EMERGENCY MANAGEMENT
CLINTON COUNTY IOWA

Clinton County

Multi-Jurisdictional Hazard Mitigation Plan
2022-2027

Prepared with assistance from
wood.

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1 Introduction and Planning Process

1.1 Executive Summary

The following jurisdictions have prepared and adopted this 2022 update of the Clinton County Hazard Mitigation Plan:

- Clinton County
- City of Andover
- City of Calamus
- City of Camanche
- City of Charlotte
- City of Clinton
- City of Delmar
- City of DeWitt
- City of Goose Lake
- City of Grand Mound
- City of Lost Nation
- City of Low Moor
- City of Toronto
- City of Welton
- City of Wheatland
- Calamus-Wheatland School District
- Camanche School District
- Central DeWitt School District
- Clinton School District
- Delwood School District
- Northeast School District

The purpose of hazard mitigation is to reduce or eliminate long-term risk to people and property from disasters or hazardous events. Studies have found that hazard mitigation is extremely cost-effective, with every dollar spent on mitigation saving an average of $6 in avoided future losses. The Federal Emergency Management Agency (FEMA) requires that Hazard Mitigation Plans (HMPs) be updated every five years for the jurisdictions to be eligible for federal mitigation assistance. All sections of the 2017 Clinton County HMP were reviewed and updated to address natural and human-caused hazards for the purpose of saving lives and reducing losses from future disasters or hazard events. The goals of the 2022 Clinton County HMP are:

- Goal 1: Increase capabilities within Clinton County entities to mitigate the effects of hazards by enhancing existing or designing and adopting new policies that will reduce the damaging effects of hazards.
- Goal 2: Protect the most vulnerable populations, buildings, and critical facilities within Clinton County through the implementation of cost-effective and technically-feasible mitigation projects.
- Goal 3: Improve the level of responder, government, business, and citizen awareness and preparedness for disaster.
- Goal 4: Develop programs to assure that response agencies, governments, educational institutions, and local businesses are able to operate during times of disaster.

Clinton County and its participating jurisdictions developed this Hazard Mitigation Plan update to guide hazard mitigation planning to better protect the people and property of the planning area from the effects of hazard events. By reducing vulnerability to known hazard risks, communities will save lives and property and minimize the social, economic, and environmental disruptions that commonly follow hazard events. This plan demonstrates the jurisdictions' commitment to reducing risks from hazards and serves as a tool to help decision makers direct mitigation activities and resources.

This plan was also developed to retain Clinton County's and the participating jurisdictions' eligibility for federal grant programs, specifically the FEMA hazard mitigation grants including the Hazard Mitigation Grant Program (HMGP), Building Resilient Infrastructure and Communities (BRIC) grant program, and Flood Mitigation Assistance (FMA) program.

Chapter 1 contains the Plan Introduction and describes the Planning Process followed to update the Plan. A broad range of public and private stakeholders, including agencies, local businesses, nonprofits, and other interested parties were invited to participate. Public input was sought throughout the planning process including online surveys and public review of the draft Plan.

Chapter 2 Community Profile describes the planning area, consisting of Clinton County and the participating jurisdictions listed above, with updated information on demographics, social vulnerability, and changes in development. It includes an assessment of programs and policies currently in place across the County to reduce hazard impacts or that could be used to implement hazard mitigation activities and identifies opportunities to enhance those capabilities.

Chapter 3 Risk Assessment identifies the natural and human-caused hazards of greatest concern to the County, and describes the risk from those hazards. The information generated through the risk assessment helps communities to prioritize and focus their efforts on those hazards of greatest concern and those assets or areas facing the greatest risk(s). The best available information on the impacts of changing weather conditions was taken into account for each hazard. The hazards profiled in the 2022 Plan and their assessed significance are listed in Table 1-1.

Table 1-1 Clinton County Planning Area Hazard Ranking Results

Hazard	Probability	Magnitude	Warning Time	Duration	Score	Planning Significance
Animal/Plant/Crop Disease	1	4	4	4	2.65	Moderate
Cyber Attack	3	3	4	4	3.25	High
Dam/Levee Failure	1	4	4	4	2.65	Moderate
Drought	4	2	1	4	2.95	Moderate
Earthquake	1	1	4	1	1.45	Low
Expansive Soils	1	1	1	1	1	Low
Extreme Heat	4	2	1	3	2.85	Moderate
Flash Flooding	4	2	4	2	3.20	High
Grass or Wildland Fire	2	2	4	1	2.20	Moderate
Hazardous Materials Incident	4	1	4	1	2.80	Moderate
Human Disease	3	3	2	4	2.95	High
Infrastructure Failure	4	2	4	3	3.30	High
Landslide	1	1	1	1	1	Low
Radiological Incident	1	3	4	4	2.35	Moderate
Riverine Flooding	3	2	2	4	2.65	Moderate
Severe Winter Storm	4	2	3	4	3.25	High
Sinkholes	1	2	4	1	1.75	Low
Terrorism	1	4	4	4	2.65	Moderate
Thunderstorm/Lightning/Hail	4	2	3	1	2.95	Moderate
Tornado/Windstorm	4	3	4	1	3.55	High
Transportation Incident	4	3	4	1	3.55	High

Chapter 4 Mitigation Strategy describes what the County and jurisdictions will do to reduce their vulnerability to the hazards identified in Chapter 3. It presents the goals of the mitigation program and details a broad range of targeted mitigation actions to reduce losses from hazard events.

Chapter 5 Plan Implementation and Maintenance details how the Plan will be implemented, monitored, evaluated, and updated, and how mitigation will be integrated into other planning mechanisms.

It is important that local decision-makers stay involved in mitigation planning to provide new ideas and insight for future updates to the Clinton County HMP. As a long-term goal, the HMP and the mitigation strategies identified within will be integrated into daily decisions and routines of local government. This will continue to require dedication and hard work, and to this end, this Plan update continues efforts to further strengthen the resiliency of Clinton County.

1.2 Background and Scope

Each year in the United States, disasters take the lives of hundreds of people and injure thousands more. Nationwide, taxpayers pay billions of dollars annually to help communities, organizations, businesses, and individuals recover from disasters. These monies only partially reflect the true cost of disasters because additional expenses to insurance companies and non-governmental organizations are not reimbursed by tax dollars. Many disasters are predictable, and much of the damage caused by these events can be alleviated or even eliminated.

Hazard mitigation is defined by FEMA as "any sustained action taken to reduce or eliminate long-term risk to human life and property from a hazard event." A 2019 report by the National Institute of Building Sciences found that on average every $1 spent on mitigation saves society $6 in avoided future losses, in addition to saving lives and preventing injuries.

Hazard mitigation planning is the process through which hazards that threaten communities are identified, likely impacts of those hazards are determined, mitigation goals are set, and appropriate strategies to lessen impacts are determined, prioritized, and implemented. Clinton County and the participating incorporated cities and public school districts initially developed a multi-jurisdictional Hazard Mitigation Plan in 2011, and subsequently updated that plan in 2017. This current planning effort serves to update the 2017 plan.

This plan documents the hazard mitigation planning process undertaken by the Clinton County Hazard Mitigation Planning Committee (HMPC). It identifies relevant hazards and vulnerabilities in the planning area and sets forth an updated mitigation strategy to decrease vulnerability and increase resiliency and sustainability in Clinton County.

This plan was prepared pursuant to the requirements of the Disaster Mitigation Act of 2000 (Public Law 106-390) and the implementing regulations set forth by the Interim Final Rule published in the Federal Register on February 26, 2002, (44 CFR §201.6) and finalized on October 31, 2007. (Hereafter, these requirements and regulations will be referred to collectively as the Disaster Mitigation Act.) While the act emphasized the need for mitigation plans and more coordinated mitigation planning and implementation efforts, the regulations established the requirements that local HMPs must meet in order for a local jurisdiction to be eligible for certain federal disaster assistance and hazard mitigation funding under the Robert T. Stafford Disaster Relief and Emergency Act (Public Law 93-288).

Information in this plan will be used to help guide and coordinate mitigation activities and decisions for local land use policy in the future. Proactive mitigation planning will help reduce the cost of disaster response and recovery to communities and their residents by protecting critical community facilities, reducing liability exposure, and minimizing overall community impacts and disruptions. The Clinton County planning area has been affected by hazards in the past and the participating jurisdictions are therefore committed to reducing future impacts from hazard events and becoming eligible for mitigation-related federal funding.

1.3 Plan Organization

This Clinton County Multi-Jurisdictional Hazard Mitigation Plan update is organized as follows:

- Chapter 1: Introduction and Planning Process
- Chapter 2: Planning Area Profile and Capabilities
- Chapter 3: Risk Assessment
- Chapter 4: Mitigation Strategy
- Chapter 5: Plan Implementation and Maintenance
- Appendices

This is the same general format that was used for the 2017 Multi-Jurisdictional Clinton County Hazard Mitigation Plan except that in the previous plan.

1.4 Planning Process

DMA Requirements §201.6(b) and §201.6(c)(1):
An open public involvement process is essential to the development of an effective plan. In order to develop a more comprehensive approach to reducing the effects of natural disasters, the planning process shall include: *An opportunity for the public to comment on the plan during the drafting stage and prior to plan approval;* *An opportunity for neighboring communities, local and regional agencies involved in hazard mitigation activities, and agencies that have the authority to regulate development, as well as businesses, academia, and other private and nonprofit interests to be involved in the planning process; and* *Review and incorporation, if appropriate, of existing plans, studies, reports, and technical information.* *[The plan shall document] the planning process used to develop the plan, including how it was prepared, who was involved in the process, and how the public was involved.*

This plan update was collaboratively prepared between March 2021 and March 2022 by Clinton County and the participating jurisdictions and stakeholders collectively known as the HMPC. Professional planning assistance was provided by Wood Environment & Infrastructure, Inc. (Wood) through a contract held with Iowa Homeland Security and Emergency Management Division. Wood's role was to:

- Assist in establishing the Hazard Mitigation Planning Team (HMPT) as defined by the Disaster Mitigation Act (DMA),
- Ensure the updated plan meets the DMA requirements as established by federal regulations and following FEMA's planning guidance,
- Facilitate the entire planning process,
- Identify the data requirements that HMPT participants could provide and conduct the research and documentation necessary to augment that data,
- Assist in facilitating the public input process,
- Produce the draft and final plan update documents, and
- Coordinate the Iowa Homeland Security and Emergency Management Division and FEMA plan reviews.

1.4.1 Multi-Jurisdictional Participation

Clinton County invited the incorporated cities, public school districts, and various other stakeholders in mitigation planning (identified in Appendix C) to participate in the Clinton County Multi-Jurisdictional Hazard Mitigation Plan update process. The jurisdictions that elected to participate in this plan are listed above in Section 1.2. These are the same jurisdictions that participated in the 2017 Plan. The DMA

requires that each jurisdiction that participates in the planning process must officially adopt the multi-jurisdictional hazard mitigation plan. Each jurisdiction that chose to participate in the planning process and development of the plan was required to meet plan participation requirements defined at the first planning meeting, which includes the following:

- Designate a representative to serve on the HMPC;
- Participate in at least one of the three HMPC planning meetings by either direct representation or authorized representation; alternately side-bar meetings and coordination were acceptable for communities with limited staff capacity or unavoidable conflicts.
- Provide data for and assist in the development of the updated risk assessment that describes how various hazards impact your jurisdiction;
- Provide data to describe current capabilities, update existing mitigation actions and identify additional mitigation actions for the plan (at least one);
- Review and comment on plan drafts;
- Inform the public, local officials, and other interested parties about the planning process and provide an opportunity for them to comment on the plan; and
- Formally adopt the mitigation plan.

All of the jurisdictions listed as official participants in this plan met all of these participation requirements. Table 1-2 shows the representation of each participating jurisdiction at the planning meetings, provision of Data Collection Guides, and update/development of mitigation actions. Sign-in sheets are included in Appendix C: Planning Process Documentation.

Table 1-2 Jurisdictional Participation in Planning Process

Jurisdiction	Kick-off Meeting	Meeting #2	Meeting #3	Coordination on Update/Develop Mitigation Actions
Clinton County	X	X	X	X
City of Andover	X		X	X
City of Calamus		X	X	X
City of Camanche			X	X
City of Charlotte			X	X
City of Clinton		X	X	X
City of De Witt	X	X	X	X
City of Delmar			X	X
City of Goose Lake	X	X	X	X
City of Grand Mound	X			X
City of Lost Nation	X	X	X	X
City of Low Moor	X		X	X
City of Toronto	X	X	X	X
City of Welton	X			X
City of Wheatland	X	X		X
Calamus-Wheatland School District			X	X

Jurisdiction	Kick-off Meeting	Meeting #2	Meeting #3	Coordination on Update/Develop Mitigation Actions
Camanche School District			X	X
Central De Witt School District				X
Clinton School District	X	X	X	X
Delwood School District			X	X
Northeast School District			X	X

The following table lists the members of the HMPC including the jurisdiction, organization, and title.

Table 1-3 Hazard Mitigation Planning Committee

Jurisdiction	Department/Organization	Title	Name
Clinton County	Emergency Management	Emergency Management Coordinator	Chance Kness
		Emergency Management Operations Officer	Dan Howard
		Emergency Management Plans Officer	Nancy Burns
	Clinton County Sherriff	Lieutenant	Tom Paarmann
	County Highways		Jeff Oster
	Secondary Roads		Don Holst
	Public Health	Manager	Michelle Cullen
Andover	City Hall	Councilperson	Leslie Schroeder
	Fire & Ambulance	Chief	Rick Johannsen
	Fire & Ambulance		Chet Hippler
Calamus	Public Works		Michael Lacey
Camanche	City Hall	Mayor	Trevor Willis
Charlotte	City Hall	Councilperson	Megan Graves
Clinton	Public Works		Brian Lemke
	Fire Department	Chief	Joel Atkinson
	Wastewater Treatment	Director	Bob Milroy
De Witt	Public Works		Matt Proctor
	Fire Department	Chief	Scott Besst
Delmar	City Hall	Mayor Protem	Steve Jebsen
Goose Lake	City Hall	Mayor	Ken Schoon
Grand Mound	City Hall	Mayor	Kurt Crosthwaite
Lost Nation	City Hall	City Clerk	Janet Burke

Jurisdiction	Department/Organization	Title	Name
Low Moor	City Hall	City Clerk	Joyce Lanning
Toronto	City Hall	City Clerk	Janet Burke
Welton	City Hall	Mayor	Dan Vosatka
Wheatland	City Hall	Councilperson	Christy Stankee
Calamus-Wheatland CSD		Superintendent	Lonnie Luepker
Camanche School District		Superintendent	Josh Davis
Central De Witt School District		Superintendent	Cyndie Johnson Business Director
Clinton School District		Superintendent	Gary DeLacy
			Paul Dotterweich
Delwood School District		Superintendent	Chris Fee
Northeast School District		Superintendent	Neil Gray

1.4.2 The Planning Steps

Wood and Clinton County worked together to establish the framework and process for this planning effort using FEMA's Local Mitigation Planning Handbook (March 2013). The plan update was completed utilizing the 9-task approach within a broad four-phase process:

1. Organize resources,
2. Assess risks,
3. Develop the mitigation plan, and
4. Implement the plan and monitor progress.

Into this process, Wood integrated a detailed 10-step planning process adapted from FEMA's Community Rating System (CRS) and FMA programs. Thus, the process used for this plan meets the funding eligibility requirements of the Hazard Mitigation Assistance grants and CRS. Table 1-4 shows how the process followed fits into FEMA's original four-phase DMA process as well as the revised Nine Task Process outlined in the 2013 Local Mitigation Planning Handbook and the 10-step CRS process.

Table 1-4 Planning Process Used to Develop the Clinton County Hazard Mitigation Plan

Phase	Community Rating System (CRS) Planning Steps (Activity 510)	Local Mitigation Planning Handbook Tasks (44 CFR Part 201)
Phase I	Step 1. Organize	Task 1: Determine the Planning Area and Resources
		Task 2: Build the Planning Team 44 CFR 201.6(c)(1)
	Step 2. Involve the public	Task 3: Create an Outreach Strategy y 44 CFR 201.6(b)(1)
	Step 3. Coordinate	Task 4: Review Community Capabilities 44 CFR 201.6(b)(2) & (3)
Phase II	Step 4. Assess the hazard	Task 5: Conduct a Risk Assessment 44 CFR 201.6(c)(2)(i) 44 CFR 201.6(c)(2)(ii) & (iii)
	Step 5. Assess the problem	
Phase III	Step 6. Set goals	Task 6: Develop a Mitigation Strategy 44 CFR 201.6(c)(3)(i); 44 CFR 201.6(c)(3)(ii); and 44 CFR 201.6(c)(3)(iii)
	Step 7. Review possible activities	
	Step 8. Draft an action plan	
Phase IV	Step 9. Adopt the plan	Task 8: Review and Adopt the Plan
	Step 10. Implement, evaluate, revise	Task 7: Keep the Plan Current
		Task 9: Create a Safe and Resilient Community 44 CFR 201.6(c)(4)

Phase I Organize Resources

Step 1: Organize the Planning Team (Handbook Tasks 1 & 2)

The planning process resulting in the preparation of this plan document officially began with an initial coordination conference call on February 22, 2021. Participants of the meeting included the Clinton County Emergency Management Coordinator and Wood Project Manager. The purpose of this meeting was to determine the jurisdictions and other stakeholders that would be invited to be participants of the HMPT (Step 1), set tentative planning meeting dates, identify GIS needs and resources, provide recommendations regarding the hazards to be included in the plan update, discuss options for the flood risk assessment methodology, develop an initial public participation strategy, and discuss the plan update format. Detailed meeting minutes are included in Appendix B.

The 2017 HMPC list that formed the basis for the previous plan update, and interim annual implementation meetings includes representatives from each participating jurisdiction. This list was reviewed and updated to form the basis for the 2021 HMPC. Other regional, local, state, and federal stakeholder organizations were also invited. Stakeholders are listed in Step 3: Coordinate with Other Departments and Agencies.

After the initial coordination meeting, a formal Kick-off planning meeting was held on August 25, 2021, followed by two additional planning meetings held on September 15, 2021, and October 6, 2021.

The HMPC communicated during the planning process with a combination of face-to-face meetings, virtual meetings, phone interviews, and email correspondence. The planning effort coincided with the 2020-2022 COVID-19 pandemic; thus, some meetings were facilitated virtually. The meeting schedule and topics are listed in Table 1-5. The meeting minutes for each of the meetings are included in Appendix B.

Table 1-5 Schedule of HMPC Meetings

Meeting	Topic	Date
Coordination call	General overview of planning process/requirements and schedule.	February 22, 2021
Kick-off Virtual meeting	Introduction to DMA, the planning process, hazard identification and public input strategy. Distribution of plan update guide to jurisdictions. Revisit hazard identification. Determine process to monitor, evaluate, and update plan.	August 25, 2021
Planning Meeting #2 in person meeting	Presentation of draft Risk Assessment including vulnerability and critical facility analysis; development of plan goals.	September 15, 2021
Planning Meeting #3 – in person meeting	Results of public survey; mitigation action update, development, and prioritization; plan maintenance; next steps in HMGP plan review and final public comment period.	October 6, 2021

During the kick-off meeting, Wood presented information on the scope and purpose of the plan, participation requirements of HMPC members, and the proposed project work plan and schedule. Plans for public involvement (Step 2) and coordination with other agencies and departments (Step 3) were discussed. Wood also introduced hazard identification requirements and data needs. The HMPC discussed potential hazards as well as past events and impacts and refined the identified hazards to be relevant to Clinton County.

Participants were given a Plan Update Guide by Wood to facilitate the collection of information needed to support the plan, such as data on historic hazard events, values at risk, and current capabilities. Each participating jurisdiction completed and returned the worksheets in the Plan Update Guide to Wood. Wood integrated this information into the plan, supporting the update of Chapters 2 and 3.

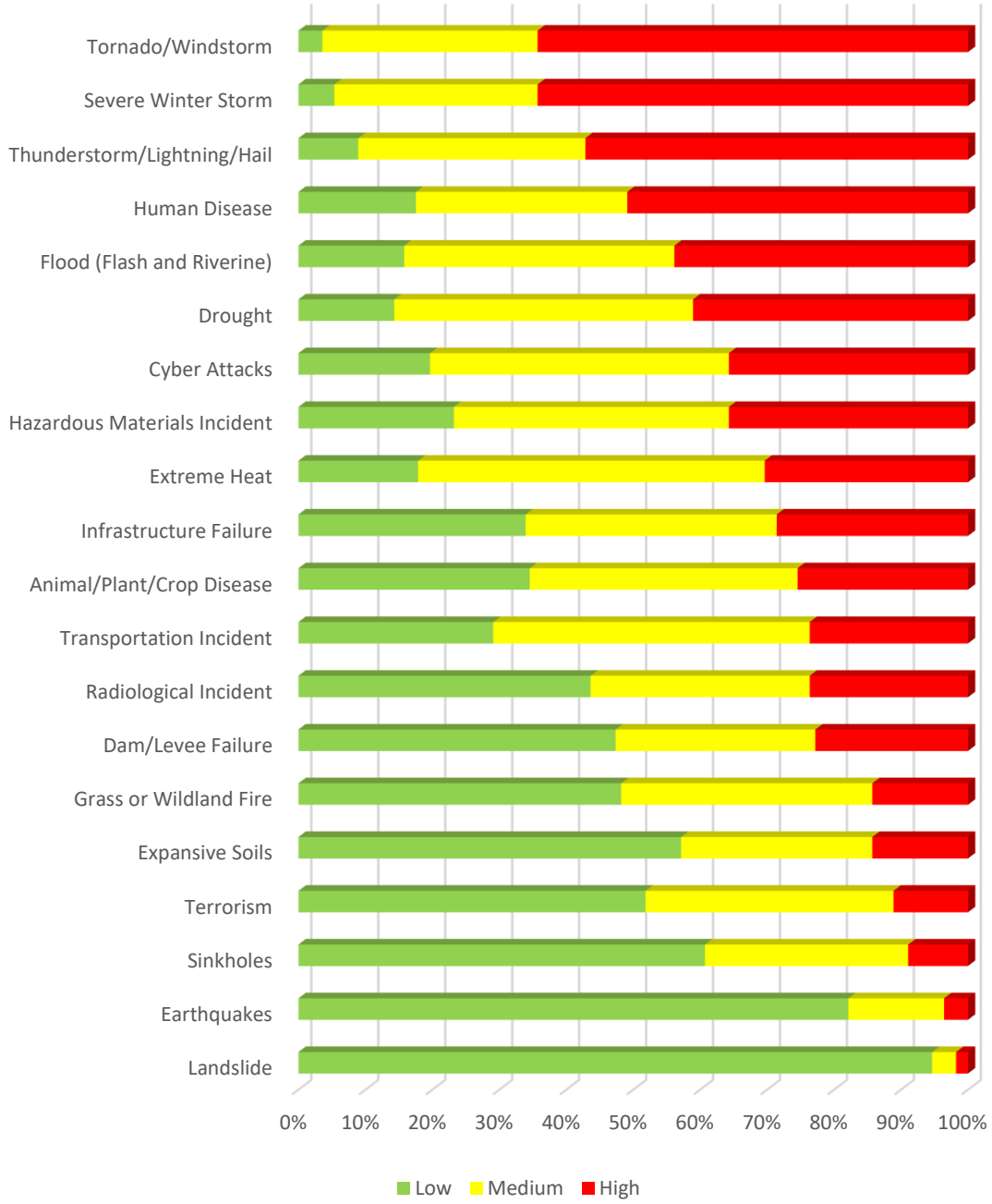
Step 2: Plan for Public Involvement (Handbook Task 3)

At the kick-off meeting, the HMPC discussed options for soliciting public input on the mitigation plan. To provide an opportunity for the public to comment during the drafting stage, the committee determined that the most effective method would be dissemination of a survey.

A survey was developed specific to the Clinton County Mitigation Plan that provided a brief plan summary as well as a questionnaire to capture public and stakeholder input. The results of the online survey are provided in Appendix B. A press release was posted to the Clinton County's website as well as each participating jurisdiction's website and social media (Facebook, Twitter) pages announced the opening of the online survey. The survey was available to the public September 10-30, 2021.

In all, 58 surveys were completed. Responses reflect the public perception that the most significant hazards are tornado/windstorm, severe winter storm, and thunderstorm, followed by human disease, flood, and drought.

Figure 1-1 Survey Results – Hazard Level of Significance

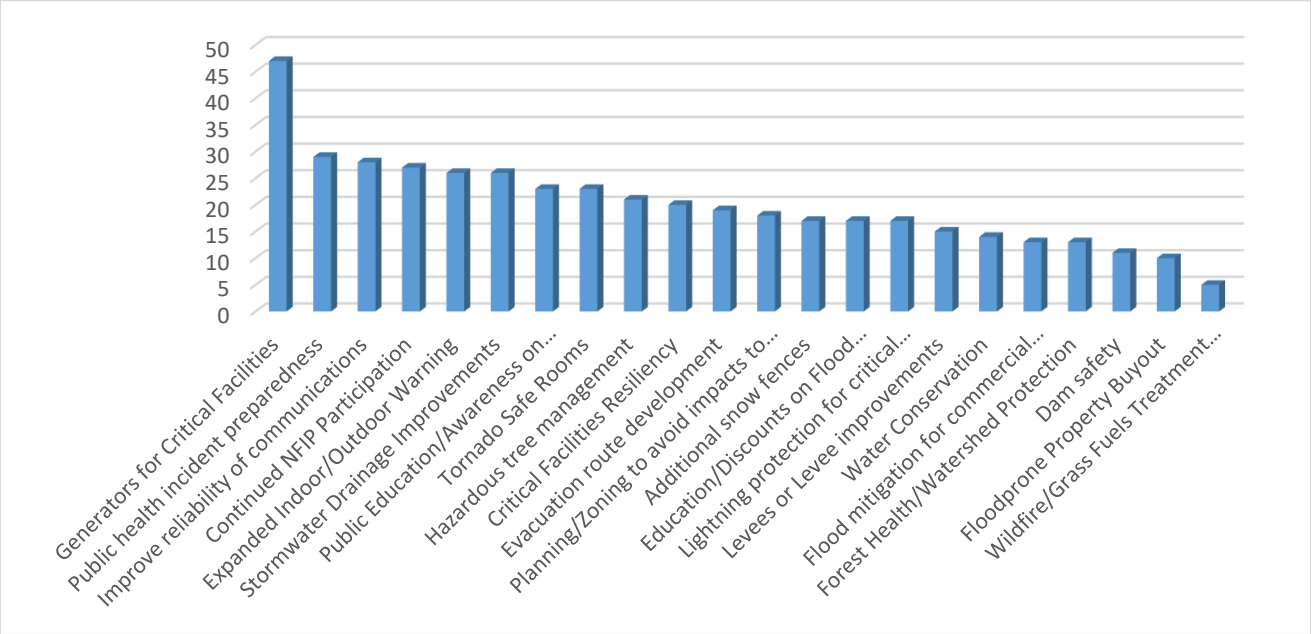


Source: Microsoft Forms Online Survey developed by Wood

In the survey, the public was also asked to review 23 types of mitigation actions. The Clinton County HMPC also considered these types of projects in the Clinton County Multi-Jurisdictional Hazard Mitigation Plan. The survey asked the public to place a check next to the mitigation project types that they felt could benefit their community. Figure 1-2 provides the compiled results of this question. The public opinion is

that generators for critical facilities, improved reliability of communications systems, and public health incident preparedness would benefit their jurisdictions the most.

Figure 1-2 Survey Results – Types of Projects



Source: Microsoft Forms Online Survey developed by Wood

The public was also asked to comment on any other issues that the Clinton County HMPC should consider in developing a strategy to reduce future losses caused by natural hazard events. Some of the comments provided by the public are included below:

- "Education to at risk populations in Clinton".
- "Bury electrical power lines".
- "Clearing trees near power lines to prevent outages. Plow timing for snow/ice storms some of the roads need clear sooner and more frequently. A local broadcast tv channel other than news outlet available to tune into for current further info for any disaster or emergency, (i.e. heat warning, snow warning, evacuation routes (radiological), rather than breaking into current broadcast ALWAYS ON, info even if just time and current news, weather, road closings). Could also have tie into a social media platform (Facebook) for anywhere anytime phone accessibility".
- "Power grid preparation".

The public was also given an opportunity to provide input on a draft of the complete plan prior to its submittal to the State and FEMA. The entire plan draft was made available on the County's website as a PDF document. An online comment form was posted to collect input. Clinton County announced the availability of the entire final draft plan and the two-week final public comment period by a variety of social media platforms listed above.

The public comment period was from April 8th through April 22nd, 2022. There were two public comments received. Comments received shared with the HMPC for consideration but did not result in any changes to the Plan.

The HMPC invited other targeted stakeholders and neighboring jurisdictions to comment on the draft plan via an email letter, which is described in greater detail in Step 3: Coordinate with Other Departments

and Agencies. There were no stakeholder comments received from the agencies which were invited to review the plan.

Step 3: Coordinate with Other Departments and Agencies and Incorporate Existing Information (Handbook Task 3)

There are organizations whose goals and interests' interface with hazard mitigation in Clinton County. Clinton County invited neighboring counties, other local, regional, state, and federal departments, and agencies to learn about the hazard mitigation planning initiative. The HMPC developed a list of additional stakeholders involved in hazard mitigation activities, or the authority to regulate development, to invite by email to review and comment on the draft of the Clinton County Multi-Jurisdictional Hazard Mitigation Plan prior to submittal to the State and FEMA. Some of these agencies were consulted for data and information during the plan update. Those agencies were invited to comment on the plan draft and included emergency management officials of adjacent counties. The third mitigation planning meeting was held in-person in the City of Clinton Emergency Management Agency (EMA) Office. Academic institutions include the participating school districts noted previously.

Stakeholders

- State of Iowa – Department of Natural Resources/Dam Safety
- State of Iowa – Department of Natural Resources/Floodplain Management
- State of Iowa Homeland Security and Emergency Management Department
- State of Iowa Department of Public Safety – State Fire Marshal Division

Private and nonprofit organizations

- Genesis Health
- Clinton County Area Solid Waste Agency

Adjacent Counties and Cities

- Jackson County Emergency Management
- Scott County Emergency Management
- Cedar County Emergency Management
- Jones County Emergency Management
- Carroll County (Illinois) Emergency Management
- Whiteside County (Illinois) Emergency Management
- Rock Island County (Illinois) Emergency Management

Appendix B includes a copy of the email letter that was sent providing a link to the draft plan during the final public comment period.

Integration of Other Data, Reports, Studies, and Plans

In addition, input was solicited from many other agencies and organizations that provided information but were not able to attend planning meetings. As part of the coordination with other agencies, the HMPC collected and reviewed existing technical data, reports, and plans. These included:

- *Iowa Hazard Mitigation Plan (June 2018);*
- *Clinton County Multi-Jurisdictional Hazard Mitigation Plan (2017);*
- FEMA;
- FEMA Community Information System, National Flood Insurance Program (NFIP), Repetitive Loss Property Data;
- Dam Inventory and Inspection Reports for Clinton County, Iowa Department of Natural Resources;

- National Drought Mitigation Center Drought Impact Reporter;
- US Drought Monitor;
- Plan Update Guides completed by each jurisdiction;
- Environmental Protection Agency;
- Flood Insurance Administration;
- Hazards US (Hazus);
- Iowa Department of Agriculture and Land Stewardship, Division of Soil Conservation;
- Iowa Department of Education, Bureau of Information and Analysis Services;
- Iowa Department of Public Safety;
- Iowa Department of Transportation (DOT), Office of Traffic and Safety;
- Iowa State University (ISU) Department of Agronomy;
- Iowa Utilities Board;
- National Oceanic and Atmospheric Administration's (NOAA) National Center for Environmental Information;
- National Weather Service;
- Pipeline and Hazardous Materials Safety Administration;
- Clinton County Emergency Management;
- Clinton County National Flood Hazard Layer;
- US Department of Agriculture, Risk Management Agency;
- US Department of Agriculture, US Forest Service (USFS);
- US Department of Transportation;
- United States Geological Survey

This information was used in the development of the hazard identification, vulnerability assessment, and capability assessment and in the formation of goals, objectives, and mitigation actions. These sources, as well as additional sources of information are documented throughout the plan and in Appendix A, References.

Integration of the 2017 Plan into Other Planning Mechanisms

The 2017 Hazard Mitigation Plan was incorporated into or cross referenced with other planning mechanisms between 2017-2021, such as the County's and some municipalities Emergency Operations Plans. Strategies and opportunities to do so in the future are outlined in Chapter 5.

Phase 2 Assess Risk (Handbook Task 5)

Step 4: Assess the Hazard: Identify and Profile Hazards

Wood assisted the HMPC in a process to identify the hazards that have impacted or could impact communities in Clinton County. At the kick-off meeting, Wood presented information gathered for all the hazards. The HMPC examined the history of disaster declarations in Clinton County. They discussed past hazard events, types of damage, and where additional information might be found. The committee identified 20 natural and human-caused hazards that have the potential to impact the planning area. Additional information on the hazard identification process and which hazards were identified for each jurisdiction is provided in Chapter 3.

During the kick-off meeting, the HMPC refined the list of hazards to make the analysis relevant to Clinton County, discussed past events and impacts and came to consensus on the preliminary probability, magnitude, warning time, and duration levels on a county-wide basis to contribute to the hazard ranking methodology utilized by the State. In addition, each jurisdiction completed either a Local or School District Plan Update Guide, including information on previous hazard events in their community. Utilizing the information from the Plan Update Guides as well as existing plans, studies, reports, and technical

information as well as information available through internet research and GIS analysis, the profile for each hazard identified was updated. More information on the methodology and resources used to identify and profile the hazards can be found in Chapter 3.

Step 5: Assess the Problem: Identify Assets and Estimate Losses

Assets for each jurisdiction were identified from the Clinton County Assessor's Department which provided public datasets with parcel and building data. The Clinton County Emergency Management Coordinator worked with the Clinton County GIS Department to populate an inventory of critical facilities in the planning area. Population data was obtained from the US Census Bureau. Methodologies and results of the analyses are provided in Chapter 3.

Additional assets such as historic, cultural, and economic assets as well as specific vulnerable populations and structures were obtained from a variety of sources as described in Chapter 3.

The HMPC also analyzed development trends from data available from the US Census Bureau as well as information obtained from each jurisdiction such as Comprehensive Plans. For each hazard, there is a discussion regarding future development and how it may impact vulnerability to that specific hazard.

After profiling the hazards that could affect Clinton County and identifying assets, the HMPC collected information to describe the likely impacts of future hazard events on the participating jurisdictions.

Existing mitigation capabilities were also considered in developing loss estimates. This assessment consisted of identifying the existing mitigation capabilities of participating jurisdictions. This involved collecting information about existing government programs, policies, regulations, ordinances, and plans that mitigate or could be used to mitigate risk from hazards. Participating jurisdictions collected information on their regulatory, personnel, fiscal, and technical capabilities, as well as previous and ongoing mitigation initiatives. This information is included in Chapter 2 Planning Area Profile and Capabilities.

Specific capabilities such as participation in the NFIP as well as designation as Fire Wise Communities or Storm Ready Communities and placement of storm sirens are incorporated in the vulnerability analysis discussions, where applicable.

Taking into consideration the vulnerability and capability assessments, a variety of methods was used to estimate losses for each profiled hazard. For geographic hazards such as river flooding, specific assets at risk and loss estimates were determined through GIS analysis. For other hazards such as weather-related hazards and hazardous materials, loss estimates were developed based on statistical analysis of historic events. For hazards such as dam failure of state-regulated dams, GIS data was not available to identify specific geographic boundaries at risk. Therefore, the risk assessment provides descriptions of the types of improvements located in approximated risk areas downstream of high and significant hazard dams. For some human-caused hazards and the tornado hazard, loss estimates were scenario-based. The methodologies for each loss estimate are described in detail in Chapter 3. Within each hazard section, the text provides details on how the hazard varies by jurisdiction, where applicable. In addition, at the conclusion of each hazard section, a summary table indicates the specific probability, magnitude, warning time, and duration rating of the hazard for each jurisdiction is provided to show how the hazard varies. Where applicable, introductory text preceding the table highlights noted variables.

Results of the preliminary risk assessment were presented at Meeting #2 to inform the planning process as the basis for updating the mitigation strategy.

Phase 3 Develop the Mitigation Plan (Handbook Task 6)

Step 6: Set Goals

Wood facilitated a discussion session with the HMPC during Meeting #2 to review and update goals. Common categories of mitigation goals were presented as well as the 2018 State Hazard Mitigation Plan goals.

This planning effort is an update to an existing hazard mitigation plan. During this process the four goals from the *2017 Clinton County Multi-Jurisdictional Hazard Mitigation Plan* were reviewed. The goals as proposed for the 2022 plan update can be found in Section 4.1.

Step 7: Review Possible Activities

The focus of Meeting #3 was to update the mitigation strategy. To consider a comprehensive range of alternatives, the HMPC reviewed all actions from the *2017 Clinton County Multi-Jurisdictional Hazard Mitigation Plan* as well as the following: key issues for each of the top 10 hazards identified in the updated risk assessment, State priorities for Hazard Mitigation Assistance Grants, public opinion from Surveys, and FEMA's January 2013 publication Mitigation Ideas. Committee members discussed issues such as: availability of funds, prioritization of actions, and feasibility of implementation utilizing the STAPLEE methodology as a guide. As part of this discussion, consideration was given to the potential cost of each project in relation to the anticipated future cost savings.

Jurisdictions were encouraged to maintain a focused approach and continue forward only those actions that are aimed at implementing long-term solutions to prevent losses from hazards. To facilitate the update of previous actions, a spreadsheet was provided listing all previous actions submitted by each jurisdiction. The jurisdictions were provided instructions for completing the status of each of the 146 previous actions as well as the details to provide for continuing and newly developed actions. A modified form of the STAPLEE prioritization method was provided to assist jurisdictions in determining the prioritization that should be assigned to each new action. Each participating jurisdiction prioritized the new actions they submitted by indicating high, moderate, or low local priority. The completed worksheets with action details were returned to Wood. Chapter 4 provides additional details regarding the process undertaken to refine the mitigation strategy to make Clinton County and its jurisdictions more disaster resistant as well as the continuing and new actions submitted as the mitigation strategy for this plan update. The completed and deleted actions have been separated out in Chapter 4. The number of completed actions have been summarized as a measure of progress toward the overall goals of the plan.

Step 8: Draft an Action Plan

A complete draft of the plan was made available to the HMPC for review. Following that review a second draft was posted online and in hard copy for review and comment by the public, other agencies and interested stakeholders. Methods for inviting interested parties and the public to review and comment on the plan were discussed in Steps 2 and 3, and materials are provided in Appendix B. A final plan was then created for submittal to the Iowa Homeland Security and Emergency Management Department and FEMA for review and approval per the DMA requirements.

Phase 4 Implement the Plan and Monitor Progress

Step 9: Adopt the Plan (Handbook Task 8)

To secure buy-in and officially continue to implement the plan, the governing bodies of each participating jurisdiction re-adopted the plan in 2022. Scanned copies of resolutions of adoption are included in Appendix C of this plan.

Step 10: Implement, Evaluate, and Revise the Plan (Handbook Tasks 7 & 9)

The HMPC developed and agreed upon an overall strategy for plan implementation and for monitoring and maintaining the plan over time during Meeting #3. This updated strategy is described in Chapter 5, Plan Maintenance Process. The only change in implementation process was a recommendation that during the third interim annual meeting that the HMPC outline necessary steps to begin the next plan update process so that the effort can be completed during year four and five, to allow time for completion, approval, and re-adoption within the five-year time frame so there is not a lapse in the plan, which could jeopardize grant funding.

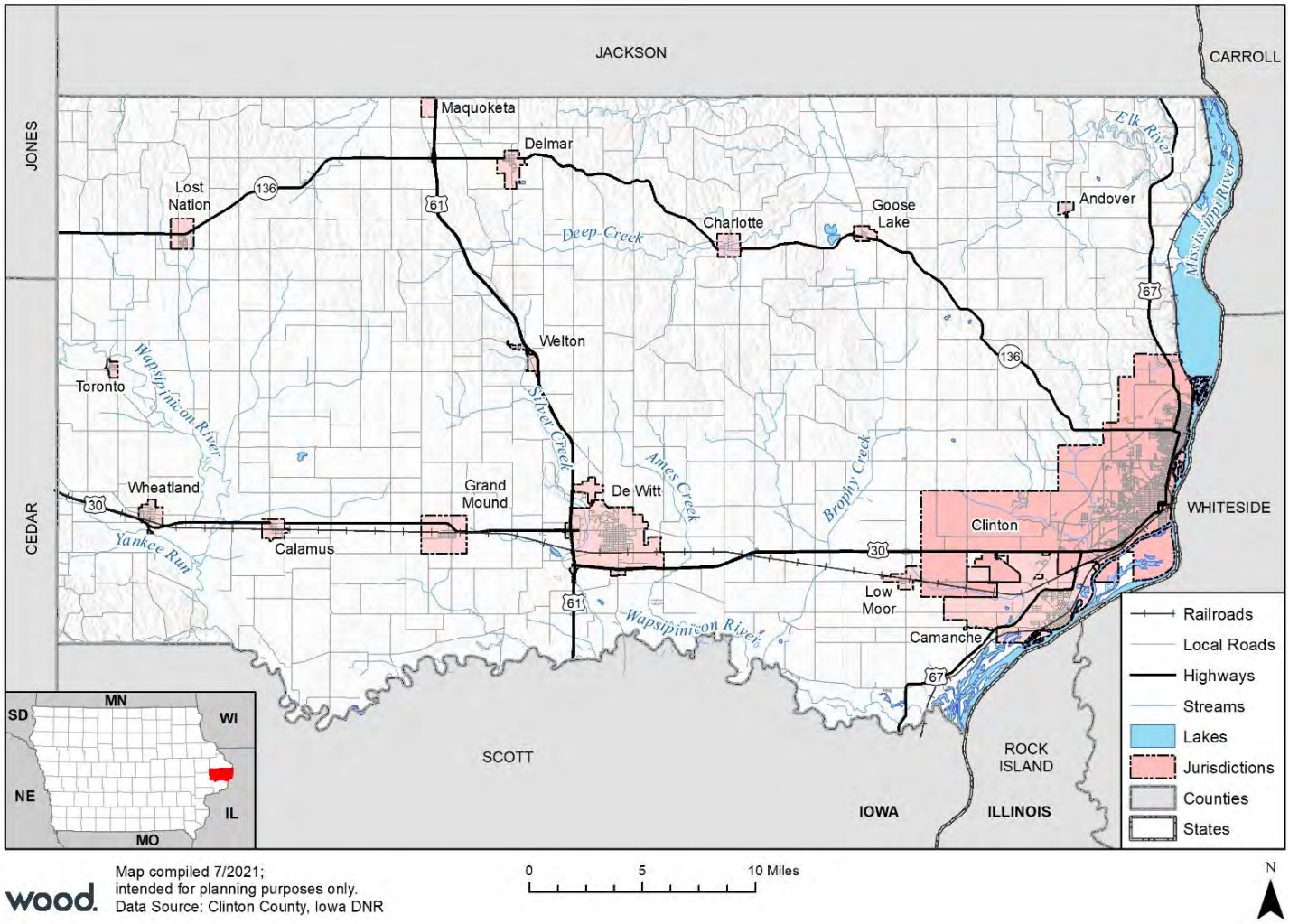
2 Planning Area Profile and Capabilities

This chapter provides a general profile of Clinton County, followed by individual sections for each participating jurisdiction. The sections for each jurisdiction provide an overview profile as well as details on existing capabilities, plans, and programs that enhance their ability to implement mitigation strategies.

2.1 Clinton County Planning Area Profile

Figure 2.1 provides a map of the Clinton County planning area. The planning area boundaries include the unincorporated areas of Clinton County as well as the following incorporated cities: Andover, Calamus, Camanche, Charlotte, Clinton, Delmar, DeWitt, Goose Lake, Grand Mound, Lost Nation, Low Moor, Toronto, Welton, and Wheatland. The following school districts that participated in development of this plan are also included in the planning area: Calamus-Wheatland School District, Camanche School District, Central DeWitt School District, Clinton School District, Delwood School District, and Northeast School District. The school districts are discussed separately in Section 0.

Figure 2-1 Clinton County Planning Area



2.1.1 Geography, Topography and Hydrology

Clinton County, Iowa is a central-eastern county located along the eastern border of Iowa bordered on the east by the Mississippi River. The City of Clinton is the County seat. The County has a total area of 710 square miles, of which 695 square miles is land and 15 square miles is water. Clinton County includes the easternmost point in the State of Iowa. Adjacent counties are:

- Jackson County (north)
- Carroll County, Illinois (northeast), across the Mississippi River
- Whiteside County, Illinois (east), across the Mississippi River
- Rock Island County, Illinois (southeast), across the Mississippi River
- Scott County (south)
- Cedar County (southwest)
- Jones County (northwest)
- Upper Mississippi River National Wildlife and Fish Refuge (part)

Major Rivers and Watersheds

The Mississippi River flows southward along the eastern border of Clinton County. The Wapsipinicon River, Elk River, in addition to Rock Creek, Spring Creek, Ames Creek, Silver Creek, Deep Creek, Mill Creek, Brophy Creek, Turtle Creek, Deer Creek, and numerous small creaks, branches of rivers, and streams flow through the County.

There are four HUC-8 watersheds in Clinton County (see Figure 2.2):

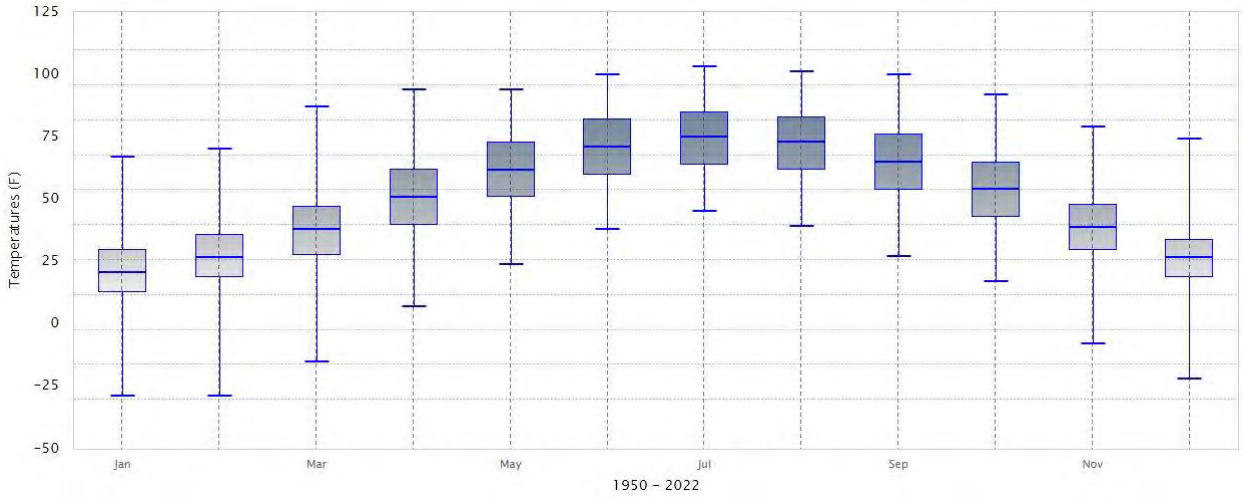
- Apple-Plum, 07060005
- Maquoketa, 07060006
- Copperas-Duck, 07080101
- Lower Wapsipinicon, 07080103

Figure 2-2 Clinton County Major Watersheds Map

2.1.2 Climate

Clinton County, like the entire state of Iowa, is within the humid continental zone. The mean annual temperature of the county is 50°F, with an average summer temperature of 73°F and a winter average of 25°F. Seasons fluctuate from being very wet to very dry, and temperatures can fluctuate greatly in spring and autumn months. Average annual precipitation is approximately 35.45 inches. Figure 2-3 and Figure 2-4 below provide the average annual temperature ranges and precipitation each month for Clinton, Iowa from 1950 to 2021.

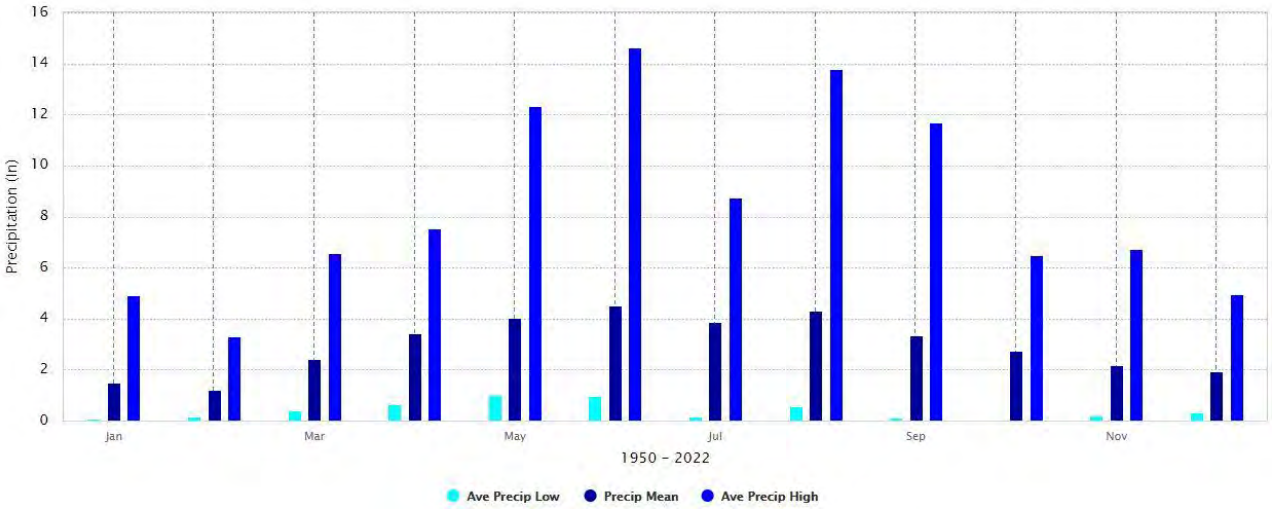
Figure 2-3 Clinton, Iowa Average Annual Temperatures, 1950-2022



Source: Southwest Climate and Environmental Information Collaborative

Clinton County frequently experiences severe weather events throughout all seasons. In the winter, the county experiences severe winter storms, while the spring and summer months can bring severe thunderstorms, hail, lightning, and tornadoes. In the summer, extremely high temperatures prove to be dangerous while more storms and early snow can affect the County in the fall.

Figure 2-4 Clinton, Iowa Average Annual Precipitation (inches), 1950-2022



Source: Southwest Climate and Environmental Information Collaborative

2.1.3 History

Clinton County was first settled in 1836. It is named for DeWitt Clinton, the seventh and ninth Governor of New York and presidential candidate in 1812.The County was organized in 1837. The original county seat was Camanche. However, this county seat was changed to Vandenburg (later called DeWitt). The first courthouse was constructed of basswood timbers and doubled as a hotel. In 1869, the county seat was relocated to the Town of Clinton because the majority of Clinton County's population lived along the Mississippi River.

2.1.4 County Government

Unincorporated Clinton County is governed by a 3-member Board of Supervisors. Each incorporated city is governed by a five-member Mayor/City Council.

The county seat for Clinton County is the City of Clinton, which is located centrally along the easter border of the county. The county is split into three districts, and each district has a representative who serves on the Clinton County Board of Supervisors. Among the Board of Supervisors, there is a chairman, vice-chairman, and member.

The County government comprises several individual positions, departments, and organizations. These include both elected and appointed positions. Elected positions in the County include: the Board of Supervisors, Sheriff, County Attorney, Auditor, Treasurer, and Recorder. All other department directors and staff are by appointment. The Clinton County government includes the following departments and offices:

- Assessor
- Auditor Elections
- Board of Supervisors
- Clinton County Justice Coordinating Commission
- Clinton County Medical Examiner
- Clinton Jackson Early Childhood Iowa
- Communications Commission
- Community Supports Department
- Conservation
- County Attorney
- Emergency Management
- Engineer
- Health Department
- Maintenance Department
- Recorder
- Sheriff
- Social Services
- Treasurer
- Veteran's Affairs
- Zoning Department

The Clinton County website lists the current individuals filling positions as well as important notifications, events, and meeting minutes. Regular Board of Supervisors meetings are held every Monday morning in Clinton.

2.1.5 Population/Demographics

According to the 2020 Census, the population of Clinton County was 46,460. This is down 7.36% from the 2010 census population of 49,116. Table 2-1 provides the populations for each city and the unincorporated county for 2000, 2010, and 2020 with the number and percent change from 2000 to 2020. The unincorporated areas population was determined by subtracting the populations of the incorporated areas from the overall county population. Further population and demographic details for each city are provided in the sections that follow.

Table 2-1 Clinton County Population 2000-2020 by City

Jurisdiction	2000 Population	2010 Population	2020 Population	# Change 2010- 2020	% Change 2010-2020
Clinton County	50,149	49,116	46,734	-2,382	-4.85%

Jurisdiction	2000 Population	2010 Population	2020 Population	# Change 2010- 2020	% Change 2010-2020
Andover	87	103	160	57	55.34%
Calamus	394	439	366	-73	-16.63%
Camanche	4,215	4,448	4,342	-106	-2.38%
Charlotte	421	394	378	-16	-4.06%
Clinton	27,772	26,885	25,290	-1,595	-5.93%
Delmar	514	525	491	-34	-6.48%
DeWitt	5,049	5,322	5,215	-107	-2.01%
Goose Lake	232	240	298	58	24.17%
Grand Mound	676	642	552	-90	-14.02%
Lost Nation	497	446	451	5	1.12%
Low Moor	240	288	326	38	13.19%
Toronto	134	124	82	-42	-33.87%
Welton	159	165	150	-15	-9.09%
Wheatland	772	764	997	233	30.50%
Unincorporated Clinton County	8,987	8,331	7,636	-695	-8.34%

Source: US Census Bureau: 2000 Decennial Census, 2010 Decennial Census, American Community Survey, 2019 & 2020 5-year estimates. Note: Unincorporated Clinton County population was estimated by subtracting populations of incorporated cities from the total Clinton County populations.

According to the 2020 census, 5.9% of the population is under age 5 and 19.6% of the population is over age 65 in Clinton County. According to the 2020 5-year American Community Survey, there were 19,477 households with an average household size of 2.46 people. Table 2-2 provides additional demographic and economic indicators for Clinton County. Table 2-3 provides the same information in comparison to the rest of the State of Iowa and the country as a whole. The Clinton County values are for the entire county, including the incorporated cities. Similar data tables are also provided for each incorporated city in Section 2.2.

Table 2-2 Clinton County Demographic and Social Characteristics, 2015-2020

Clinton County	2015	2020	% Change
Population	48,663	46,734	-3.96%
Median Age	42.2	42.8	1.42%
% of Population under 5	6%	5.9%	-1.67%
% of Population over 65	17.4%	19.6%	12.64%
Housing Occupancy Rate	91.8%	88.1%	-4.03%
% of Owner Occupied Housing	74.1%	74.1%	0.00%
% of Renter Occupied Housing	25.9%	25.9%	0.00%
% of Housing Units with no Vehicles Available	5.9%	7.0%	18.64%
Median Household Income	$49,849	$52,221	4.76%
Per Capita Income	$26,271	$28,761	9.48%

Clinton County	2015	2020	% Change
% of Individuals Below Poverty Level	14.2%	13.7%	-3.52%
# of Households	19,977	19,477	-2.50%
Average Household Size	2.5	2.46	-1.60%
% of Population Over 25 with High School Diploma	90.6%	90.4%	-0.22%
% of Population Over 25 with Bachelor's Degree or Higher	19.2%	19.3%	0.52%
% with Disability	12.7%	14.1%	11.02%
% Speak English less than "Very Well"	1.1%	0.7%	-36.36%

Source: US Census Bureau 2019 & 2020 ACS 5-year Data Estimates

Table 2-3 Clinton County Demographic and Social Characteristics Compared to the State and Nation, 2020

Demographic & Social Characteristics (as of 2020)	County	Iowa	US
Median Age	42.8	38.3	38.2
% of Population under 5	5.9%	6.2%	6.0%
% of Population over 65	19.6%	17.1%	16.0%
Housing Occupancy Rate	88.1%	90.5%	88.4%
% of Owner Occupied Housing	74.1%	71.2%	64.4%
% of Renter Occupied Housing	25.9%	28.8%	35.6%
% of Housing Units with no Vehicles Available	7.0%	5.7%	8.5%
Median Household Income	$52,221	$61,836	$64,994
Per Capita Income	$28,761	$33,021	$35,384
% of Individuals Below Poverty Level	13.7%	11.1%	12.8%
Average Household Size	2.5	2.4	2.6
% of Population Over 25 with High School Diploma	90.6%	92.5%	88.5%
% Of Population Over 25 with Bachelor's Degree or Higher	19.2%	29.3%	32.9%
% with Disability	12.7%	11.8%	12.7%
% Speak English less than "Very Well"	1.1%	3.4%	8.2%

Source: US Census Bureau 2019 & 2020 ACS 5-year Data Estimates

Table 2-4 Clinton County Demographics by Race and Sex

Clinton County	Population	%
Total Population	46,734	
Male	22,854	48.9%
Female	23,880	51.1%
White, not Hispanic	42,459	90.9%
Hispanic or Latino	1,491	3.2%
Black	1,323	2.8%

Clinton County	Population	%
Asian	311	0.7%
American Indian and Alaska Native	117	0.3%
Native Hawaiian and Other Pacific Islander	3	0.0%
Some Other Race	15	0.0%
Two or More Races	1,015	2.2%

Source: US Census Bureau 2019 & 2020 ACS 5-year Data Estimates

Table 2-5 Types and Total Amounts of Housing Units in Clinton County

Type of Housing Units	Total	%
Total Housing Units	22,114	
1-Unit Detached	16,948	76.6%
1-Unit Attached	488	2.2%
2 Units	553	2.5%
3 or 4 Units	1,016	4.6%
5 to 9 Units	682	3.1%
10 to 19 Units	753	3.4%
20 or More Units	1,175	5.3%
Mobile Home	499	2.3%
Boat, Recreational Vehicle (RV), Van, etc.	0	0.0%

Source: US Census Bureau 2020 ACS 5-year Data Estimates

City of Andover Population and Demographics Summary

Table 2-6 City of Andover Demographic and Social Characteristics, 2015-2020

City of Andover	2015	2020	% Change
Population	101	160	58.4%
Median Age	30.4	32	5.3%
% of Population under 5	13%	16.9%	30.0%
% of Population over 65	12%	5.6%	-53.3%
Housing Occupancy Rate	83.3%	100%	20.0%
% of Owner Occupied Housing	85.7%	59.7%	-30.3%
% of Renter Occupied Housing	14.3%	40.3%	181.8%
% of Housing Units with no Vehicles Available	2.90%	4.80%	65.5%
Median Household Income	$64,375	$53,125	-17.5%
Per Capita Income	$24,588	$18,016	-26.7%
% of Individuals Below Poverty Level	0.0%	20.6%	N/A
# of Households	35	62	77.1%
Average Household Size	2.97	2.58	-13.1%

City of Andover	2015	2020	% Change
% of Population Over 25 with High School Diploma	91.5%	97.9%	7.0%
% of Population Over 25 with Bachelor's Degree or Higher	15.5%	13.5%	-12.9%
% with Disability	15.8%	1.3%	-91.8%
% Speak English less than "Very Well"	0.0%	0.0%	N/A

Source: US Census Bureau 2019 & 2020 ACS 5-year Data Estimates

Table 2-7 City of Andover Demographic and Social Characteristics Compared to County and State

Demographic & Social Characteristics (as of 2020)	Andover	County	Iowa
Median Age	32	42.8	38.3
% of Population under 5	16.9%	5.9%	6.2%
% of Population over 65	5.6%	19.6%	17.1%
Housing Occupancy Rate	100%	88.1%	90.5%
% of Owner Occupied Housing	59.7%	74.1%	71.2%
% of Renter Occupied Housing	40.3%	25.9%	28.8%
% of Housing Units with no Vehicles Available	4.80%	7.0%	5.7%
Median Household Income	$53,125	$52,221	$61,836
Per Capita Income	$18,016	$28,761	$33,021
% of Individuals Below Poverty Level	20.6%	13.7%	11.1%
Average Household Size	2.58	2.5	2.4
% of Population Over 25 with High School Diploma	97.9%	90.6%	92.5%
% Of Population Over 25 with Bachelor's Degree or Higher	13.5%	19.2%	29.3%
% with Disability	1.3%	12.7%	11.8%
% Speak English less than "Very Well"	0.0%	1.1%	3.4%

Source: US Census Bureau 2020 ACS 5-year Data Estimates

Table 2-8 City of Andover Demographics by Race and Sex

Andover	Population	%
Total Population	160	
Male	61	38.1%
Female	99	61.9%
White, not Hispanic	160	100.0%
Hispanic or Latino	0	0.0%
Black	0	0.0%
Asian	0	0.0%
American Indian and Alaska Native	0	0.0%
Native Hawaiian and Other Pacific Islander	0	0.0%
Some Other Race	0	0.0%

Andover	Population	%
Two or More Races	0	0.0%

Source: US Census Bureau 2020 ACS 5-year Data Estimates

Table 2-9 Types and Total Amounts of Housing Units in Andover

Type of Housing Units	Total	%
Total Housing Units	62	100%
1-Unit Detached	57	91.9%
1-Unit Attached	0	0.0%
2 Units	0	0.0%
3 or 4 Units	0	0.0%
5 to 9 Units	0	0.0%
10 to 19 Units	0	0.0%
20 or More Units	0	0.0%
Mobile Home	5	8.1%
Boat, RV, Van, etc.	0	0.0%

Source: US Census Bureau 2020 ACS 5-year Data Estimates

City of Calamus Population and Demographics Summary

Table 2-10 City of Calamus Demographic and Social Characteristics, 2015-2020

City of Calamus	2015	2020	% Change
Population	380	366	-3.68%
Median Age	43.3	41.5	-4.16%
% of Population under 5	7%	3.3%	-52.86%
% of Population over 65	21%	18.6%	-11.43%
Housing Occupancy Rate	95%	98.1%	3.26%
% of Owner Occupied Housing	80%	87.1%	8.87%
% of Renter Occupied Housing	20%	12.9%	-35.50%
% of Housing Units with no Vehicles Available	4%	1.9%	-52.50%
Median Household Income	$55,625	$60,156	8.15%
Per Capita Income	$26,397	$28,195	6.81%
% of Individuals Below Poverty Level	8.7%	2.7%	-68.97%
# of Households	165	155	-6.06%
Average Household Size	2.3	2.36	2.61%
% of Population Over 25 with High School Diploma	96.6%	95.3%	-1.35%
% of Population Over 25 with Bachelor's Degree or Higher	14.4%	15.3%	6.25%
% with Disability	14.7%	9.3%	-36.73%
% Speak English less than "Very Well"	0.6%	0.0%	-100.00%

Source: US Census Bureau 2019 & 2020 ACS 5-year Data Estimates

Table 2-11 City of Calamus Demographic and Social Characteristics Compared to County and State

Demographic & Social Characteristics (as of 2020)	Calamus	County	Iowa
Median Age	41.5	42.8	38.3
% of Population under 5	3.3%	5.9%	6.2%
% of Population over 65	18.6%	19.6%	17.1%
Housing Occupancy Rate	98.1%	88.1%	90.5%
% of Owner Occupied Housing	87.1%	74.1%	71.2%
% of Renter Occupied Housing	12.9%	25.9%	28.8%
% of Housing Units with no Vehicles Available	1.9%	7.0%	5.7%
Median Household Income	$60,156	$52,221	$61,836
Per Capita Income	$28,195	$28,761	$33,021
% of Individuals Below Poverty Level	2.7%	13.7%	11.1%
Average Household Size	2.36	2.5	2.4
% of Population Over 25 with High School Diploma	95.3%	90.6%	92.5%
% Of Population Over 25 with Bachelor's Degree or Higher	15.3%	19.2%	29.3%
% with Disability	9.3%	12.7%	11.8%
% Speak English less than "Very Well"	0.0%	1.1%	3.4%

Source: US Census Bureau 2020 ACS 5-year Data Estimates

Table 2-12 City of Calamus Demographics by Race and Sex

Calamus	Population	%
Total Population	366	100%
Male	203	55.5%
Female	163	44.5%
White, not Hispanic	358	97.8%
Hispanic or Latino	7	1.9%
Black	0	0.0%
Asian	0	0.0%
American Indian and Alaska Native	0	0.0%
Native Hawaiian and Other Pacific Islander	0	0.0%
Some Other Race	0	0.0%
Two or More Races	1	0.3%

Source: US Census Bureau 2020 ACS 5-year Data Estimates

Table 2-13 Types and Total Amounts of Housing Units in Calamus

Type of Housing Units	Total	%
Total Housing Units	158	100%

Type of Housing Units	Total	%
1-Unit Detached	134	84.8%
1-Unit Attached	4	2.5%
2 Units	1	0.6%
3 or 4 Units	13	8.2%
5 to 9 Units	0	0.0%
10 to 19 Units	0	0.0%
20 or More Units	0	0.0%
Mobile Home	6	3.8%
Boat, RV, Van, etc.	0	0.0%

Source: US Census Bureau 2020 ACS 5-year Data Estimates

City of Camanche Population and Demographics Summary

Table 2-14 City of Camanche Demographic and Social Characteristics, 2015-2020

City of Camanche	2015	2020	% Change
Population	4,401	4,343	-1.32%
Median Age	43.9	45.9	4.56%
% of Population under 5	6%	8.2%	36.67%
% of Population over 65	17%	18.7%	10.00%
Housing Occupancy Rate	94.9%	96.3%	1.48%
% of Owner Occupied Housing	85%	80.8%	-4.94%
% of Renter Occupied Housing	15%	19.2%	28.00%
% of Housing Units with no Vehicles Available	1%	4.2%	320.00%
Median Household Income	$53,805	$52,623	-2.20%
Per Capita Income	$29,717	$27,465	-7.58%
% of Individuals Below Poverty Level	20.1%	6.4%	-68.16%
# of Households	1,939	1,998	3.04%
Average Household Size	2.2	2.17	-1.36%
% of Population Over 25 with High School Diploma	95.8%	95.7%	-0.10%
% of Population Over 25 with Bachelor's Degree or Higher	20.7%	16.0%	-22.71%
% with Disability	4.3%	15.6%	262.79%
% Speak English less than "Very Well"	3.0%	0.4%	-86.67%

Source: US Census Bureau 2019 & 2020 ACS 5-year Data Estimates

Table 2-15 City of Camanche Demographic and Social Characteristics Compared to the County and State

Demographic & Social Characteristics (as of 2019)	Camanche	County	Iowa
Median Age	45.9	42.8	38.3
% of Population under 5	8.2%	5.9%	6.2%

Demographic & Social Characteristics (as of 2019)	Camanche	County	Iowa
% of Population over 65	18.7%	19.6%	17.1%
Housing Occupancy Rate	96.3%	88.1%	90.5%
% of Owner Occupied Housing	80.8%	74.1%	71.2%
% of Renter Occupied Housing	19.2%	25.9%	28.8%
% of Housing Units with no Vehicles Available	4.2%	7.0%	5.7%
Median Household Income	$52,623	$52,221	$61,836
Per Capita Income	$27,465	$28,761	$33,021
% of Individuals Below Poverty Level	6.4%	13.7%	11.1%
Average Household Size	2.17	2.5	2.4
% of Population Over 25 with High School Diploma	95.7%	90.6%	92.5%
% of Population Over 25 with Bachelor's Degree or Higher	16.0%	19.2%	29.3%
% with Disability	15.6%	12.7%	11.8%
% Speak English less than "Very Well"	0.4%	1.1%	3.4%

Source: US Census Bureau 2019 & 2020 ACS 5-year Data Estimates

Table 2-16 City of Camanche Demographics by Race and Sex

Camanche	Population	%
Total Population	4,342	
Male	2,048	47.2%
Female	2,294	52.8%
White, not Hispanic	4,145	95.5%
Hispanic or Latino	91	2.1%
Black	0	0.0%
Asian	0	0.0%
American Indian and Alaska Native	23	0.5%
Native Hawaiian and Other Pacific Islander	0	0.0%
Some Other Race	0	0.0%
Two or More Races	83	1.9%

Source: US Census Bureau 2020 ACS 5-year Data Estimates

Table 2-17 Types and Total Amounts of Housing Units in Camanche

Type of Housing Units	Total	%
Total Housing Units	2,075	
1-Unit Detached	1,560	75.2%
1-Unit Attached	0	0.0%
2 Units	81	3.9%
3 or 4 Units	31	2.0%

Type of Housing Units	Total	%
5 to 9 Units	192	9.3%
10 to 19 Units	36	1.7%
20 or More Units	39	1.9%
Mobile Home	126	6.1%
Boat, RV, Van, etc.	0	0.0%

Source: US Census Bureau 2020 ACS 5-year Data Estimates

City of Charlotte Population and Demographics Summary

Table 2-18 City of Charlotte Demographic and Social Characteristics, 2015-2020

City of Charlotte	2015	2020	% Change
Population	383	378	-1.31%
Median Age	30.8	35.0	13.64%
% of Population under 5	16%	1.9%	-88.13%
% of Population over 65	10%	13.8%	38.00%
Housing Occupancy Rate	87.6%	87.6%	0.00%
% of Owner Occupied Housing	68.8%	71.2%	3.49%
% of Renter Occupied Housing	31.2%	28.8%	-7.69%
% of Housing Units with no Vehicles Available	2.80%	0.60%	-78.57%
Median Household Income	$45,469	$53,438	17.53%
Per Capita Income	$18,944	$26,899	41.99%
% of Individuals Below Poverty Level	12.6%	11.3%	-10.32%
# of Households	141	156	10.64%
Average Household Size	2.8	2.4	-14.29%
% of Population Over 25 with High School Diploma	92.0%	87.7%	-4.67%
% of Population Over 25 with Bachelor's Degree or Higher	13.5%	16.7%	23.70%
% with Disability	11.5%	10.1%	-12.17%
% Speak English less than "Very Well"	5.6%	0.5%	-91.07%

Source: US Census Bureau 2019 & 2020 ACS 5-year Data Estimates

Table 2-19 City of Charlotte Demographic and Social Characteristics Compared to the County and State

Demographic & Social Characteristics (as of 2020)	Charlotte	County	Iowa
Median Age	35.0	42.8	38.3

Demographic & Social Characteristics (as of 2020)	Charlotte	County	Iowa
% of Population under 5	1.9%	5.9%	6.2%
% of Population over 65	13.8%	19.6%	17.1%
Housing Occupancy Rate	87.6%	88.1%	90.5%
% of Owner Occupied Housing	71.2%	74.1%	71.2%
% of Renter Occupied Housing	28.8%	25.9%	28.8%
% of Housing Units with no Vehicles Available	0.60%	7.0%	5.7%
Median Household Income	$53,438	$52,221	$61,836
Per Capita Income	$26,899	$28,761	$33,021
% of Individuals Below Poverty Level	11.3%	13.7%	11.1%
Average Household Size	2.4	2.5	2.4
% of Population Over 25 with High School Diploma	87.7%	90.6%	92.5%
% of Population Over 25 with Bachelor's Degree or Higher	16.7%	19.2%	29.3%
% with Disability	10.1%	12.7%	11.8%
% Speak English less than "Very Well"	0.5%	1.1%	3.4%

Source: US Census Bureau 2020 ACS 5-year Data Estimates

Table 2-20 City of Charlotte Demographics by Race and Sex

Charlotte	Population	%
Total Population	378	
Male	211	55.8%
Female	167	44.2%
White, not Hispanic	345	91.3%
Hispanic or Latino	30	7.9%
Black	1	0.3%
Asian	0	0.0%
American Indian and Alaska Native	0	0.0%
Native Hawaiian and Other Pacific Islander	0	0.0%
Some Other Race	0	0.0%
Two or More Races	2	0.5%

Source: US Census Bureau 2020 ACS 5-year Data Estimates

Table 2-21 Types and Total Amounts of Housing Units in Charlotte

Type of Housing Units	Total	%
Total Housing Units	178	
1-Unit Detached	138	77.5%
1-Unit Attached	0	0.0%
2 Units	0	0.0%

Type of Housing Units	Total	%
3 or 4 Units	11	6.2%
5 to 9 Units	9	5.1%
10 to 19 Units	0	0.0%
20 or More Units	0	0.0%
Mobile Home	20	11.2%
Boat, RV, Van, etc.	0	0.0%

Source: US Census Bureau 2020 ACS 5-year Data Estimates

City of Clinton Population and Demographics Summary

Table 2-22 City of Clinton Demographic and Social Characteristics, 2015-2020

City of Clinton	2015	2020	% Change
Population	26,611	25,290	-4.96%
Median Age	41.4	43.3	4.59%
% of Population under 5	6%	5.7%	-5.00%
% of Population over 65	18%	20.5%	13.89%
Housing Occupancy Rate	90.8%	84.9%	-6.50%
% of Owner Occupied Housing	68.0%	68.3%	0.44%
% of Renter Occupied Housing	32.0%	31.7%	-0.94%
% of Housing Units with no Vehicles Available	9.20%	10.6%	15.22%
Median Household Income	$41,848	$46,066	10.08%
Per Capita Income	$25,313	$27,509	8.68%
% of Individuals Below Poverty Level	17.3%	18.4%	6.36%
# of Households	11,239	10,894	-3.07%
Average Household Size	2.41	2.26	-6.22%
% of Population Over 25 with High School Diploma	88.4%	87.7%	-0.79%
% of Population Over 25 with Bachelor's Degree or Higher	18.4%	18.7%	1.63%
% with Disability	14.2%	17.6%	23.94%
% Speak English less than "Very Well"	1.3%	0.9%	-30.77%

Source: US Census Bureau 2019 & 2020 ACS 5-year Data Estimates

Table 2-23 City of Clinton Demographic and Social Characteristics Compared to the County and State

Demographic & Social Characteristics (as of 2020)	Clinton	County	Iowa
Median Age	43.3	42.8	38.3
% of Population under 5	5.7%	5.9%	6.2%
% of Population over 65	20.5%	19.6%	17.1%
Housing Occupancy Rate	84.9%	88.1%	90.5%
% of Owner Occupied Housing	68.3%	74.1%	71.2%

Demographic & Social Characteristics (as of 2020)	Clinton	County	Iowa
% of Renter Occupied Housing	31.7%	25.9%	28.8%
% of Housing Units with no Vehicles Available	10.6%	7.0%	5.7%
Median Household Income	$46,066	$52,221	$61,836
Per Capita Income	$27,509	$28,761	$33,021
% of Individuals Below Poverty Level	18.4%	13.7%	11.1%
Average Household Size	2.26	2.5	2.4
% of Population Over 25 with High School Diploma	87.7%	90.6%	92.5%
% of Population Over 25 with Bachelor's Degree or Higher	18.7%	19.2%	29.3%
% with Disability	17.6%	12.7%	11.8%
% Speak English less than "Very Well"	0.9%	1.1%	3.4%

Source: US Census Bureau 2020 ACS 5-year Data Estimates

Table 2-24 City of Clinton Demographics by Race and Sex

Clinton	Population	%
Total Population	25,290	
Male	12,172	48.1%
Female	13,118	51.9%
White, not Hispanic	22,119	87.5%
Hispanic or Latino	967	3.8%
Black	1,288	5.1%
Asian	213	0.8%
American Indian and Alaska Native	81	0.3%
Native Hawaiian and Other Pacific Islander	0	0.0%
Some Other Race	15	0.1%
Two or More Races	607	2.4%

Source: US Census Bureau 2020 ACS 5-year Data Estimates

Table 2-25 Types and Total Amounts of Housing in the City of Clinton

Type of Housing Units	Total	%
Total Housing Units	12,827	
1-Unit Detached	9,226	71.9%
1-Unit Attached	347	2.7%
2 Units	329	2.6%
3 or 4 Units	773	6.0%
5 to 9 Units	372	2.9%
10 to 19 Units	673	5.2%
20 or More Units	1,038	8.1%

Type of Housing Units	Total	%
Mobile home	69	0.5%
Boat, RV, Van, etc.	0	0.0%

Source: US Census Bureau 2020 ACS 5-year Data Estimates

City of Delmar Population and Demographics Summary

Table 2-26 City of Delmar Demographic and Social Characteristics, 2015-2020

City of Delmar	2015	2020	% Change
Population	499	491	-1.60%
Median Age	39.9	36.6	-8.27%
% of Population under 5	7.8	7.7%	-1.28%
% of Population over 65	19.6	15.9%	-18.88%
Housing Occupancy Rate	93.2%	84.5%	-9.33%
% of Owner Occupied Housing	86.3%	91.9%	6.49%
% of Renter Occupied Housing	13.7%	8.1%	-40.88%
% of Housing Units with no Vehicles Available	3.40%	2.7%	-20.59%
Median Household Income	$49,620	$66,705	34.43%
Per Capita Income	$25,045	$28,943	15.56%
% of Individuals Below Poverty Level	5.3%	5.9%	11.32%
# of Households	205	185	-9.76%
Average Household Size	2.49	2.65	6.43%
% of Population Over 25 with High School Diploma	90.4%	94.6%	4.65%
% of Population Over 25 with Bachelor's Degree or Higher	14.3%	24.4%	70.63%
% with Disability	11.8%	12.2%	3.39%
% Speak English less than "Very Well"	1.1%	0.9%	-18.18%

Source: US Census Bureau 2019 & 2020 ACS 5-year Data Estimates

Table 2-27 City of Delmar Demographic and Social Characteristics Compared to County and State

Demographic & Social Characteristics (as of 2020)	Delmar	County	Iowa
Median Age	36.6	42.8	38.3
% of Population under 5	7.7%	5.9%	6.2%
% of Population over 65	15.9%	19.6%	17.1%
Housing Occupancy Rate	84.5%	88.1%	90.5%
% of Owner Occupied Housing	91.9%	74.1%	71.2%
% of Renter Occupied Housing	8.1%	25.9%	28.8%
% of Housing Units with no Vehicles Available	2.7%	7.0%	5.7%
Median Household Income	$66,705	$52,221	$61,836
Per Capita Income	$28,943	$28,761	$33,021

Demographic & Social Characteristics (as of 2020)	Delmar	County	Iowa
% of Individuals Below Poverty Level	5.9%	13.7%	11.1%
Average Household Size	2.65	2.5	2.4
% of Population Over 25 with High School Diploma	94.6%	90.6%	92.5%
% of Population Over 25 with Bachelor's Degree or Higher	24.4%	19.2%	29.3%
% with Disability	12.2%	12.7%	11.8%
% Speak English less than "Very Well"	0.9%	1.1%	3.4%

Source: US Census Bureau 2020 ACS 5-year Data Estimates

Table 2-28 City of Delmar Demographics by Race and Sex

Delmar	Population	%
Total Population	491	
Male	227	46.2%
Female	264	53.8%
White, not Hispanic	427	87%
Hispanic or Latino	24	4.9%
Black	13	2.6%
Asian	11	2.2%
American Indian and Alaska Native	0	0.0%
Native Hawaiian and Other Pacific Islander	0	0.0%
Some Other Race	0	0.0%
Two or More Races	16	3.3%

Source: US Census Bureau 2020 ACS 5-year Data Estimates

Table 2-29 Types and Total Amounts of Housing Units in Delmar

Type of Housing Units	Total	%
Total Housing Units	219	
1-Unit Detached	186	84.9%
1-Unit Attached	0	0.0%
2 Units	8	3.7%
3 or 4 Units	16	7.3%
5 to 9 Units	5	2.3%
10 to 19 Units	0	0.0%
20 or More Units	4	1.8%
Mobile Home	0	0.0%
Boat, RV, Van, etc.	0	0.0%

Source: US Census Bureau 2020 ACS 5-year Data Estimates

City of DeWitt Population and Demographic Summary

Table 2-30 City of DeWitt Demographic and Social Characteristics, 2015-2020

City of DeWitt	2015	2020	% Change
Population	5,297	5,215	-1.55%
Median Age	39.8	34.1	-14.32%
% of Population under 5	7%	8.9%	27.14%
% of Population over 65	15%	14.9%	-0.67%
Housing Occupancy Rate	94.1%	92.6%	-1.59%
% of Owner Occupied Housing	72.8%	78.6%	7.97%
% of Renter Occupied Housing	27.2%	21.4%	-21.32%
% of Housing Units with no Vehicles Available	2.80%	3.5%	25.00%
Median Household Income	$58,438	$56,563	-3.21%
Per Capita Income	$28,422	$29,974	5.46%
% of Individuals Below Poverty Level	9.9%	13.9%	40.40%
# of Households	2,153	1,913	-11.15%
Average Household Size	2.73	2.66	-2.56%
% of Population Over 25 with High School Diploma	96.7%	94.6%	-2.17%
% of Population Over 25 with Bachelor's Degree or Higher	26.9%	30.1%	11.90%
% with Disability	12.6%	7.3%	-42.06%
% Speak English less than "Very Well"	0.0%	0.0%	0%

Source: US Census Bureau 2019 & 2020 ACS 5-year Data Estimates

Table 2-31 City of DeWitt Demographic and Social Characteristics Compared to County and State

Demographic & Social Characteristics (as of 2020)	DeWitt	County	Iowa
Median Age	34.1	42.8	38.3
% of Population under 5	8.9%	5.9%	6.2%
% of Population over 65	14.9%	19.6%	17.1%
Housing Occupancy Rate	92.6%	88.1%	90.5%
% of Owner Occupied Housing	78.6%	74.1%	71.2%
% of Renter Occupied Housing	21.4%	25.9%	28.8%
% of Housing Units with no Vehicles Available	3.5%	7.0%	5.7%
Median Household Income	$56,563	$52,221	$61,836
Per Capita Income	$29,974	$28,761	$33,021
% of Individuals Below Poverty Level	13.9%	13.7%	11.1%
Average Household Size	2.66	2.5	2.4
% of Population Over 25 with High School Diploma	94.6%	90.6%	92.5%
% of Population Over 25 with Bachelor's Degree or Higher	30.1%	19.2%	29.3%

Demographic & Social Characteristics (as of 2020)	DeWitt	County	Iowa
% with Disability	7.3%	12.7%	11.8%
% Speak English less than "Very Well"	0.0%	1.1%	3.4%

Source: US Census Bureau 2020 ACS 5-year Data Estimates

Table 2-32 City of DeWitt Demographics by Race and Sex

DeWitt	Population	%
Total Population	5,215	
Male	2,250	43.1%
Female	2,965	56.9%
White, not Hispanic	5,009	96.0%
Hispanic or Latino	199	3.8%
Black	4	0.1%
Asian	0	0.0%
American Indian and Alaska Native	0	0.0%
Native Hawaiian and Other Pacific Islander	0	0.0%
Some Other Race	0	0.0%
Two or More Races	3	0.1%

Source: US Census Bureau 2020 ACS 5-year Data Estimates

Table 2-33 Types and Total Amounts of Housing Units in DeWitt

Type of Housing Units	Total	%
Total Housing Units	2,066	
1-Unit Detached	1,541	74.6%
1-Unit Attached	100	4.8%
2 Units	105	5.1%
3 or 4 Units	92	4.5%
5 to 9 Units	95	4.6%
10 to 19 Units	44	2.1%
20 or More Units	89	4.3%
Mobile Home	0	0.0%
Boat, RV, Van, etc.	0	0.0%

Source: US Census Bureau 2020 ACS 5-year Data Estimates

City of Goose Lake Population and Demographic Summary

Table 2-34 City of Goose Lake Demographic and Social Characteristics, 2015-2020

City of Goose Lake	2015	2020	% Change
Population	275	298	8.36%
Median Age	32.5	33.3	2.46%

City of Goose Lake	2015	2020	% Change
% of Population under 5	7.3%	3.7%	-49.32%
% of Population over 65	10.2%	11.1%	8.82%
Housing Occupancy Rate	95.6%	93.9%	-1.78%
% of Owner Occupied Housing	92.0%	95.7%	4.02%
% of Renter Occupied Housing	8.0%	4.3%	-46.25%
% of Housing Units with no Vehicles Available	2.30%	0.00%	-100.00%
Median Household Income	$75,625	$92,000	21.65%
Per Capita Income	$23,443	$23,148	-1.26%
% of Individuals Below Poverty Level	4.7%	7.8%	65.96%
# of Households	87	92	5.75%
Average Household Size	3.3	3.24	-1.82%
% of Population Over 25 with High School Diploma	92.8%	83.9%	-9.59%
% of Population Over 25 with Bachelor's Degree or Higher	18.6%	14.3%	-23.12%
% with Disability	6.9%	6.0%	-13.04%
% Speak English less than "Very Well"	0.0%	0.0%	0.0%

Source: US Census Bureau 2019 ACS 5-year Data Estimates

Table 2-35 City of Goose Lake Demographic and Social Characteristics Compared to County and State

Demographic & Social Characteristics (as of 2019)	Goose Lake	County	Iowa
Median Age	33.3	42.8	38.3
% of Population under 5	3.7%	5.9%	6.2%
% of Population over 65	11.1%	19.6%	17.1%
Housing Occupancy Rate	93.9%	88.1%	90.5%
% of Owner Occupied Housing	95.7%	74.1%	71.2%
% of Renter Occupied Housing	4.3%	25.9%	28.8%
% of Housing Units with no Vehicles Available	0.00%	7.0%	5.7%
Median Household Income	$92,000	$52,221	$61,836
Per Capita Income	$23,148	$28,761	$33,021
% of Individuals Below Poverty Level	7.8%	13.7%	11.1%
Average Household Size	3.24	2.5	2.4
% of Population Over 25 with High School Diploma	83.9%	90.6%	92.5%
% of Population Over 25 with Bachelor's Degree or Higher	14.3%	19.2%	29.3%
% with Disability	6.0%	12.7%	11.8%
% Speak English less than "Very Well"	0.0%	1.1%	3.4%

Source: US Census Bureau 2019 ACS 5-year Data Estimates

Table 2-36 City of Goose Lake Demographics by Race and Sex

Goose Lake	Population	%
Total Population	298	
Male	161	54.0%
Female	137	46%
White, not Hispanic	289	97.0%
Hispanic or Latino	0	0.0%
Black	0	0.0%
Asian	0	0.0%
American Indian and Alaska Native	0	0.0%
Native Hawaiian and Other Pacific Islander	0	0.0%
Some Other Race	0	0.0%
Two or More Races	9	3.0%

Source: US Census Bureau 2020 ACS 5-year Data Estimates

Table 2-37 Types and Total Amounts of Housing Units in Goose Lake

Type of Housing Units	Total	%
Total Housing Units	98	
1-Unit Detached	93	94.9%
1-Unit Attached	2	2.0%
2 Units	1	1.0%
3 or 4 Units	0	0.0%
5 to 9 Units	0	0.0%
10 to 19 Units	0	0.0%
20 or More Units	0	0.0%
Mobile Home	2	2.0%
Boat, RV, Van, etc.	0	0.0%

Source: US Census Bureau 2020 ACS 5-year Data Estimates

City of Grand Mound Population and Demographic Summary

Table 2-38 City of Grand Mound Demographic and Social Characteristics, 2015-2020

City of Grand Mound	2015	2020	% Change
Population	554	552	-0.36%
Median Age	41.4	36.0	-13.04%
% of Population under 5	1.8%	5.8%	222.22%
% of Population over 65	15%	20.1%	34.00%
Housing Occupancy Rate	93.3%	95.9%	2.79%
% of Owner Occupied Housing	87.0%	78.4%	-9.89%

City of Grand Mound	2015	2020	% Change
% of Renter Occupied Housing	13.0%	21.6%	66.15%
% of Housing Units with no Vehicles Available	3.40%	0.0%	-100.00%
Median Household Income	$56,000	$66,750	19.20%
Per Capita Income	$20,680	$26,975	30.44%
% of Individuals Below Poverty Level	15.9%	9.3%	-41.51%
# of Households	208	213	2.40%
Average Household Size	2.8	2.59	-7.50%
% of Population Over 25 with High School Diploma	95.8%	94.9%	-0.94%
% of Population Over 25 with Bachelor's Degree or Higher	9.5%	22.5%	136.84%
% with Disability	15.5%	13.8%	-10.97%
% Speak English less than "Very Well"	0.0%	0.0%	0.0%

Source: US Census Bureau 2019 & 2020 ACS 5-year Data Estimates

Table 2-39 City of Grand Mound Demographic and Social Characteristics Compared to County and State

Demographic & Social Characteristics (as of 2018)	Grand Mound	County	Iowa
Median Age	36.0	42.8	38.3
% of Population under 5	5.8%	5.9%	6.2%
% of Population over 65	20.1%	19.6%	17.1%
Housing Occupancy Rate	95.9%	88.1%	90.5%
% of Owner Occupied Housing	78.4%	74.1%	71.2%
% of Renter Occupied Housing	21.6%	25.9%	28.8%
% of Housing Units with no Vehicles Available	0.0%	7.0%	5.7%
Median Household Income	$66,750	$52,221	$61,836
Per Capita Income	$26,975	$28,761	$33,021
% of Individuals Below Poverty Level	9.3%	13.7%	11.1%
Average Household Size	2.59	2.5	2.4
% of Population Over 25 with High School Diploma	94.9%	90.6%	92.5%
% of Population Over 25 with Bachelor's Degree or Higher	22.5%	19.2%	29.3%
% with Disability	13.8%	12.7%	11.8%
% Speak English less than "Very Well"	0.0%	1.1%	3.4%

Source: US Census Bureau 2020 ACS 5-year Data Estimates

Table 2-40 City of Grand Mound Demographics by Race and Sex

Grand Mound	Population	%
Total Population	552	
Male	276	50.0%
Female	276	50.0%

Grand Mound	Population	%
White, not Hispanic	502	90.9%
Hispanic or Latino	26	4.7%
Black	0	0.0%
Asian	0	0.0%
American Indian and Alaska Native	0	0.0%
Native Hawaiian and Other Pacific Islander	3	0.5%
Some Other Race	0	0.0%
Two or More Races	21	3.8%

Source: US Census Bureau 2020 ACS 5-year Data Estimates

Table 2-41 Types and Total Housing Units in Grand Mound

Type of Housing Units	Total	%
Total Housing Units	222	
1-Unit Detached	195	87.8%
1-Unit Attached	0	0.0%
2 Units	5	2.3%
3 or 4 Units	14	6.3%
5 to 9 Units	8	3.6%
10 to 19 Units	0	0.0%
20 or More Units	0	0.0%
Mobile Home	0	0.0%
Boat, RV, Van, etc.	0	0.0%

Source: US Census Bureau 2020 ACS 5-year Data Estimates

City of Lost Nation Population and Demographic Summary

Table 2-42 City of Lost Nation Demographic and Social Characteristics, 2015-2020

City of Lost Nation	2015	2020	% Change
Population	502	451	-10.16%
Median Age	35.6	49.9	40.17%
% of Population under 5	7%	4.2%	-40.00%
% of Population over 65	16%	34.1%	113.13%
Housing Occupancy Rate	86.3%	91.0%	5.45%
% of Owner Occupied Housing	64.2%	68.9%	7.32%
% of Renter Occupied Housing	35.8%	31.1%	-13.13%
% of Housing Units with no Vehicles Available	6.30%	5.4%	-14.29%
Median Household Income	$35,000	$40,000	14.29%
Per Capita Income	$16,622	$25,299	52.20%

City of Lost Nation	2015	2020	% Change
% of Individuals Below Poverty Level	35.1%	11.1%	-68.38%
# of Households	176	222	26.14%
Average Household Size	2.9	2.03	-30.00%
% of Population Over 25 with High School Diploma	85.4%	87.7%	2.69%
% of Population Over 25 with Bachelor's Degree or Higher	15.6%	10.3%	-33.97%
% with Disability	15.7%	23.7%	50.96%
% Speak English less than "Very Well"	0.4%	0.0%	-100.00%

Source: US Census Bureau 2020 ACS 5-year Data Estimates

Table 2-43 City of Lost Nation Demographic and Social Characteristics Compared to County and State

Demographic & Social Characteristics (as of 2019)	Lost Nation	County	Iowa
Median Age	49.9	42.8	38.3
% of Population under 5	4.2%	5.9%	6.2%
% of Population over 65	34.1%	19.6%	17.1%
Housing Occupancy Rate	91.0%	88.1%	90.5%
% of Owner Occupied Housing	68.9%	74.1%	71.2%
% of Renter Occupied Housing	31.1%	25.9%	28.8%
% of Housing Units with no Vehicles Available	5.4%	7.0%	5.7%
Median Household Income	$40,000	$52,221	$61,836
Per Capita Income	$25,299	$28,761	$33,021
% of Individuals Below Poverty Level	11.1%	13.7%	11.1%
Average Household Size	2.03	2.5	2.4
% of Population Over 25 with High School Diploma	87.7%	90.6%	92.5%
% of Population Over 25 with Bachelor's Degree or Higher	10.3%	19.2%	29.3%
% with Disability	23.7%	12.7%	11.8%
% Speak English less than "Very Well"	0.0%	1.1%	3.4%

Source: US Census Bureau 2020 ACS 5-year Data Estimates

Table 2-44 City of Lost Nation Demographics by Race and Sex

Lost Nation	Population	%
Total Population	451	
Male	213	47.2%
Female	238	52.8%
White, not Hispanic	451	100.0%
Hispanic or Latino	0	0.0%
Black	0	0.0%
Asian	0	0.0%

Lost Nation	Population	%
American Indian and Alaska Native	0	0.0%
Native Hawaiian and Other Pacific Islander	0	0.0%
Some Other Race	0	0.0%
Two or More Races	0	0.0%

Source: US Census Bureau 2020 ACS 5-year Data Estimates

Table 2-45 Types and Total Amounts of Housing Units in Lost Nation

Type of Housing Units	Total	%
Total Housing Units	244	
1-Unit Detached	204	83.6%
1-Unit Attached	0	0.0%
2 Units	2	0.8%
3 or 4 Units	37	15.2%
5 to 9 Units	1	0.4%
10 to 19 Units	0	0.0%
20 or More Units	0	0.0%
Mobile Home	0	0.0%
Boat, RV, Van, etc.	0	0.0%

Source: US Census Bureau 2020 ACS 5-year Data Estimates

City of Low Moor Population and Demographic Summary

Table 2-46 City of Low Moor Demographic and Social Characteristics, 2015-2020

City of Low Moor	2015	2020	% Change
Population	186	326	75.27%
Median Age	33.3	43.8	31.53%
% of Population under 5	13%	2.1%	-83.85%
% of Population over 65	17%	12.0%	-29.41%
Housing Occupancy Rate	94.8%	93.1%	-1.79%
% of Owner Occupied Housing	84.9%	90.2%	6.24%
% of Renter Occupied Housing	15.1%	9.8%	-35.10%
% of Housing Units with no Vehicles Available	0.00%	0.00%	0.00%
Median Household Income	$43,281	$54,792	26.60%
Per Capita Income	$2,561	$24,912	872.75%
% of Individuals Below Poverty Level	13.4%	12.0%	-10.45%
# of Households	73	122	67.12%
Average Household Size	2.6	2.67	2.69%
% of Population Over 25 with High School Diploma	93.8%	90.4%	-3.62%

City of Low Moor	2015	2020	% Change
% of Population Over 25 with Bachelor's Degree or Higher	11.6%	7.5%	-35.34%
% with Disability	11.8%	16.0%	35.59%
% Speak English less than "Very Well"	0.0%	0.6%	N/A

Source: US Census Bureau 2019 & 2020 ACS 5-year Data Estimates

Table 2-47 City of Low Moor Demographic and Social Characteristics Compared to County and State

Demographic & Social Characteristics (as of 2020)	Low Moor	County	Iowa
Median Age	43.8	42.8	38.3
% of Population under 5	2.1%	5.9%	6.2%
% of Population over 65	12.0%	19.6%	17.1%
Housing Occupancy Rate	93.1%	88.1%	90.5%
% of Owner Occupied Housing	90.2%	74.1%	71.2%
% of Renter Occupied Housing	9.8%	25.9%	28.8%
% of Housing Units with no Vehicles Available	0.00%	7.0%	5.7%
Median Household Income	$54,792	$52,221	$61,836
Per Capita Income	$24,912	$28,761	$33,021
% of Individuals Below Poverty Level	12.0%	13.7%	11.1%
Average Household Size	2.67	2.5	2.4
% of Population Over 25 with High School Diploma	90.4%	90.6%	92.5%
% of Population Over 25 with Bachelor's Degree or Higher	7.5%	19.2%	29.3%
% with Disability	16.0%	12.7%	11.8%
% Speak English less than "Very Well"	0.6%	1.1%	3.4%

Source: US Census Bureau 2020 ACS 5-year Data Estimates

Table 2-48 City of Low Moor Demographics by Race and Sex

Low Moor	Population	%
Total Population	326	
Male	184	56.4%
Female	142	43.6%
White, not Hispanic	286	87.7%
Hispanic or Latino	0	0.0%
Black	0	0.0%
Asian	2	0.6%
American Indian and Alaska Native	0	0.0%
Native Hawaiian and Other Pacific Islander	0	0.0%
Some Other Race	0	0.0%
Two or More Races	38	11.7%

Source: US Census Bureau 2020 ACS 5-year Data Estimates

Table 2-49 Types and Total Amounts of Housing Units in Low Moor

Type of Housing Units	Total	%
Total Housing Units	131	
1-Unit Detached	119	90.8%
1-Unit Attached	0	0.0%
2 Units	10	7.6%
3 or 4 Units	2	1.5%
5 to 9 Units	0	0.0%
10 to 19 Units	0	0.0%
20 or More Units	0	0.0%
Mobile Home	0	0.0%
Boat, RV, Van, etc.	0	0.0%

Source: US Census Bureau 2020 ACS 5-year Data Estimates

City of Toronto Population and Demographic Summary

Table 2-50 City of Toronto Demographic and Social Characteristics, 2015-2020

City of Toronto	2015	2020	% Change
Population	164	82	-50.00%
Median Age	36.5	51.0	39.73%
% of Population under 5	9%	0%	-100.00%
% of Population over 65	9%	24.4%	171.11%
Housing Occupancy Rate	78.3%	62.5%	-20.18%
% of Owner Occupied Housing	88.9%	77.1%	-13.27%
% of Renter Occupied Housing	11.1%	22.9%	106.31%
% of Housing Units with no Vehicles Available	0.00%	0.00%	0.00%
Median Household Income	$51,250	$37,250	-27.32%
Per Capita Income	$18,955	$20,955	10.55%
% of Individuals Below Poverty Level	6.7%	22.0%	228.36%
# of Households	54	35	-35.19%
Average Household Size	3.1	2.34	-24.52%
% of Population Over 25 with High School Diploma	77.4%	79.4%	2.58%
% of Population Over 25 with Bachelor's Degree or Higher	5.2%	1.6%	-69.23%
% with Disability	17.7%	12.2%	-31.07%
% Speak English less than "Very Well"	0.0%	0.0%	0.00%

Source: US Census Bureau 2019 & 2020 ACS 5-year Data Estimates

Table 2-51 City of Toronto Demographic and Social Characteristics Compared to county and State

Demographic & Social Characteristics (as of 2019)	Toronto	County	Iowa
Median Age	51.0	42.8	38.3
% of Population under 5	0%	5.9%	6.2%
% of Population over 65	24.4%	19.6%	17.1%
Housing Occupancy Rate	62.5%	88.1%	90.5%
% of Owner Occupied Housing	77.1%	74.1%	71.2%
% of Renter Occupied Housing	22.9%	25.9%	28.8%
% of Housing Units with no Vehicles Available	0.00%	7.0%	5.7%
Median Household Income	$37,250	$52,221	$61,836
Per Capita Income	$20,955	$28,761	$33,021
% of Individuals Below Poverty Level	22.0%	13.7%	11.1%
Average Household Size	2.34	2.5	2.4
% of Population Over 25 with High School Diploma	79.4%	90.6%	92.5%
% of Population Over 25 with Bachelor's Degree or Higher	1.6%	19.2%	29.3%
% with Disability	12.2%	12.7%	11.8%
% Speak English less than "Very Well"	0.0%	1.1%	3.4%

Source: US Census Bureau 2020 ACS 5-year Data Estimates

Table 2-52 City of Toronto Demographics by Race and Sex

Toronto	Population	%
Total Population	82	
Male	42	51.2%
Female	40	48.8%
White, not Hispanic	80	97.6%
Hispanic or Latino	2	2.4%
Black	0	0.0%
Asian	0	0.0%
American Indian and Alaska Native	0	0.0%
Native Hawaiian and Other Pacific Islander	0	0.0%
Some Other Race	0	0.0%
Two or More Races	0	0.0%

Source: US Census Bureau 2020 ACS 5-year Data Estimates

Table 2-53 Types and Total Amounts of Housing Units in Toronto

Type of Housing Units	Total	%
Total Housing Units	56	

Type of Housing Units	Total	%
1-Unit Detached	56	100.0%
1-Unit Attached	0	0.0%
2 Units	0	0.0%
3 or 4 Units	0	0.0%
5 to 9 Units	0	0.0%
10 to 19 Units	0	0.0%
20 or More Units	0	0.0%
Mobile Home	0	0.0%
Boat, RV, Van, etc.	0	0.0%

Source: US Census Bureau 2020 ACS 5-year Data Estimates

City of Welton Population and Demographic Summary

Table 2-54 City of Welton Demographic and Social Characteristics, 2015-2020

City of Welton	2015	2020	% Change
Population	157	150	-4.46%
Median Age	38.2	43.5	13.87%
% of Population under 5	6%	0%	-100.00%
% of Population over 65	17%	25.3%	48.82%
Housing Occupancy Rate	90.6%	100%	10.38%
% of Owner Occupied Housing	79.3%	79.0%	-0.38%
% of Renter Occupied Housing	20.7%	21.0%	1.45%
% of Housing Units with no Vehicles Available	3.40%	0.00%	-100.00%
Median Household Income	$62,000	$46,875	-24.40%
Per Capita Income	$22,778	$27,039	18.71%
% of Individuals Below Poverty Level	14.0%	2.7%	-80.71%
# of Households	58	62	6.90%
Average Household Size	2.8	2.42	-13.57%
% of Population Over 25 with High School Diploma	90.5%	95.4%	5.41%
% of Population Over 25 with Bachelor's Degree or Higher	7.6%	6.4%	-15.79%
% with Disability	15.3%	15.3%	0.00%
% Speak English less than "Very Well"	0.0%	0.0%	0.00%

Source: US Census Bureau 2019 & 2020 ACS 5-year Data Estimates

Table 2-55 City of Welton Demographics and Social Characteristics Compared to County and State

Demographic & Social Characteristics (as of 2019)	Welton	County	Iowa
Median Age	43.5	42.8	38.3

Demographic & Social Characteristics (as of 2019)	Welton	County	Iowa
% of Population under 5	0%	5.9%	6.2%
% of Population over 65	25.3%	19.6%	17.1%
Housing Occupancy Rate	100%	88.1%	90.5%
% of Owner Occupied Housing	79.0%	74.1%	71.2%
% of Renter Occupied Housing	21.0%	25.9%	28.8%
% of Housing Units with no Vehicles Available	0.00%	7.0%	5.7%
Median Household Income	$46,875	$52,221	$61,836
Per Capita Income	$27,039	$28,761	$33,021
% of Individuals Below Poverty Level	2.7%	13.7%	11.1%
Average Household Size	2.42	2.5	2.4
% of Population Over 25 with High School Diploma	95.4%	90.6%	92.5%
% of Population Over 25 with Bachelor's Degree or Higher	6.4%	19.2%	29.3%
% with Disability	15.3%	12.7%	11.8%
% Speak English less than "Very Well"	0.0%	1.1%	3.4%

Source: US Census Bureau 2020 ACS 5-year Data Estimates

Table 2-56 City of Welton Demographic by Race and Sex

Welton	Population	%
Total Population	150	
Male	90	60.0%
Female	60	40.0%
White, not Hispanic	136	90.7%
Hispanic or Latino	2	1.3%
Black	0	0.0%
Asian	0	0.0%
American Indian and Alaska Native	0	0.0%
Native Hawaiian and Other Pacific Islander	0	0.0%
Some Other Race	0	0.0%
Two or More Races	12	8.0%

Source: US Census Bureau 2020 ACS 5-year Data Estimates

Table 2-57 Types and Total Amounts of Housing Units in Welton

Type of Housing Units	Total	%
Total Housing Units	62	
1-Unit Detached	61	98.4%
1-Unit Attached	0	0.0%
2 Units	0	0.0%

Type of Housing Units	Total	%
3 or 4 Units	1	1.6%
5 to 9 Units	0	0.0%
10 to 19 Units	0	0.0%
20 or More Units	0	0.0%
Mobile Home	0	0.0%
Boat, RV, Van, etc.	0	0.0%

Source: US Census Bureau 2020 ACS 5-year Data Estimates

City of Wheatland Population and Demographic Summary

Table 2-58 City of Wheatland Demographic and Social Characteristics, 2015-2020

City of Wheatland	2015	2020	% Change
Population	670	997	48.81%
Median Age	42.3	28.8	-31.91%
% of Population under 5	3%	5.4%	80.00%
% of Population over 65	25%	12.8%	-48.80%
Housing Occupancy Rate	90.8%	90.2%	-0.66%
% of Owner Occupied Housing	78.5%	79.4%	1.15%
% of Renter Occupied Housing	21.5%	20.6%	-4.19%
% of Housing Units with no Vehicles Available	1.60%	0.9%	-43.75%
Median Household Income	$48,250	$27,425	-43.16%
Per Capita Income	$21,742	$17,746	-18.38%
% of Individuals Below Poverty Level	19.5%	13.9%	-28.72%
# of Households	246	350	42.28%
Average Household Size	2.6	2.75	5.77%
% of Population Over 25 with High School Diploma	92.3%	89.3%	-3.25%
% of Population Over 25 with Bachelor's Degree or Higher	15.1%	15.7%	3.97%
% with Disability	12.2%	8.1%	-33.61%
% Speak English less than "Very Well"	0.0%	0.2%	N/A

Source: US Census Bureau 2019 & 2020 ACS 5-year Data Estimates

Table 2-59 City of Wheatland Demographics and Social Characteristics Compared to County and State

Demographic & Social Characteristics (as of 2019)	Wheatland	County	Iowa
Median Age	28.8	42.8	38.3
% of Population under 5	5.4%	5.9%	6.2%
% of Population over 65	12.8%	19.6%	17.1%
Housing Occupancy Rate	90.2%	88.1%	90.5%

Demographic & Social Characteristics (as of 2019)	Wheatland	County	Iowa
% of Owner Occupied Housing	79.4%	74.1%	71.2%
% of Renter Occupied Housing	20.6%	25.9%	28.8%
% of Housing Units with no Vehicles Available	0.9%	7.0%	5.7%
Median Household Income	$27,425	$52,221	$61,836
Per Capita Income	$17,746	$28,761	$33,021
% of Individuals Below Poverty Level	13.9%	13.7%	11.1%
Average Household Size	2.75	2.5	2.4
% of Population Over 25 with High School Diploma	89.3%	90.6%	92.5%
% of Population Over 25 with Bachelor's Degree or Higher	15.7%	19.2%	29.3%
% with Disability	8.1%	12.7%	11.8%
% Speak English less than "Very Well"	0.2%	1.1%	3.4%

Source: US Census Bureau 2019 & 2020 ACS 5-year Data Estimates

Table 2-60 City of Wheatland Demographics by Race and Sex

Wheatland	Population	%
Total Population	997	
Male	516	51.8%
Female	481	48.2%
White, not Hispanic	869	87.2%
Hispanic or Latino	84	8.4%
Black	2	0.2%
Asian	0	0.0%
American Indian and Alaska Native	0	0.0%
Native Hawaiian and Other Pacific Islander	0	0.0%
Some Other Race	0	0.0%
Two or More Races	42	4.2%

Source: US Census Bureau 2020 ACS 5-year Data Estimates

Table 2-61 Types and Total Amounts of Housing Units in Wheatland

Type of housing units	Total	%
Total Housing Units	388	
1-Unit Detached	334	86.1%
1-Unit Attached	8	2.1%
2 Units	11	2.8%
3 or 4 Units	16	4.1%
5 to 9 Units	0	0.0%

Type of housing units	Total	%
10 to 19 Units	0	0.0%
20 or More Units	0	0.0%
Mobile Home	19	4.9%
Boat, RV, Van, etc.	0	0.0%

Source: US Census Bureau 2020 ACS 5-year Data Estimates

2.1.6 Occupations

Table 2-62 provides occupation statistics for the incorporated cities and the county as a whole for the civilian employed population 16 years and over.

Table 2-62 Occupation Statistics, Clinton County, Iowa

Place	Management, Business, Science, and Arts Occupations	Service Occupations	Sales and Office Occupations	Natural Resources, Construction, and Maintenance Occupations	Production, Transportation, and Material Moving Occupations
Clinton County	29.9%	15%	21.4%	11.5%	22.2%
Andover	21.3%	18%	19.7%	9.8%	31.1%
Calamus	20.8%	14%	18%	22.5%	24.7%
Camanche	26.4%	14%	28.4%	9.3%	22%
Charlotte	29%	13.6%	5.7%	22.2%	29.5%
Clinton	26.4%	17.5%	21.1%	10.2%	24.8%
Delmar	29.6%	19%	16.5%	12%	22.9%
DeWitt	34.7%	14.3%	18.7%	9.7%	22.7%
Goose Lake	49.6%	9.6%	11.2%	15.2%	14.4%
Grand Mound	24.3%	13.9%	21.9%	17%	22.9%
Lost Nation	23.9%	16.1%	18.3%	19.4%	22.2%
Low Moor	21.1%	14.9%	18.6%	15.5%	29.8%
Toronto	11.1%	29.6%	44.4%	11.1%	3.7%
Welton	32.9%	23.3%	13.7%	12.3%	17.8%
Wheatland	44.1%	17.1%	15.4%	11%	12.4%

Source: US Census, 2020 American Community Survey, 5-year Estimates.

2.1.7 Agriculture

Because of the fertility of the soils in Clinton County and the climate conditions, agricultural crops and livestock are the backbone of the economy of Clinton. According to the 2017 Census of Agriculture there were 1,169 farms in the County covering 402,733 acres of land. Crop and livestock production are visible parts of the agricultural economy, but many related businesses contribute by producing, processing, and

marketing farm and food products. These businesses generate income, employment, and economic activity throughout the region. Farms on average were 345 acres.

2.2 Development Since 2017 Plan Update

This section provides information on development that has occurred since the 2017 Clinton County Multi-Jurisdictional Hazard Mitigation Plan Update. As discussed in Section 2.1.5, the population of Clinton County has decreased by 4.85% since 2010. The biggest declines were in Toronto (33.87%), Calamus (16.63%), Grand Mound (14.02%) and Welton (-9.09%). By contrast, Andover and Wheatland gained population (+55.34% and +30.50% respectively).

Table 2-63 provides the change in numbers of housing units in the planning area from 2010 to 2020.

Table 2-63 Change in Housing Units, 2010-2020

Jurisdiction	Housing Units 2010	Housing Units 2020	2010-2020 # Change	2010-2020 % change
Iowa	1,336,417	1,407,819	71,402	5%
Clinton County	21,733	22,114	381	2%
Andover	40	62	22	55%
Calamus	185	158	-27	-15%
Camanche	2,010	2,075	65	3%
Charlotte	174	178	4	2%
Clinton	12,202	12,827	625	5%
Delmar	227	219	-8	-4%
DeWitt	2,306	2,066	-240	-10%
Goose Lake	90	98	8	9%
Grand Mound	253	222	-31	-12%
Lost Nation	221	244	23	10%
Low Moor	124	131	7	6%
Toronto	59	56	-3	-5%
Welton	62	62	0	0%
Wheatland	317	388	71	22%

Source: US Census Bureau: 2010 Decennial Census. 2019 & 2020 ACS 5-year Data Estimates .

The HMPC shared the following about development in some of the jurisdictions since the last plan update.

- Andover – Remains mostly residential with farming operations increasing in size.
- Calamus – Residential development brought up with Hometown Pride, Community Planning with Flenker Land Architect.
- Camanche – Naeve Beef; four subdivisions' Park Vista Senior Housing.
- Clinton – Several housing developments and apartment buildings and townhouses.
- Wheatland – New Dollar Store on South end, and new houses on North end.
- Clinton School District – River King Drive residential development, new CMS.

Changes in population and future development are not expected to increase the vulnerability to any of the hazards profiled in this plan.

2.2.1 New Privately-Owned Residential Building Permits Issued Since the Last Plan Update

Figure 2-5 shows the number of building permits issued for Clinton County and its major municipalities from 2016 to 2020. Building permits are good indicator of estimated growth and development. Table 2-64 breaks these numbers down further, to include number of housing units and their values. The Cities of Clinton, Camanche, and DeWitt showed spikes in construction of multi-unit structures in 2017, but those numbers tailed off from 2018 through 2020.

Figure 2-5 Building Permits Issued, 2016-2020

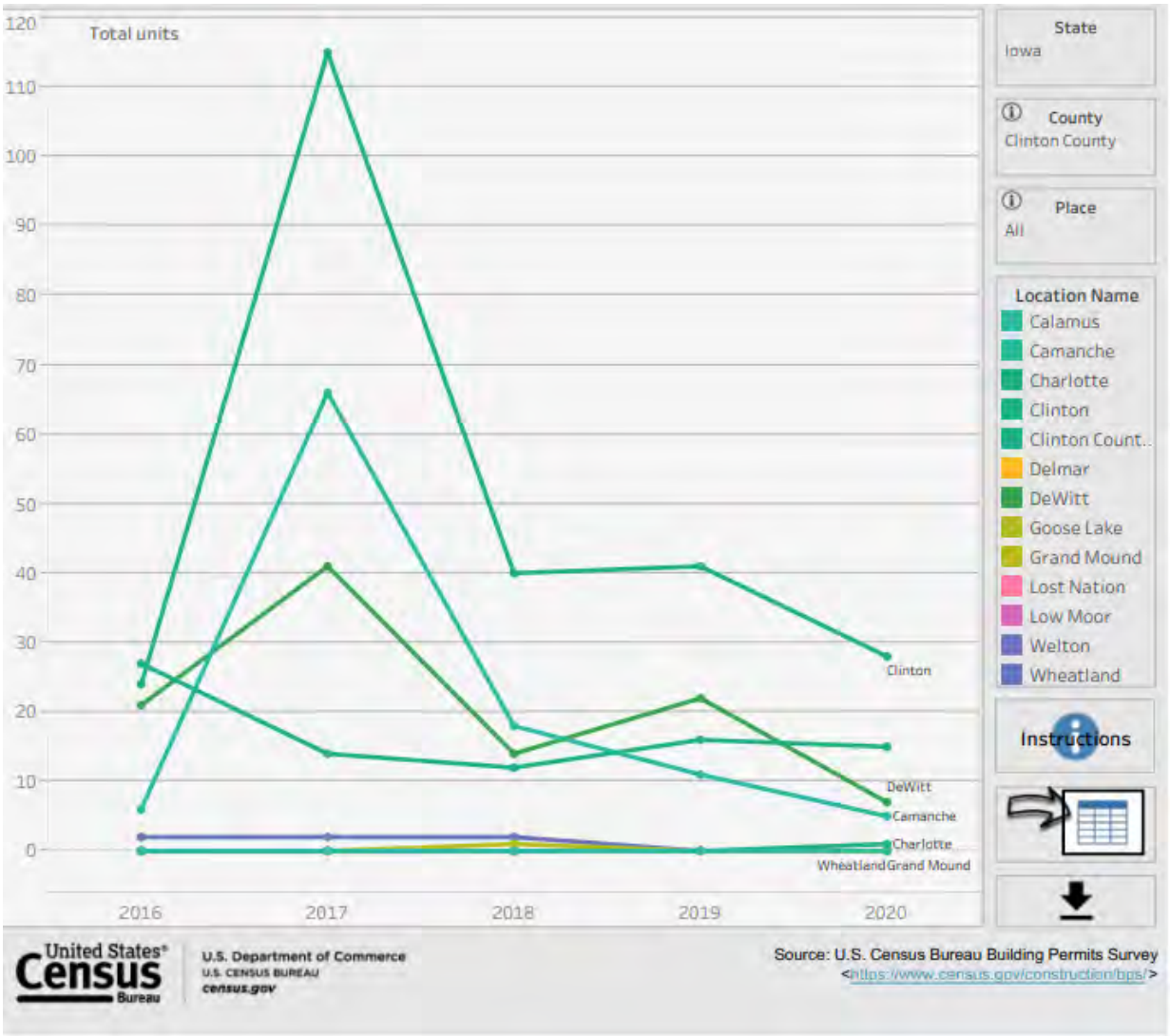


Table 2-64 Building Permits Issued in Clinton County, 2016-2020

	2106			2017			2018			2019			2020		
	Total Buildings	Total Units	Total Valuation	Total Buildings	Total Units	Total Valuation	Total Buildings	Total Units	Total Valuation	Total Buildings	Total Units	Total Valuation	Total Buildings	Total Units	Total Valuation
Clinton County	27	27	$7,021,000	14	14	$3,037,084	12	12	$2,7070,000	16	16	$4,119,312	15	15	$2,587,000
Andover*	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Calamus	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Camanche	6	6	$1,520,000	17	66	$5,940,000	12	18	$1,676,700	9	11	$2,784,000	4	5	$1,105,000
Charlotte	0	0	0	0	0	0	0	0	0	0	0	0	1	1	$237,744
Clinton	7	24	$5,734,750	30	115	$11,285,700	18	40	$4,749,600	14	41	$4,812,918	14	28	$4,428,000
Delmar	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
DeWitt	14	21	$2,072,000	9	41	$3,276,000	14	14	$2,100,000	22	22	$2,962,000	7	7	$1,420,000
Goose Lake	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Grand Mound	0	0	0	0	0	0	1	1	$150,000	0	0	0	0	0	0
Lost Nation	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Low Moor	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Toronto*	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Welton	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Wheatland	2	2	$417,783	2	2	$417,783	2	2	$417,783	0	0	0	0	0	0

Source: US Census Bureau Building Permits Survey, New Privately-Owned Housing Unit Authorizations, 2016-2020. *No data for Andover or Toronto in the survey.

2.3 Future Land Use and Development

The following sections provide details regarding future growth, land use and development. The information in this section comes from information provided by each of the participating jurisdictions as well as other sources, cited throughout. Where available, maps are provided to facilitate consideration of hazard areas in future development plans as well as potential growth area.

Clinton County

In general, Clinton County is experiencing a decline in population. This trend is expected continuing forward (see Table 2-65).

Table 2-65 Clinton County 2010 Population and Population Projections, 2010-2040

2010 Population	2020 Population Projection	2025 Population Projection	2030 Population Projection	2035 Population Projection	2040 Population Projection
49,116	48,486	48,406	48,340	48,238	48,240

Source: 2010 Population from the US Census Bureau 2010 Decennial Census; Population Projections from the "2010 State Profile: Iowa", Woods & Poole Economics, Inc, Inc., www.woodsandpoole.com Prepared by: http://www.iowadatacenter.org State Library of Iowa, State Data Center Program

Over the past five years, the County has built a new Law Center with Jail, Communications, Sheriff's Office and EOC.

City of Andover

A possible addition of ten houses may occur over the next five years.

