Muscatine County
Iowa

Multi-Jurisdictional Hazard Mitigation Plan

August 2015

Muscatine County

Multi-Jurisdictional

Hazard Mitigation Plan

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This document was prepared by:

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EXECUTIVE SUMMARY

The Muscatine County Multi-Jurisdictional Hazard Mitigation Plan Update was developed to meet the requirements of the Disaster Mitigation Act of 2000, also known as DMA 2000. DMA 2000 places increased emphasis on local mitigation planning. It requires local governments to update the 2010 mitigation plan as a condition of receiving Pre-Disaster Mitigation (PDM) and Hazard Mitigation Grant Program (HMGP) project funds from the Federal Emergency Management Agency (FEMA). In addition to supporting ongoing mitigation actions, the plan reassesses the vulnerability of the planning area to all natural hazards and one human-caused hazard. The plan also reexamines priority hazards and mitigation actions and evaluates the implementation and maintenance of the plan.

Muscatine County received a grant of HMGP planning funds to update its hazard mitigation plan. Seven of the incorporated municipalities in Muscatine County agreed to participate in order to make it a county-wide multi-jurisdictional plan. The active participation of all these jurisdictions is recorded within the plan document. Each jurisdiction that adopts the plan update receives eligibility to apply for and receive FEMA Hazard Mitigation Assistance funds.

Requirements for FEMA approval of the plan document include adoption of the plan by the local governing body. Chapter 2 of the plan documents the planning process used and public participation. The process included a Planning Committee made up of representatives of the participating jurisdictions who assisted in reviewing and refining plan draft sections. Each participating jurisdiction designated one contact to receive information and to respond to requests for data pertinent to that jurisdiction. Although other representatives may have been called on to attend meetings or respond to data requests, the primary contact structure established some continuity in the flow of information for each jurisdiction. In addition, an extended Advisory Committee was invited to represent a broader range of community interests and expertise. A list of those who received notices or attended meetings during the planning process in included in Appendix 2-5 to the document.

Chapter 3 of the plan deals with hazard analysis and risk assessment. Sixteen natural and one human-caused hazard were identified for the planning area and profiled. A scoring methodology was agreed upon by the Planning Committee and was used as an objective means of establishing an initial priority ranking of the hazards. With review and consultation of the Planning Committee, the hazards identified as a first priority for the county-wide planning area as a whole include:

- Tornado
- Severe Winter Storm
- Thunderstorm & Lightning
- Windstorm
- Flash Flood
- River Flood

As a requirement of a multi-jurisdictional plan, each individual jurisdiction has its own risk assessment section in the plan. These highlight where local conditions differ from the county-wide planning area as a whole and reflect local hazard priorities.

Chapter 4 develops the mitigation strategy. First, local hazard mitigation goals and objectives were reviewed and updated for the county-wide planning area. The Planning Committee identified mitigation actions to address a comprehensive range of categories including prevention, property protection, public education and awareness, natural resource protection, and structural projects. Using FEMA guidance, all mitigation actions considered were analyzed under STAPLEE criteria (STAPLEE is an acronym for Social, Technical, Administrative, Political, Legal, Economic, and Environmental criteria). Mitigation actions were selected to address first priority hazards with an emphasis on flood mitigation. In addition to the planning area mitigation actions, which are the responsibility of all participating jurisdictions as appropriate, each jurisdiction was required to develop at least one mitigation action specific to that jurisdiction's local priorities. The tables of priority mitigation actions provide justification for future funding requests and grant applications.

Chapter 5 describes existing planning mechanisms that will assist participating jurisdictions in implementation of priority actions. This part also outlines procedures for monitoring, evaluating, and updating the local hazard mitigation plan. Based on federal requirements, once FEMA has reviewed and approved the plan document, it must be reviewed and updated every five years or in the event of a federal Presidential Disaster Declaration, whichever comes first. Chapter 5 provides for the schedule of continued plan maintenance and continued public input.

1. PREREQUISITES

Adoption by the Local Governing Body

Muscatine County, Iowa is the subgrantee for the FEMA Hazard Mitigation Grant Program (HMGP) agreement for planning through the Iowa Homeland Security and Emergency Management Division (IHSEMD). Muscatine County is, therefore, the lead jurisdiction in a multi-jurisdictional plan process for the county and its constituent participating municipalities. As such, Muscatine County has adopted this Multi-Jurisdiction Local Hazard Mitigation Plan process and document in such form as it is approved by FEMA review. A copy of the signed resolution as adopted on (date to be determined) can be found in Appendix 1.2.

Multi-Jurisdictional Plan Adoption

The following incorporated municipalities participated in the Multi-Jurisdiction Local Hazard Mitigation planning process with Muscatine County in order to receive individual approval of the plan. A draft resolution was provided as a sample for municipalities as shown in Appendix 1.1. Each jurisdiction has adopted the plan process and document as dated below. A copy of each signed resolution as adopted is included in an Appendix 1.2.

Participating Jurisdiction	Date of Plan Adoption
City of Atalissa	
City of Conesville	
City of Fruitland	
City of Muscatine	
City of Nichols	
City of West Liberty	
City of Wilton	

Multi-Jurisdictional Planning Participation

In addition to Muscatine County, incorporated municipalities within the county participated in the local hazard mitigation plan process as listed above except for the City of Stockton and the City of Durant. The City of Stockton elected not to participate in the plan. The City of Durant was not included in the Muscatine County Hazard Mitigation Plan as the largest portion of Durant lies outside of the county. The City of Durant was contacted as part of the plan advisory group regarding information about the plan process. The West Liberty Community School District had participated in the last plan and was invited to participate in the planning process, but elected to not participate.

The remaining participating jurisdictions took part in the planning process as more fully described in the "Planning Process" section. At the initial kick-off meeting held December 12, 2012, the planning committee discussed and determined what would constitute satisfactory participation in the plan process consisting of the following: designate a primary contact; attend the majority of the planning meetings; submit required information such as list of critical facilities, development trends, and any changes to the jurisdiction since the last plan; score identified hazards from the jurisdictions perspective and explain any changes from previous plan; provide input and review of jurisdiction's risk assessment; report on progress toward previous mitigation actions; submit prioritized mitigation actions; review and comment on the plan draft;

and adopt the plan pending FEMA's approval. All of the of the above listed jurisdictions met the necessary requirements to be considered a participating jurisdiction.

Each jurisdiction designated a primary contact and assigned staff to attend meetings as part of the core planning committee. The planning committee was responsible for directing staff research, reviewing document drafts, and approving the plan process and final document. In addition to attendance at meetings, local jurisdictions responded to requests for data and provided information when conditions in an individual jurisdiction varied from the entire county-wide planning area.

2. PLAN PROCESS

Muscatine County was awarded a grant from the Federal Emergency Management Agency (FEMA) under its Hazard Mitigation Grant Program (HMGP) to develop a multi-jurisdiction local hazard mitigation plan. The grant is administered through the Iowa Homeland Security and Emergency Management Division (IHSEMD). The planning grant agreement between Muscatine County and IHSEMD was fully executed in September 2012 with an approved performance period dated from September 26, 2012 through September 28, 2015. Muscatine County contracted with Bi-State Regional Commission to guide the preparation of a local hazard mitigation plan that meets the requirements of the Disaster Mitigation Act of 2000 with a contract date to start December 1, 2012. To assure compliance with the process for developing the plan document, the Local Mitigation Plan Review Crosswalk from FEMA dated February 10, 2010 was used for guidance in meeting the requirements of the plan.

The first meeting of the Planning Committee was held on December 12, 2012. This was an introductory meeting for the municipal representatives. Bi-State staff presented a PowerPoint outline of the plan requirements as outlined in FEMA guidance, with particular note of multi-jurisdictional requirements for individual participating communities. A copy of the PowerPoint presentation is included as Appendix 2-1. The Planning Committee agreed upon a schedule of monthly meetings.

Who was Involved

Ms. Sherry Seright was designated as lead staff for Muscatine County in development of the plan and served as the principal contact person for Bi-State staff until Mr. Matt Shook was hired as the Emergency Management Director for Muscatine County. Ms. Seright made the initial contact with constituent municipalities in Muscatine County regarding planning participation. It was determined by staff to follow a direct representation model. Bi-State Regional Commission was contracted to assist with grant administration, to support the plan process, and to research and write the plan document. The core Planning Committee is made up of staff and representatives of seven participating municipalities in addition to Muscatine County as follows:

City of Atalissa

City of Conesville

City of Fruitland

City of Muscatine

City of Nichols

City of West Liberty

City of Wilton

Muscatine County

West Liberty Community School District had participated in Muscatine County's 2010 hazard mitigation plan, but elected to not participate in the update. They cited the construction of their safe room at the high school was completed since the 2010 plan and they had no plans to do

other mitigation actions within the next five years. Other school districts were contacted and invited to participate. Unfortunately, no other school districts decided to participate.

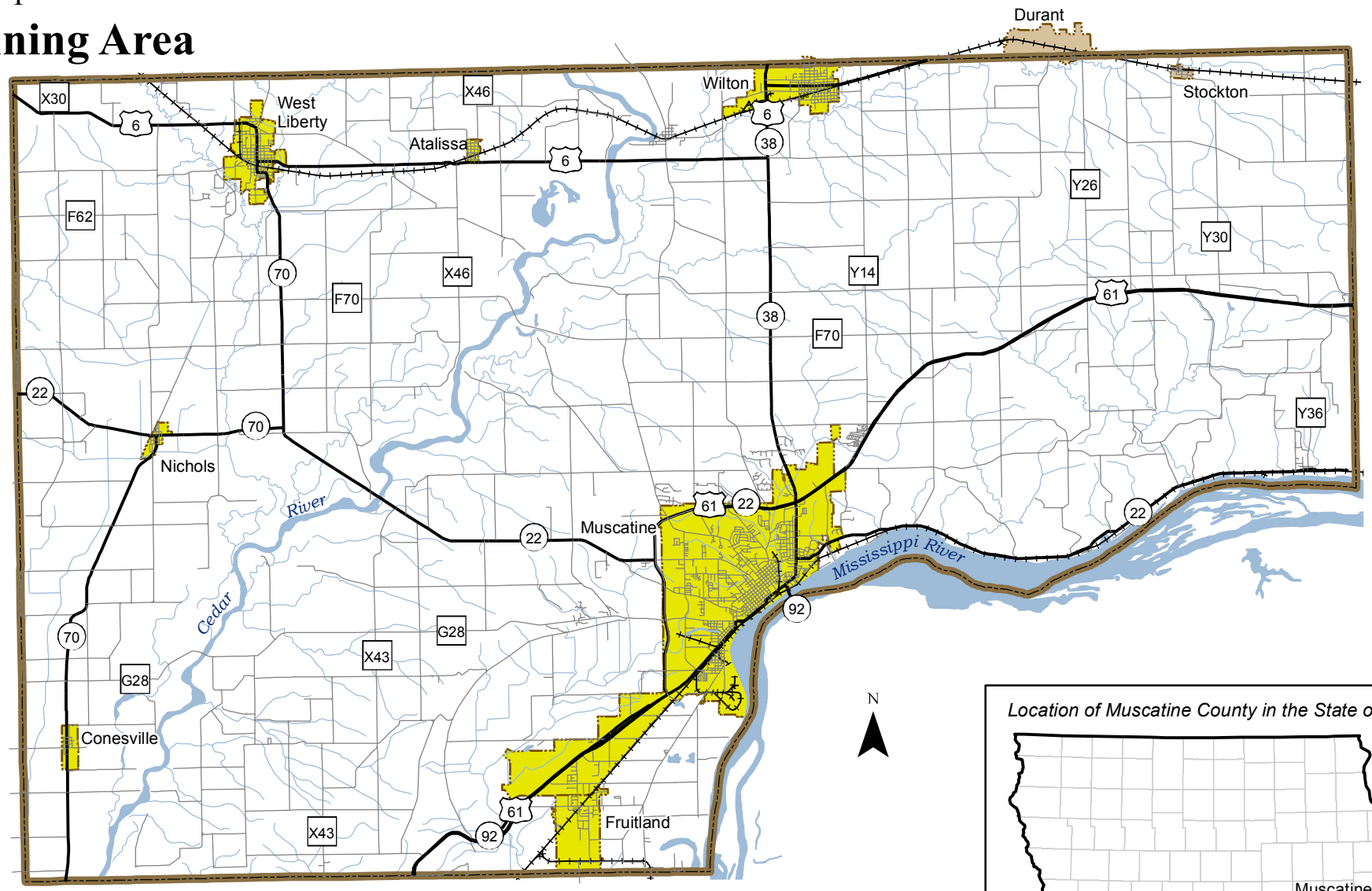
It was determined that the municipalities that agreed to participate in the multi-jurisdictional plan would designate a primary contact for all correspondence. This would follow the direct representation model as suggested in FEMA guidance for multi-jurisdictional plans. This primary contact, or another designated official or staff person, would attend planning meetings and form the core Planning Committee. The Planning Committee was be responsible for guiding decisions about the contents of the plan in relation to FEMA guidance and for reviewing staff-prepared documents. Since Planning Committee members also represented communities looking for individual FEMA approval of the multi-jurisdictional plan, they are also be responsible for noting any variation from the overall planning area for their community. Members of the Planning Committee and staff are listed in Appendix 2-2. This includes primary contacts and other community representatives who attended meetings.

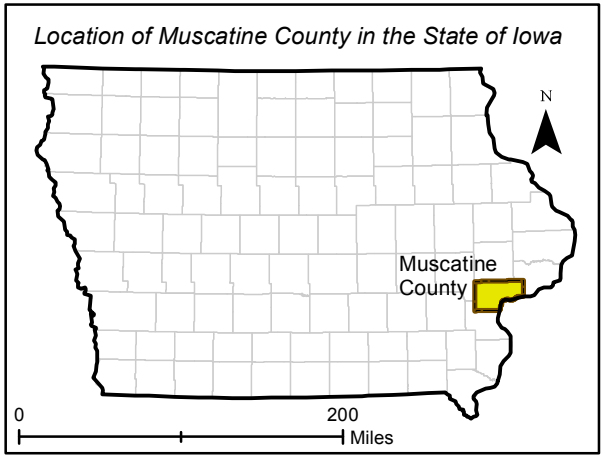
Planning Area and Map

The planning area includes all of Muscatine County with participation of constituent municipalities as described above. A base map of the planning area was developed as follows (Map 2-1 on page 7) showing jurisdictional boundaries and indicating 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 will be used to overlay identified hazard areas, vulnerable facilities, and other features with a geographic reference in following parts of the plan document.

Map 2-1

Planning Area





Map prepared by:

Bi-State Regional Commission

January 2014

0 1 2 3 4 5
Miles

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.

Legend

- Participating Communities
- Corporate Boundaries
- County Boundary
- Rivers / Water Bodies
- Highways / Major Roadways
- Roads
- Railroads
- Streams / Creeks

Advisory Group

In addition to the Planning Committee, a broader list of community groups and agencies was developed using FEMA guidance to add more participation and expertise to the planning process. Representatives were invited to participate in the planning process in an advisory capacity. They would be available to staff as resources in their respective areas of interest and provide an additional layer of review in development of document drafts. A sample list of possible contacts was brought to the Planning Committee at its first meeting. As noted in the "Prerequisites" section, the Cities of Stockton and Durant and school districts were included on the Advisory Group as neighboring communities, since they were not actively participating in the plan process. An invitation list of contacts was further developed. A copy of the invitation letter is included as Appendix 2-3. A list of agencies contacted, indicating those who actively participated, is included as Appendix 2-4. Media contacts were included in the Advisory Group invitation, which provided another opportunity for public information and participation.

Public Involvement

At its first kick-off meeting, the Planning Committee discussed public involvement and participation. It was agreed that all the scheduled Planning Committee meetings would be open to the public. Muscatine County would make use of its website to provide information about the planning process, including meeting information and schedule, 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 link to this information. In order to assure formal notification of public participation in the plan, Muscatine County would publish notice of meetings on at least two occasions (the second public notice has not been scheduled yet), once during plan draft development and once prior to adoption of the plan. Publication of such notices were be included in the three official newspapers used for countywide notices: Muscatine Journal, Wilton-Durant Advocate News, and West Liberty Index. Copies of the notices are included in Appendix 2-5. Participating jurisdictions were encouraged to have their own public meetings and staff offered to make presentations to individual communities on request. The first public meeting with formal notification was held February 13, 2013. Information was distributed that all subsequent meetings of the planning committee would be considered open to the public. Another advertised public meeting was held on August 18, 2015. It gave the public the opportunity to review the draft plan and ask questions in an open forum. The county will also hold a public hearing prior the County Board's consideration of adoption of the plan.

Existing Planning Mechanisms

In addition to the persons included in the planning process, many written resources, existing plans, studies, reports, and technical information were reviewed and incorporated into the plan process as appropriate. Technical resources used to develop the hazard profiles are referenced to each profiled hazard, but general references of note include:

- FEMA Local Hazard Mitigation Plan Review Crosswalk from the 2010 Muscatine County Multi-Jurisdictional Hazard Mitigation Plan
- FEMA State and Local Mitigation Planning How-To Guides
- 2010 and 2013 State of Iowa Hazard Mitigation Plans

– Iowa Hazard Analysis and Risk Assessment

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 by individual jurisdiction and which of those documents were utilized within the plan. There were not many changes of the list from the 2010 *Muscatine County Multi-Jurisdictional Hazard Mitigation Plan*; however, the newest changes are noted below.

Muscatine County went through an update to their Comprehensive Land Use Plan during the hazard mitigation planning process. Within the updated comprehensive plan, data related to special flood hazard areas, dams, and levees was incorporated from the hazard mitigation planning process. The plan suggested to focus on development outside of the flood hazard areas, refraining from development of flood hazard areas. It also stated development of woodlands and slopes should be treated sensitively to avoid the possibility of landslides.

The City of Muscatine also updated their comprehensive plan and included an entire chapter on the geographical and environmental conditions within the City of Muscatine. This chapter was used to identify more detailed hazard profiles and risks within the city.

Table 2-1
Record of Review

Existing Program/Policy/ Technical Documents	Did Jurisdiction Review Document? (Yes/No)	Reviewed Plan Authors and Incorporated in Plan? (Yes/No)
Muscatine County		
Comprehensive Plan 2014	Yes	Yes
Watershed Protection Plan	Yes	Yes
Emergency Response Plan	Yes	Yes
Emergency Management Plan	Yes	Yes
Zoning Ordinance	Yes	Yes
Mobile Home Park and Travel Trailer Park Ord.	Yes	Yes
Subdivision Ordinance	Yes	Yes
Building Codes	Yes	Yes
Floodplain Management Ord.	Yes	Yes
Onsite Wastewater Treatment and Disposal Systems Ord.	Yes	Yes
Site Plan Review Requirements	Yes	Yes
Flood Insurance Study (1986)	Yes	Yes
Existing Land Use Map	Yes	Yes
Elevation Certificates	Yes	
Muscatine County Trails Plan	Yes	Yes
Iowa Region 9 Long Range Transportation Plan	Yes	Yes
Bi-State Region Transit Development Plan	Yes	Yes
Comprehensive Economic Development Strategy	Yes	Yes
Well Ordinance	Yes	Yes
City of Conesville		
Public Education on Location of Storm Shelters	Yes	Yes
City of Fruitland		
Land Use Plan 2003	Yes	Yes
City of Muscatine		
Comprehensive Plan 2002 and 2013	Yes	Yes
Flood Insurance Study 1986	Yes	Yes
Mississippi River Consensus Plan 1997	Yes	No
Capital Improvement Plan	Yes	No

Table II-1 (continued)

Existing Program/Policy/ Technical Documents	Did Jurisdiction Review Document? (Yes/No)	Reviewed Plan Authors and Incorporated in Plan? (Yes/No)
City of Muscatine		
City Disaster Plan	Yes	Yes
Zoning Ordinance	Yes	No
Subdivision Ordinance	Yes	No
Building Codes	Yes	Yes
Floodplain Management Ordinance	Yes	Yes
Stormwater Management Ordinance	Yes	Yes
Site Plan Review Ordinance		No
Landscape Code		No
Solid Waste Regulations	Yes	Yes
Hazardous Waste Regulations	Yes	Yes
Architectural Review Guidelines	Yes	No
Historic Preservation Program	Yes	No
Downtown Development Program	Yes	No
Long-Range Transportation Plan	Yes	Yes
Existing Land Use Map	Yes	Yes
Elevation Certificates	Yes	No
City of Nichols		
Flood Insurance Study 1986	Yes	Yes
Building Codes	Yes	No
Zoning Ordinances	Yes	No
City of West Liberty		
Flood Insurance Study 1986	Yes	Yes
Comprehensive Plan 2006	Yes	Yes
City of Wilton		
Comprehensive Plan 2003	Yes	Yes
Zoning Ordinances	Yes	No
Emergency Response Plan	Yes	Yes
Subdivision Regulations	Yes	No
Critical Facilities Map	Yes	Yes
Existing Land Use Map	Yes	Yes

3. RISK ASSESSMENT

Identifying Hazards

An examination of all natural hazards that could possibly occur in the planning area is required for the plan. Because the hazards named are different among major resources, the Planning Committee was provided with a comparison list as follows. The first column lists natural hazards from FEMA State and Local Mitigation Planning, How-To Guide, "Understanding Your Risks: Identifying Hazards and Estimating Losses," FEMA 386-2, August 2001. The middle column comes from the 2010 *Iowa Hazard Mitigation Plan*. The right-hand column comes from the *Muscatine County Multi-Jurisdictional Hazard Mitigation Plan* adopted in 2010.

FEMA	Iowa Haz Mit Plan	Muscatine County Haz Mit Plan
Avalanche	No	No
Coastal Erosion	No	No
Coastal Storm	No	No
Dam Failure	Dam Failure	Dam Failure
—	Levee Failure	Levee Failure
Drought	Drought	Drought
Earthquake	Earthquakes	Earthquakes
Expansive Soils	Expansive Soils	Expansive Soils
Extreme Heat	Extreme Heat	Extreme Heat
Flood	River Flooding	River Flooding
—	Flash Flood	Flash Flood
Hailstorm	Hailstorms	Hailstorms
Hurricane	No	No
Land Subsidence	No	No
Landslide	Landslide	Landslide
—	Sink Holes	Sink Holes
Severe Winter Storm	Severe Winter Storms	Severe Winter Storms
Tornado	Tornadoes	Tornadoes
Tsunami	No	No
Volcano	No	No
Wildfire	Grass or Wild-land Fire	Grass or Wild-land Fire
Windstorm	Windstorms	Windstorms
—	Thunderstorm & Lightning	Thunderstorm & Lightning

The Planning Committee eliminated some hazards from further profiling because they do not occur in the planning area or their effects are not considered significant in relation to other hazards. Table 3-1 lists these hazards and provides a brief explanation for their elimination.

Table 3-1
Hazards Not Profiled in the Plan

Hazard	Explanation for Omission
Avalanche	There are no mountains in the planning area.
Coastal Erosion	The planning area is not near coastal areas.
Coastal Storm	The planning area is not near coastal areas.
Hurricane	The planning area is not near coastal areas.
Land Subsidence	There are no known subsurface void spaces in Muscatine County and no historical occurrences of this hazard.
Tsunami	The planning area is not near coastal areas.
Volcano	There are no volcanic mountains in the planning area.

In addition to the natural hazards, which are required for consideration in the local hazard mitigation plan, there are other human-caused hazards recommended for examination. These human-caused or "man-made" hazards are distinct from natural hazards in that they originate from human activity. FEMA guidance distinguishes between technological hazards as accidental events and terrorism as intentional acts.

Technological hazards include those that can arise from activities such as the manufacture, transportation, storage, or use of hazardous materials. Planning guidance suggests that it be assumed that technological emergencies are accidental and that their consequences are unintended. Intentional disruptions or acts of terrorism are considered outside of the scope of mitigation planning, where the hazard itself and its consequences are more relevant than the person causing the hazard.

The 2010 *Iowa Hazard Mitigation Plan* identifies and profiles 7 "Human-Caused Hazards."

Animal/Plant/Crop Disease
Hazardous Materials
Human Disease
Infrastructure Failure
Radiological
Terrorism
Transportation Incident

For its initial plan, the *Muscatine County Multi-Jurisdictional Hazard Mitigation Plan* included only one manmade hazard – "Hazardous Materials." At the first planning committee meeting, the 6 additional human-caused hazards in the state plan were considered in greater detail in the plan update. The planning committee decided not to include any additional manmade hazards in the plan update. These manmade hazards not covered in this plan will still be noted as secondary effects of natural hazards as appropriate. For example, an impact of "Severe Winter Storms" may be damage to power lines with resulting power outages.

Based on the process discussed above, the Planning Committee identified 16 "Natural Hazards" and 1 "Human-Caused Hazard" for Muscatine County. "Land Subsidence" has been added to the "Sinkhole" hazard profile as they are very similar hazards and can be addressed together.

These hazards are listed below and profiled in further detail in the next section.

Dam Failure
Drought
Earthquake
Expansive Soils
Extreme Heat
River Flood
Flash Flood
Hailstorm
Thunderstorm & Lightning
Landslide
Levee Failure
Severe Winter Storm
Sinkholes and Land Subsidence
Tornado
Grass or Wild-land Fire
Windstorm
Hazardous Materials Incident

Profiling Hazards

The Planning Committee elected to profile hazards similarly to the "Hazard Analysis and Risk Assessment" in the 2010 *Iowa Hazard Mitigation Plan*. Each profile contains information on:

Definition
Description including extent
Historical Occurrence
Probability (of future events)
Magnitude and Severity
Warning Time
Duration

This is a different format than the previous plan; however the information is similar and has been updated with more current information. At the top of each profile is the compiled hazard score that has been weighted by each jurisdiction's percentage of population within Muscatine County and the hazard rank. See "Prioritizing Hazards" for more information on the hazard scoring process.

The hazard profiles are provided for the entire Muscatine County planning area. As part of the multi-jurisdictional participation of this plan, additions or exceptions from the planning area are noted to the extent available and as needed within the profile as well as each individual jurisdiction's community profile.

Prioritizing Hazards

Following the review of the hazard profiles, the Planning Committee considered methodologies for evaluating the severity of the identified hazards for further consideration, ranking, and priority. The method selected following the scoring methodology outlined in the 2010 *Iowa Hazard Mitigation Plan*. This method, which is described in more detail in Appendix 3-1, uses a

4-point scale to score each of the four categories in the hazard profile worksheet. The scores are then weighted as follows:

(Probability x 0.45) + (Magnitude/Severity x 0.30) + (Warning Time x 0.15) + (Duration x 0.10) = Final Hazard Score

This provides a quantifiable system of analyzing the hazards within a flexible range and provides a consistent basis of analysis in each of the profile categories when a number of different representatives are scoring.

Representatives of the participating jurisdictions on the Planning Committee were asked to score all of the profile hazards from the perspective of their own communities. Each jurisdiction's hazard scorings are included in Appendix 3-2. The total scores for each hazard as reported by each jurisdiction were recorded in Table 3-2 with the five highest scoring hazards in each jurisdiction shaded.

Table 3-2
Individual Jurisdiction Hazard Scores

Participants	Dam Failure	Drought	Earthquake	Expansive Soils	Extreme Heat	Flash Flood	Grass & Wild-land Fire	Hailstorm	Hazardous Materials	Landslide	Levee Failure	River Flood	Severe Winter Storms	Sinkholes & Land Subsidence	Thunderstorm & Lightning	Tornado	Windstorm
Muscatine County	1.9	2.2	1.75	1.35	2.1	2.55	2.45	1.6	1.2	1.3	1.6	2.5	3	1.75	2.6	2.2	2.6
Atalissa	1	1.6	1	1.3	2.85	1.45	2.65	2.35	1.75	1	1	1	2.15	1.65	2.5	3.25	2.45
Conesville	1	2.05	1	1.3	2.95	2.35	3.3	1.45	2.15	1.45	1.45	1.3	2.1	1.55	3.35	3.25	3.35
Fruitland	1	2.05	1	1	1.65	1.85	1.45	1.75	1.45	1	2.5	2.5	2.1	1	1.3	2.65	1.3
Muscatine	1.6	2.65	2.05	1	2.1	3	1.45	2.8	2.9	1.45	2.35	3.1	3	1.55	3	3.7	3
Nichols	1	2.05	2.05	1	2.55	2.35	2.75	2.3	2.85	1	2.35	1	3.15	1	3.3	2.4	3.3
West Liberty	1	2.05	1.95	1	2.55	2.9	2.95	2.6	2.9	1	1.45	3.15	4	1	3.8	3.7	2.75
Wilton	1.45	2.05	1.75	1.45	2.55	2.8	3.2	2.65	2.7	1.45	1.45	1.85	2.75	1.45	3.2	3.45	2.65
Average Score	**1.24**	**2.09**	**1.57**	**1.18**	**2.41**	**2.41**	**2.53**	**2.19**	**2.24**	**1.21**	**1.77**	**2.05**	**2.78**	**1.37**	**2.88**	**3.08**	**2.68**
County-Wide Hazard Rank	**15**	**10**	**13**	**17**	**6**	**7**	**5**	**9**	**8**	**16**	**12**	**11**	**3**	**14**	**2**	**1**	**4**

In order to determine planning area-wide hazard scores, the Planning Committee elected to use a weighted scoring system. This system multiplies each jurisdiction's hazard scores by the percentage of their population within the county. The Planning Committee believes this methodology more accurately represents populations that may have a greater threat of specific hazards. The weighted scores are recorded in Table 3-3. An individual assessment for each participating jurisdiction based on hazard scoring and community profile information is given in the "Multi-Jurisdictional Risk Assessment" in a later section.

Table 3-3
Hazard Scores Weighted by Percentage of Total County Population

Participants	Dam Failure	Drought	Earthquake	Expansive Soils	Extreme Heat	Flash Flood	Grass & Wild-land Fire	Hailstorm	Hazardous Materials	Landslide	Levee Failure	River Flood	Severe Winter Storms	Sinkholes & Land Subsidence	Thunderstorm & Lightning	Tornado	Windstorm
Muscatine County	0.50	0.58	0.46	0.35	0.55	0.67	0.64	0.42	0.32	0.34	0.42	0.66	0.79	0.46	0.68	0.58	0.68
Atalissa	0.01	0.01	0.01	0.01	0.02	0.01	0.02	0.02	0.01	0.01	0.01	0.01	0.02	0.01	0.02	0.02	0.02
Conesville	0.01	0.02	0.01	0.01	0.03	0.02	0.03	0.01	0.02	0.01	0.01	0.01	0.02	0.02	0.03	0.03	0.03
Fruitland	0.02	0.05	0.02	0.02	0.04	0.04	0.03	0.04	0.03	0.02	0.06	0.06	0.05	0.02	0.03	0.06	0.03
Muscatine	0.86	1.42	1.10	0.54	1.12	1.61	0.78	1.50	1.55	0.78	1.26	1.66	1.61	0.83	1.61	1.98	1.61
Nichols	0.01	0.02	0.02	0.01	0.02	0.02	0.02	0.02	0.02	0.01	0.02	0.01	0.03	0.01	0.03	0.02	0.03
West Liberty	0.09	0.18	0.17	0.09	0.22	0.25	0.26	0.23	0.25	0.09	0.13	0.28	0.35	0.09	0.33	0.32	0.24
Wilton	0.10	0.13	0.11	0.10	0.17	0.18	0.21	0.17	0.18	0.10	0.10	0.12	0.18	0.10	0.21	0.23	0.17
Total Score	**1.59**	**2.41**	**1.90**	**1.13**	**2.18**	**2.81**	**2.00**	**2.41**	**2.39**	**1.35**	**2.00**	**2.80**	**3.04**	**1.53**	**2.94**	**3.25**	**2.81**
County-Wide Hazard Rank	**14**	**8**	**13**	**17**	**10**	**5**	**12**	**7**	**9**	**16**	**11**	**6**	**2**	**15**	**3**	**1**	**4**

With the numerical scoring system, the relative ranking of hazard scores seems to stimulate more discussion and analysis than individual hazard scores. The weighted hazard scores were ranked from highest to lowest and initially divided into thirds, reflecting a relative high, medium, and low ranking.

Table 3-4
Rank Order Based on Weighted Scoring from Highest to Lowest

2010 Plan			Updated		
First Third			**High**		
1	Windstorm	21.54	1	Tornado	3.25
2	Thunderstorm & Lightning	21.14	2	Severe Winter Storm	3.04
3	Severe Winter Storm	19.55	3	Thunderstorm & Lightning	2.94
4	Hailstorm	19.19	4	Windstorm	2.81
5	Tornado	18.74	5	Flash Flood	2.81
6	Hazardous Material	17.71	6	River Flood	2.80
Second Third			**Medium**		
7	Flash Flood	17.26	7	Hailstorm	2.41
8	Extreme Heat	15.71	8	Drought	2.41
9	Levee Failure	15.34	9	Hazardous Materials	2.39
10	River Flood	15.12	10	Extreme Heat	2.18
11	Grass & Wild-land Fire	14.40	11	Levee Failure	2.00
12	Drought	12.80	12	Grass & Wild-land Fire	2.00
Last Third			**Low**		
13	Earthquake	11.75	13	Earthquake	1.90
14	Landslide	8.79	14	Dam Failure	1.59
15	Sinkholes	8.75	15	Sinkholes & Land Subsidence	1.53
16	Expansive Soil	8.22	16	Landslide	1.35
17	Dam Failure	7.74	17	Expansive Soils	1.13

The results of the hazard scoring and initial numerical ranking were presented to the Planning Committee for review and discussion. The general descriptions of priority groups used in the 2010 were reviewed, and the Planning Committee decided to keep the definitions the same. Instead of using First, Second, and Third tier priories as the group names, they were renamed to High, Medium, and Low priorities. The definitions are:

High Priority: 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 Priority: These are hazards that should be addressed, but which have a lower priority or are longer term in focus. For the Medium Priority, emphasis is on risk reduction.

Low Priority: These are hazards that 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.

Using these priority definitions and local knowledge of hazard occurrence and risk, the numerical rankings were adjusted slightly from Table 3-4. "Hazardous Materials" was raised to a high priority and "Hailstorm" was lowered to a low priority. Table 3-5 shows the updated priority rankings compared to the priorities from the 2010 plan.

Table 3-5
Adjusted Rankings Based on Priority Definitions

First Priority
Thunderstorm & Lightning
Severe Winter Storm
Tornado
Hazardous Materials
River Flood
Flash Flood
Second Priority
Windstorm
Hailstorm
Extreme Heat
Levee Failure
Grass & Wild-land Fire
Third Priority
Drought
Earthquake
Landslide
Sinkholes
Expansive Soils
Dam Failure

High
Tornado
Severe Winter Storm
Thunderstorm & Lightning
Flash Flood
River Flood
Hazardous Materials
Windstorm
Medium
Drought
Extreme Heat
Levee Failure
Grass & Levee Failure
Low
Earthquake
Dam Failure
Hailstorm
Sinkholes & Land Subsidence
Landslide
Expansive Soils

These final priority rankings and weighted scores are also repeated on the hazard profile worksheets.

Although "Hazardous Materials" was originally ranked 9th in the weighted hazard scores, the Planning Committee elevated its priority due to the large presence of hazardous materials from industrial businesses in the county. "Windstorm" now appears as a high priority due to the acknowledgement that windstorms can carry as much danger as some tornadoes. "Hailstorm" was lowered to a low priority because the baseline level of protection is adequate to the Planning Committee.

Because the high priority hazards contain the greatest and most immediate threat to the planning area, the Planning Committee agreed to focus on high priority hazards in developing the mitigation strategy for the county-wide 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. This will be analyzed further in the "Multi-Jurisdictional Assessment" section.

Hazard Profile Worksheets

Dam Failure

Dam failure is the uncontrolled release of impounded water resulting in downstream flooding, which can affect life and property. Flooding, earthquakes, blockages, landslides, lack of maintenance, improper operation, poor construction, vandalism, or terrorism cause dam failures. Dams are constructed for a variety of uses, including flood control, erosion control, water supply impoundment, hydroelectric power generation, and recreation.

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 because of development downstream from the dam since its construction. Older dams may not have been built to the standards of its new classification. Below are the hazard classifications defined by Iowa Department of Natural Resources.

> **High Hazard:** A structure shall be classified as a high hazard if located in an area where failure may create a serious threat of loss of human life or result in serious damage to residential, industrial, or commercial areas; important public utilities; public buildings; or major transportation facilities.
>
> **Moderate (Significant) Hazard:** A structure shall be classified as a significant hazard if located in an area where failure may damage isolated homes or cabins, industrial or commercial buildings, or moderately traveled roads or railroads or interrupt major utility services without substantial risk of loss of human life. In addition, structures where the dam and its impoundment are themselves of public importance, such as dams associated with public water supply systems, industrial water supply, public recreation, or is an integral feature of a private development complex shall be considered significant hazard for design and regulator purposes unless a higher hazard class is warranted.
>
> **Low Hazard:** A structure shall be classified as a low hazard if located in an area where damages from a failure would be limited to loss of the dam, loss of livestock, damages to farm outbuildings, agricultural lands, and lesser used roads, and where loss of human life is considered unlikely.

Dam hazard potential classifications have nothing to do with the material condition of a dam, only the potential for death or destruction due to the size of the dam, the size of the impoundment, and the characteristics of the area downstream of the dam. The Iowa Department of Natural Resources tracks all dams in the State of Iowa with a height of at least 25 feet or a total storage of at least 50 acre feet of water. The inventory excludes all dams less than 6 feet high regardless of storage capacity and dams less than 15 acre feet of storage regardless of height.

With increased attention to sound design, quality and construction, and continued maintenance and inspection, dam failure probability can be reduced. It is important to consider that by 2020, 85% of the dams in the United States will be more than 50 years old (the design life of a dam). In Iowa, 41% of dams will be more than 50 years old in 2020. This reflects the need to consider and encourage dam failure emergency action plans for high and significant hazard dams. In the 2010 *Iowa Hazard Mitigation Plan*, the State Hazard Mitigation Team (SHMT) analysis

evaluated the probability that a dam failure in Iowa has a low chance of occurrence in any given year.

Fifteen dams are identified in Muscatine County according to data from Iowa Department of Natural Resources (IDNR). Nine of those dams are listed with low hazard potential. These dams are generally for small and privately-owned ponds used for fish ponds or recreation and are located in undeveloped or agricultural areas. Six of the dams are identified with significant hazard potential according to the IDNR. One of the dams is the federal navigation dam on the Mississippi River at Lock & Dam #16. The federal dams on the Mississippi River listed in the National Inventory of Dams (NID) include the U.S. Army Corps of Engineers (USACE) Lock and Dam # 16. The federal dams are listed in the category of significant hazard by USACE related to navigational use. Generally, the flood wave caused by a catastrophic breach of a navigation dam would be contained in the existing floodway channel, and there would not be extensive flooding or major loss of life. As a result, Lock & Dam #16 is listed with a low hazard potential in the IDNR list. No high hazard dams are located in the planning area.

The IDNR Dam Safety Program Management Tools or USACE with moderate/significant hazard potential are listed below. For security and safety concerns, the map of dams and levees within Muscatine County has not been included.

HON Dam (City of Muscatine)
Leutzinger-Lowe Watershed Site M-1
Muscatine County Roadgrade Dam 14-77-1E (Montpelier)
Muscatine Power & Water Dam
Southlawn Addition Dam
Whispering Pines Dam

Inundation areas for the county's 15 dams are not available at this time, but will be included in future plan updates as they become available. Data on the costs associated with specific dam failures is not available at this time.

Probability. There have been two historical occurrences of dam failure in the State of Iowa. One occurred in 1968 in Waterloo when the Virden Creek Dam failed. The incident claimed one life, and the dam is no longer in existence. The second occurrence happened at the Lake Delhi Dam in July of 2010 when a 92-year-old dam was breached at a nine-mile-long lake that was owned by a local homeowner's recreation association. The breach caused significant property loss, an evacuation of as many as 700 near the dam, as well as severe economic effects to the tourism industry in the area. No dam failures have occurred in Muscatine County.

Magnitude and Severity. People and property along streams are most vulnerable. Facilities and lives considerable distances from the actual impoundment are not immune from the hazard. Depending on the size and volume of the impoundment as well as the channel characteristics, a flash flood can travel a significant distance. As inundation areas are identified, more specific information related to vulnerability and the severity of effects will be obtained and incorporated into the plan.

The area affected following a dam failure would be limited to those areas in and near the floodplain. People and property outside the floodplain could also be affected depending on the proximity to the dam and the height above the normal stream level.

The severity of damage could range from property damage, if a small subdivision impoundment failed, all the way to multiple deaths, injuries, and extensive property damage if a large high hazard dam, such as a Saylorville Reservoir, failed upstream of Des Moines. Operations could be affected by communications loss, critical facility damage/destruction, etc. Worst case scenario could involve whole subdivisions being swept away by the fast flowing water.

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

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

Sources	
State of Iowa	*Iowa Hazard Mitigation Plan, 2010 and 2013*
Iowa Department of Natural Resources	*Dam Safety Program, Jan. 2013*
Muscatine County	*Muscatine County Multi-Jurisdictional Hazard Mitigation Plan 2010*
Local sources	*USACE, Rock Island District*

Drought

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

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

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

Droughts can be spotty or widespread and last from weeks to a period of years. A prolonged drought can have a serious economic impact on a community. Increased demand for water and electricity may result in shortages of resources. Moreover, food shortages may occur if agricultural production is damaged or destroyed by a loss of crops or livestock. While droughts are generally associated with extreme heat, droughts can and do occur during cooler months.

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

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

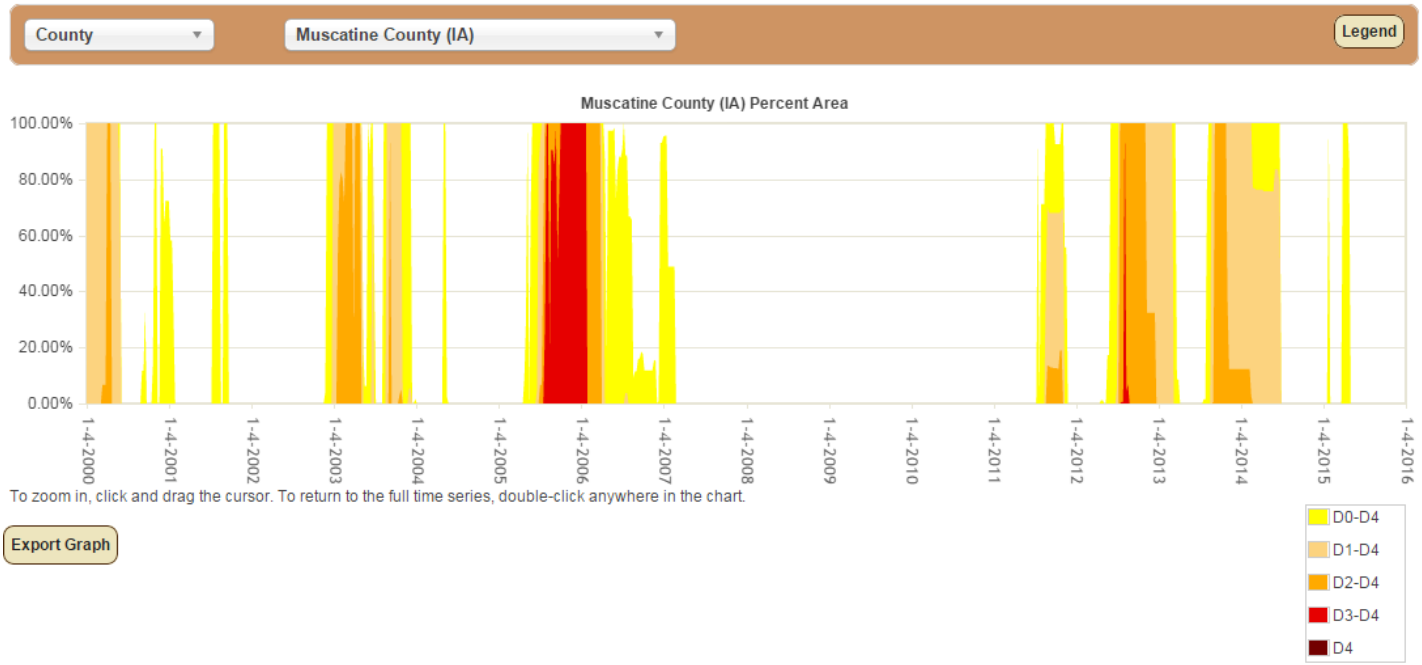
The National Drought Mitigation Center has a Drought Severity Classification system that takes into account the Palmer Drought Index, soil moisture, streamflow, and the Standardized Precipitation Index. It also looks at droughts as both short term and long term. Below is a table explaining the classification system and a graph showing droughts from 2000 until March 2015.

