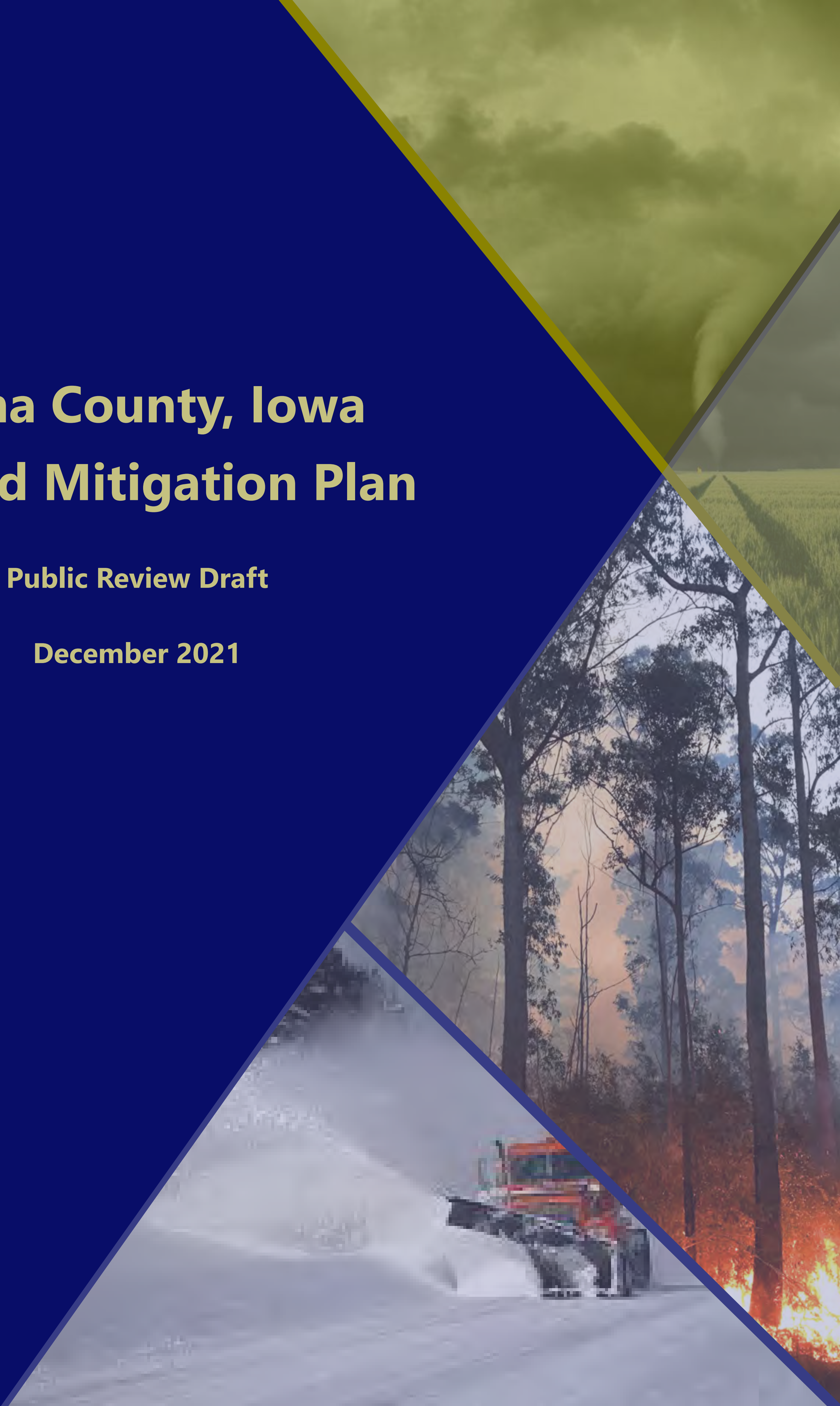
Tama County, Iowa
Hazard Mitigation Plan

Public Review Draft

December 2021



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Executive Summary

The purpose of hazard mitigation is to reduce or eliminate long-term risk to people and property from hazards. Tama County and participating jurisdictions developed this multi-jurisdictional local hazard mitigation plan update to reduce future losses to the County and its communities resulting from hazard events. The plan was prepared pursuant to the requirements of the Disaster Mitigation Act of 2000 and to achieve eligibility for the Federal Emergency Management Agency (FEMA) Hazard Mitigation Assistance Grant Programs.

The Tama County Multi-Hazard Mitigation Plan is a multi-jurisdictional plan that covers the following jurisdictions that participated in the planning process:

- Unincorporated Tama County
- City of Chelsea
- City of Clutier
- City of Dysart
- City of Elberon
- City of Garwin
- City of Gladbrook
- City of Lincoln
- City of Montour
- City of Tama
- City of Toledo
- City of Traer
- City of Vining
- South Tama School District
- North Tama School District
- Union Community Schools
- GMG Schools

Tama County and the incorporated areas that participated in this plan update developed a Multi-jurisdictional Hazard Mitigation Plan that was previously approved by FEMA in October 2015. A planning effort in 2021 serves to update the previous plan to make it effective for implementation during 2021-2026.

The plan update process followed a methodology recommended by FEMA guidance, which began with organizing the Hazard Mitigation Planning Committee (HMPC), comprised of representatives from Tama County and participating jurisdictions. The HMPC updated the risk assessment that identified and profiled hazards that pose a risk to the Tama County planning area, assessed the vulnerability to these hazards, and examined the capabilities in place to mitigate them. The planning area is vulnerable to several hazards that are identified, profiled, and analyzed in this plan. Flooding, extreme heat, winter storms, tornadoes and windstorms are among the hazards that can have a significant impact.

Based upon the risk assessment, the HMPC updated goals for reducing risk from hazards. The goals are listed below:

- Minimize losses to existing and future structures within hazard areas with an emphasis on critical facilities, lifelines and identified assets.
- Protect the health and safety of Tama County residents and visitors.
- Educate Tama County citizens about the dangers of hazards and how they can be prepared.

- Ensure the continuity of county and local operations will not be significantly disrupted by disasters in Tama County.

To meet the identified goals, the recommended mitigation action details are in Chapter 4. The HMPC developed an implementation plan for each action, which identifies priority level, background information, responsible agency, timeline, cost estimate, potential funding sources, and more.

Prerequisites

44 CFR Requirement §201.6(c)(5):
The local hazard mitigation plan shall include documentation that the plan has been formally adopted by the governing body of the jurisdiction requesting approval of the plan. For multi-jurisdictional plans, each jurisdiction requesting approval of the plan must document that it has been formally adopted.

The following jurisdictions participated in the development of this plan and have adopted the multi-jurisdictional plan. Resolutions of Adoptions are included in Appendix C.

- Unincorporated Tama County
- City of Chelsea
- City of Clutier
- City of Dysart
- City of Elberon
- City of Garwin
- City of Gladbrook
- City of Lincoln
- City of Montour
- City of Tama
- City of Toledo
- City of Traer
- City of Vining
- South Tama School District
- North Tama School District
- Union Community Schools
- GMG Schools

1 Introduction and Planning Process

1.1 Purpose

Tama County and the participating cities, and public-school districts prepared this Multi-jurisdictional 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.

This plan demonstrates the jurisdictions' commitments 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 make Tama County and the participating jurisdictions eligible for certain federal grant programs; specifically, the Federal Emergency Management Agency's (FEMA) Hazard Mitigation Assistance (HMA) grants such as the Hazard Mitigation Grant Program (HMGP), Building Resilient Infrastructure and Communities (BRIC), and Flood Mitigation Assistance Program.

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 nongovernmental 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." The results of a three-year, congressionally mandated independent study to assess future savings from mitigation activities provides evidence that mitigation activities are highly cost-effective. On average, each dollar spent on mitigation saves society an average of $6 in avoided future losses in addition to saving lives and preventing injuries (Natural Hazard Mitigation Saves: 2017 Interim Report).

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. Tama County and the incorporated areas that participated in this plan update developed a *Multi-jurisdictional Hazard Mitigation Plan* that was approved by FEMA on October 26, 2015 (hereafter referred to as the 2015 Tama County Multi-jurisdictional Hazard Mitigation Plan). Therefore, the 2021 planning effort serves to update the previous plan.

This plan documents the hazard mitigation planning process undertaken by the Tama 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 Tama County.

The *Tama County Multi-jurisdictional Hazard Mitigation Plan* is a multi-jurisdictional plan that geographically covers the participating jurisdictions within Tama County's boundaries (hereinafter referred to as the planning area). The following jurisdictions officially participated in the planning process and are the same jurisdictions that participated in the 2015 Plan:

- Unincorporated Tama County
- City of Chelsea
- City of Clutier

- City of Dysart
- City of Elberon
- City of Garwin
- City of Gladbrook
- City of Lincoln
- City of Montour
- City of Tama
- City of Toledo
- City of Traer
- City of Vining
- South Tama School District
- North Tama School District
- Union Community Schools
- GMG Schools

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 hazard mitigation plans 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 Tama 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 *Tama County Multi-jurisdictional Hazard Mitigation Plan* update is organized as follows:

- Executive Summary, Special Thanks and Acknowledgements, Table of Contents, Prerequisites
- 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 a reorganization of the general format that was used for the *2015 Tama County Multi-jurisdictional Hazard Mitigation Plan*, which was prepared by the Iowa Region 6 Planning Commission. The reorganization was to align with modern hazard mitigation plan practices and improve usability. The mitigation strategy and mitigation action table in Chapter 4 was revised to make the it easier for jurisdictions to view their mitigation actions and track progress.

1.4 Planning Process

44 CFR Requirement §201.6(c)(1):
[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-November 2021 by Tama County and the participating jurisdictions and stakeholders collectively known as the HMPC. The plan update process was initiated by the Zoning Administrator in the County Planning & Zoning Department. The leadership of the HMPC was transitioned to Emergency Management after a vacancy in the Emergency Management Coordinator position was filled. 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 Committee (HMPC) 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 HMPC 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

44 CFR Requirement §201.6(a)(C):
Multi-jurisdictional plans may be accepted, as appropriate, as long as each jurisdiction has participated in the process and has officially adopted the plan.

At the beginning of the planning process Tama County Planning & Zoning invited the incorporated cities, public school districts, and various other stakeholders in mitigation planning to participate in the *Tama 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 2015 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 three HMPC meetings by either direct representation or authorized representation;
- 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;
- Provide documentation to show time donated to the planning effort (related to FEMA planning grant awarded to the County); and
- Formally adopt the mitigation plan.

All of the jurisdictions listed as official participants in this plan met all of these participation requirements. Coordination during the planning process occurred through a combination of emails, in-person and webinar meetings, and individual meetings/discussions/emails with the County Emergency Manager as the lead planner/coordinator. Table 1-1 shows the representation of each participating jurisdiction at the planning meetings and/or provided input on update/development of mitigation actions. Sign-in sheets and attendance logs are included in Appendix B: Documentation of Planning Process.

Table 1-1 Jurisdictional Participation in Planning Process

Jurisdiction	Kick-off Meeting	Meeting #2	Meeting #3	Coordination on Update/Develop Mitigation Actions
Tama County	X	X	X	X
City of Chelsea	X	X	X	
City of Clutier				X
City of Dysart	X	X		X
City of Elberon	X		X	
City of Garwin	X	X	X	X
City of Gladbrook				X
City of Lincoln				X
City of Montour	X			X
City of Tama	X	X	X	X
City of Toledo	X	X	X	X
City of Traer	X	X	X	X
City of Vining		X		
South Tama School District	X			X
North Tama School District	X	X		X
Union Community Schools				X
GMG Community School District				X

The following table lists the members of the Hazard Mitigation Planning Committee including the jurisdiction, organization, and title.

Table 1-2 Hazard Mitigation Planning Committee

Jurisdiction	Department/Organization	Title	Name
Tama County	Auditor's Office	Auditor	Laura Kopsa
	Public Health & Home Care		Shannon Zoffka
	Sheriff's Office	Sheriff	Dennis Kucera
	911	Communications Director	Jeremy Cremeans

Jurisdiction	Department/Organization	Title	Name
	Planning & Zoning	Zoning Administrator	Todd Apfel
	Emergency Management	Emergency Management Coordinator	Ryan Goodenbour
	Attorney	County Attorney	Brent Heeren
	GIS	GIS Specialist	Maureen Kratoska
	Recorder's Office	County Recorder	Deb Kupka
	Landfill		Dave Sherwood
	Human Resources	Manager	Tammy Wise
	Conservation Board	Director	Stephan Mayne
	Conservation Board	Maintenance Supervisor	Craig Wise
	Maintenance		Dirk Henle
	Engineer	County Engineer	Lyle Brehm
	Treasurer	County Treasurer	Michelle Yuska
	Veterans Affairs	Director	Elizabeth Ledvina
Chelsea	City Clerk	City Clerk	Lonika Utterback
	Fire Department	Fire Chief	Tony Upah
Clutier	City Clerk	City Clerk	
	Emergency Medical Services	First Responder	Sharon Knoop
Dysart	City Hall	City Clerk	Tabby Kaiser
	Fire Department	Fire Chief	Tim Brown
	Police Department	Police Chief	Joe Hols
	Ambulance	Ambulance Director	Julie Scadden
	Ambulance	Paramedic	Billie Van Egmond
Elberon	City Clerk	City Clerk	Sharon Schott
	Fire/EMS	First Responder	Alicia Lidtke
Garwin	City Clerk	City Clerk	Kenna Lambersten
	Fire/EMS	Fire Chief	Nate Holven
	Fire/EMS	First Responder	Sherry Parks
Gladbrook	City Clerk	City Clerk	Jackie Stephenson
	Fire Department	Fire Chief	Matt Koester
Lincoln	City Clerk	City Clerk	
	Fire Department	Fire Chief	John Johannsen
Montour	City Clerk	City Clerk	
	Fire Department	Fire Chief	Loyce Staker
	EMS	First Responder	Mike Buchanan
Tama	City Clerk	City Clerk	Alyssa Devig
	Police Department	Police Chief	Jason Bina
	Fire Department	Fire Chief	Richard Jimenez
	EMS	First Responder	Don Weitzell
Toledo	City Clerk	City Clerk	Kim McAdoo
	Mayor	Mayor	Brian Sokol
	Public Works	Director	Kendall Jordan
	Police Department	Police Chief	Nathan Shepard
	Fire Department	Fire Chief	Kendall Jordan
	Fire Department	Assistant Chief	Greg Johnson
Traer	City Clerk	City Clerk	Haley Blaine

Jurisdiction	Department/Organization	Title	Name
	Fire Department	Fire Chief	Tyler Sell
	EMS	First Responder	Shawn Kennedy
North Tama CSD	School District	Superintendent	David Hill
South Tama CSD	School District	Maintenance	Steve McAdoo
	School District	Superintendent	Jared Smith
GMG CSD	School District	Superintendent	Ben Petty
GMG CSD	School District	Superintendent	Kim Stein
Union CSD	School District	Superintendent	Travis Fleshner

1.4.2 The Planning Steps

Wood and Tama 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 Flood Mitigation Assistance programs. Thus, the process used for this plan meets the funding eligibility requirements of the Hazard Mitigation Grant Program, Pre-Disaster Mitigation Program, Community Rating System, and Flood Mitigation Assistance Program. Table 1-3 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 1-3 Mitigation Planning Process Used to Develop the Tama County Multi-jurisdictional Local 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
		Task 7: Keep the Plan Current

Phase	Community Rating System (CRS) Planning Steps (Activity 510)	Local Mitigation Planning Handbook Tasks (44 CFR Part 201)
	Step 10. Implement, evaluate, revise	Task 9: Create a Safe and Resilient Community 44 CFR 201.6(c)(4)

Phase 1 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 Meeting held on February 25, 2021. Participants of the meeting included the Tama 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 HMPC (Step 1), discuss GIS needs, provide recommendations regarding the hazards to be included in the plan update, develop an initial public participation strategy, discuss the plan update format and the final plan document.

The 2015 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 subsection Step 3: Coordinate with Other Departments and Agencies.

After the initial coordination meeting, a formal Kick-off meeting was held on March 25, 2021 followed by two additional planning meetings held on May 26, 2021 and July 27, 2021.

The HMPC communicated during the planning process with a combination of face-to-face meetings, webinars, phone interviews, and email correspondence. The planning effort coincided with the 2020-2021 Coronavirus pandemic, thus all meetings were facilitated via a webinar; the first two meetings were all web-based, while the third meeting was an in-person meeting. The meeting schedule and topics are listed in Table 1-4. The meeting minutes for each of the meetings are included in Appendix B.

Table 1-4 Schedule of HMPC Meetings

Meeting	Topic	Date
Coordination call	General overview of planning process/requirements and schedule.	February 25, 2021
Kick-off Webinar	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.	March 25, 2021
Planning Meeting #2 Webinar	Presentation of draft Risk Assessment including vulnerability and critical facility analysis; development of plan goals.	May 26, 2021
Planning Meeting #3 – in person meeting	Results of public survey; mitigation action update, development, and prioritization; plan maintenance; next steps in plan review and final public comment period.	July 27, 2021

During the kickoff 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 Tama County.

Participants were given the Wood Plan Update Guide 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)

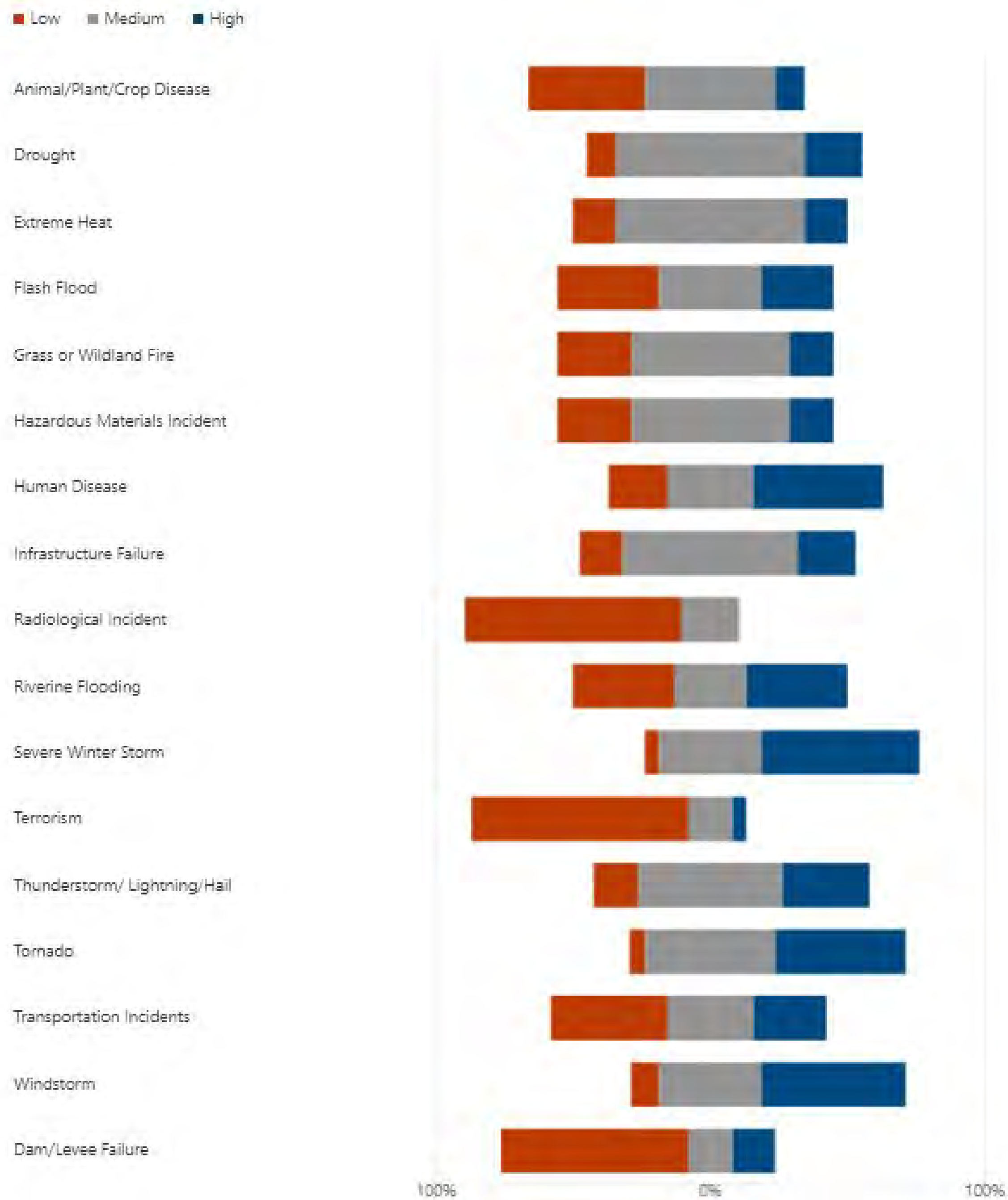
44 CFR Requirement §201.6(b):
An open public involvement process is essential to the development of an effective plan. In order to develop a more comprehensive approach to reducing the effects of natural disasters, the planning process shall include: (1) An opportunity for the public to comment on the plan during the drafting stage and prior to plan approval.

At the kickoff 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 Tama 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 and posted to the Tama County's website as well as each participating jurisdiction's website and social media (Facebook, Twitter, and/or Instagram) pages announced the opening of the online survey. The survey was available to the public from April 21 to July 1, 2021.

In all, 19 surveys were completed. Responses reflect the public perception that the most significant hazards are severe winter storm, tornado, and windstorm, followed by thunderstorm/lightning/hail, human disease, and infrastructure failure.

