 1st of 4 jurisdictions in population

Land area: 1.77 sq. miles
 0.41% of the total county's land area
 Rank: 5th of 4 land area

NFD name: Participating
 Geography

The City of West Liberty is located in northeastern Muscatine County between the Middle and West Branches of the Wapahoga Creek. West Liberty topography ranges from flat to 1-2% slopes to average slopes of up to 2-4% slopes. Due to its proximity to the creek, West Liberty has experienced flooding. Transportation features include the Iowa Interstate Railroad and U.S. 69A. West Liberty's traditional areas are primarily low-density. Other land uses include agricultural, commercial, institutional, and industrial. West Liberty has several recreational areas including the Muscatine County Parkgrounds.

Government Structure

The City of West Liberty has a mayor-council form of local government. The mayor is elected to a two-year term, and the first assembly city council is elected by four-year staggered terms with an appointed city manager. The city keeps an attorney on retainer. Staff includes the city clerk, finance officer, electric, water/sewer, and waste water treatment plant superintendent, police chief, fire chief, library director, and parks & recreation director. West Liberty has a strong ordinance and a building code and, as such, has a Planning & Zoning Board and Board of Adjustments. The city also has a library board and parks and recreation committee. The city participates in the National Flood Insurance Program and has a floodplain management ordinance enforced by the city manager. The city is a taxing body and also receives charges for road use, solid waste management, and other services. West Liberty is covered by a volunteer fire department that has the ability to call additional personnel and resources from surrounding communities through a mutual aid agreement.

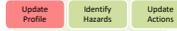
Critical Facilities

West Liberty itself serves structures as critical facilities. These are primarily local government facilities including the city hall, fire department, public works garage, and water treatment plant. Other critical facilities include the senior plant and Liberty Commission. Vulnerable populations in the area include several retirement homes, the schools, and a child care center. West Liberty also has a high population of residents that speak a language other than English.

Assured Protection

Threats to West Liberty are similar to areas commonly experienced throughout the county. Its hazard profile is age overall with Muscatine County as a whole.

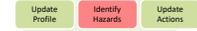
Update Critical Facilities



- Update the table to identify the critical assets and facilities in your jurisdiction.
- What facilities and vulnerable groups are the subject of hazards impacts?

Name or Description of Asset	Address Location	Critical Facilities	Vulnerable Population	Medical Facilities	Econ Asset	Historical, Cultural and Natural Resources	Other Important Facilities
Fire Department	123 Main St.	X	✓	✓	✓	✓	✓
City Hall	125 3rd St.	X					
Water Plant	126 Main St.	X					
WWTP	127 Main St.	X					
Lift Station	Corner of HWY 6 & Main St.	X					
City Garage	128 Cherry St.						X

Ranking Jurisdiction Hazards



- What are hazards in your community?
- All hazards identified need a mitigation action.
- If a hazard is not relevant (i.e. your community is not impacted by a dam or dam failure) then select "NA"

2025 RANKING HIGH / MED / LOW / NA	HAZARD TYPE
	Tornado
	Windstorm
	Flash Flood
	River Flood
	Hailstorm / Thunderstorm / Lightning
	Levee Failure
	Severe Winter Storm
	Hazardous Materials
	Drought
	Grass & Wildland Fire
	Extreme Heat
	Landslide
	Expansive Soils
	Sinkholes & Land Subsidence
	Dam Failure
	Earthquake

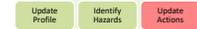
Update Mitigation Actions



- Identify and Update Mitigation Actions.
- Every hazard must have a Mitigation Action.
- Each action must tie to a goal and objective.
- Must identify responsible party (i.e., city clerk, city council, public works department), funding sources, timeline and status.
- Cost-Benefit ranking and Overall priority.

Action ID	Mitigation Action	Goal(s)	Objective	Hazard(s) Mitigated	Responsible Party	Potential Funding Source	Timeline to Complete Activity	Status	New for 2025	Cost to Jurisdiction	Benefit to Jurisdiction	Priority
1.3	Establish warming or cooling centers	1,2	ES	Severe Winter Storms; Extreme Heat								

Identify & Prioritize Actions



Cost to Jurisdiction	Benefit to Jurisdiction	ENTER Priority
High	Moderate	Low
Low	Moderate	Medium
Moderate	Moderate	
High	High	High
Low	High	
Moderate	High	

Action ID	Mitigation Action	Goal(s)	Objective	Hazard(s) Mitigated	Responsible Party	Potential Funding Source	Timeline to Complete Activity	Status	New for 2025	Cost to Jurisdiction	Benefit to Jurisdiction	Priority
1.3	Establish warming or cooling centers	1,2	ES	Severe Winter Storms; Extreme Heat								

Update Mitigation Strategies

- Send your updates by December 31st to Lahern@bistateonline.org.
- Contact Muscatine EMA or Bi-State if you would like an individual meeting to discuss your rankings or if you need technical support.

25

What's Next?

DATE	ACTIVITY
9-30-25	Public Kickoff
10-23-25	Planning Meeting 1
	Musser Public Library, Muscatine 10:00 a.m. City Admin Building, West Liberty 1:00 p.m.
Jan 2026	Planning Meeting 2 - Review of Draft
February 2026	Public Comment
<i>* May include additional meetings to build consensus on plan changes</i>	

Please contact Bi-State if your jurisdiction would like an individual meeting with Bi-State for technical support and review of hazards.