Drought Severity Classification

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

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

U.S. Drought Monitor Statistics Graph



According to the National Climatic Data Center, there have been four drought periods reported for Muscatine County between 01/01/1995 and 02/28/2015. Noticeable droughts include:

August 1995: A statewide drought, the dry weather conditions combined with well above normal temperatures produced the 4th warmest August in Iowa's history. Yield losses were greatest over southern Iowa where plantings were delayed by excessive spring rainfall. The dry conditions resulted in deterioration of corn and soybean crops.

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

July 2005 – March 2006: The drought of 2005-2006 began with below normal precipitation in June 2005, creating an official drought by July 2005. The drought conditions combined with high heat created unfavorable growing conditions for crops. By August 2005, Iowa's governor declared most of eastern Iowa an Agricultural Disaster Area. November 2005 marked the 10th consecutive month with below normal precipitation with the eastern ⅔ of Iowa in the Extreme Drought category. By March 2006, the drought begun to shrink in size and scope, and 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). By August 2012, Muscatine County along with 42 other counties in Iowa had been declared a primary natural disaster area by USDA. (On August 7, 2012 Muscatine County was listed as a D3- Extreme Drought conditions by the National Drought Mitigation Center). By the beginning of 2013, Muscatine County's conditions had improved and on March 19, 2013 was listed as D0 - Abnormally Dry conditions.

August 2013 to June 2014: After a wet start to the summer, atmospheric conditions developed in July through September that lead to less precipitation falling across the region. This lead to Severe Drought conditions that were not fully alleviated until the middle of June 2014.

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

Magnitude/Severity. Those dependent on rain would be the most vulnerable to a drought. This means that agriculture, agribusiness, and consumers (if the drought lasted long enough or affected a large area) would be affected. A drought limits the ability to produce goods and provide services. Because citizens draw their drinking water from surface water and groundwater sources, a prolonged severe drought may affect all citizens if there were to be a

dramatic drop in the stream flow coupled with the drop in the water table. Fire suppression can also become a problem due to the dryness of the vegetation and possible lack of water. According to the 2010 *Iowa Hazard Mitigation Plan*, Muscatine County has an annual loss estimate of $2,082,964 due to drought conditions. The Natural Resource Defense Council reported that the total Federal Crop Insurance Claims money paid out to Muscatine County farms in 2012 totaled $7,218,759.

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

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

Sources	
State of Iowa, IHSEMD	*Iowa Hazard Mitigation Plan, 2010 and 2013*
National Drought Mitigation Center	*http://drought.unl.edu/Home.aspx*
National Climatic Data Center	*http://www.ncdc.noaa.gov/stormevents/*
National Weather Service, Quad Cities	*http://www.crh.noaa.gov/dvn/*
Natural Resources Defense Council	*http://www.nrdc.org/water/your-soil-matters/*
NOAA, NWS Climate Prediction Center	*http://www.cpc.ncep.noaa.gov/products/expert_assessment/seasonal_drought.html*
FEMA	*http://www.ready.gov/drought*
State of Iowa Governor's Office, Iowa Drought 2012	*http://www.governor.iowa.gov/drought*
National Integrated Drought Information System	*http://www.drought.gov/portal/server.pt/community/drought_gov/202*
U.S. Drought Monitor	*http://droughtmonitor.unl.edu/*
American Red Cross	*http://www.redcross.org/prepare/disaster/drought*

Earthquake

An earthquake is any shaking or vibration of the earth that may impose a direct threat to life and property. An earthquake is 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 that is currently used in the United States is the Modified Mercalli Intensity Scale, which was developed in 1931, and contains 12 levels of increasing intensity, ranked by observed effects.

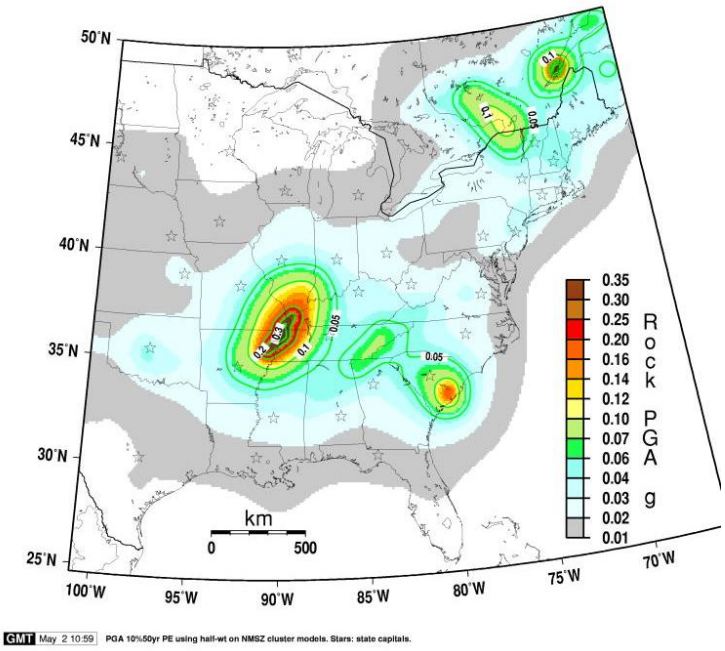
Modified Mercalli Intensity Scale	
LEVEL	**DEFINITION**
I	Not felt except by a very few under especially favorable conditions.
II	Felt only by a few persons at rest, especially on upper floors of buildings.
III	Felt quite noticeably by persons indoors, especially on upper floors of buildings. Many people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

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

Muscatine County is located in seismic risk zone 0; which is an area with very low probability of damaging ground motion. This does not mean that the area is not vulnerable to earthquake effects. Most structures in Iowa are not built to earthquake standards, but because of the relatively low magnitude of a possible quake, property damage would be minor foundational damage. The most vulnerable structures are those built on poorly consolidated substrate, especially floodplain materials.

The following 2008 USGS map shows that Iowa is located in low risk zones on the Peak Ground Acceleration Map for the New Madrid Fault.

CEUS PGA 10%/50 years, 2008



According to the State of Iowa Geological Survey, there have been 13 earthquakes in the state between 1867 and 2004, and none have occurred in Muscatine County. The largest earthquake in the State of Iowa occurred in neighboring Scott County (and the State of Iowa) in the City of Davenport on November 12, 1934. That earthquake registered as a VI on the Modified Mercalli Intensity Scale.

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

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

Magnitude/Severity. 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. The most vulnerable structures in the county would be those built on poorly consolidated substrate, especially floodplain materials. 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 injuries limited to falls and injury from unsecured objects.

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

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

Sources	
State of Iowa, IHSEMD	*Iowa Hazard Mitigation Plan, 2010 and 2013*
Iowa Geological Survey Bureau	*http://www.igsb.uiowa.edu/browse/earthqua/earthqk2.htm*
U.S. Geological Survey	*http://earthquake.usgs.gov/regional/ceus/*
U.S. Geological Survey Seismic Map	*http://www.igsb.uiowa.edu/browse/earthqua/ubc_map.htm*

Expansive Soils

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

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

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

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

Because of slow occurrence of this geological hazard, no specific shrink-swell event causing damage has been documented in Muscatine County; however, it has been noted that expansive soils may be a factor in damage to roads and underground piping and conduits that occurs over time. Map 3-1 on page 33 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. Linear extensibility of 6% to 9% has high shrink-swell potential and is shown as the orange and brown colors on the map. Various soils have different degrees of shrink-swell potential dependent on depth, which cannot be shown on a two-dimensional map. Generally, the soils that have the higher shrink-swell potential in Muscatine tend to be located upland of the major river floodplain areas and largely in undeveloped agricultural open space. An exception is the area shown in orange in the northwest portion of the Muscatine Island area. Also, the Wilton area appears to have a concentration of the soils with low to high shrink-swell potential.

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 . In the 2013 *Iowa Hazard Mitigation Plan*, the SHMT evaluated the probability of future expansive soils events in Iowa at between 10-19% chance in any one year.

Magnitude/Severity. There are few direct human effects. Effects commonly involve swelling clays beneath areas covered by buildings and slabs of concrete and asphalt, such as those used in construction of highways, walkways, and airport runways. The most extensive damage from

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

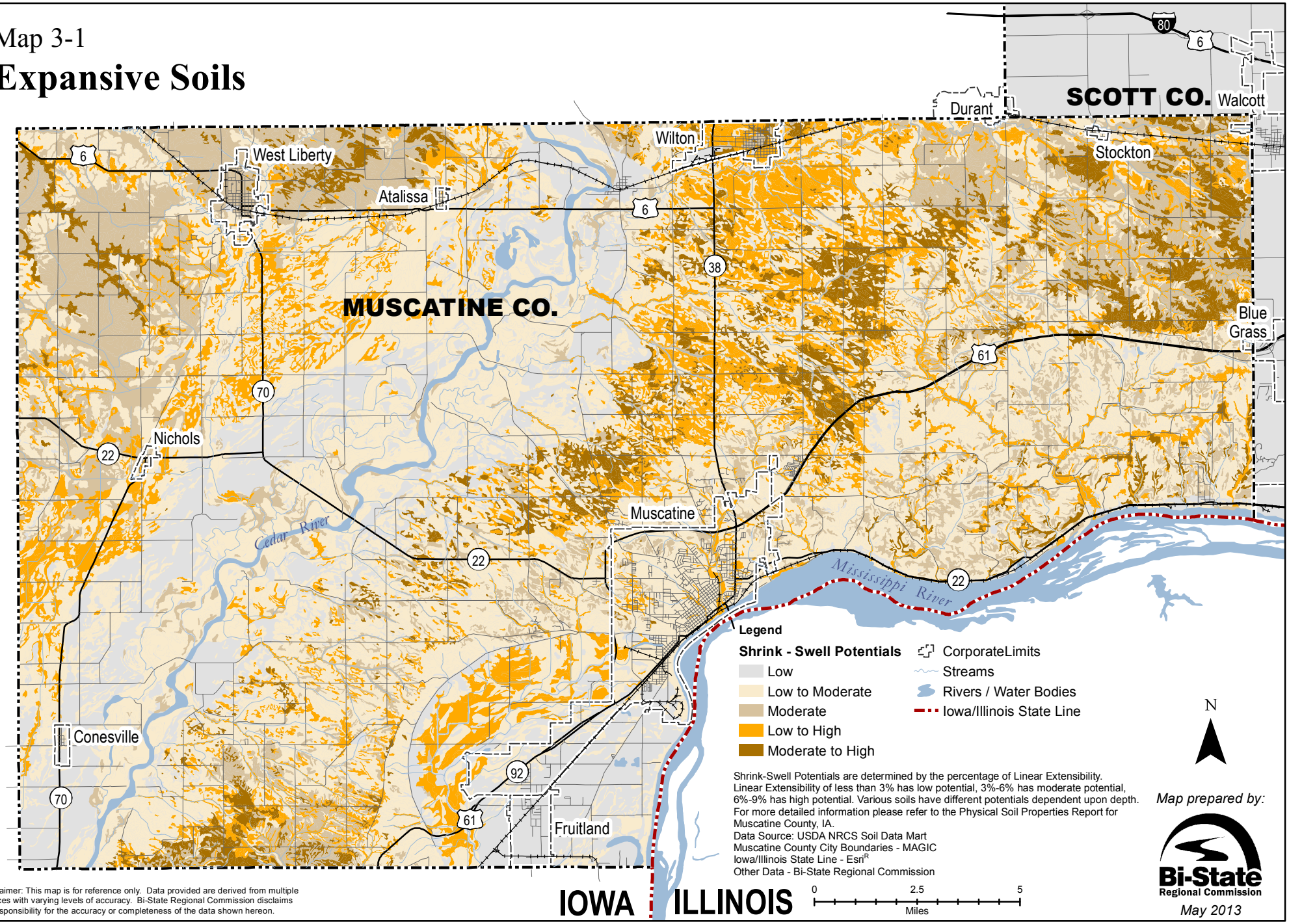
Warning Time. This is consistent with other geologic hazards that occur slowly over time.

Duration. The response tied to damage that occurs due to expansive soils depends largely on the extent of the damage and when the damage is first noticed. Damage can be mitigated on new construction with proper building technique 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.

Sources	
State of Iowa	*Iowa Hazard Mitigation Plan, 2010 and 2013*
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*

Map 3-1

Expansive Soils



Shrink-Swell Potentials are determined by the percentage of Linear Extensibility. Linear Extensibility of less than 3% has low potential, 3%-6% has moderate potential, 6%-9% has 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.
Data Source: USDA NRCS Soil Data Mart
Muscatine County City Boundaries - MAGIC
Iowa/Illinois State Line - Esri®
Other Data - Bi-State Regional Commission

Map prepared by:

Bi-State Regional Commission

May 2013

Extreme Heat

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

Incidents of extreme heat are likely to cover a large area. Urban areas pose additional risks in these occurrences when stagnant atmospheric conditions of the heat wave trap pollutants, adding to the stresses of hot weather. The following available information from the National Climatic Data Center and National Weather Service gives an indication of the magnitude and variety of such events. There have been 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°, at the Quad City International Airport station).

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

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

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

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

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

Magnitude/Severity. Certain populations, including the elderly, small children, chronic invalids, and others with medical problems are particularly susceptible to heat reactions. Low-income households without access to fans or air-conditioned rooms, particularly inner city dwellers, may also be more susceptible to heat reactions. The 2010 *Iowa Hazard Mitigation Plan* states that Muscatine County experiences approximately $3,000 in damages annually from extreme heat. The National Climatic Data Center Storm Event Database does not have any reported property or crop damage reports for extreme heat.

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

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

Sources	
State of Iowa, IHSEMD	*Iowa Hazard Mitigation Plan, 2010 and 2013*
National Climatic Data Center	*http://www.ncdc.noaa.gov/stormevents/*
National Weather Service - Quad Cities, IA/IL Office	*http://www.crh.noaa.gov/dvn/*

Flash Flood

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

Magnitude of flash flooding varies by watershed based on the effects of amounts of rain over time. The following available information from the National Climatic Data Center gives an indication of the magnitude of such events:

Event Date	Location	Amount of Rainfall
08/16/1997	Muscatine	0.91 inches in 15 minutes
07/21/1998	Muscatine County	4 inches
10/17/1998	Muscatine	3.50 inches
05/18/2000	Muscatine County	2 to 3 inches per hour
02/24/2001	Muscatine County	1 to 1.5 inches on frozen ground
06/22/2007	Muscatine, Nichols, and West Liberty	4 to 8 inches over 72-hr period

Precipitation extremes recorded at Muscatine, IA station:

Highest daily rainfall: 9.51 inches on June 7, 1967
Highest monthly rainfall: 13.73 inches in June 1990

Floods are the most common and widespread of all natural disasters except fire. In Iowa, as much as 21 inches of rain has fallen in a 24-hour period. The National Climatic Data Center identifies 25 events in Muscatine County between 08/09/1993 and 07/31/2012 as flash flooding or urban/small stream flooding due to periods of intense rainfall. Ten of the flash flood or urban flood events listed were located in the City of Muscatine where effects range from minor street flooding to roads being impassable. Notable events in the county include:

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 flood water 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.

Probability. As 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 very developed with significant amounts of impervious surfaces. As more development occurs in the watersheds, the amount of runoff produced also increases. Unless measures are taken to reduce the amount of runoff produced (or slow its movement), flash floods will continue to occur and possibly increase. In certain areas, aging storm sewer systems were not designed to carry the capacity currently needed to handle the increased storm runoff. This combined with rainfall trends (that are moving upwards) and rainfall extremes (that are patterning higher) all demonstrate the high likelihood, yet unpredictable nature of flash flooding in Muscatine County.

The State Hazard Mitigation Team (SHMT) evaluation in the 2010 *Iowa Hazard Mitigation Plan* concluded that it is highly likely that a flash flood will affect Iowa in any given year. Using NCDC data for the Muscatine County area, an average of 1.3 flash flooding events are likely to occur in any given year.

Magnitude and Severity. Flash floods occur in all 50 states in the U.S. Particularly at risk are those in low-lying areas; close to dry creek beds or drainage ditches; or near water or downstream from a dam, levee, or storage basin. People and property with insufficient storm sewers and other drainage infrastructure can also be put at risk because the drains cannot rid the area of the runoff quickly enough. Nearly half of all flash flood fatalities are auto-related. Motorists often try to traverse water-covered roads and bridges and are swept away by the current. Six inches of swiftly moving water can float a full-sized automobile. Recreational vehicles and mobile homes located in low-lying areas can also be swept away by water. The National Climatic Data Center Storm Event Database lists total property damage for flash flood events as $55,000.

Areas in a floodplain, downstream from a dam or levee, or in low-lying areas can certainly be affected by flash flooding. People and property located in areas with narrow stream channels, saturated soil, or on land with large amounts of impermeable surfaces are likely to be affected in the event of significant rainfall. Unlike areas affected by river/stream flood, flash floods can impact areas a good distance from the stream itself. Flash flood prone areas are not particularly

tied to areas adjacent to rivers and streams. Streets can become swift-moving rivers, and basements can become deathtraps because flash floods can fill them with water in a matter of minutes. As noted in the *City of Muscatine, Iowa Comprehensive Plan (2002)*: "Existing and new development located on bluffs and steep slopes throughout the City contribute to flash flooding. This has been an ongoing problem for properties located along Mad Creek…" Refer to Map 3-3 on page 56 for areas of slope 15% or greater.

Warning Time. Flash floods may be unpredictable, but there are factors that can point to the likelihood of the occurrence of a flash flood in the area. 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 (NWS) forecasts the height of flood crests, the data, and the time the flow is expected to occur at a particular location.

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

Sources	
Iowa Homeland Security Emergency Management Division (HSEMD)	*Iowa Hazard Mitigation Plan, 2010 and 2013*
National Climatic Data Center	*http://www.ncdc.noaa.gov/oa/climate/severeweather/extremes.html*
American Red Cross	*http://www.redcross.org/services/prepare/0,1082,0_240_,00.html*
Federal Emergency Management Agency (FEMA)	*http://www.fema.gov/hazard/flood/index.shtm*
Local Sources: City of Muscatine	Comprehensive Plan 2002, ref. Page 60 and Chapter 4 of 2013 plan

Grass or Wild-land Fire

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

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

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

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

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

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

The Keetch-Byram Drought Index map does not show a reporting weather station that includes 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.

According to the National Interagency Fire center, there have been 1,817 wildfires spanning 33,112 acres from 2002 to the end of 2012 in Iowa. This number is likely much greater when considering grass fires. Muscatine County Emergency Management (MUSCOM) reported 153 grass fires in the county between 2006 and May 21, 2013 not including controlled burns. 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.

Probability. There is some variation in how data was reported above for historical occurrence, and there may be some overlap in the reporting areas. Using the MUSCOM report of grassfire incidents, there was an average of 23.5 grass fires per year in the county over the 6-year

reporting period. This gives a probability of a 100% chance that there will be grass fires in Muscatine County in any given year.

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

Most grass fires are contained to highway right-of-way and rail right-of-way ditches and are less than a few acres in size. High winds can turn a small flame into a multi-acre grassfire within a matter of minutes. The extent is dependent upon conditions such as land use/land cover, moisture, and wind. No grass or wild-land fires have been reported in the National Climatic Data Center Storm Event Database.

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

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

Sources	
Iowa Homeland Security and Emergency Management Division	*Iowa Hazard Mitigation Plan, 2010*
Muscatine County	Muscatine County Multi-Jurisdictional Hazard Mitigation Plan 2010
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

Hailstorm

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

The National Climatic Data Center reports 59 hail events occurring in Muscatine County between 4/23/1965 and 11/30/2013 with hail size of at least one inch. More than one hail event may be recorded during one thunderstorm occurrence, but as separate reports from differing times and locations. The largest size hail reported for Muscatine County during this period is 2.75 inches in diameter occurring on May 11, 1975. Other significant events include:

May 9, 1995: Hail 1.75 inches in diameter was reported from a beginning location 6 miles west of the City of Muscatine resulting in $20,000-30,000 in property damage.

June 6, 1999: Wind driven golf ball size hail (reported as 1.75 inches in diameter) damaged close to 350 acres of corn, knocked out windows in a home, downed trees, and destroyed a storage trailer as reported for a location north of the City of Muscatine.

May 18, 2000: Hail reported at 1.75 inches in diameter damaged cars in the City of Muscatine with a report of $250,000 in property damage.

May 14, 2003: Hail at 1.00 inches in diameter east of Atalissa resulted in a reported $100,000 in property damage.

July 20, 2003: A storm with hail of 1.0 inches diameter left both property and crop damage in the vicinity of Muscatine.

April 13, 2006: Hail reported at 2.0 inches diameter resulted in $30,000 in property damage in Muscatine.

Hail Size (inches)	Number of Events 1950 to 2012
1.00	25
1.25	4
1.50	3
1.75	21
2.00	4
2.25	0
2.50	1
2.75	1

A scale of hailstorm intensity has been developed by the Tornado and Storm Research Organization (TORRO) of the United Kingdom. The scale extends from H0 to H10 with its increments of intensity and damage potential related to hail size (distribution and maximum). Hail texture, numbers, fall speed, speed of storm translation, and strength of the accompanying

wind are other factors that affect the damage effects. The scale as follows includes hail diameter size in both metric (mm) and inches measurements.

TORRO Hail Size Damage

Size code	Diameter		Description	Damage 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 panels and can scrape paint
H4	20-30	0.6-2.4	Golf ball size	Breaks windows and scrapes paint
H5	30-50	0.8-3.0	Tennis ball size	Breaks some roof tiles, dents cars, strips bark
H6	40-60	1.2-3.9	Baseball size	Breaks many roof tiles, damages roofs
H7	50-75	1.8-4.9	Grapefruit size	Shatter roofs, serious damage to cars
H8	60-90	2.4-5.0	Softball size	Cracks concrete roofs, splits trees, injury to people
H9	75-100	3.2-5.0	Softball size	Marks concrete walls, kills people, fells trees
H10	>100	4.0-7.0	Melon size	Destroys wooden houses, damages brick homes, kills people

Probability. Data on probability and frequency of occurrence of hailstorms is limited, but research based on historical data and input from experts at the National Weather Service indicates that any given point in Iowa can expect on average two to three hailstorms in a year. Data for just Muscatine County appears to support this average in the county as well.

Magnitude and Severity. Agricultural crops such as corn and soybeans are particularly vulnerable to hailstorms stripping the plant of its leaves. Hail can also do considerable damage to vehicles and buildings. Injuries and 4 deaths have been attributed to hail in Iowa since 1980. Exposure to hail larger than a nickel can be very dangerous and life threatening. 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 National Climatic Data Center Storm Event Database lists property damage from hail to be $608,500 and crop damage to be $32,000.

The land area affected by individual hail events is not much smaller than that of the parent thunderstorm, an average of 15 miles in diameter around the center of the storm. Hail only rarely results in loss of life directly, although injuries can occur.

Warning Time. 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 and many television weather departments. Warnings in the 20 to 30-minute range are usually available prior to the occurrence of the storm.

Duration. The occurrence of hailstorms is short term in nature and usually limited to less than 6 hours per event.

Sources	
Iowa Homeland Security and Emergency Management Division (HSEMD)	*Iowa Hazard Mitigation Plan, 2010 and 2013*
National Climatic Data Center	*http://www.ncdc.noaa.gov/oa/climate/severeweather/extremes.html*
TORRO Hailstorm Intensity Scale Storm Track Severe Weather Tables	http://www.torro.org.uk/TORRO/severeweather/hailscale.php http://www.stormtrack.org/library/edu/tables.htm

Hazardous Materials Incident

This hazard profile continues to address fixed hazardous materials incidents and 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 at a fixed facility or as a result of transportation. A hazardous substance is one that may cause damage to persons, property, or the environment when released to soil, water, or air. Chemicals are manufactured and used in ever-increasing types and quantities. 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 substances are categorized as toxic, corrosive, flammable, irritant, or explosive. Hazardous materials incidents generally affect a localized area. The use of planning and zoning can minimize the area of impact.

According to the Iowa Department of Natural Resources Chemical Spills Report Database, 249 chemical spills were reported in Muscatine County between 1995 and May 30, 2013. Of those spills, 154 were during production or handing at a fixed facility while 95 were spills as a result of transportation. Costs associated with spill clean-ups were reported.

Year	Incidents	Transport	Fix Facility	Pipeline	Railroad	Fire	Other
1995	17	3	10	-	4	-	-
1996	12	3	9	-	-	-	-
1997	13	3	9	-	1	-	-
1998	15	1	14	-	-	-	-
1999	0	-	-	-	-	-	-
2000	15	1	13	-	1	-	-
2001	13	3	7	-	-	-	3
2002	10	6	3	-	-	-	1
2003	7	2	4	-	-	-	1
2004	11	4	6	-	-	-	1
2005	9	3	5	-	-	-	1
2006	9	6	2	-	-	-	1
2007	15	3	7	1	-	1	3
2008	15	2	9	-	1	-	3
2009	30	19	9	-	-	-	2
2010	22	5	13	1	-	1	2
2011	8	2	4	-	-	-	2
2012	19	3	15	-	-	-	1
2013	9	4	3	-	-	-	2
Total	**249**	**73**	**142**	**2**	**7**	**2**	**23**
% of Total	**100%**	**29%**	**57%**	**1%**	**3%**	**1%**	**9%**
Annualized	**13.48**	**3.95**	**7.69**	**0.11**	**0.38**	**0.11**	**1.25**

Month	Incidents	Annualized	% of Total
January	33	1.79	13.25%
February	16	0.87	6.43%
March	19	1.03	7.63%
April	27	1.46	10.84%
May	30	1.62	12.05%
June	28	1.52	11.24%
July	21	1.14	8.43%
August	14	0.76	5.62%
September	17	0.92	6.83%
October	23	1.25	9.24%
November	13	0.70	5.22%
December	8	0.43	3.21%
Total	249	13.48	100.00%

Location	Incidents
Atalissa	8
Conesville	7
Fruitland	7
Muscatine	151
Nichols	3
West Liberty	25
Wilton	19

Source: Iowa DNR, Hazardous Spills Database

Examples of reported chemical spills include:

Chemical Spills at Fixed Facilities:

December 6, 1996: An unintentional release of 33,000 lbs. of plastics mixture was released on site. Butadine was released from the mix and escaped from the vents in the sewage system.

January 31, 2007: A pipeline carrying sodium hydroxide leaked between 1000 to 3300 lbs. of sodium hydroxide per day for 60 days until leak was found. The potential amount of chemical released totals 198,000 lbs. The facility was located adjacent to Mississippi River and it is unknown if the river was affected.

Chemical Spills as a Result of Transportation:

November 20, 1995: A railroad engine and two rail cars derailed on line. A fuel tank on the engine was damaged. An estimated 700 gallons of petroleum was spilled.

March 31, 1999: A supply truck and pick-up truck were in an accident on Highway 61. The supply truck was carrying 2500 gallons of fuel. The semi turned over on its top near a ditch. (No final spill amount was reported.)

The Muscatine County Emergency Management Plan identified 17 facilities that have Extremely Hazardous Substances (EHS) on premise and are located on Map 3-2 on page 51. The City of Muscatine experiences the majority of the hazard materials incident – both fixed-facility and transportation-related at a total of 60.64% of all reported chemical spills. The remainder of the reports were spread throughout the incorporated jurisdictions. Note: reports do not state whether the spill was in unincorporated Muscatine County. Addresses were given for location, and therefore, they would fall under incorporated areas. Transportation-related hazardous material incidents can occur anywhere in the county, including the two railroad lines in the county. Although there are no interstate highways within the boundaries of the county, there are other roadways where transportation incidents may occur. Fertilizer and pesticides are common chemicals used in the agricultural industry, and because Muscatine County is agricultural in nature, those chemicals are transported county-wide.

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, an average of 13 chemical spills in any given year can be expected. Of the chemical spills reported to the Iowa DNR from 1995 to May 30, 2013, 62% were located at fixed facilities while 38% were reported at chemical spills as a result of transportation. This would translate to approximately 8 spills in any given year at fixed facilities and 5 spills in any given year as a result of transportation. The fixed-facility probabilities for Muscatine County are in keeping with the State of Iowa estimated probability. The transportation-related hazardous material incident probability for Muscatine

County is lower than the state estimate. One reason for this could be that there are no interstate highways located within Muscatine County. Analysis of the data shows that the percentage of transportation-related hazardous materials incidents are increasing. 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. 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 monitors 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.

Magnitude and Severity. 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 higher risk. Populations near transportation corridors or downstream, downwind, and downhill of a released substance are also vulnerable. 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. Hazardous material response services for the county are provided for by the Muscatine Fire Department. It has an agreement to service all portions of Muscatine County.

Most of the hazardous materials incidents are localized and are quickly contained or stabilized by highly trained fire departments and hazardous materials teams. 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. More widespread effects occur when the product contaminates the municipal water supply or water system such as a river, lake, or aquifer.

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.

Warning Time. 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.

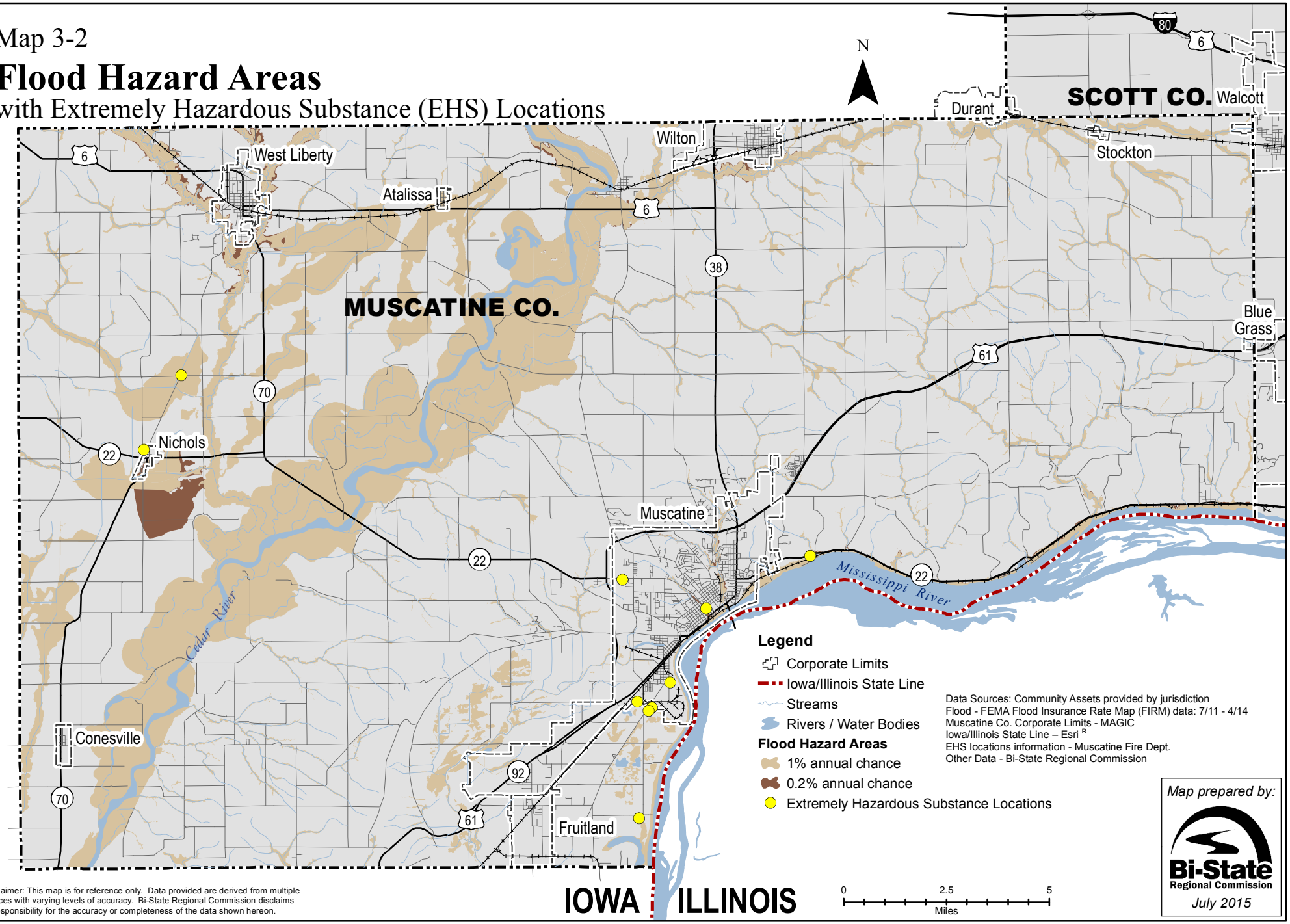
Duration. Response to a hazardous materials release is generally limited to the immediate effects of a release of dangerous materials and their threat to life and property. However, due to the laws surrounding hazardous materials and the duty to the public to inform and protect citizens from the effects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

Sources	
Iowa Homeland Security Emergency Management Division (HSEMD)	*Iowa Hazard Mitigation Plan, 2010*
Muscatine County Emergency Management Agency	*Muscatine County Hazard Mitigation Plan 2003*
Muscatine County	*Muscatine County Multi-Jurisdictional Hazard Mitigation Plan 2010*
Iowa Dept. of Natural Resources (DNR) Emergency Response & Security Unit Spill Data	http://www.iowadnr.gov/spills/data.html
U.S. Department of Transportation Federal Highway Administration Office of Operations	http://www.ops.fhwa.dot.gov/publications/fhwahop08058/20.htm

Map 3-2

Flood Hazard Areas

with Extremely Hazardous Substance (EHS) Locations



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

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

The Iowa Department of Transportation reconnaissance trips to over fifty 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) and are either translational or shallow rotational. A translational slide involves planar failure surfaces with movement in which the vector is primarily down slope with no upward component. The movement may be essentially parallel to the original slope surface. A rotational slide includes a large downward component near the top of the slide and an upward component at the bottom of the slide. These slides are deeper than translational slides. Rock falls can also occur in the sandstone and limestone outcrops in the Wild Cat Den State Park area.

Muscatine County is in an area of Iowa covered with loess of variable thickness. The loess ranges 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 average depth on the uplands is 12 to 15 feet. This loess overlies glacial till. Local relief varies from 30 m (l00 ft) to 9 m (30 ft) and the hillslopes are intermediate in slope angle between the Des Moines lobe in the center of the state and the loess hills of western Iowa. 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. The term is taken from pottery making. In geotechnical engineering terms, 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.

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.

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

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

slopes 21'-30' high, and 13% occurred in slopes greater than 30 feet high. Slope was 3:1 on 96% of slopes prior to slope failure. See Map 3-3 on page 56.

Muscatine County has steep terrain adjacent to the Mississippi River that is susceptible to landslides. There is one area in the county where a significant landslide has occurred on more than one occasion. 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 that "...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.

Probability: Per an IDOT survey of county engineers on the number of landslides that occurred in their county from 1993 – 2001, it was determined that southeast and western Iowa were high risk area for landslides. These high risk areas contain deep to moderately deep loess. Most of the counties in the eastern part of Iowa had a significant number of landslides from 1993 to 2001, ranging from 6 to more than 15, except Scott County with 1-5 landslides. In Muscatine County, areas of greater than 15% slope may be at a high risk of landslides if disturbed or they become saturated or top loaded. While the 2010 *Iowa Hazard Mitigation Plan* does not mention Muscatine county, the 2007 *Iowa Hazard Mitigation Plan* has two areas of note for Muscatine County. The area between Montpelier and Fairport is indicated as having high susceptibility as also noted in the historical occurrence above. The 2007 plan also shows an area in southwest Muscatine County that has a moderate risk of landslides. The steeper the slope of the land, the greater the probability of slope failure and a landslide. The 2010 *Iowa Hazard Mitigation Plan* SHMT evaluated the probability of a significant landslide event in Iowa and indicated it was between 10% and 25% in any given year.

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

Landslides have a significant adverse effect on buildings and infrastructure and threaten transportation corridors, fuel and energy conduits, and communications linkages. Road building and construction often exacerbate the landslide problem in hilly areas by altering the landscape, slopes, and drainages and by changing and channeling runoff, thereby increasing the potential for

landslides. Landslides along roads can disrupt the use of that road until repairs are made to stabilize the slope and remove debris. Utilities such as pipelines, phone or fiber optic cables, power poles, etc. are often vulnerable to the downward movement of soil or rock. This may cause disruptions to water or sewer service, electricity, phone service, or internet access.

Landslides and others 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.

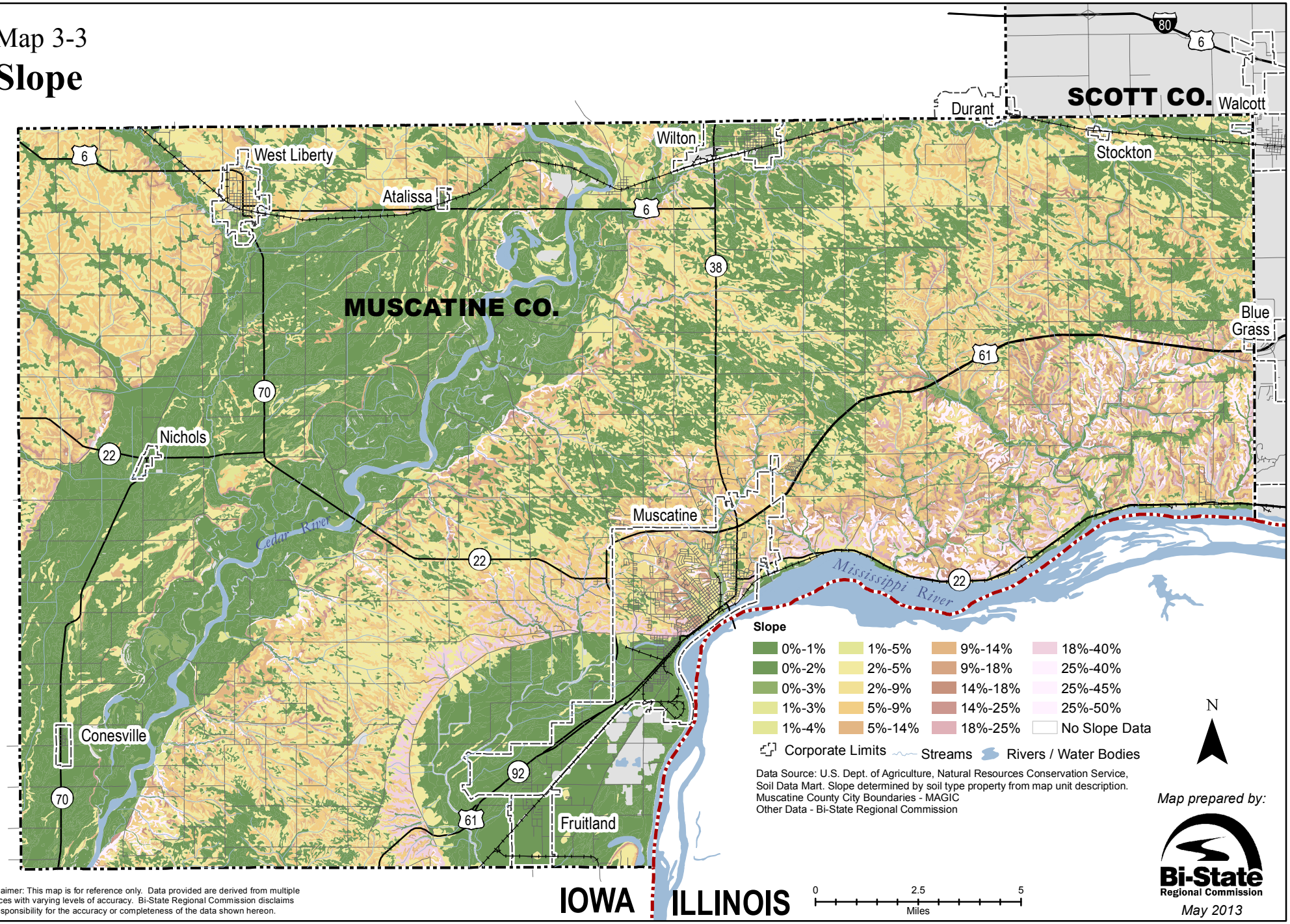
Warning Time: Landslide formation can be very slow or can occur very quickly. Landslides are often triggered by other natural hazards. Landslides and heavy rain or flooding and ground saturation can occur together. Landslides can be detected if areas at high risk are monitored for early signs of a slide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

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

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
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/**
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)
Iowa Homeland Security and Emergency Management Division (HSEMD)	*Iowa Hazard Mitigation Plan, 2007, 2010 and 2013*
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 Colombia'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*

Map 3-3

Slope



Data Source: U.S. Dept. of Agriculture, Natural Resources Conservation Service, Soil Data Mart. Slope determined by soil type property from map unit description.
Muscatine County City Boundaries - MAGIC
Other Data - Bi-State Regional Commission

Map prepared by:

Bi-State Regional Commission

May 2013

Levee Failure

A levee failure is a loss of structural integrity of a wall, dike, berm, or elevated soil by erosion, piping, saturation, or under seepage causing water to inundate normally dry areas. Levees constructed of compacted clay with a high plasticity tend to crack during cycles of long dry spells. During heavy rainfalls that follow the dry spells, water fills the cracks and fissures. In addition to increasing the hydrostatic forces, the water is slowly absorbed by the clay. This results in a simultaneous increase of the slide (driving) forces and a decrease of the resisting (shear strength) forces.

Furthermore, the cyclic shrink/swell behavior of the cracked clay zone results in a progressive reduction of the sheer strength of the clay, perhaps approaching its residual strength. It also results in deepening of the cracked clay zone, which may eventually reach a depth of 9 ft. (2.74 m) or more, especially for clays with a plasticity index greater than 40. The end result may be a sloughing failure following a heavy rainfall. It is believed that fast removal of the runoff water from the interconnected network of cracks could alleviate this surface instability problem.

Due to security concerns, the actual levees are not included on a map in the plan. Map 3-4 on page 60 shows areas protected by certified levees. Levees identified in Muscatine County as of 5/30/2013 are:

- Federal urban levee at City of Muscatine for Mad Creek/Mississippi River (Level of Protection 100-500 year flood). This levee system has been certified, and two areas of floodplain have been reclassified as "X- Protected be Levee."
- Federal rural agricultural levees listed for the City of Muscatine but in Louisa County (Agricultural population level of protection 100-500 year flood)
- Levee between Nichols and West Liberty Muscatine Island Levee District (Agricultural and Residential/Urban)
- Eichelberger Levee (Agricultural)
- Holcomb Levee (Agricultural)
- King Levee (Agricultural)
- The levee from Levee District No. 17 located on the west bank of the Cedar River. The levee was overtopped in 2008 causing structural damage with as many as 15 holes as deep as 12 feet. The levee was repaired by the levee district; however the levee is not certified.
- The Muscatine Island Levee District and the Muscatine-Louisa County Drainage District No. 13, together with the upper half mile of the Louisa Drainage District No. 15, for a joint drainage and flood control system of the 26,478 acres of bottom land. The area is located immediately downstream of the City of Muscatine in Muscatine and Louisa Counties. The levee was certified, and the majority of the land behind the levee has been reclassified as "X – Protected by Levee."
- There is also a levee along Hockey' Slough from its mouth at Wapsinonoc Creek to about 4,500 feet upstream of the City of Nichols. This levee provides some protection against floods of less than 10-year frequency.