City of Calamus

New sewer system and lagoon are planned for construction in the next five years.

City of Camanche

A new subdivision on the southwest side of town has been platted and is currently under construction.

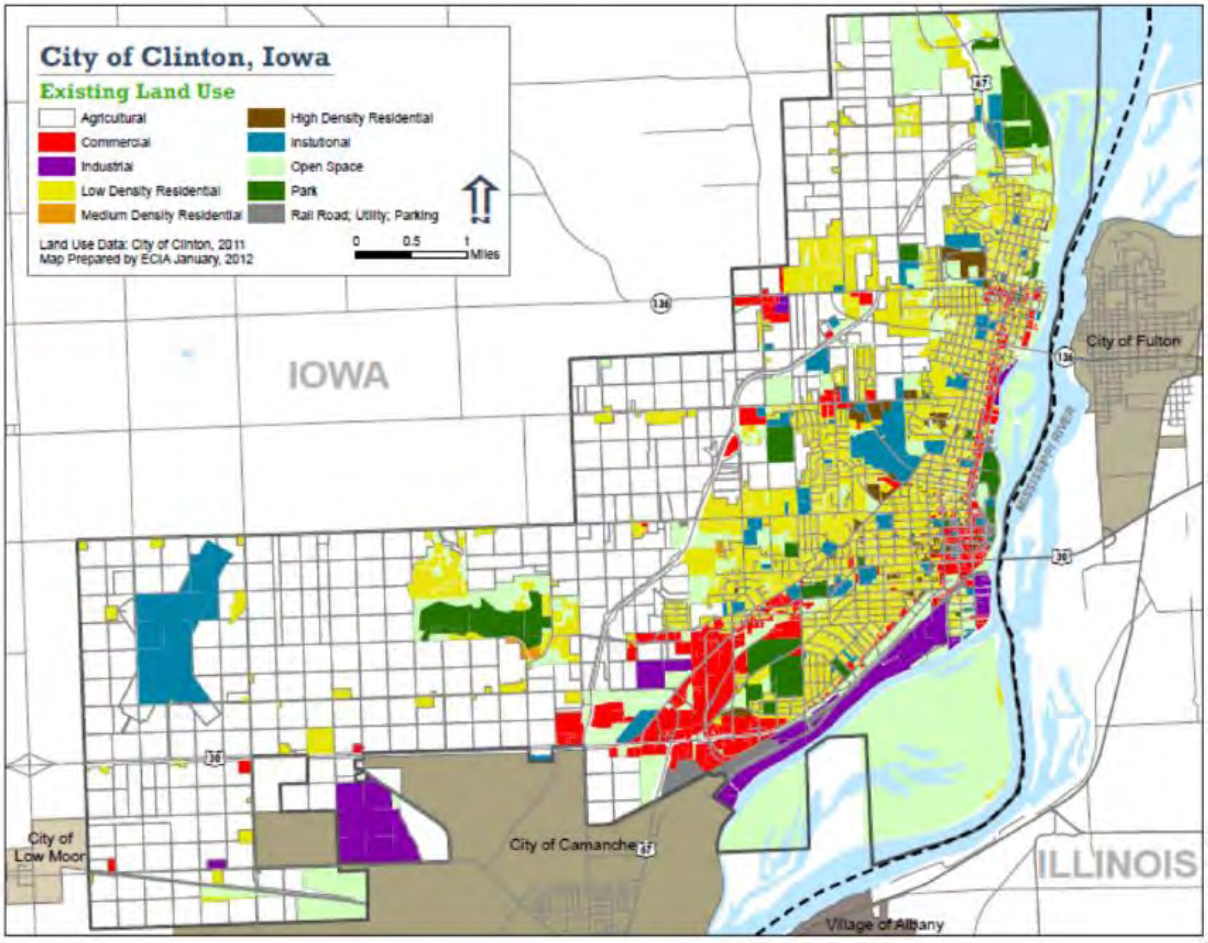
City of Charlotte

No specific future development is anticipated in the next five years.

City of Clinton

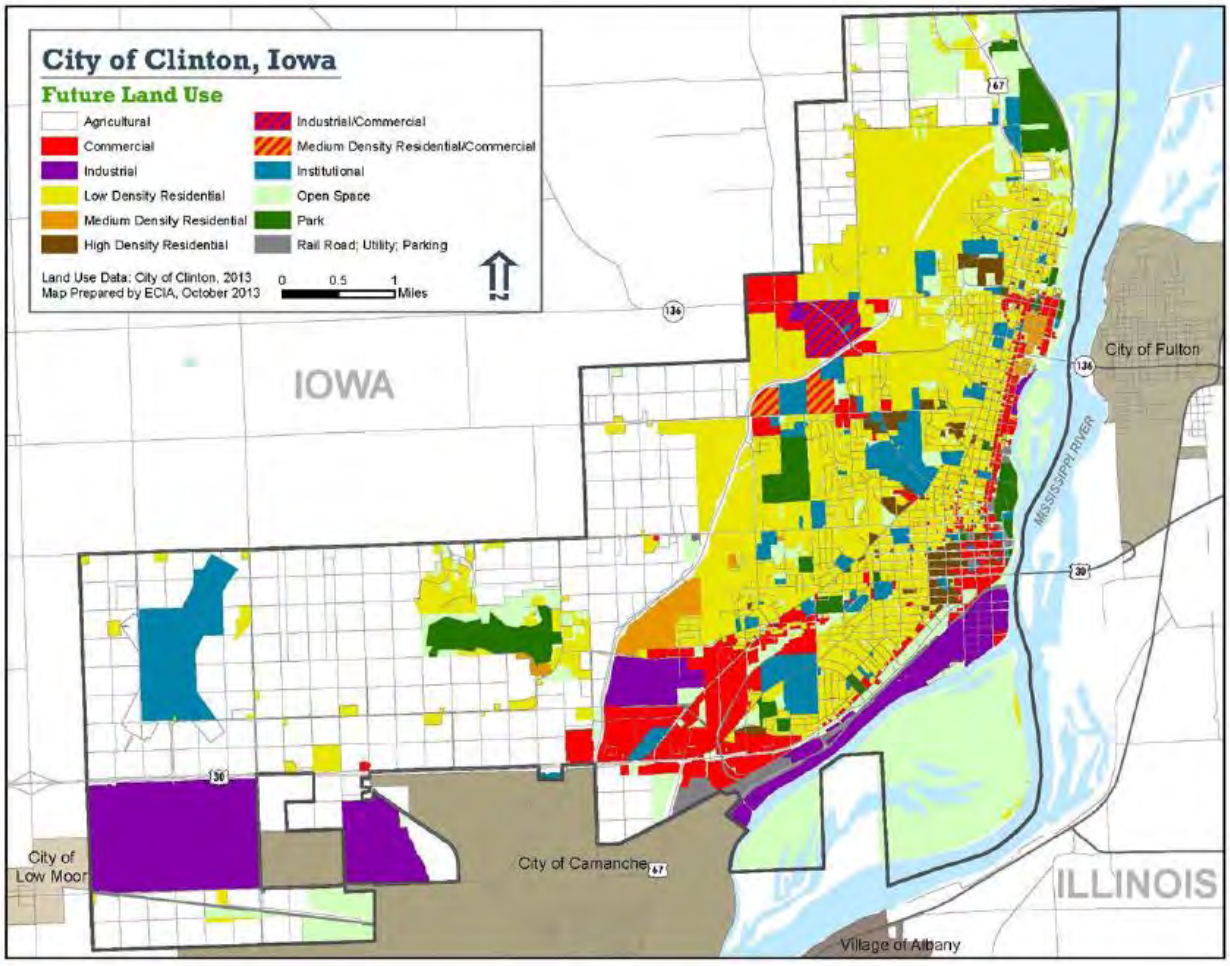
The City has seen new growth on the fringes of currently developed areas, specifically within the border of Mill Creek Parkway. One new residential subdivision has started, with others in the planning stages. Economic development efforts have been focused on the Lincolnway Rail and Air Park and the Lyons Business and Technology Park. No new development is slated for development in the floodplain. However, development may occur in levee protected areas. The Existing Land Use Map is provided as Figure 2-6 followed by the Future Land Use Map in Figure 2-7.

Figure 2-6 City of Clinton Existing Land Use Map



Source: City of Clinton 2032 Comprehensive Plan

Figure 2-7 City of Clinton Future Land Use Map

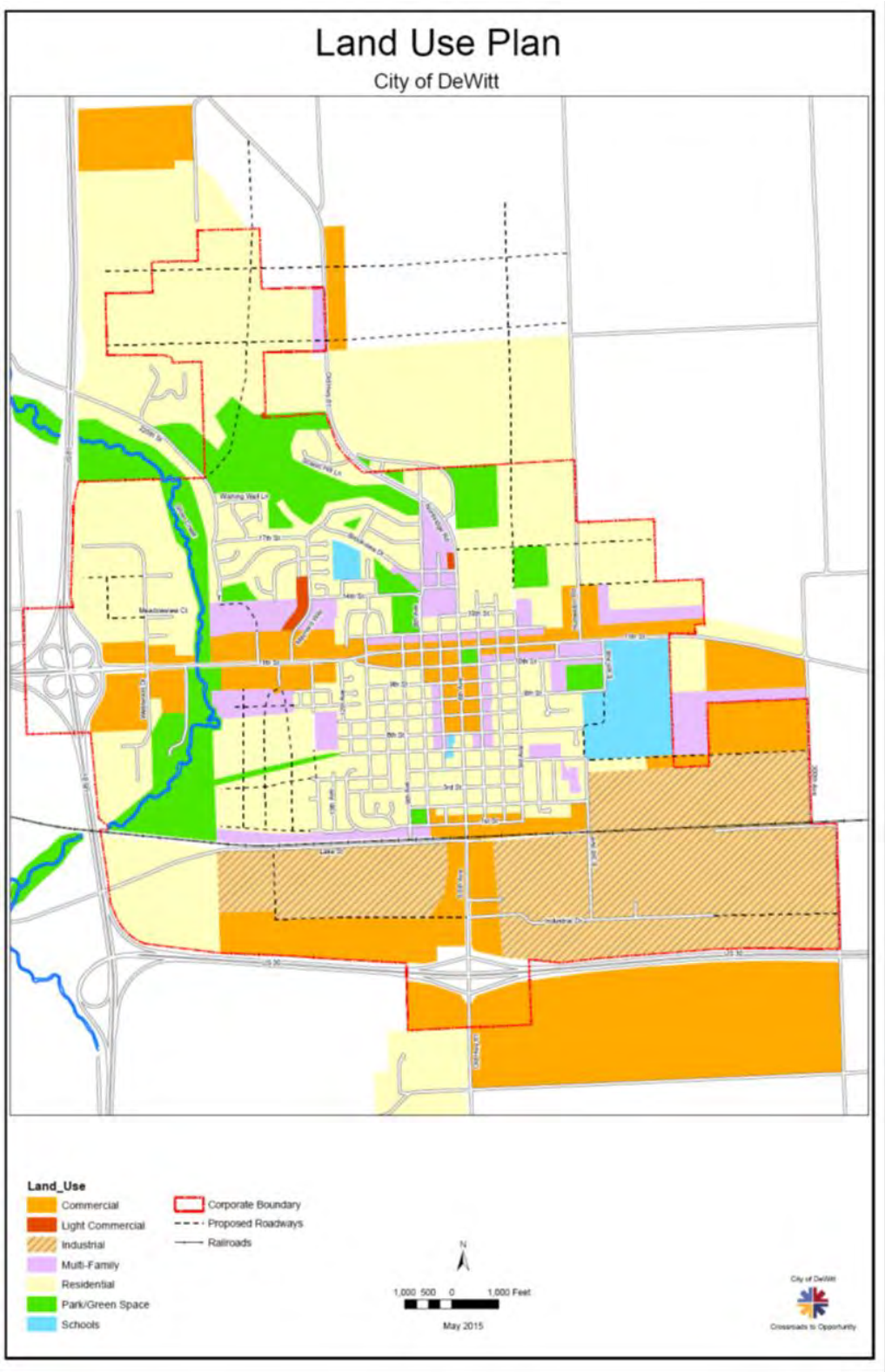


Source: City of Clinton 2032 Comprehensive Plan

City of De Witt

It is likely that the City of DeWitt will continue to have growth in the northwest corridor in the Hickory Bend, Cobblestone and Mackin Subdivision. There will also be continued growth in the southwest quarter in the Jacobson Farms Subdivision. Almost all this growth is outside of the floodplain. However, there are condos located in what was designated in the flood plain. These condos have been or will be permitted by the Iowa Department of Natural Resources (IDNR) and have no basements and have their base elevations at 1 foot of above the 100-year flood plain. The DeWitt Land Use Plan is provided as Figure 2-8.

Figure 2-8 DeWitt Land Use Plan Map



Source: City of DeWitt

City of Delmar

No specific future development is anticipated in the next five years.

City of Goose Lake

Potential growth could occur in the residential area of town.

City of Grand Mound

Storm sewer improvement project recently completed along Hwy 30 and Sunnyside Street.

City of Lost Nation

No specific future development is anticipated in the next five years.

City of Low Moor

No specific future development is anticipated in the next five years.

City of Toronto

No specific future development is anticipated in the next five years.

City of Welton

In process of constructing a new bridge.

City of Wheatland

No specific future development is anticipated in the next five years.

Calamus-Wheatland School District

Remodel of Wheatland classrooms is underway. Construction in progress at Calamus Elementary School.

Camanche School District

Undergoing renovations now. Camanche School District voters approved a $13.4 million bond issue in 2021 to pay for facilities improvements to address safety and security measures at the elementary building; construct, build, furnish and equip additions to the high school building; remodel, repair, furnish and equip the high school building; and improve the site.

Central De Witt School District

No specific future development plans at this time.

Clinton School District

The District broke ground for the new high school in 2021. The $62 million project will, in phases, replace most of the high school campus with new construction.

Delwood School District

No specific future development plans at this time.

Northeast School District

Possible elementary school expansion.

2.4 Jurisdictional Capabilities Summary

This section includes the capabilities of each jurisdiction that relate to their ability to implement mitigation opportunities. Table 2-66 through Table 2-67 summarize the following capabilities in the County and each incorporated city: city governance, policies & ordinances, programs, staffing & departments, non-governmental organizations (NGOs), and local funding availability.

Table 2-66 Mitigation Capabilities

Element	Clinton County	Andover	Calamus	Camanche	Charlotte	Clinton	Delmar	DeWitt	Goose Lake	Grand Mound	Lost Nation	Low Moor	Toronto	Welton	Wheatland
City Governance – Departments, Boards, & Commissions															
City Hall (City Clerk)	County Auditor	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Fire Department	NA	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	No – Contract with Wheatland	Yes- but not financially attached to the City of Welton	Yes
Police Department	Sheriff's Office	Sheriff's Office	Sheriff's Office	Yes	Sheriff's Office	Yes	Sheriff's Office	Yes	Sheriff's Office	Sheriff's Office	Sheriff's Office	Sheriff's Office	Sheriff's Office	Sheriff's Office	Sheriff's Office
Public Works Department	Secondary Roads	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	No	No	No	No	Yes
Planning & Zoning Commission	Yes	No	Yes – Hometown Pride Committee	Yes	No	Yes	No	No	Yes	Yes	No	No	No	Utilize County	Yes
Board Of Adjustments	County Assessor	No	No	No	No	Yes	No	No	No	Yes	No	No	No	No	No
Library Board of Trustees	NA	No	Yes	No	No	Yes	No	No	No	No	No	No	No	No	Yes
Electric Board of Trustees	NA	No	No	No	No	No	No	No	No	No	No	No	No	Yes- for Welton Township	No
Community Center Board	NA	Yes - Township Trustees	Yes	No	No	No	No	No	No	No	No	No	No	No	Yes
Policies/Ordinances															
Comprehensive/ Master/Land Use Plan	No	No	No	Yes-2006	No	Yes-2014 (2032 Comp Plan)	No	Yes-2016	No	No	No	No	No	No	No

Element	Clinton County	Andover	Calamus	Camanche	Charlotte	Clinton	Delmar	DeWitt	Goose Lake	Grand Mound	Lost Nation	Low Moor	Toronto	Welton	Wheatland
Capital Improvement Plan	Yes-5-year Road and Bridge Plan	No	No	Yes	No	Yes-2015 (updated annually)	No	Yes – 2016	No	No	No	No	No	No	No
Emergency Plan	Yes	County	County	County	Yes	County	County	County	Fire Department Ordinance - 2016 & County	County	County	County	County	County	County
Local Mitigation Plan	Yes	County HMP	County HMP	County HMP	County HMP	County HMP	County HMP	County HMP	County HMP	County HMP	County HMP	County HMP	County HMP	County HMP	County HMP
FMA Plan	No	No	No	No	No	No	No	No	No	No	No	No	No	Yes	No
Watershed Plan	No	No	No	No	No	No	No	No	No	No	No	No	No	No	No
Critical Facilities Plan (Mitigation/ Response/ Recovery)	No	No	No	No	No	No	No	No	No	No	No	No	No	No	No
Economic Development Plan	No	No	No	No	Yes	No	No	No	Yes - LMI plan under developme nt	No	No	No	No	No	No
Transportation Plan	Yes-2005, Traffic Incident Manageme nt Book	Yes-2005, Traffic Incident Manageme nt Book	Yes-2005, Traffic Incident Manageme nt Book	Yes-2005, Traffic Incident Manageme nt Book	Yes-2005, Traffic Incident Manageme nt Book	Yes-2005, Traffic Incident Manageme nt Book	Yes-2005, Traffic Incident Manageme nt Book	Yes – 2005 Traffic Incident Manageme nt Book	Yes-2005, Traffic Incident Manageme nt Book	No	No	No	Yes – 2005, Traffic Incident Manageme nt Book	Yes-2005, Traffic Incident Manageme nt Book	Yes-2005, Traffic Incident Manageme nt Book
Firewise Or Other Fire Mitigation Plan	No	No	No	No	No	No	No	No	No	No	No	No	No	No	No
Programs															
Zoning Ordinance	Yes-1999	No	Yes	Yes-2006	No	Yes-2001 was last review, comprehen	No	Yes	Yes	Yes	No	No	No	No	No

Element	Clinton County	Andover	Calamus	Camanche	Charlotte	Clinton	Delmar	DeWitt	Goose Lake	Grand Mound	Lost Nation	Low Moor	Toronto	Welton	Wheatland
						sive review planned									
Restricted Residential District	No	No	No	No	No	No	No	No	No	No	No	No	No	No	No
Subdivision Ordinance	Yes-1999	No	Yes	Yes	No	Yes-2016	No	No	Yes	No	No	No	No	No	No
Building Code	No	No	Yes	Yes	No	Yes-version 2012 adopted in 2014	No	Yes – 2012 IBC	Yes - Residential	No	No	No	No	No	No
Building Permit Ordinance	No	No	Yes	Yes	No	Yes	No	No	Yes	No	No	No	No	Yes	Yes
Floodplain Ordinance	Yes	Yes	Yes	Yes	Yes	Yes	No	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Tree Trimming Ordinance	No	No	Yes	No	No	Yes	No	Yes	Yes	No	No	No	No	No	Yes
Nuisance Ordinance	Yes-1996	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	No	No	No	Yes	Yes	Yes
Stormwater Ordinance	No	No	Yes	No	No	Yes	Yes	Yes	No	No	No	No	No	No	No
Drainage Ordinance	No	No	Yes	No	No	Yes-part of stormwater ordinance	Yes	No	No	No	No	No	No	Yes	No
Site Plan Review Requirements	Yes-in Subdivision Ordinance	No	Yes	Yes	No	Yes	No	Yes	No	No	No	No	No	No	No
Historic Preservation Ordinance	No	No	No	No	No	Yes	No	No	No	No	No	No	No	No	No
Landscape Ordinance	No	No	No	No	No	Yes	No	No	Yes	No	No	No	No	No	No
Iowa Wetlands and Riparian Areas Conservation Plan	No	No	No	No	No	No	No	No	No	No	No	No	No	No	No
Debris Management Plan	Yes	County	County	County	County	County	County	County	County	County	County	County	County	County	County

Element	Clinton County	Andover	Calamus	Camanche	Charlotte	Clinton	Delmar	DeWitt	Goose Lake	Grand Mound	Lost Nation	Low Moor	Toronto	Welton	Wheatland
Zoning/Land Use Restrictions	Yes	No	Yes	Yes	No	Yes	No	No	Yes	No	No	No	No	No	No
Codes Building Site/Design	No	No	Yes	Yes	No	Yes	No	Yes	Yes	No	No	No	No	No	No
NFIP Participant	Yes Joined 9/1/90	Yes Joined 7/9/13	Yes Joined 8/9/11	Yes Joined 12/18/84	Yes Joined 9/4/85	Yes Joined 9/17/80	No, doesn't have any identified floodplain	Yes Joined 10/27/95	Yes Joined 11/9/11	Yes Joined 7/18/11	Yes Joined 7/18/11	Yes Joined 7/18/11	Yes Joined 7/18/11	Yes Joined 9/4/85	Yes Joined 7/18/11
NFIP CRS Participant	No	No	No	No	No	No	No	No	No	No	No	No	No	No	No
Hazard Awareness Program	Yes	No	No	No	No	No	No	No	No	No	No	No	No	No	No
Engineering Studies for Streams (Local/County/ Regional)	Yes	No	No	No	No	No	No	No	Yes	No	No	No	No	No	No
National Weather Service (NWS) Storm Ready	Yes-2021 review, applies to entire county and all jurisdictions	County	County	County	County	County	County	County	County	County	County	County	County	County	County
Building Code Effectiveness Grading (BCEGs)	No	No	No	No	No	Yes-Rating 4/5	No	No	No	No	No	No	No	No	No
ISO Fire Rating	Unknown	Unknown	Unknown	Rating - 5	Yes	Yes-Rating 2	Unknown	04/4Y	Not Reported	No	No	No	Not Reported	Not Reported	Rating: 7
Economic Development Program	No	No	No	No	No	Yes-urban renewal/ revitalization plans	No	No	No	No	No	No	No	No	No
Land Use Program	Yes	No	No	Yes	No	No	No	No	No	No	No	No	No	No	No
Public Education/ Awareness	Yes	No	No	No	No	Yes	No	No	Yes	No	No	No	No	No	No

Element	Clinton County	Andover	Calamus	Camanche	Charlotte	Clinton	Delmar	DeWitt	Goose Lake	Grand Mound	Lost Nation	Low Moor	Toronto	Welton	Wheatland
Property Acquisition	No	No	No	No	No	No	No	Yes	No	No	No	No	No	No	No
Planning/Zoning Boards	Yes	No	No	Yes	No	Yes	No	No	No	No	No	No	No	No	No
Stream Maintenance Program	Yes	No	No	No	No	No	No	No	No	No	No	No	No	No	No
Tree Trimming Program	Yes-for County Parks	No	No	No	No	Yes	Yes	No	No	No	No	No	No	No	No
Engineering Studies for Streams (Local/ County/Regional)	Yes	No	No	No	No	No	No	No	No	No	No	No	No	No	No
Mutual Aid Agreements	Yes-2016	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Staff/Departments															
Building Code Official	No	No	No	Yes - Full	No	Yes	No	Yes	No	No	No	No	No	No	No
Building Inspector	No	No	No	Yes	No	Yes	No	Yes	No	No	No	No	No	No	No
Mapping Specialist (GIS)	Yes	No	No	No	No	Contracted	No	Yes – Part Time	No	No	No	No	No	No	No
Engineer	Yes	Contracted when needed	No	Contracted when needed	No	Yes	No	Yes	No	No	No	No	No	No	Contracted
Public Works Official	Yes-County Engineer	Yes	Yes	Yes	Yes	Separate Public Works Divisions for streets, solid waste, transit, fleet, and wastewater	Yes	No	Yes	No	No	No	Yes	No	No
Emergency Response Team	Yes	No	No	No	No	Contracted when needed-	No	No	No	No	No	No	Yes	No	No

Element	Clinton County	Andover	Calamus	Camanche	Charlotte	Clinton	Delmar	DeWitt	Goose Lake	Grand Mound	Lost Nation	Low Moor	Toronto	Welton	Wheatland
						East Central Intergovernmental Association									
NFIP Floodplain Administrator	Yes	Yes	Yes	Yes	Yes	Yes	No	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Development Planner	Yes	Yes	Yes	Yes	Yes	Yes	No	No	Yes	No	No	No	No	No	No
Emergency Management Coordinator	Yes	County	County	County	County	County	County	County	County	County	County	County	County	County	County
Hazardous Materials Expert	Contracted-Davenport Haz-Mat Team	Contracted-Davenport Haz-Mat Team	Contracted-Davenport Haz-Mat Team	Contracted-Davenport Haz-Mat Team	Contracted-Davenport Haz-Mat Team	Contracted-Davenport Haz-Mat Team	Contracted-Davenport Haz-Mat Team	Contracted Davenport Haz-Mat Team	Contracted-Davenport Haz-Mat Team	Contracted-Davenport Haz-Mat Team	Contracted-Davenport Haz-Mat Team	Contracted-Davenport Haz-Mat Team	Contracted-Davenport Haz-Mat Team	Contracted-Davenport Haz-Mat Team	Contracted-Davenport Haz-Mat Team
Local Emergency Planning Committee	Yes-Region 6 LEPC	Yes-Region 6 LEPC	Yes-Region 6 LEPC	Yes-Region 6 LEPC	Yes-Region 6 LEPC	Yes-region 6 LEPC	Yes-region 6 LEPC	Yes-region 6 LEPC	Yes-Region 6 LEPC	Yes-Region 6 LEPC	Yes-Region 6 LEPC	Yes-Region 6 LEPC	Yes-Region 6 LEPC	Yes-Region 6 LEPC	Yes-Region 6 LEPC
County Emergency Management Commission	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Sanitation Department	Yes	No	No	Contracted	No	Yes	No	Contracted	Contracted	No	No	No	No	No	Yes
Transportation Department	Yes-Secondary Roads Dept.	No	No	No	No	Yes	No	No	No	No	No	No	No	No	Yes
Economic Development Department	No	No	No	No	No	Yes	No	Public/Private Development Company	No	No	No	No	No	No	No
Housing Department	No	No	No	No	No	Yes-rental inspection program	No	No	No	No	No	No	No	No	No
Planning Consultant	Contracted	Contracted	Contracted	Contracted	Contracted	Yes	Contracted	Contracted	Contracted	No	No	No	Contracted	Contracted	Contracted

Element	Clinton County	Andover	Calamus	Camanche	Charlotte	Clinton	Delmar	DeWitt	Goose Lake	Grand Mound	Lost Nation	Low Moor	Toronto	Welton	Wheatland
Regional Planning Agencies	East Central Intergovernmental Association	East Central Intergovernmental Association	East Central Intergovernmental Association	East Central Intergovernmental Association	East Central Intergovernmental Association	East Central Intergovernmental Association	East Central Intergovernmental Association	East Central Intergovernmental Association	East Central Intergovernmental Association	East Central Intergovernmental Association	East Central Intergovernmental Association	East Central Intergovernmental Association	East Central Intergovernmental Association	East Central Intergovernmental Association	East Central Intergovernmental Association
Historic Preservation	No	No	No	No	No	Yes		No	No	No	No	No	No	No	No
Non-Governmental Organizations (NGOs)															
American Red Cross	No-utilize Dubuque Chapter	No-utilize Dubuque Chapter	No-utilize Dubuque Chapter	No-utilize Dubuque Chapter	No-utilize Dubuque Chapter	No-utilize Dubuque Chapter	No-utilize Dubuque Chapter	No-utilize Dubuque Chapter	No-utilize Dubuque Chapter	No-utilize Dubuque Chapter	No-utilize Dubuque Chapter	No-utilize Dubuque Chapter	No-utilize Dubuque Chapter	No-utilize Dubuque Chapter	No-utilize Dubuque Chapter
Salvation Army	No	No	No	No	No	Yes	No	Yes	No	No	No	No	No	No	No
Veterans Groups	Yes-multiple	No	No	No	Yes	Yes-Amvets	No	Yes	No	No	No	No	No	No	No
Environmental Groups	No	No	No	No	No	No	No	No	No	No	No	No	No	No	No
Homeowner Associations	Yes	No	No	Yes	No	Yes	No	Yes	No	No	No	No	No	No	No
Neighborhood Associations	Unknown	No	No	No	No	Yes	No	No	No	No	No	No	No	No	No
Chamber Of Commerce	N/A	No	No	Yes	No	Yes	No	Yes	No	No	No	No	No	No	No
Community Organizations (Lions, Kiwanis, Etc.)	Yes-multiple	Yes-Lions	Yes	Yes	Yes	Yes	Yes	Yes	Yes	No	No	No	No	No	No
Local Funding Availability															
Apply for Community Development Block Grants	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	No	No	No	Yes	Yes	No
Ability to fund projects through Capital Improvements funding	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	No	No	No	No	Yes	No

Element	Clinton County	Andover	Calamus	Camanche	Charlotte	Clinton	Delmar	DeWitt	Goose Lake	Grand Mound	Lost Nation	Low Moor	Toronto	Welton	Wheatland
Authority to levy taxes for a specific purpose	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	No	No	No	Yes	No	No
Fees for water, sewer, gas, or electric services	No	Yes	Yes	Yes	Yes	Yes, the City does not own the water	Yes	Yes	Yes	No	No	No	Yes - Sewer	Yes	No
Impact fees for new development	No	No	No	No	Yes	Yes	No	No	No	No	No	No	No	No	No
Ability to incur debt through general obligation bonds	Yes	No	Yes	Yes	Yes	Yes	Yes	Yes	Yes	No	No	No	Yes	Yes	Yes
Ability to incur debt through special tax bonds	Yes	No	No	Yes	Yes	Yes	Yes	No	Yes	No	No	No	Yes	No	Yes
Ability to incur debt through private activities	No	No	No	No	No	No	No	No	No	No	No	No	No	No	Yes
Ability to withhold spending in hazard prone areas	Unknown	No	No	No	No	No	No	No	Yes	No	No	No	No	No	Yes
Other Local Funding Availability	No	No	Yes	No	No	No	No	Yes	No	No	No	No	No	Yes	No

Table 2-67 Additional Jurisdictional Capabilities

Jurisdiction	Mitigation-related Public Education Programs	Mitigation Programs	Tornado Safe Rooms
Clinton County (unincorporated)	Annual fire safety open houses and EMA outreach involvement. Annual Law Enforcement Night Outs and EMA involvement. EMA outreach on severe weather and personal preparedness.	Alert Iowa, Reverse 911	Yes - DeWitt Secondary Roads building
Andover	Smoke detector program to install Smoke detectors in residences that don't have one	None Reported	None

Jurisdiction	Mitigation-related Public Education Programs	Mitigation Programs	Tornado Safe Rooms
Calamus	Fire Prevention Week	Changing water meters for accurate water usage per household (water conservation)	None
Camanche	Fire Department does a fire safety open house annually.	In process of text notification capability	Fire Station
Charlotte	Fire Safety	None Reported.	None
Clinton	A local newsletter goes to every residence in Clinton. The City has offered three different Citizen's Academies in recent years: an overall view of the City, a Police specific academy, and a Fire specific academy. Both Police and Fire do trainings within the community related to safety as well as utilize social media for the same purpose.	Standby Generator for Beaver Channel Pump Station. Creation of a wetland in a flood zone through property acquisition of property. Redid storm sewers in the turtle creek area.	None – through the County
Delmar	None reported	Emergency generator for sewer lagoon.	None
DeWitt	-The DeWitt Fire Department annually speaks with all area pre-schools and elementary schools (grades K thru 3rd) for Fire Prevention Week in October. -Smoke detectors installed at residents that do not have sufficient detectors. Flyers are taken to churches and schools, etc. -The Fire Department also arranges to have a Smoke House at the annual National Night Out. The house teaches how to safely exit a building that is on fire.	In 2011 the City made improvements to its east drainage ditch including adding a detention area on the north side and cleaning and reshaping the ditch system. This system has alleviated (although not completed stopped) street flooding and private property flooding.	None
Goose Lake	Programs offered by ECIA	The City of Goose Lake and the Northeast Community School district jointly funded a civil engineer to look at storm water issues and provide possible solutions.	The Northeast Community School District has a FEMA approved tornado shelter/saferoom that is to be accessible to the public population of Goose Lake when a tornado advisory is in effect.
Grand Mound	Public notices, social media, Fire Department	None Reported	None
Lost Nation	None Reported	Removal of dilapidated buildings	None
Low Moor	Quarterly utility bills include a "did you know" information slip that may review ordinances and policies	None Reported	None
Toronto	None Reported	None Reported	None
Welton	None Reported	None Reported	Fire Station – not designed to FEMA standard
Wheatland	Fire safety program	None Reported	None

Chapter 29C of the Code of Iowa creates the State Emergency Management Division and the local Emergency Management Commission in Iowa. Clinton County has an active Emergency Management Commission that coordinates emergency management capabilities in the County. This Commission has developed the Emergency Management Grant Funding program to address the need for mitigation projects in the County. There is also an active Community Emergency Response Team (CERT) in the County to supplement response capabilities. There are 36 outdoor warning sirens throughout the county in incorporated and unincorporated areas. Of these, 18 owned by the County, 18 owned by Constellation Energy. All are activated by Clinton County Communications. Clinton County participates in the Emergency Notification System (CCENS), part of the Alert Iowa system contracted with RAVE Mobile Safety. All jurisdictions within the County have the ability to utilize this service.

2.5 Public School District Profiles and Mitigation Capabilities

This section includes general profile information for six Clinton County school districts. The school districts with buildings in the planning area are as follows.

- Calamus-Wheatland School District
- Camanche School District
- Central DeWitt School District
- Clinton School District
- Delwood School District
- Northeast School District

Portions of the Easton Valley, Maquoketa, and Midland School District boundaries extend into Clinton County from adjacent counties. However, there are not buildings associated with these school districts in Clinton County.

Figure 2-9 provides the boundaries of the school districts in Clinton County, and Table 2-68 provides location and enrollment information for each school district.

Figure 2-9 Clinton County, Iowa Public School Districts

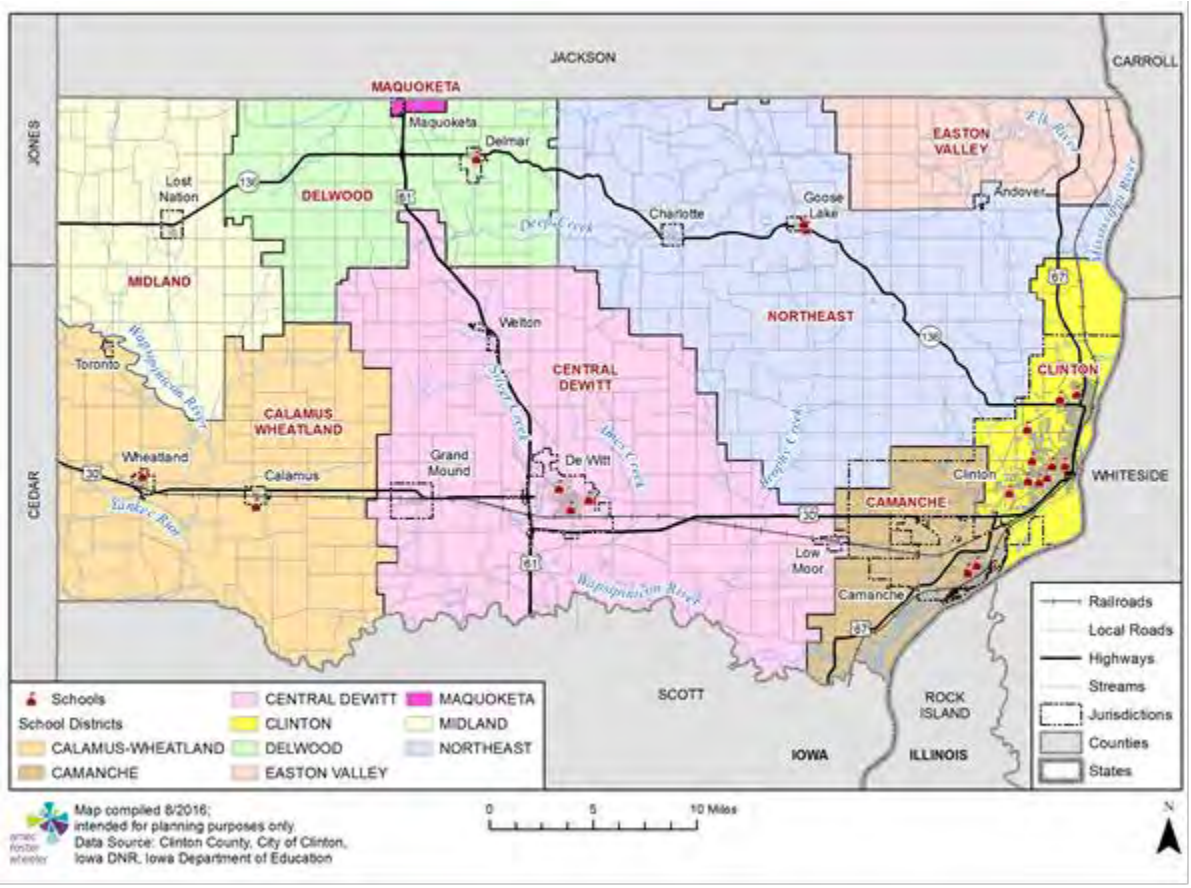


Table 2-68 Clinton County School Enrollment Data, 2020-2021

District Name	2020-2021 Enrollment
Calamus-Wheatland	392
Camanche	812
Central DeWitt	1,462
Clinton	3,652
Delwood	212
Northeast	524

Source: Iowa Department of Education, Bureau of Planning, Research and Evaluation
http://educateiowa.gov/index.php?option=com_content&view=article&id=346&Itemid=4439

Potential capabilities to implement mitigation programs and projects can vary among school districts. To determine mitigation capabilities, each of the participating school districts completed a Data Collection Guide to report planning, personnel, fiscal, and other capabilities related to implementation of mitigation programs and projects. Table 2-69 provides a summary of the reported capabilities for each participating school district

Table 2-69 Summary of Mitigation Capabilities, Clinton County Public School Districts

Element	Calamus-Wheatland School District	Camanche School District	Central DeWitt School District	Clinton School District	Delwood School District	Northeast School District
Policies/Ordinance						
Master Plan	Yes- 2011	No	No	No	Yes -2015	Yes-2016
Capital Improvement Plan	No	Yes-2015	Yes-2015	No	Yes -2012	Yes-2016
School Emergency Plan	Yes	Yes	Yes	Yes	Yes	Yes-2016
Local Mitigation Plan	Yes	Yes	Yes	Yes	Yes	Yes-2016
FMA Plan	No	No	No	No	No	Yes-2016
Watershed Plan	No	No	No	No	No	Yes-2016
Critical Facilities Plan (Mitigation/Response/ Recovery)	No	Yes	Yes	No	No	Yes
Transportation Plan	Yes	Yes	Yes	Yes	No	No
Firewise Or Other Fire Mitigation Plan	No	Yes	Yes	No	No	Yes
Debris Management Plan	County	County	County	County	County	County
Programs						
Hazard Awareness Program	Yes	Yes	Yes	Yes – Right to Know, Blood Banks, Asbestos	No	Yes
NWS Storm Ready	County	County	County	County	County	County
Public Education & Awareness	Yes	Yes	Yes	Yes	No	Yes
Tree Trimming Program	Yes	Yes	No	No	No	Yes
Mutual Aid Agreements	Yes	Yes	Yes	Yes – Mercy One, Red Cross	Yes	Yes
Staff/Department						

Element	Calamus-Wheatland School District	Camanche School District	Central DeWitt School District	Clinton School District	Delwood School District	Northeast School District
Building Code Official	Yes-Principal/ Superintendent	Yes- Principal	Yes	No	Yes – Principal	Yes- Superintendent
Building Inspector	No	No	No	No	No	No
Mapping Specialist (GIS)	No	No	No	No	No	No
Engineer	No	No	No	No	No	No
Public Works Official	No	No	No	No	No	No
Emergency Response Team	Yes	Yes	No	No	No	Yes
Development Planner	No	No	No	No	No	No
Emergency Management Coordinator	County	Yes- Superintendent	Yes – Director of Operations	County	County	County
Grant Writer	No	No	Yes- Superintendent	No	Yes- Superintendent	No
Public Information Officer	No	Yes- Superintendent	Yes- Business Manager	No	Yes – Superintendent	No
Sanitation Department	Yes	No	No	No	Yes	No
Transportation Department	Yes	Yes	Yes	Yes	Yes	Yes
Local Funding Availability						
Apply for Community Development Block Grants	NA	NA	NA	NA	NA	NA
Ability to fund projects through Capital Improvements funding	Yes	Yes	Yes	Yes	Yes	Yes
Authority to levy taxes for a specific purpose	NA	NA	Yes	Yes	NA	NA
Fees for water, sewer, gas, or electric services	NA	NA	No	No	NA	NA
Impact fees for new development	NA	NA	No	No	NA	NA

Element	Calamus-Wheatland School District	Camanche School District	Central DeWitt School District	Clinton School District	Delwood School District	Northeast School District
Ability to incur debt through general obligation bonds	Yes-voter approval needed	Yes-voter approval needed	Yes	Yes	Yes – voter approval needed	Yes-voter approval needed
Ability to incur debt through special tax bonds	Yes-voter approval needed	Yes-voter approval needed	No	No	Yes – voter approval needed	Yes-voter approval needed
Ability to incur debt through private activities	Yes	Yes	No	No	Yes	Yes
Ability to withhold spending in hazard prone areas	Yes	Yes	No	No	NA	NA
Other Local Funding Availability	Yes-limited	Yes-limited	No	No	Yes	Yes
Other						
NOAA Weather Radios	Yes	Yes	Yes	Yes	Yes	Yes
Tornado Shelter/Saferoom	No	No	No	No	No	Yes
Anticipated Enrollment Change - Next 5 Years	No change anticipated	Stable to small decrease	2% increase or decrease	Unknown	Unknown	Unknown

2.6 Opportunities for Capabilities Enhancement

The 2021-2022 update process provided the County and participating jurisdictions an opportunity to review and update the capabilities currently in place to mitigate hazards. There are also opportunities for the County and jurisdictions to expand or improve on their policies, programs and fiscal capabilities and further protect the community. Future improvements may include providing training for staff members related to hazards or hazard mitigation grant funding in partnership with the County, City, School Districts, and Iowa Department of Homeland Security and Emergency Management (DHSEM). Additional training opportunities will help to inform County, City and District staff members on how best to integrate hazard information and mitigation projects into their departments.

The following are specific examples of potential opportunities for enhancing existing capabilities identified by the HMPC:

- The County will continue to work with all jurisdictions to adopt and update their building codes.
- Multiple jurisdictions do not have tree trimming programs. Broken branches during windstorms are a major cause of power outages.
- All jurisdictions will work on improving the integration of hazards information and mitigation planning into other plans and processes, see Section 5.2.
- City of Camanche – Including more information on hazards and mitigation in the quarterly newsletters and use of social media.
- City of Clinton – Posting flood evacuation routes. Adding emergency generators at all flood stations. Acquiring property in flood zones.

3 Risk Assessment

DMA Requirement §201.6(c)(2):
[The plan shall include] A risk assessment that provides the factual basis for activities proposed in the strategy to reduce losses from identified hazards. Local risk assessments must provide sufficient information to enable the jurisdiction to identify and prioritize appropriate mitigation actions to reduce losses from identified hazards. The risk assessment shall include:
(i) A description of the type, location, and extent of all natural hazards that can affect the jurisdiction. The plan shall include information on previous occurrences of hazard events and on the probability of future hazard events.
(ii) A description of the jurisdiction's vulnerability to the hazards described in paragraph (c)(2)(i) of this section. This description shall include an overall summary of each hazard and its impact on the community. The plan should describe vulnerability in terms of:
(A) The types and numbers of existing and future buildings, infrastructure, and critical facilities located in the identified hazard areas;
(B) An estimate of the potential dollar losses to vulnerable structures identified in paragraph (c)(2)(ii)(A) of this section and a description of the methodology used to prepare the estimate;
(C) Providing a general description of land uses and development trends within the community so that mitigation options can be considered in future land use decisions.

The risk assessment process identifies and profiles relevant hazards and assesses the exposure of lives, property, and infrastructure of Clinton County, Iowa to these hazards. The goal of the risk assessment is to estimate the potential loss in the planning area, including loss of life, personal injury, property damage, and economic loss, from a hazard event. The risk assessment process allows communities in the planning area to better understand their potential risk to the identified hazards and provides a framework for developing and prioritizing mitigation actions to reduce risk from future hazard events.

The risk assessment for Clinton County and participating jurisdictions followed the methodology described in the 2013 FEMA Local Mitigation planning Handbook, which includes a four-step process:

Step 1—Describe Hazards

Step 2—Identify Community Assets

Step 3—Analyze Risks

Step 4—Summarize Vulnerability

This chapter is divided into six main parts:

- Section 3.1 Hazard Identification identifies the hazards that threaten the planning area and the methodology utilized to score or rank the hazards;
- Section 3.2 Assets at Risk provides the planning area's total exposure to natural hazards, considering critical facilities and other community assets at risk;
- Section 3.3 Hazard Profiles and Vulnerability for each hazard, this section is divided into two parts: 1) Hazard Profile discusses the threat to the planning area, the geographic location/extent at risk, previous occurrences of hazard events, and probability of future occurrence; and 2) Vulnerability Assessment further discusses specific assets at risk as well as loss estimates. Specifically, where data is available, this section defines and quantifies populations, buildings, critical facilities, and other community assets at risk to natural hazards with estimates of potential losses to those assets, where possible;

- Section 3.4 Hazard Analysis Summary provides a tabular summary of the hazard ranking for each jurisdiction in the planning area.

3.1 Hazard Identification

The hazards identified for this plan update are listed below in alphabetical order

- Animal/Plant/Crop Disease
- Cyber Attacks
- Dam/Levee Failure
- Drought
- Earthquake
- Extreme Heat
- Flooding – Riverine and Flash Flooding
- Grass/Wildland Fire
- Hazardous Materials
- Human Disease
- Infrastructure Failure
- Radiological Incident
- Severe Winter Storm
- Sinkholes
- Terrorism
- Thunderstorm/Lightning/Hail
- Tornado/Windstorm
- Transportation Incident

Sections 3.1.1 through 3.1.4 describe how these hazards were identified for this plan update.

3.1.1 Review of Existing Mitigation Plans

Prior to 2010, Hazard Mitigation Planning in Clinton County was implemented on a jurisdictional basis. In 2010-2011, the jurisdictions of Clinton County participated in the development of the first Clinton County Multi-Jurisdictional Multi-Hazard Mitigation Plan. This multi-jurisdictional plan was approved by Iowa Homeland Security and Emergency Management Department and FEMA, with a formal approval date of July 20, 2011. Since that time, this multi-jurisdictional plan has served as a guide for implementation of the mitigation strategy for Clinton County, the incorporated cities, and the public school districts that participated in development of that plan. The HMP was updated and re-adopted in 2017.

This plan is the result of multi-jurisdictional coordination to update the 2016 plan. To identify hazards to include in the Risk Assessment update, a comparison was performed between the hazard identification in the 2018 Iowa State Hazard Mitigation Plan and the 2016 Clinton County Multi-Jurisdictional Multi-Hazard Mitigation Plan. After a review of the hazards, it was agreed to generally keep the way hazards are named and grouped consistent with the 2018 State Plan; however, while riverine flooding and street flooding are grouped in the same profile they are analyzed separately to reflect the very different risk profiles of these two hazards. This plan also profiles cyber attacks as a separate hazard, while the State plan profiles them under terrorism.

3.1.2 Review Disaster Declaration History

Additional Information utilized to identify hazards relevant for Clinton County was obtained by examining events that triggered federal disaster declarations. Federal and/or state declarations may be granted when the severity and magnitude of an event surpasses the ability of the local government to respond and recover. Disaster assistance is supplemental and sequential. When the local government's capacity has been surpassed, a state disaster declaration may be issued, allowing for the provision of state assistance. If the disaster is so severe that both the local and state governments' capacities are exceeded, a federal emergency or disaster declaration may be issued allowing for the provision of federal assistance.

FEMA also issues emergency declarations, which are more limited in scope and do not include the long-term federal recovery programs of major disaster declarations. Determinations for declaration type are based on scale and type of damages and institutions or industrial sectors affected.

Table 3-1 lists federal disaster declarations that included Clinton County for the period from 1965 through 2021.

Table 3-1 FEMA Disaster Declarations that included Clinton County, 1960-2020

Major Disaster Declaration Number	Declaration Date	Incident Period	Description
4557	8/17/2020	8/10/2020	Severe Storms
4483	3/23/2020	1/20/2020-continuing	Covid-19 Pandemic
3480	3/13/2020	1/20/2020-continuing	Covid-19
4421	3/23/2019	3/12/2019-continuing	Severe Storms and Flooding
4119	5/31/2013	4/17-4/30/2013	Severe Storms, Straight-line Winds, and Flooding
1763	5/27/2008	5/25-8/13/2008	Severe Storms, Tornadoes, Flooding
1737	1/4/2008	12/10-12/11/2007	Severe Winter Storm
1688	3/14/2007	2/23-3/2/2007	Severe Winter Storm
3239	9/10/2005	8/29-10/1/2005	Hurricane Katrina Evacuation
1518	5/25/2004	5/19-6/24/2004	Severe Storms, Tornadoes, Flooding
1420	6/19/2002	6/3-6/25/2002	Severe Storms and Flooding
1367	5/2/2001	4/8-5/29/2001	Severe Storms and Flooding
1277	5/21/1999	5/16-5/29/1999	Severe Storms, Flooding, Tornadoes
1230	7/2/1998	6/13 to 7/15/1998	Severe Weather, Tornadoes and Flooding
996	7/9/1993	4/13-10/1/1993	Flooding, Severe Storm
868	5/26/1990	5/18-7/6/1990	Flooding, Severe Storm
443	6/24/1974	6/24/1974	Severe Storms, Flooding
356	5/23/1973	5/23/1973	Severe Storms, Flooding
259	4/25/1969	4/25/1969	Flooding
248	8/4/1968	8/4/1968	Heavy Rains, Flooding
193	4/22/1965	4/22/1965	Flooding

Source: Federal Emergency Management Agency, www.fema.gov/

The US Department of Agriculture's Secretary of Agriculture is authorized to designate counties as disaster areas to make emergency loans (EM) to producers suffering losses in those counties, and in counties that are contiguous to a designated county. In addition to EM eligibility, other emergency assistance programs, such as Farm Service Agency (FSA) disaster assistance programs, have historically used disaster designations as an eligibility requirement trigger.

Table 3-2 provides the United States Department of Agriculture (USDA) Secretarial disaster declarations that included Clinton County from 2009 through 2021.

Table 3-2 USDA Secretarial Disaster Declarations Including Clinton County, 2009-2021

USDA Declaration Number	Approval Date	Description
S4786	8/10/2020	Derecho

USDA Declaration Number	Approval Date	Description
S4508	8/7/2019	Excessive Moisture, Flooding and Flash Flooding
S3865	8/12/2015	Excessive Rainfall and Flooding
S3264	7/11/2012	Frost/Freeze
S3310	8/1/2012	Drought, High Winds, Fire/Wildfire, Excessive Heat, Insects
S3311	8/1/2012	Drought, High Winds, Fire/Wildfire, Excessive Heat, Insects
S2902	4/1/2010	Excessive Rainfall and Flooding
S2898	5/15/2009	Severe Storms, Hail and Flooding

Source: US Department of Agriculture; https://www.fsa.usda.gov/programs-and-services/disaster-assistance-program/disaster-designation-information/index and 2016 Clinton County Multi-Jurisdictional Hazard Mitigation Plan

3.1.3 Research Additional Sources

Additional data on locations and past impacts of hazards in the planning area was collected from the following sources:

- Clinton County Digital Flood Insurance Rate Map (DFIRM), FEMA
- Preliminary DFIRM Panels (7) to be Effective in November 2016, FEMA
- Clinton County Emergency Management
- Clinton County Flood Insurance Study, FEMA
- Clinton County Multi-Jurisdictional Multi-Hazard Mitigation Plan (2016)
- Data Collection Guides completed by each jurisdiction
- Environmental Protection Agency
- FEMA
- Flood Insurance Administration
- Iowa Department of Agriculture and Land Stewardship, Division of Soil Conservation
- Iowa Department of Education, Bureau of Information and Analysis Services
- IDNR
- Iowa Department of Public Safety
- Iowa Department of Transportation, Office of Traffic and Safety
- Iowa State Hazard Mitigation Plan (September 2018)
- Iowa Utilities Board
- National Drought Mitigation Center Drought Reporter
- National Fire Incident Reporting System (NFIRS)
- NOAA National Center for Environmental Information
- Pipeline and Hazardous Materials Safety Administration
- US Army Corps of Engineers
- USDA Risk Management Agency Crop Insurance Statistics
- US Department of Transportation
- United States Geological Survey
- Various articles and publications available on the internet (sources are indicated where data is cited)

3.1.4 Hazards Identified

Through the hazard identification review process, 20 natural and human-caused/technological hazards with the potential to significantly affect the planning area were chosen for further analysis in the risk assessment. The hazards identified for this plan update are listed below in alphabetical order:

1. Animal/Plant/Crop Disease
2. Cyber Attack
3. Dam/Levee Failure
4. Drought
5. Earthquake
6. Expansive Soils
7. Extreme Heat
8. Flooding – Riverine and Flash Flooding
9. Grass or Wildland Fire
10. Hazardous Materials
11. Human Disease
12. Infrastructure Failure
13. Landslide
14. Radiological Incident
15. Severe Winter Storm
16. Sinkholes
17. Terrorism
18. Thunderstorm/Lightning/Hail
19. Tornado/Windstorm
20. Transportation Incident

The hazards identified for this update include all hazards that were included in the 2018 Iowa State Hazard Mitigation Plan, as well as cyber attack which was profiled under terrorism in the state plan. For this multi-jurisdictional plan, the risks are assessed for each jurisdiction where they deviate from the risks facing the entire planning area.

The planning area is fairly uniform in terms of climate and topography as well as building construction characteristics. Accordingly, the geographic areas of occurrence for weather-related hazards do not vary greatly across the planning area for most hazards. The more urbanized areas within the planning area have more assets that are vulnerable to the weather-related hazards and varied development trends impact the future vulnerability. Similarly, more rural areas have more assets (crops/livestock) that are vulnerable to drought. These differences are discussed in greater detail in the vulnerability sections of each hazard.

Although 18 hazards with the potential to significantly affect the planning area were identified and selected for additional analysis, not all hazards impact every jurisdiction. Table 3-3 provides a summary of the jurisdictions impacted by each hazard. An "x" indicates the jurisdiction is impacted by the hazard. A "N/A" indicates the hazard is not applicable to that jurisdiction.

Table 3-3 Hazards Identified for Each Jurisdiction

Jurisdiction	Animal/Plant/Crop Disease	Cyber Attack	Dam / Levee Failure	Drought	Earthquake	Expansive Soils	Extreme Heat	Flash Flooding	Grass/Wildland Fire	Hazardous Materials Incident	Human Disease	Infrastructure Failure	Landslide	Radiological Incident	Riverine Flooding	Severe Winter Storm	Sinkholes	Terrorism	Thunderstorm/Lightning/Hail	Tornado/Windstorm	Transportation Incident
Unincorporated County	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x
Andover	x	x	-	x	x	x	x	x	x	x	x	x	-	x	x	x	x	x	x	x	x
Calamus	x	x	-	x	x	x	x	-	x	x	x	x	-	x	x	x	x	x	x	x	x
Camanche	x	x	-	x	x	x	x	x	x	x	x	x	-	x	x	x	x	x	x	x	x

Jurisdiction	Animal/Plant/Crop Disease	Cyber Attack	Dam / Levee Failure	Drought	Earthquake	Expansive Soils	Extreme Heat	Flash Flooding	Grass/Wildland Fire	Hazardous Materials Incident	Human Disease	Infrastructure Failure	Landslide	Radiological Incident	Riverine Flooding	Severe Winter Storm	Sinkholes	Terrorism	Thunderstorm/Lightning/Hail	Tornado/Windstorm	Transportation Incident
Charlotte	x	x	-	x	x	x	x	x	x	x	x	x	-	x	x	x	x	x	x	x	x
Clinton	x	x	x	x	x	x	x	x	x	x	x	x	-	x	x	x	x	x	x	x	x
Delmar	x	x	-	x	x	x	x	-	x	x	x	x	-	x	x	x	x	x	x	x	x
DeWitt	x	x	-	x	x	x	x	x	x	x	x	x	-	x	x	x	x	x	x	x	x
Goose Lake	x	x	-	x	x	x	x	x	x	x	x	x	-	x	x	x	x	x	x	x	x
Grand Mound	x	x	-	x	x	x	x	x	x	x	x	x	-	x	x	x	x	x	x	x	x
Lost Nation	x	x	-	x	x	x	x	x	x	x	x	x	-	x	x	x	x	x	x	x	x
Low Moor	x	x	-	x	x	x	x	x	x	x	x	x	-	x	x	x	x	x	x	x	x
Toronto	x	x	-	x	x	x	x	x	x	x	x	x	-	x	x	x	x	x	x	x	x
Welton	x	x	-	x	x	x	x	x	x	x	x	x	-	x	x	x	x	x	x	x	x
Wheatland	x	x	-	x	x	x	x	x	x	x	x	x	-	x	x	x	x	x	x	x	x
Calamus - Wheatland School District	x	x	-	x	x	x	x	-	x	x	x	x	-	x	x	x	x	x	x	x	x
Camanche School District	x	x	-	x	x	x	x	-	x	x	x	x	-	x	x	x	x	x	x	x	x
Central DeWitt School District	x	x	-	x	x	x	x	-	x	x	x	x	-	x	x	x	x	x	x	x	x
Clinton School District	x	x	x	x	x	x	x	-	x	x	x	x	-	x	x	x	x	x	x	x	x

Jurisdiction	Animal/Plant/Crop Disease	Cyber Attack	Dam / Levee Failure	Drought	Earthquake	Expansive Soils	Extreme Heat	Flash Flooding	Grass/Wildland Fire	Hazardous Materials Incident	Human Disease	Infrastructure Failure	Landslide	Radiological Incident	Riverine Flooding	Severe Winter Storm	Sinkholes	Terrorism	Thunderstorm/Lightning/Hail	Tornado/Windstorm	Transportation Incident
Delwood School District	x	x	-	x	x	x	x	-	x	x	x	x	-	x	x	x	x	x	x	x	x
Northeast School District	x	x	-	x	x	x	x	-	x	x	x	x	-	x	x	x	x	x	x	x	x

"-" Indicates hazard not applicable to this jurisdiction

3.1.5 Hazard Scoring Methodology

Proposed mitigation actions were prioritized based on a hazard scoring system that considers four elements of risk: probability, magnitude/severity, warning time, and duration. Table 3-4 provides definitions for each of the four elements along with associated rating levels.

Table 3-4 Hazard Score Element Definitions and Rating Scales

Element/Score	Definitions
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	
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—Occasional	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% or 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% or the event is likely to occur.
4—Highly Likely	More than 33% probability in any given year (event has up to 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 jurisdiction.	
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.

Element/Score	Definitions
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. This should be taken as an average warning time.	
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 time (up to 6 hours warning).
Duration: A measure of the duration of time that the hazard will affect the jurisdiction.	
1	Less than 6 hours.
2	Less than 1 day.
3	Less than 1 week.
4	More than one week.

Using the rating scales described in the table above, the formula used to determine each hazard's score, including weighting factors, is provided below:

(Probability x.45) + (Magnitude/Severity x.30) + (Warning Time x.15) + (Duration x.10) = SCORE

Based on the hazard's overall weighted score, the hazards are categorized as follows: High (3.0-4.0), Moderate (2.0-2.9), and Low (1.0-1.9).

These terms relate to the level of planning analysis to be given to the particular hazard in the risk assessment process and are not meant to suggest that a hazard would have only limited impact. In order to focus on the most critical hazards, those assigned a level of high or moderate were given more extensive attention in the remainder of the risk assessment (e.g., quantitative analysis or loss estimation), while those with a low planning significance were addressed in more general or qualitative ways.

The HMPC determined overview hazard ranking scores for the planning area as a whole. The results of this overview are provided below in Table 3-5 Additionally, the hazard ranking overview is provided at the beginning of each hazard profile and vulnerability section. A detailed hazard summary by jurisdiction is provided at the conclusion of each hazard profile and vulnerability section to provide a summary of how the hazard varies by jurisdiction.

Table 3-5 Clinton County Planning Area Hazard Ranking Results

Hazard	Probability	Magnitude	Warning Time	Duration	Score	Planning Significance
Animal/Plant/Crop Disease	1	4	4	4	2.65	Moderate
Cyber Attack	3	3	4	4	3.25	High
Dam/Levee Failure	1	4	4	4	2.65	Moderate
Drought	4	2	1	4	2.95	Moderate
Earthquake	1	1	4	1	1.45	Low
Expansive Soils	1	1	1	1	1	Low
Extreme Heat	4	2	1	3	2.85	Moderate

Hazard	Probability	Magnitude	Warning Time	Duration	Score	Planning Significance
Flash Flooding	4	2	4	2	3.2	High
Grass or Wildland Fire	2	2	4	1	2.20	Moderate
Hazardous Materials Incident	4	1	4	1	2.80	Moderate
Human Disease	3	3	2	4	2.95	High
Infrastructure Failure	4	2	4	3	3.30	High
Landslide	1	1	1	1	1	Low
Radiological Incident	1	3	4	4	2.35	Moderate
Riverine Flooding	3	2	2	4	2.65	Moderate
Severe Winter Storm	4	2	3	4	3.25	High
Sinkholes	1	2	4	1	1.75	Low
Terrorism	1	4	4	4	2.65	Moderate
Thunderstorm/Lightning/Hail	4	2	3	1	2.95	Moderate
Tornado/Windstorm	4	3	4	1	3.55	High
Transportation Incident	4	3	4	1	3.55	High

3.1.6 Climate Change

According to the Fourth National Climate Assessment, climate change impacts in the Midwest will include increased frequency of late-growing season drought conditions. Future conditions of surface soil moisture are projected to increase in insufficient levels in summer driven by an increase in temperatures leading to greater loss of moisture through evaporation (US Global Change Research Program 2018).

Iowa is already beginning to experience changes to its climate, to include:

More Precipitation

- Increased frequency of precipitation extremes that can lead to flooding.
- Increase of 8 percent more precipitation from 1873 to 2008.
- A larger increase in precipitation in eastern Iowa than in western Iowa.

Higher Temperatures

- Long-term winter temperatures have increased six times more than summer temperatures.
- Nighttime temperatures have increased more than daytime temperatures since 1970.
- Iowa's humidity has risen substantially, especially in summer, which now has 13 percent more atmospheric moisture than 35 years ago as indicated by a 3 - 5 degree F rise in dew-point temperature. This fuels convective thunderstorms that provide more summer precipitation.

Agricultural Challenges

- Climate extremes, not averages, have the greater impact on crop and livestock productivity.
- Increased soil erosion and water runoff.
- Increased challenges associated with manure applications.
- Favorable conditions for survival and spread of many unwanted pests and pathogens.

Habitat Changes

- Plants are leafing out and flowering sooner.
- Birds are arriving earlier in the spring.

- Particular animals are now being sighted farther north than in the past.

Public Health Effects

- Increases in heart and lung programs from increasing air pollutants of ozone and fine particles enhanced by higher temperatures.
- Increases in infectious diseases transmitted by insects that require a warmer, wetter climate.
- An increased prevalence of asthma and allergies.

Climate change considerations are further discussed under each hazard profile.

3.2 Assets at Risk

This section assesses the population, structures, critical facilities and infrastructure, and other important assets in the planning area that may be at risk to hazards.

3.2.1 Total Exposure of Population and Structures

Unincorporated County and Incorporated Cities

Table 3-6 provides a summary of the assets at risk in the planning area including total population, total buildings, improved parcel counts and improvement/dwelling values for the county and each city in the planning area broken down by usage type. Population data is based on the US Census Bureau's 2015-2019 American Community Survey – 5-year Estimates. Building counts and building exposure values are based on building footprints obtained from Microsoft and parcel data provided by the Clinton County Assessor's Office. The methodology employed to extract the summary of building/improvement counts and values from the parcel data is provided below:

- Parcel values that had an associated dwelling or improvement value were used to determine the number of improved parcels;
- Microsoft building footprints were used to identify individual buildings;
- The contents exposure values were calculated by factoring a multiplier to the building exposure values based on usage type. The contents multipliers were derived from Hazus and are defined below Table 3-6; and
- Land values have been purposely excluded from the tables because land remains following disasters, and subsequent market devaluations are frequently short-term and difficult to quantify. Additionally, state and federal disaster assistance programs generally do not address loss of land or its associated value (other than crop insurance).

Population data is based on the 2019 population estimates from the US Census Bureau reported by ISU of Science and Technology. Building Exposure values are based on parcel data provided by the Clinton County GIS Department. Contents Exposure Values were calculated by factoring a multiplier to the Building Exposure Values based on property type. According to the assessor's data, the sum of the actual value improvements in the County is $2,840,492,463 (total building exposure). Contents exposure is estimated as a percent of the improvement value (specifically, 50% of the improvement value for residential and multi-residential structures, 150% for industrial structures, 100% for agricultural structures, commercial, and mixed use structures), based on standard FEMA methodologies. Table 3-7 That follows provides a summary of the improved parcel counts and values by usage type.

Table 3-6 Population and Building Exposure by Jurisdiction-Unincorporated County and Incorporated Cities

Jurisdiction	2019 Population Estimate	Improved Parcel Count	Building Count	Improved Value	Estimated Content Value	Total Value
Andover	98	48	66	$3,114,769	$1,947,699	$5,062,468
Calamus	401	213	267	$13,223,165	$7,852,123	$21,075,288
Camanche	4,365	1,753	2,373	$263,598,001	$166,104,946	$429,702,947
Charlotte	361	184	239	$12,248,244	$7,266,584	$19,514,828
Clinton	25,093	10,476	12,904	$1,446,904,098	$1,116,718,605	$2,563,622,703
Delmar	483	253	341	$20,455,785	$11,541,695	$31,997,480
DeWitt	5,192	2,168	2,477	$414,970,747	$290,083,946	$705,054,693
Goose Lake	220	114	138	$17,101,435	$12,699,350	$29,800,785
Grand Mound	593	294	380	$28,579,408	$17,279,730	$45,859,138
Lost Nation	406	245	287	$12,321,486	$7,327,571	$19,649,057
Low Moor	247	145	207	$12,066,198	$6,653,988	$18,720,186
Maquoketa	5,990	1	3	$1,110	$1,110	$2,220
Toronto	117	72	89	$2,262,279	$1,281,574	$3,543,853
Welton	148	85	111	$6,255,763	$3,774,753	$10,030,516
Wheatland	723	357	438	$32,556,199	$19,103,569	$51,659,768
Unincorporated	1,992	4,406	11,771	$554,833,776	$294,888,075	$849,721,851
Total	**46,429**	**20,814**	**32,091**	**$2,840,492,463**	**$1,964,525,316**	**$4,805,017,779**

Sources: Clinton County Assessor's GIS Office, Microsoft Footprint Database, Population - US Census Bureau reported by ISU of Science and Technology, Wood Analysis

Table 3-7 Building/Improvement Counts by Usage Type

Jurisdiction	Agricultural	Commercial	Exempt	Industrial	Mixed Use	Residential	Total
Andover	-	5	2	-	2	57	66
Calamus	12	31	10	2	2	210	267
Camanche	14	118	25	45	10	2,161	2,373
Charlotte	16	20	11	-	3	189	239
Clinton	60	1,091	-	121	99	11,533	12,904
Delmar	-	24	14	-	1	302	341
DeWitt	1	262	90	18	26	2,080	2,477
Goose Lake	1	11	13	-	1	112	138
Grand Mound	4	36	20	-	2	318	380
Lost Nation	9	28	15	-	6	229	287
Low Moor	24	-	3	-	1	179	207
Maquoketa	3	-	-	-	-	-	3
Toronto	4	3	4	-	1	77	89
Welton	4	13	1	-	-	93	111
Wheatland	12	42	15	-	1	368	438
Unincorporated	1,751	110	48	16	2	9,844	11,771
Total	1,915	1,794	271	202	157	27,752	32,091

Source: Clinton County Assessor's GIS Office Microsoft Footprint Database, Wood Analysis

Public School Districts

The enrolled number of students at the participating public school districts is provided in Table 3-8, as well as the number of buildings, building values (building exposure) and contents value (contents exposure).

Table 3-8 Enrollment and Building Exposure by Jurisdiction-Public School Districts

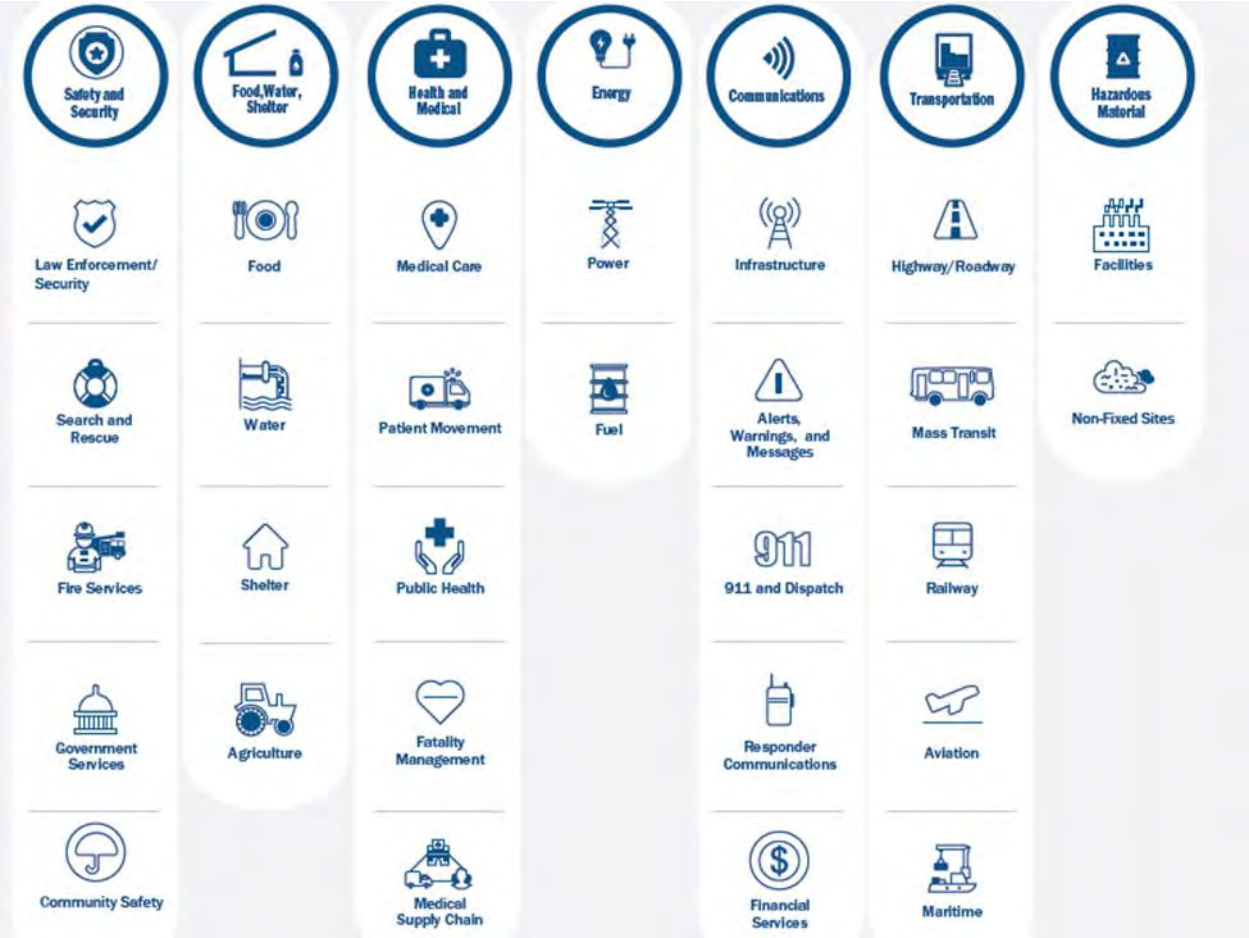
Public School District	2020-2021 Enrollment	Building Count	Building Exposure ($)	Contents Exposure ($)	Total Exposure ($)
Calamus-Wheatland	453	6 (2 schools)	18,936,507	$2,272,667	21,209,174
Camanche	94,	4	$38,700,000	$3,755,000	42455004
Central DeWitt	1,603	8			
Clinton	3,504	11	$150,981,014	$16,130,074	$167,111,088
Delwood	150	1	$5,800,000	N/A	$5,800,000
Northeast	889	6 (2 schools)	$36,043,739	$1,841,263	$37,885,002
Total	**7,543**	**28**			

Source: Enrollment Statistics from 2020-2021 Iowa Public School PreK-12 Enrollments by District – Iowa Department of Education, Bureau of Information and Analysis Services; Building Count and Exposure from Data Collection Guides from Public School Districts

3.2.2 Critical and Essential Facilities and Infrastructure

For the purposes of this plan, a critical facility is defined as one that is essential in providing utility or direction either during the response to an emergency or during the recovery operation. FEMA organizes critical facilities into seven lifeline categories as shown in Figure 3-1.

Figure 3-1 FEMA Lifeline Categories



Source: FEMA

These lifeline categories standardize the classification of critical facilities and infrastructure that provide indispensable service, operation, or function to a community. A lifeline is defined as providing indispensable service that enables the continuous operation of critical business and government functions, and is critical to human health and safety, or economic security. These categorizations are particularly useful as they:

- Enable effort consolidations between government and other organizations (e.g. infrastructure owners and operators)
- Enable integration of preparedness efforts among plans; easier identification of unmet critical facility needs
- Refine sources and products to enhance awareness, capability gaps, and progress towards stabilization
- Enhance communication amongst critical entities, while enabling complex interdependencies between government assets
- Highlight lifeline related priority areas regarding general operations as well as response efforts.

To develop a comprehensive list of critical facilities in Clinton County, three data sources were compiled and broken down along the three aforementioned critical asset categories: Clinton County's GIS databases

of critical facilities and infrastructure. The results of this analysis are summarized in Table 3-9 and broken down in further detail in Table 3-10.

The best available data was used, but some limitations include lack of complete or comprehensive data and values such as replacement costs. These databases were used in vulnerability assessments for hazards such as dam and flood and are represented in maps and tables in the vulnerability by hazard section that follows. Figure 3-2 illustrates the location of critical facilities in Clinton County.

Table 3-9 Summary of Critical Facilities and Infrastructure by Jurisdiction

Jurisdiction	Com	Energy	Food,	Hazar	Healt	Safety	Transp	Total
Andover	-	-	2	-	-	1	-	**3**
Calamus	-	1	4	3	-	2	-	**10**
Camanche	1	5	17	12	1	9	3	**48**
Charlotte	-	-	6	-	-	1	2	**9**
Clinton	29	11	33	48	26	39	29	**215**
Delmar	-	-	3	-	-	4	-	**7**
DeWitt	8	1	6	17	6	12	13	**63**
Goose Lake	-	-	5	-	-	4	-	**9**
Grand Mound	3	-	5	1	-	2	1	**12**
Lost Nation	-	-	3	1	-	2	1	**7**
Low Moor	-	-	3	4	-	2	-	**9**
Toronto	-	-	1	-	-	1	-	**2**
Welton	-	-	2	1	-	1	1	**5**
Wheatland	-	-	3	-	2	2	2	**9**
Unincorporated	45	8	89	16	-	6	331	**495**
Total	**86**	**26**	**184**	**103**	**35**	**88**	**383**	**903**

Source: Clinton County, IDNR, National Bridge Inventory, HIFLD, HSIP

Table 3-10 Inventory of Critical Facilities and Infrastructure by Jurisdiction

Jurisdiction	FEMA Lifeline	Facility Type	Count
Andover	Food, Water, Shelter	Water Treatment Plant	2
	Safety and Security	Fire Station	1
		Total	**3**
Calamus	Energy	Electric Substation	1
	Food, Water, Shelter	Wastewater Treatment Plant	1
		Water Treatment Plant	1
		Water Use Well	2
	Hazardous Material	EHS Tier II Facility	1
		EPA RMP Facility	1
		Tier II Facility	1

Jurisdiction	FEMA Lifeline	Facility Type	Count
	Safety and Security	Fire Station	1
		Government Building	1
		Total	**10**
Camanche	Communications	Microwave Service Tower	1
	Energy	Electric Substation	5
	Food, Water, Shelter	Water Treatment Plant	2
		Water Use Well	15
	Hazardous Material	Contaminated Facilities	1
		EHS Tier II Facility	4
		EPA RMP Facility	2
		Tier II Facility	5
	Health and Medical	Nursing Home	1
	Safety and Security	Daycare	2
		Fire Station	1
		Law Enforcement	1
		Public School	3
		Solid Waste Facility	2
	Transportation	Bridge - Fair Condition	1
		Bridge - Good Condition	2
		Total	**48**
Charlotte	Food, Water, Shelter	Open Feedlot	1
		Wastewater Treatment Plant	1
		Water Treatment Plant	1
		Water Use Well	3
	Safety and Security	Fire Station	1
	Transportation	Bridge - Fair Condition	1
		Bridge - Good Condition	1
		Total	**9**
Clinton	Communications	Cell Tower	13
		Microwave Service Tower	14
		Paging Tower	2
	Energy	Electric Substation	9
		Power Plant	2
	Food, Water, Shelter	Open Feedlot	1
		Wastewater Treatment Plant	1
		Water Treatment Plant	6
		Water Use Well	25

Jurisdiction	FEMA Lifeline	Facility Type	Count
	Hazardous Material	Contaminated Facilities	5
		EHS Tier II Facility	18
		EPA RMP Facility	8
		Tier II Facility	17
	Health and Medical	Healthcare	10
		Nursing Home	13
		Public Health Office	1
		Vulnerable Population	2
	Safety and Security	College	2
		Daycare	5
		EOC	1
		Fire Station	3
		Government Building	4
		Law Enforcement	2
		Preschool	4
		Private	1
		Public School	8
		Solid Waste Facility	9
	Transportation	Airport	1
		Bridge - Fair Condition	10
		Bridge - Good Condition	15
		Bridge - Poor Condition	2
		Heliport	1
		Total	**215**
Delmar	Food, Water, Shelter	Water Treatment Plant	1
		Water Use Well	2
	Safety and Security	Fire Station	1
		Government Building	2
		Public School	1
		Total	**7**
DeWitt	Communications	Cell Tower	3
		Microwave Service Tower	5
	Energy	Electric Substation	2
	Food, Water, Shelter	Wastewater Treatment Plant	1
		Water Treatment Plant	1
		Water Use Well	3
	Hazardous Material	Contaminated Facilities	1

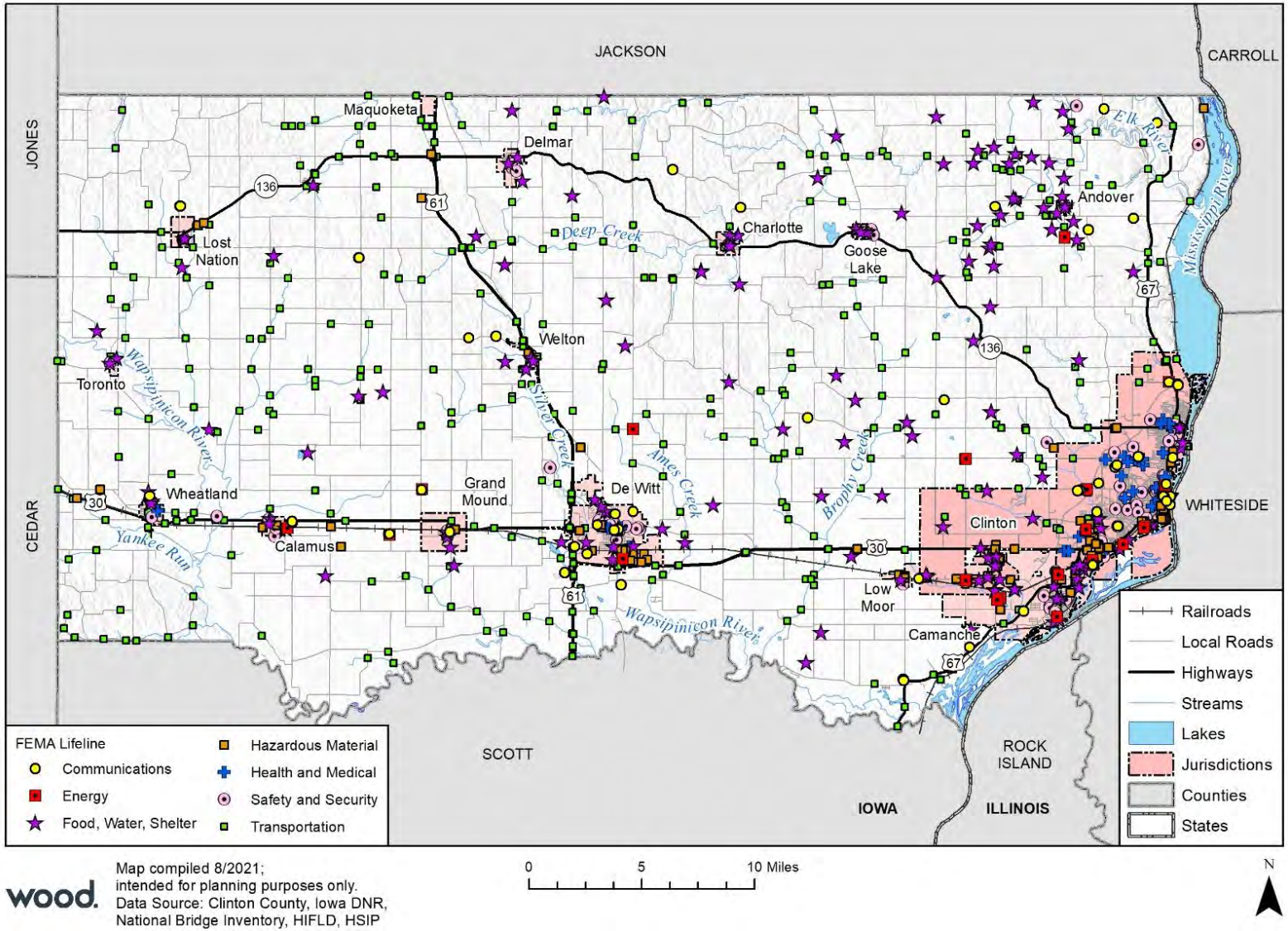
Jurisdiction	FEMA Lifeline	Facility Type	Count
		EHS Tier II Facility	6
		EPA RMP Facility	2
		Tier II Facility	8
	Health and Medical	Healthcare	1
		Nursing Home	4
		Vulnerable Population	1
	Safety and Security	Daycare	2
		Fire Station	1
		Government Building	2
		Law Enforcement	1
		Preschool	1
		Private	1
		Public School	4
	Transportation	Bridge - Fair Condition	9
		Bridge - Good Condition	3
		Government Building	1
		Total	**63**
Goose Lake	Food, Water, Shelter	Wastewater Treatment Plant	1
		Water Treatment Plant	2
		Water Use Well	2
	Safety and Security	Daycare	1
		Fire Station	1
		Public School	2
		Total	**9**
Grand Mound	Communications	Cell Tower	3
	Food, Water, Shelter	Wastewater Treatment Plant	1
		Water Treatment Plant	1
		Water Use Well	3
	Hazardous Material	EPA RMP Facility	1
	Safety and Security	Fire Station	1
		Government Building	1
	Transportation	Bridge - Fair Condition	1
		Total	**12**
Lost Nation	Food, Water, Shelter	Water Treatment Plant	1
		Water Use Well	2
	Hazardous Material	EPA RMP Facility	1
	Safety and Security	Fire Station	1

Jurisdiction	FEMA Lifeline	Facility Type	Count
		Government Building	1
	Transportation	Bridge - Good Condition	1
		Total	**7**
Low Moor	Food, Water, Shelter	Water Treatment Plant	1
		Water Use Well	2
	Hazardous Material	EHS Tier II Facility	2
		EPA RMP Facility	2
	Safety and Security	Fire Station	1
		Government Building	1
		Total	**9**
Toronto	Food, Water, Shelter	Water Treatment Plant	1
	Safety and Security	Fire Station	1
		Total	**2**
Welton	Food, Water, Shelter	Water Treatment Plant	1
		Water Use Well	1
	Hazardous Material	EPA RMP Facility	1
	Safety and Security	Fire Station	1
	Transportation	Bridge - Good Condition	1
		Total	**5**
Wheatland	Food, Water, Shelter	Water Treatment Plant	1
		Water Use Well	2
	Health and Medical	Nursing Home	2
	Safety and Security	Fire Station	1
		Public School	1
	Transportation	Bridge - Good Condition	2
		Total	**9**
Unincorporated County	Communications	Cell Tower	24
		Microwave Service Tower	21
	Energy	Electric Substation	8
	Food, Water, Shelter	Open Feedlot	61
		Shelter	1
		Wastewater Treatment Plant	7
		Water Treatment Plant	17
		Water Use Well	3
	Hazardous Material	EHS Tier II Facility	7
		EPA RMP Facility	4
		Tier II Facility	5

Jurisdiction	FEMA Lifeline	Facility Type	Count
	Safety and Security	Public School	1
		Solid Waste Facility	5
	Transportation	Bridge - Fair Condition	97
		Bridge - Good Condition	219
		Bridge - Poor Condition	15
		Total	**495**
		Grand Total	**903**

Source: Clinton County, IDNR, National Bridge Inventory, HIFLD, HSIP

Figure 3-2 Clinton County Critical Facilities



Other Assets

Assessing the vulnerability of the planning area to disaster also involves inventorying the natural, historic, cultural, and economic assets of the area. This is important for the following reasons:

- The plan participants may decide that these types of resources warrant a greater degree of protection due to their unique and irreplaceable nature and contribution to the overall economy.
- If these resources are impacted by a disaster, knowing about them ahead of time allows for more prudent care in the immediate aftermath, when the potential for additional impacts is higher.
- The rules for reconstruction, restoration, rehabilitation, and/or replacement are often different for these types of designated resources.
- Natural resources can have beneficial functions that reduce the impacts of natural hazards, such as wetlands and riparian habitat, which help absorb and attenuate floodwaters.
- Losses to economic assets (e.g., major employers or primary economic sectors) could have severe impacts on a community and its ability to recover from disaster.

In the planning area, specific assets include the following:

Threatened and Endangered Species: Table 3-11 includes Federally Threatened, Endangered, Proposed and Candidate Species in Clinton County, Iowa.

Table 3-11 Threatened and Endangered Species in Clinton County

Group	Common Name	Scientific Name	Status
Clams	Higgins eye	*Lampsilis higginsii*	Endangered
Flowering Plants	Eastern prairie fringed orchid	*Platanthera leucophaea*	Threatened
	Prairie bush-clover	*Lespedeza leptostachya*	Threatened
	Western prairie fringed Orchid	*Platanthera praeclara*	Threatened
Insects	Regal fritillary	*Speyeria idalia*	Under Review
	Monarch butterfly	*Danaus pleippus*	Candidate
Mammal	Northern Long-Eared Bat	*Myotis septentrionalis*	Threatened
Reptile	Eastern Massasuga	*Sistrurus catenatus*	Threatened

Source: US Fish and Wildlife Service, http://www.fws.gov/midwest/endangered/lists/iowa_cty.html

Natural Resources: The Clinton County Conservation Board manages 22 parks and wildlife areas around the county. There are also four State-managed wildlife areas and three federally managed areas, as well as two privately operated public areas. Table 3-12 and Figure 3-3 provide additional details.

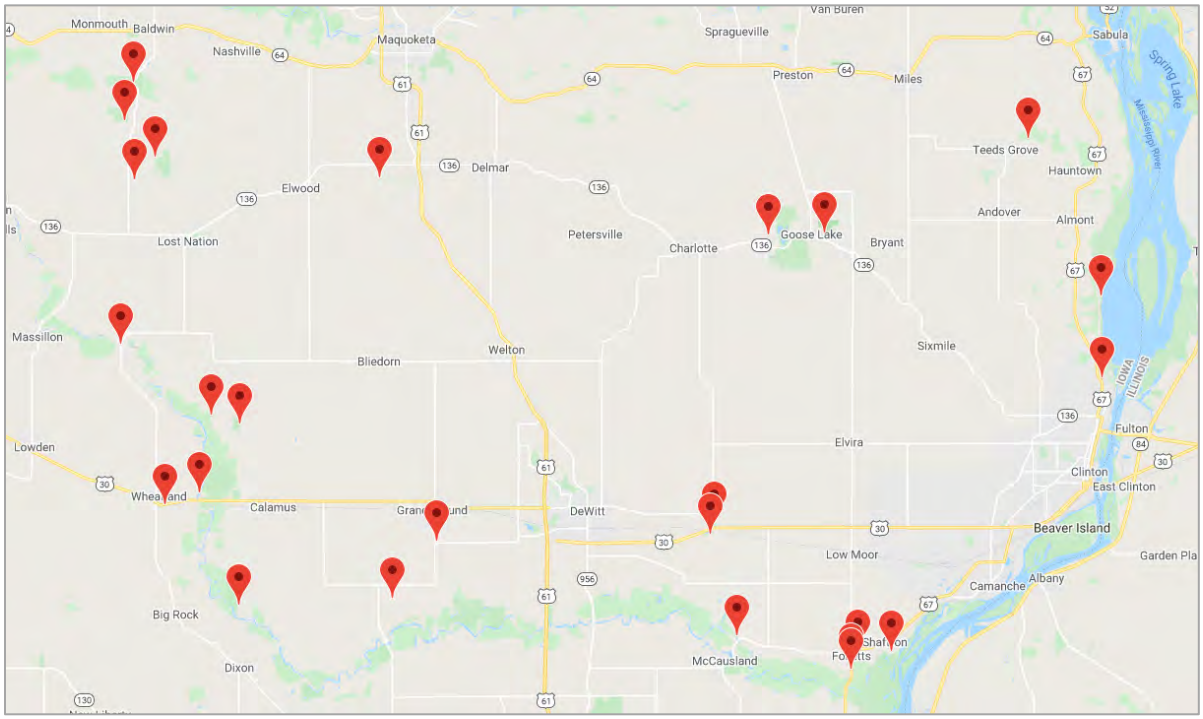
Table 3-12 List of Parks and Wildlife Areas in Clinton County, Iowa

Parks	City	Acres	Activities
Ben Martinsen Wildlife Area	Camanche	420	Hunting, Fishing
Brookfield Recreational Trail	Delmar	21	Wildlife and bird watching
Bulger's Hollow Recreation Area, USACOE	Clinton	NA	Camping, Boating
Camp Miss-Elk-Ton	Clinton	39	Cabin, Hiking trails, Elk River
Clinton County Conservation Headquarters	Grand Mound	NA	
Duke Prairie	Grand Mound	20	Prairie

Parks	City	Acres	Activities
Eden Valley Refuge	Baldwin	201	Camping, Cabins, Nature Center, Hiking, Playground
Folletts Park	Camanche	7	Picnic shelter, Disc golf course
Goose Lake Wildlife Area, IDNR	Charlotte	1290	Wildlife, Boating
Hagenson Pond	Camanche	9	Fishing
Killdeer Recreation Area	DeWitt	9	Fishing
Lost Nation Public Hunting Area	Lost Nation	260	Hunting, Hiking, Birdwatching
Malone Park	DeWitt	30	Hiking, Fishing, Picnicking, Swimming, Disc Golf
Manikowski Prairie Wildlife Area	Goose Lake	185	Hunting, Hiking, Birdwatching
McAndrews Wildlife Area	Lost Nation	198	Hunting, Fishing, Hiking, Birdwatching
McCausland Boat Ramp	McCausland	NA	Boating
Mockridge Wildlife Area	Calamus	75	Hiking, Birdwatching
Ringneck Marsh Wildlife Area	Calamus	260	Hunting
Rock Creek Marina & Campground	Camanche	NA	Camping, cabins, boating, fishing, hiking
Sherman Park	Calamus	233	Camping, boat ramp, hiking, picnicking, hunting
Smithtown Church	Lost Nation	NA	Historic property
Soaring Eagle Nature Center	Clinton	NA	Hiking, nature center, dog park
Syracuse Boat Ramp	Calamus	NA	Boating
Walnut Grove Park	Wheatland	24	Camping, boating, fishing, picnicking
Wheatland Wildlife Area	Wheatland	215	Hunting

Source: Clinton County, Iowa Conservation Board, https://www.mycountyparks.com/County/Clinton/Parks.aspx. NA = Not Available

Figure 3-3 Map of Parks and Wildlife Areas in Clinton County



Source: Clinton County, Iowa Conservation Board, https://www.mycountyparks.com/County/Clinton/Parks.aspx

Historic Resources: The National Register of Historic Places is the official list of the Nation's cultural resources worthy of preservation. Authorized under the National Historic Preservation Act of 1966, the National Register is part of a national program to coordinate and support public and private efforts to identify, evaluate, and protect our historic and archeological resources. The National Register is administered by the National Park Service under the Secretary of the Interior. Properties listed in the National Register include districts, sites, buildings, structures, and objects that are significant in American history, architecture, archeology, engineering, and culture. Table 3-13 provides the list of Properties on the National Register of Historic Places in Clinton County.

Table 3-13 Clinton County Properties on the National Register of Historic Places

Property Name	Address	Location	Date Listed
Ames Creek Bridge	300th Street over Ames Circle	DeWitt	1988
Ankeny Building	201 Fifth Avenue S.	Clinton	2006
Anthony, Horace House	1206 Anthony Place	Camanche	1991
Castle Terrace Historic District	Junction of Terrace Dr & Caroline Avenue	Clinton	1998
Cherry Bank	1458 Main Avenue	Clinton	1999
Clinton County Courthouse	612 N 2nd Street	Clinton	1981
Clinton Public Library	306 8th Avenue S.	Clinton	1983
Curtis, George M., House	420 S. 5th Avenue	Clinton	1979
Delmar Caboose	Vane Street	Delmar	1981

Property Name	Address	Location	Date Listed
Delmar Depot	W of Main Street, between Railroad Street & Clinton Avenue	Delmar	1997
DeWitt Public Library	822 Sixth Avenue	DeWitt	1983
Dierks, Peter House	IA 136, 5 miles W of Clinton.	Clinton	1998
Dugan's Saloon	516 Smith Street	Grand Mound	2001
Farmers and Merchants Savings Bank	601 Smith Street	Grand Mound	2001
First National Bank	226 Fifth Avenue S	Clinton	1985
Grand Mound Town Hall and Water Works Historic District	613-615 Clinton Street	Grand Mound	2001
Helvig-Olson Farm Historic District	2008 260th Street	Grand Mound	2000
Howes Building	419-425 Second Street S.	Clinton	2004
Johnson, George, House	2566 190th Avenue	Calamus	2000
Kvindherred Lutheran Church, School and Cemetery	2589 190th Avenue	Calamus	2000
Lamb, Lafayette, House	317 7th Avenue S	Clinton	1979
Moezinger-Marquis Hardware Co.	721 Second Street S	Clinton	2006
Saint Bonifice Church	2500 N Pershing Boulevard	Clinton	1997
Saint Irenaeus Church	2811 N 2nd Street	Clinton	1997
Sharon Methodist Episcopal Church	1223 125th Street	Lost Nation	2003
Van Allen Store	5th Avenue and 2nd Street	Clinton	1976
Washington Junior High School and Jefferson Grade School	751 2nd Avenue S.	Clinton	2015
Wilson Buildings	211-219 5th Avenue S.	Clinton	2014
Wilson District #7 School	1507 270th Avenue	Delmar	2004
Young, WJ, Company Machine Works	N of junction of 10th Avenue and 1st Street	Clinton	1985

Source: National Park Service, National Register of Historic Places

It should be noted that as defined by the National Environmental Policy Act (NEPA), any property over 50 years of age may be considered a historic resource and is potentially eligible for the National Register. Thus, in the event that the property is to be altered, or has been altered, as the result of a major federal action, the property must be evaluated under the guidelines set forth by NEPA. Structural mitigation projects are considered alterations for the purpose of this regulation.

Economic Assets: Economic assets at risk may include major employers or primary economic sectors, such as agriculture, whose losses or inoperability would have severe impacts on the community and its ability to recover from disaster. After a disaster, economic vitality is the engine that drives recovery. Every community has a specific set of economic drivers, which are important to understand when planning ahead to reduce disaster impacts to the economy. When major employers are unable to return to normal operations, impacts ripple throughout the community. Table 3-14 lists the leading employers in Clinton County.

Table 3-14 Leading Employers in Clinton County

Employer	Industry	Number of Employees	Location
MercyOne	Healthcare	950	Clinton
Archer Daniels Midland ADM	Manufacturing	750	Clinton
Custom-Pak Inc.	Manufacturing	725	Clinton/DeWitt
Clinton Community School District	Education	575	Clinton
Nestle Purina PetCare	Manufacturing	522	Clinton
Wild Rose Casino	Service/Entertainment	346	Clinton
LyondellBasell	Manufacturing	325	Clinton
Clysar	Manufacturing	300	Camanche
Guardian Glass	Manufacturing	300	DeWitt
Car-Freshner	Manufacturing	Unknown	DeWitt
City of Clinton	Municipality	296	Clinton
Collis, Inc.	Manufacturing	265	Clinton
WestRock	Manufacturing	246	Clinton
Wendling Quarries, Inc.	Building Materials	225	Camanche/DeWitt
Clinton County	County Government	200	Clinton County
Skyline Center	Co-packing & Manufacturing	150	Clinton
The University of Arizona – Global Campus	Education	145	Clinton
Focus Services	Call Center	140	Clinton
Colony Brands	Retail	131	Clinton
Data Dimensions	Digital Imaging	130	Clinton
Clausen Supply Co	Trucking & Warehousing	98	Clinton
The Egging Company	Manufacturing	80	Clinton
Sethness	Manufacturing	75	Clinton
Economy Coating	Rail Car Repair	75	Camanche
Iowa American Water	Utility	74	Clinton
Air Control Inc	Metal	41	Clinton
UFP Technologies	Manufacturing	32	Clinton

Source: Clinton Regional Development Corp.

3.3 Hazard Profiles and Vulnerability

Hazard Profiles

Each hazard identified in Section 3.1.4 is profiled individually in this section in alphabetical order.

The level of information presented in the profiles varies by hazard based on the information available. With each update of this plan, new information will be incorporated to provide for better evaluation and prioritization of the hazards that affect the planning area. Detailed profiles for each of the identified hazards include information categorized as follows:

Hazard Description

This section consists of a general description of the hazard and the types of impacts it may have on a community. It also includes the ratings assigned to the hazard relative to typical warning times and duration of hazard events as described in Table 3-4.

Geographic Location/Extent

This section describes the geographic location of the hazard in the planning area. Where available, maps are utilized to indicate the specific locations of the planning area that are vulnerable to the subject hazard. This section also provides information as to the extent of the hazard (i.e. the size or degree of impacts).

Previous Occurrences

This section includes information on historic incidents and their impacts.

Probability of Future Occurrence

The frequency of past events is used to gauge the likelihood of future occurrences. Where possible, the probability or chance of occurrence was calculated based on historical data. Probability was determined by dividing the number of events observed by the number of years and multiplying by 100. This gives the percent chance of the event happening in any given year. An example would be three droughts occurring over a 30-year period, which suggests a 10 percent chance of a drought occurring in any given year. For each hazard, the probability is assigned a rating as defined in Table 3-4.

Vulnerability Assessments

Following the hazard profile for each hazard is the vulnerability assessment. The vulnerability assessment further defines and quantifies populations, buildings, critical facilities, and other community assets at risk to natural hazards. The vulnerability assessments were conducted based on the best available data and the significance of the hazard. Data to support the vulnerability assessments was collected from the following sources:

- Available GIS data sets such as FEMA NFHL, parcel data, critical facilities, etc. (all sourced when used);
- Homeland Security Infrastructure Program Freedom;
- Written descriptions of assets and risks provided by participating jurisdictions;
- Existing plans and reports;
- Personal interviews with planning Team members and other stakeholders; and
- Other sources as cited.

Detailed profiles for each of the identified hazards include information categorized as follows:

Vulnerability Overview

This section consists of a general overview narrative of the planning area's vulnerability to the hazard. Within this section, the magnitude/severity of the hazard is discussed. The magnitude of the impact of a hazard event (past and perceived) is related directly to the vulnerability of the people, property, and the

environment it affects. This is a function of when the event occurs, the location affected, the resilience of the community, and the effectiveness of the emergency response and disaster recovery efforts.

For each hazard, the magnitude/severity is assigned a rating as defined in Table 3-4.

Potential Losses to Existing Development

This section provides the potential losses to existing development. Where data is available, this section provides estimated financial losses as well as the methodology used. For hazards with an overall "Low" rating, potential losses may not be discussed.

Future Development

This section provides information on how vulnerability to this hazard will be impacted by planned future development as well as information for jurisdictions to consider in planning future development.

Climate Change Impacts

This section will discuss any potential impacts to this hazard as a result of climate change.

Hazard Summary by Jurisdiction

For hazards that vary by jurisdiction, this section will provide an overview of how the hazard varies, followed by a table indicating the probability, magnitude, warning time, and duration rankings for each jurisdiction with the resulting hazard score and level.

3.3.1 Animal/Plant/Crop Disease

Hazard Score Calculation					
Probability	**Magnitude/Severity**	**Warning Time**	**Duration**	**Weighted Score**	**Level**
1	4	4	4	2.65	Moderate

Profile

Hazard Description

Agricultural infestation is the naturally occurring infection of vegetation, crops or livestock with insects, vermin, or diseases that render the crops or livestock unfit for consumption or use. Some level of agricultural infestation is normal in Iowa. The concern is when the level of an infestation escalates suddenly, or a new infestation appears, overwhelming normal control efforts. The levels and types of agricultural infestation appear to vary by many factors, including cycles of heavy rains and drought.

Because of Iowa's overall substantial agricultural industry and related facilities and locations, the potential for infestation of crops or livestock poses a significant risk to the economy of the State. Iowa cropland is vulnerable to disease and other agricultural pests. In 2019, Iowa farmers harvested an estimated 13.4 billion acres of corn, 9.1 billion acres of soybeans, 50,000 acres of oats and 1.1 billion acres of hay and grass silage, according to USDA figures.

According to the 2017 Census of Agriculture, 402,733 acres within Clinton County is farmland, of which 337,237 acres was harvested. There were 1,169 farms with an average size of 345 acres per farm. Table 3-15 provides a summary of the value of agricultural products sold in the planning area. Agricultural infestation of crops or livestock in the planning area would severely affect the economy.

Table 3-15 Market Value of Agricultural Products Sold, Clinton County, IA

Market Value of Products Sold	**$339,813,000**
Crop Sales	$210,340,000 (62%)
Livestock Sales	$129,472,000 (38%)
Average Per Farm	$290,687

Source: USDA National Agricultural Statistics Service, 2017 Census of Agriculture.

Animal Disease

Agricultural incidents are naturally occurring infection of livestock with insects, vermin, or diseases that render the livestock unfit for consumption or use. The livestock inventory for the state of Iowa includes 3,900,000 cattle and calves. According to the 2017 Census of Agriculture, Clinton County ranks 10th in the state with 90,159 head of cattle and calves.

The Iowa Department of Agriculture and Land Stewardship (IDALS) monitors and reports on the following animal reportable diseases in Iowa:

- Avian Influenza
- Bovine Spongiform Encephalopathy (BSE) Disease
- Chronic Wasting Disease (CWD)
- Virulent Newcastle Disease (vND)
- Foot and Mouth Disease
- Johne's Disease
- Pseudo rabies

- Scrapie, and
- West Nile Virus.

Producers are required by state law to report any of the reportable animal diseases to the IDALS's Bureau of Animal Industry. The IDALS's Bureau of The Center for Agriculture Security is the lead coordinating bureau for any emergency response for an agriculture incident.

Avian Influenza continues to be of concern in Iowa as the State is number one in poultry egg layers – over 17 million in 2019 and consisting of 15% of the egg production in the United States; 7th nationally in turkey raised, 5% of total raised in the United States in 2019 (USDA 2020).

Bovine Spongiform Encephalopathy (BSE) "mad cow" disease is a chronic, degenerative disease affecting the central nervous system of cattle. Cases have been found worldwide since 1986, but in Canada and the US only a single cow was reported with BSE in 2003. Additional cases were reported in 2005, 2006, 2012 and 2017. A BSE case was reported in 2018 in Florida, making it the sixth recorded case in the United States since 2003 (USDA 2020). No cases have been reported in the state of Iowa.

Chronic Wasting Disease (CWD) is a fatal, neurological disease of farmed and wild deer and elk. The disease has been identified in wild and captive mule deer, white-tailed deer, and North American elk, and in captive black-tailed deer. The first case of CWD in Iowa was found in 2012 on a hunting preserve in the southeastern part of the State.

Virulent Newcastle disease (vND), (formally known as Exotic Newcastle disease [END] is a contagious and fatal viral disease affecting all species of birds. There was an epidemic of vND in California in 2003 that is resulting in the death of millions of chickens and other birds, and costing millions of dollars. vND is probably one of the most infectious diseases of poultry in the world. vND is so virulent that many birds die without showing any clinical signs. As of June 1, 2020, the USDA Animal and Plant Health Inspection Services, certified that the United States has eradicated vND from poultry, satisfying the World Organization for Animal Health criteria for eradication of the disease (USDA APHIS 2021).

Johne's (yo-knees) disease is a contagious, chronic, and eventually fatal infection that affects the small intestine of ruminants, including cattle, sheep, and goats. Johne's, also called Para tuberculosis, is a slow progressive wasting disease with an incubation period of usually two or more years. Johne's is a reportable disease, but not a quarantinable disease.

Pseudo rabies is a viral disease most prevalent in swine, often causing newborn piglets to die. Older pigs can survive infection, becoming carriers of the pseudo rabies virus for life. Other animals infected from swine die from pseudo rabies, which is also known as Aujeszky's disease and "mad itch." Infected cattle and sheep can first show signs of pseudo rabies by scratching and biting themselves. In dogs and cats, pseudo rabies can cause sudden death. The virus does not cause illness in humans. Due to an extensive eradication program, Iowa and the rest of United States are free of pseudo rabies.

Scrapie is a fatal, degenerative disease affecting the central nervous system of sheep and goats that is very similar to BSE, although it does not cause disease in humans, and has been present in the US for over 50 years. Infected flocks that contain a high percentage of susceptible animals can experience significant production losses. In these flocks, over a period of several years, the number of infected animals increases and the age at onset of clinical signs decreases making these flocks economically unviable. Animals sold from infected flocks spread scrapie to other flocks. The presence of scrapie in the US also prevents the export of breeding stock, semen, and embryos to many other countries. Currently there is a national program underway to eradicate scrapie in the US

Disease outbreaks can also occur in wild animal populations. The IDALS's Bureau of Animal Industry also monitors wild animal species and game throughout the state as well as diseases that may impact them.

Crop Pests/Diseases

A plant disease outbreak or a pest infestation could negatively impact crop production and agriculturally dependent businesses. An extreme outbreak or infestation could potentially result in billions of dollars in production losses across the US The cascading net negative economic effects could result in widespread business failures, reduction of tax revenues, harm to other state economies, and diminished capability for this country to compete in the global market.

Many factors influence disease development in plants, including hybrid/variety genetics, plant growth stage at the time of infection, weather (e.g., temperature, rain, wind, hail, etc.), single versus mixed infections, and genetics of the pathogen populations. The two elements of coordination and communication are essential when plant diseases or pest infestations occur. The USDA Animal Plant Health Inspection Service, IDALS, local producers, local government, assessment teams, and state government entities must work together to effectively diagnose the various plant hazards to determine if immediate crop quarantine and destruction is required.

ISU, College of Agriculture and Life Sciences, has the Plant and Insect Diagnostic Clinic that provides diagnosis of plant problems (plant diseases, insect damage, and assessment of herbicide damage) and the identification of insects and weeds from the field, garden, and home. Specific plant pests can vary from year to year.

Emerald Ash Borer

The HMPT is also aware of the Emerald Ash Borer pest that threatens Iowa's forests and urban landscape. This pest is a slender, emerald green beetle that is ½ inch long, and responsible for the destruction of approximately 20 million ash trees in Ohio, Michigan, Indiana, Illinois, and Ontario, Canada.

Wildlife

Iowa farmers lose a significant amount of crops each year as a result of wildlife foraging. This can be particularly problematic in areas where natural habitat has been diminished or in years where weather patterns such as early/late frost deep snow, or drought has caused the wild food sources to be limited.

Warning Time Score: 4—minimal or no warning time

Duration Score: 4—more than 1 week

Geographic Location/Extent

Animal Location/Extent

Table 3-16 provides the top livestock inventory items in Clinton County and the state rank for each according to USDA – National Agriculture Statistics Service, 2017 Census of Agriculture.

Table 3-16 Top Livestock Inventory Items (number), 2017

	Livestock Inventory	
	Sales ($1,000)	Ranking in State
Poultry and eggs	(D)	55
Hogs and pigs	25,828	70
Cattle and calves	90,159	10
Sheep	175	60

	Livestock Inventory	
	Sales ($1,000)	Ranking in State
Horses, ponies, mules, burros, donkeys	193	25

Source: USDA National Agriculture Statistics Service; 2017 Census of Agriculture
Note: (D) withheld to avoid disclosing data for individual operations.

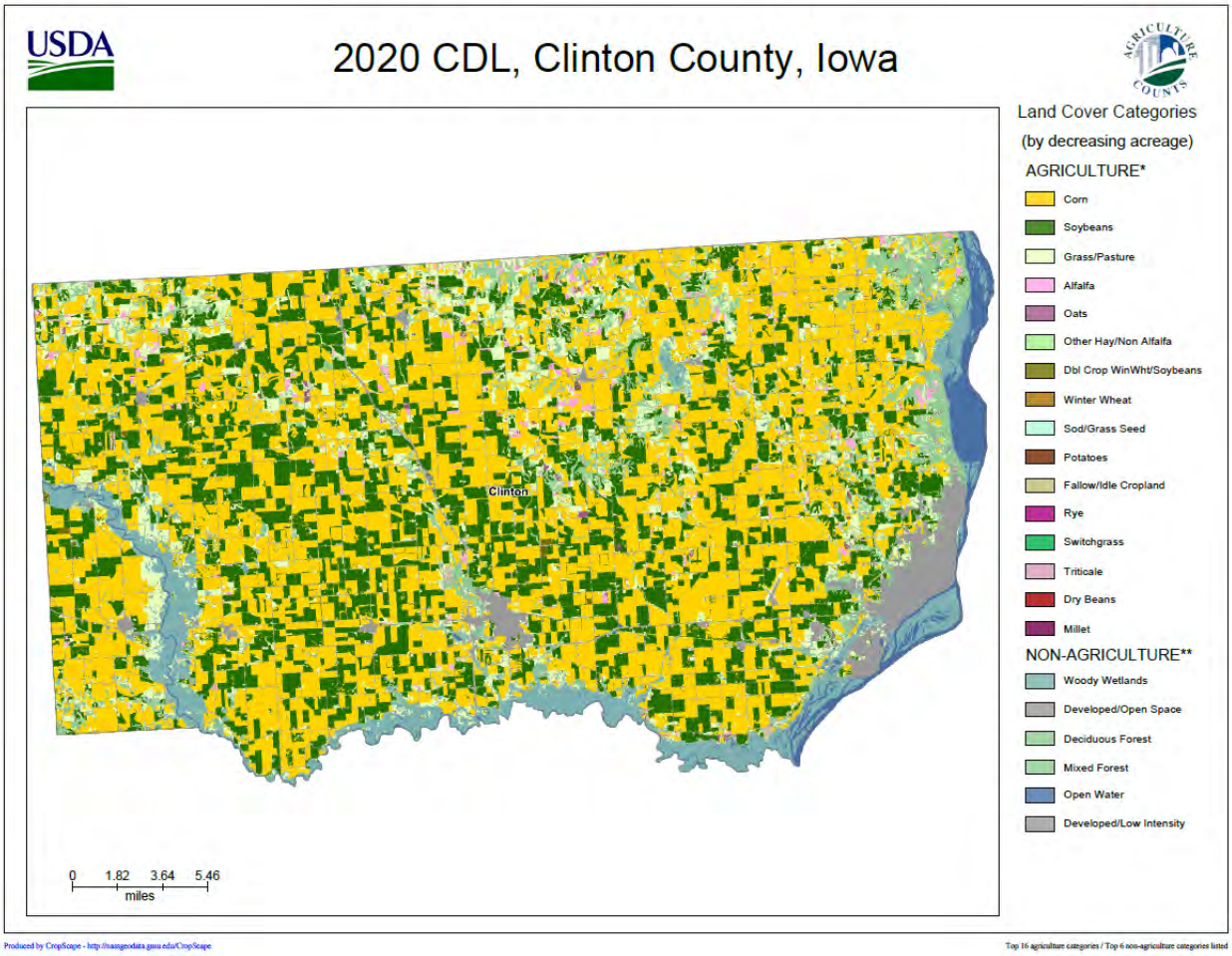
In addition to the animal farm operations, there are also confined and open feeding operations in Clinton County. According to data from the Iowa Natural Resources Geographic Information Systems (NRGIS) repository, there are 81 animal feeding operations listed in the IDNR Animal Feeding Operations Database. This includes 51 confined animal feeding operations and 35 open feedlots, and five combination confined/open feedlots. There is also one registered captive cervid herd in Clinton County (deer and elk).

Crop Location/Extent

- According to the USDA National Agricultural Statistics Service, in 2017 Clinton County's top crop items in acres, included the following: Corn for grain, 198,385 acres
- Soybeans, 121,644 acres
- Forage (hay/haylage), all, 13,027 acres
- Corns for silage or greenchop, 3,693 acres
- Oats for grain, 283 acres

As can be seen in the USDA Cropland Data Layer (CDL) in Figure 3-4, the majority of land in Clinton County outside the incorporated areas is in agricultural use, with primary crops of corn and soybeans.

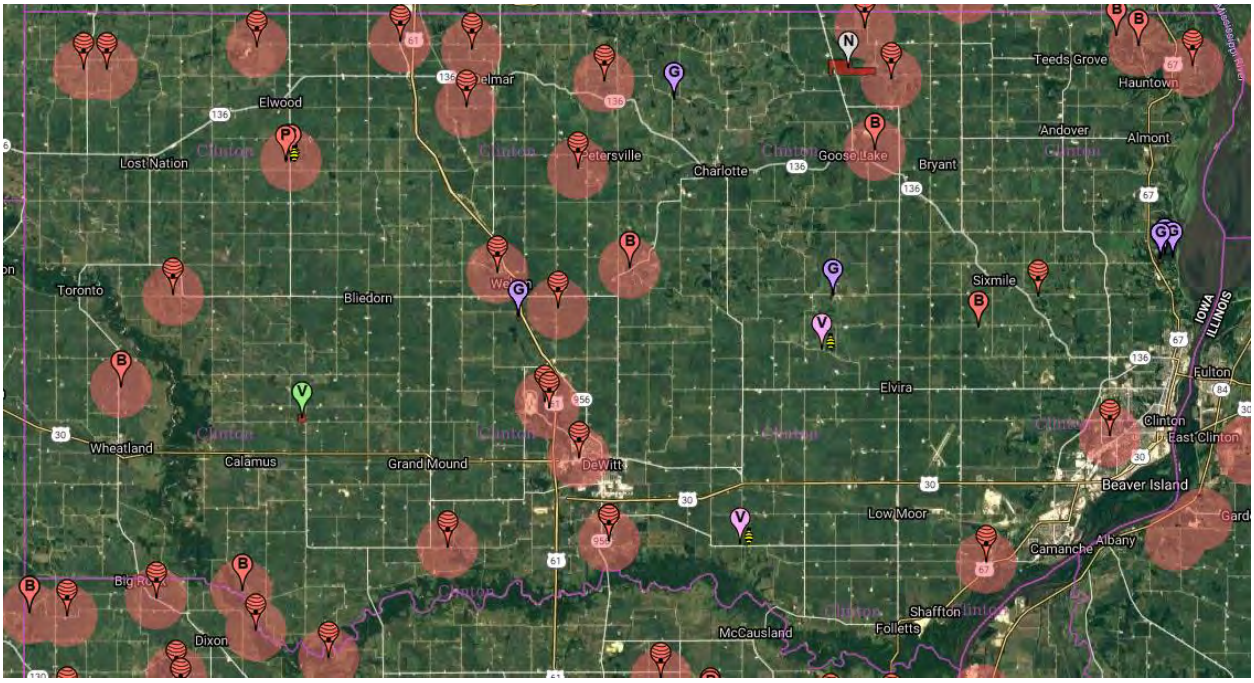
Figure 3-4 Clinton County Cropland Data Layer



Source: USDA, produced by CropScape, http://nassgeodata.gmu.edu/CropScape/

According to the IDALS, Pesticide Bureau, there are 24 sites on the Sensitive Crops Registry report for pesticide applicators to avoid. Figure 3-5 provides the location of the sites included on the Sensitive Crops Registry according to the IDALS, Pesticide Bureau. The crops include organic fruits and vegetables, honey, and vineyards (IDALS).

Figure 3-5 Sensitive Crops Registered Sites, Clinton County



Source: Iowa Specialty Crop Site Registry, https://ia.driftwatch.org/map

Previous Occurrences

Avian Influenza (Bird Flu)

Avian Influenza, or Bird Flu, was detected in Iowa in the spring of 2015. At the time that this plan was written in the summer of 2015, 70 farm facilities have been affected in 18 counties, resulting in 32.7 million affected chickens or turkeys in Iowa (IDALS 2015). There were no reported infected flocks in Clinton County. However, as a precautionary measure, the poultry events were cancelled at the Clinton County Fair in 2015.