26

Contacts

Lisa Ahern
Community & Economic Development Director
lahern@bistateonline.org
309-793-6300 x1122



Chris Jasper
Director – Emergency Management/911
cjasper@muscatineiowa.gov
563-264-7142



Muscatine County Hazard Mitigation Plan Update Planning Meeting

AGENDA

February 17, 2026

1:00-2:00

Via Zoom

<https://us06web.zoom.us/j/84270651066?pwd=feSMMXYBCKsG51VXb6OWz4bxfiKQfZ.1>

- I. Updates
- II. Overview of Plan Content
- III. Review of Mitigation Strategies
- IV. Draft Available
 - A. EMA Website
 - B. BSRC Website
 - C. Other (Hard copy available)
- V. Public Comment and Adoption
 - A. March 9th Board of Supervisors Meeting 9:00 A.M.
- VI. Next Steps for Jurisdictions
 - A. Inform Bi-State of changes needed **by February 27**
 - B. Prepare a Resolution to Adopt the Plan **after March 9th**
 - C. After your jurisdiction adopts the plan, send a copy of your resolution and minutes to Bi-State.
- VII. Questions
- VI. Adjourn

Muscatine County Hazard Mitigation Plan Update

Planning Meeting

1:00 PM on February 17, 2026

In attendance:

Name	Title/Representing	Email
Lisa Ahern	Community and Economic Development Director / Bi-State Regional Commission	lahern@bistateonline.org
Natalie Murphy	Planner / Bi-State Regional Commission	nmurphy@bistateonline.org
Chris Jasper	EMA / Muscatine County	cjasper@muscatineiowa.gov
Eric Furnas	P & Z & Development Administrator / Muscatine County	ericfurnas@muscatinecountyiowa.gov
Matt Mardesen	City Administrator / City of Muscatine	mmardesene@muscatineiowa.gov
Katie Hammond	Director / Muscatine County Conservation	katie.hammond@muscatinecountyiowa.gov
Chris Nienhaus	Director of Operations / Muscatine Community School District	chris.nienhaus@mcsdonline.org
Jim Hawkes	Associate Director of Public Safety and Emergency Management / Eastern Iowa Community College	jehawkes@eicc.edu
Lee Geertz	City Manager / City of West Liberty	lgeertz@cityofwestlibertyia.org
Kurt Kirchner	County Board of Supervisors / Muscatine County	kurt.kirchner@muscatinecountyiowa.gov
Josh Houser	Police Chief / City of West Liberty	jhouser@cityofwestlibertyia.org
Jeff Sorensen	County Board of Supervisors / Muscatine County	jeff.sorensen@muscatinecountyiowa.gov
Torie Roenfeldt	City Clerk / City of Fruitland	cityoffruitland@fruitlandia.gov

I. Hazard Mitigation Plan Updates

- Lisa Ahern, Director of Community and Economic Development at Bi-State Regional Commission, welcomed everyone to the meeting and shared that the most recent draft would be posted and available online through Bi State and the County website by Friday, February 20th, 2026.

II. Overview of Plan Content

- Lisa Ahern provided a general overview of the plan chapters. Chapters one, two, and five outline the plan, the process and participation, and maintenance, respectively. Chapter three is pretty large due to identifying and describing each of the hazards. The second half of chapter is more specific to each jurisdiction in their vulnerability assessment, land trends, and jurisdictional profile. The committee was encouraged to review the latter half of chapter three to make sure their local information was adequately captured.

III. *Mitigation Strategies*

- Lisa Ahern showed the committee chapter four of the plan which was previously sent to the committee via email. Chapter four, mitigation strategies, was largely unchanged from what was sent in from jurisdictions. Bi-State staff and Chris Jasper made small changes so that the mitigation strategies were complete and fully addressed all hazards. Lisa Ahern opened up the conversation for any comments on the strategies. County Board of Supervisor Jeff Sorensen asked if there was any mention of additional phases of the levee project and new pumps. Chris Jasper said he would look into the plan and ensure it is identified in the plan.

IV. *Draft Available*

- Lisa Ahern said that the draft plan will be available on the Muscatine County Emergency Management Agency's website and Bi-State's website. The public notice for comment will be published on February 25th, 2026. Bi-State staff is therefore asking for any changes to be shared before February 24th, 2026.

V. *Public Comment and Adoption*

- The plan will go before the Muscatine County Board of Supervisors on Monday, March 9th at 9:00am.

VI. *Next Steps for Jurisdictions*

- Bi-State asked for changes by February 24th, 2025. After the resolution is passed at the Board of Supervisor's meeting, jurisdictions are asked to prepare their own resolutions to adopt the plan and send it to Bi-State. Lisa Ahern will follow-up with jurisdictions with a draft resolution. Chris Jasper said he plans to attend all meetings of plan adoption to answer questions.

VII. *Questions*

- Lee Geertz offered her assistance to get the word out about public comment for the plan. Lisa Ahern noted it will also be sent out via email to the Stakeholder contact list.

VIII. *Adjourn*

- The committee adjourned at 1:20 pm.

APPENDIX 2-2

PUBLIC NOTICE

DRAFT

Muscatine Journal

AFFIDAVIT OF PUBLICATION

State of Florida, County of Broward, ss:

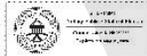
Anjana Bhadoriya, being first duly sworn, deposes and says: That (s)he is a duly authorized signatory of Column Software, PBC, duly authorized agent of The Muscatine Journal, morning edition, a daily newspaper printed and published by Lee Enterprises, Incorporated, in the City of Muscatine, Muscatine County, Iowa, and that a notice, a printed copy of which is made part of this affidavit, was published in said The Muscatine Journal, on the dates listed below.
September. 18 2025

NOTICE ID: 9fwSNyFrROxbpu7kM8nR
PUBLISHER ID: COL-IA-400953
NOTICE NAME: HAZMIT PLAN PUBLIC MEETING
Publication Fee: \$49.11

The affiant further deposes and says that all of the facts set forth in the foregoing affidavit are true as he/she verily believes.

Anjana Bhadoriya

(Signed)



VERIFICATION

State of Florida
County of Broward

Subscribed in my presence and sworn to before me on this: 09/22/2025

S. Smith

Notary Public

Notarized remotely online using communication technology via Proof.