The flood of 1993 was so great that the limits of many levees were tested and sometimes exceeded. Of the 275 U.S. Army Corps of Engineers (USACE) levees affected by the flood, 85% held, but 31 were overtopped, 8 were eroded and ruptured, and 3 were breached. The

performance of nonfederal dams was much worse: only 43% withstood the trauma, and 800 of 1,400 failed. In Muscatine County, assistance was requested for the Eichelberger Levee as a result of heavy rains and flooding. However, since it is a private levee, it was not eligible for assistance under U.S. Army Corps of Engineers (USACE) programs. On June 22, 2007, the levee between Nichols and West Liberty topped during a rain event according to National Climatic Data Center In June 2008, Levee District No. 17, which had not been maintained, was overtopped by record level floodwaters on the Cedar River. This is 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 2013 *Iowa Hazard Mitigation Plan* estimated the probability of a dam/levee failure event associated with heavy flooding in Iowa is between 10-20% in any given year.

Magnitude and Severity. People, property, and utilities in the floodplain are most at risk. Levees and floodwalls give a false sense of security. People feel that levees will protect them and their property against any future flooding. While this is usually true, the hazard is only temporarily contained.

Floodwaters breaching a levee are usually contained in the historic floodplain. Interestingly enough, levee failure in one area may prevent flooding in another area. 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.

Sudden failure in an urban setting could cause a catastrophe as was demonstrated in Cedar Rapids in 2008. 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. Water bursting through a narrow levee breach is moving much faster than the floodwaters in the main channel. The breaking out of this front of water and its fast flow can cause more destruction to structures behind the levee than floodwaters in the main channel would have caused. A failed levee continues to cause damage long after it breaks.

Residents behind levees often have a false sense of security. If the actual risk is not communicated to the residents by the jurisdiction, there may be effects to the reputation of the community if the levee fails. Effects would be similar to those experienced during a river or flash flood.

With updated floodplain mapping, FEMA requires certification of levees in order for property protected by the levee to be eligible for flood insurance at the rate of flood-level protection. Without certification, those properties would only be eligible for flood insurance at the actuarial rate for the elevation of the structure compared to the 100-year or 1 percent flood level.

Warning Time. 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

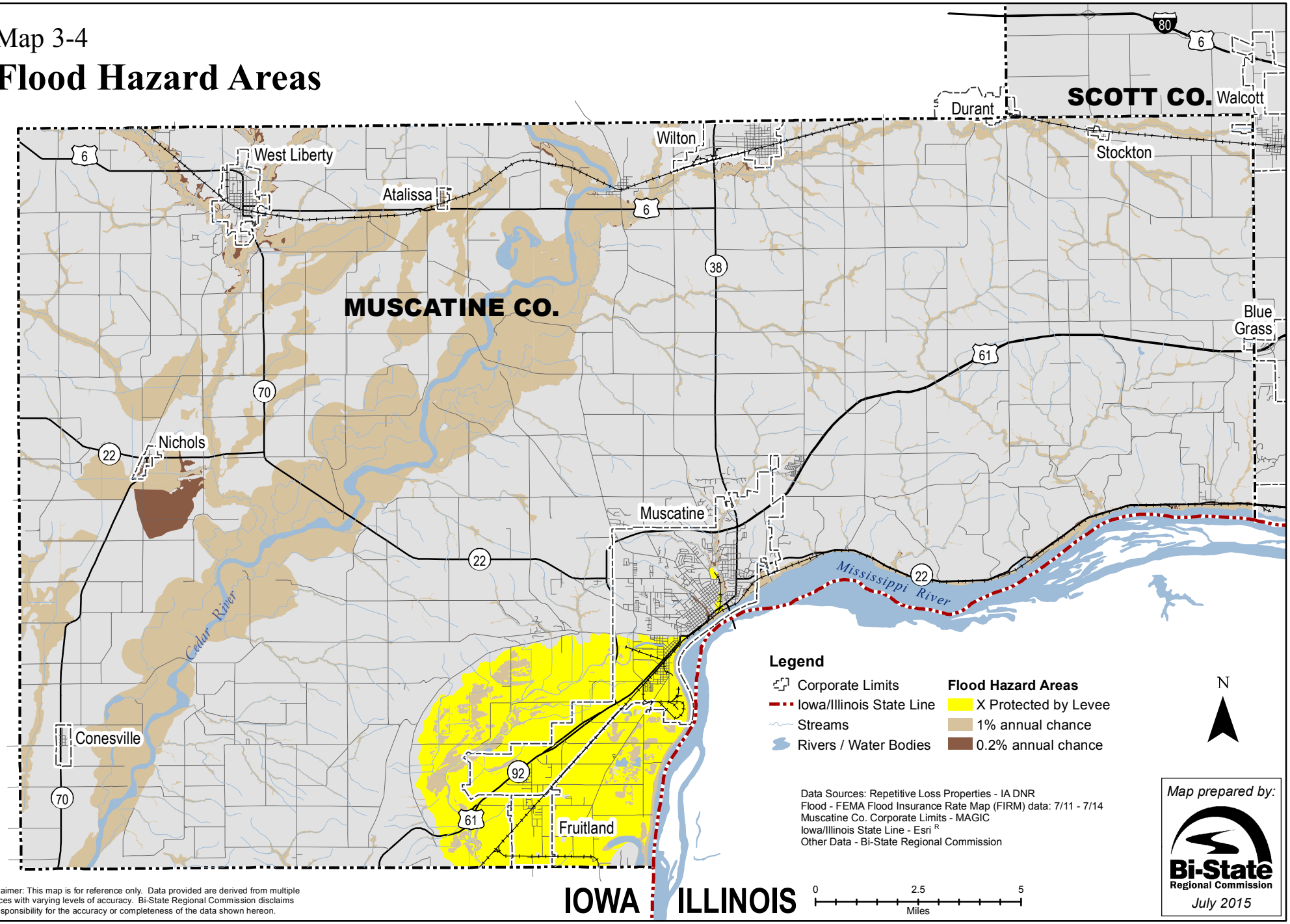
this does not provide complete security from a rupture in the levee itself. A sudden failure of a portion of the levee may send floodwaters gushing from this break within seconds. Normally, occupants of the floodplain can be warned about potential levee breaches or breaks when high water encroaches upon the levee.

Duration. 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 needed to remove floodwaters that breach the levees. This alleviates some of the effects associated with levee failures.

Sources	
Iowa Homeland Security Emergency Management Division (HSEMD)	Iowa Hazard Mitigation Plan, 2010 and 2013
Muscatine County	Muscatine County Multi-Jurisdictional Hazard Mitigation Plan 2010
U.S. Army Corps of Engineers (USACE) National Levee Database	http://nld.usace.army.mil/egis/f?p=471:1:
Iowa Department of Natural Resources	http://www.iowadnr.com
Local sources: Bi-State Regional Commission	Long-Range Flood Recovery Plan for the Bi-State Region: 1994
FEMA Flood Insurance Study	Muscatine County Unincorporated, 1986

Map 3-4

Flood Hazard Areas



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

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

Floodwaters can be extremely dangerous. The force of six inches of swiftly moving water can knock people off their feet and two feet of water can float a car. Floods can be slow, or fast rising, but generally develop over a period of days. Flooding is a natural and expected phenomenon that occurs annually, usually restricted to specific streams, rivers, or watershed areas.

Since the *Muscatine County Multi-Jurisdictional Hazard Mitigation Plan* was adopted in April 2010, the entire county has adopted new flood insurance rate maps, which had previously been preliminary at plan adoption. The Muscatine Island Levee was accredited with portions of the 1% annual chance Special Flood Hazard Area and was moved to "Area Protected by Levee" in new FIRMs in 2014. Details of the new maps can been seen in Map 3-4 on page 60.

The National Flood Insurance Program (NFIP) Repetitive Loss Properties (RLP) report identifies properties vulnerable to multiple flood losses. The *Iowa State Floodplain Manager* report shows 29 unmitigated repetitive loss properties within Muscatine County as of 3/27/2013. Most of the repetitive loss properties were single family (26), while three were non-residential structures. Repetitive loss properties are any National Flood Insurance Program (NFIP) insured buildings for which two or more claims of more than $1,000 each were paid by the NFIP within any 10-year period. The 2013 *Iowa Hazard Mitigation Plan* showed that as of November 2012, unmitigated repetitive loss properties within Muscatine County had received in total over $1.3 billion in NFIP payments. Map 3-4 on page 60 shows approximate locations of the repetitive loss properties in Muscatine County as well as the Flood Insurance Rate Map 1% chance of flooding occurring in any given year. More detailed FIRMS for the planning area can be found in Appendix 3-3. The 2010 *Iowa Hazard Mitigation Plan* also states that an average of $383,235.29 in flood damages occur annually in Muscatine County.

Flood categories in feet at the National Weather Service gage point within Muscatine County:

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

The National Climatic Data Center reports 57 flood events for Muscatine County between 8/9/1993 and 3/28/2013. Twenty-six of these events are listed as flash flood or urban/small

stream flooding and are addressed in the "Flash Flood" hazard profile. The remaining 31 events document flooding on the major rivers in Muscatine County: the Mississippi River and its tributary the Cedar 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 estimated at 643 residential structures damaged or destroyed at a cost of $6,580,191. An additional $647,300 was spent in the county for infrastructure damage and flood control.

Major to record flooding occurred along the Cedar River in Muscatine County during the month of June 2008 due to prolific persistent heavy rain from late May into early June. This was part of a state-wide disaster declaration. The Cedar River reached its record height on June 15, 2008 as part of the flood event. Many roads in eastern Iowa sustained severe damage from the flooding. The flooding of the Cedar River also forced closure of many roads including I-80 between interchanges #265 and #267. This location is between Iowa City, IA and Davenport, IA. The detour route was designated as US 61 to US 20 to I-35. This detour added 115 miles to the normal route. 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. Final costs have not been confirmed with the Levee District. In addition, several houses were destroyed. Through both FEMA Hazard Mitigation Grant Program funds and HUD Community Development Block Grant funds, a total of 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, which disbursed a total of $381,549.18 to assist 16 homeowners repair their homes within Muscatine County. Damage estimates for eastern Iowa alone are approximately $1 billion.

Historic crests at National Weather Service gage points as of February 22, 2013 are as follows:

Mississippi River at Muscatine:

1) 25.61 ft on 07/09/1993
2) 24.81 ft on 04/29/1965
3) 24.42 ft on 06/17/2008
4) 23.81 ft on 07/05/2014 (preliminary)
5) 23.50 ft on 04/25/2001
6) 21.87 ft on 04/25/2011
7) 21.86 ft on 04/22/2013 (preliminary)
8) 21.63 ft on 04/25/1973
9) 21.47 ft on 05/01/2008
10) 21.29 ft on 04/25/1993

Cedar River near Conesville:

1) 23.40 ft. on 06/15/2008
2) 17.88 ft on 07/02/2014 (preliminary)
3) 17.11 ft on 04/06/1993
4) 17.00 ft on 05/29/2004
5) 16.90 ft on 06/03/2013
6) 16.87 ft on 06/18/1990
7) 16.85 ft on 04/12/1965
8) 16.80 ft on 07/28/1999
9) 16.74 ft on 07/07/1993
10) 16.62 ft on 04/0201961

Probability. The 2010 *Iowa Hazard Mitigation Plan* gave the probability that it is likely that there will be many minor events in any given year and a high likelihood that a major flooding event requiring federal assistance will occur in the next five years. Given that the list of events for Muscatine County includes more than one event in some years, it might be estimated that at least minor flooding could occur nearly every year somewhere in the county.

Magnitude/Severity. The vulnerability from river flooding is quite delineated. Much work in the area of flood hazard mapping has allowed many communities to restrict development in hazardous areas.

The Federal Emergency Management Agency has delineated the special flood hazard areas in most areas. These Flood Insurance Rate Maps (FIRMs) show properties affected by the floods that have at least a 1% chance of occurring in any given year. Generally, these areas are in the floodplain or adjacent areas. Map 3-5 on page 64 shows general locations of the repetitive loss properties as associated with the Special Flood Hazard Areas with a 1% chance of flooding annually in the preliminary Digital FIRM for Muscatine County.

Flooding effects include potential loss of life. River flooding does not have as high of a risk as flash flooding because of the slower onset of the river flood. Personal property can be extensively damaged and destroyed by swift moving water. Facilities and infrastructure can be scoured around, degrading its structural integrity.

Damage and disruption of communications, transportation, electric service, and community services are likely in severe cases. Water treatment and wastewater treatment facilities are often located in or near the floodplain and are at high risk of flooding and will eventually be taken offline. The National Climatic Data Center Storm Event Database reported floods causing $11,475,000 in property damage and $5,000 in crop damage.

Warning Time. Gages along streams and rain gages throughout the state provide for an early flood warning system. River flooding usually develops over the course of several hours or even days, depending on the basin characteristics and the position of the particular reach of the stream. The National Weather Service provides flood forecasts for Iowa. Flood warnings are issued over emergency radio and 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.

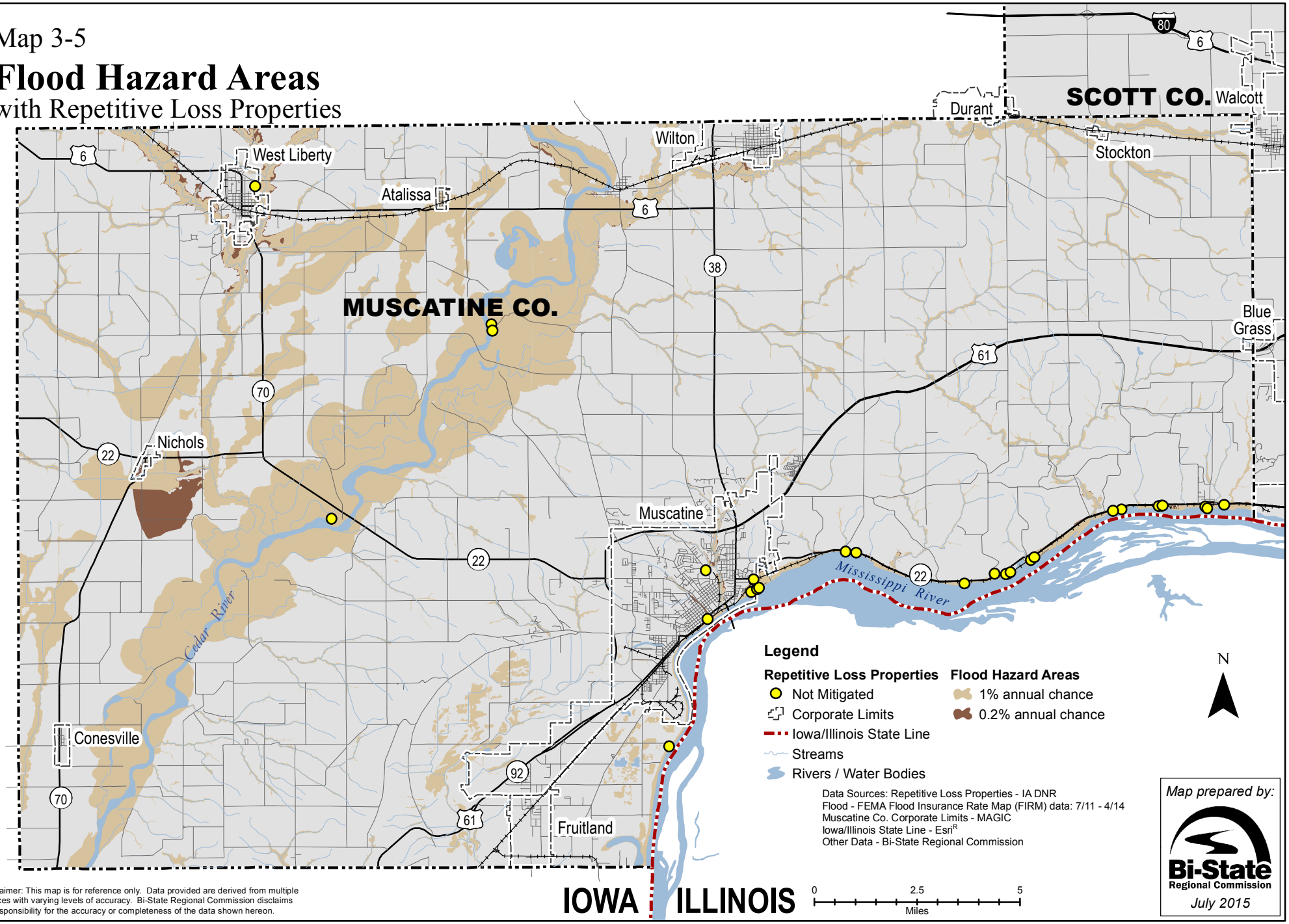
Duration. The response to the effect of river flooding in Iowa are extensive and require many days to adequately respond to the needs of the county, cities, school districts, and citizens.

Sources	
Iowa Homeland Security and Emergency Management Division (HSEMD)	*Iowa Hazard Mitigation Plan, 2010 and 2013*
National Climatic Data Center	*http://ncdc.noaa.gov/oa/climate/severeweather/extremes.html*
FEMA	*Flood Insurance Study, 1986*
Bi-State Regional Commission	Long-Range Flood Recovery Plan for the Bi-State Region: 1994

Map 3-5

Flood Hazard Areas

with Repetitive Loss Properties



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.

Map prepared by:

Bi-State Regional Commission

July 2015

Severe Winter Storms

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

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

There have been 120 winter weather events recorded in Muscatine County between 1/1/1993 and 3/31/2015 (NCDC). Events included were heavy snowfalls, extreme cold temperatures, blizzard conditions, freezing rain or glazing, blowing snow, frost, and sleet. Below are significant events that have occurred in the county.

February 24, 2007: A widespread and crippling ice/snow storm affected eastern Iowa, northwest and western Illinois, and extreme northeast Missouri. This massive ice storm was the worst to affect the region since January 22-23, 1965. Ice accumulations of around one inch were common, with some reports to near two inches. East winds gusting over 50 mph, combined with the heavy ice accumulation, brought down numerous tree branches and power lines, along with several thousand power poles. Several trees also fell from the weight of the ice. Widespread power outages occurred, affecting over 180,000 people, which lasted more than a week in some of the rural areas. 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), then extreme cold temperatures set in on January 14-16. Actual air temperatures were -10° to -20° F (wind chills -30° to -50° F). Cedar Rapids set a record low of -29° F.

January 31-February 2, 2011: A tremendous blizzard affected the region, with snowfall totals ranging from 10-20 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 inches fell along 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.

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

Magnitude/Severity: Hazardous driving conditions due to snow and ice on highways and bridges lead to many traffic accidents. About 70% of winter-related deaths occur in automobiles, and about 25% are people caught out in a storm. Those at risk are primarily either engaged in outdoor activity (shoveling snow, digging out vehicles, or assisting stranded motorists), or are elderly or very young. The 2010 *Iowa Hazard Mitigation Plan* reports that an average annual loss estimate of $86,771.80 from severe winter storms in Muscatine County. The National Climatic Data Center Storm Event Database reported $497,000 in winter storm related property damage.

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

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

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

Sinkholes and Land Subsidence

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 such as aquifer-system compaction from excessive groundwater withdrawal or 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 by localized collapse of subsurface cavities forming sinkholes. This type of subsidence is commonly triggered by ground water level declines from pumping. Sink holes are also 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.

Collapse of surface material into underground voids during the creation of a sinkhole is the most dramatic form of subsidence. Damage can consist of damaged or destroyed buildings or other structures, potential contamination of groundwater, and removal of land from productive use. Losses can also include business and personal losses that accrue during periods of repair. The sudden and unpredictable nature of sinkholes can result in the loss of human life.

Probability: Per the *Iowa Hazard Mitigation Plan 2010*: "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. 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. Very few Karst areas are located within Muscatine County. According to the Iowa DNR, there were a few small coal mines near Wyoming Hill in Montpelier Township that 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 that these sources provide, it seems likely that the mines were adits/drifts located near the bluffs above the river (e.g. Wyoming Hill) and could contribute to instability of those slopes. In Muscatine County, the current risk of general land subsidence or formation of sinkholes is very low.

Magnitude/Severity: General land subsidence may pose a greater risk to property than to life. Sudden sinkhole formation may pose a threat to life. Significant damage to property, facilities, and infrastructure could occur if an actual sinkhole formed resulting in loss of land surface, undermined foundations, and destruction of structures.

Warning Time: Regional lowering occurs gradually over time, while the collapse of abandoned mines can occur suddenly.

Duration: The response tied to sinkholes 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.

Sources	
FEMA	*"A Cornerstone of National Mitigation Strategy." July, 1997*
City of Muscatine	*Muscatine Comprehensive Plan 2002*
Iowa DNR Geological Survey Bureau	http://www.igsb.uiowa.edu/service/hazards.htm
U. S. Geological survey	USGS Fact Sheet -165-00 Land Subsidence in the Unites States.
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)

Thunderstorms and Lightning

Thunderstorms are common in Iowa and can occur singly, in clusters, or in lines. Thunderstorms typically include thunder, heavy rains (which may cause flash flooding), and strong winds reaching or exceeding 58 mph producing tornadoes, or 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 tornadoes, straight-line winds and microburst's above 58 mph, lightning, hailstorms, and flooding. The National Weather Service considers a thunderstorm severe if it produces hail at least one-inch in diameter, wind 58 mph or higher, or tornadoes. Straight-line winds can often exceed 60 mph, are common occurrences, and are often mistaken for tornadoes. A number of thunderstorms have caused other hazards such as flash flooding, river flooding, and tornadoes. The associated hazards related to thunderstorms are discussed further as separate hazards.

Between 1980 and August 20, 2013 with the most recent entry dated 6/17/2014, there were a total of 138 thunderstorm/windstorm events within Muscatine County, according to the National Climatic Data Center. Because thunderstorms may occur singly, in clusters, or in lines, it is possible that several thunderstorms may affect the same area in the course of a few hours.

The data for thunderstorms also includes other high wind events. Since windstorms are a separate hazard profile for Muscatine County, high wind events exceeding 63 knots will be discussed in that profile. Because most of those windstorms were also associated with thunderstorms, they were not removed from the total number of thunderstorm events. It is common to have multiple entries in the database per day; however, that is being interpreted as separate storm multiple storm events that can occur in quick succession.

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

The National Climatic Data Center storm events database lists lightning separately from thunderstorm/windstorm. There have been four events recorded. The recorded event dates span from the months of March through August. While not in the National Climatic Data Center, on May 4, 2015, two males were struck by lightning while on horseback rounding up cattle near the 2,500th block of 150th Street in rural Muscatine. One was treated and released while the other died from the lightning strike.

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

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

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

Like tornadoes, thunderstorms and lightning can cause death, serious injury, and substantial property damage. The power of lightning's electrical charge and intense heat can electrocute people and livestock on contact, split trees, ignite fires, and cause electrical failures. Thunderstorms can also bring large hail that can damage homes and businesses, break glass, destroy vehicles, and cause bodily injury to people, pets, and livestock.

High winds can damage trees, homes (especially mobile homes), and businesses, and can blow vehicles off of the road. Straight-line winds are responsible for most thunderstorm damage. One or more severe thunderstorms occurring over a short period (especially on saturated ground) can lead to flooding and cause extensive power and communication outages as well as agricultural damage. The 2010 *Iowa Hazard Mitigation Plan* estimates that losses from lightning and thunderstorms totals approximately $168,941 annually in Muscatine County. The National Climatic Data Center Storm Event Database lists $2,817,000 in property damage and $167,050 in crop damage from thunderstorm, lightning, and wind events.

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

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

Sources	
Iowa Homeland Security Emergency Management Division	Iowa Hazard Mitigation Plan 2010
National Climatic Data Center	*http://www.ncdc.noaa.gov/oa/climate/severeweathe/extremes.html*
Muscatine County	Muscatine County Multi-Jurisdictional Hazard Mitigation Plan 2010
Other	Individual Accounts and news coverage of recent events
KWQC	http://kwqc.com/2015/05/05/one-dead-after-lightning-strike-in-muscatine-county/

Tornado

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

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

According to the National Climatic Data Center, there were 34 tornado reports for Muscatine County between 01/01/1950 and 7/01/2013. 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. Most of the reports are of F0 or F1 tornados. Notable events include:

May 23, 1966 and May 07, 1967: F2 tornadoes 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 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 doing extensive damage to a machine shed. Corn was flattened in spots and trees 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. The tornado weakened as it approached the southwest portions of Muscatine. 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 F3 tornado is reported at 774 yards in major width and traveling 10 miles with property damage of $15 million.

April 25, 2008: The 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.

June 24, 2013: An EF1 tornado was spotted along Highway 61 in Muscatine just before 3:30 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.

Probability. The SMHT analysis evaluated the probability that damaging tornadoes will occur in Iowa is highly likely in any given year. Using the number of events in Muscatine County over the recording period, it is likely that a tornado event will occur every three years.

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

The Enhanced Fujita (EF) Scale

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

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

Generally, the destructive path of a tornado is only a couple of hundred feet in width, but stronger tornadoes can leave a path of destruction up to a mile wide. Normally, a tornado will stay on the ground for no more than 20 minutes; however, one tornado can touch ground several times in different areas. Large hail, strong straight-line winds, heavy rains, flash flooding, and lightning are also associated with severe storms and may cause significant damage to a wider

area. The 2010 *Iowa Hazard Mitigation Plan* estimates that losses from tornadoes in Muscatine County totals approximately $303,133 annually. According to the National Climatic Data Center Storm Event Database, $18,707,000 in property damage and $5,000 in crop damage were estimated to have occurred within Muscatine County.

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

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

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

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

Sources	
National Climatic Data Center Enhanced Fujita Scale	*http://www.ncdc.noaa.gov/oa/satellite/satelliteseye/educational/fujita.html*
National Climatic Data Center	*http://ncdc.noaa.gov/oa/climate/severeweather/extremes.html*
Iowa Homeland Security Emergency Management Division	*Iowa Hazard Mitigation Plan 2010*
Muscatine County	*Muscatine County Multi-Jurisdictional Hazard Mitigation Plan 2010*
Iowa Weather Blog	*http://iowawx.com/2013/06/25/muscatine-tornado-on-monday-was-an-ef1/*

Windstorm

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

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

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

Based on historical averages, Iowa would expect to have 15 to 20 wind events each year where wind speeds exceed 64 knots (73 mph). (Note: 1 knot = 1.15155 mph). Since 1987, Muscatine County has experienced 16 events where wind speeds exceeded 64 knots, according to the National Climatic Data Center storm events database.

> **June 29, 1998:** Super-cell thunderstorms developed over Central Iowa and rapidly intensified into a long squall line that raced 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 with these storms and 8 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.

Probability. Large-scale extreme wind phenomena are experienced over every region of the United States. Historically, high wind events are associated with severe thunderstorms and blizzards. It is often difficult to separate windstorms and tornado damage when winds get above 64 knots (74 mph). Based on historical information, Muscatine County can expect to have 1-2 windstorms every one to two years. The SHMT determined the probability of storms with the potential to cause large scale power outages to be 10-20% statewide in any given year.

Magnitude and Severity. The 2010 *Iowa Hazard Mitigation Plan* estimated that windstorms cause approximately $23,060 in losses in Muscatine County annually. Those most at risk from windstorms include people living in mobile homes, campgrounds, and other dwellings without secure foundations or basements. People in automobiles are also very vulnerable to wind storms, particularly tornadoes. The elderly, very young, and the physically and mentally handicapped are most vulnerable because of the lack of mobility to seek shelter or escape the path of destruction. People who may not understand watches or warnings due to language barriers are also at risk.

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

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

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

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

Sources	
Iowa Homeland Security Emergency Management Division (HSEMD)	*Iowa Hazard Mitigation Plan, 2010*
National Climatic Data Center	*http://ncdc.noaa.gov/oa/climate/severeweather/extremes.html*
Muscatine County	*Muscatine County Multi-Jurisdictional Hazard Mitigation Plan 2010*

Assessing Vulnerability: Overview

This section analyzes the county's vulnerability to natural and man-made hazards in terms of the types and numbers of existing and future buildings, infrastructure, and critical facilities. The first part is a general profile of Muscatine County that describes the county's characteristics and its historic development.

Community Profile: Muscatine County, Iowa

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 West Liberty, Wilton, Nichols, Atalissa, Stockton, Fruitland, and Conesville.

The soils in Muscatine County are nearly level, gently sloping (0-5 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.

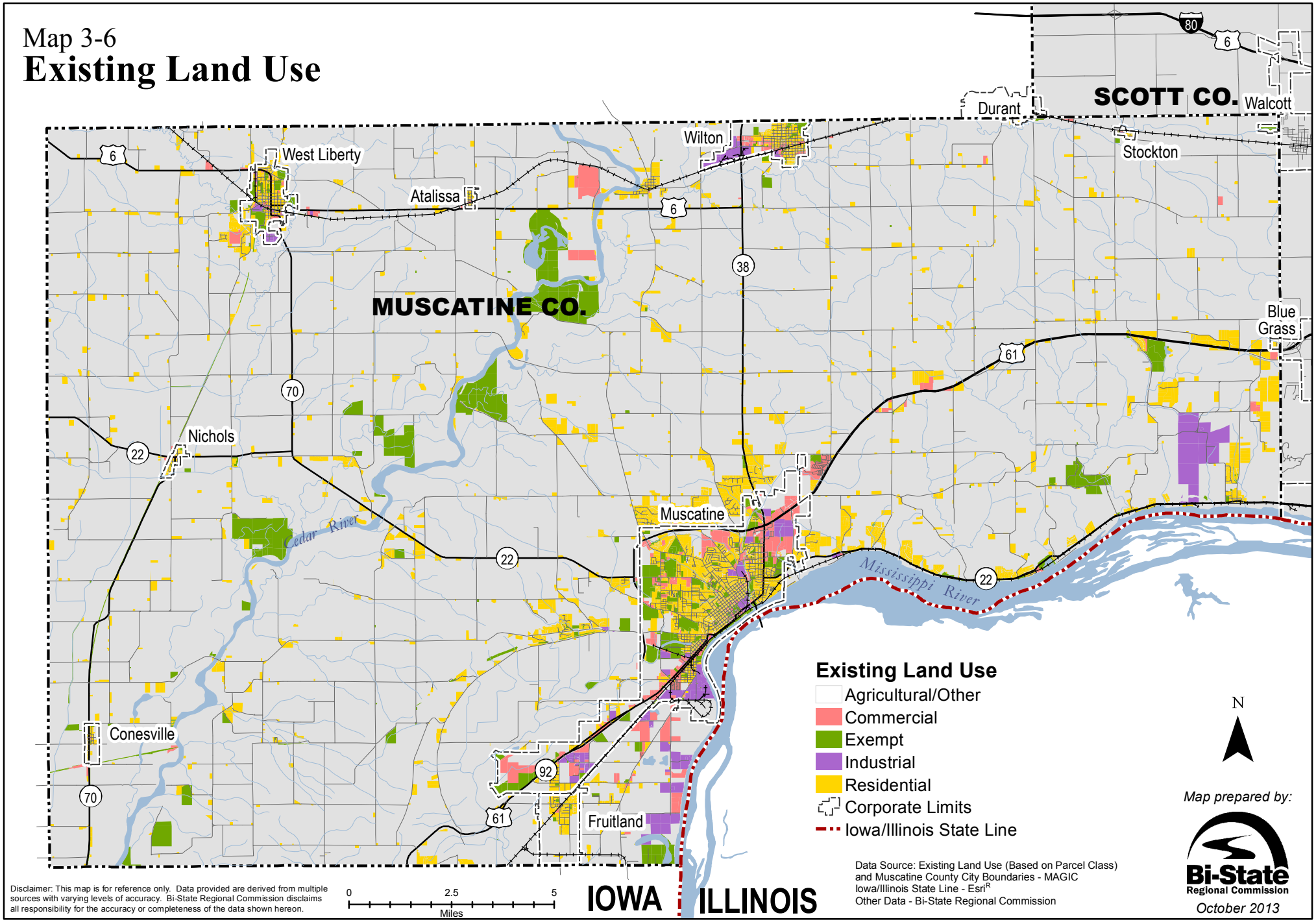
Muscatine County is predominantly agricultural with residential areas located in or near incorporated cities and along highways and county roads. Commercial and industrial areas are predominantly located within the City of Muscatine with additional industrial areas near West Liberty, Wilton, and along Highway 22 in southeastern Muscatine County. Recreational areas are located along the Cedar River and within incorporated areas. Map 3-6 on page 81 shows existing land uses in Muscatine County as described.

Climate and Weather

The climate of the Muscatine County area is subhumid midcontinental, with an average annual temperature of 51.6 degrees Fahrenheit. The average July temperature is 76.2 degrees Fahrenheit, and the January temperature is 23.7 degrees Fahrenheit. The typical precipitation in Muscatine County is 38.53 inches with an average of 25.2 inches of snowfall. [Source: National Climatic Data Center, 1981-2010 Summary of Monthly Normals; Muscatine , IA Station (USC00135837)]

Map 3-6

Existing Land Use



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.

Data Source: Existing Land Use (Based on Parcel Class) and Muscatine County City Boundaries - MAGIC
Iowa/Illinois State Line - Esri®
Other Data - Bi-State Regional Commission

Map prepared by:

Bi-State Regional Commission

October 2013

Government Structure

Muscatine County is governed by a five-member County Board elected by district to four-year terms. Elections are on a staggered basis. The county has both taxing and bonding authority. County government provides court and law enforcement services, the Department of Public Health, veteran's assistance, community mental health facilities and services, and a zoning office who handles all inspections, platting, and building permits.

Other participating jurisdictions include incorporated municipalities that range from very few to sizeable staffs. All the cities have a similar mayor-council form of government with the mayor as the chief elected official. The mayor is generally elected for a two-year term. Council members are elected for each of five wards and serve for four-year terms under a staggered system, with the exception of the City of Muscatine, which has council members in five wards and two at-large council members who represent the entire community. The cities of Muscatine, West Liberty, and Wilton appoint a city administrator or city manager to carry out the policies formulated by the council in addition to other duties. More information on government structure can be found under the individual jurisdiction profiles.

Local History

The name of Muscatine is of Indian origin, derived from the Mascoutin Indians, a war-like tribe, who had been driven westward across the Mississippi River and settled on a large sandy bottomland encircled by a slough just south of present day City of Muscatine. This area, now known as Muscatine Island, was once an actual island that became farmland when the Mississippi River changed its course. It is 30,000 acres of farmland known throughout the Midwest for its sweet corn, cantaloupes, watermelons, potatoes, and tomatoes, with the Muscatine Melon being perhaps the most recognized.

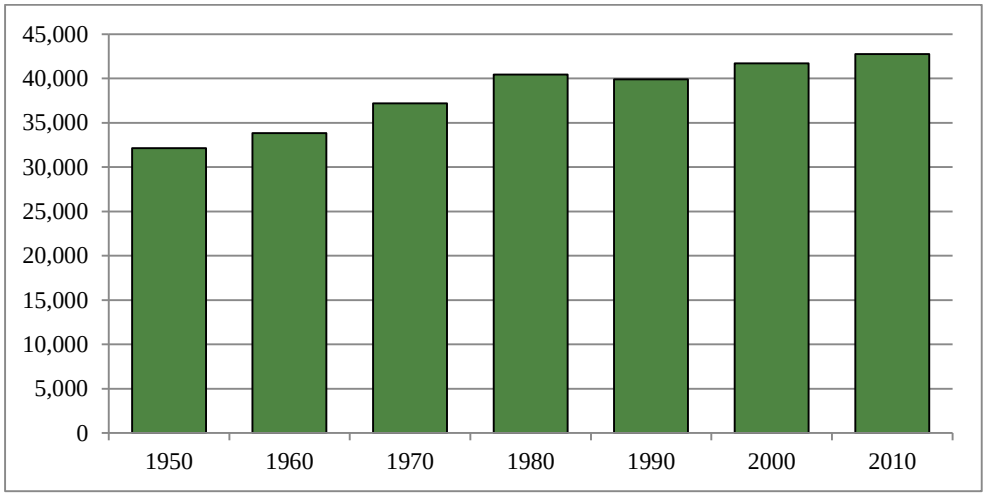
The City of Muscatine, seat of Muscatine County, first came into existence in the summer of 1833 when Colonel George Davenport of Rock Island, Illinois, sent three representatives into the territory to set up a trading post. That same year, James W. Casey and John Vanatta stopped at the outpost. Casey's "woodpile" stocked the steamboats providing access to the frontier opened June 1, 1833 by the Black Hawk Purchase and gave the settlement its first name, "Casey's Woodpile." In May 1836, a surveyor was engaged to survey a town, and when the first plat was made, the name Newburg was given to the town. This name was discarded and changed to Bloomington.

The town of Bloomington was originally incorporated in 1839, but the name led to confusion. Frequent miscarriages of letters by mail occurred because there were towns of the same name in Illinois, Kentucky, Missouri, and Indiana. On June 7, 1849, the town's name was changed from Bloomington to Muscatine. Muscatine became a stopping place on the Mississippi River as a lumbering center. In 1890, the manufacture of pearl buttons began to supplant other industries. Muscatine soon became the world's largest pearl button manufacturer, known as the Pearl Button Capital of the World, and employing approximately half the town in its factories. Muscatine's pearl button factory opened the door to other industries such as H.J. Heinz Co., Stanley Consulting, Inc., Grain Processing Corp., HON Industries, Carver Pump Company, Bandag Inc., Musco Sports Lighting, Monsanto Company, IPSCO, North Star Steel, Communication Data Services, and West Liberty Foods.

Population & Households

In 2010, Muscatine County's population was 42,745, which is the all-time highest population the county has experienced. Historically, the county has grown steadily from 1950 to 1980 at an average of 8.0% a decade. The 1990s saw a small population decrease of 1.3% that rebounded successfully by 4.5% to 41,722 in 2000, which was the new highest population at the time. [Source: U.S. Census Bureau] Figure 3-1 shows the county's population by decade in more detail.

Figure 3-1
Historical Population of Muscatine County



Source: U.S. Census Bureau, 1950 - 2010 Censuses

The City of Muscatine is the largest municipality within Muscatine County which makes up approximately 53.5% of the county's population. The Cities of West Liberty and Wilton are the next largest. [Source: U.S. Census Bureau] Table 3-6 shows the comparison of all the municipalities within Muscatine County.

Table 3-6
Muscatine County Populations by Municipality

	2000	2010
Muscatine County	**41,722**	**42,745**
City of Atalissa	283	311
City of Conesville	424	432
City of Fruitland	703	977
City of Muscatine	22,697	22,886
City of Nichols	374	374
City of Stockton	182	197
City of West Liberty	3,332	3,736
City of Wilton	2,825	2,802
Unincorporated Area	10,902	11,030

Source: U.S. Census Bureau, 1950 - 2010 Censuses

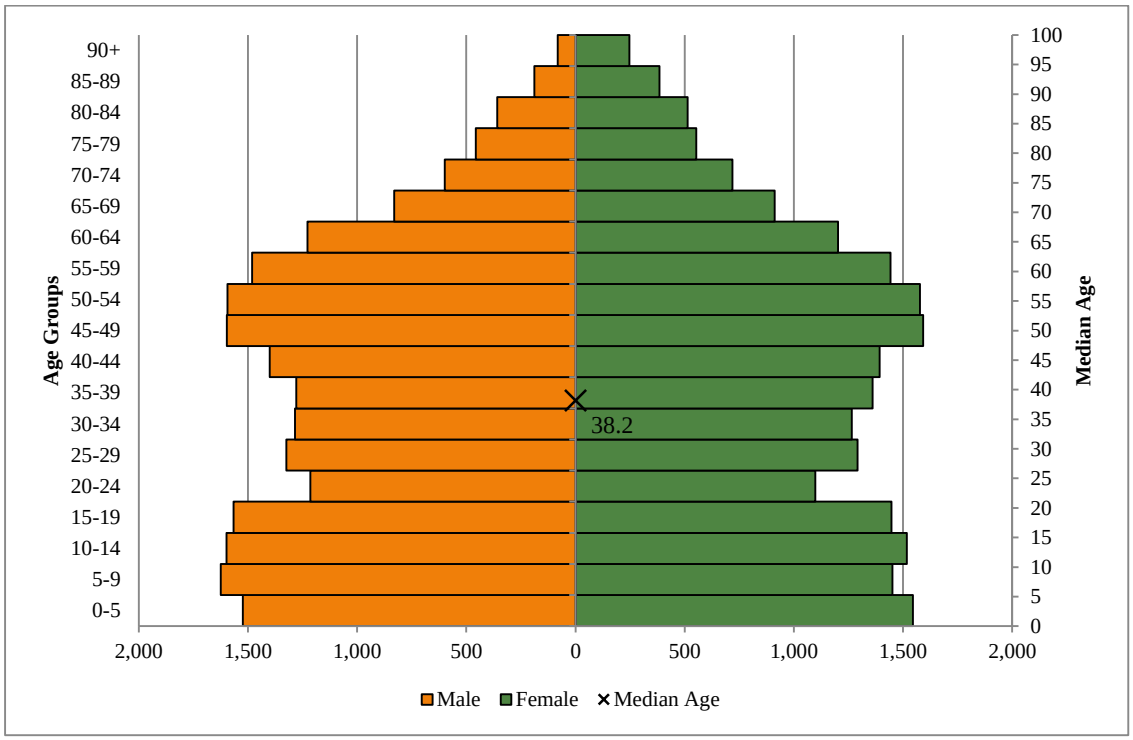
In 2010 there were 16,412 households in Muscatine County. Of those households, 69.8% are family households. Of those family households, 34.7% are living with their own children under 18, with 10.3% being single parent households. The average household size is 2.57, and the average family size is 3.04. [Source: U.S. Census Bureau]

Age & Gender

The median age is a statistic that can be used to gauge the overall age of a population. The higher the median age the older a population, and conversely the lower the median age the younger the population. Muscatine County's median age in 2010 was 38.2, which is a 2.2 year increase since 2000.

Similar to the majority of U.S. places, Muscatine County has nearly equal amounts of males and females. As of the 2010 Census, Muscatine County was 49.7% male and 50.3% female. [Source: U.S. Census Bureau] Figure 3-2 shows Muscatine County's population by age distribution and median age.