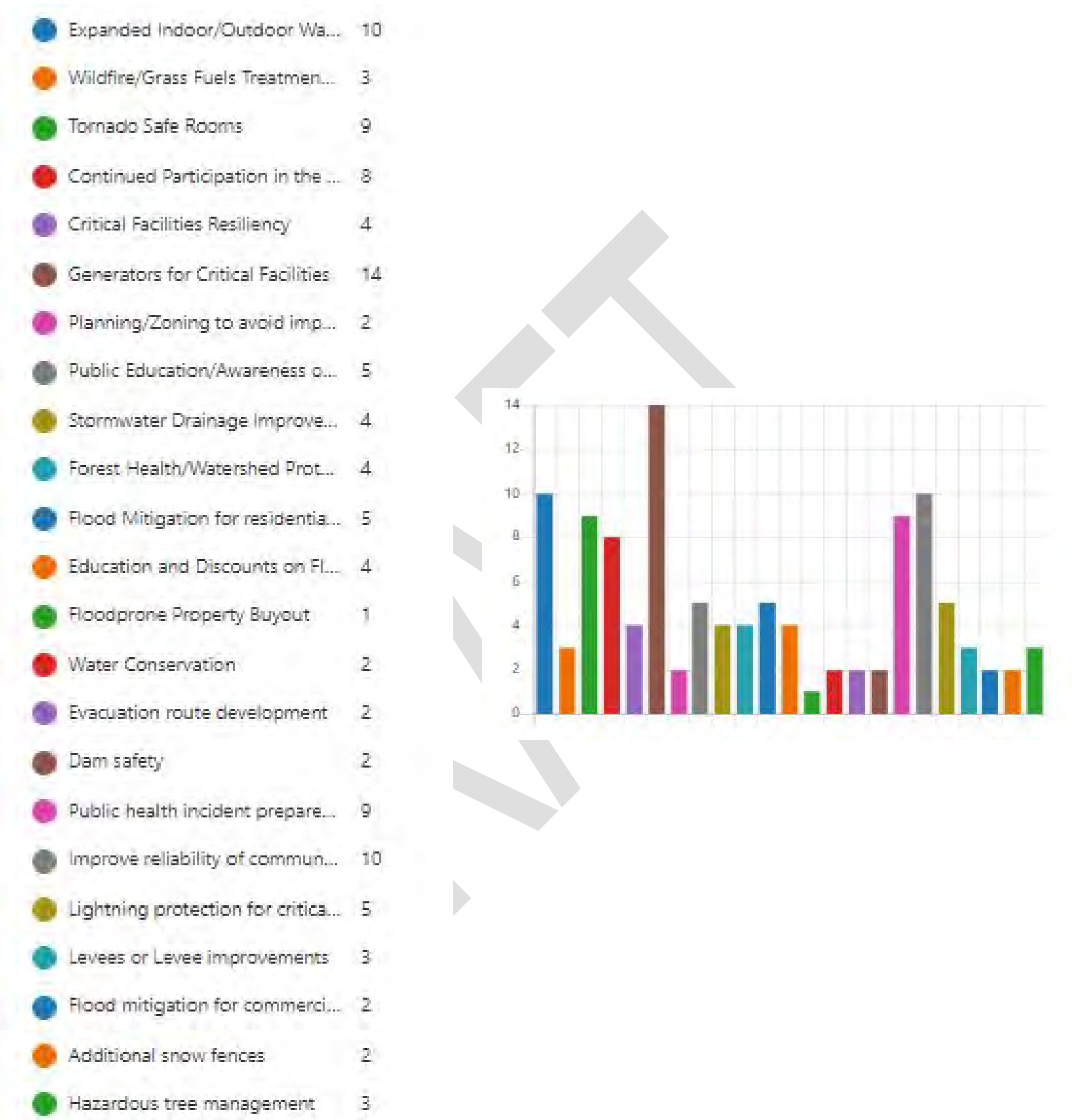
Figure 1-1 Survey Results – Hazard Level of Significance



Source: Microsoft Forms Online Survey developed by Wood

In the survey, the public was also asked to review 23 types of mitigation actions. The Tama County HMPC also considered these types of projects in the Tama 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 expanded indoor/outdoor warning systems 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 Tama 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:

- “Does public health have a disaster team ready to go help immediately after a disaster?”

- "Future biological emergencies."
- "Would like to see a building for people in trailer courts and without basements to be able go to in tornado season."
- "Making sure construction of schools, medical facilities, and emergency operation centers (law enforcement, fire, utilities, electronic communication, transportation networks include locations to avoid natural disasters and meet standards to withstand natural disasters. Any communication system which will provide the most advance notice to the most people in the area should be a priority -- prediction and warning are critical. Pretty tough to prevent a natural disaster -- well maintained and a functional community wide alarm or siren system is a major component."

In addition to the survey a member of the press (Times Republican) was invited to and attended HMPC meeting #3 on July 27, 2021.

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.

Tama County announced the availability of the entire final draft plan and the two-week final public comment period in .... and a variety of social media platforms. A hardcopy was available for review at the ...... A copy of the announcement is provided in Appendix B. The final public comment period was from November 2- December 17, 2021. There were x public comments received.

The HMPC invited other targeted stakeholders to comment on the draft plan via an e-mail letter, which is described in greater detail in Step 3: Coordinate with Other Departments and Agencies. There were x comments received.

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

44 CFR Requirement §201.6(b):
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: (2) 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 non-profit interests to be involved in the planning process. (3) Review and incorporation, if appropriate, of existing plans, studies, reports, and technical information.

There are organizations whose goals and interests interface with hazard mitigation in Tama County. Tama 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 e-mail to review and comment on the draft of the Tama 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. Tama County and Marshall County were working on updating their HMPs during 2021 on a similar time frame. The third mitigation planning meeting was held jointly in-person in Tama County at the Meskwaki Casino in July 2021, as an example of neighboring jurisdiction cross-coordination in mitigation planning. In addition, the Zoning Administrator for Tama County that initially organized the HMP update also serves as Marshall County Zoning, Sanitarian, & Weed Commissioner in the Public Health Department. Academic institutions include the participating school districts noted previously.

Iowa's only federally recognized Indian tribe, also known as the Sac & Fox Tribe of the Mississippi in Iowa, is known as the Meskwaki Nation, or the "People of the Red Earth." The Tribe was invited to participate early in effort. The Tribe chose to participate as an interested stakeholder, as opposed to a participating jurisdiction, and actively participated in the planning effort including providing a facility to host the third meeting of the HMPC. Tribes have similar but separate planning requirements for hazard mitigation plans in accordance with the DMA 2000.

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 non-profit organizations
- Iowa Premium Beef Processing
- Tama County Landfill

Neighboring Jurisdictions

- Meskwaki Nation (Sac & Fox Tribe of the Mississippi in Iowa)
- Marshall County Emergency Management
- Marshall County Public Health
- Grundy County Emergency Management
- Black Hawk County Emergency Management
- Benton County Emergency Management
- Iowa County Emergency Management
- Poweshiek County Emergency Management
- Jasper County Emergency Management

Appendix B includes a copy of the e-mail 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);
- Tama County Multi-jurisdictional Hazard Mitigation Plan (October 2015);
- Federal Emergency Management Agency (FEMA);
- FEMA Community Information System, NFIP, Repetitive Loss Property Data;
- Dam Inventory and Inspection Reports for Tama County, Iowa Department of Natural Resources;
- National Drought Mitigation Center Drought Impact Reporter;
- U.S. 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, Office of Traffic and Safety;
- Iowa State University 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;
- Tama County Emergency Management;
- Tama County National Flood Hazard Layer;
- U.S. Department of Agriculture, Risk Management Agency;
- U.S. Department of Agriculture, Forest Service
- U.S. 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 and Resources.

Integration of the 2015 Plan into Other Planning Mechanisms

The 2015 Hazard Mitigation Plan was not incorporated, or cross referenced in other planning mechanisms between 2015-2020. 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 Tama County. At the kick-off meeting, Wood presented information gathered for all the hazards. The HMPC examined the history of disaster declarations in Tama County. They discussed past hazard events, types of damage, and where additional information might be found. The committee identified 17 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 the current Tama 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. 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, a profile was developed for each hazard identified. 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 Tama County Assessor's Department which provided public datasets with parcel and building data. The Tama County Zoning Administrator worked with the Tama County GIS Department and Wood to update an inventory of critical facilities in the planning area.

Population data was obtained from the U.S. 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 U.S. Census Bureau as well as information obtained from each jurisdiction such as Comprehensive Plans and Plan Update Guides. 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 Tama 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 National Flood Insurance Program as well as designation as 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 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 and the Draft Risk Assessment (Chapter 3) was provided to the HMPC for review and comment. Comments, corrections, and suggestions were provided to Wood and incorporated into the risk assessment as appropriate.

Phase 3 Develop the Mitigation Plan (FEMA Handbook Task 6)

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. As a result, the 4 goals from the *2015 Tama County Multi-jurisdictional Hazard Mitigation Plan* were reviewed for current relevancy. The planning committee decided to After discussion, the HMPC decided to keep the 2015 goals with some minor alterations to the wording in goals 1 and 4 but maintaining the same intent. The plan goals are:

1. Minimize losses to existing and future structures within hazard areas with an emphasis on critical facilities, lifelines and identified assets.
2. Protect the health and safety of Tama County residents and visitors.
3. Educate Tama County citizens about the dangers of hazards and how they can be prepared.
4. Ensure the continuity of county and local operations will not be significantly disrupted by disasters in Tama County.

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 *2015 Tama 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 Booklet, 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 identified in the 2015 HMP by each jurisdiction. The jurisdictions were provided instructions for completing the status of each of the 150 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 reviewed priority on continuing actions and prioritized the new actions they submitted by indicating high, medium, 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 Tama 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 strategy is described in Chapter 5, Plan Maintenance Process. This process was generally followed in the 2015-2020 timeframe, although there were no annual meetings of the HMPC. The only change in implementation process in 2021 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.

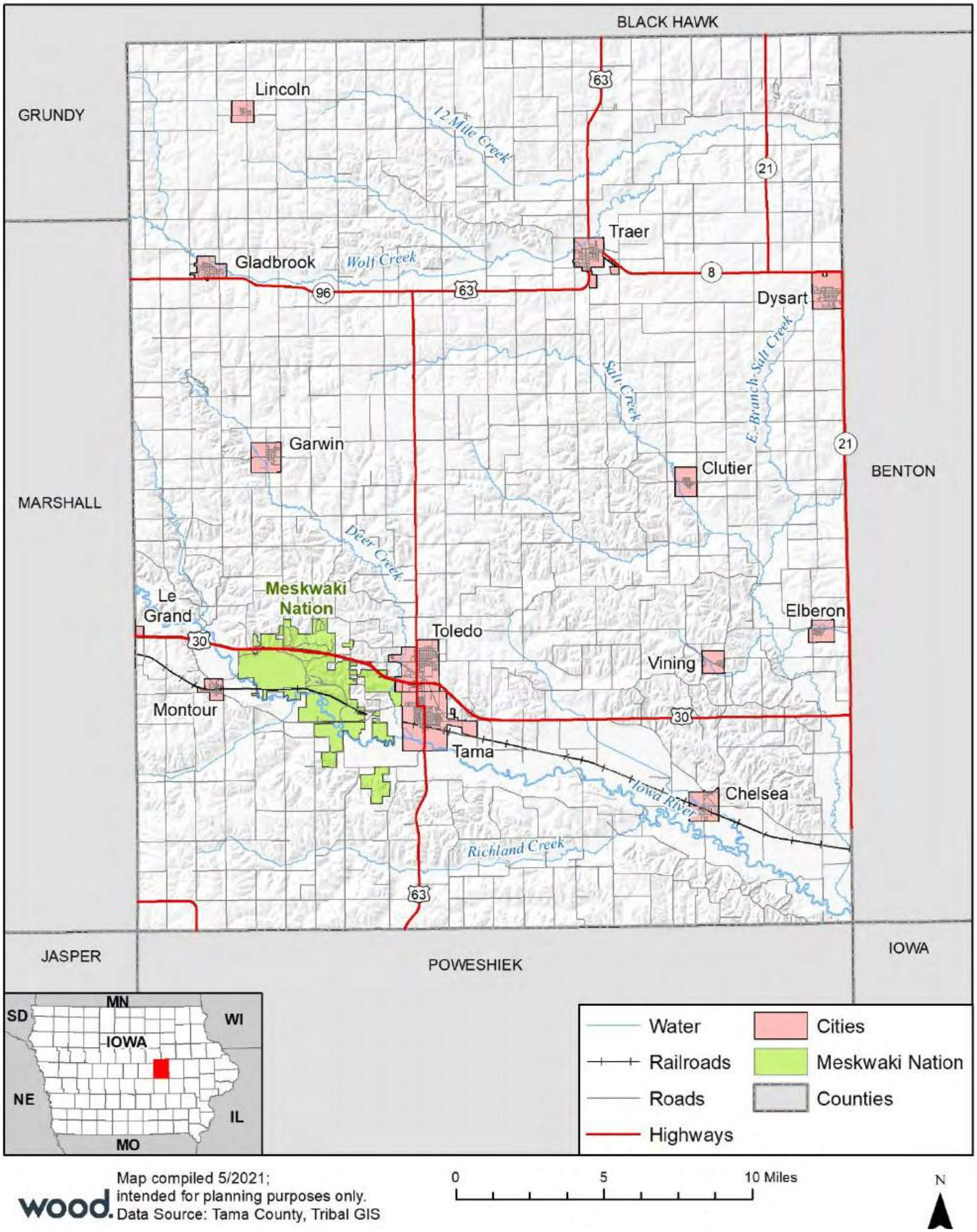
2 Planning Area Profile and Capabilities

This chapter provides a general profile of Tama 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 Tama County Planning Area Profile

Figure 2-1 provides a map of the Tama County planning area. The planning area boundaries include the unincorporated areas of Tama County as well as the city limits of the following incorporated cities: City of Chelsea, City of Clutier, City of Dysart, City of Elberon, City of Garwin, City of Gladbrook, City of Lincoln, City of Montour, City of Tama, City of Toledo, City of Traer, and City of Vining. Several public-school districts also participated in the plan update process, including North Tama Community School District, South Tama School District, GMG Community School District, and Union Community School District. The boundaries of these districts are shown later in this section in Figure 2-5.

Figure 2-1 Tama County Planning Area



2.1.1 Geography, Topography, and Hydrology

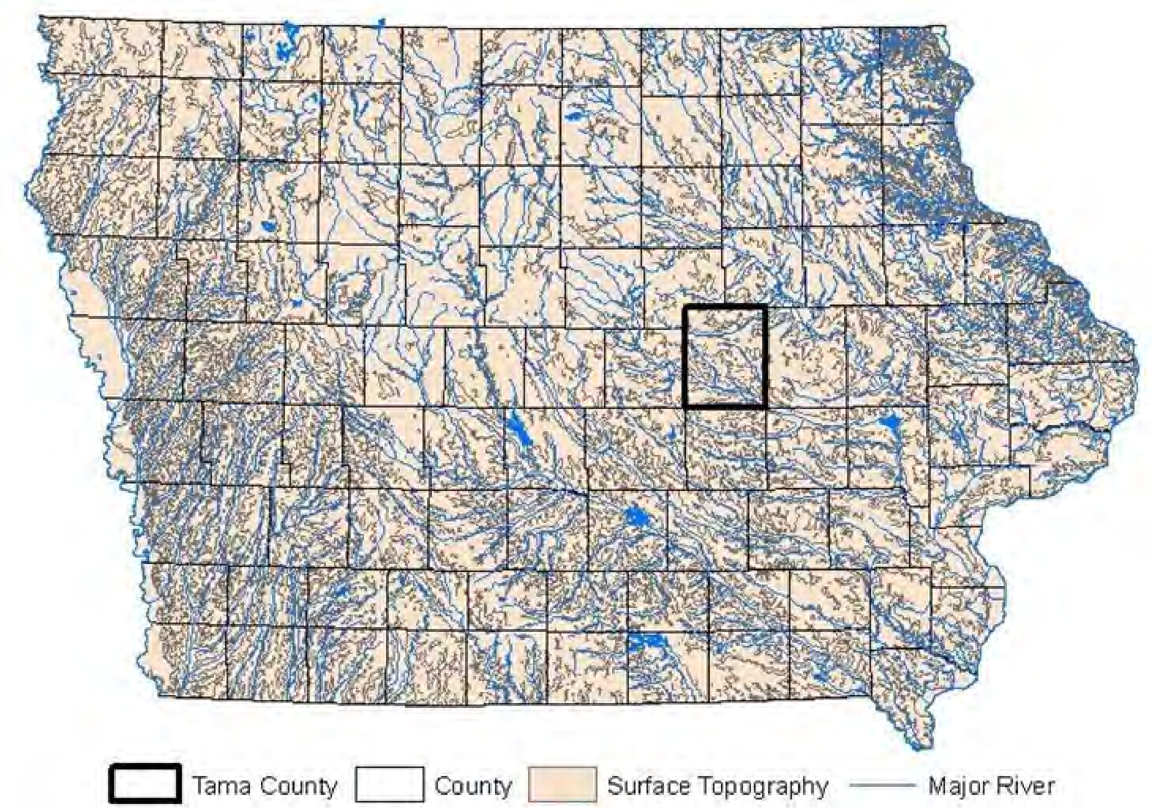
Tama County has an area of 462,300 acres, or about 720 square miles. The Iowa River, one of the main rivers in the state, crosses the southern part of the county and runs in a southeasterly direction to its southeast corner. It is of medium gradient and is subject to flooding of low velocity and short duration in the spring and after periods of heavy rainfall. Damage by flooding is chiefly to the agricultural land in the county. In some areas, loess hills rise quite abruptly to a height of 150 to 200 feet above the river.

Most of Tama County is on dissected uplands. About three-fourths of the county is drained by the Iowa River and its principal tributaries-Deer Creek, Richland Creek, and Salt Creek. Wolf Creek, in the northern part of the county, drains the rest of the county. It runs from Gladbrook to about 3 miles south of the northeast corner of the county. The entire drainage system eventually empties into the Mississippi River.

The highest surface elevation in the county is about 1,060 feet above sea level. It is in the northwest corner of the county. The lowest elevation is about 770 feet above sea level. It is in the southeast corner of the county where the Iowa River leaves the county.

Generally, the topography is nearly level to rolling to very steep in the southern half, along the Iowa River and its tributaries. Some small areas between the rivers and creeks on the major divides are level or nearly level. Refer to Figure 2-2 Pahas, or prominent elongated ridges or elliptical mounds that are 50 to 75 feet above the nearly level plain, are in the northern part of the county. They are oriented in a northwest-southeast direction. The word “paha” means small in some Native American languages.

Figure 2-2 Topography and Waterways of Iowa



For comparison, all of Iowa is shown in Figure 2-2. Tama County is not entirely as flat as some parts of Iowa, and it has relatively less variation in elevation compared to other counties.

Most of the soils in Tama County formed in material that transported from other locations and redeposited through the action of glacial ice, water, wind, or gravity. Primary parent materials in the county include loess, alluvium, glacial drift, and sand eolian material.

Loess, a silt material deposited by wind, covers about 83 percent of the county. It ranges in depth from about 15 to 20 feet on the more stable ridge tops, south of the Iowa River, to about 4 to 8 feet on the ridge tops of the Iowa erosion surface in the northern half of the county. In most areas, it overlies glacial till.

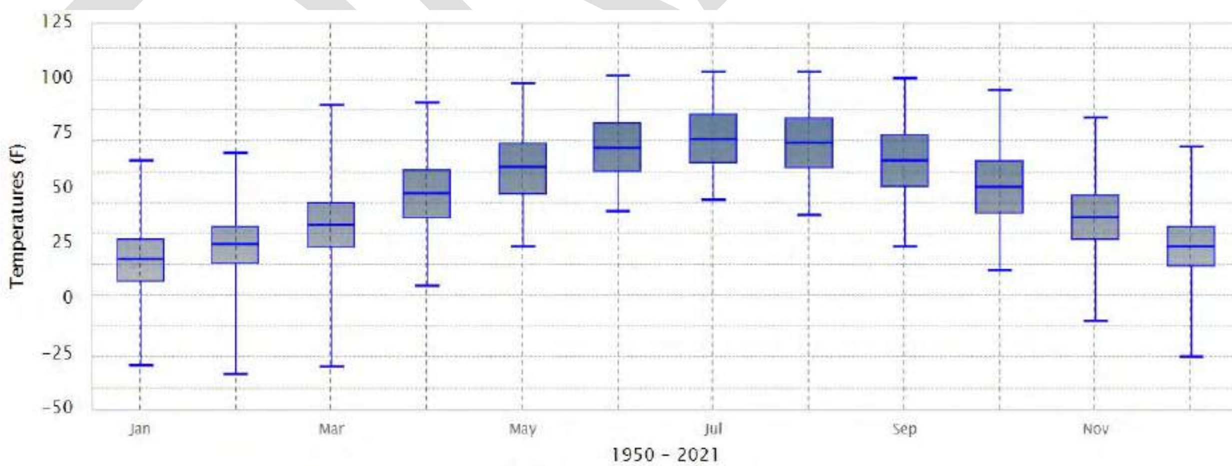
About 17 percent of the soils in the county formed in alluvium. The major areas of these soils are along the Iowa River and Wolf Creek and their tributaries. Large flood plains are located along the Iowa River and some of the alluvial terraces. The flood plain along the Iowa River, stretching from the City of Tama to the eastern edge of the county, is 0.5 mile to 1.5 miles wide. The stream terrace near the junction of Otter Creek and the Iowa River is about 960 acres in size, while the stream terrace near the junction of Salt Creek and the Iowa River is about 1,200 acres in size. (Soil Survey of Tama County, Iowa, 1995)

For more extensive information on the soils in Tama County, refer to the Soil Survey of Tama County, Iowa. This survey was completed in 1988-89 by the USDA and several Iowa government departments and institutions and updated in 1995.

2.1.2 Climate

The climate in Tama County fluctuates widely in temperature and precipitation throughout the year. The average annual temperature is 48 degrees Fahrenheit (F.) with an average high in July of 84 degrees F. and average low in January of 8 degrees F. The annual precipitation averages 34.32 inches. Of this, 24.73 inches fall during the growing season between April and September. An average of 34.3 inches of snowfall occurs each winter, with the majority occurring in December, January, and February (Weatherbase 2021). Figure 2-3 and Figure 2-4 below illustrate the average annual temperature ranges and precipitation each month.

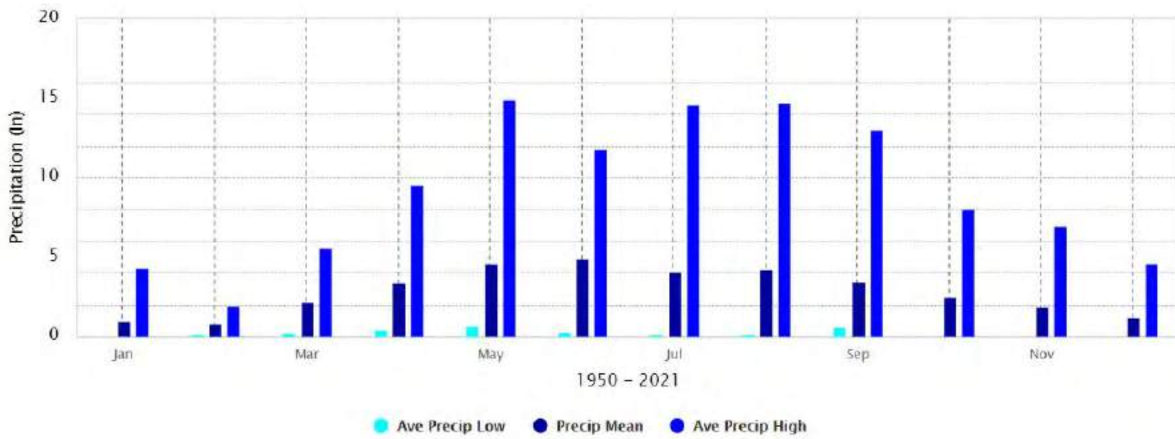
Figure 2-3 Toledo, Iowa Average Annual Temperatures, 1950-2021



Source: Southwest Climate and Environmental Information Collaborative

Tama 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 Toledo, Iowa Average Annual Precipitation (in), 1950-2021



Source: Southwest Climate and Environmental Information Collaborative

2.1.3 Population and Demographics

Table 2-1 provides the populations for each city and the unincorporated county for 2000, 2010, and 2019 with the number and percent change from 2010 to 2019 (note: detailed population and demographic information from the 2020 census was not yet available during the 2021 update of this plan). The unincorporated areas population was determined by subtracting the populations of the incorporated areas from the overall county population.

US Census Bureau data indications that the population of Tama County in 2019 was estimated to be 17,032, which indicates a decline in population since 2010. Of the total population, 10,564 people lived in the incorporated cities of the County, leaving the remaining 6,468 people in the unincorporated areas of Tama County. Based on this data, over one-third of the Tama County population was under the County's jurisdiction, while the majority of the population fell under a City's jurisdiction.