NOTICE OF PUBLIC KICKOFF MEETING FOR MUSCATINE COUNTY MULTI-JURISDICTIONAL HAZARD MITIGATION PLAN

This notice is to invite you or another representative of your organization to the public kickoff meeting for the update to the Muscatine County Multi-Jurisdictional Hazard Mitigation Plan. The Muscatine County EMA has contracted with Bi-State Regional Commission to update the 2020 Muscatine County Hazard Mitigation Plan. In addition to Muscatine County, the EMA, schools, and the local jurisdiction representatives, the planning process requires the opportunity for input from a broad range of stakeholders and neighboring jurisdictions.

The plan will meet the requirements of the Local Mitigation Planning Policy Guide (the Guide) and Title 44 of the Code of Federal Regulations (CFR) for FEMA approval. An approved, adopted mitigation plan is a gateway to apply for FEMA Hazard Mitigation Assistance (HMA) and High Hazard Potential Dam (HHPD) grant programs. FEMA requires local governments develop and submit mitigation plans as a condition of receiving these grants and plans must be updated every 5 years in order to remain eligible. The primary legal authority for mitigation is derived from the Stafford Act, as amended by the Disaster Mitigation Act of 2000. Section 322 of the Stafford Act specifically addresses mitigation planning. This establishes the requirement that state and local governments prepare hazard mitigation plans as a precondition for receiving FEMA grants for mitigation projects.

You are invited to attend this public kickoff of the plan development which will be held via Zoom at 10:00 a.m. on September 30, 2025. To secure a link or call-in information to participate in the meeting go to www.bistateline.org/news or call Bi-State Regional Commission at the number below.

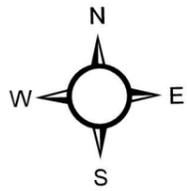
Bi-State Regional Commission will be assisting Muscatine County with the plan update, and you may contact Lisa Ahern at lahern@bistateline.org or 309-793-6300 Ext. 1122, or Chris Jasper, Muscatine County Emergency Manager at cjasper@muscatineiowa.gov or 563-264-7142 with questions regarding the project.
COL-IA-400953



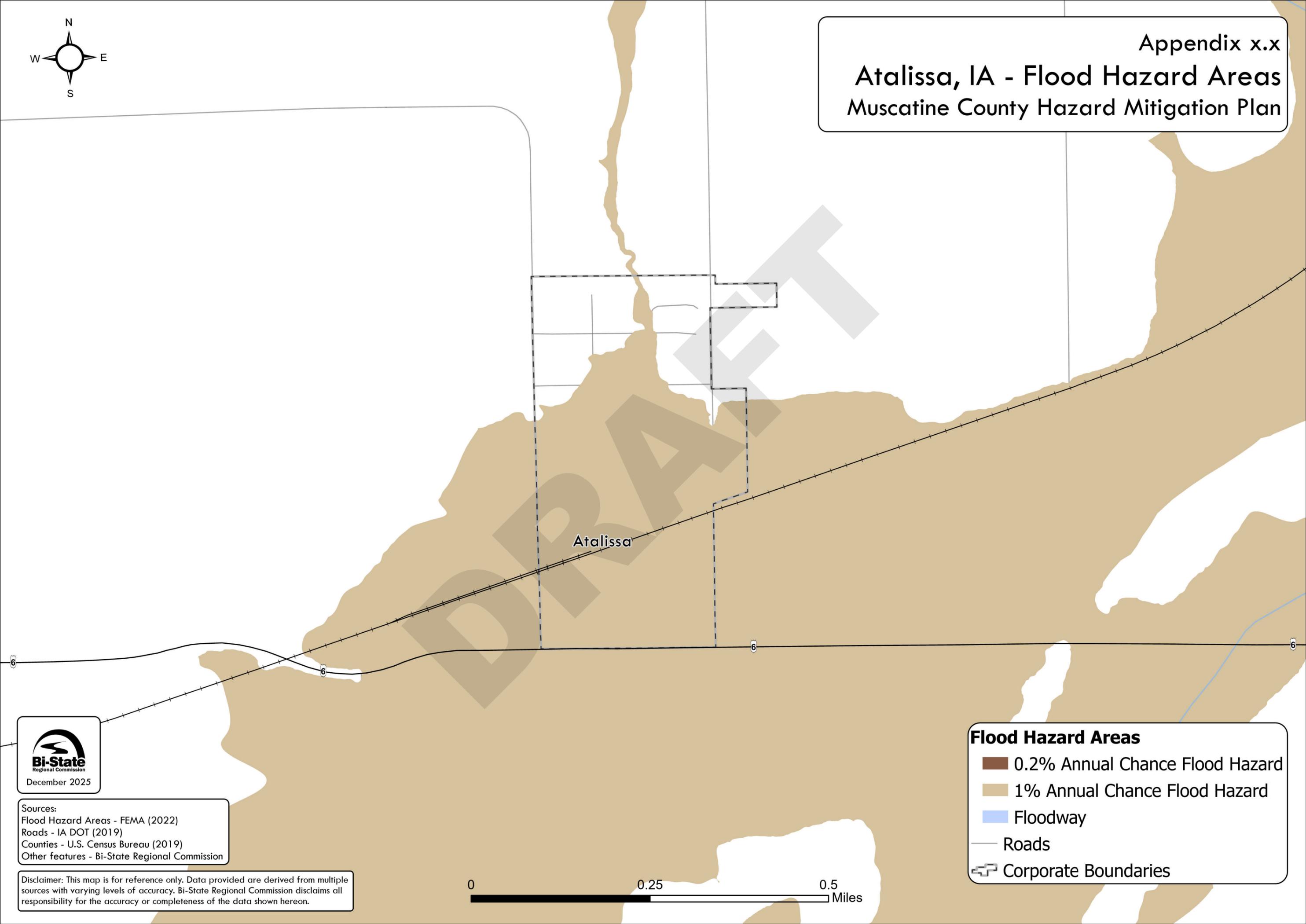
APPENDIX 3-1
FLOOD HAZARD AREA MAPS

DRAFT





Appendix x.x
Atalissa, IA - Flood Hazard Areas
Muscatine County Hazard Mitigation Plan