Figure 3-2
Muscatine County Population by Age Distribution



Source: U.S. Census Bureau, 2010 Census

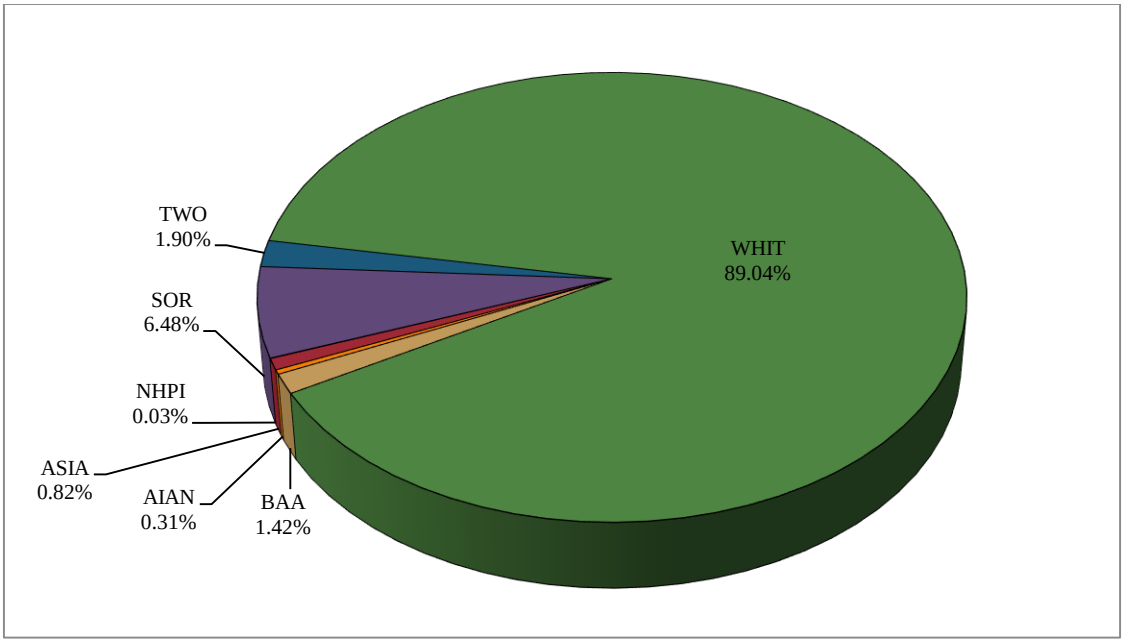
Race & Ethnicity

The Census Bureau tabulates race data into the following general categories that persons choose to self-identify with:

- White alone
- Black or African American alone
- American Indian or a Native alone
- Asian alone
- Native Hawaiian or other Pacific Islander alone
- Two or more races
- Some other race

Muscatine County's population as of the 2010 Census shows that 89.04% of the population is identified as white alone. The most common single racial minority are persons of Black or African American race (1.42%), followed by Asian race (0.82%). Figure 3-3 shows the race categories for Muscatine County in more detail. Hispanic or Latino ethnicity can be associated with any race. In 2010, 15.9% of Muscatine County's population identified themselves as Hispanic or Latino (of any race). [Source: U.S. Census Bureau]

Figure 3-3
Race by Category for Muscatine County



Source: U.S. Census Bureau, 2010 Census
Note: WHIT - White alone; BAA - Black or African American alone; AIAN - American Indian and Alaska Native alone; ASIA - Asian alone; NHPI - Native Hawaiian or Other Pacific Islander alone; SOR - Some Other Race alone; TWO - Two or more races

Ancestry

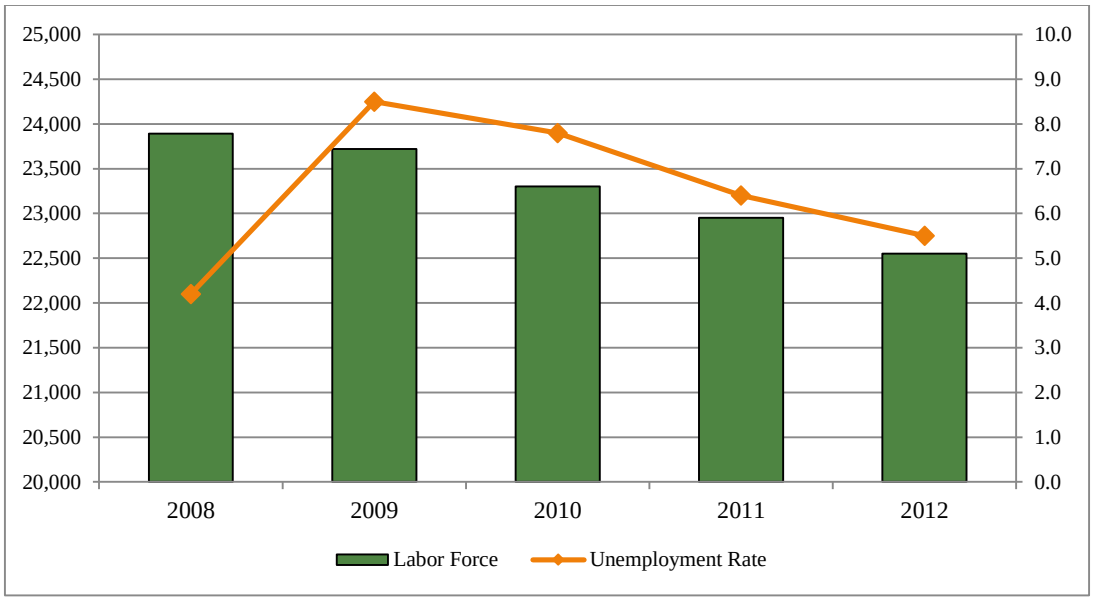
The U.S. Census Bureau records ancestry in the American Community Survey. Persons can choose from numerous ancestries and may pick more than one. A person's race or ethnic status has no bearing on the ancestries they may choose.

The most common identified ancestry in Muscatine County was German (35.3%), followed by Irish (14.5%), and English (8.5%). [Source: U.S. Census Bureau, ACS 3-year estimates (2009-11)]

Employment

Since 2008, Muscatine County's labor force has declined by 5.6%, and in 2012, Muscatine County's annual average labor force was 22,550 people. Unemployment rates in the county doubled from 4.0% to 8.2% from 2008 to 2009. Since then, the unemployment rates have steadily declined and were an average of 5.5% in 2012. [Source: Iowa Workforce Development] Figure 3-4 shows Muscatine County's labor force and unemployment trends over the past few years.

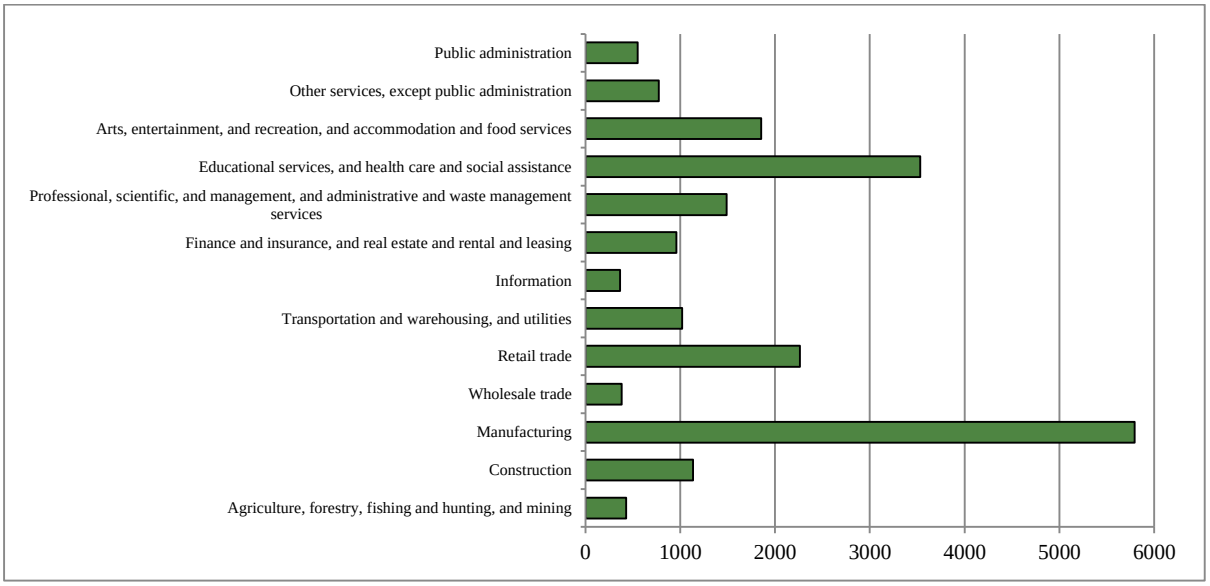
Figure 3-4
Muscatine County Labor Force



Source: Iowa Workforce Development

Muscatine County's workers are employed in a variety of industries. The most common industry reported was manufacturing, which employers more than a quarter of all workers (28.2%). The next most common industries are educational services, and health care and social assistance (17.2%) and retail trade (11.0%). Figure 3-5 shows employment by industry in more detail. The largest employers in Muscatine County are listed in Table 3-7. These employers show a variety of industries including manufacturing, education, and government. [Source: U.S. Census Bureau, ACS 3-year estimates (2009-11)]

Figure 3-5
Employment by Industry in Muscatine County for the Population 16 and over



Source: U.S. Census Bureau, American Community Survey 3-year estimates (2009-11)

Table 3-7
Major Employers in Muscatine County

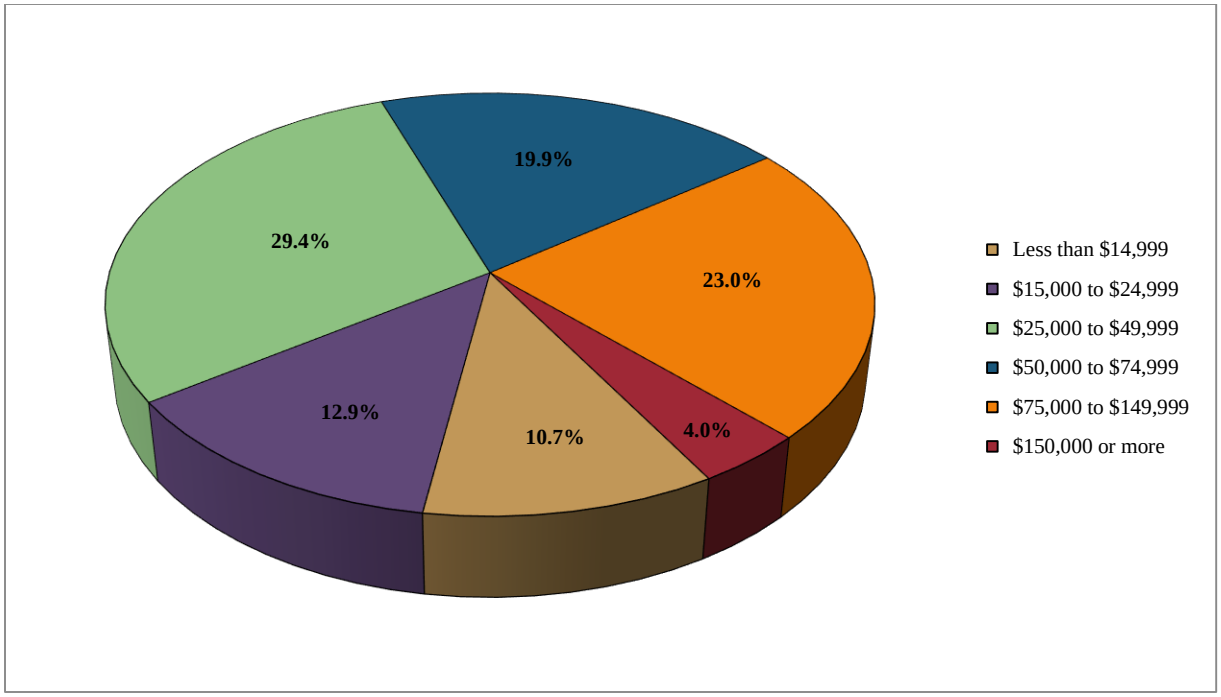
Employer	Employed	Industry
HNI Corporation	3,200	Office furniture manufacturer
Kent Corporation	1,011	Animal Feed producer
Muscatine Community School District	823	Education
Trinity Muscatine	483	Health Care
SSAB of Iowa	410	Place work and fabricated structural products
Musco Sports Lighting	400	Sports and event lighting
Monsanto Company	381	Herbicide and Pesticide producer
Walmart	350	Retail services
H.J. Heinz LP	305	Food processing
Muscatine Power and Water	300	Utility service company
The Stanley Group	279	Engineering and consulting services
City of Muscatine	224	Government
The Raymond Corporation	220	Electrical lift trucks
Muscatine County	184	Government
Bridgestone Commercial Service Solutions Groups	180	Pre cured tread rubber

Source: Muscatine Chamber of Commerce

Income

Median household income is a standard measure of prosperity in a community. Muscatine County's median household income is $47,364 (2011 dollars). Compared to the State of Iowa ($50,028), the county is just slightly below the state average. Figure 3-6 shows household income breakouts in more detail. [Source: U.S. Census Bureau, ACS 3-year estimates (2009-11)]

Figure 3-6
Household Income in Muscatine County

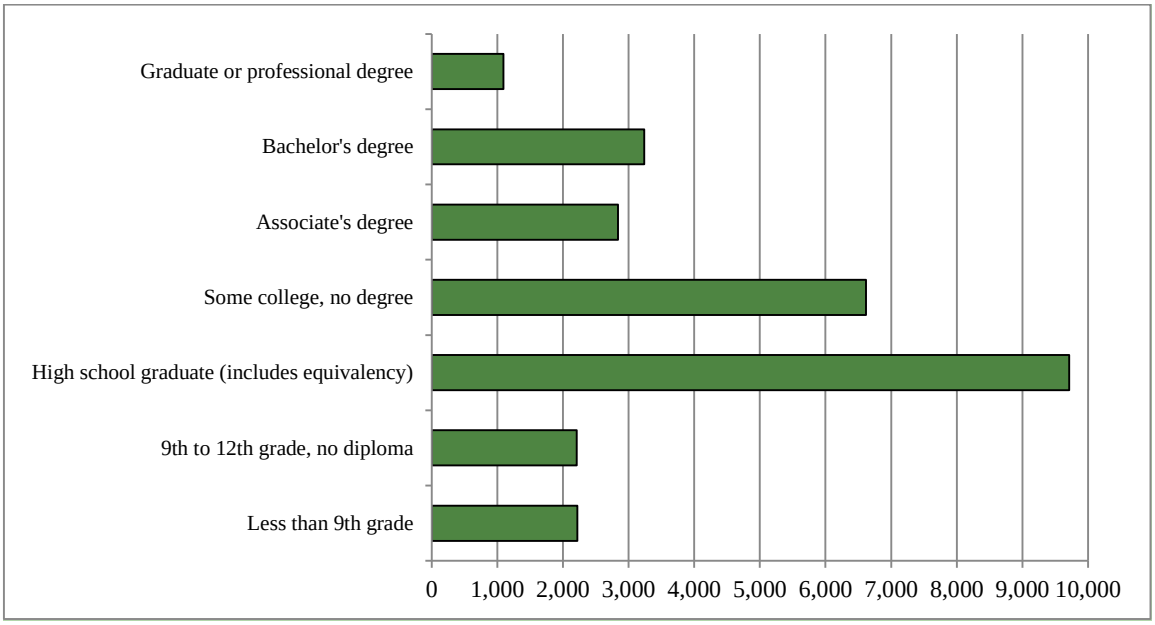


Source: U.S. Census Bureau, American Community Survey 3-year estimates (2009-11)
(Shown in 2011 inflation-adjusted dollars)

Education

The United States is becoming a more highly educated society. The percentage of Iowan's age 25 and older with a bachelor's degree or higher increased by 30.1% from 2000 to 2011. As of 2011, 84.1% of Muscatine County's residents had a high school diploma or higher, and 15.5% had a bachelor's degree or higher. [Source: U.S. Census Bureau, ACS 3-year estimates (2009-11)] See Figure 3-7 for more details.

Figure 3-7
Educational Attainment in Muscatine County for the Population 25 years and over



Source: U.S. Census Bureau, American Community Survey 3-year estimates (2009-11)

As of 2011, 10,905 persons over the age of 3 were enrolled in school. With more than half of that population in Preschool through 8th grade (56.7%), and 19% of the population is enrolled in College or Graduate school. [Source: U.S. Census Bureau, ACS 3-year estimates (2009-11)]

There are three public school districts in Muscatine County. Portions of the county also fall into outside school districts (Columbus-Junction Community School District, and Louisa-Muscatine Community School district). There is also one community college located in the county, Muscatine Community College. See Table 3-8 for public school district enrollments.

Table 3-8
Public School Districts in Muscatine County (2012-13 school year)

School District	Total Enrollment
Muscatine Community School District	5,524
West Liberty Community School District	1,231
Wilton Community School District	821

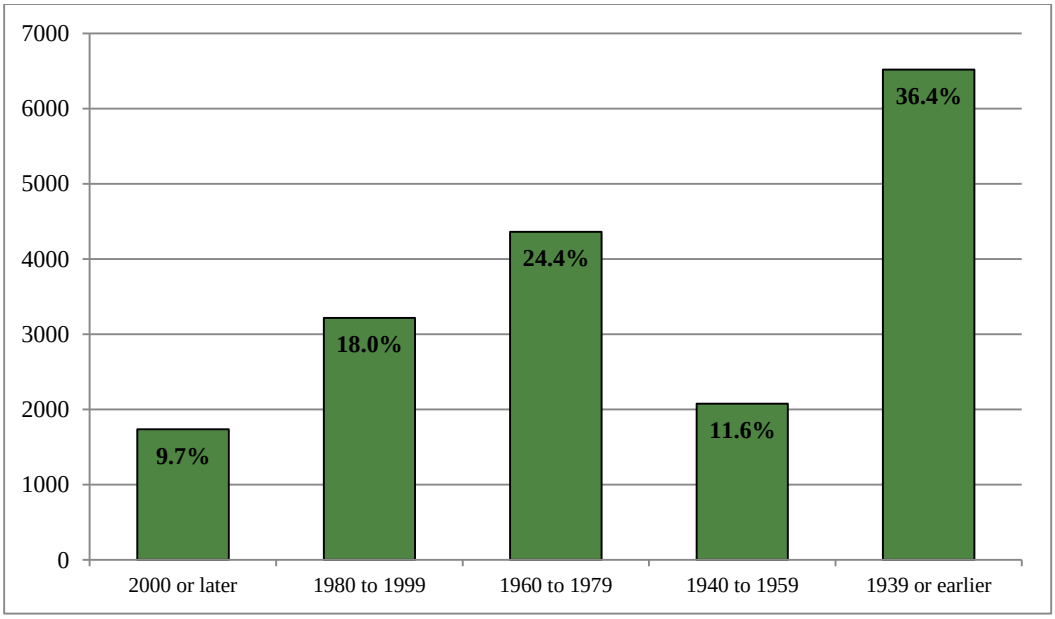
Source: Iowa Department of Education, Bureau of Information and Analysis

Housing

As defined by the U.S. Census Bureau, housing units are physical structures, such as a house, apartment, or mobile home that is occupied as living quarters. As of 2011, there were 17,907 housing units in Muscatine County with an average value of $121,500 (owner occupied). Approximately 92.4% of the total housing units are occupied (7.6% vacant). More than three-quarters of the total housing units are owner occupied (24.0% renter occupied).

The housing stock in Muscatine County averages 50 years or older with more than a third of all housing units built before 1939 and the median year built 1962. [Source: U.S. Census Bureau, ACS 3-year estimates (2009-11)] See Figure 3-8 for more details.

Figure 3-8
Housing in Muscatine County Year Structure was Built



Source: U.S. Census Bureau, American Community Survey 3-year estimates (2009-11)

Infrastructure

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 and 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 Chicago and Eastern and Iowa Interstate. 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 which 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. 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 Muscatine, West Liberty, and Wilton).

Medical and Healthcare

Muscatine County is served by one hospital, Trinity Muscatine.

Communications

Newspapers	Radio Stations	Telephone Service	Public Safety
4 (Daily & Sunday)	3	AT&T	911 Service
3 (Weekly)		Quest	

Recreation and Tourism

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 and two sites owned by the Army Corps of Engineers totaling more than 20 acres 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 plans and animals, including 352 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, home to the Oscar Grossheim collection of over 55,000 glass plate negatives; historic Musser Mansion, home to the Muscatine Art Center and the contemporary Stanley Gallery; 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.

The 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 Muscatine County Fair is the oldest county fair in the State of Iowa.

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.

Determining Community Assets

An outline and definition of assets was taken from the state and local hazard mitigation planning how to guide *Understanding your Risks: Identifying Hazards and Estimating Losses*, FEMA document 386-2. The following types of facilities were considered, and general information about the presence of these types of facilities in the county-wide area is mentioned as available. However, a description of the facilities selected by participating jurisdictions is included within the individual multi-jurisdiction risk assessments later in this chapter. FEMA separates critical buildings and facilities into five categories based on their loss potential. All of the following elements are considered critical facilities.

Essential Facilities

Essential facilities provide for the health and welfare of the whole population and are especially important following hazard events. The potential consequences of losing them are so great that they should be carefully inventoried. Be sure to consider not only their structural integrity and content value, but also the effects on the interruption of their functions because the vulnerability is based on the service they provide rather than simply their physical aspects. Essential facilities include hospitals and other medical facilities, police and fire stations, emergency operation centers and evacuation shelters, and schools.

Hospitals and Medical Facilities	Police Stations	Fire Stations	Emergency Operation Centers	Evacuation Shelters	Schools and Colleges
Trinity Muscatine	Muscatine	Atalissa	Muscatine	Various Locations	Muscatine Community SD
	West Liberty	Conesville	Wilton		West Liberty Community SD
	Wilton	Fruitland			Wilton Community SD
		Montpelier			Muscatine CC
		Muscatine			
		Nichols			
		West Liberty			
		Wilton			

Transportation Systems

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).

Airways	Highways	Railways	Waterways
Muscatine Municipal Airport (KMUT)	U.S. Highways - 6, 61	Canadian Pacific (DME)	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)

Lifeline Utility Systems

Lifeline utility systems include potable water, wastewater, oil, natural gas, electric power, and communication systems.

Potable Water*	Wastewater*	Natural Gas	Electric Power
Atalissa	Atalissa	Alliant Energy	Alliant Energy
Muscatine	Conesville	MidAmerican Energy	Eastern Iowa REC
West Liberty	Fruitland		MidAmerican Energy
	Montpelier		Muscatine Power and Water
	Muscatine		West Liberty
	Nichols		Wilton
	West Liberty		
	Wilton		

* Operated by individual jurisdictions

High Potential Loss Facilities

These are facilities that would have a high loss associated with them, such as nuclear power plants, dams, and military installations.

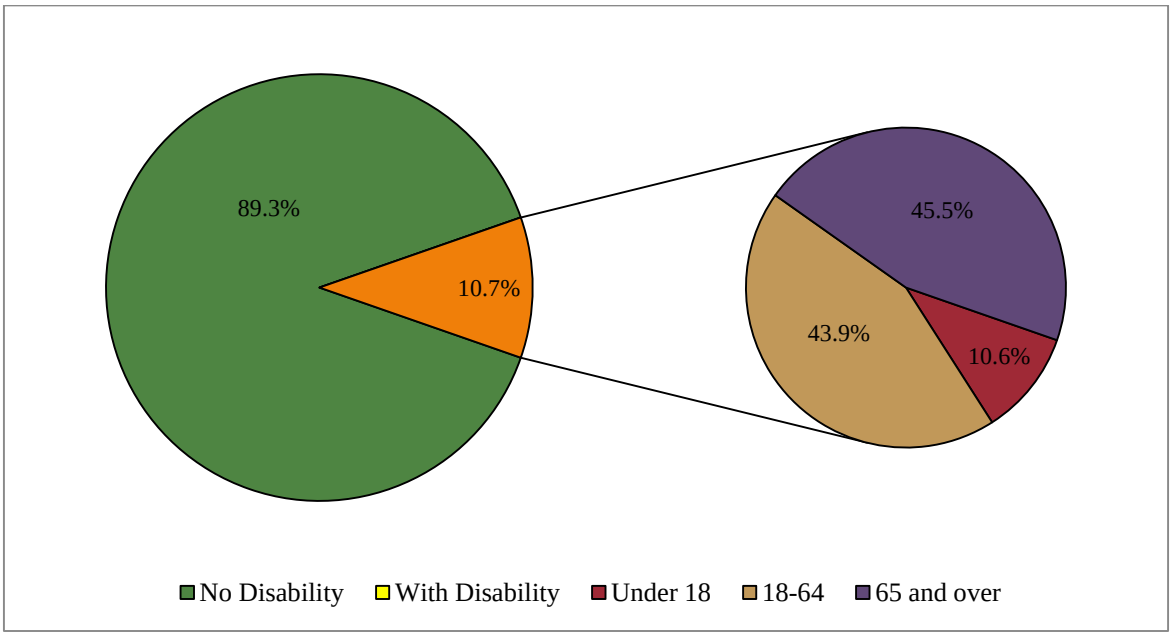
Hazardous Material Facilities

These are facilities housing industrial/hazardous materials, such as corrosives, explosives, flammable materials, radioactive materials, and toxins. There are 17 identified facilities within Muscatine County that house extremely hazardous substances. The most common hazardous materials found in the county are fertilizers and pesticides. See "Hazardous Material Incident" hazard profile for more information.

Vulnerable Populations

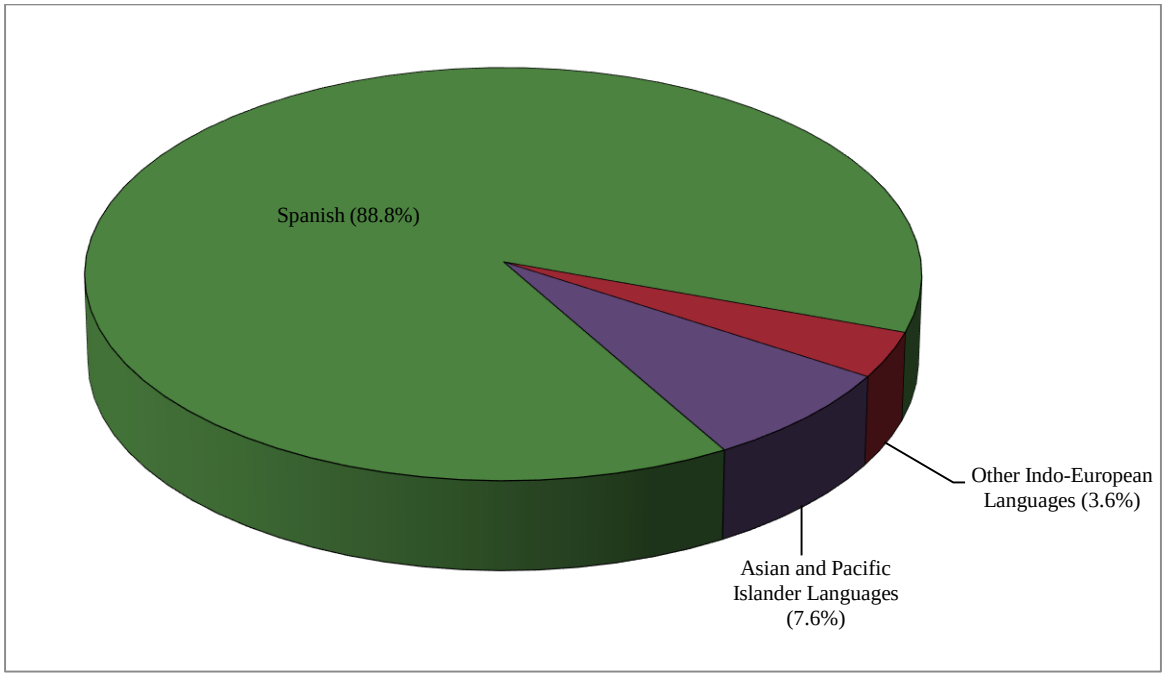
The risk assessment should include areas of greater population density, as well as populations that may have unique vulnerabilities or be less able to respond and recover during a disaster. Certain groups of people may not be able to comfortably or safely access the standard resources offered in emergencies. These populations could include small children, persons with disabilities, elderly persons, or non-English speaking residents that may require special response assistance or special medical care after a disaster. In Muscatine County over a quarter of the population is under 5 or over 65 (7.1% and 14.0% respectively). Of the non-institutionalized population in Muscatine County, 10.7% of the population have a disability. Figure 3-9 shows disability in detail by age. Of the population in Muscatine County age 5 and over, 85.9% speak English only. Of the population who speak a language other than English, 5.5% speak English less than "very well." Figure 3-10 shows language spoken in more detail.

Figure 3-9
Disability Status by Age of the Civilian Non-Institutionalized Population in Muscatine County



Source: U.S. Census Bureau, American Community Survey 3-year estimates (2009-11)

Figure 3-10
Language Spoken for the Population 5 years and Over Who Speak English Less Than "Very Well" in Muscatine County



Source: U.S. Census Bureau, American Community Survey 3-year estimates (2009-11)

Economy

Every community has specific economic features that are important and assist in the recovery of a community following a disaster. They can also add to the impact of a disaster if severely damaged or became inoperable. These can be major employers, primary economic sectors (i.e. manufacturing), and commercial centers.

Muscatine County
City Halls
County Facilities
Federal Buildings and Courthouse
Fire Stations
Police Stations
Public Works Facilities
U.S. Postal Facilities

Other Significant Areas

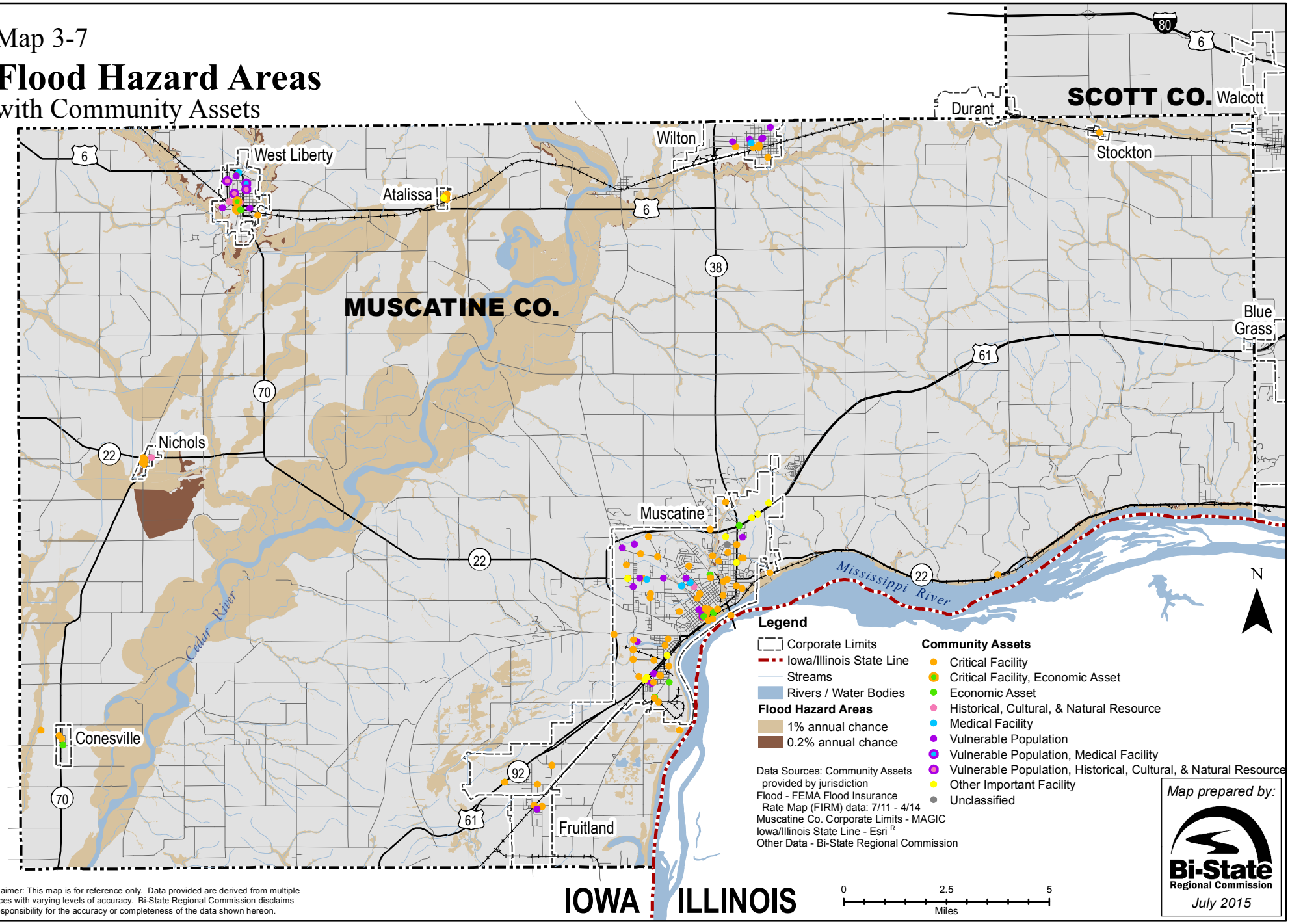
Other areas that should be taken into consideration when planning are areas of historical, cultural, and natural resource significance; high density areas; and other facilities that that help ensure a full recovery of your community following a hazard event.

Historical, Cultural, and Natural Resources	High Density Areas	Other Facilities
Historical districts	Shopping districts	Grocery Stores
County and State Parks	High density residential developments	Hardware Stores
Agricultural areas	Commercial buildings	Gas Stations
	Sports facilities	
	Fairgrounds	

Map 3-7

Flood Hazard Areas

with Community Assets



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.

Critical Facilities

Participating jurisdictions were asked to inventory community assets that could be damaged by a hazard event using the samples listed above as a guide. They individually determined which ones they considered critical facilities. These assets and critical facilities are described in general terms for each participating jurisdiction in the "Multi-Jurisdiction Risk Assessment" section. While specific site addresses are not included in this document for security reasons, the selected critical facilities have been mapped for the planning area as a whole in relation to the special flood hazard areas as represented on Map 3-7 on page 97. A total of 155 facilities were identified from the lists provided by the individual jurisdictions and Muscatine County EMA. Of these, 9 or 5.9% were found to be located within the 1% floodplain as represented on the map. Since this has been an initial effort to identify critical facilities, the list may be further refined in future plan updates.

Assessing Vulnerability: Estimating Potential Losses

Estimating potential losses due to natural hazards is recommended in the hazard analysis and risk assessment portion of the local hazard mitigation plan, but is required only for flood hazards according to the funding which supports this plan process. The FEMA hazard mitigation planning guidance offers methodology for calculating potential losses to due hazards; however, this required a level of detail for individual structures not readily available for the county-wide planning area. 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, utilities, and exempt land classifications. Data was collected for all the values of land, residential improvements, commercial improvements, yard items, and agricultural improvements, and 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 with only a portion of the floodplain were classified as located in totality 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 estimation 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. The next plan update will include more detailed information on structure types and numbers if available.

Table 3-9
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	14,692	$1,632.44	4,156	$137.80	28%
Commercial	3,183	$327.59	1,144	$32.35	36%
Industrial	2,744	$246.86	703	$68.71	26%
Agricultural Land	199,401	$404.59	101,019	$183.03	51%
Agricultural Dwelling	40,623	$216.02	19,816	$90.98	49%
Utility	1,454	$4.45	738	$1.29	51%
Exempt	8,136	$229.46	6,073	$58.85	75%
Total	**270,223**	**$3,061.42**	**133,649**	**$573.01**	—

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.

Development Trends and Future Land Use

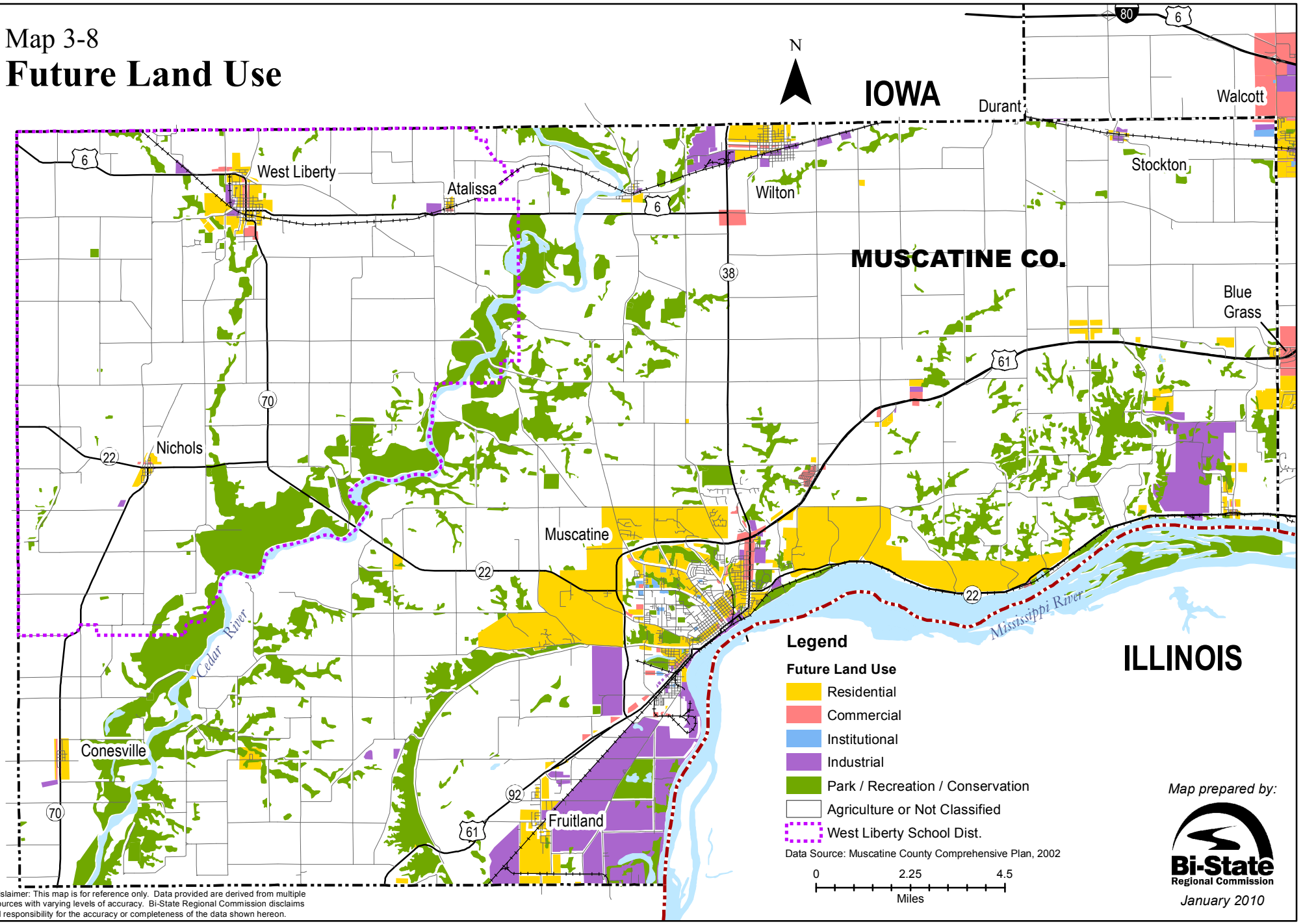
Currently, development in Muscatine County is concentrated around the cities of Atalissa, Conesville, Fruitland, Muscatine, Nichols, Stockton, West Liberty, and Wilton. Muscatine County has jurisdiction over land uses in the unincorporated area. These land uses are largely agricultural and open spaces with the exception of limited residential development in unincorporated areas such as north of the City of Muscatine and along highways. Map 3-8 shows future land use within Muscatine County.

As the future land use map shows, a significant increase in county land 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.

Industry is an integral part of the county's economy, accounting for approximately 30% of employment. As such, two industrial areas show where anticipated industrial growth may occur. One is located along the Mississippi River east of Fruitland between the City of Muscatine and the Louisa County border, while the second area is located west of the City of Muscatine close to the Scott County border with land adjacent to the Mississippi River.

Map 3-8

Future Land Use



Dislaimer: 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.

Development Trends by Jurisdiction

The following are detailed summaries of development plans by jurisdiction (of the participating jurisdictions). The communities of Atalissa and Nichols do not have comprehensive land use plans at this time.

City of Atalissa

No development has occurred within the city since the 2010 plan was adopted. Currently the city does not have any development plans within the next 5 years.

City of Fruitland

There has been no significant new development within the city since the 2010 hazard mitigation plan was adopted. The City of Fruitland's most current comprehensive plan dates from November 1999. The main development goal laid out in this plan was to retain the city's bedroom community image. Accordingly, residential land uses have almost doubled since 1999. The future land use goals in the plan also continue to confine industrial uses to the current zone adjacent to the railroad and commercial development to the city's main arterial, Muscatine Avenue.

City of Muscatine

Since the 2010 hazard mitigation plan was adopted, the city has seen development occur within its community. Development has been largely in the form of infill development including apartments above retail space in the downtown and fringe development. This development has been entirely out of the floodplain. The city annexed Ripley's manufactured home park along Highway 61 and County Road G14. There was the addition of a large business between Highway 92 and the railroad tracks by the airport

The city's current comprehensive plan was adopted September 19, 2013. This plan discusses existing land use as well as future land use plans. As of 2013, the parcels within the city's zoning districts contain land uses of the following categories (based on acreage): residential (48.5%), industrial (31.2%), agricultural (11.2%), special use (5.6%), and commercial (3.5%). Residential, commercial, and industrial are further defined by type.

The city plans for new development to occur within infill areas and limit development on the urban fringe for only those locations that are suitable for urban development. There is a large supply of residential parcels available for development (Mulberry Ave/U.S. 61 bypass), and no further large residential developments are planned for the next 5 years. The city averages 16 new residential homes a year.

City of Nichols

There has been no major development in the city since the hazard mitigation plan was adopted in 2010. Currently the city does not have any development plans within the next 5 years.

City of West Liberty

No major development has occurred within the city since the hazard mitigation plan was adopted in 2010. West Liberty's most recent comprehensive plan was adopted in February 2006. Existing land use data shows that West Liberty is 28% residential, 4% commercial, 3% industrial, 10% institutional, 5.5% open space, and 49.5% agricultural/ non-classifiable. The

West Liberty Industrial Park, which was undeveloped at the time this data was gathered, is designated as "non-classifiable."

The City of West Liberty has outlined several broad development goals including encouraging small businesses, expanding industrial land uses, and providing a variety of housing. These goals are reflected in the future land use map, which proposes an increase of residential to account for almost half of land uses, as well as an additional 550 acres of industrial land and 320 acres of commercial land. Currently, the city does not have any development plans within the next 5 years.

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.

Population Trends

Table 3-10 shows population, household, and housing unit change from 2000 to 2012, as well as projections for 2017 for Muscatine County. Both population and housing can be used to indicate the amount of development that has occurred in an area and help plan for future developments. Between 2000 and 2010 growth has mainly occurred in Fruitland (+18.4%), West Liberty (+12.5%), and the unincorporated area of the county (+5.8%). Comparatively, other areas of the county have seen population decline by -0.1% to -13.9%. Muscatine County overall continues to grow and is projected to gain 2.5% in population by 2017 (from 2010).