Table 2-1 Tama County Population 2000-2019 by City

Jurisdiction	2000 Population	2010 Population	2019 Population Estimates	# Change 2010-2019	% Change 2010-2019
Tama County	18,103	17,767	17,032	-735	-4.1%
Unincorporated County	7,054	6,860	6,468	-392	-5.7%
City of Chelsea	287	265	272	7	2.6%
City of Clutier	229	213	171	-42	-19.7%
City of Dysart	1,303	1,379	1,391	12	0.9%
City of Elberon	245	196	165	-31	-15.8%
City of Garwin	565	527	530	3	0.6%
City of Gladbrook	1,015	945	982	37	3.9%
City of Lincoln	182	162	116	-46	-28.4%
City of Montour	285	249	254	5	2.0%
City of Tama	2,731	2,877	2,769	-108	-3.8%
City of Toledo	2,539	2,341	2,303	-38	-1.6%
City of Traer	1,598	1,703	1,547	-156	-9.2%
City of Vining	70	50	64	14	28.0%

Source: U.S. Bureau of the Census, 2000, 2010 U.S. Census Bureau ACS 5-year Data Estimates 2014-2019

Of all the cities, Tama and Toledo have the highest population, while Vining remains the smallest city, with a population under 100 people.

Over the past decade, Tama County experienced a population decrease of about 4.1%; however, Lincoln had the highest decline, losing over 28% of its population. Similarly, Clutier and Elberon saw a large decrease in their populations, at 19.7% and 15.8%, respectively. Chelsea, Dysart, Garwin, Gladbrook, Montour, and Vining all experienced an increase in population, with Vining having the largest relative increase at 28%, but still remains the smallest community.

According to the 2019 population estimates, 6.4 percent of the population is under age 5 and 19.5 percent of the population is over age 65 in Tama County. There were 6,767 households with an average household size of 2.44 people. Table 2-2 provides additional demographic and economic indicators for Tama 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 Tama County values are for all of Tama County, including the incorporated cities. These details are also included for each incorporated city in Section 3.2.

Table 2-2 Tama County Demographic and Social Characteristics, 2014-2019

Tama County	2014	2019	% Change
Population	17,568	17,032	-3.05%
Median Age	42.5	42.6	0.2%
% of Population under 5	6%	6.4%	10.3%
% of Population over 65	18.8%	19.5%	3.7%
Housing Occupancy Rate	87.6%	86.8%	-0.9%
% of Owner Occupied Housing	76.1%	75.8%	-0.4%
% of Renter Occupied Housing	23.9%	24.2%	1.3%
% of Housing Units with no Vehicles Available	3.8%	3.7%	-2.6%
Median Household Income	$54,325	$56,037	3.2%
Per Capita Income	$26,247	$28,585	8.9%
% of Individuals Below Poverty Level	12.4%	12.0%	-3.2%
# of Households	6,815	6,767	-0.7%
Average Household Size	2.52	2.44	-3.2%
% of Population Over 25 with High School Diploma	90.4%	91.3%	1.0%
% of Population Over 25 with Bachelor's Degree or Higher	16.2%	15.8%	-2.5%
% with Disability	13.1%	10.5%	-19.8%
% Speak English less than "Very Well"	3.7%	4.1%	10.8%

Source: US Census Bureau ACS 5-year Data Estimates, 2014-2019

Table 2-3 Tama County Demographic and Social Characteristics Compared to the State and Nation, 2014-2019

Demographic & Social Characteristics (as of 2019)	County	Iowa	U.S.
Median Age	42.6	38.5	37.9
% of Population under 5	6.4%	6%	6%
% of Population over 65	19.5%	17.5%	17%
Housing Occupancy Rate	86.8%	90.7%	87.8%
% of Owner Occupied Housing	75.8%	71%	64.1%
% of Renter Occupied Housing	24.2%	29.5%	35.9%
% of Housing Units with no Vehicles Available	3.7%	6.1%	8.7%
Median Household Income	$56,037	$61,691	$60,293

Demographic & Social Characteristics (as of 2019)	County	Iowa	U.S.
Per Capita Income	$28,585	$33,109	$32,621
% of Individuals Below Poverty Level	12.0%	7.3%	14.1%
Average Household Size	6,767	2.4	2.6
% of Population Over 25 with High School Diploma	2.44	92.6%	87.7%
% of Population Over 25 with bachelor's degree or Higher	91.3%	29.3%	31.5%
% with Disability	15.8%	11.8%	12.6%
% Speak English less than "Very Well"	10.5%	3.6%	8.5%

Source: US Census Bureau ACS 5-year Data Estimates, 2014-2019

Table 2-4 presents race and gender composition of Tama County. The county is almost equally comprised of males and females with females having a slightly larger population (50.4%) than males (49.6%). The majority of the population identifies as White (not Hispanic) (88.8%), while the Black (9.8%) and American Indian and Alaska Native (9.0%) races make up the second largest percentages in the county. The Asian and Native Hawaiian and other Pacific Islander races have the lowest populations present in the county.

Table 2-4 Demographics by Race and Sex

Tama County	Population	%
Total Population	17,032	
Male	8,444	49.6%
Female	8,588	50.4%
White, not Hispanic	15,123	88.8%
Hispanic or Latino	1,666	9.8%
Black	177	1.0%
Asian	121	0.7%
American Indian and Alaska Native	1,539	9.0%
Native Hawaiian and Other Pacific Islander	4	0.0%
Some other race	246	1.4%
Two or more races	178	1.0%

Source: US Census Bureau ACS 5-year Data Estimates, 2014-2019

2.1.4 Occupations

Table 2-5 provides occupation statistics or the incorporated cities and the county as a whole.

Table 2-5 Occupation Statistics for Tama County

Jurisdiction	Management, Business, Science, and Arts Occupations	Service Occupations	Sales and Office Occupations	Natural Resources, Construction, and Maintenance Operations	Production, Transportation, and Material Moving Operations
Iowa	36.2%	16.3%	20.7%	9.5%	17.3%
Tama County	26.3%	17.1%	19.9%	12.0%	24.6%
Unincorporated County	18.9%	14.2%	5.5%	15.0%	46.5%
City of Chelsea	16.5%	21.6%	17.5%	17.5%	26.8%
City of Clutier	33.8%	24.3%	16.7%	9.6%	15.6%
City of Dysart	19.5%	23.2%	13.4%	8.5%	35.4%
City of Elberon	15.5%	16.2%	26.4%	13.5%	28.4%

Jurisdiction	Management, Business, Science, and Arts Occupations	Service Occupations	Sales and Office Occupations	Natural Resources, Construction, and Maintenance Operations	Production, Transportation, and Material Moving Operations
City of Garwin	25.1%	26.1%	11.5%	11.7%	25.7%
City of Gladbrook	18.0%	23.0%	4.9%	32.8%	21.3%
City of Lincoln	13.9%	25.8%	15.9%	15.2%	29.1%
City of Montour	13.0%	21.1%	17.5%	19.7%	28.6%
City of Tama	20.8%	14.4%	23.4%	12.1%	29.2%
City of Toledo	31.5%	23.4%	19.4%	10.2%	15.4%
City of Traer	24.0%	4.0%	24.0%	8.0%	40.0%
City of Vining	36.2%	16.3%	20.7%	9.5%	17.3%

Source: US Census Bureau ACS 5-year Data Estimates, 2014-2019

The per capita income for Tama County in 2019 was approximately $28,585, which is only below that of the state ($33,109). Tama County's median household income was $56037 compared to the state's $61,691.

In 2019, an estimated 12% of the county's population, about 2,044 people, lived in poverty, which is higher than that of the state, where 7.3% of the population was estimated to be living below the poverty level. 7.6% of the county's population had no vehicles available at home, which was a higher percentage than most of the cities with the county, aside from Dysart and Toledo. The absence a vehicle at home and unknown access to public transportation indicates potential barrier for such households to easily evacuate in the case of a disaster or emergency.

Of the Tama County population that is 25 years or older, 91.3% have a high school degree or its equivalent, while 15.8% received a bachelor's degree.

2.1.5 Agriculture

According to the 2017 Census of Agriculture for Marshall County there were 1,072 farms in the County covering 406,984 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. In 2017, Tama County farmers harvested 167,964 acres of corn, 147,261 acres of soybeans and produced 97,992 hogs and 41,242 head of cattle. Farms in Tama County have an average size of 380 acres. Total market value of agricultural products sold countywide in 2017 was approximately $288 million. The agriculture industry provides 628 jobs, representing 7.4% of the County's workforce.

2.1.6 Cultural Resources

Meskwaki Nation

Iowa's only federally recognized Indian tribe, the Sac & Fox Tribe of the Mississippi in Iowa, is known as the Meskwaki Nation, or the "People of the Red Earth." Their settlement is located in Tama, Iowa, and is comprised of more than 8,624 acres. The Nation has a population of more than 1,450 enrolled tribal members, and is the largest employer in Tama County, employing over 1,100 people. The Tribe is of Algonquian origin from the Eastern Woodland Culture areas and have been historically located in the St. Lawrence River Valley, Michigan, Wisconsin, Illinois, Missouri, and Iowa. After fighting in the Fox Wars and being relocated multiple times, the Meskwaki formally purchased land in Tama County, Iowa, which gave formal federal identity to the Meskwaki people as the "Sac & Fox of the Mississippi in Iowa." The Meskwaki Cultural Center & Museum was opened in 2010 in part of the Iowa Great Places designation received by Tama County. The Nation also operates a hotel, casino and conference center.

Outdoor Public Recreation

Many parks have been established throughout the county. The long, narrow, deep valleys and the side slopes and flood plains of the valleys are excellent sites for large earthen dams that form lakes. The largest dam is 4 miles south of Gladbrook at Union Grove State Park.

Tama County also has many public outdoor recreation areas maintained by the Tama County Conservation Department and the Iowa DNR. Hickory Hills Park is one recreation area within Tama County that is maintained by Black Hawk County, which is located directly northeast of Tama County

It should be noted that all outdoor recreation areas are considered in this plan regardless of what institution maintains the area because they are located within the boundaries of Tama County and emergency response from the County may be needed should a disaster occur. Two major issues in outdoor recreation areas are the park's ability to provide shelter during hazard events and how to prevent damage to property within the park as well as the park's natural assets.

The most important issue in outdoor recreation areas throughout Tama County is shelter for park visitors during hazard events like windstorms, hail, and tornadoes. In most parks, the only refuges provided are open picnic shelters, otherwise there are none. This is not sufficient during severe weather. Shelters engineered for high winds and flying debris need to be included in park facilities to ensure the safety of park visitors.

Other outdoor facilities include trails both local and regional.

Outdoor Private Recreation

Several privately owned and maintained outdoor recreation facilities exist in Tama County and have been identified by the Tama County Economic Development Commission.

Historic Sites

Besides outdoor recreation, Tama County has many more cultural offerings in the form of historic sites. Several sites have been listed in Tama County on the National Register of Historic Places. These include:

- Brooks and Moore Bank Building in Traer, added 1998. This building was significant between 1850 and 1874 as a financial institution functioning in commerce and trade.
- Chambers Ford Bridge in Chelsea, added 1998. This was a significant engineering structure between 1875 and 1899.
- Conant's Cabin and Park, aka Rural Wayside Rest and Recreation Site, east of Gladbrook, added 2000. This building was significant in the time periods of 1900-1924, 1925-1949, and 1950-1974 as an outdoor recreation facility emphasizing recreation and culture.
- Hope Fire Company Engine House, aka Toledo Fire Station, located in Toledo, added 1983. This building was significant in the period of 1875-1899 as a fire station.
- Le Grand Bridge in Tama added 1998. This was a significant engineering structure between 1875 and 1899.
- Lincoln Highway Bridge, added 1978. This was a significant transportation structure between 1900 and 1924. The bridge is located on East 5th Street in Tama.
- Round Barn in Buckingham Township, added 1986. This building was significant between 1900 and 1924 as an animal facility emphasizing agriculture and subsistence.
- Star-Clipper-Canfield Building and Winding Stairway in Traer added 1975. This building was significant between 1875 and 1899 as a business emphasizing commerce and trade.
- Tama County Courthouse in Toledo added 1981. This building was significant between 1850 and 1874 as a government courthouse and continues as such in the present.

- Tama County Jail, aka Tama County Historical Museum, in Toledo, added 1981. This building was significant between 1850 and 1874 as a government correctional facility and has since become a recreation and culture museum. The old Tama Public Library in Tama added 1983.
- Toledo Bridge, which is on Ross Street, crossing over Deer Circle, in Toledo, added 1998.

This was a significant transportation structure between 1900 and 1924.

- Traer Public Library in Traer added 1983. This building continues to be the public library in the Traer jurisdiction.
- Wieting Theater in Toledo, added 1986. This building was significant between 1900 and 1924 as a theatre for recreation and culture and continues as such today.
- Young, John W., Round Barn in Traer, added 1986. This building was significant between 1900 and 1924 as an animal facility emphasizing agriculture and subsistence.

The Wieting Theatre in Toledo

Image by Alicia Rosman, March 2010

Historic Toledo Fire Station

Image by Alicia Rosman, March 2010

Winding Staircase in Traer

Image from Tama County Economic Development Commission, March 2010

Courthouse in Toledo

Image by Alicia Rosman, March 2010

2.2 Jurisdiction Descriptions and Capabilities

This section includes the capabilities of each jurisdiction that relate to their ability to implement mitigation opportunities. Table 2-6 and Table 2-7 provide a summary table of 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. Following the summary table, individual profiles are provided for each participating jurisdiction with information including size, government structure, and previous and ongoing mitigation capabilities and programs.

Table 2-6 City/County Jurisdictional Profiles and Mitigation Capabilities

	Tama County	City of Chelsea	City of Clutier	City of Dysart	City of Elberon	City of Garwin	City of Gladbrook	City of Lincoln
City Governance – Departments, Boards, & Commissions								
City Hall (City Clerk)	Yes	No	Yes	Yes	Yes	No	Yes	No
Fire Department	Yes	No	Yes	Yes	Yes	No	Yes	No
Police Department	Yes	No	No	Yes	No	No	No	No
Public Works Department	Yes	No	Yes	Yes	Yes	No	Yes	No
Planning & Zoning Commission	Yes	No	No	Yes	No	No	No	No
Board of Adjustments	Yes	No	No	yes	No	No	No	No
Library Board of Trustees	No	No	Yes	yes	Yes	No	Yes	No
Electric Board of Trustees	No	No	No	Yes	No	No	N/A	No
Community Center Board	No	No	No	No	No	No	Yes	No
Policies/Ordinances								
Comprehensive/Land Use Plan	Yes	No	No	No	No	No	No	No
Capital Improvement Plan	Yes	No	No	Yes	No	No	Yes	No
Local/County Emergency Plan	No	No	No	Yes	Yes	No	No	No
Local Mitigation Plan	No	No	No	Yes	No	No	No	No
Flood Mitigation Assistance (FMA) Plan	Yes	No	No	No	No	No	No	No
Watershed Plan	No	No	No	No	No	No	Yes	No
Critical Facilities Plan (Mitigation/Response/Recovery)	No	No	No	No	No	No	No	No
Economic Development Plan	No	No	No	No	No	No	No	No
Transportation Plan	No	No	No	No	No	No	No	No
Firewise or Other Fire Mitigation Plan	No	No	No	No	Yes	No	No	No
Zoning Ordinance	Yes	No	No	Yes	Yes	No	No	No
Restricted Residential District	No	No	N/A	No	No	No	Yes	No
Subdivision Ordinance	No	No	N/A	No	No	No	No	No
Building Code	Yes	No	No	Yes	No	No	Yes	Yes
Building Permit Ordinance	Yes	No	No	Yes	No	No	Yes	Yes
Floodplain Ordinance	Yes	Yes	Yes	Yes	No	Yes	Yes	No

	Tama County	City of Chelsea	City of Clutier	City of Dysart	City of Elberon	City of Garwin	City of Gladbrook	City of Lincoln
Tree Trimming Ordinance	No	No	No	Yes	No	No	Yes	No
Nuisance Ordinance	No	No	Yes	Yes	Yes	No	Yes	No
Stormwater Ordinance	No	No	Yes	Yes	No	No	Yes	No
Drainage Ordinance	No	No	Yes	Yes	No	No	No	No
Site Plan Review Requirements	No	No	No	Yes	No	No	No	Yes
Historic Preservation Ordinance	No	No	No	No	No	No	No	NA
Landscape Ordinance	No	No	Yes/to a minimum	Yes	No	No	No	No
Iowa Wetlands and Riparian Areas Conservation Plan	No	No	N/A	No	No	No	No	No
Debris Management Plan	No	No	No	No	No	No	No	No
Program								
Zoning/Land Use Restrictions	No	No	No	Yes	No	No	Yes	No
Codes Building Site/Design	No	No	No	Yes	No	No	Yes	No
National Flood Insurance Program (NFIP) Participant	Yes, Joined 5/4/2006	Yes, Joined 12/16/1980	Yes, Joined 8/19/1985	Yes, Joined 3/10/2011	Not Participating – Sanctioned 6-19-89	Yes, Joined 8/19/1985	Yes, Joined 9/4/1985	Not Participating – no SFHA not required
NFIP Community Rating System (CRS) Participant	No	No	No	No	No	No	No	No
Hazard Awareness Program	No	No	No	No	No	No	No	No
Planning/Zoning Boards	Yes	No	No	Yes	No	No	No	Yes
Tree Trimming Program	No	No	No	Yes	No	No	No	Yes
Engineering Studies for Streams (Local/County/Regional)	No	No	No	No	Yes	No	No	No
National Weather Service (NWS) Storm Ready	No	No	No	No	No	No	Yes	No
Building Code Effectiveness Grading (BCEGs)	No	No	No	No	Yes	No	No	No
ISO Fire Rating	Yes	No	Yes	No	Yes	No	Yes	No
Economic Development Program	No	No	No	Yes	No	No	Yes	No

	Tama County	City of Chelsea	City of Clutier	City of Dysart	City of Elberon	City of Garwin	City of Gladbrook	City of Lincoln
Land Use Program	No	No	No	No	No	No	No	No
Public Education/Awareness	No	No	No	Yes	No	No	No	No
Property Acquisition	No	No	No	No	No	No	No	No
Stream Maintenance Program	No	No	No	N/A	No	No	No	No
Engineering Studies for Streams (Local/County/Regional)	No	No	Yes	Yes	Yes	No	No	N/A
Mutual Aid Agreements	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Staff/Department								
Building Code Official	Yes	No	No	Yes	No	No	Yes	Yes
Building Inspector	No	No	No	No	No	No	No	Yes
Mapping Specialist (GIS)	Yes	No	No	No	No	No	No	Yes
Engineer	Yes	No	No	Yes	No	No	No	No
Public Works Official	Yes	No	Yes	Yes	Yes	No	Yes	No
Emergency Response Team	Yes	No	No	Yes	No	No	Yes, Limited	No
NFIP Floodplain Administrator	Yes	Yes	Yes	Yes	No	Yes	Yes	No
Development Planner	No	No	No	No	No	No	No	No
Emergency Management Coordinator	Yes	No	No	No	No	No	No	No
Hazardous Materials Expert	No	No	No	No	No	No	No	No
Local Emergency Planning Committee	No	No	No	Yes	No	No	No	No
County Emergency Management Commission	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Sanitation Department	No	No	No	No	No	No	No	No
Transportation Department	No	No	Yes	No	No	No	No	No
Economic Development Department	No	No	No	No	No	No	No	No
Housing Department	No	No	No	No	No	No		No
Planning Consultant	No	No	No	Yes	No	No	No	No
Regional Planning Agencies	Yes	No	No	Yes	No	No	Yes	Yes
Historic Preservation	No	No	Yes	No	No	No	No	No
Non-Governmental Organizations (NGOs)								
American Red Cross	No	No	No	No	No	No	No	No

	Tama County	City of Chelsea	City of Clutier	City of Dysart	City of Elberon	City of Garwin	City of Gladbrook	City of Lincoln
Salvation Army	No	No	No	No	No	No	No	No
Veterans Groups	No	No	No	No	Yes	No	Yes	No
Environmental Organization	No	No	No	No	No	No	Yes	No
Homeowner Associations	No	No	No	No	No	No	No	No
Neighborhood Associations	No	No	No	No	No	No	No	No
Chamber of Commerce	No	No	No	No	No	No	No	No
Community Organizations (Lions, Kiwanis, etc.	No	No	No	Yes	No	No	Yes	No
Local Funding Availability								
Ability to fund projects through Capital Improvements funding	No	No	No	Yes	No	No	Yes	No
Ability to incur debt through general obligation bonds	No	No	No	Yes	Yes	No	Yes	No
Ability to incur debt through special tax bonds	No	No	No	Yes	Yes	No	Yes	No
Ability to incur debt through private activities	No	No	Yes	No	No	No		No
Ability to withhold spending in hazard prone areas	No	No	N/A	No	No	No	Yes	No
Fees for water, sewer, gas, or electric services	No	No	Yes	Yes	Yes	No	Yes	No
Apply for Community Development Block Grants	No	No	Yes	Yes	Yes	No	Yes	No
Authority to levy taxes for a special purpose	No	No	Yes	Yes	Yes	No	Yes	No
Impact fees for new development	No	No	No	No	No	No	Yes	No
Other local funding availability	No	No	No	No	No	No	Yes	No

Table 2-7 City/County Jurisdictional Profiles and Mitigation Capabilities Continued

	City of Montour	City of Tama	City of Toledo	City of Traer	City of Vining
City Governance – Departments, Boards, & Commissions					
City Hall (City Clerk)	Yes	No	Yes	No	No
Fire Department	Volunteer	No	Yes	No	No
Police Department	No	No	Yes	No	No
Public Works Department	Yes	No	Yes	No	No
Planning & Zoning Commission	No	No	Yes	No	No
Board of Adjustments	No	No	Yes	No	No
Library Board of Trustees	No	No	Yes	No	No
Electric Board of Trustees	No	No	No	No	No
Community Center Board	Yes	No	No	No	No
Policies/Ordinances					
Comprehensive/Land Use Plan	No	Yes	No	No	No
Capital Improvement Plan	No	No	No	No	No
Local/County Emergency Plan	Yes	No	Yes	No	No
Local Mitigation Plan	No	No	Yes	No	No
Flood Mitigation Assistance (FMA) Plan	Yes	No	Yes	No	No
Watershed Plan	No	No	No	No	No
Critical Facilities Plan (Mitigation/Response/Recovery)	No	No	No	No	No
Economic Development Plan	No	No	No	No	No
Transportation Plan	No	No	No	No	No
Firewise or Other Fire Mitigation Plan	No	No	No	No	No
Zoning Ordinance	No	No	Yes	No	No
Restricted Residential District	No	No	No	No	No
Subdivision Ordinance	No	No	Yes	No	No
Building Code	No	No	Yes	No	No
Building Permit Ordinance	No	No	Yes	No	No
Floodplain Ordinance	Yes	Yes	Yes	Yes	Yes
Tree Trimming Ordinance	Yes	No	Yes	No	No
Nuisance Ordinance	Yes	No	Yes	No	No
Stormwater Ordinance	Yes	Yes	Yes	No	No
Drainage Ordinance	Yes	No	Yes	No	No
Site Plan Review Requirements	No	No	Yes	No	No
Historic Preservation Ordinance	No	No	No	No	No
Landscape Ordinance	No	No	No	No	No
Iowa Wetlands and Riparian Areas Conservation Plan	No	No	No	No	No
Debris Management Plan	No	No	No	No	No
Program					
Zoning/Land Use Restrictions	No	Yes	Yes	Yes	No
Codes Building Site/Design	No	Yes	Yes	No	No
National Flood Insurance Program (NFIP) Participant	Yes, joined 3/22/2006	Yes, joined 1/17/1990	Yes, joined 5/28/2009	Yes, joined 9/4/1985	Yes, joined 2/8/2013
NFIP Community Rating System (CRS) Participant	No	No	No	No	No
Hazard Awareness Program	No	No	Yes	No	No