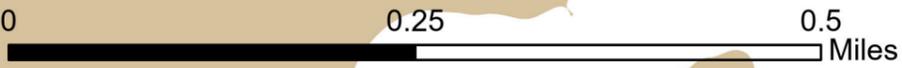


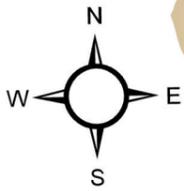
Sources:
Flood Hazard Areas - FEMA (2022)
Roads - IA DOT (2019)
Counties - U.S. Census Bureau (2019)
Other features - Bi-State Regional Commission

Disclaimer: This map is for reference only. Data provided are derived from multiple sources with varying levels of accuracy. Bi-State Regional Commission disclaims all responsibility for the accuracy or completeness of the data shown hereon.

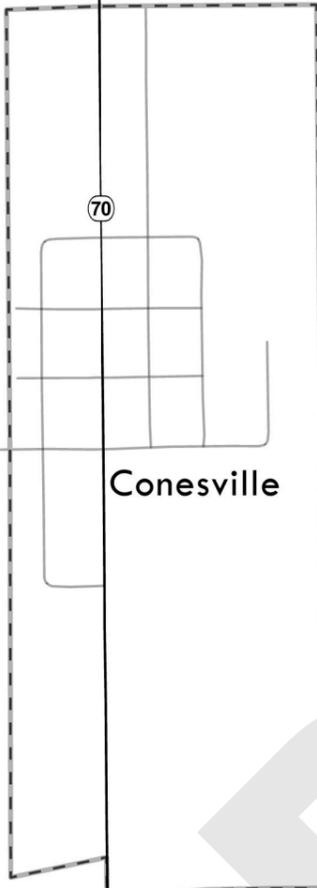
Flood Hazard Areas

- 0.2% Annual Chance Flood Hazard
- 1% Annual Chance Flood Hazard
- Floodway
- Roads
- Corporate Boundaries





Appendix x.x
Conesville, IA - Flood Hazard Areas
Muscatine County Hazard Mitigation Plan



Conesville

DRAFT



Sources:
Flood Hazard Areas - FEMA (2022)
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Counties - U.S. Census Bureau (2019)
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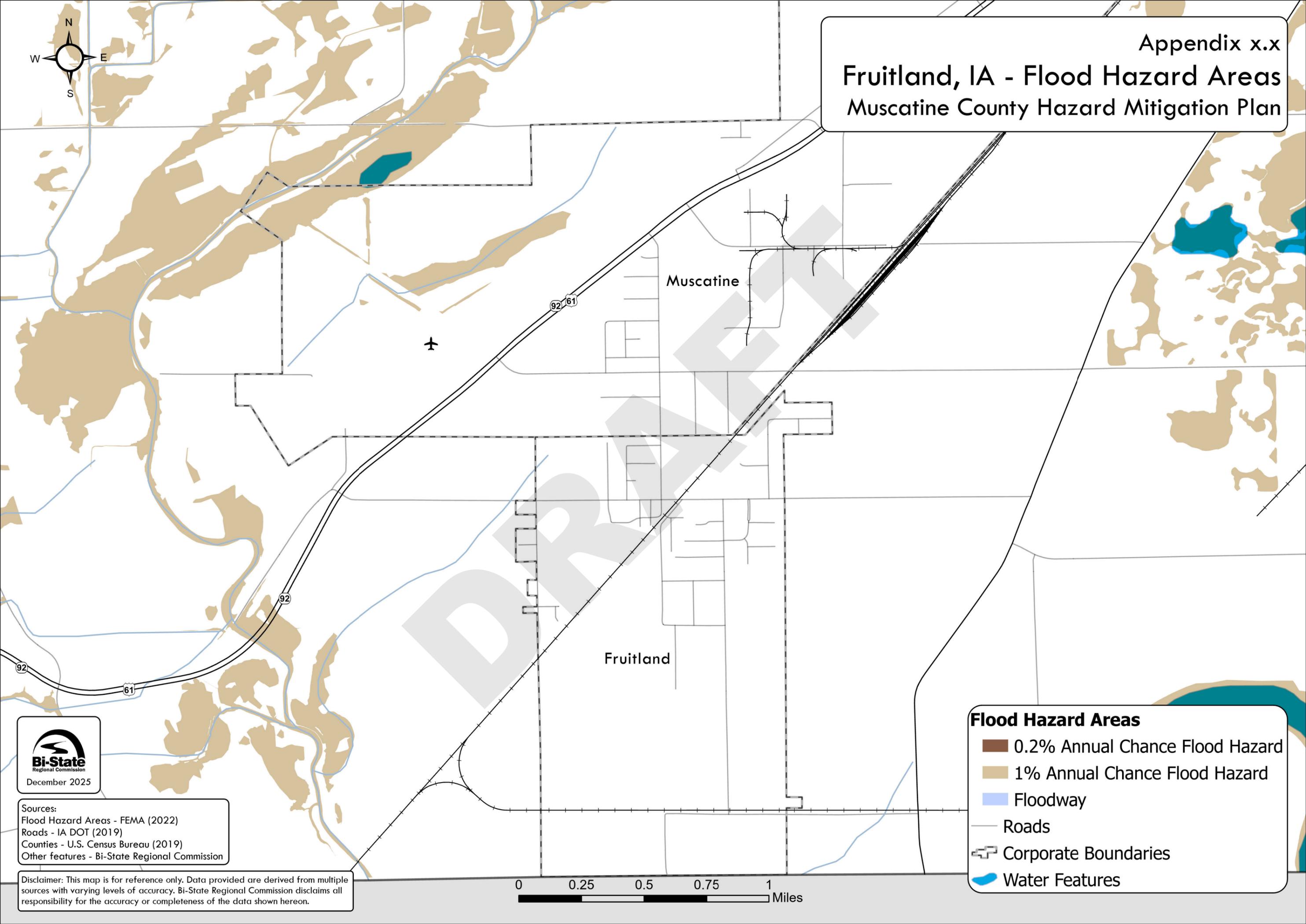
Flood Hazard Areas