Table 3-10
Change in Population, Households, and Housing Units

Population	2000	2010	2012	2017	Percent Change 2000-2010	Percent Change 2000-2017
Muscatine County	41,722	42,745	43,206	43,794	2.5%	5.0%
City of Atalissa	361	311	312	314	-13.9%	-13.0%
City of Conesville	443	432	439	449	-2.5%	1.4%
City of Fruitland	825	977	952	914	18.4%	10.8%
City of Muscatine	22,920	22,886	23,255	23,734	-0.1%	3.6%
City of Nichols	403	374	387	406	-7.2%	0.7%
City of Stockton	198	197	192	185	-0.5%	-6.6%
City of West Liberty	3,321	3,736	3,732	3,725	12.5%	12.2%
City of Wilton	2,830	2,802	2,881	2,991	-1.0%	5.7%
Unincorporated	10,421	11,030	11,056	11,076	5.8%	6.3%

Households	2000	2010	2012	2017	Percent Change 2000-2010	Percent Change 2000-2017
Muscatine County	15,847	16,412	16,589	16,820	3.6%	6.1%
City of Atalissa	122	111	111	112	-9.0%	-8.2%
City of Conesville	129	132	134	138	2.3%	7.0%
City of Fruitland	286	331	322	308	15.7%	7.7%
City of Muscatine	9,012	9,008	9,153	9,347	0.0%	3.7%
City of Nichols	148	142	147	154	-4.1%	4.1%
City of Stockton	70	73	71	69	4.3%	-1.4%
City of West Liberty	1,144	1,251	1,248	1,244	9.4%	8.7%
City of Wilton	1,101	1,155	1,187	1,230	4.9%	11.7%
Unincorporated	3,835	4,209	4,216	4,218	9.8%	10.0%

Housing Units	2000	2010	2012	2017	Percent Change 2000-2010	Percent Change 2000-2017
Muscatine County	16,786	17,910	18,011	18,244	6.7%	8.7%
City of Atalissa	131	122	119	117	-6.9%	-10.7%
City of Conesville	145	153	153	155	5.5%	6.9%
City of Fruitland	295	342	340	336	15.9%	13.9%
City of Muscatine	9,493	9,830	9,916	10,092	3.5%	6.3%
City of Nichols	151	150	153	159	-0.7%	5.3%
City of Stockton	73	76	76	75	4.1%	2.7%
City of West Liberty	1,186	1,316	1,326	1,341	11.0%	13.1%
City of Wilton	1,138	1,231	1,255	1,294	8.2%	13.7%
Unincorporated	4,174	4,690	4,673	4,675	12.4%	12.0%

Source: Esri, Community Analyst (2012)
Note: Data from 2000 and 2010 are Census data; data from 2012 and 2017 are Esri estimates

Multi-Jurisdictional Risk Assessment

As described in the previous section on profiling hazards, each of the participating jurisdictions evaluated the hazards identified for the planning area. Each jurisdiction was asked to score the hazards profiled based on methodology in Appendix 3-1 for the following categories:

- Probability
- Magnitude/Severity
- Warning Time
- Duration

Each jurisdiction was asked to score the hazards based on their own local perspective and to note any additional information for the profile specific to its jurisdiction. The individual community scores were weighted by percentage of total population for determining the ranking and priority of the identified hazards for the whole 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 top ranking hazards based on the hazard profile scoring and adjusted as needed based on 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 3-6 on page 81. More detailed maps showing the special flood hazard areas for each jurisdiction can be found in Appendix 3-3.

Atalissa

Population (2010 Census): 311, an increase of 9.89% since 2000
0.73% of the total county's population
Ranks 8 of 8 jurisdictions in population

Land area: 0.14 sq. miles
0.03% of the total county's land area
Ranks 8 of 8 in land area

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 are U.S. Highway 6 and Iowa Interstate Railroad, which runs 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.

Hazard Priorities

2015 Priorities

1. Tornado
2. Thunderstorm & Lightning
3. Windstorm
4. Flash Flood
5. Extreme Heat
6. Grass or Wild-land Fire

2010 Priorities

1. Tornado
2. Thunderstorm & Lightning
3. Flash Flood
4. Windstorm
5. Hailstorm

Discussion

The top five hazards for the City of Atalissa include common hazards found throughout the county. Tornados rank as the highest threat to the city, followed by extreme heat. Grass or wild-land fire, thunderstorm & lightning, and windstorm round off their top hazards due to the extensive damage these hazards can cause. There are no levees or levee inundation areas within Atalissa, and there are no known occurrences of sinkholes within the jurisdiction. According to the Flood Insurance Rate Map, the majority of the city now lies in the 1% annual flood plain (see Appendix 3-3), but the city sees only flooding during extensive heavy rains that then recede quickly. The city views this as flash flooding instead of river flooding.

Critical Facilities

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

Conesville

Population (2010 Census): 432, an increase of 1.89% since 2000
1.01% of the total county's population
Ranks 6 of 8 jurisdictions in population

Land area 0.36 sq. miles
0.08% of the total county's land area
Rank 6 of 8 in land area

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, 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 a budget annually, but it does not have a capital improvement plan. The city has no identified special flood hazard areas and does not 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 has the ability to call additional personnel and resources from surrounding communities through a mutual aid agreement.

Hazard Priorities

2015 Priorities

1. Tornado
2. Extreme Heat
3. Grass or Wild-land Fire
4. Thunderstorm & Lightning
5. Windstorm
6. Severe Winter Storm

2010 Priorities

1. Thunderstorm & Lightning
2. Windstorm
3. Tornado
4. Flash Flood
5. Severe Winter Storm

Discussion

When scoring, the City of Conesville ranked tornado highest among the hazards. Conesville has experienced a damaging tornado. While tornado hazards do not occur as frequently as other hazards, Conesville has experienced firsthand the severe damage to property and people sustained during a tornado. Grass or wild-land fires occur frequently in the area; however, the damage has been minimal and fires have been easily controlled. Thunderstorm & lightning and windstorm hazards are common to the entire planning area, occur frequently, and can cause significant damage and injury. Hail was pushed below the severe winter storm hazard because the occurrence of hail is more infrequent than severe winter storms and does not cause as much damage. Conesville has no special flood hazard areas, and does not participate in the National Flood Insurance Program (see Appendix 3-3). There are no levees or levee inundation areas within Conesville. There are no known occurrences of sinkholes within Conesville.

Critical Facilities

The City of Conesville listed three critical facilities: city hall, the fire station, and the sewage treatment facility.

Fruitland

Population (2010 Census): 977, an increase of 38.98% since 2000
2.29% of the total County's Population
Ranks 5 of 8 jurisdictions in population

Land area: 1.80 SQ. Miles
0.41% of the total County's Land Area
Ranks 4 of 8 in land area

Geography

Fruitland is located in the southeast corner 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 is located close to the Mississippi River, which is approximately 2 miles east of the town border. 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 that runs along the west; Iowa, Chicago, and 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 and five-member city council are elected to two-year, staggered terms. The city keeps an attorney on retainer. Staff includes the city clerk, police chief, health officer, superintendent of public works, and building official. Fruitland has a zoning ordinance and a building code, and as such has a Planning & Zoning Board and Board of Adjustments. The city also has nuisance and park committees. The city creates a budget annually, but it does not have a capital improvement plan. The city participates in the National Flood Insurance Program and has a floodplain management ordinance. 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.

Hazard Priorities

2015 Priorities

1. Tornado
2. Levee Failure/River Flood
3. Severe Winter Storm
4. Drought
5. Flash Floods

2010 Priorities

1. Thunderstorm & Lightning
2. Tornado
3. Windstorm
4. Severe Winter Storm
5. Hailstorm
6. Flash Flood

Discussion

The top 5 hazards for the City of Fruitland include many of the same hazards common throughout the county. The greatest threat to the City of Fruitland is tornadoes, followed by a tie between levee failures and river floods. The remaining hazards included in the top are severe

winter storms, drought, and flash floods. With the adoption of the new flood maps in 2014, Fruitland no longer has special flood hazard areas to the northwest and southeast corners of the jurisdiction (see Appendix 3-3). Damage is expected to be minimal. There is a levee along the Mississippi River that has an inundation area that covers all of Fruitland. All of Fruitland's critical facilities would likely be affected by a levee breech. The Planning Committee intends to review the amount of property damage a levee breech would cause in the next plan update, as information related to this is not available at this time. Historically, there are no known occurrences of levee breech on this levee. There are no known occurrences of sinkholes within the City of Fruitland.

Critical Facilities

The City of Fruitland recognized three buildings in their list of critical facilities and one area with a vulnerable population. Included in the list were city hall, the fire station, the post office, and a trailer park area.

Muscatine

Population (2010 Census): 22,886, an increase of 0.83% since 2000
53.54% of the total county population
Ranks 1 of 8 jurisdictions in population

Land area 17.30 sq. miles
3.95% of total county's land area
Rank 2 of 8 in land area

Geography

The City of Muscatine is the largest municipality in terms of population. It is located along the Mississippi River where the river turns south in the south central portion of the Muscatine County. The city extends along State Highway 92. The City of Muscatine is bordered by Fruitland in the southwest, and the Mississippi River acts at this jurisdiction's southwestern border. Since the 2010 *Muscatine County Multi-Jurisdictional Hazard Mitigation Plan*, the City of Muscatine has annexed a mobile home and manufactured home park along U.S. 61 and County Road G14. 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. 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 the city limit 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 adopted 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 15 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 full list of plans and policies for the city can be found in Table 2-1 in Chapter 2.

Hazard Priorities

2015 Hazard Priorities

1. Tornado
2. River Flood
3. Flash Flood
4. Thunderstorm & Lightning
5. Windstorm
6. Severe Winter Storm

2010 Hazard Priorities

1. Windstorm
2. Thunderstorm & Lightning
3. Severe Winter Storm
4. Hazardous Material
5. River Flood/Tornado

Discussion

The City of Muscatine's hazard priorities are similar to Muscatine County as a whole, although they are in a slightly different order due to the proximity of the City of Muscatine to the Mississippi River. A certified levee protects the City of Muscatine's Muscatine Island from flooding on the Mississippi River. The majority of repetitive loss properties within the City of Muscatine are located along the Mississippi River on the eastern side of the city. Thunderstorm & lightning, severe winter storms, and tornados can occur anywhere in the county. The city has experienced deaths related to lightning and tornadoes during the plan development. With the removal of the floodplain behind the Muscatine Island levee system due to levee certification, the majority of the City of Muscatine's special flood hazard areas are located Mad Creek (see Appendix 3-3). The existing land use in this area is industrial and commercial in nature. The land located in this area is included in the "Assessing Vulnerability: Estimating Potential Losses" section of the plan. The Muscatine Island levee is located along the Mississippi River in the City of Muscatine, and the southwestern portion of the jurisdiction is located in an inundation area. The Planning Committee intends to review the amount of property damage a levee breech would cause in the next plan update, as information related to this is not available at this time. Historically, there are no known occurrences of levee breech on this levee. There are no known occurrences of sinkholes within the City of Muscatine.

Critical Facilities

The City of Muscatine listed a total of 60 buildings and structures as critical facilities. Among those listed were City Hall; the Public Safety Building; the fire stations; power & water facilities; public works; the solid waste transfer station; the county jail; courthouse; other county operations; schools; communication facilities; the bridges over the Mississippi River, Mad Creek and Geneva Creek; and the sewer lift stations.

Muscatine County – Rural /Unincorporated

Population (2010 Census): 11,227, an increase in 1.33% since 2000
26.27% of the total county's population
Ranks 2 of 8 jurisdictions in population

Land area: 413 sq. miles
94.63% of the total county's land area
Ranks 1 of 8 in land area

Geography

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 85% 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 and 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 Administration, Assessor's Office, Attorney's Office, Auditor's Office, Health, Building, Community Services, Conservation, Emergency Management, Engineer, Environmental Health, GIS, Information Technology, Medical Examiner, Recorder's Office, Sheriff's Office, Veteran's 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 2014 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.

Hazard Priorities

2015 Hazard Priorities

1. Severe Winter Storm
2. Thunderstorm & Lightning
3. Windstorm
4. Flash Flood
5. River Flood
6. Tornado

2010 Hazard Priorities

1. Severe Winter Storms
2. Thunderstorm & Lightning
3. Tornado
4. Windstorm
5. River Floods/Hailstorms

Discussion

Rural/Unincorporated Muscatine County's top six hazards fall approximately within the same order as the countywide priorities. With the location in a rural area, this puts severe winter storms as the top hazard, with the likelihood of at least one major occurrence annually. Severe winter storms are followed in rank by; Thunderstorm & Lightning Windstorms which often

occur together. The last of the top priorities are Flash Flood, River Flood and Tornado. With two major rivers located within the county (Mississippi River and Cedar River), river flooding will always be top hazard concern.

Critical Facilities

In addition to all of the identified facilities within incorporated areas of Muscatine County, rural and unincorporated Muscatine County recognized one building in their list of critical facilities. Included in the list was City Hall of Stockton, a non-participating jurisdiction. Muscatine County's facilities are primarily located within the City of Muscatine and include the jail, courthouse, and administration building.

Nichols

Population (2010 Census): 374, no population change has occurred since 2000
0.87% of the total county's population
Ranks 7 of 8 jurisdictions in population

Land area: 0.23 sq. miles
0.05% of the total county's land area
Ranks 7 of 8 in land area

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.

Hazard Priorities

2015 Priorities
1. Thunderstorm & Lightning/ Windstorm
2. Severe Winter Storm
3. Hazardous Materials
4. Grass or Wild-land Fire
5. Extreme Heat

2010 Priorities
1. Flash Floods
2. Windstorm
3. Hazardous Materials
4. Tornado
5. Severe Winter Storm

Discussion

Threats to Nichols are common to the same ones experienced throughout the county. The top hazard in the community is thunderstorm & lightning followed by severe winter storm, hazardous materials, grass or wild-land fire, and extreme heat. The top hazards are pretty close to the 2010 priorities with the exception of flash flood. There are special flood hazard areas located within the City of Nichols (see Appendix 3-3) along the southeastern part of the city from a tributary to Wapsinonoc Creek. There are no levees or levee inundation areas located within Nichols. There are no known occurrences of sinkholes within Nichols.

Critical Facilities

The City of Nichols listed 16 critical facilities, including two vulnerable populations. Included in the list were city hall, the fire station, the sewer pumping station, electrical transmission lines, and city parks.

West Liberty

Population (2010 Census): 3,736, an increase of 12.12% since 2000
8.71% of the total county's population
Ranks 3 of 8 jurisdictions in population

Land area: 1.73 sq. miles
0.40% of the total county's land area
Ranks 5 of 8 in land area

Geography

The City of West Liberty is located in northwestern Muscatine County between the Middle Branch of the Wapsinonoc Creek and the West Branch of the Waspinonoc 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 parks and 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 are elected to four-year staggered terms with an appointed city manager. The city keeps an attorney on retainer. Staff includes the city clerk, police chief, fire chief, public works director, city treasurer, and parks & 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 creates a budget annually, but it does not have a capital improvement plan. 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.

Hazard Priorities

2015 Priorities
1. Severe Winter Storm
2. Thunderstorm & Lightning
3. Tornado
4. Flash Flood
5. Grass & Wild-land Fire
6. River Flood /Hazardous Materials

2010 Priorities
1. Severe Winter Storms
2. Hazardous Material
3. Thunderstorm & Lightning
4. Tornado
5. River Flood/Flash Flood

Discussion

The City of West Liberty's top priorities mirror those of the countywide priorities, with the omission of windstorm and the addition of grass or wild-land fire and hazardous materials. The city's location near the East Branch of the Wapsinonoc Creek and West Branch of the Wapsinonoc Creek make West Liberty susceptible to river floods while the range in slopes in the area can contribute to flash floods. West Liberty has a special flood hazard area along both branches of Wapsinonoc in the northern part of the jurisdiction (see Appendix 3-3). This area is primarily residential in nature. The land located in this area is included in the "Assessing Vulnerability: Estimating Potential Losses" section of the plan. Severe winter storms, thunderstorm & lightning, and tornados can occur anywhere in the county and can be regional in nature. West Liberty has several industries in the area that handle hazardous materials, making the city more susceptible to hazardous materials incidents. There are no levees or levee inundation areas located within West Liberty. There are no known occurrences of sinkholes within West Liberty.

Critical Facilities

West Liberty listed seven 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. According to the 2013 American Community Survey, 42.5% of people living in West Liberty speak English "less than 'very well.'"

Wilton

Population (2010 Census): 2,802, a decrease of 0.81% since 2000
6.56% total county
Ranks 4 of 8 jurisdictions in population

Land area 1.95 sq. miles
0.45% total county area
Rank 3 of 8 jurisdictions in land area

Geography

The City of Wilton is located in northern Muscatine County, and a small portion of Wilton is located in Cedar County. U.S. 6/IA 38 runs north/south through the city while the Iowa Interstate Railroad crosses the 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. No storm water detention areas have been developed within the city.

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, economic development coordinator, and community center director. Wilton 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, community center board, municipal light board, pool 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 that has the ability to call additional personnel and resources from surrounding communities through a mutual aid agreement.

Hazard Priorities

2015 Priorities

1. Tornado
2. Thunderstorm & Lightning
3. Flash Flood
4. Severe Winter Storm
5. Hazardous Materials
6. Grass or Wild-land Fire

2010 Priorities

1. Flash Flood
2. Tornado
3. Severe Winter Storm
4. Windstorm
5. Hazardous Materials

Discussion

The City of Wilton's hazard priorities are similar to the county, with tornados ranked as the top priority. The remaining top hazards are grass or wild-land fire, thunderstorm & lightning, flash flood, severe winter storms, and hazardous materials. Due to the high percentage of industrially-zoned land within Wilton and the desire to expand upon that industrial area in the future, hazardous materials incidents ranked within the top priorities for the city. The City of Wilton has a small special flood hazard area along Mud Creek in the southern portion of the jurisdiction (see Appendix 3-3). Much of this area is undeveloped and is slated for open space or recreational areas in Wilton's comprehensive plan. The land located in this area is included in the "Assessing Vulnerability: Estimating Potential Losses" section of the plan. There are no levees or levee inundation areas located within Wilton. There are no known occurrences of sinkholes within the jurisdiction.

Critical Facilities

The City of Wilton listed a total of 41 critical facilities, five of those identified as facilities with vulnerable populations. Critical facilities include the water plant, sewer plant, public works, electric plant, city hall/library, and fire station. Vulnerable populations include the city's schools, assisted living, and day care facilities.

APPENDIX 1-1 DRAFT RESOLUTION

Resolution Number # _____

A RESOLUTION OF THE CITY OF _____ IN SUPPORT OF THE APPROVAL AND ADOPTION OF THE MUSCATINE COUNTY MULTI-JURISDICTION LOCAL HAZARD MITIGATION PLAN

WHEREAS, Muscatine County applied for and was awarded funding from the Hazard Mitigation Grant Program (HMGP) administered by the Federal Emergency Management agency (FEMA) and through the Iowa Homeland Security and Emergency Management Division (IHSEMD) for developing a multi-jurisdictional local hazard mitigation plan; and

WHEREAS, the County contracted with the Bi-State Regional Commission (BSRC) for assistance in preparing the Plan; and

WHEREAS, the City of _____, with the assistance from Muscatine County and BSRC has gathered information and prepared the Muscatine County Multi-Jurisdictional Local Hazard Mitigation Plan; and

WHEREAS, the Muscatine County Multi-Jurisdictional Local Hazard Mitigation Plan has been prepared in accordance with FEMA requirements at 44 CFR 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 _____ has 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 _____, 201_ at the meeting of the Mayor and City Council for the City of _____.

_____

_____, Mayor

Attest:

_____

_____, Clerk

APPENDIX 1-2 EXECUTED JURISDICTION ADOPTION RESOLUTIONS

APPENDIX 2-1 POWERPOINT FROM KICK-OFF MEETING

MUSCATINE COUNTY MULTI-JURISDICTIONAL HAZARD MITIGATION PLAN

Plan Update Kick-Off Meeting

Bi-State Regional Commission

December 12, 2012

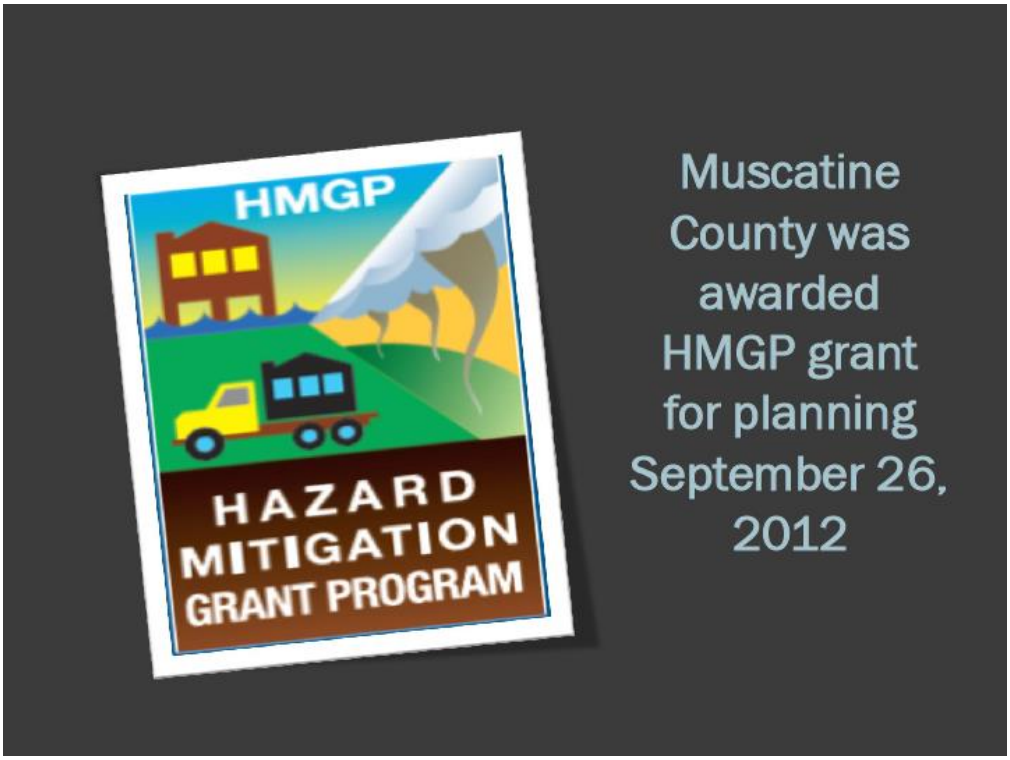
What is Hazard Mitigation?

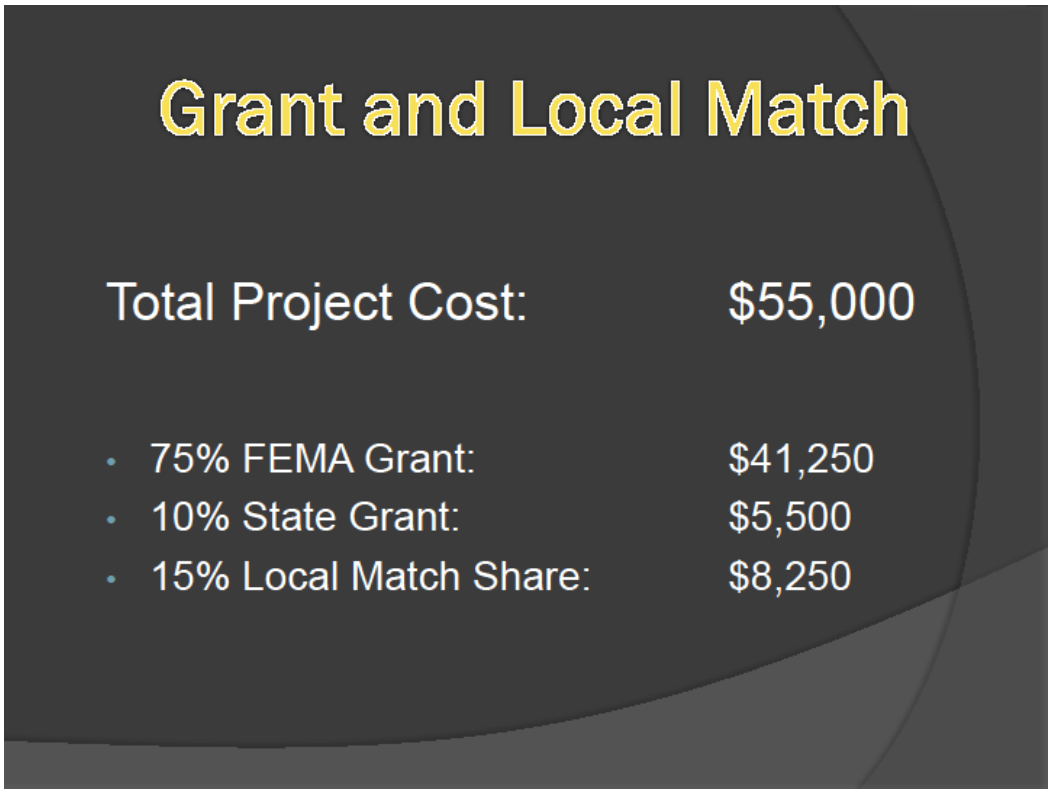
What is Hazard Mitigation Planning?

Why Create a Hazard Mitigation Plan?

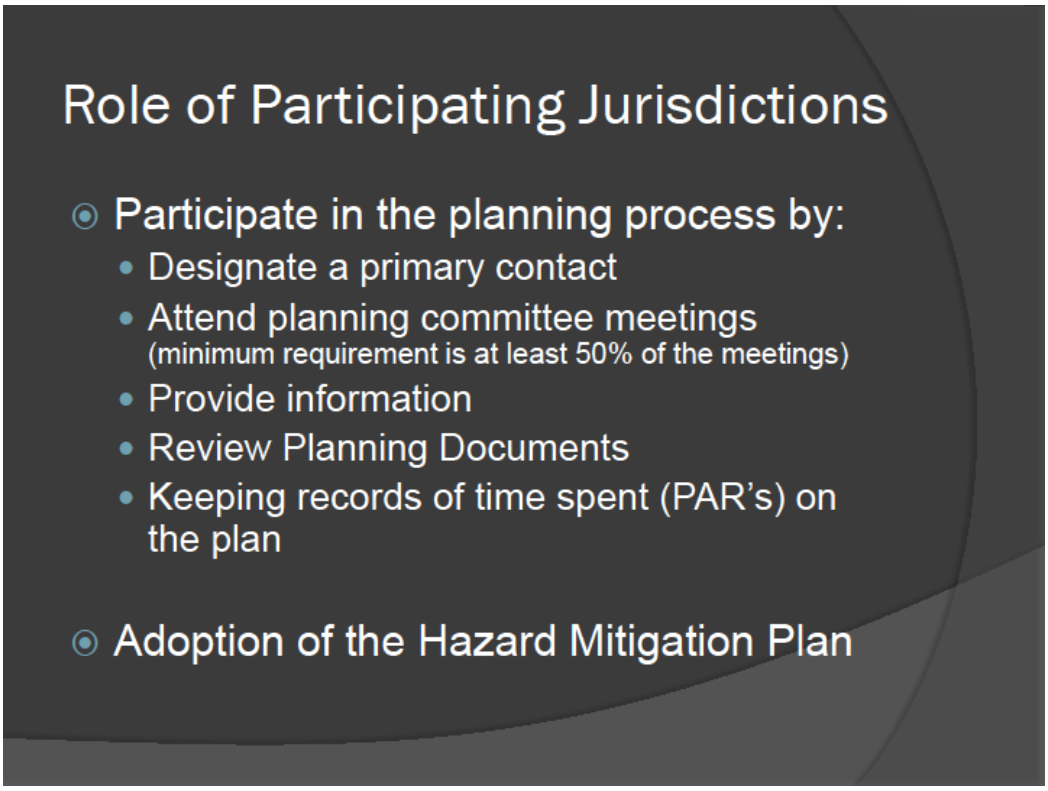
- Disaster Mitigation Act of 2000
- Allows communities to be eligible for FEMA Hazard Mitigation Assistance Grant Programs
- Update to the current Hazard Mitigation Plan

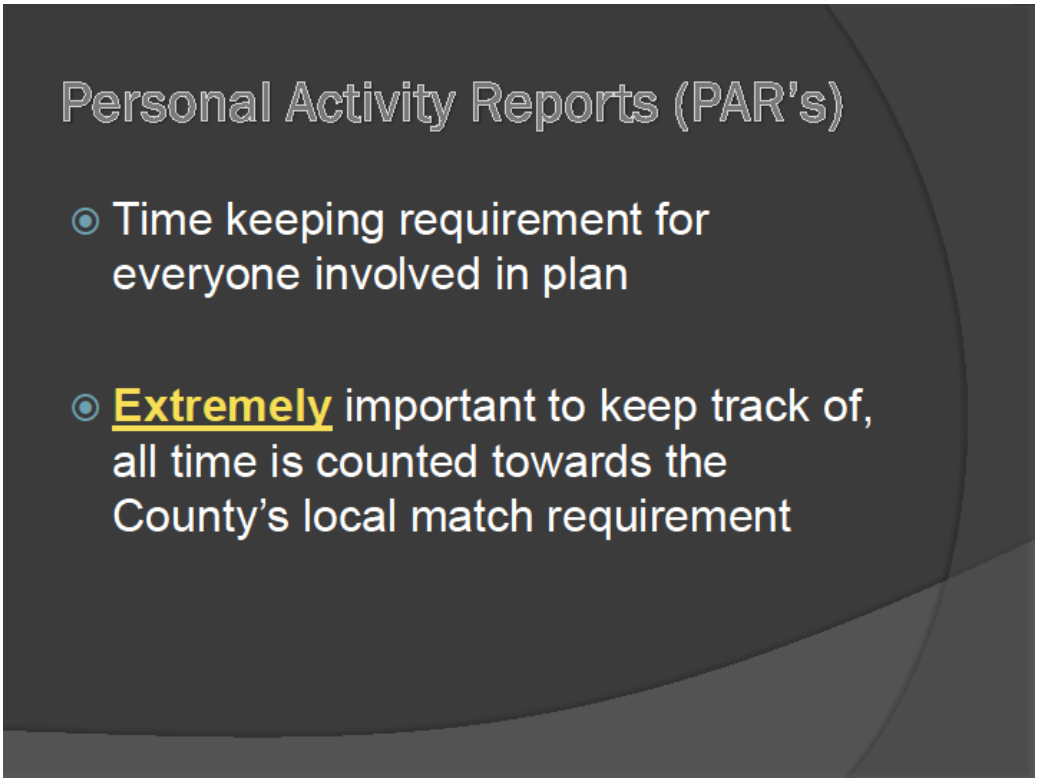

2010 Muscatine County Plan
Muscatine County
Iowa
Multi-Jurisdictional
Hazard Mitigation Plan
April 2010


HMGP
HAZARD
MITIGATION
GRANT PROGRAM
Muscatine
County was
awarded
HMGP grant
for planning
September 26,
2012

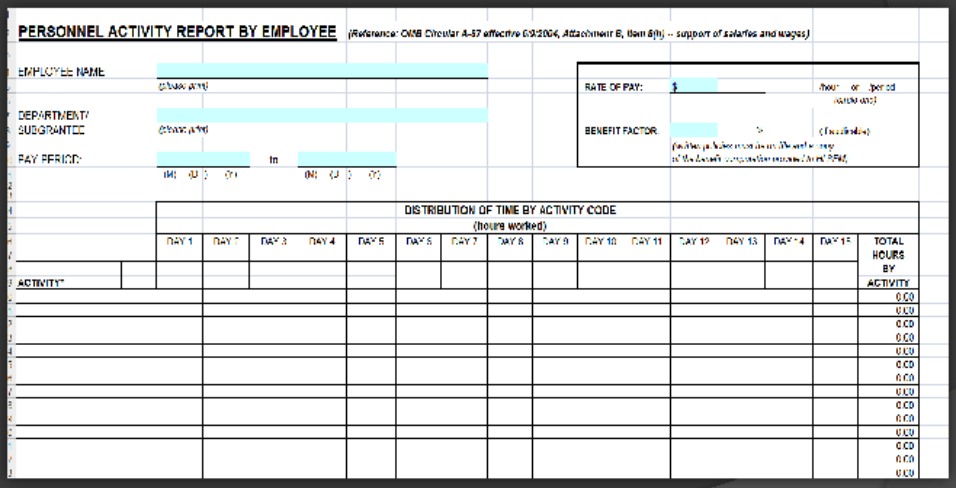

Grant and Local Match
Total Project Cost: $55,000
75% FEMA Grant: $41,250
10% State Grant: $5,500
15% Local Match Share: $8,250


Participating Jurisdictions
Muscatine County*
Atalissa*
Conesville*
Fruitland*
Muscatine*
Nichols*
Stockton
West Liberty*
Wilton*
Muscatine Community School District
West Liberty Community School District*
Wilton Community School District
Muscatine Community College
* Participated in previous plan; final list TBD


Role of Participating Jurisdictions
Participate in the planning process by:
Designate a primary contact
Attend planning committee meetings
(minimum requirement is at least 50% of the meetings)
Provide information
Review Planning Documents
Keeping records of time spent (PAR's) on the plan
Adoption of the Hazard Mitigation Plan


Personal Activity Reports (PAR's)
Time keeping requirement for everyone involved in plan
Extremely important to keep track of, all time is counted towards the County's local match requirement

PAR's



PERSONNEL ACTIVITY REPORT BY EMPLOYEE *(Reference: OMB Circular A-87 effective 05/2004, Attachment B, Item 8(h) -- support of salaries and wages)*

EMPLOYEE NAME:

DEPARTMENT/ SUBGRANTEE:

PAY PERIOD: to

RATE OF PAY: $ /hour or /period

BENEFIT FACTOR: %

DISTRIBUTION OF TIME BY ACTIVITY CODE
(hours worked)

ACTIVITY*	DAY 1	DAY 2	DAY 3	DAY 4	DAY 5	DAY 6	DAY 7	DAY 8	DAY 9	DAY 10	DAY 11	DAY 12	DAY 13	DAY 14	DAY 15	TOTAL HOURS BY ACTIVITY
																0.00
																0.00
																0.00
																0.00
																0.00
																0.00
																0.00
																0.00
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																0.00
																0.00
																0.00
																0.00
																0.00

Public Input

- Important part of the planning process
- Ideas:
  - Send information out in utility bills
  - Online survey (i.e. Survey Monkey)
  - Informational booths at events
  - Others??

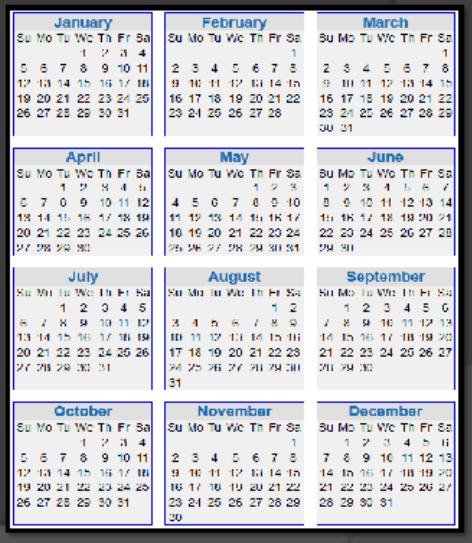
Planning Committee Meetings

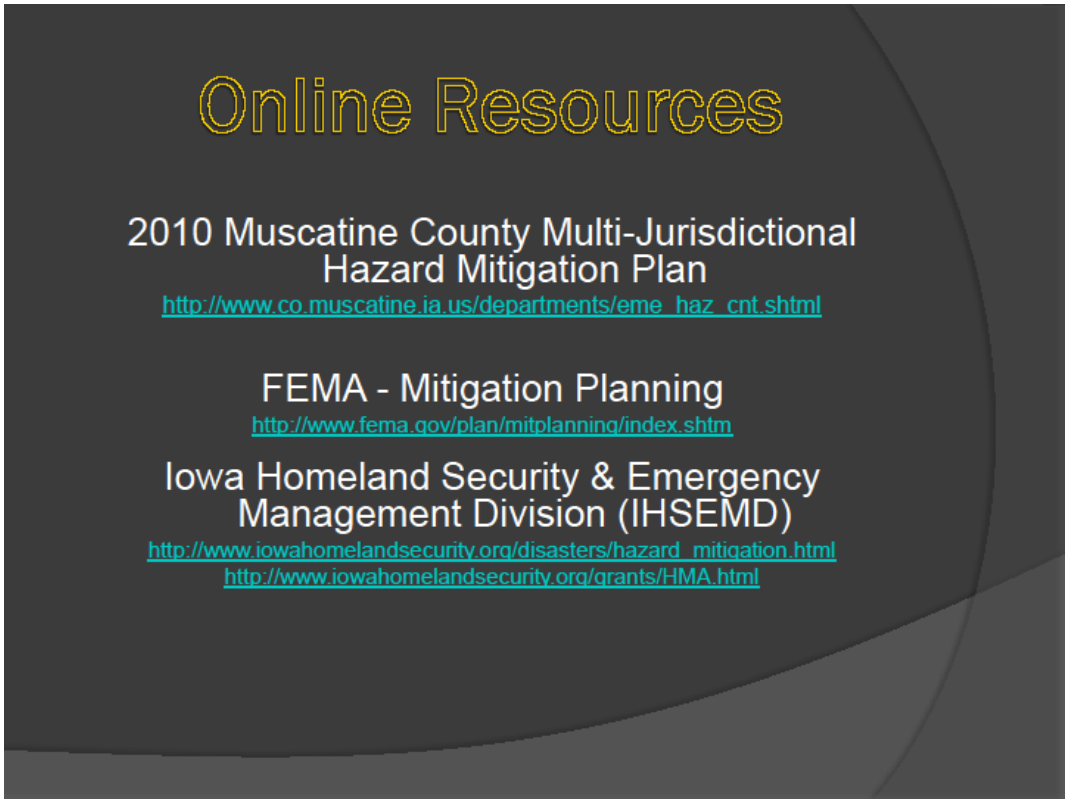
- Meetings will begin in January 2013
- Best day and time
- Location
- Each community will need to attend a minimum of 50% of the meetings for participation

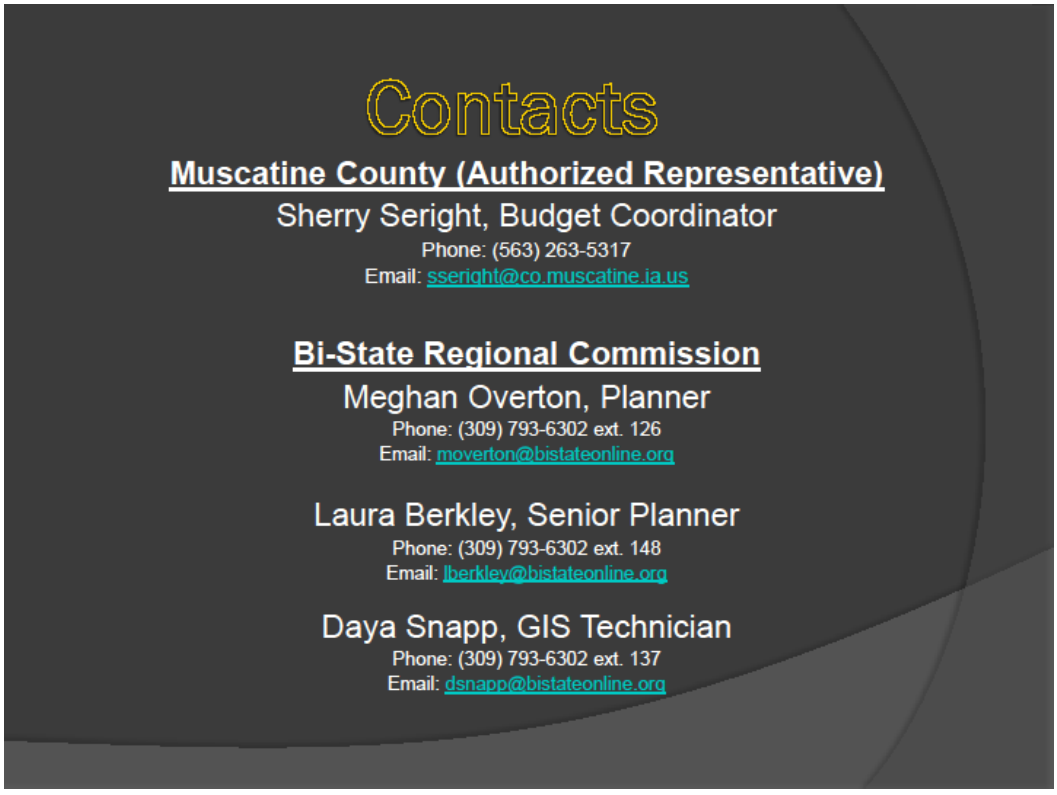
Meeting Schedule

2013

2014




Online Resources
2010 Muscatine County Multi-Jurisdictional Hazard Mitigation Plan
http://www.co.muscatine.ia.us/departments/eme_haz_cnt.shtml
FEMA - Mitigation Planning
http://www.fema.gov/plan/mitplanning/index.shtm
Iowa Homeland Security & Emergency Management Division (IHSEMD)
http://www.iowahomelandsecurity.org/disasters/hazard_mitigation.html
http://www.iowahomelandsecurity.org/grants/HMA.html


Contacts
Muscatine County (Authorized Representative)
Sherry Seright, Budget Coordinator
Phone: (563) 263-5317
Email: sseright@co.muscatine.ia.us
Bi-State Regional Commission
Meghan Overton, Planner
Phone: (309) 793-6302 ext. 126
Email: moverton@bistateonline.org
Laura Berkley, Senior Planner
Phone: (309) 793-6302 ext. 148
Email: lberkley@bistateonline.org
Daya Snapp, GIS Technician
Phone: (309) 793-6302 ext. 137
Email: dsnapp@bistateonline.org

APPENDIX 2-2 PLANNING STAFF AND PLANNING COMMITTEE

Muscatine County Hazard Mitigation Plan

Planning Committee Contacts

Primary Contacts

Jurisdiction	Name	Title
Bi-State Regional Commission	Laura Berkley	Senior Planner
Bi-State Regional Commission	Meghan Overton	Planner
Atalissa	Joe Blick	Mayor
Coneville	Dan Conaway	Fire Chief
Fruitland	Scott Wilson	City Council
Muscatine	Jerry Ewers	Fire Chief
Muscatine MUSCOM	Lorrie Lacina	Manager
Muscatine County	Scott Sauer	Board of Supervisors
Muscatine County EMA	Matt Shook	Director
Nichols	Russ Grim	Fire Chief/City Council
West Liberty	Robbie Rock	Fire Chief
Wilton	Chris Balls	City Administrator

APPENDIX 2-3 ADVISORY COMMITTEE INVITATION LETTER

Bi-State
Regional Commission
1504 3rd Avenue • P.O. Box 3368
Rock Island, IL 61204-3368
Phone: (309) 793-6300 • Fax: (309) 793-6305
Website: http://www.bistateonline.org

To All Organizations and Interested Parties:

This notice is to invite you or another representative of your organization to participate in a planning process to update the Muscatine County Multi-Jurisdictional Hazard Mitigation Plan. Muscatine County, Iowa contracted with Bi-State Regional Commission to guide the preparation of the update of the 2010 Muscatine County Multi-Jurisdictional Hazard Mitigation Plan. In addition to Muscatine County and the local jurisdiction representatives, the planning process requires a broad range of input and expertise from individuals and organizations with interest in hazard mitigation within Muscatine County (and neighboring organizations).

The plan will meet the requirements of the Disaster Mitigation Act of 2000, also known as DMA 2000. The Act, which was signed into law on October 30, 2000, streamlines delivery and utilization of disaster recovery assistance and places increased emphasis on local mitigation planning. It requires local governments to develop and submit mitigation plans as a condition of receiving project grants under four FEMA programs: Pre-Disaster Mitigation (PDM), Hazard Mitigation Grant Program (HMGP), Flood Mitigation Assistance (FMA), Severe Repetitive Loss (SRL). Plans must be updated every 5 years in order to remain eligible.

Those participating are asked to review materials as the planning document develops. Participants are invited to attend planning group meetings as scheduled. An informational public hearing will be held on **Wednesday, February 13, 2013 at 7:00 pm** at the Muscatine County Environmental Learning Center, 3300 Cedar Street, Muscatine, Iowa.

Please let us know if you or another representative of your organization would be willing to participate in this planning process, so that we may develop an accurate contact list. Also, if you know of other organizations that should be included in this process, please let us know. Bi-State Regional Commission will be assisting Muscatine County in the plan update and you may be contacted regarding correspondence and questions. Contact information is provided below. Thank you for your assistance with this planning process, and we hope to see you at the meeting on February 13th.

Questions regarding the ongoing planning process may be directed to Laura Berkley at Bi-State Regional Commission (309) 793-6300 or lberkley@bistateonline.org.