	City of Montour	City of Tama	City of Toledo	City of Traer	City of Vining
Planning/Zoning Boards	No	Yes	N/a	Yes	
Tree Trimming Program	No	No	No	No	No
Engineering Studies for Streams (Local/County/Regional)	No	No	Yes	No	No
National Weather Service (NWS) Storm Ready	No	No	No	No	No
Building Code Effectiveness Grading (BCEGs)	No	No	No	No	No
ISO Fire Rating	No	No	Yes	No	No
Economic Development Program	No	No	Yes	No	No
Land Use Program	No	No	No	No	No
Public Education/Awareness	No	No	No	No	No
Property Acquisition	No	No	N/a	No	No
Stream Maintenance Program	No	No	No	No	No
Engineering Studies for Streams (Local/County/Regional)	Yes	No	No	No	No
Mutual Aid Agreements	No	No	Yes	No	No
Staff/department					
Building Code Official	No	No	Yes	No	No
Building Inspector	No	No	Yes	No	No
Mapping Specialist (GIS)	No	No	Yes	No	No
Engineer	Contracted out	No	Yes	No	No
Public Works Official	Yes	No	Yes	No	No
Emergency Response Team	Volunteer	No	Yes	No	No
NFIP Floodplain Administrator	Yes	Yes	Yes	Yes	Yes
Development Planner	No	No	Yes	No	No
Emergency Management Coordinator	No	No	Yes	No	No
Hazardous Materials Expert	No	No	Yes	No	No
Local Emergency Planning Committee	No	No	Yes	No	No
County Emergency Management Commission	No	No	Yes	No	No
Sanitation Department	No	No	Yes	No	No
Transportation Department	No	No	No	No	No
Economic Development Department	No	No	No	No	No
Housing Department	No	No	No	No	No
Planning Consultant	No	No	No	No	No
Regional Planning Agencies	Yes	Yes	Yes	No	No
Historic Preservation	No	No	Yes	No	No
Non-governmental organizations (ngos)					
American Red Cross	No	No	No	No	No
Salvation Army	No	No	No	No	No
Veterans Groups	No	Yes	Yes	No	No
Environmental Organization	No	No	No	No	No
Homeowner Associations	No	No	No	No	No
Neighborhood Associations	No	No	No	No	No
Chamber of Commerce	No	Yes	Yes	No	No

	City of Montour	City of Tama	City of Toledo	City of Traer	City of Vining
Community Organizations (Lions, Kiwanis, etc.	No	Yes	Yes	No	No
Local funding availability					
Ability to fund projects through Capital Improvements funding	No	Yes	Yes	No	No
Ability to incur debt through general obligation bonds	Yes	Yes	Yes	No	No
Ability to incur debt through special tax bonds	Yes	Yes	Yes	No	No
Ability to incur debt through private activities	Yes	No	No	No	No
Ability to withhold spending in hazard prone areas	No	No	No	No	No
Fees for water, sewer, gas, or electric services	Yes	Yes	Yes	No	No
Apply for Community Development Block Grants	No	Yes	Yes	No	Yes
Authority to levy taxes for a special purpose	Yes	Yes	Yes	No	Yes
Impact fees for new development	No	No	No	No	No
Other local funding availability	Es	Yes	Yes	No	Limited capabilities

2.2.1 Unincorporated Tama County

The county seat for Tama County is the City of Toledo, which is located in the south-central portion of the county. The county is split into three districts, and each district has a representative who serves on the Tama 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 Tama County government includes the following departments and offices:

- 911
- Assessor
- Conservation Board
- Elections
- Emergency Management
- Better Tomorrows
- Engineer
- General Relief
- Planning & Zoning
- Public Health &Home Care
- Sanitarian & Environmental Health
- Sheriff
- Social Services
- Veteran’s Affairs

The Tama County website—www.tamacounty.org—lists the current individuals filling positions as well as important notifications, events, and meeting minutes. Regular Board of Supervisors meeting are held every Monday morning in Toledo.

Mitigation Initiatives/Capabilities

Chapter 29C of the Code of Iowa creates the State Emergency Management Division and the local Emergency Management Commission in Iowa. The Tama County Emergency Management Agency is made up of the mayors of all the jurisdictions in Tama County, one member of the Tama County Board of Supervisors (who serves as the chair) and the Sheriff. The Commission appoints an Emergency Management Coordinator to manage the agency and assist the commission.

Additional initiatives/capabilities are discussed below:

- The Alert Iowa System, which is a high-speed emergency notification system that sends warning messages to certain areas in the county or the entire county through telephone.
- Web based "Guide to Country Living in Tama County, Iowa" includes discussion of hazards such as floods and other considerations of rural living where emergency services are limited.
- CERT and all-hazards education offered to the public
- Opportunity for improvement: Review floodplain ordinance to reflect new mapping; adding safe room shelters in bathrooms in parks and public recreation areas.

2.2.2 City of Chelsea

The City of Chelsea is located in the southeast area of Tama County. The City of Chelsea is located in southeast Tama County at the intersection of county road V18 and county road E66. Chelsea is also located just 3 miles south of U.S. Highway 30 and 12 miles east of U.S. Highway 63. It had a 2019 estimated population of 272 persons, a 2.6% increase from the 2010 population. Table 2-8 through Table 2-11 below provide details on several demographic and social characteristics of Chelsea.

Table 2-8 City of Chelsea Demographic and Social Characteristics, 2014-2019

City of Chelsea	2014	2019	% Change
Population	188	272	44.68%
Median Age	43.1	29.6	-31.3%
% of Population under 5	11%	7%	-37.7%
% of Population over 65	24%	8%	-66.1%
Housing Occupancy Rate	72.0%	85.0%	18.1%
% of Owner Occupied Housing	100.0%	79.1%	-20.9%
% of Renter Occupied Housing	0.0%	20.9%	#DIV/0!
% of Housing Units with no Vehicles Available	2.40%	2.20%	-8.3%
Median Household Income	$41,250	$48,750	18.2%
Per Capita Income	$21,015	$18,023	-14.2%
% of Individuals Below Poverty Level	4.8%	30.8%	541.7%
# of Households	85	91	7.1%
Average Household Size	2.21	2.99	35.3%
% of Population Over 25 with High School Diploma	78.6%	79.5%	1.1%
% of Population Over 25 with Bachelor's Degree or Higher	9.9%	7.5%	-24.2%
% with Disability	4.3%	9.6%	123.3%
% Speak English less than "Very Well"	11.9%	18.9%	58.8%

Table 2-9 City of Chelsea Demographic and Social Characteristics Compared to the County and State

Demographic & Social Characteristics (as of 2019)	Chelsea	County	Iowa
Median Age	29.6	38.7	38.5
% of Population under 5	7%	6.7%	6%
% of Population over 65	8%	17.7%	17.5%
Housing Occupancy Rate	85%	91.8%	90.7%
% of Owner Occupied Housing	79%	70.5%	71%
% of Renter Occupied Housing	21%	29.5%	29.5%
% of Housing Units with no Vehicles Available	2%	7.6%	6.1%
Median Household Income	48750.0	$56,437	$61,691
Per Capita Income	18023.0	$27,196	$33,109
% of Individuals Below Poverty Level	31%	12.2%	7.3%
Average Household Size	9100%	2.52	2.4
% of Population Over 25 with High School Diploma	299%	83.8%	92.6%
% of Population Over 25 with bachelor's degree or Higher	80%	18.8%	29.3%
% with Disability	8%	11.6%	11.8%
% Speak English less than "Very Well"	10%	12.6%	3.6%

Table 2-10 City of Chelsea Demographics by Race and Sex

Chelsea	Population	%
Total Population	272	
Male	143	52.6%
Female	129	47.4%
White, not Hispanic	271	99.6%
Hispanic or Latino	126	46.3%
Black	0	0.0%
Asian	0	0.0%
American Indian and Alaska Native	1	0.4%
Native Hawaiian and Other Pacific Islander	0	0.0%
Some other race	0	0.0%
Two or more races	0	0.0%

Table 2-11 Types and Total Amounts of Housing Units in Chelsea

Type of housing units	Total	%
Total housing units	107	
1-unit detached	107	100.0%
1-unit attached	0	0.0%
2 units	0	0.0%
3 or 4 units	0	0.0%

Type of housing units	Total	%
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%

Mitigation Initiatives/Capabilities

Chelsea completed a Hazard Mitigation Grant Program project that involves acquiring and demolishing three structures that were badly damaged by flood waters in 2008. Chelsea also participates in Tama County's Alert Iowa system. With participation in the system, Chelsea residents are notified of emergency situations in their area or across the entire county through messages by telephone. Both land lines and cell phones can be registered to receive the warnings that are determined and issued by Tama County officials

There are multiple ways the City of Chelsea could finance a hazard mitigation project. This city in particular does not maintain its own utilities or water system so fees for these services are not available to finance projects. The resources available to the City of Chelsea are below.

- Grants
- General obligation bonds (up to 5% of City's valuation)
- Revenue bonds through publicly secured sources (paid back using road use tax, local option sales tax in accordance with approved referendum, revenue from certain enterprises, and tax increment financing)
- Capital improvements fund
- Special assessment taxes

Finance tools like impact fees cannot be used to fund projects because they are considered unconstitutional in the State of Iowa. For most projects in Chelsea, grants would need to be the main funding source in order for the project to be feasible.

- Opportunity for improvement: Promoting public information on hazards and mitigation.

2.2.3 City of Clutier

The City of Clutier is located centrally towards the eastern boundary of the county. Clutier is located at the intersection of county road V18 and county road E36. Clutier is 9 miles north of U.S. Highway 30 and 12 miles east of U.S. Highway 63. The entire area contained within the city corporate limit is ¾ square mile. Clutier, the youngest incorporated town in Tama County, was originally the 80-acre farm. It had a 2019 estimated population of 171 persons, a decrease of 19.7% from the 2010 population. Table 2-12 through Table 2-15 below provide details on several demographic and social characteristics of Clutier.

Table 2-12 City of Clutier Demographic and Social Characteristics, 2014-2019

City of Clutier	2014	2019	% Change
Population	256	171	-33.20%
Median Age	42.9	43.3	0.9%
% of Population under 5	4%	9%	118.6%
% of Population over 65	18%	21%	19.9%
Housing Occupancy Rate	90%	66.7%	-25.7%

City of Clutier	2014	2019	% Change
% of Owner Occupied Housing	84%	82.1%	-1.7%
% of Renter Occupied Housing	17%	17.9%	8.5%
% of Housing Units with no Vehicles Available	6%	2.40%	-60.7%
Median Household Income	$37,188	$51,250	37.8%
Per Capita Income	$19,067	$26,201	37.4%
% of Individuals Below Poverty Level	20.5%	12.9%	-37.1%
# of Households	115	84	-27.0%
Average Household Size	2.2	2.1	-4.1%
% of Population Over 25 with High School Diploma	81.6%	81.5%	-0.1%
% of Population Over 25 with Bachelor's Degree or Higher	7.5%	8.5%	13.3%
% with Disability	30.9%	14.6%	-52.8%
% Speak English less than "Very Well"	0.8%	0.0%	-100.0%

Table 2-13 City of Clutier Demographic and Social Characteristics Compared to the County and State

Demographic & Social Characteristics (as of 2019)	Clutier	County	Iowa
Median Age	43.3	38.7	38.5
% of Population under 5	4%	6.7%	6%
% of Population over 65	24%	17.7%	17.5%
Housing Occupancy Rate	66.7%	91.8%	90.7%
% of Owner Occupied Housing	82.1%	70.5%	71%
% of Renter Occupied Housing	17.9%	29.5%	29.5%
% of Housing Units with no Vehicles Available	2.4%	7.6%	6.1%
Median Household Income	$51,250	$56,437	$61,691
Per Capita Income	$26,201	$27,196	$33,109
% of Individuals Below Poverty Level	12.9%	12.2%	7.3%
Average Household Size	2.1	2.52	2.4
% of Population Over 25 with High School Diploma	81.5%	83.8%	92.6%
% of Population Over 25 with bachelor's degree or Higher	8.5%	18.8%	29.3%
% with Disability	14.6%	11.6%	11.8%
% Speak English less than "Very Well"	0.0%	12.6%	3.6%

Table 2-14 City of Clutier Demographics by Race and Sex

City of Clutier	Population	%
Total Population	171	
Male	78	45.6%
Female	93	54.4%
White, not Hispanic	161	94.2%
Hispanic or Latino	10	5.8%
Black	0	0.0%
Asian	6	3.5%
American Indian and Alaska Native	0	0.0%

City of Clutier	Population	%
Native Hawaiian and Other Pacific Islander	0	0.0%
Some other race	4	2.3%
Two or more races	6	3.5%

Table 2-15 Types and Total Amounts of Housing Units in Clutier

Type of housing units	Total	%
Total housing units	126	
1-unit detached	114	90.5%
1-unit attached	0	0.0%
2 units	6	4.8%
3 or 4 units	4	3.2%
5 to 9 units	0	0.0%
10 to 19 units	0	0.0%
20 or more units	2	1.6%
Mobile home	0	0.0%
Boat, RV, van, etc.	0	0.0%

Mitigation Initiatives/Capabilities

There are multiple ways the City of Clutier could finance a hazard mitigation project. This city in particular does not maintain its own energy utilities so fees for these services are not available to finance projects, but the City does maintain the city's water system. The financing resources available to the City of Clutier are below.

- Grants
- General obligation bonds (up to 5% of City's valuation)
- Revenue bonds through publicly secured sources (paid back using sewer fees, water fees, road use tax, local option sales tax in accordance with approved referendum, revenue from certain enterprises, and tax increment financing)
- Capital improvements fund
- Special assessment taxes

Finance tools like impact fees cannot be used to fund projects because they are considered unconstitutional in the State of Iowa. For most projects in Clutier, grants would need to be the main funding source in order for the project to be feasible.

Clutier participates in Tama County's Alert Iowa system. With participation in the system, Clutier residents are notified of emergency situations in their area or across the entire county through messages by telephone. Both land lines and cell phones can be registered to receive the warnings that are determined and issued by Tama County officials.

- Opportunity for improvement: Promoting public information on hazards and mitigation.

2.2.4 City of Dysart

The City of Dysart is located along the eastern boundary of the county in the northwest quadrant, at the intersection of Iowa Highway 21 and 8. Dysart is 15 miles north of U.S. Highway 30, 9 miles east of U.S. Highway 63, and 5 miles west of U.S. Highway 218. Initially settled in 1863, the City of Dysart was officially incorporated in 1881. In 2019, the city's estimated population was 1,391, which represented a slight increase of less than 1% from the 2010 population. Table 2-16 through Table 2-19 below provide details on several demographic and social characteristics of Dysart.

Table 2-16 City of Dysart Demographic and Social Characteristics, 2014-2019

City of Dysart	2014	2019	% Change
Population	1,532	1,391	-9.20%
Median Age	43.6	48.2	10.6%
% of Population under 5	8%	7%	-13.1%
% of Population over 65	23%	23%	-1.3%
Housing Occupancy Rate	83.1%	92.1%	10.8%
% of Owner Occupied Housing	87%	89%	2.3%
% of Renter Occupied Housing	13%	11%	-15.0%
% of Housing Units with no Vehicles Available	3%	1%	-85.3%
Median Household Income	$53,962	$68,500	26.9%
Per Capita Income	$24,631	$31,265	26.9%
% of Individuals Below Poverty Level	11.0%	7.1%	-35.5%
# of Households	596	558	-6.4%
Average Household Size	2.6	2.4	-6.5%
% of Population Over 25 with High School Diploma	92.8%	95.5%	2.9%
% of Population Over 25 with Bachelor's Degree or Higher	19.1%	17.8%	-6.8%
% with Disability	15.2%	10.7%	-29.6%
% Speak English less than "Very Well"	0.0%	0.5%	0%

Table 2-17 City of Dysart Demographic and Social Characteristics Compared to the County and State

Demographic & Social Characteristics (as of 2019)	Dysart	County	Iowa
Median Age	1391.0	38.7	38.5
% of Population under 5	48.2	6.7%	6%
% of Population over 65	7%	17.7%	17.5%
Housing Occupancy Rate	23%	91.8%	90.7%
% of Owner Occupied Housing	92%	70.5%	71%
% of Renter Occupied Housing	89%	29.5%	29.5%
% of Housing Units with no Vehicles Available	11%	7.6%	6.1%
Median Household Income	$68,500	$56,437	$61,691
Per Capita Income	$31,265	$27,196	$33,109
% of Individuals Below Poverty Level	7.1%	12.2%	7.3%
Average Household Size	2.44	2.52	2.4
% of Population Over 25 with High School Diploma	95.5%	83.8%	92.6%
% of Population Over 25 with bachelor's degree or Higher	17.8%	18.8%	29.3%
% with Disability	10.7%	11.6%	11.8%
% Speak English less than "Very Well"	0.5%	12.6%	3.6%

Table 2-18 City of Dysart Demographics by Race and Sex

Dysart	Population	%
Total Population	1,391	
Male	683	49.1%
Female	708	50.9%
White, not Hispanic	1,344	96.6%
Hispanic or Latino	0	0.0%
Black	27	1.9%
Asian	35	2.5%
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	15	1.1%

Table 2-19 Types and Total Amounts of Housing Units in Dysart

Type of housing units	Total	%
Total housing units	606	
1-unit detached	570	94.1%
1-unit attached	3	0.5%
2 units	0	0.0%
3 or 4 units	7	1.2%
5 to 9 units	10	1.7%
10 to 19 units	0	0.0%
20 or more units	0	0.0%
Mobile home	16	2.6%
Boat, RV, van, etc.	0	0.0%

Mitigation Initiatives/Capabilities

There are multiple ways the City of Dysart could finance a hazard mitigation project. This city in particular provides all utilities except natural gas, so they have more fees to backup bonds than other cities. The financing resources available to the City of Dysart are below.

- Grants
- General obligation bonds (up to 5% of City's valuation)
- Revenue bonds through publicly secured sources (paid back using sewer fees, water fees, road use tax, local option sales tax in accordance with approved referendum, revenue from certain enterprises, and tax increment financing)
- Capital improvements fund
- Special assessment taxes

Finance tools like impact fees cannot be used to fund projects because they are considered unconstitutional in the State of Iowa. For most projects in Dysart, grants would need to be the main funding source in order for the project to be feasible.

Dysart participates in Tama County's Alert Iowa system. With participation in the system, Dysart residents are notified of emergency situations in their area or across the entire county through messages by telephone. Both land lines and cell phones can be registered.

- Opportunity for improvement: Update the City's emergency action plan and complete training.

2.2.5 City of Elberon

Elberon is located in east central Tama County. It is six miles north of U.S. Highway 30, 15 miles east of Highway 63, and about one mile west of Highway 21. In 2019, the city's estimated population was 165, a decrease of approximately 15.8% from the 2010 population. Table 2-20 through Table 2-23 below provide details on several demographic and social characteristics of Elberon.

Table 2-20 City of Elberon Demographic and Social Characteristics, 2014-2019

City of Elberon	2014	2019	% Change
Population	170	165	-2.94%
Median Age	42.7	35.4	-17.1%
% of Population under 5	6%	4%	-28.8%
% of Population over 65	18%	21%	20.5%
Housing Occupancy Rate	83.9%	88.9%	6.0%
% of Owner Occupied Housing	87.2%	93.8%	7.6%
% of Renter Occupied Housing	12.8%	6.3%	-50.8%
% of Housing Units with no Vehicles Available	6.40%	3.10%	-51.6%
Median Household Income	$53,125	$57,500	8.2%
Per Capita Income	$23,595	$26,956	14.2%
% of Individuals Below Poverty Level	7.6%	17.6%	131.6%
# of Households	78	64	-17.9%
Average Household Size	2.2	2.3	4.1%
% of Population Over 25 with High School Diploma	88.4%	90.4%	2.3%
% of Population Over 25 with Bachelor's Degree or Higher	2.5%	0.8%	-68.0%
% with Disability	7.1%	18.8%	164.8%
% Speak English less than "Very Well"	0.0%	0.6%	0

Table 2-21 City of Elberon Demographic and Social Characteristics Compared to the County and State

Demographic & Social Characteristics (as of 2019)	Elberon	County	Iowa
Median Age	35.4	38.7	38.5
% of Population under 5	4%	6.7%	6%
% of Population over 65	21%	17.7%	17.5%
Housing Occupancy Rate	0.9	91.8%	90.7%
% of Owner Occupied Housing	94%	70.5%	71%
% of Renter Occupied Housing	6%	29.5%	29.5%
% of Housing Units with no Vehicles Available	3%	7.6%	6.1%
Median Household Income	$57,500.00	$56,437	$61,691
Per Capita Income	$26,956.00	$27,196	$33,109
% of Individuals Below Poverty Level	18%	12.2%	7.3%

Demographic & Social Characteristics (as of 2019)	Elberon	County	Iowa
Average Household Size	64.0	2.52	2.4
% of Population Over 25 with High School Diploma	230%	83.8%	92.6%
% of Population Over 25 with bachelor's degree or Higher	90%	18.8%	29.3%
% with Disability	1%	11.6%	11.8%
% Speak English less than "Very Well"	19%	12.6%	3.6%

Table 2-22 City of Elberon Demographics by Race and Sex

Elberon	Population	%
Total Population	165	
Male	98	59.4%
Female	67	40.6%
White, not Hispanic	165	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%
Two or more races	0	0.0%

Table 2-23 Types and Total Amounts of Housing Units in Elberon

Type of housing units	Total	%
Total housing units	72	
1-unit detached	70	97.2%
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	2	2.8%
Boat, RV, van, etc.	0	0.0%

Mitigation Initiatives/Capabilities

There are multiple ways the City of Elberon could finance a hazard mitigation project. The city does have a backup generator at the town hall to run the community center and city offices in emergencies. This city in particular does not maintain its own utilities or water system so fees for these services are not available to finance projects. The resources available to the City of Elberon are below:

- Grants
- General obligation bonds (up to 5% of City's valuation)

- Revenue bonds through publicly secured sources (paid back using road use tax, local option sales tax in accordance with approved referendum, revenue from certain enterprises, and tax increment financing)
- Capital improvements fund
- Special assessment taxes

Finance tools like impact fees cannot be used to fund projects because they are considered unconstitutional in the State of Iowa. For most projects in Elberon, grants would need to be the main funding source in order for the project to be feasible.

Elberon participates in Tama County's Alert Iowa system. With participation in the system, Elberon residents are notified of emergency situations in their area or across the entire county through messages by telephone. Both land lines and cell phones can be registered to receive the warnings that are determined and issued by Tama County officials.

- Opportunity for improvement: Consider joining the NFIP; outreach and education program on hazards and mitigation

2.2.6 City of Garwin

The City of Garwin is centrally located in the western portion of the county, at the intersection of County Road T47 and County Road E27. Garwin is 6 miles west of U.S. Highway 63 and 7 miles north of U.S. Highway 30. In 2019, the total population was 530, an increase of 0.6% over the 2010 population. Table 2-24 through Table 2-27 below provide details on several demographic and social characteristics of Garwin.