- 0.2% Annual Chance Flood Hazard
- 1% Annual Chance Flood Hazard
- Floodway
- Roads
- Corporate Boundaries
- Water Features



Fruitland, IA - Flood Hazard Areas

Muscatine County Hazard Mitigation Plan



Muscatine

Fruitland

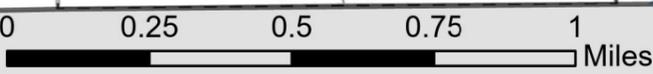
Flood Hazard Areas

- 0.2% Annual Chance Flood Hazard
- 1% Annual Chance Flood Hazard
- Floodway
- Roads
- Corporate Boundaries
- Water Features



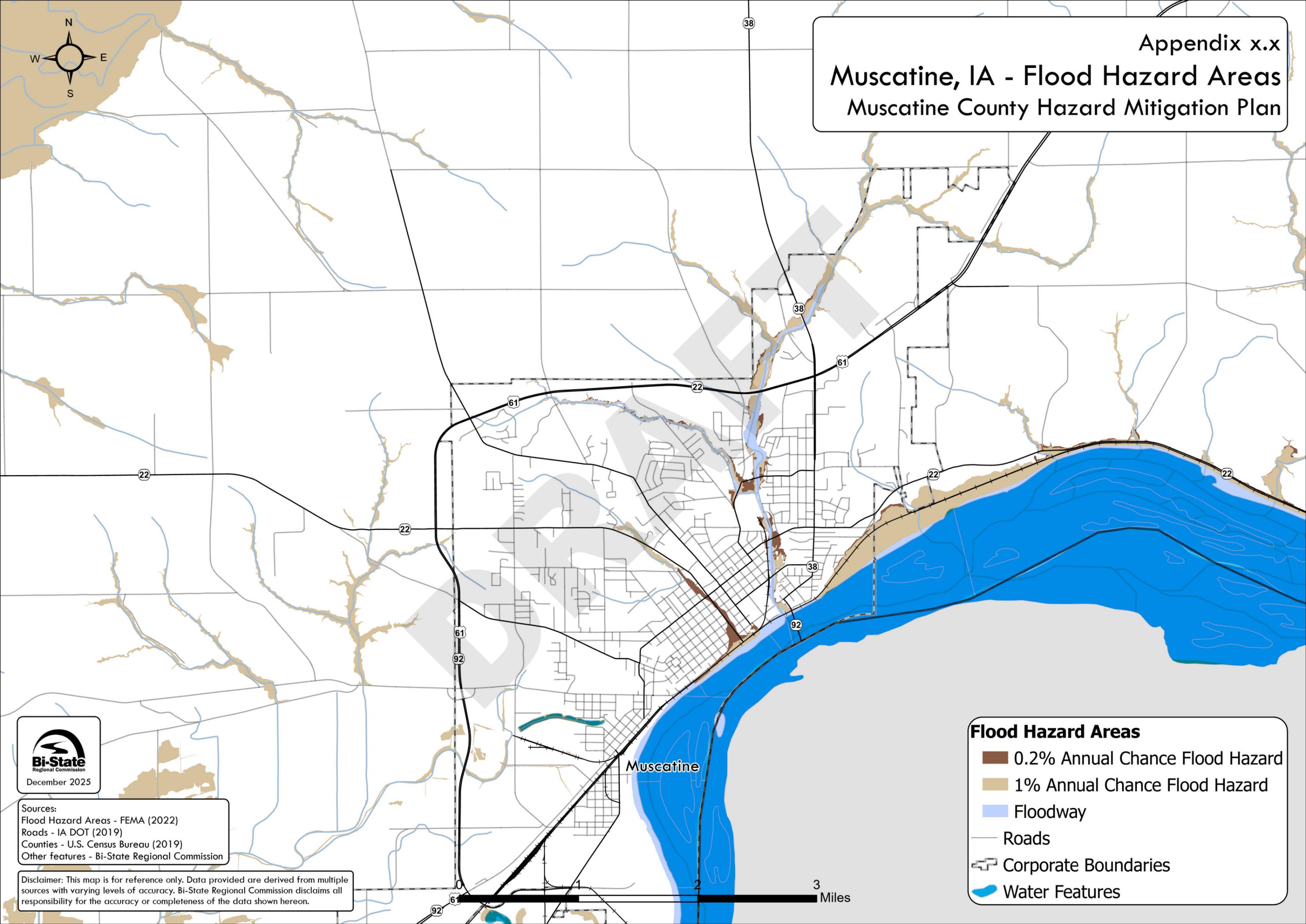
Sources:
Flood Hazard Areas - FEMA (2022)
Roads - IA DOT (2019)
Counties - U.S. Census Bureau (2019)
Other features - Bi-State Regional Commission

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Muscatine, IA - Flood Hazard Areas

Muscatine County Hazard Mitigation Plan



Sources:
Flood Hazard Areas - FEMA (2022)
Roads - IA DOT (2019)
Counties - U.S. Census Bureau (2019)
Other features - Bi-State Regional Commission