Laura Berkley, Senior Planner
Bi-State Regional Commission
1504 3rd Avenue, P.O. Box 3368
Rock Island, IL 61204-3368
(309) 793-6300
lberkley@bistateonline.org

Note: If you would NOT like to be contacted please email Laura Berkley at lberkely@bistateonline.org and we will remove you from the list.

APPENDIX 2-4 ADVISORY COMMITTEE LIST

MUSCATINE COUNTY MULTI-JURISDICTIONAL HAZARD MITIGATION PLAN
ADVISORY GROUP

Neighboring Communities/ Non-Participating Communities

Organization	Contact Name	Title
City of Durant	Dawn Smith	Mayor
Scott County EMA	Ross Bergen	Director

State, Regional and Local Government Representatives

Organization	Contact Name	Title
Muscatine County EMA	Matt Shook	Director
Muscatine County Sheriff	Dave White	Sheriff
Iowa State Patrol	District 12 Office	
IHSEMD	Linda Roose	Lead State Mitigation Project Officer
IHSEMD	Mat Noble	Mitigation Planner
Iowa NFIP Coordinator	Bill Cappuccio	State Floodplain Manager
Iowa State Climatologist	Harry Hillaker	Climatologist
Iowa State Geologist	Dr. Robert Libra	Geologist

Business and Developmental Agencies

Organization	Contact Name	Title
Muscatine Chamber of Commerce	Bill Phelan	President & CEO
Wilton Chamber of Commerce	Jackie Barten	
West Liberty Chamber of Commerce/ WeLead	Becky Algood	

Federal Agency Representatives

Organization	Contact Name	Title
USACE	Jerry Skalak	Project Manager / Floodplain Manager
National Weather Service	Donna Dubberke	Meterologist

Neighborhood Groups and Non-Profits

Organization	Contact Name	Title
Red Cross	Brooke Mehaffey	Unit Director
United Way	Shane Orr	Interim CPO
Muscatine County Conservation Board	Curt Weiss	Director

Media

Organization	Contact Name	Title
KWQC-TV 6	Ken Freedman	General Manager
WHBF -TV 4	Marshall Porter	General Manager
WQAD-TV 8	Jim Kiser	President and General Manager
Muscatine Journal	Steve Jameson	Publisher
West Liberty Index	Stuart Clark and Jake Krob	Publisher
Wilton-Durant Advocate		Publisher

APPENDIX 2-5 PUBLIC HEARING PUBLICATION AFFIDAVITS

PROOF OF PUBLICATION

STATE OF IOWA
Muscatine County} SS.

I, *Paulette H. Theobald*, being first duly sworn on oath depose and say; that I am circulation manager of the ***Wilton-Durant Advocate News***, a newspaper published weekly in the City of Wilton, Muscatine County, State of Iowa, and that notice of:

Public Meeting, Muscatine County, Haz. Mit. Plan, to be held 2-13-13

hereto attached and made a part hereof, was published once each week for 1 week(s) in succession, in said newspaper, and that the date of publication was 2-7-13 and that the copy of said printed notice, hereto attached, was cut from one of said publications.

Paulette Theobald

Subscribed and sworn to before me on this 7th day of February, 2013.

Barbara J. Rochholz
Notary Public

BARBARA J. ROCHHOLZ
COMMISSION NUMBER 724504
MY COMMISSION EXPIRES:
9-16-15

PUBLIC NOTICES

NOTICE

Muscatine County is in the process of preparing the update of the 2010 Muscatine County Multi-Jurisdictional Local Hazard Mitigation Plan. An introductory meeting for public participation will be held on Wednesday, February 13, 2013 at 7:00 pm at the Muscatine County Environmental Learning Center, 3300 Cedar Street, Muscatine, Iowa. Muscatine County received a Hazard Mitigation Grant Program (HMGP) grant to prepare the plan from the Federal Emergency Management Agency (FEMA). Grant administration and an additional 10 percent match to the grant comes through the Iowa Homeland Security Emergency Management Division (IHSEMD). Jurisdictions participating in the plan in addition to Muscatine County include the Cities of Atalissa, Conesville, Fruitland, Muscatine, Nichols, Stockton, West Liberty, and Wilton. The School Districts have also been invited to participate in the plan. Public participation and comments are invited as the plan document is developed. All planning meetings are open to the public. The schedule of meetings, related documents, and plan drafts will be posted for review on the County's website at http://www.co.muscatine.ia.us. Questions regarding the ongoing plan process may be directed to Laura Berkley at Bi-State Regional Commission (309) 793-6300 or Sherry Seright with Muscatine County (563) 263-5317.

APR 8 2013

PROOF OF PUBLICATION

Muscatine County

Public Notice

Muscatine County is in the process of preparing the update of the 2010 Muscatine County Multi-Jurisdictional Local Hazard Mitigation Plan. An introductory meeting for public participation will be held on Wednesday, February 13, 2013 at 7:00 pm at the Muscatine County Environmental Learning Center, 3300 Cedar Street, Muscatine, Iowa. Muscatine County received a Hazard Mitigation Grant Program (HMGP) grant to prepare the plan from the Federal Emergency Management Agency (FEMA). Grant administration and an additional 10 percent match to the grant comes through the Iowa Homeland Security Emergency Management Division (IHSEMD). Jurisdictions participating in the plan in addition to Muscatine County include the Cities of Atalissa, Conesville, Fruitland, Muscatine, Nichols, Stockton, West Liberty, and Wilton. The School Districts have also been invited to participate in the plan. Public participation and comments are invited as the plan document is developed. All planning meetings are open to the public. The schedule of meetings, related documents, and plan drafts will be posted for review on the County's website at http://www.co.muscatine.ia.us. Questions regarding the ongoing plan process may be directed to Laura Berkley at Bi-State Regional Commission (309) 793-6300 or Sherry Seright with Muscatine County (563) 263-5317.

State of Iowa, Muscatine County, ss:

I, Jesse Mullen, Editor of the West Liberty Index, a weekly newspaper of general circulation published at West Liberty, in said county, and being duly sworn, do declare and say that a Notice, of which one hereto attached is a copy, was published in said West Liberty Index respectively:

2-7-13

Fee: $ 12-86

Sworn to by said Jesse Mullen before me and signed by her in my presence this _____ day of _____, _____

Notary Public

Received of _____ _____ Dollars in full on above publication.

PROOF OF PUBLICATION

I, Jeff Lee, being duly sworn, on my oath, say that I am an advertising clerk at the *Muscatine Journal*, a newspaper of general circulation, published in the City of Muscatine, Muscatine County, Iowa; and that the following Notice:

Bi-State Regional Commission
Notice Of Public Review

Of which the annexed printed slip is a true, correct and complete copy, was published in said *Muscatine Journal* one time having been made there in on:

August 6, 2015

Jeff Lee

STATE OF IOWA
MUSCATINE COUNTY
6th day of August, 2015

NOTICE OF PUBLIC REVIEW

MUSCATINE County has prepared the update of the 2010 Muscatine County Multi-Jurisdictional Local Hazard Mitigation Plan. An informational meeting for the public will be held on Tuesday, August 18, 2018 at 6:30 pm at the Muscatine County Environmental Learning Center, 3300 Cedar Street, Muscatine, Iowa. Muscatine County received a Hazard Mitigation Grant Program (HMGP) grant to prepare the plan from the Federal Emergency Management Agency (FEMA). Jurisdictions participating in the plan in addition to the County include the Cities of Atalissa, Conesville, Fruitland, Muscatine, Nichols, West Liberty, and Wilton. Public participation and comments are invited as the plan development is finalized before plan adoption. The plan draft will be posted for review on the County's website at http://www.co.muscatine.ia.us/219/Emergency-Management. If you have questions or comments regarding the plan, please email, call or write to Bi-State Regional Commission, 1504 Third Avenue P.O. Box 3368, Rock Island, Illinois 61204-3368, (309) 793-6300, information@bistateonline.org.

Stefanie D. Trinh, Notary Public

Stefanie D. Trinh
Iowa Notarial Seal
Commission number 778997
My Commission Expires 06/20/2016

AUG 11 2015

AUG 10 2015

PROOF OF PUBLICATION

STATE OF IOWA

ss }

County of Muscatine

I, Jacob Lane, being duly sworn, on my oath to do say, that I am editor of the West Liberty Index, a Newspaper issued weekly at West Liberty in said County of Muscatine, that the Notice of which the attached printed copy taken from the printed files of said Newspaper is a copy, was inserted and published in said Newspaper in the issue of

and the reasonable fee for publishing said Notice is

Jacob Lane

Jacob Lane, Editor

Subscribed by the above named Jacob Lane in my presence, and by him sworn before me, at West Liberty, Muscatine County, Iowa.

TOM K. BURGER
Commission Number 775814
My Commission Expires
11-20-15

Tom K Burger

Notary Public in and for Muscatine County, Iowa

Public Notice

NOTICE OF PUBLIC REVIEW

Muscatine County has prepared the update of the 2010 Muscatine County Multi-Jurisdictional Local Hazard Mitigation Plan. An informational meeting for the public will be held on Tuesday, August 18, 2018 at 6:30 pm at the Muscatine County Environmental Learning Center, 3300 Cedar Street, Muscatine, Iowa. Muscatine County received a Hazard Mitigation Grant Program (HMGP) grant to prepare the plan from the Federal Emergency Management Agency (FEMA). Jurisdictions participating in the plan in addition to the County include the Cities of Atalissa, Conesville, Fruitland, Muscatine, Nichols, West Liberty, and Wilton. Public participation and comments are invited as the plan development is finalized before plan adoption. The plan draft will be posted for review on the County's website at http://www.co.muscatine.ia.us/219/Emergency-Management. If you have questions or comments regarding the plan, please email, call or write to Bi-State Regional Commission, 1504 Third Avenue P.O. Box 3368, Rock Island, Illinois 61204-3368, (309) 793-6300, Information@bistateonline.org.

AUG 10 2015

APPENDIX 3-1 HAZARD ANALYSIS & RISK ASSESSMENT PROCESS

Muscatine County Multi-Jurisdictional Hazard Mitigation Plan
Hazard Scoring Methodology

Each hazard will be scored in 4 categories: Probability, Magnitude/Severity, Warning Time, and Duration

Probability: Reflects the likelihood of the hazard occurring again in the future, considering both the hazard's historical occurrence and the projected likelihood of the hazard occurring in any given year.

SCORE	DESCRIPTION	
1	Unlikely	Less than 10% probability in any given year (up to 1 in 10 chance of occurring). History of events is less than 10% likely or the event is unlikely but there is a possibility of its occurrence.
2	Occassional	Between 10% and 20% probability in any given year (up to 1 in 5 chance of occurring), history of events is greater than 10% but less than 20% the event could possibly occur.
3	Likely	Between 20% and 33% probability in any given year (up to 1 in 3 chance of occurring), history of events is greater than 20% but less than 33% the event is likely to occur.
4	Highly Likely	More than 33% probability in any given year (event has a 1 in 1 chance of occurring), history of events is greater than 33% likely or the event is highly likely to occur.

Magnitude/Severity: Assessment of severity in terms of injuries and fatalities, personal property, and infrastructure and the degree and extent with which the hazard affects the county.

SCORE	DESCRIPTION	
1	Negligible	Less than 10% of property severely damaged, shutdown of facilities and services for less than 24 hours, and/or injuries/illnesses treatable with first aid.
2	Limited	10% to 25% of property severely damaged, shutdown of facilities and services for more than a week, and/or injuries/illnesses that do not result in permanent disability.
3	Critical	25% to 50% of property severely damaged, shutdown of facilities and services for at least 2 weeks, and/or injuries/illnesses that result in permanent disability.
4	Catastrophic	More than 50% of property severely damaged, shutdown of facilities and services for more than 30 days , and/or multiple deaths.

Warning Time: Rating of the potential amount of warning time that is available before the hazard occurs.

SCORE	DESCRIPTION
1	More than 24 hours warning time.
2	12 to 24 hours warning time.
3	6 to 12 hours warning time.
4	Minimal or no warning (up to 6 hours warning).

Duration: A measure of the duration of time that the hazard will affect the state.

SCORE	DESCRIPTION
1	Less than 6 hours.
2	Less than 1 day.
3	Less than 1 week.
4	More than 1 week.

APPENDIX 3-2 JURISDICTION HAZARD PROFILE SCORES

Muscatine County Multi-Jurisdictional Hazard Mitigation Plan

Hazard Analysis and Risk Assessment

Hazard Profile Scoring Summary Page

Jurisdiction: Atalissa

1. DAM FAILURE	
Probability	1
Magnitude/Severity	1
Warning Time	1
Duration	1
Total:	4

2. DROUGHT	
Probability	1
Magnitude/Severity	2
Warning Time	1
Duration	4
Total:	8

3. EARTHQUAKE	
Probability	1
Magnitude/Severity	1
Warning Time	1
Duration	1
Total:	4

4. EXPANSIVE SOILS	
Probability	1
Magnitude/Severity	1
Warning Time	1
Duration	4
Total:	7

5. EXTREME HEAT	
Probability	4
Magnitude/Severity	2
Warning Time	1
Duration	3
Total:	10

6. FLASH FLOOD	
Probability	1
Magnitude/Severity	1
Warning Time	4
Duration	1
Total:	7

7. GRASS OR WILDLAND FIRE	
Probability	3
Magnitude/Severity	2
Warning Time	4
Duration	1
Total:	10

8. HAIL	
Probability	3
Magnitude/Severity	1
Warning Time	4
Duration	1
Total:	9

9.HAZARDOUS MATERIALS	
Probability	1
Magnitude/Severity	2
Warning Time	4
Duration	1
Total:	8

10. LANDSLIDE	
Probability	1
Magnitude/Severity	1
Warning Time	1
Duration	1
Total:	4

OVER →

11. LEVEE FAILURE	
Probability	1
Magnitude/Severity	1
Warning Time	1
Duration	1
Total:	4

12. RIVER FLOOD	
Probability	1
Magnitude/Severity	1
Warning Time	1
Duration	1
Total:	4

13. SINKHOLE	
Probability	1
Magnitude/Severity	1
Warning Time	4
Duration	3
Total:	9

14. THUNDERSTORM AND LIGHTNING	
Probability	4
Magnitude/Severity	1
Warning Time	2
Duration	1
Total:	8

15. TORNADO	
Probability	3
Magnitude/Severity	3
Warning Time	4
Duration	4
Total:	14

16. WINDSTORM	
Probability	3
Magnitude/Severity	2
Warning Time	2
Duration	2
Total:	9

17. WINTERSTORM	
Probability	3
Magnitude/Severity	1
Warning Time	2
Duration	2
Total:	8

Muscatine County Multi-Jurisdictional Hazard Mitigation Plan

Hazard Analysis and Risk Assessment

Hazard Profile Scoring Summary Page

Jurisdiction: Conesville

1. DAM FAILURE	
Probability	1
Magnitude/Severity	1
Warning Time	1
Duration	1
Total:	4

2. DROUGHT	
Probability	2
Magnitude/Severity	2
Warning Time	1
Duration	4
Total:	9

3. EARTHQUAKE	
Probability	1
Magnitude/Severity	1
Warning Time	1
Duration	1
Total:	4

4. EXPANSIVE SOILS	
Probability	1
Magnitude/Severity	1
Warning Time	1
Duration	4
Total:	7

5. EXTREME HEAT	
Probability	4
Magnitude/Severity	2
Warning Time	1
Duration	4
Total:	11

6. FLASH FLOOD	
Probability	3
Magnitude/Severity	1
Warning Time	4
Duration	1
Total:	9

7. GRASS OR WILDLAND FIRE	
Probability	4
Magnitude/Severity	2
Warning Time	4
Duration	3
Total:	13

8. HAIL	
Probability	1
Magnitude/Severity	1
Warning Time	4
Duration	1
Total:	7

9.HAZARDOUS MATERIALS	
Probability	1
Magnitude/Severity	3
Warning Time	4
Duration	2
Total:	10

10. LANDSLIDE	
Probability	1
Magnitude/Severity	1
Warning Time	4
Duration	1
Total:	7

OVER ⟶

11. LEVEE FAILURE	
Probability	1
Magnitude/Severity	1
Warning Time	4
Duration	1
Total:	7

12. RIVER FLOOD	
Probability	1
Magnitude/Severity	1
Warning Time	1
Duration	4
Total:	7

13. SINKHOLE	
Probability	1
Magnitude/Severity	1
Warning Time	4
Duration	2
Total:	8

14. THUNDERSTORM AND LIGHTNING	
Probability	4
Magnitude/Severity	3
Warning Time	3
Duration	2
Total:	12

15. TORNADO	
Probability	3
Magnitude/Severity	4
Warning Time	4
Duration	1
Total:	12

16. WINDSTORM	
Probability	4
Magnitude/Severity	3
Warning Time	3
Duration	2
Total:	12

17. WINTERSTORM	
Probability	3
Magnitude/Severity	1
Warning Time	1
Duration	3
Total:	8

Muscatine County Multi-Jurisdictional Hazard Mitigation Plan

Hazard Analysis and Risk Assessment

Hazard Profile Scoring Summary Page

Jurisdiction: Fruitland

1. DAM FAILURE	
Probability	1
Magnitude/Severity	1
Warning Time	1
Duration	1
Total:	

2. DROUGHT	
Probability	2
Magnitude/Severity	2
Warning Time	1
Duration	4
Total:	

3. EARTHQUAKE	
Probability	1
Magnitude/Severity	1
Warning Time	1
Duration	1
Total:	

4. EXPANSIVE SOILS	
Probability	1
Magnitude/Severity	1
Warning Time	1
Duration	1
Total:	

5. EXTREME HEAT	
Probability	2
Magnitude/Severity	1
Warning Time	1
Duration	3
Total:	

6. FLASH FLOOD	
Probability	1
Magnitude/Severity	2
Warning Time	4
Duration	2
Total:	

7. GRASS OR WILDLAND FIRE	
Probability	1
Magnitude/Severity	1
Warning Time	4
Duration	1
Total:	

8. HAIL	
Probability	1
Magnitude/Severity	2
Warning Time	4
Duration	1
Total:	

9.HAZARDOUS MATERIALS	
Probability	1
Magnitude/Severity	1
Warning Time	4
Duration	1
Total:	

10. LANDSLIDE	
Probability	1
Magnitude/Severity	1
Warning Time	1
Duration	1
Total:	

OVER →

11. LEVEE FAILURE	
Probability	1
Magnitude/Severity	4
Warning Time	3
Duration	4
Total:	

12. RIVER FLOOD	
Probability	1
Magnitude/Severity	4
Warning Time	3
Duration	4
Total:	

13. SINKHOLE	
Probability	1
Magnitude/Severity	1
Warning Time	1
Duration	1
Total:	

14. THUNDERSTORM AND LIGHTNING	
Probability	1
Magnitude/Severity	1
Warning Time	3
Duration	1
Total:	

15. TORNADO	
Probability	1
Magnitude/Severity	4
Warning Time	4
Duration	4
Total:	

16. WINDSTORM	
Probability	1
Magnitude/Severity	1
Warning Time	3
Duration	1
Total:	

17. WINTERSTORM	
Probability	2
Magnitude/Severity	2
Warning Time	2
Duration	3
Total:	

Muscatine County Multi-Jurisdictional Hazard Mitigation Plan

Hazard Analysis and Risk Assessment

Hazard Profile Scoring Summary Page

Jurisdiction: Muscatine County

1. DAM FAILURE	
Probability	1
Magnitude/Severity	3
Warning Time	1
Duration	4
Total:	9

2. DROUGHT	
Probability	3
Magnitude/Severity	1
Warning Time	1
Duration	4
Total:	9

3. EARTHQUAKE	
Probability	1
Magnitude/Severity	2
Warning Time	4
Duration	1
Total:	8

4. EXPANSIVE SOILS	
Probability	1
Magnitude/Severity	1
Warning Time	2
Duration	3
Total:	7

5. EXTREME HEAT	
Probability	3
Magnitude/Severity	1
Warning Time	1
Duration	3
Total:	8

6. FLASH FLOOD	
Probability	3
Magnitude/Severity	2
Warning Time	2
Duration	3
Total:	10

7. GRASS OR WILDLAND FIRE	
Probability	3
Magnitude/Severity	1
Warning Time	4
Duration	2
Total:	10

8. HAIL	
Probability	2
Magnitude/Severity	1
Warning Time	2
Duration	1
Total:	6

9.HAZARDOUS MATERIALS	
Probability	1
Magnitude/Severity	1
Warning Time	1
Duration	3
Total:	6

10. LANDSLIDE	
Probability	1
Magnitude/Severity	1
Warning Time	1
Duration	4
Total:	7

OVER →

11. LEVEE FAILURE	
Probability	1
Magnitude/Severity	2
Warning Time	1
Duration	4
Total:	8

12. RIVER FLOOD	
Probability	3
Magnitude/Severity	2
Warning Time	1
Duration	4
Total:	10

13. SINKHOLE	
Probability	1
Magnitude/Severity	1
Warning Time	4
Duration	4
Total:	10

14. THUNDERSTORM AND LIGHTNING	
Probability	4
Magnitude/Severity	1
Warning Time	2
Duration	2
Total:	9

15. TORNADO	
Probability	2
Magnitude/Severity	2
Warning Time	2
Duration	4
Total:	10

16. WINDSTORM	
Probability	4
Magnitude/Severity	1
Warning Time	2
Duration	2
Total:	9

17. WINTERSTORM	
Probability	4
Magnitude/Severity	2
Warning Time	2
Duration	3
Total:	11

Muscatine County Multi-Jurisdictional Hazard Mitigation Plan

Hazard Analysis and Risk Assessment

Hazard Profile Scoring Summary Page

Jurisdiction: Muscatine

1. DAM FAILURE	
Probability	1
Magnitude/Severity	2
Warning Time	1
Duration	4
Total:	8

2. DROUGHT	
Probability	4
Magnitude/Severity	1
Warning Time	1
Duration	4
Total:	10

3. EARTHQUAKE	
Probability	1
Magnitude/Severity	2
Warning Time	4
Duration	4
Total:	11

4. EXPANSIVE SOILS	
Probability	1
Magnitude/Severity	1
Warning Time	1
Duration	1
Total:	4

5. EXTREME HEAT	
Probability	3
Magnitude/Severity	1
Warning Time	1
Duration	3
Total:	8

6. FLASH FLOOD	
Probability	4
Magnitude/Severity	1
Warning Time	4
Duration	3
Total:	12

7. GRASS OR WILDLAND FIRE	
Probability	1
Magnitude/Severity	1
Warning Time	4
Duration	1
Total:	7

8. HAIL	
Probability	4
Magnitude/Severity	1
Warning Time	4
Duration	1
Total:	10

9.HAZARDOUS MATERIALS	
Probability	4
Magnitude/Severity	1
Warning Time	4
Duration	2
Total:	11

10. LANDSLIDE	
Probability	1
Magnitude/Severity	1
Warning Time	4
Duration	1
Total:	7

OVER →

11. LEVEE FAILURE	
Probability	1
Magnitude/Severity	3
Warning Time	4
Duration	4
Total:	12

12. RIVER FLOOD	
Probability	4
Magnitude/Severity	1
Warning Time	4
Duration	4
Total:	13

13. SINKHOLE	
Probability	1
Magnitude/Severity	1
Warning Time	4
Duration	2
Total:	8

14. THUNDERSTORM AND LIGHTNING	
Probability	4
Magnitude/Severity	1
Warning Time	4
Duration	3
Total:	12

15. TORNADO	
Probability	4
Magnitude/Severity	3
Warning Time	4
Duration	4
Total:	15

16. WINDSTORM	
Probability	4
Magnitude/Severity	1
Warning Time	4
Duration	3
Total:	12

17. WINTERSTORM	
Probability	4
Magnitude/Severity	1
Warning Time	4
Duration	3
Total:	12

Muscatine County Multi-Jurisdictional Hazard Mitigation Plan

Hazard Analysis and Risk Assessment

Hazard Profile Scoring Summary Page

Jurisdiction: Nichols

1. DAM FAILURE	
Probability	1
Magnitude/Severity	1
Warning Time	1
Duration	1
Total:	4

2. DROUGHT	
Probability	2
Magnitude/Severity	2
Warning Time	1
Duration	4
Total:	9

3. EARTHQUAKE	
Probability	1
Magnitude/Severity	2
Warning Time	4
Duration	4
Total:	11

4. EXPANSIVE SOILS	
Probability	1
Magnitude/Severity	1
Warning Time	1
Duration	1
Total:	4

5. EXTREME HEAT	
Probability	3
Magnitude/Severity	2
Warning Time	2
Duration	3
Total:	10

6. FLASH FLOOD	
Probability	2
Magnitude/Severity	2
Warning Time	3
Duration	4
Total:	11

7. GRASS OR WILDLAND FIRE	
Probability	3
Magnitude/Severity	2
Warning Time	4
Duration	2
Total:	11

8. HAIL	
Probability	2
Magnitude/Severity	2
Warning Time	4
Duration	2
Total:	10

9.HAZARDOUS MATERIALS	
Probability	3
Magnitude/Severity	2
Warning Time	4
Duration	3
Total:	12

10. LANDSLIDE	
Probability	1
Magnitude/Severity	1
Warning Time	1
Duration	1
Total:	4

OVER ⟶

11. LEVEE FAILURE	
Probability	2
Magnitude/Severity	2
Warning Time	3
Duration	4
Total:	11

12. RIVER FLOOD	
Probability	1
Magnitude/Severity	1
Warning Time	1
Duration	1
Total:	4

13. SINKHOLE	
Probability	1
Magnitude/Severity	1
Warning Time	1
Duration	1
Total:	4

14. THUNDERSTORM AND LIGHTNING	
Probability	4
Magnitude/Severity	2
Warning Time	4
Duration	3
Total:	13

15. TORNADO	
Probability	2
Magnitude/Severity	2
Warning Time	4
Duration	3
Total:	11

16. WINDSTORM	
Probability	4
Magnitude/Severity	2
Warning Time	4
Duration	3
Total:	13

17. WINTERSTORM	
Probability	4
Magnitude/Severity	2
Warning Time	3
Duration	3
Total:	12

Muscatine County Multi-Jurisdictional Hazard Mitigation Plan

Hazard Analysis and Risk Assessment

Hazard Profile Scoring Summary Page

Jurisdiction: West Liberty

1. DAM FAILURE	
Probability	1
Magnitude/Severity	1
Warning Time	1
Duration	1
Total:	4

2. DROUGHT	
Probability	2
Magnitude/Severity	2
Warning Time	1
Duration	4
Total:	9

3. EARTHQUAKE	
Probability	1
Magnitude/Severity	2
Warning Time	4
Duration	3
Total:	10

4. EXPANSIVE SOILS	
Probability	1
Magnitude/Severity	1
Warning Time	1
Duration	1
Total:	4

5. EXTREME HEAT	
Probability	3
Magnitude/Severity	2
Warning Time	2
Duration	3
Total:	10

6. FLASH FLOOD	
Probability	3
Magnitude/Severity	3
Warning Time	3
Duration	2
Total:	11

7. GRASS OR WILDLAND FIRE	
Probability	4
Magnitude/Severity	2
Warning Time	3
Duration	1
Total:	10

8. HAIL	
Probability	2
Magnitude/Severity	3
Warning Time	4
Duration	2
Total:	11

9.HAZARDOUS MATERIALS	
Probability	2
Magnitude/Severity	4
Warning Time	4
Duration	2
Total:	12

10. LANDSLIDE	
Probability	1
Magnitude/Severity	1
Warning Time	1
Duration	1
Total:	4

OVER ⟶

11. LEVEE FAILURE	
Probability	2
Magnitude/Severity	1
Warning Time	1
Duration	1
Total:	5

12. RIVER FLOOD	
Probability	3
Magnitude/Severity	4
Warning Time	2
Duration	3
Total:	12

13. SINKHOLE	
Probability	1
Magnitude/Severity	1
Warning Time	1
Duration	1
Total:	4

14. THUNDERSTORM AND LIGHTNING	
Probability	4
Magnitude/Severity	4
Warning Time	4
Duration	2
Total:	14

15. TORNADO	
Probability	4
Magnitude/Severity	3
Warning Time	4
Duration	4
Total:	15

16. WINDSTORM	
Probability	3
Magnitude/Severity	2
Warning Time	4
Duration	2
Total:	11

17. WINTERSTORM	
Probability	4
Magnitude/Severity	4
Warning Time	4
Duration	4
Total:	16

Muscatine County Multi-Jurisdictional Hazard Mitigation Plan

Hazard Analysis and Risk Assessment

Hazard Profile Scoring Summary Page

Jurisdiction: Wilton

1. DAM FAILURE	
Probability	1
Magnitude/Severity	1
Warning Time	4
Duration	1
Total:	7

2. DROUGHT	
Probability	2
Magnitude/Severity	2
Warning Time	1
Duration	4
Total:	9

3. EARTHQUAKE	
Probability	1
Magnitude/Severity	1
Warning Time	4
Duration	4
Total:	10

4. EXPANSIVE SOILS	
Probability	1
Magnitude/Severity	1
Warning Time	4
Duration	1
Total:	7

5. EXTREME HEAT	
Probability	3
Magnitude/Severity	2
Warning Time	2
Duration	3
Total:	10

6. FLASH FLOOD	
Probability	4
Magnitude/Severity	2
Warning Time	2
Duration	1
Total:	9

7. GRASS OR WILDLAND FIRE	
Probability	4
Magnitude/Severity	2
Warning Time	4
Duration	2
Total:	12

8. HAIL	
Probability	3
Magnitude/Severity	2
Warning Time	4
Duration	1
Total:	10

9.HAZARDOUS MATERIALS	
Probability	2
Magnitude/Severity	3
Warning Time	4
Duration	3
Total:	12

10. LANDSLIDE	
Probability	1
Magnitude/Severity	1
Warning Time	4
Duration	1
Total:	7

OVER →

11. LEVEE FAILURE	
Probability	1
Magnitude/Severity	1
Warning Time	4
Duration	1
Total:	7

12. RIVER FLOOD	
Probability	2
Magnitude/Severity	2
Warning Time	1
Duration	2
Total:	7

13. SINKHOLE	
Probability	1
Magnitude/Severity	1
Warning Time	4
Duration	1
Total:	7

14. THUNDERSTORM AND LIGHTNING	
Probability	4
Magnitude/Severity	2
Warning Time	4
Duration	2
Total:	12

15. TORNADO	
Probability	3
Magnitude/Severity	4
Warning Time	4
Duration	3
Total:	14

16. WINDSTORM	
Probability	3
Magnitude/Severity	2
Warning Time	4
Duration	1
Total:	10

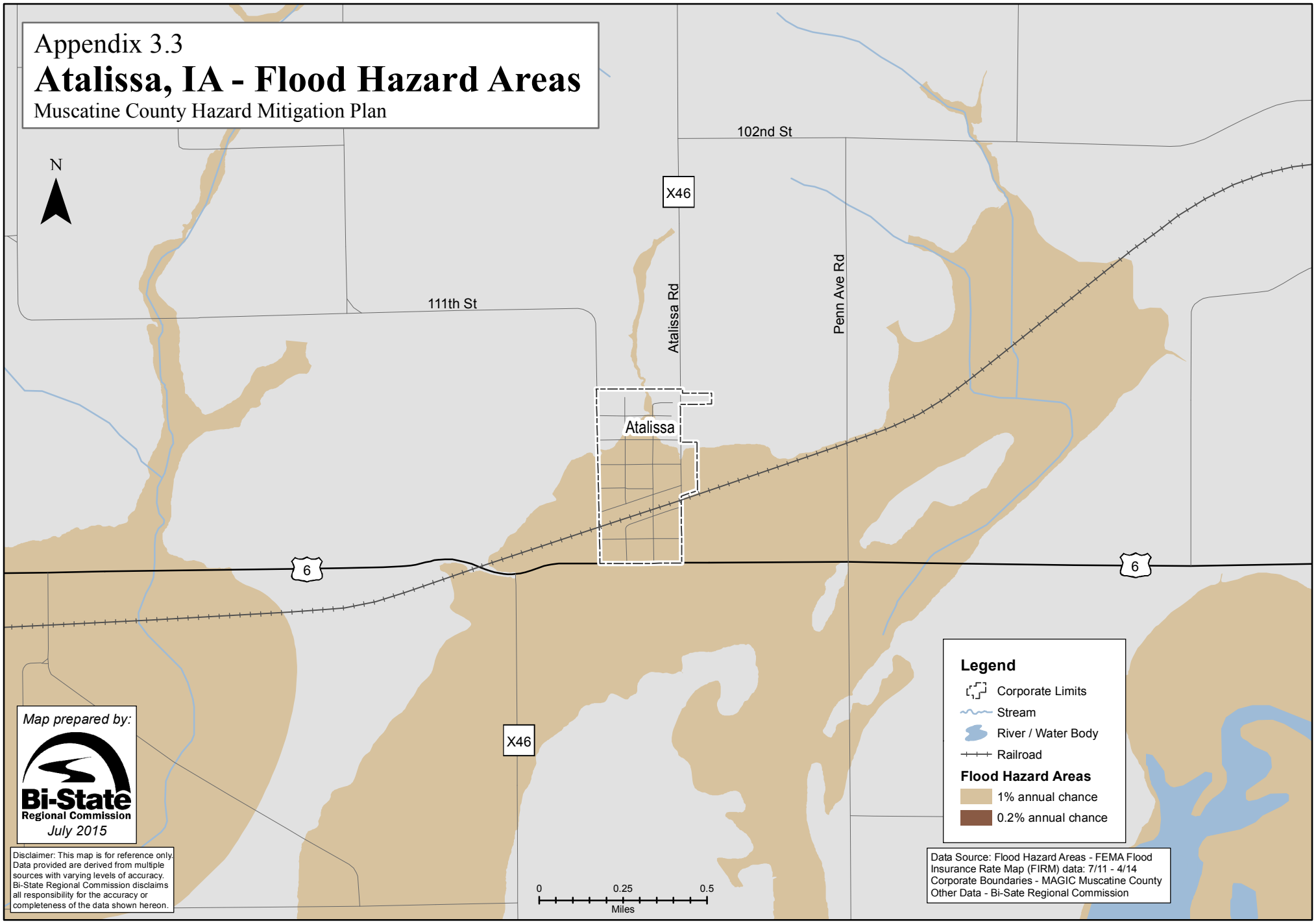
17. WINTERSTORM	
Probability	3
Magnitude/Severity	3
Warning Time	2
Duration	2
Total:	10

APPENDIX 3-3 SPECIAL FLOOD HAZARD AREA MAPS BY JURISDICTION

Appendix 3.3

Atalissa, IA - Flood Hazard Areas

Muscatine County Hazard Mitigation Plan



Map prepared by:

Bi-State Regional Commission

July 2015

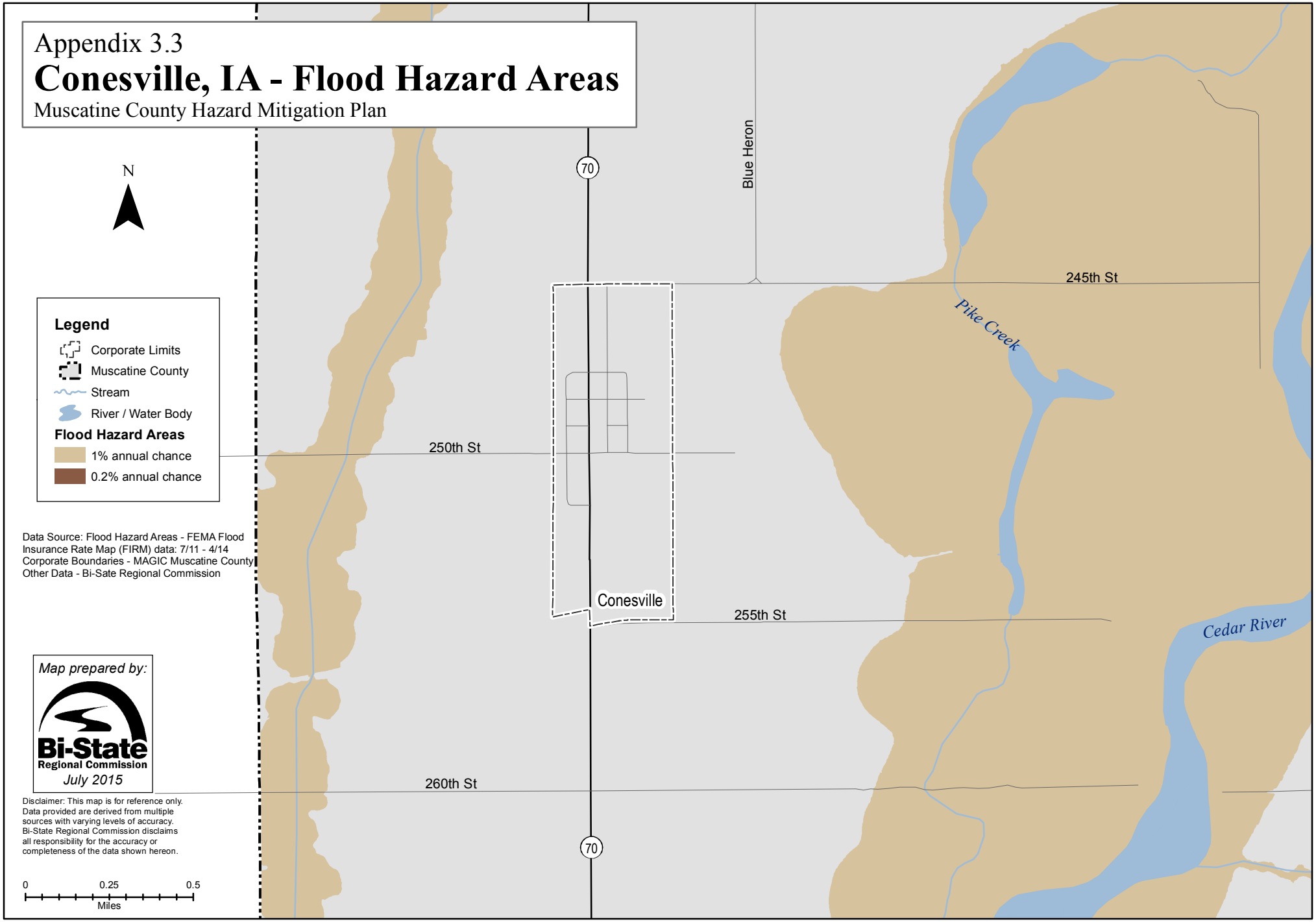
Disclaimer: This map is for reference only. Data provided are derived from multiple sources with varying levels of accuracy. Bi-State Regional Commission disclaims all responsibility for the accuracy or completeness of the data shown hereon.