Table 2-24 City of Garwin Demographic and Social Characteristics, 2014-2019

City of Garwin	2014	2019	% Change
Population	516	530	2.71%
Median Age	41.3	46.6	12.8%
% of Population under 5	4%	3%	-41.9%
% of Population over 65	15%	22%	45.8%
Housing Occupancy Rate	86.4%	86%	0.0%
% of Owner Occupied Housing	85.8%	85.4%	-0.4%
% of Renter Occupied Housing	14.2%	14.6%	2.8%
% of Housing Units with no Vehicles Available	1.00%	2.40%	140.0%
Median Household Income	$49,375	$47,986	-2.8%
Per Capita Income	$24,197	$28,425	17.5%
% of Individuals Below Poverty Level	8.9%	11.1%	24.7%
# of Households	204	247	21.1%
Average Household Size	2.45	2.22	-9.4%
% of Population Over 25 with High School Diploma	94.0%	85.9%	-8.6%
% of Population Over 25 with Bachelor's Degree or Higher	14.1%	11.8%	-16.3%
% with Disability	13.0%	12.1%	-6.9%
% Speak English less than "Very Well"	0.0%	0.8%	0

Table 2-25 City of Garwin Demographic and Social Characteristics Compared to the County and State

Demographic & Social Characteristics (as of 2018)	Garwin	County	Iowa
Median Age	46.6	38.7	38.5
% of Population under 5	0.0	6.7%	6%
% of Population over 65	0.2	17.7%	17.5%
Housing Occupancy Rate	7%	91.8%	90.7%
% of Owner Occupied Housing	85%	70.5%	71%
% of Renter Occupied Housing	15%	29.5%	29.5%
% of Housing Units with no Vehicles Available	2%	7.6%	6.1%
Median Household Income	$47,986.00	$56,437	$61,691
Per Capita Income	$28,425.00	$27,196	$33,109
% of Individuals Below Poverty Level	11%	12.2%	7.3%
Average Household Size	2.2	2.52	2.4
% of Population Over 25 with High School Diploma	86%	83.8%	92.6%
% of Population Over 25 with bachelor's degree or Higher	12%	18.8%	29.3%
% with Disability	12%	11.6%	11.8%
% Speak English less than "Very Well"	1%	12.6%	3.6%

Table 2-26 City of Garwin Demographics by Race and Sex

Garwin	Population	%
Total Population	530	
Male	289	54.5%
Female	241	45.5%
White, not Hispanic	524	98.9%
Hispanic or Latino	3	0.6%
Black	8	1.5%
Asian	0	0.0%
American Indian and Alaska Native	4	0.8%
Native Hawaiian and Other Pacific Islander	0	0.0%
Some other race	2	0.4%
Two or more races	8	1.5%

Table 2-27 Types and Total Amounts of Housing Units in Garwin

Type of housing units	Total	%
Total housing units	286	
1-unit detached	263	92.0%
1-unit attached	2	0.7%
2 units	5	1.7%
3 or 4 units	9	3.1%
5 to 9 units	0	0.0%
10 to 19 units	0	0.0%
20 or more units	0	0.0%
Mobile home	7	2.4%
Boat, RV, van, etc.	0	0.0%

Mitigation Initiatives/Capabilities

There are multiple ways the City of Garwin could finance a hazard mitigation project. This city in particular does not maintain its own utilities or water system so fees for these services are not available to finance projects. The resources available to the City of Garwin are below:

- Grants
- General obligation bonds (up to 5% of City's valuation)
- Revenue bonds through publicly secured sources (paid back using road use tax, local option sales tax in accordance with approved referendum, revenue from certain enterprises, and tax increment financing)
- Capital improvements fund
- Special assessment taxes

Finance tools like impact fees cannot be used to fund projects because they are considered unconstitutional in the State of Iowa. For most projects in Garwin, grants would need to be the main funding source in order for the project to be feasible.

Garwin participates in Tama County's Alert Iowa system. With participation in the system, Garwin residents are notified of emergency situations in their area or across the entire county through messages by telephone. Both land lines and cell phones can be registered to receive the warnings that are determined and issued by Tama County officials.

- Opportunity for improvement: Promoting public information on hazards and mitigation.

2.2.7 City of Gladbrook

The City of Gladbrook is located in the northwest area of the county, at the intersection of County Road T47 and State Highway 96. Gladbrook is also 7 miles west of U.S. Highway 63 and 14 miles north U.S. Highway 30. In 2019, the total population was 982, an increase of 3.9% from the 2010 population. Table 2-28 through Table 2-31 below provide details on several demographic and social characteristics of Gladbrook.

Table 2-28 City of Gladbrook Demographic and Social Characteristics, 2014-2019

City of Gladbrook	2014	2019	% Change
Population	819	982	19.90%
Median Age	46.9	42.4	-9.6%
% of Population under 5	4%	9%	102.3%
% of Population over 65	31%	25%	-20.3%
Housing Occupancy Rate	81.7%	89.0%	8.9%
% of Owner Occupied Housing	74.8%	72.5%	-3.1%
% of Renter Occupied Housing	25.2%	27.5%	9.1%
% of Housing Units with no Vehicles Available	5.30%	4.80%	-9.4%
Median Household Income	$62,083	$55,938	-9.9%
Per Capita Income	$28,363	$28,994	2.2%
% of Individuals Below Poverty Level	3.0%	--	#VALUE!
# of Households	357	436	22.1%
Average Household Size	2.24	2.3	3.1%
% of Population Over 25 with High School Diploma	93.6%	95.6%	2.1%
% of Population Over 25 with Bachelor's Degree or Higher	16.4%	17.6%	7.3%
% with Disability	12.7%	11.3%	-11.0%
% Speak English less than "Very Well"	0.5%	0.0%	-100.0%

Table 2-29 City of Gladbrook Demographic and Social Characteristics Compared to the County and State

Demographic & Social Characteristics (as of 2019)	Gladbrook	County	Iowa
Median Age	42.4	38.7	38.5
% of Population under 5	9%	6.7%	6%
% of Population over 65	25%	17.7%	17.5%
Housing Occupancy Rate	89%	91.8%	90.7%
% of Owner Occupied Housing	73%	70.5%	71%
% of Renter Occupied Housing	28%	29.5%	29.5%
% of Housing Units with no Vehicles Available	4.8%	7.6%	6.1%
Median Household Income	$55,938	$56,437	$61,691
Per Capita Income	$28,994	$27,196	$33,109
% of Individuals Below Poverty Level	--	12.2%	7.3%
Average Household Size	2.3	2.52	2.4
% of Population Over 25 with High School Diploma	95.6%	83.8%	92.6%
% of Population Over 25 with bachelor's degree or Higher	17.6%	18.8%	29.3%
% with Disability	11.3%	11.6%	11.8%
% Speak English less than "Very Well"	0.0%	12.6%	3.6%

Table 2-30 City of Gladbrook Demographics by Race and Sex

Gladbrook	Population	%
Total Population	982	
Male	491	50.0%
Female	491	50.0%
White, not Hispanic	969	98.7%
Hispanic or Latino	8	0.8%
Black	7	0.7%
Asian	0	0.0%
American Indian and Alaska Native	6	0.6%
Native Hawaiian and Other Pacific Islander	0	0.0%
Some other race	0	0.0%
Two or more races	7	0.7%

Table 2-31 Types and Total Amounts of Housing Units in Gladbrook

Type of housing units	Total	%
Total housing units	490	
1-unit detached	404	82.4%
1-unit attached	4	0.8%
2 units	0	0.0%
3 or 4 units	21	4.3%
5 to 9 units	34	6.9%
10 to 19 units	15	3.1%
20 or more units	6	1.2%
Mobile home	6	1.2%
Boat, RV, van, etc.	0	0.0%

Mitigation Initiatives/Capabilities

There are multiple ways the City of Gladbrook could finance a hazard mitigation project. This city in particular does not maintain its own energy utilities so fees for these services are not available to finance projects, but the City does maintain the city's water system. The financing resources available to the City of Gladbrook are below.

- Grants
- General obligation bonds (up to 5% of City's valuation)
- Revenue bonds through publicly secured sources (paid back using sewer fees, water fees, road use tax, local option sales tax in accordance with approved referendum, revenue from certain enterprises, and tax increment financing)
- Capital improvements fund
- Special assessment taxes

Finance tools like impact fees cannot be used to fund projects because they are considered unconstitutional in the State of Iowa. For most projects in Gladbrook, grants would need to be the main funding source in order for the project to be feasible.

Gladbrook participates in Tama County's Alert Iowa system. With participation in the system, Gladbrook residents are notified of emergency situations in their area or across the entire county through messages by telephone. Both land lines and cell phones can be registered to receive the warnings that are determined and issued by Tama County officials.

- Opportunity for improvement: Promoting public information on hazards and mitigation.

2.2.8 City of Lincoln

Lincoln is located along county road D65. Lincoln is one mile west of county road T47, 12 miles west of U.S. Highway 63, and 19 miles north of U.S. Highway 30. Lincoln was incorporated in 1913. In 2019, the total population of the city was 116, a decrease of over 28% from the 2010 population. Table 2-32 through Table 2-35 below provide details on several demographic and social characteristics of Lincoln.

Table 2-32 City of Lincoln Demographic and Social Characteristics

City of Lincoln	2014	2019	% Change
Population	134	116	-13.43%
Median Age	48.3	51.5	6.6%
% of Population under 5	10.4	4%	-99.6%
% of Population over 65	25.4	17%	-99.3%
Housing Occupancy Rate	91.5%	63.5%	-30.6%
% of Owner Occupied Housing	76.9%	87.0%	13.1%
% of Renter Occupied Housing	23.1%	13.0%	-43.7%
% of Housing Units with no Vehicles Available	13.80%	3.70%	-73.2%
Median Household Income	$32,083	$40,833	27.3%
Per Capita Income	$19,271	$25,252	31.0%
% of Individuals Below Poverty Level	26.1%	17.0%	-34.9%
# of Households	65	54	-16.9%
Average Household Size	2.1	1.8	-13.9%
% of Population Over 25 with High School Diploma	93.0%	91.5%	-1.6%
% of Population Over 25 with Bachelor's Degree or Higher	4.7%	3.7%	-21.3%
% with Disability	31.3%	12.9%	-58.8%
% Speak English less than "Very Well"	0.0%	0.9%	0

Table 2-33 City of Lincoln Demographic and Social Characteristics Compared to the County and State

Demographic & Social Characteristics (as of 2019)	Lincoln	County	Iowa
Median Age	51.5	38.7	38.5
% of Population under 5	4%	6.7%	6%
% of Population over 65	17%	17.7%	17.5%
Housing Occupancy Rate	64%	91.8%	90.7%
% of Owner Occupied Housing	87%	70.5%	71%
% of Renter Occupied Housing	13%	29.5%	29.5%
% of Housing Units with no Vehicles Available	3.7%	7.6%	6.1%
Median Household Income	$40,833	$56,437	$61,691
Per Capita Income	$25,252	$27,196	$33,109
% of Individuals Below Poverty Level	17.0%	12.2%	7.3%
Average Household Size	1.8	2.52	2.4
% of Population Over 25 with High School Diploma	91.5%	83.8%	92.6%
% of Population Over 25 with bachelor's degree or Higher	3.7%	18.8%	29.3%
% with Disability	12.9%	11.6%	11.8%
% Speak English less than "Very Well"	0.9%	12.6%	3.6%

Table 2-34 City of Lincoln Demographics by Race and Sex

Lincoln	Population	%
Total Population	116	
Male	68	58.6%
Female	48	41.4%
White, not Hispanic	116	100.0%
Hispanic or Latino	10	8.6%
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	10	8.6%

Table 2-35 Types and Total Amounts of Housing Units in Lincoln

Type of housing units	Total	%
Total housing units	85	
1-unit detached	73	85.9%
1-unit attached	0	0.0%
2 units	1	1.2%
3 or 4 units	5	5.9%
5 to 9 units	0	0.0%
10 to 19 units	0	0.0%
20 or more units	0	0.0%
Mobile home	6	7.1%
Boat, RV, van, etc.	0	0.0%

Mitigation Initiatives/Capabilities

There are multiple ways the City of Lincoln could finance a hazard mitigation project. This city in particular does not maintain its own energy or water utilities so fees for these services are not available to finance projects. The financing resources available to the City of Lincoln are below.

- Grants
- General obligation bonds (up to 5% of City's valuation)
- Revenue bonds through publicly secured sources (road use tax, local option sales tax in accordance with approved referendum, revenue from certain enterprises, and tax increment financing)
- Capital improvements fund
- Special assessment taxes

Finance tools like impact fees cannot be used to fund projects because they are considered unconstitutional in the State of Iowa. For most projects in Lincoln, grants would need to be the main funding source in order for the project to be feasible.

Lincoln participates in Tama County's Alert Iowa system. With participation in the system, Lincoln residents are notified of emergency situations in their area or across the entire county through messages by telephone. Both land lines and cell phones can be registered to receive the warnings that are determined and issued by Tama County officials.

- Opportunity for improvement: Promoting public information on hazards and mitigation; improving and updating emergency siren.

2.2.9 City of Montour

Montour is located in western Tama County less than two miles south of U.S. Highway 30. It is approximately 10 miles west of Toledo, the Tama County seat, and less than 15 miles east of Marshalltown in neighboring Marshall County. In 2019, Montour had a total population of 254, an increase of 2% over the 2010 population. Table 2-36 through Table 2-39 below provide details on several demographic and social characteristics of Montour.

Table 2-36 City of Montour Demographic and Social Characteristics, 2014-2019

City of Montour	2014	2019	% Change
Population	268	254	-5.22%
Median Age	47.4	47.0	-0.8%
% of Population under 5	7.8	2%	-99.7%
% of Population over 65	17.9	19%	-98.9%
Housing Occupancy Rate	89.6%	81.7%	-8.8%
% of Owner Occupied Housing	89.3%	88.8%	-0.6%
% of Renter Occupied Housing	10.7%	11.2%	4.7%
% of Housing Units with no Vehicles Available	0.90%	0.00%	-100.0%
Median Household Income	$57,083	$50,938	-10.8%
Per Capita Income	$27,247	$32,621	19.7%
% of Individuals Below Poverty Level	7.8%	9.1%	16.7%
# of Households	112	107	-4.5%
Average Household Size	2.4	2.2	-6.8%
% of Population Over 25 with High School Diploma	85.0%	88.8%	4.5%
% of Population Over 25 with Bachelor's Degree or Higher	5.8%	9.3%	60.3%
% with Disability	14.9%	16.1%	8.1%
% Speak English less than "Very Well"	0.0%	0.8%	0

Table 2-37 City of Montour Demographic and Social Characteristics Compared to the County and State

Demographic & Social Characteristics (as of 2019)	Montour	County	Iowa
Median Age	47.0	38.7	38.5
% of Population under 5	2%	6.7%	6%
% of Population over 65	19%	17.7%	17.5%
Housing Occupancy Rate	82%	91.8%	90.7%
% of Owner Occupied Housing	89%	70.5%	71%
% of Renter Occupied Housing	11%	29.5%	29.5%
% of Housing Units with no Vehicles Available	0.0%	7.6%	6.1%
Median Household Income	$50,938	$56,437	$61,691
Per Capita Income	$32,621	$27,196	$33,109
% of Individuals Below Poverty Level	9.1%	12.2%	7.3%
Average Household Size	2.2	2.52	2.4
% of Population Over 25 with High School Diploma	88.8%	83.8%	92.6%
% of Population Over 25 with bachelor's degree or Higher	9.3%	18.8%	29.3%
% with Disability	16.1%	11.6%	11.8%
% Speak English less than "Very Well"	0.8%	12.6%	3.6%

Table 2-38 City of Montour Demographics by Race and Sex

Montour	Population	%
Total Population	254	
Male	130	51.2%
Female	124	48.8%
White, not Hispanic	233	91.7%
Hispanic or Latino	14	5.5%
Black	11	4.3%
Asian	0	0.0%
American Indian and Alaska Native	11	4.3%
Native Hawaiian and Other Pacific Islander	0	0.0%
Some other race	0	0.0%
Two or more races	0	0.0%

Table 2-39 Types and Total Amounts of Housing Units in Montour

Type of housing units	Total	%
Total housing units	131	
1-unit detached	117	89.3%
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	14	10.7%
Boat, RV, van, etc.	0	0.0%

Mitigation Initiatives/Capabilities

Montour participates in Tama County's Alert Iowa system. With participation in the system, Montour residents are notified of emergency situations in their area or across the entire county through messages by telephone. Both land lines and cell phones can be registered to receive the warnings that are determined and issued by Tama County officials.

In 2009, Montour was awarded a Supplemental CDBG Disaster Recovery Funding Public Infrastructure Grant to help finance sewer improvements within the city. The project involves replacing and lining several thousand feet of sewer lines, replacing and rehabilitating manholes, grouting, installing a new lift station pump, constructing a new outfall line to the lagoon, purchasing a backup generator for the lift station, and flood proofing the lift station. The improvements alone cost over $900,000 and the grant award amount is almost $822,000.

The impetus for this project is the frequent backups in the city wastewater system that causes substantial flooding in several Montour residents' homes. System backups also cause bypasses of raw sewage into Indian Creek, which is an Iowa River tributary. The poor condition of the wastewater system is mainly due to age and overloading during the 2008 flood.

- Opportunity for improvement: Promoting public information on hazards and mitigation.

2.2.10 City of Tama

Tama is located at the junction of U.S. Highway 30 and Iowa 63 in the south-central part of the County. The City is about sixty-five miles northeast of Des Moines, the state capital. Tama also shares its northern border with Toledo, the county seat. Tama was officially incorporated in 1869. In 2019, the City of Tama had a total population of 2,769, an increase of 3.8% over the 2010 population. Table 2-40 through Table 2-43 below provide details on several demographic and social characteristics of Tama.

Table 2-40 City of Tama Demographic and Social Characteristics, 2014-2019

City of Tama	2014	2019	% Change
Population	2,835	2,769	-2.33%
Median Age	34.5	35.9	4.1%
% of Population under 5	7%	8%	10.3%
% of Population over 65	13%	16%	30.2%
Housing Occupancy Rate	89.2%	89.9%	0.8%
% of Owner Occupied Housing	71.0%	68.4%	-3.7%
% of Renter Occupied Housing	29.0%	31.6%	9.0%
% of Housing Units with no Vehicles Available	4.70%	5.50%	17.0%
Median Household Income	$50,610	$50,792	0.4%
Per Capita Income	$19,949	$21,108	5.8%
% of Individuals Below Poverty Level	22.3%	15.5%	-30.5%
# of Households	1,032	1,021	-1.1%
Average Household Size	2.7	2.9	7.4%
% of Population Over 25 with High School Diploma	85.2%	82.5%	-3.2%
% of Population Over 25 with Bachelor's Degree or Higher	18.3%	7.7%	-57.9%
% with Disability	12.6%	1.6%	-87.3%
% Speak English less than "Very Well"	10.4%	14.7%	41.3%

Table 2-41 City of Tama Demographic and Social Characteristics Compared to the County and State

Demographic & Social Characteristics (as of 2019)	Tama	County	Iowa
Median Age	35.9	38.7	38.5
% of Population under 5	8%	6.7%	6%
% of Population over 65	13%	17.7%	17.5%
Housing Occupancy Rate	90%	91.8%	90.7%
% of Owner Occupied Housing	68%	70.5%	71%
% of Renter Occupied Housing	32%	29.5%	29.5%
% of Housing Units with no Vehicles Available	5.5%	7.6%	6.1%
Median Household Income	$50,792	$56,437	$61,691
Per Capita Income	$21,108	$27,196	$33,109
% of Individuals Below Poverty Level	15.5%	12.2%	7.3%
Average Household Size	2.9	2.52	2.4
% of Population Over 25 with High School Diploma	82.5%	83.8%	92.6%
% of Population Over 25 with bachelor’s degree or Higher	7.7%	18.8%	29.3%
% with Disability	1.6%	11.6%	11.8%
% Speak English less than "Very Well"	14.7%	12.6%	3.6%

Table 2-42 City of Tama Demographics by Race and Sex

Tama	Population	%
Total Population	2,769	
Male	1,401	50.6%
Female	1,368	49.4%
White, not Hispanic	2,261	81.7%
Hispanic or Latino	959	34.6%
Black	65	2.3%
Asian	30	1.1%
American Indian and Alaska Native	236	8.5%
Native Hawaiian and Other Pacific Islander	0	0.0%
Some other race	177	6.4%
Two or more races	26	0.9%

Table 2-43 Types and Total Amounts of Housing Units in Tama

Type of housing units	Total	%
Total housing units	1,136	
1-unit detached	841	74.0%
1-unit attached	5	0.4%
2 units	105	9.2%
3 or 4 units	46	4.0%
5 to 9 units	73	6.4%
10 to 19 units	56	4.9%
20 or more units	0	0.0%
Mobile home	10	0.9%
Boat, RV, van, etc.	0	0.0%

Mitigation Initiatives/Capabilities

There are multiple ways the City of Tama could finance a hazard mitigation project. This city in particular does not maintain its own energy utilities so fees for these services are not available to finance projects, but the City does maintain the city's water system. The financing resources available to the City of Tama are below.

- Grants
- General obligation bonds (up to 5% of City's valuation)
- Revenue bonds through publicly secured sources (paid back using sewer fees, water fees, road use tax, local option sales tax in accordance with approved referendum, revenue from certain enterprises, and tax increment financing)
- Capital improvements fund
- Special assessment taxes

Finance tools like impact fees cannot be used to fund projects because they are considered unconstitutional in the State of Iowa. For most projects in Tama, grants would need to be the main funding source in order for the project to be feasible

The Iowa River runs through the southern part of Tama where major flooding is historically a problem. In 1993-1994, a levee was built to prevent flooding in southern Tama. According to information from Iowa Homeland Security, the levee is believed to be certifiable to a 100-year flood level protection. In the 2008 flood, the levee prevented major flooding in the city, and the only major issue was debris that had to be removed from wells.

Also, Tama participates in Tama County's Alert Iowa system. With participation in the system, Tama residents are notified of emergency situations in their area or across the entire county through messages by telephone. Both land lines and cell phones can be registered to receive the warnings that are determined and issued by Tama County officials.

- Opportunity for improvement: Promoting public information on hazards and mitigation, including evacuation procedures.

2.2.11 City of Toledo

The City of Toledo is located in the southwest quadrant of the county, at the intersection of U.S. Highways 30 and Iowa Highway 63. Toledo is centrally located between three of Iowa's largest cities—Cedar Rapids, Waterloo, and Des Moines. Interstate 80 is just 20 miles south while Interstate 35 is 55 miles west, and Interstate 380 is 50 miles east of Toledo. The City of Toledo was chosen as the county seat of Tama County in 1853. In 2019, Toledo had a total population of 2,303, representing a 1.6% decrease from 2010 population. Table 2-44 through Table 2-47 below provide details on several demographic and social characteristics of Toledo.