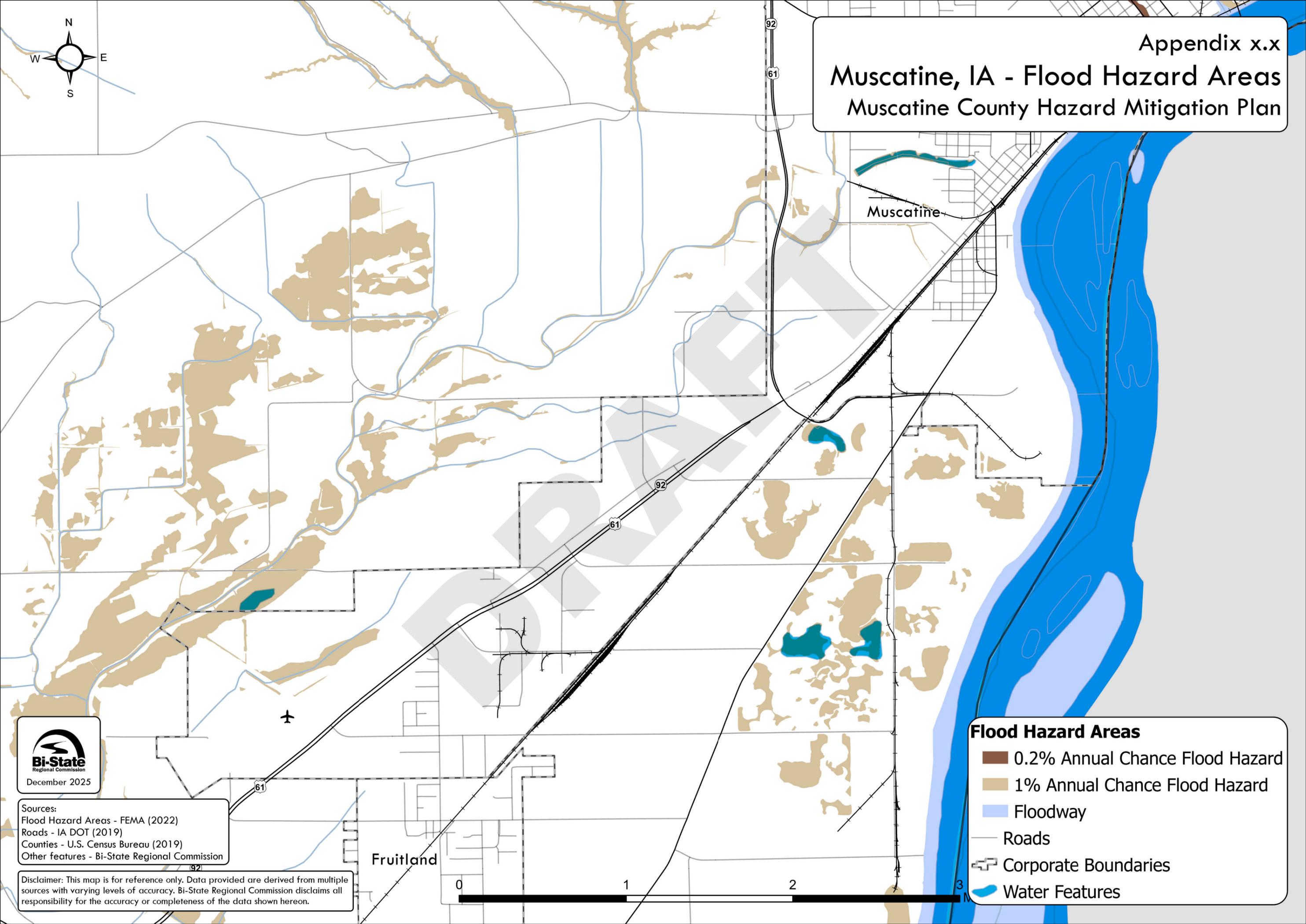
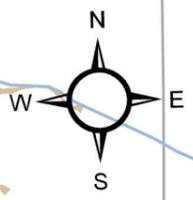
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Flood Hazard Areas

- 0.2% Annual Chance Flood Hazard
- 1% Annual Chance Flood Hazard
- Floodway
- Roads
- Corporate Boundaries
- Water Features