Data Source: Flood Hazard Areas - FEMA Flood Insurance Rate Map (FIRM) data: 7/11 - 4/14
Corporate Boundaries - MAGIC Muscatine County
Other Data - Bi-Sate Regional Commission

Appendix 3.3

Conesville, IA - Flood Hazard Areas

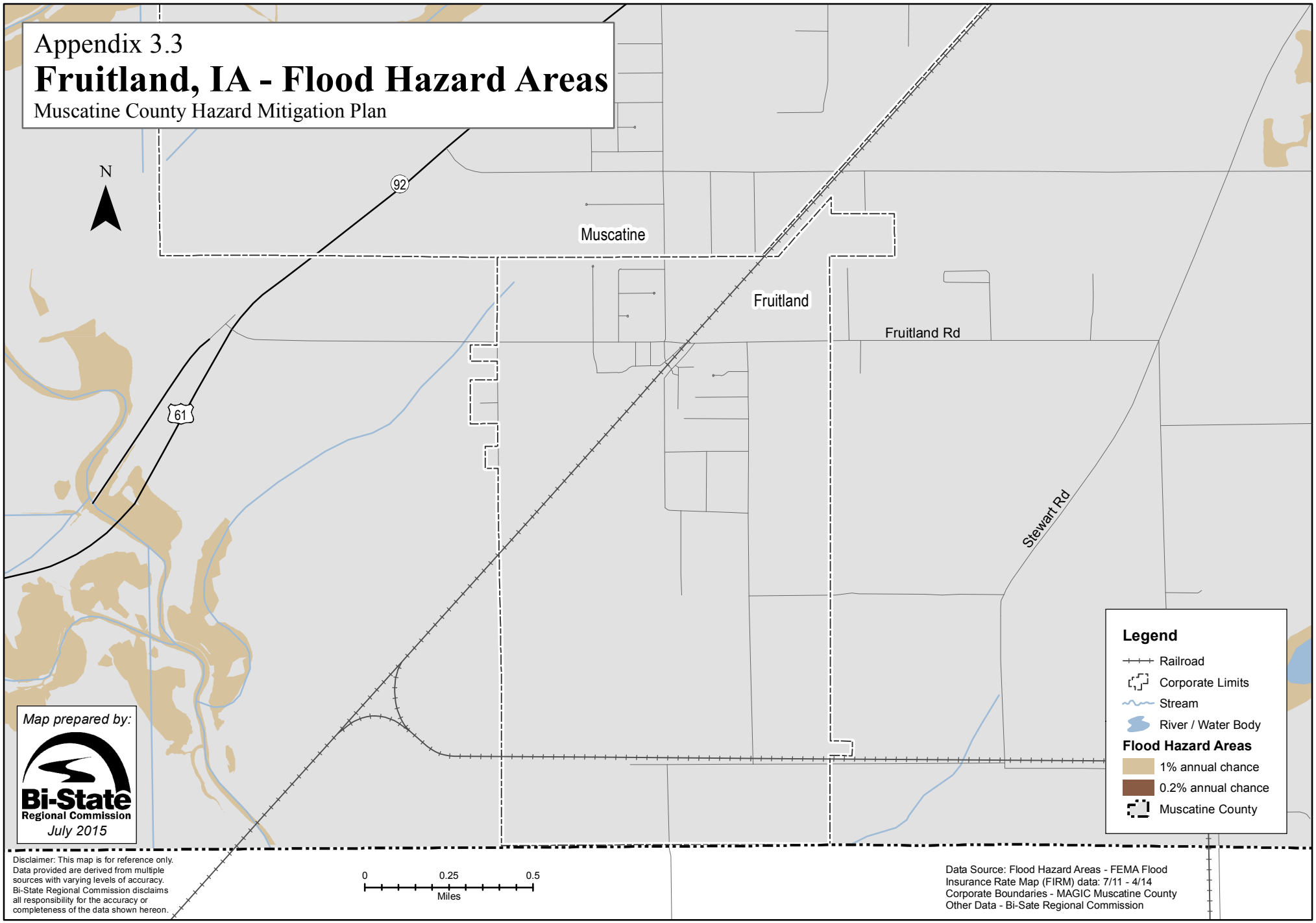
Muscatine County Hazard Mitigation Plan



Appendix 3.3

Fruitland, IA - Flood Hazard Areas

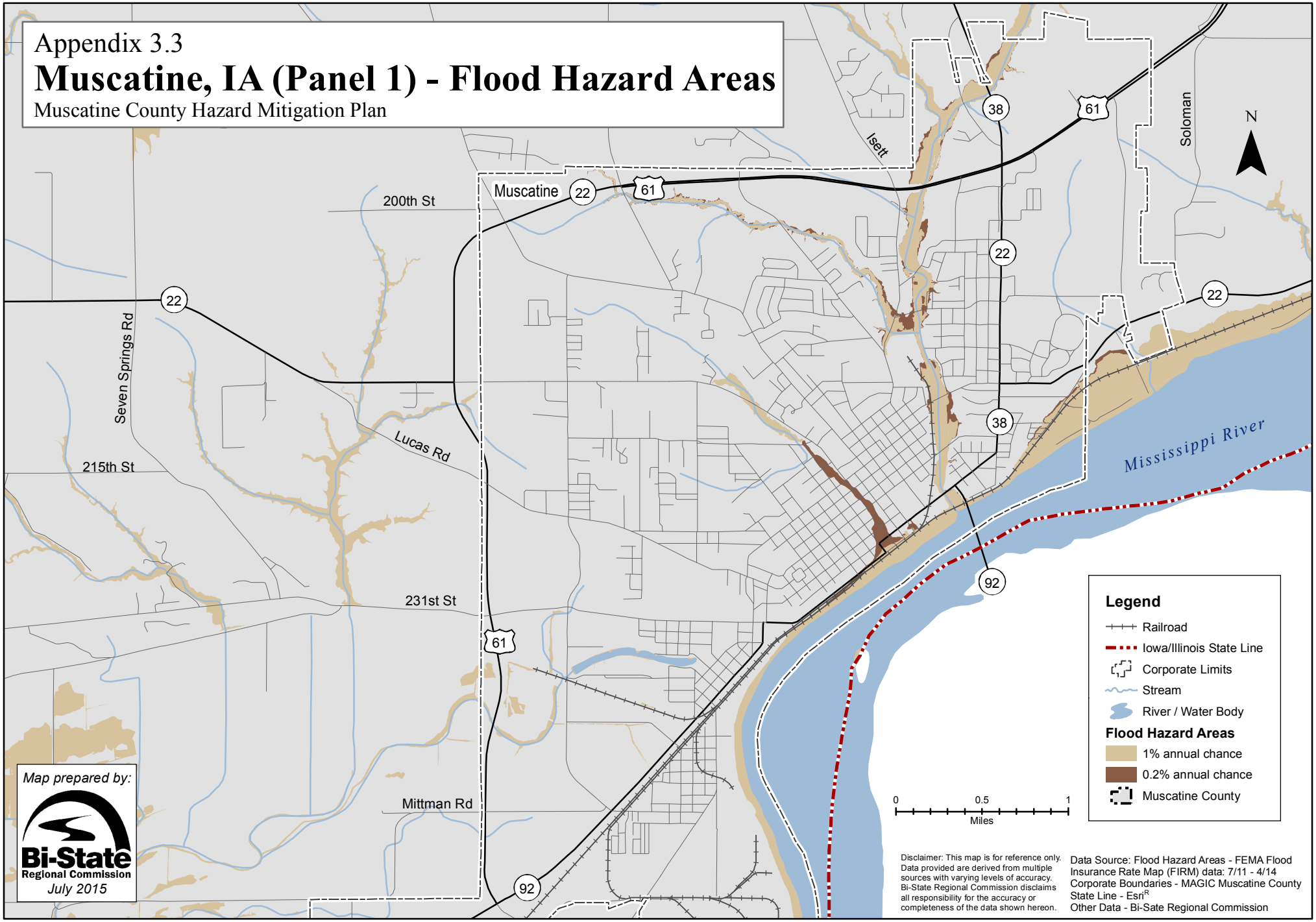
Muscatine County Hazard Mitigation Plan



Appendix 3.3

Muscatine, IA (Panel 1) - Flood Hazard Areas

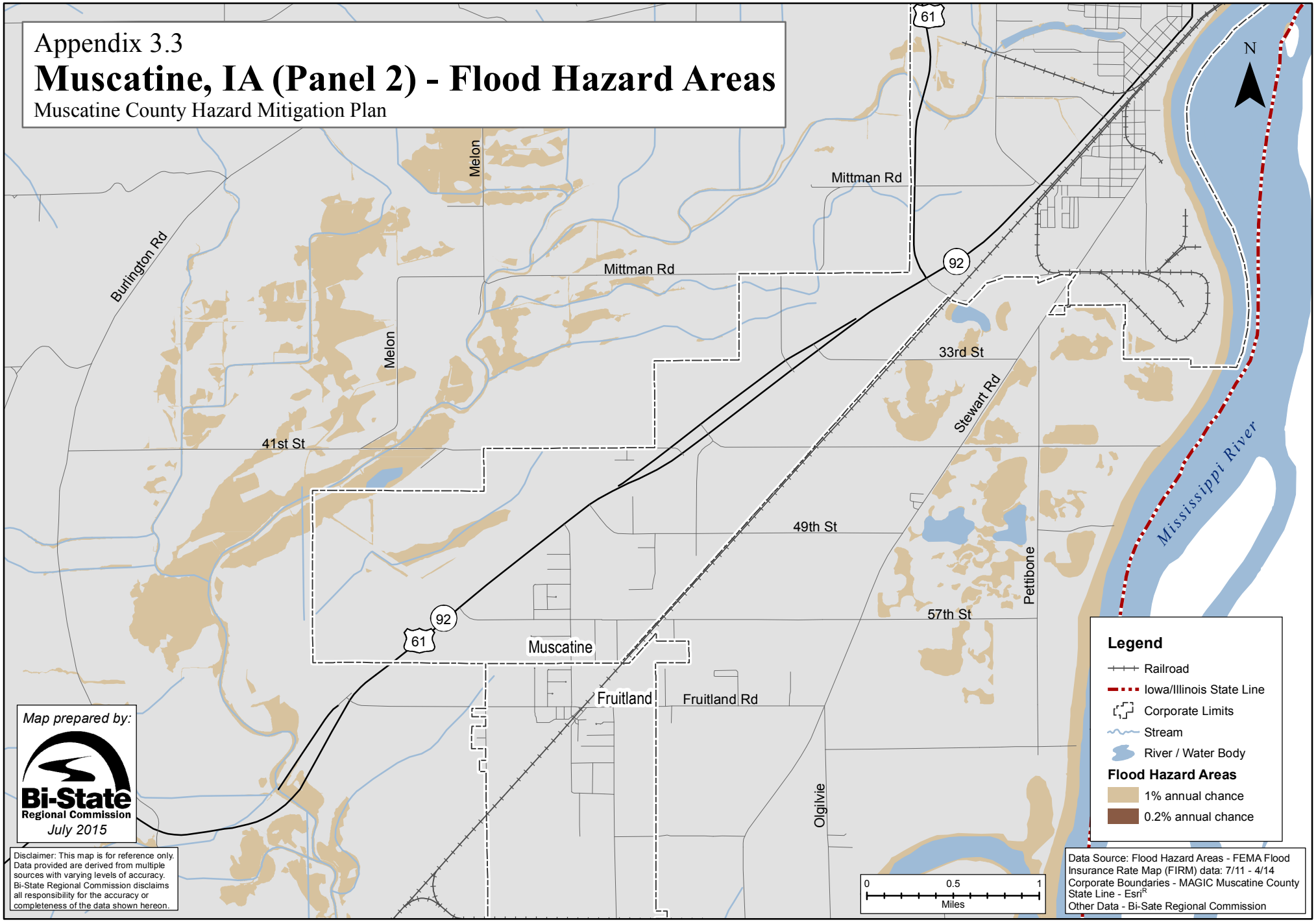
Muscatine County Hazard Mitigation Plan



Appendix 3.3

Muscatine, IA (Panel 2) - Flood Hazard Areas

Muscatine County Hazard Mitigation Plan



Map prepared by:

Bi-State Regional Commission

July 2015

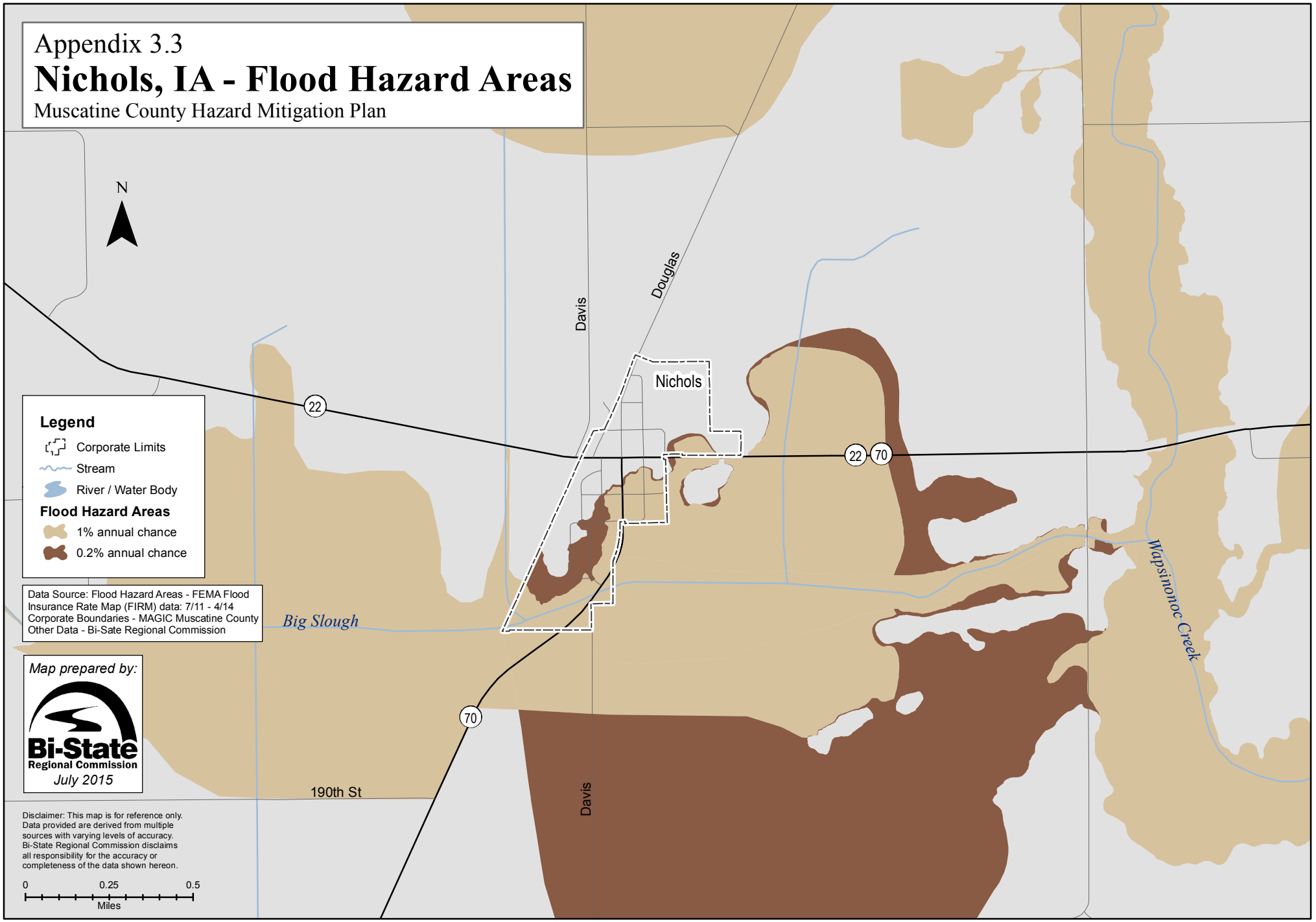
Disclaimer: This map is for reference only. Data provided are derived from multiple sources with varying levels of accuracy. Bi-State Regional Commission disclaims all responsibility for the accuracy or completeness of the data shown hereon.

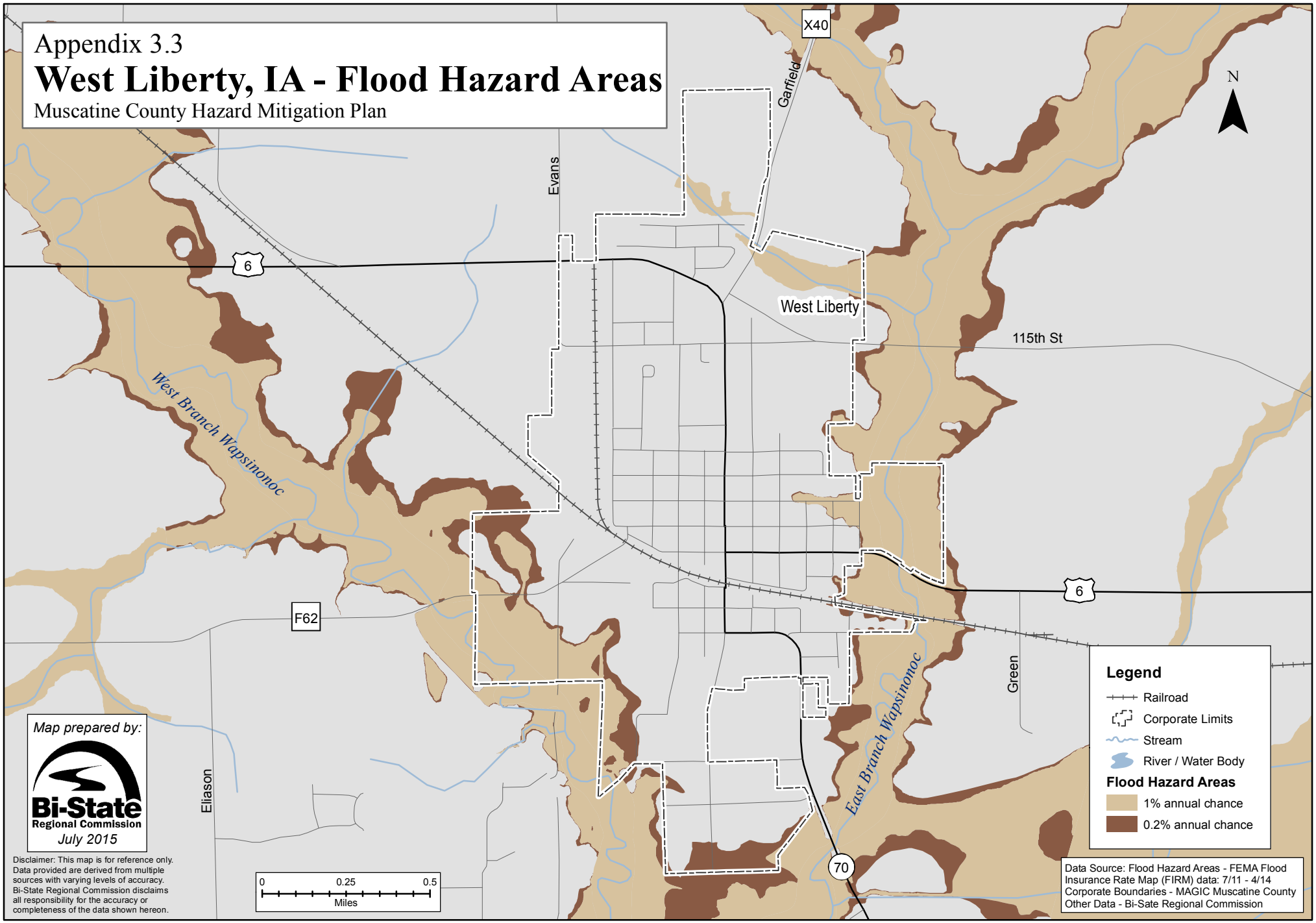
Data Source: Flood Hazard Areas - FEMA Flood Insurance Rate Map (FIRM) data: 7/11 - 4/14
Corporate Boundaries - MAGIC Muscatine County
State Line - Esri®
Other Data - Bi-Sate Regional Commission

Appendix 3.3

Nichols, IA - Flood Hazard Areas

Muscatine County Hazard Mitigation Plan

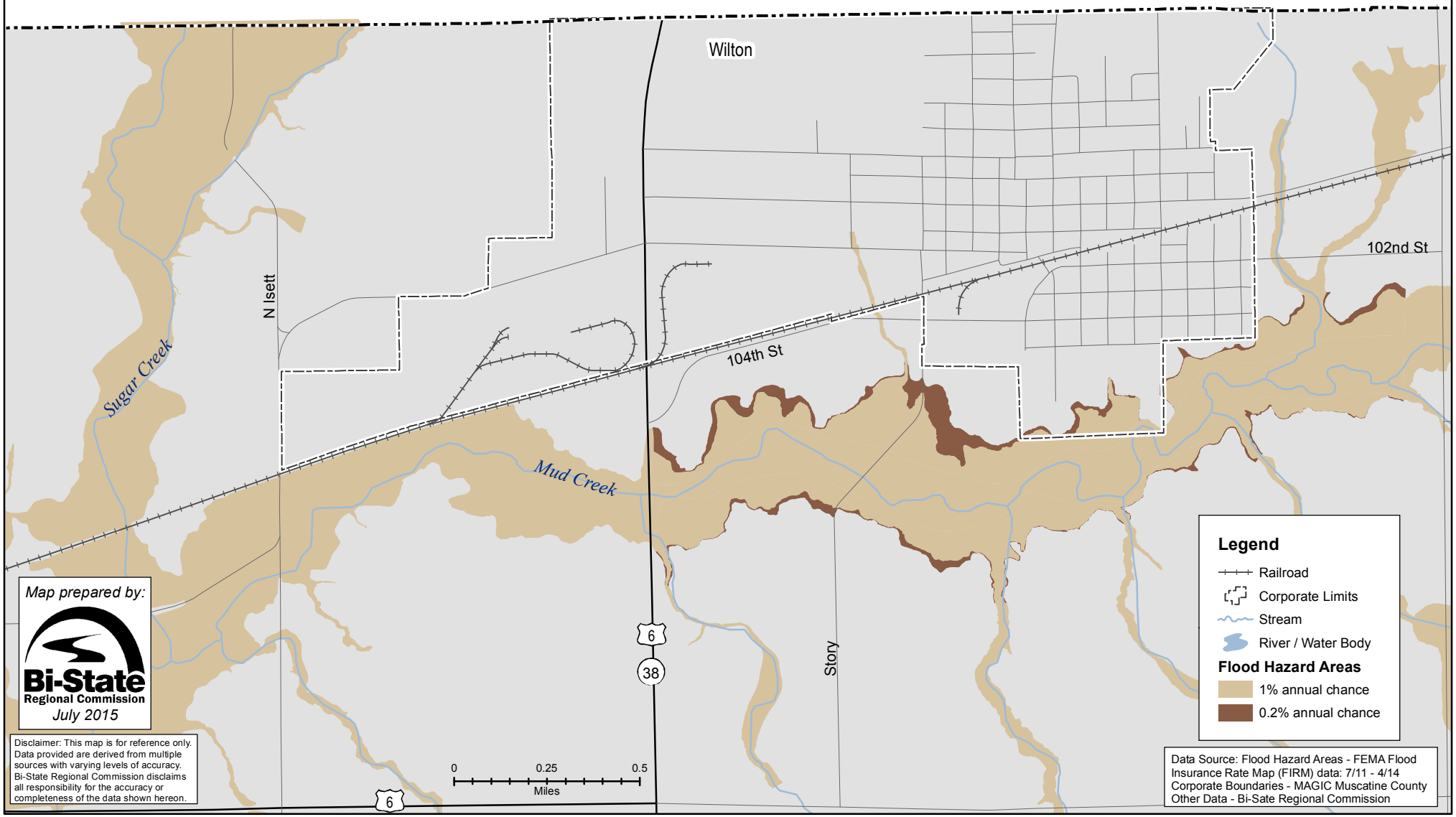



Appendix 3.3
West Liberty, IA - Flood Hazard Areas
Muscatine County Hazard Mitigation Plan
X40
Garfield
Evans
N
6
West Liberty
115th St
West Branch Wapsinonoc
F62
6
Green
East Branch Wapsinonoc
Eliason
70
Legend
Railroad
Corporate Limits
Stream
River / Water Body
Flood Hazard Areas
1% annual chance
0.2% annual chance
Map prepared by:
Bi-State
Regional Commission
July 2015
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.
0
0.25
0.5
Miles
Data Source: Flood Hazard Areas - FEMA Flood Insurance Rate Map (FIRM) data: 7/11 - 4/14
Corporate Boundaries - MAGIC Muscatine County
Other Data - Bi-Sate Regional Commission

Appendix 3.3

Wilton, IA - Flood Hazard Areas

Muscatine County Hazard Mitigation Plan



APPENDIX 4-1 STAPLEE EVALUATION METHOD

STAPLEE Evaluation Criteria for Mitigation Actions

The STAPLEE evaluation method uses seven criteria for evaluating a mitigation action: Social, Technical, Administrative, Political, Legal, Economic, and Environmental. Within each of those criteria are additional considerations that may call upon the Risk Assessment and other sources of information for evaluation. Both the criteria and considerations are presented in a sample worksheet format at the end of this Appendix. An explanation of how each of the STAPLEE criteria may be applied to evaluation of mitigation actions follows:

Social: The public must support the overall implementation strategy and specific mitigation actions and the mitigation actions are evaluated in terms of community acceptance.

Considerations:
Community Acceptance: Will the action disrupt established neighborhoods, break up voting districts, or cause the relocation of lower income people? Is the action compatible with present and future community values?
Effect on Segment of Population: Will the proposed action adversely affect one segment of the population?

Technical: It is important to determine if the proposed action is technically feasible, will help to reduce losses in the long term, and has minimal secondary impacts. This category evaluates whether the alternative action is a whole or partial solution, or not a solution at all.

Considerations:
Technical Feasibility: How effective is the action in avoiding or reducing future losses?
Long-Term Solution: Does the action solve the problem or only a symptom?
Secondary Impacts: Will the action create more problems than it solves?

Administrative: This category examines the anticipated staffing, funding, and maintenance requirements for the mitigation actions to determine if the jurisdiction has the personnel and administrative capabilities to implement the actions or whether outside help will be necessary.

Considerations:
Staffing (sufficient number of staff and training): Does the jurisdiction have the capability (staff, technical experts) to implement the action?
Funding allocated: Does the jurisdiction have the funding to implement the action or can it readily be obtained? Can it be accomplished in a timely manner?
Maintenance/Operations: Can the community provide the necessary maintenance?

Political: This considers the level of political support for the mitigation activities and programs.

Considerations:
Political Support: Is there political support to implement and maintain this action? Have political leaders participated in the planning process so far?
Local Champion or Plan Proponent (respected community member): Is there a local champion willing to help see the action to completion?
Public Support (stakeholders): Is there enough public support to ensure the success of the action? Have all the stakeholders been offered an opportunity to participate in the planning process?

Legal: Whether the jurisdiction has the legal authority to implement the actions, or whether the jurisdiction must pass new laws or regulations, is important in determining how the mitigation action can be best carried out.

Considerations:

State Authority: Does the state have authority to implement the action?

Existing Local Authority: Are proper laws, ordinances, and resolutions in place to implement the actions?

Potential Legal Challenge: Is there a technical, scientific, or legal basis for the mitigation action (i.e. does the mitigation actions "fit" the hazard setting)? Are there any potential legal consequences? Is the action likely to be challenged by stakeholders who may be negatively affected?

Economic: Economic considerations must include evaluation of the present economic base and projected growth. Cost-effective mitigation actions that can be funded in current or up-coming budget cycles are more likely to be implemented than actions requiring general obligation bonds or other instruments that would incur long-term debt to a community.

Considerations:

Benefit of Action: What benefits will the action provide?

Cost of Action: Does the cost seem reasonable for the size of the problem and the likely benefits? What burden will be places on the tax base or local economy to implement this action?

Contributes to Economic Goals: Does the action contribute to other community economic goals, such as capital improvements or economic development?

Outside Funding Required: Are there currently sources of funds that can be used to implement the action? What proposed actions should be considered by be "tabled" for implementation until outside sources of funding are available?

Environmental: Impact on the environment is an important consideration because of public desire for sustainable and environmentally healthy communities. Also, statutory considerations, such as the National Environmental Policy Act (NEPA), need to be kept in mind when using federal funds.

Considerations:

Affects Land/Water Bodies: How will this action affect land/water?

Affects Endangered Species: How will this action affect Endangered Species?

Affects Hazardous Materials and Waste Sites: How will this action affect Hazardous Materials and waste sites?

Consistent with Community's Environmental Goals: Is this action consistent with community environmental goals?

Consistent with Federal Laws: Is the action consistent with Federal Laws, such as the National Environmental Policy Act (NEPA)?

APPENDIX 4-2 STAPLEE SAMPLE WORKSHEET

STAPLEE Worksheet Instructions

1. Fill in the mitigation action. Use a separate worksheet for each mitigation action.

2. Scoring uses a plus (+) for favorable evaluation for each consideration, a negative (-) for less favorable evaluation, and N/A for considerations that do not apply.

Action ID:
Action considered:

STAPLEE Criteria	**S** Social		**T** Technical			**A** Administrative			**P** Political			**L** Legal			**E** Economic				**E** Environment				
Considerations → **For Alternative Actions** ↓	Community Acceptance	Effect on Population Segment	Technical Feasibility	Long-term Solution	Secondary Impacts	Staffing	Funding Allocated	Maintenance/Operations	Political Support	Local Champion	Public Support	State Authority	Existing Local Authority	Potential Legal Challenge	Benefit of Action	Cost of Action	Contributes to Economic Goals	Outside Funding Required	Effect on Land/Water	Effect on Endangered Species	Effect on HAZMAT Sites	Consistent w/ Community Environmental Goals	Consistent w/ Federal Laws

Comments:

Benefit: Explain how the project will provide a benefit in mitigation a hazard

Cost/Funding Source: Estimate of project or possible funding sources if available

Responsible Party: State who will be the lead on the project by the person's title

Timeframe for Completion: How long do you think the project will take to start and how long will the project take once started

Priority Level: Rank your mitigation actions according to the community's priorities. Please take into consideration how beneficial the project will be based on its effectiveness and costs (often referred to as a benefit/cost analysis).

APPENDIX 4-3 STAPLEE EVALUATIONS

MULTI-JURISDICTIONAL

ACTION ID: 4.1

Action Considered: Public information and signage of the location of emergency storm shelters.

STAPLEE Criteria	S Social		T Technical			A Administrative			P Political			L Legal			E Economic				E Environment				
Considerations → For Alternative Actions ↓	Community Acceptance	Effect on Population Segment	Technical Feasibility	Long-term Solution	Secondary Impacts	Staffing	Funding Allocated	Maintenance/Operations	Political Support	Local Champion	Public Support	State Authority	Existing Local Authority	Potential Legal Challenge	Benefit of Action	Cost of Action	Contributes to Economic Goals	Outside Funding Required	Effect on Land/Water	Effect on Endangered Species	Effect on HAZMAT Sites	Consistent w/ Community Environmental Goals	Consistent w/ Federal Laws
	+	+	+	+	+	−	−	+	+	+	+	N/A	+	N/A	+	+	N/A	+	N/A	N/A	N/A	N/A	N/A

Comments: This depends on the creation of emergency storm shelters. Then depends on the type of hazard shelter needed.

Benefit: Potential life-saving action; shelter for vulnerable populations

Cost/Funding Source: Staff time and additional costs for new signs.

Responsible Party: Muscatine County EMA Director

Timeframe for Completion: General information anticipated to be completed 6 months after emergency shelter list created. Announcement of instruction to use shelter in event of anticipated storm or hazard event.

Priority Level: Priority 7

ACTION ID: 4.2

Action Considered: Continue to educate the public on the importance of purchasing NOAA weather radios.

STAPLEE Criteria	S Social		T Technical			A Administrative			P Political			L Legal			E Economic				E Environment				
Considerations → For Alternative Actions ↓	Community Acceptance	Effect on Population Segment	Technical Feasibility	Long-term Solution	Secondary Impacts	Staffing	Funding Allocated	Maintenance/Operations	Political Support	Local Champion	Public Support	State Authority	Existing Local Authority	Potential Legal Challenge	Benefit of Action	Cost of Action	Contributes to Economic Goals	Outside Funding Required	Effect on Land/Water	Effect on Endangered Species	Effect on HAZMAT Sites	Consistent w/ Community Environmental Goals	Consistent w/ Federal Laws
	+	+	+	+	+	+	+	+	+	+	+	N/A	N/A	N/A	+	−	N/A	+	N/A	N/A	N/A	N/A	N/A

Comments: Applies to new and existing community assets.

Benefit: Advanced warning of weather-related events.

Cost/Funding Source: Staff time for education. Individuals can purchase NOAA radios for approximately $50.

Responsible Party: City and County Governments.

Timeframe for Completion: Ongoing. Suggest pushing hardest in April for tornado awareness month

Priority Level: Priority 4

ACTION ID: 4.4

Action Considered: Public education on what to do during a storm or hazard event.

STAPLEE Criteria	S Social		T Technical			A Administrative			P Political			L Legal			E Economic				E Environment				
Considerations → For Alternative Actions ↓	Community Acceptance	Effect on Population Segment	Technical Feasibility	Long-term Solution	Secondary Impacts	Staffing	Funding Allocated	Maintenance/Operations	Political Support	Local Champion	Public Support	State Authority	Existing Local Authority	Potential Legal Challenge	Benefit of Action	Cost of Action	Contributes to Economic Goals	Outside Funding Required	Effect on Land/Water	Effect on Endangered Species	Effect on HAZMAT Sites	Consistent w/ Community Environmental Goals	Consistent w/ Federal Laws
	+	+	+	+	+	+	+	+	+	+	+	N/A	N/A	N/A	+	+	N/A	N/A	N/A	N/A	N/A	N/A	N/A

Comments: Utilize existing information to disseminate on website and other methods of distribution

Benefit: Potential life-saving action.

Cost/Funding Source: Staff time for education and possible printing costs.

Responsible Party: Muscatine County Emergency Management Director

Timeframe for Completion: One year, can be done immediately

Priority Level: Priority 1

ACTION ID: 4.5

Action Considered: Create educational materials about all hazards relevant to Muscatine County.

STAPLEE Criteria	S Social		T Technical			A Administrative			P Political			L Legal			E Economic				E Environment				
Considerations → For Alternative Actions ↓	Community Acceptance	Effect on Population Segment	Technical Feasibility	Long-term Solution	Secondary Impacts	Staffing	Funding Allocated	Maintenance/Operations	Political Support	Local Champion	Public Support	State Authority	Existing Local Authority	Potential Legal Challenge	Benefit of Action	Cost of Action	Contributes to Economic Goals	Outside Funding Required	Effect on Land/Water	Effect on Endangered Species	Effect on HAZMAT Sites	Consistent w/ Community Environmental Goals	Consistent w/ Federal Laws
	+	+	+	+	+	+	+	+	+	+	+	N/A	N/A	N/A	+	+	N/A	+	N/A	N/A	N/A	N/A	N/A

Comments:	Utilize information from plan and other resources
Benefit:	Potential life-saving action.
Cost/Funding Source:	Staff time for education and printing costs.
Responsible Party:	Muscatine County Emergency Management Director
Timeframe for Completion:	Material production anticipated to take 12-18 months to compile. May choose to roll out information on each hazard separately.
Priority Level:	Priority 6

ACTION ID: 4.6

Action Considered: Create public educational materials on flood hazard areas, flood regulations, mitigation

STAPLEE Criteria	**S** Social		**T** Technical			**A** Administrative			**P** Political			**L** Legal			**E** Economic				**E** Environment				
Considerations → For Alternative Actions ↓	Community Acceptance	Effect on Population Segment	Technical Feasibility	Long-term Solution	Secondary Impacts	Staffing	Funding Allocated	Maintenance/Operations	Political Support	Local Champion	Public Support	State Authority	Existing Local Authority	Potential Legal Challenge	Benefit of Action	Cost of Action	Contributes to Economic Goals	Outside Funding Required	Effect on Land/Water	Effect on Endangered Species	Effect on HAZMAT Sites	Consistent w/ Community Environmental Goals	Consistent w/ Federal Laws
	+	+	+	+	+	+	+	+	+	+	+	N/A	N/A	N/A	+	+	N/A	+	N/A	N/A	N/A	N/A	N/A

Comments:	Applies to new and existing community assets. Utilize existing information from reputable sources.
Benefit:	Potential life-saving and property damage reducing action.
Cost/Funding Source:	Staff time for education and printing costs.
Responsible Party:	Zoning and Floodplain Managers
Timeframe for Completion:	Anticipated to come out after general information on hazards. Creation to take 9 months.
Priority Level:	Priority 5

ACTION ID: 4.7

Action Considered: Make sure educational materials regarding hazards are bilingual.

STAPLEE Criteria	S Social		T Technical			A Administrative			P Political			L Legal			E Economic				E Environment				
Considerations → For Alternative Actions ↓	Community Acceptance	Effect on Population Segment	Technical Feasibility	Long-term Solution	Secondary Impacts	Staffing	Funding Allocated	Maintenance/Operations	Political Support	Local Champion	Public Support	State Authority	Existing Local Authority	Potential Legal Challenge	Benefit of Action	Cost of Action	Contributes to Economic Goals	Outside Funding Required	Effect on Land/Water	Effect on Endangered Species	Effect on HAZMAT Sites	Consistent w/ Community Environmental Goals	Consistent w/ Federal Laws
	+	+	+	+	+	+	+	+	+	+	+	+	+	N/A	+	+	+	+	N/A	N/A	N/A	N/A	N/A

Comments:	To coincide with the release of educational materials in English
Benefit:	Potential life-saving action.
Cost/Funding Source:	May need to hire a translator and the cost of materials.
Responsible Party:	Muscatine County EMA Director with assistance from West Liberty
Timeframe for Completion:	see information on other actions
Priority Level:	Priority 2

ACTION ID: 4.3

Action Considered: Education of early warning systems and how to respond.

STAPLEE Criteria	S Social		T Technical			A Administrative			P Political			L Legal			E Economic				E Environment				
Considerations → For Alternative Actions ↓	Community Acceptance	Effect on Population Segment	Technical Feasibility	Long-term Solution	Secondary Impacts	Staffing	Funding Allocated	Maintenance/Operations	Political Support	Local Champion	Public Support	State Authority	Existing Local Authority	Potential Legal Challenge	Benefit of Action	Cost of Action	Contributes to Economic Goals	Outside Funding Required	Effect on Land/Water	Effect on Endangered Species	Effect on HAZMAT Sites	Consistent w/ Community Environmental Goals	Consistent w/ Federal Laws
	+	+	+	+	+	+	+	+	+	+	+	N/A	N/A	N/A	+	+	N/A	+	N/A	N/A	N/A	N/A	N/A

Comments:	In the form of press releases and information on website. Can also work with National Weather Service
Benefit:	Potential life-saving action.
Cost/Funding Source:	Staff time for education and cost of materials.
Responsible Party:	Muscatine County Emergency Management Director
Timeframe for Completion:	Anticipated to occur on a regular basis in conjunction with weather preparedness pushes
Priority Level:	Priority 3

MUSCATINE COUNTY

ACTION ID: 1.1

Action Considered: Evaluate Safe Room Construction where vulnerable populations may not have other sources of shelter and construct where financially and technically feasible.

STAPLEE Criteria	S Social		T Technical			A Administrative			P Political			L Legal			E Economic				E Environment				
Considerations → For Alternative Actions ↓	Community Acceptance	Effect on Population Segment	Technical Feasibility	Long-term Solution	Secondary Impacts	Staffing	Funding Allocated	Maintenance/Operations	Political Support	Local Champion	Public Support	State Authority	Existing Local Authority	Potential Legal Challenge	Benefit of Action	Cost of Action	Contributes to Economic Goals	Outside Funding Required	Effect on Land/Water	Effect on Endangered Species	Effect on HAZMAT Sites	Consistent w/ Community Environmental Goals	Consistent w/ Federal Laws
	+	+	+	+	+	−	−	−	+	−	+	+	+	+	+	−	−	+	N/A	N/A	N/A	+	+

Comments: Changed action from "consider" to "evaluate" and "construct" based on recommendation from FEMA and IHSEMD

Benefit: Potential life-saving action.

Cost/Funding Source: Determined by the size of structure. Outside funding would be required.

Responsible Party: Muscatine County EMA Director

Timeframe for Completion: As federal funds are available. Between determining possible locations, working with other entities, design and construction, this project is expected to take 8-10 years to complete - depending funding.

Priority Level: Priority 9

ACTION ID: 1.2

Action Considered: Implement voluntary flood acquisition/demolition programs when financially feasible

STAPLEE Criteria	S Social		T Technical			A Administrative			P Political			L Legal			E Economic				E Environment				
Considerations → For Alternative Actions ↓	Community Acceptance	Effect on Population Segment	Technical Feasibility	Long-term Solution	Secondary Impacts	Staffing	Funding Allocated	Maintenance/Operations	Political Support	Local Champion	Public Support	State Authority	Existing Local Authority	Potential Legal Challenge	Benefit of Action	Cost of Action	Contributes to Economic Goals	Outside Funding Required	Effect on Land/Water	Effect on Endangered Species	Effect on HAZMAT Sites	Consistent w/ Community Environmental Goals	Consistent w/ Federal Laws
	+	+	+	+	+	−	−	−	+	+	+	N/A	+	N/A	+	−	N/A	+	N/A	N/A	N/A	N/A	N/A

Comments: Changed wording from "consider" to "implement" based on recommendation from FEMA and IHSEMD

Benefit: Permanently removes residents from flood hazard areas.

Cost/Funding Source: Limited by availability of FEMA funding. Possibility to use local funding if budgeted long-term.

Responsible Party: Environmental, Zoning & Board of Health Administrator

Timeframe for Completion: Ongoing as funding is available. To be determined by Federal funding and local funding. Muscatine County did property acquisition and demolition for properties substantially damaged by DR-1763.

Priority Level: Priority 3

ACTION ID: 1.3

Action Considered: Establish warming and/or cooling centers.

STAPLEE Criteria	**S** Social		**T** Technical			**A** Administrative			**P** Political			**L** Legal			**E** Economic				**E** Environment				
Considerations → For Alternative Actions ↓	Community Acceptance	Effect on Population Segment	Technical Feasibility	Long-term Solution	Secondary Impacts	Staffing	Funding Allocated	Maintenance/Operations	Political Support	Local Champion	Public Support	State Authority	Existing Local Authority	Potential Legal Challenge	Benefit of Action	Cost of Action	Contributes to Economic Goals	Outside Funding Required	Effect on Land/Water	Effect on Endangered Species	Effect on HAZMAT Sites	Consistent w/ Community Environmental Goals	Consistent w/ Federal Laws
	+	+	+	+	+	−	−	−	+	+	+	N/A	+	N/A	+	−	N/A	+	N/A	N/A	N/A	N/A	N/A

Comments: Partner with Red Cross and community leaders to accomplish action. One has been established in City of Muscatine

Benefit: Provides centers that will be ready to accept populations vulnerable to hazards.

Cost/Funding Source: Local funding and Red Cross. Costs not established at this time. Will be based on the number of people center can have.

Responsible Party: Muscatine County EMA Director

Timeframe for Completion: Will take approximately 2 years to establish centers for each community.

Priority Level: Priority 6

ACTION ID: 1.4

Action Considered: Update and enforce building codes to current International Code Series

STAPLEE Criteria	S Social		T Technical			A Administrative			P Political			L Legal			E Economic				E Environment				
Considerations → For Alternative Actions ↓	Community Acceptance	Effect on Population Segment	Technical Feasibility	Long-term Solution	Secondary Impacts	Staffing	Funding Allocated	Maintenance/Operations	Political Support	Local Champion	Public Support	State Authority	Existing Local Authority	Potential Legal Challenge	Benefit of Action	Cost of Action	Contributes to Economic Goals	Outside Funding Required	Effect on Land/Water	Effect on Endangered Species	Effect on HAZMAT Sites	Consistent w/ Community Environmental Goals	Consistent w/ Federal Laws
	+	+	+	+	+	+	+	+	+	+	+	+	+	N/A	+	+	+	N/A	N/A	N/A	N/A	+	+

Comments: Applies to new community assets and reconstruction of updating of existing assets. Currently using 2006 codes. Plan to adopt 2015 codes in 2016.

Benefit: Ensure construction meets latest standards of safety.

Cost/Funding Source: No additional costs for ongoing enforcement procedures.

Responsible Party: Environmental, Zoning & Board of Health Administrator

Timeframe for Completion: Building Code enforcement will occur continuously based on permits and inspections. Code adoption will happen as net codes are available, upon review by administrator and county board. Codes come out approximately every 3 years and may take 2-3 years before adoption occurs.

Priority Level: Priority 4

ACTION ID: 2.2

Action Considered: Ensure that mobile homes have adequate tie downs.

STAPLEE Criteria	S Social		T Technical			A Administrative			P Political			L Legal			E Economic				E Environment				
Considerations → For Alternative Actions ↓	Community Acceptance	Effect on Population Segment	Technical Feasibility	Long-term Solution	Secondary Impacts	Staffing	Funding Allocated	Maintenance/Operations	Political Support	Local Champion	Public Support	State Authority	Existing Local Authority	Potential Legal Challenge	Benefit of Action	Cost of Action	Contributes to Economic Goals	Outside Funding Required	Effect on Land/Water	Effect on Endangered Species	Effect on HAZMAT Sites	Consistent w/ Community Environmental Goals	Consistent w/ Federal Laws
	+	+	+	+	+	N/A	N/A	N/A	+	+	+	+	+	N/A	+	–	N/A	N/A	N/A	N/A	N/A	+	+

Comments: Currently assessing a plan on how to enforce

Benefit: Preventative measure for manufactured homes.

Cost/Funding Source: No additional costs for ongoing enforcement.

Responsible Party: Environmental, Zoning & Board of Health Administrator

Timeframe for Completion: Plan for enforcement will be developed in 1-2 years. Enforcement will be on-going as permits come in to the office.

Priority Level: Priority 5

ACTION ID: 2.3

Action Considered: Continue NFIP compliance by enforcing flood plain ordinances based on the State of Iowa Model Code.

STAPLEE Criteria	S Social		T Technical			A Administrative			P Political			L Legal			E Economic				E Environment				
Considerations → For Alternative Actions ↓	Community Acceptance	Effect on Population Segment	Technical Feasibility	Long-term Solution	Secondary Impacts	Staffing	Funding Allocated	Maintenance/Operations	Political Support	Local Champion	Public Support	State Authority	Existing Local Authority	Potential Legal Challenge	Benefit of Action	Cost of Action	Contributes to Economic Goals	Outside Funding Required	Effect on Land/Water	Effect on Endangered Species	Effect on HAZMAT Sites	Consistent w/ Community Environmental Goals	Consistent w/ Federal Laws
	+	+	+	+	+	+	+	+	+	+	+	+	+	N/A	+	N/A	+	N/A	N/A	N/A	N/A	+	+

Comments: Applies to new community assets and substantial improvement requirements for existing assets.

Benefit: Reduces or eliminates losses from flood hazards.

Cost/Funding Source: No additional costs for on-going enforcement.

Responsible Party: Environmental, Zoning & Board of Health Administrator

Timeframe for Completion: Ongoing

Priority Level: Priority 1

ACTION ID: 2.4

Action Considered: Reduce repetitive loss properties by requiring elevation of properties.

STAPLEE Criteria	S Social		T Technical			A Administrative			P Political			L Legal			E Economic				E Environment				
Considerations → For Alternative Actions ↓	Community Acceptance	Effect on Population Segment	Technical Feasibility	Long-term Solution	Secondary Impacts	Staffing	Funding Allocated	Maintenance/Operations	Political Support	Local Champion	Public Support	State Authority	Existing Local Authority	Potential Legal Challenge	Benefit of Action	Cost of Action	Contributes to Economic Goals	Outside Funding Required	Effect on Land/Water	Effect on Endangered Species	Effect on HAZMAT Sites	Consistent w/ Community Environmental Goals	Consistent w/ Federal Laws
	+	+	+	+	+	N/A	+	N/A	+	+	+	N/A	+	N/A	+	+	N/A	+	N/A	N/A	N/A	+	+

Comments: Applies to existing community assets.

Benefit: Reduces NFIP claims and protects people and property in the flood hazard area.