Bovine Spongiform Encephalopathy (BSE) (Mad Cow Disease)

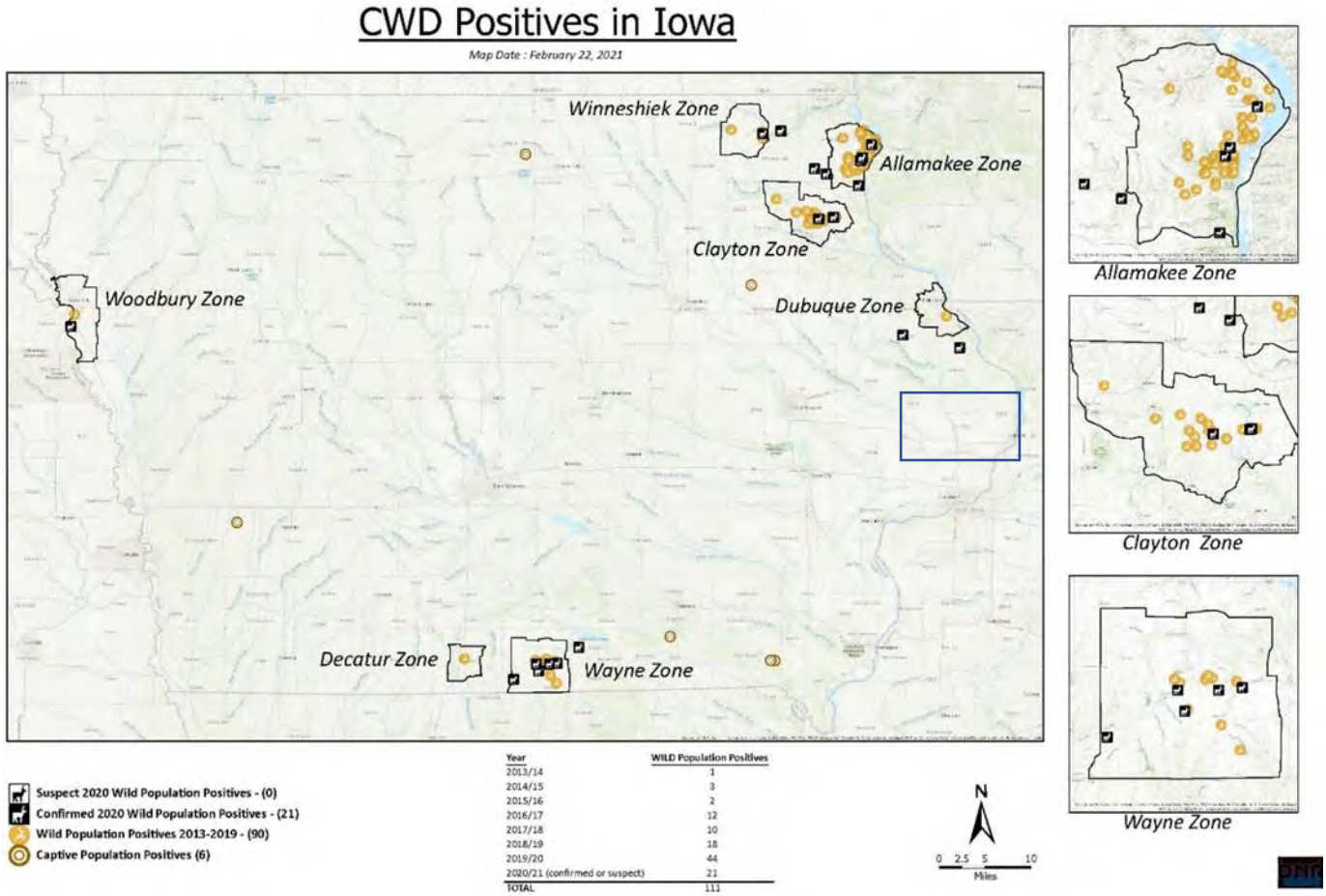
To date, BSE has been confirmed in Great Britain, Belgium, France, Germany, Spain, Switzerland, Japan, Canada, and the United States. In the United States, the first positive BSE cow was discovered in Washington. As a result of a surveillance program from June 2004 to March 2006, two additional positive domestic cows were found; one each in Texas and Alabama. Since 1997, the Food and Drug Administration (FDA) implemented a feed ban prohibiting the feeding of feedstuff derived from ruminants to other ruminants. The results of this ban and enhanced surveillance indicate that while BSE is present, it is at an extremely low level in US cattle.

Chronic Wasting Disease

The first case of CWD in Iowa was found in 2012 on a hunting preserve in the southeastern part of the state. In that case, it was determined the CWD-positive mature buck had been transferred to the hunting preserve from a deer farm in north central Iowa. Subsequent testing found CWD at the deer farm. The farm was placed under quarantine, but the owners sued for compensation. The litigation prevented the farm from being depopulated of deer until August 2014. IDNR collects samples from deer hunters and conducts testing for CWD. A total of 68,878 samples were collected between 2002 and the 2018/19 hunting season statewide; 2,810 samples were collected in Clinton County in this time period (IDNR 2019).

No positive cases have been found in Clinton County in 2020. In samples collected between 2013 and 2020 from wild deer populations found 111 positives in the state. A majority of the positive cases were found in the state Department of Natural Resources established deer management zones.

Figure 3-6 Positive CWD Cases in Iowa 2013-2021



Source: IDNR Note: Blue square represents Clinton County

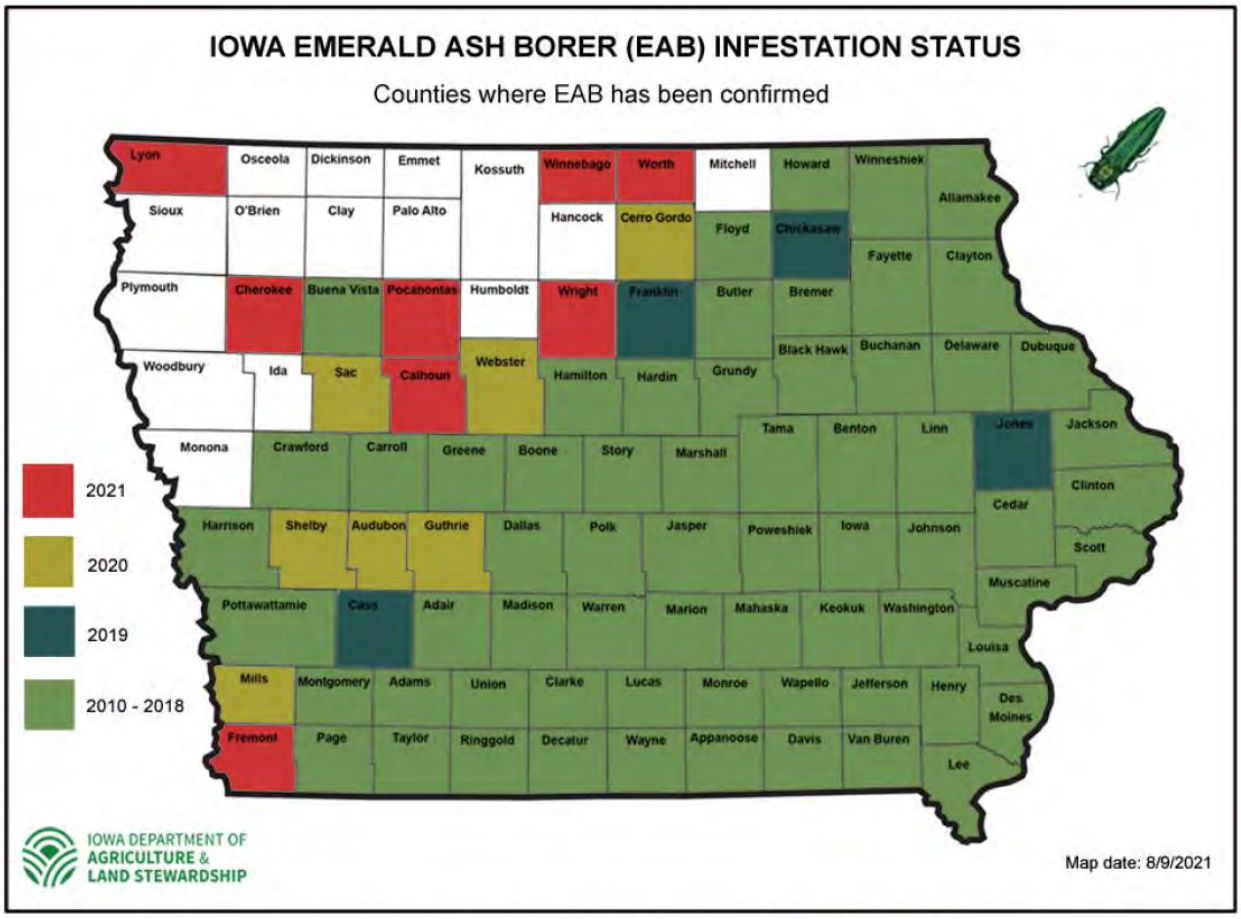
Scrapie

There has been a total of 77 sheep flocks in Iowa that have been found to be infected with Scrapie since the accelerated national Scrapie Eradication Program started in November 2001. In fiscal year 2005, Iowa had a high of 15 newly infected flocks. The number of new infected flocks has been decreasing since that time. Iowa's last infected flock was found in June 2010. There were no infected herd identified in the United States in 2020 (USDA 2020).

Emerald Ash Borer (EAB)

As of August 2021, 84 counties in Iowa had confirmed EAB within their boundaries since 2010. Between 2010 and 2018, EAB was confirmed in Clinton County. While no confirmed cases were found in Clinton County in 2021, 8 counties in the state, Lyon, Winnebago, Worth, Cherokee, Pocahontas, Wright, Calhoun, and Fremont, do have confirmed cases.

Figure 3-7 Iowa Emerald Ash Borer (EAB) Infestation Status, August 2021



Iowa Department of Agriculture & Land Stewardship, Entomology & Plant Science Bureau, Entomology@IowaAgriculture.gov, 515-725-1470

According to the USDA Risk Management Agency, during the 13-year period from 2006-2019 (no records for crop pests, disease or wildlife were found for 2020) combined crop insurance payments for damages resulting from insects, plant disease, and wildlife totaled $371,772 in Clinton County. Table 3-17 provides a summary of insured crop losses as a result of crop infestations

Table 3-17 Crop Insurance Payments for Crop Pests/Diseases and Wildlife, 2006-2019

Crop Year	Cause of Loss Description	Determined Acres	Insurance Paid ($)
2006	Plant Disease	-	$35,687
	Wildlife	-	$4,721
2007	Insects	121	$14,317
	Plant Disease	188	$34,617
	Wildlife	68	$6,872
2008	Insects	38	$26,476
	Plant Disease	178	$16,340
2009	Plant Disease	69	$1,799

Crop Year	Cause of Loss Description	Determined Acres	Insurance Paid ($)
2010	Plant Disease	561	$20,758
2011	Plant Disease	90	$11,305
	Wildlife	4	$530
2013	Wildlife	39	$8,403
2014	Asian Soybean Rust	-	$396
	Wildlife	6	$275
2016	Plant Disease	70	$4,117
2017	Wildlife	15	$1,868
2018	Plant Disease	1077	$176,457
2019	Wildlife	23	$6,834
	Total	**2,544**	**$371,772**

Source: USDA Risk Management Agency

Probability of Future Occurrence

The planning area experiences some level of agricultural loss every year as a result of naturally occurring diseases that impact animals/livestock. The concern is when the level of an infestation escalates suddenly, or a new infestation appears, overwhelming normal control efforts. Normal control efforts include crop insurance and employment of various other agricultural practices that limit impact. For purposes of determining probability of future occurrence, the HMPC defined occurrence as an infestation occurring suddenly, a new infestation, or infestation that overwhelmed normal control efforts. Research did not reveal any infestations in Clinton County that have reached this level of defined occurrence. Therefore, it was determined that the probability of this defined "occurrence" of agricultural infestation is Unlikely.

Probability Score: 1—Unlikely

Vulnerability

Overview

A widespread infestation of animals/livestock and crops could impact the economic base of the County. According to the US Bureau of Economic Analysis, in 2019 there were 1,154 jobs (full-time and part-time) related to farming in Clinton County. Of the individuals employed in the County (22,152), 2.9 percent of Clinton County's total workforce are employed in the agricultural industry (ACS 2019). These ag-related jobs include farm owners, farm laborers, crop and livestock consultants, veterinarians, feed suppliers, food processors, farm machinery operators and fertilizer manufacturers. The largest portion of the ag-related jobs are involved directly in agricultural production. According to the 2017 Agricultural Census, the total value of Clinton County's agricultural production was $339,813,000. With this contribution of agriculture to the economy, a wide-scale agricultural infestation could severely impact the economic stability of the County.

Magnitude Score: 4—Catastrophic

Potential Losses to Existing Development

Buildings, infrastructure, and critical facilities are not vulnerable to this hazard. Its impacts are primarily economic and environmental, rather than structural effects.

Rough estimates of potential direct losses from a maximum threat event fall in a range of 1-75 percent of livestock receipts. The market value of all livestock in Clinton County in 2017 was $129,472,000. Based on a worst-case scenario where 75 percent of livestock is lost in a given year due to agricultural infestations, the total direct costs could exceed $97 million.

Rough estimates of potential direct losses from a maximum threat event fall in a range of 1-50 percent of annual crop receipts. The market value of all crops sold in Clinton County in 2017 was $210,340,000. Based on a worst-case scenario where 50 percent of crop production is lost in a given year due to agricultural infestations, the total direct costs could exceed $105 million.

The USFS estimates that Clinton County has 50,000 to 500,000 ash trees in the County. Removal of debris if an infestation would occur would be challenging and costly. If only 10 percent of 1 million Ash trees were impacted in Clinton County that could translate to 5,000 to 50,000. It is estimated that it costs $682 to replace each Ash tree. In Clinton County, this translates to 3.4 to 34 million.

Future Development

Future development is not expected to significantly impact the planning area's vulnerability to this hazard. However, if crop production and numbers of animals/livestock increases, the amount vulnerable to infestation also increases. Regarding the EAB, the IDNR recommends that other native tree species be planted in lieu of Ash trees to avoid increasing vulnerability to infestation of the EAB.

Climate Change Impacts

The climate change impacts below are excerpted from the 2010 Report on Climate Change Impacts on Iowa developed by the Iowa Climate Change Impacts Committee

Crops

Despite great improvements in yield potential over the last several years, crop production remains highly dependent on climate in conjunction with other variables. The overall effect of climate change on crop productivity in Iowa remains unclear, as positive climatic events could be overridden by the impacts of poor management or genetics, or favorable management and genetics could override negative climate events.

Regardless of these interactions, it is certain that climate changes will affect future crop production. Greenhouse and growth chamber studies suggest increases in atmospheric carbon dioxide (CO_2) will generally have a substantial positive effect on crop yields by increasing plant photosynthesis and biomass accumulation.

Greater precipitation during the growing season, as we have been experiencing in Iowa, has been associated with increased yields; however, excessive precipitation early in the growing season adversely affects crop productivity. Waterlogged soil conditions during early plant growth often result in shallower root systems that are more prone to diseases, nutrient deficiencies, and drought stress later in the season.

An increase in temperature, especially during nighttime, reduces corn yield by shortening the time in which grain is accumulating dry matter (the grain fill period). According to research, Iowa's nighttime temperatures have been increasing more rapidly than daytime temperatures.

The current changes in precipitation, temperature, wind speeds, solar radiation, dew-point temperatures, and cloud cover imply less ventilation of crops and longer dew periods. Soybean plants in particular readily absorb moisture, making harvest problematic. One adaptive approach to these conditions involves farmers purchasing larger harvesting equipment to speed harvest, compensating for the reduced daily time suitable for soybean harvest.

The recent extreme weather events involving greater intensity and amount of rainfall have increased the erosive power of Iowa's precipitation, resulting in significant erosion of topsoil. The impact of climate change on the erosive force of precipitation in the US is expected to increase by as much as 58%. These rates are expected to increase exponentially as precipitation continues to rise.

Plant disease can also increase as temperature, soil wetness, and humidity increase as these conditions favor the development of various plant diseases.

According to the Fourth National Climate Assessment, climate change will increase the frequency of late-growing-season drought conditions, which will lead to worsening effects of invasive species, pests, and plant disease.

Animals

Despite the fact that Iowa ranks first in hog and fifth in cattle production nationwide, there is a lack of information about the effects of climate change on animal production in Iowa. Nevertheless, our general knowledge and principles pertaining to livestock and extreme weather events are applicable to Iowa's changing climate conditions.

High temperatures have been shown to reduce summer milk production, impair immunological and digestive functions of animals, and increase mortality rates among dairy cattle.

In general, domestic livestock can adapt to gradual changes in environmental conditions; however, extended periods of exposure to extreme conditions greatly reduce productivity and is potentially life-threatening.

Animal/Crop/Plant Disease Hazard Summary by Jurisdiction

The magnitude determinations discussed in the vulnerability overview sections were factored into the following hazard summary table to show how this hazard varies by jurisdiction. It has been determined that the magnitude of animal/crop/plant disease would be slightly less in the cities and for the school districts due to less agriculture within city limits. However, an infestation of the EAB would likely have a larger impact in the incorporated areas and the economy of incorporated areas is heavily dependent on agriculture. As a result, the magnitude in the unincorporated area was determined to be a 4 and the magnitude in the incorporated areas was determined to be a 3. School districts may have limited Ash trees to dispose of in the event of infestation; therefore, the magnitude was determined to be a 1.

Jurisdiction	Probability	Magnitude	Warning Time	Duration	Score	Level
Unincorporated Clinton County	1	4	4	4	2.65	Moderate
Andover	1	3	4	4	2.35	Moderate
Calamus	1	3	4	4	2.35	Moderate
Camanche	1	3	4	4	2.35	Moderate
Charlotte	1	3	4	4	2.35	Moderate
Clinton	1	3	4	4	2.35	Moderate
Delmar	1	3	4	4	2.35	Moderate
DeWitt	1	3	4	4	2.35	Moderate
Goose Lake	1	3	4	4	2.35	Moderate
Grand Mound	1	3	4	4	2.35	Moderate
Lost Nation	1	3	4	4	2.35	Moderate

Jurisdiction	Probability	Magnitude	Warning Time	Duration	Score	Level
Low Moor	1	3	4	4	2.35	Moderate
Toronto	1	3	4	4	2.35	Moderate
Welton	1	3	4	4	2.35	Moderate
Wheatland	1	3	4	4	2.35	Moderate
Calamus-Wheatland School District	1	1	4	4	1.75	Low
Camanche School District	1	1	4	4	1.75	Low
Central DeWitt School District	1	1	4	4	1.75	Low
Clinton School District	1	1	4	4	1.75	Low
Delwood School District	1	1	4	4	1.75	Low
Northeast School District	1	1	4	4	1.75	Low

3.3.2 Cyber Attack

Hazard Score Calculation					
Probability	**Magnitude/Severity**	**Warning Time**	**Duration**	**Weighted Score**	**Level**
3	3	4	4	3.25	High

Profile

Hazard Description

Cyber attacks use malicious code to alter computer operations or data. The vulnerability of computer systems to attacks is a growing concern as people and institutions become more dependent upon networked technologies. The Federal Bureau of Investigation (FBI) reports that, "cyber intrusions are becoming more commonplace, more dangerous, and more sophisticated," with implications for private- and public-sector networks. Cyber threats can take many forms, including:

- **Distributed Denial of Service (DDoS) attack:** Perhaps the most common type of cyber attack, a DDoS attack seeks to overwhelm a network and causes it to either be inaccessible or shut down. A DDoS typically uses other infected systems and internet connected devices to "request" information from a specific network or server that is not configured or powerful enough to handle the traffic.
- **Data breach:** Hackers gaining access to large amounts of personal, sensitive, or confidential information has become increasingly common in recent years. In addition to networked systems, data breaches can occur due to the mishandling of external drives.
- **Phishing attacks:** Phishing attacks are fraudulent communications that appear to come from legitimate sources. Phishing attacks typically come through email but may come through text messages as well. Phishing may also be considered a type of social engineering meant to exploit employees into paying fake invoices, providing passwords, or sending sensitive information.
- **Malware attacks:** Malware is malicious code that may infect a computer system. Malware typically gains a foothold when a user visits an unsafe site, downloads untrusted software, or may be downloaded in conjunction with a phishing attack. Malware can remain undetected for years and spread across an entire network.
- **Ransomware:** Ransomware typically blocks access to a jurisdiction's/agency's/ business' data by encrypting it. Perpetrators will ask for a ransom to provide the security key and decrypt the data, although many ransomware victims never get their data back even after paying the ransom.
- **Critical Infrastructure/SCADA System attack:** There have been recent critical infrastructure Supervisory Control and Data Acquisition (SCADA) system attacks aimed at taking down lifelines such as power plants and wastewater facilities. These attacks typically combine a form of phishing, malware, or other social engineering mechanisms to gain access to the system.

Warning Time Score: 4—Minimal or no warning

Duration Score: 4—more than 1 week

Geographic Location/Extent

Cyber attacks can and have occurred in every location regardless of geography, demographics, and security posture. Incidents may involve a single location or multiple geographic areas. A disruption can have far-reaching effects beyond the location of the targeted system; disruptions that occur far outside the state can still impact people, businesses, and institutions within the city. All servers in Clinton County and participating jurisdictions are potentially vulnerable to cyber attacks. The geographic extent is significant.

Previous Occurrences

The cybersecurity firm Symantec reports there were a total of 1,209 data breaches worldwide in 2016. While the number of breaches has remained relatively steady, the average number of identities stolen has increased to almost one million per incident. The report also found that one in every 131 emails contained malware, and the company's software blocked an average of 229,000 web attacks every day.

The Privacy Rights Clearinghouse, a nonprofit organization based in San Diego, maintains a timeline of 9,741 data breaches resulting from computer hacking incidents in the United States from 2005-2019. Attacks happening outside of the state can also impact local businesses, personal identifiable information, and credit card information. Table 3-18 shows several of the more significant cyber attacks in Iowa in recent years.

Table 3-18 Major Cyber Attacks Impacting Iowa, 2005-2019

Date Made Public	Company	Total Records	Description of Incident
5/18/2005	University of Iowa (UI)	30,000	A computer containing credit card numbers and campus ID numbers for University Book Store customers was breached by a hacker.
9/2/2005	Iowa Student Loan	165,000	A compact disc containing personal information, including Social Security Numbers (SSN) was lost when shipped by private courier.
12/12/2005	ISU	5,500	At least one ISU computer was hacked. SSNs and encrypted credit card numbers may have been obtained.
2/18/2006	University of Northern Iowa	6,000	A laptop computer holding W-2 forms of student employees and faculty was illegally accessed.
7/14/2006	UI	280	Laptop computer containing personal information of current and former MBA students was stolen.
9/29/2006	UI Department of Psychology	14,500	A computer containing SSNs of 14,500 psychology department research study subjects was the object of an automated attack designed to store pirated video files for subsequent distribution.
2/14/2007	Iowa Department of Education	600	Up to 600 files of General Equivalency Diploma (GED) recipients were viewed when the online database was hacked. Files included names, addresses, birthdates, and SSNs of GED graduates from 1965 to 2002.
6/8/2007	UI	1,100	SSNs of faculty, students and prospective students were stored on the Web database program that was compromised.
10/8/2007	UI	184	A laptop computer was stolen from a former teaching assistant. The theft of the computer, which occurred in a break-in of the instructor's home, contained class records such as attendance, test scores, and grades of students who took his philosophy courses at the UI between 2002 and 2006. SSNs were also present in 100 of the records.
12/10/2007	IDNR	7,000	A contractor working for the Department of Natural Resources (DNR) revealed that a computer jump drive containing the names and SSNs for 7,000 people is missing. The contractor believes the jump drive fell off of his desk and into a garbage can.

Date Made Public	Company	Total Records	Description of Incident
1/11/2008	UI	216	Iowa College of Engineering has notified some of its former students that some of their personal information, including SSNs, was inadvertently exposed on the Internet for several months.
6/27/2008	Montgomery Ward	51,000	Hackers extracted information from an online database that held credit card account information.
9/11/2008	UI College of Engineering	500	Some students are being notified by the College that their personal information may have been exposed in a recent computer breach. The compromised computer contained a file with names and SSNs of students stored on its hard drive.
6/12/2009	Kirkwood Community College	1,600	Someone took a storage device from a counselor's office in Iowa City. That device contained names and SSNs for participants in the PROMISE JOBS program.
1/31/2010	Iowa State Racing and Gaming Commission	80,000	The Iowa Racing and Gaming Commission says someone gained access to a computer server that holds more than 80,000 records containing casino employee information. The person who hacked into the system was traced back to China and had used a computer with an external account.
7/16/2010	Buena Vista University (BVU)	93,000	Someone gained unauthorized access to a BVU database. The database contained records of names, SSNs, and driver's license numbers of BVU applicants, current and former students, parents, current and former faculty, and staff, alumni, and donors. These records go back as far as 1987.
7/22/2010	IDALS	3,404	A laptop containing personal information from Iowa residents was stolen from a locked state vehicle. The computer was encryption protected and contained names, addresses, phone numbers and SSNs. Iowa residents who participate in the Iowa Horse and Dog Breeding Program were notified.
9/21/2010	Pediatric and Adult Allergy, PC	19,222	Patients were notified that a backup tape with their personal information was lost on or around July 11. The patient information included name, address, phone number, date of birth, SSN, dates of service, services, and diagnoses. Medical records and financial information were not on the backup tape.
4/8/2012	Contempo Enterprises, LLC	330	A hacker or hackers accessed and posted sensitive Contempo Enterprises information online.
5/11/2012	Iowa Department of Human Services	3,000	Improper Disposal Business.
5/12/2012	Warren County Iowa, Iowa Department of Human Services	3,000	Warren County residents had their names, SSNs, addresses, phone numbers, and other information exposed. A fire destroyed a Warren County human services office on December 4, 2011. Records from the location that were due to be shredded were moved to a secure facility owned by warren County. A county maintenance worker mistakenly moved a container full of the damaged sensitive records back to the destroyed building in early February of 2012. The mistake was discovered on March 14 when

Date Made Public	Company	Total Records	Description of Incident
			the department received a call from a resident near the area who found a Department of Human Services (DHS) paper in her yard.
4/9/2013	Kirkwood Community College	125,000	Hackers accessed Kirkwood Community College's website and applicant database system on March 13. Anyone who applied to a Kirkwood Campus may have had their names, SSNs, dates of birth, race, and contact information exposed.
10/2/2013	UnityPoint Health	1,800	A breach was discovered on August 8 during a routine audit. It was discovered that a contractor accessed UnityPoint's electronic medical records (EMR) system without a legitimate reason. An employee gave computer passwords to an employee of another company that provides care to patients. Names, medical insurance account numbers, home addresses, dates of birth and other health information was accessed between February of 2013 and August of 2013.
10/2/2013	UnityPoint Health Affiliated	1,825	Unauthorized Access/Disclosure.
12/11/2013	UI	-	An employee called the UI 's help desk after clicking a suspicious link in an email. It was discovered that the personal information and direct deposit information of over a dozen UI employees may have been exposed through compromised employee computers and accounts. Two sets of phishing emails were sent to nearly 2,000 UI employees and the scam has been contained.
3/10/2014	Iowa Dept. of Human Services	2,042	
4/18/2014	VGM Homelink	1,400	Unauthorized Access/Disclosure.
4/22/2014	ISU	29,780	ISU has reported a data breach of one of their systems. SSNs of approximately 30,000 people who enrolled in certain classes between 1995 and 2012 along with university ID numbers for nearly 19,000 additional people. Authorities believe that the person or persons motivation was apparently to generate enough computing power to create the virtual currency bitcoin.
4/25/2014	Iowa Medicaid Enterprise	862	Unauthorized Access/Disclosure.
1/13/2016	Tax Act	450	TaxAct has notified customers of a data breach when an unauthorized party or parties infiltrated their system.
1/18/2016	University of Northern Iowa	100	Over 100 University of Northern Iowa employees reported that their tax returns had been rejected in 2014 because someone had filed a return fraudulently on their behalf, collecting their refund.
2/2/2016	Grx Holdings LLC dba Medicap Pharmacy	2,300	Grx Holdings, LLC dba Medicap Pharmacy notified Health and Human Services of a data breach when they suffered a loss of information.
3/25/2016	Mercy Iowa City	15,625	Location of breached information: Hacking/ Information Technology (IT) Incident Business associate present: No.

Date Made Public	Company	Total Records	Description of Incident
5/11/2016	Unity Point Health	1,620	As reported by Health and Human Services, unauthorized access/disclosure of EMRs. No specific information as to what information was compromised as provided by health and human services.
7/1/2016	UnityPoint Health Affiliated Covered Entity	1,620	Unauthorized Access/Disclosure.
7/1/2016	Planned Parenthood of the Heartland	2,506	As reported by Health and Human Services unauthorized access/disclosure/paper/films. No specific information as to what information was compromised as provided by health and human services.
11/8/2016	Planned Parenthood of the Heartland	2,506	Unauthorized Access/Disclosure.
6/22/2017	Iowa Veterans Home	2,969	Location of breached information: Unauthorized Access/Disclosure Business associate present: No.
8/4/2017	UI Hospitals & Clinics	5,292	Location of breached information: Unauthorized Access/Disclosure Business associate present: No.
12/8/2017	Iowa DHS	820	Hacking/IT Incident.
2/13/2018	Central Iowa Hospital Corporation d/b/a Blank Children's Hospital	557	Unauthorized Access/Disclosure.
11/30/2018	UnityPoint Health	16,000	UnityPoint Health confirmed that its dealing with an information breach that impacted patients.
3/29/2019	Thielen Student Health Center	599	Unauthorized Access/Disclosure.

Source: Privacy Rights Clearinghouse

A 2017 study found ransomware payments over a two-year period totaled more than $16 million. Even if a victim is perfectly prepared with full offline data backups, recovery from a sophisticated ransomware attack typically costs far more than the demanded ransom. However, according to a 2016 study by Kaspersky Lab, roughly one in five ransomware victims who pay their attackers never recover their data.

Recent years have seen an increase in ransomware attacks, particularly against local government systems. The City of Atlanta was hit by a major ransomware attack in 2018, recovery from which wound up costing a reported $2.6 million, significantly more than the $52,000 ransom demand. A similar attack against the City of Baltimore in 2019 affected the city government's email, voicemail, property tax portal, water bill, and parking ticket payment systems, and delayed more than 1,000 pending home sales. In March 2019, Orange County, North Carolina was attacked with a ransomware virus, causing slowdowns and service problems at key public offices such as the Register of Deeds, the Sheriff's Office, and county libraries. The attack impacted a variety of county services, including disrupting the county's capability to process real

estate closings, issue marriage licenses, process fees or permits, process housing vouchers, and verify tax bills.

A large, sophisticated malware attack, known as Olympic Destroyer, was launched against the 2018 Winter Olympics in PyeongChang, South Korea. The attack initially took down servers, email, Wi-Fi, and ticketing systems, which could have severely disrupted the games. Fortunately, the organizing committee had a robust cybersecurity group that was able to quickly restore most functions.

Probability of Future Occurrence

Small-scale cyber attacks such as DDoS attacks occur daily, but most have negligible impacts at the local or regional level. Data breaches are also extremely common, but again most have only minor impacts on government services.

Perhaps of greatest concern to the county and jurisdictions are ransomware attacks, which are becoming increasingly common. It is difficult to calculate the odds of Clinton County or one of its municipal governments being hit with a successful ransomware attack in any given year, but it is safe to say it is likely to be attacked in the coming years.

The possibility of a larger disruption affecting systems within the county is a constant threat, but it is difficult to quantify the exact probability due to such highly variable factors as the type of attack and intent of the attacker. Major attacks specifically targeting systems or infrastructure in the county cannot be ruled out. Despite the low history of events in the planning area, cyber attacks are rapidly becoming much more common. The probably of future cyber attack is likely.

Probability Score: 3—Likely

Vulnerability

Overview

Most cyber attacks affect only data and computer systems. However, sophisticated attacks have occurred against the SCADA systems of critical infrastructure, which could potentially result in system failures on a scale equal with natural disasters. Facilities and infrastructure such as the electrical grid could become unusable. A cyber attack affected the power grid in Ukraine in 2015, leaving over 230,000 people without power. Injuries or fatalities from cyber attacks would generally only be possible from a major cyber terrorist attack against critical infrastructure. More likely impacts to the public are financial losses and an inability to access systems such as public websites and permitting sites. Indirect impacts could include interruptions to traffic control systems or other infrastructure. The 2003 Northeast Blackout, while not the result of a cyber attack, caused 11 deaths and an estimated $6 billion in economic loss. More recently in February 2021, a cyber attack on a water treatment system in Oldsmar Florida put thousands at risk of being poisoned. A hacker accessed the system remotely and adjusted the level of sodium hydroxide to more than 100 times its normal levels. Fortunately, an operator noticed the intrusion immediately and was able to reduce the levels back before any significant effects on the city's water supply.

Economic impacts from a cyber attack can be debilitating. The cyber attack in 2018 that took down the City of Atlanta cost at least $2.5 million in contractor costs and an estimated $9.5 million additional funds to bring everything back online. The attack in Atlanta took more than a third of the 424 software programs offline and recovery lasted more than 6 months. The 2018 cyber attack on the Colorado Department of Transportation (CDOT) cost an estimated $1.5 million. None of these statistics consider the economic losses to businesses and ongoing IT configuration to mitigate from a future cyber attack.

Magnitude/Severity Score: 3—Critical

Potential Losses to Existing Development

Most cyber attacks affect only data and computer systems and have minimal impact on general property. Data breaches and subsequent identify thefts can have huge impacts on the public. The Internet Crime Complaint Center (IC3) estimates that identity theft alone resulted in $2.7 billion in losses to businesses and $149 million in losses to individuals.

Future Development

Changes in development have no impact to the threat, vulnerability, and consequences of a cyber attack. Cyber attacks can and have targeted small and large jurisdictions, multi-billion dollar companies, small mom-and-pop shops, and individual citizens. The decentralized nature of the internet and data centers means that the cyber threat is shared by all, regardless of new construction and changes in development.

Climate Change Impacts

There are no known effects of climate induced impacts on cyber attacks.

Cyber Attack Hazard Summary by Jurisdiction

Jurisdiction	Probability	Magnitude	Warning Time	Duration	Score	Level
Unincorporated Clinton County	4	3	4	4	3.7	High
Andover	4	3	4	4	3.7	High
Calamus	4	3	4	4	3.7	High
Camanche	4	3	4	4	3.7	High
Charlotte	4	3	4	4	3.7	High
Clinton	4	3	4	4	3.7	High
Delmar	4	3	4	4	3.7	High
DeWitt	4	3	4	4	3.7	High
Goose Lake	4	3	4	4	3.7	High
Grand Mound	4	3	4	4	3.7	High
Lost Nation	4	3	4	4	3.7	High
Low Moor	4	3	4	4	3.7	High
Toronto	4	3	4	4	3.7	High
Welton	4	3	4	4	3.7	High
Wheatland	4	3	4	4	3.7	High
Calamus-Wheatland School District	4	3	4	4	3.7	High
Camanche School District	4	3	4	4	3.7	High
Central DeWitt School District	4	3	4	4	3.7	High
Clinton School District	4	3	4	4	3.7	High
Delwood School District	4	3	4	4	3.7	High
Northeast School District	4	3	4	4	3.7	High

3.3.3 Dam / Levee Failure

Hazard Score Calculation					
Probability	**Magnitude/Severity**	**Warning Time**	**Duration**	**Weighted Score**	**Level**
1	4	4	4	2.65	Moderate

Description

Many of Iowa's community settlements were founded along rivers and streams due to their reliance on water resources. Often, these streams or rivers later needed a dam or levee for flood control or a reservoir for a constant water source. This section discusses both dam and levee failure.

Dam Failure

A dam is defined as a barrier constructed across a watercourse for the purpose of storage, control, or diversion of water. Dams are typically constructed of earth, rock, concrete, or mine tailings. Dam failure is the uncontrolled release of impounded water resulting in downstream flooding, affecting both life and property. Dam failure can be caused by any of the following: flooding; earthquakes; flow blockages; landslides; lack of maintenance; improper operation; poor construction; vandalism; or terrorism.

Levee Failure

Levee Failure is the uncontrolled release of water resulting from a structural failure. Possible causes of the failure could include flooding, earthquakes, blockages, landslides, lack of maintenance, improper operation, poor construction, vandalism, terrorism, erosion, piping, saturation, or under seepage.

Warning Time Score: 4—Minimal or no warning (up to 6 hrs. warning)

Duration Score: 4—More than 1 week

Location

Dams in Planning Area

The thresholds for when a dam falls under State regulation are outlined in Iowa Administrative Code 567-71.3 and are listed below. The thresholds are primarily based on both dam height and water storage volumes. State-regulated dams are those dams that meet the following:

In Rural Areas:

a) Any dam designed to provide a sum of permanent and temporary storage exceeding 50 acre-feet at the top of dam elevation, or 25 acre-feet if the dam does not have an emergency spillway, and which has a height of 5 feet or more.

b) Any dam designed to provide permanent storage in excess of 18 acre-feet and which has a height of 5 feet or more.

c) Any dam across a stream draining more than ten square miles.

d) Any dam located within 1 mile of an incorporated municipality, if the dam has a height of 10 feet or more, stores 10 acre-feet or more at the top of dam elevation, and is situated such that the discharge from the dam will flow through the incorporated area.

In Urban Areas:

Any dam which exceeds the thresholds in 71.3 (1) "a", "b", or "d".

Low Head Dams:

Any low head dam on a stream draining two or more square miles in an urban area, or ten or more square miles in a rural area.

Dams are classified by the State of Iowa into three categories based on the potential risk to people and property in the event of failure (see Table 3-19). The classification can change over time due to changes in development downstream from the dam. In addition, older dams may not have been built to the standards of their updated classification when this occurs. The IDNR performs annual inspections on all high hazard dams in the State.

Table 3-19 Dam Hazard Classification Definitions

Hazard Class	Definition
High	A structure shall be classified as 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)*	A structure shall be classified as moderate hazard if located in an area where failure may damage isolated homes or cabins, industrial or commercial buildings, moderately traveled roads or railroads, interrupt major utility services, but without substantial risk of loss of human life. In addition, structures where the dam and its impoundment are of themselves of public importance, such as dams associated with public water supply systems, industrial water supply or public recreation, or which are an integral feature of a private development complex, shall be considered moderate hazard for design and regulatory purposes unless a higher hazard class is warranted by downstream conditions.
Low	A structure shall be classified as 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 live is considered unlikely.

Source: IDNR; *the term "moderate" is used by the IDNR. However, the National Inventory of Dams uses the term "significant" to identify the same general hazard classification

For this plan update, both the National Inventory of Dams as well as the State-regulated dam inventory were consulted. There are 12 state-regulated dams and one federal dam inside the county boundaries of Clinton County. Of the 12 state-regulated dams, four are High Hazard dams and eight are Low Hazard dams. The federal dam in the county, the Mississippi River Lock & Dam No. 13, is a low hazard dam. There are no Significant Hazard dams in the county. The four high hazard dams in the county are as follows:

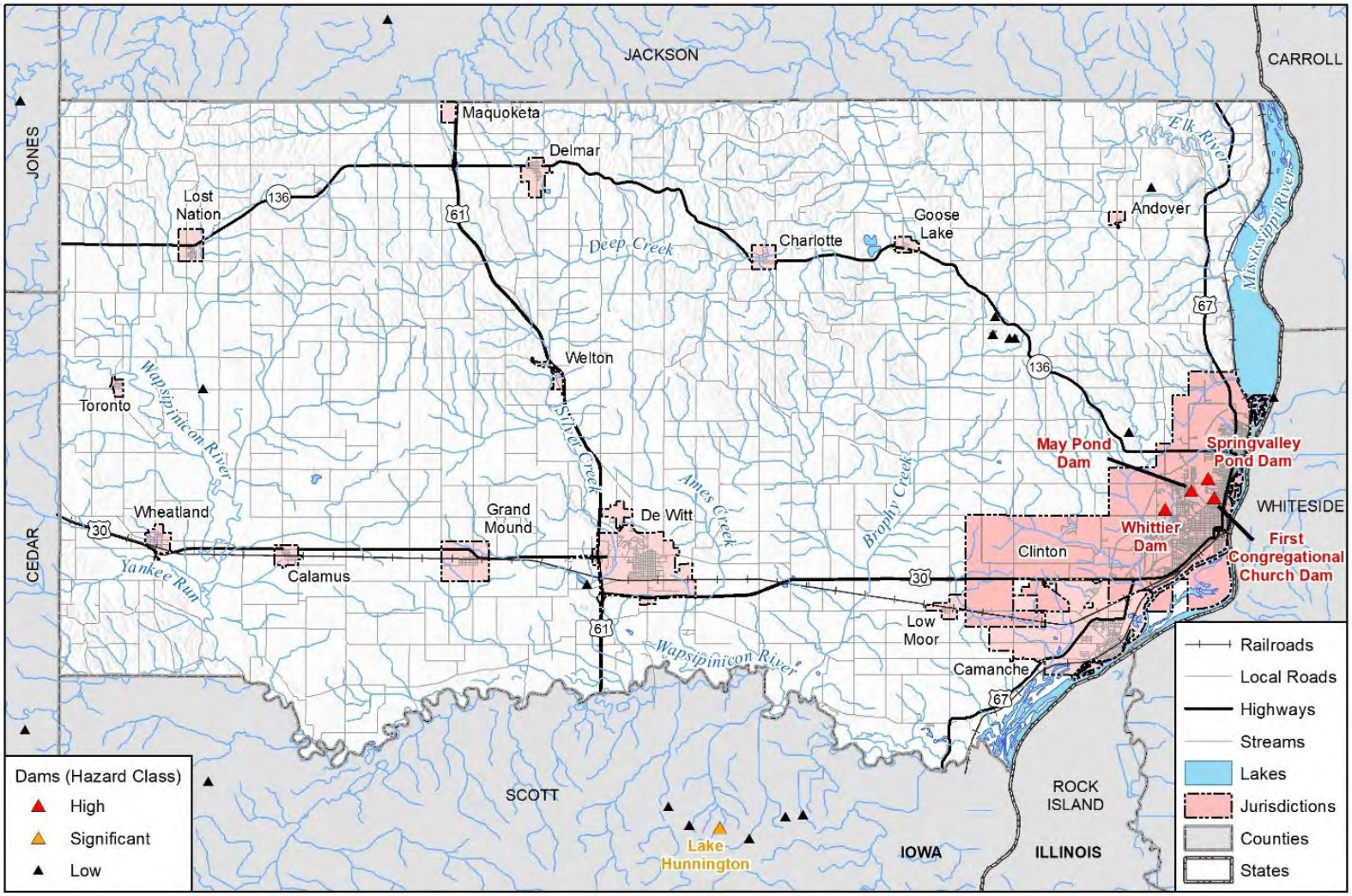
- Clinton Flood Control – First Congregational Church Dam
- Clinton Flood Control – May Pond Dam
- Clinton Flood Control –Springvalley Pond Dam
- Clinton Flood Control – Whittier Dam

In the event of failure of the high hazard dams, the only jurisdiction that would be impacted is the City of Clinton.

In the event of failure of the Federal Dam, Lock & Dam No. 13, ability to navigate that portion of the Mississippi River could be impacted. This could also impact industry water intakes and other water intakes if the failure caused the water level to go below the intake level.

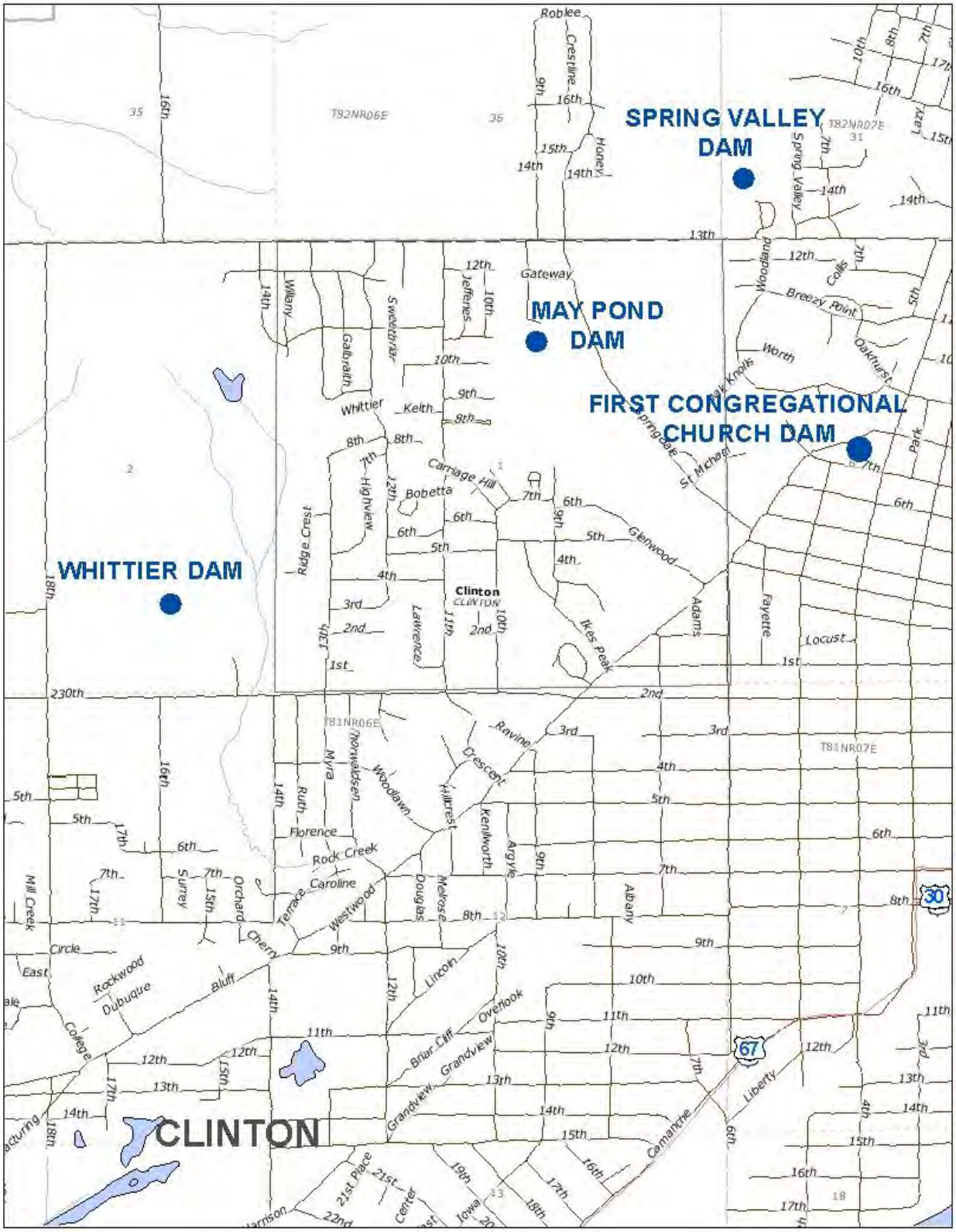
Figure 3-8 shows the locations of all dams in Clinton County. Figure 3-9 shows the high hazard dams.

Figure 3-8 Dam Locations in Clinton County



Map compiled 7/2021;
intended for planning purposes only.
Data Source: Clinton County, Iowa DNR, Floodplain Section of the DNR

Figure 3-9 Clinton County High Hazard Dams - Clinton Flood Control Dams



Dams Upstream of Planning Area

According to the IDNR, there are no known dams upstream of the planning area that would have a significant impact on Clinton County in the unlikely event of failure.

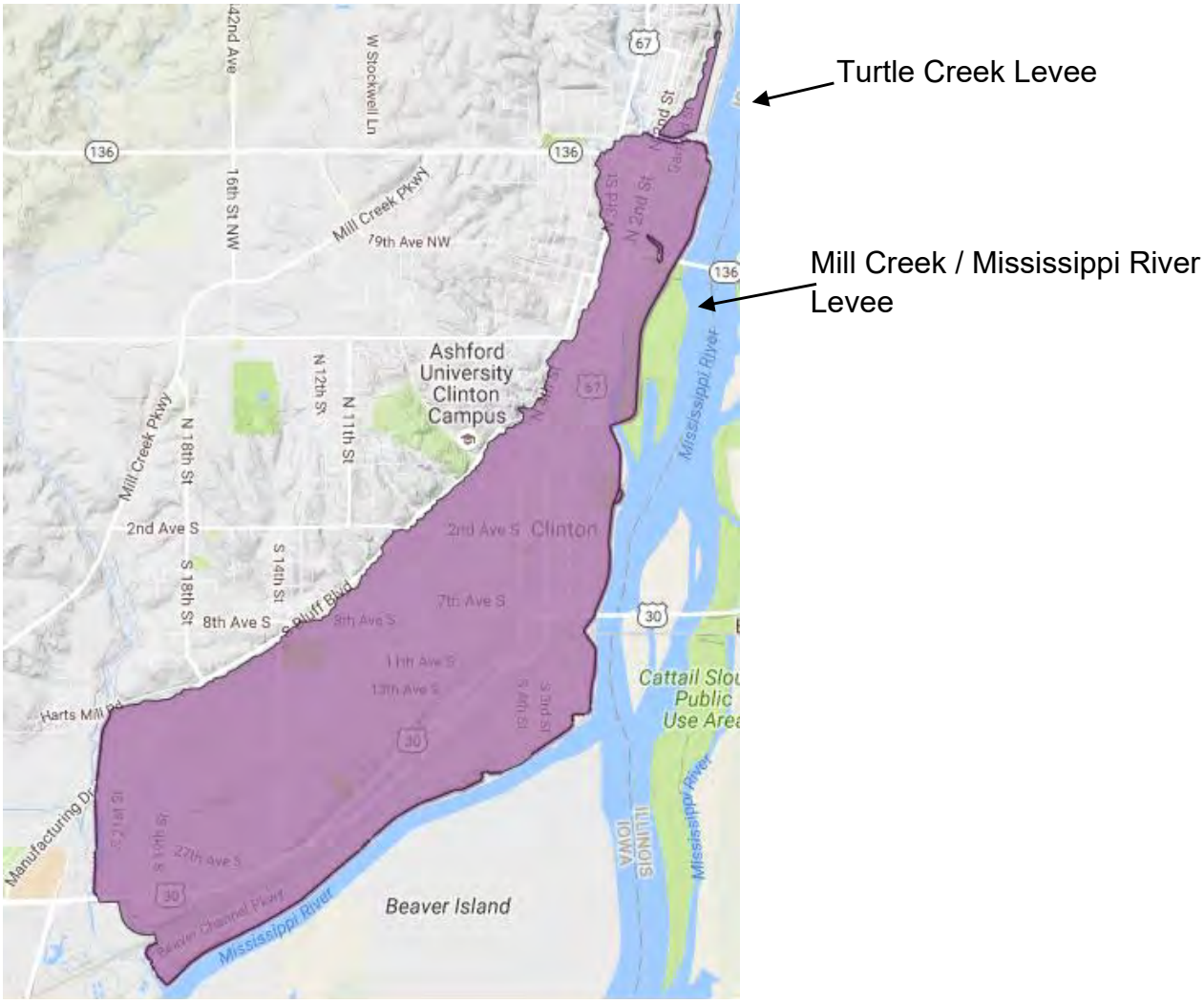
Levees in Planning Area

The National Levee Database and the FEMA DFIRM were consulted to identify levees in the planning area. There are two levee segments in Clinton County. Both provide protection of the City of Clinton as follows:

- Turtle Creek Levee – completed in 1977 (.2 miles long)
- Mill Creek Mississippi River – completed in 1981 (8.3 miles).

Figure 3-10 provides the locations of the levees in Clinton County, including the areas protected.

Figure 3-10 Levees in Clinton County



Source: US Army Corps of Engineers (USACE) National Levee Database

There also may exist various agricultural (earthen) levees in the planning area. However currently there is no inventory to catalog these dams nor any inspection requirements.

Historic Occurrences

Dam Failure

To determine previous occurrences of dam failure within Clinton County, the 2016 Clinton County Multi-Jurisdictional Hazard Mitigation Plan, the Iowa State Hazard Mitigation Plan, and the Stanford University's National Performance of Dams Program (https://npdp.stanford.edu/) were reviewed for historical dam failures. No record of dam failure within Clinton County boundaries was found.

Levee Failure

The levee segments that protect the City of Clinton, Iowa have had no previous occurrences of failure. The levee has successfully protected the City during several river surges, to include the most recent incident in 2019. There have been no reported levee failure incidents since the last plan update.

Probability and Future Occurrences

There is no reported history of dam or levee failure in Clinton County. High Hazard dams are routinely inspected by the IDNR and the levee segments that protect the City of Clinton are routinely inspected by the Corps of Engineers. As a result, there is an overall low probability of dam or levee failures impacting Clinton County. Therefore, the probability rating has been determined to be Unlikely.

Probability Score: 1—Unlikely

Climate Change Impacts

Increased frequency of precipitation and precipitation extremes leading to flooding could cause additional stress on dam and levee structures.

Magnitude and Severity (Extent)

A failure of a low hazard dam, which includes most dams in Clinton County, would result in damages that are limited to loss of the dam, livestock, farm outbuildings, agricultural lands, and lesser used roads. Low hazard dam failure would likely not have an impact on property beyond where the dam is located. The loss of human life is considered highly unlikely.

A failure of a moderate hazard dam may damage isolated homes or cabins, industrial or commercial buildings, moderately traveled roads, or interrupt major utility services, but are without substantial risk of loss of human life. Dams are also classified as Moderate Hazard where the dam and its impoundment are themselves of public importance, such as dams associated with public water supply systems, industrial water supply or public recreation or which are an integral feature of a private development complex.

A failure of a high hazard dam creates a serious threat of loss of human life or would result in serious damage to residential, industrial, or commercial areas, important public utilities, public buildings, or major transportation facilities. The City of Clinton is at risk to high hazard dam failure due to the four high hazard flood control dams in the city.

Severity of Impact

Most jurisdictions in Clinton County determined the severity of impact of a dam failure to be negligible, with few or no injuries, little or no property damage, and any interruption of services to take place for less than four hours, if at all.

The City of Clinton has a much higher severity of impact due to the high hazard dams within the city. Additional details about these dams are provided in the Vulnerability section.

Speed of Onset

A dam failure can be immediate, 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.

Vulnerability

People

Dam or levee failure is typically an additional or secondary impact of another disaster such as flooding or earthquake. Additional details on the high hazard dams are provided below:

Table 3-20 High Hazard Dams in Clinton County

Site	Whittier Dam	First Congregational Dam	May Pond Dam	Spring Valley Dam
Inventory Dam No.	IA 02826	IA02329	IA02328	IA02827
Year Built	1994	1987	1988	1994
Height, ft	24 feet	16 Feet	21 Feet	21 Feet
Hazard Class	High	High	High	High
Drainage Area, acres	235 Feet	17	112	110
Dam Owner	City of Clinton	City of Clinton	City of Clinton	City of Clinton
Dam Operator	City of Clinton	City of Clinton	City of Clinton	City of Clinton

Source: IDNR

Spring Valley Dam and May Pond Dam were last inspected on June 29th, 2016 by the IDNR and were given a rating of "Satisfactory". Whittier Dam and First Congregational Dam were last inspected on May 30th, 2018 by the IDNR and were given a rating of "Satisfactory. A "Satisfactory" rating means "no existing or potential dam safety deficiencies recognized. Safe performance is expected under all anticipated loading conditions, including such events as infrequent hydrologic and/or seismic events". A summary of impacts in the combined Draft Emergency Action Plan for the four High Hazard dams indicates several homes and businesses could be impacted as well as multiple roadways.

In the event of failure of the low hazard Federal dam, Lock & Dam No. 13, ability to navigate that portion of the Mississippi River could be impacted. This could also impact industry water intakes and other water intakes if the failure caused the water level to go below the intake level.

The Corps of Engineers conducts two types of levee inspections as part of the Levee Safety Program:

- Routine Inspections, also called annual inspections or continuing eligibility inspections, are visual inspections that verify proper levee system operation and maintenance. Routine Inspections are conducted on an annual basis.
- Periodic Inspections provide a more rigorous assessment than the Routine Inspection and include a more detailed and consistent evaluation of the condition of the levee system. Periodic Inspections verify proper operation and maintenance; evaluate operational adequacy, structural stability, and safety of the system; and compare current design and construction criteria with those in place when the levee was built. Periodic Inspections are conducted every five years.

Inspection results of acceptable, minimally acceptable, or unacceptable are provided to project sponsors to address deficiencies. Additionally, the District will work with sponsors to identify performance concerns, areas for further analysis, changes in design criteria and potential consequences of levee failures that need to be addressed to provide the continued safety of the levee.

The Clinton County flood protection system received a "minimally acceptable" inspection finding during its most recent routine/periodic inspection.

The City of Clinton and Clinton School District are the only jurisdictions that could be impacted by the unlikely failure of the high hazard dams in the county or failure of the levee system that protects the City. The magnitude of "catastrophic" is appropriate for these jurisdictions due to the potential for loss of life in the unlikely event of failure of any of the high hazard dams or levees. The low hazard dams and agricultural levees would impact mainly agricultural areas in the unincorporated portions of the county. Therefore, a "negligible" magnitude is appropriate. The remaining jurisdictions are not at risk to dam or levee failure.

Analysis was conducted to determine the estimated population vulnerable to the high hazard dams in the City of Clinton. A detailed breakdown is provided in Table 3-21. According to this analysis, there are an estimated 1,706 people at risk to catastrophic high hazard dam failure in the City of Clinton.

Magnitude/Severity Score: 4—Catastrophic

Property

In the event of failure of the high hazard dams or levees, the jurisdiction that would be impacted is the City of Clinton.

Based on the definition of high hazard dams, failure of these dams could 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.

Inundation maps were obtained from the IDNR for the four high hazard dams that would impact the City of Clinton in the unlikely event of failure. GIS analysis was performed utilizing the inundation layers along with the detailed parcel data provided by the City of Clinton. This allowed for analysis of actual parcels and values by type that fall within the boundaries of the potential inundation areas.

Analysis was conducted to determine the number and values of buildings at risk to failure of the high hazard dams. GIS was used to create a centroid or point representing the center of the parcel polygon. The inundation area data was then overlaid on the parcel centroids. For the purposes of this analysis, if the inundation area intersected a parcel centroid, inundation was assigned for the entire parcel. The model assumes that every parcel with a building or dwelling value greater than zero is improved in some way. Specifically, an improved parcel assumes there is a building on it. It is important to note that there could be more than one structure or building on an improved parcel (i.e. condo complex occupies one parcel but might have several structures). In these cases, the analysis counts this as one structure. Only improved parcels and the value of their improvements were analyzed. The result is an inventory of the number and types of parcels and buildings subject to dam failure.

According to this analysis, shown in detail in Table 3-21, there are a total of 757 structures at risk to significant damage resulting from high hazard dam failure in the City of Clinton.

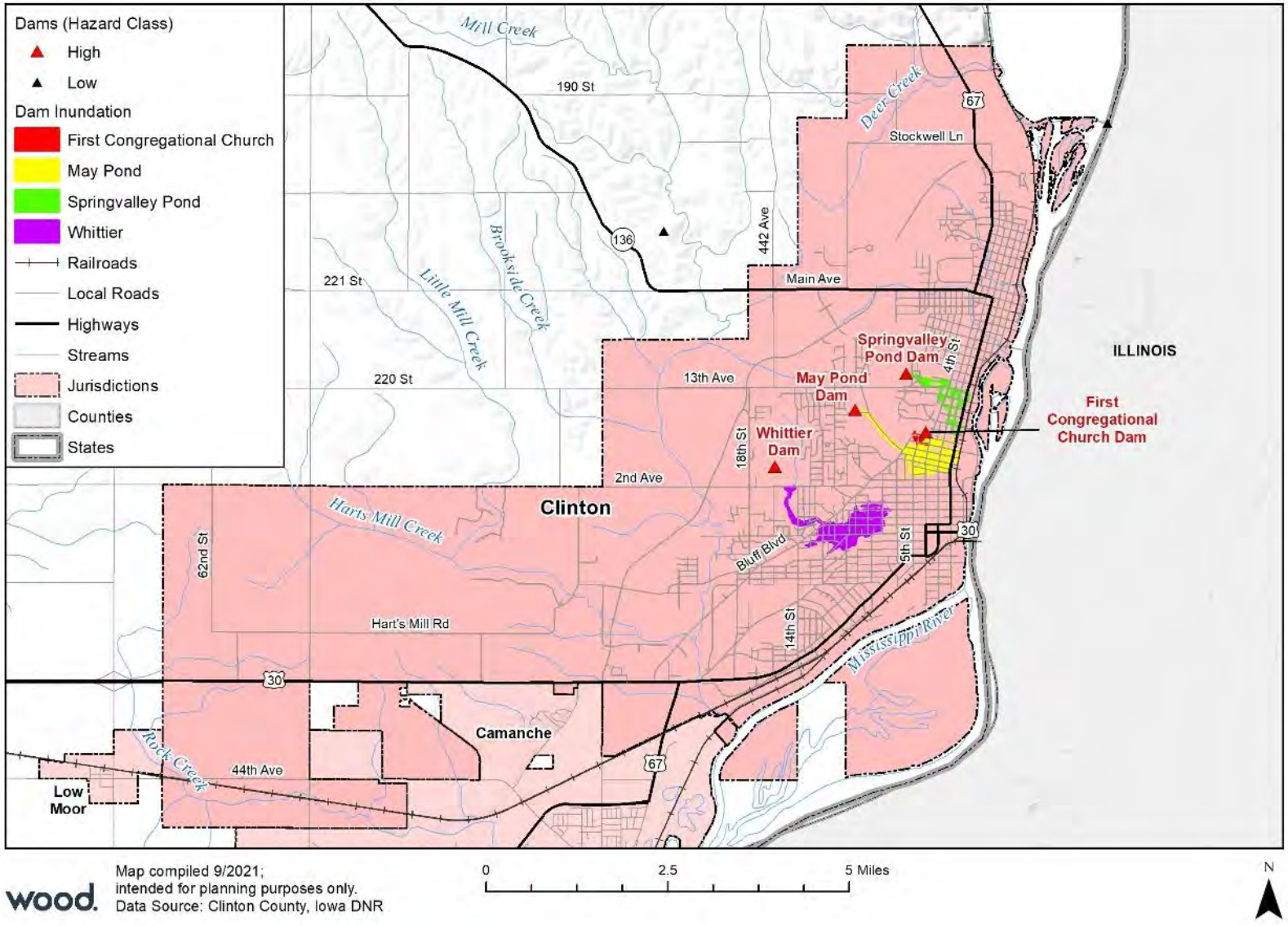
Table 3-21 City of Clinton Improved Properties at Risk to Dam Inundation by Dam and Property Type

Dam Name	Property Type	Improved Parcel Count	Building Count	Population
May Pond	Commercial	28	31	
	Mixed Use	2	2	5
	Residential	270	308	739

Dam Name	Property Type	Improved Parcel Count	Building Count	Population
	Total	**300**	**341**	**744**
Springvalley Pond	Commercial	4	5	
	Residential	41	47	113
	Total	**45**	**52**	**113**
Whittier	Commercial	5	10	
	Mixed Use	1	1	2
	Residential	290	353	847
	Total	**296**	**364**	**850**
	Grand Total	**641**	**757**	**1,706**

Source: Wood analysis of Clinton County Assessor's data

Figure 3-11 Dam Inundation in the City of Clinton



Since a DFIRM is available and the County has detailed parcel data in a GIS format with assessed values, comparative analysis of these two layers was determined to be the preferred approach for the Levee Failure Risk Assessment. This will allow for analysis of actual parcels and values by type that fall within the boundaries of the levee protected areas. Please note, however, that this analysis is only possible for the levees that protect the City of Clinton that are accredited as providing protection from the 1-percent annual chance flood.

Analysis was conducted to determine the number and values of buildings at risk to failure of the accredited levees. GIS was used to create a centroid or point representing the center of the parcel polygon. The DFIRM data with integrated preliminary panels was then overlaid on the parcel centroids. For the purposes of this analysis, if the levee protected area intersected a parcel centroid, the levee protection area (and thus the area prone to failure) was assigned for the entire parcel. The model assumes that every parcel with a building or dwelling value greater than zero is improved in some way. Specifically, an improved parcel assumes there is a building on it. It is important to note that there could be more than one structure or building on an improved parcel (i.e. condo complex occupies one parcel but might have several structures). In these cases, the analysis counts this as one structure. Only improved parcels and the value of their improvements were analyzed. The result is an inventory of the number and types of parcels and buildings subject to levee failure.

Table 3-22 provides the numbers of parcels, improved parcels (structures), and values by type of parcel that are in the levee protected areas according to the analysis methodology described above.

Table 3-22 Assets at Risk to Levee Failure in the City of Clinton

Jurisdiction	Property Type	Improved Parcel Count	Building Count	Improved Value	Estimated Content Value	Total Value	Loss Estimate	Population
Clinton	Commercial	407	465	$86,784,394	$86,784,394	$173,568,788	$43,392,197	
	Industrial	22	61	$134,320,525	$201,480,788	$335,801,313	$83,950,328	
	Mixed Use	68	71	$4,351,744	$4,351,744	$8,703,488	$2,175,872	170
	Residential	1,991	2,441	$146,383,471	$146,383,471	$292,766,942	$73,191,736	5,858
Total		**2,488**	**3,038**	**$371,840,134**	**$439,000,397**	**$810,840,531**	**$202,710,133**	**6,029**

Source: Wood analysis of Clinton County Assessor's data

According to this analysis, there are nearly $500 million in improvements / contents value in the areas protected by the Clinton Flood Protection levees. Of those, parcels with residential improvements are as follows:

- 1,991 residential
- 407 are commercial
- 68 are mixed use
- 22 are industrial

This totals to 2,488 residential parcels with improvements utilized as dwellings. To determine the potential number of people that might be impacted by levee failure, the average household size from the 2010 US Census of 2.4 was multiplied by the number of dwellings in the levee protected area. This analysis revealed approximately 6,029 people in the levee protected areas that are considered at risk to levee failure.

Critical Facilities and Infrastructure

To analyze critical facilities at risk in the planning area, the inventory of critical and essential facilities and infrastructure in the planning area was compiled from Clinton County. All facilities in the compiled inventory, (including school facilities) were compiled in a GIS format. This compiled inventory consisted of 905 critical facilities. A comparison was made of the 905 critical functions in GIS format with the DFIRM layer to determine those facilities that would be damaged in the event of a levee failure. According to the analysis, no critical facilities intersected a dam inundation area. This analysis determined that 61 facilities in the City of Clinton could be impacted in the event of a levee failure. Table 3-23 provides a breakdown by FEMA Lifeline type of these facilities.

Table 3-23 Critical Facilities within the Area Protected from 1% Annual Chance Flood Hazard by Levee

Jurisdiction	Communications	Energy	Food, Water, Shelter	Hazardous Material	Health and Medical	Safety and Security	Transportation	Total
City of Clinton	13	4	10	21	2	11	-	**61**
Total	**13**	**4**	**10**	**21**	**2**	**11**	**0**	**61**

Source: Wood analysis of Clinton County, IDNR, National Bridge Inventory, HIFLD, HSIP data

Economy

Economic impacts due to a dam or levee failure event will be related to both the event (i.e. damage to containment structure) and the recovery after the event. Table 3-22 estimates the improved value of buildings at risk to levee failure and provides an estimate of economic damages that could be sustained related to this event.

Historic, Cultural, and Natural Resources

A dam failure event in Clinton County could cause damage to agricultural land and recreational facilities. There are no historic or cultural resources that would be affected by a dam or levee failure. The Clinton Historic District is not within the area protected by levees and therefore would not be affected by a failure of the levee system. There are some historical landmarks in Downtown Clinton that could be in the inundation area of a potential high hazard dam breach.

Development Trends

Future development located downstream from dams in floodplains or inundation zones and/or in levee protected areas would increase vulnerability to dam or levee failure. Overall, Clinton County has seen a net decrease (-4%) in population since 2010. Population growth is not a significant factor contributing to development in floodplains, dam inundation zones, or levee protected areas.

Dam Failure Hazard Summary by Jurisdiction

Jurisdiction	Probability	Magnitude	Warning Time	Duration	Score	Level
Unincorporated Clinton County	1	1	4	4	1.75	Low
Andover	N/A	N/A	N/A	N/A	N/A	N/A
Calamus	N/A	N/A	N/A	N/A	N/A	N/A

Jurisdiction	Probability	Magnitude	Warning Time	Duration	Score	Level
Camanche	N/A	N/A	N/A	N/A	N/A	N/A
Charlotte	N/A	N/A	N/A	N/A	N/A	N/A
Clinton	1	4	4	4	2.65	Moderate
Delmar	N/A	N/A	N/A	N/A	N/A	N/A
DeWitt	N/A	N/A	N/A	N/A	N/A	N/A
Goose Lake	N/A	N/A	N/A	N/A	N/A	N/A
Grand Mound	N/A	N/A	N/A	N/A	N/A	N/A
Lost Nation	N/A	N/A	N/A	N/A	N/A	N/A
Low Moor	N/A	N/A	N/A	N/A	N/A	N/A
Toronto	N/A	N/A	N/A	N/A	N/A	N/A
Welton	N/A	N/A	N/A	N/A	N/A	N/A
Wheatland	N/A	N/A	N/A	N/A	N/A	N/A
Calamus-Wheatland School District	N/A	N/A	N/A	N/A	N/A	N/A
Camanche School District	N/A	N/A	N/A	N/A	N/A	N/A
Central DeWitt School District	N/A	N/A	N/A	N/A	N/A	N/A
Clinton School District	1	4	4	4	2.65	Moderate
Delwood School District	N/A	N/A	N/A	N/A	N/A	N/A
Northeast School District	N/A	N/A	N/A	N/A	N/A	N/A

3.3.4 Drought

Hazard Score Calculation					
Probability	**Magnitude/Severity**	**Warning Time**	**Duration**	**Weighted Score**	**Level**
4	2	1	4	2.95	Moderate

Profile

Hazard Description

Drought is generally defined as a condition of moisture levels significantly below normal for an extended period over a large area that adversely affects plants, animal life, and humans. There are four types of drought conditions relevant to Iowa:

Meteorological drought is defined based on the degree of dryness (in comparison to some "normal" or average amount) and the duration of the dry period. A meteorological drought must be considered as region-specific since the atmospheric conditions that result in deficiencies of precipitation are highly variable from region to region.

Hydrological drought is associated with the effects of periods of precipitation (including snowfall) shortfalls on surface or subsurface water supply (e.g., streamflow, reservoir and lake levels, ground water). The frequency and severity of hydrological drought is often defined on a watershed or river basin scale. Although all droughts originate with a deficiency of precipitation, hydrologists are more concerned with how this deficiency plays out through the hydrologic system. Hydrological droughts are usually out of phase with or lag the occurrence of meteorological and agricultural droughts. It takes longer for precipitation deficiencies to show up in components of the hydrological system such as soil moisture, streamflow, and ground water and reservoir levels. As a result, these impacts are out of phase with impacts in other economic sectors.

Agricultural drought focus is on soil moisture deficiencies, differences between actual and potential evaporation, reduced ground water or reservoir levels, and so forth. Plant water demand depends on prevailing weather conditions, biological characteristics of the specific plant, its stage of growth, and the physical and biological properties of the soil.

Socioeconomic drought refers to when physical water shortage begins to affect people.

The four different types of drought can all occur in Iowa. A meteorological drought is the easiest to determine based on rainfall data and is an easier drought to monitor from rain gauges and reports. A hydrological drought means that stream and river levels are low, which also has an impact for surface water and ground water irrigators. In addition, in-stream discharges that fall below a pre-required level also place the State in regulatory difficulty with US Fish and Wildlife and with neighboring states over cross-border flowage rights. An agricultural drought represents difficulty for Iowa's agricultural-based economy and is also relatively easy to monitor based on crop viabilities for different regions.

The National Drought Mitigation Center (NDMC) located at the University of Nebraska in Lincoln provides a clearinghouse for information on the effects of drought, based on reports from media, observers, and other sources.

The NDMC categorizes impacts of drought as economic, environmental, or social. Many economic impacts occur in agriculture and related sectors, including forestry and fisheries, because of the reliance of these sectors on surface and subsurface water supplies. In addition to obvious losses in yields in both crop and livestock production, drought is associated with increases in insect infestations, plant disease and wind erosion. Droughts also bring increased problems with insects and disease to forests and reduce growth. The incidence of forest and range fires increases substantially during extended droughts, which in

turn places both human and wildlife populations at higher levels of risk. Income loss is another indicator used in assessing the impacts of drought because so many sectors are affected.

Although drought is not predictable, long-range outlooks may indicate an increased chance of drought, which can serve as a warning. A drought period can last for months, years, or even decades. It is rarely a direct cause of death, though the associated heat, dust and stress can all contribute to increased mortality.

Warning Time Score: 1—24+ Hours

Duration Score: 4—more than 1 week

Geographic Location/Extent

While the entire planning area in Clinton County is at risk to drought, the agricultural areas are more vulnerable to the immediate effects of drought. According to the 2017 Census of Agriculture, 402,733 acres within Clinton County is farmland, of which 337,237 acres was harvested. The map in Figure 3-4 in the Animal/Plant/Crop Disease hazard section displays the locations of various cropland uses in Clinton County.

According to the Iowa Environmental Mesonet, the average annual precipitation for Clinton County is 34.71 inches. In average years, this represents enough rainfall to prevent drought; however, it is the result of successive years of below-average rainfall that cause drought impacts in the planning area.

The following figure describes potential impacts during drought for the State of Iowa. The US Drought Monitor developed the impact table based on reported impacts for each level of drought during past events in the State of Iowa.

Figure 3-12 Iowa Drought Impacts

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

Source: US Drought Monitor https://droughtmonitor.unl.edu/Data/StateImpacts.aspx

Previous Occurrences

Drought occurs periodically in Iowa with the most severe in historical times occurring in the 1930's. Other major droughts, usually characterized by deficient rainfall combined with unusually high summer temperatures, occurred in 1886, 1893-1894, 1901, 1954-1956, 1976– 1977, 1988–1989, 1999, 2000, 2003, 2005, 2006, 2012-2013, 2017-2018. Historically droughts cause more economic damage to the State than all other weather events combined.

According to the NDMC's Drought Impact Reporter, between January 2000 and December 31, 2020, Clinton County was included in ten listed drought impacts. The following are the categories and reported number of impacts. Note: some impacts have been assigned to more than one category:

- Agriculture – 3
- Business & Industry – 1
- Energy – 0
- Fire – 2
- Plant & Wildlife – 0
- Relief, Response & Restrictions – 2
- Society & Public Health – 0
- Tourism & Recreation –0
- Water Supply & Quality – 5

Impacts of recent drought periods in Iowa that affected Clinton County are provided below. Unless otherwise indicated, these impacts are from the Drought Impact Reporter.

Table 3-24 Drought Impacts in Clinton County, 1999-2020

Start Date	End Date	Title	Description
7/6/2016	Ongoing	Corn yield potential down in Iowa	The corn yield potential was down in parts of Iowa, but it was too early to determine how much was lost, according to Mark Licht, ISU Extension cropping systems agronomist at Ames. Some livestock producers were likely needing to supplement water in pastures as creeks run low. Farm Progress (St. Charles, Ill.), July 6, 2016.
8/31/2013	9/30/2013	Bans on open burning in southeastern Iowa	The burn ban in Clinton County remained in effect. Sioux City Journal (Iowa), Sept. 30, 2013Muscatine, Clinton, Scott and Louisa counties in Iowa banned outdoor burning as the fire danger continues to rise. A ban on open burning took effect in Muscatine County on Sept. 9. County officials in Scott and Clinton counties followed suit and implemented burn bans on Sept. 11, deeming the fire danger too high to allow open burning. The state fire marshal said that the dry conditions in Scott County were such that open burning constitutes a danger to life or property. Louisa County authorities adopted a ban on open burning on Sept. 12. Parts of southeastern Iowa have not received much rain since early August and were seeing more fires as a consequence. WQAD-TV 8 (Davenport/Rock Island/Moline) (Iowa), Sept. 11, 2013 and from Ray Wolf, NOAA, Davenport, Iowa, on September 13, 2013.

Start Date	End Date	Title	Description
7/1/2011	11/8/2011	Businesses in Illinois and neighboring areas eligible for loans from the Small Business Administration	Small businesses in most Illinois counties were eligible for low-interest loans from the Small Business Administration for financial loss due to drought and heat since July 1, 2011. The primary counties include Adams, Brown, Champaign, Christian, Clark, Clay, Clinton, Crawford, Cumberland, Douglas, Edgar, Edwards, Effingham, Fayette, Ford, Franklin, Fulton, Gallatin, Hamilton, Hancock, Hardin, Henry, Iroquois, Jasper, Jefferson, Johnson, Knox, Lawrence, Macon, Marion, Massac, McDonough, McLean, Morgan, Piatt, Pope, Richland, Rock Island, Saline, Shelby, Vermilion, Wabash, Wayne and Williamson, while the neighboring counties are Adams, Brown, Champaign, Christian, Clark, Clay, Clinton, Crawford, Cumberland, Douglas, Edgar, Edwards, Effingham, Fayette, Ford, Franklin, Fulton, Gallatin, Hamilton, Hancock, Hardin, Henry, Iroquois, Jasper, Jefferson, Johnson, Knox, Lawrence, Macon, Marion, Massac, McDonough, McLean, Morgan, Piatt, Pope, Richland, Rock Island, Saline, Shelby, Vermilion, Wabash, Wayne and Williamson in Illinois; Clinton, Lee, Louisa, Muscatine and Scott in Iowa, Crittenden, Livingston, McCracken and Union counties in Kentucky; and Clark, Lewis and Marion in Missouri. The declaration makes small businesses, small agricultural cooperatives, and nurseries eligible for loans through the Economic Injury Disaster Loan program. Farmers and ranchers should not apply. Applications must be received by July 2, 2012. Sacramento Bee (Calif.), Nov. 8, 2011.
8/3/2006	8/3/2006	Water Supply & Quality impact from Media submitted on 8/11/2006	Due to reduced water levels in the Mississippi River due to the drought, the Coast Guard issued an advisory requiring barge operators to run fewer barges with lighter loads per tow. Reducing the number of barges and the weight that they can tow increases barge companies' operating costs. According to the American Waterways Operators, a five barge decrease amount to a decrease of almost 12,000 tons of weight per tow. The drought and low river levels are causing some barge companies to go out of business, according to the president of MEMCO Barge Line. Impact Source: Media More Information: http://www.ky3.com/news/3543987.html
12/14/2005	12/14/2005	Water Supply & Quality impact from Media submitted on 12/16/2005	The Mississippi River at St. Louis is at -0.85 feet. North-bound tows are limited to 15 barges at 9.5-foot drafts. The USACE notes that one-foot loss in draft per barge equals 18 tons. Under normal conditions, barge tows have numbered as many as 30, carrying as much as 40,000 tons of goods--the equivalent of 870 tractor-trailers, or more than two 100-car trains. A spokesman for the Illinois Corn Growers Association notes that corn freight costs have increased 200% since last year, with the summer drought and hurricanes aggravating the situation. Impact Source: Media More Information: http://myac.yellowbrix.com/pages/myac/Story.nsp?story_id=86753019&ID=myac&scategory=Transportation&

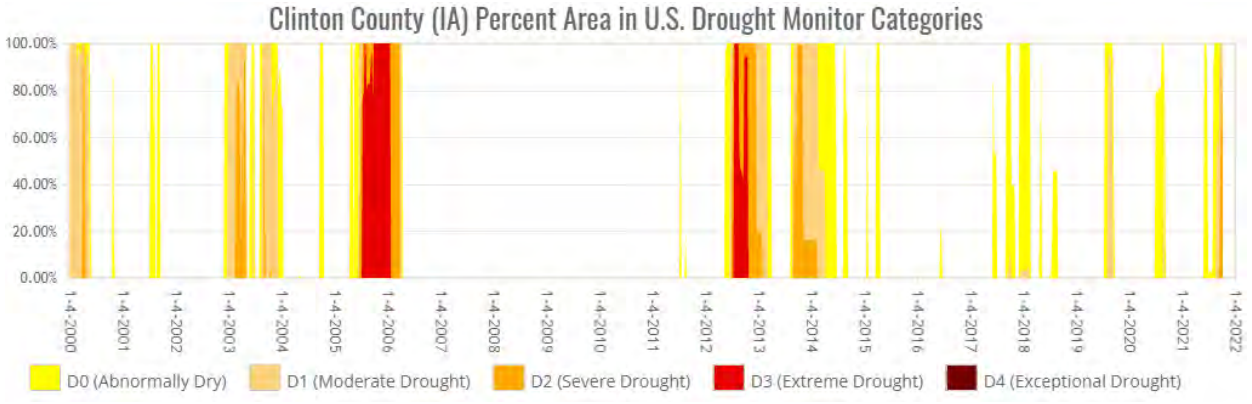
Start Date	End Date	Title	Description
9/14/2005	9/14/2005	Agriculture impact from Media submitted on 9/15/2005	The USDA has made a disaster declaration for 16 eastern Iowa counties (Cedar, Clinton, Davis, Des Moines, Henry, Iowa, Jackson, Jefferson, Johnson, Keokuk, Lee, Louisa, Muscatine, Scott, Van Buren, and Washington). In addition, ten contiguous counties (Appanoose, Benton, Dubuque, Jones, Linn, Mahaska, Monroe, Poweshiek, Tama, and Wapello) are eligible for assistance. The corn yield has been estimated at about 110-125 bushels an acre, a decrease of about 25-30%, in the Quad-City area. Impact Source: Media More Information: http://www.muscatinejournal.com/articles/2005/09/14/news/doc432835b327d9c610297769.txt
8/5/2005	8/5/2005	Water Supply & Quality impact from Media submitted on 8/8/2005	The Mississippi River at St. Louis has dropped more than 2 ft. in the past week, and water levels are near the minimum needed for barge traffic. The Coast Guard has issued a low water advisory for the upper Mississippi. They advise owners of heavy draft vessels to get them off the river as soon as possible. The Corps of Engineers says that 278 grain barges ran south through Lock #27 near St. Louis this week, compared to 357 the week before. Impact Source: Media More Information: http://hibernia.stockpoint.com/hibernia/newspaper.asp?Mode=Finance&Story=20050805/217r0990.xml
7/21/2005	7/21/2005	Water Supply & Quality impact from Media submitted on 7/22/2005	Over the past 30 days, water usage in Quad Cities area has exceeded 28 million gallons a day; average daily use last summer was 17.3 million gallons. Water supplier will probably ask for voluntary conservation, primarily because increased usage has strained the supplier's equipment. Impact Source: Media More Information: http://www.qctimes.net/articles/2005/07/21/news/local/doc42e02d821c222930087260.txt
7/16/2005	7/16/2005	Fire impact from Media submitted on 7/17/2005	Burn bans in effect in Clinton, Louisa, Muscatine, and Scott counties in Iowa and Sherrard, Illinois. Impact Source: Media More Information: http://www.qctimes.net/articles/2005/07/16/news/local/doc42d8a0bf412ec513278430.txt
1/1/2005	12/31/2005	Agriculture impact from Media submitted on 5/24/2006	According to the USDA, Quad-City area farmers claimed greater losses due to the 2005 drought than at any time since 1993. Nearly a third of the crop loss payments in Iowa went to farmers in just four counties: Scott, Clinton, Cedar and Jackson. Scott County farmers received most payments in the Quad Cities, just over $3 million. Rock Island County farmers received about $1.3 million but paid more in premiums than it got back in claims payments. Clinton County farmers fared the worst in terms of losses as the federal government paid out nearly $8 million in insurance payments to farmers there. This figure is 78 percent more than what farmers paid in premiums. In Cedar County, Iowa, the government paid farmers $6.1 million in insurance payments, 67 percent more than premium payments. According to the director of the USDA Risk Management Agency in St. Paul, Minn., insurance data don't fully reflect the lost income to the farmer. When the losses farmers take off the top are thrown in, Scott County probably took a hit of between $7 million and $8 million. Impact Source: Media More Information: http://www.qctimes.net/articles/2006/04/09/news/local/doc443893c26eedd045834772.txtMonetary Loss: Over $20M.

Start Date	End Date	Title	Description
10/26/1999	10/26/1999	Water Supply & Quality impact from Media submitted on 1/9/2006	Drought is causing problems for shippers on the Mississippi River due to low water levels. Traffic on the river has been reduced to one lane in some areas and barges are being forced to a crawl, slowing deliveries. Products transported along the river include food, gasoline, oil, and timber. (10/26/99, ABC News Wire) Impact Source: Media.

Source: NDMC, Drought Impact Reporter, 9/6/2021, http://droughtreporter.unl.edu/advancedsearch/impacts.aspx

Figure 3-13 below provided by the US Drought Monitor, summarizes the historical drought conditions for Clinton County by intensity and percent area from 2000 through January 2021. The chart shows that the County has experienced periods of moderate to extreme drought in 2003-2004, 2005-2006, 2012-2013 and in 2014.

Figure 3-13 Historic Drought Intensity (Percent Area) 2000-October 5, 2021



Source: US Drought Monitor, http://droughtmonitor.unl.edu/MapsAndData/DataTables.aspx

Clinton County has been designated in two USDA Secretarial disaster designations (S3310 and S3311) related to drought. USDA Disaster Designations make emergency loans available to producers suffering losses.

According to the USDA's Risk Management Agency, payments for insured crop losses in Clinton County as a result of drought conditions occurred in all ten years from 2006-2020 and totaled $30,494,904 (see Table 3-25). This equates to an estimated $2,178,207 average annualized crop loss due to drought. With the extensive drought conditions during the years of 2012 and 2013, 91 percent of the 10-year crop losses came from those two years alone.

Table 3-25 Crop Insurance Claims Paid From Drought, 2006-2020

Year	Net Acres	Insurance Paid
2006	-	$37,774
2007	1,094	$85,315
2008	263	$38,449
2011	681	$109,955
2012	86,486	$17,889,037
2013	67,167	$8,533,017.76

Year	Net Acres	Insurance Paid
2014	25,378	$2,239,964.13
2015	53	$2,183
2017	1,708	$82,812
2018	1,324	$183,652
2019	1,170	$169,139
2020	14,039	$1,123,606
Total	**199,363**	**$30,494,904**

Source: USDA Risk Management Agency

Probability of Future Occurrence

NOAA's National Climatic Data Center uses the US Palmer Drought Indices and the Standardized Precipitation Index to monitor and predict drought conditions. Lack of precipitation for a given area is the primary contributor to drought conditions. Since precipitation levels cannot be predicted in the long term, the following indices can be used to determine the probability of future occurrences of drought.

The following are the indices:

- Palmer Z Index monitors short-term monthly moisture conditions when depart from normal.
- Palmer Drought Severity Index measures the duration and intensity of the long-term (meteorological) drought patterns.
- Palmer Hydrological Drought Index measures long-term (hydrological) drought and wet conditions reflecting groundwater and reservoir levels.
- Standardized Precipitation Index is a probability index that considers only precipitation. This is important to farmers to estimate soil moisture.

In the past 14 years, there have been 12 years with crop insurance claims because of drought in Clinton County. If this trend continues, this results in a probability of 85% of agricultural impacts as a result of drought in any given year. The probability rating for this hazard is "Highly Likely".

Probability Score: 4—Highly Likely

Vulnerability

Overview

Clinton County jurisdictions are impacted by drought because it is an expensive weather disaster; it reduces agricultural productivity and causes a strain on urban water supplies. In Clinton County, farmers bear the most direct stress from drought as wells may run dry; crops wilt and die, and forage for livestock becomes scarce and costly.

Clinton County has 1,169 farms in the County that cover 402,733 acres of land. Therefore, the planning area has a high exposure to this hazard. Aside from agricultural impacts, other losses related to drought include increased costs of fire suppression and damage to roads and structural foundations due to the shrink dynamic of expansive soils during excessively dry conditions.

Drought also presents hazards to public health in extreme cases, where drinking water production cannot keep up with demand. Water wells become less productive during drought and a failure of remaining productive wells (due to power outage, etc.) can cause public drinking water supplies to become compromised.

Magnitude Score: 2—Limited

Potential Losses to Existing Development

Areas associated with agricultural use are vulnerable to drought conditions which could result in a decrease in crop production or a decrease in available grazing area for livestock. Drought has no real effect on houses and buildings. The impacts would be minimal in terms of landscaping. Rationing water supplies would most likely be the worst-case scenario impact.

According to the fourteen-year period from USDA's Risk Management Agency, the number of claims paid for crop damage because of drought in Clinton County was $30,494,904. This equates to an average annual loss of $2,178,207. Refer to Table 3-25).

Future Development

Increases in acreage planted with crops would increase the exposure to drought-related agricultural losses. In addition, increases in population add additional strain on water supply systems to meet the growing demand for treated water.

Climate Change Impacts

For the most part, climate change studies have shown increases in precipitation, rather than decreases. However, drought cycles still continue. Climate change studies have also shown some increases in average temperatures. If this occurs during a drought cycle, the drought impacts will be exacerbated and increased agricultural losses will be sustained. According to the Fourth National Climate Assessment, climate change impacts in the Midwest will include increased frequency of late-growing season drought conditions. Future conditions of surface soil moisture are projected to insufficient levels in summer driven by an increase in temperatures leading to greater loss of moisture through evaporation. Increasing drought conditions are likely to accelerate the rate of species declines and extinctions (US Global Change Research Program 2018).

Drought Hazard Summary by Jurisdiction

As discussed in the drought previous occurrences and vulnerability sections, many of the damages seen historically as a result of drought are to crops and other agriculture-related activities. Therefore, the magnitude of the impacts is greater in the unincorporated areas. In the cities, the frequency of drought conditions would be the same, but the magnitude would be less with lawns and local gardens affected and leading to expansive soil problems around foundations. If drought conditions are severe and prolonged, water supplies could also be affected.

Jurisdiction	Probability	Magnitude	Warning Time	Duration	Score	Level
Unincorporated Clinton County	4	3	1	4	3.25	High
Andover	4	2	1	4	1.95	Moderate
Calamus	4	2	1	4	1.95	Moderate
Camanche	4	2	1	4	1.95	Moderate
Charlotte	4	2	1	4	1.95	Moderate
Clinton	4	2	1	4	1.95	Moderate
Delmar	4	2	1	4	1.95	Moderate
DeWitt	4	2	1	4	1.95	Moderate
Goose Lake	4	2	1	4	1.95	Moderate
Grand Mound	4	2	1	4	1.95	Moderate

Jurisdiction	Probability	Magnitude	Warning Time	Duration	Score	Level
Lost Nation	4	2	1	4	1.95	Moderate
Low Moor	4	2	1	4	1.95	Moderate
Toronto	4	2	1	4	1.95	Moderate
Welton	4	2	1	4	1.95	Moderate
Wheatland	4	2	1	4	1.95	Moderate
Calamus-Wheatland School District	4	2	1	4	1.95	Moderate
Camanche School District	4	2	1	4	1.95	Moderate
Central DeWitt School District	4	2	1	4	1.95	Moderate
Clinton School District	4	2	1	4	1.95	Moderate
Delwood School District	4	2	1	4	1.95	Moderate
Northeast School District	4	2	1	4	1.95	Moderate

3.3.5 Earthquake

Hazard Score Calculation					
Probability	**Magnitude/Severity**	**Warning Time**	**Duration**	**Weighted Score**	**Level**
1	1	4	1	1.45	Low

Profile

Hazard Description

An earthquake is a sudden motion or trembling that is caused by a release of energy accumulated within or along the edge of Earth's tectonic plates. Earthquakes occur primarily along fault zones, tears in the Earth's crust, along which stresses build until one side of the fault slips, generating compressive and shear energy that produces the shaking and damage to the built environment. Heaviest damage generally occurs nearest the epicenter which is that point on the Earth's surface directly above the point of fault movement. The composition of geologic materials between these points is a major factor in transmitting the energy to buildings and other structures on the Earth's surface.

Warning Time Score: 4—less than 6 hours

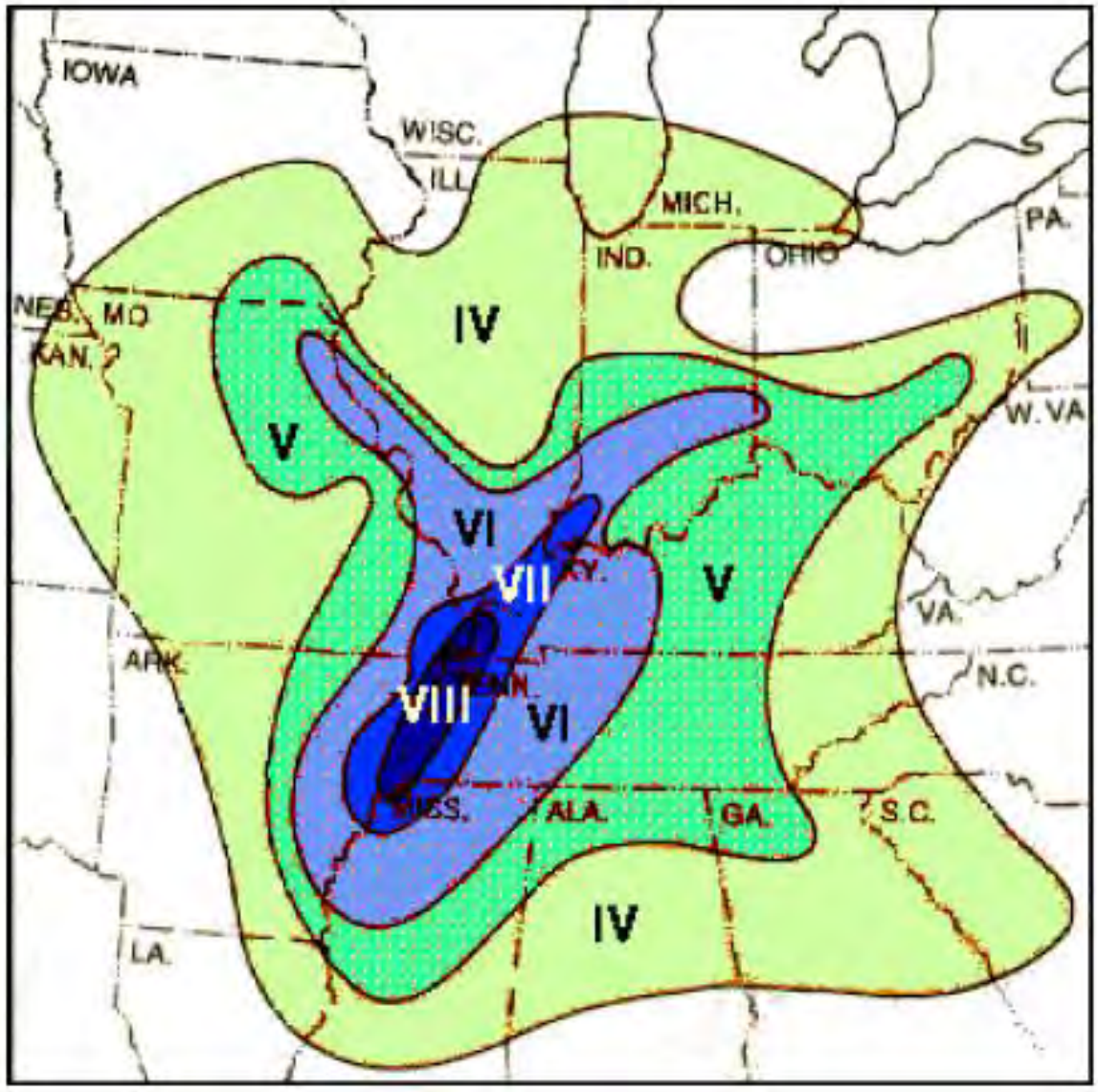
Duration Score: 1—less than 6 hours

Geographic Location/Extent

While geologists often refer to the Midwest as the "stable midcontinent," because of its lack of major crustal movements, there are two regions of active seismicity, the Nemaha Ridge and the New Madrid Fault Zone. The Nemaha Ridge in Kansas and Nebraska, associated with the Humboldt Fault, is characterized by numerous small earthquakes that release stresses before they build to dangerous levels. The fault is not considered a threat to Iowa. The New Madrid Fault Zone, on the other hand, has greater destructive potential. It is located along the valley of the Mississippi River, from its confluence with the Ohio River southward, and includes portions of Illinois, Kentucky, Tennessee, Missouri, Arkansas, and Mississippi. The Earth's crust in the midcontinent is older, and therefore thicker, cooler, and more brittle than that in California for example. Consequently, earthquake shock waves travel faster and farther in the Midwest, making quakes here potentially more damaging than similar sized events in other geologic settings.

Iowa counties are in low risk zones as a whole. The southeastern part of the State is more at risk to earthquake effects from the New Madrid Fault Zone. Figure 3-14 shows the estimated effects of a 6.5 Richter magnitude earthquake scenario along the New Madrid Fault Zone. It suggests that Iowans in four southeast counties could experience trembling buildings, some broken dishes and cracked windows, movement and falling of small unstable objects, abrupt openings or closing doors, and liquids spilling from open containers. About 29 other counties, from Page to Polk to Muscatine, could experience vibrations similar to the passing of a heavy truck, rattling of dishes and windows, creaking of walls, and swinging of suspended objects. These effects will vary considerably with differences in local geology and construction techniques. There is also a minor fault in Southwest Iowa located near Fremont County.

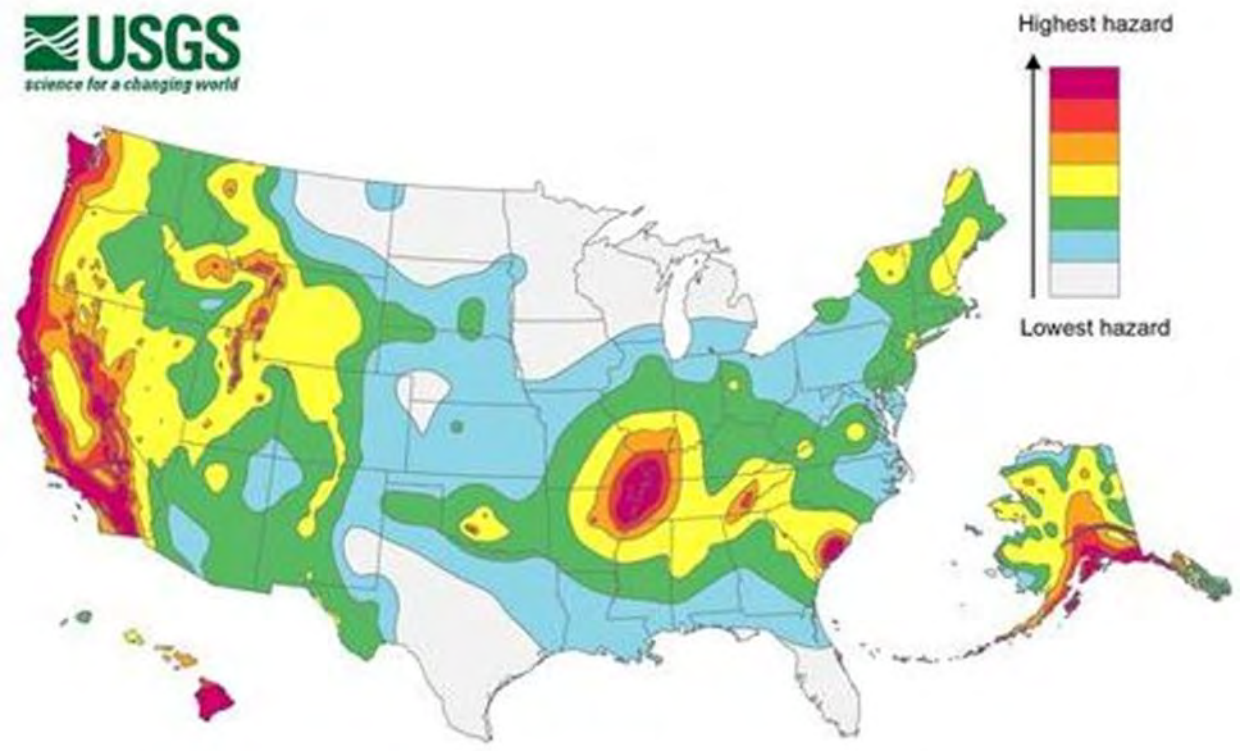
Figure 3-14 6.5 Richter Magnitude Earthquake Scenario, New Madrid Fault Zone



Source: http://www.igsb.uiowa.edu/Browse/quakes/quakes.htm

Figure 3-15 shows the Seismic Hazard Map for the US showing the peak ground acceleration of 10 percent in a 50-year timeframe.

Figure 3-15 United States Seismic Hazard Map



Source: United States Geological Survey, https://www.usgs.gov/media/images/2018-long-term-national-seismic-hazard-map

The extent or severity of earthquakes is generally measured in two ways: 1) Magnitude Measurement utilizes the Richter Magnitude Scale and 2) Severity Measurement utilizes the Modified Mercalli Intensity Scale.

Richter Magnitude Scale

The Richter Magnitude Scale was developed in 1935 by Charles F. Richter of the California Institute of Technology as a mathematical device to compare the size of earthquakes. The magnitude of an earthquake is determined from the logarithm of the amplitude of waves recorded by seismographs. Adjustments are included for the variation in the distance between the various seismographs and the epicenter of the earthquakes. On the Richter Scale, magnitude is expressed in whole numbers and decimal fractions. For example, a magnitude 5.3 might be computed for a moderate earthquake, and a strong earthquake might be rated as magnitude 6.3. Because of the logarithmic basis of the scale, each whole number increase in magnitude represents a tenfold increase in measured amplitude; as an estimate of energy, each whole number step in the magnitude scale corresponds to the release of about 31 times more energy than the amount associated with the preceding whole number value.

Modified Mercalli Intensity Scale

The effect of an earthquake on the Earth's surface is called the intensity. The intensity scale consists of a series of certain key responses such as people awakening, movement of furniture, damage to chimneys, and finally - total destruction. Although numerous intensity scales have been developed over the last several hundred years to evaluate the effects of earthquakes, the one currently used in the United States is the Modified Mercalli (MM) Intensity Scale. It was developed in 1931 by the American seismologists Harry

Wood and Frank Neumann. This scale, composed of 12 increasing levels of intensity that range from imperceptible shaking to catastrophic destruction, is designated by Roman numerals. It does not have a mathematical basis; instead it is an arbitrary ranking based on observed effects.

The MM Intensity value assigned to a specific site after an earthquake has a more meaningful measure of severity to the nonscientist than the magnitude because intensity refers to the effects actually experienced.

The lower numbers of the intensity scale generally deal with the manner in which the earthquake is felt by people. The higher numbers of the scale are based on observed structural damage. Structural engineers usually contribute information for assigning intensity values of VIII or above.

Previous Occurrences

Iowa has experienced little effects from only a few earthquakes in the past 177 years. The epicenters of 13 earthquakes have been in the State with the majority along the Mississippi River. The strongest earthquake in Iowa occurred in Davenport in 1934 which is in Scott County, adjacent to and south of Clinton County. The 1934 Davenport earthquake resulted in only slight damage. (Iowa DHSEM 2013). Details of the 13 Iowa Earthquakes are provided below:

Table 3-26 Iowa Earthquakes 1867-1934

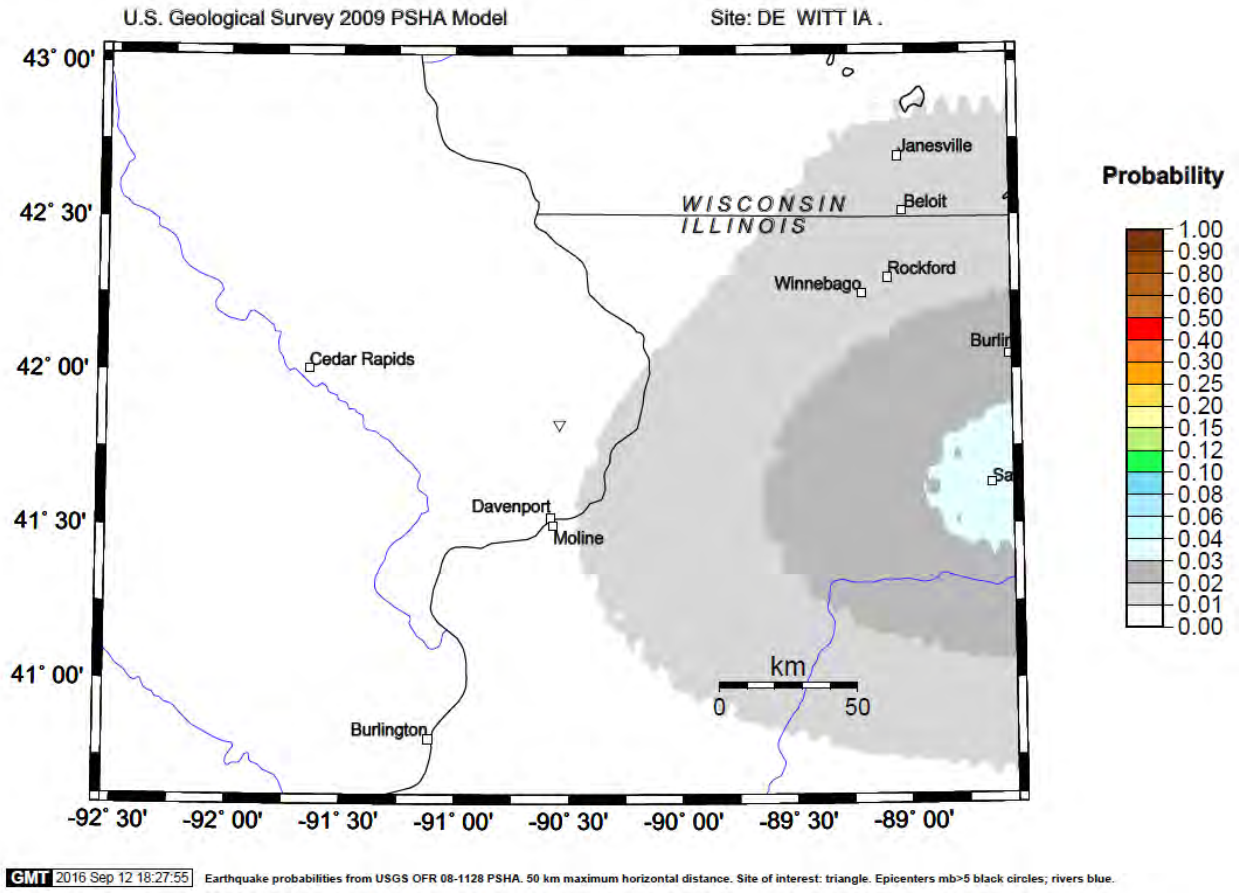
Date	Nearest Town	Mercalli Intensity
7/16/2004	Shenandoah, IA	III
4/20/1948	Oxford, IA	IV
11/24/1939	Davenport, IA / Rock Island, IL	II-III
11/8/1938	Dubuque, IA	I-II
10/11/1938	Inwood, IA	V
2/26/1935	Burlington, IA	III
1/5/1935	Rock Island, IL / Davenport, IA	III
1/5/1935	Rock Island, IL / Davenport, IA	IV
11/12/1934	Davenport, IA \ Rock Island, IL	VI
1/26/1925	Waterloo, IA	II
4/13/1905	Wayland, MO / Keokuk, IA	IV-V
12/9/1875	Sidney, IA / Nebraska City, NE	III
4/28/1867	Sidney, IA / Nebraska City, NE	IV

Source: State of Iowa Hazard Mitigation Plan, 2018

Probability of Future Occurrence

Figure 3-16 demonstrates the probability of an earthquake with a magnitude greater than 5.0 in the Clinton County in a 100-year period. The purple square shows the approximate Clinton County boundary. As shown in this graphic, the probability of a 5.0 Magnitude or greater earthquake in the next 100 years is one percent. The probability of a significant earthquake in any given year is Unlikely.

Figure 3-16 Probability of Magnitude 5.0 or greater within 100 Years – Clinton County



Source: United States Geological Survey, http://geohazards.usgs.gov/eqprob/2009/ Note: Purple shape is approximate location of Clinton County, IA

Probability Score: 1—Unlikely

Vulnerability

Overview

As discussed under the probability section, the probability of a 5.0 Magnitude or greater earthquake in the next 100 years is one percent. Although a damaging event is unlikely, the potential impacts could be costly in the more urban areas of the County. Most structures in Clinton County are not built to withstand earthquake shaking, but because of the relatively low magnitude of a possible quake, property damage would likely be very minor damage.

The main impacts to Clinton County from a New Madrid Earthquake would be related to incoming evacuees from areas more heavily damaged by the event. This could result in a shortage of short-term lodging, such as hotel rooms and extended stay establishments. Depending on the magnitude of the earthquake, shelters may be designated in Clinton County as evacuee shelter locations. If this occurred, assistance would be coordinated through the Emergency Management Assistance Compact (EMAC) between the State of Iowa and State governments of impacted areas.

Magnitude Score: 1—Negligible

Potential Losses to Existing Development

FEMA's loss estimation software, Hazus was utilized to analyze a 500-year probabilistic scenario earthquake event. This earthquake scenario is equivalent to a 10 percent probability of exceedance in 50 years. The earthquake scenario utilized is based on a probabilistic scenario, rather than a deterministic scenario. Therefore, this is not a magnitude-based scenario, but is rather based on ground shaking using the probabilistic mapping done by United States Geological Survey (USGS). The Hazus Earthquake module reports earthquake damage by census tract. As a result, it is not possible to separate the resulting damage amounts by incorporated area, as the census tract boundaries are not the same as the incorporated area boundaries. Table 3-27 below provides the results of the Hazus analysis for Clinton County. This analysis estimates that the total direct structural damage would be just over $3 million. The combined building, contents and related economic losses such as lost wages, rental, and relocation costs calculated to be over $4.6 million.

Table 3-27 Clinton County, Iowa Estimated Economic Losses—500 Year Probabilistic Earthquake Event

	Single Family	Other Residential	Commercial	Industrial	Others	Total
Income Losses						
Wage	-	$10,000	$360,000	$10,000	$40,000	$420,000
Capital-Relocated	-	$10,000	$290,000	$10,000	$10,000	$310,000
Rental	$50,000	$70,000	$180,000	$10,000	$10,000	$310,000
Relocation	$160,000	$50,000	$260,000	$30,000	$100,000	$600,000
Subtotal	**$210,000**	**$130,000**	**$1,800,000**	**$60,000**	**$160,000**	**$1,600,000**
Capital Stock Losses						
Structural	$320,000	$120,000	$380,000	$100,000	$150,000	$1,060,000
Non-Structural	$740,000	$230,000	$410,000	$80,000	$140,000	$1,610,000
Content	$120,000	$30,000	$110,000	$40,000	$40,000	$330,000
Inventory	-	-	-	$10,000	-	$10,000
Subtotal	**$1,180,000**	**$380,000**	**$900,000**	**$230,000**	**$$330,000**	**$3,020,000**
Total	**$1,380,000**	**$510,000**	**$1,980,000**	**-$290,000**	**$490,000**	**$4,660,000**

Source: Hazus-MH 2.2, September 2016

Table 3-28 provides the anticipated numbers of buildings by type and damage category that would result according to the Hazus analysis. The estimated building types and counts are from the Hazus damage outputs utilizing census block data. According to this analysis, no buildings would suffer complete damage, five buildings would have extensive damage, 51 would have moderate damage and 209 would have slight damage. Most buildings in the planning area (nearly 21,000) would not be damaged.

Table 3-28 Expected Building Damage by Building Occupancy Type—500 Year Probabilistic Earthquake Event

Use Type	None	Slight	Moderate	Extensive	Complete
Agricultural	344	9	3	0	0
Commercial	1,280	31	10	1	0
Education	37	1	0	0	0

Use Type	None	Slight	Moderate	Extensive	Complete
Government	42	1	0	0	0
Industrial	344	8	3	0	0
Other Residential	1,478	35	10	1	0
Religious	117	3	1	0	0
Single Family	17,076	122	23	2	0
Total	**20,718**	**209**	**51**	**5**	**0**

Source: Hazus-MH 2.2

Based on the estimate of 25 single-family and 11 other residential buildings with moderate and extensive damages and considering the average household size in the county of 2.39, the displaced population would be less than 100 people.

Future Development

Overall, the planning area has a low vulnerability to earthquake risk. Future development is not expected to increase the risk other than contributing to the overall exposure of what could become damaged because of an unlikely event.

Climate Change Impacts

No information was available to discuss the impacts that climate change might have on the frequency or severity of earthquakes.

Earthquake Hazard Summary by Jurisdiction

The following hazard summary table shows that this hazard does not significantly vary by jurisdiction. Although damage amounts would be higher in the more urban areas, damage ratios would be relatively the same.

Jurisdiction	Probability	Magnitude	Warning Time	Duration	Score	Level
Unincorporated Clinton County	1	1	4	1	1.45	Low
Andover	1	1	4	1	1.45	Low
Calamus	1	1	4	1	1.45	Low
Camanche	1	1	4	1	1.45	Low
Charlotte	1	1	4	1	1.45	Low
Clinton	1	1	4	1	1.45	Low
Delmar	1	1	4	1	1.45	Low
DeWitt	1	1	4	1	1.45	Low
Goose Lake	1	1	4	1	1.45	Low
Grand Mound	1	1	4	1	1.45	Low
Lost Nation	1	1	4	1	1.45	Low
Low Moor	1	1	4	1	1.45	Low
Toronto	1	1	4	1	1.45	Low
Welton	1	1	4	1	1.45	Low
Wheatland	1	1	4	1	1.45	Low
Calamus-Wheatland School District	1	1	4	1	1.45	Low
Camanche School District	1	1	4	1	1.45	Low

Jurisdiction	Probability	Magnitude	Warning Time	Duration	Score	Level
Central DeWitt School District	1	1	4	1	1.45	Low
Clinton School District	1	1	4	1	1.45	Low
Delwood School District	1	1	4	1	1.45	Low
Northeast School District	1	1	4	1	1.45	Low

3.3.6 Expansive Soils

Hazard Score Calculation					
Probability	**Magnitude/Severity**	**Warning Time**	**Duration**	**Weighted Score**	**Level**
1	1	1	1	1	Low

Profile

Hazard Description

Soils and swelling bedrock contain clay which causes the material to increase in volume when exposed to moisture and shrink as it dries. They are also commonly known as expansive, shrinking and swelling, bentonitic, heaving, or unstable soils and bedrock. In general, the term refers to both soil and bedrock contents although the occurrence of the two materials may occur concurrently or separately. Soils and soft rock that tend to swell or shrink excessively due to changes in moisture content are commonly known as expansive soils. The effects of expansive soils are most prevalent in regions of moderate to high precipitation, where prolonged periods of drought are followed by long periods of rainfall. The hazard occurs in many parts of the southern, central, and western United States. Estimates conducted in 1980 put the annual damage from expansive soils as high as $7 billion, with single-family and commercial buildings accounting for nearly one-third of the total damage amount. (Krohn and Slosson, 1980). However, because the hazard develops gradually and seldom presents a threat to life, expansive soils have received limited attention, despite their costly effects. Expansive soils can also contribute to or cause damage to roadways, bridges, pipelines, and other infrastructure

The clay materials in swelling soils are capable of absorbing large quantities of water and expanding 10 percent or more as the clay becomes wet. The force of expansion is capable of exerting pressures of 15,000 pounds per square foot or greater on foundations, slabs, and other confining structures. (Ibid., p 17.) The amount of swelling (or potential volume of expansion) is linked to five main factors: the type of mineral content, the concentration of swelling clay, the density of the materials, moisture changes in the environment, and the restraining pressure exerted by materials on top of the swelling soil. Each of these factors impact how much swelling a particular area will experience, but may be modified, for better or worse, by development actions in the area.

- **Low:** This soils class includes sands and silts with relatively low amounts of clay minerals. Sandy clays may also have low expansion potential if the clay is kaolinite. Kaolinite is a common clay mineral.
- **Moderate:** This class includes silty clay and clay textured soils, if the clay is kaolinite, and includes heavy silts, light sandy clays, and silty clays with mixed clay minerals.
- **High:** This class includes clays and clay with mixed montmorillonite, a clay mineral which expands and contracts more than kaolinite.

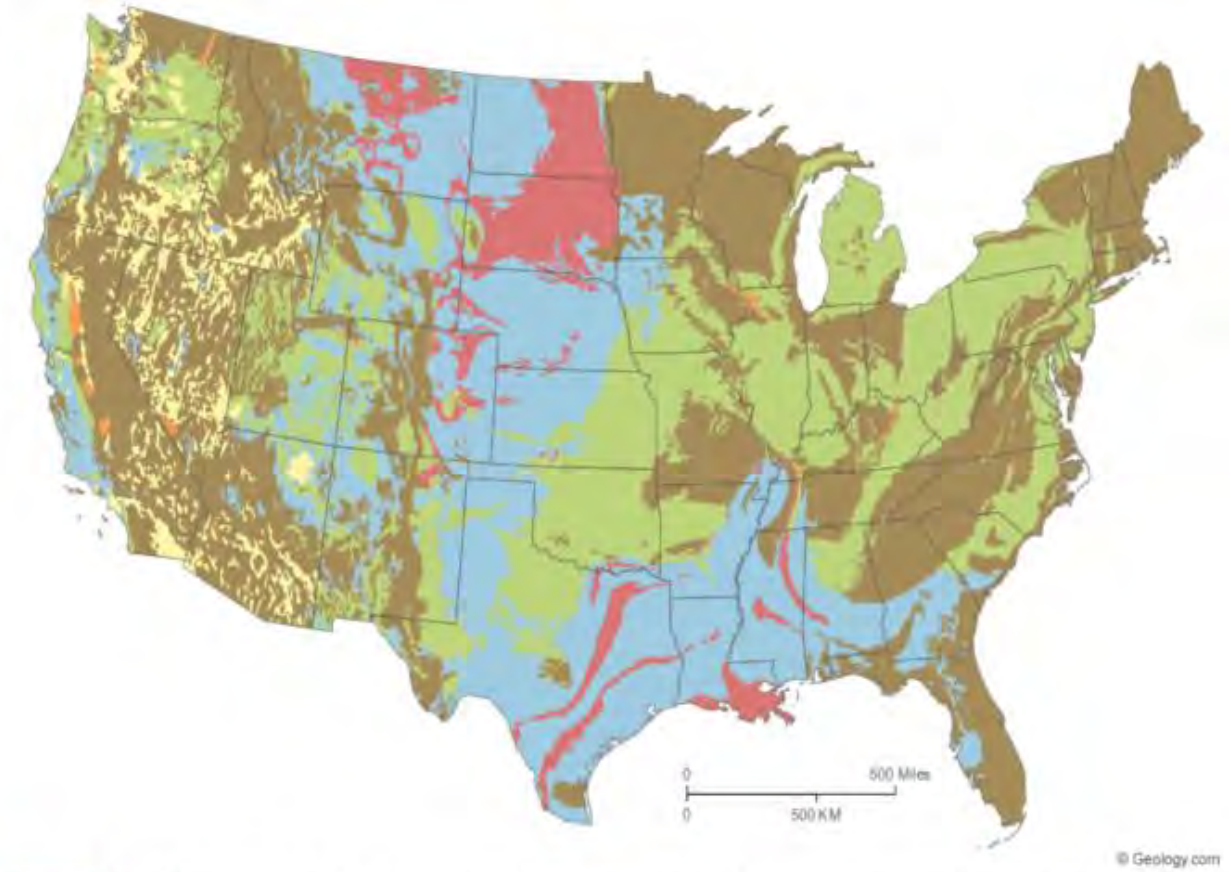
Warning Time Score: 1—More than 24 hours warning time

Duration Score: 1—Less than 6 hours

Geographic Location/Extent

According to the US Geological Survey (USGS), the northwest section of the state has the highest probability of the incidence of expansive soils. That risk is rated as “less than 50 percent of the soil being of the expansive clay” variety. Figure 3-17 below shows the presence of soils with swelling potential throughout the US Figure 3-18 below shows the same information specific to the State of Iowa.

Figure 3-17 Presence of Swelling Clays in the Contiguous United States



Over 50 percent of these areas are underlain by soils with abundant clays of high swelling potential.

Less than 50 percent of these areas are underlain by soils with clays of high swelling potential.