Table 2-44 City of Toledo Demographic and Social Characteristics, 2014-2019

City of Toledo	2014	2019	% Change
Population	2,208	2,303	4.30%
Median Age	41.3	38.6	-6.5%
% of Population under 5	7%	6%	-16.4%
% of Population over 65	24%	21%	-13.8%
Housing Occupancy Rate	90.7%	84.8%	-6.5%
% of Owner Occupied Housing	69.2%	69.6%	0.6%
% of Renter Occupied Housing	30.8%	30.4%	-1.3%
% of Housing Units with no Vehicles Available	5.50%	8.90%	61.8%
Median Household Income	$42,708	$39,767	-6.9%

City of Toledo	2014	2019	% Change
Per Capita Income	$21,107	$20,215	-4.2%
% of Individuals Below Poverty Level	23.9%	15.8%	-33.9%
# of Households	847	924	9.1%
Average Household Size	2.4	2.2	-5.9%
% of Population Over 25 with High School Diploma	81.3%	85.2%	4.8%
% of Population Over 25 with Bachelor's Degree or Higher	9.0%	12.0%	33.3%
% with Disability	18.2%	10.5%	-42.3%
% Speak English less than "Very Well"	8.1%	7.7%	-4.9%

Table 2-45 City of Toledo Demographic and Social Characteristics Compared to the County and State

Demographic & Social Characteristics (as of 2019)	Toledo	County	Iowa
Median Age	38.6	38.7	38.5
% of Population under 5	6%	6.7%	6%
% of Population over 65	21%	17.7%	17.5%
Housing Occupancy Rate	85%	91.8%	90.7%
% of Owner Occupied Housing	70%	70.5%	71%
% of Renter Occupied Housing	30%	29.5%	29.5%
% of Housing Units with no Vehicles Available	8.9%	7.6%	6.1%
Median Household Income	$39,767	$56,437	$61,691
Per Capita Income	$20,215	$27,196	$33,109
% of Individuals Below Poverty Level	15.8%	12.2%	7.3%
Average Household Size	2.2	2.52	2.4
% of Population Over 25 with High School Diploma	85.2%	83.8%	92.6%
% of Population Over 25 with bachelor's degree or Higher	12.0%	18.8%	29.3%
% with Disability	10.5%	11.6%	11.8%
% Speak English less than "Very Well"	7.7%	12.6%	3.6%

Table 2-46 City of Toledo Demographics by Race and Sex

Toledo	Population	%
Total Population	2,303	
Male	999	43.4%
Female	1,304	56.6%
White, not Hispanic	2,049	89.0%
Hispanic or Latino	326	14.2%
Black	28	1.2%
Asian	20	0.9%
American Indian and Alaska Native	202	8.8%
Native Hawaiian and Other Pacific Islander	0	0.0%
Some other race	56	2.4%
Two or more races	52	2.3%

Table 2-47 Types and Total Amounts of Housing Units in Toledo

Type of housing units	Total	%
Total housing units	1,089	
1-unit detached	789	72.5%
1-unit attached	0	0.0%
2 units	50	4.6%
3 or 4 units	26	2.4%
5 to 9 units	58	5.3%
10 to 19 units	15	1.4%
20 or more units	23	2.1%
Mobile home	126	11.6%
Boat, RV, van, etc.	0	0.0%

Mitigation Initiatives/Capabilities

Toledo participates in Tama County's Alert Iowa system. With participation in the system, Toledo residents are notified of emergency situations in their area or across the entire county through messages by telephone. Both land lines and cell phones can be registered to receive the warnings that are determined and issued by Tama County officials. The City of Toledo was awarded approximately $800,000 in I-Jobs funding to move the Public Works Building. During the 2008 flood, the building was inundated with thirty inches of flood water. In the past thirty years, this building has flooded six times so the problem is definitely recurring. The equipment and supplies located in this building are extremely important for day-to-day and even disaster-related city services. The City's trucks, tractors, barricades, signs, and other supplies are at risk for damage. Fortunately, this is the only building in Toledo that receives regular flooding. The Public Works Facility is going to be relocated to city land by the city's wastewater treatment facility.

There are multiple ways the City of Toledo could finance a hazard mitigation project. This city in particular does not maintain its own energy utilities so fees for these services are not available to finance projects, but the City does maintain the city's water system. The financing resources available to the City of Toledo are below.

- Grants
- General obligation bonds (up to 5% of City's valuation)
- Revenue bonds through publicly secured sources (paid back using sewer fees, water fees, road use tax, local option sales tax in accordance with approved referendum, revenue from certain enterprises, and tax increment financing)
- Capital improvements fund
- Special assessment taxes

Finance tools like impact fees cannot be used to fund projects because they are considered unconstitutional in the State of Iowa. For most projects in Toledo, grants would need to be the main funding source in order for the project to be feasible.

2.2.12 City of Traer

Traer is located in northeast Tama County, about 21 miles south of the Cedar Valley at the intersection of Highways 63 and 8. In 2019, Traer had a total population of 1,547, representing a 9.2% decrease from 2010 population. Table 2-48 through Table 2-51 below provide details on several demographic and social characteristics of Traer.

Table 2-48 City of Traer Demographic and Social Characteristics, 2014-2019

City of Traer	2014	2019	% Change
Population	1,814	1,547	-14.72%
Median Age	41.7	47.0	12.7%
% of Population under 5	7%	7%	-10.8%
% of Population over 65	24%	29%	22.0%
Housing Occupancy Rate	94.3%	89.1%	-5.5%
% of Owner Occupied Housing	66.6%	73.4%	10.2%
% of Renter Occupied Housing	33.4%	26.6%	-20.4%
% of Housing Units with no Vehicles Available	5.40%	5.40%	0.0%
Median Household Income	$48,889	$60,673	24.1%
Per Capita Income	$25,117	$30,417	21.1%
% of Individuals Below Poverty Level	8.3%	4.8%	-42.2%
# of Households	724	669	-7.6%
Average Household Size	2.5	2.4	-3.2%
% of Population Over 25 with High School Diploma	90.4%	94.1%	4.1%
% of Population Over 25 with Bachelor's Degree or Higher	17.9%	24.2%	35.2%
% with Disability	14.6%	15.7%	7.5%
% Speak English less than "Very Well"	1.2%	0.0%	-100.0%

Table 2-49 City of Traer Demographic and Social Characteristics Compared to the County and State

Demographic & Social Characteristics (as of 2019)	Traer	County	Iowa
Median Age	47.0	38.7	38.5
% of Population under 5	7%	6.7%	6%
% of Population over 65	29%	17.7%	17.5%
Housing Occupancy Rate	89%	91.8%	90.7%
% of Owner Occupied Housing	73%	70.5%	71%
% of Renter Occupied Housing	27%	29.5%	29.5%
% of Housing Units with no Vehicles Available	5.4%	7.6%	6.1%
Median Household Income	$60,673	$56,437	$61,691
Per Capita Income	$30,417	$27,196	$33,109
% of Individuals Below Poverty Level	4.8%	12.2%	7.3%
Average Household Size	2.4	2.52	2.4
% of Population Over 25 with High School Diploma	94.1%	83.8%	92.6%
% of Population Over 25 with bachelor's degree or Higher	24.2%	18.8%	29.3%
% with Disability	15.7%	11.6%	11.8%
% Speak English less than "Very Well"	0.0%	12.6%	3.6%

Table 2-50 City of Traer Demographics by Race and Sex

Traer	Population	%
Total Population	1,547	
Male	714	46.2%
Female	833	53.8%
White, not Hispanic	1,538	99.4%
Hispanic or Latino	29	1.9%
Black	0	0.0%

Traer	Population	%
Asian	9	0.6%
American Indian and Alaska Native	4	0.3%
Native Hawaiian and Other Pacific Islander	4	0.3%
Some other race	3	0.2%
Two or more races	11	0.7%

Table 2-51 Types and Total Amounts of Housing Units in Traer

Type of housing units	Total	%
Total housing units	751	
1-unit detached	620	82.6%
1-unit attached	20	2.7%
2 units	30	4.0%
3 or 4 units	37	4.9%
5 to 9 units	13	1.7%
10 to 19 units	29	3.9%
20 or more units	3	0.4%
Mobile home	0	0.0%
Boat, RV, van, etc.	0	0.0%

Mitigation Initiatives/Capabilities

Traer participates in Tama County's Alert Iowa system. With participation in the system, Traer residents are notified of emergency situations in their area or across the entire county through messages by telephone. Both land lines and cell phones can be registered to receive the warnings that are determined and issued by Tama County officials

There are multiple ways the City of Traer could finance a hazard mitigation project. Traer purchases electricity wholesale and distributes to residents. Along with electric utilities, the City maintains the water system so fees from electric and water utilities can be used toward debt incurred for projects. The financing resources available to the City of Traer are below.

- Grants
- General obligation bonds (up to 5% of City's valuation)
- Revenue bonds through publicly secured sources (utility fees, road use tax, local option sales tax in accordance with approved referendum, revenue from certain enterprises, and tax increment financing)
- Capital improvements fund
- Special assessment taxes

Finance tools like impact fees cannot be used to fund projects because they are considered unconstitutional in the State of Iowa. For most projects in Traer, grants would need to be the main funding source in order for the project to be feasible.

- Opportunity for improvement: Promoting public information on hazards and mitigation; bolster warning capabilities including a siren on west side of city.

2.2.13 City of Vining

The City of Vining is located at the intersection of County Road V18 and County Road E44. Vining is 2 miles north of U.S. Highway 30 and 12 miles east of U.S. Highway 63. Incorporated in 1881, Vining is Tama County's smallest incorporated city. In 2019, Vining had a population of 64, which was 28% higher than its

2010 population. Table 2-52 through Table 2-55 below provide details on several demographic and social characteristics of Vining.

Table 2-52 City of Vining Demographic and Social Characteristics, 2014-2019

City of Vining	2014	2019	% Change
Population	78	64	-17.95%
Median Age	41	59.0	43.9%
% of Population under 5	10%	0%	-100.0%
% of Population over 65	17%	41%	143.1%
Housing Occupancy Rate	84.6%	97.3%	15.0%
% of Owner Occupied Housing	93.9%	100.0%	6.5%
% of Renter Occupied Housing	6.1%	0.0%	-100.0%
% of Housing Units with no Vehicles Available	0.00%	0.00%	#DIV/0!
Median Household Income	$61,250	$58,750	-4.1%
Per Capita Income	$27,203	$33,567	23.4%
% of Individuals Below Poverty Level	5.1%	6.3%	23.5%
# of Households	33	36	9.1%
Average Household Size	2.5	1.8	-27.3%
% of Population Over 25 with High School Diploma	98.4%	94.2%	-4.3%
% of Population Over 25 with Bachelor’s Degree or Higher	12.9%	11.5%	-10.9%
% with Disability	9.0%	20.3%	125.6%
% Speak English less than "Very Well"	0.0%	0.0%	0

Table 2-53 City of Vining Demographic and Social Characteristics Compared to the County and State

Demographic & Social Characteristics (as of 2019)	Vining	County	Iowa
Median Age	59.0	38.7	38.5
% of Population under 5	0%	6.7%	6%
% of Population over 65	41%	17.7%	17.5%
Housing Occupancy Rate	97%	91.8%	90.7%
% of Owner Occupied Housing	100%	70.5%	71%
% of Renter Occupied Housing	0%	29.5%	29.5%
% of Housing Units with no Vehicles Available	0.0%	7.6%	6.1%
Median Household Income	$58,750	$56,437	$61,691
Per Capita Income	$33,567	$27,196	$33,109
% of Individuals Below Poverty Level	6.3%	12.2%	7.3%
Average Household Size	1.8	2.52	2.4
% of Population Over 25 with High School Diploma	94.2%	83.8%	92.6%
% of Population Over 25 with bachelor’s degree or Higher	11.5%	18.8%	29.3%
% with Disability	20.3%	11.6%	11.8%
% Speak English less than "Very Well"	0.0%	12.6%	3.6%

Table 2-54 City of Vining Demographics by Race and Sex

Vining	Population	%
Total Population	64	
Male	29	45.3%
Female	35	54.7%
White, not Hispanic	64	100.0%

Vining	Population	%
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	0	0.0%

Table 2-55 Types and Total Amounts of Housing Units in Vining

Type of housing units	Total	%
Total housing units	37	
1-unit detached	30	81.1%
1-unit attached	0	0.0%
2 units	6	16.2%
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	1	2.7%
Boat, RV, van, etc.	0	0.0%

Mitigation Initiatives/Capabilities

There are multiple ways the City of Vining could finance a hazard mitigation project. This city in particular does not maintain its own utilities or water system so fees for these services are not available to finance projects. The resources available to the City of Vining are below:

- Grants
- General obligation bonds (up to 5% of City's valuation)
- Revenue bonds through publicly secured sources (paid back using road use tax, local option sales tax in accordance with approved referendum, revenue from certain enterprises, and tax increment financing)
- Capital improvements fund
- Special assessment taxes

Finance tools like impact fees cannot be used to fund projects because they are considered unconstitutional in the State of Iowa. For most projects in Vining, grants would need to be the main funding source in order for the project to be feasible.

Vining participates in Tama County's Alert Iowa system. With participation in the system, Vining residents are notified of emergency situations in their area or across the entire county through messages by telephone. Both land lines and cell phones can be registered to receive the warnings that are determined and issued by Tama County officials.

- Opportunity for improvement: Promoting public information on hazards and mitigation; enforcement of a burn ban during dry weather

2.2.14 School Districts Participating in the Tama County Hazard Mitigation Plan

This section includes general profile information for four Tama County school districts. The four school districts in the planning area are as follows.

- GMG Marshall Community School District
- North Tama Community School District
- South Tama Community School District
- Union Community School District

The map in Figure 2-5 provides the boundaries of the school districts in Tama County and Table 2-56 that follows provides location and enrollment information for each school district. For school districts that are in more than one county, the school building and enrollment data is for the entire district, not only the portion within Tama County.

Mitigation Initiatives/Capabilities

Additional mitigation initiatives/capabilities since the last plan update are discussed below:

- GMG School District has planted trees around school to shade parking and school area.
- Union Community School District has made roof improvements to school district buildings and done crisis planning and drills
- Opportunities for improvement: Review and document lessons learned from COVID-19 pandemic to mitigate impacts from future disease outbreaks
- Opportunity for improvement: Construction of a new safe room/emergency shelter in schools for each district.

Figure 2-5 Tama County School District Boundaries

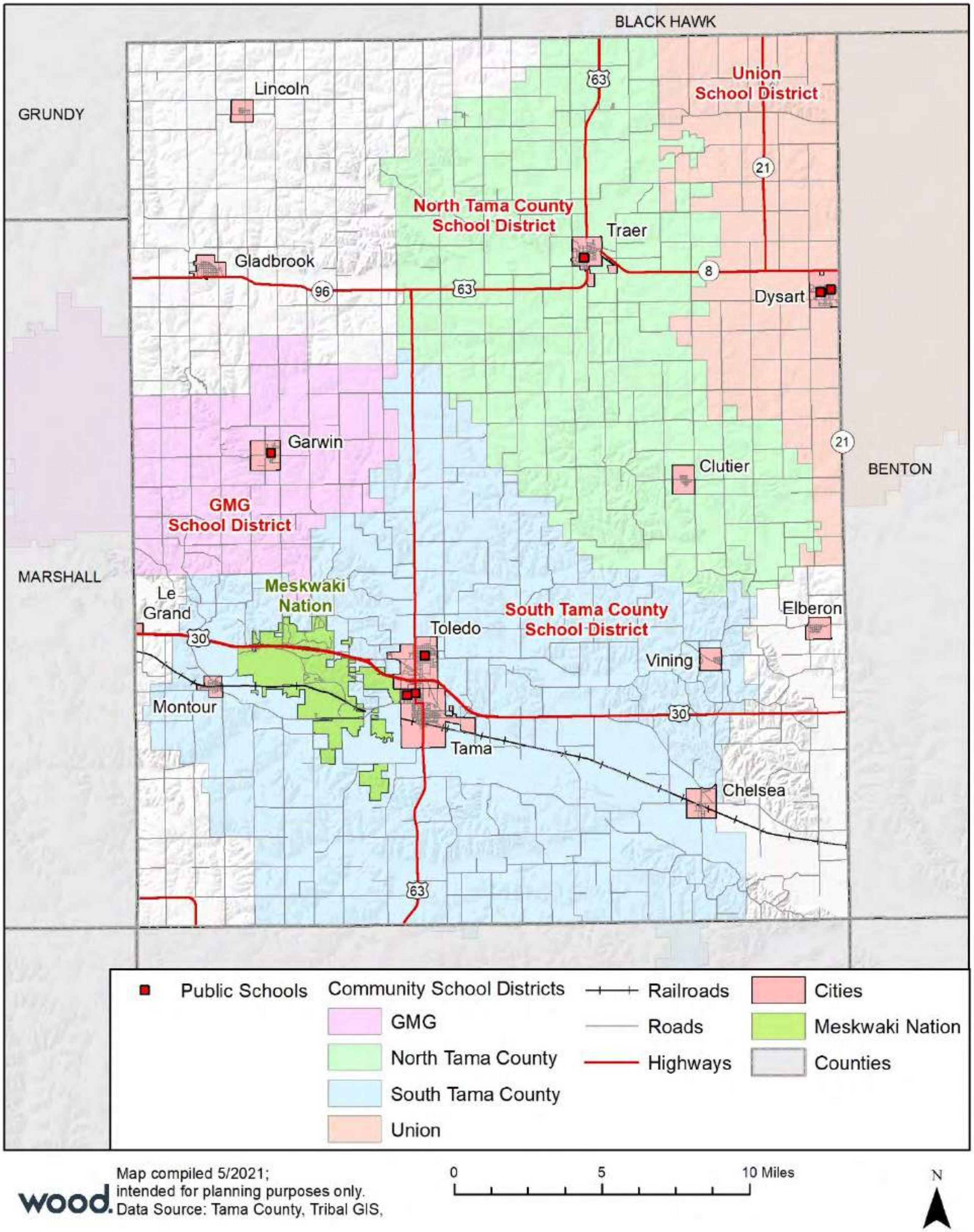


Table 2-56 Tama County School Districts Enrollment Data, 2010-2020

District	2010-2011 Certified Enrollment	2020-2021 Certified Enrollment	# Change 2010-2020	% Change 2010-2020
GMG	329.4	250.4	-79	-24%
North Tama	527.8	435.1	-92.7	-17.6%
South Tama	1,518.5	1,512.6	-5.9	-0.4%
Union	1,253.9	992.8	-261.1	-20.8%

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 2-57 provides a summary of the reported capabilities for each participating school district.

Table 2-57 Summary of Mitigation Capabilities, Tama County Public School Districts

Capability	GMG Community School District	North Tama County School District	South Tama County School District	Union Community School District
	Planning Elements			
Master Plan	Y	Y	Y	Y
Capital Improvement Plan	Y	Y	Y	Y
School Emergency Plan	Y	Y	Y	Y
Weapons Policy	Y	Y	Y	Y
Personnel Resources	Y	Y	Y	Y
Full-time building official (i.e. principal)	Y	Y	Y	Y
Emergency Manager	N	N	N	N
Grant Writer	N	N	N	N
Public Information Officer	N	N	N	N
	Financial Resources			
Capital Improvements project funding	Y	Y	Y	Y
Local funds	Y	Y	Y	Y
General obligation bonds	Y	Y	Y	Y
Bonds	Y	Y	Y	Y
Private activities/donations	Y	Y	Y	Y
State and federal funds	Y	Y	Y	Y
Other				
	Public Education Programs			
Fire evacuation training	Y	Y	Y	Y
Tornado sheltering Exercises	Y	Y	Y	Y
Public Address/Emergency Alert System	Y	Y	Y	Y
NOAA Weather Radios	Y	Y	Y	Y
Lock-down security training	Y	Y	Y	Y
Mitigation Programs	N	N	N	N
Tornado Shelter/Saferoom				
Campus Police	N	N	N	N

3 Risk Assessment

44 CFR 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 process identifies and profiles relevant hazards and assesses the exposure of lives, property, and infrastructure within Tama 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 Tama 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

The risk assessment is the process of measuring the potential loss of life, personal injury, economic injury, and property damage resulting from natural and human caused hazards. It allows emergency management personnel to establish early response priorities by identifying potential hazards and vulnerable assets. Data collected through this process has been incorporated into the following sections of this chapter:

Section 3.1: Hazard Identification – Identifies the hazards that threaten the Planning Area (Tama County) and describes why some hazards have been omitted from further consideration.

Section 3.2: Assets Summary - Describes the methodology for inventorying assets as the basis for determining vulnerability of the Planning Area to the identified hazards.

Sections 3.3-3.4: Hazard Profiles - Discusses the threat each hazard poses to the Planning Area and describes previous occurrences of hazard events and the likelihood of future occurrences (2013 FEMA Local Mitigation Planning Handbook Risk Assessment, Step 1). It also includes a vulnerability assessment for each hazard, considering assets at risk, critical facilities, and future development trends (2013 FEMA Local Mitigation Planning Handbook Risk Assessment, Steps 2, 3 and 4). Section 3.3 discusses natural hazards, while Section 3.4 Other Hazards discusses human caused hazards.

3.1 Hazard Identification

DMA Requirement §201.6(c)(2)(i):
[The risk assessment shall include a] description of the type 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.

The first step in developing a risk assessment is identifying the hazards. The Tama County Hazard Mitigation Planning Committee (HMPC) conducted a hazard identification study to determine the hazards that threaten the Planning Area and estimates of potential losses or assets that could be affected by those hazards (if/as applicable).

3.1.1 Results and Methodology

The hazard scoring methodology used for this plan follows the methodology used in the 2016 planning process, which was modeled off of Iowa's 2007 Hazard Mitigation Plan.

The previous plan included the following five ranking criteria: (1) historic occurrence, (2) probability, (3) human vulnerability, (5) severity of impact, and (6) speed of onset. The hazard scoring methodology that was used for the risk assessment of this plan update is described in the following tables.

Historical Occurrence: number of times that a hazard has occurred in the jurisdiction in the past.

Score	Number of Historical Occurrences
1	Less than 4 occurrences
2	4 to 7 occurrences
3	8 to 12 occurrences
4	More than 12 occurrences

Probability reflects the likelihood of a hazard occurring again in the future.

Score	Frequency of Occurrence
1	Unlikely – Less than 10% chance probability in the next year
2	Possible -Between 10% and 25% probability in the next year
3	Likely – Between 26% and 60% probability in the next year
4	High Likely – More than 60% chance in the next year

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

Score	Percentage of People and Property Affected
1	Less than 25% of people and property affected
2	25-50% of people and property affected
3	51-75% of people and property affected
4	More than 75% of people and property affected

Severity of Impact is an assessment of severity in terms of injuries and fatalities, personal property, and infrastructure.

Score	Characteristics
1	Negligible Few if any injuries. Minor quality of life lost with little or no property damage. Brief interruption of critical facilities and services for less than 4 hours. No environmental impact. No impact to reputation of the jurisdiction
2	Limited Minor injuries and illness. Minor or short-term property damage which does not threaten structural stability. Shutdown of critical facilities and services for 4 to 24 hours. Minor short-term environmental impact. Very limited impact to reputation of the jurisdiction
3	Critical Serious injury and illness. Major or long-term property damage which threatens structural stability. Shutdown of essential facilities for 24 to 72 hours. Minor long-term environmental impact. Moderate impact to the reputation of the jurisdiction
4	Catastrophic Multiple deaths. Property destroyed or damaged beyond repair. Complete shutdown of critical facilities and services for 3 days or more. Major long-term environmental impact. Severe impacts to the reputation of the jurisdiction.

Speed of Onset is the rating of the potential amount of warning time that is available before the hazard occurs.