Cost/Funding Source:	Responsibility of individual property owner with up to $30,000 reimbursable from the NFIP Increase Cost of Compliance (ICC) program.
Responsible Party:	House Owner in partnership with Environmental, Zoning & Board of Health Administrator
Timeframe for Completion:	Ongoing, as homes meet substantially damaged criteria
Priority Level:	Priority 2

ACTION ID: 3.1

Action Considered: Pursue Community Rating System

STAPLEE Criteria	**S** Social		**T** Technical			**A** Administrative			**P** Political			**L** Legal			**E** Economic				**E** Environment				
Considerations → For Alternative Actions ↓	Community Acceptance	Effect on Population Segment	Technical Feasibility	Long-term Solution	Secondary Impacts	Staffing	Funding Allocated	Maintenance/Operations	Political Support	Local Champion	Public Support	State Authority	Existing Local Authority	Potential Legal Challenge	Benefit of Action	Cost of Action	Contributes to Economic Goals	Outside Funding Required	Effect on Land/Water	Effect on Endangered Species	Effect on HAZMAT Sites	Consistent w/ Community Environmental Goals	Consistent w/ Federal Laws
	+	+	+	+	+	–	–	–	+	+	–	N/A	+	N/A	+	–	+	+	N/A	N/A	N/A	N/A	N/A

Comments:	Discuss feasibility with State Floodplain Manager
Benefit:	Provides lower NFIP premiums for structures with jurisdiction.
Cost/Funding Source:	Staff time for implementation.
Responsible Party:	Environmental, Zoning & Board of Health Administrator
Timeframe for Completion:	Initial discussion should happen within 1 year of plan approval; the length of time to join the CRS has not been determined.
Priority Level:	Priority 10

ACTION ID: 3.2

Action Considered: Identify critical facilities, such as lift stations; where back up power generators should be installed and install as financially feasible.

STAPLEE Criteria	**S** Social		**T** Technical			**A** Administrative			**P** Political			**L** Legal			**E** Economic				**E** Environment				
Considerations → For Alternative Actions ↓	Community Acceptance	Effect on Population Segment	Technical Feasibility	Long-term Solution	Secondary Impacts	Staffing	Funding Allocated	Maintenance/Operations	Political Support	Local Champion	Public Support	State Authority	Existing Local Authority	Potential Legal Challenge	Benefit of Action	Cost of Action	Contributes to Economic Goals	Outside Funding Required	Effect on Land/Water	Effect on Endangered Species	Effect on HAZMAT Sites	Consistent w/ Community Environmental Goals	Consistent w/ Federal Laws
	+	+	+	+	+	–	–	–	+	+	+	N/A	N/A	N/A	+	–	+	+	+	N/A	N/A	N/A	N/A

Comments:	Applies to existing community assets. In progress, however funding has been a hurdle.
Benefit:	Ensures continuation of essential services.
Cost/Funding Source:	Generators varies in cost depending on size and use. Outside funding may be required.
Responsible Party:	Public Works
Timeframe for Completion:	Funding will need to be required before installation can take place
Priority Level:	Priority 8

ACTION ID: 2.5

Action Considered: Implement uniform method of additional early warning system county-wide

STAPLEE Criteria	**S** Social		**T** Technical			**A** Administrative			**P** Political			**L** Legal			**E** Economic				**E** Environment				
Considerations → For Alternative Actions ↓	Community Acceptance	Effect on Population Segment	Technical Feasibility	Long-term Solution	Secondary Impacts	Staffing	Funding Allocated	Maintenance/Operations	Political Support	Local Champion	Public Support	State Authority	Existing Local Authority	Potential Legal Challenge	Benefit of Action	Cost of Action	Contributes to Economic Goals	Outside Funding Required	Effect on Land/Water	Effect on Endangered Species	Effect on HAZMAT Sites	Consistent w/ Community Environmental Goals	Consistent w/ Federal Laws
	+	+	+	+	+	+	+	+	+	+	+	N/A	N/A	N/A	+	+	N/A	N/A	N/A	N/A	N/A	N/A	N/A

Comments:	Currently utilizing outdoor signals and exploring mass notification
Benefit:	Potential life-saving action.
Cost/Funding Source:	Costs and funding sources have not been identified for mass notification system
Responsible Party:	MUSCOM
Timeframe for Completion:	Undetermined as this time. Will explore as funding is available.
Priority Level:	Priority 7

ATALISSA

ACTION ID: 1.3

Action Considered: Establish warming and cooling centers.

STAPLEE Criteria	S Social		T Technical			A Administrative			P Political			L Legal			E Economic				E Environment				
Considerations → For Alternative Actions ↓	Community Acceptance	Effect on Population Segment	Technical Feasibility	Long-term Solution	Secondary Impacts	Staffing	Funding Allocated	Maintenance/Operations	Political Support	Local Champion	Public Support	State Authority	Existing Local Authority	Potential Legal Challenge	Benefit of Action	Cost of Action	Contributes to Economic Goals	Outside Funding Required	Effect on Land/Water	Effect on Endangered Species	Effect on HAZMAT Sites	Consistent w/ Community Environmental Goals	Consistent w/ Federal Laws
	+	+	+	+	N/A	–	–	–	+	–	+	N/A	N/A	N/A	+	–	N/A	+	N/A	N/A	N/A	N/A	N/A

Comments: Need to identify a potential center. Work with Red Cross to find good place.

Benefit: Health and safety of vulnerable populations.

Cost/Funding Source: Information not available at this time. Will work with Red Cross to identify

Responsible Party: Fire Chief

Timeframe for Completion: Contact Red Cross within 6 months of plan approval. Establishment of center may take 1-2 years

Priority Level: Priority 2

ACTION ID: 2.3

Action Considered: Continue NFIP compliance by enforcing flood plain ordinances based on the State of Iowa Model Code.

STAPLEE Criteria	S Social		T Technical			A Administrative			P Political			L Legal			E Economic				E Environment				
Considerations → For Alternative Actions ↓	Community Acceptance	Effect on Population Segment	Technical Feasibility	Long-term Solution	Secondary Impacts	Staffing	Funding Allocated	Maintenance/Operations	Political Support	Local Champion	Public Support	State Authority	Existing Local Authority	Potential Legal Challenge	Benefit of Action	Cost of Action	Contributes to Economic Goals	Outside Funding Required	Effect on Land/Water	Effect on Endangered Species	Effect on HAZMAT Sites	Consistent w/ Community Environmental Goals	Consistent w/ Federal Laws
	+	+	+	+	N/A	–	–	–	+	–	+	+	+	N/A	+	–	+	+	+	N/A	+	+	+

Comments: Applies to new community assets and substantial improvement requirements for existing assets.

Benefit: Reduces or eliminates losses from flood hazards

Cost/Funding Source: No additional costs for on-going enforcement

Responsible Party: Floodplain Manager/City Clerk

Timeframe for Completion: Ongoing

Priority Level: Priority 1

ACTION ID: 3.2

Action Considered: Identify critical facilities, such as lift stations; where back up power generators should be installed and install.

STAPLEE Criteria	S Social		T Technical			A Administrative			P Political			L Legal			E Economic				E Environment				
Considerations → For Alternative Actions ↓	Community Acceptance	Effect on Population Segment	Technical Feasibility	Long-term Solution	Secondary Impacts	Staffing	Funding Allocated	Maintenance/Operations	Political Support	Local Champion	Public Support	State Authority	Existing Local Authority	Potential Legal Challenge	Benefit of Action	Cost of Action	Contributes to Economic Goals	Outside Funding Required	Effect on Land/Water	Effect on Endangered Species	Effect on HAZMAT Sites	Consistent w/ Community Environmental Goals	Consistent w/ Federal Laws
	+	+	+	+	+	–	–	–	+	+	+	N/A	N/A	N/A	+	–	+	+	+	N/A	N/A	N/A	N/A

Comments: Look into possible portable generator if fix generators are cost-prohibitive.

Benefit: Ensure continuation of essential services.

Cost/Funding Source: Generators varies in cost depending on size and use. Outside funding may be required.

Responsible Party: City Council Fire Chief

Timeframe for Completion: 3-5 years

Priority Level: Priority 3

CONESVILLE

ACTION ID: 1.1

Action Considered: Construct safe room construction where vulnerable populations may not have other sources of shelter where technically and financially feasible.

STAPLEE Criteria	S Social		T Technical			A Administrative			P Political			L Legal			E Economic				E Environment				
Considerations → For Alternative Actions ↓	Community Acceptance	Effect on Population Segment	Technical Feasibility	Long-term Solution	Secondary Impacts	Staffing	Funding Allocated	Maintenance/Operations	Political Support	Local Champion	Public Support	State Authority	Existing Local Authority	Potential Legal Challenge	Benefit of Action	Cost of Action	Contributes to Economic Goals	Outside Funding Required	Effect on Land/Water	Effect on Endangered Species	Effect on HAZMAT Sites	Consistent w/ Community Environmental Goals	Consistent w/ Federal Laws
	+	+	+	+	+	N/A	–	+	+	+	+	N/A	N/A	N/A	+	+	+	+	N/A	N/A	N/A	+	+

Comments:	Applies to new community assets. Changed action on recommendation of IHSEMD and FEMA
Benefit:	Potential life-saving action.
Cost/Funding Source:	Determined by size of structure. Outside funding would be required.
Responsible Party:	Fire Chief / City Council
Timeframe for Completion:	Outside funding will determine completion date.
Priority Level:	Priority 5

ACTION ID: 1.3

Action Considered: Establish warming and cooling centers at fire station.

STAPLEE Criteria	**S** Social		**T** Technical			**A** Administrative			**P** Political			**L** Legal			**E** Economic				**E** Environment				
Considerations → For Alternative Actions ↓	Community Acceptance	Effect on Population Segment	Technical Feasibility	Long-term Solution	Secondary Impacts	Staffing	Funding Allocated	Maintenance/Operations	Political Support	Local Champion	Public Support	State Authority	Existing Local Authority	Potential Legal Challenge	Benefit of Action	Cost of Action	Contributes to Economic Goals	Outside Funding Required	Effect on Land/Water	Effect on Endangered Species	Effect on HAZMAT Sites	Consistent w/ Community Environmental Goals	Consistent w/ Federal Laws
	+	+	+	+	N/A	N/A	–	+	+	+	N/A	N/A	N/A	N/A	+	+	+	N/A	N/A	N/A	N/A	N/A	N/A

Comments:	Fire station has been identified as preferred choice.
Benefit:	Health and safety of vulnerable populations.
Cost/Funding Source:	Information not available at this time. Work with Red Cross
Responsible Party:	Fire Chief / City Council
Timeframe for Completion:	Based on availability of funding. Will contact Red Cross within 6 months of plan approval. Overall may take 1-2 years to finalize center
Priority Level:	Priority 3

ACTION ID: 1.5

Action Considered: Encourage development of check-on-neighbor programs for; seniors, disabled, and special needs citizens.

STAPLEE Criteria	S Social		T Technical			A Administrative			P Political			L Legal			E Economic				E Environment				
Considerations → For Alternative Actions ↓	Community Acceptance	Effect on Population Segment	Technical Feasibility	Long-term Solution	Secondary Impacts	Staffing	Funding Allocated	Maintenance/Operations	Political Support	Local Champion	Public Support	State Authority	Existing Local Authority	Potential Legal Challenge	Benefit of Action	Cost of Action	Contributes to Economic Goals	Outside Funding Required	Effect on Land/Water	Effect on Endangered Species	Effect on HAZMAT Sites	Consistent w/ Community Environmental Goals	Consistent w/ Federal Laws
	+	+	+	+	+	+	–	–	–	+	+	–	+	–	+	N/A	–	–	N/A	N/A	N/A	N/A	N/A

Comments: Currently not formally conducted, although emergency personnel do check on known vulnerable people.

Benefit: Reduces risk to vulnerable populations.

Cost/Funding Source: Staff time and coordination with Red Cross to establish necessary procedures.

Responsible Party: Fire Chief / City Council

Timeframe for Completion: 1 year

Priority Level: Priority 2

ACTION ID: 2.6

Action Considered: Provide NOAA weather radios for schools, municipal buildings, and public assembly facilities; such as soccer fields and sports stadiums.

STAPLEE Criteria	S Social		T Technical			A Administrative			P Political			L Legal			E Economic				E Environment				
Considerations → For Alternative Actions ↓	Community Acceptance	Effect on Population Segment	Technical Feasibility	Long-term Solution	Secondary Impacts	Staffing	Funding Allocated	Maintenance/Operations	Political Support	Local Champion	Public Support	State Authority	Existing Local Authority	Potential Legal Challenge	Benefit of Action	Cost of Action	Contributes to Economic Goals	Outside Funding Required	Effect on Land/Water	Effect on Endangered Species	Effect on HAZMAT Sites	Consistent w/ Community Environmental Goals	Consistent w/ Federal Laws
	+	+	+	+	+	+	+	N/A	N/A	+	+	N/A	N/A	N/A	+	–	–	–	N/A	N/A	N/A	+	+

Comments: Would like at fire station, city hall, and Grace United Church.

Benefit: Advanced warning of weather related events for vulnerable populations and critical facilities.

Cost/Funding Source: NOAA radios cost approximately $50 each.

Responsible Party: Mayor
Timeframe for Completion: To be completed within 6 months of plan adoption
Priority Level: Priority 1

ACTION ID: 3.2
Action Considered: Obtain generators for fire department, city hall and church.

STAPLEE Criteria	S Social		T Technical			A Administrative			P Political			L Legal			E Economic				E Environment				
Considerations → For Alternative Actions ↓	Community Acceptance	Effect on Population Segment	Technical Feasibility	Long-term Solution	Secondary Impacts	Staffing	Funding Allocated	Maintenance/Operations	Political Support	Local Champion	Public Support	State Authority	Existing Local Authority	Potential Legal Challenge	Benefit of Action	Cost of Action	Contributes to Economic Goals	Outside Funding Required	Effect on Land/Water	Effect on Endangered Species	Effect on HAZMAT Sites	Consistent w/ Community Environmental Goals	Consistent w/ Federal Laws
	+	+	+	+	+	+	+	+	+	+	+	N/A	+	N/A	+	+	+	+	+	–	N/A	+	+

Comments:
Benefit: Ensure continuation of essential services.
Cost/Funding Source: Unknown costs and funding source. Will investigate further upon plan approval
Responsible Party: City Council
Timeframe for Completion: 3-5 years
Priority Level: Priority 4

FRUITLAND

ACTION ID: 2.3

Action Considered: Continue NFIP compliance by enforcing flood plain ordinances based on the State of Iowa Model Code.

STAPLEE Criteria	S Social		T Technical			A Administrative			P Political			L Legal			E Economic				E Environment				
Considerations → For Alternative Actions ↓	Community Acceptance	Effect on Population Segment	Technical Feasibility	Long-term Solution	Secondary Impacts	Staffing	Funding Allocated	Maintenance/Operations	Political Support	Local Champion	Public Support	State Authority	Existing Local Authority	Potential Legal Challenge	Benefit of Action	Cost of Action	Contributes to Economic Goals	Outside Funding Required	Effect on Land/Water	Effect on Endangered Species	Effect on HAZMAT Sites	Consistent w/ Community Environmental Goals	Consistent w/ Federal Laws
	+	+	+	+	+	+	+	+	+	+	+	+	+	N/A	+	N/A	+	N/A	N/A	N/A	N/A	+	+

Comments:	Applies to new community assets and substantial improvement requirements for existing assets.
Benefit:	Reduces or eliminates losses from flood hazards.
Cost/Funding Source:	No additional cost for ongoing enforcement.
Responsible Party:	Mayor and City Council
Timeframe for Completion:	On going
Priority Level:	Priority 3

ACTION ID: 1.5

Action Considered: Encourage development of check-on-neighbor programs for; seniors, disabled, and special needs citizens.

STAPLEE Criteria	**S** Social		**T** Technical			**A** Administrative			**P** Political			**L** Legal			**E** Economic				**E** Environment				
Considerations → For Alternative Actions ↓	Community Acceptance	Effect on Population Segment	Technical Feasibility	Long-term Solution	Secondary Impacts	Staffing	Funding Allocated	Maintenance/Operations	Political Support	Local Champion	Public Support	State Authority	Existing Local Authority	Potential Legal Challenge	Benefit of Action	Cost of Action	Contributes to Economic Goals	Outside Funding Required	Effect on Land/Water	Effect on Endangered Species	Effect on HAZMAT Sites	Consistent w/ Community Environmental Goals	Consistent w/ Federal Laws
	+	+	+	+	+	N/A	N/A	N/A	+	+	+	N/A	N/A	N/A	+	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A

Comments:	Continuing efforts
Benefit:	Reduces risk to vulnerable populations.
Cost/Funding Source:	Staff time and coordination with Red Cross.
Responsible Party:	Mayor and City Council
Timeframe for Completion:	
Priority Level:	Priority 2

ACTION ID: 5.1

Action Considered: Test warning systems.

STAPLEE Criteria	S Social		T Technical			A Administrative			P Political			L Legal			E Economic				E Environment				
Considerations → For Alternative Actions ↓	Community Acceptance	Effect on Population Segment	Technical Feasibility	Long-term Solution	Secondary Impacts	Staffing	Funding Allocated	Maintenance/Operations	Political Support	Local Champion	Public Support	State Authority	Existing Local Authority	Potential Legal Challenge	Benefit of Action	Cost of Action	Contributes to Economic Goals	Outside Funding Required	Effect on Land/Water	Effect on Endangered Species	Effect on HAZMAT Sites	Consistent w/ Community Environmental Goals	Consistent w/ Federal Laws
	+	+	+	+	+	+	+	+	+	+	+	N/A	N/A	N/A	+	+	N/A	+	N/A	N/A	N/A	N/A	N/A

Comments: System integrated with MUSCOM. City tests siren and batteries twice a month

Benefit: Potential lifesaving action.

Cost/Funding Source: No additional cost for ongoing activity.

Responsible Party: Mayor

Timeframe for Completion: On going

Priority Level: Priority 1

MUSCATINE

ACTION ID: 1.4

Action Considered: Update and enforce building codes to current International Code Series.

STAPLEE Criteria	S Social		T Technical			A Administrative			P Political			L Legal			E Economic				E Environment				
Considerations → For Alternative Actions ↓	Community Acceptance	Effect on Population Segment	Technical Feasibility	Long-term Solution	Secondary Impacts	Staffing	Funding Allocated	Maintenance/Operations	Political Support	Local Champion	Public Support	State Authority	Existing Local Authority	Potential Legal Challenge	Benefit of Action	Cost of Action	Contributes to Economic Goals	Outside Funding Required	Effect on Land/Water	Effect on Endangered Species	Effect on HAZMAT Sites	Consistent w/ Community Environmental Goals	Consistent w/ Federal Laws
	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+

Comments:

Benefit: Ensure construction meets latest standards of safety.

Cost/Funding Source: No additional costs for ongoing enforcement procedures.

Responsible Party: Building and Zoning Administrator

Timeframe for Completion: New codes are released every 3 years. It takes 2-3 years to review and adopt.

Priority Level: Priority 4

ACTION ID: 2.3

Action Considered: Maintain legally enforceable floodplain management regulations that are compliant with Title 44 CFR 60 to ensure Muscatine residents and businesses are eligible to participate in NFIP.

STAPLEE Criteria	**S** Social		**T** Technical			**A** Administrative			**P** Political			**L** Legal			**E** Economic				**E** Environment				
Considerations → For Alternative Actions ↓	Community Acceptance	Effect on Population Segment	Technical Feasibility	Long-term Solution	Secondary Impacts	Staffing	Funding Allocated	Maintenance/Operations	Political Support	Local Champion	Public Support	State Authority	Existing Local Authority	Potential Legal Challenge	Benefit of Action	Cost of Action	Contributes to Economic Goals	Outside Funding Required	Effect on Land/Water	Effect on Endangered Species	Effect on HAZMAT Sites	Consistent w/ Community Environmental Goals	Consistent w/ Federal Laws
	+	+	+	+	+	+	+	+	+	+	+	+	+	N/A	+	N/A	+	N/A	N/A	N/A	N/A	+	+

Comments: Reworded to match Muscatine Comprehensive Plan

Benefit: Reduces or eliminates losses from flood hazards.

Cost/Funding Source: No additional cost for ongoing enforcement.

Responsible Party: Floodplain Manager/Building & Zoning Administrator

Timeframe for Completion: On going

Priority Level: Priority 1

ACTION ID: 3.2

Action Considered: Identify critical facilities, such as lift stations; where back up power generators should be installed and install

STAPLEE Criteria	**S** Social		**T** Technical			**A** Administrative			**P** Political			**L** Legal			**E** Economic				**E** Environment				
Considerations → For Alternative Actions ↓	Community Acceptance	Effect on Population Segment	Technical Feasibility	Long-term Solution	Secondary Impacts	Staffing	Funding Allocated	Maintenance/Operations	Political Support	Local Champion	Public Support	State Authority	Existing Local Authority	Potential Legal Challenge	Benefit of Action	Cost of Action	Contributes to Economic Goals	Outside Funding Required	Effect on Land/Water	Effect on Endangered Species	Effect on HAZMAT Sites	Consistent w/ Community Environmental Goals	Consistent w/ Federal Laws
	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	N/A	N/A	N/A	N/A	N/A

Comments:

Benefit: Ensure continuation of essential services.

Cost/Funding Source: Generators varies in cost depending on size and use. Outside funding may be required.

Responsible Party: Director of Public Works

Timeframe for Completion: 3-5 years

Priority Level: Priority 5

ACTION ID: 3.3

Action Considered: Continue routine maintenance of levees; as needed.

STAPLEE Criteria	**S** Social		**T** Technical			**A** Administrative			**P** Political			**L** Legal			**E** Economic				**E** Environment				
Considerations → For Alternative Actions ↓	Community Acceptance	Effect on Population Segment	Technical Feasibility	Long-term Solution	Secondary Impacts	Staffing	Funding Allocated	Maintenance/Operations	Political Support	Local Champion	Public Support	State Authority	Existing Local Authority	Potential Legal Challenge	Benefit of Action	Cost of Action	Contributes to Economic Goals	Outside Funding Required	Effect on Land/Water	Effect on Endangered Species	Effect on HAZMAT Sites	Consistent w/ Community Environmental Goals	Consistent w/ Federal Laws
		+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+

Comments:

Benefit: Provides long-term flooding solution to river flooding in those areas.

Cost/Funding Source: Costs will depending on needed maintenance repairs or upgrades. Will be incorporated into City's CI

Responsible Party: Director of Public Works

Timeframe for Completion: On going

Priority Level: Tied for Priority 1

ACTION ID: 3.4

Action Considered: Separate combined sewer systems at the Papoose Creek pumping station.

STAPLEE Criteria	S Social		T Technical			A Administrative			P Political			L Legal			E Economic				E Environment				
Considerations → For Alternative Actions ↓	Community Acceptance	Effect on Population Segment	Technical Feasibility	Long-term Solution	Secondary Impacts	Staffing	Funding Allocated	Maintenance/Operations	Political Support	Local Champion	Public Support	State Authority	Existing Local Authority	Potential Legal Challenge	Benefit of Action	Cost of Action	Contributes to Economic Goals	Outside Funding Required	Effect on Land/Water	Effect on Endangered Species	Effect on HAZMAT Sites	Consistent w/ Community Environmental Goals	Consistent w/ Federal Laws
	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+

Comments: Consent order with US EPA signed in 2007 to commit to separation. Hersey Ave Area project completed in 2011

Benefit: Identifies systems that need a higher level of protection to avoid discharges from waste water systems during flood conditions.

Cost/Funding Source: Estimated at $50 million and is part of the City's CIP

Responsible Party: Director of Public Works

Timeframe for Completion: This is on-going. Estimated completion is 2028

Priority Level: Priority 2

NICHOLS

ACTION ID: 1.1

Action Considered: Safe room construction where vulnerable populations may not have other sources of shelter, where feasible.

STAPLEE Criteria	S Social		T Technical			A Administrative			P Political			L Legal			E Economic				E Environment				
Considerations → For Alternative Actions ↓	Community Acceptance	Effect on Population Segment	Technical Feasibility	Long-term Solution	Secondary Impacts	Staffing	Funding Allocated	Maintenance/Operations	Political Support	Local Champion	Public Support	State Authority	Existing Local Authority	Potential Legal Challenge	Benefit of Action	Cost of Action	Contributes to Economic Goals	Outside Funding Required	Effect on Land/Water	Effect on Endangered Species	Effect on HAZMAT Sites	Consistent w/ Community Environmental Goals	Consistent w/ Federal Laws
	+	+	+	–	–	–	–	–	+	–	+	–	–	–	+	–	–	+	N/A	N/A	N/A	N/A	N/A

Comments: If any city buildings are constructed, the city will consider if safe room construction is feasible.

Benefit: Potential life-saving action.

Cost/Funding Source: Determine by size of structure. Outside funding would be required.
Responsible Party: Mayor
Timeframe for Completion: TBD, as project and funding becomes available
Priority Level: Priority 5

ACTION ID: 1.3

Action Considered: Establish warming and cooling centers.

STAPLEE Criteria	S Social		T Technical			A Administrative			P Political			L Legal			E Economic				E Environment				
Considerations → For Alternative Actions ↓	Community Acceptance	Effect on Population Segment	Technical Feasibility	Long-term Solution	Secondary Impacts	Staffing	Funding Allocated	Maintenance/Operations	Political Support	Local Champion	Public Support	State Authority	Existing Local Authority	Potential Legal Challenge	Benefit of Action	Cost of Action	Contributes to Economic Goals	Outside Funding Required	Effect on Land/Water	Effect on Endangered Species	Effect on HAZMAT Sites	Consistent w/ Community Environmental Goals	Consistent w/ Federal Laws
	+	+	+	+	N/A	–	–	–	+	–	+	N/A	N/A	N/A	+	–	N/A	–	N/A	N/A	N/A	N/A	+

Comments: Will work with Red Cross and Muscatine County EMA

Benefit: Health and safety of vulnerable populations.
Cost/Funding Source: Information not available at this time.
Fire Chief Fire Chief
Timeframe for Completion: Approximately 2 years from plan adoption
Priority Level: Priority 2

ACTION ID: 2.3

Action Considered: Continue NFIP compliance by enforcing flood plain ordinances based on the State of Iowa Model Code.

STAPLEE Criteria	S Social		T Technical			A Administrative			P Political			L Legal			E Economic				E Environment				
Considerations → For Alternative Actions ↓	Community Acceptance	Effect on Population Segment	Technical Feasibility	Long-term Solution	Secondary Impacts	Staffing	Funding Allocated	Maintenance/Operations	Political Support	Local Champion	Public Support	State Authority	Existing Local Authority	Potential Legal Challenge	Benefit of Action	Cost of Action	Contributes to Economic Goals	Outside Funding Required	Effect on Land/Water	Effect on Endangered Species	Effect on HAZMAT Sites	Consistent w/ Community Environmental Goals	Consistent w/ Federal Laws
	+	+	–	–	–	–	–	–	+	+	+	+	+	+	+	–	N/A	–	N/A	N/A	N/A	+	+

Comments:

Benefit: Reduces or eliminates losses from flood hazards.

Cost/Funding Source: No additional cost for ongoing enforcement.

Responsible Party: Floodplain Manager/Mayor

Timeframe for Completion: On going

Priority Level: Priority 1

ACTION ID: 3.2

Action Considered: Identify critical facilities, such as lift stations; where back up power generators should be installed and install

STAPLEE Criteria	**S** Social		**T** Technical			**A** Administrative			**P** Political			**L** Legal			**E** Economic				**E** Environment				
Considerations → For Alternative Actions ↓	Community Acceptance	Effect on Population Segment	Technical Feasibility	Long-term Solution	Secondary Impacts	Staffing	Funding Allocated	Maintenance/Operations	Political Support	Local Champion	Public Support	State Authority	Existing Local Authority	Potential Legal Challenge	Benefit of Action	Cost of Action	Contributes to Economic Goals	Outside Funding Required	Effect on Land/Water	Effect on Endangered Species	Effect on HAZMAT Sites	Consistent w/ Community Environmental Goals	Consistent w/ Federal Laws
	+	+	+	+	+	−	−	−	+	−	+	N/A	N/A	N/A	+	−	N/A	−	+	N/A	+	+	+

Comments: Consider portable generator if permanent ones are cost prohibitive

Benefit: Ensure continuation of essential services.

Cost/Funding Source: Generators varies in cost depending on size and use. Outside funding may be required.

Responsible Party: Mayor

Timeframe for Completion: 4-5 years after approval of the plan

Priority Level: Priority 4

ACTION ID: 2.7

Action Considered: Establish real-time systems for notifying emergency responders and the public of road closings due to flash floods.

STAPLEE Criteria	S Social		T Technical			A Administrative			P Political			L Legal			E Economic				E Environment				
Considerations → For Alternative Actions ↓	Community Acceptance	Effect on Population Segment	Technical Feasibility	Long-term Solution	Secondary Impacts	Staffing	Funding Allocated	Maintenance/Operations	Political Support	Local Champion	Public Support	State Authority	Existing Local Authority	Potential Legal Challenge	Benefit of Action	Cost of Action	Contributes to Economic Goals	Outside Funding Required	Effect on Land/Water	Effect on Endangered Species	Effect on HAZMAT Sites	Consistent w/ Community Environmental Goals	Consistent w/ Federal Laws
	+	+	+	+	+	–	–	–	+	–	+	+	–	–	+	–	N/A	N/A	N/A	N/A	+	N/A	N/A

Comments: Look into using social media or non-emergency police number to self-reporting

Benefit: Potential life-saving action. Cuts down on emergency response time. Improves communication both between communities and with the public.

Cost/Funding Source: Costs not identified at this time.

Responsible Party: Fire Chief

Timeframe for Completion: 2-3 years after approval of the plan

Priority Level: Priority 3

WEST LIBERTY

ACTION ID: 2.3

Action Considered: Continue NFIP compliance by enforcing flood plain ordinances based on the State of Iowa Model Code.

STAPLEE Criteria	S Social		T Technical			A Administrative			P Political			L Legal			E Economic				E Environment				
Considerations → For Alternative Actions ↓	Community Acceptance	Effect on Population Segment	Technical Feasibility	Long-term Solution	Secondary Impacts	Staffing	Funding Allocated	Maintenance/Operations	Political Support	Local Champion	Public Support	State Authority	Existing Local Authority	Potential Legal Challenge	Benefit of Action	Cost of Action	Contributes to Economic Goals	Outside Funding Required	Effect on Land/Water	Effect on Endangered Species	Effect on HAZMAT Sites	Consistent w/ Community Environmental Goals	Consistent w/ Federal Laws
	+	+	–	–	–	–	–	–	+	+	+	+	+	+	+	–	N/A	–	N/A	N/A	N/A	+	+

Comments: Need to identify a potential center. Work with Red Cross to find good place.

Benefit: Reduces or eliminates losses from flood hazards.

Cost/Funding Source: No additional cost for ongoing enforcement.

Responsible Party: Floodplain Manager/City Clerk

Timeframe for Completion: On going

Priority Level: Priority 2

ACTION ID: 2.6

Action Considered: Provide NOAA weather radios for schools, municipal buildings, and public assembly facilities; such as soccer fields and sports stadiums.

STAPLEE Criteria	S Social		T Technical			A Administrative			P Political			L Legal			E Economic				E Environment				
Considerations → For Alternative Actions ↓	Community Acceptance	Effect on Population Segment	Technical Feasibility	Long-term Solution	Secondary Impacts	Staffing	Funding Allocated	Maintenance/Operations	Political Support	Local Champion	Public Support	State Authority	Existing Local Authority	Potential Legal Challenge	Benefit of Action	Cost of Action	Contributes to Economic Goals	Outside Funding Required	Effect on Land/Water	Effect on Endangered Species	Effect on HAZMAT Sites	Consistent w/ Community Environmental Goals	Consistent w/ Federal Laws
	+	+	+	+	+	N/A	+	+	+	+	+	+	+	+	+	+	N/A	+	N/A	N/A	N/A	+	+

Comments:

Benefit: Advances warning of weather related events for vulnerable populations and critical facilities.

Cost/Funding Source: NOAA radios cost approximately $50 each. If extensive need is determined outside funding may be required.

Responsible Party: Mayor

Timeframe for Completion: 2 years following approval of the plan

Priority Level: Priority 1

ACTION ID: 3.2

Action Considered: Identify critical facilities, such as lift stations; where back up power generators should be

STAPLEE Criteria	S Social		T Technical			A Administrative			P Political			L Legal			E Economic				E Environment				
Considerations → For Alternative Actions ↓	Community Acceptance	Effect on Population Segment	Technical Feasibility	Long-term Solution	Secondary Impacts	Staffing	Funding Allocated	Maintenance/Operations	Political Support	Local Champion	Public Support	State Authority	Existing Local Authority	Potential Legal Challenge	Benefit of Action	Cost of Action	Contributes to Economic Goals	Outside Funding Required	Effect on Land/Water	Effect on Endangered Species	Effect on HAZMAT Sites	Consistent w/ Community Environmental Goals	Consistent w/ Federal Laws
	+	+	+	+	+	N/A	+	+	+	+	+	+	+	+	+	+	+	+	N/A	N/A	N/A	+	+

Comments:	Applies to existing community assets.
Benefit:	Ensure continuation of essential services.
Cost/Funding Source:	Generators varies in cost depending on size and use. Outside funding may be required.
Responsible Party:	Water/Wastewater Superintendent and City Administrator
Timeframe for Completion:	3-5 years following plan adoption
Priority Level:	Priority 4

ACTION ID: 2.7

Action Considered: Establish real-time systems for notifying emergency responders and the public of road

STAPLEE Criteria	**S** Social		**T** Technical			**A** Administrative			**P** Political			**L** Legal			**E** Economic				**E** Environment				
Considerations → For Alternative Actions ↓	Community Acceptance	Effect on Population Segment	Technical Feasibility	Long-term Solution	Secondary Impacts	Staffing	Funding Allocated	Maintenance/Operations	Political Support	Local Champion	Public Support	State Authority	Existing Local Authority	Potential Legal Challenge	Benefit of Action	Cost of Action	Contributes to Economic Goals	Outside Funding Required	Effect on Land/Water	Effect on Endangered Species	Effect on HAZMAT Sites	Consistent w/ Community Environmental Goals	Consistent w/ Federal Laws
	+	+	+	+	+	N/A	+	+	+	+	+	+	N/A	N/A	N/A	+	+	+	N/A	N/A	N/A	N/A	+

Comments:	Look into using social media or non-emergency police number to self-reporting
Benefit:	Potential life-saving action. Cuts down on emergency response time. Improves communication both between communities and with the public.
Cost/Funding Source:	Costs not identified at this time.
Responsible Party:	Fire Chief
Timeframe for Completion:	2-3 years after approval of the plan
Priority Level:	Priority 3

WILTON

ACTION ID: 1.3

Action Considered: Establish warming and cooling centers.

STAPLEE Criteria	S Social		T Technical			A Administrative			P Political			L Legal			E Economic				E Environment				
Considerations → For Alternative Actions ↓	Community Acceptance	Effect on Population Segment	Technical Feasibility	Long-term Solution	Secondary Impacts	Staffing	Funding Allocated	Maintenance/Operations	Political Support	Local Champion	Public Support	State Authority	Existing Local Authority	Potential Legal Challenge	Benefit of Action	Cost of Action	Contributes to Economic Goals	Outside Funding Required	Effect on Land/Water	Effect on Endangered Species	Effect on HAZMAT Sites	Consistent w/ Community Environmental Goals	Consistent w/ Federal Laws
	+	+	+	+	N/A	–	–	–	+	–	+	N/A	N/A	N/A	+	–	N/A	–	N/A	N/A	N/A	N/A	+

Comments: Will work with Red Cross and Muscatine County EMA

Benefit: Health and safety of vulnerable populations.

Cost/Funding Source: Information not available at this time.

Responsible Party: Fire Chief

Timeframe for Completion: Approximately 2 years from plan adoption

Priority Level: Priority 3

ACTION ID: 1.4

Action Considered: Update and enforce building codes to current International Code Series.

STAPLEE Criteria	S Social		T Technical			A Administrative			P Political			L Legal			E Economic				E Environment				
Considerations → For Alternative Actions ↓	Community Acceptance	Effect on Population Segment	Technical Feasibility	Long-term Solution	Secondary Impacts	Staffing	Funding Allocated	Maintenance/Operations	Political Support	Local Champion	Public Support	State Authority	Existing Local Authority	Potential Legal Challenge	Benefit of Action	Cost of Action	Contributes to Economic Goals	Outside Funding Required	Effect on Land/Water	Effect on Endangered Species	Effect on HAZMAT Sites	Consistent w/ Community Environmental Goals	Consistent w/ Federal Laws
	+	+	–	+	+	–	+	N/A	+	+	+	+	+	+	+	–	+	+	N/A	N/A	N/A	+	+

Comments:

Benefit: Ensure construction meets latest standards of safety.

Cost/Funding Source: No additional costs for ongoing enforcement procedures.

Responsible Party: Building and Zoning Administrator

Timeframe for Completion: New codes are released every 3 years. It takes 2-3 years to review and adopt.

Priority Level: Priority 4

ACTION ID: 2.3

Action Considered: Continue NFIP compliance by enforcing flood plain ordinances based on the State of Iowa

STAPLEE Criteria	S Social		T Technical			A Administrative			P Political			L Legal			E Economic				E Environment				
Considerations → For Alternative Actions ↓	Community Acceptance	Effect on Population Segment	Technical Feasibility	Long-term Solution	Secondary Impacts	Staffing	Funding Allocated	Maintenance/Operations	Political Support	Local Champion	Public Support	State Authority	Existing Local Authority	Potential Legal Challenge	Benefit of Action	Cost of Action	Contributes to Economic Goals	Outside Funding Required	Effect on Land/Water	Effect on Endangered Species	Effect on HAZMAT Sites	Consistent w/ Community Environmental Goals	Consistent w/ Federal Laws
	+	+	+	+	+	+	+	+	+	+	+	+	+	N/A	+	N/A	+	N/A	N/A	N/A	N/A	+	+

Comments: Applies to new community assets and substantial improvement requirements for existing assets.

Benefit: Reduces or eliminates losses from flood hazards.

Cost/Funding Source: No additional cost for ongoing enforcement.

Responsible Party: Floodplain Manager/City Clerk

Timeframe for Completion: On going

Priority Level: Priority 1

ACTION ID: 3.2

Action Considered: Identify critical facilities, such as lift stations, where back-up generators should be installed

STAPLEE Criteria	S Social		T Technical			A Administrative			P Political			L Legal			E Economic				E Environment				
Considerations → For Alternative Actions ↓	Community Acceptance	Effect on Population Segment	Technical Feasibility	Long-term Solution	Secondary Impacts	Staffing	Funding Allocated	Maintenance/Operations	Political Support	Local Champion	Public Support	State Authority	Existing Local Authority	Potential Legal Challenge	Benefit of Action	Cost of Action	Contributes to Economic Goals	Outside Funding Required	Effect on Land/Water	Effect on Endangered Species	Effect on HAZMAT Sites	Consistent w/ Community Environmental Goals	Consistent w/ Federal Laws
	+	+	+	+	+	+	−	+	+	+	+	+	+	+	+	−	+	+	+	N/A	N/A	+	+

Comments: Applies to existing community assets.

Benefit: Ensure continuation of essential services.

Cost/Funding Source: Generators varies in cost depending on size and use. Outside funding may be required.

Responsible Party: Water/Wastewater Superintendent and City Administrator

Timeframe for Completion: 3-5 years following plan adoption

Priority Level: Priority 5

ACTION ID: 3.4

Action Considered: Separate combined sewer systems

STAPLEE Criteria	S Social		T Technical			A Administrative			P Political			L Legal			E Economic				E Environment				
Considerations → For Alternative Actions ↓	Community Acceptance	Effect on Population Segment	Technical Feasibility	Long-term Solution	Secondary Impacts	Staffing	Funding Allocated	Maintenance/Operations	Political Support	Local Champion	Public Support	State Authority	Existing Local Authority	Potential Legal Challenge	Benefit of Action	Cost of Action	Contributes to Economic Goals	Outside Funding Required	Effect on Land/Water	Effect on Endangered Species	Effect on HAZMAT Sites	Consistent w/ Community Environmental Goals	Consistent w/ Federal Laws
	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	N/A	N/A	+	+

Comments:

Benefit: Identifies systems that need a higher level of protection to avoid discharges from waste water systems during flood conditions.

Cost/Funding Source: Initial research to identify which systems would need the additional protection would have a cost of staff time. Once needs are determined, outside funding resources may be needed to upgrade waste water infrastructure.

Responsible Party: Water/Wastewater Supervisor and City Administrator

Timeframe for Completion: 5-10 year after plan adoption

Priority Level: Priority 6

ACTION ID: 5.1

Action Considered: Test Warning Systems

STAPLEE Criteria	S Social		T Technical			A Administrative			P Political			L Legal			E Economic				E Environment				
Considerations → For Alternative Actions ↓	Community Acceptance	Effect on Population Segment	Technical Feasibility	Long-term Solution	Secondary Impacts	Staffing	Funding Allocated	Maintenance/Operations	Political Support	Local Champion	Public Support	State Authority	Existing Local Authority	Potential Legal Challenge	Benefit of Action	Cost of Action	Contributes to Economic Goals	Outside Funding Required	Effect on Land/Water	Effect on Endangered Species	Effect on HAZMAT Sites	Consistent w/ Community Environmental Goals	Consistent w/ Federal Laws
	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	N/A	N/A	+	+

Comments: On-going action.

Benefit:	Potential life-saving action.
Cost/Funding Source:	No additional cost for on-going activity.
Responsible Party:	City Clerk, Fire Department and City Administrator
Timeframe for Completion:	On going
Priority Level:	Priority 2

APPENDIX 5-1 ANNUAL FORM REPORT

MUSCATINE COUNTY HAZARD MITIGATION PLAN
ANNUAL UPDATE

REPORTING PERIOD: APRIL 1, _____ TO MARCH 31, _____

JURISDICTION: _____

CONTACT INFORMATION:

NAME/ TITLE

EMAIL

PHONE

SECTION 1: PLAN INCORPORATION

DID YOUR JURISIDITION ATTENDED THE ANNUAL PLANNING COMMITTEE MEETING (Y/N) _____

HAS THE MCHM PLAN BEEN INCORPORATED INTO ANY NEW PLANNING OR LAND USE DOCUMENTS. IF YES PLEASE LIST.

HAS THE MCHM PLAN BEEN INCORPORATED INTO ANY NEW ZONING DOCUMENTS. IF YES PLEASE LIST.

HAS THE MCHM PLAN BEEN INCORPORATED INTO ANY NEW BUILDING CODE DOCUMENTS. IF YES PLEASE LIST.

HAS THE MCHM PLAN BEEN INCORPORATED INTO ANY GRANT APPLICATIONS. IF YES PLEASE LIST.

HAS ANY GRANT FUNDING BEEN RECEIVED BASED ON MITIGATION ACTIONS. IF YES PLEASE LIST (WITH AMOUNT RECEIVED).

(OVER) →

SECTION 2: MITIGATION ACTIONS

HAS YOUR JURISDICTION COMPLETED ANY MITIGATION ACTIONS. IF YES PLEASE LIST.

HAS YOUR JURISDICTION ADDED ANY MITIGATION ACTIONS. IF YES PLEASE LIST.

SECTION 3: PUBLIC INVOLVEMENT

HOW HAS YOUR JURISDICTION KEPT THE PUBLIC INVOLVED WITH THE MCHM PLAN. PLEASE LIST.

HAS YOUR JURISDICTION CONDUCTED ANY PUBLIC EDUCATION. IF YES PLEASE LIST.

FORM MUST BE SUBMITTED NO LATER THAN APRIL 30TH.

SUBMIT FORM TO:

MUSCATINE COUNTY
Sherry Seright
sseright@co.muscatine.ia.us

MUSCATINE EMA
Matt Shook
mshook@muscatineiowa.gov

BI-STATE REGIONAL COMMISSION
Laura Berkley
lberkley@bistateonline.org

MUSCATINE COUNTY HAZARD MITIGATION PLAN ANNUAL UPATE REPORT