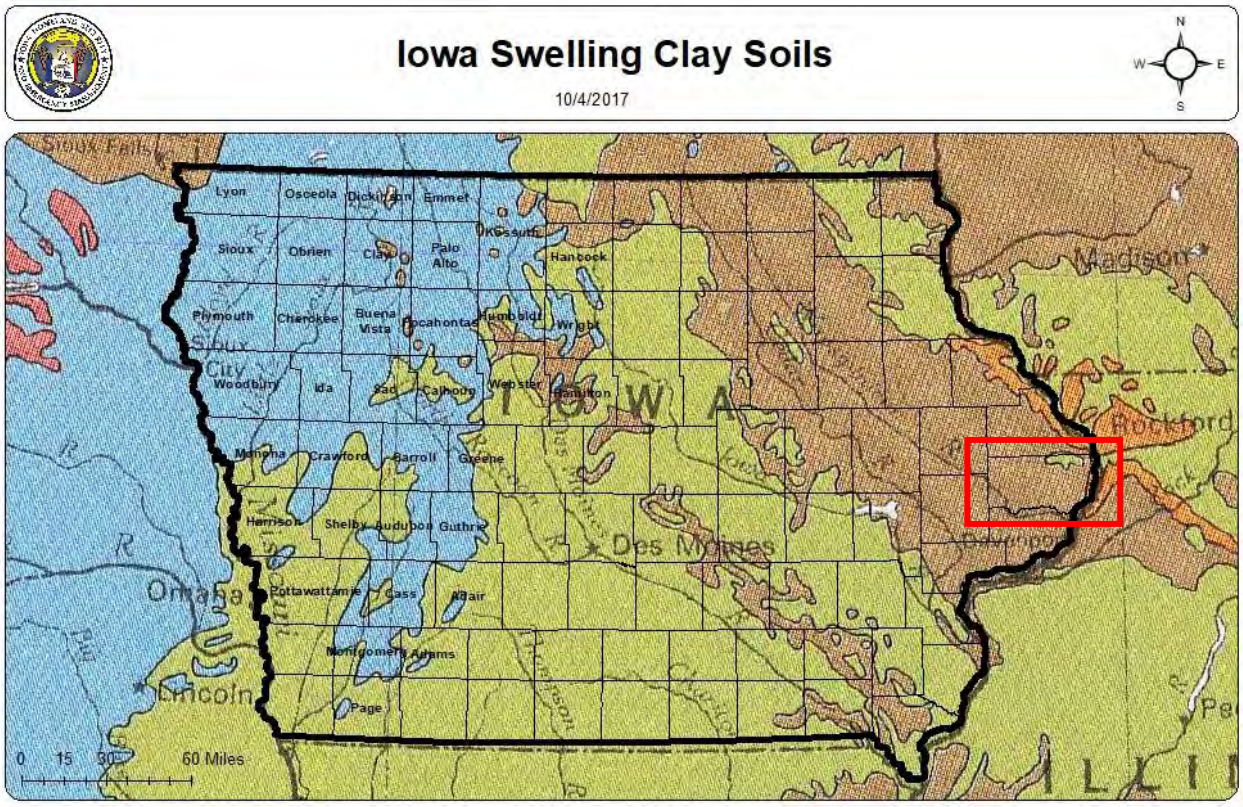
Over 50 percent of these areas are underlain by soils with abundant clays of slight to moderate swelling potential.

Less than 50 percent of these areas are underlain by soils with abundant clays of slight to moderate swelling potential.

These areas are underlain by soils with little to no clays with swelling potential.

Data insufficient to indicate the clay content or the swelling potential of soils.

Figure 3-18 Iowa Swelling Clay Soils



Source: Iowa State Hazard Mitigation Plan, 2018. Clinton County shown in red square.

As shown above, the vast majority of Clinton County is underlain by soils with little to no clays with swelling potential, with a very small area in the northeast of the county that potentially contains less than 50% soils with abundant clays of slight to moderate swelling potential. This area of the county is not home to any towns or urban areas. Based on this information, expansive soils are estimated to affect a negligible portion of the planning area.

Previous Occurrences

Very little data exists on expansive soil problems and past damages in Clinton County. Studies on the issue have not been performed and no database exists to catalog occurrences. Damages due to expansive soils such as foundation cracks, parking lot/sidewalk cracks, etc. may occur but are generally handled by individual property owners and insurance. Other damages to supply lines, roads, railways, bridges, and power lines typically occur over time and are not attributed to or reported as an event. There have been no recorded incidences of disaster associated specifically to expansive soils.

Probability of Future Occurrence

Since records of specific occurrences are not readily available, it is difficult to estimate the probability of future occurrences. Due to the limited presence of expansive soils throughout the planning area, impacts of expansive soils will not likely create measurable impacts on the county.

Probability Score: 1—Unlikely

Vulnerability

Overview

Vulnerability to expansive soils comes from exposure to the hazard. Damage from these soils will typically be isolated events, which will cause damage to a small number of buildings or road segments over time, and does not cause complete damage or structure loss, or fatalities or injuries of residents and visitors to Clinton County. While maps show that there are areas of the state that may be somewhat susceptible to expansive soils, this is currently not a hazard that has had an impact on Clinton County.

Magnitude/Severity Score: 1—Negligible

Estimated Losses to Existing Development

As mentioned above, the majority of this hazard's significance is drawn from the exposure of existing development to soils with swelling potential. There is very limited extent of this hazard throughout Clinton County. Nonetheless, older construction may not be resistant to swelling soil conditions and, therefore, may experience expensive and potentially extensive damages. This includes heaving sidewalks, structural damage to walls and basements, the need to replace windows and doors, or dangers and damages caused by ruptured pipelines.

Future Development

The most effective mitigation actions for expansive soil are complete avoidance or non-conflicting use, or correct engineering design. Modern building practices incorporate mitigation techniques, such as foundation design, adequate drainage, landscaping, and appropriate interior finishing, provided proper geotechnical testing is employed to identify expansive soils. If areas prone to expansive soils are identified, future areas for development will need to take this hazard into account. Due to mitigation with new development and generally low rates of development losses are not expected to increase with this hazard.

Climate Change Impacts

Many soils and rocks have the potential to swell or expand based on a combination of its mineralogy and water content. The actual swelling of expansive soils will be caused by a change in the environment (e.g. water content, stress, chemistry, or temperature) in which the material exists. Changes in humidity and precipitation in Iowa which are anticipated with a changing climate could therefore impact the presence of expansive soils in Clinton County, albeit the results would likely be negligible. More extremes in climate conditions (e.g. wet-dry conditions), could potentially exacerbate the swelling of expansive soil issues in the future.

Expansive Soils Hazard Summary by Jurisdiction

Expansive soils are a regional hazard with limited impacts to all jurisdictions in the planning area.

Jurisdiction	Probability	Magnitude	Warning Time	Duration	Score	Level
Unincorporated Clinton County	1	1	1	1	1	Low
Andover	1	1	1	1	1	Low
Calamus	1	1	1	1	1	Low
Camanche	1	1	1	1	1	Low
Charlotte	1	1	1	1	1	Low
Clinton	1	1	1	1	1	Low

Jurisdiction	Probability	Magnitude	Warning Time	Duration	Score	Level
Delmar	1	1	1	1	1	Low
DeWitt	1	1	1	1	1	Low
Goose Lake	1	1	1	1	1	Low
Grand Mound	1	1	1	1	1	Low
Lost Nation	1	1	1	1	1	Low
Low Moor	1	1	1	1	1	Low
Toronto	1	1	1	1	1	Low
Welton	1	1	1	1	1	Low
Wheatland	1	1	1	1	1	Low
Calamus-Wheatland School District	1	1	1	1	1	Low
Camanche School District	1	1	1	1	1	Low
Central DeWitt School District	1	1	1	1	1	Low
Clinton School District	1	1	1	1	1	Low
Delwood School District	1	1	1	1	1	Low
Northeast School District	1	1	1	1	1	Low

3.3.7 Extreme Heat

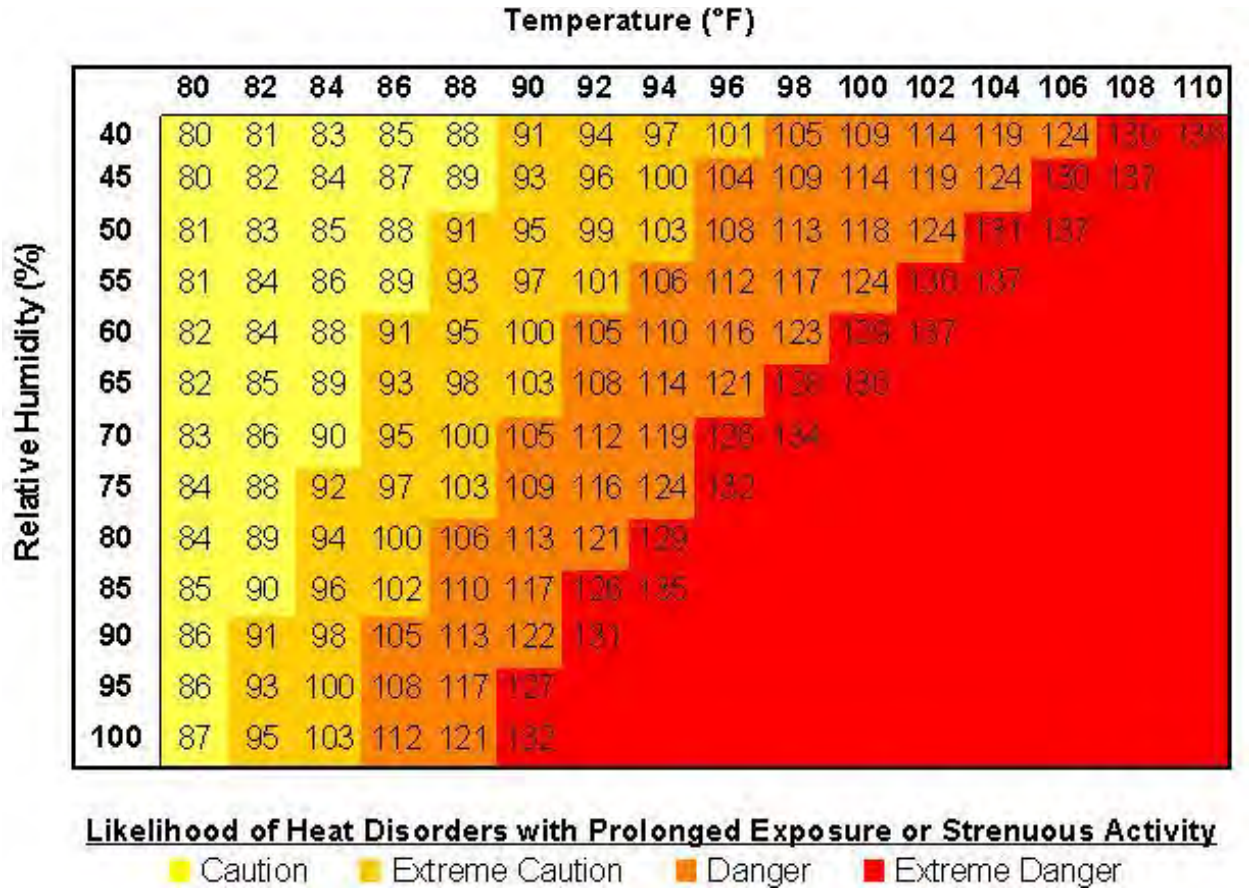
Hazard Score Calculation					
Probability	**Magnitude/Severity**	**Warning Time**	**Duration**	**Weighted Score**	**Level**
4	2	1	3	2.85	Moderate

Profile

Hazard Description

According to information provided by FEMA, extreme heat is defined as a long period (2 to 3 days) of high heat and humidity with temperatures above 90 degrees. Ambient air temperature is one component of heat conditions, with relative humidity being the other. The relationship of these factors creates what is known as the apparent temperature. The Heat Index Chart in Figure 3-19 uses both of these factors to produce a guide for the apparent temperature or relative intensity of heat conditions.

Figure 3-19 Heat Index (HI) Chart



Source: NWS

Note: Exposure to direct sun can increase HI values by as much as 15°F. The shaded zone above 105°F corresponds to a HI that may cause increasingly severe heat disorders with continued exposure and/or physical activity.

During these conditions, the human body has difficulty cooling through the normal method of the evaporation of perspiration. Health risks rise when a person is over exposed to heat. Health risks rise when a person is over exposed to heat. 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.

According to a study from the Centers for Disease Control and Prevention (CDC), an average of 702 heat-related deaths occurred in the US annually between 2004 and 2018 (Vaidyanathan 2020). One of the most dangerous places to be is in a home with little or no air conditioning. 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. Those at greatest risk for heat-related illness include people 65 years of age and older, people who are overweight, and people who are ill or on certain medications. However, even young and healthy individuals are susceptible if they participate in strenuous physical activities during hot weather. In agricultural areas, the exposure of farm workers, as well as livestock, to extreme heat is a major concern.

The most dangerous place to be is in a permanent home, with little or no air conditioning. Those at greatest risk for heat-related illness include people 65 years of age and older, people who are overweight, and people who are ill or on certain medications. However, even young and healthy individuals are susceptible if they participate in strenuous physical activities during hot weather. In agricultural areas, the exposure of farm workers, as well as livestock, to extreme heat is a major concern.

Table 3-29 lists typical symptoms and health impacts of exposure to extreme heat.

Table 3-29 Typical Health Impacts of Extreme Heat

Heat Index (HI)	Disorder
80-90° F (HI)	Fatigue possible with prolonged exposure and/or physical activity
90-105° F (HI)	Sunstroke, heat cramps, and heat exhaustion possible with prolonged exposure and/or physical activity
105-130° F (HI)	Heatstroke/sunstroke highly likely with continued exposure

Source: NWS HI Program, https://www.weather.gov/safety/heat-index

Warning Time Score: 1—More than 24 hours warning time

Duration Score: 3—Less than one week

Geographic Location/Extent

As extreme heat events are largely a regional occurrence, it can be assumed that the entire planning area would be subjected to an extreme heat event simultaneously and all participating jurisdictions would be affected. There could be minimal, localized variations in temperature throughout the county, such as higher temperatures in urban areas.

The NWS has a system in place to initiate alert procedures (advisories or warnings) when the HI is expected to have a significant impact on public safety. The expected severity of the heat determines whether advisories or warnings are issued. A common guideline for issuing excessive heat alerts is when the maximum daytime HI is expected to equal or exceed 105 degrees Fahrenheit (°F) and the nighttime minimum HI is 80°F or above for two or more consecutive days. A heat advisory is issued when temperatures reach 105 degrees and a warning is issued at 115 degrees.

Previous Occurrences

According to information obtained from the NWS for Clinton County Zone on the Iowa Environmental Mesonet, ISU Department of Agronomy website, there have been a combined 59 excessive heat advisories, watches, and warnings between 2005 and September 2021. These events are summarized in Table 3-30 below. The greatest number of heat-related warnings in a given year was 2011, with five advisories, one warning, and two watches. Historic data tells us that extreme heat is a common occurrence in Clinton County.

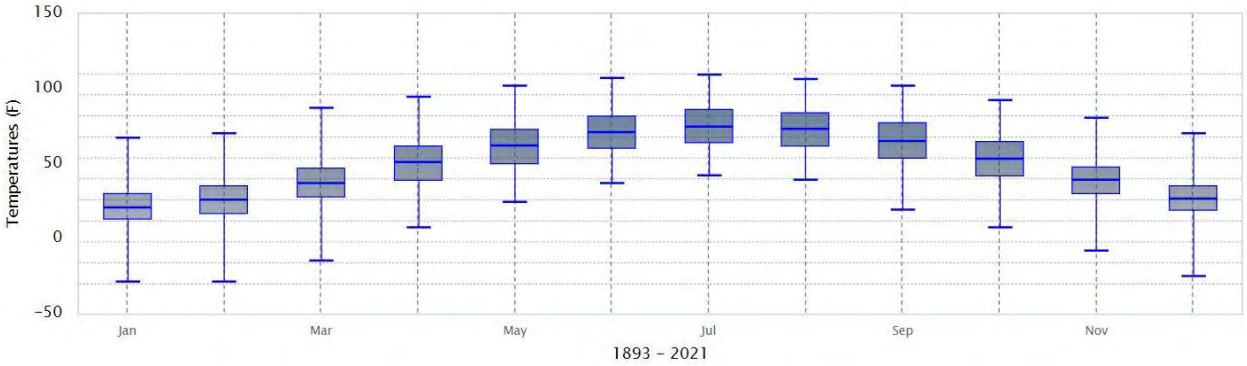
Table 3-30 Number of Heat Advisories, Watches, and Warnings, 2005-September 2021, Clinton County

Year	Heat Advisory	Excessive Heat Warning	Excessive Heat Watch
2005	1	0	0
2006	2	0	0
2007	0	0	0
2008	0	0	0
2009	4	0	0
2010	4	0	0
2011	5	1	2
2012	5	1	1
2013	3	0	0
2014	1	0	0
2015	2	0	0
2016	1	1	1
2017	4	0	0
2018	4	1	0
2019	2	1	1
2020	5	0	0
2021	5	0	0
Totals	**49**	**5**	**5**

Source: ISU Environmental Mesonet

Figure 3-20 provides the average temperature breakdown for the Clinton, Iowa weather station for the period of record from 1893 to October 2021, from the Southwest Climate and Environmental Information Collaborative (SCENIC). Data from SCENIC show that a record high temperature of 109 °F was reached on July 13, 1936. The months of the year with the highest temperatures are generally July and August. The average maximum temperature for July is 86 °F and August is 84 °F for the planning area.

Figure 3-20 Average Temperature, Clinton, Iowa, 1893-2021



Source: SCENIC

The National Centers for Environmental Information (NCEI) database reported one regional heat and excessive heat events in and around Clinton County during the period from 1950 to 2020. According to NCEI, this dangerous heat event began about noon on July 4, 2012 with relief from the heat and humidity finally arriving during the evening of July 7. During this period, afternoon and early evening temperatures soared into the upper 90s to lower 100s with nighttime temperatures remaining well into the 70s. Combining the heat and humidity created HI values of 105 to 115 during the afternoon and evening. The hottest day was Saturday July 7 when many locations reported afternoon maximum temperatures of 100 to 105.

Table 3-31 Claims Paid in Clinton County for Crop Loss as a Result of Heat (2007-2020)

Year	Heat	Hot Wind	Grand Total
2006	$25,793.00		$25,793.00
2007	$838.00		$838.00
2011	$608,098.00	$42,748.00	$650,846.00
2012	$551,969.00		$551,969.00
2013	$88,500.68	$1,177.00	$89,677.68
2014		$4,754.00	$4,754.00
2015	$5,851.00		$5,851.00
2018	$8,331.00		$8,331.00
2020	$100,858.00	$86,887.00	$187,745.00
Grand Total	**$1,289,380.68**	**$48,679.00**	**$1,499,487.68**

Source: Crop Insurance Paid is from the USDA's Risk Management Agency for 2007-2020; Note: There were no claims paid as a result of Heat or Hot Wind in 2008, 2009, 2010, 2016, 2017, or 2019.

Probability of Future Occurrence

For purposes of determining probability of future occurrence, the definition of extreme heat from FEMA's Ready.gov Community Preparedness program was used: "extreme heat is a long period (2 to 3 days) of high heat and humidity with temperatures above 90 degrees". While there were 59 heat-related advisories over the 15.5-year period from 2005 to 2021 only 17 of the episodes lasted for two or more days. This translates to a greater than 100 percent probability, or a highly likely rate of occurrence, in any given year of an extreme heat event.

Probability Score: 4—Highly Likely

Vulnerability

Overview

The impacts of extreme heat on health are a consideration in evaluating the overall vulnerability of Clinton County. According to the US Census Bureau 2019 American Community Survey estimates, approximately 19.3% of Clinton County residents are over the age of 65. Traditionally, the very young and very old are considered at higher risk to the effects of extreme heat, but any populations outdoors exposed, including otherwise young and healthy adults and homeless populations, are at risk of adverse health impacts. Arguably, the young-and-otherwise-healthy demographic may be more exposed and experience a higher vulnerability because of the increased likelihood that they will be out in the extreme temperature deviation, whether due to commuting for work or school, conducting property maintenance, working in the agricultural sector, or for recreational reasons.

Recent research indicates that the impact of extreme heat has been historically under-represented. The risks of extreme temperatures are often profiled as part of larger hazards, such as drought. However, as temperature variances may occur outside of larger hazards or outside of the expected seasons but still incur large costs, it is important to examine them as stand-alone hazards. Extreme heat may overload demands for electricity to run air conditioners in homes and businesses during prolonged periods of exposure and presents health concerns to individuals outside in the temperatures.

Prolonged heat exposure can have significant impacts on infrastructure. Another type of infrastructure damage that can occur because of extreme heat is road damage. Prolonged high heat exposure increases the potential of pavement deterioration, as well as railroad warping or buckling. As mentioned above, high heat also puts a strain on energy systems and consumption, as air conditioners are run at a higher rate and for longer. Extreme heat can also reduce transmission capacity over electric systems.

Extreme heat impacts on the economy may be more indirect compared to other hazards. 2.9% of all employment in Clinton County is in the agriculture sector, and 8.8% of employment is in the construction sector. As noted previously outdoor laborers who are exposed to extreme heat are at a high risk of heat-related illnesses, and a long-term heat event could cause work interruptions. Crops are also impacted by heat events and could have an impact on the overall economy in the county. According to the USDA Risk Management Agency (RMA) Indemnity Report, since 2007 there have been 9,220 acres lost to heat resulting in $1,499,487 in indemnity payments due to insured crop loss. This results in an estimated $115,345 of annualized crop loss due to heat.

Magnitude/Severity Score: 2—Limited

Estimated Losses to Existing Development

As mentioned above, since 2007 there has been a total of just under $1.5 million in insured crop losses due to heat in Clinton County. This results in an estimated $115,345 in annual crop losses due to heat. As the occurrences of extreme heat worsen and become more frequent, this figure can be expected to grow if the hazard is left unmitigated.

Extreme heat can also cause a strain on electricity delivery infrastructure which can be overloaded during peak use of electricity to power air conditioning during extreme heat events. Another type of infrastructure damage that can occur because of extreme heat is road damage. When asphalt is exposed to prolonged extreme heat, it can cause buckling of asphalt-paved roads, driveways, and parking lots.

Future Development

Since Clinton County is not experiencing large population growth, the number of people vulnerable to extreme heat is not increasing.

Climate Change Impacts

According to the IDNR, the effects of climate change have already been felt in Iowa. Several of the climatic changes related to extreme heat which have been noted by the DNR are:

- Long-term winter temperatures have increased six times more than summer temperatures.
- Nighttime temperatures have increased more than daytime temperatures since 1970.
- Iowa's humidity has risen substantially, especially in summer, which now has 13 percent more atmospheric moisture than 35 years ago as indicated by a 3 – 5-degree Fahrenheit rise in dew-point temperature. This fuels convective thunderstorms that provide more summer precipitation.

Each of these changes could have direct impacts on human health in terms of heat-related illness. With the general trend of increased warming of average temperatures, extreme high temperatures will likely increase as well. Cascading impacts include increased stress on water quantity and quality, degraded air quality, and increased potential for more severe or catastrophic natural events such as heavy rain, droughts, and wildfire. Another cascading impact includes increased duration and intensity of wildfires with warmer temperatures.

Extreme Heat Hazard Summary by Jurisdiction

Extreme heat is a regional hazard and impacts all jurisdictions in the planning area.

Jurisdiction	Probability	Magnitude	Warning Time	Duration	Score	Level
Unincorporated Clinton County	4	2	1	3	2.85	Moderate
Andover	4	2	1	3	2.85	Moderate
Calamus	4	2	1	3	2.85	Moderate
Camanche	4	2	1	3	2.85	Moderate
Charlotte	4	2	1	3	2.85	Moderate
Clinton	4	2	1	3	2.85	Moderate
Delmar	4	2	1	3	2.85	Moderate
DeWitt	4	2	1	3	2.85	Moderate
Goose Lake	4	2	1	3	2.85	Moderate
Grand Mound	4	2	1	3	2.85	Moderate
Lost Nation	4	2	1	3	2.85	Moderate
Low Moor	4	2	1	3	2.85	Moderate
Toronto	4	2	1	3	2.85	Moderate
Welton	4	2	1	3	2.85	Moderate
Wheatland	4	2	1	3	2.85	Moderate
Calamus-Wheatland School District	4	2	1	3	2.85	Moderate
Camanche School District	4	2	1	3	2.85	Moderate

Jurisdiction	Probability	Magnitude	Warning Time	Duration	Score	Level
Central DeWitt School District	4	2	1	3	2.85	Moderate
Clinton School District	4	2	1	3	2.85	Moderate
Delwood School District	4	2	1	3	2.85	Moderate
Northeast School District	4	2	1	3	2.85	Moderate

3.3.8 Flooding – Flash, Riverine

River Flooding Hazard Score Calculation					
Probability	**Magnitude/Severity**	**Warning Time**	**Duration**	**Weighted Score**	**Level**
3	2	2	4	2.65	Moderate
Flash Flooding Hazard Score Calculation					
Probability	**Magnitude/Severity**	**Warning Time**	**Duration**	**Weighted Score**	**Level**
4	2	4	2	3.2	High

Description

Flooding can be broken into two main categories: River Flooding and Flash Flooding.

Riverine flooding is defined as the overflow of rivers, streams, drains, and lakes due to excessive rainfall, rapid snowmelt, or ice melt. The areas adjacent to rivers and stream banks that carry excess floodwater during rapid runoff are called floodplains. A floodplain is defined as the lowland and relatively flat area adjoining a river or stream. The terms "base flood" and "100-year flood" refer to the area in the floodplain that is subject to a one percent or greater chance of flooding in any given year. Floodplains are part of a larger entity called a basin, which is defined as all the land drained by a river and its branches.

Gauges along streams and rain gages throughout the state provide for an early flood warning system. River flooding usually develops over the course of several hours or even days depending on the basin characteristics and the position of the particular reach of the stream. The NWS provides flood forecasts for Iowa. Flood warnings are issued over emergency radio and television messages as well as the NOAA Weather Radio. People in the paths of river floods may have time to take appropriate actions to limit harm to themselves and their property.

A **flash flood** is an event that occurs when water levels rise at an extremely fast rate as a result of intense rainfall over a brief period, sometimes combined with rapid snowmelt, ice jam release, frozen ground, saturated soil or impermeable surfaces.

Ice jam flooding is a form of flash flooding that occurs when ice breaks up in moving waterways, and then stacks on itself where channels narrow. This creates a natural dam, often causing flooding within minutes of the dam formation.

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 which can reach full peak in only a few minutes and allows little or no time for protective measures to be taken by those in its path. Flash flood waters move at very fast speeds and can move 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.

In some cases, flooding may not be directly attributable to a river, stream, or lake overflowing its banks. Rather, it may simply be the combination of excessive rainfall or snowmelt, saturated ground, and inadequate drainage. With no place to go, the water will find the lowest elevations–areas that are often not in a floodplain. This type of flooding, often referred to as sheet flooding, is becoming increasingly prevalent as development outstrips the ability of the drainage infrastructure to properly carry and disburse the water flow.

In certain areas, aging storm sewer systems are not designed to carry the capacity currently needed to handle the increased storm runoff. Typically, the result is water backing into basements, which damages mechanical systems and can create serious public health and safety concerns. This combined with rainfall

trends and rainfall extremes all demonstrate the high probability, yet generally unpredictable nature of flash flooding in the planning area.

Although flash floods are somewhat unpredictable, there are factors that can point to the likelihood of flash floods occurring. Weather surveillance radar is being used to improve monitoring capabilities of intense rainfall. This, along with knowledge of the watershed characteristics, modeling techniques, monitoring, and advanced warning systems increases the warning time for flash floods.

With the Mississippi River and the Wapsipinicon River making up the east and southern boundaries of the county, respectively, flooding from these rivers and their tributaries has been a significant problem for many of the communities in Clinton County. Many of the communities were settled and developed largely because of their proximity to water resources. A flood is partial or complete inundation of normally dry land areas. Heavy precipitation can cause flooding either in the region of precipitation or in areas downstream. Heavy accumulations of ice or snow can also cause flooding during the melting stage. These events are complicated by the freeze/thaw cycles characterized by moisture thawing during the day and freezing at night.

Riverine Flooding Warning Time Score: 2 — 12 to 24 hours warning time

Flash Flooding Warning Time Score: 4 — Minimal or no warning time (less than 6 hours)

Riverine Flooding Duration Score: 4 — More than one week

Flash Flooding Duration Score: 2 — Less than one day

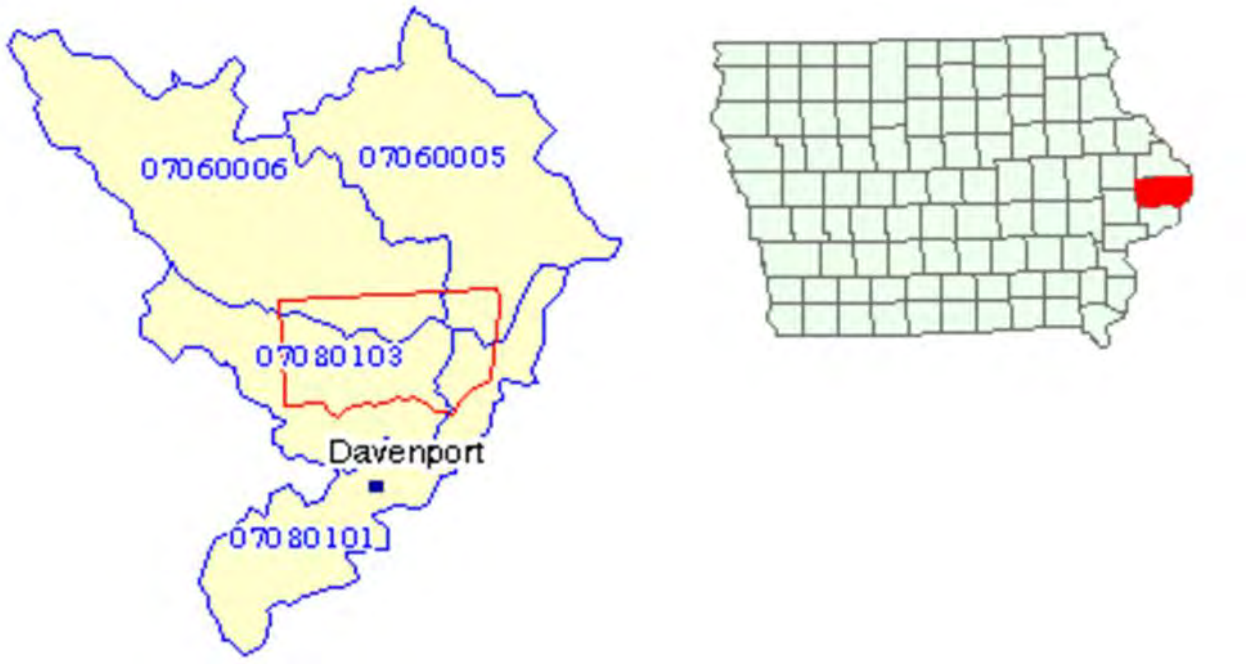
Geographic Location/Extent

Clinton County is well drained by numerous streams and rivers that flow through the county and several significant waterways exist. The Mississippi River flows southward along the eastern border of Clinton County. The Wapsipinicon River, Elk River, in addition to Rock Creek, Spring Creek, Ames Creek, Silver Creek, Deep Creek, Mill Creek, Brophy Creek, Turtle Creek, Deer Creek, and numerous small creeks, branches of rivers and streams flow through the County.

There are four HUC-8 watersheds in Clinton County (see Figure 3-21):

- Apple-Plum, 07060005
- Maquoketa, 07060006
- Copperas-Duck, 07080101
- Lower Wapsipinicon, 07080103

Figure 3-21 Clinton County Major Watersheds Map



Source: Environmental Protection Agency (EPA) Surf Your Watershed, https://cfpub.epa.gov/surf/county.cfm?fips_code=19045

For purposes of this hazard profile and vulnerability analysis, the geographic location/extent for river flooding will be considered as those areas at risk to the 100-year flood (also known as the 1-percent annual chance flood). The 1-percent annual chance flood has been adopted by FEMA as the base flood for floodplain management purposes.

Flash flooding occurs in those locations of the planning area that are low-lying and/or do not have adequate drainage to carry away the amount of water that falls during intense rainfall events. According to NCEI and specific reports from planning team members, the following locations have a history of flash flooding events:

- Unincorporated County
  - Highway 30
  - Old Highway 61 south of De Witt
- Andover
- City of Charlotte
  - Deep Creek
  - Rock Creek
  - Highway 136
  - Honey Creek
  - Case Street
- City of Clinton
  - 1200 Block of 2nd Street

  - 1400 Block of S 15th Street
  - Intersection of Highway 67 and Highway 30
  - Intersection of Emma Court and Jackson Blvd (Goose Lake)
- De Witt
  - Silver Creek
  - E 11th Street
  - East Industrial Street
  - South 3rd Avenue East
- Grand Mound
  - 500 Block of Sunnyside Street
- Low Moor
- Toronto
  - Wapsipinicon River
- Welton
- Wheatland
  - Creek that runs through town is subject to flash flooding causing problems in low-lying areas and occasionally the sewer lagoons.

The NWS has various flash flooding products that are issued to the public to provide information regarding upcoming and current flash flood threats (see Table 3-32).

Table 3-32 National Weather Service Flash Flooding Products

Product	What It Means	You Should…
Hazardous Weather Outlook	Will there be any threat of flash flooding in the next several days?	If there is a threat of flash flooding, check back later for updated forecasts and possible watches and warnings. Latest Hazardous Weather Outlook
Flash Flood Watch	There is a threat of flash flooding within the next 48 hours, either because of heavy rain, ice jams, or the threat of a dam break.	Monitor weather conditions closely, especially if you live in an area prone to flash flooding.
Flash Flood Warning	There is an immediate threat for flash flooding in the warned area, especially in low-lying and poor drainage areas. These warnings are updated frequently with Flash Flood Statements.	If you live in an area susceptible to flash flooding, be prepared to evacuate and head to higher ground. Be very cautious when driving in the warned area, especially at night or while it is still raining. You may not be able to see a flooded road until it is too late!
A Flash Flood Emergency may be declared when a severe threat to human life and catastrophic damage from a flash flood is imminent or ongoing. The declaration of a Flash Flood Emergency would typically be found in either a Flash Flood Warning or Flash Flood Statement. People are strongly encouraged to avoid the geographic area of		

Product	What It Means	You Should…
concern in a Flash Flood Emergency. The Flash Flood Emergency wording is used very rarely and is reserved for exceptionally rare and hazardous events.		
Areal Flood Warning	The threat of flash flooding is over, but there is still significant standing water in the affected area.	Areal flood warnings will typically list locations and roads impacted by the flooding. Try to avoid these locations until the water has receded.

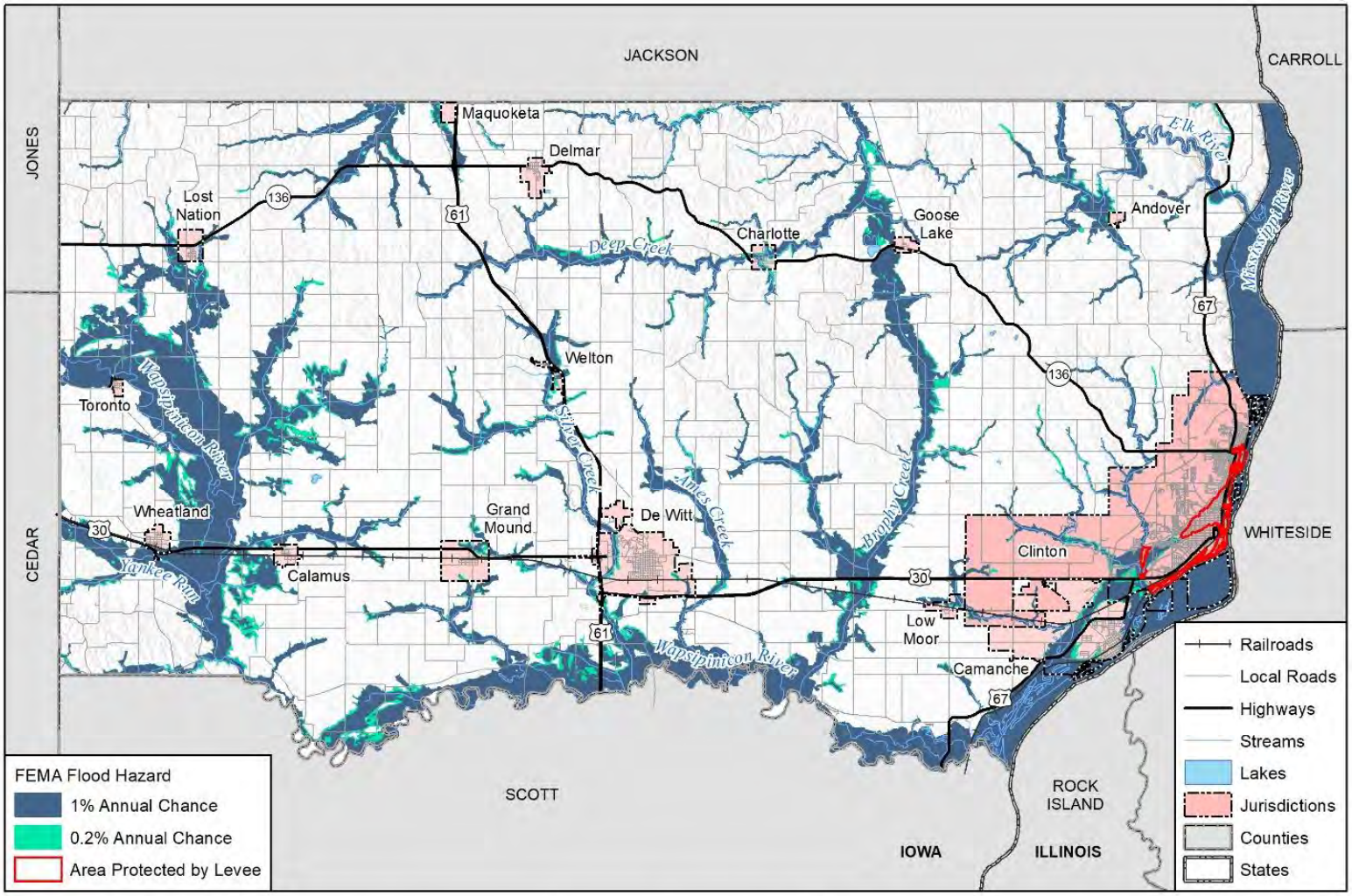
Source: NWS, website accessed 8/26/2013 http://www.crh.noaa.gov/dmx/?n=prepare floodproducts

As this risk assessment update was being developed, Clinton County was in the process of receiving updated panels to the FEMA regulatory flood maps. The updated panels, six in total, were still considered preliminary at the time this flood risk assessment was completed. However, it is not anticipated that there will be many, if any, changes to the panels prior to becoming effective in 2022. As a result, these preliminary panels have been used in conjunction with the effective DFIRM – effective date July 21, 2020, for Clinton County. Since a DFIRM is available and the County has detailed parcel data in a GIS format with assessed values, comparative analysis of these two layers was determined to be the preferred approach for the Flood Risk Assessment. This will allow for analysis of actual parcels and values by type that fall within the boundaries of the preliminary regulatory/preliminary floodplain. A Level I Hazus analysis, which can provide loss estimates according to the depth-damage function is considered to be less accurate since census block data is used and aggregated and the Hazus approximated floodplain considers only those streams that drain ten square miles or more.

Jurisdictional Flood Hazard Maps

Figure 3-22 to Figure 3-38 provide the mapped FEMA flood hazard areas for all jurisdictions in the planning area. These maps include incorporation of the six preliminary panels where applicable. The city-level maps include flooded structures vulnerable to the 1% and 0.2% annual chance flood hazard areas. The county-level map is provided first, and the remaining maps are provided in alphabetical order by city. Figures showing the critical facilities vulnerable to flood hazards will be shown and discussed in greater detail in the vulnerability section.

Figure 3-22 Clinton County FEMA Flood Hazard Areas



Map compiled 7/2021;
intended for planning purposes only.
Data Source: Clinton County, Iowa DNR,
FEMA NFHL Effective 7/22/2020 and Preliminary 6/1/2021

Figure 3-23 City of Andover FEMA Flood Hazard Areas

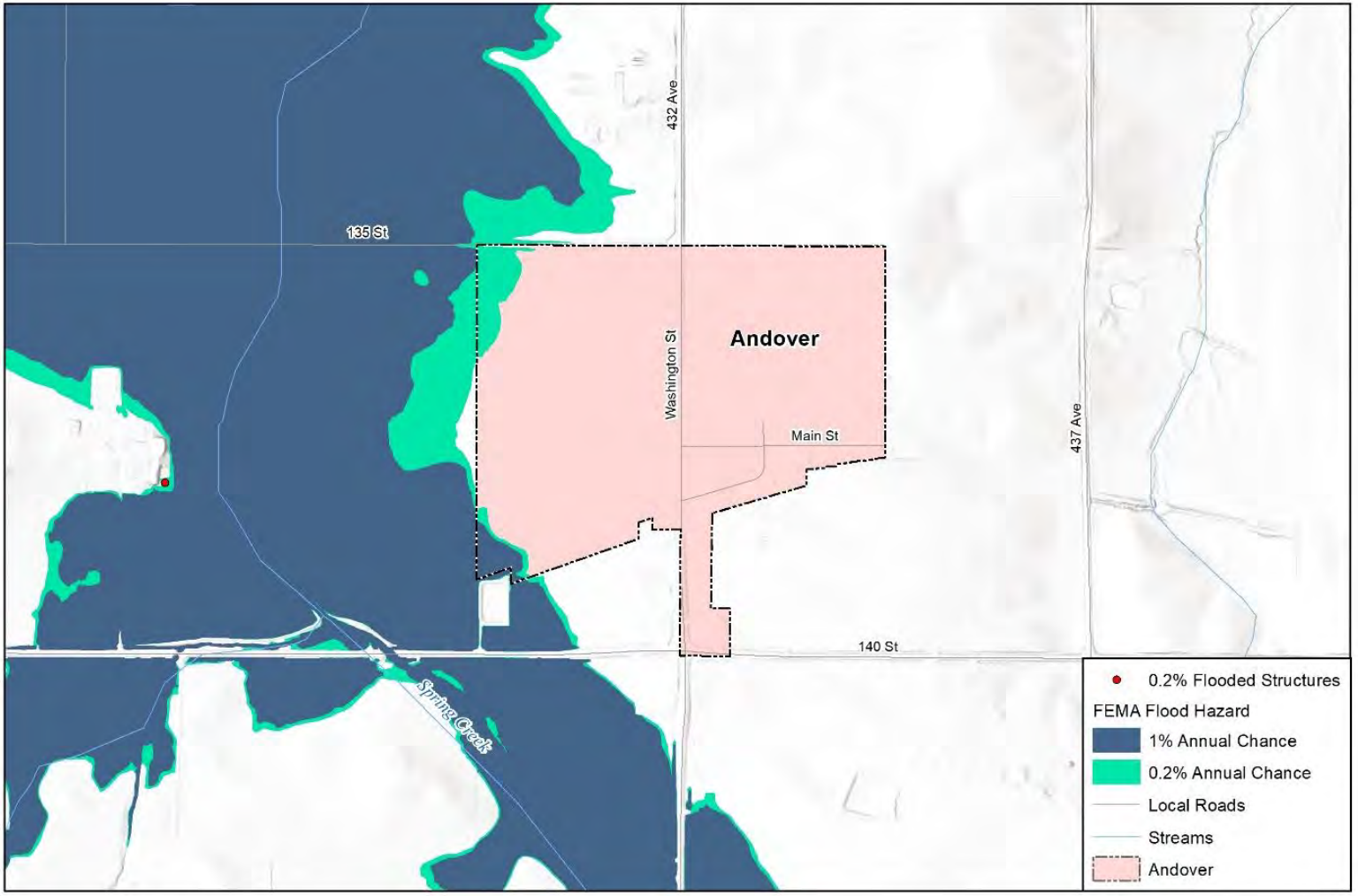
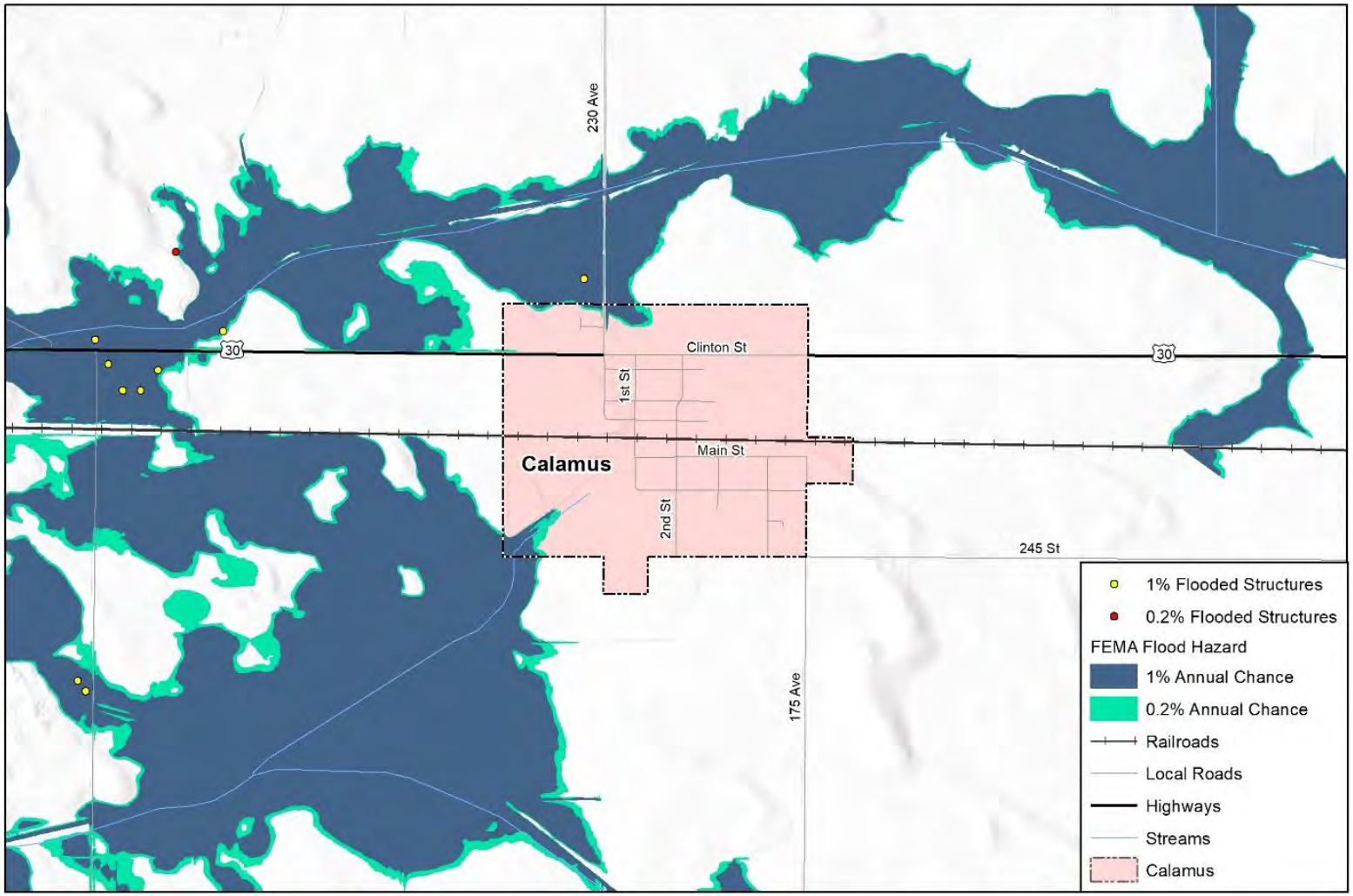


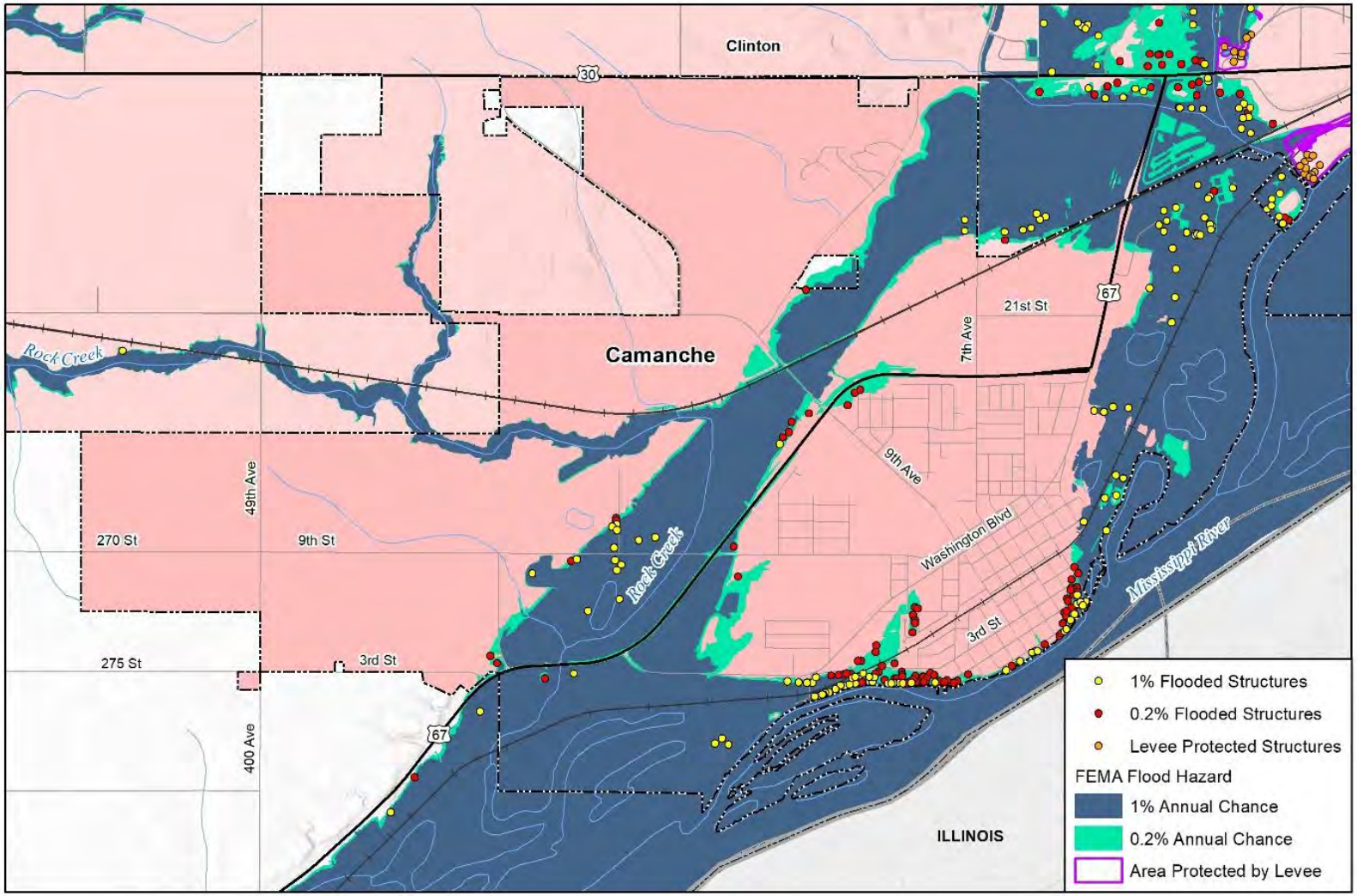
Figure 3-24 City of Calamus FEMA Flood Hazard Areas



wood.

Map compiled 9/2021;
intended for planning purposes only.
Data Source: Clinton County, Iowa DNR,
FEMA NFHL Effective 7/22/2020 and Preliminary 6/1/2021

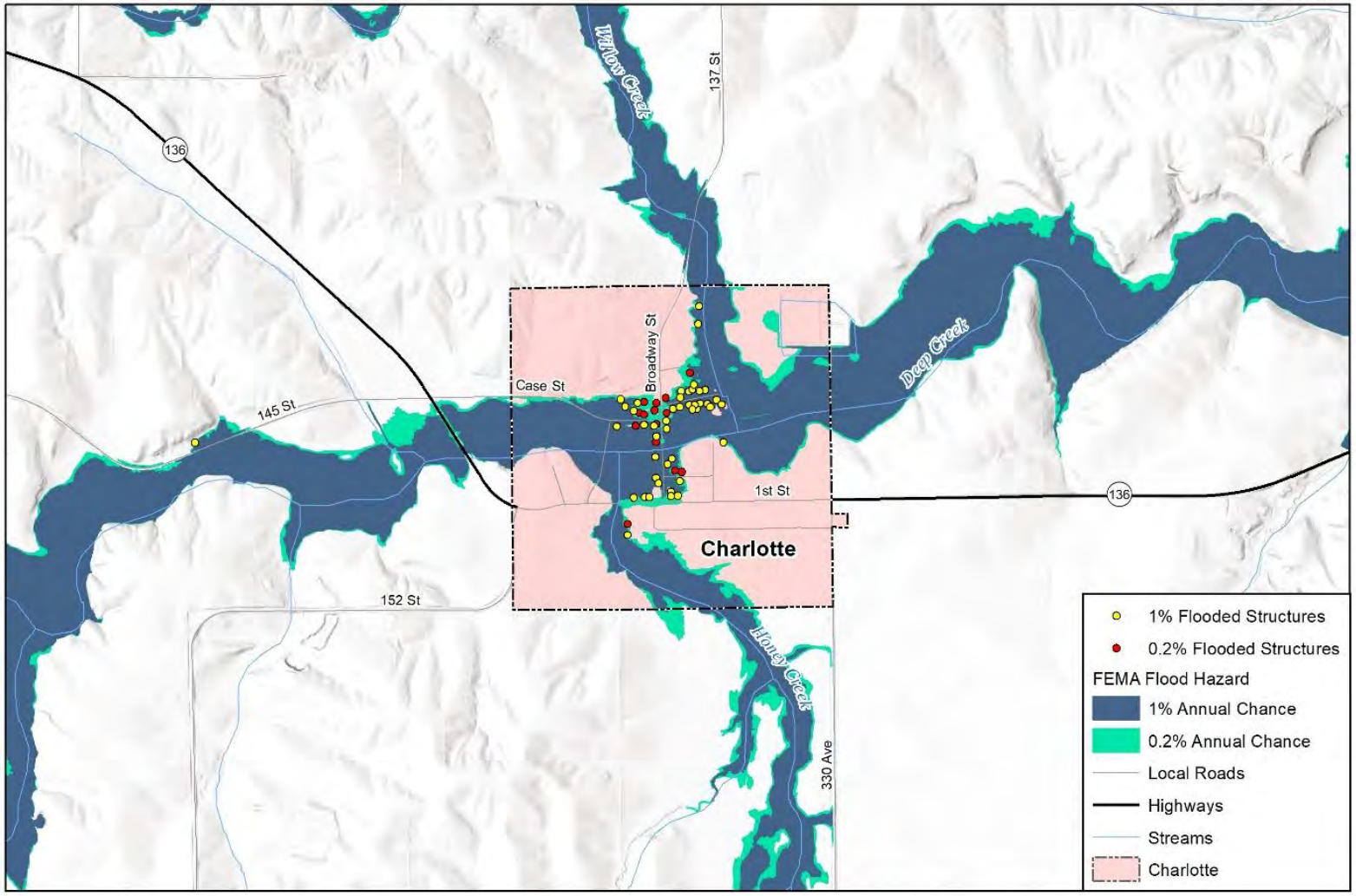
Figure 3-25 City of Camanche FEMA Flood Hazard Areas



wood.

Map compiled 9/2021;
intended for planning purposes only.
Data Source: Clinton County, Iowa DNR,
FEMA NFHL Effective 7/22/2020 and Preliminary 6/1/2021

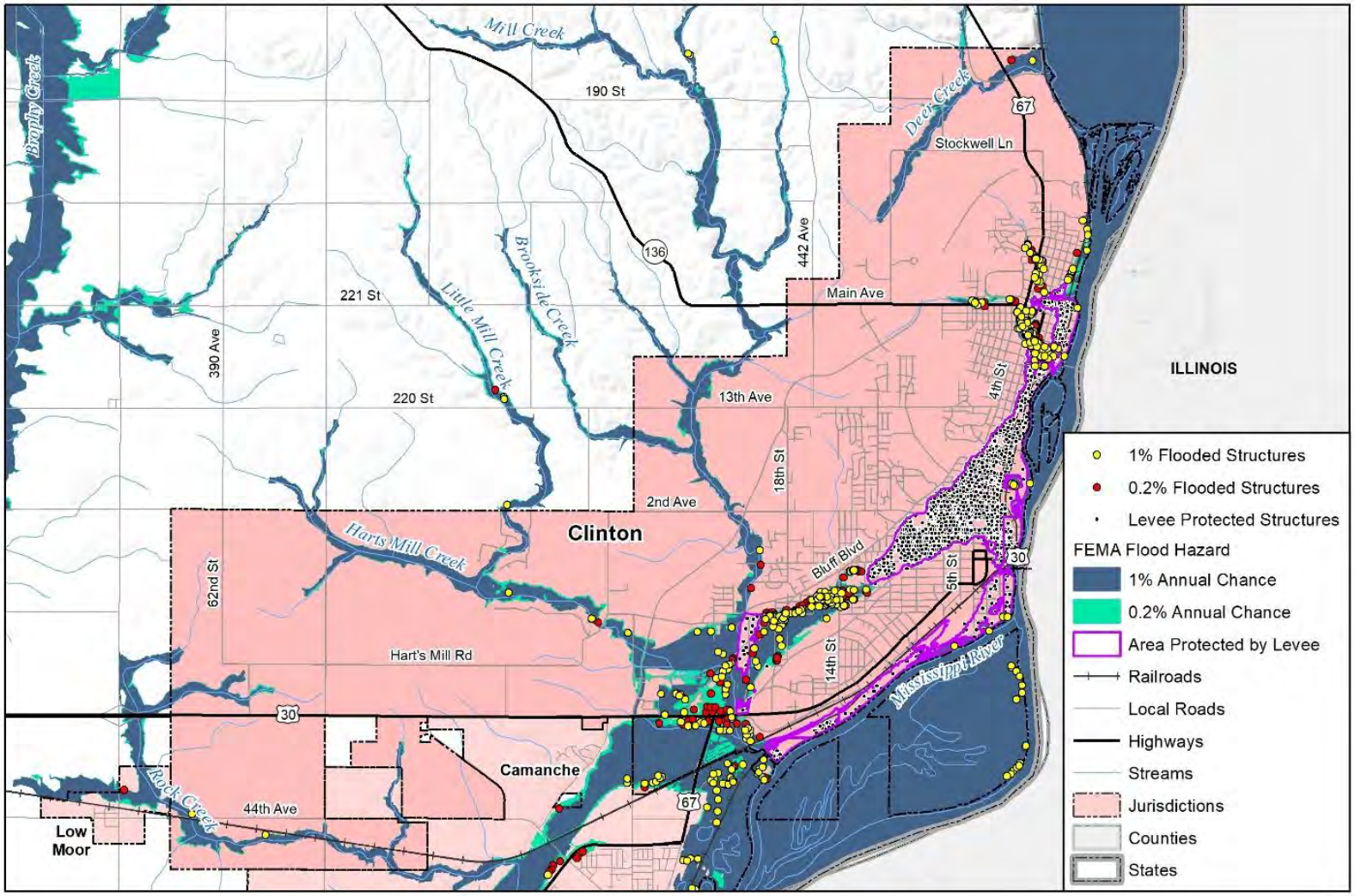
Figure 3-26 City of Charlotte FEMA Flood Hazard Areas



wood.

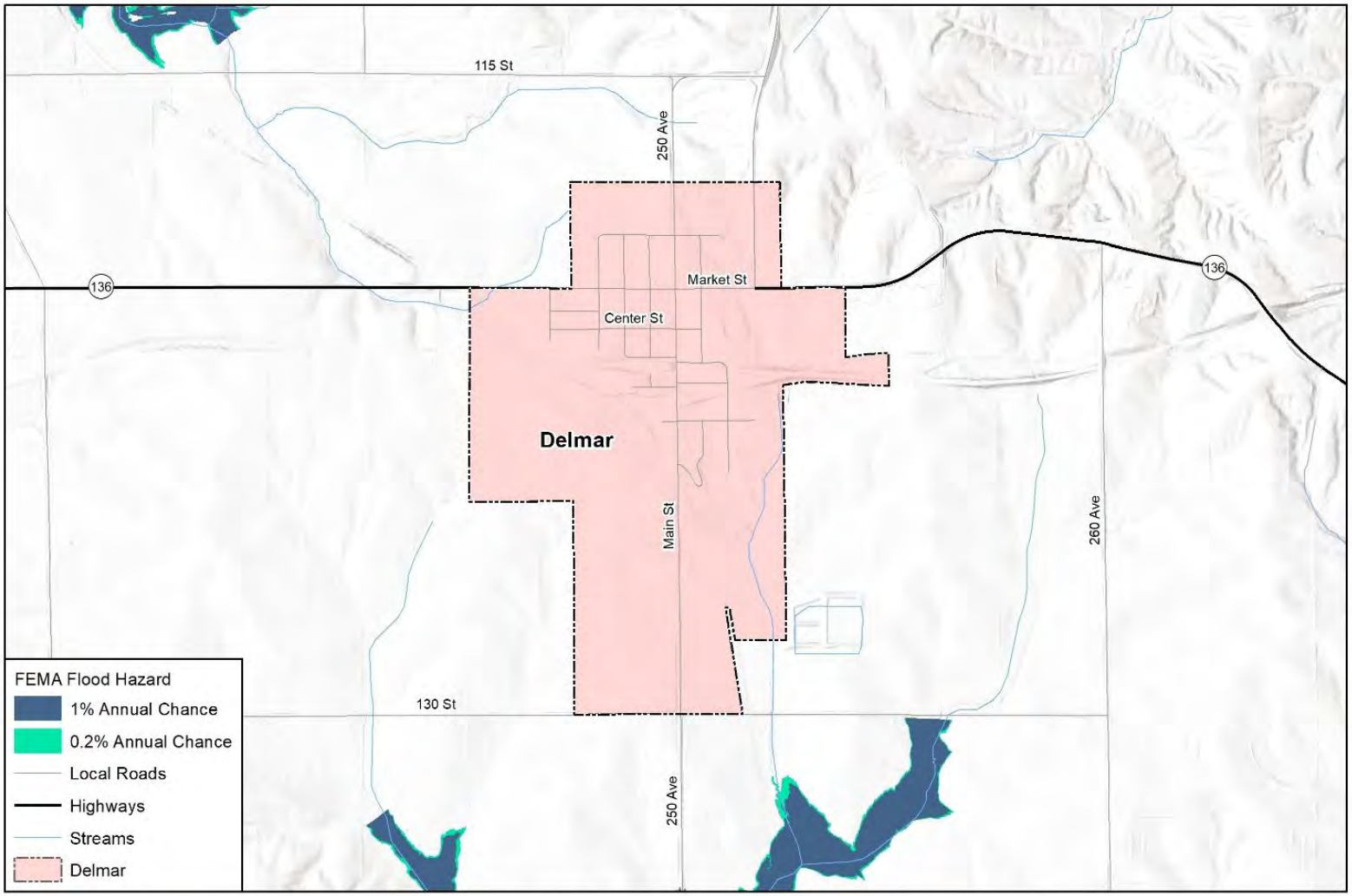
Map compiled 9/2021;
intended for planning purposes only.
Data Source: Clinton County, Iowa DNR,
FEMA NFHL Effective 7/22/2020 and Preliminary 6/1/2021

Figure 3-27 City of Clinton FEMA Flood Hazard Areas



Map compiled 9/2021;
intended for planning purposes only.
Data Source: Clinton County, Iowa DNR,
FEMA NFHL Effective 7/22/2020 and Preliminary 6/1/2021

Figure 3-28 City of Delmar FEMA Flood Hazard Areas



Map compiled 9/2021;
intended for planning purposes only.
Data Source: Clinton County, Iowa DNR,
FEMA NFHL Effective 7/22/2020 and Preliminary 6/1/2021

Figure 3-29 City of De Witt FEMA Flood Hazard Areas

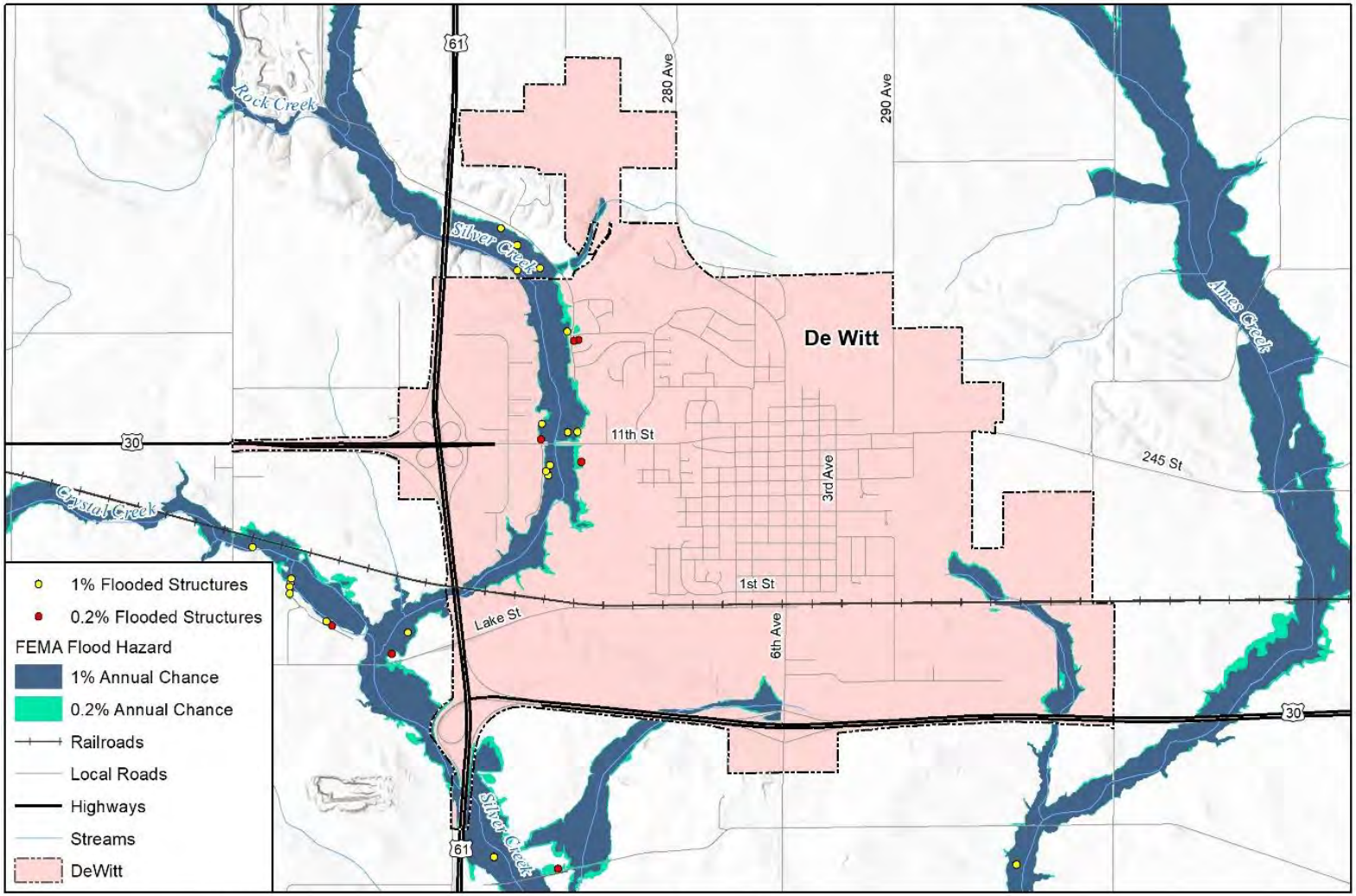
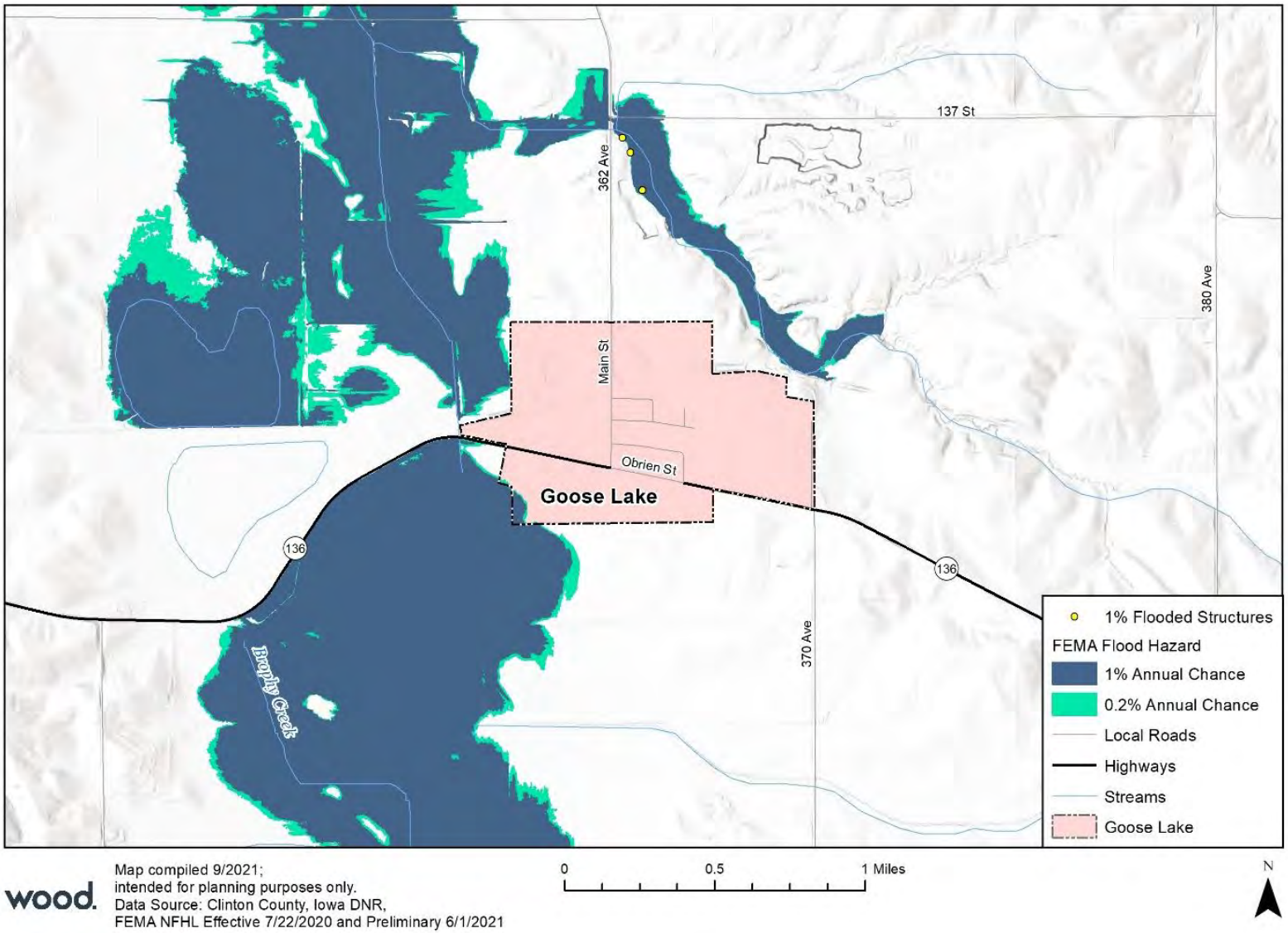


Figure 3-30 City of Goose Lake FEMA Flood Hazard Areas



wood.

Map compiled 9/2021;
intended for planning purposes only.
Data Source: Clinton County, Iowa DNR,
FEMA NFHL Effective 7/22/2020 and Preliminary 6/1/2021

Figure 3-31 City of Grand Mound FEMA Flood Hazard Areas

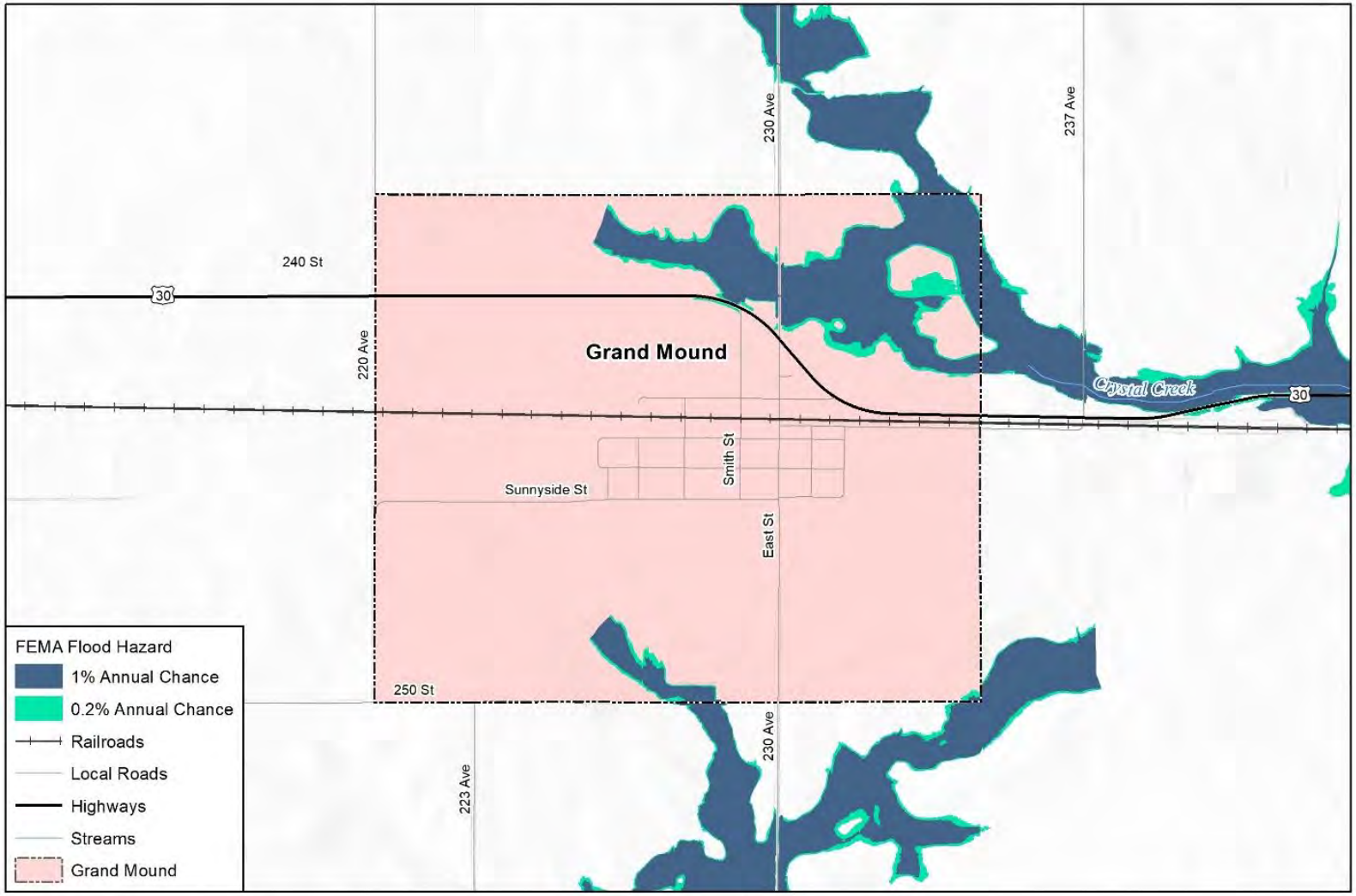
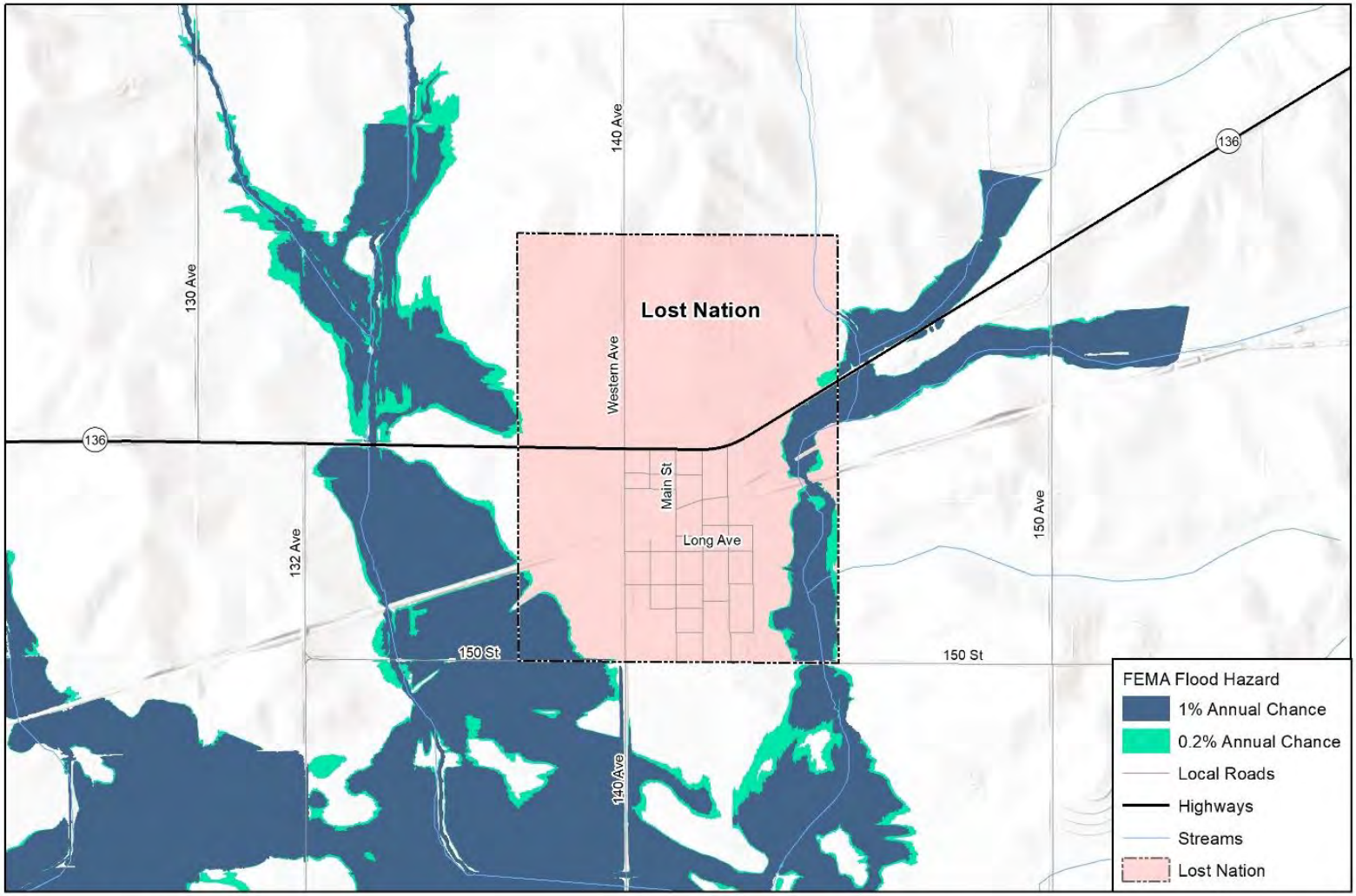
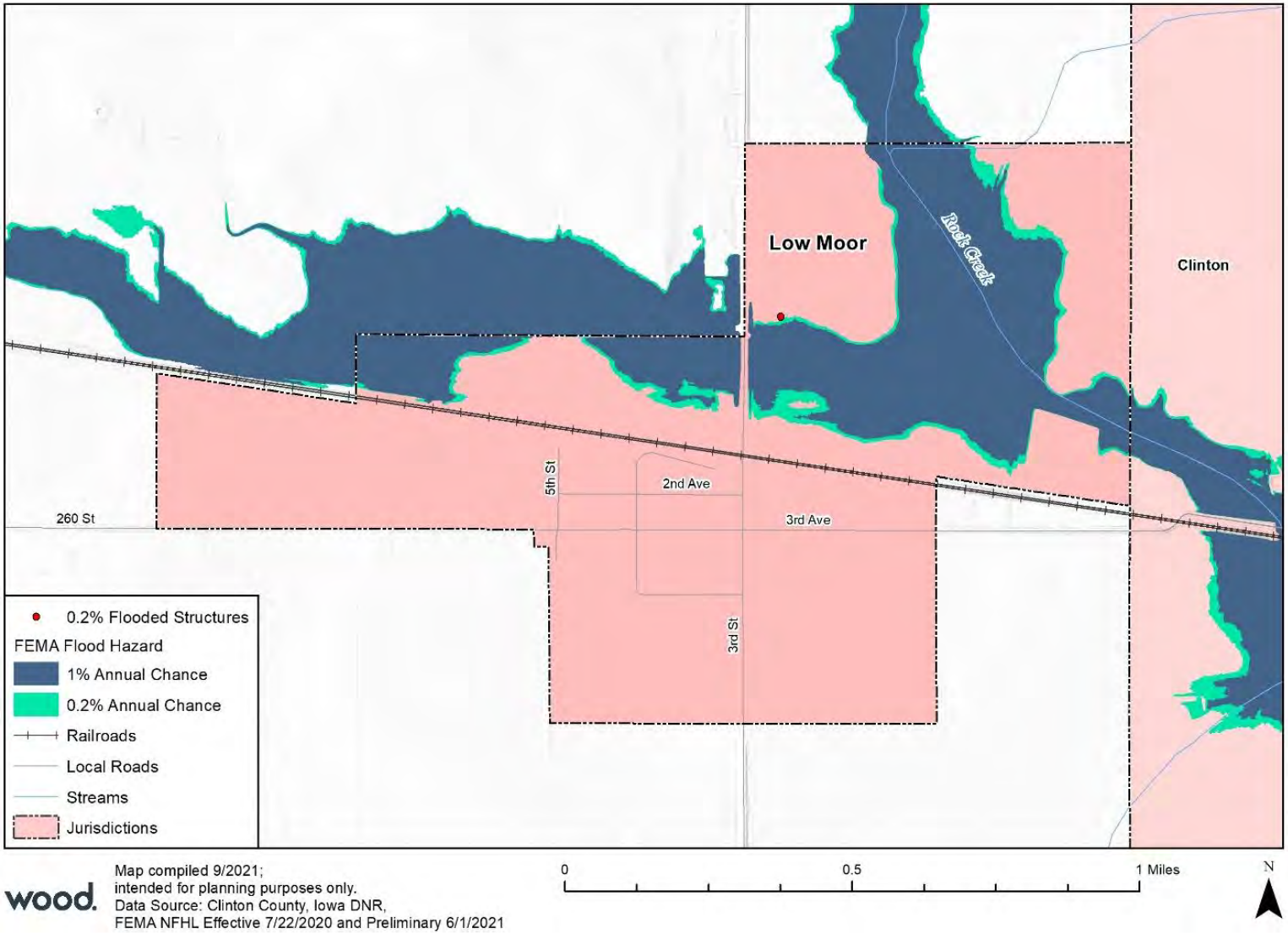


Figure 3-32 City of Lost Nation FEMA Flood Hazard Areas



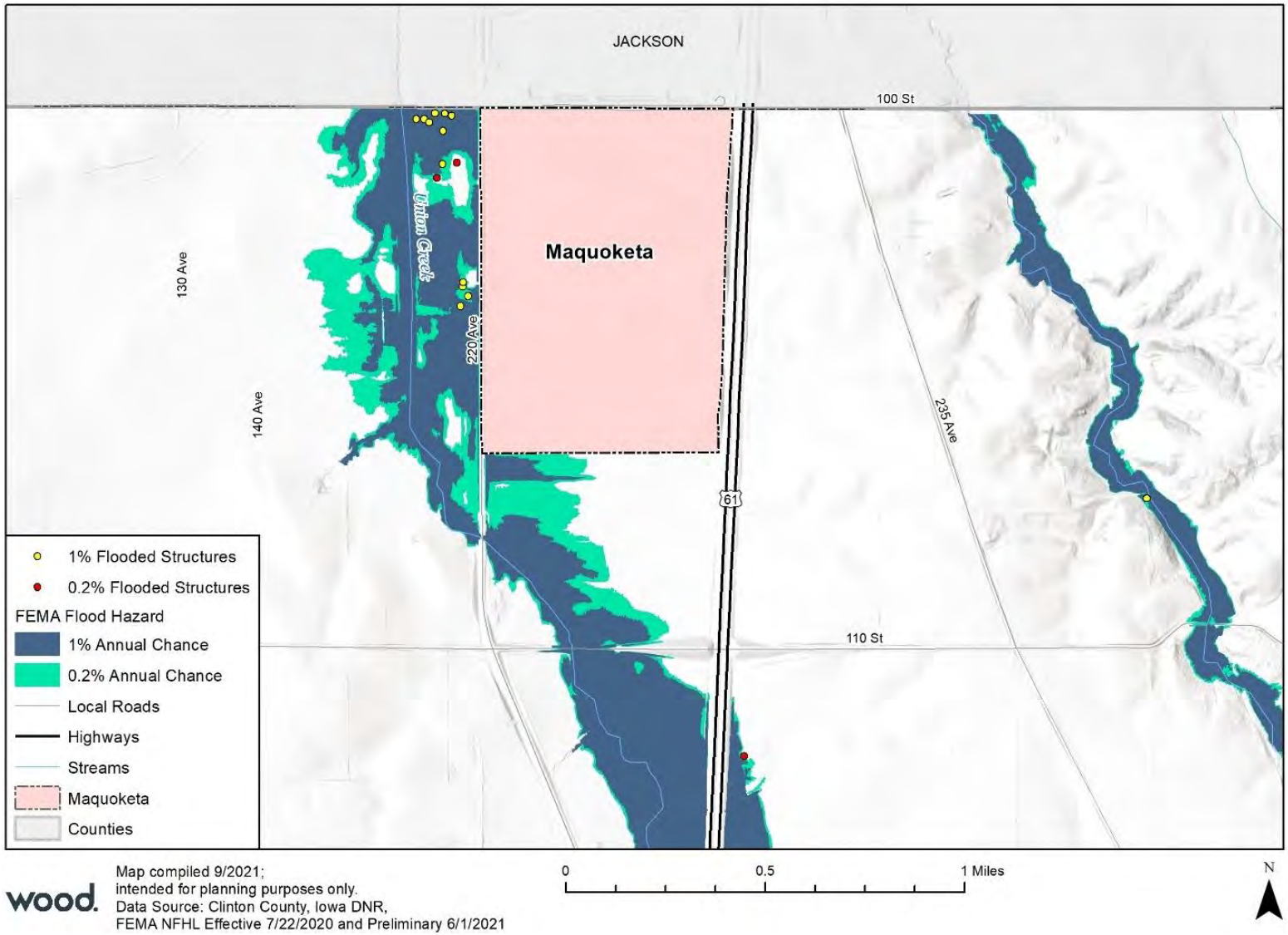
Map compiled 9/2021;
intended for planning purposes only.
Data Source: Clinton County, Iowa DNR,
FEMA NFHL Effective 7/22/2020 and Preliminary 6/1/2021

Figure 3-33 City of Low Moor FEMA Flood Hazard Areas



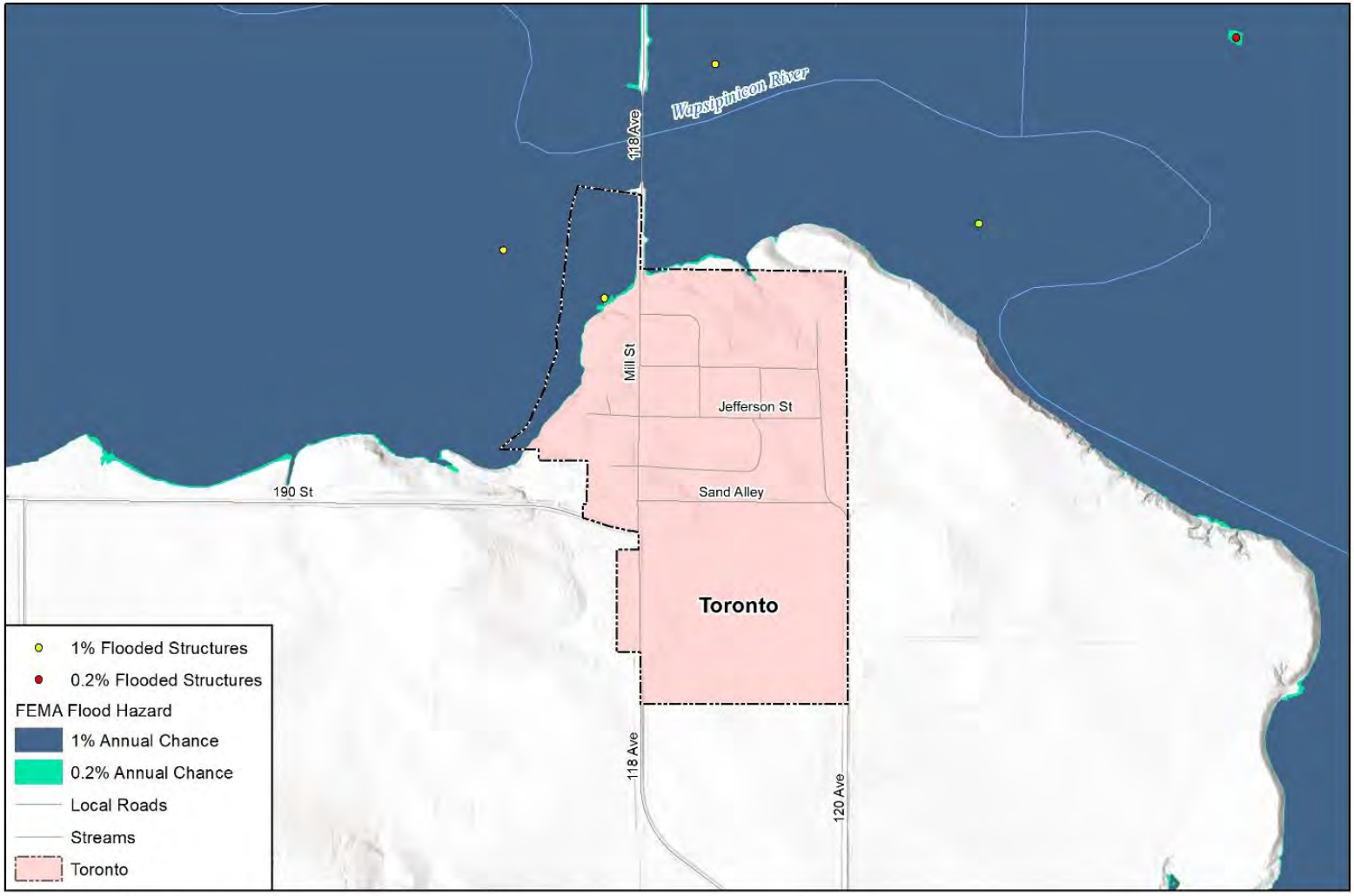
Map compiled 9/2021;
intended for planning purposes only.
Data Source: Clinton County, Iowa DNR,
FEMA NFHL Effective 7/22/2020 and Preliminary 6/1/2021

Figure 3-34 City of Maquoketa FEMA Flood Hazard Areas



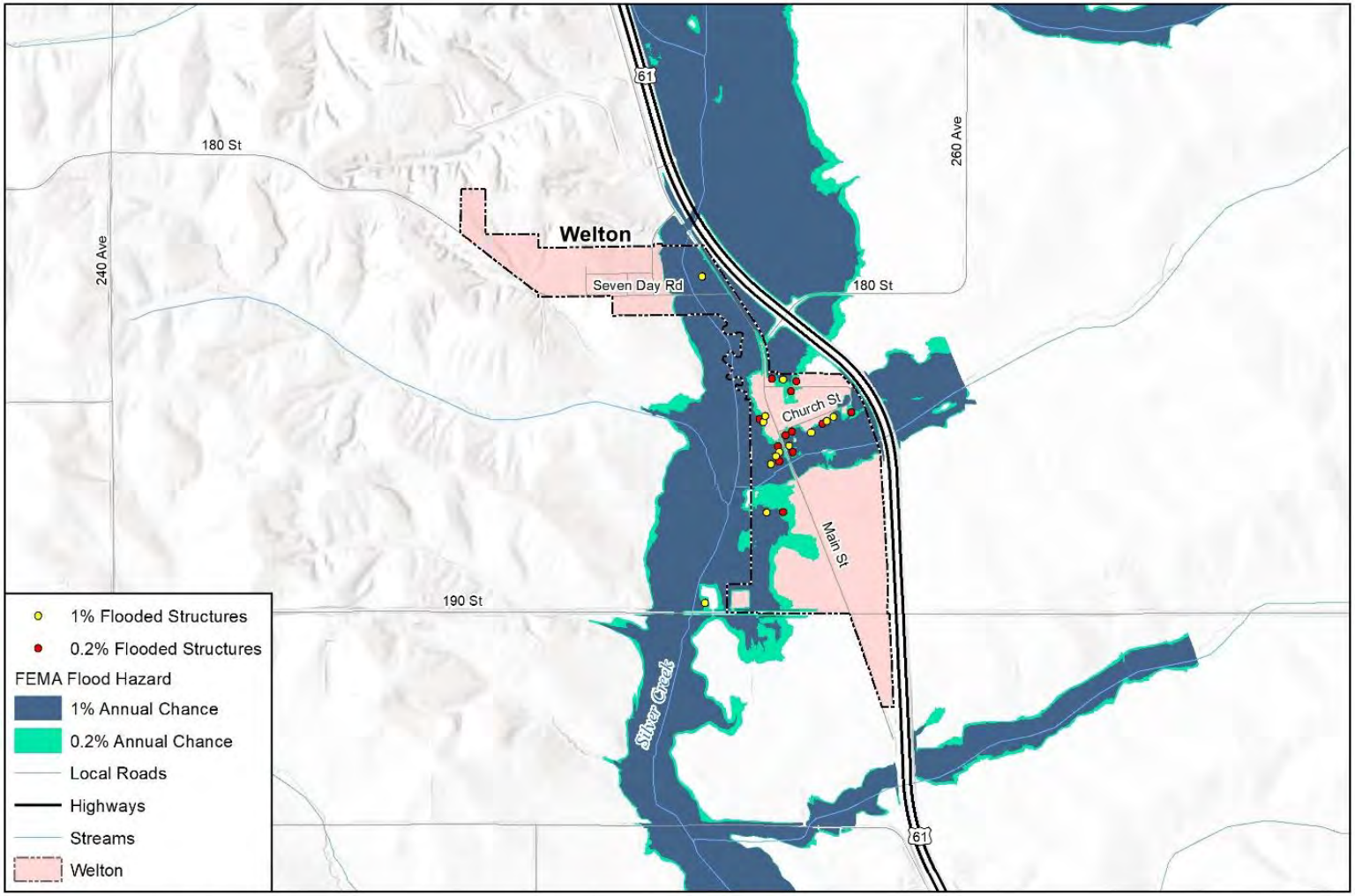
Map compiled 9/2021;
intended for planning purposes only.
Data Source: Clinton County, Iowa DNR,
FEMA NFHL Effective 7/22/2020 and Preliminary 6/1/2021

Figure 3-35 City of Toronto FEMA Flood Hazard Areas



Map compiled 9/2021;
intended for planning purposes only.
Data Source: Clinton County, Iowa DNR,
FEMA NFHL Effective 7/22/2020 and Preliminary 6/1/2021

Figure 3-36 City of Welton FEMA Flood Hazard Areas



Map compiled 9/2021;
intended for planning purposes only.
Data Source: Clinton County, Iowa DNR,
FEMA NFHL Effective 7/22/2020 and Preliminary 6/1/2021

Figure 3-37 City of Wheatland FEMA Flood Hazard Areas

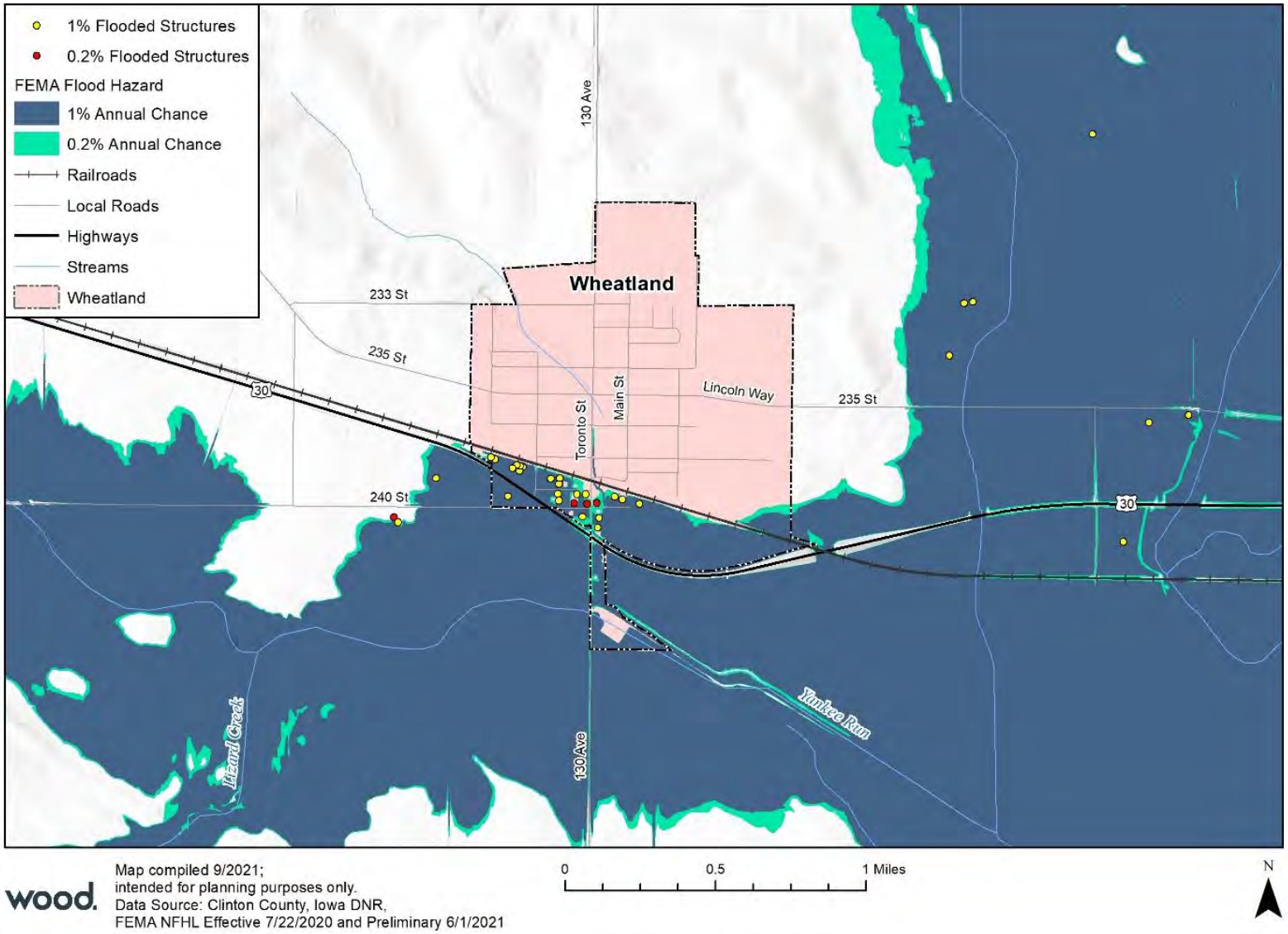
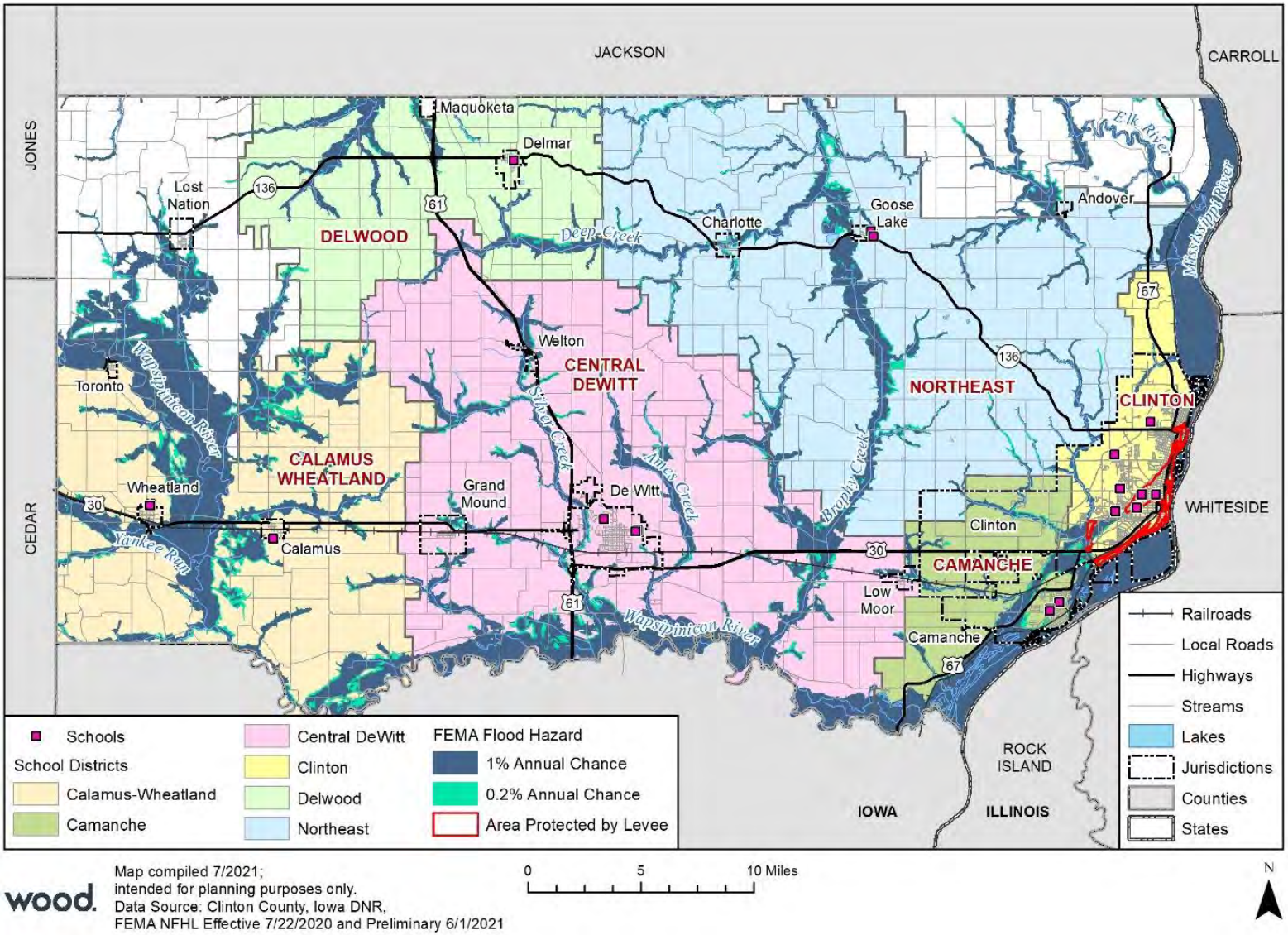


Figure 3-38 Clinton County School District Map with 1-Percent Annual Chance Floodplain (100-Year Floodplain)



Historic Occurrences

Table 3-33 provides details regarding the flash flood and areal flood watches and warnings issued for Clinton County and the Clinton County forecast zone by NWS. Areal flooding is a type of flash flooding that is generally over a large area usually due to the amount and duration of rainfall.

Table 3-33 Flood-Related National Weather Service Watches, Advisories, and Warnings Issued for Clinton County, Iowa Forecast Zone (1986 to June 2020)

Year	Flash Flood Warning	Flood Advisory	Flood Warning
2021	0	0	3
2020	2	0	6
2019	3	0	14
2018	3	0	15
2017	1	0	11
2016	0	0	12
2015	5	0	4
2014	2	0	12
2013	4	0	14
2012	0	0	0
2011	0	0	9
2010	6	0	17
2009	10	0	13
2008	2	0	13
2007	1	6	4
Total	**39**	**6**	**147**

Source: ISU Department of Agronomy. http://mesonet.agron.iastate.edu/vtec/search.php

Table 3-34 provides the top 30 rainfall events at the Clinton Weather Station from 1950 through 2021.

Table 3-34 Top 30 Rainfall Events, Clinton Weather Station, 1893 to 2021

Date	Amount (inches)
1927-09-09	8.71
1961-09-13	6.5
1973-06-17	4.8
1898-06-13	4.61
1963-07-19	4.53
1927-08-07	4.48
2007-08-23	4.45
1939-08-08	4.2
1941-09-08	4.06
1967-08-07	4

Date	Amount (inches)
1921-09-16	4
1934-07-05	3.9
1945-08-14	3.85
1990-06-16	3.73
1926-07-30	3.69
2017-07-22	3.67
1947-09-21	3.65
1924-08-19	3.64
1960-10-31	3.55
1954-10-10	3.55
2018-09-01	3.52
1909-06-08	3.42
1902-07-18	3.41
1952-11-17	3.39
2011-07-23	3.38
1949-08-11	3.37
1937-06-25	3.36
1952-07-18	3.3
1915-08-02	3.3
1990-06-14	3.28

Source: ISU Department of Agronomy http://mesonet.agron.iastate.edu/climodat/index.phtml?network=IACLIMATE&station=IA0576&report=02

Information from the NCEI was obtained from 1997 through 2020 to determine previous occurrences for flooding and flash flooding in the planning area. During this timeframe, there were 33 flash flood events and 53 river flooding events. During this timeframe, there were no injuries or deaths reported. Total property damages for these events were estimated to be $4,262,000, although that number likely includes damages outside of Clinton County due to the way NCEI reports incidents.

Presidential Declarations for Flooding in Planning Area

Since 1965 there have been twelve Presidential Disaster Declarations that included flooding in the planning area. Additional details of the flood-related disaster declarations are provided in Table 3-1 in the Hazard Identification Section.

Figure 3-39 provides photos of the April 2019 flooding that resulted in a Presidential Disaster Declaration.

Figure 3-39 April 2019 Flooding near Camanche, Clinton County

Source: The Clinton Herald

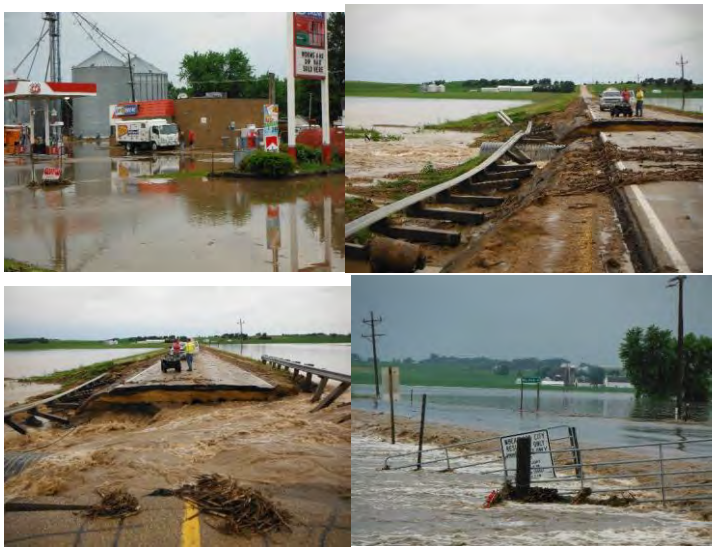
- **March-April 2020:** Brief periods of minor flooding along the Mississippi and the Wapsipinicon for short times in March and April. No major damage noted.
- **June-July 2020:** Periods of moderate to major flooding along the Wapsipinicon through the month with no major damage. Heavy rainfall around 6/23 led to a rise to major flooding but no reported damage.
- **June 8, 2020:** Tropical Storm Cristobal brought risks of heavy rainfall and flooding to the area. No major damage noted.
- **March-May 2019:** Extended periods of flooding on Wapsipinicon and Mississippi Rivers and multiple crests. Damages seen in North Clinton to homes, in Camanche to homes and infrastructure and to rural roads. State Individual Assistance and Federal Disaster Declaration were available for public assistance. Several jurisdictions applied for FEMA grants.
- **October 2019:** Elevated Mississippi Levels for approximately 10 days. Levels were elevated but did not reach the flood levels from the previous spring. No damages reported.
- **August 28, 2018:** Severe weather and tornado damage reported. Flooding in low-lying areas.
- **August-October 2018:** The Wapsipinicon River experienced an extended flooding event starting in August and rising and receding through September and most of October.
- **September 2018:** Heavy rain on 9/2/2018 mostly affecting the City of Clinton caused basement flooding.
- **July 2017:** Flash Flooding Event—Clinton experienced a heavy rain/severe weather event during the evening of 7/21/2017 into the early morning hours of 7/22/2017. Due to saturation of the ground, flash flooding occurred in many areas throughout the city. A State Individual Assistance declaration was obtained, and 64 households were assisted. Volunteer teams were utilized to assist residents with cleanup.
- **June 2015:** Heavy rain caused flash flooding of Deep Creek. In Charlotte some homes were flooded, and roads were closed.

Figure 3-40 June 2015 Flooding, Charlotte

Source: Clinton County Emergency Management

- **July 2015:** Heavy rain caused flash flooding of Deep and Honey Creeks. Roads were closed and some homes flooded.
- **Spring 2015:** Heavy rains caused short-term flooding of road and yards near 500 block of Sunnyside Street in Grand Mound.
- **June 24, 2013:** Flooding occurred in Wheatland.

Figure 3-41 June 2013 Flooding, Wheatland



Source: Clinton County Emergency Management

- **June 23, 2010:** Heavy rains resulted in flash flooding of several streets in De Witt, IA during the morning of June 23. The flood waters covered E 11th Street, which prompted its closure. In addition, Silver Creek was out of its banks.
- **August 26, 2009:** Heavy rains resulted in flash flooding in the Clinton, IA and De Witt, IA during the late morning and afternoon hours of August 26. In Clinton, six to eight inches of water was covering Highway 30 at Camanche Avenue for a time. On the northeast side of De Witt, flooding was observed on 11th Street. The flood waters were several inches deep around 130 pm. Several roads were closed.

Near Old Highway 30, Silver Creek flooded out of its banks during the late afternoon and early evening.

- J**uly 4, 2007:** Three to six inches of rain fell in a short amount of time during the early morning hours of July 4th in Clinton, IA resulting in flash flooding. In Clinton, a water rescue was performed on the 1200 block of S 2nd Street of a vehicle stalled in flood waters. Several other vehicles were stalled in water 1 to 2 feet deep in streets, or about halfway up the doors of cars. On the 1400 block of S 15th Street, the water was 4 feet deep in places. In Charlotte, Honey Creek was out of its banks, which resulted in the closure of Highway 136 in Charlotte. By 5:30 AM, fourteen residences were flooded, and home evacuations were being conducted. The flood waters finally receded by evening. Near De Witt, flood waters one foot deep were observed flowing over Old Highway 61.

The USACE, Cold Regions Research and Engineering Laboratory (CRREL) maintains a database of historic ice jams. According to a query of that database from 1950 to the present, four ice jams have occurred in the planning area, all near De Witt. Details are provided in Table 3-35.

Table 3-35 Ice Jams in Clinton County, 1939 to October 2021

City	State	River	Jam Date
Clinton	IA	Mississippi River	01/03/1947
Clinton	IA	Mississippi River	12/13/1945
Clinton	IA	Mississippi River	12/03/1942
Clinton	IA	Mississippi River	01/21/1940
Clinton	IA	Mississippi River	01/24/1939
De Witt	IA	Wapsipinicon River	02/12/1996
De Witt	IA	Wapsipinicon River	03/11/2014
De Witt	IA	Wapsipinicon River	01/25/2019
De Witt	IA	Wapsipinicon River	02/17/2011
De Witt	IA	Wapsipinicon River	01/03/2010
De Witt	IA	Wapsipinicon River	01/07/2008
Maquoketa	IA	Maquoketa River	02/04/2019
Maquoketa	IA	Maquoketa River	02/09/1966

Source: http://rsgisias.crrel.usace.army.mil/apex/f?p=524:1

Probability of Future Occurrences

The frequency of past events is used to gauge the likelihood of future occurrences. With the history of flooding in the planning area, it is likely that flooding of various levels will continue to occur. DeWitt, Toronto, and the unincorporated areas of Clinton County have the highest risk of flooding due to river or flash floods. Riverine flooding probability is often defined by the 1% and 0.2% chance flood events. The terms "base flood", "100-year flood", and "1% Annual Chance" refer to the area in the floodplain that is subject to a one percent or greater chance of flooding in any given year. Likewise, the terms "500-year flood" and "0.2% Annual Chance" refer to the area in the floodplain that is subject to a 0.2% chance of flooding or greater in any given year. Based on the 86 total flooding events in Clinton County in the 23-year span from 1997-2020, there is a 100% Annual Chance of flooding of some magnitude in Clinton County, and on average 3/year.

Based on HMPC input, flash flooding occurs more often in the County than riverine flooding.

Riverine Flooding Probability Score: 3—Likely

Flash Flooding Probability Score: 4—Highly Likely

Magnitude and Severity (Extent)

Areas in a floodplain, downstream from a dam or levee, or in low-lying areas can be impacted. 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 impacted in the event of a significant rainfall. Unlike areas impacted by a river/stream flood, flash floods can impact areas a good distance from the stream itself. Flash flood-prone areas are not particularly those 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.

Severity of Impact

Flash floods are the number one weather-related killer in the United States. They can quickly inundate areas thought not to be flood-prone. Other impacts of flooding can include loss of life; property damage and destruction; damage and disruption of communications, transportation, electric service, and community services; crop and livestock damage and interruption of business. Hazards of fire, health and transportation accidents, and contamination of water supplies are likely effects of flooding situations.

Clinton, Camanche, and De Witt have experienced moderate to major flooding.

Speed of Onset

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 NWS provides flood forecasts for Iowa. Flood warnings are issued over emergency radio and television messages as well as the NOAA weather radios. Jurisdictions in Clinton County would likely have at least 12-24 hours of warning time if a river flooding event was imminent.

Flash floods are somewhat unpredictable, but there are factors that can point to the likelihood of a flood occurring in the area. Flash floods occur within a few minutes or hours of excessive rainfall, a dam or levee failure, or a sudden release of water held by an ice jam. Warnings may not always be possible for these sudden flash floods. Predictability of flash floods depends primarily on the data available on the causal rain. Individual basins react differently to precipitation events. Weather surveillance radar is being used to improve monitoring capabilities of intense rainfall. Knowledge of the watershed characteristics, modeling, monitoring, and warning systems increase the predictability of flash floods. Depending on the location in the watershed, warning time can be increased. The NWS forecasts the height of floods crests, the data, and time the flow is expected to occur at a particular location.

Riverine Flooding Magnitude/Severity Score: 2—Limited

Flash Flooding Magnitude/Severity Score: 2—Limited

Climate Change Considerations

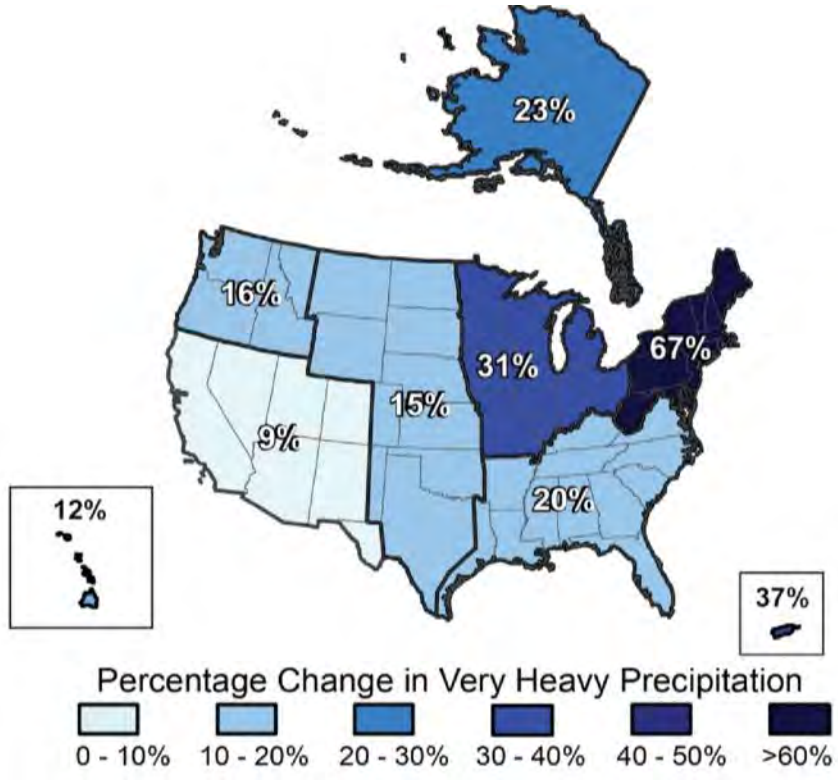
In 2010, the Iowa Climate Change Advisory Council reported to the Governor and the Iowa General Assembly on Climate Change Impacts on Iowa. According to this report, Iowa is already experiencing:

- More Precipitation
  - Increased frequency of precipitation extremes that lead to flooding
  - Increase of 8 percent more precipitation from 1873 to 2008
  - A larger increase in precipitation in eastern Iowa than in western Iowa

- Higher Temperatures
  - Iowa's humidity has risen substantially, especially in summer, which now has 13 percent more atmospheric moisture than 35 years ago, as indicated by a 3 – 5-degree F rise in dew-point temperature. This fuels convective thunderstorms that provide more summer precipitation.

Figure 3-42 shows that all of Iowa is in the region with a 31% increase in very heavy precipitation from 1958 to 2007. For this study, very heavy precipitation was defined as the heaviest 1% of all events.

Figure 3-42 Increase in Very Heavy Precipitation in the US, 1958-2007



Source: Karl, T.R., J.M. Melillo, and T.C. Peterson(eds). 2009. Global Climate Change Impacts in the United States. US Global Climate Change Research Program. Cambridge University Press and http://www.globalchange.gov/publications/reports/scientific-assessments/us-impacts as cited in the 2010 Climate Change Impacts on Iowa report by the Iowa Climate Change Impacts Committee

In 2018, the US Global Change Research Program published the Fourth National Climate Assessment. According to this report, flood risk continues to increase in the Midwest due to increasing temperatures and humidity, leading to increased rainfall. Episodes of widespread heavy rains in recent years have led to flooding, soil erosion, and water quality issues.

To reduce the impact of climate change and changing weather patterns, the report highlights that mitigation measures such as restoring systems like wetlands and forested floodplains and implementing agricultural best management strategies that increase vegetative cover (such as cover crops and riparian buffers) can help reduce flooding risks and protect water quality.