Muscatine, IA - Flood Hazard Areas

Muscatine County Hazard Mitigation Plan



Muscatine

Fruitland

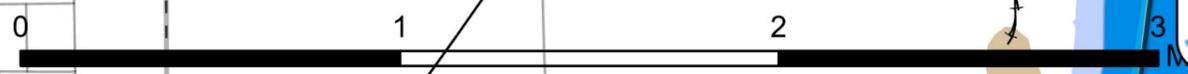


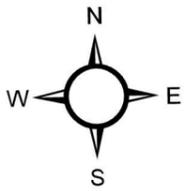
Sources:
Flood Hazard Areas - FEMA (2022)
Roads - IA DOT (2019)
Counties - U.S. Census Bureau (2019)
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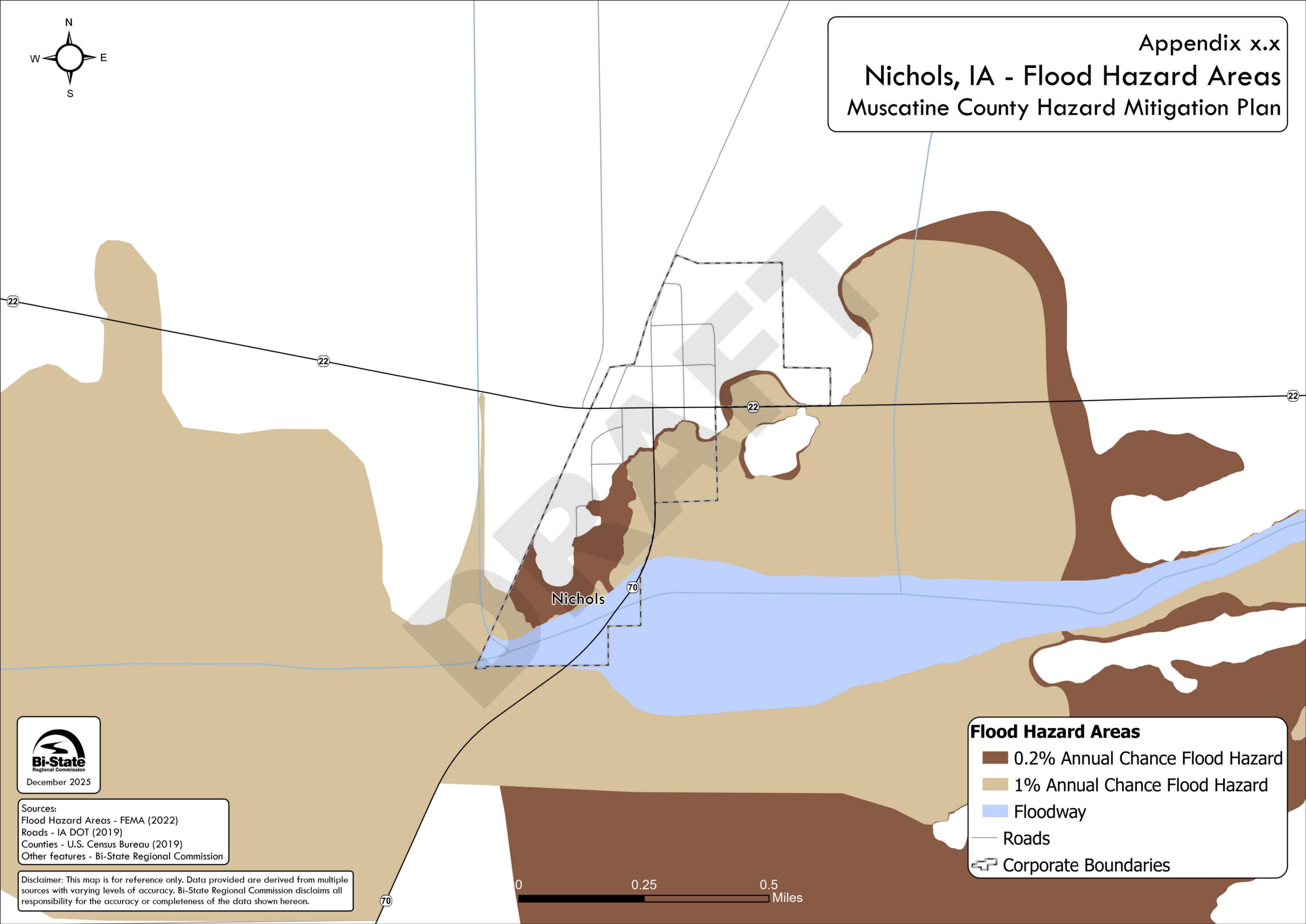
Flood Hazard Areas

- 0.2% Annual Chance Flood Hazard
- 1% Annual Chance Flood Hazard
- Floodway
- Roads
- Corporate Boundaries
- Water Features





Appendix x.x
Nichols, IA - Flood Hazard Areas
Muscatine County Hazard Mitigation Plan



Sources:
Flood Hazard Areas - FEMA (2022)
Roads - IA DOT (2019)
Counties - U.S. Census Bureau (2019)
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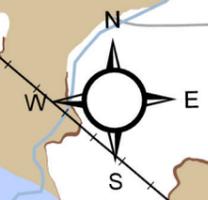
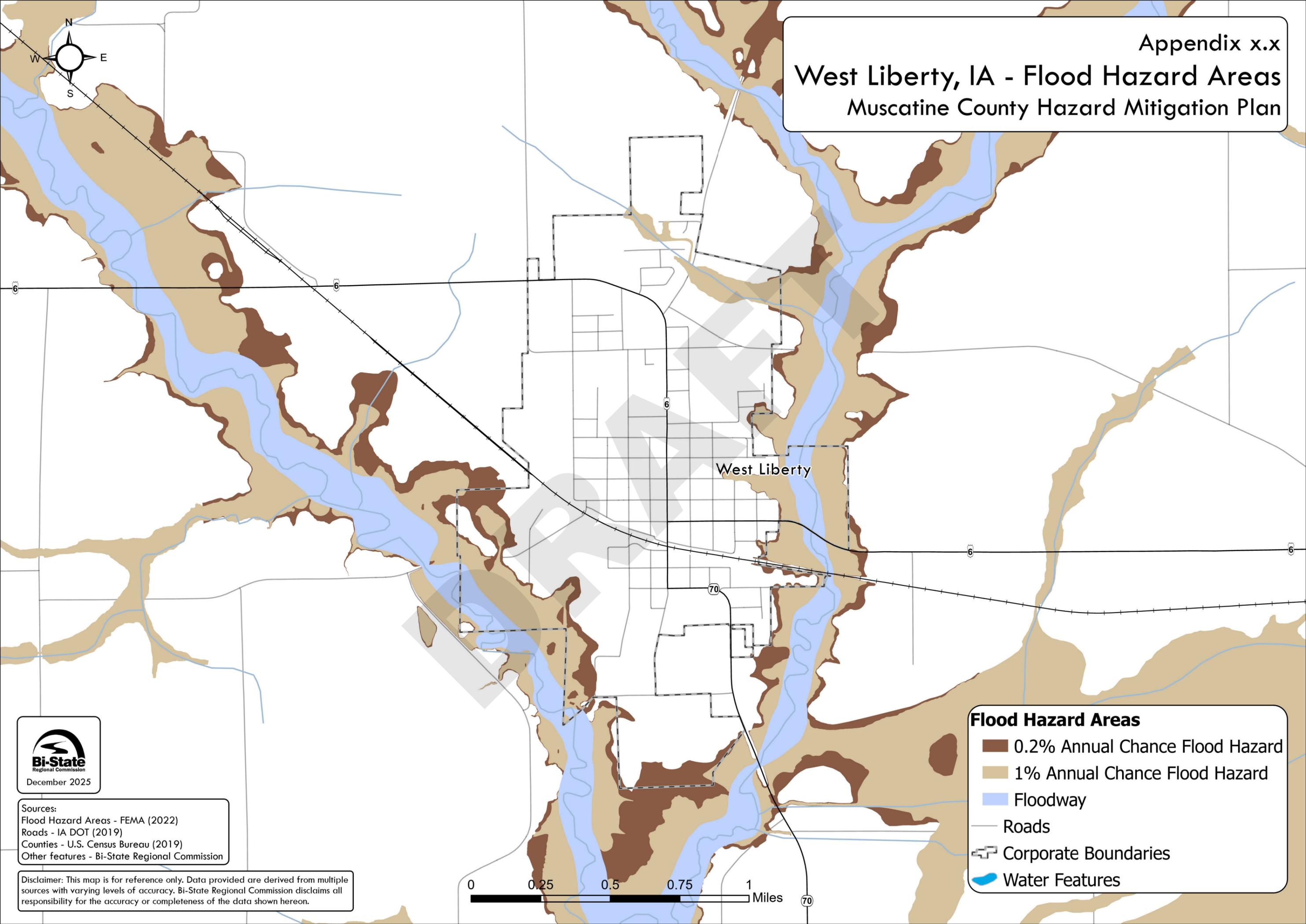
Flood Hazard Areas