Score	Probable Amount of 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

The results from the hazard risk and vulnerability assessment of this plan were used to help determine just how vulnerable Tama County and its individual jurisdictions are to natural and manmade hazards. For the purposes of determining what the greatest risks were across the county according to the results of the risk assessment, risk assessment scores were averaged among jurisdictions to result in one total hazard score per hazard. These averaged scores are included in Table 3-1. As a reminder, the total risk assessment score considered the following hazard characteristics: historical occurrence, probability, vulnerability, severity of impact, and speed of onset.

During the scoring process, the highest score a hazard could possibly receive is 20. Based on averaged scores, the highest score a hazard received was a 17, while the lowest score a hazard received was a 5. These scores were used to assign a vulnerability rating of high, medium, or low. Hazards that scored 15 to 17 are considered high priority. Hazards that scored 10 to 14 are medium, and hazards that scored 9 or below are considered lower priority. It is important to note that although a score may have received an overall vulnerability rating, there are differences among jurisdictions regarding hazard risk and vulnerability. Some of these differences were described in this chapter.

Regarding the vulnerability rating, a high rating generally indicates that the hazard is a major threat to a jurisdiction. Its effects may be widespread and severe, and the hazard could result in loss of life or injury and major property damage. Effects may vary among the high vulnerability hazards so a more detailed description of a hazard's potential effects will be discussed later in this section. In addition, referring back to the detailed ranking score for each hazard will help distinguish the differences among all of the high-rated hazards.

A hazard with a medium rating is also a major threat to a jurisdiction, but its effects are on a smaller, less severe scale. The details of these hazards will also be discussed and referring back to the detailed ranking score for each hazard will be helpful to distinguish differences among hazards. The hazards rated "low," on the other hand, are those that do not pose a major threat to the jurisdiction. If they were to occur, more than likely, their effects would not be extremely widespread or very severe when compared to the high- and medium-rated hazards. Human disease priority changed from low to medium during the 2021 plan update process to reflect hazard events of the previous five years, including the impacts of COVID-19 pandemic. Radiological changed from medium to low due to closing of the Duane Arnold nuclear plant in 2021.

Table 3-1 Final Table of Risk Assessment Scores (Average)

Hazard	Total Score	Priority
Thunderstorms, Lightning, and Hail	17	High
Windstorms	16	High
Tornado	16	High
Severe Winter Storm	15	High
Extreme Heat	14	Medium
Hazardous Materials	12	Medium
Drought	11	Medium
Flooding	11	Medium
Infrastructure Failure	11	Medium
Transportation Incident	10	Medium
Human Disease	10	Medium
Terrorism	9	Low
Grass or Wildland Fire	8	Low
Dam/Levee Failure	8	Low
Radiological	8	Low
Animal/Plant/Crop Disease	5	Low

Jurisdictions' vulnerability to hazards are described in the chapter in several ways. First, an average annual countywide loss estimate has been calculated for hazards that have previous loss data. This calculation is based on the methodology described above. Hazards that did not have historical loss estimates available do not have average annual countywide loss estimates.

Data Sources

Hazard data was obtained from various federal, state, and local sources such as FEMA, the National Oceanic and Atmospheric Administration (NOAA) National Center for Environmental Information (NCEI), the United States Geological Survey (USGS), and others. Together, these sources were examined to assess the significance of these hazards to the County. The hazards evaluated in this plan include those that have occurred historically or have the potential to cause significant human and/or monetary losses in the future.

Data Limitations

While this plan takes advantage of the data that is available through NOAA's National Center for Environmental Information (NCEI) Storm Events Database and other sources, some hazards have a shorter span of time for which data is available. The NCEI database is used as a primary source for many hazards discussed in this plan, but for some hazards and/or some communities, only partial records of significant events are available. In addition, details about each hazard event may not be available if the data is older. For example, tornado data from the 1950's classifies tornado events at the county level and often does not give a specific location of the event within the county. Historical trends can help us predict the probability of each hazard, but realistically, many hazards analyzed in this plan could occur at any point in time. The hazard identification and risk assessment activities rank hazards according to the data that was available at the time of the plan update.

For flash flooding, communities described flood events in which short periods of heavy rainfall flooded streets, basements, and backed up sewer systems. In some cases, any period of prolonged rainfall could cause streets or sewers to flood; NCEI data did not capture the frequency of these events, but communities did not feel that it was necessary to add to the events that NCEI data already reported. It should be noted that these events may not cause substantial damage to homes or structures, but they may result in flood costs that the county taxpayers and individual property owners must finance.

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Data timeframes vary for each hazard. For most hazards with established data sets (i.e.: NCEI, IDNR hazardous spills summary reports, Iowa Department of Public Health, etc.), the data frame begins with the earliest year in which data was available and ends with 2020. The year 2020 was used as an ending date for data to allow for a complete year of data as data collection and the planning process began in 2021. For hazards that relied more on the knowledge of city officials, public works employees, firefighters, and emergency responders as a data source, a ten-year data frame was generally used. The ten-year period for this type of data allows people to recall events and problems to the best of their knowledge.

3.1.2 Hazard Identification and Summary

For this plan, the Hazard Mitigation Planning Committee (HMPC) considered the full range of natural hazards that could impact the planning area and then listed hazards that present the greatest concern. The process also incorporated a review of state and local hazard planning documents. Anecdotal information regarding natural hazards and the perceived vulnerability of the planning area's assets to them was also used. Based on the review, this plan addresses the following hazards of concern:

Natural Hazards

- Animal/Crop/Plant Disease
- Dam/Levee Failure
- Drought
- Flooding

- Extreme Heat
- Grass or Wildland Fire
- Severe Winter Storm
- Thunderstorm/Lightning/Hail
- Tornado
- Windstorm

Other Hazards

- Hazardous Materials Incident
- Human Disease
- Infrastructure Failure
- Radiological
- Terrorism
- Transportation Incident

During the 2021 plan update process the HMPC compared the list of hazards with the 2018 Iowa Hazard Mitigation Plan (HMP) and discussed adding or removing hazards. The group felt that the list of hazards remained relevant. The only change was to combine the Riverine Flood and Flash Flood sections into one overall Flood section to be more consistent with the State HMP.

Hazards not Profiled

At the first meeting, the HMPC was asked to discuss how the county might be affected by each hazard listed above. The HMPC was also asked if they wanted to add any additional hazards to the plan; no hazards were added. Members were given the option to remove hazards from the plan if they could provide sufficient reasoning related to a lack of historical occurrence, low likelihood of a future occurrence, or less potential for mitigation. The HMPC removed the following hazards from consideration in the plan:

1. **Expansive Soils.** Tama County is not located in an area that has high percentages of clay soils that can swell or shrink excessively due to variations in moisture content. The community has a remote chance of sustaining damage from this hazard. Most of Tama County is located in a “brown” area on the map below that contains little or no swelling clay or at most, no more than 50%. Expansive soils were also excluded from the previous plan. See Figure 3-1 for more information.

Figure 3-1 USGS Map of Percentage of Swelling Clay in Iowa

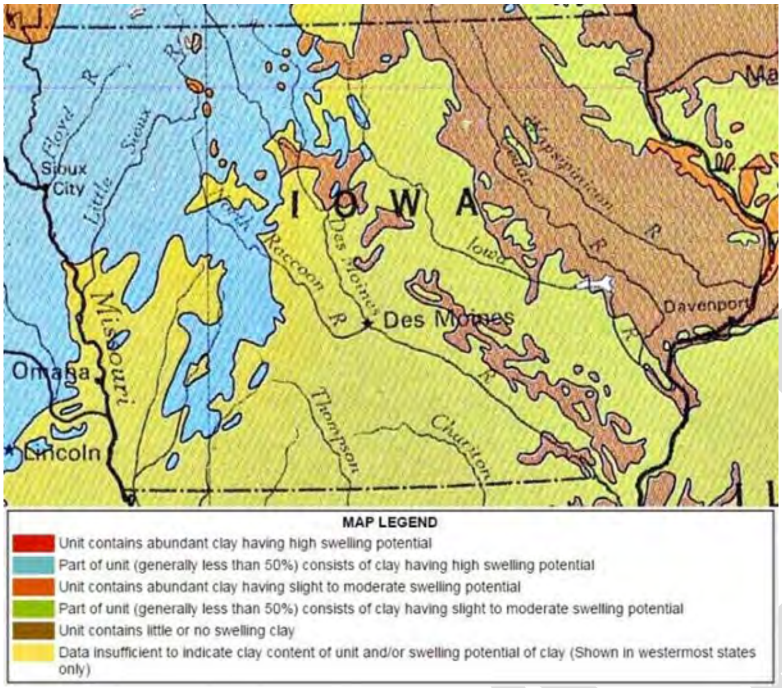


Image Obtained from: http://www.surevoid.com/soil_maps/ia.php

2. **Earthquake:** No earthquake damage has ever been reported in Tama County. The nearest fault line is located in New Madrid, Missouri. According to Figure 3-2, Tama County straddles the lowest Earthquake Hazard Zone for risk from the New Madrid fault line. If an earthquake were to occur on this fault line, the earthquake would not be felt, or would be very minimally felt. Damage from this hazard would be unlikely. While earthquakes were included in the previous plan, the HMPC decided to remove the hazard from the plan after viewing the data.

Figure 3-2 Magnitude 6.5 Earthquake Hazard Zone for the New Madrid Fault Line

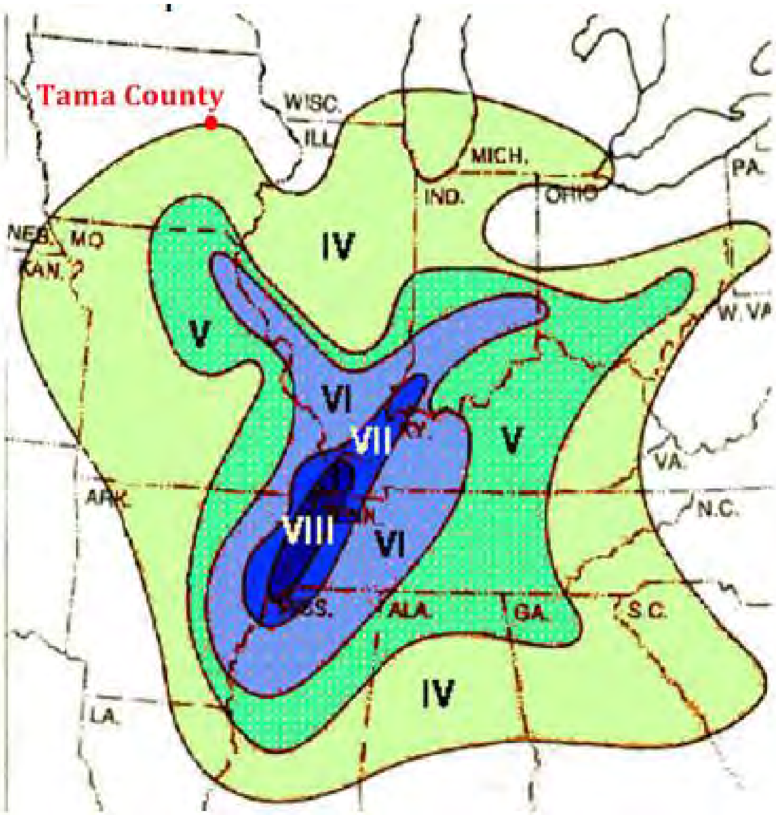
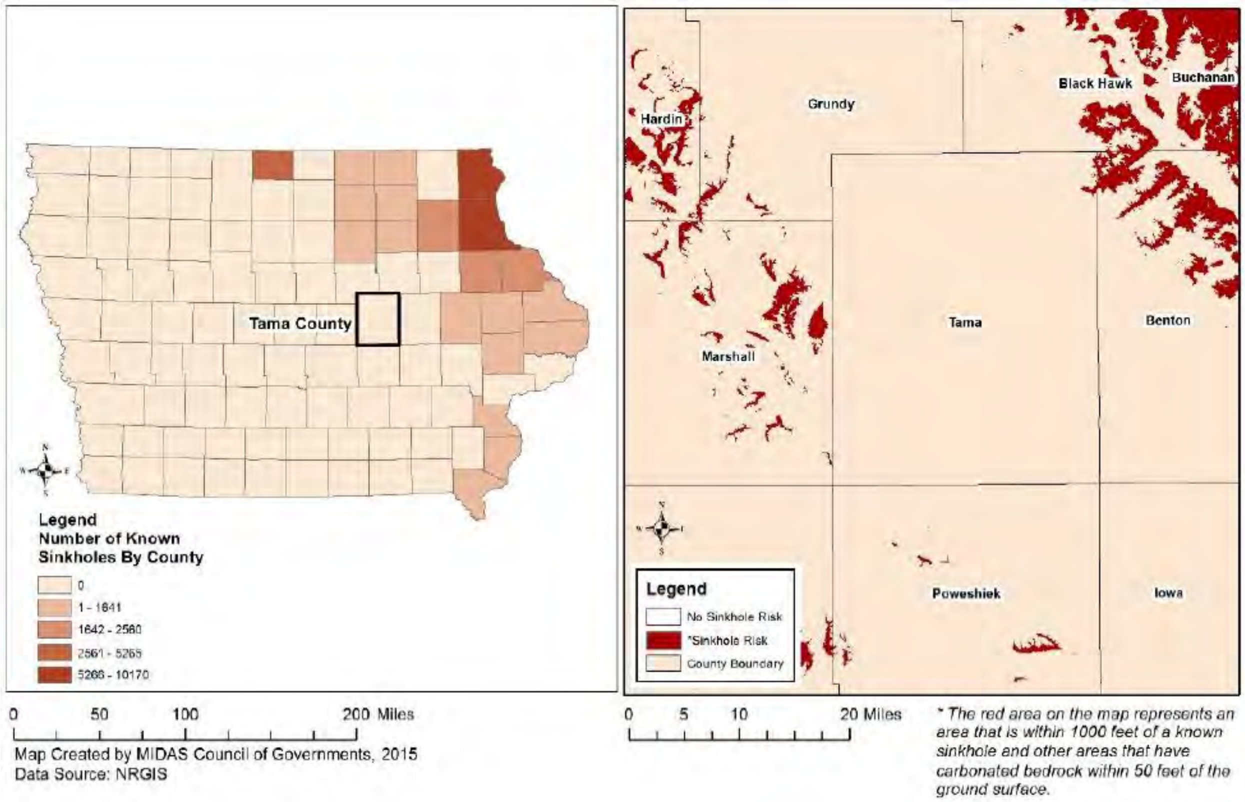


Image Obtained from: http://www.iihr.uiowa.edu/igs/browse/quakes/quakes.htm

3. **Landslide.** Tama County does not have significant slopes that could play a role in a landslide event. Tama County's elevation varies from between 810-1,080 feet, a difference of 270 feet (NRGIS 2015). The HMPC did not recall any landslide events that had ever occurred in Tama County. The hazard was removed based on all of the information available. Landslides were also removed from the previous plan.

4. **Sinkholes.** There are no known sinkholes in Tama County. This risk of sinkholes is remote, as no area of Tama County is within 1,000 feet of a known sinkhole or other areas that have carbonated bedrock within 50 feet of the ground surface (a risk factor for sinkholes), as shown in Figure 3-3. While sinkholes were included in the previous plan, the HMPC decided to remove the hazard from the plan after viewing the data.

Figure 3-3 Sinkhole Risk in Tama County



Disaster Declaration History

One method used to identify hazards applicable for this HMP involved researching past events that triggered federal and state emergency or disaster declarations in Tama County. Federal disaster declarations may be granted when the severity and magnitude of an event surpasses the ability of the local government to respond to such hazard event and have difficulty in recovering. 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. Should the disaster be 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 monetary or other assistance. In other words, a presidential disaster declaration puts federal recovery programs in place to help disaster victims, business, and public agencies.

The federal government may issue a disaster declaration through FEMA, the U.S. Department of Agriculture (USDA), or the Small Business Administration (SBA). FEMA also issues emergency declarations, which are more limited in scope and come without the long-term federal recovery programs of major disaster declarations (Farm Service Agency 2018). The quantity and types of damage are the determining factors behind receiving these assistance sources. The following section focuses on state and federal disaster and emergency declarations.

Tama County is among the many communities in Iowa that are susceptible to disasters. Details on federal and state disaster declarations were obtained by the HMPC and FEMA and compiled in chronological order in Table 3-2. A review of state and federal declared disasters indicates that Tama County experienced 20 disaster declarations between 1965 and 2020. The 2020 declarations were related to the

Covid-19 pandemic, an ongoing disaster that occurred during the 2021 plan update process, and severe storms.

Review of these events helps identify hazards for risk reduction and ways to increase a community's capability to avoid large-scale events in the future. Still, many natural hazard events do not trigger federal disaster declaration protocol but have significant impacts on their communities. These events are also important to consider in establishing recurrence intervals for hazards of concern. More detailed event tables can be found in the individual hazard profile sections.

Table 3-2 Disaster Declarations in Iowa 1965-2020

Date Declared	Disaster Type
2020	Severe Storms
2020	COVID-19 Pandemic
2020	COVID-19
2019	Severe Storms and Flooding
2018	Severe Storms and Tornadoes
8/5/2014	Severe Storms, Tornadoes, Straight-line Winds, and Flooding
7/24/2014	Severe Storms, Tornadoes, Straight-line Winds, and Flooding
7/14/2014	Severe Storms, Tornadoes, Straight-line Winds, and Flooding
7/31/2013	Severe Storms, Tornadoes, and Flooding
7/2/2013	Severe Storms, Tornadoes, and Flooding
5/31/2013	Severe Storms, Straight-line Winds, and Flooding
5/6/2013	Severe Winter Storm
8/30/2011	Severe Storms and Flooding
8/24/2011	Severe Storms, Straight-Line Winds, and Flooding
6/27/2011	Flooding
5/5/2011	Severe Storms, Tornadoes, and Straight-line Winds
7/29/2010	Severe Storms, Flooding, and Tornadoes
7/27/2010	Severe Storms and Flooding
3/2/2010	Severe Winter Storms
2/25/2010	Severe Winter Storms and Snowstorm
8/13/2009	Severe Storm
5/27/2008	Severe Storms, Tornadoes, and Flooding
1/4/2008	Severe Winter Storm
9/14/2007	Severe Storms and Flooding
5/25/2007	Severe Storms, Flooding, and Tornadoes
3/30/2007	Snow
3/14/2007	Severe Winter Storms
9/10/2005	Hurricane Katrina Evacuation
5/25/2004	Severe Storms, Tornadoes, and Flooding
6/19/2002	Severe Storms and Flooding
5/2/2001	Severe Storms & Flooding
7/22/1999	Severe Storms and Flooding
5/21/1999	Severe Storms, Flooding and Tornadoes
7/2/1998	Severe Weather, Tornadoes and Flooding
11/20/1997	Severe Snowstorms
8/21/1996	Flooding
6/24/1996	Flooding
7/9/1993	Flooding, Severe Storm
4/26/1993	Flooding, Severe Storm
10/2/1992	Flooding, Severe Storm
12/26/1991	Ice Storm
7/12/1991	Flooding, Severe Storm
9/6/1990	Flooding, Severe Storm
5/26/1990	Flooding, Severe Storm
1974	Severe Storms and Flooding

Date Declared	Disaster Type
1969	Heavy Rains and Flooding
1969	Flooding
1965	Flooding

Data Source: FEMA Disaster Declarations https://www.fema.gov/data-visualization/disaster-declarations-states-and-counties

3.1.3 Overview of Hazard Identification and Risk Assessment

Sections contains detailed hazard profiles for the identified hazards. Each hazard profiled includes the following subsections:

- **Description**—This section gives a description of the hazard in question and associated issues followed by details on the hazard specific to the Tama County Planning Area.
- **Historical Occurrence**—This section contains information on historical incidents, including impacts where known.
- **Location**– This section gives a spatial description of the potential location or areas of Tama County where the hazard is expected to have an impact or generally occur.
- **Probability of Future Occurrence –** The frequency of past events is used in this section to gauge the likelihood of future occurrences. Where possible, frequency was calculated based on existing data.
- **Magnitude and Severity (Extent)**– This section also gives a description of the potential strength or magnitude of the hazard as it pertains to Tama County.
- **Climate Change Considerations**—Descriptions of the potential for climate change to affect the frequency and intensity of the hazard in the future.
- **Vulnerability** —Following the hazard profiles is a vulnerability assessment for each identified hazard. The assessment was conducted through the study of potential impacts to the following specific sectors:
  - People
  - Property
  - Critical Facilities and Infrastructure
  - Economy
  - Historic, Cultural, and Natural Resources

Development Trends – This section reviews current trends in land use development in the county and how that might impact the vulnerability to specific hazards in the County.

3.2 Asset Summary

As a starting point for analyzing the Planning Area's vulnerability to identified hazards, the HMPC used a variety of data to define a baseline of property exposure against which disaster impacts could be compared. If a catastrophic disaster was to occur in the Planning Area, this section describes significant assets exposed or at risk in the Planning Area. Data used in this baseline assessment included:

- Total property assets at risk based on County Assessor's Office parcel values;
- Critical facility inventory;
- Cultural, historical, and natural resources; and
- Population growth and land use/development trends.

Total Assets at Risk

Tama County Assessor data was used to inventory the total number and types of parcels with improvements, defined as parcels with an improvement value greater than zero, in the County. Building content values were estimated using the following formulas based on FEMA methods: a) Residential properties received content values worth 50% of the improved values; b) Commercial, Agricultural, and

Government related properties (including State Assessed and Exempt parcels) received content values worth 100% of the improved values; and c) Industrial properties received content values worth 150% of the improved values. Adding up these content and original improved values yields the Total Value of Improved Parcels, which is an estimation of the total property exposure within the County. Building counts were based on an address point database to further refine the number of structures, as one parcel may have multiple buildings.