Vulnerability Assessment

The risk of flooding is prevalent within all regions of Clinton County, however not all exposed areas have equal risk, and many areas may not experience serious flooding or flood-related damages. This section

summarizes the results of a county-wide risk analysis intended to identify the vulnerability of population, property, and infrastructure. The vulnerability analysis was performed using an address point layer to obtain more accurate property locations and the assessor's parcel layer to obtain different parcel types and improved values. Using GIS, this combined dataset was intersected with the effective FEMA special flood hazard area (SFHA) to determine at risk population, infrastructure, and assets.

Water over low-lying roads and bridges is the most frequent impacts associated with flash flooding that has occurred in the planning area. This can cause wash out of bridge abutments and erosion/scour damage on roads. There is potential for loss of life if motorists drive into moving water. However, public education campaigns have helped to educate citizens about not driving through moving water. Building damage is generally limited to water in basements where rain is too intense for drainage systems and natural drainage to carry water away from the structure. In addition, when combined storm/sanitary sewer systems are overloaded, this can result in sewer back-up. Generally, flash flooding is short in duration and government services and business operations are not impacted.

In DeWitt, stormwater has posed a significant problem for the sanitary sewer system. Large amounts of stormwater are channeled in the sanitary sewers which causes backups to occur. In 2008/2009, the City did complete a large improvement project on the east side of DeWitt. A large detention area was built in northeast DeWitt adjacent to the Humeston Road north of 11th Street. Additionally, the City cleaned and reshaped the existing drainage ditch from north of 11th Street to East 3rd Avenue. That project has reduced street and private property flooding in that area.

City of Clinton has completed a number of mitigation projects since the last Plan that have reduced the City's flood risk.

- Recently acquired nine properties within Floodway of Manufacturer's Ditch and successfully relocated all tenants using FEMA funding.
- Recently completed stormwater projects within Basin 6 and surrounding areas which have been known to alleviate street flooding and prevent basement backups.
- Added storm water pumping station in Riverview Park.
- All new pump stations and critical infrastructure projects are outfitted with emergency backup generators.
- Added elevation and generator to lift station at 1st Avenue.
- Added permeable pavement along 25th Avenue North.
- Including flood articles with the quarterly city newsletter.

Upcoming mitigation efforts in the City of Clinton will focus on the lower end of Manufacturing Ditch, where several flooding problem spots remain.

People

Flash flooding poses the greatest risk to loss of life because of the sudden onset resulting in little warning time and high volume and velocity of water. Water over low-lying roads and bridges is the most frequent type of impact associated with flash flooding. There is potential for loss of life if motorists drive into moving water; however, public education campaigns have helped to educate citizens about not driving through moving water. River flooding can also pose a risk to human life, but in general, there is enough forecasting and warning time for evacuations to avoid significant loss to human life.

Table 3-36 and Table 3-37 contain population estimates, based on average household size, that are within the 0.2- and 1-percent annual chance flood hazard areas.

Property

When roads and bridges are inundated by water during a flash flooding event, damage often occurs as the water scours materials around bridge abutments and gravel roads. See Figure 3-2 in Section 3.2, "Assets at Risk", for a map of all bridges in Clinton County.

The water can also cause erosion undermining roadbeds. In some instances, steep slopes that are saturated with water may cause mud or rockslides onto roadways. These damages can cause costly repairs for state, county, and city road/bridge maintenance departments. When sewer back-up occurs, this can result in costly cleanup for home and business owners as well as present a health hazard.

The potential losses to existing development during river flooding events will be provided for the following categories of losses:

- Building Losses—this will include counts and values for buildings exposed to potential damage from the 1-percent annual chance flood for each jurisdiction in the planning area;
- Estimated Population Displaced;
- Critical Facilities and Infrastructure at Risk.

The flood vulnerability and loss estimates for the unincorporated county and the incorporated jurisdictions were generated using the July 2021 Effective DFIRM, the six Preliminary Panels, and the parcels layers provided by the Clinton County Assessor's Office.

Analysis was conducted to determine the number and values of buildings at risk to the 1% annual chance flood and the 0.2% annual chance flood. GIS was used to create a centroid representing the center of the parcel polygon. The DFIRM flood data with integrated preliminary panels was then overlaid on the parcel centroids. For the purposes of this analysis, the flood zone that intersected a parcel centroid was assigned the flood zone for the entire parcel. The model assumes that every parcel with a building or dwelling value greater than zero is improved in some way. Specifically, an improved parcel assumes there is a building on it. It is important to note that there could be more than one structure or building on an improved parcel (i.e. condo complex occupies one parcel but might have several structures). In these cases, the analysis counts this as one structure. Only improved parcels and the value of their improvements were analyzed. The result is an inventory of the number and types of parcels and buildings subject to flood hazard at the designated frequency. Results are presented by unincorporated county and incorporated jurisdictions. Detailed tables show counts of parcels and land use type (Agriculture, Commercial, Industrial and Residential) within each flood zone.

Table 3-36 provides the numbers of parcels, improved parcels, values by type of parcel, and population estimate that are in the 1-percent annual chance floodplain for the unincorporated county and cities according to the analysis methodology described above. Table 3-37 that follows provides the number of parcels, improved parcels, and values by type of parcel that are in the 0.2-percent annual chance floodplain for the county and communities according to the same analysis methodology.

According to this analysis, the City of Clinton has the greatest number of improved parcels in the floodplain with a total of 277. Of those, 168 are residential, multi-residential, commercial residential, or agriculture residential and 109 are commercial or industrial. The next highest number of improved parcels in the floodplain is in the Unincorporated County with 202 total buildings in the 1-percent annual chance floodplain. The greatest exposure of building value in the 1-percent annual chance floodplain is in the City of Clinton with a total of over $75 Million in improvements present in the 1-percent annual chance floodplain.

The City of Clinton is also the jurisdiction with the greatest number of improved parcels in the 0.2-percent annual chance floodplain with a total of 100. Of those, 55 are residential or mixed use, and 45 are commercial. The next highest number of improved parcels in the floodplain is in the unincorporated County with 75 total buildings in the 0.2-percent annual chance floodplain. The greatest exposure of building value in the 0.2-percent annual chance floodplain is in the City of Clinton with a total of over $51 Million in improvements present.

Table 3-36 Clinton County, Iowa Improved Parcels / Values in the 1-Percent Annual Chance Floodplain

Jurisdiction	Property Type	Improved Parcel Count	Building Count	Improved Value	Estimated Content Value	Total Value	Loss Estimate	Population
Camanche	Commercial	5	12	$6,402,480	$6,402,480	$12,804,960	$3,201,240	
	Industrial	5	23	$8,686,280	$13,029,420	$21,715,700	$5,428,925	
	Mixed Use	2	4	$351,090	$351,090	$702,180	$175,545	9
	Residential	52	60	$7,846,140	$3,923,070	$11,769,210	$2,942,303	137
	Total	**64**	**99**	**$23,285,990**	**$23,706,060**	**$46,992,050**	**$11,748,013**	**146**
Charlotte	Agricultural	2	3	$35,130	$35,130	$70,260	$17,565	
	Commercial	8	8	$281,260	$281,260	$562,520	$140,630	
	Exempt	1	1	$690	$690	$1,380	$345	
	Residential	24	32	$1,022,990	$511,495	$1,534,485	$383,621	70
	Total	**35**	**44**	**$1,340,070**	**$828,575**	**$2,168,645**	**$542,161**	**70**
Clinton	Commercial	101	135	$51,218,767	$51,218,767	$102,437,534	$25,609,384	
	Industrial	8	11	$14,616,690	$21,925,035	$36,541,725	$9,135,431	
	Mixed Use	2	2	$269,060	$269,060	$538,120	$134,530	5
	Residential	166	193	$9,195,173	$4,597,587	$13,792,760	$3,448,190	463
	Total	**277**	**341**	**$75,299,690**	**$78,010,449**	**$153,310,139**	**$38,327,535**	**468**
DeWitt	Exempt	1	3	$23,090	$23,090	$46,180	$11,545	
	Residential	4	4	$625,870	$312,935	$938,805	$234,701	11
	Total	**5**	**7**	**$648,960**	**$336,025**	**$984,985**	**$246,246**	**11**
Toronto	Residential	1	1	$27,620	$13,810	$41,430	$10,358	2
	Total	**1**	**1**	**$27,620**	**$13,810**	**$41,430**	**$10,358**	**2**
Welton	Agricultural	1	1	$11,240	$11,240	$22,480	$5,620	
	Commercial	1	1	$5,190	$5,190	$10,380	$2,595	
	Residential	9	10	$578,360	$289,180	$867,540	$216,885	23
	Total	**11**	**12**	**$594,790**	**$305,610**	**$900,400**	**$225,100**	**23**

Jurisdiction	Property Type	Improved Parcel Count	Building Count	Improved Value	Estimated Content Value	Total Value	Loss Estimate	Population
Wheatland	Agricultural	3	3	$35,510	$35,510	$71,020	$17,755	
	Commercial	5	13	$1,571,650	$1,571,650	$3,143,300	$785,825	
	Residential	5	5	$221,480	$110,740	$332,220	$83,055	12
	Total	**13**	**21**	**$1,828,640**	**$1,717,900**	**$3,546,540**	**$886,635**	**12**
Unincorporated	Agricultural	58	74	$494,720	$494,720	$989,440	$247,360	
	Commercial	2	3	$403,540	$403,540	$807,080	$201,770	
	Exempt	2	2	$7,953	$7,953	$15,906	$3,977	
	Residential	140	231	$15,598,340	$7,799,170	$23,397,510	$5,849,378	483
	Total	**202**	**310**	**$16,504,553**	**$8,705,383**	**$25,209,936**	**$6,302,484**	**483**
Grand Total		**608**	**835**	**$119,530,313**	**$113,623,812**	**$233,154,125**	**$58,288,531**	**1,214**

Source: FEMA Effective DFIRM, July 2011 and Preliminary Panels, November 2016; Clinton County Assessor's Office and City of Clinton Assessor's Office

Table 3-37 Clinton County, Iowa Improved Parcels / Values in the 0.2-Percent Annual Chance Floodplain

Jurisdiction	Property Type	Improved Parcel Count	Building Count	Improved Value	Estimated Content Value	Total Value	Loss Estimate	Population
Camanche	Agricultural	1	1	$1,160	$1,160	$2,320	$580	
	Commercial	2	3	$774,830	$774,830	$1,549,660	$387,415	
	Industrial	1	1	$1,778,940	$2,668,410	$4,447,350	$1,111,838	
	Residential	71	82	$10,942,950	$5,471,475	$16,414,425	$4,103,606	187
	Total	**75**	**87**	**$13,497,880**	**$8,915,875**	**$22,413,755**	**$5,603,439**	**187**
Charlotte	Agricultural	1	1	$1,770	$1,770	$3,540	$885	
	Commercial	1	1	$610	$610	$1,220	$305	
	Exempt	1	2	$21,411	$21,411	$42,822	$10,706	
	Mixed Use	1	1	$44,120	$44,120	$88,240	$22,060	2
	Residential	9	9	$504,490	$252,245	$756,735	$189,184	20
	Total	**13**	**14**	**$572,401**	**$320,156**	**$892,557**	**$223,139**	**22**
Clinton	Commercial	45	55	$45,756,243	$45,756,243	$91,512,486	$22,878,122	
	Mixed Use	1	1	$1,200,630	$1,200,630	$2,401,260	$600,315	2
	Residential	54	58	$4,441,120	$2,220,560	$6,661,680	$1,665,420	139
	Total	**100**	**114**	**$51,397,993**	**$49,177,433**	**$100,575,426**	**$25,143,857**	**142**
DeWitt	Commercial	1	1	$723,160	$723,160	$1,446,320	$361,580	
	Residential	3	3	$620,270	$310,135	$930,405	$232,601	8
	Total	**4**	**4**	**$1,343,430**	**$1,033,295**	**$2,376,725**	**$594,181**	**8**
Low Moor	Residential	1	1	$162,200	$81,100	$243,300	$60,825	3
	Total	**1**	**1**	**$162,200**	**$81,100**	**$243,300**	**$60,825**	**3**
Welton	Commercial	1	1	$7,630	$7,630	$15,260	$3,815	
	Residential	11	11	$549,960	$274,980	$824,940	$206,235	25
	Total	**12**	**12**	**$557,590**	**$282,610**	**$840,200**	**$210,050**	**25**
Wheatland	Agricultural	1	1	$28,330	$28,330	$56,660	$14,165	

Jurisdiction	Property Type	Improved Parcel Count	Building Count	Improved Value	Estimated Content Value	Total Value	Loss Estimate	Population
	Residential	2	2	$117,520	$58,760	$176,280	$44,070	5
	Total	**3**	**3**	**$145,850**	**$87,090**	**$232,940**	**$58,235**	**5**
Unincorporated	Agricultural	11	12	$243,130	$243,130	$486,260	$121,565	
	Commercial	3	5	$557,670	$557,670	$1,115,340	$278,835	
	Residential	61	71	$8,028,610	$4,014,305	$12,042,915	$3,010,729	148
	Total	**75**	**88**	**$8,829,410**	**$4,815,105**	**$13,644,515**	**$3,411,129**	**148**
Grand Total		**283**	**323**	**$76,506,754**	**$64,712,664**	**$141,219,418**	**$35,304,855**	**539**

Source: FEMA Effective DFIRM, July 2011 and Preliminary Panels, November 2016; Clinton County Assessor's Office and City of Clinton Assessor's Office

Agricultural Impacts

Additionally, USDA crop insurance claims for excess moisture/precipitation/rain and flood conditions for the ten-year period from 2006-2015 totaled $14,969,821. Considering that 89 percent of insurable crops are insured in Iowa (2015 Iowa Crop Insurance Profile, USDA, RMA), the adjusted losses calculate to $16,820,023 for all insurable crops for the period. This results in an average annual loss estimate of $1,682,002 to insurable crops because of excess moisture/precipitation/rain and flood conditions affecting agriculture.

Previous Agricultural Impacts

Flooding and excess moisture take a toll on crop production in the planning area. According to the USDA's RMA, payments for insured crop losses in the planning area because of excess moisture and flood conditions from 2006-2020 totaled $24,405,911.10. This translates to an annual average of $1,743,279. Table 3-38 summarizes the claims paid by year.

Table 3-38 Crop Insurance Claims Paid in Clinton County for Crop Loss as a result of Excess Moisture/Precipitation/Rain and Flood (2006-2020)

Year	Cold Wet Weather	Excess Moisture/Precip/Rain	Flood	Grand Total
2006	$19,651.00	$53,301.00	$782.00	$73,734.00
2007	$1,105.00	$167,141.00	$28,786.00	$197,032.00
2008	$50,464.00	$4,741,131.00	$702,157.00	$5,493,752.00
2009	$41,322.00	$564,108.00	$24,017.00	$629,447.00
2010	$804.00	$1,622,772.00	$92,337.00	$1,715,913.00
2011		$84,652.00		$84,652.00
2012	$31,149.00	$33,784.00		$64,933.00
2013	$15,937.60	$663,325.59	$368,193.40	$1,047,456.59
2014	$98,172.00	$2,870,542.82	$229,558.47	$3,198,273.29
2015	$2,031.80	$2,439,154.22	$23,442.20	$2,464,628.22
2016	$7,711	$241,624	$39,356	$288,691
2017	$10,477	$446,063	$16,360	$472,900
2018	$1,446	$1,055,642	$165,033	$1,222,121
2019	$34,269	$7,153,622	$50,377	$7,238,268
2020	$7,876	$84,846	$121,388	$214,110
Grand Total	**$322,415.40**	**$22,221,708.63**	**$1,861,787.07**	**$24,405,911.10**

Source: USDA RMA

Critical Facilities and Infrastructure

To analyze critical facilities at risk in the planning area, the inventory of critical and essential facilities and infrastructure in the planning area was provided by Clinton County. This compiled inventory consisted of 905 critical facilities. A comparison was made of the 905 critical functions in GIS format with the DFIRM layer to determine those facilities that would be damaged in the 1-percent and 0.2-percent annual chance flood events. This analysis determined 213 critical facilities could be impacted by a 1-percent annual chance flood and an additional 34 critical facilities could be impacted by a 0.2-percent annual chance flood.

Table 3-39 Critical Facilities within the 1% Annual Chance Flood Hazard Area by Jurisdiction

Jurisdiction	Communications	Energy	Food, Water, Shelter	Hazardous Material	Health and Medical	Safety and Security	Transportation	Total
Camanche	1	1	8	1	-	-	1	**12**
Charlotte	-	-	1	-	-	-	1	**2**
Clinton	1	2	2	6	-	2	11	**24**
DeWitt	-	-	-	-	-	-	1	**1**
Welton	-	-	1	-	-	-	1	**2**
Wheatland	-	-	-	-	-	-	1	**1**
Unincorporated	1	-	6	1	-	1	162	**171**
Total	**3**	**3**	**18**	**8**	**0**	**3**	**178**	**213**

Source: Wood analysis of Clinton County, IDNR, National Bridge Inventory, HIFLD, HSIP data

Table 3-40 Critical Facilities within the 0.2% Annual Chance Flood Hazard Area by Jurisdiction

Jurisdiction	Communications	Energy	Food, Water, Shelter	Hazardous Material	Health and Medical	Safety and Security	Transportation	Total
Camanche	-	-	-	2	-	-	1	**3**
Charlotte	-	-	1	-	-	-	1	**2**
Clinton	1	-	-	1	1	-	3	**6**
Unincorporated	-	-	2	-	-	-	21	**23**
Total	**1**	**0**	**3**	**3**	**1**	**0**	**26**	**34**

Source: Wood analysis of Clinton County, IDNR, National Bridge Inventory, HIFLD, HSIP data

Economy

Economic damages related to flooding include crop loss, building damage, and recovery efforts after flood events. Flood insurance can help mitigate some of the costs of flood damages. Participation in the NFIP helps flood-prone communities reduce their economic risk to flooding.

National Flood Insurance Program (NFIP) Information in Clinton County

According to the FEMA Community Information System, as of October 2021, in Clinton County Unincorporated Areas, there are 26 total flood insurance policies. The premiums amount to $20,197, and the insurance in force amounts to $4,409,600. There have been 21 total closed paid losses amounting to $264,210.

In the City of Camanche, there are 42 total flood insurance policies. The premiums amount to $47,282, and the insurance in force amounts to $9,347,800. There have been 64 total closed paid losses amounting

to $525,505. There are four total minus-rated policies in the A zone. There are two total Increased Cost of Compliance (ICC) coverage closed paid losses amounting to $17,251.

In the City of Charlotte, there are eight total flood insurance policies. The premiums amount to $5,437, and the insurance in force amounts to $806,800. There have been 15 total closed paid losses amounting to $121,576. There was one total ICC closed paid loss amounting to $19,468.

In the City of Clinton, there are 93 total flood insurance policies. The premiums amount to $122,030, and the insurance in force amounts to $20,100,500. There have been 55 total closed paid losses amounting to $247,604. There is one total minus-rated policy in the A zone. There was one closed paid loss on a manufactured home amounting to $985.

In the City of DeWitt, there are no flood insurance policies. There has been 1 closed paid loss amounting to $5,179.

In the City of Low Moor, there is one flood insurance policy. The premium amounts to $163, and the insurance in force amounts to $15,000. There have been no closed paid losses.

In the City of Maquoketa, there are five total flood insurance policies. The premiums amount to $6,137, and the insurance in force amounts to $999,000. There have been 7 total closed paid losses amounting to $13,856.

In the City of Welton, there are six total flood insurance policies. The premiums amount to $5,546, and the insurance in force amounts to $1,357,000. There have been 4 total closed paid losses amounting to $14,634.

In the City of Wheatland, there are three total flood insurance policies. The premiums amount to $2,813, and the insurance in force amounts to $668,000. There has been 1 total closed paid loss amounting to $15,897. There is one policy on a manufactured home.

No other communities in Clinton County have flood insurance policies.

Repetitive Loss/Severe Repetitive Loss Properties

Repetitive Loss: Repetitive Loss (RL) Properties are those properties with at least two flood insurance payments of $5,000 or more in a 10-year period. A RL property may or may not be currently insured by the NFIP. The following RL information is from the FEMA Community Information System, as of October 2021.

In Clinton County Unincorporated Areas, there are four total RL properties. These properties have resulted in six total RLs, with $116,137 in building loss payments and $20,453 in contents loss payments. The total RL payments amount to $136,589.

In the City of Camanche, there are 21 total RL properties. 4 of these are insured. These properties have resulted in 37 total RLs, ten of which were insured. There has been $340,392 in total building loss payments, and $10,079 in contents loss payments. The total RL payments amount to $350,471, with $105,260 of that going to insured buildings.

In the City of Charlotte, there is one total RL property. This property has resulted in one total RL, with $8,029 in building loss payments. The total RL payments amount to $8,029.

In the City of Maquoketa, there is one total RL property. This property has resulted in one total RL, with $383 in building loss payments and 1,848 in contents loss payments. The total RL payments amount to $2,232.

There are no other RL properties in Clinton County.

Severe Repetitive Loss (SRL): SRL properties are defined it as "a single family property" (consisting of one-to-four residences) that is covered under flood insurance by the NFIP and has incurred flood-related damage for which four or more separate claims payments have been paid under flood insurance coverage with the amount of each claim payment exceeding $5,000 and with cumulative amounts of such claims payments exceeding $20,000; or for which at least two separate claims payments have been made with the cumulative amount of such claims exceeding the reported value of the property.

In the City of Camanche, there are two total SRL buildings.

There are no other SRL properties in Clinton County.

Historic, Cultural, and Natural Resources

A flood in Clinton County could cause damage to businesses, homes, roads, and agricultural land. There is a historic district in the City of Clinton, but it is not within the 1%- or 0.2% annual chance flood hazard areas.

Development Trends

There is a correlation between increased population growth and development and increased risk to more intense flooding. Overall, Clinton County has seen a net decrease (-4%) in population since 2010. Population growth is not a significant factor contributing to Clinton County's flood risk. Communities that are mapped and participating in the NFIP who implement their floodplain ordinance typically do not see an increase in flood risk. Development in the 500 year floodplain, which is not regulated, could result in an increased flood risk because it reduces the floodwater storage areas of large events.

In planning future development, jurisdictions in the planning area should avoid development in low-lying areas near rivers and streams or where interior drainage systems are not adequate to provide drainage during heavy rainfall events. Future development should also take into consideration the impact of additional impervious surfaces to water runoff and drainage capabilities during heavy rainfall events.

Flooding Hazard Summary by Jurisdiction

River Flooding Hazard Summary by Jurisdiction						
Jurisdiction	Probability	Magnitude	Warning Time	Duration	Score	Level
Unincorporated Clinton County	3	2	2	2	2.45	Moderate
Andover	3	2	2	2	2.45	Moderate
Calamus	2	1	2	2	1.70	Low
Camanche	2	1	2	2	1.70	Moderate
Charlotte	3	4	2	2	3.05	High
Clinton	3	2	2	2	2.45	Moderate
Delmar	2	1	2	2	1.70	Low
DeWitt	3	2	2	2	2.45	Moderate
Goose Lake	2	1	2	2	1.70	Low
Grand Mound	3	2	2	2	2.45	Moderate
Lost Nation	2	1	2	2	1.70	Low
Low Moor	3	2	2	2	2.45	Moderate
Toronto	3	2	2	2	2.45	Moderate

River Flooding Hazard Summary by Jurisdiction						
Jurisdiction	Probability	Magnitude	Warning Time	Duration	Score	Level
Welton	3	2	2	2	2.45	Moderate
Wheatland	3	2	2	2	2.45	Moderate
Calamus-Wheatland School District	2	1	2	2	1.70	Low
Camanche School District	2	1	2	2	1.70	Low
Central DeWitt School District	2	1	2	2	1.70	Low
Clinton School District	2	1	2	2	1.70	Low
Delwood School District	2	1	2	2	1.70	Low
Northeast School District	2	1	2	2	1.70	Low
Flash Flooding Hazard Summary by Jurisdiction						
Jurisdiction	Probability	Magnitude	Warning Time	Duration	Score	Level
Unincorporated Clinton County	4	2	4	2	3.20	High
Andover	4	1	4	2	2.90	Moderate
Calamus	N/A	N/A	N/A	N/A	N/A	N/A
Camanche	4	2	4	2	3.20	High
Charlotte	4	3	4	2	3.50	High
Clinton	4	2	4	2	3.20	High
Delmar	N/A	N/A	N/A	N/A	N/A	N/A
DeWitt	4	1	4	2	2.90	Moderate
Goose Lake	4	1	4	2	2.90	Moderate
Grand Mound	4	1	4	2	2.90	Moderate
Lost Nation	4	1	4	2	2.90	Moderate
Low Moor	4	1	4	2	2.90	Moderate
Toronto	4	1	4	2	2.90	Moderate
Welton	4	3	4	2	3.50	High
Wheatland	4	1	4	2	2.90	Moderate
Calamus-Wheatland School District	N/A	N/A	N/A	N/A	N/A	N/A
Camanche School District	N/A	N/A	N/A	N/A	N/A	N/A
Central DeWitt School District	N/A	N/A	N/A	N/A	N/A	N/A
Clinton School District	N/A	N/A	N/A	N/A	N/A	N/A
Delwood School District	N/A	N/A	N/A	N/A	N/A	N/A
Northeast School District	N/A	N/A	N/A	N/A	N/A	N/A

3.3.9 Grass or Wildland Fire

Hazard Score Calculation					
Probability	**Magnitude/Severity**	**Warning Time**	**Duration**	**Weighted Score**	**Level**
2	2	4	1	2.20	Moderate

Profile

Hazard Description

Iowa's urban/rural interface (areas where development occurs within or immediately adjacent to wildland, near fire-prone trees, brush, and/or other vegetation), is growing as metro areas expand into natural forest, prairies and agricultural areas that are in permanent vegetative cover through the Conservation Reserve Program (CRP). The State has the largest number of CRP contracts in the nation, totaling over 1.5 million acres. Most of this land is planted in cool and warm season grass plantings, tree plantings and riparian buffer strips. There is an additional 230,000 acres in federal ownership and conservation easements.

Wildfires are frequently associated with lightning and drought conditions, as dry conditions make vegetation more flammable. As new development encroaches into the wildland/urban interface more and more structures and people are at risk. On occasion, ranchers and farmers intentionally set fire to vegetation to restore soil nutrients or alter the existing vegetation growth. Also, individuals in rural areas frequently burn trash, leaves and other vegetation debris. These fires have the potential to get out of control and turn into wildfires.

The risk of wildfires is a real threat to landowners across the State. The NWS monitors the conditions supportive of wildfires in the State daily so that wildfires can be predicted, if not prevented.

The risk factors considered are:

- High temperature
- High wind speed
- Fuel moisture (greenness of vegetation)
- Low humidity
- Little or no cloud cover

Grass and wildland fire can occur when conditions are favorable, such as during periods of drought when natural vegetation would be drier and more combustible. Most communities in Clinton County are surrounded by agricultural land. Parcels located on the outskirts of incorporated areas and parcels in unincorporated Clinton County are most likely to experience effects from this hazard.

Warning Time Score: 4—Minimal or no warning time.

Duration Score: 1—Less than 6 hours

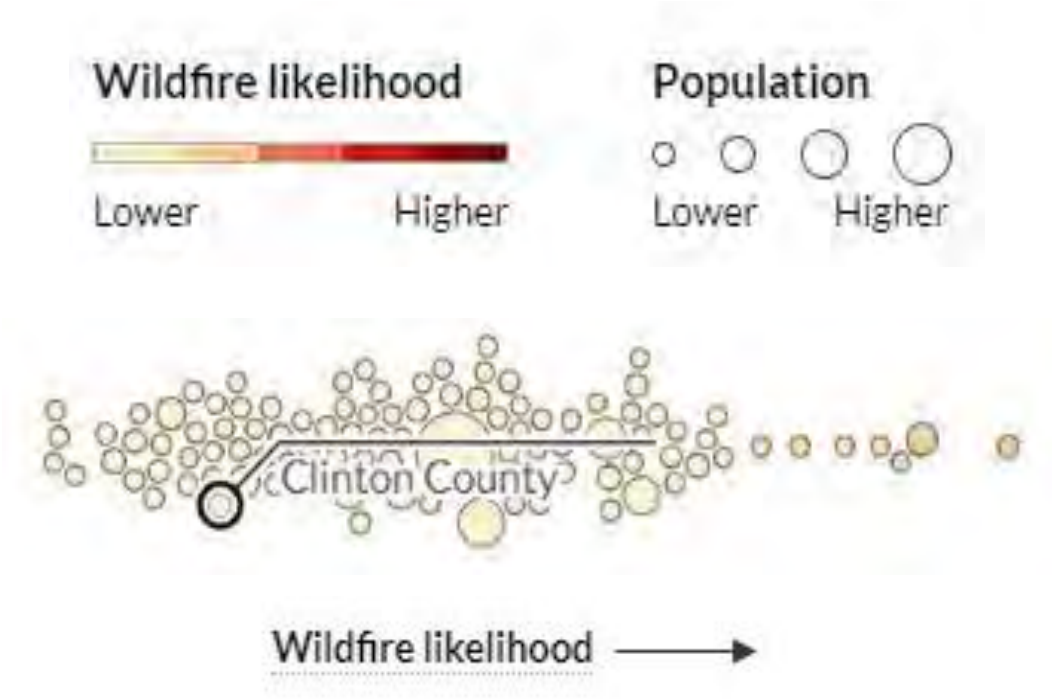
Geographic Location/Extent

The USDA Forest Service, under the direction of Congress in the 2018 Consolidated Appropriations Act (H.R. 1625, Section 210), developed a nationwide wildfire risk assessment. The Wildfire Risk to Communities study results were used to assess risk to Wildfire in Clinton County. Wildfire Risk to Communities uses the best available science data to identify risk and provide resources for communities to manage and mitigate risk. This is a national analysis for comparing risk that varies across a state, region, or county to help prioritize actions to mitigate risk.

The Wildfire Likelihood and Risk to Homes wildfire analysis categories were reviewed to represent risk. Figure 3-43 shows the Wildfire Likelihood in Clinton County relative to the rest of Iowa's counties, with the

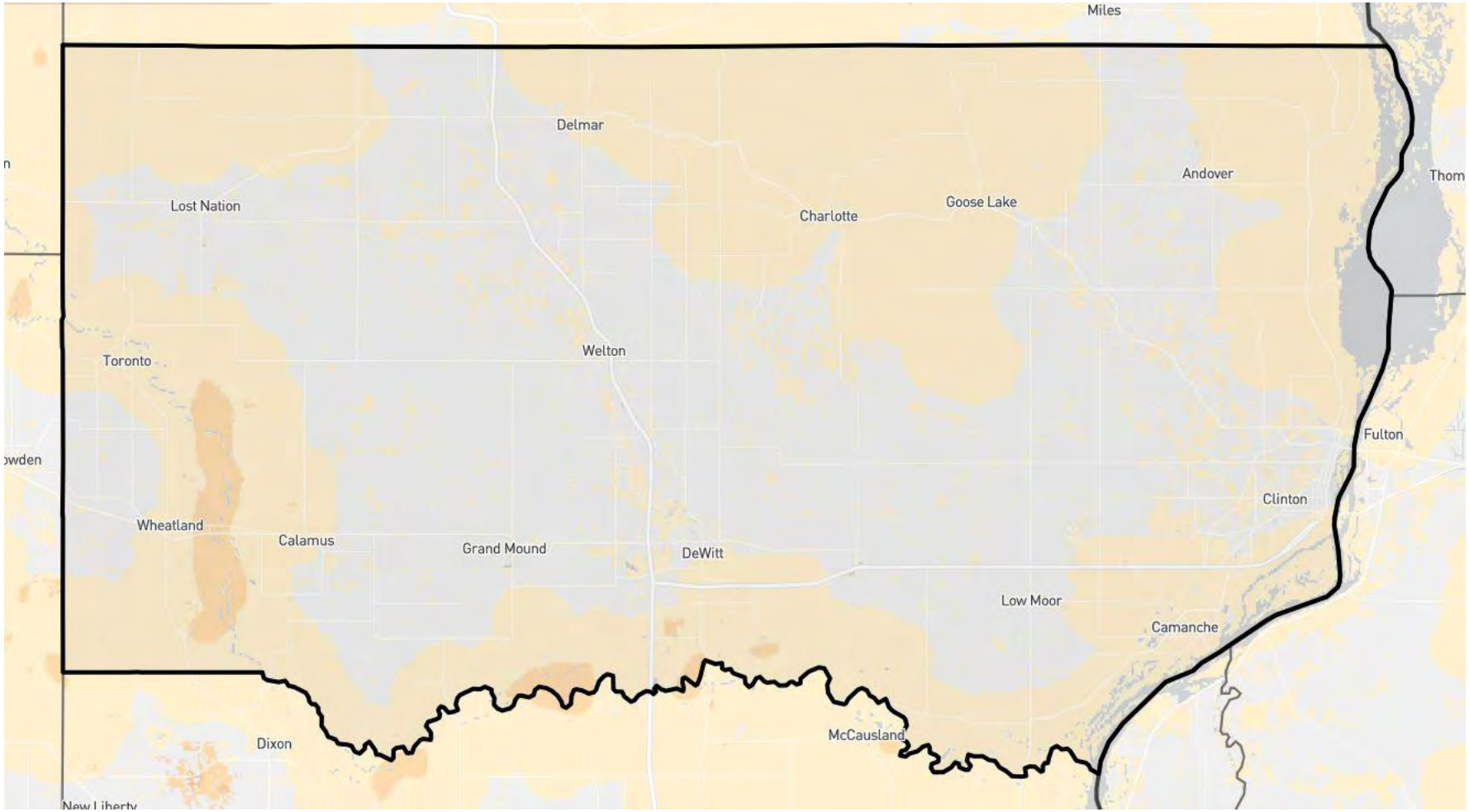
placement of the circle indicating where the planning area is in relation to the other counties in Iowa. The size of the circles in the legend is a proportional representation of the county's population compared to other counties in the state. Figure 3-44 below illustrates how wildfire likelihood varies across Clinton County.

Figure 3-43 Clinton County Wildfire Likelihood Relative to Other Iowa Counties



Source: https://wildfirerisk.org/explore/2/19/19045/

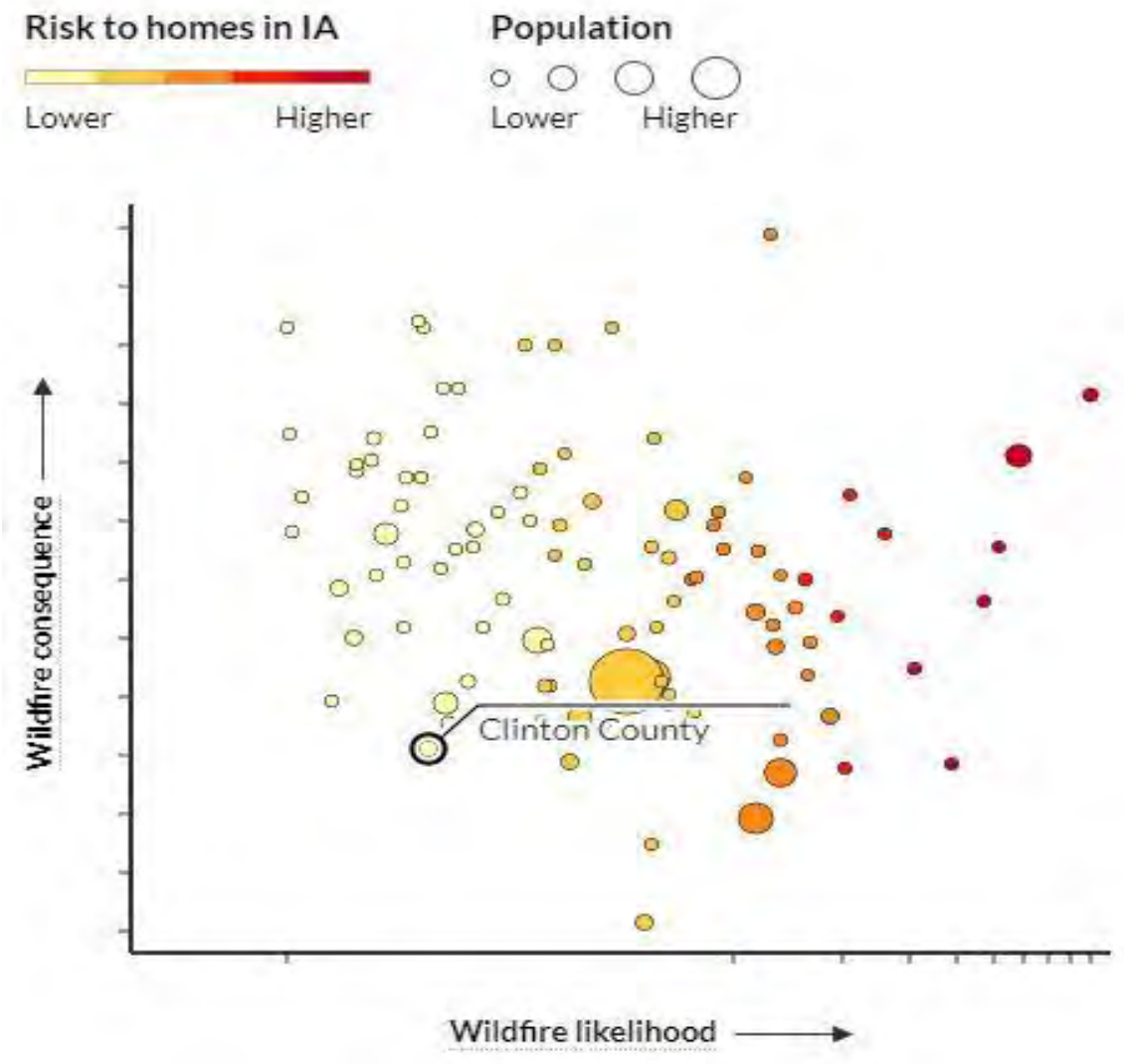
Figure 3-44 Clinton County Wildfire Likelihood



Source: https://wildfirerisk.org/explore/2/19/19045/

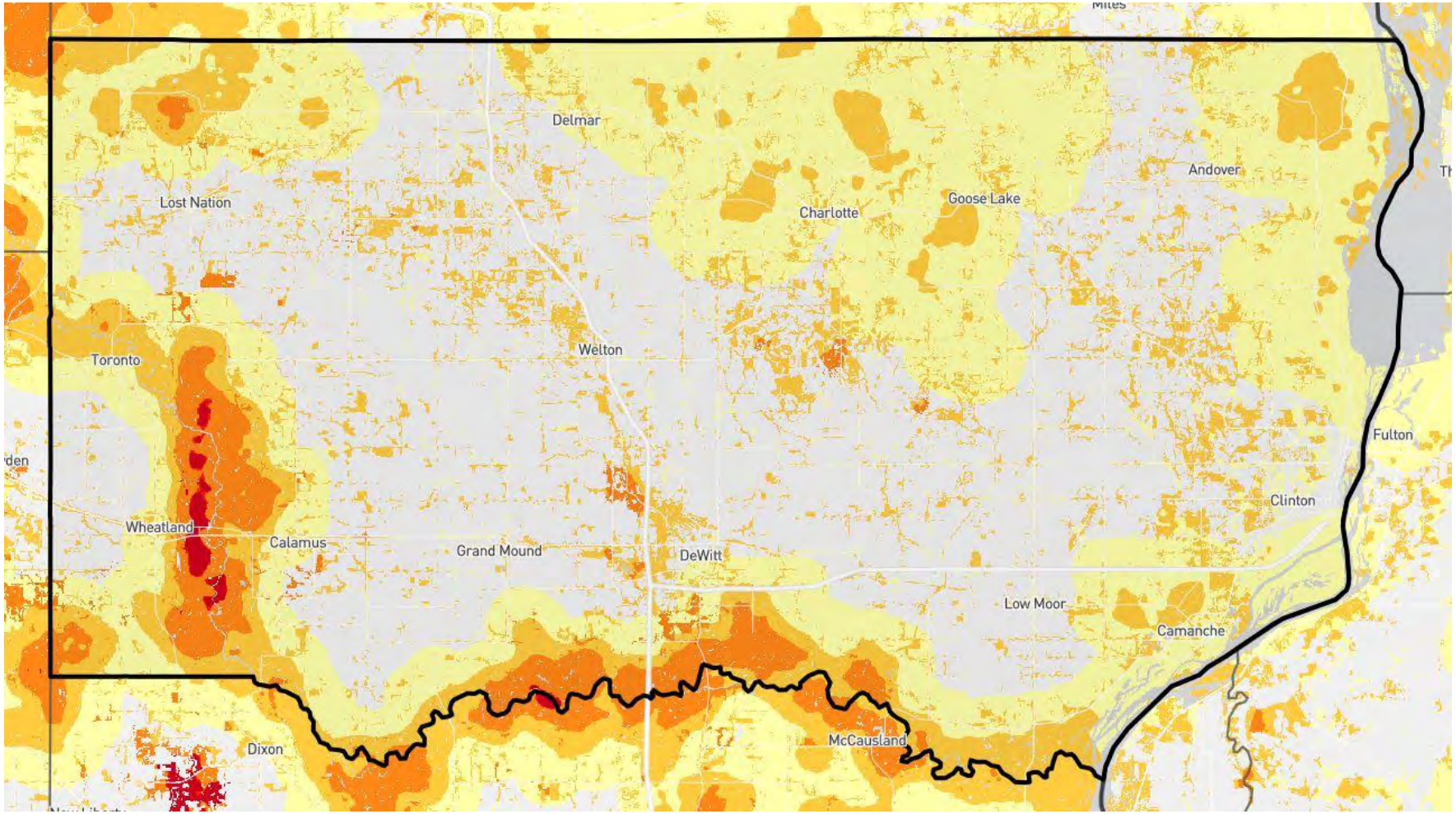
Figure 3-45 shows the Risk to Homes within Clinton County relative to the rest of the state, with the placement of the circle indicating where the planning area is in relation to the other counties in Iowa. The size of the circles in the legend is a proportional representation of the county's population compared to other counties in the state. Figure 3-46 below illustrates how the risk to homes varies across Clinton County. Clinton County has a relatively low risk to Homes compared to other counties within the State. Risk to Homes combines wildfire likelihood and intensity with generalized results to a home within the planning area. The Risk to Homes data integrate wildfire likelihood and wildfire intensity from simulation modeling to represent wildfire hazard. Wildfire Risk to Communities uses a generalized concept of susceptibility that all homes that encounter wildfire will be damaged and the degree of damage is directly related to the fire's intensity.

Figure 3-45 Clinton County Wildfire Risk to Homes Relative to Other Iowa Counties



Source: https://wildfirerisk.org/explore/0/19/19045/

Figure 3-46 Clinton County Wildfire Risk to Homes



Source: https://wildfirerisk.org/explore/0/19/19045/

Previous Occurrences

According to the NCEI database there were no wildland or forest fire events with significant impact that have been reported in Clinton County. This does not account for small or contained grass fires that may not have been reported. The HMPC reported a burn ban that was issued for the county in April 2018 due to weather conditions causing a heightened risk of wildfire. There is no available data to provide an accurate assessment of fires in the jurisdictions. While there is a lack of available data for the historical occurrences, it can be assumed that smaller brush fires which are regularly contained by the fire departments in the county occur annually throughout the planning area. These fires rarely result in any damage to property; however, cropland is at a higher risk. In addition, many communities in Clinton County have adequate fire gear, or have standing mutual aid agreements, to respond to most grassland fires and do not consider small grassland fires significant hazard events. Unincorporated Clinton County is the jurisdiction with the highest historical occurrence because of the large amount of cropland and open space.

Probability of Future Occurrence

Historical data was not available to document the average number of wildland/grass fires per year. Since updated statistical data was unavailable to determine a quantitative probability, a qualitative probability is based on the anecdotal descriptions from the HMPC. Although grass/wildland fires do occur annually, the HMPC indicated that events that cause any notable damages occur less frequently. Based on this qualitative analysis, the probability of a damaging or severe grass or wildland fire in the future is unlikely. Wildfire likelihood as it varies across the county is depicted in Figure 3-43. The probability rating for this hazard is Occasional.

Probability Score: 2—Occasional

Vulnerability

Overview

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 grass fire within a matter of minutes, but the extent is dependent upon conditions such as land use/land cover, moisture, and wind. Grass fires are equally likely to affect Clinton County communities where there is dense or high vegetation. Rural areas are much more likely to experience grass or wildland fires. 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. It should be noted that all communities stressed that their vulnerability to damage from grass or wildland fires is extremely low due to the ability of fire departments throughout the county to respond to and put out fires before they are able to spread. Less than 25% of people and property would be affected by any grass or wildland fire occurring in any Clinton County community.

Wildfire Likelihood found in Figure 3-43 is based on fire behavior modeling across thousands of simulations of possible fire seasons and annual probability of wildfire burning in a specific location. On average Clinton County has a greater likelihood of wildfire than 20% of other counties in the State. Factors contributing to the probability of a fire occurring include weather, topography, and ignitions are based on observation patterns in recent decades. Current forecasted weather or fire danger conditions were not accounted for in the modeling of fire likelihood. Wildfire likelihood is simply a probability that any location could experience a wildfire but does not account for wildfire intensity of a fire if it should occur. Wildfires can be reduced through fuel treatments and ignition prevention projects.

Clinton County Risk to Homes is low compared to other counties within the State found in Figure 3-45. Risk to Homes combines wildfire likelihood and intensity with generalized results to a home within the planning area. The Risk to Homes data integrate wildfire likelihood and wildfire intensity from simulation modeling to represent wildfire hazard. Wildfire Risk to Communities uses a generalized concept of susceptibility that all homes that encounter wildfire will be damaged and the degree of damage is directly related to the fire's intensity. Based on this data, populated areas in Clinton County have, on average, greater risk than 15% of counties in Iowa.

As evidenced by previous wildland-type fires in the planning area, they have historically been the smaller brush/grass fires that can occur anywhere that has open grassy areas. As the previous events show, the number of wildland-type fires increases during periods of severe drought. The year 2012 was one of the worst years of drought in recent history in the planning area. To demonstrate how vulnerability to this hazard varies by jurisdiction, the 2010 spatial data indicating acreage of Wildland Urban Interface (WUI)/Intermix areas from the SILVIS Lab, Department of Forest Ecology and Management, University of Wisconsin-Madison was compared against the corporate boundary layer for the planning area. Table 3-41 and Table 3-42 provide additional details. The unincorporated areas have the most intermix areas with 3,060 acres, followed by Clinton, Camanche, and De Witt. Clinton has the most interface areas with 1,929 acres followed by Camanche, unincorporated areas, Calamus, and Wheatland.

Table 3-41 Clinton County Wildland/Urban Interface and Intermix Acres

Jurisdiction	Intermix (acres)	Interface (acres)
Andover	0	0
Calamus	0	298
Camanche	266	443
Charlotte	0	0
Clinton	731	1,929
De Witt	70	0
Delmar	0	0
Goose Lake	0	0
Grand Mound	0	0
Lost Nation	0	0
Low Moor	0	0
Maquoketa	0	0
Toronto	0	0
Welton	0	0
Wheatland	0	225
Unincorporated	3,060	350
Total	**4,127**	**3,245**

Source: SILVIS Lab, Department of Forest Ecology and management, University of Wisconsin-Madison; WUI 2010, http://silvis.forest.wisc.edu/maps/wui/state10

Table 3-42 Wildland Urban Intermix / Interface Acreage by WUI Class

WUI Class	Acres
High Density Interface	907
High Density Intermix	0.2
Medium Density Interface	1,595
Medium Density Intermix	525
Low Density Interface	743
Low Density Intermix	3,602
Total	**7,373**

Source: SILVIS Lab, Department of Forest Ecology and management, University of Wisconsin-Madison; WUI 2010, http://silvis.forest.wisc.edu/maps/wui/state10

Potential Losses to Existing Development

Wildfires can be responsible for extensive damage to crops, the environment and occasionally residential or business facilities. Homes built in rural areas are more vulnerable since they are in closer proximity to land that is burned, and homeowners are more likely to burn trash and debris in rural locations. The vulnerability of structures in rural areas is exacerbated due to the lack of hydrants in these areas for firefighting and the distance required for firefighting vehicles and personnel to travel to respond. Potential losses to crops and rangeland are additional concerns.

In recent years, burn bans have been effective to reduce the number of grass fires. Wheatland specifically reported the effectiveness of burn bans. In addition, residents are required to call in their controlled burns to raise awareness by the fire department. Estimated economic loss was not included with the historical wildfire data for Clinton County and due to the multitude of variables that come in to play; it is difficult to determine potential losses. Wildfire events that do not cause damage to crops or the built environment still carry the cost of any necessary firefighting response.

Magnitude Score: 2—Limited

Future Development

Future development in the wildland urban interface/intermix areas would increase vulnerability to this hazard.

Climate Change Impacts

Iowa is already experiencing the effects of climate change. The Iowa Climate Change Impacts Committee's Report to the Governor and the Iowa General Assembly has highlighted many expected effects, many of which may impact the severity and frequency of grass or wildland fires in the coming years:

- Long-term winter temperatures have increased six times more than summer temperatures.
- Nighttime temperatures have increased more than daytime temperatures since 1970.
- Iowa's humidity has risen substantially, especially in summer, which now has 13 percent more atmospheric moisture than 35 years ago as indicated by a 3 - 5 degree F rise in dew-point temperature. This fuels convective thunderstorms that provide more summer precipitation.

The impacts of higher temperatures listed above could also impact the frequency and severity of drought, which in turn could help fuel more severe wildland fires. The complexities of the impacts of climate change related to wildland fires in Iowa will likely lead to many cascading hazards, such as increased erosion and flooding following fires.

Grass or Wildland Fires Hazard Summary by Jurisdiction

The unincorporated county and the City of Clinton have the highest probability of larger wildland/grass fires as a result of the amount of WUI interface and intermix areas. Other jurisdictions at risk include Calamus, Camanche, De Witt, and Wheatland. Smaller grass fires could occur in any area as a result of trash/leaf/shrub fires getting out of control. There is less potential for wildland/grass fires to impacting schools due to general locations away from WUI/Intermix Areas. If a wildland/grass fire were to occur near school buildings, the magnitude would be lower due to close proximity to firefighting services.

Jurisdiction	Probability	Magnitude	Warning Time	Duration	Score	Level
Unincorporated Clinton County	2	2	4	1	2.20	Moderate
Andover	1	1	4	4	1.75	Low
Calamus	2	2	4	1	2.20	Moderate
Camanche	2	1	4	4	2.20	Moderate
Charlotte	1	1	4	4	1.75	Low
Clinton	2	2	4	1	2.20	Moderate
Delmar	1	1	4	4	1.75	Low
DeWitt	2	2	4	1	2.20	Moderate
Goose Lake	1	1	4	4	1.75	Low
Grand Mound	1	1	4	4	1.75	Low
Lost Nation	1	1	4	4	1.75	Low
Low Moor	1	1	4	4	1.75	Low
Toronto	1	1	4	4	1.75	Low
Welton	1	1	4	4	1.75	Low
Wheatland	2	2	4	1	2.20	Moderate
Calamus-Wheatland School District	1	1	4	4	1.75	Low
Camanche School District	1	1	4	4	1.75	Low
Central DeWitt School District	1	1	4	4	1.75	Low
Clinton School District	1	1	4	4	1.75	Low
Delwood School District	1	1	4	4	1.75	Low
Northeast School District	1	1	4	4	1.75	Low

3.3.10 Hazardous Materials Incident

Hazard Score Calculation					
Probability	**Magnitude/Severity**	**Warning Time**	**Duration**	**Weighted Score**	**Level**
4	1	4	1	2.80	Moderate

Profile

Hazard Description

A hazardous substance is one that may cause damage to persons, property, or the environment when released to soil, water, or air. Chemicals are manufactured and used in increasing types and quantities. Each year over 1,000 new synthetic chemicals are introduced and as many as 500,000 products pose physical or health hazards and can be defined as hazardous chemicals. Hazardous substances are categorized as toxic, corrosive, flammable, irritant, or explosive. Hazardous material incidents generally affect a localized area.

The USDOT, US Environmental Protection Agency (EPA) and the Occupational Safety and Health Administration (OSHA) all have responsibilities relating to the transportation, storage, and use of hazardous materials and waste. The Right to Know Network maintained by the US Coast Guard's National Response Center (NRC) is a primary national point of contact for reporting all oil, chemical, radiological, biological, and etiological discharges into the environment anywhere in the United States and its territories.

Fixed Hazardous Materials Incident

A fixed hazardous materials incident is the accidental release of chemical substances or mixtures during production or handling at a fixed facility.

Transportation Hazardous Materials Incident

A transportation hazardous materials incident is the accidental release of chemical substances or mixtures during transport. Transportation Hazardous Materials Incidents in Clinton County can occur during highway, rail, barge, or air transport. Highway and rail accidents involving hazardous materials pose a great potential for public exposures. Both nearby populations and motorists can be impacted and become exposed by accidents and releases. Barge accidents involving hazardous materials pose potential for exposure through contamination of the water as well as populations near the point of release. If airplanes carrying hazardous cargo crash, or otherwise leak contaminated cargo, populations and the environment in the impacted area can become exposed.

Pipeline Incident

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

Warning Time Score: 4—Less than six hours warning time

Duration Score: 1—Less than 6 hours

Geographic Location/Extent

This section provides geographic locations within Clinton County impacted by each type of potential hazardous materials incident.

Fixed Hazardous Materials Incident

According to the IDNR, as of 2020, there were 36 sites in Clinton County that because of the volume or toxicity of the materials on site were designated as Tier II Facilities under the Superfund Amendments and Reauthorization Act. There are also 38 sites that reported materials that are Extremely Hazardous Substances (EHS). Table 3-43 provides the number of Tier II Facilities, as well as the number with EHS for each jurisdiction in the planning area. The locations of the facilities were overlaid with the corporate boundaries provided by the Clinton County GIS Department to determine the number of facilities in each jurisdiction. Figure 3-47 that follows is a map showing the locations of Tier II Facilities, including those with EHS.

Table 3-43 Number of Tier II Facilities and EHS Facilities Jurisdiction

Row Labels	# of Facilities	# of EHS Facilities
Calamus	1	1
Camanche	5	4
Clinton	17	18
DeWitt	8	6
Low Moor	-	2
Unincorporated	5	7
Grand Total	**36**	**38**

Source: IDNR; Clinton County GIS

Transportation Hazardous Materials Incident

The transport of hazardous materials in Clinton County occurs via trucks on the highways/roads and railways as well as via barge traffic on the Mississippi River and airplanes carrying hazardous cargo.

Truck Transport

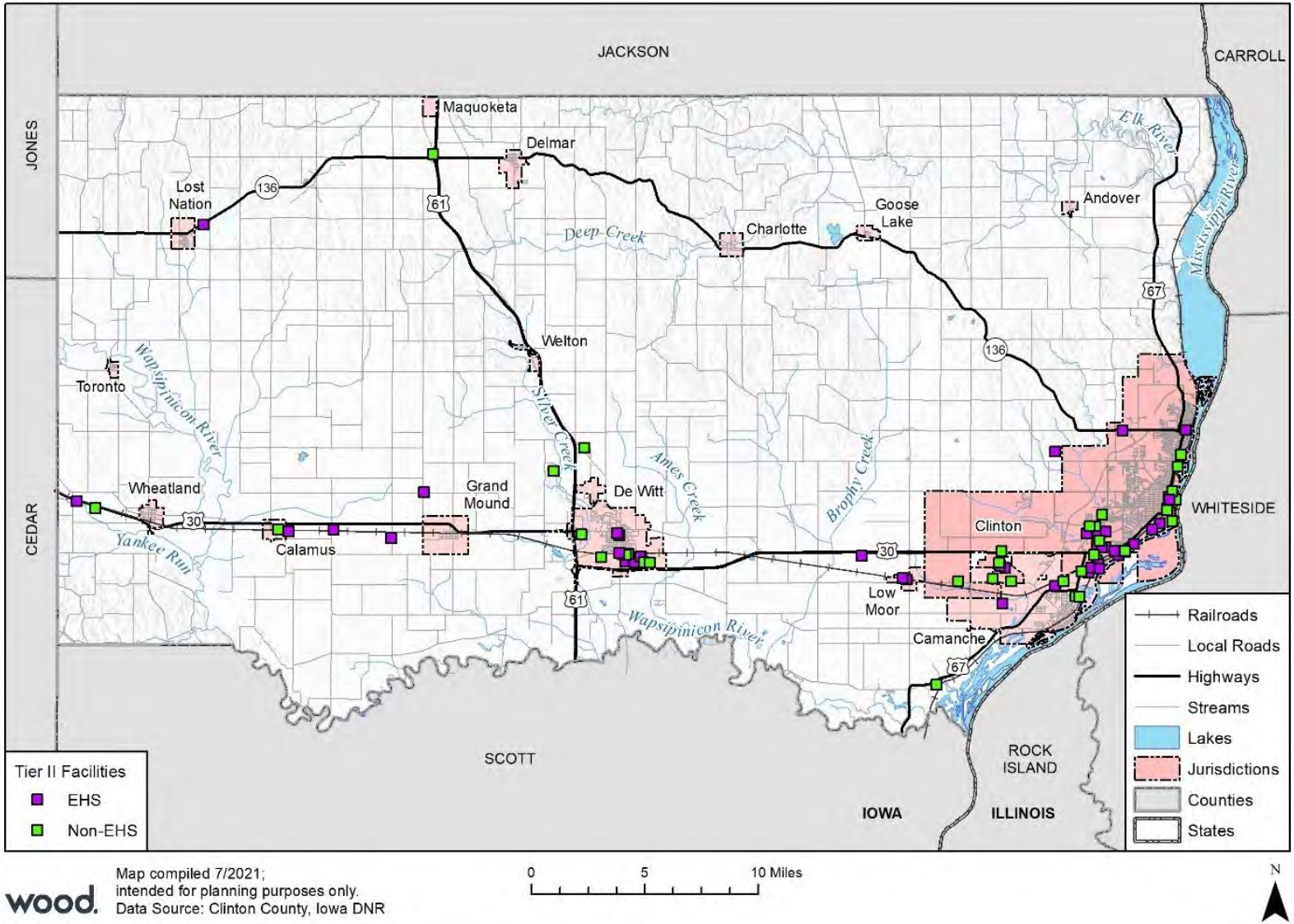
Hazardous materials can be transported on any of the roads in Clinton County. Main conduits of transport include US Route 30, US Route 61, US Route 67, and IA Highway 136. Agriculture is important to the economy of Clinton County As a result, chemicals utilized in agriculture are frequently transported along county and local roadways.

Rail Transport

Burlington Northern, Central Pacific, and Union Pacific railroads operate within the county. The following jurisdictions have rail lines:

- Unincorporated County
- City of Clinton
- City of Camanche
- City of Low Moor
- City of De Witt
- City of Grand Mound
- City of Calamus
- City of Wheatland

Figure 3-47 Tier II Facilities in Clinton County



Barge Freight

Barge traffic traveling on the Mississippi River, including through Lock and Dam #13 near Clinton, accounts for hundreds of millions of dollars in interstate commerce each year. The Rock Island District of the USACE has a primary mission of ensuring the river remains navigable. The Upper Mississippi River Basin Association, coordination with the EPA, IDNR, US Fish and Wildlife Service, US Coast Guard, and USACE has coordinated the development of the Upper Mississippi River Spill Response Plan and Resource Manual.

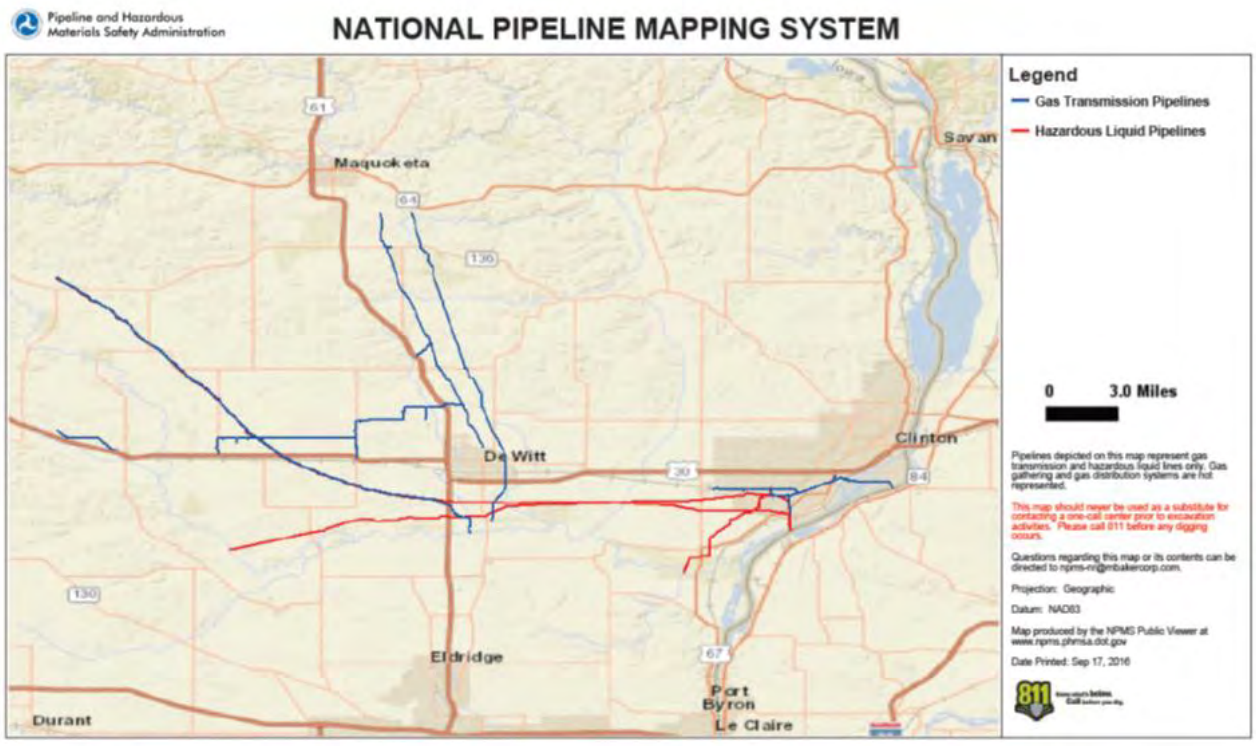
Air Freight

The only airport in Clinton County is the Clinton Airport in the City of Clinton.

Pipeline Incident

Figure 3-48 provides the locations of pipelines in Clinton County. The data for this map consists of gas transmission pipelines and hazardous liquid trunklines. It does not contain gathering or distribution pipelines, such as lines which deliver gas to a customer's home. Therefore, not all pipelines in the County will be visible.

Figure 3-48 Pipelines in Clinton County



Source: Pipeline and Hazardous Materials Safety Administration, National Pipeline Mapping System, https://www.npms.phmsa.dot.go/PublicViewer/

Any type of hazardous materials incident within a city that includes a large release of hazardous materials could affect large areas of the city in the right conditions, possibly even the entire city. This could necessitate evacuation of large areas. In the rural unincorporated areas where population densities are low, even in the event of a large release the number of homes that may need to be evacuated would be significantly lower than in an urban environment.

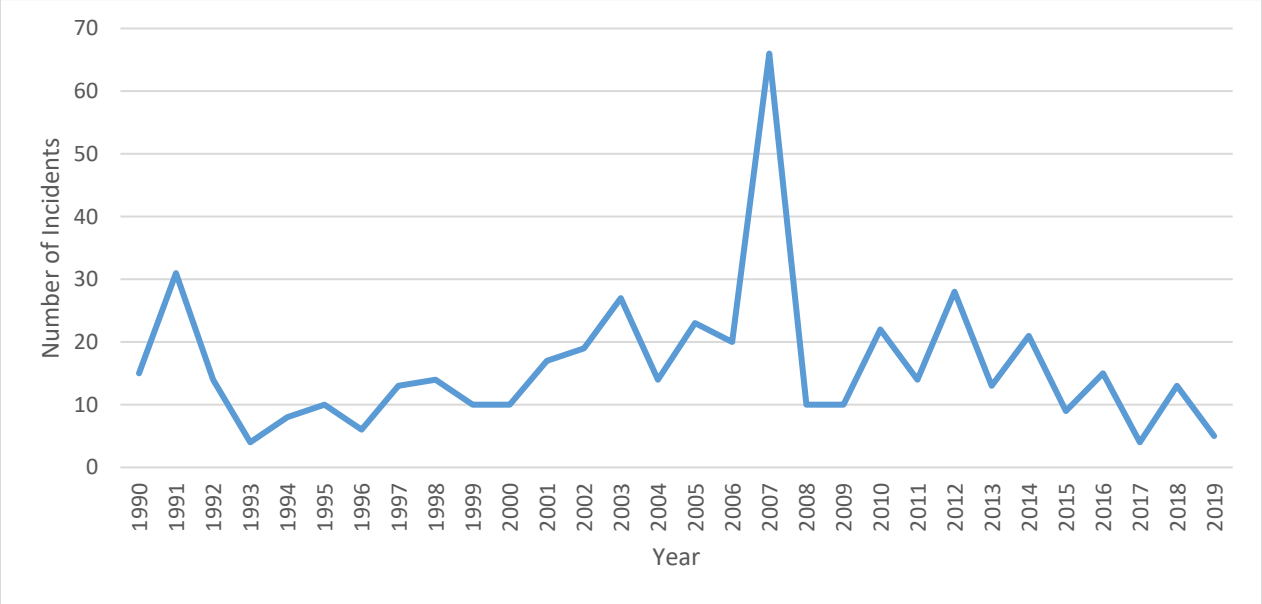
Immediate dangers from hazardous materials include fires and explosions. The release of some toxic gases may cause immediate death, disablement, or sickness if absorbed through the skin, injected, ingested, or inhaled. Contaminated water resources may be unsafe and unusable, depending on the amount of contaminant. Some chemicals cause painful and damaging burns if they come in direct contact with skin. Contamination of air, ground, or water may result in harm to fish, wildlife, livestock, and crops. The release of hazardous materials into the environment may cause debilitation, disease, or birth defects over a long period of time. Loss of livestock and crops may lead to economic hardships within the community. The occurrence of a hazmat incident many times shuts down transportation corridors for hours at a time while the scene is stabilized, the product is off-loaded, and reloaded on a replacement container.

Previous Occurrences

In Iowa, hazardous materials spills are reported to the DNR. According to Iowa Administrative Code Chapter 131, Notification of Hazardous Conditions, any person manufacturing, storing, handling, transporting, or disposing of a hazardous substance must notify the DNR and the local police department or the office of the sheriff of the affected county of the occurrence of a hazardous condition as soon as possible but not later than six hours after the onset of the hazardous condition or the discovery of the hazardous condition. The DNR maintains a database of reported spills.

According to the NRC database hazardous materials spills throughout Clinton County are common. From 1990 through 2019, the county experienced a total of 485 reported hazardous spills, as shown in Figure 3-49. Of the total spills, 74% of these events involved fixed incidents,15% involved transportation of hazardous materials, and the remaining 10% involved pipeline (1.4%), continuous (0.2%), unknown sheen (3.3%), and storage tank incidents (5.4%). Of the 485 spills reported in the NRC database, one resulted in a fatality and seven incidents resulted in a total of 22 injuries.

Figure 3-49 Hazardous Materials Incidents in Clinton County, 1990-2019



Source: NRC

Pipelines

The US DOT Pipeline and Hazardous Materials Safety Administration maintains a database of pipeline incidents and mileage reports. From 1996 to 2019, there were two reported pipeline incidents in Clinton County. There were no fatalities or injuries associated with these incidents. Table 3-44 provides additional details.

Table 3-44 Clinton County, IA Pipeline Incidents, 1996-2019

Date	Reported Cause of Incident	Incident Cause Subtype	Operator Name	System Type	Total Cost as Reported	Total Cost Current Year Dollars	Barrels Spilled
08/19/2005	Material/weld/equip failure	Ruptured or leaking seal/pump packing	Enterprise Products Operating LLC	Hazardous liquid	$736	$883	10
03/12/2013	Excavation damage	Previous damage due to excavation	Alliant Energy - Interstate Power and Light Company	Gas transmission	$245,809	$249,207	0

Source: Pipeline and Hazardous Materials Safety Administration, https://hip.phmsa.dot.gov/analyticsSOAP/saw.dll?Portalpages

Probability of Future Occurrence

From 1990 to 2019 (29 years), there have been 485 spills in Clinton County reported to the NRC. This computes to an annual average of 16.7 hazardous materials spills per year. Therefore, the probability of future occurrence of hazardous materials incidents is determined to be Highly Likely.

Probability Score: 4—Highly Likely

Vulnerability

Vulnerability Overview

A hazardous materials incident can occur almost anywhere. So, all jurisdictions are considered to have at least some vulnerability to this hazard. People, pets, livestock, and vegetation near facilities producing, storing, or transporting hazardous substances are at higher risk. Populations downstream, downwind, and downhill of a released substance are particularly vulnerable. Depending on the characteristics of the substance released, more people, in a larger area may be in danger from explosion, absorption, injection, ingestion, or inhalation.

Most of the hazardous materials incidents that have occurred in Clinton County are localized and are quickly contained or stabilized. Depending on the characteristic of the hazardous material or the volume of product involved, the affected area can be as small as a room in a building or as large as five 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 river, lake, or aquifer. Spills can be costly to clean up due to the specialized equipment and training, and disposal sites that are necessary. Since most spills in the county are small and quickly maintained within existing capabilities, the magnitude was determined to be Negligible.

Magnitude Score: 1—Negligible

Potential Losses to Existing Development

The impact of this type of disaster will likely be localized to the immediate area surrounding the incident. The initial concern will be for people, then the environment. If contamination occurs, the spiller is responsible for the cleanup actions and will work closely with responders in the local jurisdiction, the IDNR, and the EPA to ensure that cleanup is done safely and in accordance with federal and state laws.

As mentioned, it is difficult to determine the potential losses to existing development because of the variable nature of a hazardous materials spill. For example, a spill of a toxic airborne chemical in a populated area could have greater potential for loss of life. By contrast a spill of a very small amount of a chemical in a remote rural area would be much less costly and possibly limited to remediation of soil.

Data provided by the NRC did not provide information relative to costs associated with cleaning up any of the spills or of any property damage that occurred. Without data on costs of previous events, it is not possible to determine potential costs associated with future spills.

Future Development

The number and types of hazardous chemicals stored and transported through Clinton County will likely continue to increase. As populations grow, this also increases the number of people vulnerable to the impacts of hazardous materials spills. Population and business growth along major transportation corridors increases the vulnerability to transportation hazardous materials spills.

Hazardous Materials Hazard Summary by Jurisdiction

All jurisdictions within the planning area have experienced hazardous materials spills in the last 29 years. The most have occurred in the City of Clinton. The magnitude was determined to be "limited" for cities with populations over 4,000, Warning time, and duration is the same for all jurisdictions. The probability rating for each jurisdiction is based on the previous occurrences over 21 years of data.

Jurisdiction	Probability	Magnitude	Warning Time	Duration	Score	Level
Unincorporated Clinton County	4	1	4	1	2.80	Moderate
Andover	4	1	4	1	2.80	Moderate
Calamus	4	1	4	1	2.80	Moderate
Camanche	4	2	4	1	3.10	High
Charlotte	4	1	4	1	2.80	Moderate
Clinton	4	2	4	1	3.10	High
Delmar	4	1	4	1	2.80	Moderate
DeWitt	4	2	4	1	3.10	High
Goose Lake	4	1	4	1	2.80	Moderate
Grand Mound	4	1	4	1	2.80	Moderate
Lost Nation	4	1	4	1	2.80	Moderate
Low Moor	4	1	4	1	2.80	Moderate
Toronto	4	1	4	1	2.80	Moderate
Welton	4	1	4	1	2.80	Moderate
Wheatland	4	1	4	1	2.80	Moderate
Calamus-Wheatland School District	4	1	4	1	2.80	Moderate

Jurisdiction	Probability	Magnitude	Warning Time	Duration	Score	Level
Camanche School District	4	1	4	1	2.80	Moderate
Central DeWitt School District	4	1	4	1	2.80	Moderate
Clinton School District	4	1	4	1	2.80	Moderate
Delwood School District	4	1	4	1	2.80	Moderate
Northeast School District	4	1	4	1	2.80	Moderate

3.3.11 Human Disease

Hazard Score Calculation					
Probability	**Magnitude/Severity**	**Warning Time**	**Duration**	**Weighted Score**	**Level**
3	3	2	4	2.95	Moderate

Profile

Hazard Description

A human disease outbreak is a medical, health or sanitation threat to the public (such as contamination, epidemic, plague and insect infestation). The outbreak may be spread by direct contact with an infected person or animal, ingesting contaminated food or water, vectors such as mosquitoes or ticks, contact with contaminated surroundings such as animal droppings, infected droplets, or by aerosolization.

Iowa's public health and health care communities work to protect Iowans from infectious diseases and preserve the health and safety of Iowans by rapidly identifying and containing a wide range of biological agents. Local public health departments and the Iowa Department of Public Health, Center for Acute Epidemiology investigate disease "outbreaks" of routine illnesses. There are a number of biological diseases/agents that are of concern to the State of Iowa such as vaccine preventable disease, foodborne disease and community associated infections having significant impact on the morbidity of Iowans. The following descriptions are general, and it should be noted that individuals may experience more or less severe consequences. Note, during the 2021 planning process the United States, including the State of Iowa, was continuing to be impacted by the COVID-19 pandemic.

Vaccine Preventable Disease

In the US, there are common infectious diseases that include polio, measles, diphtheria, pertussis, rubella, mumps, tetanus and Haemophilus influenzae type b that are now rare because of widespread use of vaccines. Routine childhood immunizations have helped protect both individuals and communities each year saving nearly $14 billion in direct medical costs and $69 billion in costs to society according to the US Department of Health and Human Services, CDC.

The immunization rates in Iowa are consistent with national average (see Table 3-48). Vaccine preventable diseases continue to threaten the health of Iowans when children, adolescents and adults are un-immunized or under-immunized.

Influenza

Influenza (flu) is a viral infection of the nose, throat, bronchial tubes, and lungs. There are two main types of virus: A and B. Each type includes many different strains, which tend to change each year. In Iowa, influenza occurs most often in the winter months. Illnesses resembling influenza may occur in the summer months, but these are usually the result of other viruses that exhibit symptoms commonly referred to as influenza-like illness or ILI.

Influenza is highly contagious and is easily transmitted through contact with droplets from the nose and throat of an infected person during coughing and sneezing. Typical symptoms include headache, fever, chills, cough, and body aches. Although most people are ill for only a few days some may have secondary infections, such as pneumonia, and may need to be hospitalized. Anyone can get influenza, but it is typically more serious in the elderly and people with chronic illnesses such as cancer, emphysema, or diabetes or weak immune systems. It is estimated that thousands of people die each year in the United States from flu or related complications.

In 2011, influenza and pneumonia combined was the 8th leading causes of death in Iowa with 657 deaths. In 2008, there were over 800 influenza/pneumonia deaths. See Table 3-46 under Previous Occurrence for the number of deaths and rate from 2002-2014.

Pandemic Influenza

A pandemic is a global disease outbreak. A pandemic flu is a human flu that causes a global outbreak, or pandemic, of serious illness. A flu pandemic occurs when a new influenza virus emerges for which people have little or no immunity, and for which there is no vaccine.

This disease spreads easily person-to-person, causing serious illness, and can sweep across the country and around the world in a very short time. The CDC has been working closely with other countries and the World Health Organization to strengthen systems to detect outbreaks of influenza that might cause a pandemic and to assist with pandemic planning and preparation.

During 2009 and 2010 health professionals around the globe worked to combat the H1N1 influenza virus. This relatively mild and stable influenza virus circulated across the globe and caused one of the most robust worldwide vaccination campaigns since the 1970s. Health professionals continue to monitor the possibility of an avian (bird) flu pandemic associated with a highly pathogenic avian H5N1 virus. Since 2003, avian influenza has been spreading through Asia. A growing number of human H5N1 cases contracted directly from handling infected poultry have been reported in Asia, Europe, and Africa, and more than half the infected people have died. There has been no sustained human-to-human transmission of the disease, but the concern is that H5N1 will evolve into a virus capable of human-to-human transmission.

An especially severe influenza pandemic could lead to high levels of illness, death, social disruption, and economic loss. Impacts could range from school and business closings to the interruption of basic services such as public transportation, health care, and the delivery of food and essential medicines.

Pandemics are generally thought to be the result of novel strains of viruses. Because of the process utilized to prepare vaccines, it is impossible to have vaccine pre-prepared to combat pandemics. A portion of the human and financial cost of a pandemic is related to lag time to prepare a vaccine to prevent future spread of the novel virus. In some cases, current vaccines may have limited activity against novel strains.

Since March 2020 and during the update of this plan, Clinton County, the nation, and the world were dealing with the COVID-19 pandemic, confirming that pandemic is a key public health hazard in the county. Unlike seasonal flu, an influenza pandemic has much greater potential for loss of life and significant social disruption due to higher rates of transmission and more severe health impacts. The COVID-19 virus has a much higher rate of transmission than the seasonal flu, primarily by airborne transmission of droplets/bodily fluid. Common symptoms include fever, cough, fatigue, shortness of breath or breathing difficulties, and loss of smell and taste. While most people have mild symptoms, some people develop acute respiratory distress syndrome with roughly one in five requiring hospitalization and a fatality rate of approximately 1%. A key challenge in containing the spread has been the fact that it can be transmitted by people who are asymptomatic.

Foodborne Disease

There are several agents that can cause illness when consumer in contaminated food, beverages, or water. Foodborne illness (food poisoning) can also be spread person-to-person as well as from contact with animals. Table 3-45 is a list of common foodborne diseases

Table 3-45 Common Foodborne Diseases

Organism	Onset of Symptoms	Associated Food(s)
Botulism	12 - 36 hours	Canned fruits and vegetables
Campylobacter	2 - 5 days, range 1 - 10 days	Undercooked chicken or pork, unpasteurized milk
Cholera	12 - 72 hours	Undercooked or raw seafood, especially oysters

Organism	Onset of Symptoms	Associated Food(s)
Cryptosporidium	7 days, range 1 - 12 days	Unpasteurized beverages, contaminated food or water, person-to-person
E. coli (shiga-toxin)	3 - 4 days, range 2 - 10 days	Undercooked ground meats, unpasteurized milk, contaminated fruits or vegetables, person-to-person
Giardia	7 - 10 days, range 3 - 25 days	Contaminated water, person-to-person
Hepatitis A	28 - 30 days, range 15 - 50 days	Raw produce, undercooked foods, person-to-person
Listeria	3 weeks, range 3 - 70 days	Soft cheeses, unpasteurized milk, ready-to-eat deli meats, hot dogs, undercooked poultry, unwashed raw vegetables
Norovirus	24 - 48 hours, range 10 - 50 hours	Contaminated ready-to-eat food, undercooked shellfish, person-to-person
Salmonella	12 - 36 hours, range 6 - 72 hours	Contaminated eggs, poultry, beef, raw fruits and vegetables, unpasteurized milk or juice, cheese
Shigella	1 - 3 days, range 12 - 96 hours	Contaminated food or water, person-to-person
Trichinosis	8 - 15 days, range 5 - 45 days	Raw or undercooked pork or wild game meat

Source: Iowa Department of Public Health, Center for Acute Disease Epidemiology http://www.idph.state.ia.us/Cade/Foodborne.aspx).

Warning Time Score: 2—12-24 hours

Duration Score: 4—More than 1 week

Geographic Location/Extent

A human disease outbreak has no geographic boundaries. Because of our highly mobile society, disease can move rapidly through a school, business and across the nation within days, weeks, or months. Many of the infectious diseases that are designated as notifiable at the national level result in serious illness if not death. Some are treatable, for others only the symptoms are treatable.

The current COVID-19 pandemic has affected all 99 Iowa counties. Clinton County has reported 10,414 cases and 124 deaths, as of January 2022. All communities in the county are likely to be impacted, either directly or indirectly. Some indirect consequences may be the diversion of resources that may be otherwise available.

The magnitude of a public health emergency will range significantly depending on the aggressiveness of the virus in question and the ease of transmission. Pandemic influenza is more easily transmitted from person-to-person but advances in medical technologies have greatly reduced the number of deaths caused by influenza over time.

Today, a much larger percentage of the world's population is clustered in cities, making them ideal breeding grounds for epidemics. Additionally, the explosive growth in air travel means the virus could literally be spread around the globe within hours. Under such conditions, there may be very little warning time. Most experts believe we will have just one to six months between the time that a dangerous new influenza strain is identified and the time that outbreaks begin to occur in the United States. Outbreaks are expected to occur simultaneously throughout much of the nation, preventing shifts in human and material resources that normally occur with other natural disasters. These and many other aspects make influenza pandemic unlike any other public health emergency or community disaster. Pandemics typically last for several months to 1-2 years.

The Pandemic Intervals Framework (PIF) is a six-phased approach to defining the progression of an influenza pandemic. This framework is used to guide influenza pandemic planning and provides recommendations for risk assessment, decision making, and action. These intervals provide a common method to describe pandemic activity which can inform public health actions. The duration of each pandemic interval might vary depending on the characteristics of the virus and the public health response.

The six-phase approach was designed for the easy incorporation of recommendations into existing national and local preparedness and response plans. Phases 1 through 3 correlates with preparedness in the pre-pandemic interval, including capacity development and response planning activities, while Phases 4 through 6 signal the need for response and mitigation efforts during the pandemic interval.

Pre-Pandemic Interval

In nature, influenza viruses circulate continuously among animals (primarily birds). Even though such viruses might develop into pandemic viruses, in Phase 1 no viruses circulating among animals have been reported to cause infections in humans.

- Phase 1 is the natural state in which influenza viruses circulate continuously among animals but do not affect humans.

In Phase 2 an animal influenza virus circulating among domesticated or wild animals is known to have caused infection in humans and is thus considered a potential pandemic threat.

- Phase 2 involves cases of animal influenza that have circulated among domesticated or wild animals and have caused specific cases of infection among humans.

In Phase 3 an animal or human-animal influenza virus has caused sporadic cases or small clusters of disease in people but has not resulted in human-to-human transmission sufficient to sustain community-level outbreaks. Limited human-to-human transmission may occur under some circumstances, for examples, when there is close contact between an infected person and an unprotected caregiver. Limited transmission under these circumstances does not indicate that the virus has gained the level of transmissibility among humans necessary to cause a pandemic.

- Phase 3 represents the mutation of the animal influenza virus in humans so that it can be transmitted to other humans under certain circumstances (usually very close contact between individuals). At this point, small clusters of infection have occurred.

Pandemic Interval

Phase 4 is characterized by verified human-to-human transmission of the virus able to cause "community-level outbreaks." The ability to cause sustained disease outbreaks in a community marks a significant upward shift in the risk for a pandemic.

- Phase 4 involves community-wide outbreaks as the virus continues to mutate and become more easily transmitted between people (for example, transmission through the air)

Phase 5 is characterized by verified human-to-human spread of the virus into at least two countries in one World Health Organization (WHO) region. While most countries will not be affected at this stage, the declaration of Phase 5 is a strong signal that a pandemic is imminent and that the time to finalize the organization, communication, and implementation of the planned mitigation measures is short.

- Phase 5 represents human-to-human transmission of the virus in at least two countries.

Phase 6, the pandemic phase, is characterized by community-level outbreaks in at least one other country in a different WHO region in addition to the criteria defined in Phase 5. Designation of this phase will indicate that a global pandemic is underway.

- Phase 6 is the pandemic phase, characterized by community-level influenza outbreaks.

Previous Occurrences

The WHO tracks and reports on epidemics and other public health emergencies through the Global Alert and Response (see historic epidemics at www.who.int/en/).

There have been four acknowledged pandemics in the past century:

- **2020-Ongoing COVID-19:** The COVID-19 or novel coronavirus pandemic began in December 2019 and was declared a pandemic in March of 2020. As of October 30th, 2020, 45 million cases have been reported around the world with over 1 million deaths, including 9 million cases and 229,000 deaths in the US As of September 1, 2021, this figure has increased to over 218 million cases and approximately 4.53 million deaths reported globally, according to the World Health Organization (WHO). Within the US (as of September 1, 2021), over 39.3 million cases and approximately 641,000 deaths have been reported, which is more than double since October 2020. Several COVID-19 vaccines had been given emergency approval by the FDA and in August 2021 the Pfizer vaccine was fully approved by the FDA. Vaccine hesitancy has resulted in 52% of the US population to be fully vaccinated (as of August 2021). It may take months for the entire population to receive a vaccine and achieve herd immunity. In addition, many other countries do not have access or the capabilities to disseminate vaccines as the US does; thus, the pandemic is expected to continue for an indefinite period of time.
- **2009 H1N1 Influenza:** The 2009 H1N1 Pandemic Influenza caused 659 hospitalizations with lab confirmed H1N1 since 9/1/09 and resulting in 41 fatalities. Typically, people who became ill were the elderly, the very young and people with chronic medical conditions and high-risk behaviors.
- **1968–69 Hong Kong flu (H3N2):** This strain caused approximately 34,000 deaths in the United States and more than 700,000 deaths worldwide. It was first detected in Hong Kong in early 1968 and spread to the United States later that year. Those over age 65 were most likely to suffer fatal consequences. This virus returned in 1970 and 1972 and still circulates today.
- **1957–58 Asian flu (H2N2):** This virus was quickly identified because of advances in technology, and a vaccine was produced. Infection rates were highest among school children, young adults, and pregnant women. The elderly had the highest rates of death. A second wave developed in 1958. In total, there were about 70,000 deaths in the United States. Worldwide deaths were estimated between one and two million.
- **1918–19 Spanish flu (H1N1):** This flu is estimated to have sickened 20-40 percent of the world's population. Over 20 million people lost their lives. Between September 1918 and April 1919, 500,000 Americans died. The flu spread rapidly; many died within a few days of infection, others from secondary complications. The attack rate and mortality was highest among adults 20-50 years old; the reasons for this are uncertain.

Other Reportable Diseases

Table 3-46 shows the historical reported deaths in Clinton County from Influenza and Pneumonia as well as Infective and Parasitic Disease

Table 3-46 Deaths by Year 2005-2019, Influenza and Pneumonia and Infective and Parasitic Disease, Clinton County and State of Iowa

Year	Influenza/ Pneumonia Deaths, Clinton County	Influenza/ Pneumonia Deaths, Iowa	Infective/Parasitic Disease Deaths, Clinton County	Infective/Parasitic Disease Deaths, Iowa
2019	9	575	18	634
2018	20	1,198	9	532
2017	8	572	18	564
2016	16	491	6	474
2015	<5	608	<5	489
2014	13	549	12	448
2013	12	755	10	511
2012	8	656	11	511
2011	8	657	8	464
2010	17	557	5	441
2009	6	633	9	457
2008	5	825	8	493
2007	11	748	7	427
2006	11	765	11	424
2005	16	893	6	358

Source: Iowa Department of Public Health, Bureau of Health Statistics-Vital Statistics of Iowa in Brief, http://idph.iowa.gov/health-statistics/data

Table 3-47 provides the number of common reportable diseases in Clinton County from 2014 to 2017 from the Iowa Department of Public Health, Center for Acute Epidemiology Annual Reports.

Table 3-47 Iowa Common Reportable Diseases by Year in Clinton County

Year	2014	2015	2016	2017
Campylobacteriosis	3	3	8	24
Cryptosporidiosis	3	0	1	3
Cyclosporiasis	2	0	0	0
Cholera	-	-	0	0
CRE	-	-	0	1
E. Coli	0	2	3	2
Giardia	2	2	0	1
Hemolytic Uremic Syndrome	0	0	0	0
Hep A	1	0	0	0
Hep B, Acute	0	1	3	0
Hep B, Chronic	3	5	0	5
Legionella	0	2	1	2
Listeria	0	0	0	0

Year	2014	2015	2016	2017
Lyme Disease	1	5	4	0
Meningococcal Disease	0	0	0	0
Mumps	0	1	1	1
Pertussis	0	0	3	0
Q Fever (Acute)	-	0	0	0
Rabies (Animal)	0	0	0	0
Rocky Mountain Spotted Fever	0	0	0	0
Salmonella	8	12	12	16
Shigella	2	0	4	0
Syphilis	0	0	0	0
Tuberculosis	0	0	0	0
Tularemia	-	0	0	0
West Nile Virus	0	0	2	0
Total by Year	**25**	**33**	**42**	**55**

Source: Iowa Department of Public Health, Center for Acute Disease Epidemiology Annual Reports. 2014-2017, http://idph.iowa.gov/CADE

Probability of Future Occurrence

For purposes of determining probability of future occurrence, the HMPT defined "occurrence" of human disease outbreak as a medical, health or sanitation threat to the public (such as contamination, epidemic, or plague). Although legally reportable diseases occurred annually in Clinton County, none in have reached the threshold of being a medical, health, or sanitation threat to the public that would warrant the classification of an outbreak occurrence. The COVID-19 Pandemic has changed the perceptions of the likelihood that a pandemic of that scale could occur in the United States. There is no definite way to predict when the next pandemic might happen. Some indicators will be present, but not every new virus turns into a pandemic. Based on the five pandemics that have affected the United States in roughly the last 100 years, a pandemic occurs on average roughly every 20 years. The HMPC determined during the 2020-2021 plan update process to increase the probability of Human Disease to Likely.

Probability Score: 3—Likely

Vulnerability

Overview

Although infectious diseases do not respect geographic boundaries, several populations in Clinton County are at specific risk to infectious diseases. Communicable diseases are most likely to spread quickly in institutional settings such as nursing home facilities, day care facilities, and schools. There are 42 facilities that are classified as nursing homes, elderly housing, or housing for other vulnerable populations. There are also 25 school facilities and 12 group day care facilities in the county.

According to the Iowa Department of Public Health – Immunization Program Audit Report from 2019-2020 school year, Clinton County had 96 percent with immunization certificates in kindergarten thru 12th grade. The County Immunization Assessment for 2-year-old and 13-17-year-old coverage is provided in Table 3-48.

Table 3-48 2019 Vaccination Coverage Percent of Individual Vaccines and Selected Vaccination Series in Clinton County (2-year old coverage and 13-15 year old coverage)

	4 DTaP Coverage Percent	3 Polio Coverage Percent	1 MMR Coverage Percent	3 Hib Coverage Percent	3 Hep B Coverage Percent	1 Varicella Coverage Percent	4 PCV Coverage Percent	Up-To-Date 4-3-1-3-3-1-4 Coverage Percent
2-Year Old Coverage	72.2	90.2	87.9	88.1	89.8	86.8	79.4	67.5

	3 Hep B Coverage Percent	1 Meningitis Coverage Percent	2 MMR Coverage Percent	1 Td/Tdap Coverage Percent	2 Varicella Coverage Percent	Up-to-Date 3-1-2-1-2 Coverage Percent
13-17 Year Old Coverage	90.6	77.6	86.4	79.3	85.6	72.3

Source: Iowa Department of Public Health, Iowa Immunization Program Annual Report, 2014 County Immunization Assessment, http://www.idph.state.ia.us/ImmTB/Immunization.aspx?prog=Imm&pg=ImmHome

* Note: Up-to-date are 2-year old children who have completed the 4 DTaP, 3 Polio, 1 MMR, 3 Hib, 3 Hep B, 1 Varicella, 4 PCV by 24 months of age or adolescents 13- to 15-year-olds who have completed the 3 Hep B, 1 Meng, 2 MMR, 1 Td or Tdap, 2 Varicella series.

The HMPC ranked human disease outbreak as catastrophic based on a pandemic scenario. The magnitude of an infectious disease outbreak is related to the ability of the public health and medical communities to stop the spread of the disease. Most disease outbreaks that cause critical numbers of deaths are communicable in nature, meaning that they are spread from person-to-person. The key to reducing the critical nature of the event is to stop the spread of disease. This is generally done in three ways: (1) identification and isolation of the ill, (2) quarantine of those exposed to the illness to prevent further spread, and (3) education of the public about methods to prevent transmission. The public health and health care providers in Clinton County routinely utilize all three methods to reduce morbidity and mortality from infectious disease.

Magnitude Score: 4—Critical

Potential Losses to Existing Development

Adverse impacts are expected to be severe for unprotected personnel and moderate to light for protected personnel. Medications may be limited to help prevent or treat the disease. Typically, it takes years to manufacture a vaccine and would likely become available in small quantities at first. It may become necessary to ration limited amounts of medications, vaccinations, and other health care supplies. Risk groups cannot be predicted with certainty; the elderly, people with underlying medical conditions, and young children are usually at higher risk, but as discussed above this is not always true for all pandemics. People without health coverage or access to good medical care are also likely to be more adversely affected. Mental health of the public could also be impacted depending on the length of the event and public health guidance on prevention.

As noted under Previous Occurrences, the COVID-19 pandemic has resulted in 92 million cases worldwide as of January 13, 2021, with over 1.9 million deaths. The US has seen 23 million cases with 383,113 deaths. As of October 2021, Clinton County specifically has seen 7,392 cases and 100 deaths. In addition to the direct impacts, the pandemic has completely disrupted life for many people. Most large gatherings have had to be cancelled and sheltering in place and social distancing have been highly encouraged and, in some places, mandated, leaving some individuals isolated for months. The HMPC noted that the participating school districts have been greatly impacted by the COVID-19 pandemic.

Local economy and finances may be adversely affected, possibly for an extended period of time. Unscheduled sick leave from a large portion of the workforce could result in millions of dollars lost in productivity. Business restrictions due to social distancing requirements can also be significant. In a normal year, lost productivity due to illness costs US employers an estimated $530 billion. During a pandemic, that figure would likely be considerably high and could trigger a recession or even a depression.

The economic impact of the COVID-19 pandemic and associated closures has been significant, triggering a recession and high unemployment; the unemployment rate jumped for 4.4% in March of 2020 to 14.7% in April and stayed in the double-digits through most of the summer. Some studies estimate that 1 in 5 renters are at risk of eviction. The stock market suffered major losses in the early days of the pandemic. The restaurant, retail, and oil and gas industries have been particularly hard hit, with numerous businesses closing or filing for bankruptcy. And among household with children, food insecurity – defined as when a household does not have sufficient food for its members to maintain healthy and active lives and lacks the resources to obtain more food – has more than doubled from 14% in 2018 to 32% in July 2020.

While buildings, infrastructure, and critical facilities are not considered vulnerable to this hazard, access to facilities and infrastructure in the area of the incident may be denied until decontamination is complete. Workplace closures due to social distancing and quarantine requirements can make facility operation more difficult.

Future Development

The population in Clinton County is declining and thus there are not as many people to potential ill from a human disease. But 17.4 percent of the population is over 65 years old. Those over 65 are more susceptible to health complications as a result of disease.

Climate Change Impacts

Additional research is needed to determine the effects of climate change on the frequency and duration of epidemics and pandemics. Climate change may influence vector-borne disease transmission, although the direction of the effects (increased or decreased incidence) will be location- and disease-specific. The intensity and extent of certain diseases is projected to increase.

Ongoing efforts to reduce greenhouse gas emissions, building climate resiliency, and creating robust public health campaigns to prevent or prepare for possible increased vector-borne diseases may help to reduce the impacts of climate change on pandemics.

The 2010 Climate Change Impacts on Iowa Report. details the following as climate change contributors to negative consequences for public health in Iowa:

- Extreme Precipitation Events, Rising Humidity, and Associated Disease
- Illness and Death Associated with Extreme Heat and Heat Waves
- Warming, Air Quality and Respiratory Problems
- Pollen Production and Allergies
- Diseases Transferred by Food, Water, and Insects

Human Disease Hazard Summary by Jurisdiction

Due to disease spreading more quickly in areas with high density, the cities with over 4,000 in population and the community schools in those cities were given a magnitude of 4, and the unincorporated county and cities with populations less than 4,000 were given a magnitude of 3. The rest of the elements are not varied across jurisdictions.

Jurisdiction	Probability	Magnitude	Warning Time	Duration	Score	Level
Unincorporated Clinton County	3	3	2	4	2.95	Moderate
Andover	3	3	2	4	2.95	Moderate
Calamus	3	3	2	4	2.95	Moderate
Camanche	3	4	2	4	3.25	High
Charlotte	3	3	2	4	2.95	Moderate
Clinton	3	4	2	4	3.25	High
Delmar	3	3	2	4	2.95	Moderate
DeWitt	3	4	2	4	3.25	High
Goose Lake	3	3	2	4	2.95	Moderate
Grand Mound	3	3	2	4	2.95	Moderate
Lost Nation	3	3	2	4	2.95	Moderate
Low Moor	3	3	2	4	2.95	Moderate
Toronto	3	3	2	4	2.95	Moderate
Welton	3	3	2	4	2.95	Moderate
Wheatland	3	3	2	4	2.95	Moderate
Calamus-Wheatland School District	3	4	2	4	3.25	High
Camanche School District	3	4	2	4	3.25	High
Central DeWitt School District	3	4	2	4	3.25	High
Clinton School District	3	4	2	4	3.25	High
Delwood School District	3	4	2	4	3.25	High
Northeast School District	3	4	2	4	3.25	High

3.3.12 Infrastructure Failure

Hazard Score Calculation					
Probability	**Magnitude/Severity**	**Warning Time**	**Duration**	**Weighted Score**	**Level**
4	2	4	3	3.30	High

Profile

Hazard Description

Critical infrastructure involves several different types of facilities and systems including electric power, transportation routes, natural gas and oil pipelines, water and sewer systems, storage networks, and internet/telecommunications systems. Failure of utilities or other components of the infrastructure in the planning area can seriously impact public health, functioning of communities and the economy. Disruption of any of these services could result from most of the natural, technological, and manmade hazards described in this plan. In addition to a secondary or cascading impact from another primary hazard, utilities and infrastructure can fail because of faulty equipment, lack of maintenance, degradation over time, or accidental damage such as damage to buried lines or pipes during excavation.

To maintain consistency with the state plan, this hazard encompasses a variety of different types of infrastructure failure, including communications failure, energy failure, structural failure, and structural fire.

Communications Failure

Communications failure is the widespread breakdown or disruption of normal communication capabilities. This could include major telephone outages, internet interruption, loss of cellular telephone service, loss of local government radio facilities, long-term interruption of electronic broadcast services, or emergency 911. Law enforcement, fire, emergency medical services (EMS), public works, and emergency warning systems are just a few of the vital services which rely on communications systems to effectively protect citizens. In addition, business and industry rely heavily on various modes of communication. Mechanical failure, traffic accidents, power failure, line severance, and weather can all affect communications systems and disrupt service. Disruptions and failures can range from localized and temporary to widespread and long-term.

The types of hazards and impacts to internet and telecommunications infrastructure are very similar to electric power supply. Land line phone lines often utilize the same poles as electric lines. So, when weather events such as windstorm or winter weather cause lines to break, both electricity and telephone services experience outages. With the increasing utilization of cellular phones, hazard events such as tornado that can damage cellular repeaters can cause outages. In addition, during any hazard event, internet and telecommunications systems can become overwhelmed due to the surge in call/usage volume.

Energy Failure

Energy failure includes interruption of service to electric, petroleum, or natural gas. Disruption of electric power supply can be a cascading impact of several other hazards. Electric power is the type of energy failure that is most often a secondary impact of other hazard events. The most common hazards analyzed in this plan that disrupt power supply are flood, tornado, windstorm, and winter weather as these hazards can cause major damage to power infrastructure. To a lesser extent, extreme temperatures, dam failure, lightning, and terrorism can disrupt power. Extreme heat can disrupt power supply when air conditioning use spikes during heat waves which can cause brownouts. Dam failure is like flood in that infrastructure can be damaged or made inaccessible by water. Lightning strikes can damage substations and transformers but is usually isolated to small areas of outage. Many forms of terrorism could impact power supply either by direct damage to infrastructure or through cyber terrorism targeting power supply networks.

Primary hazards that can impact natural gas and oil pipelines are earthquake, expansive soils, land subsidence, landslide, and terrorism.

Other Utility Failure

Interruption of other utilities such as water and sewer systems can be a devastating, costly impact. The primary hazards that can impact water supply systems are drought, flood, hazardous materials, and terrorism. Winter storm can also impact water supply if low temperatures cause failure/breakage of water infrastructure. The primary hazard that impacts sewer systems is flood.

Structural Failure / Structure Fire

The collapse (partial or total) of any structure including roads, bridges, towers, and buildings is considered a structural failure. A road, bridge, or building may collapse due to the failure of the structural components or because the structure was overloaded. Natural events such as heavy snow may also cause the roof of a building to collapse (under the weight of snow). In 1983, a KWWL television tower collapsed due to ice buildup. Heavy rains and flooding can undercut and washout a road or bridge. This occurred twice in 2008 when railway bridges failed in Waterloo and Cedar Rapids due to flooding. The age of the structure is sometimes independent of the cause of the failure. Enforcement of building codes can better guarantee that structures are designed to hold-up under normal conditions. Routine inspection of older structures may alert inspectors to weak points. The level of damage and severity of the failure is dependent on factors such as the size of the building or bridge, the number of occupants of the building, the time of day, day of week, amount of traffic on the road or bridge, and the type, and amount of products stored in the structure. There have been structural failures across the state in the past as mentioned above. They have included homes, commercial structures, and communications towers. There is no central collection point for this information, but news articles document infrastructure failure.

A structural fire is an uncontrolled fire in a populated area that threatens life and property and is beyond normal day-to-day response capability. Structural fires present a far greater threat to life and property and the potential for much larger economic losses. Modern fire codes and fire suppression requirements in new construction and building renovations, coupled with improved firefighting equipment, training, and techniques lessen the chance and impact of a major urban fire. Most structural fires occur in residential structures, but the occurrence of a fire in a commercial or industrial facility could affect more people and pose a greater threat to those near the fire or fighting the fire because of the volume or type of the material involved. Less severe structural fires are almost a common occurrence in some communities.

Warning Time Score: 4—less than six hours warning time

Duration Score: 3—less than 1 week

Geographic Location/Extent

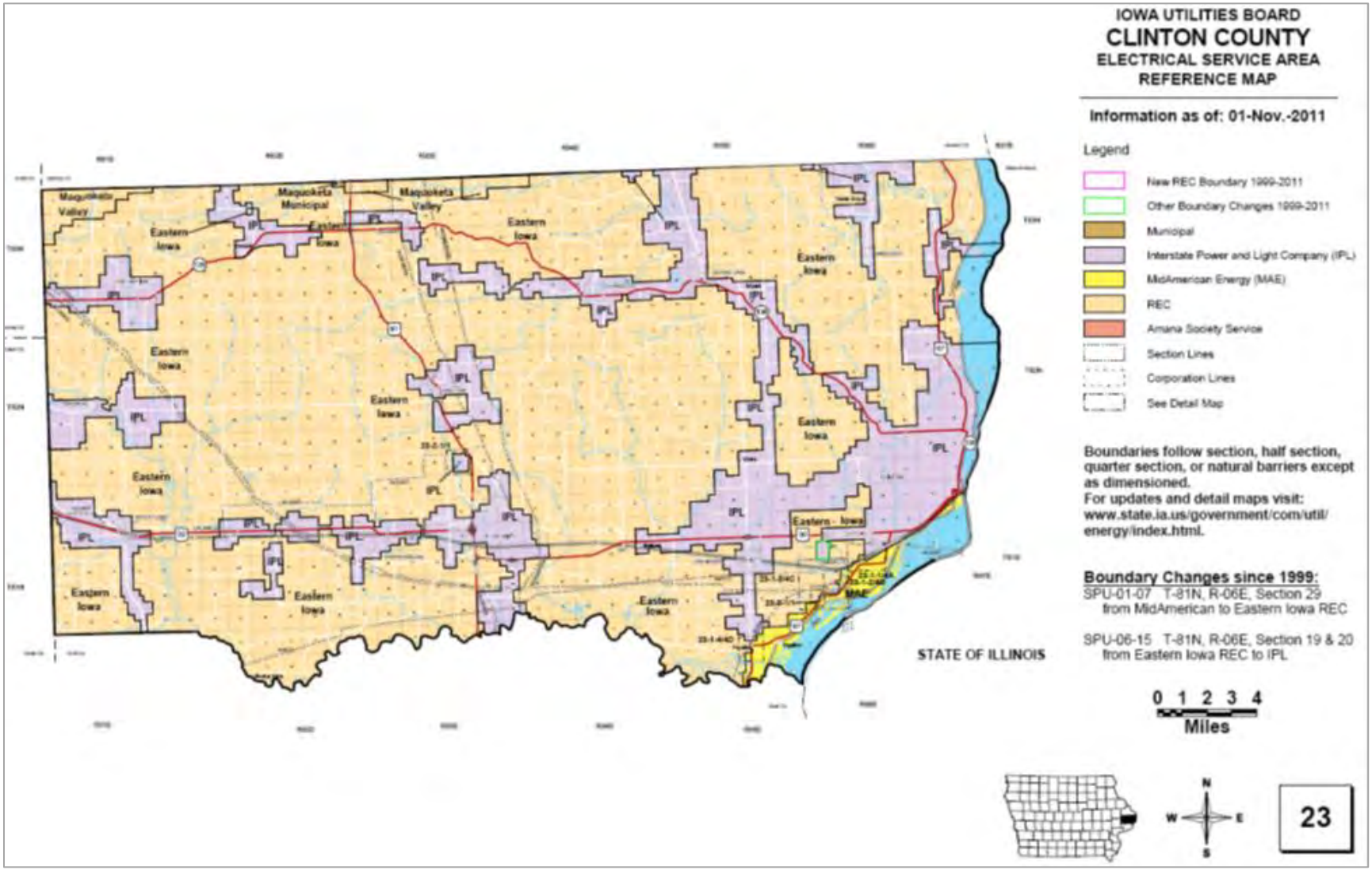
The entire planning area is at risk to all types of infrastructure failure included in the hazard description section, either from primary failure due to malfunction, degradation, or accidental or intentional damage or as a result of a secondary impact related to another hazard event.

Power outages can occur in outlying areas with more frequency than in more developed areas. A loss of electric power can also interrupt your supply of water from a well. You may also lose food in freezers or refrigerators and power outages can cause problems with computers as well.

Chapter 2 provides details on relevant infrastructure in Clinton County. Section 3.5.18 details Clinton County Transportation Systems.

Figure 3-50 is the electrical service area map for Clinton County.

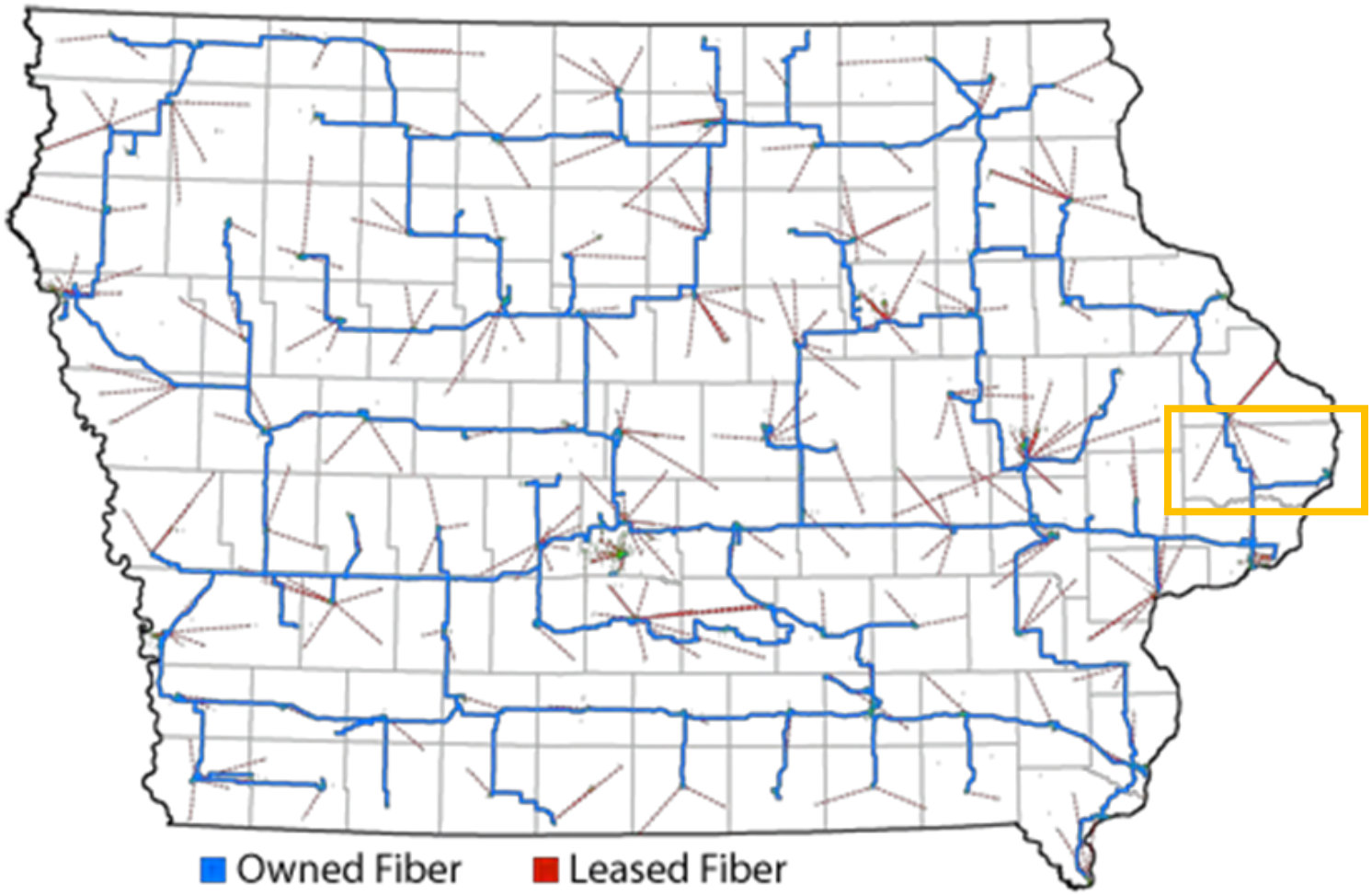
Figure 3-50 Electrical Service Areas in Clinton County



Source: http://www.iowadot.gov/maps/ms/electrical/Clinton_23.pdf

Figure 3-51 shows the Iowa Communications Network (ICN) that administers Iowa's statewide fiber optic telecommunications network.

Figure 3-51 Map of Iowa Communication Network



Source: http://icn.iowa.gov/about-icn/agency-information-icn-story
Note: Orange box outlines Clinton County.

A map of the transportation infrastructure is provided in Figure 3-77 and a map specific to Clinton County bridges is provided in Figure 3-2.

Previous Occurrences

As indicated in the Hazard Description Section, Infrastructure Failure often occurs as a secondary impact to other hazard events. For specific descriptions associated with other hazard events, please see the Previous Occurrences Section of the Thunderstorm with Lighting and Hail, Severe Winter Storm and Tornado/Windstorm hazard profiles. Similarly, some incidents related to natural gas events may be found under the Hazardous Materials Incidents profile.

The structural fires that have occurred in Clinton County have been within the normal day-to-day response capability, including use of pre-arranged mutual aid and do not fall into the category of uncontrolled fires in a populated area that threatens life and property.

Infrastructure failure can also occur as a stand-alone event. The following incidents were shared by the HMPC.

- **March 14, 2012:** A communications wire was accidentally severed by a road maintenance crew in Clinton County. This caused landline telephone and 911 service outage to the cities of Delmar and Welton and the surrounding areas.
- **February 8, 2017:** 911 Outage. An outage on landline 911 service in Camanche and parts of Clinton was discovered. Cellular to 911 was not affected. Outage lasted 2 hours before service was restored.
- **February 5, 2018:** Iowa American Water had a rupture of a 16-inch water main in the 1400 block of 13th Ave. South in Clinton. This break affected the entire city in water availability and/or pressure. The repairs took 10 hours, and the entire city was placed under a boil order which was not lifted until February 7th.
- **September 25, 2017:** Hog confinement fire. Called to a hog confinement fire in rural Clinton County with a request for a cooling vest from the Clinton Fire Department. No other assistance required. Multiple buildings and hundreds of hogs killed.
- **November 8, 2017:** Natural gas leak at apartment complex in Clinton. Called to scene of an underground natural gas leak. Residents evacuated from the building. Plans put in place in case residents needed sheltering. Repairs to the line were completed and no sheltering needs were identified.
- **August 10, 2018:** A water main break at 5th Avenue South and 3rd Street resulted in brief loss of water pressure in Clinton including at Mercy Hospital which activated their emergency water plan. Water was restored in a few hours and only a small area was put under a boil order.
- **August 23, 2018:** A natural gas leak occurred in a vacant house in Clinton. Residences on all sides of the structure were evacuated. Alliant Energy shut off the gas to the structure and the Clinton Fire Department vented the structure. Evacuated residents in surrounding structures were allowed to return.
- **September 9, 2019:** EMA was notified of a large gas leak in Camanche and requested to respond. County Emergency Management responded to the 19th Avenue areas of Camanche and met with Fire Chief who notified them that Alliant had shut off the gas and they could clear the scene.
- **January 2, 2020:** Gas leak in Camanche. No major damage or injuries reported.
- **November 5, 2020:** There was a 911 outage throughout Clinton County for several hours. Landline customers calling 911 were forwarded to Jackson County. Wireless customers calling 911 were forwarded to Iowa State Police. It appears that the outage was caused by an ICN fiber issue.
- **September 1, 2021:** City of DeWitt lost water pressure citywide. Likely due to a computer failure the incident resulted in restaurants being closed and one days of school closure.

Probability of Future Occurrences

As discussed in other hazard sections in this plan, infrastructure failure occurs as a secondary or cascading impact from several primary hazards such as winter storm, windstorm, and tornado. In addition, other incidents such as structure fire that are included in this hazard profile occur annually. Therefore, the HMPT determined the probability of future occurrence of this hazard to be Highly Likely.

Probability Score: 4—Highly Likely

Vulnerability

Vulnerability Overview

Iowa is almost entirely dependent on out-of-state resources for energy. Iowans purchase oil, coal, and natural gas from outside sources. As a result, world and regional fuel disruptions are felt in Iowa.

Every community in the planning area is at risk to some type of utility/infrastructure failure. Business and industry in the urban areas are reliant on electricity to power servers, computers, automated systems, etc. Rural areas of the County are vulnerable as well, as modern agricultural practices are reliant on energy; such as electric milking machines, and irrigation pivots.

Generally, the smaller utility suppliers such as small electrical suppliers have limited resources for mitigation. This could mean greater vulnerability in the event of a major, widespread disaster, such as a major flood, severe winter storm or ice storm. The municipal utilities that exist in the County purchase power on the wholesale market for resale to their customers. This may make them more vulnerable to regional shortages of power as well. For example, the City of Toronto does not have a public water system, water is sourced from private wells. The City does have a public sewer system and it is less than 20 years old.

In the event of a large-scale event impacting water supply or wastewater treatment homes and businesses with, well-supplied water and septic systems for waste treatment would be largely unaffected. However, these systems may be prone to individual failure and do not have backup systems in place in the event of failure as larger systems might.

Generators have been positioned at several critical infrastructure sites throughout the county, which has lowered their vulnerability.

Magnitude Score: 2—Limited

Potential Losses to Existing Development

Since utility/infrastructure failure is generally a secondary or cascading impact of other hazards, it is not possible to quantify estimated potential losses specific to this hazard due to the variables associated with affected population, duration of outages, etc.

Although the variables make it difficult to estimate specific future losses, FEMA has developed standard loss of use estimates in conjunction with their Benefit-Cost Analysis methodologies to estimate the cost of lost utilities on a per-person, per-use basis (See Table 3-49).

Table 3-49 FEMA Standard Values for Loss of Service for Utilities and Roads/Bridges

Loss of Electric Power	Cost of Complete Loss of Service
Total Economic Impact	$126 per person per day
Loss of Potable Water Service	Cost of Complete Loss of Service
Total Economic Impact	$93 per person per day

Loss of Wastewater Service	Cost of Complete Loss of Service
Total Economic Impact	$41 per person per day
Loss of Road/Bridge Service	Cost of Complete Loss of Service
Vehicle Delay Detour Time	$38.15 per vehicle per hour
Vehicle Delay Mileage	$0.55 per mile (or current federal mileage rate)

Source: FEMA BCA Reference Guide, June 2009, Appendix C

Future Development

Increases in development and population growth would increase the demand for utilities and use of infrastructure as well as the level of impacts when the utilities or infrastructure fail. However, Clinton County has seen a slight population decrease since the 2000 census. As technological advances are made, and systems become more and more automated and dependent on power and communications infrastructure. As a result, the impacts of infrastructure failure could increase even though population is decreasing.

Climate Change Impacts

Please refer to the Climate Change Impacts sections of the following primary hazards that can cause a cascading or secondary impact of infrastructure failure: River Flood, Severe Winter Storm, Tornado/Windstorm, Thunderstorm/Lightning Hail, Extreme Heat, Flash Flood, and Terrorism.

Infrastructure Failure Incident Hazard Summary by Jurisdiction

All jurisdictions within the planning area are at significant risk to infrastructure failure, due to the high probability and high potential consequences of such an incident.

Jurisdiction	Probability	Magnitude	Warning Time	Duration	Score	Level
Unincorporated Clinton County	4	2	4	3	3.30	High
Andover	4	2	4	3	3.30	High
Calamus	4	2	4	3	3.30	High
Camanche	4	2	4	3	3.30	High
Charlotte	4	2	4	3	3.30	High
Clinton	4	2	4	3	3.30	High
Delmar	4	2	4	3	3.30	High
DeWitt	4	2	4	3	3.30	High
Goose Lake	4	2	4	3	3.30	High
Grand Mound	4	2	4	3	3.30	High
Lost Nation	4	2	4	3	3.30	High
Low Moor	4	2	4	3	3.30	High
Toronto	4	2	4	3	3.30	High
Welton	4	2	4	3	3.30	High
Wheatland	4	2	4	3	3.30	High
Calamus-Wheatland School District	4	2	4	3	3.30	High
Camanche School District	4	2	4	3	3.30	High

Jurisdiction	Probability	Magnitude	Warning Time	Duration	Score	Level
Central DeWitt School District	4	2	4	3	3.30	High
Clinton School District	4	2	4	3	3.30	High
Delwood School District	4	2	4	3	3.30	High
Northeast School District	4	2	4	3	3.30	High

3.3.13 Landslide

Hazard Score Calculation					
Probability	**Magnitude/Severity**	**Warning Time**	**Duration**	**Weighted Score**	**Level**
1	1	1	1	1	Low

Profile

Hazard Description

A landslide is a general term for a variety of mass movement processes that generate a downslope movement of soil, rock, and vegetation under gravitational influence. Landslides are a serious geologic hazard common to almost every state in the United States. It is estimated that nationally they cause up to $2 billion in damages and from 25 to 50 deaths annually. Some landslides move slowly and cause damage gradually, whereas others move so rapidly that they can destroy property and take lives suddenly and unexpectedly. Gravity is the force driving landslide movement. Factors that allow the force of gravity to overcome the resistance of earth material to landslide include saturation by water, erosion or construction, alternate freezing or thawing, earthquake shaking, and volcanic eruptions.

Landslides are typically associated with periods of heavy rainfall or rapid snow melt and tend to worsen the effects of flooding that often accompanies these events. In areas burned by forest and brush fires, a lower threshold of precipitation may initiate landslides. Generally significant landslides follow periods of above-average precipitation over an extended period, followed by several days of intense rainfall. It is on these days of intense rainfall that slides are most likely.