- 0.2% Annual Chance Flood Hazard
- 1% Annual Chance Flood Hazard
- Floodway
- Roads
- Corporate Boundaries



West Liberty, IA - Flood Hazard Areas

Muscatine County Hazard Mitigation Plan



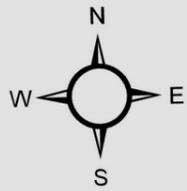
Sources:
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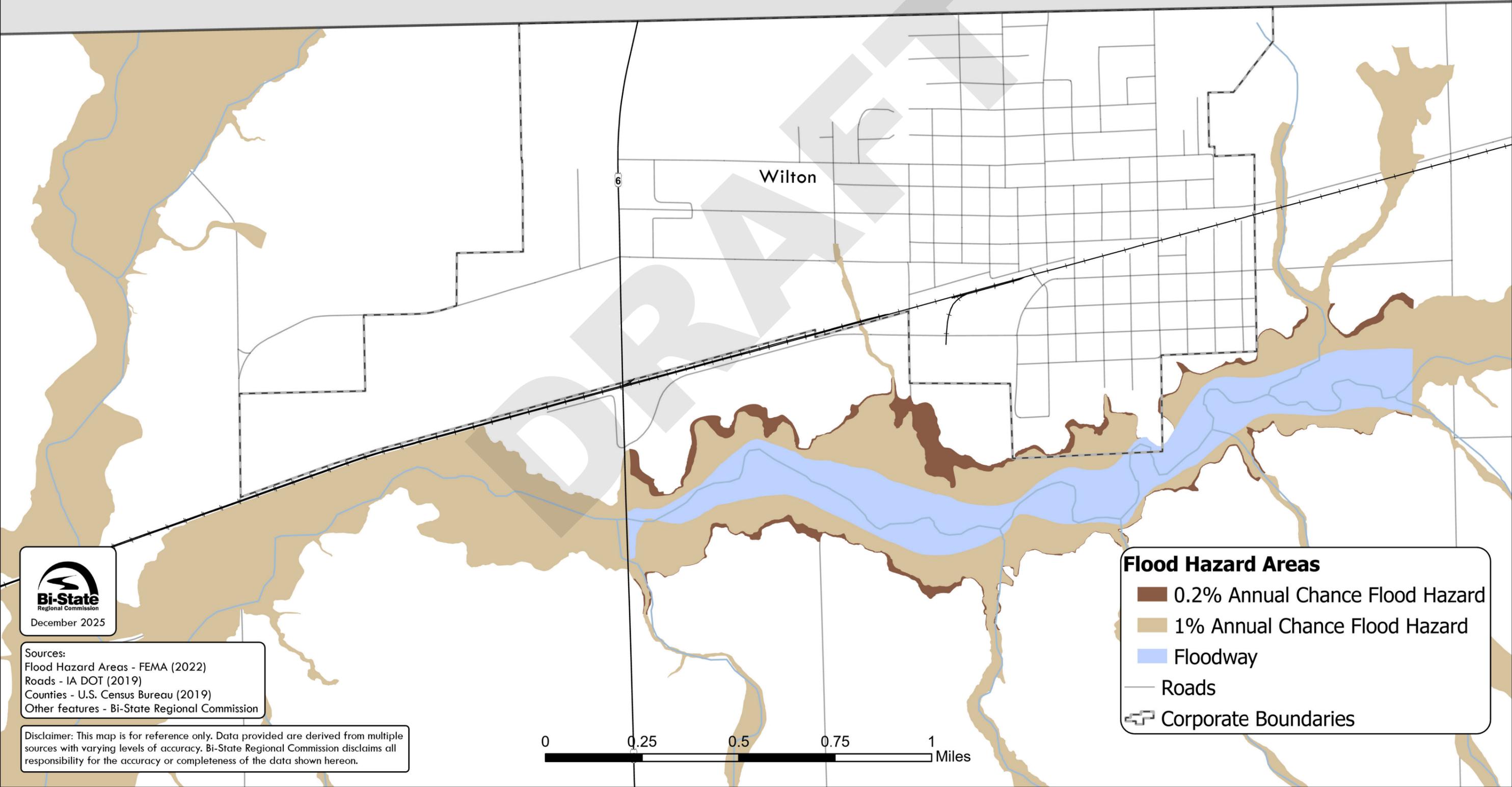
Flood Hazard Areas

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- 1% Annual Chance Flood Hazard
- Floodway
- Roads
- Corporate Boundaries
- Water Features





Appendix x.x
Wilton, IA - Flood Hazard Areas
Muscatine County Hazard Mitigation Plan



Sources:
Flood Hazard Areas - FEMA (2022)
Roads - IA DOT (2019)
Counties - U.S. Census Bureau (2019)
Other features - Bi-State Regional Commission

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Flood Hazard Areas

- 0.2% Annual Chance Flood Hazard
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- Floodway
- Roads
- Corporate Boundaries