Areas that are generally prone to landslide hazards include existing old landslides; the bases of steep slopes; the bases of drainage channels; and developed hillsides where leach-field septic systems are used. Landslides are often a secondary hazard related to other natural disasters. Landslide triggering rainstorms often produce damaging floods. Earthquakes often induce landslides that can cause additional damage.

Slope failures are capable of damaging or destroying portions of roads and railroads, sewer and water lines, homes and public buildings, and other utility lines. Even small-scale landslides are expensive due to cleanup costs that may include debris clearance from streets, drains, streams and reservoirs; new or renewed support for road and rail embankments and slopes; minor vehicle and building damage; personal injury; and livestock, timber, crop and fencing losses and damaged utility systems. Specific to Iowa and Clinton County, landslides are primarily very small, non-damaging events.

Warning Time Score: 1—More than 24 hours warning time

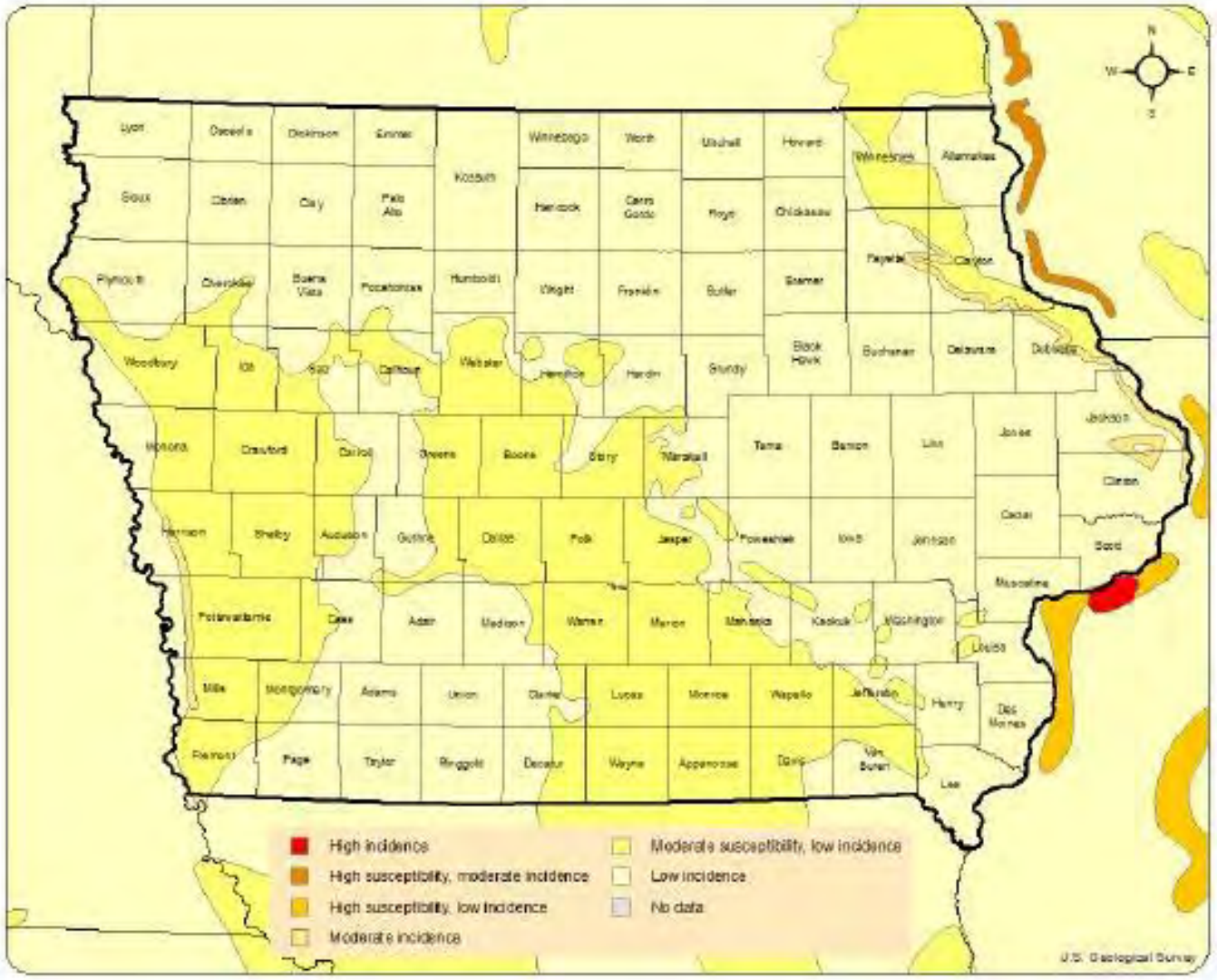
Duration Score: 1—Less than 6 hours

Geographic Location/Extent

A portion of the state is moderately susceptible to landslides. In northeastern Iowa, along the Silurian Escarpment, you can find blocks of dolomite slumped onto the underlying Maquoketa shale. In the hilly terrain of central Iowa, areas of Pennsylvanian shale are susceptible to slides where it is overlain by loess or till. Susceptible areas are found along the adjacent steep terrain associated with the major river valleys such as the Mississippi, Missouri, Des Moines, and Iowa and in the Loess Hills of western Iowa.

While locations of areas more susceptible than others are mapped (see Figure 3-52 below), the likelihood or probability of landslides is not well understood in Iowa. There are some limited areas of Clinton County which may have moderate susceptibility for landslides, primarily in the eastern areas of the county along the Mississippi River. However, much of the county has low incidence and low susceptibility for landslides.

Figure 3-52 Landslide Susceptibility in Iowa



Source: Iowa State Hazard Mitigation Plan, 2018

Previous Occurrences

There have been no reported landslide events in Iowa resulting in injury or death. The geographic extent of the documented historic events has been limited to less than a city block in size and has "run-out" over the stretch of less than 100 yards. This holds true for Clinton County. However, as no State agency documents historical data on landslides in Iowa, there may be undocumented past events that were larger.

Probability of Future Occurrence

The probability of a landslide causing damage in the Clinton County is difficult to determine because of the lack of historic data on past events. Due to the limited presence of steep slopes and areas susceptible to landslides throughout the planning area, impacts of landslides will not likely create measurable impacts on the county.

Probability Score: 1—Unlikely

Vulnerability

Overview

While Figure 3-52 above shows that there are areas of the state that may be somewhat susceptible to landslides, this is currently not a hazard that has had much impact in Clinton County. Still, it would be wise for areas of moderate and higher landslide susceptibility to include in their land use codes a requirement that developers evaluate the potential for landslides at specific sites. This seems to be even more warranted because of evidence that extreme rain events, which could trigger landslides, appear to be occurring more frequently in Iowa.

Magnitude/Severity Score: 1—Negligible

Estimated Losses to Existing Development

As mentioned throughout this chapter, the majority of this hazard's significance is drawn from the exposure of existing development to areas susceptible to landslide. There is very limited extent of this hazard throughout Clinton County, and the areas at higher susceptibility to landslide do not have existing development, infrastructure, or jurisdictions. As such, losses to existing development from landslides is not likely.

Future Development

Areas which may be prone to landslide are well documented in Clinton County, and are primarily centered on bluffs along the Mississippi River in the northeast of the county. Future development will need to take this hazard into account, and where they do not already exist, ordinances should be adopted to limit or prohibit development on steep or unstable slopes.

Climate Change Impacts

Increased temperatures are projected to contribute to more water evaporation making drought more common, which could increase the probability of wildfire, reducing the vegetation that helps to support steep slopes. Additionally, increases in the occurrence of extreme precipitation events could lead to oversaturated hillsides, which are at increased risk of landslide.

Landslide Hazard Summary by Jurisdiction

Expansive soils are a regional hazard with limited impacts to all jurisdictions in the planning area.

Jurisdiction	Probability	Magnitude	Warning Time	Duration	Score	Level
Unincorporated Clinton County	1	1	1	1	1	Low
Andover	1	1	1	1	1	Low
Calamus	1	1	1	1	1	Low
Camanche	1	1	1	1	1	Low
Charlotte	1	1	1	1	1	Low
Clinton	1	1	1	1	1	Low
Delmar	1	1	1	1	1	Low
DeWitt	1	1	1	1	1	Low
Goose Lake	1	1	1	1	1	Low
Grand Mound	1	1	1	1	1	Low
Lost Nation	1	1	1	1	1	Low
Low Moor	1	1	1	1	1	Low
Toronto	1	1	1	1	1	Low
Welton	1	1	1	1	1	Low
Wheatland	1	1	1	1	1	Low
Calamus-Wheatland School District	1	1	1	1	1	Low
Camanche School District	1	1	1	1	1	Low
Central DeWitt School District	1	1	1	1	1	Low
Clinton School District	1	1	1	1	1	Low
Delwood School District	1	1	1	1	1	Low
Northeast School District	1	1	1	1	1	Low

3.3.14 Radiological Incident

Hazard Score Calculation					
Probability	**Magnitude/Severity**	**Warning Time**	**Duration**	**Weighted Score**	**Level**
1	3	4	4	2.35	Moderate

Profile

Hazard Description

A radiological incident is an occurrence resulting in the release of radiological material at a fixed facility (such as power plants, hospitals, laboratories, etc.) or in transit.

Radiological incidents related to transportation are described as an incident resulting in a release of radioactive material during transportation. Transportation of radioactive materials through Iowa over the interstate highway system is considered a radiological hazard. The transportation of radioactive material by any means of transport is licensed and regulated by the federal government. As a rule, there are two categories of radioactive materials that are shipped over the interstate highways:

1. Low level waste consists primarily of materials that have been contaminated by low level radioactive substances but pose no serious threat except through long-term exposure. These materials are shipped in sealed drums within placarded trailers. The danger to the public is no more than a wide array of other hazardous materials.
2. High level waste, usually in the form of spent fuel from nuclear power plants, is transported in specially constructed casks that are built to withstand a direct hit from a locomotive.

Warning Time Score: 4 — less than six hours warning time

Duration Score: 4 — more than 1 week

Geographic Location/Extent

Transportation Radiological Incidents

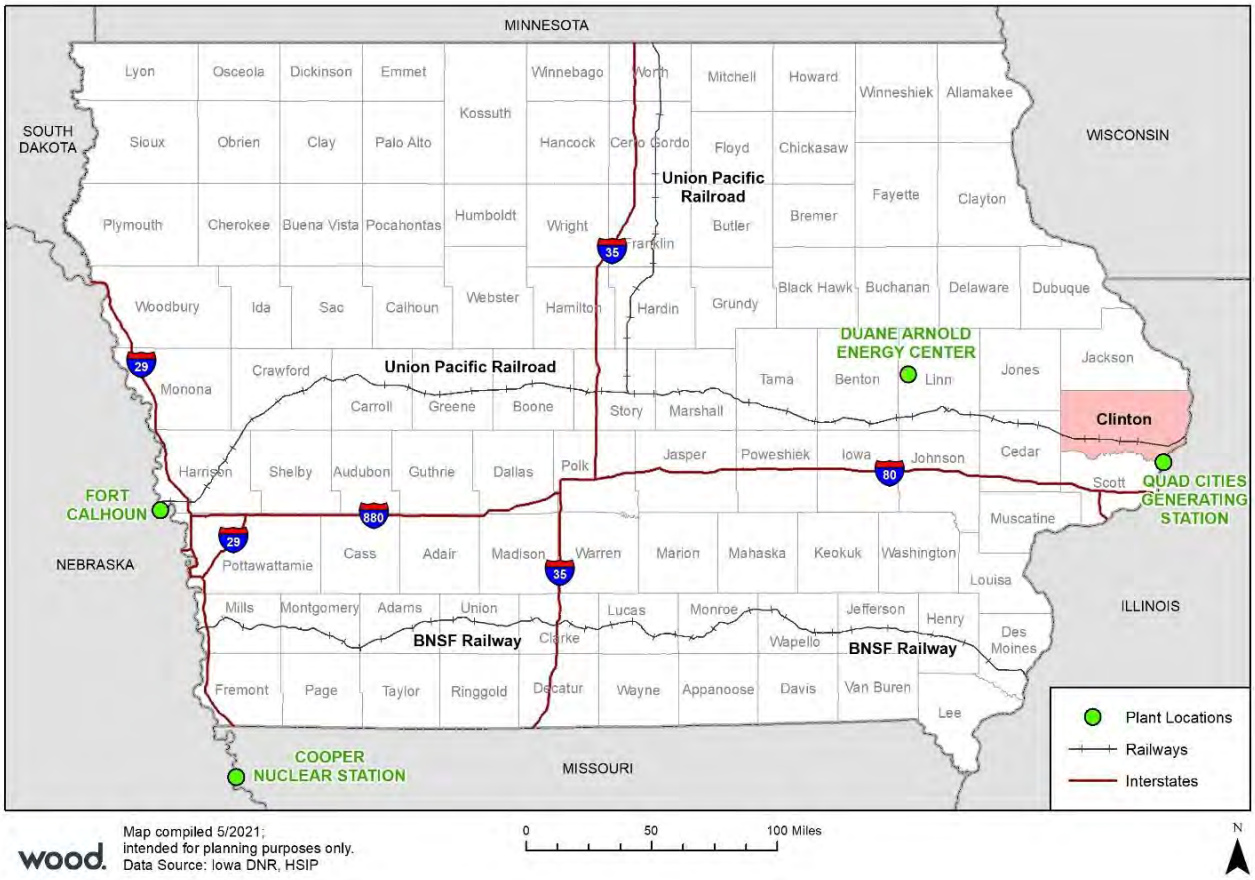
There is potential for the transport of radioactive waste within Clinton County, primarily along major highways.

Fixed Facilities

The most significant fixed facility radiological incident would be a release of radioactive materials from an accident at a nuclear power plant. There are two nuclear power plants whose 50-mile planning buffer includes Clinton County, as shown in Figure 3-53.

- Quad Cities Generating Station is an operating two-unit nuclear power plant on the Mississippi River near Cordova, Illinois. All of Clinton County is within Quad Cities' 50-mile planning buffer.
- The Duane Arnold Energy Center in Linn County was Iowa's only nuclear power plant. This facility was shut down in 2021 following storm damage from the August 2020 derecho event. Spent nuclear fuel is still stored on the site, but an accident involving spent fuel rods would be unlikely to affect Clinton County.

Figure 3-53 Map of Nuclear Power Plants and Transportation Routes



Previous Occurrences

The US Nuclear Regulatory Commission has emergency classifications divided into four categories. Each level has a certain response requirement from the plant and government. The following are the emergency classifications from least to most severe:

- Unusual Event
- Alert
- Site Area Emergency
- General Emergency

From 1990 to 2021, the following emergency classifications have occurred for the Quad Cities and Duane Arnold Nuclear Power Plants:

- The Quad Cities Generating Station has had eighteen Unusual Events, seven Alerts, and no Site Area Emergencies or General Emergencies.
- The Duane Arnold Energy Center has had seven Unusual Events, one Alert, and no Site Area Emergencies or General Emergencies.

It should be noted that none of the above listed occurrences qualify as a radiological hazard event. According to the 2018 Iowa State Hazard Mitigation Plan, there have been no radiological transportation incidents in Iowa since 1990.

Probability of Future Occurrence

The Nuclear Regulatory Commission regulates commercial nuclear power plants and other uses of nuclear materials through licensing, inspection, and enforcement of requirements. Within the NRC, several Offices and Divisions have various responsibilities to ensure nuclear power plant safety. The Office of Nuclear Reactor Regulation (NRR) is responsible for accomplishing key components of the NRC's nuclear reactor safety mission. As such, NRR conducts a broad range of regulatory activities in the four primary program areas of rulemaking, licensing, oversight, and incident response for commercial nuclear power reactors, and test and research reactors to protect the public health, safety, and the environment. NRR works with the regions and other offices to accomplish its mission and contribute to the agency mission.

Additionally, the Radiological Emergency Preparedness (REP) Program within FEMA coordinates the national effort to provide state, local, and tribal governments with relevant and executable planning, training, and exercise guidance and policies necessary to ensure that adequate capabilities exist to prevent, protect against, mitigate the effects of, respond to, and recover from incidents involving commercial nuclear power plants. Clinton County Emergency Management works closely with the REP program to ensure preparedness for any incidents involving the nuclear power plants.

Based on the safety record of the Quad Cities Generating Station, the fact that the Duane Arnold Energy Center has been shut down, and the regulatory and preparedness programs that are currently in place, the probability of future occurrences of radiological incidents is considered Unlikely. However, the possibility of an accident at Quad Cities cannot be ruled out.

Probability Score: 1—Unlikely

Vulnerability

Vulnerability Overview

In general, danger to the public in the planning area is less than a wide array of other hazardous materials. Those working with or near sources of radiation are at a greater risk than the general citizens in the planning area. Those responding to a radiological incident should be trained in recognizing a radiological incident and minimize exposure to radioactive materials. Although the probability of occurrence is low, if a release of radiation from the nuclear power plants did occur, this could have serious consequences in Clinton County. Even if health impacts were not evident, the number of worried well could flood available healthcare facilities.

Magnitude Score: 3—Critical

Potential Losses to Existing Development

Responding to the effects of a radiological incident in the planning area would be extensive and would require resources and assistance from several state and federal agencies to determine and evaluate the threat to life and the environment. Due to the variable nature of this hazard, it is not possible to quantify potential losses.

Future Development

In June 2016, Exelon Corporation, which owns and operates the Quad Cities nuclear plant, announced that it will move forward to shut down the plant. However, after the initial planned shutdown in 2016, the Exelon Corporation received Illinois state subsidies to keep the Quad Cities plant operational. It currently does not have a planned shutdown date.

Increased development in the planning buffer zones and along transportation corridors would increase the number of people vulnerable to this hazard in the planning area.

Climate Change Impacts

Drought can impact of water levels for intake pipes that carry water from the Mississippi River to cool the reactor. See Section 3.5.3 for discussion of Climate Change Impacts for Drought.

Radiological Incident Hazard Summary by Jurisdiction

The entire planning area is within the planning buffer zone of the Quad Cities Quad Cities; all jurisdictions within the planning area are potentially at risk to this hazard.

Jurisdiction	Probability	Magnitude	Warning Time	Duration	Score	Level
Unincorporated Clinton County	1	3	4	3	2.25	Moderate
Andover	1	3	4	3	2.25	Moderate
Calamus	1	3	4	3	2.25	Moderate
Camanche	1	3	4	3	2.25	Moderate
Charlotte	1	3	4	3	2.25	Moderate
Clinton	1	3	4	3	2.25	Moderate
Delmar	1	3	4	3	2.25	Moderate
DeWitt	1	3	4	3	2.25	Moderate
Goose Lake	1	3	4	3	2.25	Moderate
Grand Mound	1	3	4	3	2.25	Moderate
Lost Nation	1	3	4	3	2.25	Moderate
Low Moor	1	3	4	3	2.25	Moderate
Toronto	1	3	4	3	2.25	Moderate
Welton	1	3	4	3	2.25	Moderate
Wheatland	1	3	4	3	2.25	Moderate
Calamus-Wheatland School District	1	3	4	3	2.25	Moderate
Camanche School District	1	3	4	3	2.25	Moderate
Central DeWitt School District	1	3	4	3	2.25	Moderate
Clinton School District	1	3	4	3	2.25	Moderate
Delwood School District	1	3	4	3	2.25	Moderate
Northeast School District	1	3	4	3	2.25	Moderate

3.3.15 Severe Winter Storm

Hazard Score Calculation					
Probability	**Magnitude/Severity**	**Warning Time**	**Duration**	**Weighted Score**	**Level**
4	2	3	4	3.25	High

Profile

Hazard Description

Severe winter storms are an annual occurrence in Iowa. A major winter storm can last for several days and be accompanied by high winds, freezing rain or sleet, heavy snowfall, cold temperatures, and drifting snow creating blizzards. The NWS describes different types of winter storm events as follows:

- **Blizzard**—Winds of 35 mph or more with snow and blowing snow reducing visibility to less than ¼ mile for at least three hours.
- **Blowing Snow**—Wind-driven snow that reduces visibility. Blowing snow may be falling snow and/or snow on the ground picked up by the wind.
- **Snow Squalls**—Brief, intense snow showers accompanied by strong, gusty winds. Accumulation may be significant.
- **Snow Showers**—Snow falling at varying intensities for brief periods of time. Some accumulation is possible.
- **Freezing Rain**—Measurable rain that falls onto a surface with a temperature below freezing. This causes it to freeze to surfaces, such as trees, cars, and roads, forming a coating or glaze of ice. Most freezing-rain events are short lived and occur near sunrise between the months of December and March.
- **Sleet**—Rain drops that freeze into ice pellets before reaching the ground. Sleet usually bounces when hitting a surface and does not stick to objects.

Heavy accumulations of ice, often the result of freezing rain, can bring down trees, utility poles, and communications towers and disrupt communications and power for days. Even small accumulations of ice can be extremely dangerous to motorists and pedestrians.

Severe winter storms include extreme cold, heavy snowfall, ice, and strong winds which can push the wind chill well below zero degrees in the planning area. Heavy snow can bring a community to a standstill by inhibiting transportation (in whiteout conditions), weighing down utility lines, and by causing structural collapse in buildings not designed to withstand the weight of the snow. Repair and snow removal costs can be significant. Ice buildup can collapse utility lines and communication towers, as well as make transportation difficult and hazardous. Ice can also become a problem on roadways if the air temperature is high enough so that precipitation falls as freezing rain rather than snow.

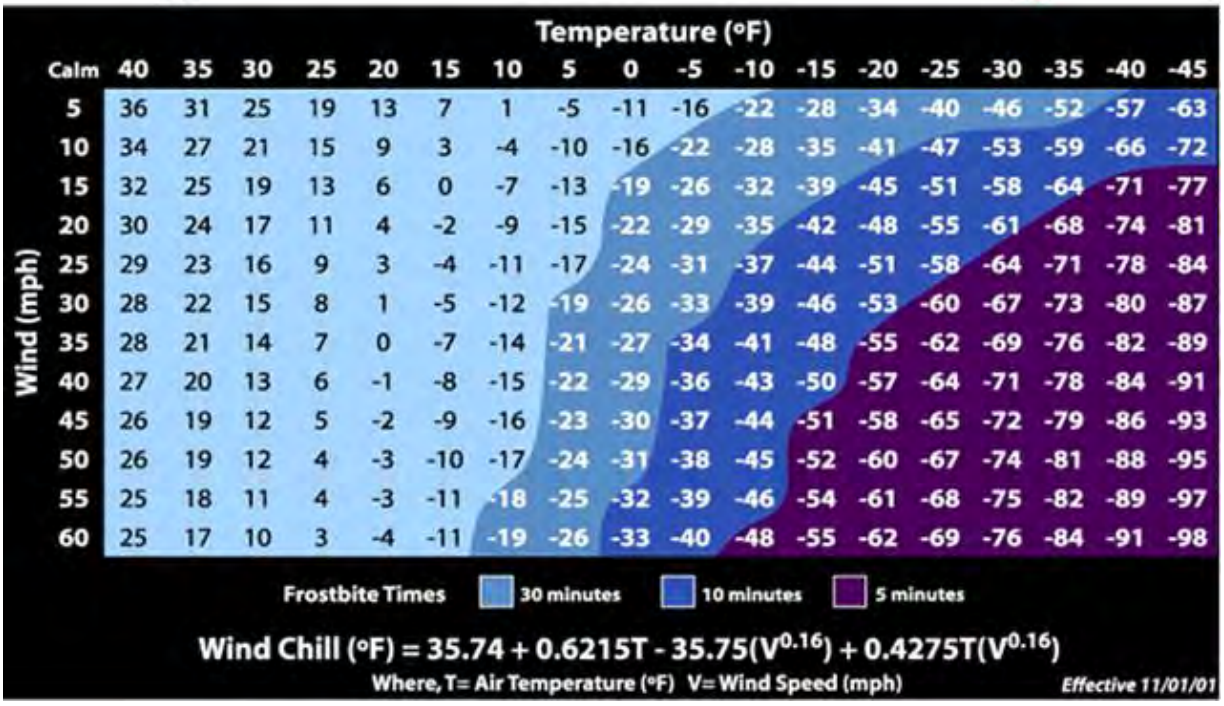
Extreme cold often accompanies severe winter storms and can lead to hypothermia and frostbite in people who are exposed to the weather without adequate clothing protection. Cold can cause fuel to congeal in storage tanks and supply lines, stopping electric generators. Cold temperatures can also overpower a building's heating system and cause water and sewer pipes to freeze and rupture. When combined with high winds from winter storms, extreme cold becomes extreme wind chill, which is extremely hazardous to health and safety.

The National Institute on Aging estimates that more than 2.5 million Americans are especially vulnerable to hypothermia, with the isolated elderly being most at risk. About 10 percent of people over the age of 65 have some kind of temperature-regulating defect, and 3-4 percent of all hospital patients over 65 are hypothermic.

Also, at risk are those without shelter or who are stranded, or who live in a home that is poorly insulated or without heat. Other impacts of extreme cold include asphyxiation (unconsciousness or death from a lack of oxygen) from toxic fumes from emergency heaters; household fires, which can be caused by fireplaces and emergency heaters; and frozen/burst pipes.

Wind can greatly amplify the impact of cold ambient air temperatures. Provided by the National Weather Service, Figure 3-54 below shows the relationship of wind speed to apparent temperature and typical time periods for the onset of frostbite.

Figure 3-54 Wind Chill Chart



Source: NWS

Warning Time Score: 3—6-12 hours

Duration Score: 4—more than 1 week

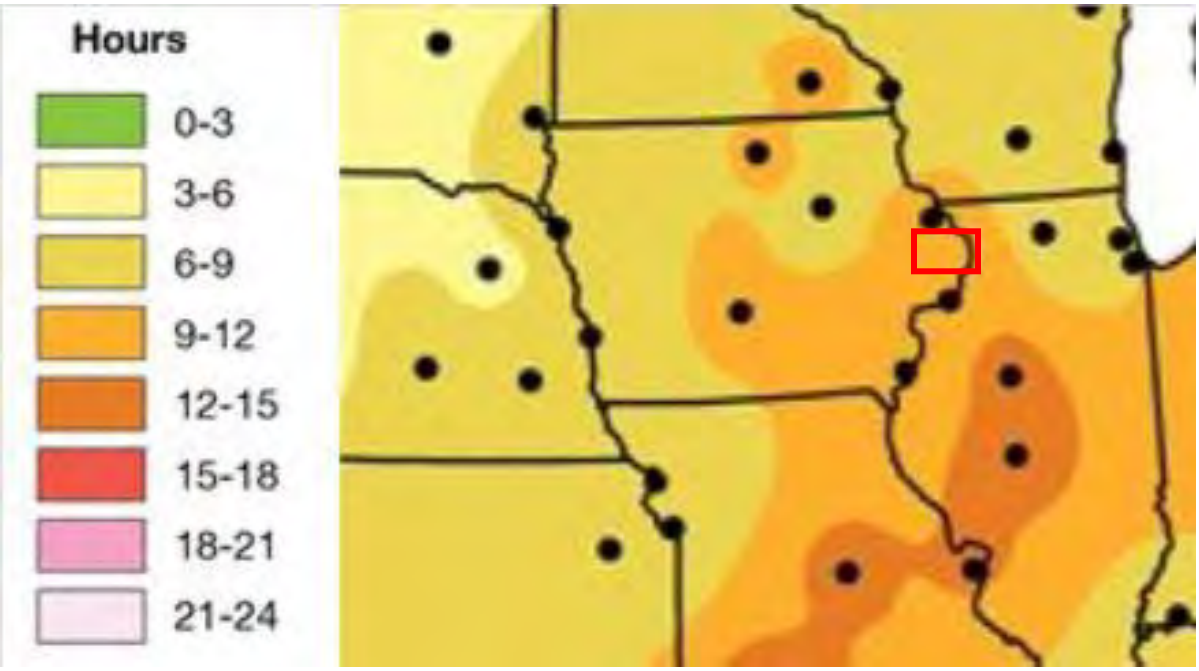
Geographic Location/Extent

According to the High Plains Regional Climate Center (http://climod.unl.edu/) and based on the Clinton Weather Station, the planning area has an average high temperature of 35 degrees Fahrenheit in December, 30 degrees Fahrenheit in January, and 35. degrees Fahrenheit in February. Average lows for those same three months are 19, 13, and 17 degrees Fahrenheit. Average snowfall is highest in December, January, and February with an annual average of 34.9 inches.

The entire state of Iowa is vulnerable to heavy snow, extreme cold temperatures, and freezing rain. Generally, winter storms occur between the months of November and March but can occur as early as October and as late as April.

Figure 3-55 shows that the planning area (approximated within the red square) is in the orange-shaded area that receives 9-12 hours of freezing rain per year.

Figure 3-55 Average Number of Hours per Year with Freezing Rain



Source: Midwestern Regional Climate Center; http://mcc.sws.uiuc.edu/living_wx/icestorms/index.html
Note: Red square provides approximate location of planning area.

Previous Occurrences

From 1996 to June 2021, the NCEI database reported five blizzard events, 10 extreme cold/wind chill events, 16 heavy snow events, 7 ice storm events, and 64 winter storm events in Clinton County. This results in a total of 102 incidents of severe winter storms in the county. According to NCEI data, these weather events did not result in any deaths or injuries, but they did cause a total of $264,000 million in property damages. This translates to an average of approximately four winter storm events per year.

Historically, there have been two Presidential Disaster Declarations for Severe Winter Storm/Ice Storm that included Clinton County since 1990; January 2008 and March 2007.

NOAA's NWS has issued 507 Advisory, Watch, and/or Warnings concerning winter weather phenomena in the planning area between 2005 and June 2021. This data is housed by the Iowa Environmental Mesonet, ISU Department of Agronomy website and the summary of these issuances can be found below in Table 3-50.

Table 3-50 National Weather Service Issuances for Winter Weather in Clinton County, IA

Phenomena	Significance	Number Issued between 2005 and June 2021
Blizzard	Watch	4
Blizzard	Warning	9
Blowing Snow	Advisory	7
Freeze	Watch	8
Freeze	Warning	34

Phenomena	Significance	Number Issued between 2005 and June 2021
Freezing Rain	Advisory	5
Frost	Advisory	42
Ice Storm	Warning	4
Snow	Advisory	15
Snow and Blowing Snow	Advisory	5
Wind Chill	Advisory	87
Wind Chill	Watch	4
Wind Chill	Warning	18
Winter Storm	Watch	60
Winter Storm	Warning	54
Winter Weather	Advisory	151
Total		507

Source: Environmental Mesonet, ISU Department of Agronomy website, http://mesonet.agron.iastate.edu/vtec/search.php

On February 2, 2011, Governor Branstad added Clinton County to a disaster emergency proclamation in response to severe weather. As a result of this event, the Iowa DOT closed Highway 136 from the City of Clinton to 380th Avenue just east of Goose Lake. This was done because of numerous stranded vehicles caused by whiteout conditions and snow drifts across the roadway.

Probability of Future Occurrence

Winter storms regularly move easterly and use both the southward plunge of arctic cold air from Canada and the northward flow of moisture from the Gulf of Mexico to produce heavy snow and sometimes blizzard conditions in Iowa and other parts of the Midwest. The cold temperatures, strong winds, and heavy precipitation are the ingredients of winter storms. Most counties in Iowa can usually expect 2 or 3 winter storms a season with an extreme storm every 3 to 5 years on average. Based on the historic occurrences of this hazard, Clinton County can expect to experience four winter storm events per year, giving a rating of Highly Likely.

Probability Score: 4—Highly Likely

Vulnerability

Vulnerability Overview

The entire planning area is vulnerable to the effects of winter storm. Hazardous driving conditions due to snow and ice on highways and bridges lead to many traffic accidents and can impact the response of emergency vehicles. The leading cause of death during winter storms is transportation accidents. About 70 percent of winter-related deaths occur in automobiles due to traffic accidents and about 25 percent are from people caught outside in a storm. Emergency services such as police, fire, and ambulance are unable to respond due to road conditions. Emergency needs of remote or isolated residents for food or fuel, as well as for feed, water and shelter for livestock are unable to be met. The probability of utility and infrastructure failure increases during winter storms due to freezing rain accumulation on utility poles and power lines. People, pets, and livestock are also susceptible to frostbite and hypothermia during winter storms. Those at risk are primarily either engaged in outdoor activity (shoveling snow, digging out vehicles, or assisting stranded motorists), or are the elderly. Schools often close during extreme cold or heavy snow conditions to protect the safety of children and bus drivers. Citizens' use of kerosene heaters

and other alternative forms of heating may create other hazards such as structural fires and carbon monoxide poisoning.

Elderly populations are considered to be at increased risk to Winter Storms and associated extreme cold events. According to the 2019 US Census Bureau American Community Survey estimates, approximately 19.3% of Clinton County's population is over the age of 65. Additionally, the US Department of Health and Human Services estimates that there are 486 electricity-dependent Medicare beneficiaries in the county. These individuals are extremely vulnerable during power outages, which commonly accompany severe winter storm events.

The County has backup power at several facilities that can be used as warming shelters, lowering the vulnerability to this hazard.

Magnitude Score: 2—Limited

Potential Losses to Existing Development

Vulnerable Buildings, Infrastructure, and Critical Facilities

Buildings with overhanging tree limbs are more vulnerable to damage during winter storms. Businesses experience loss of income as a result of closure during power outages. Businesses can experience loss of income as a result of closure during winter storms.

Roads are especially susceptible to the effects of a severe winter storm, which can temporarily hinder transportation and require resources for snow removal. As noted under the people section, heavy snow accumulation may also lead to downed power lines not only causing disruption to customers but also have potentially negative impacts on critical facilities in the county which may have cascading impacts on the local governments' ability to operate. Potential losses would include cost of repair or replacement of damaged facilities and lost economic opportunities for businesses. Secondary effects from loss of power could include burst water pipes in homes without electricity during winter storms. Public safety hazards include risk of electrocution from downed power lines. Specific amounts of estimated losses are not available due to the complexity and multiple variables associated with this hazard.

Loss of Use

Overhead power lines and infrastructure are also vulnerable to damages from winter storms, in particular ice accumulation during winter storm events can cause damages to power lines due to the ice weight on the lines and equipment as well as damage caused to lines and equipment from falling trees and tree limbs weighted down by ice. Potential losses would include cost of repair or replacement of damaged facilities and lost economic opportunities for businesses. Secondary effects from loss of power could include burst water pipes in homes without electricity during winter storms. Public safety hazards include risk of electrocution from downed power lines. Specific amounts of estimated losses are not available due to the complexity and multiple variables associated with this hazard.

The electric power loss of use estimates provided in Table 3-51 below were calculated using FEMA's Standard Values for Loss of Service for Utilities published in the June 2009 BCA Reference Guide. These figures are used to provide estimated costs associated with the loss of power in relation to the populations in Clinton County's jurisdictions. The loss of use estimates for power failure associated with winter storms is provided as the loss of use cost per person, per day of loss. The estimated loss of use provided for each jurisdiction represents the loss of service of the indicated utility for one day for 10 percent of the population. It is understood that in rural areas, the typical loss of use may be for a larger percentage of the population for a longer time during weather extremes. These figures do not take into account physical damages to utility equipment and infrastructure.

Table 3-51 Loss of Use Estimates for Power Failure (10-percent of Population for One Day)

Jurisdiction	2019 Population Estimate	Estimated Affected Population (10%)	Electric Loss of Use Estimate ($126 per person per day)
Andover City, Iowa	127	13	$1,600
Calamus City, Iowa	426	43	$5,368
Camanche City, Iowa	4,334	433	$54,608
Charlotte City, Iowa	323	32	$4,070
Clinton City, Iowa	25,416	2542	$320,242
De Witt City, Iowa	5,203	520	$65,558
Delmar City, Iowa	514	51	$6,476
Goose Lake City, Iowa	207	21	$2,608
Grand Mound City, Iowa	628	63	$7,913
Lost Nation City, Iowa	461	46	$5,809
Low Moor City, Iowa	284	28	$3,578
Toronto City, Iowa	111	11	$1,399
Welton City, Iowa	133	13	$1,676
Wheatland City, Iowa	715	72	$9,009
Clinton County, Iowa	8,027	803	$101,140
Total	**46,909**	**4,866**	**$591,053**

Source: Loss of Use Estimates from FEMA BCA Reference Guide, 2009; Population Estimates, US Census Bureau, 2019 5-year American Community Survey

Property Losses

High snow loads can cause damage to buildings and roofs. Most property damages with winter storms are related to the heavy snow loads and vehicle accidents. Older buildings are more at risk, as are buildings with large flat rooftops (often found in public buildings such as schools). Vulnerability is influenced both by architecture and type of construction material and should be assessed on a building-by-building basis.

The total property loss reported by the NCEI for a total of 102 winter events that impacted the planning area during the 24.5-year time period from 1996 thru June 2021 was $264,000. According to the USDA RMA Indemnity data, insured crop losses due to cold, wet weather, or other causes (including snow) were reported to be $339,024 from 2007 to 2020.

Future Development

Future development could potentially increase vulnerability to this hazard by increasing demand on the utilities and increasing the exposure of infrastructure networks.

Climate Change Impacts

Climate change has the potential to exacerbate the severity and intensity of winter storms, including potential heavy amounts of snow. A warming climate may also result in warmer winters, the benefits of which may include lower winter heating demand, less cold stress on humans and animals, and a longer growing season. However, these benefits are expected to be offset by the negative consequences of warmer summer temperatures.

The effects of a changing climate in Iowa in relation to temperatures and precipitation have already been observed. According to the report Climate Change in the Midwest: A Synthesis Report for the National Climate Assessment3, referenced in the 2018 Iowa State Hazard Mitigation Plan, average winter temperatures in Iowa have trended 0.031 degrees cooler per year from 1981-2010 and winter precipitation averages have increased by 0.031 inches per year over the same time period. These changes in average climate may impact the frequency and severity of winter weather in the coming years.

Severe Winter Storm Hazard Summary by Jurisdiction

Although crop loss as a result of winter storm occurs more in the unincorporated portions of the planning area, the crops losses are not high since corn and soybeans are not in the ground during winter months and only get affected from unusual weather events. The density of vulnerable populations is higher in the cities. Transportation incidents related to winter storm could also impact all jurisdictions. With these vulnerabilities that apply to both urban and rural jurisdictions, the magnitude of this hazard is relatively equal. The factors of probability, warning time, and duration are also equal across the planning area. This hazard does not substantially vary by jurisdiction.

Jurisdiction	Probability	Magnitude	Warning Time	Duration	Score	Level
Unincorporated Clinton County	4	2	3	4	3.25	High
Andover	4	2	3	4	3.25	High
Calamus	4	2	3	4	3.25	High
Camanche	4	2	3	4	3.25	High
Charlotte	4	2	3	4	3.25	High
Clinton	4	2	3	4	3.25	High
Delmar	4	2	3	4	3.25	High
DeWitt	4	2	3	4	3.25	High
Goose Lake	4	2	3	4	3.25	High
Grand Mound	4	2	3	4	3.25	High
Lost Nation	4	2	3	4	3.25	High
Low Moor	4	2	3	4	3.25	High
Toronto	4	2	3	4	3.25	High
Welton	4	2	3	4	3.25	High
Wheatland	4	2	3	4	3.25	High
Calamus-Wheatland School District	4	2	3	4	3.25	High
Camanche School District	4	2	3	4	3.25	High
Central DeWitt School District	4	2	3	4	3.25	High
Clinton School District	4	2	3	4	3.25	High
Delwood School District	4	2	3	4	3.25	High
Northeast School District	4	2	3	4	3.25	High

3.3.16 Sinkholes

Hazard Score Calculation					
Probability	**Magnitude/Severity**	**Warning Time**	**Duration**	**Weighted Score**	**Level**
1	2	4	1	1.75	Low

Description

Sinkholes are common where the rock below the land surface is limestone, carbonate rock, salt beds, or rocks that can naturally be dissolved by ground water circulating through them. As the rock dissolves, void spaces and caverns develop underground. This type of "soluble" rock is called karst. The sudden collapse of the land surface can be dramatic and range in size from broad, regional lowering of the land surface to localized collapse. Although subsidence can be a naturally occurring hazard from a karst landscape, the primary causes of most incidents of subsidence are human activities: underground mining of coal, groundwater or petroleum withdraw, and drainage of organic soils. Land subsidence occurs slowly and continuously over time or on occasion abruptly, as in the sudden formation of sinkholes. Sinkholes can be aggravated by flooding.

Warning Time Score: 4—Minimal or no warning time

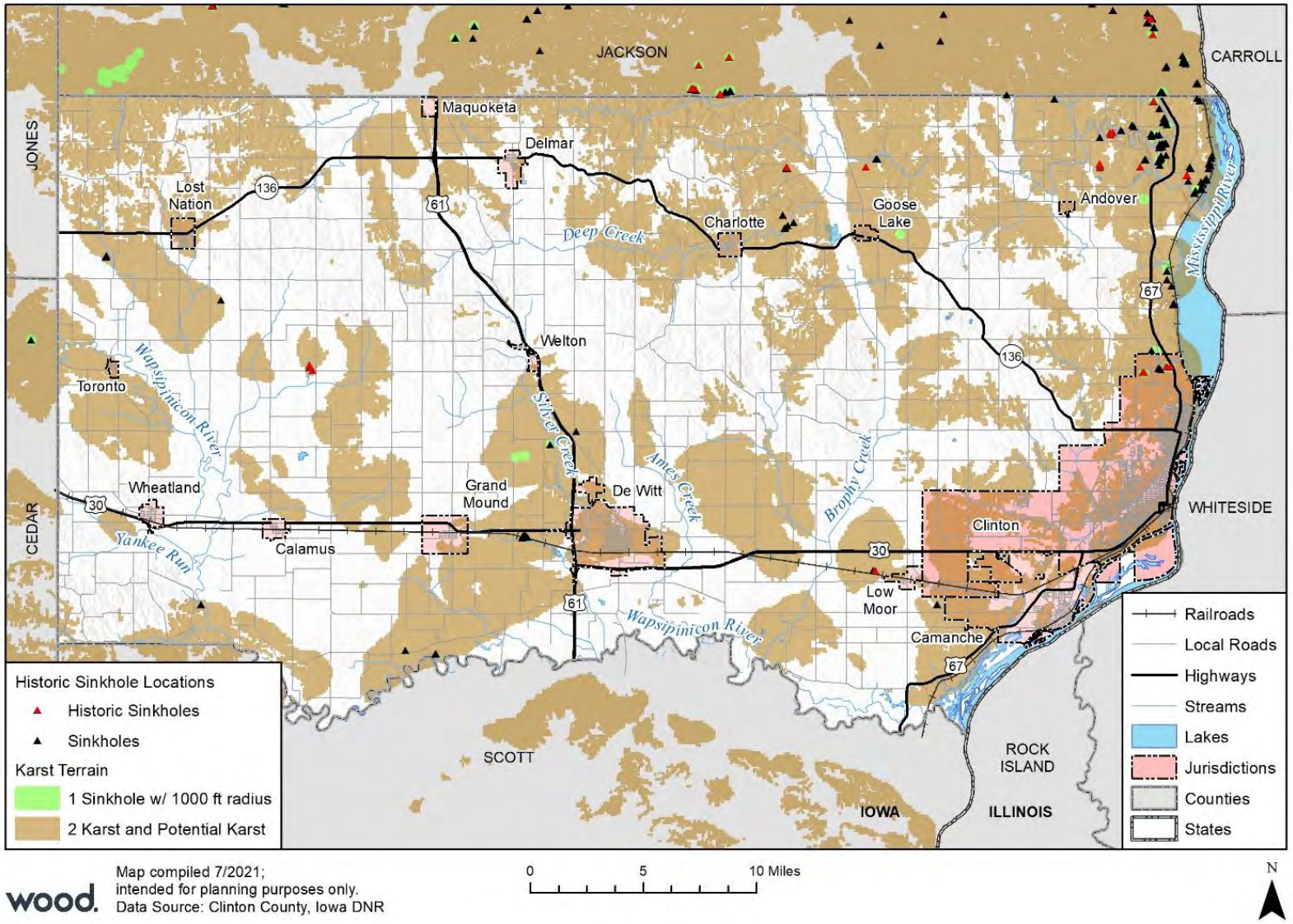
Duration Score: 1—Less than 6 hours

Location

There are three areas in Iowa where large numbers of sinkholes exist: 1) within the outcrop belt of the Ordovician Galena Group carbonates in Allamakee, Clayton, and Winneshiek Counties; 2) in Devonian carbonates in Bremer, Butler, Chickasaw, and particularly Floyd and Mitchell counties; and 3) along the erosional edge of Silurian carbonates in Dubuque and Clayton Counties.

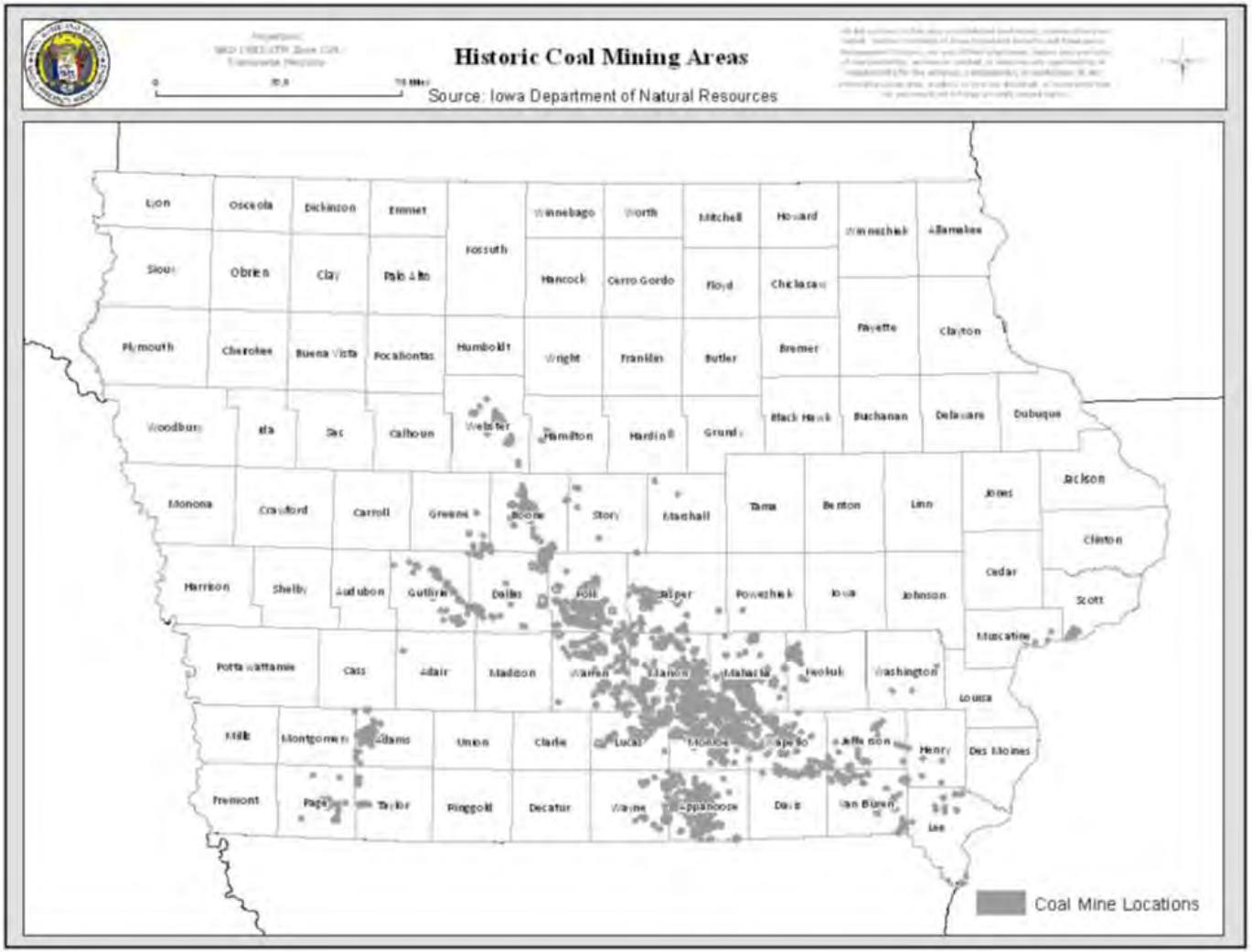
According to the IDNR, Clinton County, has several areas of karst and potential karst. Additionally, there are 25 known sinkholes in Clinton Count with seven being in the City of Clinton. (See Figure 3-56).

Figure 3-56 Clinton County Karst Terrain and Sinkholes.



Although there is potential of subsidence due to karst and potential karst, mining activity in the planning area has been minimal (see Figure 3-57).

Figure 3-57 Historic Mining Areas in Clinton County



Source: IDNR

Historic Occurrences

Research revealed one reported previous occurrence of sinkholes in the planning area. On June 3, 2011, a reported sinkhole in the City of Clinton swallowed a home (See Figure 3-58). According to the news article, "a poorly built foundation, non-compliant with the city's current building, was fingered as one of the causes for the house's collapse."

Figure 3-58 Clinton Iowa Home Damaged by Reported Sinkhole

Source: The Clinton Herald, June 10, 2011, Mark Hagen, Herald Staff Writer,

Probability and Future Occurrences

If current building codes are followed, the occurrence of damages because of known sinkholes should be minimized. There has been one known reported sinkhole event in the planning area. However, there were other contributing factors. Based on just this one reported previous sinkhole event, the probability of future occurrences is Unlikely.

Probability Score: 1—Unlikely

Magnitude and Severity (Extent)

Severity of Impact

If a sinkhole were to form, people and structures located on or near the sinkhole are the most at risk for injury, death, and property damage. Most of the known sinkholes in the planning area occur in rural areas where their main impact is rendering some land unsuitable for row-crop agriculture. There are, however, seven known sinkholes in the City of Clinton. Locations of the sinkholes in the County as well as the City of Clinton should be consulted prior to future development in these known hazard areas.

Damages due to sinkholes are generally isolated and are not usually widespread.

Speed of Onset

Sinkholes can occur with little to no warning, as they are caused by bedrock that is dissolved over time and eventually gives way to the weight on top of it.

Climate Change Considerations

There are no noted trends in climate change that would not have a significant effect on the occurrence of sinkholes.

Vulnerability Assessment

People

Sinkholes can kill and injure people. A person can be harmed when stepping into an existing sinkhole or when the ground beneath gives way during a sinkhole's collapse. GIS analysis was performed by overlaying property data with karst data to determine the number of potential properties and estimated population counts impacted by sinkholes. Table 3-52 in the Property section displays the results of this analysis in detail. In Clinton County, based on the average household size of each jurisdiction, there is an estimated 33,538 people at risk to karst and potential karst features.

Property

A GIS analysis was performed by overlaying property data with karst data to determine the number of potential properties and estimated population counts impacted by sinkholes. Table 3-52 shows these analysis results in detail. In Clinton County, there are a total of 11,500 improved properties and 16,481 buildings at risk to karst and potential karst features.

Table 3-52 Clinton County Improved Properties at Risk to Karst and Potential Karst by Jurisdiction and Property Type

Jurisdiction	Property Type	Improved Parcel Count	Building Count	Population
Andover	Commercial	3	4	
	Exempt	2	2	
	Mixed Use	1	2	6
	Residential	41	57	159
	Total	**47**	**65**	**165**
Camanche	Agricultural	6	12	
	Commercial	26	38	
	Exempt	1	2	
	Industrial	6	19	
	Mixed Use	1	2	5
	Residential	204	425	969
	Total	**244**	**498**	**974**
Charlotte	Agricultural	3	16	
	Commercial	14	14	
	Exempt	8	10	
	Mixed Use	2	2	4
	Residential	129	159	347
	Total	**156**	**201**	**351**
Clinton	Agricultural	13	29	
	Commercial	535	651	

Jurisdiction	Property Type	Improved Parcel Count	Building Count	Population
	Industrial	34	102	
	Mixed Use	70	73	175
	Residential	6,102	7,348	17,635
	Total	**6,754**	**8,203**	**17,810**
Delmar	Commercial	10	11	
	Exempt	4	4	
	Mixed Use	1	1	3
	Residential	41	57	143
	Total	**56**	**73**	**146**
DeWitt	Agricultural	1	1	
	Commercial	176	216	
	Exempt	47	79	
	Industrial	7	9	
	Mixed Use	23	25	67
	Residential	1,623	1,788	4,774
	Total	**1,877**	**2,118**	**4,841**
Goose Lake	Agricultural	1	1	
	Commercial	11	11	
	Exempt	6	13	
	Mixed Use	1	1	2
	Residential	95	112	271
	Total	**114**	**138**	**273**
Grand Mound	Commercial	8	9	
	Total	**8**	**9**	**0**
Lost Nation	Agricultural	7	9	
	Commercial	28	28	
	Exempt	13	15	
	Mixed Use	6	6	13
	Residential	182	218	480
	Total	**236**	**276**	**493**
Low Moor	Commercial	1	1	
	Residential	9	13	35
	Total	**10**	**14**	**35**
Toronto	Agricultural	2	2	
	Commercial	3	3	
	Exempt	3	4	
	Mixed Use	1	1	2

Jurisdiction	Property Type	Improved Parcel Count	Building Count	Population
	Residential	56	69	148
	Total	**65**	**79**	**150**
Unincorporated	Agricultural	368	739	
	Commercial	36	61	
	Exempt	11	20	
	Industrial	4	15	
	Residential	1,514	3,972	8,301
	Total	**1,933**	**4,807**	**8,301**
Grand Total		**11,500**	**16,481**	**33,538**

Sources: Clinton County Assessor's GIS Office, IDNR - NRGIS, Wood Analysis

Critical Facilities and Infrastructure

A GIS analysis was done using critical facility data provided by Clinton County overlaid with karst data for Clinton County to determine critical facilities at risk to karst and potential karst features. The results of this analysis are shown in Table 3-53. There are a total of two critical facilities at risk to damage from sinkholes in Clinton County.

Table 3-53 Critical Facilities within the Sinkhole Hazard Area by Jurisdiction

Jurisdiction	Communications	Energy	Food, Water, Shelter	Hazardous Material	Health and Medical	Safety and Security	Transportation	Total
Clinton	-	-	-	-	-	-	2	**2**
Unincorporated	-	-	-	-	-	-	2	**2**
Total	**0**	**0**	**0**	**0**	**0**	**0**	**4**	**4**

Source: Wood analysis of Clinton County, IDNR, National Bridge Inventory, HIFLD, HSIP data

Economy

Economic damages from sinkholes would most likely impact structures located on or near the sinkhole. Most of the known sinkholes in the planning area occur in rural areas where their main impact is rendering some land unsuitable for row-crop agriculture. There are, however, seven known sinkholes in the City of Clinton. Locations of the sinkholes in the County as well as the City of Clinton should be considered prior to future development in these known hazard areas.

Historic, Cultural and Natural Resources

There are no known historic or cultural resources at risk to damage from sinkholes.

Future Development

Future development in areas with known sinkholes and karst and potential karst areas will increase vulnerability to this hazard. The only known sinkhole damage in Clinton occurred to building with a foundation that was not compliant with the city's current building codes. Enforcing current building codes on future development can minimize damages caused by known sinkholes.

Sinkhole Hazard Summary by Jurisdiction

Sinkhole Hazard Summary by Jurisdiction						
Jurisdiction	**Probability**	**Magnitude**	**Warning Time**	**Duration**	**Score**	**Level**
Unincorporated Clinton County	1	2	4	1	1.75	Low
Andover	1	2	4	1	1.75	Low
Calamus	1	2	4	1	1.75	Low
Camanche	1	2	4	1	1.75	Low
Charlotte	1	2	4	1	1.75	Low
Clinton	1	2	4	1	1.75	Low
Delmar	1	2	4	1	1.75	Low
DeWitt	1	2	4	1	1.75	Low
Goose Lake	1	2	4	1	1.75	Low
Grand Mound	1	2	4	1	1.75	Low
Lost Nation	1	2	4	1	1.75	Low
Low Moor	1	2	4	1	1.75	Low
Toronto	1	2	4	1	1.75	Low
Welton	1	2	4	1	1.75	Low
Wheatland	1	2	4	1	1.75	Low
Calamus-Wheatland School District	1	2	4	1	1.75	Low
Camanche School District	1	2	4	1	1.75	Low
Central DeWitt School District	1	2	4	1	1.75	Low
Clinton School District	1	2	4	1	1.75	Low
Delwood School District	1	2	4	1	1.75	Low
Northeast School District	1	2	4	1	1.75	Low

3.3.17 Terrorism

Hazard Score Calculation					
Probability	**Magnitude/Severity**	**Warning Time**	**Duration**	**Weighted Score**	**Level**
1	4	4	4	2.65	Moderate

Profile

Hazard Description

This hazard encompasses the following sub-hazards: enemy attack, biological terrorism, agro-terrorism, chemical terrorism, conventional terrorism, cyber terrorism, radiological terrorism, and public disorder. These hazards can occur anywhere and demonstrate unlawful force, violence, and/or threat against persons or property causing intentional harm for purposes of intimidation, coercion, or ransom in violation of the criminal laws of the United States. These actions may cause massive destruction and/or extensive casualties. The threat of terrorism, both international and domestic, is ever present, and an attack can occur when least expected.

Enemy attack is an incident that could cause massive destruction and extensive casualties throughout the world. Some areas could experience direct weapons' effects: blast and heat; others could experience indirect weapons' effect. International political and military activities of other nations are closely monitored by our federal government and the State of Iowa would be notified of any escalating military threats.

The use of biological agents against persons or property in violation of the criminal laws of the United States for purposes of intimidation, coercion or ransom can be described as biological terrorism. Liquid or solid contaminants can be dispersed using sprayers/aerosol generators or by point of line sources such as munitions, covert deposits and moving sprayers. Biological agents vary in the amount of time they pose a threat. They can be a threat for hours to years depending upon the agent and the conditions in which it exists.

Agro-terrorism consists of acts to intentionally contaminate, ruin, or otherwise make agricultural products unfit or dangerous for consumption or further use. Agriculture is an important industry in Iowa and Clinton County. The introduction of a biological agent into the population of 70,000 cattle and calves, or the 56,615 hogs and pigs, or the 190,000 acres of corn in Clinton County would be financially devastating and would have a major impact on the food supply of the state and the nation. A major attack involving the nation's food supply could be launched in a rural area that has little capacity to respond. Potential terrorists' targets for livestock disease introduction would be concentration points, such as the County's licensed feedlots or livestock markets discussed later in the Geographic Location section.

Chemical terrorism involves the use or threat of chemical agents against persons or property in violation of the criminal laws of the United States for purposes of intimidation, coercion, or ransom.

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

Radiological terrorism is the use of radiological materials against persons or property in violation of the criminal laws of the United States for purposes of intimidation, coercion, or ransom. Radioactive contaminants can be dispersed using sprayers/aerosol generators, or by point of line sources such as

munitions, covert deposits and moving sprayers or by the detonation of a nuclear device underground, at the surface, in the air or at high altitude.

Mass demonstrations, or direct conflict by large groups of citizens, as in marches, protect rallies, riots, and non-peaceful strikes are examples of public disorder. These are assembling of people together in a manner to substantially interfere with public peace to constitute a threat, and with use of unlawful force or violence against another person, or causing property damage or attempting to interfere with, disrupting, or destroying the government, political subdivision, or group of people. Labor strikes and work stoppages are not considered in this hazard unless they escalate into a threat to the community. Vandalism is usually initiated by a small number of individuals and limited to a small target or institution. Most events are within the capacity of local law enforcement.

Electronic attack using one computer system against another to intimidate people or disrupt other systems is a cyber attack. Cyber attacks are discussed separately in Section 3.5.2.

The Southern Poverty Law Center reported in 2014 there were five active hate groups in Iowa: one racist skinhead group (Aryan Strike force), three Ku Klux Klan groups (Fraternal White Knights of the Ku Klux Klan [KKK], Loyal White Knights of the KKK, and New Empire Knights of the KKK) and one Neo-Nazi group (National Socialist Movement).

Warning Time Score: 4—Minimal or no warning

Duration Score: 4—More than 1 week

Geographic Location/Extent

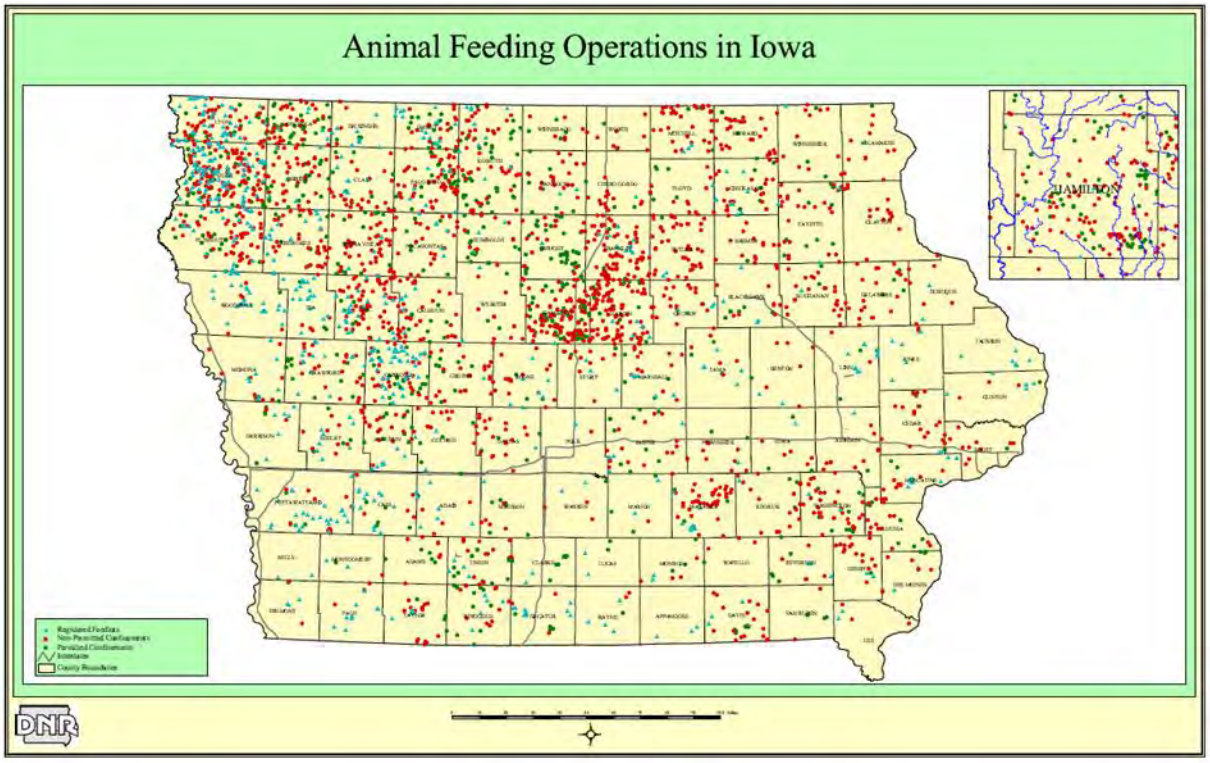
According to the FBI, the most common targets of terrorist attacks in the US are:

- Businesses: 27%
- Government: 17%
- Private Citizens & Property: 13%
- Abortion-related: 9%
- Military: 6%
- Police: 6%
- Religious: 5%

The entire planning area has a low potential for terrorist activity. However, any venue with a large gathering of people could be a potential target for terrorists. The most likely targets of a conventional terrorism attack in Clinton County include public school system facilities the Clinton County Courthouse and law enforcement centers within Clinton County.

For agro-terrorism planning, Figure 3-59 shows the locations of animal feeding operations in Clinton County. Additional agricultural assets are discussed in Section 3.5.1, Animal/Plant/Crop Disease.

Figure 3-59 Animal Feeding Operations in Iowa

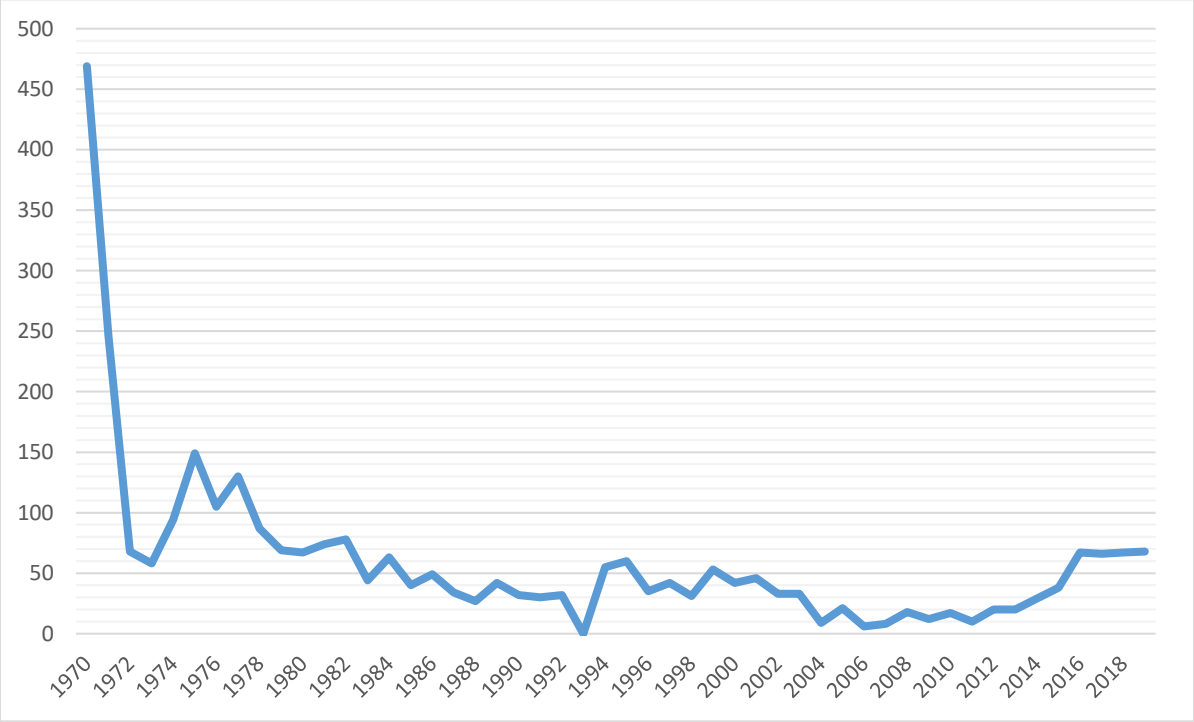


Previous Occurrences

The Global Terrorism Database (GTD) catalogs more than 200,000 terrorist attacks dating back to 1970. As shown in Figure 3-60, GTD data shows that despite public perception the number of terrorist attacks on US soil decreased for most of past 50 years. From an average of 148 incidents per year in the 1970s, the frequency of attacks had declined to less than 23 per year in the 2000s. An increase in attacks starting around 2014 has brought that average back-up to 43 incidents per year for 2011 through 2019 (the most recent year the GTD has analyzed), the highest since the 1980s.

In most years, the number of people killed or injured by terrorists on American soil is fairly low, with a median of 25 casualties per year. (The average is significantly higher due to a handful of high-casualty incidents such at the 9-11 attacks.) According to the GTD data, there have only been 11 years since 1970 where 100 or more Americans were killed or injured in terrorist attacks; however, six of those years have been in the last 10 years.

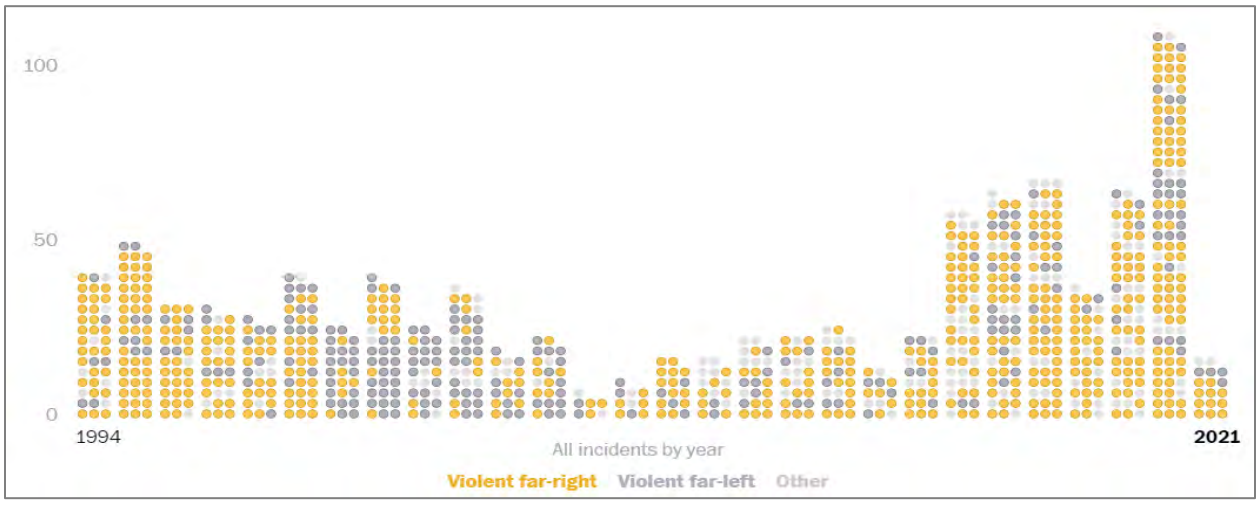
Figure 3-60 Terrorist Attacks in The US 1970-2019



Source: GTD, https://www.start.umd.edu/gtd/

The increase in attacks over the last decade has been driven almost entirely by domestic terrorism, not international terrorism. A recent report by the Center for Strategic & International Studies records 980 domestic terrorist attacks in the US since 1994, with sharp growth over the last 10-15 years. Figure 3-61 shows a breakdown of terrorist attacks based on the ideology of the attacker.

Figure 3-61 Domestic Terrorist Attacks in The US 1994-2021



Source: Center for Strategic & International Studies

There have not been any large-scale enemy attacks or acts of radiological terrorism in Iowa. There have been biological and chemical agent threats, animal rights activists' vandalism and many bomb threats. In 2002, pipe bombs were found in 18 states including Iowa and six people were injured in the bombings in Iowa and Illinois. In 2005 and 2006, pipe bombs were used in attempted murder cases in two Iowa cities.

The Iowa Department of Public Safety issued a 2009 Iowa Uniform Crime Report showing 18 hate/bias crimes were reported statewide in 2009, with an average of 33 hate/bias crimes statewide from 2000-2009.

According to the Southern Poverty Law Center, there have not been any hate crimes incidents reported in Clinton County.

Probability of Future Occurrence

While difficult to estimate, the probability for a terrorist event is "Unlikely" within the next 10 years in Clinton County.

Probability Score: 1—Unlikely

Vulnerability

Overview

A terrorism event could occur in either limited area of a jurisdiction or over the entire jurisdiction at once. This hazard can directly cause substantial structural losses and potentially loss of life.

Magnitude Score: 4—Catastrophic

Potential Losses to Existing Development

Potential losses from Terrorism include all infrastructure, critical facilities, crops, humans, and animals. The degree of impact would be directly related to the type of incident and the target. Potential losses could include cost of repair or replacement of damaged facilities, lost economic opportunities for businesses, loss of human life, injuries to persons, loss of food supplies, disruption of the food supply chain, and immediate damage to the surrounding environment. Secondary effects of infrastructure failure could include public safety hazards, spread of disease, increased morbidity and mortality among the local and distant populations, public panic, and long-lasting damage to the environment. Terrorism events are rare occurrences and specific amounts of estimated losses for previous occurrences are not available due to the complexity and multiple variables associated with these types of hazards. In some instances, information about these events is secure and unavailable to the public to maintain national security and prevent future attacks.

As discussed previously, it is difficult to quantify potential losses in terms of the jurisdictions most threatened by CBRNE (chemical, biological, radiological, nuclear, and high yield explosive) attack events due to the many variables and human element. Therefore, for the purposes of this plan, the loss estimates will consider a hypothetical scenario. The attack scenario is staged at a Friday night high school football game. The hypothetical football stadium has approximately 500 persons in the stadium and concession areas on any home football game nights during the fall.

Analysis of vulnerable populations is aided by a program developed by Johns Hopkins University in 2006 called Electronic Mass Casualty Assessment and Planning Scenarios (EMCAPS) http://www.hopkins-cepar.org/EMCAPS/EMCAPS.html which utilizes scenarios developed by the DHSEM.

*******THE FOLLOWING HYPOTHETICAL SCENARIO IS FOR INSTRUCTIONAL AND ILLUSTRATIVE PURPOSES ONLY*******

Chemical Attack – Toxic Gas – Chlorine Release

Scenario Overview: A bomb is attached to a truck trailer tanker carrying compressed chlorine and enters the high school football stadium parking lot. The entire contents of the tank escape to the atmosphere and the plume spreads to the stadium and the immediate surrounding parking lot area. This particular type of attack would cause harm to humans and could render portions of the stadium unusable for a short time period in order to allow for a costly cleanup. There might also be a fear by the public of long-term contamination of the stadium and the high school subsequent closing the high school.

Assumptions: (1) The population density is approximately 500 persons around the high school stadium (2) Chlorine is toxic and may damage eyes, skin, and respiratory tract. (3) The rate of "worried well" is equal to nine times the number of infected cases or the full exposed population, whichever is least.

Table 3-54 Described Losses from a Chemical Attack – Chlorine Scenario

Eye pain & swelling, headache, restricted airflow – difficulty breathing, possible chemical burns	22 persons
Eye pain & swelling, headache, rapid breathing, skin irritation	42 persons
Eye pain & swelling, headache, rapid breathing, coughing, chest pain, skin irritation	86 persons
Eye irritation, headache, throat irritation, coughing, skin irritation	119 persons
Eye irritation, headache, coughing, skin irritation	82 persons
Total "Worried Well" Cases (total exposed population)	500 persons
Deaths	16 persons
Cost of Decontamination @ $12/person (assumes all persons with skin injuries will require decontamination and approximately 1/10 of the worried well will demand to be decontaminated) - total persons =417	$5,004

Notes: Victims will require decontamination and both long- and short-term treatment.

Improvised Explosive Device Attack – ANFO

Scenario Overview: An Improvised Explosive Device (IED) utilizing an ammonium nitrate/fuel oil (ANFO) mixture is carried in a panel van to a high school parking area at the beginning of a home football game when people are leaving their cars and entering the stadium. Potential losses with this type of scenario include both human and structural assets.

Assumptions: (1) The population density in the parking lot during the beginning and ending of the game is high, at least one person /1 square feet. (2) The quantity of ANFO used is 500 lbs.

Table 3-55 Described Losses from an Improvised Explosive Device Attack - ANFO

Total Dead	86 persons
Total Traumatic Injuries	151 persons
Total Urgent Care Injuries	745 persons

Injuries not Requiring Hospitalization	279 persons
Structures and Other Physical Assets (Damages would certainly occur to vehicles and depending on the proximity of other structures, damages would occur to the stadium complex itself. The exact amount of these damages is difficult to predict because of the large numbers of factors, including the type of structures nearby and the amount of insurance held by vehicle owners)	Vehicles – Replacement cost for approximately 350 vehicles @ $10,000 per vehicle inside the 200 ft. Lethal Air Blast range = $ 3,500,000 Repair / repainting cost for approximately 70 vehicles @ $ 4,000 per vehicle inside the Falling Debris Hazard range = $280,000

Note: These are the numbers of persons that could be injured from an IED Attack if they are in the area.

Future Development

As public events are held at various venues in the County, the potential may exist for these locations to become targets of attack. With human-caused hazards such as this that can have multiple variables involved, increases in development is not always a factor in determining risk, although the physical damages of the event may increase with the increased or newly developed areas.

Climate Change Impacts

There are no known climate change impacts relevant to this hazard.

Terrorism Hazard Summary by Jurisdiction

The overall rating for any type of terrorism in the County is 2.65 "Moderate". This rating score applies to all jurisdictions in the planning area due to the variables and unknowns involved in terrorism events. If a wide-scale event occurred in any jurisdiction, it could have devastating consequences.

Jurisdiction	Probability	Magnitude	Warning Time	Duration	Score	Level
Unincorporated Clinton County	1	4	4	4	2.65	Moderate
Andover	1	4	4	4	2.65	Moderate
Calamus	1	4	4	4	2.65	Moderate
Camanche	1	4	4	4	2.65	Moderate
Charlotte	1	4	4	4	2.65	Moderate
Clinton	1	4	4	4	2.65	Moderate
Delmar	1	4	4	4	2.65	Moderate
DeWitt	1	4	4	4	2.65	Moderate
Goose Lake	1	4	4	4	2.65	Moderate
Grand Mound	1	4	4	4	2.65	Moderate
Lost Nation	1	4	4	4	2.65	Moderate
Low Moor	1	4	4	4	2.65	Moderate
Toronto	1	4	4	4	2.65	Moderate
Welton	1	4	4	4	2.65	Moderate
Wheatland	1	4	4	4	2.65	Moderate
Calamus-Wheatland School District	1	4	4	4	2.65	Moderate
Camanche School District	1	4	4	4	2.65	Moderate

Jurisdiction	Probability	Magnitude	Warning Time	Duration	Score	Level
Central DeWitt School District	1	4	4	4	2.65	Moderate
Clinton School District	1	4	4	4	2.65	Moderate
Delwood School District	1	4	4	4	2.65	Moderate
Northeast School District	1	4	4	4	2.65	Moderate

3.3.18 Thunderstorm with Lightning and Hail

Hazard Score Calculation					
Probability	**Magnitude/Severity**	**Warning Time**	**Duration**	**Weighted Score**	**Level**
4	2	3	1	2.95	Moderate

Profile

Hazard Description

A thunderstorm is defined as a storm that contains lightning and thunder which is caused by unstable atmospheric conditions. When the colder upper air sinks and warm moist air rises, storm clouds or 'thunderheads' develop, resulting in thunderstorms. This can occur singularly, in clusters or in lines. Severe thunderstorms most often occur in Iowa in the spring and summer, during the afternoon and evenings, but can occur at any time. Thunderstorms can result in heavy rains, high winds, tornadoes, and hail.

The NWS considers a thunderstorm severe if it produces hail at least ¾ inch in diameter, wind 58 mph or higher, or tornadoes. High straight-line winds, which can often exceed 60 mph, are common occurrences and are often mistaken for tornadoes. Hail is produced by many strong thunderstorms. Strong rising currents of air within a storm will carry water droplets to a height where freezing occurs. The size of hail ranges from 0.75 inches in diameter to 2.75 inches. 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.

Lightning

All thunderstorms produce lightning, which often strikes outside of the area where it is raining and is known to fall more than 10 miles away from the rainfall area. Thunder is simply the sound that lightning makes. 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 creates thunder. According to the NWS, lightning kills on average 49 people per year in the United States. Lightning strikes can also start building fires, wildland fires, and damage electrical systems and equipment.

Hail

According to the NOAA, hail is precipitation that is formed when updrafts in thunderstorms carry raindrops upward into extremely cold areas of the atmosphere causing them to freeze. The raindrops form into small frozen droplets and then continue to grow as they come into contact with super-cooled water which will freeze on contact with the frozen rain droplet. This frozen rain droplet can continue to grow and form hail. As long as the updraft forces can support or suspend the weight of the hailstone, hail can continue to grow.

At the time when the updraft can no longer support the hailstone, it will fall to the earth. For example, a ¼" diameter or pea sized hail requires updrafts of 24 mph, while a 2 ¾" diameter or baseball sized hail requires an updraft of 81 mph. The largest hailstone recorded in the United States was found in Vivian, South Dakota on July 23, 2010, measuring eight inches in diameter, almost the size of a soccer ball. Soccer-ball-sized hail is the exception, but even small pea sized hail can do damage.

Hailstorms in Iowa cause damage to property, crops, and the environment and kill and injure livestock. In the United States, hail causes more than $1 billion in damage to property and crops each year. Much of the damage inflicted by hail is to crops. Even relatively small hail can shred plants to ribbons in a matter of

minutes. Vehicles, roofs of buildings and homes, and landscaping are the other things most damaged by hail. Hail has been known to cause injury to humans, occasionally, these injuries can be fatal.

Based on information provided by the Tornado and Storm Research Organization, Table 3-56 below describes typical damage impacts of the various sizes of hail.

Table 3-56 Tornado and Storm Research Organization Hailstorm Intensity Scale

Intensity Category	Diameter (mm)	Diameter (inches)	Size Description	Typical Damage Impacts
Hard Hail	5-9	0.2-0.4	Pea	No damage
Potentially Damaging	10-15	0.4-0.6	Mothball	Slight general damage to plants, crops
Significant	16-20	0.6-0.8	Marble, grape	Significant damage to fruit, crops, vegetation
Severe	21-30	0.8-1.2	Walnut	Severe damage to fruit and crops, damage to glass and plastic structures, paint and wood scored
Severe	31-40	1.2-1.6	Pigeon's egg > squash ball	Widespread glass damage, vehicle bodywork damage
Destructive	41-50	1.6-2.0	Golf ball > Pullet's egg	Wholesale destruction of glass, damage to tiled roofs, significant risk of injuries
Destructive	51-60	2.0-2.4	Hen's egg	Bodywork of grounded aircraft dented, brick walls pitted
Destructive	61-75	2.4-3.0	Tennis ball > cricket ball	Severe roof damage, risk of serious injuries
Destructive	76-90	3.0-3.5	Large orange > Soft ball	Severe damage to aircraft bodywork
Super Hailstorms	91-100	3.6-3.9	Grapefruit	Extensive structural damage. Risk of severe or even fatal injuries to persons caught in the open
Super Hailstorms	>100	4.0+	Melon	Extensive structural damage. Risk of severe or even fatal injuries to persons caught in the open

Source: Tornado and Storm Research Organization (TORRO), Department of Geography, Oxford Brookes University
Notes: In addition to hail diameter, factors including number and density of hailstones, hail fall speed and surface wind speeds affect severity.

The onset of thunderstorms with lightning and hail is generally rapid. However, advancements in meteorological forecasting allow for some advance warning.

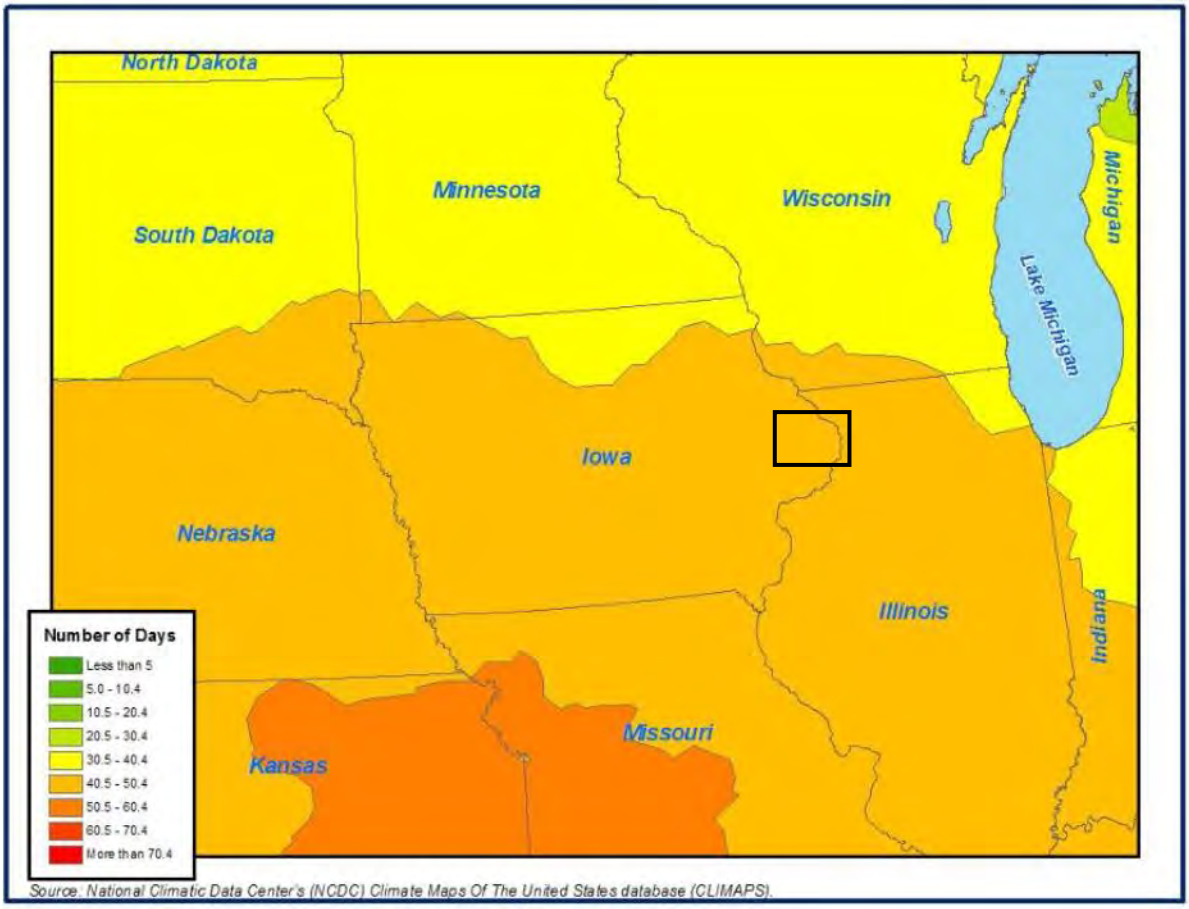
Warning Time Score: 3—6-12 hours

Duration Score: 1—Less than 6 hours

Geographic Location/Extent

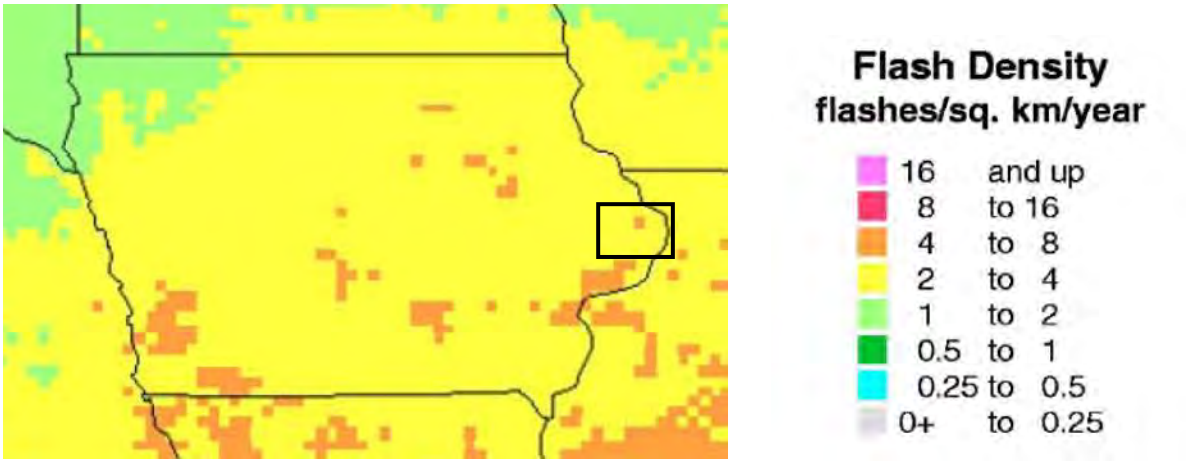
Thunderstorms and the associated hail and lightning impact the entire County with relatively similar frequency. Although, these events occur similarly throughout the planning area, they are more frequently reported in more urbanized areas. In addition, damages are more likely to occur in more densely developed urban areas as well as to cropland. Figure 3-62 displays the average number of days with thunder experienced throughout different areas of Iowa each year, showing the County experiences between 40.5 to 50.4 days with thunder per year. Figure 3-63 shows 2 to 4 lightning strikes per square kilometer per year with predominantly yellow shaded areas covering the planning area.

Figure 3-62 Distribution and Frequency of Thunderstorms



Note: Black Square indicates approximate location of Clinton County

Figure 3-63 Location and Frequency of Lightning in Iowa



Source: NWS, www.lightningsafety.noaa.gov/lightning_map.htm
Note: Black Square indicates approximate location of Clinton County

Previous Occurrences

Since 1970, Clinton County has been included in 14 presidential disaster declarations that included severe storms/weather, listed below in Table 3-57. Some of the damages that resulted in the declarations were from tornadoes and flooding that accompanied the severe weather.

Table 3-57 Presidential Disaster Declarations for Severe Storms that included Clinton County (1970-2021)

Number	Declared	Incident Period	Description
4557	8/17/2020	8/10/2020	Severe Storms
4421	3/23/2019	3/12/2019 to present	Severe Storms and Flooding
1930	7/29/2010	6/1 to 8/31/2010	Severe Storms, Flooding and Tornadoes
1763	5/27/2008	5/25 to 8/13/2008	Severe Storms, Tornadoes and Flooding
1518	5/25/2004	5/19 to 6/24/2004	Severe Storms, Tornadoes, and Flooding
1420	6/19/2002	6/3 to 6/25/2002	Severe Storms and Flooding
1367	5/2/2001	4/8 to 5/29/2001	Severe Storms and Flooding
1277	5/21/1999	5/16 to 5/29/1999	Severe Storms, Flooding, and Tornadoes
1230	7/2/1998	6/13 to 7/15/1998	Severe Weather, Tornadoes and Flooding
996	7/9/1993	4/13 to 10/1/1993	Flooding, Severe Storm
879	9/6/1990	7/25 to 8/31/1990	Flooding, Severe Storm
868	5/26/1990	5/18 to 7/6/1990	Flooding, Severe Storm
443	6/24/1974	6/24/1974	Flooding, Severe Storm
386	5/23/1973	5/23/1973	Severe Storms, Flooding

Source: FEMA

The NCEI reported 135 total hail and lightning events for the Clinton County planning area over the 70-year period since 1950. The hail events search was limited to hail size of at least 0.75 inches in diameter. Of the reported events, there was $1,020,000 in total property damage, $318,000 in crop losses, and no reported injuries or fatalities.

Table 3-58 Thunderstorm Summary for Clinton County (1993-2020)

Event Type	Number of Events	Property Damages
Hail	129	$996,000
Lightning	6	$24,000
Grand Total	**230**	**$1,020,000**

Source: NCEI

Figure 3-64 below displays the locations of several other hail events that have been observed in Clinton County since 1950. Figure 3-65 shows the size of hail from a significant event that occurred July 13, 2015 in Calamus. According to the HMPC, another notable event occurred on May 16, 2019. The Davenport NWS saw radar indications of tennis ball sized hail between Toronto and Welton on 190th Street. Clinton County residents posted pictured on the EMA Facebook page showing large hail varying from pea size to golf ball size in some areas. No major damage reports were received.

Figure 3-64 Clinton County Hail Events, 1950-2019

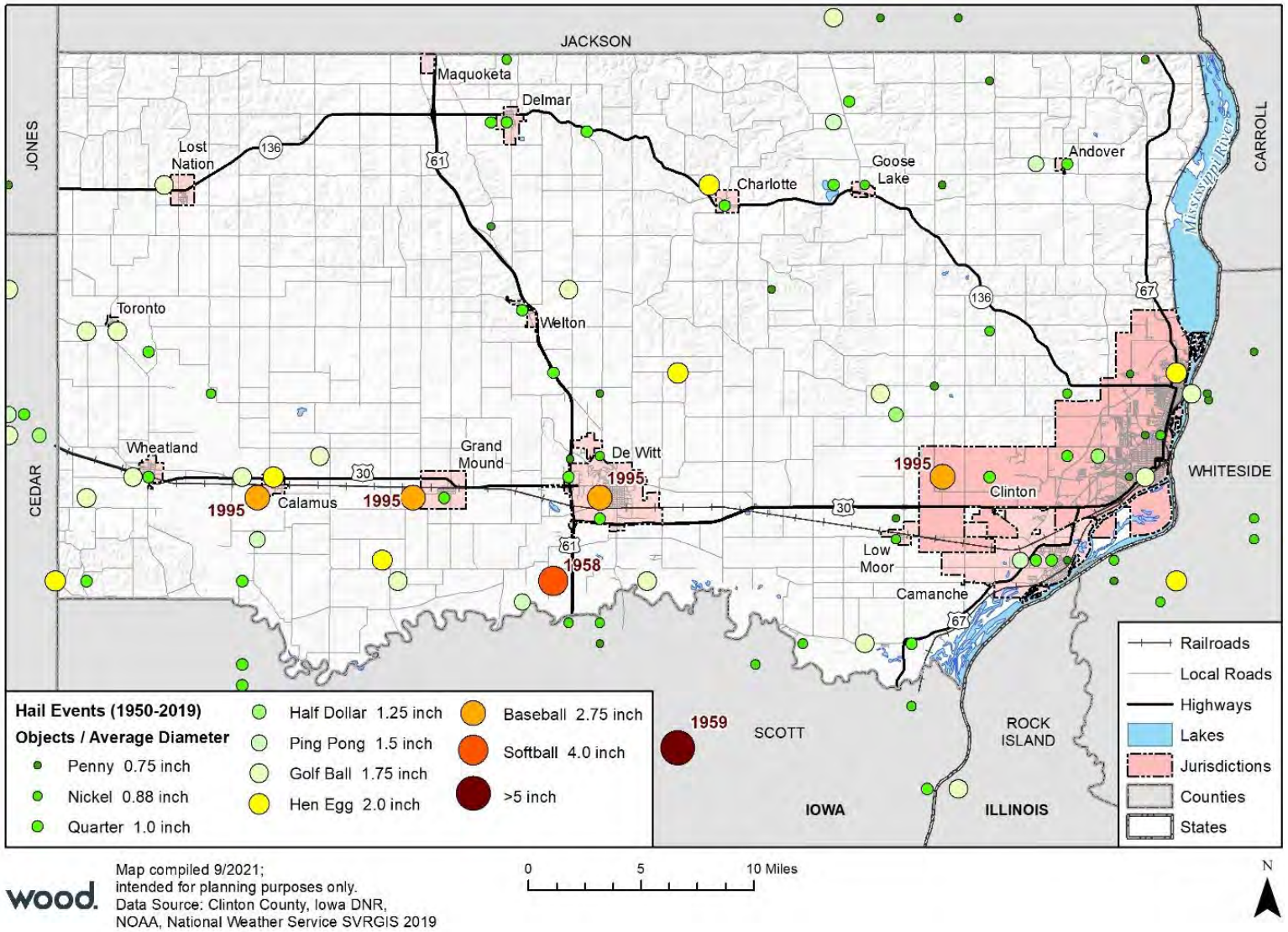


Figure 3-65 July 13, 2015 Hail Event, Calamus

Source: Clinton County Emergency Management

Probability of Future Occurrence

Thunderstorms occur annually throughout the planning area, many times each year. The NWS issues an average of nine Severe Thunderstorm Watches and 16-17 Severe Thunderstorm Warnings per year. This rate indicates that thunderstorms are certain to occur every year. However, the probability of events which cause significant damage, monetary losses, or death or injury is not necessarily as high.

NCEI reported no damaging lightning events. Since lightning accompanies thunderstorms, it can be assumed that lightning occurs more often than being reported. These rates of occurrence are expected to continue in the future.

Based on NCEI data, there have been 129 hail events reported producing hail 0.75 inches and larger in a 70-year period, producing an average of just under two hail events each year in Clinton County. Some of these 129 instances include multiple reports of differing sized hail observed in separate municipalities but generated by the same storm event. When limiting the probability analysis to hail events producing hail 1.75 inches and larger, there have 33 events in a 65-year period. Based on this history, the probability of a destructive hail event in any given year is 50 percent. Based on this history, there can be a severe hail event every year making the probability for damaging hail "highly likely" in any given year. When considering the frequencies of severe thunderstorms, as mentioned above, there are an average of 16-17 per year, meaning a severe thunderstorm occurring in a given year is certain.

Probability Score: 4—Highly Likely

Vulnerability

Overview

In general, assets in the County are vulnerable to thunderstorms, winds, lightning, and hail including people, crops, vehicles, and built structures. Although this hazard results in high annual losses, generally private property insurance and crop insurance cover the majority of losses. Considering insurance coverage as a recovery capability and therefore mitigation of devastating impacts to the economy, the overall impact on jurisdictions is reduced; therefore, this hazard's magnitude score to the planning area is "limited".

Magnitude Score: 2—Limited

Potential Losses to Existing Development

Most lightning damages occur to electronic equipment located inside buildings. But structural damage can also occur when a lightning strike causes a building fire. In addition, lightning strikes can cause damages to crops if fields light on fire. Communications equipment and warning transmitters and receivers can also be knocked out by lightning strikes. There have not been any fatalities in Clinton County from lightning strikes.

Thunderstorm winds and hail can cause damage to property, vehicles, trees, and crops.

Property and Crop Losses

Table 3-59 provides the estimated annualized property damages resulting from Thunderstorms, including hail. Damages resulting from "thunderstorm winds" are profiled under the Tornado/Windstorm section. This annualized damage has been compared to the total building exposure for Clinton County and the level of damage is minimal compared to the value of building exposure. Building Exposure values are based on parcel data provided by the Clinton County GIS Department.

Table 3-59 Estimated Annualized Property Damages Resulting from Severe Thunderstorms (Hail/Lightning, 1994-2020)

Building Exposure	Hail/Lightning Property Damages		Annualized Property Damages
	Hail	$996,000	
$4,805,017,779	Lightning	$24,000	$39,231
	Total	$1,020,000	

Source: Building Exposure, Clinton County Assessor's Office; Hail and Lightning Property Damage from NCEI records

Table 3-60 provides the insured crop losses for resulting from hail. The insured loss is taken from the USDA RMA's crop loss data.

Table 3-60 Estimated Insurable Annualized Crop Damages Resulting from Severe Thunderstorms (Hail)

Market Value of Products Sold (2017)	Insurance Paid (2007-2020)
$339,813,000	Hail -$1,596,943

Source: Insurance paid is from USDA's RMA; Market Value of Products sold in Clinton CO is from USDA's Census of Agriculture (2017).

Future Development

As mentioned above, occurrences of thunderstorms with hail and lightning occur at similar rates throughout the planning area, however they are most often reported in more urban areas due to the increased damage that is caused in these areas. Any additional future development will result in more property being vulnerable to damages from severe thunderstorms, lightning, and hail. To minimize vulnerability, protective measures could be implemented such as wind-resistant construction, lightning rods, surge protection, and use of materials less prone to hail/wind damage.

Climate Change Impacts

According to the IDNR, the effects of climate change have already been felt in Iowa. Several of the climatic changes related to extreme heat which have been noted by the DNR are:

- Long-term winter temperatures have increased six times more than summer temperatures.

- Nighttime temperatures have increased more than daytime temperatures since 1970.
- Iowa's humidity has risen substantially, especially in summer, which now has 13 percent more atmospheric moisture than 35 years ago as indicated by a 3 – 5-degree Fahrenheit rise in dew-point temperature. This fuels convective thunderstorms that provide more summer precipitation.

According to the 2010 Climate Change Impacts on Iowa report, growing evidence points to stronger summer storm systems in the Midwest. Studies have not been done to conclusively say that severe storms, including hail, lightning, and strong winds, are increasing. However, with summer temperatures becoming warmer and humidity levels increasing, an increase in the likelihood of these hazards is plausible.

Thunderstorm, Lightning and Hail Hazard Summary by Jurisdiction

The following hazard summary table shows that this hazard does not vary significantly by jurisdiction. Although structural property damages are higher in the urban areas, the rural areas have higher damages to agriculture.

Jurisdiction	Probability	Magnitude	Warning Time	Duration	Score	Level
Unincorporated Clinton County	4	2	3	1	2.95	Moderate
Andover	4	2	3	1	2.95	Moderate
Calamus	4	2	3	1	2.95	Moderate
Camanche	4	2	3	1	2.95	Moderate
Charlotte	4	2	3	1	2.95	Moderate
Clinton	4	2	3	1	2.95	Moderate
Delmar	4	2	3	1	2.95	Moderate
DeWitt	4	2	3	1	2.95	Moderate
Goose Lake	4	2	3	1	2.95	Moderate
Grand Mound	4	2	3	1	2.95	Moderate
Lost Nation	4	2	3	1	2.95	Moderate
Low Moor	4	2	3	1	2.95	Moderate
Toronto	4	2	3	1	2.95	Moderate
Welton	4	2	3	1	2.95	Moderate
Wheatland	4	2	3	1	2.95	Moderate
Calamus-Wheatland School District	4	2	3	1	2.95	Moderate
Camanche School District	4	2	3	1	2.95	Moderate
Central DeWitt School District	4	2	3	1	2.95	Moderate
Clinton School District	4	2	3	1	2.95	Moderate
Delwood School District	4	2	3	1	2.95	Moderate
Northeast School District	4	2	3	1	2.95	Moderate

3.3.19 Tornado/Windstorm

Hazard Score Calculation					
Probability	**Magnitude/Severity**	**Warning Time**	**Duration**	**Weighted Score**	**Level**
4	3	4	1	3.55	High

Profile

Hazard Description

This hazard section discusses both tornado and windstorm.

Tornado: The NWS defines a tornado as "a violently rotating column of air extending from a thunderstorm to the ground." It is usually spawned by a thunderstorm and produced when cool air overrides a layer of warm air, forcing the warm air to rise rapidly. Often, vortices remain suspended in the atmosphere as funnel clouds. When the lower tip of a vortex touches the ground, it becomes a tornado and a force of destruction.

Tornadoes are the most violent of all atmospheric storms and are capable of tremendous destruction. Wind speeds can exceed 250 miles per hour, and damage paths can be more than one mile wide and 50 miles long. Tornadoes have been known to lift and move objects weighing more than 300 tons a distance of 30 feet, toss homes more than 300 feet from their foundations, and siphon millions of tons of water from water bodies. Tornadoes also generate a tremendous amount of flying debris or "missiles," which often become airborne shrapnel that causes additional damage. If wind speeds are high enough, missiles can be thrown at a building with enough force to penetrate windows, roofs, and walls. However, the less spectacular damage is much more common.

Windstorm: Windstorms for purposes of this plan refer to other non-tornadic damaging winds of thunderstorms including downbursts, microbursts, and straight-line winds. Downbursts are localized currents of air blasting down from a thunderstorm, which induce an outward burst of damaging wind on or near the ground. Microbursts are minimized downbursts covering an area of less than 2.5 miles across. They include a strong wind shear (a rapid change in the direction of wind over a short distance) near the surface. Microbursts may or may not include precipitation and can produce winds at speeds of more than 150 miles per hour. Straight-line winds are generally any thunderstorm wind that is not associated with rotation. It is these winds, which can exceed 100 mph, which represent the most common type of severe weather and are responsible for most wind damage related to thunderstorms. Since thunderstorms do not have narrow tracks like tornadoes, the associated wind damage can be extensive and affect entire (and multiple) counties. Objects like trees, barns, outbuildings, high-profile vehicles, and power lines/poles can be toppled or destroyed, and roofs, windows, and homes can be damaged as wind speeds increase.

Derecho: A derecho is a widespread, long-lived, straight-line windstorm. Derechos are associated with bands of rapidly moving showers or thunderstorms variously known as bow echoes, squall lines, or quasi-linear convective systems. Derechos can produce a similar level of destruction as a tornado; however, the damage typically occurs in one direction along a relatively straight path. According to NOAA, if the swath of wind damage extends for more than 250 miles (about 400 kilometers), includes wind gusts of at least 58 mph (93 km/h) along most of its length, and also includes several, well-separated 75 mph (121 km/h) or greater gusts, then the event may be classified as a derecho. Because they occur most often during the warm season, derechos pose particular risk to those recreating outdoors, potentially overturning boats and RVs and leading to death or injury from falling trees, tree limbs, and other flying debris. Clinton County experienced a derecho in the summer of 2020 (Refer to Previous Occurrences).

Strong winds can occur year-round in Iowa. These winds typically develop with strong pressure gradients and gusty frontal passages. The closer and stronger two systems are, (one high pressure, one low

pressure) the stronger the pressure gradient, and therefore, the stronger the winds are. Objects such as trees, barns, outbuildings, high-profile vehicles, and power line/poles can be toppled or destroyed, and roofs, windows, and homes can be damaged as wind speeds increase. Downbursts can be particularly dangerous to aviation.

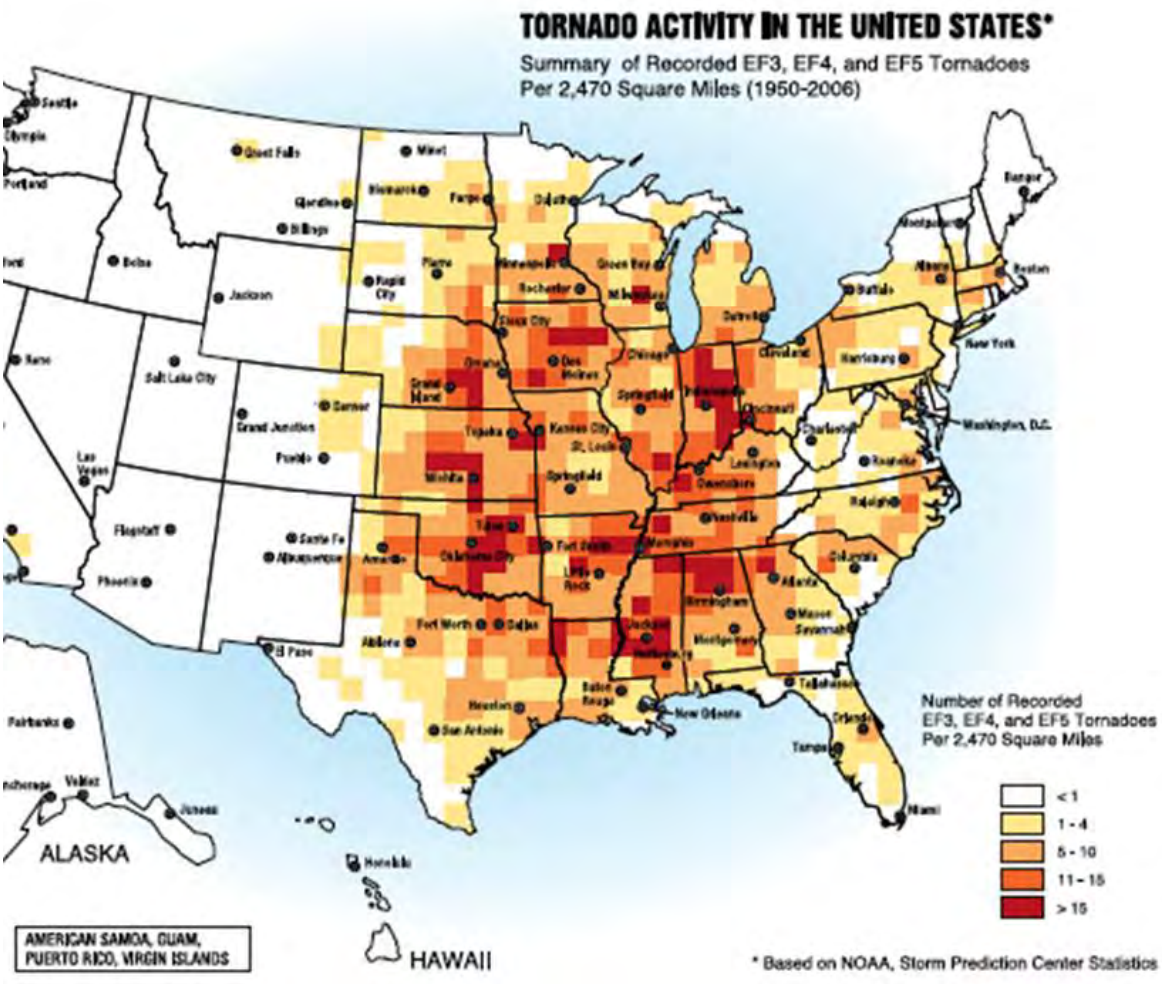
Warning Time Score: 4—minimal or no warning (up to 6 hours)

Duration Score: 1—less than 6 hours

Geographic Location/Extent

Iowa is in a part of the United States where tornadoes are a common occurrence. Iowa has experienced 1,237 tornadoes from 2000 through 2020 (20-year period) with approximately 91 percent of them being rated EF0 and EF1, and 9 percent rated F2 through F5. Only one EF5 rated tornado has occurred in Iowa during this timeframe (Parkersburg in 2008). Since 2020, there have been on average 61 tornadoes per year in Iowa. Most tornadoes occurred in May and June but can occur during any month. Also, midafternoon until around sunset is the peak time of day for tornado activity. There have been 830 injuries and 30 deaths attributable to tornadoes from 1980 through 2019 (source: NWS, Iowa Tornado Climatology Report 1980-2019). Tornadoes can occur in the entire planning area. Figure 3-66 illustrates the number of F3, F4, and F5 tornadoes recorded in the United States per 3,700 square miles between 1950 and 2006. Clinton County is in the section with light and medium orange shading, indicating 5-15 tornadoes of this magnitude during this 57-year period.

Figure 3-66 Tornado Activity in the United States



Source: FEMA 320, Taking Shelter from the Storm, 3rd edition

Tornadoes are classified according to the EF Scale. The Enhanced F- Scale (see Table 3-61) attempts to rank tornadoes according to wind speed based on the damage caused. This update to the original F scale was implemented in the US on February 1, 2007.

Table 3-61 Enhanced F Scale for Tornado Damage

Fujita Scale		Derived EF Scale		Operational EF Scale		
F Number	Fastest 1/4-mile (mph)	3 Second Gust (mph)	EF Number	3 Second Gust (mph)	EF Number	3 Second Gust (mph)
0	40-72	45-78	0	65-85	0	65-85
1	73-112	79-117	1	86-109	1	86-110
2	113-157	118-161	2	110-137	2	111-135
3	158-207	162-209	3	138-167	3	136-165

Fujita Scale		Derived EF Scale		Operational EF Scale		
F Number	Fastest 1/4-mile (mph)	3 Second Gust (mph)	EF Number	3 Second Gust (mph)	EF Number	3 Second Gust (mph)
4	208-260	210-261	4	168-199	4	166-200
5	261-318	262-317	5	200-234	5	Over 200

Source: The NWS, www.spc.noaa.gov/faq/tornado/ef-scale.html

The wind speeds for the EF scale and damage descriptions are based on information on the NOAA Storm Prediction Center as listed in Table 3-62. The damage descriptions are summaries. For the actual EF scale, it is necessary to look up the damage indicator (type of structure damaged) and refer to the degrees of damage associated with that indicator. Information on the Enhanced Fujita Scale's damage indicators and degrees of damage is located online at www.spc.noaa.gov/efscale/ef-scale.html.

Table 3-62 Enhanced Fujita Scale with Potential Damage

Enhanced Fujita Scale			
Scale	**Wind Speed (mph)**	**Relative Frequency**	**Potential Damage**
EF0	65-85	53.5%	Light. Peels surface off some roofs; some damage to gutters or siding; branches broken off trees; shallow-rooted trees pushed over. Confirmed tornadoes with no reported damage (i.e. those that remain in open fields) are always rated EF0).
EF1	86-110	31.6%	Moderate. Roofs severely stripped; mobile homes overturned or badly damaged; loss of exterior doors; windows and other glass broken.
EF2	111-135	10.7%	Considerable. Roofs torn off well-constructed houses; foundations of frame homes shifted; mobile homes complete destroyed; large trees snapped or uprooted; light object missiles generated; cars lifted off ground.
EF3	136-165	3.4%	Severe. Entire stores of well-constructed houses destroyed; severe damage to large buildings such as shopping malls; trains overturned; trees debarked; heavy cars lifted off the ground and thrown; structures with weak foundations blown away some distance.
EF4	166-200	0.7%	Devastating. Well-constructed houses and whole frame houses completely levelled; cars thrown and small missiles generated.
EF5	>200	<0.1%	Explosive. Strong frame houses levelled off foundations and swept away; automobile-sized missiles fly through the air in excess of 300 ft.; steel reinforced concrete structure badly damaged; high rise buildings have significant structural deformation; incredible phenomena will occur.

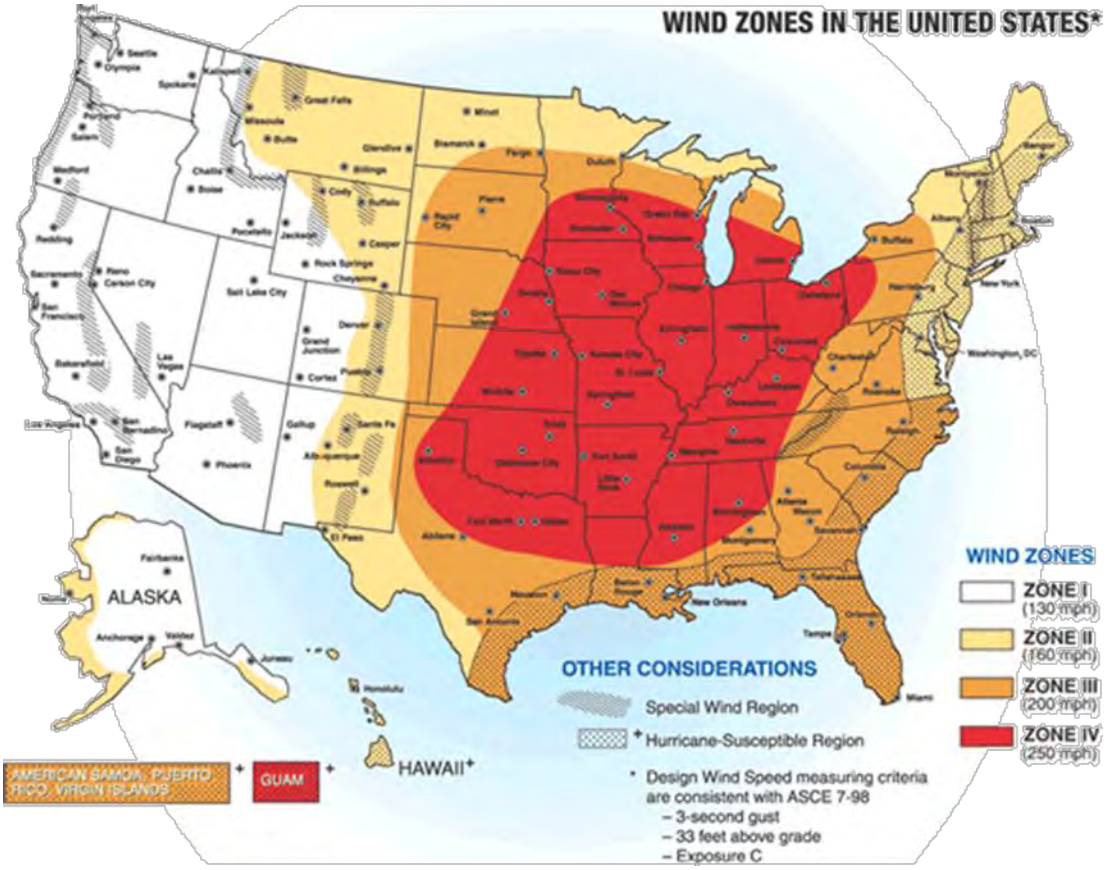
Source: NOAA Storm Prediction Center

The advancement in weather forecasting has provided for the ability to predict severe weather that is likely to produce tornadoes days in advance. Tornado watches can be delivered to those in the path of these storms several hours in advance. Lead time for actual tornado warnings 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 if they occur after sundown or due to blowing dust or driving

rain and hail. According to the Iowa Environmental Mesonet, there is an average of five tornado watches and two tornado warnings issued per year in Clinton County.

All of Clinton County is susceptible to high wind events. The County is in Wind Zone IV, which is susceptible to winds up to 250 mph. All the participating jurisdictions are vulnerable to this hazard. Figure 3-67 shows the wind zones of the United States based on maximum wind speeds; the entire state of Iowa is located within wind zone IV, the highest inland category.

Figure 3-67 Wind Zones in the United States



Source: FEMA; http://www.fema.gov/plan/prevent/saferoom/tsfs02_wind_zones.shtm

Damage from windstorms can be difficult to quantify. Wind, by itself, has not historically caused high insured dollar losses. For the insurance industry to track a weather event, it must be a large enough storm that insurance companies may declare it a catastrophe, and then damage estimates for auto and homeowner claims are collected and published. This generally equates to damages in excess of $25 million, though significant events impacting small communities are also tracked occasionally.

Table 3-63 shows The Beaufort Wind Scale. The replication of the scale only reflects land-based effects.

Table 3-63 The Beaufort Wind Scale

Beaufort Number	Description	Windspeed (Knots)	Land Conditions
0	Calm	<1	Calm. Smoke rises vertically.

Beaufort Number	Description	Windspeed (Knots)	Land Conditions
1	Light air	1 – 3	Wind motion visible in smoke.
2	Light breeze	4 – 6	Wind felt on exposed skin. Leaves rustle.
3	Gentle breeze	7 – 10	Leaves and smaller twigs in constant motion.
4	Moderate breeze	11 – 16	Dust and loose paper raised. Small branches begin to move.
5	Fresh breeze	17 – 21	Branches of a moderate size move. Small trees begin to sway.
6	Strong breeze	22 – 27	Large branches in motion. Whistling heard in overhead wires. Umbrella use becomes difficult. Empty plastic garbage cans tip over.
7	Near Gale	28 – 33	Whole trees in motion. Effort needed to walk against the wind.
8	Gale	34 – 40	Some twigs broken from trees. Cars veer on road. Progress on foot is seriously impeded.
9	Strong gale	41 – 47	Slight structural damage occurs; slate blows off roofs.
10	Storm	48 – 55	Seldom experienced on land; trees uprooted or broken; considerable structural damage.
11	Violent storm	56-63	
12	Hurricane	64+	

Source: National Oceanographic and Atmospheric Association

The NWS can issue High Wind Watch, High Wind Warning, and Wind Advisory to the public. The following are the definitions of these issuances:

- **High Wind Watch:** This is issued when there is the potential of high wind speeds developing that may pose a hazard or is life-threatening.
- **High Wind Warning: T**he 1-minute surface winds of 35 knots (40 mph) or greater lasting for one hour or longer, or winds gusting to 50 knots (58 mph) or greater, regardless of duration, that are either expected or observed over land.
- **High Wind Advisory:** This is issued when high wind speeds may pose a hazard. Sustained winds 25 to 39 mph and/or gusts to 57 mph.

Previous Occurrences – Tornadoes

On June 3, 1860, Camanche was the scene of the most tremendous tornado on record. The tornado lasted only about three minutes, but the village of 1,200 people was almost totally destroyed. The storm that developed into the Camanche tornado began in the early afternoon near Fort Dodge. As it moved to the east-southeast, the storm spawned the first of what was to be many tornadoes along its path. By the time the storm got to Cedar Rapids, two tornadoes were visible, 12 miles apart. Between Wheatland and DeWitt, the two tornadoes merged into a monster tornado and headed easterly. Between the merger and the City of Camanche, numerous farmsteads were hit, killing 28 people. At about 7 pm, the tornado hit Camanche. The tornado events of this day killed a total of 141 people, including 115 in Iowa and 74 in Clinton County alone. Another 329 were injured from the tornadoes (Source: Iowa Weather Network).

During the plan update process, the HMPC reported the following past tornado events.

- **February 28, 2017:** Severe weather and tornado warning for Clinton County with a weak tornado spotted. No damage reported.

- **March 6, 2017:** Three tornadoes were reported in Clinton County. There were 2 EF1s and 1 EF2. Multiple reports of damage to structures, however no State Individual Assistance requests were made.
- **July 26, 2017:** An EF0 tornado touched down near De Witt. Minor damage reported and no assistance required.
- **August 20, 2018:** A weak EF0 tornado was confirmed by the NWS near Delmar. Damage to soybeans and tree limbs were reported.
- **August 28, 2018:** Severe Weather and Tornado Damage. The NWS reported an EF0 tornado. (Refer to flooding for additional impacts from this event.)
- **August 18, 2019:** NWS confirmed that an EF0 tornado touched down just 2.8 southwest of Grand Mound. Appeared to only affect one property. Numerous tree branches down and one tree uprooted completely. The home had trim and shingle damage and one broken window. The tornado traveled a tenth of a mile and had a maximum width of 20 yards, lasting about one minute.
- **May 23, 2020:** Severe weather and tornado near Lost Nation. NWS service reports that radar showed a tornado about 1.5 miles South of Lost Nation. Farm near Lost Nation had damage to a barn. Outdoor warning sirens were sounded in Western and some of Central Clinton County for a Tornado Warning. Figure 3-68 shows pictures of tornadoes west of Wheatland and east of Lost Nation respectively.

Figure 3-68 May 23, 2020 Tornadoes

Source: Clinton County Emergency Management

According to NCEI records Clinton County had 35 recorded tornado events from 1950 to May 2020. Of these:

- 1 was F4
- 2 were F3
- 6 were F2
- 13 were F1/EF1
- 1 was an EF2
- 23 were F0/EF0

During this time frame, there was one fatality and 29 injuries. The fatality and 20 of the injuries occurred in the 1974 tornado that went through the City of Clinton and unincorporated Clinton County. It was noted by the planning committee that the property damages reported were for the March 15, 2016 event. Table 3-64 summarizes these events.

Table 3-64 Recorded Tornadoes in Clinton County, 1950 – May 2020

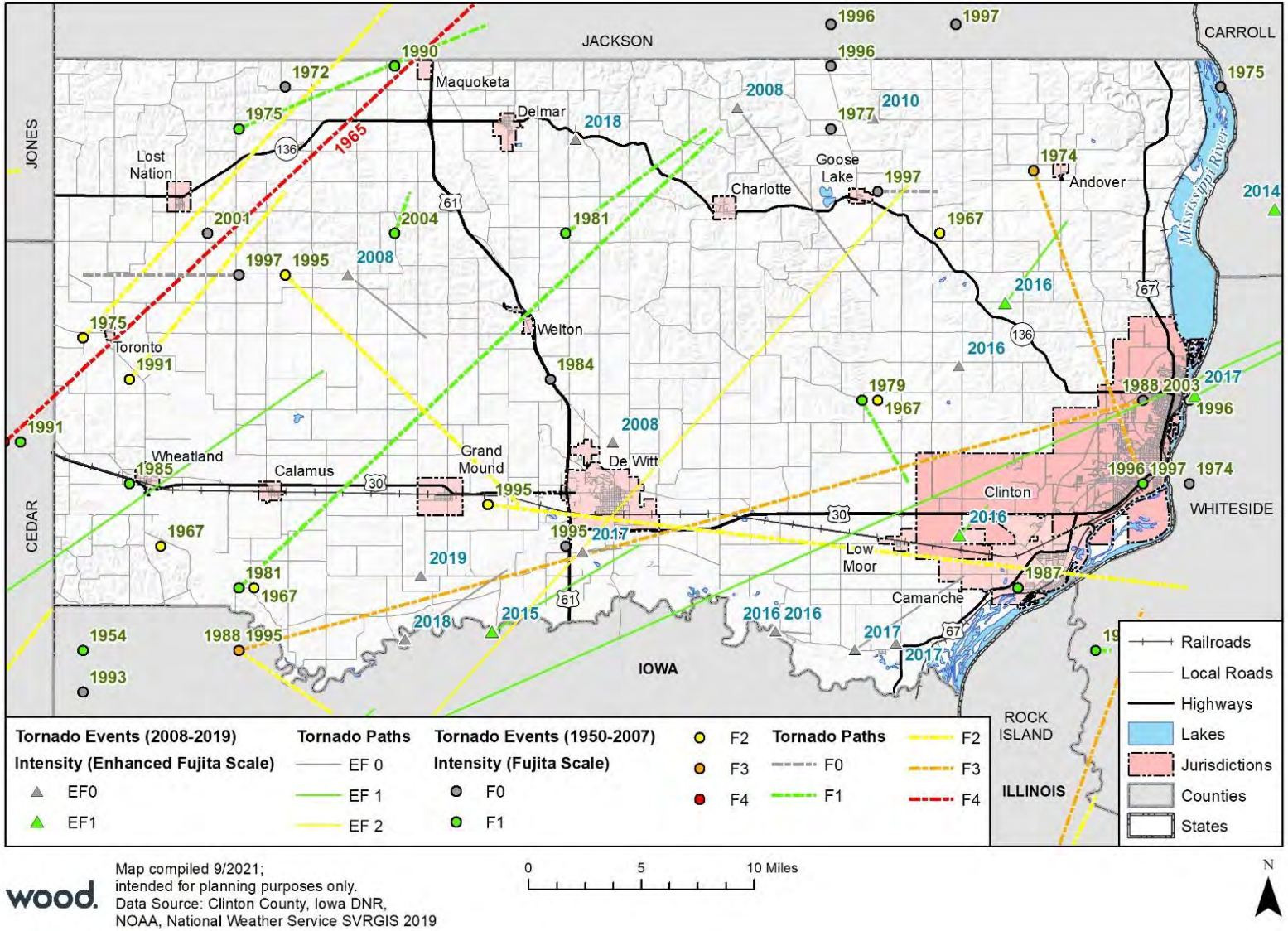
Date	Magnitude	Fatalities	Injuries	Damages	Length	Width	Begin Location	End Location
5/23/2020	EF0	0	0	$0	1.19	20	Lost Nation	Lost Nation
8/18/2019	EF0	0	0	$0	0.1	20	Grand Mound	Grand Mound
8/28/2018	EF0	0	0	$0	3.12	25	Grand Mound	Dewitt
8/20/2018	EF0	0	0	$0	0.47	15	Delmar	Delmar
7/26/2017	EF0	0	0	$0	1.25	25	Dewitt	Dewitt
3/6/2017	EF0	0	0	$10,000	11.3	100	Big Rock	Calamus Eastvold Arp
	EF1	0	0	0	19.51	200	Dewitt	Bryant
	EF2	0	0	0	4.36	50	Folletts	Low Moor
2/28/2017	EF0	0	0	$0	0.04	25	Folletts	Folletts
5/31/2016	EF0	0	0	$0	0.03	10	Elvira	Elvira
3/15/2016	EF0	0	0	$0	1.17	50	Folletts	Folletts
	EF1	0	3	$50,000	1.35	75	Clinton Muni Arpt	Low Moor
	EF1	0	0	$0	3.38	300	Bryant	Almont
4/9/2015	EF1	0	0	$10,000	5.7	100	Grand Mound	Dewitt
	EF1	0	0	$0	8.56	75	Clinton Muni Arpt	Clinton
6/5/2010	EF0	0	0	$0	0.43	100	Goose Lake	Bryant
8/4/2008	EF0	0	0	$250,000	7.98	250	Charlotte	Goose Lake
7/10/2008	EF0	0	0	$125,000	3.43	100	Welton	Welton
	EF0	0	0	$0	0.01	25	Dewitt	Dewitt
4/20/2004	F1	0	0	$30,000	1.3	100	Delmar	Delmar
4/15/2001	F0	0	0	$0	0.1	10	Lost Nation	Lost Nation
4/30/1997	F0	0	0	$40,000	2	20	Goose Lake	Bryant
	F0	0	0	$0	0	10	Clinton	Clinton
	F0	0	0	$0	0	10	Lost Nation	Lost Nation
5/10/1996	F1	0	0	$1,000,000	5	100	Clinton	Clinton
4/19/1996	F0	0	0	$0	0.2	25	Goose Lake	Goose Lake
7/27/1995	F2	0	0	$200,000	10.5	70	Elwood To	Grand Mound
	F0	0	0	$5,000	0.3	35	Dewitt	Not Reported
3/22/1991	F2	0	0	$2,500,000	7	60	Not Reported	Not Reported
3/13/1990	F1	0	0	$250,000	5	43	Not Reported	Not Reported
8/8/1988	F0	0	0	$250,000	0.5	13	Not Reported	Not Reported
5/8/1988	F3	0	0	$25,000,000	30	150	Not Reported	Not Reported

Date	Magnitude	Fatalities	Injuries	Damages	Length	Width	Begin Location	End Location
7/29/1987	F1	0	0	$250,000	2	23	Not Reported	Not Reported
5/14/1985	F1	0	0	$0	0.2	20	Not Reported	Not Reported
4/12/1984	F0	0	0	$2,500	0	33	Not Reported	Not Reported
4/4/1981	F1	0	0	$2,500,000	20.5	33	Not Reported	Not Reported
8/5/1979	F1	0	1	$250,000	1.3	300	Not Reported	Not Reported
5/16/1977	F0	0	0	$0	0	33	Not Reported	Not Reported
12/14/1975	F1	0	0	$25,000	5.7	33	Not Reported	Not Reported
11/9/1975	F2	0	2	$250,000	12.3	200	Not Reported	Not Reported
6/20/1974	F3	1	20	$2,500,000	10.6	200	Not Reported	Not Reported
8/1/1972	F0	0	0	$25,000	1	50	Not Reported	Not Reported
1/24/1967	F2	0	0	$25,000	2	150	Not Reported	Not Reported
	F2	0	0	$25,000	1	200	Not Reported	Not Reported
	F2	0	0	$250,000	0	100	Not Reported	Not Reported
4/11/1965	F4	0	3	$2,500,000	21.3	200	Not Reported	Not Reported
Total		**1**	**29**	**$38,322,500**				

Source: NCEI Storm Events Database

The map in Figure 3-69 shows the paths of the events in the table above that were from 1950 to 2019. Note: Not all events had available latitude and longitude coordinates. As a result, not all events are displayed.

Figure 3-69 Tornado Paths in Clinton County, 1950-2019



Map compiled 9/2021;
intended for planning purposes only.
Data Source: Clinton County, Iowa DNR,
NOAA, National Weather Service SVRGIS 2019

According to the USDA RMA, Clinton County has lost 224 acres and $69,643 indemnity payments due to tornado events. All losses took placed in 2018.

Clinton County has been included in four Presidential Disaster Declarations that involved tornadoes since 1965. See Table 3-1 in the Hazard Identification Section for additional details.

Figure 3-70 provides images of the March 2016 EF1 tornado.

Figure 3-70 March 2016 EF1 Tornado

Source: Clinton County Emergency Management

Figure 3-71 provides photos of the April 9, 2015, EF1 tornado that hit DeWitt.

Figure 3-71 April 9, 2015 EF1 Tornado, DeWitt

Source: Clinton County Emergency Management

Figure 3-72 shows damage to a machine shed roof as a result of the July 23, 2011, downburst that struck Clinton County

Figure 3-72 July 23, 2011 Downburst, Clinton County – Folletts Area

Source: Clinton County Emergency Management

Previous Occurrences – Windstorms

According to the NCEI database, there have been 155 thunderstorm wind events, 19 high wind events and two strong wind events in Clinton County from 1993 to August 10, 2020. During this time period there

were no reported deaths or injuries. There was an estimated $3,871,100 in property damages. Recorded wind gusts ranged from a high of 113 knots to a low of 32 knots. Note: not all events had provided magnitude data. Table 3-65 provides a summary of the wind speeds reported for the wind events.

Table 3-65 Reported Wind Speeds, NCEI Events from 1957 to August 2020

Event Type / Wind Speed	Number of Events
Thunderstorm Wind	
0	31
50-59	102
60-66	39
70-78	12
90	1
113	1
High Wind	
36-39	3
42-43	3
50-59	14
60	1
Strong Wind	
Not Reported	1
49	1

Source: NCEI

The Central DeWitt School District reported wind damage to the ball fields from a July 24, 2016, high wind event. Damage occurred to the bleachers, fence, and backstop/netting.

On June 30, 2019, 70 mph winds set off sirens and resulted in downed limbs and power outages throughout the county. A large tree fell on a house in Charlotte just off Park Avenue.

On July 11, 2020, severe storms moved through western Clinton County with winds of 80 mph, but no major damages were reported.

The August 10, 2020, Derecho event is the greatest recorded wind event at 92 miles per hour (mph) in the Storm Events Database. The Derecho traveled a total of 770 miles in 14 hours from the southeast from South Dakota to Ohio. The event resulted in a Federal Disaster Declaration, DR-4557. The 2020 Derecho event is estimated to be the costliest ($11.2 Billion) thunderstorm disaster in US history (NOAA). The NCEI Storm Events Database did not list impacts from the 2020 Derecho. The HMPC provided the following description about the impacts of the derecho. The derecho caused major damages to trees and buildings and caused widespread power outages throughout the county. Mobile Resource Center set up and managed for citizens with cooperation with EMA, CFD, CPD, IRAS, MercyOne, and Public Health. CERT Volunteers assisted as well. Major cellphone and radio communications outages occurred.

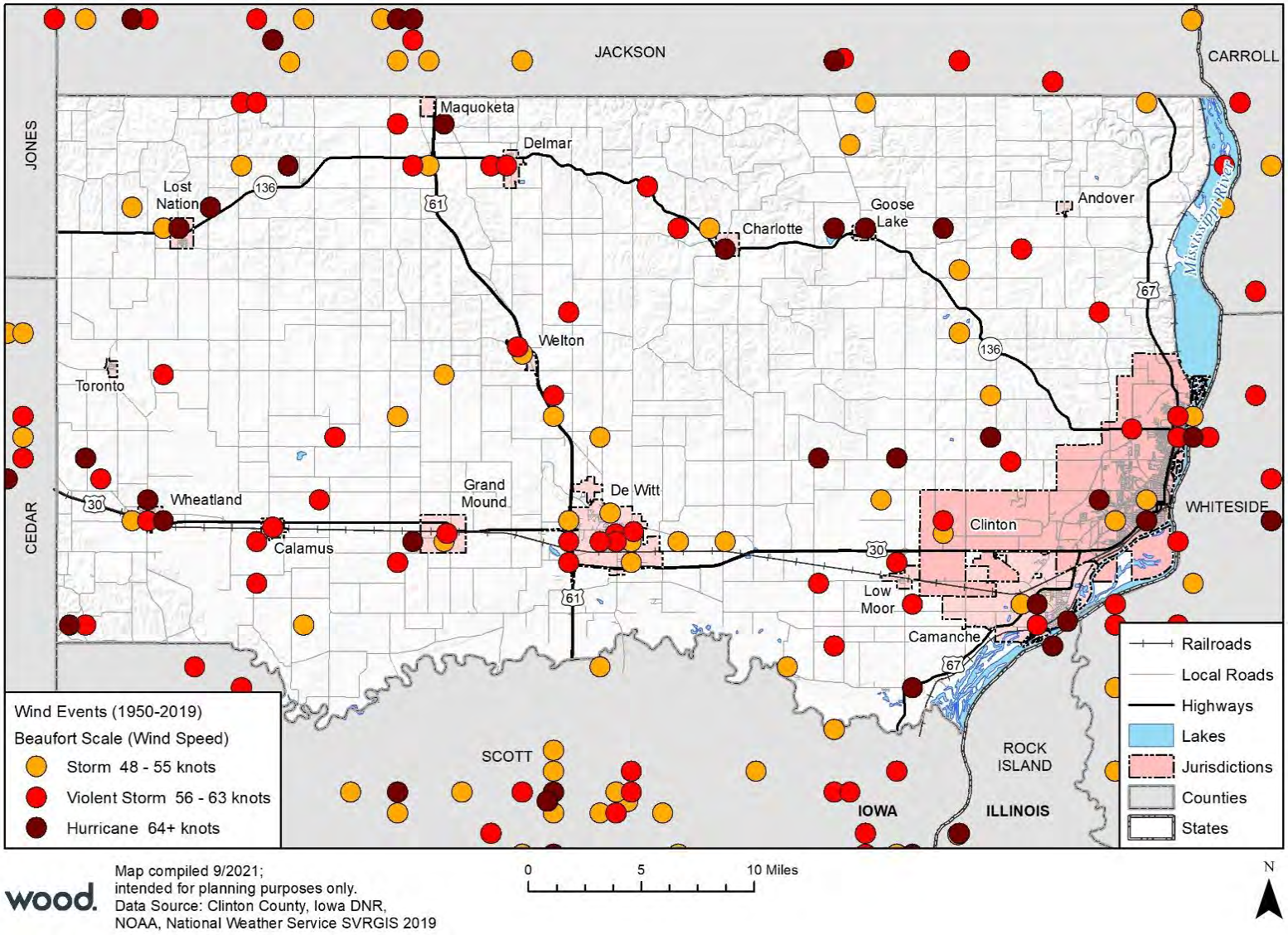
Figure 3-73 August 10, 2020, Derecho Damage

Source: Clinton County Emergency Management

The map in Figure 3-74 shows the approximate center points of the events in the table above from 1950 to 2020. Note: Not all events had available latitude and longitude coordinates. As a result, not all events are displayed.

According to the USDA RMA, between 2007 and 2020 Clinton County has lost 55,704 acres and $5,387,329 indemnity payments due to windstorm events.

Figure 3-74 Clinton County Wind Events, 1950-2019



Probability of Future Occurrence

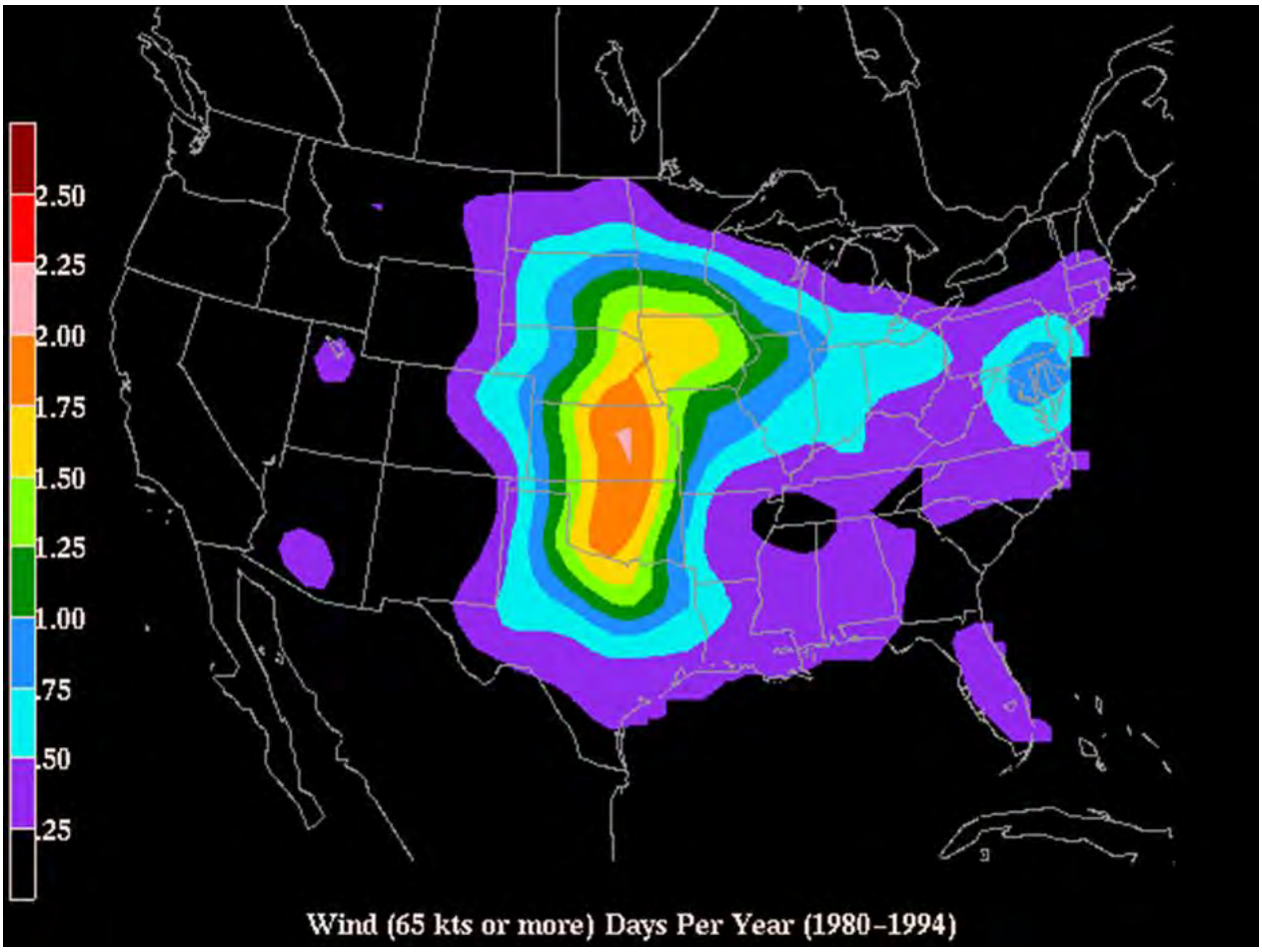
According to NCEI records, 35 tornadoes in Clinton County in a 70-year time period, which calculates to 50 percent chance of a tornado in any given year. Therefore, it is a high probability that some portion of Clinton County will experience tornado activity in any given year.

According to NCEI, there were 176 windstorm events from 1957 to 2020 (63-year period) in Clinton County. Based on this data, the County averages three high wind events per year. Therefore, it is highly likely that some portion of Clinton County will experience tornado activity in any given year.

Probability Score: 4—Highly Likely

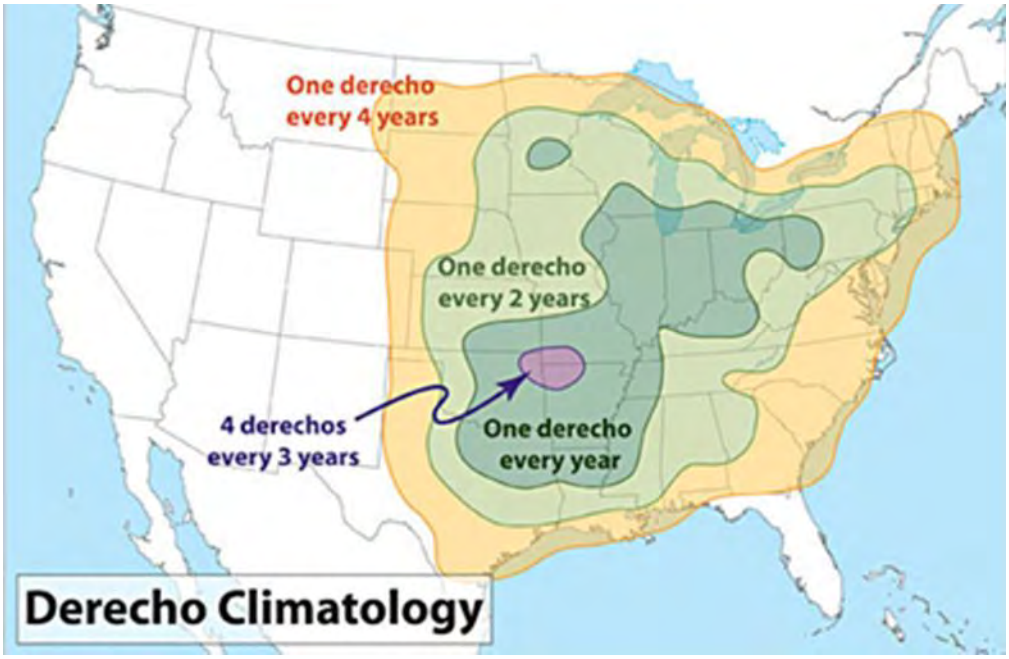
Figure 3-75 below shows the probability of a windstorm event (65 knots or greater) in the US The Clinton County planning area (approximated by red rectangle) is colored lime green and dark green, showing that 65+ knot winds are probable to occur 1.00 to 1.25 times a year.

Figure 3-75 Annual Windstorm Probability (65+ knots), United States 1980-1994



Source: National Severe Storms Laboratory (NSSL), http://www.nssl.noaa.gov/users/brooks/public_html/bigwind.gif;
Note: Red rectangle indicates approximate location of Clinton County

Figure 3-76 Annual Derecho Probability in the United States



Vulnerability

Overview

As evidenced by previous occurrences, all of Clinton County is vulnerable to tornadic and high wind events.

Windstorms can cause injury and death in Clinton County. The highest risk demographic is to first responders who are dealing with emergency situations resulting from the windstorm. Those working or recreating outdoors will be susceptible to injury from wind borne debris. Vulnerable populations also include the elderly, low income or mentally handicapped, linguistically isolated populations, people with life-threatening illnesses, and residents living in areas that are isolated from major roads. Power outages can be life-threatening to those dependent on electricity for life support. In Clinton County, 5% of Medicare Beneficiaries (486of 10,796 total beneficiaries) rely on electricity to live independently in their homes. Isolation of these populations is a significant concern. These populations face isolation and exposure during wind events and could suffer more secondary effects of the hazard.

Based on the tornadoes that have occurred in the County ranging from EF/F0 to F4 as well as the location in areas known to have the potential for damaging tornadoes, the magnitude was determined to be a 3, "Limited".

Magnitude Score: 3—Limited

Potential Losses to Existing Development

Overhead power lines and infrastructure are also vulnerable to damages from windstorms. Potential losses would include cost of repair or replacement of damaged facilities and lost economic opportunities for businesses. Public safety hazards include risk of electrocution from downed power lines.

Light frame structures, such as mobile homes, outbuildings and sheds are considered especially vulnerable to damage from tornadoes. 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 twisters.

Statewide, mobile homes represent about 3.7% of total housing compared to 6.1% Nationwide. Mobile homes in Clinton County represent 2.3%. Table 3-66 shows the breakdown of mobile for each jurisdiction.

Table 3-66 Percent of Mobiles Homes as Total Housing, by Jurisdiction

Jurisdiction	Total Housing	% Mobile Homes
Unincorporated County	22,026	2.3%
Andover	47	8.5%
Calamus	191	5.2%
Camanche	2,102	5.9%
Charlotte	167	11.4%
Clinton	12,401	0.7%
Delmar	232	0%
DeWitt	2,210	0%
Goose Lake	84	1.2%
Grand Mound	240	0%
Lost Nation	246	0%
Low Moor	113	0%
Toronto	66	0%
Welton	67	0%
Wheatland	313	9.3%

Source: US Census, American Community Survey (ACS) 5-Year Estimates, 2015-2019

In Clinton County, the NCEI estimate for past property damages resulting from tornadoes from 1950 – May 2020 was $38,322,500. This translates to an annualized loss of $547,464. For windstorms, NCEI loss estimates were $3,871,100 from 1993 to August 2020. This translates to an annualized loss of $143,374.

Future Development

Public buildings such as schools, government offices, as well as other buildings with a high occupancy and mobile home parks should consider inclusion of a tornado saferoom to shelter occupants in the event of a tornado.

Windstorm is primarily a public safety and economic concern, and the planning area is in a region with a very high frequency of occurrence. Windstorm can cause damage to structures and power lines which in turn create hazardous conditions for people. Debris flying from high wind events can shatter windows in structures and vehicles and can harm people that are not adequately sheltered.

Although windstorms occur frequently in the planning area and damages to property occur, much of the damage is generally covered by private insurance. This results in less impact to individuals and the community since recovery is facilitated by insurance.

Climate Change Impacts

The influence of climate change on wind is not fully understood at this time. While there have been several significant wind events in recent years, there is not enough observations to determine if there are any long-term trends in frequency of severity of events (US Global Change Research Program 2018). NASA's Earth Observatory has conducted studies in 2013, which aim to understand the interaction between climate change and tornadoes. Based on these studies meteorologists are unsure why some thunderstorms generate tornadoes and others don't, beyond knowing that they require a certain type of wind shear. Tornadoes spawn from approximately one percent of thunderstorms, usually supercell thunderstorms that are in a wind shear environment that promotes rotation. Some studies show a potential for a decrease in wind shear in mid-latitude areas. The level of significance of this hazard should be revisited over time

Tornado/Windstorm Hazard Summary by Jurisdiction

The magnitude was rated as a level 3 for all the participating jurisdictions, as they are all vulnerable to tornado and windstorm damage. The factors of probability, warning time, and duration are also equal across the planning area. This hazard does not substantially vary by jurisdiction.

Jurisdiction	Probability	Magnitude	Warning Time	Duration	Score	Level
Unincorporated Clinton County	4	3	4	1	3.40	High
Andover	4	3	4	1	3.40	High
Calamus	4	3	4	1	3.40	High
Camanche	4	3	4	1	3.40	High
Charlotte	4	3	4	1	3.40	High
Clinton	4	3	4	1	3.40	High
Delmar	4	3	4	1	3.40	High
DeWitt	4	3	4	1	3.40	High
Goose Lake	4	3	4	1	3.40	High
Grand Mound	4	3	4	1	3.40	High
Lost Nation	4	3	4	1	3.40	High
Low Moor	4	3	4	1	3.40	High
Toronto	4	3	4	1	3.40	High
Welton	4	3	4	1	3.40	High
Wheatland	4	3	4	1	3.40	High
Calamus-Wheatland School District	4	3	4	1	3.40	High
Camanche School District	4	3	4	1	3.40	High
Central DeWitt School District	4	3	4	1	3.40	High
Clinton School District	4	3	4	1	3.40	High
Delwood School District	4	3	4	1	3.40	High
Northeast School District	4	3	4	1	3.40	High

3.3.20 Transportation Incident

Hazard Score Calculation					
Probability	**Magnitude/Severity**	**Warning Time**	**Duration**	**Weighted Score**	**Level**
4	3	4	1	3.40	High

Profile

Hazard Description

This hazard encompasses the following: air transportation, highway transportation, boating transportation, and railway transportation. The transportation incidents can involve any mode of transportation that directly threatens life, and which results in property damage and/or death(s)/injury(s), and/or adversely impacts a community's capabilities to provide emergency services. Incidents involving buses and other high occupancy vehicles could trigger a response that exceeds the normal day-to-day capabilities of response agencies.

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

Highway transportation incidents are very complex. Contributing factors can include a roadway's design and/or pavement conditions (e.g. rain, snow and ice), a vehicle's mechanical condition (e.g. tires, brakes, lights), a driver's behavior (e.g. speeding, inattentiveness and seat belt usage), the driver's condition (e.g. alcohol use, age-related conditions, physical impairment) and driver inattention by using a wireless device. In fact, the driver's behavior and condition factors are the primary cause in an estimated 67 percent of highway crashes and a contributing factor in an estimated 95 percent of all crashes.

A waterway transportation incident could include a collision between two vessels or between a vessel and a stationary object. The primary location for boating in Clinton County is the Mississippi River. Boating is also allowed on some of the lakes/waterways managed by the Clinton County Conservation Board. See Table 3-12 in Section 3.2.2.

A railway transportation incident is a train accident that directly threatens life and/or property, or adversely impacts a community's capabilities to provide emergency services. Railway incidents may include derailments, collisions, and highway/rail crossing accidents. Train incidents can result from a variety of causes; human error, mechanical failure, faulty signals, and/or problems with the track. Results of an incident can range from minor "track hops" to catastrophic hazardous material incidents and even human/animal casualties. With so many miles of track in Iowa, vehicles must cross the railroad tracks at numerous at-grade crossings.

Warning Time Score: 4—Minimal or no warning

Duration Score: 1—Less than 6 hours

Geographic Location/Extent

The entire planning area is subject to transportation incidents and all participating jurisdictions are affected. The major transportation routes include Interstate 30, 61, and 67 and State Highway 136. Transportation routes were discussed previously in Section 3.5.8, Hazardous Materials

The Clinton Municipal Airport (CWI) is the only airport in the County. There are two designated hospital heliports in the County, one at MercyOne and one at Genesis DeWitt.

The primary rail line in Clinton County is the Union Pacific Railroad that runs east to west in the southern portion of the County. There is also a Canadian Pacific rail line that runs north to south along the Mississippi River. Figure 3-77 shows the main transportation routes in Clinton County.

Figure 3-78 shows the locations of bridges in the planning area included in the National Bridge Inventory data set within the Homeland Infrastructure Foundation-Level Data (HIFLD) 2020 database. One of the database items in the National Bridge Inventory is a "scour index", which is used to quantify the vulnerability of a bridge to scour from flood or erosion. Bridges with a scour index between 1 and 3 are considered "scour critical", or a bridge with a foundation element determined to be unstable for the observed or evaluated scour condition. Of the 373 bridges in Clinton County, none were identified as scour critical within the planning area. The National Bridge Inventory has identified ten bridges that are in poor condition, represented as a purple square in Figure 3-78 below.

Transportation incidents can almost always be expected to occur in specific areas, on or near airports, roadways, waterways, or other transportation infrastructure. The exception is air transportation incidents can occur anywhere. However, it is difficult to predict the magnitude of any specific event because these types of events are accidental and the circumstances surrounding these events will impact the extent of damage or injuries that occur. The number of urban and rural highway/roadway transportation accidents from 2011 to 2020 was a total of 8,995 crashes during this 9-year time period (average 999 per year). Transportation incidents have resulted in the most deaths historically in the county compared to other hazards.

Due to the potential for fatalities to occur, this hazard received a magnitude rating of Critical.

Magnitude Score: 3— Critical

Figure 3-77 Clinton County Transportation Routes & Airport

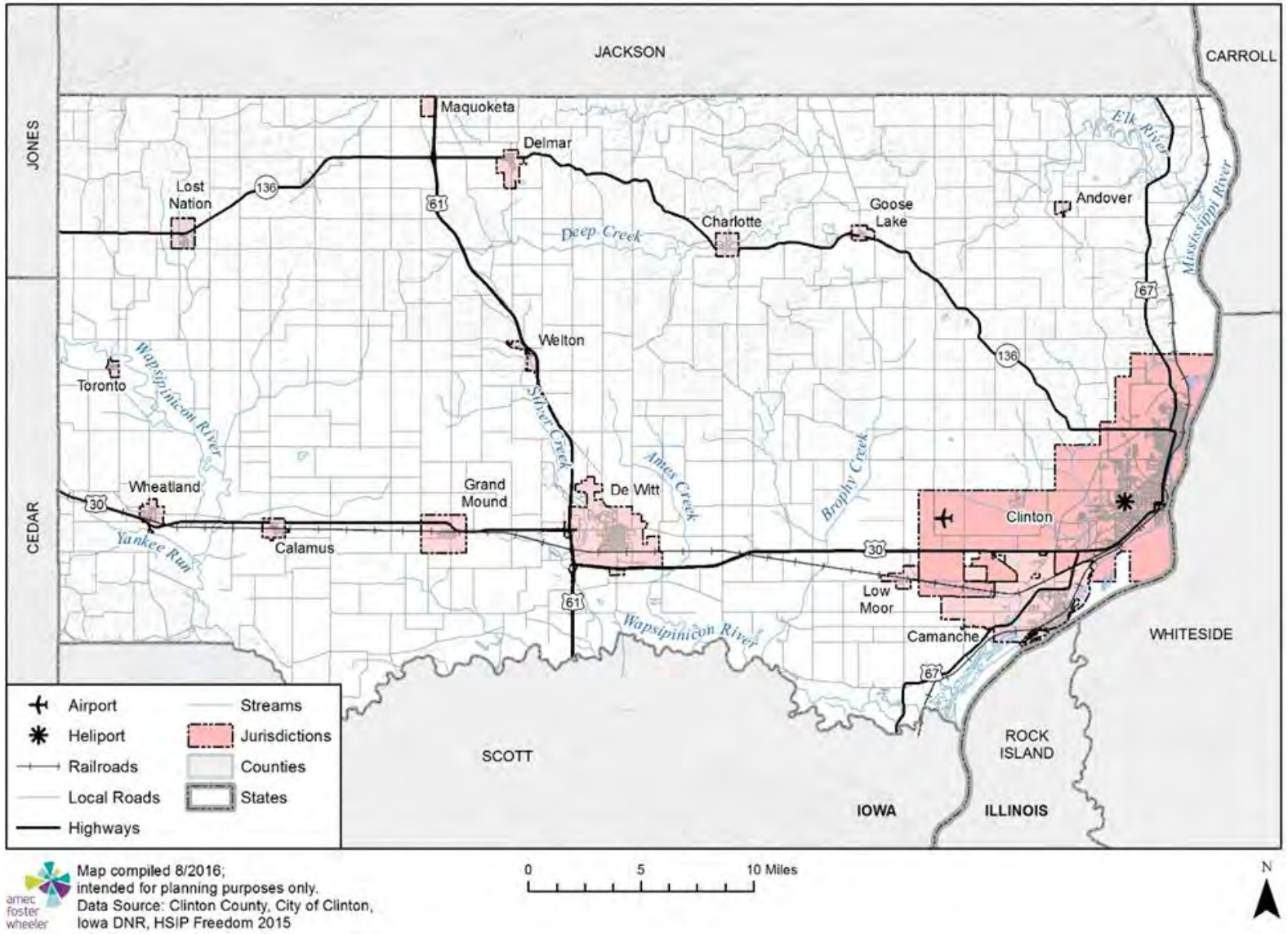
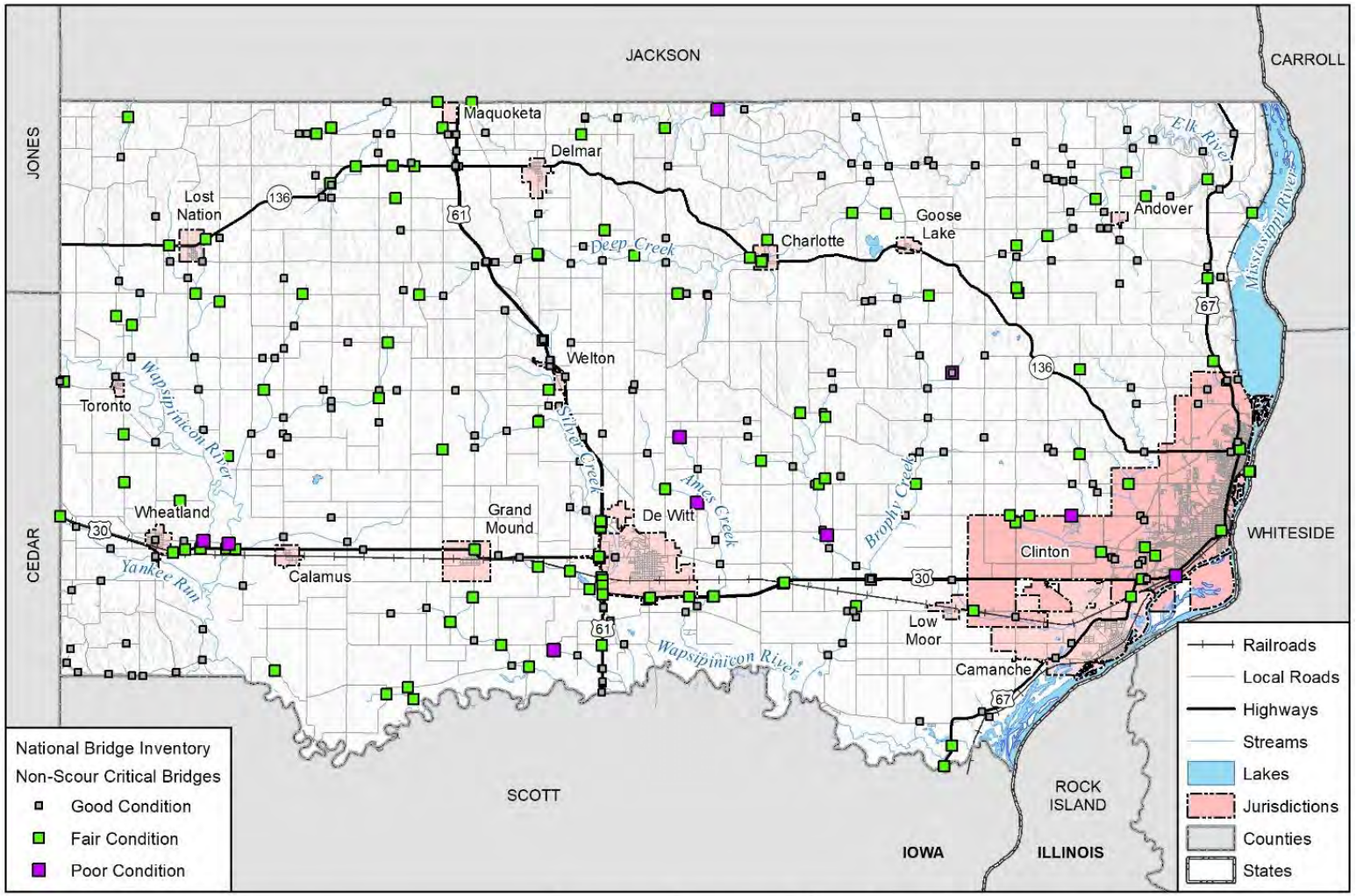


Figure 3-78 Clinton County Bridges



Map compiled 7/2021;
intended for planning purposes only.
Data Source: Clinton County, Iowa DNR, National Bridge Inventory

Note: Clinton County doesn't have any Scour Critical Bridges.

Previous Occurrences

Air Transportation Incidents:

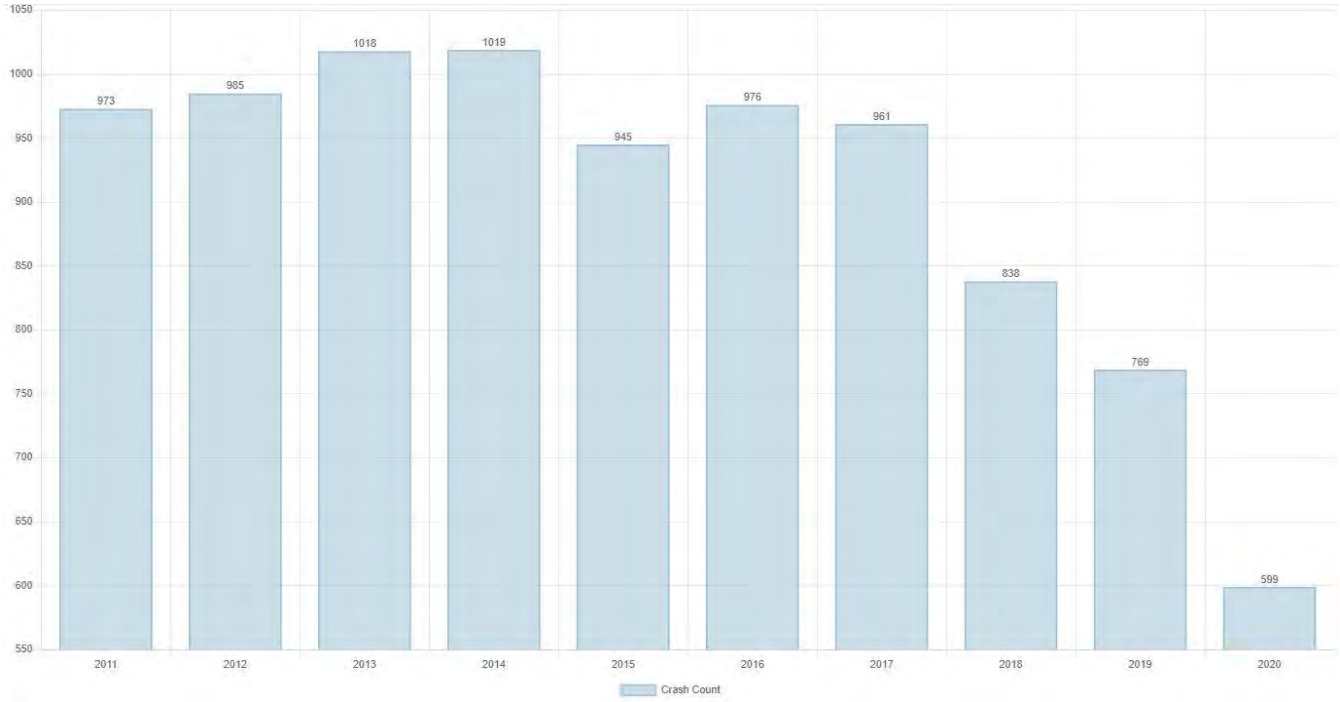
Research revealed the following air transportation incidents

- **September 12, 2012:** A Varga model 2150A, N4651V, was struck from behind by a Great Lakes 2T-1A-2 airplane, N3793F, while landing on runway 21 at EMCWI, Clinton, Iowa. There were no injuries. The tail of N4651V was severed by the propeller of N3793F.
- **August 20, 2008:** A Cessna A188B, N53243, collided with a ditch during takeoff from a private airstrip in Camanche, Iowa. The commercial pilot was not injured. The airplane received substantial damage.
- **September 27, 1999:** A Piper PA-28-140, N5747U, was destroyed on impact with the Mississippi River near Clinton, Iowa. The pilot sustained fatal injuries. The personal flight originated at 1640 from Chetek Municipal-Southworth Airport, Chetek, Wisconsin and was enroute to Illinois Valley Regional-Walter A. Duncan Field Airport, Peru, Illinois.
- **January 10, 1986:** A Cessna 182A crashed near Clinton, Iowa. No additional details are available.
- **February 26, 1975:** A Piper PA-28 crashed near Clinton, Iowa. No additional details are available.
- **January 15, 1974:** A Champion 7GCAA crashed near Andover, Iowa. No additional details are available.
- **February 18, 1971:** A Champion 8KCAB crashed near Clinton, Iowa. No additional details are available.

Highway Transportation Incidents:

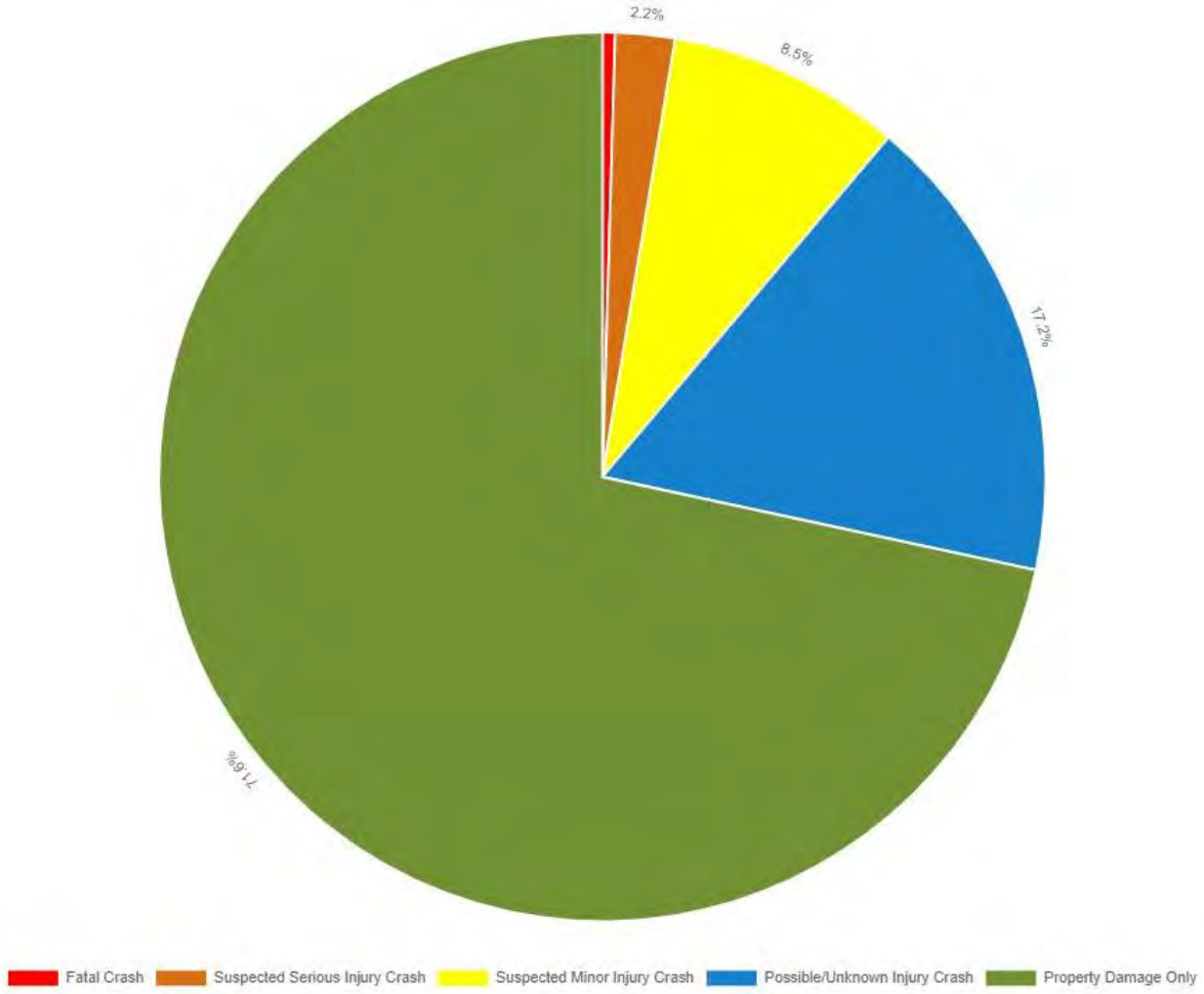
The Iowa DOT's Office of Traffic and Safety maintains traffic crash statistics and location maps by county and cities in Iowa. Figure 3-79 shows the trend of crashes in Clinton County between 2011 and 2020. Note the decline in 2020 is likely due to the effects of the Covid-19 Pandemic and people driving less during that time. Of the crashes recorded, 72% resulted in property damages only; 2.2% resulted in serious injuries, while 17% resulted in possible/unknown injuries, 8.5% resulted in minor injuries, The remaining.5% were fatal crashes. Figure 3-81 compares rural and urban crashes in Clinton County between 2011 and 2020. In that time period there were 4,345 more urban crashes than rural.

Figure 3-79 Clinton County Crashes, 2011-2020



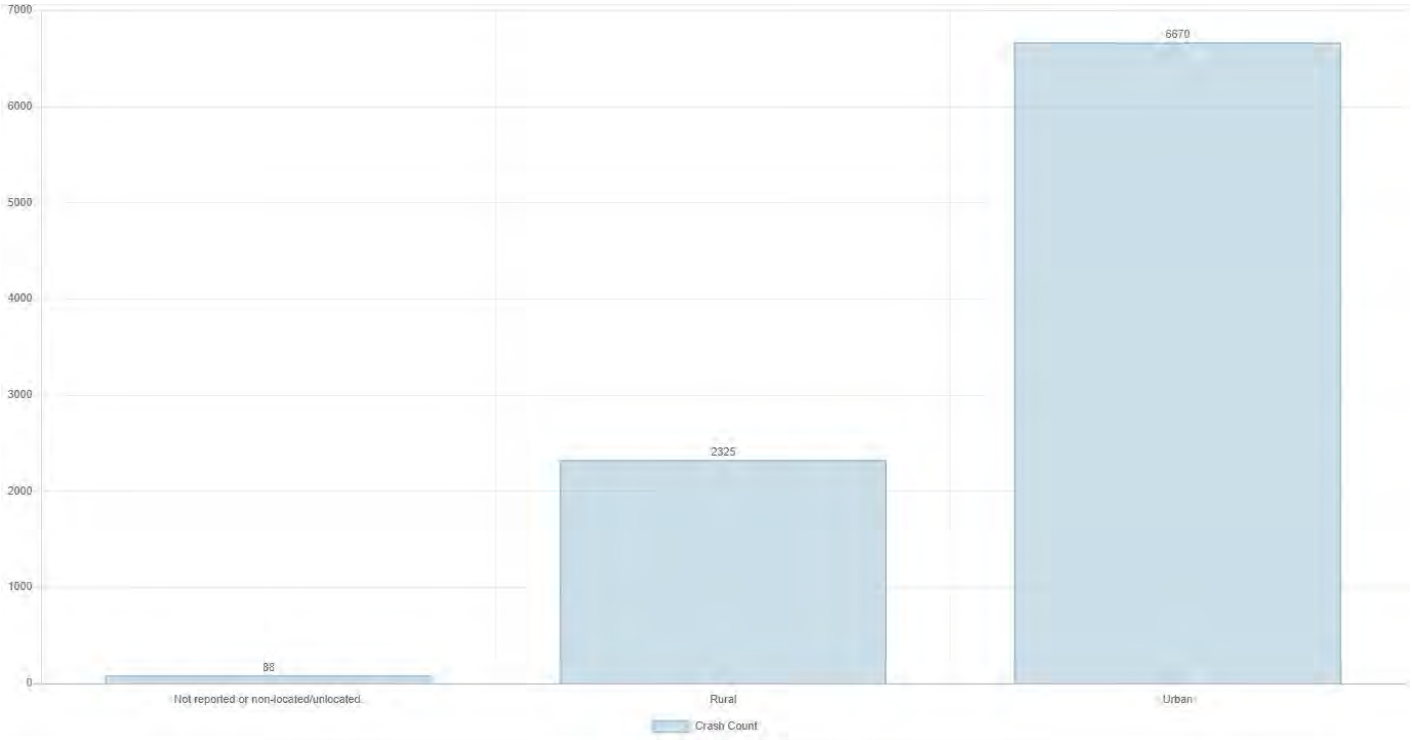
Source: Iowa DOT

Figure 3-80 Clinton County Crash Severity, 2011-2020



Source: Iowa DOT

Figure 3-81 Clinton County Urban and Rural Crashes, 2011-2020



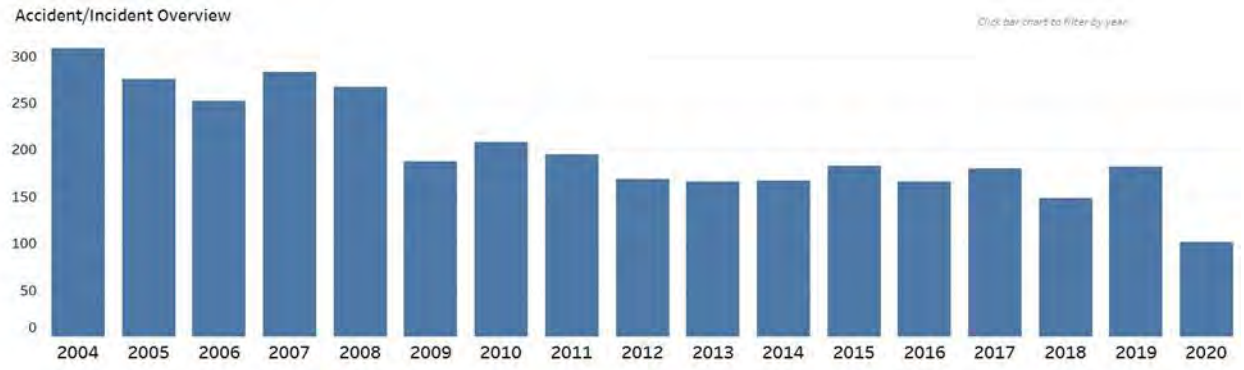
Source: Iowa DOT

The HMPC noted the following accident that occurred May 5, 2018. A Northwest School Bus rolled at 302nd Avenue and 160th Street. There were multiple injuries and multiple students were transported by ground and one by air.

Railway Transportation Incidents

Throughout Iowa, railcar traffic has increased but the number of derailments in relation to the traffic is trending downward according to the Iowa DOT (see Figure 3-82). Iowa has 5,157 public highway-rail crossings in the State on state, city, and county highways.

Figure 3-82 Iowa Railway Accidents/Incidents, 2004-2020



Source: US DOT Federal Railroad Administration, Overview Reports

According to the US DOT, Federal Railroad Administration records, there have been 27 accidents in Clinton County at highway-rail grade crossings between 2000 and 2019. Of these events, 17 of the drivers were uninjured, seven were injured, and three were killed. City of Clinton has the most events recorded (14) in this time period followed by Camanche (3), De Witt (2) and Grand Mound (2). Details are provided in Table 3-67.

Table 3-67 Highway-Rail Grade Crossing Accidents in Clinton County, 2000-2019

Railroad	Date	# of Train Cars	City	Highway	Driver Condition
UP	12/21/2000	1	Clinton	Harrison Drive	Uninjured
BNSF	12/26/2000	7		7th Avenue	Injured
IMRL	10/21/2000	27	Camanche	Rock Creek	Injured
UP	5/30/2001	3	Clinton	With Yard Limits	Uninjured
BNSF	7/23/2002	0		17th Avenue South	Injured
UP	5/30/2002	4	Clinton	Manufacturing Drive	Injured
UP	10/23/2003	135	De Witt	260th Avenue	Killed
UP	12/11/2003	134	Clinton	9th Street	Uninjured
ICE	9/27/2004	17	Clinton	17th Avenue South	Uninjured
BNSF	5/7/2004	27		Beaver Channel PW	Uninjured
UP	9/19/2005	6	Low Moor	3rd Street, County Road #291	Uninjured
UP	8/24/2006	110	Grand Mound	237th Street	Uninjured
UP	1/4/2006	5	Clinton	Ralston Purina Plant	Uninjured
ICE	4/5/2007	3	Clinton	21st Avenue	Injured
ICE	9/27/2007	2	Clinton	4th Avenue North	Uninjured
UP	3/16/2008	129	Camanche	9th Avenue	Injured
ICE	6/2/2008	37	Clinton	25th Avenue	Injured
UP	2/20/2008	5	Clinton	Harrison Drive	Uninjured
DME	9/26/2009	30	Clinton	17th Avenue North	Uninjured
BNSF	4/26/2012	5	Clinton	Private Entrance	Uninjured
DME	7/6/2012	2	Clinton	17th Avenue North	Uninjured
UP	10/29/2014	80		190th Avenue	Killed
CP	5/31/2016	57	Clinton	30th Avenue	Uninjured
UP	11/10/2017	115	Grand Mound	East Street	Uninjured
UP	7/2/2017	90		Private 335th Avenue	Uninjured
UP	7/14/2017	141	De Witt	S 6th Avenue	Killed
CP	1/21/2019	102	Camanche	4th Avenue	Uninjured

Source: US DOT Federal Railroad Administration

Waterway Transportation Incidents

Research revealed the following waterway transportation incidents in Clinton County:

- **September 6, 2014:** A one-vessel boat occurred on the Mississippi River, Pool 14. There were no injuries (Source Des Moines Register, http://db.desmoinesregister.com/iowa-boating-accidents).
- **July 26, 2014:** A collision between two boats occurred in the Mississippi River near the Clinton Marina. Eight people were involved, and one person had minor injuries. (Source: KROS Radio, http://krosradio.com/?p=4870).
- **June 14, 2014:** A one-boat fatality accident occurred on the Mississippi River (Source Des Moines Register, http://db.desmoinesregister.com/iowa-boating-accidents).
- **June 4, 2011:** A collision occurred between two boats on Joyce's Clugh between a fishing boat and a ski boat near the dock. There were no injuries (Source Des Moines Register, http://db.desmoinesregister.com/iowa-boating-accidents).
- **August 30, 2008:** A one-boat accident occurred on the Wapsipinicon River during high-speed operation of an airboat. One person was injured (Source Des Moines Register, http://db.desmoinesregister.com/iowa-boating-accidents).
- **July 29, 2006:** A two-boat collision occurred on the Mississippi River due to a vessel not operating lights after dark. There were three injuries (Source Des Moines Register, http://db.desmoinesregister.com/iowa-boating-accidents).
- **June 4, 2006:** A two-boat collision occurred on the Mississippi River due to a boat drifting into another boat. There were no injuries (Source Des Moines Register, http://db.desmoinesregister.com/iowa-boating-accidents).

Probability of Future Occurrence

A major transportation incident can occur at any time, even though traffic engineering, inspection of traffic facilities, and land use management of areas adjacent to roads and highways has increased, incidents continue to occur. Current population trends indicate a slight decrease in population in Clinton County. If the volume of traffic on the county roads, highways and interstates decreases with population decreases, the number of traffic accidents will likely also decrease. The combination of cars and trucks, farm equipment, wildlife, unpredictable weather conditions, potential mechanical problems and human error always leaves the potential for a transportation accident.

Based on the available information, the probability of air transportation, highway, waterway, or railway incident that directly threatens life and which results in property damage and/or death(s)/injury(s) and/or adversely impact a community's capabilities to provide emergency services is Highly Likely as multiple occurrences happen each year.

Probability Score: 4—Highly Likely

Vulnerability

Those who use the surface transportation system are most vulnerable. Travelers, truckers, delivery personnel, and commuters are at risk the entire time they are on the road. During high traffic hours and holidays the number of people on the road in Clinton County is higher. This is also true before and after major gatherings such as sporting events, concerts, and conventions. Pedestrians and citizens of the community are less vulnerable but still not immune from the impacts of a highway incident.

For railway transportation incidents, people, and property near the railway lines, crossing, sidings, switching stations, and loading/unloading points are most at risk. Those away from railroad tracks and facilities are vulnerable only to large-scale incidents including those in which hazardous materials are involved.

Potential Losses to Existing Development

Incidents involving highway accidents could result in injuries, fatalities, closed roads, rerouted traffic, and a strain on the capacity of emergency service personnel who must respond to the incident. In general, all critical facilities in all jurisdictions could be vulnerable to transportation incidents. Highway accidents could affect the flow of traffic and ability of residents to travel within and out of the jurisdiction. For those cities vulnerable to railway transportation incidents, large areas of the city could be affected by a train derailment.

The US DOT Federal Highway Administration issued a technical advisory in 1994 providing suggested estimates of the cost of traffic crashes to be used for planning purposes. These figures were converted from 1994 dollars to 2020 dollars. The costs are listed below in Table 3-68.

Table 3-68 Costs of a Traffic Crash

Severity	Cost per injury (in 2020 dollars $)
Fatal	$4,632,233
Evident Injury	$64,139
Possible Injury	$33,851
Property Damage Only	$3,563

Source: US DOT Federal Highway Administration Technical Advisory T 7570.2, 1994. Adjusted to 2020 dollars.

No county-wide or jurisdictional loss estimates were calculated due to lack of data. Generally, property involved by such an event would likely be insured but impacts would be small, targeted, and would likely not last for a long period of time.

Future Development

Overall, Clinton County has seen a slight decrease in population. Future development is not anticipated to substantially increase or decrease vulnerability to this hazard.

Climate Change Impact

If projections regarding milder winters come to fruition, climate change impacts may reduce the number of transportation incidents associated with some severe weather. However, if ice occurs, rather than snow, this could result in higher incidents of weather-related accidents.

Transportation Hazard Summary by Jurisdiction

All jurisdictions within the planning area are at risk to a transportation incident.

Jurisdiction	Probability	Magnitude	Warning Time	Duration	Score	Level
Unincorporated Clinton County	4	3	4	1	3.40	High
Andover	4	3	4	1	3.40	High
Calamus	4	3	4	1	3.40	High
Camanche	4	3	4	1	3.40	High
Charlotte	4	3	4	1	3.40	High
Clinton	4	3	4	1	3.40	High
Delmar	4	3	4	1	3.40	High
DeWitt	4	3	4	1	3.40	High

Jurisdiction	Probability	Magnitude	Warning Time	Duration	Score	Level
Goose Lake	4	3	4	1	3.40	High
Grand Mound	4	3	4	1	3.40	High
Lost Nation	4	3	4	1	3.40	High
Low Moor	4	3	4	1	3.40	High
Toronto	4	3	4	1	3.40	High
Welton	4	3	4	1	3.40	High
Wheatland	4	3	4	1	3.40	High
Calamus-Wheatland School District	4	3	4	1	3.40	High
Camanche School District	4	3	4	1	3.40	High
Central DeWitt School District	4	3	4	1	3.40	High
Clinton School District	4	3	4	1	3.40	High
Delwood School District	4	3	4	1	3.40	High
Northeast School District	4	3	4	1	3.40	High

3.4 Hazard Analysis Summary

This table below provides a tabular summary of the hazard ranking for each jurisdiction in the planning area.

Table 3-69 Hazard Ranking Summary by Jurisdiction

Jurisdiction	Animal/Plant/Crop Disease	Cyber Attack	Dam/Levee Failure	Drought	Earthquake	Expansive Soils	Extreme Heat	Flash Flood	Grass/Wildland Fire	Hazmat Incident	Human Disease	Infrastructure Failure	Landslide	Radiological Incident	River Flood	Severe Winter Storm	Sinkholes	Terrorism	Thunderstorm	Tornado/Windstorm	Transportation Incident
Unincorporated Clinton County	M	H	L	H	L	L	M	H	M	M	M	H	L	M	M	H	L	M	M	H	H
Andover	M	H	--	M	L	L	M	M	L	M	M	H	L	M	M	H	L	M	M	H	H
Calamus	M	H	--	M	L	L	M	--	M	M	M	H	L	M	L	H	L	M	M	H	H
Camanche	M	H	--	M	L	L	M	H	M	H	H	H	L	M	M	H	L	M	M	H	H
Charlotte	M	H	--	M	L	L	M	H	L	M	M	H	L	M	H	H	L	M	M	H	H
Clinton	M	H	M	M	L	L	M	H	M	H	H	H	L	M	M	H	L	M	M	H	H
Delmar	M	H	--	M	L	L	M	--	L	M	M	H	L	M	L	H	L	M	M	H	H
DeWitt	M	H	--	M	L	L	M	M	M	H	H	H	L	M	M	H	L	M	M	H	H
Goose Lake	M	H	--	M	L	L	M	M	L	M	M	H	L	M	L	H	L	M	M	H	H
Grand Mound	M	H	--	M	L	L	M	M	L	M	M	H	L	M	M	H	L	M	M	H	H
Lost Nation	M	H	--	M	L	L	M	M	L	M	M	H	L	M	L	H	L	M	M	H	H
Low Moor	M	H	--	M	L	L	M	M	L	M	M	H	L	M	M	H	L	M	M	H	H
Toronto	M	H	--	M	L	L	M	M	L	M	M	H	L	M	M	H	L	M	M	H	H
Welton	M	H	--	M	L	L	M	H	L	M	M	H	L	M	M	H	L	M	M	H	H
Wheatland	M	H	--	M	L	L	M	M	M	M	M	H	L	M	M	H	L	M	M	H	H

Jurisdiction	Animal/Plant/Crop Disease	Cyber Attack	Dam/Levee Failure	Drought	Earthquake	Expansive Soils	Extreme Heat	Flash Flood	Grass/Wildland Fire	Hazmat Incident	Human Disease	Infrastructure Failure	Landslide	Radiological Incident	River Flood	Severe Winter Storm	Sinkholes	Terrorism	Thunderstorm	Tornado/Windstorm	Transportation Incident
Calamus-Wheatland School District	L	**H**	--	M	L	L	M	--	L	M	**H**	**H**	L	M	L	**H**	L	M	M	**H**	**H**
Camanche School District	L	**H**	--	M	L	L	M	--	L	M	**H**	**H**	L	M	L	**H**	L	M	M	**H**	**H**
Central DeWitt School District	L	**H**	--	M	L	L	M	--	L	M	**H**	**H**	L	M	L	**H**	L	M	M	**H**	**H**
Clinton School District	L	**H**	M	M	L	L	M	--	L	M	**H**	**H**	L	M	L	**H**	L	M	M	**H**	**H**
Delwood School District	L	**H**	--	M	L	L	M	--	L	M	**H**	**H**	L	M	L	**H**	L	M	M	**H**	**H**
Northeast School District	L	**H**	--	M	L	L	M	--	L	M	**H**	**H**	L	M	L	**H**	L	M	M	**H**	**H**

4 Mitigation Strategy

44 CFR Requirement §201.6(c)(3):

[The plan shall include] a mitigation strategy that provides the jurisdiction's blueprint for reducing the potential losses identified in the risk assessment, based on existing authorities, policies, programs and resources, and its ability to expand on and improve these existing tools. This section shall include:
(i) A description of mitigation goals to reduce or avoid long-term vulnerabilities to the identified hazards.
(ii) A section that identifies and analyzes a comprehensive range of specific mitigation actions and projects being considered to reduce the effects of each hazard, with particular emphasis on new and existing buildings and infrastructure.
(iii) An action plan describing how the actions identified in section (c)(3)(ii) will be prioritized, implemented, and administered by the local jurisdiction. Prioritization shall include a special emphasis on the extent to which benefits are maximized according to a cost benefit review of the proposed projects and their associated costs.

This section presents the mitigation strategy updated by the HMPC based on the updated risk assessment. The mitigation strategy was developed through a collaborative group process and consists of validated general goal statements to guide the jurisdictions in efforts to lessen disaster impacts as well as specific mitigation actions that can be put in place to directly reduce vulnerability to hazards and losses. The following definitions are based upon those found in FEMA's 2013 Local Mitigation Planning Handbook:

- Goals are general guidelines that explain what the community wants to achieve with the plan. They are usually broad policy-type statements that are long-term, and they represent visions for reducing or avoiding losses from the identified hazards.
- Mitigation Actions are specific actions that help achieve goals.

4.1 Goals

This planning effort is an update to an existing hazard mitigation plan. Therefore, the goals from the 2017 Clinton County Hazard Mitigation Plan were reviewed to determine if they are still valid. Wood facilitated a discussion session with the HMPC during their second and third meetings to review and update the plan goals. To ensure that the goals are comprehensive and support State goals, the 2018 State Hazard Mitigation Plan goals were reviewed. Wood also presented common categories of mitigation goals from other plans.

After discussion, the HMPC decided to maintain the 2017 goals as written. The plan goals are as follows:

- **Goal 1:** Increase capabilities within Clinton County entities to mitigate the effects of hazards by enhancing existing or designing and adopting new policies that will reduce the damaging effects of hazards.
- **Goal 2:** Protect the most vulnerable populations, buildings, and critical facilities within Clinton County through the implementation of cost-effective and technically-feasible mitigation projects.
- **Goal 3:** Improve the level of responder, government, business, and citizen awareness and preparedness for disaster.
- **Goal 4:** Develop programs to assure that response agencies, governments, educational institutions, and local businesses can operate during times of disaster.

4.2 Identification and Analysis of Mitigation Actions

During the second meeting of the HMPC, the highlights of the risk assessment update were provided to the HMPC members for review and the key issues were identified for specific hazards. Meeting #2 concluded with an introduction to mitigation actions to prompt discussions within and among the jurisdictions about any new mitigation actions as well as ongoing actions from the existing plans. In addition, Wood provided the HMPC with information on the Iowa Homeland Security and Emergency Management Division's funding priorities and the types of mitigation actions generally recognized by FEMA.

The focus of Meeting #3 was to update the mitigation strategy. For a comprehensive range of mitigation alternatives/actions to consider, the HMPC reviewed the following information during Meeting #3:

- Existing Actions submitted in the previous mitigation plan,
- Recap of Hazard Significance/Key Issues from Risk Assessment,
- Typical projects funded by Hazard Mitigation Assistance Grants,
- Other non-FEMA funding options,
- Public opinion from the survey,
- FEMA Mitigation Ideas (2013), and
- FEMA Mitigation Action Portfolio (2020).

In development of each jurisdiction's final mitigation strategy for submission to the plan, the jurisdictions were presented with a recap of the hazard significance levels and the key issues from the risk assessment to think about the vulnerabilities specific to their jurisdiction. Then for comparison, the results of the public survey were provided, which included typical mitigation actions that the public might support.

Prioritization Process

The STAPLEE prioritization method in general is a tool used to assess the costs, benefits, and overall feasibility of mitigation actions. STAPLEE stands for:

- **S**ocial: Will the action be acceptable to the community? Could it have an unfair effect on a particular segment of the population?
- **T**echnical: Is the action technically feasible? Are there secondary impacts? Does it offer a long-term solution?
- **A**dministrative: Are there adequate staffing, funding, and maintenance capabilities to implement the project?
- **P**olitical: Will there be adequate political and public support for the project?
- **L**egal: Does your jurisdiction have the legal authority to implement the action?
- **E**conomic: Is the action cost-beneficial? Is there funding available? Will the action contribute to the local economy?
- **E**nvironmental: Will there be negative environmental consequences from the action? Does it comply with environmental regulations? Is it consistent with community environmental goals?

Additional questions were added to the modified STAPLEE worksheet to include elements to consider mitigation effectiveness related to protection of life and reduction of damages as well as reduction in the need for response actions, and the potential for benefits to exceed the cost.

As part of the mitigation strategy meeting discussion, jurisdictions were instructed to consider STAPLEE as they reviewed existing and developed new actions, and the potential cost of each project in relation to the anticipated future cost savings. This type of discussion allowed the committee as a whole to understand the broad priorities and discussion of the types of projects most beneficial to all jurisdictions within

Clinton County. With STAPLEE in mind new proposed actions were voted on with sticky dots at HMPC meeting #3. This provided an initial prioritization that was subsequently converted to high, medium, or low.

4.3 Progress on Previous Mitigation Actions

Prior to the third meeting, the HMPC was emailed an electronic spreadsheet with details of each jurisdiction's previous mitigation actions from the 2017 plan. The spreadsheet provided to members of the HMPC included the action titles and two open columns for the "2022 Action Status" and a column to provide notes of the progress of implementation, both to be completed by the jurisdiction. Each jurisdiction was instructed to complete the column titled "2022 Action Status" with one of the following status choices:

- Not Started
- In Progress
- Annual Implementation
- Continued
- Deleted

Based on updates from each jurisdiction, of the 145 actions in the previous plan, 16 have been completed, 5 were deleted, and 124 were continued in the plan update. Table 4-1 summarizes actions from the 2017 Plan along with 27 new actions added for 2022. Table 4-2 list the actions that were completed or deleted from the 2017 plan.

The jurisdictions were encouraged to be comprehensive and include all appropriate actions to work toward becoming more disaster resilient. However, they were encouraged to maintain a realistic approach and were reminded that the hazard mitigation plan is a "living document". As capabilities, vulnerabilities, or the nature of hazards that threaten each jurisdiction change, the mitigation actions can and should be updated to reflect those changes, including addition or deletion of actions, as appropriate. Jurisdictions also revisited the priority ratings and adjusted where necessary. A concerted effort to ensure the mitigation strategy is realistic and achievable resulted in several actions being considered no longer relevant or realistic, and thus have been deleted. The continued actions are discussed in additional detail, along with the new actions in Section 4.4.

Table 4-1 Summary of Progress of Actions in Previous Plan and New Actions

Jurisdiction	# Actions in 2017 HMP	# Actions Completed	# Actions Deleted	# Actions Continued	New Actions Added	# Actions in 2021 HMP
Clinton County	14	0	0	14	1	15
Andover	4	0	0	4	2	6
Calamus	7	1	0	6	1	7
Camanche	9	0	0	9	3	12
Charlotte	4	0	0	4	2	6
Clinton, City of	17	3	0	14	1	15
Delmar	5	1	0	4	1	5
DeWitt	9	0	0	9	1	10
Goose Lake	2	2	0	0	1	1
Grand Mound	7	3	0	4	2	6
Lost Nation	7	1	0	6	1	7

Jurisdiction	# Actions in 2017 HMP	# Actions Completed	# Actions Deleted	# Actions Continued	New Actions Added	# Actions in 2021 HMP
Low Moor	11	2	2	7	1	8
Toronto	8	2	0	6	1	7
Welton	5	0	1	4	1	5
Wheatland	10	1	0	9	2	11
Calamus-Wheatland School District	4	0	0	4	1	5
Camanche School District	4	0	0	4	1	5
Central DeWitt School District	4	0	0	4	1	5
Clinton School District	5	0	1	4	1	5
Delwood School District	2	0	0	2	1	3
Northeast School District	7	0	1	6	1	7
TOTAL	**145**	**16**	**5**	**124**	**27**	**151**

Table 4-2 Completed and Deleted Actions

Jurisdiction	Mitigation Action Title	Hazard(s) Mitigated	Goals Addressed	Comments
Calamus	Update to sewer system	Flood	2	**Completed**
Delmar	Create and implement procedure to backup all critical data to prevent loss in the event of hazard	Flood, Infrastructure Failure	2	**Completed**
Goose Lake	Replace lift station and controls and clear storm sewer drains and continue long-term curb/gutter installation	Flood	1	**Completed**
Goose Lake	Enforcement of the adopted floodplain management ordinance to include utilizing current effective regulatory maps, issuing floodplain development permits, and monitoring substantial damage / improvements	Flood	1	**Completed**
Grand Mound	Update snow and ice equipment as needed to better respond to snow and ice events	Severe Winter Storm	3	**Completed**
Grand Mound	Mitigate flood-prone properties to include resizing culverts to address drainage problems and acquire properties if deemed appropriate	Flood	2	**Completed**
Grand Mound	Create extreme heat hazard plan for city employees and recommendation for citizens via public access	Extreme Heat	1	**Completed**
Lost Nation	Provide backup power generators and wiring for critical facilities	Infrastructure Failure, Severe Winter Storm, Thunderstorm/ lightning/Hail, Tornado/ Windstorm	2	**Completed**
Low Moor	Create call down list of all critical personnel	All	3	**Completed**

Jurisdiction	Mitigation Action Title	Hazard(s) Mitigated	Goals Addressed	Comments
Low Moor	Create and implement procedure to backup all critical data to prevent loss in the event of hazard	All	3	**Completed**
Low Moor	Distribute pamphlets throughout the community on use of new warning sirens	Thunderstorm/ Lightning/Hail, Tornado/ Windstorm	3	**Deleted**
Low Moor	Add approximately seven blocks of curb and gutter with storm drains to improve city infrastructure and prevent flooding	Flood	2	**Deleted**
Toronto	Provide backup power generators and wiring for critical facilities	Infrastructure Failure, Severe Winter Storm, Thunderstorm/ lightning/Hail, Tornado/ Windstorm	2	**Completed**
Toronto	Designate Toronto City Hall as shelter during power outages	Extreme Heat, Severe Winter Storm, Thunderstorm/ Lightning/Hail, Tornado/ Windstorm	2	**Completed**
Welton	Build storm sewer in the lower part of Welton	Flash Flooding	4	**Deleted**
Wheatland	Create and implement procedure to backup all critical data to prevent loss in the event of hazard	Infrastructure Failure	1	**Completed**

4.3.1 FEMA Hazard Mitigation Assistance Grants in Planning Area

Between 1990 and 2019, $4.6 million in Hazard Mitigation Assistance grants has been awarded to subgrantees in Clinton County. Table 4-3 provides details on the previous FEMA Hazard Mitigation Assistance grants in the planning area.

Table 4-3 FEMA HMA Grants in Clinton County from 1990-2019

Project Type	Sub-Applicant	Total Cost
Generators	City of Low Moor	$13,944
Acquisition of Private Real Property (Structures and Land) - Riverine	City of Charlotte	$26,062
Local Multi-hazard Mitigation Plan	Clinton County	$8,042
Local Multi-hazard Mitigation Plan	City Of Clinton	$8,042
Local Multi-hazard Mitigation Plan	City Of Dewitt	$2,010
Local Multi-hazard Mitigation Plan	City Of Lost Nation	$4,860
Local Multi-hazard Mitigation Plan	City Of Charlotte	$4,860
Local Multi-hazard Mitigation Plan	City Of Delmar	$4,416
Local Multi-hazard Mitigation Plan	City Of Welton	$3,780
Local Multi-hazard Mitigation Plan	City Of Low Moor	$4,860
Local Multi-hazard Mitigation Plan	City Of Grand Mound	$4,860
Local Multi-hazard Mitigation Plan	City Of Andover	$3,780
Local Multi-hazard Mitigation Plan	City Of Goose Lake	$4,860
Safe Room (Tornado and Severe Wind Shelter) - Public Structures	Northeast Community High School	$2,720,467
Local Multi-hazard Mitigation Plan	Clinton (County)	$56,439
Generators	City Of Camanche	$177,765
Generators	Clinton (County)	$286,288
Generators	Clinton (County)	$41,680
Local Multi-hazard Mitigation Plan	Clinton County	$30,000
Acquisition of Private Real Property (Structures and Land) - Riverine	Clinton	$746,000
Generators - Regular	Clinton	$526,590
	Total	**$4,679,605**

Source: OpenFEMA Dataset: Hazard Mitigation Assistance Projects

4.4 Mitigation Action Plan

Jurisdictions were encouraged to meet with others in their community to finalize the actions to be submitted to the updated mitigation strategy. Throughout the discussion of the types of projects that the committee would include in the mitigation plan, emphasis was placed on the importance of a benefit-cost analysis in determining project priority. Recognizing the federal regulatory requirement to prioritize by benefit-cost, and the need for any publicly funded project to be cost-effective, the HMPC decided to pursue implementation according to when and where damage occurs, available funding, political will, jurisdictional priority, and priorities identified in the Iowa State Hazard Mitigation Plan. Due to many

variables that must be examined during project development, the benefit/cost review at the planning stage was primarily qualitative rather than a detailed quantitative analysis. For each action, the jurisdictions included a narrative describing the types of benefits that could be realized with implementation of the action. Where possible, the cost was estimated as closely as possible with further refinement to occur as project development occurs. Cost-effectiveness will be considered in additional detail when seeking FEMA Hazard Mitigation Assistance grant funding for eligible projects identified in this plan. At that time, additional information will be researched to provide for a quantitative benefit-cost analysis.

Continued Compliance with the National Flood Insurance Program

As noted previously, all jurisdictions in Clinton County participate in the NFIP except for Delmar, which does not have an identified floodplain. Given the flood hazard and risk in the planning area and recognizing the importance of the NFIP in mitigating flood losses, an emphasis is placed on continued compliance with the NFIP by Clinton County and all NFIP-participating jurisdictions. As NFIP participants, these communities have and will continue to make every effort to remain in good standing with NFIP. This includes continuing to comply with the NFIP's standards for updating and adopting floodplain maps and maintaining and updating the floodplain zoning ordinance. There are several action items identified in Table 4-4 that address specifics related to NFIP continued compliance. Other details related to NFIP participation are noted in Chapter 2 under the Jurisdictional Capabilities Section 2.4 and the flood vulnerability discussion in Chapter 3.3.8.

Updated Mitigation Action Plan

The 2022 mitigation action plans for each jurisdiction are provided in Table 4-4 through Table 4-24 and are representative of the current priorities of each jurisdiction. In addition to the 124 actions that were continued from the previous plan, 18 new actions were identified, for a combined total of 142 actions in this updated mitigation strategy. During the mitigation strategy update process communities were encouraged to develop new mitigation actions. Many chose to focus on implementation of existing actions that have not been completed yet. Each continued and new action has been assigned an Action ID for tracking purposes. Action IDs are in numerical order based on the jurisdiction proposing the action, with continued actions numbered lowest and new actions assigned the next sequential Action ID. The mitigation action plan includes description on how each action will be implemented and administered by the local jurisdiction.

Many of these mitigation actions are intended to reduce impacts to existing development. Those that protect future development from hazards, as required per the DMA 2000 regulations, are indicated by an asterisk '*' in the action identification number. These actions include those that promote wise development and hazard avoidance, such as building code, mapping, and zoning improvements, and continued enforcement of floodplain development regulations.

Table 4-4 Clinton County Mitigation Action Plan

ID	Action Description/ Background/Benefits	Goal	Hazard(s) Mitigated	Lead Agency and Partners	Potential Funding	Cost Estimate	Priority	Timeline	Status/ Implementation Notes
County 1	Update snow and ice equipment as needed to better respond to snow and ice events. Maintain ability to respond to severe winter weather events and minimize impact/ recovery.	1	Severe Winter Storm	Clinton County Secondary Roads, State DOT	Local Funds	$500,000 to $1,000,000	Low	More than 5 years	Continue - In Progress. Constructed 21 heated bays for snow removal equipment to address extreme cold weather response issues regarding equipment, purchased a truck mounted snow blower 2019, goal to get all heated sheds for snow equipment, lost nation and charlotte sheds planned for 2022
County 2	Provide backup power generators and wiring for critical facilities. Clinton County has invested in backup power for critical facilities and shelter locations	2	Infrastructure failure, severe winter storm, thunderstorm/ lightning/ hail, tornado/windstorm	Clinton County Emergency Management, Clinton County Maintenance Department, All other county departments	FEMA HMA Grant (HMGP, PDM, or FMA)	$500,000 to $1,000,000	High	More than 5 years	Continue - In Progress. New Law Center completed in 2019 with new generator replacing old Courthouse and LC generators. Failure of Admin Building generator being addressed currently
County 3*	Construct tornado saferooms in new construction. Protection from high wind events should be provided for vulnerable populations and critical facilities	2	Tornado/ windstorm, terrorism	Clinton County Emergency Management, Clinton County Maintenance Department	Local Funds	Over $1,000,000	High	More than 5 years	Continue - In Progress. Secondary Roads constructed a safe room in DeWitt Building
County 4*	Purchase or elevate structures, add lift stations, increase/ reinforce culvert size, and add curb and gutter to streets in areas in flood zones with severe and repetitive flood damage to prevent reoccurrence. Reduce impact of flash flooding or river flooding events	2	Flash flood, river flooding	Clinton County Secondary Roads, Clinton County Emergency Management	FEMA HMA Grant (HMGP, PDM, or FMA)	Over $1,000,000	High	More than 5 years	Continue - In Progress. Constructed 14'x4' RCBC on 120th Ave to mitigate flooding and road damage

ID	Action Description/ Background/Benefits	Goal	Hazard(s) Mitigated	Lead Agency and Partners	Potential Funding	Cost Estimate	Priority	Timeline	Status/ Implementation Notes
County 5	Continue to maintain existing outdoor warning siren systems. Public warning for alerting citizens who need to take action.	2	Hazardous materials incident, radiological incident, thunderstorms/ lightning/hail, tornado/windstorm	Clinton County Emergency Management, Clinton County Maintenance Department, Clinton County Municipalities	Local Funds	$50,000 to $100,000	High	More than 5 years	Continue - Annual Implementation. Siren Server replacement 2021
County 6	Purchase barricades and signage as deemed necessary to better communicate flood information. Clinton County maintains signage and barricades for communication to the public regarding dangerous or closed areas.	2	Transportation Incident, Tornado/ Windstorm, River Flooding, Hazardous Materials, Flash Flood, Infrastructure Failure, Dam/Levee Failure,	Clinton County Secondary Roads State DOT	Local Funds	$50,000 to $100,000	High	More than 5 years	Continue - Annual Implementation
County 7	Distribute pamphlets throughout the community on use of new warning sirens. Ensuring the public knows what the outdoor warning system means.	3	Hazardous materials incident, radiological incident, thunderstorms/ lightning/hail, tornado/windstorm	Clinton County Emergency Management Clinton County Municipalities	Local Funds	Less than $10,000	Medium	More than 5 years	Continue - Annual Implementation
County 8	Train personnel as weather spotters. Ensure responders can report severe weather accurately.	3	Thunderstorms/ lightning/hail, tornado/windstorm	Clinton County Emergency Management, Local fire and police departments, National Weather Service	Local Funds	Less than $10,000	Medium	More than 5 years	Continue - Annual Implementation
County 9*	Maintain ordinance for manufactured homes regarding storm shelters. Ensure shelter space for new vulnerable populations.	1	Thunderstorms/ lightning/hail, tornado/windstorm	Clinton County Planning and Zoning	Local Funds	Little or No Cost	High	More than 5 years	Continue - Annual Implementation

ID	Action Description/ Background/Benefits	Goal	Hazard(s) Mitigated	Lead Agency and Partners	Potential Funding	Cost Estimate	Priority	Timeline	Status/ Implementation Notes
County 10	Improve compliance with NFIP including enforcement of the adopted floodplain management ordinance to include utilizing current effective regulatory maps, issuing floodplain development permits, and monitoring substantial damage/improvements. Clinton County is a member of NFIP	1	River flooding, flashflood	Clinton County Planning and Zoning	Local Funds	Less than $10,000	Medium	More than 5 years	Continue - Annual Implementation. July 2020 flood plain ordinances updated
County 11	Remove existing structures from flood hazard areas. Minimize future flood losses.	2	River flooding, flashflood, dam/levee failure	Clinton County Board of Supervisors, Clinton County Planning and Zoning	FEMA HMA Grant (HMGP, PDM, or FMA)	$100,000 to $500,000	Medium	More than 5 years	Continue - Not Started
County 12	Elevate or retrofit structures or utilities. Minimize future flood losses.	2	River flooding, flashflood, dam/levee failure	Clinton County Planning and Zoning	FEMA HMA Grant (HMGP, PDM, or FMA)	$100,000 to $500,000	Medium	More than 5 years	Continue - Not Started
County 13	Local funding mechanism for hazard mitigation. Local reserves funds established for public mitigation measures.	4	All	Clinton County Emergency Management, All other public partners	Local Funds	Over $1,000,000	High	More than 5 years	Continue - Annual Implementation
County 14	Install low water crossings for water to flow over on frequently damaged roads. There are areas where roads are frequently washed out and a strategy should be implemented to reduce the damage from these events.	1	River flooding, flashflood	Clinton County Secondary Roads	Local Funds	$100,000 to $500,000	High	More than 5 years	Continue - In Progress. 247th Ave low water crossings under construction, will be completed in FY 21
County 15	Placement of rain gauges to improve flood prediction and warning. Hill flood events are different based on amount and location of rainfall. Need better prediction.	2	Flash Flooding, Riverine Flooding	EMA; Cities, Fire Department	Local funds Private Non-Profit	$10,000 to $50,000	Medium	3-5 years	New in 2022

Table 4-5 City of Andover Mitigation Action Plan

ID	Action Description/ Background/Benefits	Goal	Hazard(s) Mitigated	Lead Agency and Partners	Potential Funding	Cost Estimate	Priority	Timeline	Status/ Implementation Notes
Andover 1	Train personnel as weather spotters. This is needed to assist in providing advance warning of severe weather.	3	Severe Thunderstorm, Tornado	Andover City Council, TBD	Local Funds	Little or No Cost	Low	1 year	Continue - Not Started
Andover 2	Work with Andover Meat Locker, DNR and EPA to reduce contamination to City Lagoon. This is needed to ensure waste is properly disposed of	2	Hazardous Materials Incident, Human Disease	Andover City Council, Engineers	Local Funds and other grants TBD	Less than $10,000	Medium	3-5 years	Continue - In Progress
Andover 3	Portable generator for City Hall to be able to use as warming or cooling shelter. The fire station is currently used for this purpose and has a generator. This would provide a backup facility in case the fire station could not be used.	2	Extreme Heat, Severe Winter Storm	Andover City Council, Clinton County Emergency Management	FEMA HMA Grant (HMGP, PDM, or FMA); Local Funds: Clinton County Emergency Management grant	Less than $10,000	Medium	2-3 years	Continue - In Progress
Andover 4	Enforcement of the adopted floodplain management ordinance to include utilizing current effective regulatory maps, issuing floodplain development permits, and monitoring substantial damage / improvements.	1	Flooding	Andover City Council, IDNR	Local Funds	Little or No Cost	Medium	More than 5 years	Continue - In Progress
Andover 5	Cooling Station as a safe house continuing capabilities. Currently, there is no local assistance for people at risk to cool themselves in extreme heat.	1	Extreme Heat	Fire Department; Ambulance Service and City of Andover	FEMA Hazard Mitigation Assistance Grants; City Funds	$10,000 to $50,000	High	2-3 years	New in 2022
Andover 6	Storm Water Management. Protect many homes from flooding and prevent land deterioration.	1	Flash Flooding, Infrastructure Failure	Maze water Management; Mayor's Office	FEMA Hazard Mitigation Assistance Grants; City Funds	Less than $10,000	Medium	1 year	New in 2022

Table 4-6 City of Calamus Mitigation Action Plan

ID	Action Description/ Background/Benefits	Goal	Hazard(s) Mitigated	Lead Agency and Partners	Potential Funding	Cost Estimate	Priority	Timeline	Status/ Implementation Notes
Calamus 1	Coordinate with the volunteer fire department to update fire and rescue equipment as needed to better respond to emergencies. To maintain a safe community, fire and rescue equipment must be kept up to date for better emergency response.	2	All Hazards	Calamus City Council, Calamus Volunteer Fire Company	Local Funds, FEMA Assistance to Firefighters Grant	$50,000 to $100,000	High	2-3 years	Continue - Not Started. Update rescue truck
Calamus 2	Provide backup power generators and wiring for critical facilities. Prevent power loss that would disable critical facilities; Fire Department could be used as a secondary or overflow shelter. CALCO building is currently primary shelter.	2	Flood, Infrastructure Failure, Severe Winter Storm, Tornado/Windstorm, Thunderstorm/ Lightning/Hail	Calamus Volunteer Fire Company, Clinton County Emergency Management	FEMA HMA Grant (HMGP, PDM, or FMA); local funds, Clinton County Emergency Management Grant	$10,000 to $50,000	High	1 year	Continue - In Progress. Possible coordination with local fuel station
Calamus 3*	Construct community tornado saferoom at RV park to be used by residents and patrons of the park. Needed to save lives in the event of severe storm. Currently there is no tornado shelter at the RV park or general community shelter for residents.	2	Tornado / Windstorm	Calamus City Council, Clinton County Emergency Management	FEMA HMA Grant (HMGP, PDM, or FMA); Local Funds, Donated Funds	$100,000 to $500,000	Medium	3-5 years	Continue - Not Started. Potential non-FEMA standard shelter for RV park in the works
Calamus 4*	Purchase or elevate structures, add lift stations, increase/reinforce culvert size, and add curb and gutter to streets in areas in flood zones with severe and repetitive flood damage to prevent reoccurrence. Reduce impact of flash flooding events.	2	Flood, Infrastructure Failure	Calamus City Council, None Identified	FEMA HMA Grant (HMGP, PDM, or FMA); Local Funds; other grant funds to be identified	$10,000 to $50,000	High	2-3 years	Continue - In Progress. Ongoing curb and gutter. Some storm drain upgrades
Calamus 5	Perform smoke and other studies to see who is dumping into sewage system to enforce disconnecting so system will not be overloaded in event of storm or to	2	Flood	Calamus City Council	FEMA Hazard Mitigation Assistance Grants, Local Funds,	$10,000 to $50,000	Medium	3-5 years	Continue - In Progress. Occurring October 2021

ID	Action Description/ Background/Benefits	Goal	Hazard(s) Mitigated	Lead Agency and Partners	Potential Funding	Cost Estimate	Priority	Timeline	Status/ Implementation Notes
	locate damage to pipes. This is needed to keep the system from being overflowed with runoff, groundwater, sump pumps, etc.				Other grants to be identified				
Calamus 6	Enforcement of the adopted floodplain management ordinance to include utilizing current effective regulatory maps, issuing floodplain development permits, and monitoring substantial damage / improvements. Currently the City of Calamus does not have any Special Flood Hazard Areas. However, the City has elected to join the NFIP so that residents have the option of purchasing flood insurance. In the event of future annexation designated floodplain or revision of maps indicating floodplain areas, the floodplain management ordinance will be enforced to ensure any future development is in compliance.	1	Flood	Calamus City Council, IDNR	Local Funds	Little or No Cost	Medium	More than 5 years	Continue - Annual Implementation
Calamus 7	Water and Wastewater Mains. Water mains installed prior to 1960 are failing and breaking. Relocating mains to right of way will reduce breaks.	1	Infrastructure Failure	Calamus Public Works	FEMA Mitigation Grants, City funds, CCDA	$100,000 to $500,000	Medium	2-3 years	New in 2022

Table 4-7 City of Camanche Mitigation Action Plan

ID	Action Description/ Background/Benefits	Goal	Hazard(s) Mitigated	Lead Agency and Partners	Potential Funding	Cost Estimate	Priority	Timeline	Status/ Implementation Notes
Camanche 1	Update snow and ice equipment as needed to better respond to snow and ice events. The City is prone to receiving snow and/or ice storms which can be severe and extreme in nature.	3	Severe Winter Storm	Public Works Department	Local Funds, other grants to be identified	$50,000 to $100,000	High	More than 5 years	Continue - Annual Implementation. 2019 Snowplow truck
Camanche 2	Update fire and rescue equipment as needed to better respond to emergencies. To maintain a safe community, fire and rescue equipment must be kept up to date for better emergency response.	3	Earthquake, Grass / Wildland Fire, Radiological Incident, Flooding, Tornado / Windstorm, Transportation Incident	Fire Department, City Council	Assistance to Firefighters Grants (AFG), Local Funds, Donated Funds	$100,000 to $500,000	Medium	More than 5 years	Continue - Annual Implementation. Purchase of low water rescue boat 2022
Camanche 3	Mitigate RL Properties and other flood-prone properties from flood damages to include Purchase or elevate structures, add lift stations, increase/ reinforce culvert size, and add curb and gutter to streets in areas in flood zones with severe and repetitive flood damage to prevent reoccurrence. Provide backup power generators and wiring for critical facilities.	2	Flood	City Council Clinton County Emergency Management	FEMA HMA Grant (HMGP, PDM, or FMA); Local Funds	$10,000 to $50,000	Medium	2-3 years	Continue – In Progress. Repaired sewer post after Flooding.
Camanche 4	Provide backup power generators and wiring for critical facilities. These actions are needed to prevent damages as a result of flash flooding and Mississippi River Flooding. There are eight unmitigated RL properties in the City of Camanche two of which are SRL properties.	2	Flood, Infrastructure Failure, Severe Winter Storm, Tornado/Windstorm, Thunderstorm/ Lightning/Hail	Public Works Department	FEMA HMA Grant (HMGP, PDM, or FMA); local funds	$100,000 to $500,000	High	More than 5 years	Continue - In Progress. Working on City Hall Generator
Camanche 5	Purchase barricades and signage as deemed necessary to better communicate flood information. The City needs to have the ability to make the public as aware as possible of flooding and street closures so that they are	2	Flooding	Public Works Department	FEMA HMA Grant (HMGP, PDM, or FMA); other grants (IDNR)	Less than $10,000	Medium	More than 5 years	Continue - In Progress. Have ordered barricades and signage, expected in 2022

ID	Action Description/ Background/Benefits	Goal	Hazard(s) Mitigated	Lead Agency and Partners	Potential Funding	Cost Estimate	Priority	Timeline	Status/ Implementation Notes
	not in danger of being swept away by floodwaters over roadways.								
Camanche 6	Train personnel as weather spotters. This is needed to have advance warning to avoid the loss of life during severe weather events.	3	Thunderstorm / Lightning / Hail, Tornado / Windstorm	Police Department, Fire Department	Local Funds	Less than $10,000	Medium	More than 5 years	Continue - In Progress. Assigned as new officers are hired
Camanche 7	Purchase sand-bagging equipment or other flood barrier systems to better respond to flooding. Mississippi River flooding is a constant threat. To better mitigate damage, we need to have the means to quickly protect areas from rising waters.	2	Flood	Public Works Department Police Department, Fire Department	FEMA HMA Grant (HMGP, PDM, or FMA); Local Funds	Less than $10,000	Medium	More than 5 years	Continue - Not Started
Camanche 8*	Purchase riprap and install as necessary to prevent erosion on riverbanks. Reducing erosion on the riverbank will help to mitigate damages caused by rising flood waters.	2	Flood	Public Works Department	Local Funds	Less than $10,000	Medium	More than 5 years	Continue - Not Started
Camanche 9*	Enforcement of the adopted floodplain management ordinance to include utilizing current effective regulatory maps, issuing floodplain development permits, and monitoring substantial damage / improvements. The floodplain management ordinance will be enforced to ensure any future development is in compliance.	1	Flood	City Council, Iowa DNR	Local Funds	Little or No Cost	Medium	More than 5 years	Continue - Annual Implementation
Camanche 10	Upgrade/Replace existing older sewer infrastructure on the river side of town. The pressure created by the longevity of river flood waters caused some sewer line failures during flood 2 years ago.	1,2	Flood, Infrastructure Failure	Public Works	FEMA Mitigation Grants, City funds	$500,000 to $1,000,000	High	More than 5 years	New in 2022
Camanche 11*	Develop a storm shelter ordinance for new construction of homes without sufficient protection.	1,2	Thunderstorm/ Lightning/Hail, Severe Winter	Public Works, City Council	Local Funds	Little or No Cost	Medium	2-3 years	New in 2022

ID	Action Description/ Background/Benefits	Goal	Hazard(s) Mitigated	Lead Agency and Partners	Potential Funding	Cost Estimate	Priority	Timeline	Status/ Implementation Notes
			Storm, Tornado/ Windstorm						
Camanche 12	Work with existing manufactured housing communities to develop plans for sheltering or installation of storm shelters where feasible.		Thunderstorm/ Lightning/Hail, Severe Winter Storm, Tornado/ Windstorm	Public Works, City Council	Local Funds, FEMA Mitigation Grants	Little or No Cost for planning; cost of shelters TBD	Medium	2-5 years	New in 2022

Table 4-8 City of Charlotte Mitigation Action Plan

ID	Action Description/ Background/Benefits	Goal	Hazard(s) Mitigated	Lead Agency and Partners	Potential Funding	Cost Estimate	Priority	Timeline	Status/ Implementation Notes
Charlotte 1	Create call down list of all critical personnel. Critical personnel may not be notified immediately.	3	Animal/Plant/ Crop Disease, Dam/Levee Failure, Drought, Earthquake, Extreme Heat, Flash Flood, Grass/Wildland Fire, HazMat, Human Disease, Infrastructure Failure, Radiological Incident, River Flood, Severe Winter Storm, Sinkholes, Terrorism, Thunderstorm/ Lightning/Hail, Tornado/Wind, Transport Incident	city clerk/ mayor/fire chief	NA	Staff Time	High	1 year	Continue - Annual Implementation
Charlotte 2*	Build a tornado safe room for all new construction. Some citizens may not have adequate shelter.	2	Tornado/ Windstorm	city council, financial assistance, engineering	grants	unknown	Low	More than 5 years	Continue - Not Started
Charlotte 3*	Purchase or elevate structures, add lift stations, increase/reinforce culvert size, and add curb and gutter to streets in areas in flood zones with severe and repetitive flood damage to prevent reoccurrence. Some homes in town are in the flood plain and are affected by flooding.	2	Flood	city council, financial assistance, engineering	grants	unknown	Medium	More than 5 years	Continue - In Progress. Curb and gutter planned to be replaced from bridge to post office on Broadway Street. Evaluating purchase of sewer station meters for above ground
Charlotte 4	Review flood plain ordinance annually. Ensure floodplain ordinance is being followed.	4	Flood	city clerk/mayor/ city council Emergency management	NA	Staff Time	Medium	1 year	Continue - Annual Implementation
Charlotte 5	Abandoned buildings/houses in small town(s) create a health hazard-risk of collapse from weather-related incidents, close to floodplain.	1	Transportation Incident, Severe Winter Storm, Thunderstorm/ Lightning/Hail, Windstorm	City Maintenance, Mayor's Office	FEMA Mitigation Grants, City funds	$100,000 to $500,000	Low	2-3 years	New in 2022

ID	Action Description/ Background/Benefits	Goal	Hazard(s) Mitigated	Lead Agency and Partners	Potential Funding	Cost Estimate	Priority	Timeline	Status/ Implementation Notes
Charlotte 6	Flash flooding washing out creek embankment. Prevent erosion/bank washing out - possibility of causing worse flooding.	1	Flash Flooding	City Maintenance, Mayor's Office, DNR, FEMA	FEMA Mitigation Grants, City funds	$100,000 to $500,000	Medium	2-3 years	New in 2022

Table 4-9 City of Clinton Mitigation Action Plan

ID	Action Description/ Background/Benefits	Goal	Hazard(s) Mitigated	Lead Agency and Partners	Potential Funding	Cost Estimate	Priority	Timeline	Status/ Implementation Notes
Clinton 1	Update snow and ice equipment as needed to better respond to snow and ice events. Maintain ability to respond to severe winter weather events and minimize impact/recover. Enable movement of personnel and resources. Allow other emergency response organizations to respond in a timely fashion.	1	Severe Winter Storm	Clinton Street Department; Clinton Parks Department, Iowa DOT	Local funds	$500,000 to $1,000,000	High	More than 5 years	Annual Implementation. City has purchased new equipment over the last several years and will continue to evaluate.
Clinton 2	Update fire and rescue equipment as needed to better respond to emergencies. Maintain ability to respond to natural and manmade disasters as well as routine Fire and EMS emergencies. Avoid losses by fire and loss of life or property to other natural and manmade hazards.	2	Flash Flood, Dam/Levee Failure, Grass and Wildland Fire, Hazardous Materials Incident, Infrastructure Failure, Severe Winter Storm, Terrorism, Tornado/ Windstorm, Transportation Incident	Clinton Fire Department; Clinton County Emergency Management, FEMA, Clinton County Development Association, Local Industry	Local Funds	Over $1,000,000	High	More than 5 years	In Progress. Fire Truck has been purchased, next would be ambulance replacements
Clinton 3	Provide backup power generators and wiring for critical facilities. Prevent power loss that would disable critical facilities including sanitary sewers and flood control structures. Flooding or sanitary sewer backups to homes and businesses, loss of power to critical facilities.	2	Flash Flood, Infrastructure Failure, River flooding, Severe Winter Storm, Tornado/Windstorm, Thunderstorm/ Lightning/Hail	Regional Water Reclamation Facility, City of Clinton Engineering; Clinton County Emergency Management	Local Funds	Over $1,000,000	High	More than 5 years	In Progress. All new pump stations and critical infrastructure projects are outfitted with emergency backup generators. Recently received grant funding for generators at the 1st Avenue Pump Station, Ericksen Center, treatment plant and beaver channel pumping station. Will continue to add where none exist at existing facilities.
Clinton 4*	Construct tornado saferooms in new construction. Tornado safe rooms provide	2	Tornado/Windstorm	City Administrator; County Emergency Management	FEMA Hazard Mitigation Assistance Grants, Local	Over $1,000,000	Low	1 year	Not Started. A number of projects are occurring in all those areas annually as part of the Long Term

ID	Action Description/ Background/Benefits	Goal	Hazard(s) Mitigated	Lead Agency and Partners	Potential Funding	Cost Estimate	Priority	Timeline	Status/ Implementation Notes
	protection for City employees and citizens. Protection of lives.				Funds, Private Non- profit				Control Plan or Pavement Management Program.
Clinton 5*	Purchase or elevate structures, add lift stations, increase/reinforce culvert size, and add curb and gutter to streets in areas in flood zones with severe and repetitive flood damage to prevent reoccurrence. Required by the DNR and need to improve street conditions. Prevention of flooding and improved water quality.	2	Flash Flood, Infrastructure Failure, Sink Holes, Transportation Incident	Regional Water Reclamation Facility, City of Clinton Engineering; Engineering Firm	Local Funds	Over $1,000,000	High	More than 5 years	In Progress. Working to elevate bridges in flood zone on Manufacturing Drive. Have added elevation to lift station at 1st Avenue included generators. Have added permeable pavement along 25th Avenue North. Have added storm water pumping station in Riverview Park.
Clinton 6	Purchase barricades and signage as deemed necessary to better communicate flood information. City of Clinton maintains signage and barricades for communication to the public regarding dangerous or closed areas. Prevent individuals from driving or walking into dangerous or flooded areas.	2	Transportation Incident, Tornado/Windstorm, River Flooding, Hazardous Materials Incident, Flash Flood, Infrastructure Failure, Dam/Levee Failure,	Clinton Street Department; State DOT, Clinton County Secondary Roads	Local Funds	$50,000 to $100,000	High	More than 5 years	In Progress. Considering warning signs along Roosevelt Street in 800 block and for other flood prone areas.
Clinton 7	Train personnel as weather spotters. City Employees are typically on duty (24/7 depts.) when weather issues occur. More aware and observant employees.	3	Tornado/Windstorm	City Administrator; National Weather Service	Local Funds	Little or No Cost	Medium	More than 5 years	In Progress. Some fire personnel have been trained, but a training offered to city employees has not occurred.
Clinton 8	Continue annual inspection of levee to ensure safety. Required by Corps of Engineers. Flooding to the lower portion of the City of Clinton.	4	Flooding, Dam/Levee Failure, Infrastructure Failure	Regional Water Reclamation Facility; Army Corps of Engineers	Local Funds	$10,000 to $50,000	High	More than 5 years	Annual Implementation. Working with USACE on a yearly basis.
Clinton 9	Create Public Information Campaign to educate the public about levee safety and maintenance. Many residents are not aware of the issues surrounding the levee system and their role in maintaining preparedness. Increased personal	3	Flooding, Dam/Levee Failure, Infrastructure Failure	Regional Water Reclamation Facility; Clinton County Emergency Management, Insurance Agents,	Local Funds	Less than $10,000	High	2-3 years	In Progress. Have been including flood articles with the quarterly city newsletter.

ID	Action Description/ Background/Benefits	Goal	Hazard(s) Mitigated	Lead Agency and Partners	Potential Funding	Cost Estimate	Priority	Timeline	Status/ Implementation Notes
	preparedness leading to awareness and reduced losses.			Army Corps of Engineers					
Clinton 10	Maintain floodgates and gate wells to continue protective measures and prevent flooding. Required by Corps of Engineers. Flooding to the lower portion of the City of Clinton.	2	Flooding, Dam/Levee Failure, Infrastructure Failure	Regional Water Reclamation Facility; Army Corps of Engineers	Local Funds	Less than $10,000	High	More than 5 years	Annual Implementation. This is done annually.
Clinton 11	Continue ongoing sewer separation to prevent infiltration and flooding. Required by the DNR and need to improve street conditions. Prevention of flooding and improved water quality.	2	Flash Flood, Infrastructure Failure, River flooding, Severe Winter Storm, Tornado/Windstorm, Thunderstorm/Lightning/Hail	Regional Water Reclamation Facility, City of Clinton Engineering; Iowa DNR	Local Funds	$100,000 to $500,000	High	More than 5 years	In Progress. Have recently completed projects within Basin 6 and surrounding areas which have been known to alleviate street flooding and prevent basement backups.
Clinton 12	Removal of Dead and Diseased Trees from the right-of-way. City of Clinton desires to reduce the number of emergency tree removals by addressing critical trees routinely. Prevent tree falls on infrastructure, vehicles, and people.	1	Animal/Plant/Crop Disease, Tornado/Windstorm, Thunderstorm/Lightning/Hail, Severe Winter Storm,	Clinton Street Department; Private Contractors	Local Funds	$100,000 to $500,000	High	More than 5 years	In Progress. Public Works Department has routinely inspected damaged trees and put out for bid the removal of said trees.
Clinton 13	Create and maintain a High Hazard Dam, Emergency Action Plan. A few high hazard dams exist in the City of Clinton. A plan is necessary to protect citizens and property. Identify ways to prepare and respond to an emergency involving high hazard dams.	1	dam/levee failure	Regional Water Reclamation Facility; Clinton County Emergency Management, City of Clinton Engineer	Local Funds	Little or No Cost	Medium	More than 5 years	In Progress. These dams are inspected routinely by the DNR.
Clinton 14	Acquisition of Flood-prone properties. Minimize future flood losses. Eliminate repetitive flood losses.	2	Flash Flood, River Flooding, Dam / Levee Failure	Clinton City Council and City Engineer; Regional Water Reclamation Facility	FEMA HMA Grants	$100,000 to $500,000	High	More than 5 years	In Progress. Recently acquired nine properties within Floodway of Manufacturer's Ditch and successfully relocated all tenants using FEMA funding. Looking for more opportunities.

ID	Action Description/ Background/Benefits	Goal	Hazard(s) Mitigated	Lead Agency and Partners	Potential Funding	Cost Estimate	Priority	Timeline	Status/ Implementation Notes
Clinton 15	Manufacturing Drive Reconstruction. Manufacturing Drive is scheduled for a complete rebuild starting in 2024. This will include upgrades to stormwater infrastructure, bridges, etc. to mitigation current flash flooding that is common in that area.	2	Flash Flooding	Engineering	FEMA HMA Grants, Local Funds	$500,000 to $1,000,000	Low	2-3 years	New in 2022

Table 4-10 City of Delmar Mitigation Action Plan

ID	Action Description/ Background/Benefits	Goal	Hazard(s) Mitigated	Lead Agency and Partners	Potential Funding	Cost Estimate	Priority	Timeline	Status/ Implementation Notes
Delmar 1	Provide backup power generators and wiring for critical facilities. This is needed to ensure continuous power for all critical facilities.	1	Flood, Infrastructure Failure, Severe winter Storm, Thunderstorm/ Lightning/Hail, Tornado/Windstorm	City Council	Local Funds, Donated Funds	Less than $10,000	Medium	1 year	Continue - In Progress. Lagoon generator installed 2021
Delmar 2*	Purchase or elevate structures, add lift stations, increase/reinforce culvert size, and add curb and gutter to streets in areas in flood zones with severe and repetitive flood damage to prevent reoccurrence. A combination of these actions is needed to prevent damages because of flash flooding.	3	Flood, Infrastructure Failure	City Council	FEMA HMA Grant (HMGP, PDM, or FMA)	$100,000 to $500,000	Medium	More than 5 years	Continue - In Progress. Sewer inspection and leak repairs 2020. Richland Avenue added 18-inch culvert. Culvert improvement minimized in town flash flooding
Delmar 3	Continue to upgrade water supply system to get rid of dead-end mains so water will re-circulate and be more readily available for emergency.	2	Drought, Grass/Wildland Fire, Infrastructure Failure	City Council	Local Funds, other grants to be identified	$500,000 to $1,000,000	Medium	More than 5 years	Continue - Not Started
Delmar 4	Continue to repair water system and replace sections of rusting pipe. This is needed to ensure clean, continuous water supply.	2	Drought, Grass/Wildland Fire, Infrastructure Failure	City Council	Local Funds, other grants to be identified	$500,000 to $1,000,000	Medium	More than 5 years	Continue - In Progress. New pipes in section of main street
Delmar 5	Storm Sewer Upgrade. Storm water back-up on street and property.	2	Flash Flooding, Infrastructure Failure	City Maintenance; Mayor and Council	FEMA Mitigation Grants	$100,000 to $500,000	Low	3-5 years	New in 2022

Table 4-11 City of DeWitt Mitigation Action Plan

ID	Action Description/ Background/Benefits	Goal	Hazard(s) Mitigated	Lead Agency and Partners	Potential Funding	Cost Estimate	Priority	Timeline	Status/ Implementation Notes
DeWitt 1	Enhance or Install GIS System to better track critical facilities and vulnerable populations as well as respond to emergencies. Retaining infrastructure information in a retrievable and storable format.	2	Infrastructure Failure	Public Works/ Administration	Local Funds	$50,000 to $100,000	Low	More than 5 years	Continue - In Progress
DeWitt 2	Update snow and ice equipment as needed to better respond to snow and ice events.	1	Severe Winter Storms	Public Works/Administration	Local Funds	$500,000 to $1,000,000	Low	More than 5 years	Continue - Annual Implementation. All large snowplow replaced. New street shop planned 2022-2023
DeWitt 3	Update fire and rescue equipment as needed to better respond to emergencies.	2	Grass / Wildland Fire	Fire Department/Administration	Local Funds	Over $1,000,000	High	More than 5 years	Continue - Annual Implementation. Aerial in service 2016, Multi-purpose vehicle in this year budget
DeWitt 4	Provide backup power generators and wiring for critical facilities. Provide backup power generators and wiring for critical facilities.	2	Flood, Infrastructure Failure, Severe Winter Storm, Tornado/ Windstorm, Thunderstorm/ Lightning/Hail	City Council, Clinton County Emergency Management	FEMA HMA Grants; Local Funds	$10,000 to $50,000	High	2-3 years	Continue - In Progress. City Hall and Industrial Street lift #2 are scheduled for 2021. Industrial #1 is in service
DeWitt 5*	Construct tornado saferooms in new construction.	2	Tornado/Windstorm	City Council, FEMA	Local Funds	$500,000 to $1,000,000	Low	More than 5 years	Continue - Not Started
DeWitt 6	Purchase or elevate structures, add lift stations, increase/reinforce culvert size, and add curb and gutter to streets in areas in flood zones with severe and repetitive flood damage to prevent reoccurrence.	2	Flood	Public Works/Administration, IDNR	Local Funds	$100,000 to $500,000	Low	More than 5 years	Continue - Not Started

ID	Action Description/ Background/Benefits	Goal	Hazard(s) Mitigated	Lead Agency and Partners	Potential Funding	Cost Estimate	Priority	Timeline	Status/ Implementation Notes
DeWitt 7	Train personnel as weather spotters.	4	Tornado/Windstorm	City Council, Emergency Management	Local Funds	Less than $10,000	Low	More than 5 years	Continue - Annual Implementation
DeWitt 8	Install additional ground storage with booster pump or new tower to increase water pressure for fire/emergency coverage, droughts can occur this allow for more stored water.	2	Drought	City Council	Local Funds	Over $1,000,000	Low	More than 5 years	Continue - Not Started
DeWitt 9*	Enforcement of the adopted floodplain management ordinance to include utilizing current effective regulatory maps, issuing floodplain development permits, and monitoring substantial damage / improvements. The floodplain management ordinance will be enforced to ensure any future development is in compliance.	1	Flood	City Council, Iowa DNR	Local Funds	Little or No Cost	Medium	More than 5 years	Continue - Annual Implementation. Adopted newest FEMA/Homeland flood maps and updated ordinances accordingly
DeWitt 10	The City lacks critical storm water infrastructure in certain areas of town, particularly the SW corner. This leads to localized street flooding that disrupts movement, and can cause damage to buildings, roads, and other infrastructure.	2	Flash Flooding Infrastructure Failure	Dewitt Public Works; Contracted Engineers	FEMA HMA Grants, Local Funds	$500,000 to $1,000,000	High	2-3 years	New in 2022

Table 4-12 City of Goose Lake Mitigation Action Plan

ID	Action Description/ Background/Benefits	Goal	Hazard(s) Mitigated	Lead Agency and Partners	Potential Funding	Cost Estimate	Priority	Timeline	Status/ Implementation Notes
Goose Lake 1	Storm Water Mitigation. During heavy rainfall water runoff from higher elevations creates a massive storm water flow through residential areas in the City of Goose Lake. This project will reduce/minimize residential property damage and reduce/minimize land erosion A feasibility study for storm water management has already been completed.	2	Flash Flooding	School Superintendent; City of Goose Lake	FEMA HMA Grants	$100,000 to $500,000	High	3-5 years	New in 2022

Table 4-13 City of Grand Mound Mitigation Action Plan

ID	Action Description/ Background/Benefits	Goal	Hazard(s) Mitigated	Lead Agency and Partners	Potential Funding	Cost Estimate	Priority	Timeline	Status/ Implementation Notes
Grand Mound 1	Update fire and rescue equipment as needed to better respond to emergencies. Updated equipment is necessary to ensure effective emergency response	3	Flood, Hazardous Materials Incident, Severe Winter Storm, Grass / Wildland Fire, Transportation Incident	Fire Department	Local Funds and Other Grants - possibly FEMA AFG program	$50,000 to $100,000	Medium	1 year	Continue - Annual Implementation. Ongoing as needed
Grand Mound 2*	Construct a Community Saferoom. This would allow for residents to have a safe place to go in the event of a tornado	2	Tornado / Windstorm	City Council	FEMA HMA Grant (HMGP, PDM, or FMA), Local Funds	$100,000 to $500,000	Medium	More than 5 years	Continue - Not Started. Not started, but still a priority
Grand Mound 3	Distribute pamphlets throughout the community on use of new warning sirens. This is needed to ensure residents understand the use of the warning sirens	3	Thunderstorm/Lightning/Hail, Tornado / Windstorm	City Council, City Clerk	Local Funds	Little or No Cost	High	1 year	Continue - Not Started. Can be done with a mailer and social media/City Website
Grand Mound 4	Annually review Floodplain Management Ordinance. This is needed to ensure that the ordinance is meeting the needs of the City's ability to manage the floodplain	2	Flood	City Council	No Funding Needed	Little or No Cost	Low	1 year	Continue - Annual Implementation. Updates made to Ordinance as required by FEMA. Floodplain development permits implemented and issued
Grand Mound 5	Encourage participation in Alert Iowa program for residents and businesses.	2	All Hazards	Fire Department	No Funding Needed	Little or No Cost	Medium	1 year	New in 2022
Grand Mound 6	Build picnic shelters in city parks to provide emergency refuge during hail or lightning	2	Thunderstorm/ Lightning/Hail	Parks Department	City general funds, FEMA HMGP, CDBG	<$10k	Low	2-3 years	New in 2022

Table 4-14 City of Lost Nation Mitigation Action Plan

ID	Action Description/ Background/Benefits	Goal	Hazard(s) Mitigated	Lead Agency and Partners	Potential Funding	Cost Estimate	Priority	Timeline	Status/ Implementation Notes
Lost Nation 1	Create call down list of all critical personnel. This is needed to ensure timely communication of information to critical personnel in the event of an emergency.	2	All	Mayor, Clinton County Emergency Management, Sheriff, Fire, Ambulance	Local Funds	Little or No Cost	Medium	More than 5 years	Continue - In Progress
Lost Nation 2	Update snow and ice equipment as needed to better respond to snow and ice events. Ongoing maintenance and/or replacement of snow removal equipment is necessary to ensure this capability is maintained.	4	Severe Winter Storm	City Council, Public Works Department	Local Funds	$10,000 to $50,000	Medium	More than 5 years	Continue - In Progress
Lost Nation 3*	Construct a tornado safe room. There is no nearby shelter for vulnerable residents during a tornado.	2	Thunderstorm/Lightning/ Hail, Tornado / Windstorm	City Council, Clinton County Emergency Management	FEMA HMA Grants, other grants	$100,000 to $500,000	Low	More than 5 years	Continue - Not Started
Lost Nation 4	Stormwater drainage Improvements. The City of Lost Nation does not have a history of flood problems. However, improvements to the stormwater drainage would provide added protection against flooding.	2	Flood	City Council, None Identified	Local Funds	$50,000 to $100,000	Low	More than 5 years	Continue - Not Started
Lost Nation 5	Maintain tree trimming programs and debris management as it relates to vegetative debris. This action is needed to eliminate tree limbs and branches from falling on roads and/or property due to high wind, heavy snow, or ice.	1	Severe Winter Storm, Thunderstorm/ Lightning/Hail, Tornado/Windstorm	City Council, Property Owners	Local Funds	Less than $10,000	Medium	More than 5 years	Continue - Annual Implementation
Lost Nation 6	Annually review Floodplain Management Ordinance. This is needed to ensure the adopted ordinance is meeting the City's floodplain management needs.	1	Flood	City Council, Property Owners	Local funds	Little or No Cost	Medium	More than 5 years	Continue - Annual Implementation
Lost Nation 7*	Adopt a building code. The City does not have any building codes at present.	2	Severe Winter Storm, Thunderstorm/ Lightning/ Hail, Tornado, Windstorm	City Council, Clinton County Emergency Management	Local funds	Less than $10,000	High	2-3 years	New in 2022

Table 4-15 City of Low Moor Mitigation Action Plan

ID	Action Description/ Background/Benefits	Goal	Hazard(s) Mitigated	Lead Agency and Partners	Potential Funding	Cost Estimate	Priority	Timeline	Status/ Implementation Notes
Low Moor 1	Update snow and ice equipment as needed to better respond to snow and ice events. To ensure that our community has the proper tools and equipment needed when responding to an emergency during a Severe Winter Storm or Ice Event.	1	Severe Winter Storm	City Council, Emergency Management	Local Funds	Less than $10,000	High	More than 5 years	Continue - Annual Implementation
Low Moor 2	Update fire and rescue equipment as needed to better respond to emergencies. Updating fire and rescue equipment is an ongoing action item through the Low Moor Fire Department to ensure that our community has the needed items to appropriately respond to different types of emergencies.	2	All	Fire Department, Emergency management	FEMA AFG grant, Local Funds, In-Kind (donated), Private Non-Profit Donations	$100,000 to $500,000	Medium	More than 5 years	Continue - Annual Implementation
Low Moor 3*	Construct tornado saferoom in new construction. This action item may be needed to help keep our citizens safe at home during a storm or tornado.	2	Tornado / Windstorm	City Council, Emergency Management	FEMA HMA Grant (HMGP, PDM, or FMA), Local Funds	$100,000 to $500,000	Low	More than 5 years	Continue - Not Started
Low Moor 4*	Purchase or elevate structures, add lift stations, in areas in flood zones with repetitive flood damage to prevent reoccurrence. This action would prevent property from being damaged because of flooding.	2	Flood	City Council, Clinton County Emergency Management, Iowa League of Cities	FEMA HMA Grant (HMGP, PDM, or FMA); Local Funds	$500,000 to $1,000,000	Low	More than 5 years	Continue - Annual Implementation
Low Moor 5	Purchase barricades and signage as deemed necessary to better communicate flood information. This action is needed to keep motorists from driving into floodwaters and make residents aware of flood events.	2	Flood, Dam / Levee Failure	City Council, Clinton County Emergency Management and Fire Department	Local Funds, Donated Funds	Less than $10,000	Low	3-5 years	Continue - In Progress
Low Moor 6	Train personnel as weather spotters. Action needed to provide advance warning during a storm or tornado.	3	Thunderstorm/Lightning/Hail, Tornado / Windstorm	City Council, Clinton County Emergency Management and Fire Department	Local Funds	Little or No Cost	Medium	2-3 years	Continue - Annual Implementation

ID	Action Description/ Background/Benefits	Goal	Hazard(s) Mitigated	Lead Agency and Partners	Potential Funding	Cost Estimate	Priority	Timeline	Status/ Implementation Notes
Low Moor 7	Enforcement of the newly adopted floodplain management ordinance to include utilizing current effective regulatory maps, issuing floodplain development permits, and monitoring substantial damage / improvements. After years of being a sanctioned community, the City of Low Moor joined the NFIP during this plan update process. This allows property owners within the community to purchase flood insurance as well as provides a mechanism to regulate any development in the floodplain to reduce future impact.	1	Flood	City Council, Iowa DNR	Local Funds	Little or No Cost	Low	More than 5 years	Continue - Annual Implementation
Low Moor 8	Perform smoke and other studies to see who is dumping into sewage system to enforce disconnecting so system will not be overloaded in event of storm. Locate damaged pipes and enforce disconnect so system isn't overloaded.	2	Flash Flooding Thunderstorm/ Lightning/Hail	Wastewater Superintendent and City Council; Iowa American Water?	FEMA Mitigation Grants, Local funds	$10,000 to $50,000	Medium	3-5 years	New in 2022

Table 4-16 City of Toronto Mitigation Action Plan

ID	Action Description/ Background/Benefits	Goal	Hazard(s) Mitigated	Lead Agency and Partners	Potential Funding	Cost Estimate	Priority	Timeline	Status/ Implementation Notes
Toronto 1	Create call down list of all critical personnel. This is needed to ensure timely communication of information to critical personnel in the event of an emergency.	2	All	Mayor, Clinton County Emergency Management, Sheriff, Fire	Local Funds	Little or No Cost		More than 5 years	Continue – In Progress
Toronto 2	Update snow and ice equipment as needed to better respond to snow and ice events. Ongoing maintenance and/or replacement of snow removal equipment is necessary to ensure this capability is maintained.	4	Severe Winter Storm	City Council	Local Funds	$10,000 to $50,000	Medium	More than 5 years	Continue - In Progress
Toronto 3*	Construct tornado saferooms in new construction. This would allow for residents to have a safe place to go in the event of a tornado.	2	Thunderstorm/ Lightning/Hail, Tornado/ Windstorm	City Council	FEMA HMA Grants and other grants	$100,000 to $500,000	Low	More than 5 years	Continue - Not Started
Toronto 4	Purchase or elevate structures, add lift stations, increase/reinforce culvert size, and add curb and gutter to streets in areas in flood zones with severe and repetitive flood damage to prevent reoccurrence. This is a low priority at this time but, the city would like to leave the action in the plan for future consideration.	2	Flood	City Council	Local Funds	$10,000 to $50,000	Low	More than 5 years	Continue - Not Started
Toronto 5	Convert from private wells to City water system. Private wells are aging. There is a need to ensure consistent, safe water supply.	2	Drought	City Council, Private Citizens	Local Funds, other grants	$100,000 to $500,000	Low	More than 5 years	Continue - Not Started
Toronto 6	Annually review Floodplain Management Ordinance. This is needed to ensure the adopted ordinance is meeting the City's floodplain management needs.	1	Flood	City Council, Property Owners	Local funds	Little or No Cost	Medium	More than 5 years	Continue- Annual Implementation
Toronto 7*	Adopt a building code. The City does not have any building codes at present.	2	Severe Winter Storm, Thunderstorm/ Lightning/ Hail, Tornado, Windstorm	City Council, Clinton County Emergency Management	Local funds	Less than $10,000	High	2-3 years	New in 2022

Table 4-17 City of Welton Mitigation Action Plan

ID	Action Description/ Background/Benefits	Goal	Hazard(s) Mitigated	Lead Agency and Partners	Potential Funding	Cost Estimate	Priority	Timeline	Status/ Implementation Notes
Welton 1	Create call down list of all critical personnel. This is needed to create a closed loop on all critical people that need to be contacted in the event of a disaster. Better communications and help provided in the event of a disaster.	3	All	Welton City Council; Welton Fire, Clinton County Sheriff	Local Funds	Little or No Cost	Medium	1 year	Annual Implementation. This task is ongoing based on personnel movement.
Welton 2*	Construct tornado saferooms in new construction. Needed to save lives in the event of severe storm. safe place for those in need during times of a tornado or high winds.	4	Tornado	Welton City Council; none	Local Funds	$10,000 to $50,000	Low	2-3 years	Not Started. No planned construction. Will evaluate as need arises.
Welton 3	Perform smoke and other studies to see who is dumping into sewage system to enforce cleanup so system will not be overloaded in event of storm or to locate damage to pipes. This is needed to minimize water back up in sewer system, save some flooded basements in the city. less water in sewer system will result in less chance for back up.	2	Flash Flood	Welton City Council; none	Local Funds	Little or No Cost	Medium	3-5 years	Annual Implementation. This is a matter of visual inspection of sump pump line connections in each residence. Any reroute comes at the cost of the resident.
Welton 4*	Enforcement of the adopted floodplain management ordinance to include utilizing current effective regulatory maps, issuing floodplain development permits, and monitoring substantial damage / improvements. The floodplain management ordinance will be enforced to ensure any future development is in compliance. Avoid damages to future construction in the event of a flood.	1	Riverine Flooding	Welton City Council; Iowa DNR	Local Funds	Little or No Cost	Medium	More than 5 years	Not Started. Will reach out to the DNR for specific action items to meet this mitigation objective.
Welton 5	Acquisition of Flood-prone properties. Minimize future flood losses. Eliminate repetitive flood losses.	1, 2	Riverine Flooding, Flash Flood	Public Works, Parks	FEMA HMA Grants	TBD, varies depending on property	Low	3-5 years	New in 2022

Table 4-18 City of Wheatland Mitigation Action Plan

ID	Action Description/ Background/Benefits	Goal	Hazard(s) Mitigated	Lead Agency and Partners	Potential Funding	Cost Estimate	Priority	Timeline	Status/ Implementation Notes
Wheatland 1	Create call down list of all critical personnel. This will allow for faster, coordinated communication during an emergency event.	1	All	Mayor, Clinton County Emergency Management	Local Funds	Little or No Cost	Medium	More than 5 years	Continue - Annual Implementation
Wheatland 2	Update snow and ice equipment as needed to better respond to snow and ice events. This is needed to keep citizens safe during cold environment emergencies.	2	Severe Winter Storm	City Council	Local Funds	Less than $10,000	High	More than 5 years	Continue - In Progress. 2021 new truck ordered but not received. New blades. Ongoing
Wheatland 3	Update fire and rescue equipment as needed to better respond to emergencies. This is needed to keep citizens safe and to be able to respond effectively to emergencies.	2	All	City Council, Clinton County Emergency Management, Hazardous Materials Teams	Local Funds	Less than $10,000	High	More than 5 years	Continue - Annual Implementation. 3 new trucks. Brush, tanker, and mini pumper
Wheatland 4	Provide backup power generators and wiring for critical facilities. This is needed to keep power on for critical facilities.	2	Extreme Heat, Flood, Human Disease, Infrastructure Failure, Severe Winter Storm, Thunderstorm/ Lightning/Hail, Tornado/Windstorm, Transportation Incident	City Council, Clinton County Emergency Management, other cities in the county	Local Funds	Less than $10,000	Medium	1 year	Continue - In Progress. Local nursing home installed generator
Wheatland 5*	Construct tornado saferooms for mobile homes and new public buildings. This is needed to keep citizens safe during severe weather events.	1	Tornado/Windstorm	City Council	FEMA HMA Grant, Local Funds	$100,000 to $500,000	Medium	More than 5 years	Continue - Not Started
Wheatland 6	Purchase/elevate structures/well pumps, increase/reinforce culverts. This is needed to prevent damage from flooding.	2	Dam/Levee Failure, Flood	City Council	FEMA HMA Grants, Local Funds	$100,000 to $500,000	Low	More than 5 years	Continue - Not Started. Bridge of concern not owned by government

ID	Action Description/ Background/Benefits	Goal	Hazard(s) Mitigated	Lead Agency and Partners	Potential Funding	Cost Estimate	Priority	Timeline	Status/ Implementation Notes
Wheatland 7	Maintain barricades / signage to better communicate weather / road issues. This is needed to keep citizens informed of weather issues and road closures.	2	Dam / Levee Failure, Flood, Hazardous Materials Incident, Severe Winter Storm, Sinkholes, Thunderstorm / Lightning/Hail	City Council	Local Funds	Less than $10,000	Low	More than 5 years	Continue - Annual Implementation
Wheatland 8	Repair or elevate streets to prevent further flood damage. This is needed to prevent damage from flooding.	2	Dam/Levee Failure, Flood	City Council	FEMA HMA Grant, Local Funds	$100,000 to $500,000	Low	More than 5 years	Continue - Not Started
Wheatland 9*	Enforcement of the adopted floodplain management ordinance to include utilizing current effective regulatory maps, issuing floodplain development permits, and monitoring substantial damage / improvements. The floodplain management ordinance will be enforced to ensure any future development is in compliance.	1	Flood	City Council, Iowa DNR	Local Funds	Little or No Cost	Medium	More than 5 years	Continue - Annual Implementation
Wheatland 10	Encourage participation in Alert Iowa program for residents and businesses.	2	All Hazards	City Council	Local Funds	Little or No Cost	Medium	1-3 years	New in 2022
Wheatland 11	Establish an advance hazard warning system for recreational areas to warn people who are outdoors.	2, 3	Thunderstorm/ Lightning/Hail, Tornado/ Windstorm	Parks	FEMA HMA Grants	<$10K	Low	3-5 years	New in 2022

Table 4-19 Calamus-Wheatland School District Mitigation Action Plan

ID	Action Description/ Background/Benefits	Goal	Hazard(s) Mitigated	Lead Agency and Partners	Potential Funding	Cost Estimate	Priority	Timeline	Status/ Implementation Notes
Calamus-Wheatland SD 1	Create and implement procedure to backup all critical data to prevent loss in the event of hazard. This is necessary to be able to restore any lost data.	2	Infrastructure Failure	School District Office	Local Funds - school district	Less than $10,000	Medium	2-3 years	Continue - In Progress
Calamus-Wheatland SD 2	Update fire and rescue equipment as needed to better respond to emergencies. We must always be prepared with current extinguishers.	3	Grass / Wildland Fire	School District Office	Local Funds - school district	Less than $10,000	Medium	More than 5 years	Continue - In Progress
Calamus-Wheatland SD 3*	Construct tornado saferooms in new construction. A safe area is needed for students and staff to take refuge in the event of severe weather.	3	Tornado / Windstorm	School District Office	FEMA HMA Grant (HMGP, PDM, or FMA); Local funds - school district	$500,000 to $1,000,000	Medium	More than 5 years	Continue - Not Started
Calamus-Wheatland SD 4	Train personnel as weather spotters. Early alerts of weather issues would help the school district to be more prepared.	3	Flood, Severe Winter Storm, Thunderstorm/ Lightning/Hail, Tornado/Windstorm	School District Office	Local Funds - school district	Little or No Cost	Medium	1 year	Continue - Annual Implementation
Calamus-Wheatland SD 5	Install back-up generators at Calamus School Building and High School for freezers, fridges, and IT.	4	Flooding, Thunderstorm/ Lightning/Hail, Tornado/ Windstorm	School District Office	Local Funds - school district	Less than $10,000	Low	1-3 years	New in 2022

Table 4-20 Camanche School District Mitigation Action Plan

ID	Action Description/ Background/Benefits	Goal	Hazard(s) Mitigated	Lead Agency and Partners	Potential Funding	Cost Estimate	Priority	Timeline	Status/ Implementation Notes
Camanche SD 1	Create and implement procedure to backup all critical data to prevent loss in the event of hazard. Certain data is required to be maintained by school districts.	3	Earthquake, Infrastructure Failure, Tornado / Windstorm	Central Office, Private contractor	Local Funds - school district	$50,000 to $100,000	Medium	1 year	Continue - In Progress. Significant progress made in the area of inventory
Camanche SD 2	Provide backup power generators and wiring for critical facilities. It is critical to maintain power in school facilities that usually house hundreds of people.	2	Earthquake, Infrastructure Failure, Flooding, Severe Winter Storm, Terrorism, Thunderstorm/ Lightning/Hail, Tornado/ Windstorm	Central Office	FEMA HMA Grant (HMGP, PDM, or FMA), Local Funds	$50,000 to $100,000	Medium	1 year	Continue - Not Started
Camanche SD 3*	Build a tornado safe room to provide a safe shelter during severe weather.	2	Earthquake, Severe Winter Storm, Thunderstorm/Lightning/Hail, Tornado/ Windstorm	Central Office, City	FEMA HMA Grant (HMGP, PDM, or FMA), Local Funds	Over $1,000,000	Medium	2-3 years	Continue - Not Started
Camanche SD 4*	Develop policy to prevent construction in the floodplain of educational buildings or supporting structures. The school district is located on the banks of the Mississippi River.	4	Flood	Central Office	Local Funds - school district	Little or No Cost	High	1 year	Continue - In Progress. Ongoing Facilities Enhancement Project will comply with this goal
Camanche SD 5	Encourage participation in Alert Iowa program for faculty & students.	2	All Hazards	Central Office	NA	None	Medium	1 year	New in 2022

Table 4-21 Central DeWitt School District Mitigation Action Plan

ID	Action Description/ Background/Benefits	Goal	Hazard(s) Mitigated	Lead Agency and Partners	Potential Funding	Cost Estimate	Priority	Timeline	Status/ Implementation Notes
Central DeWitt SD 1	Update snow and ice equipment as needed to better respond to snow and ice events.	1	Severe Winter Storm	Facilities, Operations	Local Funds	Less than $10,000	Medium	1 year	Continue - Not Started
Central DeWitt SD 2	Provide backup power generators and wiring for critical facilities. To provide power in case of outage.	2	Infrastructure Failure, Severe Winter Storm, Thunderstorm/ Lightning/Hail, Tornado/ Windstorm	Facilities, Operations	Local funds or grants	$100,000 to $500,000	Medium	More than 5 years	Continue - Not Started
Central DeWitt SD 3*	Construct tornado saferooms in new construction.	2	Tornadoes	Facilities, Operations	FEMA HMA Grants	Over $1,000,000	Medium	More than 5 years	Continue - Not Started
Central DeWitt SD 4*	Develop policy to prevent construction in the floodplain of educational buildings or supporting structures. To reduce potential future damages.	4	Flood	Administration	Local Funds	Little or No Cost	High	2-3 years	Continue - Not Started
Central DeWitt SD 5	Establish an advance hazard warning system to warn students and faculty, particularly when they are outdoors.	2, 3	Thunderstorm/ Lightning/Hail, Tornado/ Windstorm	Facilities, Operations	FEMA HMA Grants	Less than $10,000	Low	2-3 years	New in 2022

Table 4-22 Clinton School District Mitigation Action Plan

ID	Action Description/ Background/Benefits	Goal	Hazard(s) Mitigated	Lead Agency and Partners	Potential Funding	Cost Estimate	Priority	Timeline	Status/ Implementation Notes
Clinton SD 1	Update snow and ice equipment as needed to better respond to snow and ice events. This is needed for the safety of our students, staff, and families.	1	Severe Winter Storm	Plant Services, State Agencies	Local Funds	$100,000-$500.000	Medium	More than 5 years	Continue - Annual Implementation. New truck and plow yearly. Brine treatment by City in School parking lots before storms. New bus barn planned to get all equipment inside.
Clinton SD 2	Update fire and rescue equipment as needed to better respond to emergencies. This is needed for student transportation or classroom emergencies.	2	Transportation Incident & Human Disease	Transportation, Emergency Management	Local Funds	$50,000-$100,000	High	More than 5 years	Continue - Annual Implementation. Getting Very High Frequency (VHF) upgrade base stations and handhelds. Keeping Ultra High Frequency (UHF) for transportation.
Clinton SD 3	Provide backup power generators and wiring for critical facilities. This is needed for electrical, water & heating needs of students & staff.	2	Severe Winter Storm, Thunderstorm/ Lightning/Hail, Tornado/Windstorm	Plant Services, FEMA	FEMA Grants	$100,000-$500,000	Medium	More than 5 years	Continue - In Progress. New generator installed at District Administration Building in 2021. Evaluating other facilities.
Clinton SD 4*	Construct tornado saferooms in new construction. This is needed to protect the lives of students, staff, and community members.	2	Tornado/Windstorm	Plant Services/ Superintendent, FEMA	FEMA Grants	Over $1,000,000	Medium	More than 5 years	Continue - Not Started. Pursuing funds for the Middle School for a Safe Room/Auditorium.
Clinton SD 5	Safe rooms in existing school buildings. Several schools don't have a designated space. Review all buildings to identify safe rooms and retrofit rooms as needed.	2	Severe Winter Storm, Thunderstorm/ Lightning/Hail, Tornado/Windstorm	Superintendent / Business Office; Community, City of Clinton	FEMA Grants, Local Funds	$50,000 to $100,000	Medium	2-3 years	New in 2022

Table 4-23 Delwood School District Mitigation Action Plan

ID	Action Description/ Background/Benefits	Goal	Hazard(s) Mitigated	Lead Agency and Partners	Potential Funding	Cost Estimate	Priority	Timeline	Status/ Implementation Notes
Delwood SD 1	Create and implement procedure to backup all critical data to prevent loss in the event of hazard. Files and data could be lost.	3	Grass Fire, Infrastructure Failure	Superintendent, IT Department	FEMA HMA Grants	Less than $10,000	Low	2-3 years	Continue - Not Started
Delwood SD 2*	Construct tornado saferooms in new construction. Safety for students.	2	Tornado/Windstorm	Superintendent, School Board, Contractors, architects	FEMA HMA Grants	$50,000 to $100,000	Low	3-5 years	Continue - Not Started
Delwood SD 3	Replace porous flours/surfaces with hard floorings, easy to clean/sanitize flooring/materials. The school building is currently carpeted thought-out all halls/shared spaces making it difficult to sanitize and or clean after a disaster.	2, 4	Flash Flooding, Human Disease, Thunderstorm/ Lighting/Hail	School Board	Esser/Cares Act funds	$100,000 to $500,000	Medium	1 year	New in 2022

Table 4-24 Northeast School District Mitigation Action Plan

ID	Action Description/ Background/Benefits	Goal	Hazard(s) Mitigated	Lead Agency and Partners	Potential Funding	Cost Estimate	Priority	Timeline	Status/ Implementation Notes
Northeast SD 1	Create call down list of all critical personnel.	3	All	Administration Office	Local Funds	Little or No Cost	Medium	1 year	Continue - Annual Implementation. Use of navigate prepared notification system
Northeast SD 2	Update snow and ice equipment as needed to better respond to snow and ice events. More area to clear, same number of personnel to address, aging equipment.	1	Severe Winter Weather	Administration Office	Local Funds	$5,00-10,000 per year for 4 years	Medium	3-5 years	Continue - Annual Implementation. Plow truck purchase 2020. More parking lot added at elementary
Northeast SD 3	Update fire and rescue equipment as needed to better respond to emergencies. Necessary update of fire and rescue equipment.	2	Grass / Wildland Fire	Administration Office	Local Funds	$10,000 to $50,000	High	2-3 years	Continue - Annual Implementation. Fire extinguisher maintenance, 2019 new interior and exterior wayfinding signage. Fine tune fire evacuation strategy
Northeast SD 4*	Purchase or elevate structures, add lift stations, increase/reinforce culvert size, and add curb and gutter to streets in areas in flood zones with severe and repetitive flood damage to prevent reoccurrence. Current lift station may need to be replaced, new well would require an additional lift station — no curb and gutter in place.	2	Flood	Administration Office, Board of Education	Local Funds	$100,000 to $500,000	Medium	More than 5 years	Continue - In Progress. Watershed study with the City. No action yet
Northeast SD 5	Train personnel as weather spotters. Safety of students, staff, community.	4	Thunderstorm/ Lightning/Hail, Tornado/ Windstorm	Administration Office	Local Funds	Less than $10,000	High	1 year	Continue - Annual Implementation
Northeast SD 6*	Develop policy to prevent construction in the floodplain of educational buildings or supporting structures. Protection of local flood plain.	4	Flood	Administration Office, Board of Education	Local Funds	$100,000 to $500,000	Low	More than 5 years	Continue - In Progress

ID	Action Description/ Background/Benefits	Goal	Hazard(s) Mitigated	Lead Agency and Partners	Potential Funding	Cost Estimate	Priority	Timeline	Status/ Implementation Notes
Northeast SD 7	Storm Water Mitigation. During heavy rainfall water runoff from higher elevations creates a massive storm water flow through residential areas in the City of Goose Lake. This project will reduce/minimize residential property damage and reduce/minimize land erosion A feasibility study for storm water management has already been completed.	2	Flash Flooding	School Superintendent; City of Goose Lake	FEMA HMA Grants	$100,000 to $500,000	High	3-5 years	New in 2022

5 Plan Maintenance Process

DMA Requirement §201.6(c)(4)(ii):
[The plan shall include] a plan maintenance process that includes: *(i) A section describing the method and schedule of monitoring, evaluating, and updating the mitigation plan within a five-year cycle.* *(ii) A process by which local governments incorporate the requirements of the mitigation plan into other planning process by which local governments incorporate the requirements of the mitigation plan into other planning mechanisms such as comprehensive or capital improvement plans, when appropriate.* *(iii) Discussion on how the community will continue public participation in the plan maintenance process.*

This chapter provides an overview of the overall strategy for plan maintenance and outlines the method and schedule for monitoring, updating, and evaluating the plan. The chapter also discusses incorporating the plan into existing planning mechanisms and how to address continued public involvement.

5.1 Monitoring, Evaluating, and Updating the Plan

5.1.1 Hazard Mitigation Planning Committee (HMPC)

With adoption of this plan, the HMPC will be tasked with plan monitoring, evaluation, and maintenance. The participating jurisdictions and agencies, led by the Clinton County Emergency Management Coordinator, agree to:

- Meet annually to review the Hazard Mitigation Plan;
- Act as a forum for hazard mitigation issues;
- Disseminate hazard mitigation ideas and activities to all participants;
- Pursue the implementation of high priority, low- or no-cost recommended actions;
- Maintain vigilant monitoring of multi-objective, cost-share, and other funding opportunities to help the community implement the plan's recommended actions for which no current funding exists;
- Monitor and assist in implementation and update of this plan;
- Keep the concept of mitigation in the forefront of community decision making by identifying plan recommendations when other community goals, plans, and activities overlap, influence, or directly affect increased community vulnerability to disasters;
- Report on plan progress and recommended changes to the governing bodies of participating jurisdictions; and
- Inform and solicit input from the public.

The HMPC is an advisory body and can only make recommendations to county, city, town, or district elected officials. Its primary duty is to see the plan successfully carried out and to report to the community governing boards and the public on the status of plan implementation and mitigation opportunities. Other duties include reviewing and promoting mitigation proposals, hearing stakeholder concerns about hazard mitigation, passing concerns on to appropriate entities, and posting relevant information in areas accessible to the public.

The HMPC meets annually in February to review the mitigation plan and evaluate the progress of the mitigation program.

5.1.2 Plan Maintenance Schedule

The HMPC agrees to meet annually and after a state or federally declared hazard event as appropriate to monitor progress and update the mitigation strategy. The Clinton County Emergency Management

Coordinator will be responsible for initiating the plan reviews in conjunction with the County Commissioners' meeting and inviting the school superintendents to the meeting.

In coordination with the other participating jurisdictions, a five-year written update of the plan will be submitted to the Iowa Homeland Security and Emergency Management Department and FEMA Region VII per Requirement §201.6(c)(4)(i) of the DMA of 2000, unless disaster or other circumstances (e.g., changing regulations) require a change to this schedule. During the third interim annual meeting, the HMPC will outline steps to begin the next plan update process so that the effort can be completed during year four and five; this will ensure there is time for completion, approval, and re-adoption within the five-year time frame.

5.1.3 Plan Maintenance Process

Evaluation of progress can be achieved by monitoring changes in vulnerabilities identified in the plan. Changes in vulnerability can be identified by noting:

- Decreased vulnerability as a result of implementing recommended actions,
- Increased vulnerability as a result of failed or ineffective mitigation actions, and/or
- Increased vulnerability as a result of new development (and/or annexation).

The annual reviews and updates to this plan will:

- Consider changes in vulnerability due to action implementation,
- Document success stories where mitigation efforts have proven effective,
- Document areas where mitigation actions were not effective,
- Document any new hazards that may arise or were previously overlooked,
- Incorporate new data or studies on hazards and risks,
- Incorporate new capabilities or changes in capabilities,
- Incorporate growth and development-related changes to inventories, and
- Incorporate new action recommendations or changes in action prioritization.

To best evaluate the mitigation strategy during plan review and update, the participating jurisdictions will follow the following process:

- A representative from the responsible office identified in each mitigation action will be responsible for tracking and reporting the action status on an annual basis to the jurisdictional HMPC member and providing input on any completion details or whether the action still meets the defined objectives and is likely to be successful in reducing vulnerabilities.
- If the action does not meet identified objectives, the jurisdictional HMPC member will determine what additional measures may be implemented, and an assigned individual will be responsible for defining action scope, implementing the action, monitoring success of the action, and making any required modifications to the plan.

Changes will be made to the plan to accommodate for actions that have failed or are not considered feasible after a review of their consistency with established criteria, time frame, community priorities, and/or funding resources. Actions that were not ranked high but were identified as potential mitigation activities will be reviewed as well during the monitoring and update of this plan to determine feasibility of future implementation. Updating of the plan will be by written changes and submissions, as the Clinton County HMPC deems appropriate and necessary, and as approved by the Clinton County Board of Supervisors and the governing boards of the other participating jurisdictions.

5.2 Incorporation into Existing Planning Mechanisms

Where possible, plan participants will use existing plans and/or programs to implement hazard mitigation actions. This plan builds upon the some of the previous related efforts and recommends implementing actions, where possible, through the following means:

- Comprehensive plans of participating jurisdictions
- Ordinances of participating jurisdictions
- Building codes
- Capital improvements plans and budgets
- School district facilities plans
- Mutual aid agreement (28E Agreement)
- Other community plans within the county either in existence or developed in the future such as water conservation plans, storm water management plans, and parks and recreation plans

The governing bodies of the jurisdictions adopting this plan will encourage all other relevant planning mechanism under their authority to consult this plan to ensure minimization of risk to natural and manmade hazards as well as coordination of activities.

The Board of Supervisors or the governing board of the participating jurisdictions involved in the plan update will be responsible for encouraging the integration of goals and information in the mitigation plan as appropriate. The Board of Supervisors is also responsible for monitoring this integration and incorporating the appropriate information into the five-year update of the plan.

The two largest cities in the County, the City of Clinton and the City of DeWitt, together with the City of Grand Mound, are the only three jurisdictions that have Comprehensive Plans. Many of the small jurisdictions in Clinton County do not have standing formal planning mechanisms such as a Comprehensive Plan or Capital Improvements Plan through which formal integration of mitigation actions can be documented. As a result, activities that occur in these small communities are developed through, annual budget planning, regular City Council Meetings, and other community forums rather than a formal planning process. Planning mechanisms that do exist within the participating jurisdictions include:

- Comprehensive Plans—Cities of Clinton, DeWitt and Grand Mound;
- Various ordinances of participating jurisdictions, including floodplain management ordinances in NFIP-participating communities;
- Clinton County Emergency Operations Plan;
- Clinton County Debris Management Plan; and
- Capital Improvement Plans—Cities of Clinton and DeWitt and public school districts.

For a detailed summary of planning mechanisms and other mitigation-related capabilities, see Table 2.8 in Chapter 2.

In the period since the adoption of the 2017 Clinton County Hazard Mitigation Plan, it was incorporated into several existing planning mechanisms as follows:

Unincorporated County

- Clinton County Emergency Management incorporated portions of the 2017 HMP into annual emergency management training, planning, and purchasing plans.
- The County's Emergency Management Grant Fund was set up to address the mitigation action need of additional generators in the County.
- Portions of the Risk Assessment were incorporated in the County Emergency Operations Plan.

City of Clinton

- The City of Clinton 2032 Comprehensive Plan, adopted in January 2014, specifically integrated the 2017 HMP in Chapter 12 "Hazards". To facilitate review of the Comprehensive plan for compliance with Iowa's Smart planning grant expectation, the "safe growth audit questions" were incorporated from the FEMA publication Hazard Mitigation: Integrating Best Practices into Planning. Additionally, the Comprehensive Plan included specific action steps for Hazard Mitigation.
- The City of Clinton's Long Term Control Plan included a consent decree with the State for sewer separation. This included a requirement to upgrade lift stations and sewer separation for more effective stormwater management.

City of DeWitt

- The City of DeWitt's Comprehensive Plan, "DeWitt 2030: Envisioning Opportunity" was approved in May 2016. This plan specifically integrated the 2017 HMP in Chapter IX, "Hazards".
- The mitigation strategy had also been integrated within the Capital Improvement Planning Process and the annual budget planning process.

With the 2021 update of the HMP, committee members have made a renewed commitment to use existing plans and/or programs to implement hazard mitigation actions, where possible. Based on the capability assessments of the participating jurisdictions, communities in Clinton County will continue to plan and implement programs to reduce losses to life and property from hazards. This plan builds upon the momentum developed through previous and related planning efforts and mitigation programs and recommends implementing actions, where possible, through the following plans and mechanisms listed in Table 5-1.

Table 5-1 Integration Strategies for Hazard Mitigation Plan Update

Jurisdiction	Integration Process for Plan Update
Clinton County	-Incorporate into annual emergency management training, planning, and purchasing plans. -Continue coordination of mitigation strategy with County's Emergency Management Grant Fund as well as seek additional funding sources -Continue integration of the Risk Assessment in future updates of the Comprehensive Emergency Operations Plan. - Integrate risk information in future updates of the Local Emergency Plan. - Integrate risk information into future updates to the Floodplain Ordinance. - Integrate risk information into future updates to the Capital Improvement Plan. - Integrate risk information into subdivision ordinances and site plan review requirements.
Andover	-Integrate mitigation strategy into the annual budget planning process. -Integrate risk information into the development of zoning, subdivision, and floodplain ordinances.
Calamus	-Integrate mitigation strategy into the annual budget planning process. -Integrate risk information into the development of zoning, subdivision, and floodplain ordinances.
Camanche	-Integrate mitigation strategy into the annual budget planning process. -Integrate risk information into the development of zoning, subdivision, and floodplain ordinances.

Jurisdiction	Integration Process for Plan Update
Charlotte	-Integrate mitigation strategy into the annual budget planning process. -Integrate risk information into the development of zoning, subdivision, and floodplain ordinances.
Clinton	-Integrate risk assessment and mitigation strategy into the 2019 update of the Comprehensive Plan -Integrate mitigation strategy into the annual updates of the Capital Improvement Plan -Integrate mitigation strategy into the annual updates of the City Infrastructure Plan -Integrate mitigation strategy into the annual updates of the City Strategic Plan -Integrate risk information into the development of zoning, subdivision, and floodplain ordinances.
Delmar	-Integrate mitigation strategy into the annual budget planning process. -Integrate risk information into the development of zoning, subdivision, and floodplain ordinances.
DeWitt	-Integrate risk assessment and mitigation strategy into future updates of the Comprehensive Plan. -Integrate mitigation strategy into the annual Capital Improvement Plan. -Integrate mitigation strategy into the annual updates of the City Strategic Plan -Integrate risk information into the development of zoning, subdivision, and floodplain ordinances. -Integrate mitigation strategy into the annual budget planning process.
Goose Lake	-Integrate mitigation strategy into the annual budget planning process. -Integrate risk information into the development of zoning, subdivision, and floodplain ordinances.
Grand Mound	-Integrate mitigation strategy into the annual budget planning process. -Integrate risk information into the development of zoning, subdivision, and floodplain ordinances.
Lost Nation	-Integrate mitigation strategy into the annual budget planning process. -Integrate risk information into the development of zoning, subdivision, and floodplain ordinances.
Low Moor	-Integrate mitigation strategy into the annual budget planning process. -Integrate risk information into the development of zoning, subdivision, and floodplain ordinances.
Toronto	-Integrate mitigation strategy into the annual budget planning process. -Integrate risk information into the development of zoning, subdivision, and floodplain ordinances.
Welton	-Integrate mitigation strategy into the annual budget planning process. -Integrate risk information into the development of zoning, subdivision, and floodplain ordinances.
Wheatland	-Integrate mitigation strategy into the annual budget planning process. -Integrate risk information into the development of zoning, subdivision, and floodplain ordinances.
Calamus-Wheatland School District	-Integrate mitigation strategy into Master Plan update.

Jurisdiction	Integration Process for Plan Update
Camanche School District	-Integrate mitigation strategy into Capital Improvement Plan update.
Central DeWitt School District	-Integrate mitigation strategy into Capital Improvement Plan update.
Clinton School District	-Integrate mitigation strategy into Capital Improvement Plan update.
Delwood School District	-Integrate mitigation strategy into Capital Improvement Plan update.
Northeast School District	-Integrate mitigation strategy into Capital Improvement Plan update.

5.3 Continued Public Involvement

The update process provides an opportunity to publicize success stories from the plan's implementation and seek additional public comment. Information about the annual reviews will be posted on the County website following each annual review of the mitigation plan. When the HMPC reconvenes for the update, it will coordinate with all stakeholders participating in the planning process, including those who joined the HMPC after the initial effort, to update and revise the plan. Public notice will be posted, at a minimum, through available website postings, social media, and press releases to local media outlets, primarily newspapers. Public participation in the next plan update will be done in accordance with DMA 2000 requirements, by providing an opportunity for the public to comment on the plan during the drafting stage and prior to plan approval. This may be accomplished through public surveys, social media notices, public meetings, discussing the plan at public forums etc.

Appendix A: References and Resources

- American Meteorological Society, Freezing Rain Events in the United States
- Center for Disease Control and Prevention (CDC)
- City of Clinton 2032 Comprehensive Plan, January 2014
- Clinton County Conservation Board
- Clinton County Assessor's Office (Parcel Data in GIS Format)
- Clinton County, Iowa Multi-jurisdictional Hazard Mitigation Plan, 2016
- Climate Change Impacts on Iowa, January 1, 2011
- Climate Change Research Program. Cambridge University Press
- DeWitt 2030: Envisioning Opportunity, City of DeWitt Comprehensive Plan, May 2016
- OpenData.gov, FEMA HMA Grants in Clinton County
- Environmental Protection Agency, Surf Your Watershed
- Federal Emergency Management Agency, BCA Reference Guide, 2009
- Federal Emergency Management Agency, Clinton County DFIRM and Preliminary DFIRM
- Federal Emergency Management Agency, Clinton County Flood Insurance Study
- Federal Emergency Management Agency, Community Status Book
- Federal Emergency Management Agency, Presidential Disaster Declarations
- Federal Emergency Management Agency, Taking Shelter from the Storm, 3rd Edition
- Flood Insurance Administration, Policy and Loss Statistics
- Hazards US MH (HAZUS)
- Hazards Vulnerability Research Institute, Social Vulnerability Index
- High Plains Regional Climate Center
- Iowa Climate Change Advisory Council
- Iowa Department of Agriculture
- Iowa Department of Agriculture and Land Stewardship, Division of Soil Conservation
- Iowa Department of Agriculture and Land Stewardship, Pesticide Bureau
- Iowa Department of Education, Bureau of Information and Analysis Services
- Iowa Department of Health Center for Acute Disease Epidemiology
- Iowa Department of Natural Resources, Animal Feeding Operations
- Iowa Department of Natural Resources, Dam Safety Program
- Iowa Department of Natural Resources, Deer Disease Information, Deer Disease Monitoring in Iowa
- Iowa Department of Natural Resources, Emergenc Response and Homeland Security Unit, Tier II Chemical Facilities
- Iowa Department of Public Health, Bureau of Health Statistics
- Iowa Department of Public Safety, State Fire Marshal Division
- Iowa Department of Transportation's Office of Traffic and Safety, Crash Facts Reports
- Iowa Environmental Mesonet, climate data
- Iowa Hospital Association http://www.iowahospitalcharges.com/wa Hospital Association,
- Iowa Specialty Crop Site Registry
- Iowa State Fire Marshal Division
- Iowa State Hazard Mitigation Plan, 2018
- Iowa State University Department of Economics
- Iowa State University, Department of Agronomy, Environmental Mesonet
- Iowa State University, Extension Office, Distribution of Ash Trees in Iowa

- Iowa Utilities board, Electrical Service Area Reference Map
- Johns Hopkins University 2021 Coronavirus Resource Center, COVID-19 Dashboard by the Center for Systesms science and Engineering.
- Johns Hopkins University Electronic Mass Casualty Assessment and Planning Scenarios (EMCAPS) http://www.hopkins-cepar.org/EMCAPS/EMCAPS.html
- Karl, T.R., J.M. Melillo, and T.C. Peterson (eds). 2009. Global Climate ChangeImpacts in the United States. U.S. Global
- National Center for Environmental Information (NCEI), Storm Events Database
- National Drought Mitigation Center, U.S. Drought Monitor & Drought Impact Reporter
- National Fire Incident Reporting System (NFIRS)
- National Oceanic and Atmospheric Administration's (NOAA) National Weather Service, Quad Cities Weather Forecast Office
- National Oceanic and Atmospheric Administration, Storm Prediction Center
- National Severe Storms Laboratory
- National Weather Service
- NFIP Community Status Book
- Pipeline and Hazardous Materials Safety Administration, National Pipeline Mapping System, https://www.npms.phmsa.dot.go/PublicViewer/
- http://planecrashmap.com/list/ia/
- Southwest Climate and Environmental Information Collaborative (SCENIC)
- SILVIS Lab, Department of Forest Ecology and Management, University of Wisconsin
- State Historical Society of Iowa, National Register of Historic Places Listings
- Tornado and Storm Research Organization (TORRO), Department of Geography, Oxford Brooks University
- U.S. Census Bureau American Community Survey 5-Year Estimates, 2015-2019
- U.S. Census Bureau, Building Permit Data
- U.S. Census Bureau, Decennial Census, 2010 and 2020
- U.S. Army Corps of Engineers, Cold Regions Research and Engineering Laboratory
- U.S. Department of Agriculture National Agricultural Statistics Service, 2017
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- U.S. Nuclear Regulatory Commission
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Appendix B: Adoption Resolutions

<placeholder for resolutions after FEMA provides approval pending adoption letter>

MODEL RESOLUTION

Resolution # _____

Adopting the Clinton County Multi-Jurisdictional Local Hazard Mitigation Plan

Whereas the (Name of Government/District/Organization seeking FEMA approval of hazard mitigation plan) recognizes the threat that natural hazards pose to people and property within our community; and

Whereas, undertaking hazard mitigation actions will reduce the potential for harm to people and property from future hazard occurrences; and

Whereas the U.S Congress passed the Disaster Mitigation Act of 2000 ("Disaster Mitigation Act") emphasizing the need for pre-disaster mitigation of potential hazards;

Whereas the Disaster Mitigation Act made available hazard mitigation grants to state and local governments; and

Whereas an adopted Local Hazard Mitigation Plan is required as a condition of future funding for mitigation projects under multiple FEMA pre- and post-disaster mitigation grant programs; and

Whereas the (Name of Government/District/Organization) fully participated in the hazard mitigation planning process to prepare this Multi-Jurisdictional Local Hazard Mitigation Plan; and

Whereas the Iowa Homeland Security and Emergency Management Department and the Federal Emergency Management Agency Region VII officials have reviewed the "Clinton County Multi-Jurisdictional Local Hazard Mitigation Plan," and approved it contingent upon this official adoption of the participating governing body; and

Whereas the (Name of Government/District/Organization) desires to comply with the requirements of the Disaster Mitigation Act and to augment its emergency planning efforts by formally adopting the Clinton County Multi-Jurisdictional Local Hazard Mitigation Plan; and

Whereas adoption by the governing body for the (Name of Government/District/Organization) demonstrates the jurisdictions' commitment to fulfilling the mitigation goals outlined in this Multi-Jurisdictional Local Hazard Mitigation Plan

Whereas adoption of this legitimizes the plan and authorizes responsible agencies to carry out their responsibilities under the plan;

Now, therefore, be it resolved, that the (Name of Government/District/Organization) adopts the "Clinton County Multi-Jurisdictional Local Hazard Mitigation Plan" as an official plan; and

Be it further resolved, the (Name of Government/District/Organization) will submit this Adoption Resolution to the Iowa Homeland Security and Emergency Management Department and Federal Emergency Management Agency Region VII officials to enable the plan's final approval.

Date: _____

Certifying Official: _____

Appendix C: Planning Process Documentation

CLINTON COUNTY
MULTI-JURISDICTIONAL
HAZARD MITIGATION PLAN UPDATE
KICKOFF MEETING/WEBINAR

Wednesday, August 25, 2021
6:00 pm—7:30 pm CST

Remote Webinar link: Click here to join the meeting
+1 281-810-1627 United States, Houston
(866) 670-1764 United States (Toll-free)
Conference ID: 417 238 015#

1. **Introductions**
2. **Hazard Mitigation Overview**
3. **Hazard Mitigation Planning Process and Requirements**
4. **Role of the Hazard Mitigation Planning Committee**
5. **Plan Update Requirements, Key Elements, and Schedule**
6. **Review of Identified Hazards and 2017 Mitigation Plan**
7. **Coordinating with Other Agencies/Related Planning Efforts/Planning for Public Involvement**
8. **Initial Information Needs**
9. **Next Steps/Adjourn**

Clinton County, Iowa Multi-Jurisdictional Hazard Mitigation Plan 2021 Update

Kick-Off Meeting/Webinar Summary

Wednesday, August 25, 2021

6:00 – 7:30 pm CST

MS Teams Virtual Meeting

Introductions and Opening Remarks

This document summarizes the kickoff meeting for the Clinton County Hazard Mitigation Plan update in 2021. The virtual meeting was facilitated by Wood Environment & Infrastructure Solutions, Inc. (Wood), the consulting firm working under a contract with the Iowa Department of Homeland Security and Security and Emergency Management (IA HSEMD), to facilitate the planning process and develop the updated County plan. Nancy Burns with Clinton County began the meeting by taking attendance of those present on the call. Scott Field, project manager at Wood, then explained the importance of the plan update and thanked everyone for attending. Scott began by asking those attending to virtually introduce themselves by typing their name, title, and agency/jurisdiction into the Chat feature in MS Teams. Nineteen (19) persons representing a mix of the consultant team, county departments, cities, and school districts were present for the meeting.

1. Scott Field, Wood E&IS
2. Christopher Johnson, Wood E&IS
3. Amy Carr, Wood E&IS
4. Bob Milroy, Clinton Wastewater Treatment
5. Nancy Burns, Clinton County EMA
6. Christy Stankee, City of Wheatland
7. Janet Burke, City of Lost Nation & Toronto
8. Dan Howard, Clinton County EMA
9. Dan Vosatka, Mayor, City of Welton
10. Joel Atkinson, Clinton Fire Department
11. Ken Schoon, Mayor, City of Goose Lake
12. Kurt Crosthwaite, Mayor, City of Grand Mound
13. Matt Proctor, Public Works, City of DeWitt
14. Rick Johannsen, Andover Fire
15. Chet Hippler, Andover Fire
16. Tom Paarmann, Clinton County Sherriff's Office
17. Joyce Lanning, City Clerk, City of Low Moor
18. Gary DeLacy, Clinton Community School District
19. Scott Besst, DeWitt Fire Department

Following introductions Scott discussed the agenda items; the key discussion is summarized below, and additional details are within the meeting PowerPoint presentation.

Hazard Mitigation Overview

Mitigation is any sustained action taken to reduce or eliminate long-term risk to human life and property from natural or human-caused hazards. Mitigation Planning guides mitigation activities in a coordinated and economic manner to make communities more disaster resilient. The U.S. Disaster Mitigation Act of 2000 requires state and local governments to adopt a hazard mitigation plan, updated every five years, to maintain eligibility for FEMA mitigation assistance grants.

There are trends resulting in increased costs for disaster response and recovery related to population growth and the increase in the types of events we experience as a community. The COVID-19 pandemic is a good example of a circumstance that can cause disruption in our community and to the economy. Scott explained we need these plans for several reasons because they reduce future recovery costs, we can plan around predictive events, and they guide mitigation activities in a coordinated manner.

An additional benefit the community gains from having a FEMA approved hazard mitigation plan (HMP) is making the community eligible for FEMA grants (Pre-Disaster Mitigation, Flood Mitigation Assistance, Hazard Mitigation Grant Program-Post-Disaster). Any grant proposals for FEMA mitigation funds need to be based on the hazards and mitigation strategy in the HMP. Information from the hazard mitigation plan, specifically the vulnerability assessment and mitigation strategy, can be used in other hazard related plans such as emergency operations plans.

Hazard Mitigation Planning Process and Requirements

Scott reviewed the Disaster Mitigation Act (DMA) of 2000 Requirements and explained that the Clinton County Multi-Jurisdictional Hazard Mitigation Plan (HMP) will be updated in accordance with these requirements. The planning process involves a 4 Phase approach with 9 tasks per FEMA guidance updated in 2013. The kickoff meeting is the first step in the process and also covers tasks 1-3 (Determine the planning area and resources; Build the planning team; Create an outreach strategy).

Scott presented a slide with the 21 jurisdictions that are expected to participate in 2021 and will need to re-adopt the plan.

- Unincorporated Clinton County
- City of Andover
- City of Calamus
- City of Camanche
- City of Charlotte
- City of Clinton
- City of Delmar
- City of DeWitt
- City of Goose Lake
- City of Grand Mound
- City of Lost Nation
- City of Low Moor
- City of Toronto
- City of Welton
- City of Wheatland
- Calamus-Wheatland School District

- Camanche School District
- Central DeWitt School District
- Clinton School District
- Delwood School District
- Northeast School District

Role of the Hazard Mitigation Planning Committee (HMPC)

The first step in getting organized is to determine the hazard mitigation planning committee members, which has already started with those in attendance at the kickoff meeting. Scott presented a slide with a summary of those invited to be on the committee, based on the previous HMP and input from the County.

Scott emphasized that all jurisdictions and districts wishing to adopt the plan must participate throughout the planning process – simply adopting the plan at the end of the process is not sufficient. Participation includes the following:

- Attend meetings and participate in the planning process
- Provide requested information to update or develop jurisdictional information
- Review drafts and provide comments
- Identify mitigation projects specific to jurisdiction, provide status
- Assist with and participate in the public input process
- Coordinate formal adoption

Stakeholders include other local, state and federal agencies with a stake in hazard mitigation in the County or may include academic institutions and local business and industry. Neighboring counties were also notified about the update and will be given an opportunity to provide input into the process. Stakeholders have various options and levels of participation including:

- Attend HMPC meetings or stay in loop via email list
- Provide data/information
- Partner on mitigation efforts
- Review draft plan

Plan Update Requirements, Key Elements and Schedule

Aspects of the planning process include:

- Engage the participants to take part in planning process and efforts
- Raise awareness and engage the public
- Update hazards and baseline development data to reflect current conditions
- Update the mitigation strategy
- Document progress and note changes in priorities

Conducting a risk assessment is a key aspect of a hazard mitigation plan and involves two components; hazard identification (what can happen here) and the vulnerability assessment (what will be affected). The HMP update will be based on existing documents and studies, with the Clinton County Hazard Mitigation Plan (2017) providing the baseline for identified hazards and the groundwork for goals, policies and actions for hazard mitigation.

The HMP will be updated over the next several months, with two more meetings with the Hazard Mitigation Planning Committee. Wood will be updating the Hazard Identification and Risk Assessment (HIRA) in the next couple of months, with input from the HMPC. Three drafts of the HMP will be created: the first for review by HMPC committee, a second for public review, and a third for state and FEMA review. The first draft for HMPC review is targeted for October 2021, a public review draft in November followed by a review by Iowa DHSEM in late November and then tentatively approved by FEMA in February 2022.

Review of Identified Hazards

Based on hazards from the 2017 County HMP, the list of potential hazards was reviewed. Scott showed a slide that listed the hazards in the 2017 HMP.

- Animal/Plant/Crop Disease
- Dam/Levee Failure
- Drought
- Earthquake
- Extreme Heat
- Flash Flood
- Grass or Wildland Fire
- Hazardous Materials Incident
- Human Disease
- Infrastructure Failure
- Radiological Incident
- River Flooding
- Severe Winter Storms
- Sinkholes
- Terrorism
- Thunderstorms/Lightning/Hail
- Tornado/Windstorm
- Transportation Incident

The group thought the original list of hazards was still valid although there was discussion that the levels of significance may have changed since 2017. Scott showed a slide of how the hazards were ranked by significance in the 2017 plan. There will be more detail provided on methodology during the next meeting. Additional comments made during the presentation are noted in the meeting chat log.

Scott noted that Flash Flood and Riverine Flooding would be combined in one hazard profile align with the State's 2018 Hazard Mitigation Plan hazard list. Scott noted that every hazard profiled must have at least one mitigation action identified, and each jurisdiction will need at least one new action added to the updated plan.

Scott asked the group to review the list of hazards and comment on how they could be enhanced or updated with:

- Historic incidents
- Incident logs
- Public perception

- Scientific studies
- Other plans and reports (e.g., flood and drainage studies, incident damage assessments, Internet databases)
- Recent disasters

Coordinating with Other Agencies\Related Planning Efforts\Recent Studies

A discussion on recent studies of hazards in other documents and reports followed the identified hazards discussion. Opportunities for coordinating and cross-referencing the HMP were discussed.

Planning for Public and Stakeholder Involvement

A public survey will be developed to gather input from the public on hazard concerns and mitigation ideas. Advertisement of public survey will be through public information channels, official websites, social media, email blasts etc. He asked for opportunities for outreach at scheduled public meetings or events. Suggestions included discussing the HMP update at City Council and County Commission meetings.

Scott asked for ideas on additional stakeholders to be made aware of the plan update effort. Rural water was suggested in the chat.

Initial Information Needs and Next steps

Scott discussed a slide with initial information needs and next steps. Scott encouraged the group to send by email information on:

- Recent hazard events (since 2017) – damages, incident logs, damage assessments, etc.
- Growth and development trends
- Recent updated plans and policies
- GIS Data

Where available online, Wood will try to obtain the updated plans previously noted. Scott encouraged the group to send other information that might not be readily accessible online.

A GIS needs list was provided to the County to assist with data collection, which is already in progress. The County will provide the meeting summary, handouts, presentation and sign in sheet by email so that other HMPC members that could not attend today's meeting could get up to speed. Wood will begin work on the Hazard Identification and Risk Assessment update and develop a public survey that can be used online.

The next HMPC meeting will be following the update of the Hazard Identification and Risk Assessment section of the plan. The specific date will be shared when available.

Adjourn

The meeting adjourned at 7:15 pm CST.

Attachments:

MS Teams Meeting chat log

Attachment: Clinton County Hazard Mitigation Plan Update

Kickoff Meeting Chat Log

[8/3 8:59 AM] Carr, Amy and 3 others were invited to the meeting.
8/3 8:59 AM] Field, Scott named the meeting to Clinton Kickoff.
[8/3 9:06 AM] Field, Scott named the meeting to Clinton Kickoff.
[Yesterday 4:50 PM] Unknown User Rich Johannsen & Chet Hippler (Guest) has temporarily joined the chat.
[Yesterday 4:51 PM] Unknown User Christy (Guest) has temporarily joined the chat.
[Yesterday 4:54 PM] Unknown User Dan Howard - Clinton County EMA (Guest) has temporarily joined the chat.
[Yesterday 4:55 PM] Unknown User Matt Proctor (Guest) has temporarily joined the chat.
[Yesterday 4:55 PM] Unknown User Janet Burke (Guest) has temporarily joined the chat.
[Yesterday 4:56 PM] Unknown User Dan Vosatka (Guest) has temporarily joined the chat.
[Yesterday 4:56 PM] Unknown User Burns, Nancy (Guest) has temporarily joined the chat.
[Yesterday 4:58 PM] Unknown User Bob Milroy (Guest) has temporarily joined the chat.
[Yesterday 4:58 PM] Unknown User T Paarmann (Guest) has temporarily joined the chat.
[Yesterday 4:58 PM] Unknown User Joel Atkinson (Guest) has temporarily joined the chat.
[Yesterday 4:58 PM] Unknown User Kurt Crosthwaite (Guest) has temporarily joined the chat.
[Yesterday 4:58 PM] Unknown User Tom P (Guest) has temporarily joined the chat.
[Yesterday 5:00 PM] Unknown User Ken Schoon (Guest) has temporarily joined the chat.
[Yesterday 5:03 PM] Unknown User BESST (Guest) has temporarily joined the chat.
[Yesterday 5:03 PM] Unknown User Gary DeLacy (Guest) has temporarily joined the chat.
[Yesterday 5:03 PM] Unknown User Joyce Lanning (Guest) has temporarily joined the chat.

[Yesterday 5:09 PM] Dan Vosatka (Guest)

Dan Vosatka- City of Welton: Mayor

[Yesterday 5:09 PM] Joyce Lanning (Guest)
Joyce Lanning - City Clerk - City of Low Moor

[Yesterday 5:09 PM] Bob Milroy (Guest)

Bob Milroy

[Yesterday 5:09 PM] Janet Burke (Guest)
Janet Burke - Lost Nation & Toronto

[Yesterday 5:09 PM] Matt Proctor (Guest)
Matt Proctor DeWitt Public Works

[Yesterday 5:09 PM] Gary DeLacy (Guest)
Gary DeLacy---Clinton Community School District

[Yesterday 5:09 PM] Ken Schoon (Guest)
Ken Schoon - Mayor - City of Goose Lake

[Yesterday 5:10 PM] Dan Howard - Clinton County EMA (Guest)
Dan Howard - Clinton County EMA

[Yesterday 5:10 PM] BESST (Guest)

Scott Besst - DeWitt Fire Department

[Yesterday 5:10 PM] T Paarmann (Guest)

[Yesterday 5:10 PM] Bob Milroy (Guest)
Bob Milroy City of Clinton

[Yesterday 5:11 PM] Christy (Guest)
Christy Stankee, Wheatland

[Yesterday 5:11 PM] Rich Johannsen & Chet Hippler (Guest)
Rich Johannsen - Andover Fire

[Yesterday 5:11 PM] Rich Johannsen & Chet Hippler (Guest)
Chet Hippler - Andover Fire

[Yesterday 5:14 PM] Joel Atkinson (Guest)
joel Atkinson Clinton fire

[Yesterday 5:26 PM] Gary DeLacy (Guest)
Was Mercy One listed as part of the team?

[Yesterday 5:26 PM] Field, Scott
If not we'll reach out to Mercy One - thanks.

[Yesterday 5:28 PM] Gary DeLacy (Guest)
I'm wondering about emergency transportation---evacuation---Clinton MTA or even Clinton Airport?

(1 liked)[Yesterday 5:31 PM] Gary DeLacy (Guest)
I believe Genesis is the medical provider for DeWitt

[Yesterday 5:45 PM] Gary DeLacy (Guest)
Is the Cordova Nuclear Power Plant mitigation plans a subset of the Clinton County Plan?

[Yesterday 5:50 PM] Burns, Nancy (Guest)
Nancy Burns - Clinton County EMA

[Yesterday 5:51 PM] Gary DeLacy (Guest)
Should Alliant or Mid-American Energy be part of this plan? The dericho made this very apparent

[Yesterday 5:56 PM] Dan Vosatka (Guest)
Good point Gary. As the Health and Safety rep for Iowa American Water Company, I recently had my recent hazard risk assessment of our infrastructure and assets in Clinton, and included EMA and Clinton Fire during the process. So it's only fair to return the favor.

[Yesterday 6:16 PM] Ken Schoon (Guest)
Thank you Scott. I hope to send you some information and a report that the City of Goose Lake has gotten in hopes to mitigate some rain water flow issues we have had. Ken Schoon

[Yesterday 6:16 PM] Unknown User Gary DeLacy (Guest) no longer has access to the chat.
[Yesterday 6:16 PM] Unknown User Rich Johannsen & Chet Hippler (Guest) no longer has access to the chat.
[Yesterday 6:16 PM] Unknown User Janet Burke (Guest) no longer has access to the chat.
[Yesterday 6:16 PM] Unknown User Joyce Lanning (Guest) no longer has access to the chat.
[Yesterday 6:16 PM] Unknown User Ken Schoon (Guest) no longer has access to the chat.
[Yesterday 6:17 PM] Unknown User Matt Proctor (Guest) no longer has access to the chat.

[Yesterday 6:17 PM] Unknown User Christy (Guest) no longer has access to the chat.
[Yesterday 6:17 PM] Unknown User T Paarmann (Guest) no longer has access to the chat.
[Yesterday 6:20 PM] Unknown User Dan Howard - Clinton County EMA (Guest) no longer has access to the chat.

Meeting ended 1h 15m 6:15 PM
1h 15m
Meeting Recorded by: Carr, Amy

Clinton County Hazard Mitigation Plan
2021 Update Risk Assessment Meeting

Date: Wednesday, September 15, 2021 **Time: 6:00 – 8:00 pm CDT**

Physical Location:

241 7th Ave North Clinton, IA 52732
2nd Floor, next to EMA Office

Subject/Purpose: Review the highlights of the updated Hazard Identification and Risk Assessment and revisit the plan's goals.

Attendees: Hazard Mitigation Planning Committee and Stakeholders

Agenda:

1. Introductions
2. Review of the planning process
3. Review of identified hazards and vulnerability assessment
4. Capabilities Assessment Update
5. Updating Goals for the Mitigation Plan and updating Mitigation Actions
6. Next Steps
7. Questions

Clinton County Hazard Mitigation Plan
2021 Update Mitigation Strategy Meeting

Date: Wednesday, October 6, 2021 **Time: 6:00 – 8:00 pm CDT**

Physical Location:

241 7th Ave North Clinton, IA 52732
2nd Floor, next to EMA Office

Subject/Purpose: Review and update the mitigation goals, objectives, and actions from the previous plan, and identify new mitigation actions.

Attendees: Hazard Mitigation Planning Committee and Stakeholders

Agenda:

1. Introductions
2. Review of the planning process
3. Review of mitigation goals
4. Review of Mitigation Action Categories and Alternatives
5. Progress on 2017 Mitigation Actions
6. Identification of New Mitigation Actions
7. Plan Implementation and Maintenance
8. Next Steps
9. Questions

Mitigation Action Selection and Prioritization Criteria

- Does the proposed action protect lives or vulnerable populations?
- Does the proposed action address hazards or areas with the highest risk?
- Does the proposed action protect critical facilities, infrastructure, or community assets?
- Does the proposed action meet multiple goals or hazards?
- Is there a strong advocate for the action or project that will support the action's implementation?

STAPLE/E

Developed by FEMA, this method of applying evaluation criteria enables the planning team to consider in a systematic way the social, technical, administrative, political, legal, economic, and environmental opportunities and constraints of implementing a particular mitigation action. For each action, the HMPC should ask, and consider the answers to, the following questions:

Social - Does the measure treat people fairly (different groups, different generations)? Does it consider social equity, disadvantaged communities, or vulnerable populations?

Technical - Will it work? (Does it solve the problem? Is it feasible?)

Administrative - Is there capacity to implement and manage project?

Political - Who are the stakeholders? Did they get to participate? Is there public support? Is political leadership willing to support it?

Legal - Does your organization have the authority to implement? Is it legal? Are there liability implications?

Economic - Is it cost-beneficial? Is there funding? Does it contribute to the local economy or economic development? Does it reduce direct property losses or indirect economic losses?

Environmental - Does it comply with environmental regulations or have adverse environmental impacts?

Review the proposed new mitigation actions and use the STAPLE/E criteria to begin prioritizing each action. Mark a plus sign (+) or minus sign (-) or blank under each category if you think it is a positive, negative, or neutral for the project.

Action	Hazards	Social	Technical	Admin.	Political	Legal	Economic	Environ.	Other	Total +/-

Example Mitigation Action Items

Alternative Mitigation Actions	Dam Failure	Floods	Hazardous Materials	Drought	Weather Extremes (hail, lightning, temps,)	Wind/ Tornado	Wildland Fires	Severe Winter Storm
PREVENTION								
Building codes and enforcement		■	■	■	■	■	■	■
Comprehensive Watershed Tax		■						
Density controls	■	■	■				■	
Design review standards		■	■	■		■	■	
Easements		■	■				■	
Environmental review standards		■	■				■	
Floodplain development regulations	■	■	■					
Hazard mapping	■	■	■				■	
Floodplain zoning	■	■	■					
Forest fire fuel reduction			■				■	
Housing/landlord codes			■	■	■			
Slide-prone area/grading/hillside development regulations							■	
Manufactured home guidelines/regulations		■			■	■		
Minimize hazardous materials waste generation			■					
Multi-Jurisdiction Cooperation within watershed	■	■		■				
Open space preservation	■	■					■	
Performance standards	■	■		■	■	■	■	■
Periodically contain/remove wastes for disposal			■					
Pesticide/herbicide management regulations			■					
Special use permits	■	■	■				■	
Stormwater management regulations		■	■					
Subdivision and development regulations	■	■	■	■		■	■	
Surge protectors and lightning protection					■			
Tree Management				■	■	■	■	■
Transfer of development rights		■					■	
Utility location			■		■	■		■

PROPERTY PROTECTION								
Acquisition of hazard prone structures	■	■					■	
Facility inspections/reporting	■	■	■					
Construction of barriers around structures	■	■	■					
Elevation of structures	■	■						
Relocation out of hazard areas	■	■	■				■	
Structural retrofits (e.g., reinforcement, floodproofing, bracing, etc.)		■	■	■	■	■	■	■
PUBLIC EDUCATION AND AWARENESS						■		
Debris Control		■				■		
Flood Insurance	■	■						
Hazard information centers	■	■	■	■	■	■	■	■
Public education and outreach programs	■	■	■	■	■	■	■	■
Real estate disclosure	■	■	■		■		■	■
Crop Insurance				■	■			
Lightning detectors in public areas					■			
NATURAL RESOURCE PROTECTION								
Best Management Practices (BMPs)		■	■	■	■		■	
Forest and vegetation management	■	■		■	■		■	■
Hydrological Monitoring	■	■	■	■	■			
Sediment and erosion control regulations	■	■	■	■				
Stream corridor restoration		■						
Stream dumping regulations		■	■					
Urban forestry and landscape management		■		■	■		■	■
Wetlands development regulations		■	■				■	
EMERGENCY SERVICES								
Critical facilities protection	■	■	■	■	■	■	■	■
Emergency response services	■	■	■		■	■	■	■
Facility employee safety training programs	■	■	■		■	■	■	■
Hazard threat recognition	■	■	■	■	■	■	■	■
Hazard warning systems (community sirens, NOAA weather radio)	■	■	■		■	■	■	■
Health and safety maintenance	■	■	■	■	■	■	■	■
Post-disaster mitigation	■	■	■	■	■	■	■	■
Evacuation planning	■	■	■				■	

STRUCTURAL PROJECTS								
Channel maintenance		■						
Dams/reservoirs (including maintenance)	■	■						
Isolate hazardous materials waste storage sties			■					
Levees and floodwalls (including maintenance)		■						
Safe room/shelter					■	■		■
Secondary containment system			■					
Site reclamation/restoration/revegetation		■	■	■				
Snow fences								■
Water supply augmentation				■	■			

Clinton County Emergency Management Agency, Iowa

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A new Pages experience is coming soon

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Create Live Event Job Volunteers

Clinton County Emergency Management Agency, Iowa

Published by Nancy Burns · 52m

We need your help. No one knows the hazards where you work and live in Clinton County better than you. Can you please help us in planning by completing this short survey?

https://forms.office.com/r/ST8BcsRE5x

Please share this also to get the word out. Thank you.

Create Ad See All

How would you like to grow your business?

Create New Ad

Make an ad using text, photos or videos to promote your business

Boost a Post

Automated Ads

Get personalized ads that adjust over time to help you get better results

Free Facebook Business Tools

Sell Your Products
Set up a shop on your Page to start selling products online

Add Appointment Bookings
Display your services and availability so that people can book an appointment.

Host Paid Online Events
Create online events that people can pay to access.

Post a Job
Find qualified candidates by posting job opportunities with your business on...

Show More

We Need You!

Clinton County is conducting our 5 year Hazard Mitigation Plan Update for FEMA and the State of Iowa.

This plan is important in allowing our communities and entities throughout Clinton County to apply for FEMA funds.

We need our citizens to tell us about the hazards that you see where you live and work.

What is Hazard Mitigation?

The purpose of hazard mitigation is to reduce or eliminate long-term risk to people and property from hazards. Clinton County and participating jurisdictions developed this multi-jurisdictional local hazard mitigation plan update to reduce future losses to the County and its communities as a result of hazard events.

What can you do to help?

Please help us by filling out this survey. This will help us gather the data needed to update our plan.

https://forms.office.com/r/ST8BcsRE5x

EMERGENCY MANAGEMENT CLINTON COUNTY


clintoncounty-ia.gov
CLINTON
COUNTY, IOWA
ABOUT
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PROGRAMS
CALENDAR
HOW DO I...?
Recent News
6/1/2021
NEWS RELEASE: Clinton County Residents will need to Register or Re-Register to Experience Upgrades to the New Alert Iowa Emergency Notification System
We Need You!
What is Hazard Mitigation?
What can you do to help?
EMERGENCY MANAGEMENT
Quick Links
Board of Supervisors
Agenda|Minutes
Media Releases
Election Information
Request for Proposals/Bids
Assessor
Property values reside on Vanguard, a local government GIS for the web.
Assessor Data Website
Assessor
Phone: (563) 244-0569

Camanche Family Resource Coordinator
31m ·

can you help by filling out this survey for Clinton County?

Clinton County Emergency Management Agency, Iowa
September 10 at 2:25 PM ·

We need your help. No one knows the hazards where you work and live in Clinton County better than you. Can you please help us in planning by completing this short survey?
https://forms.office.com/r/ST8BcsRE5x

Please share this also to get the word out. Thank you.

Like Comment Share

Choose Clinton, Iowa
September 10 at 4:32 PM

We Need You! Clinton County is conducting our 5 year Hazard Mitigation Plan Update for FEMA and the State of Iowa.

This plan is important in allowing our communities and entities throughout Clinton County to apply for FEMA funds.

We need our citizens to tell us about the hazards that you see where you live and work.

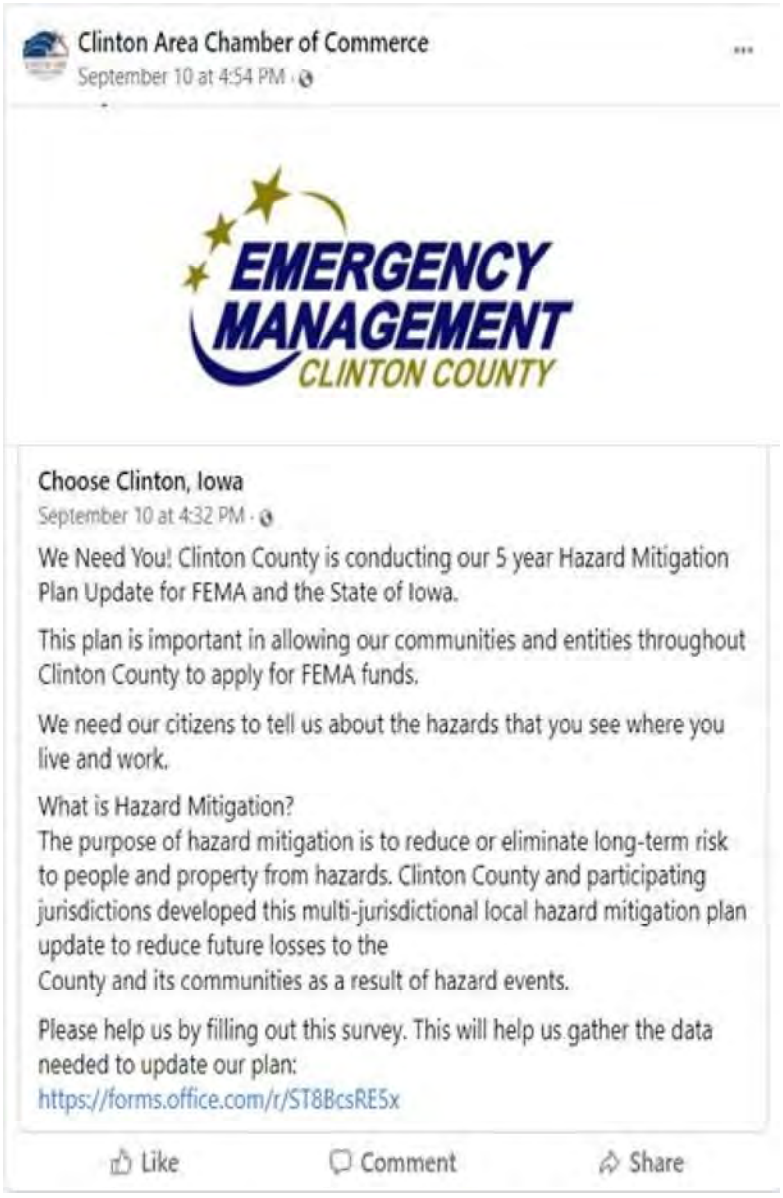
What is Hazard Mitigation?
The purpose of hazard mitigation is to reduce or eliminate long-term risk to people and property from hazards. Clinton County and participating jurisdictions developed this multi-jurisdictional local hazard mitigation plan update to reduce future losses to the
County and its communities as a result of hazard events.

Please help us by filling out this survey. This will help us gather the data needed to update our plan:
https://forms.office.com/r/ST8BcsRE5x

EMERGENCY MANAGEMENT
CLINTON COUNTY

1 3 Shares

Like Comment Share


Clinton Area Chamber of Commerce
September 10 at 4:54 PM
EMERGENCY MANAGEMENT
CLINTON COUNTY
Choose Clinton, Iowa
September 10 at 4:32 PM
We Need You! Clinton County is conducting our 5 year Hazard Mitigation Plan Update for FEMA and the State of Iowa.
This plan is important in allowing our communities and entities throughout Clinton County to apply for FEMA funds.
We need our citizens to tell us about the hazards that you see where you live and work.
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County and its communities as a result of hazard events.
Please help us by filling out this survey. This will help us gather the data needed to update our plan:
https://forms.office.com/r/ST8BcsRE5x
Like
Comment
Share

Let's Live Healthy, Clinton Area Initiative
Yesterday at 8:00 AM ·

#letsliveheathy

Clinton County Emergency Management Agency, Iowa
September 10 at 2:25 PM ·

We need your help. No one knows the hazards where you work and live in Clinton County better than you. Can you please help us in planning by completing this short survey?
https://forms.office.com/r/ST8BcsRE5x

Please share this also to get the word out. Thank you.

Like Comment Share

Clinton County Health Department
Yesterday at 8:00 AM ·

Clinton County Emergency Management Agency, Iowa
September 10 at 2:25 PM ·

We need your help. No one knows the hazards where you work and live in Clinton County better than you. Can you please help us in planning by completing this short survey?
https://forms.office.com/r/ST8BcsRE5x

Please share this also to get the word out. Thank you.

Qian, Adam

From: Nancy Burns <nburns@clintoncounty-ia.gov>
Sent: Tuesday, September 14, 2021 6:30 AM
To: Field, Scott
Cc: Chance R. Kness
Subject: FW: [External] Fw: Help us spread the word
Attachments: Public Survey.pdf

Follow Up Flag: Follow up
Flag Status: Flagged

Sent to the Board of Health email group.

Nancy Burns | Plans Officer
Clinton County Emergency Management
nburns@clintoncounty-ia.gov
Office: (563) 242-5712 **|** Fax: (563) 242-3095

From: Kelli Eggers
Sent: Monday, September 13, 2021 8:08 AM
To: Andrea Barnett <barnetta@mercyhealth.com>; Angie Eacker (Community Health Care) <aeacker@chcqca.org>; Angie Maze (Medical Associates) <amazing5.6.2006@gmail.com>; Becky Nowachek (IDPH) <Becky.Nowachek@idph.iowa.gov>; Candace Seitz <CandaceSeitz<cseitz@asac.us>; Chance R. Kness <kness@clintoncounty-ia.gov>; Cindy Kaczinski (WIC) <ckaczinski@hillcrest-fs.org>; Clinton After School Program (chol.chagai@csdkq.org) <chol.chagai@csdkq.org>; glinda Gonzalez (Bridgeview) <glinda.gonzalez@bridgeviewcmhc.com>; Gwen Deming <gdeming@clintoncounty-ia.gov>; Heather Montgomery (whsdirector@gmtel.net) <whsdirector@gmtel.net>; Joanne Hermiston <jhermiston@gmtel.net>; Jocelyn Meyer <jocelyn.meyer@BRIDGEVIEWCMHC.COM>; Kelly Herd <kherd@foundation2.org>; Kristin Huisenga <kristin@gatewayimpactcoalition.com>; Kristin Huisenga <kristin@csaciowa.org>; Kristyna Wennmacher (Community Health Care) <kwennmacher@chcqca.org>; Krystle Krauss (CADS) <KKrauss@cads-ia.com>; Laura Norris <Laura.Norris@mercyhealth.com>; Lauren Schwardt (Camanch-De Witt Coalition) <coordinator@camanche-dewittcoalition.org>; Lorin Renner (Amerigroup) <lorin.renner@amerigroup.com>; Lynda Murray <lyndam306@aim.com>; Michele Cullen (Genesis VNA-Public Health) <cullenm@genesishealth.com>; Mike Wolf <mwolf@clintonca.net>; Nancy Burns <nburns@clintoncounty-ia.gov>; Nicky Stansell (HIV Rural Outreach) <nicky.stansell@idph.iowa.gov>; Peggy Sellnau <psellnau@clintoncounty-ia.gov>; Renee Crock (USDA Housing Specialist) <renee.crock@ia.usda.gov>; Shane McClintock <smcclintock@clintoncounty-ia.gov>; Shannon McManus (EveryStep) (SMcManus@everystep.org) <SMcManus@everystep.org>; Sheryl Ernst (allpets@mediacombb.net) <allpets@mediacombb.net>
Subject: FW: [External] Fw: Help us spread the word

Please see the attached survey if you live in Clinton County. Have a great week.

Kelli Eggers
Administrative Assistant
Clinton County Environmental Health Department keggers@clintoncounty-ia.gov
Office: 563-659-8148 Fax: 563-659-2616

From: Nancy Burns
Sent: Friday, September 10, 2021 14:34
To:
Subject: Help us spread the word

Good Afternoon,

We are working on our required 5 year update for our Hazard Mitigation Plan. We need help getting the word out that we need public input for this. Attached you will find a flyer for a short survey that we need members of the public to fill out for us. If you could please share to your contacts, social media, etc. it would really help us get the word out. We would also ask that you help by filling it out yourself as well. I apologize if you receive this multiple times but we are just trying to get it out to all of our groups. Thank you in advance for any assistance you can provide.

Here is the link to the survey: https://forms.office.com/r/ST8BcsRE5x

Nancy Burns | Plans Officer
Clinton County Emergency Management
nburns@clintoncounty-ia.gov
Office: (563) 242-5712 **|** Fax: (563) 242-3095

Qian, Adam

From: Nancy Burns <nburns@clintoncounty-ia.gov>
Sent: Tuesday, September 14, 2021 6:44 AM
To: Field, Scott
Subject: FW: Help us spread the word
Attachments: Public Survey.pdf

Follow Up Flag: Follow up
Flag Status: Flagged

Sent to our large virtual EOC group with community partners of all kinds.

Nancy Burns | Plans Officer
Clinton County Emergency Management
nburns@clintoncounty-ia.gov
Office: (563) 242-5712 **|** Fax: (563) 242-3095

From: Nancy Burns
Sent: Friday, September 10, 2021 2:34 PM
To: 'Adam Haut' <hauta@genesishealth.com>; 'Al Loeffelholz' <loeffelholza@genesishealth.com>; 'Allen Schutte' <Aschutte@clintonfd.us>; 'Amy Berentes (berentea@mercyhealth.com)' <berentea@mercyhealth.com>; 'jscott@dhs.state.ia.us' <jscott@dhs.state.ia.us>; 'Andrew Kida' <akida@camancheia.org>; 'Andy Josund' <andy.josund@adm.com>; 'Andy Sokolovich (asokolovich@clintondevelopment.com)' <asokolovich@clintondevelopment.com>; Autumn Griffin <agriffin@clintoncounty-ia.gov>; 'Barb Randolph (barb.randolph@northeastcsd.org)' <barb.randolph@northeastcsd.org>; 'Bethaney Conklin' <conklinb@genesishealth.com>; 'Bill Brauer' <blbrauer@netins.net>; Sheriff Greenwalt <sheriffgreenwalt@gapa911.us>; 'Bob Milroy' <bobmilroy@cityofclintoniowa.us>; 'Brad Burken (Charlotte)' <bjburken@gmail.com>; 'Brad Nolan' <bnolan@dps.state.ia.us>; 'Brad Seward' <ccaswa@gmtel.net>; Brad Taylor <Btaylor@clintoncounty-ia.gov>; 'Brad Weber' <bradleyweber@alliantenergy.com>; 'Brenda Kay' <peterins@fbcom.net>; Brent Vogel <brentvogel@gapa911.us>; 'Brian Lemke' <blemke@cityofclintoniowa.us>; 'Brian McKenrick' <brian.mckenrick@gmail.com>; 'Bruce Ferguson (Lyondell)' <bruce.ferguson@lyondellbasell.com>; 'Cara Vosatka' <vosatkac@genesishealth.com>; 'Cathy Marx' <cathymarx@cityofclintoniowa.us>; 'Century Schnede' <cschnede13@gmail.com>; Chance R. Kness <kness@clintoncounty-ia.gov>; 'Chris Webster' <websterchris@genesishealth.com>; Colin Reid <colinreid@gapa911.us>; Corey Johnson <cjohnson@clintoncounty-ia.gov>; Dan Howard <dhoward@clintoncounty-ia.gov>; 'Dan Peterson' <dan.peterson@cd-csd.org>; Dan Srp <dsrp@clintoncounty-ia.gov>; 'Daniel Vosatka' <danielvosatka@gmail.com>; 'Darren Bierman (darren@sandryfire.com)' <darren@sandryfire.com>; 'Dave Schneden' <4schnedens@fbcom.net>; 'Dave Schutte' <camanchefire@yahoo.com>; David Porter <dporter@gapa911.us>; Dawn Aldridge <daldridge@clintoncounty-ia.gov>; 'Denise Zimmer' <dzimmer@aea9.k12.ia.us>; 'Dennis Hart' <dennishart@cityofclintoniowa.us>; 'Derek Hoenig (LowMoor)' <derekhoenig@gmail.com>; 'Donald Thiltgen' <cdmayor@gmtel.net>; Donn Holst <dholst@clintoncounty-ia.gov>; Medical Examiner <medexam@clintoncounty-ia.gov>; Eric Dau <ericdau@gapa911.us>; Eric Van Lancker

<vanlancker@clintoncounty-ia.gov>; 'Fran & Frank Cornwell' <cornwellfnf@gmail.com>; 'Fred Roling' <froling@clintonfd.us>; 'Garey Chrones' <gchrones@omc-copiers.com>; 'Greg Forari' <gforari@clintonfd.us>; 'Jarrek Lucke' <jarrek.lucke@amwater.com>; 'Jason Johnson' <Jbird1398@yahoo.com>; 'Jeff Chapman' <jchapman@clintonfd.us>; 'Jeff Sanders-Welzien' <welzienj@mercyhealth.com>; Jim Irwin <jirwin@clintoncounty-ia.gov>; 'Jim Phillips' <phillijt@mercyhealth.com>; 'Joe Raaymakers' <josephraaymakers@gapa911.us>; 'Joel Atkinson (Clinton)' <jatkinson@clintonfd.us>; 'John Davison' <achiefdwfire@gmtel.net>; 'John Steinbeck (eaglepoint.admin@imgcares.onmicrosoft.com)' <eaglepoint.admin@imgcares.onmicrosoft.com>; 'Jolene Carpenter' <jolene.carpenter@redcross.org>; 'Josh Eggers' <joshuaeggers@cityofclintoniowa.us>; 'Julie Dunn' <dunnja@mercyhealth.com>; 'Karna Rehr' <karnamiller@clintonautogroup.com>; 'Kay Bates' <silent-oaks@hotmail.com>; 'Kelly Snyder' <mayorcharlotteia@yahoo.com>; 'Kendall Schoon' <ken.schoon@northeastcsd.org>; 'Kent Brix' <gmfire@gmtel.net>; 'Kevin Cain (Goose Lake)' <kevincain1963@gmail.com>; 'Kevin Gyrion' <kevingyrion@gapa911.us>; 'Kurt Crosthwaite' <kurtc@insaudit.com>; 'Leslie Schroeder - Andover' <louschroeder@yahoo.com>; 'Lisa Frederick' <lisafrederick@cityofclintoniowa.us>; 'Lonnie Luepker' <lluepker@cal-wheat.net>; 'Lori Palzkill' <palzkilll@genesishealth.com>; 'Mark Bloom' <mbloom@mbaea.org>; 'Marla Naeve' <marla.naeve@northeastcsd.org>; 'Matt Brooke (mattbrooke@cityofclintoniowa.us)' <mattbrooke@cityofclintoniowa.us>; 'Michael Dillie' <michaeldillie@alliantenergy.com>; 'Michele Cullen' <cullenm@genesishealth.com>; 'Mike Lacey' <mlacey@fbcom.net>; 'Mike McQuistion' <mmcquistion@clintonfd.us>; Mike Wolf <mwolf@clintonca.net>; 'Neil Gray' <neil.gray@northeastcsd.org>; 'Nick Carlson' <ncarlson@clintonfd.us>; 'Nick Neblung' <nick.neblung@cityoffulton.us>; 'Nicole Uthoff' <nuthoff@dhs.state.ia.us>; 'Pat Cullen' <patrickcullen@gapa911.us>; 'Patty Hardin' <rdsplash@yahoo.com>; Paul Banowetz <pbanowetz@clintoncounty-ia.gov>; 'Paul Stankee (Wheatland)' <termman75@yahoo.com>; 'Paul Varner' <pvarner@camancheia.org>; Philip Visser <pvisser@clintoncounty-ia.gov>; 'Ramon Gilroy' <rgilroy85@netins.net>; 'Regan Michaelsen (irasmichaelsen@gmail.com)' <irasmichaelsen@gmail.com>; 'Rich Schmitz' <RichSchmitz@gapa911.us>; 'Richard Mojeiko' <richardmojeiko@gapa911.us>; 'Robert Atkinson (Lost Nation)' <rnatkinson2@netins.net>; 'Rox Korf' <rkorf@dhs.state.ia.us>; Ryan Waltz <rwaltz@clintoncounty-ia.gov>; 'Scott Besst (DeWitt)' <fireman1771@gmail.com>; 'Scott Maddasion (smaddasion@cityofclintoniowa.us)' <smaddasion@cityofclintoniowa.us>; Shane McClintock <smcclintock@clintoncounty-ia.gov>; 'Sharon Roling' <sharon.roling@sj-dwt.org>; Steve Diesch <stevediesch@gapa911.us>; 'Steve Lindner' <cdadmin@gmtel.net>; 'Sue Alpen' <alpens@genesishealth.com>; 'Thomas Parker' <tparker@camanchecsd.org>; 'Tom Bowman' <tbowman@chcqca.org>; Tom Determann <tdetermann@clintoncounty-ia.gov>; 'Tom Goldensoph' <tina.goldensoph@mchsi.com>; Tom Paarmann <tompaarmann@gapa911.us>; 'Trevor Willis (twillis@camancheia.org)' <twillis@camancheia.org>; 'Tyler Leibold' <leiboldtyler@gmail.com>; 'Angela Rheingans' <director@dewittiowa.org>; 'Cali Beecher' <cali.beecher@lsiowa.org>; 'A.J. Steines' <Arlen.Steines@adm.com>; 'Alexis Hughes' <ahughes@newchoicesinc.com>; 'Ann Bormann' <annb@SkylineCenter.org>; 'Bill Zumdome' <bzumdome@magnaflux.com>; 'Cindy Hintermeister' <Cindy.Hintermeister@hawkinsinc.com>; 'Dave Frett' <dfrett@caeiowa.org>; 'Diane Mullin' <dmullin@newchoicesinc.com>; 'Emily Hoeft' <Emily.Hoeft@adm.com>; 'James Knoche' <jknoche@imagineia.org>; 'Jason Reiland' <Jason.Reiland@Clysar.com>; 'Jim Harden' <jharden@guardian.com>; 'Julie Bray' <jlbray@acroot.net>; 'Kris Michels' <kmichels@newchoicesinc.com>; 'Lacey Leytem' <lleytem@imagineia.org>; 'Pat McGarry' <patmcgarry@cityofclintoniowa.us>; 'Paula Schneckloth' <Paulaschneckloth@alliantenergy.com>; 'Rachel (adminassistant' <adminassistant@comprehensiverehabinc.com>; 'Rod Phillips' <rphillips@plastipaint.com>; 'Shannon Sander-Welzien' <ed@ywcaclinton.org>; 'Tom Kenneavy' <eaglepoint.maint@imgcares.com>; 'Tom Wiebenga' <twiebenga@caeiowa.org>; 'Vicki Schaefer' <vschaefer@qualitysurgi.com>; Jeff Oster <joster@clintoncounty-ia.gov>; 'Kelli Smith' <kellismith@gapa911.us>; 'Shaun Eberhart' <shaun.eberhart@northeast.k12.ia.us>; 'Adam Huling' <huling96@gmail.com>; 'Amanda Scharff' <ascharff@imagineia.org>; 'Barb Randolph' <barb_randolph@northeast.k12.ia.us>; 'Bill & Lois Hall' <K9TraxK9Hawk@gmail.com>; 'Dan Peterson' <dan.peterson@central-csd.org>; 'Dave Vickers' <dave@krosradio.com>; David Porter <dporter@gapa911.us>; 'Dawn Ebensberger' <dawn.ebensberger@mercyhealth.com>; 'Dick Schrad' <dickschrad@cityofclintoniowa.us>; 'Jeff Kilburg' <jeffkilburg1967@yahoo.com>; 'Joe Snodgrass' <snodgrassj@genesishealth.com>; 'Kim Brackemyer' <kimb@skylinecenter.com>; 'Skyline Maintenance' <maintenance@skylinecenter.org>; 'Skyline Warehouse (warehouse2@skylinecenter.com)' <warehouse2@skylinecenter.com>; 'Stephany McKown' <swulf@comprehensiverehabinc.com>; 'Steve Kupfer' <steve.kupfer@adm.com>; 'Wanda Haack' <haack@genesishealth.com>; 'sryan@dhs.state.ia.us' <sryan@dhs.state.ia.us>; 'Tobin Kirk' <tobin.kirk@timken.com>;

'Jeremy VanZuiden' <jeremy.vanzuiden@westrock.com>; 'Kristi David' <kristi.david@clysar.com>; 'Nicole R. Glass' <Nicole.Glass@mercyhealth.com>; Darin Voss <DVoss@clintoncounty-ia.gov>; 'James Bornemann' <pwd@camancheia.org>; 'Jen Vance' <jen.vance@cd-csd.org>; 'Matt Whalen' <mwhalen@gapa911.us>; 'Matt Lorenzen' <matthewlorenzen@gapa911.us>; 'Andrew Bradley' <andrew.bradley@prince.pvt.k12.ia.us>; 'steve.hasenmiller@remingtonseeds.com' <steve.hasenmiller@remingtonseeds.com>; 'Rich Johannsen (Andover)' <richjohannsen@yahoo.com>; 'Gary DeLacy' <gary.delacy@csdkq.org>; 'dmbowman@mchsi.com' <dmbowman@mchsi.com>
Cc: Chance R. Kness <kness@clintoncounty-ia.gov>; Dan Howard <dhoward@clintoncounty-ia.gov>
Subject: Help us spread the word

Good Afternoon,

We are working on our required 5 year update for our Hazard Mitigation Plan. We need help getting the word out that we need public input for this. Attached you will find a flyer for a short survey that we need members of the public to fill out for us. If you could please share to your contacts, social media, etc. it would really help us get the word out. We would also ask that you help by filling it out yourself as well. I apologize if you receive this multiple times but we are just trying to get it out to all of our groups. Thank you in advance for any assistance you can provide.

Here is the link to the survey: https://forms.office.com/r/ST8BcsRE5x

Nancy Burns | Plans Officer
Clinton County Emergency Management
nburns@clintoncounty-ia.gov
Office: (563) 242-5712 **|** Fax: (563) 242-3095

Qian, Adam

From: Nancy Burns <nburns@clintoncounty-ia.gov>
Sent: Tuesday, September 14, 2021 6:44 AM
To: Field, Scott
Subject: FW: Public Input for Clinton County Hazard Mitigation Plan Update
Attachments: Public Survey.pdf

Follow Up Flag: Follow up
Flag Status: Flagged

Sent to the two official print newspapers in our county.

Nancy Burns | Plans Officer
Clinton County Emergency Management
nburns@clintoncounty-ia.gov
Office: (563) 242-5712 **|** Fax: (563) 242-3095

From: Nancy Burns
Sent: Friday, September 10, 2021 3:05 PM
To: 'Clinton Herald News (news@clintonherald.com)' <news@clintonherald.com>; 'DeWitt Observer' <news@dewittobserver.com>
Cc: Chance R. Kness <kness@clintoncounty-ia.gov>
Subject: Public Input for Clinton County Hazard Mitigation Plan Update

We are asking for your assistance in getting the word out that we need public input to assist us in updating the Clinton County Multi-Jurisdictional Hazard Mitigation Plan which we are required to do every 5 years by FEMA.

We are asking the public to complete this very short survey to help us gather the public input data needed: https://forms.office.com/r/ST8BcsRE5x. We will also be posting the link on the Clinton County Iowa website: https://www.clintoncounty-ia.gov/

Thank you.

Nancy Burns | Plans Officer
Clinton County Emergency Management
nburns@clintoncounty-ia.gov
Office: (563) 242-5712 **|** Fax: (563) 242-3095

From:	Nancy Burns
To:	Chance R. Kness; Scott Besst (DeWitt); "clerk@cityoflowmoor.com"; Michele Cullen; Kevin Gyrion; Sheriff Greenwalt; David Porter; Rich Schmitz; Eric Van Lancker; Eric Dau; Brent Vogel; Todd Kinney; Shane McClintock; Bob Milroy; Brian Lemke; James Bornemann; Matt Proctor; "gmcity@gmtel.net"; Steve Lindner; Andrew Kida; Matt Brooke (mattbrooke@cityofclintoniowa.us); "cmeyer@cal-wheat.net"; "jsb0557@hotmail.com"; "teresacityhall@netins.net"; "cyndie.johnson@central-csd.org"; "jschroeder71048@gmail.com"; "cdclerk@gmtel.net"; "cityguys@fbcom.net"; "gmcity@gmtel.net"; Andrew Bradley; Chris Fee; Rich Johannsen (Andover); DeWitt Mayor; Christy Stankee; Gary DeLacy; calamuspwd@fbcom.net; Laurie Ganzer (calamusclerk@fbcom.net); Dan Peterson; Lonnie Luepker; jheileman@cityofwheatland.org; Jeremiah Wiese; Laurie Ganzer (calamusclerk@fbcom.net); Ashley Paulsen; CITY OF WELTON; Thomas Parker; Melissa Conner; Kurt Crosthwaite; Austin Pruett; Sheriff Greenwalt; Brenda Kay; Dan Srp; Jason Johnson; Jim Irwin; Karna Rehr; Kelly Hosette; Kelly Snyder; Kendall Schoon; Lance Goettsch; Leslie Schroeder - Andover; Patty Hardin; Paul Stankee (Wheatland); Ramon Gilroy; Scott Maddasion (smaddasion@cityofclintoniowa.us); Steve Hasenmiller; Tom Determann; Tom Goldensoph; Jeff Welzien ; A.J. Steines ; Adam Haut; Adam Huling; Al Loeffelholz; Alexis Hughes; Amanda Scharff; Andy Josund; Barb Randolph; Bill & Lois Hall ; Bill Zumdome; Brad Seward; Brad Weber; Bruce Ferguson; Cali Beecher; Cara Vosatka; Cathy Marx; Chris Webster; Cindy Hintermeister; Dan Peterson; Dan Vosatka - AM Water; Dave Schutte ; Dave Vickers; David Porter; Dawn Aldridge; Dennis Hart; Diane Mullin; Dick Schrad; Donn Holst; Emily Hoeft; Eric Westphall; Fran & Frank Cornwell; Garey Chrones; Greg Forari; James Knoche; Jeff Chapman; Jeff Kilburg ; Jeremy VanZuiden; Jim Phillips; Joel Atkinson ; John Steinbeck (jsteinbeck@eaglepointhealthcarecenter.com); Jolene Carpenter - Red Cross (Jolene.Carpenter@redcross.org); Josh Eggers; Josh Hansen; Julie Bray ; Kay Bates; Kevin Rockrohr; Kim Brackemyer; Kris Michels; Kristi David; Lacey Leytem; Lisa Frederick; Lori Palzkill ; Lynne Hilgendorf; Maggie McLoud; Marla Naeve; Megan Heinrich; Michael Dillie; Pat McGarry; Paul Varner; Paula Schneckloth; Rachel Connor; Regan Michaelsen (irasmichaelsen@gmail.com); Robert Atkinson ; Sabrina Schaeffer; Shannon Sander-Welzien; Skyline Maintenance; Skyline Warehouse (warehouse2@skylinecenter.com); Stephany McKown; Steve Kupfer; Sue Alpen; Tom Determann; Tom Kenneavy; Vicki Schaefer; Wally Maier; Wanda Haack ; Wendy Anderson
Cc:	Chance R. Kness; Field, Scott
Subject:	Hazard Mitigation Plan Update - Public Comments needed
Date:	Friday, April 8, 2022 10:02:39 AM

We are required to update our Clinton County Hazard Mitigation Plan every 5 years. As part of that update we reach out for public comments on the plan. Please feel free to share this and make comments as well. Thank you.

Clinton County is updating our Hazard Mitigation Plan, and we need your input. This plan analyzes the County's vulnerabilities to natural and human-caused hazards, and identifies mitigation actions we can take to lessen the impacts of disasters minimizing property damage and reducing the loss of life.

The following jurisdictions participated in and are covered by this plan:
- Clinton County
- City of Andover
- City of Calamus
- City of Camanche
- City of Charlotte
- City of Clinton
- City of Delmar
- City of DeWitt
- City of Goose Lake
- City of Grand Mound
- City of Lost Nation
- City of Low Moor
- City of Toronto

• City of Welton
• City of Wheatland
• Calamus-Wheatland School District
• Camanche School District
• Central DeWitt School District
• Clinton School District
• Delwood School District
• Northeast School District

The draft 2022 Hazard Mitigation Plan is being made available for public review and comment before it is finalized. You can download the draft plan at:https://drive.google.com/drive/folders/119E1wIeVUeTiVRqq1aaDGX37k8K6PrbO. A shorter Executive Summary is also available 2022 Clinton County Hazard Mitigation Plan. Please submit your comments on the draft plan at https://forms.office.com/r/j0XHNS3v98
by April 22, 2022. Thank you for your input!

Nancy Burns | Plans Officer
Clinton County Emergency Management
nburns@clintoncounty-ia.gov
Office: (563) 242-5712 **|** Fax: (563) 242-3095

From:	Nancy Burns
To:	Chance R. Kness; "Scott Besst (DeWitt)"; "clerk@cityoflowmoor.com"; "Michele Cullen"; "Kevin Gyrion"; Sheriff Greenwalt; David Porter; "Rich Schmitz"; Eric Van Lancker; Eric Dau; Brent Vogel; Todd Kinney; Shane McClintock; "Bob Milroy"; "Brian Lemke"; "James Bornemann"; "Matt Proctor"; "gmcity@gmtel.net"; "Steve Lindner"; "Andrew Kida"; "Matt Brooke (mattbrooke@cityofclintoniowa.us)"; "cmeyer@cal-wheat.net"; "jsb0557@hotmail.com"; "teresacityhall@netins.net"; "cyndie.johnson@central-csd.org"; "jschroeder71048@gmail.com"; "cdclerk@gmtel.net"; "cityguys@fbcom.net"; "gmcity@gmtel.net"; "Andrew Bradley"; "Chris Fee"; "Rich Johannsen (Andover)"; DeWitt Mayor; "Christy Stankee"; "Gary DeLacy"; "calamuspwd@fbcom.net"; "Laurie Ganzer (calamusclerk@fbcom.net)"; Dan Peterson; Lonnie Luepker; "jheileman@cityofwheatland.org"; Jeremiah Wiese; Laurie Ganzer (calamusclerk@fbcom.net); Ashley Paulsen; "CITY OF WELTON"; Thomas Parker; "Melissa Conner"; Kurt Crosthwaite; Austin Pruett; Bill Greenwalt ; Brenda Kay; Dan Srp; Jason Johnson; Jim Irwin; Karna Rehr; Kelly Hosette; Kelly Snyder; Kendall Schoon; "Lance Goettsch"; Leslie Schroeder - Andover; Patty Hardin; Paul Stankee (Wheatland); Ramon Gilroy; Scott Maddasion (smaddasion@cityofclintoniowa.us); Steve Hasenmiller; Tom Determann; Tom Goldensoph; " Jeff Welzien "; "A.J. Steines "; Adam Haut; "Adam Huling"; Al Loeffelholz; Alexis Hughes; Amanda Scharff; "Andy Josund"; "Barb Randolph"; "Bill & Lois Hall "; "Bill Zumdome"; "Brad Seward"; Brad Weber; Bruce Ferguson; Cali Beecher; Cara Vosatka; Cathy Marx; "Chris Webster"; Cindy Hintermeister; "Dan Peterson"; Dan Vosatka - AM Water; "Dave Schutte "; "Dave Vickers"; "David Porter"; Dawn Aldridge; "Dennis Hart"; Diane Mullin; "Dick Schrad"; Donn Holst; "Emily Hoeft"; "Eric Westphall"; Fran & Frank Cornwell; Garey Chrones; "Greg Forari"; James Knoche; Jeff Chapman; "Jeff Kilburg "; Jeremy VanZuiden; Jim Phillips; "Joel Atkinson "; John Steinbeck (jsteinbeck@eaglepointhealthcarecenter.com); "Jolene Carpenter - Red Cross (Jolene.Carpenter@redcross.org)"; Josh Eggers; Josh Hansen; "Julie Bray "; Kay Bates; Kevin Rockrohr; Kim Brackemyer; Kris Michels; Kristi David; Lacey Leytem; Lisa Frederick; "Lori Palzkill "; Lynne Hilgendorf; Maggie McLoud; Marla Naeve; "Megan Heinrich"; Michael Dillie; Pat McGarry; Paul Varner; Paula Schneckloth; Rachel Connor; Regan Michaelsen (irasmichaelsen@gmail.com); "Robert Atkinson "; Sabrina Schaeffer; "Shannon Sander-Welzien"; Skyline Maintenance; Skyline Warehouse (warehouse2@skylinecenter.com); Stephany McKown; Steve Kupfer; Sue Alpen; Tom Determann; "Tom Kenneavy"; Vicki Schaefer; Wally Maier; "Wanda Haack "; Wendy Anderson
Cc:	Chance R. Kness; "Field, Scott"
Subject:	Hazard Mitigation Plan Update - Public Comments needed
Date:	Friday, April 8, 2022 11:02:00 AM

We are required to update our Clinton County Hazard Mitigation Plan every 5 years. As part of that update we reach out for public comments on the plan. Please feel free to share this and make comments as well. Thank you.

Clinton County is updating our Hazard Mitigation Plan, and we need your input. This plan analyzes the County's vulnerabilities to natural and human-caused hazards, and identifies mitigation actions we can take to lessen the impacts of disasters minimizing property damage and reducing the loss of life.

The following jurisdictions participated in and are covered by this plan:
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- City of Clinton
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- City of Grand Mound
- City of Lost Nation
- City of Low Moor
- City of Toronto
- City of Welton
- City of Wheatland
- Calamus-Wheatland School District
- Camanche School District

• Central DeWitt School District
• Clinton School District
• Delwood School District
• Northeast School District

The draft 2022 Hazard Mitigation Plan is being made available for public review and comment before it is finalized. You can download the draft plan at:https://drive.google.com/drive/folders/119E1wIeVUeTiVRqq1aaDGX37k8K6PrbO. A shorter Executive Summary is also available 2022 Clinton County Hazard Mitigation Plan. Please submit your comments on the draft plan at https://forms.office.com/r/j0XHNS3v98
by April 22, 2022. Thank you for your input!

Nancy Burns | Plans Officer
Clinton County Emergency Management
nburns@clintoncounty-ia.gov
Office: (563) 242-5712 **|** Fax: (563) 242-3095

Clinton County Emergency Management Agency, Iowa

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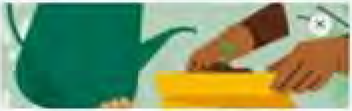

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+1 563-242-5712

EmergencyManagement@ClintonCounty-IA.gov

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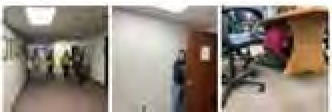

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Recent News

Clinton County is updating our Hazard Mitigation Plan, and we need your input. This plan analyzes the County's vulnerabilities to natural and human-caused hazards, and identifies mitigation actions we can take to lessen the impacts of disasters minimizing property damage and reducing the loss of life.

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March 3, 2022 Community spread by county

Max Levy Public Notice February 2, 2022

1/20/2022

COVIDtests.gov - Free at-home COVID-19 tests

6/1/2021

NEWS RELEASE: Clinton County Residents will need to Register or Re-Register to Experience Upgrades to the New Alert Iowa Emergency Notification System

· Quick Links ·

- Board of Supervisors Agenda|Minutes
- Media Releases
- Election Information
- Request for Proposals/Bids
- Jobs & Employment
- Secure Email Login
- Clinton County Policies

· Assessor ·

Property values reside on Vanguard, a local government GIS for the web.

Assessor Data Website

Assessor
Phone: (563) 244-0569
Email: btiesman@clintoncounty-ia.gov

· Sheriff ·

Jail Information
Weapons Permits
Submit a Crimestopper Tip

Bill Greenwalt, Clinton County Sheriff
Phone: (563) 242-9211
Fax: (563) 242-6307
Email: ccso@gapa911.us

· County Treasurer ·

Motor Vehicle Registration
Property Tax

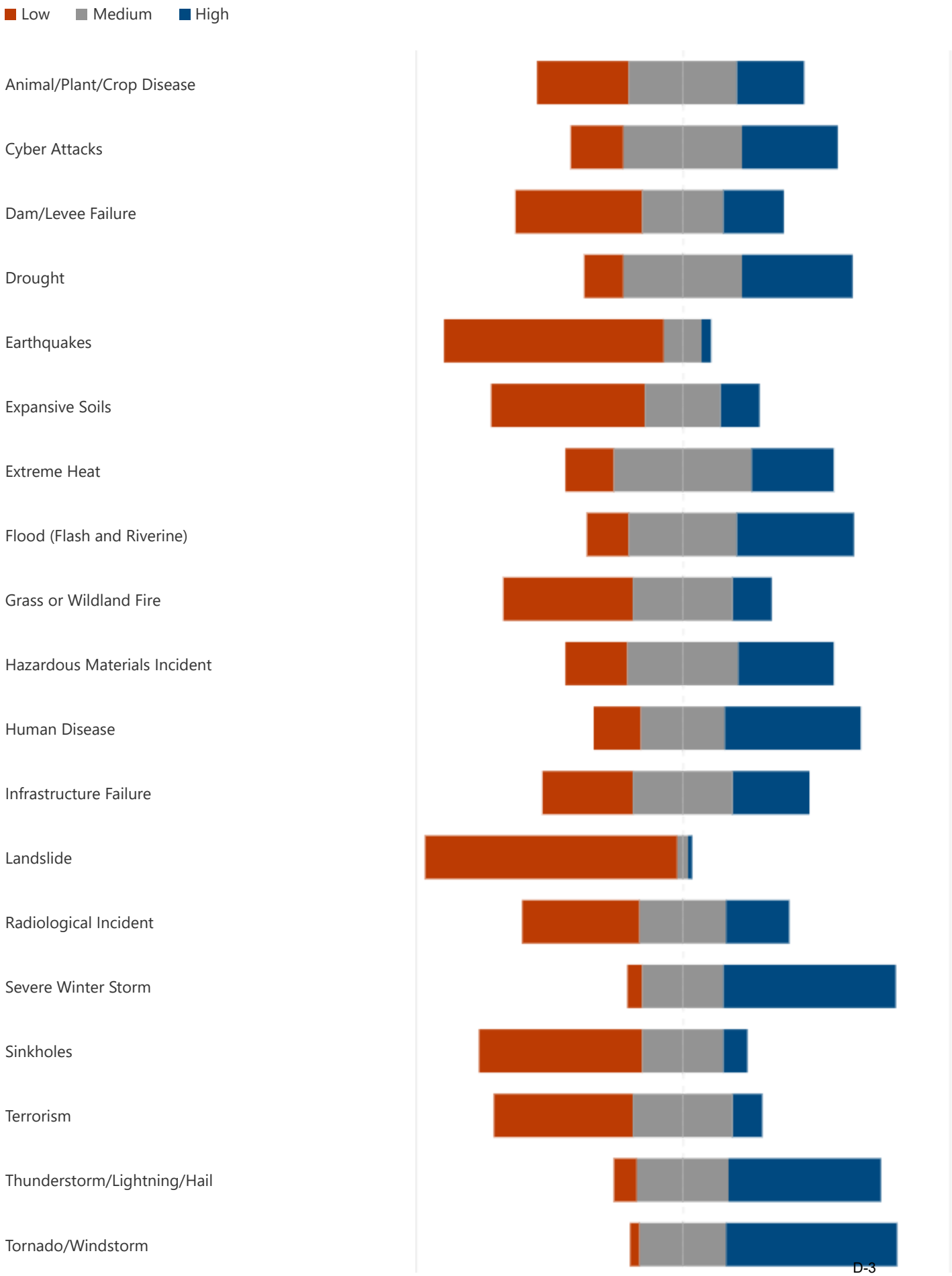
Dustin Johnson, Clinton County Treasurer
Phone: (563) 244-0573
Fax: (563) 243-6874
Email: treasurer@clintoncounty-ia.gov

Appendix D: Public Survey Results and Public Comments

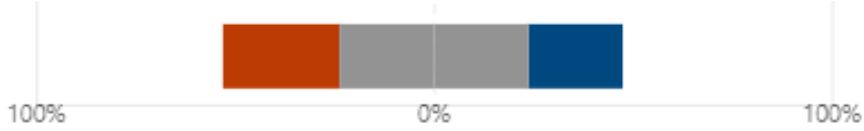
Clinton County Hazard Planning Public Input Survey

58	05:38	Active
Responses	Average time to complete	Status

1. The hazards addressed in the Clinton County Hazard Mitigation Plan update are listed below. Please indicate the level of significance in Clinton County that you perceive for each hazard.



Transportation Incident



2. How many times has a natural hazard disrupted your daily life in the last five years?

0	2
1-2	29
3-5	19
More than 5 times	8

3. Do you have information on specific hazard issues/problem areas that you would like the planning committee to consider? Note the jurisdiction to which it applies:

18
Responses

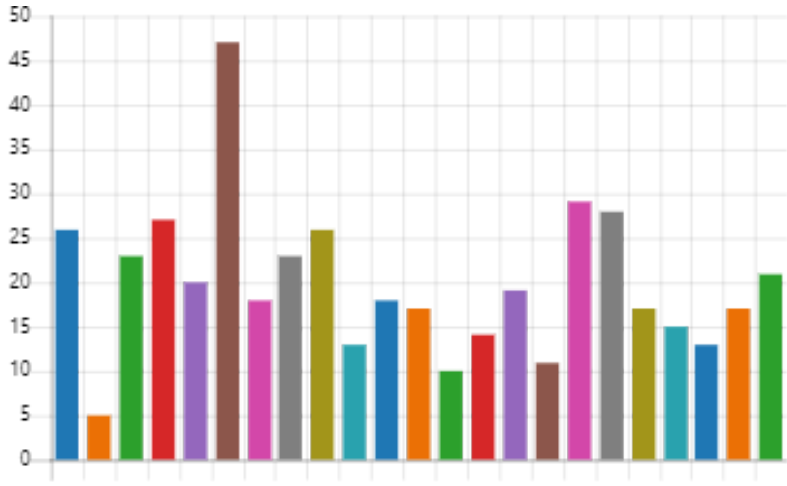
Latest Responses
"*no*"

3 respondents (**17**%) answered **flooding** for this question.

4. Mitigation is actions that can be taken to reduce or eliminate the long-term risk to hazards.

The following types of mitigation actions may be considered in Clinton County. Please indicate the types of mitigation actions that you think should have the highest priority in the Clinton County Hazard Mitigation Plan.

Expanded Indoor/Outdoor Wa...	26
Wildfire/Grass Fuels Treatmen...	5
Tornado Safe Rooms	23
Continued Participation in the ...	27
Critical Facilities Resiliency	20
Generators for Critical Facilities	47
Planning/Zoning to avoid imp...	18
Public Education/Awareness o...	23
Stormwater Drainage Improve...	26
Forest Health/Watershed Prot...	13
Flood Mitigation for residentia...	18
Education and Discounts on Fl...	17
Floodprone Property Buyout	10
Water Conservation	14
Evacuation route development	19
Dam safety	11
Public health incident prepare...	29
Improve reliability of commun...	28
Lightning protection for critica...	17
Levees or Levee improvements	15
Flood mitigation for commerci...	13
Additional snow fences	17
Hazardous tree management	21

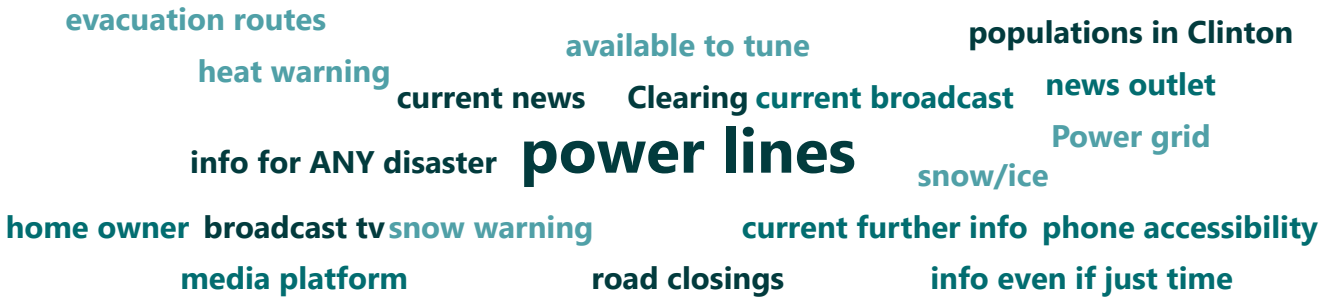


5. Please comment on any other pre-disaster strategies that the planning committee should consider for reducing future losses caused by natural disasters:

13
Responses

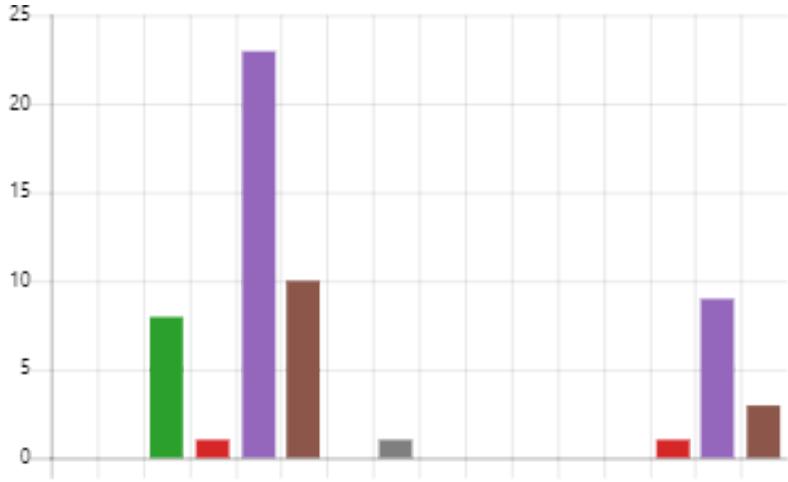
Latest Responses
"*none*"

2 respondents (**15**%) answered **power lines** for this question.



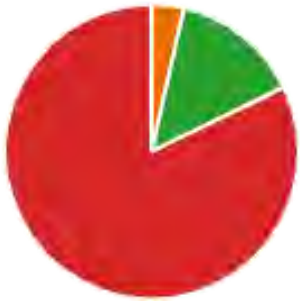
6. Please indicate the community where you live

City of Andover	0
City of Calamus	0
City of Camanche	8
City of Charlotte	1
City of Clinton	23
City of DeWitt	10
City of Delmar	0
City of Goose Lake	1
City of Grand Mound	0
City of Lost Nation	0
City of Low Moor	0
City of Toronto	0
City of Welton	0
City of Wheatland	1
Unincorporated Clinton County	9
Other	3



7. How long have you lived in this community?

Less than 1 year	0
1-5 years	2
5-10 years	8
Over 10 years	46



8. Optional: Provide your name and email address if you would like to be added to a distribution list for upcoming activities related to the planning process:

8

Responses

Latest Responses

1 respondents (**13**%) answered **Stanley Teal** for this question.

ID	Start time	Completion time	Email	contact information	Comments:	Select affiliation:	Zip code	Where do you live
1	4/8/22 10:17:49	4/8/22 10:19:45	anonymous	Ashton Schulz	Implantation of a regional wide pre hospital medical disaster plan during an event where all Clinton county and/or nearby resources are limited or unavailable.	Government-Local		City of DeWitt
2	4/8/22 12:52:40	4/8/22 12:53:10	anonymous			Member of the Public		City of Clinton