Table 3-3 Property Exposure Summaries by Jurisdiction and Parcel Type

Jurisdiction	Property Type	Improved Parcels/Structures	Improved Value	Estimated Content Value	Total Value
Chelsea	Agricultural	1	$3,700	$3,700	$7,400
	Commercial	14	$767,530	$767,530	$1,535,060
	Industrial	1	$17,570	$26,355	$43,925
	Residential	113	$1,941,870	$970,935	$2,912,805
	Total	**129**	**$2,730,670**	**$1,768,520**	**$4,499,190**
Clutier	Commercial	16	$984,360	$984,360	$1,968,720
	Residential	114	$4,102,150	$2,051,075	$6,153,225
	Total	**388**	**$10,547,850**	**$6,572,475**	**$17,120,325**
Dysart	Agricultural	1	$1,710	$1,710	$3,420
	Commercial	71	$6,283,670	$6,283,670	$12,567,340
	Industrial	1	$78,720	$118,080	$196,800
	Mixed Use	4	$264,023	$264,023	$528,046
	Residential	542	$57,196,860	$28,598,430	$85,795,290
	Total	**619**	**$63,824,983**	**$35,265,913**	**$99,090,896**
Elberon	Agricultural	2	$27,340	$27,340	$54,680
	Commercial	9	$2,827,240	$2,827,240	$5,654,480
	Residential	94	$4,689,180	$2,344,590	$7,033,770
	Total	**105**	**$7,543,760**	**$5,199,170**	**$12,742,930**
Garwin	Agricultural	1	$7,460	$7,460	$14,920
	Commercial	18	$660,730	$660,730	$1,321,460
	Industrial	1	$189,160	$283,740	$472,900
	Mixed Use	5	$145,704	$145,704	$291,408
	Residential	220	$14,153,360	$7,076,680	$21,230,040
	Total	**245**	**$15,156,414**	**$8,174,314**	**$23,330,728**
Gladbrook	Commercial	44	$2,983,070	$2,983,070	$5,966,140
	Industrial	3	$490,060	$735,090	$1,225,150
	Mixed Use	4	$206,974	$206,974	$413,948
	Residential	398	$28,646,770	$14,323,385	$42,970,155
	Total	**449**	**$32,326,874**	**$18,248,519**	**$50,575,393**
Lincoln	Agricultural	2	$6,060	$6,060	$12,120
	Commercial	14	$4,817,480	$4,817,480	$9,634,960
	Residential	82	$4,319,880	$2,159,940	$6,479,820
	Total	**98**	**$9,143,420**	**$6,983,480**	**$16,126,900**
Montour	Agricultural	5	$36,230	$36,230	$72,460

Jurisdiction	Property Type	Improved Parcels/Structures	Improved Value	Estimated Content Value	Total Value
	Commercial	8	$359,490	$359,490	$718,980
	Residential	124	$6,576,450	$3,288,225	$9,864,675
	Total	**137**	**$6,972,170**	**$3,683,945**	**$10,656,115**
Tama	Agricultural	1	$26,230	$26,230	$52,460
	Commercial	94	$6,437,720	$6,437,720	$12,875,440
	Industrial	5	$6,954,360	$10,431,540	$17,385,900
	Mixed Use	19	$963,127	$963,127	$1,926,254
	Residential	1,030	$69,253,060	$34,626,530	$103,879,590
	Total	**1,149**	**$83,634,497**	**$52,485,147**	**$136,119,644**
Toledo	Agricultural	6	$27,250	$27,250	$54,500
	Commercial	99	$14,528,560	$14,528,560	$29,057,120
	Industrial	5	$6,613,180	$9,919,770	$16,532,950
	Mixed Use	11	$592,382	$592,382	$1,184,764
	Residential	789	$63,910,900	$31,955,450	$95,866,350
	Total	**910**	**$85,672,272**	**$57,023,412**	**$142,695,684**
Traer	Agricultural	1	$620	$620	$1,240
	Commercial	68	$6,409,170	$6,409,170	$12,818,340
	Industrial	1	$296,720	$445,080	$741,800
	Mixed Use	14	$910,540	$910,540	$1,821,080
	Residential	661	$64,620,360	$32,310,180	$96,930,540
	Total	**745**	**$72,237,410**	**$40,075,590**	**$112,313,000**
Vining	Commercial	1	$9,510	$9,510	$19,020
	Residential	32	$1,135,330	$567,665	$1,702,995
	Total	**33**	**$1,144,840**	**$577,175**	**$1,722,015**
Unincorporated	Agricultural	426	$5,362,030	$5,362,030	$10,724,060
	Commercial	43	$16,062,530	$16,062,530	$32,125,060
	Industrial	9	$11,378,180	$17,067,270	$28,445,450
	Residential	2,383	$289,230,120	$144,615,060	$433,845,180
	Total	**2,861**	**$322,032,860**	**$183,106,890**	**$505,139,750**
	Grand Total	**7,868**	**$712,968,020**	**$419,164,550**	**$1,132,132,570**

Source: Tama County Assessor's GIS Office, Wood Analysis

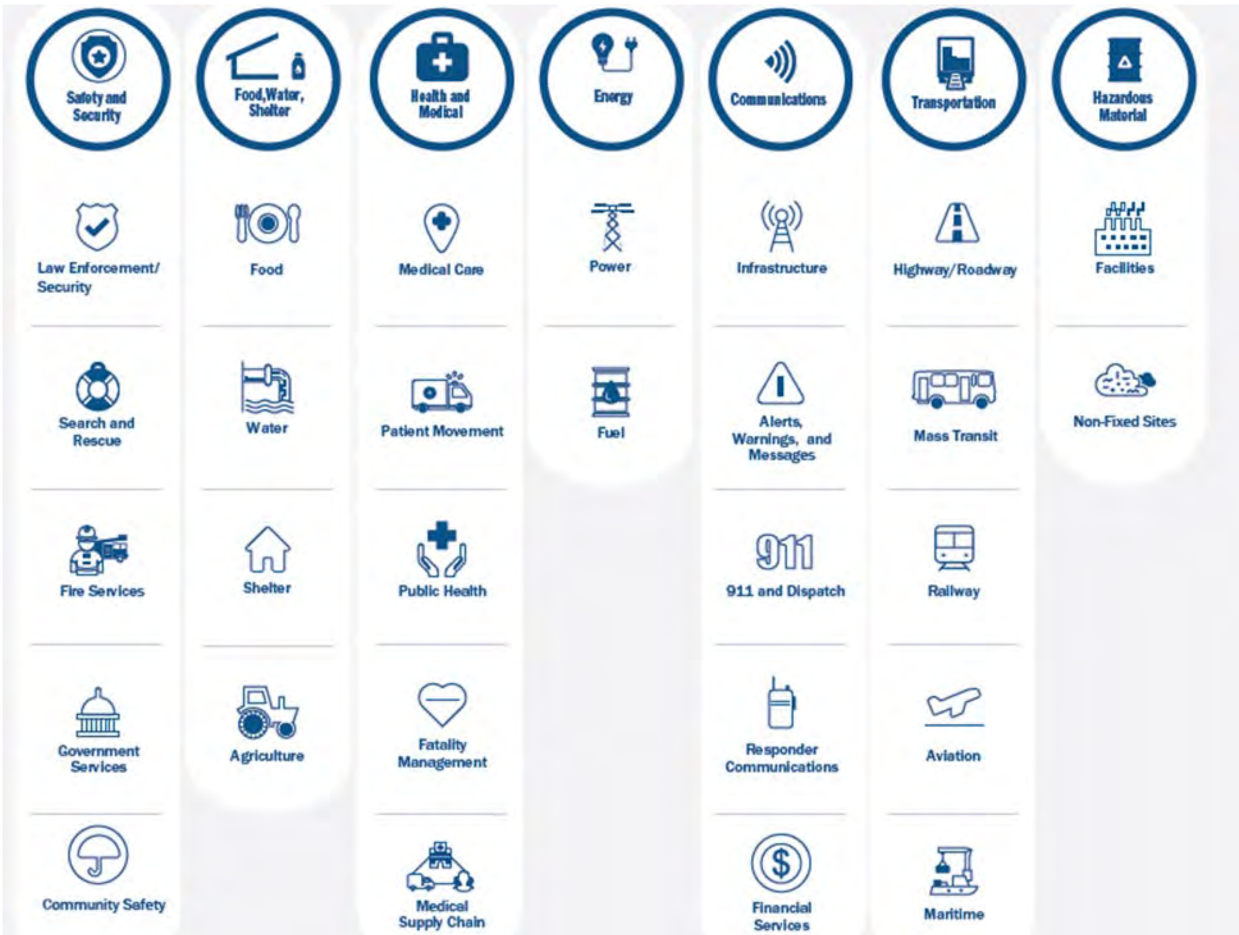
3.2.1 Human Assets

The people who live and visit Tama County are the first priority for providing protection from natural and manmade hazards. One of the two main goals of hazard mitigation is to prevent human injury and death. The largest concentration of people in Tama County is in its incorporated cities. Tama and Toledo have the highest populations followed by Traer and Dysart. There is also a higher concentration of people living in the northeast corner of the county. Otherwise, the rest of the population is evenly spread among the smaller cities and the unincorporated areas throughout the county. Refer to Chapter 2, section 2.1.3 Population Trends and Characteristics for more details on population trends in the county.

3.2.2 Critical Facilities, Infrastructure, Other Community Assets

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 3-4.

Figure 3-4 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 Tama County (Table 3-4), three data sources were compiled and broken down along the three aforementioned critical asset categories: Tama County's GIS databases of critical facilities and infrastructure.

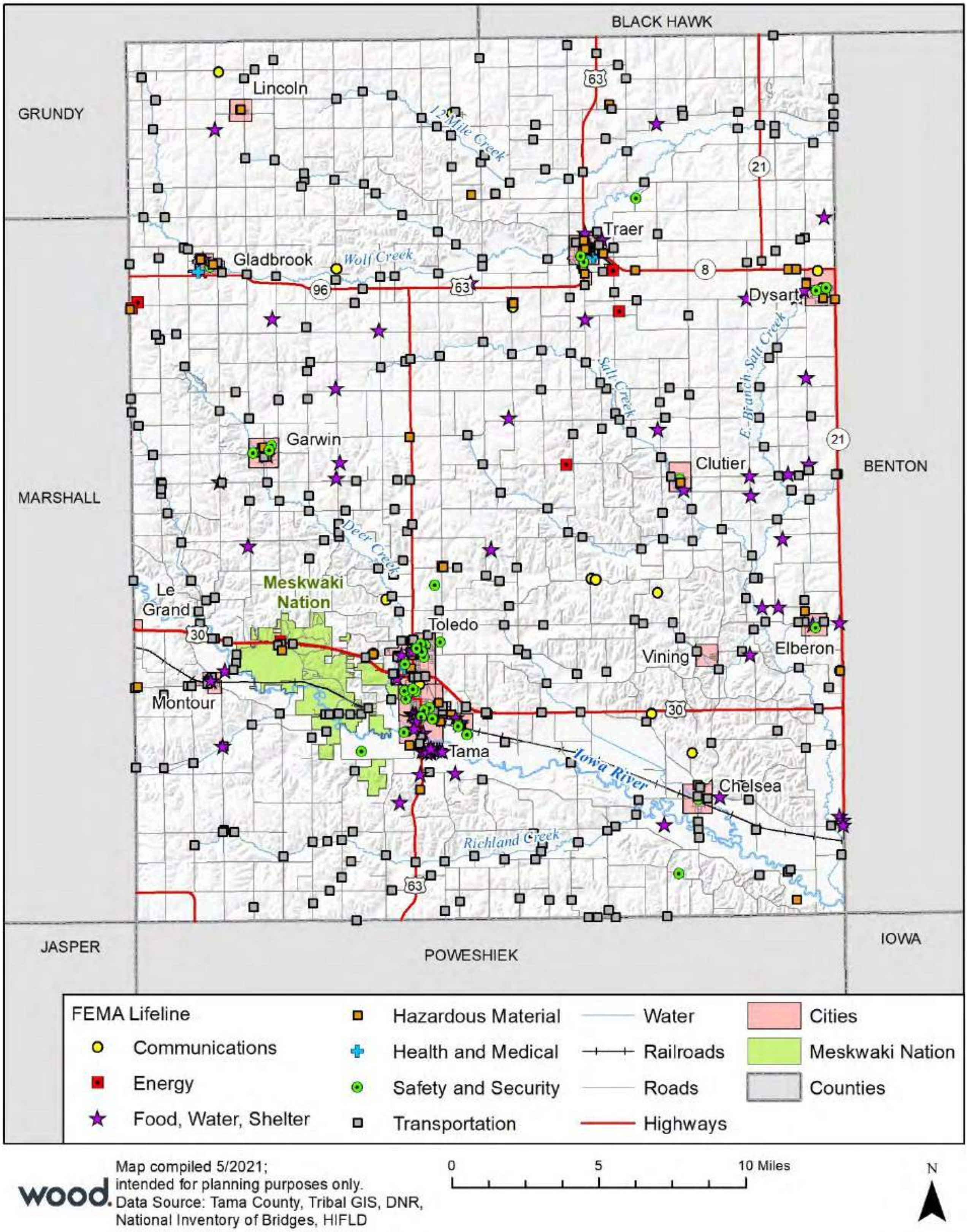
The best available data was used, but some limitations include lack of complete or comprehensive data and values such as replacement costs. These databases were used in vulnerability assessments for hazards such as wildfire and flood and are represented in maps and tables in the vulnerability by hazard section that follows. Figure 3-5 illustrates the location of critical facilities in Tama County.

Table 3-4 Total Critical Facilities by FEMA Lifeline and Jurisdiction

Jurisdiction	FEMA Lifeline	Count
Chelsea	Safety and Security	1
	Transportation	4
	Total	**5**
Clutier	Food, Water, Shelter	1
	Hazardous Material	2
	Safety and Security	1
	Transportation	1
	Total	**5**
Dysart	Communications	1
	Hazardous Material	4
	Health and Medical	1
	Safety and Security	6
	Total	**12**
Elberon	Food, Water, Shelter	1
	Safety and Security	1
	Transportation	2
	Total	**4**
Garwin	Food, Water, Shelter	1
	Hazardous Material	3
	Safety and Security	4
	Transportation	2
	Total	**10**
Gladbrook	Food, Water, Shelter	1
	Hazardous Material	3
	Health and Medical	1
	Safety and Security	1
	Transportation	2
	Total	**8**
Lincoln	Hazardous Material	3
	Total	**3**
Montour	Food, Water, Shelter	2
	Transportation	4
	Total	**6**
Tama	Communications	2
	Food, Water, Shelter	11

Jurisdiction	FEMA Lifeline	Count
	Hazardous Material	13
	Health and Medical	1
	Safety and Security	14
	Transportation	4
	Total	**45**
Toledo	Communications	2
	Food, Water, Shelter	5
	Hazardous Material	4
	Health and Medical	2
	Safety and Security	10
	Transportation	11
	Total	**34**
Traer	Energy	3
	Food, Water, Shelter	3
	Hazardous Material	8
	Health and Medical	2
	Safety and Security	5
	Transportation	4
	Total	**25**
Unincorporated	Communications	37
	Energy	7
	Food, Water, Shelter	54
	Hazardous Material	22
	Safety and Security	8
	Transportation	319
	Total	**447**
Vining	Transportation	1
	Total	**1**
	Grand Total	**605**

Figure 3-5 Tama County Critical Facilities



3.2.3 Historic Assets

The 13 historic sites are spread across only some parts of Tama County. There are two major clusters of historic sites in the cities of Traer and Toledo. Because these historic sites are in such close proximity, they should have a high priority and consideration when it comes to protection from hazards. Many of these sites are used presently as critical facilities such as government facilities and therefore, maintain a high importance to the city. The full list of Tama County's historic sites is below:

1. Chambers Ford Bridge
2. Conant's Cabin and Park
3. First United Brethren Church
4. Hope Fire Company Engine House
5. King Tower Historic District
6. Le Grand Bridge
7. Lincoln Highway Bridge
8. Round Barn, Buckingham Township
9. Star-Clipper-Canfield Building and Winding Stairway
10. Tama County Courthouse
11. Tama County Jail
12. Wieting Theater
13. Young, John W., Round Barn

3.3 Natural Hazards

The following hazards are included in this section: Animal/Plant/Crop Disease, Drought, Dam/Levee Failure, Extreme Heat, Flooding, Thunderstorm/Lightning/Hail, Tornado, Severe Winter Storms, and Wind. Natural hazard profiles are listed in alphabetical order.

3.3.1 Animal/Crop/Plant Disease

Animal/Crop/Plant Disease – Hazard Score Calculation						
Jurisdiction	Historical Occurrence	Probability	Vulnerability	Severity of Impact	Speed Of Onset	Total Score
Chelsea	1	1	1	1	1	5
Clutier	1	1	1	1	1	5
Dysart	1	1	1	1	1	5
Elberon	1	1	1	1	1	5
Garwin	1	1	1	1	1	5
Gladbrook	1	1	1	1	1	5
Lincoln	1	1	1	1	1	5
Montour	1	1	1	1	1	5
Tama	1	1	1	1	1	5
Toledo	1	1	1	1	1	5
Traer	1	1	1	1	1	5
Vining	1	1	1	1	1	5
Tama County	1	1	1	1	1	5
GMG Community SD	1	1	1	1	1	5
North Tama Community SD	1	1	1	1	1	5
South Tama Community SD	1	1	1	1	1	5
Union Community SD	1	1	1	1	1	5

Description

Agricultural, Crop or Plant Disease is defined as an outbreak of disease that can be transmitted from animal to animal or plant to plant. Infectious diseases introduced onto an operation can have a devastating effect on cash flow and equity. Major animal diseases include foot and mouth disease, rinderpest, African swine fever, classical swine fever, brucellosis, lumpy skin disease, and others. Adverse effects of infectious diseases can occur at the farm or industry level. Some diseases may severely limit or eliminate animal marketing options (for example: to slaughter only). In the future, producers may be responsible for potential pathogen contamination of the food supply or environment. Negative effects may be short- or long-term depending on the nature of the pathogen and level of concern among producers and consumers. Presence of some pathogens can also affect market access for high priority in day-to-day management decisions.

With Tama County's large amount of cropland, the county is vulnerable to an animal/plant/crop disease outbreak. According to the 2017 Census of Agriculture, Tama County has 1,072 farms which use approximately 406,984 acres of land in the county. The most common livestock produced in Tama County is cattle and calves (46,950 sold) followed by hogs and pigs (41,757 sold). Corn for grain was the top crop in acres with 167,964 in the County. Table 3-5 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 3-5 Market Value of Agricultural Products Sold in Tama County

Market Value of Products Sold (Total)	$288,014
Crop Sales	$197,025
Livestock Sales	$90,989
Average Per Farm	$268,670

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. With this substantial agricultural industry and related facilities throughout the State, the potential for infestation of livestock poses a significant risk to the Iowa economy.

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,
- Exotic Newcastle Disease,
- 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 world-wide since 1986, but in Canada and the U.S. 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 2020).

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 2 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 (mad cow disease), although it does not cause disease in humans, and has been present in the U.S. 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 U.S. 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 U.S.

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/Disease

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. The cascading net negative economic effects could result in wide-spread 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 United States Department of Agriculture/ Animal Plant Health Inspection Service, Iowa Department of Agriculture and Land Stewardship, 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.

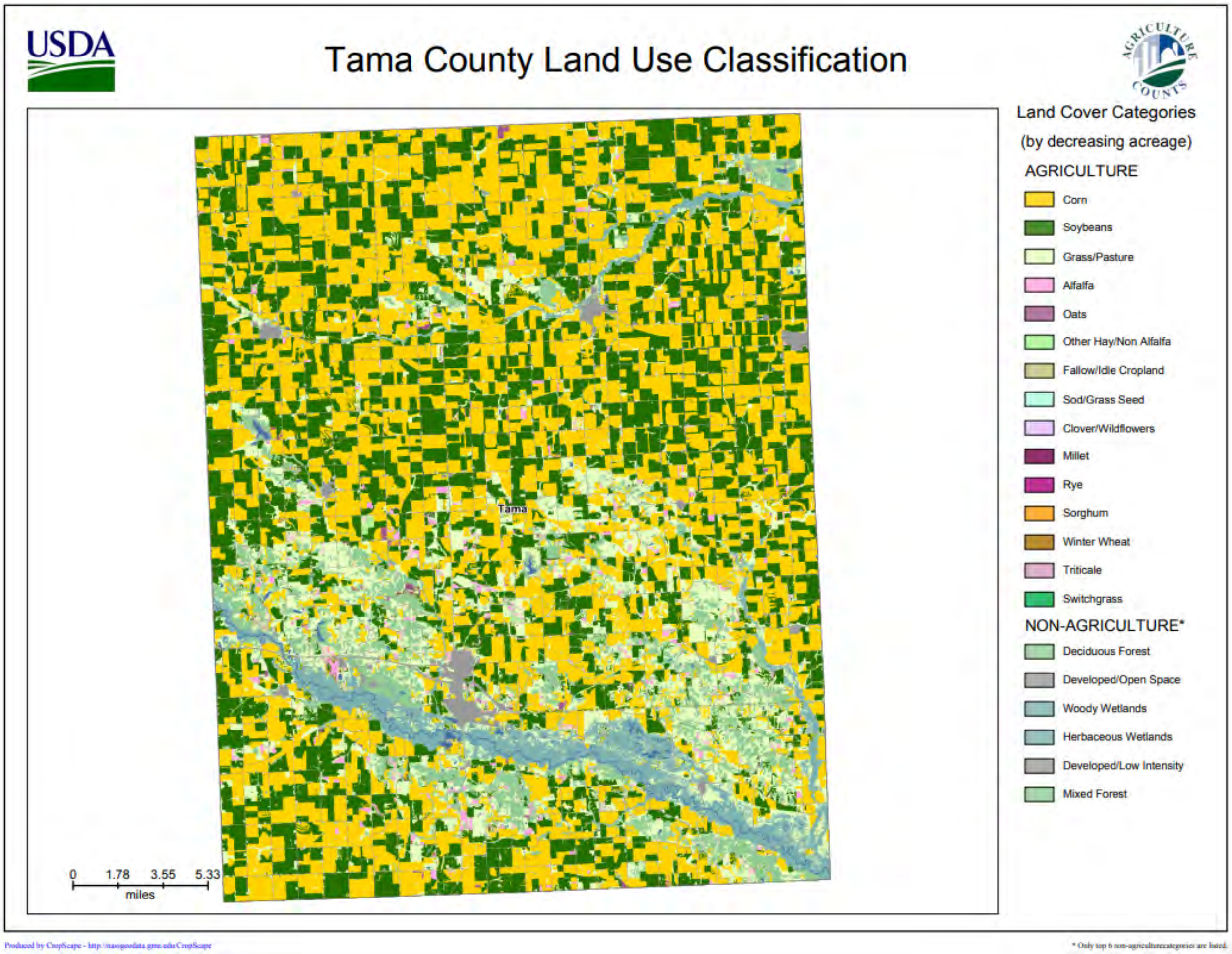
Iowa State University, College of Agriculture and Life Sciences, has The Plant and Insect Diagnostic Clinic that provides diagnosis of plant problems (plant diseases, insect damage, and assessment of herbicide damage) and the identification of insects and weeds from the field, garden, and home. Specific plant pests can vary from year to year. For complete details of all insects and diseases that can impact crops in Tama County, see the website above.

Location

All of Tama County is subject to animal/livestock incidents and agricultural infestations. There are 1,072 farms in the County that cover 406,984 acres of land.

As can be seen in the USDA Crop Data Layer (CDL) for 2020 in Figure 3-6, a large amount of land outside the county's boundaries is in agricultural use, with primary crops of corn and soybeans.

Figure 3-6 Tama County Land Use Classification



Historical Occurrence

Statewide, there are several animal/plant/crop diseases that have the potential to affect Tama County.

Animal Disease

One disease is the West Nile Virus (WNV). First identified in New York City and carried by birds and mosquitoes, the disease spread to four states in 1999 and to 12 states and the District of Columbia in 2000. WNV causes severe neuralgic infections in humans, horses, and other mammal species. As of early 2003, the disease has been found in nearly all states east of the Rocky Mountains, including Iowa where 15 confirmed human cases, 113 birds, and 1,039 horses have tested positive. Tama County has had two reported cases of West Nile Virus that occurred in 2012 (Iowa Department of Public Health, Center for Acute Disease Epidemiology 2015).

Porcine Epidemic Diarrhea (PED) Virus was confirmed in the US in 2013 (Iowa State University Veterinary Medicine Center 2015). The disease causes severe diarrhea in pigs of all ages; mortality rates in young pigs range from 30 – 100%. This disease's effect on Tama County alone is not clear, but it has affected the hog market at large.

In Tama County, according to a local veterinarian, there was a pseudo rabies outbreak in swine livestock in the 1990s. There was also an outbreak of pulmonary, respiratory, reproduction syndrome in the early

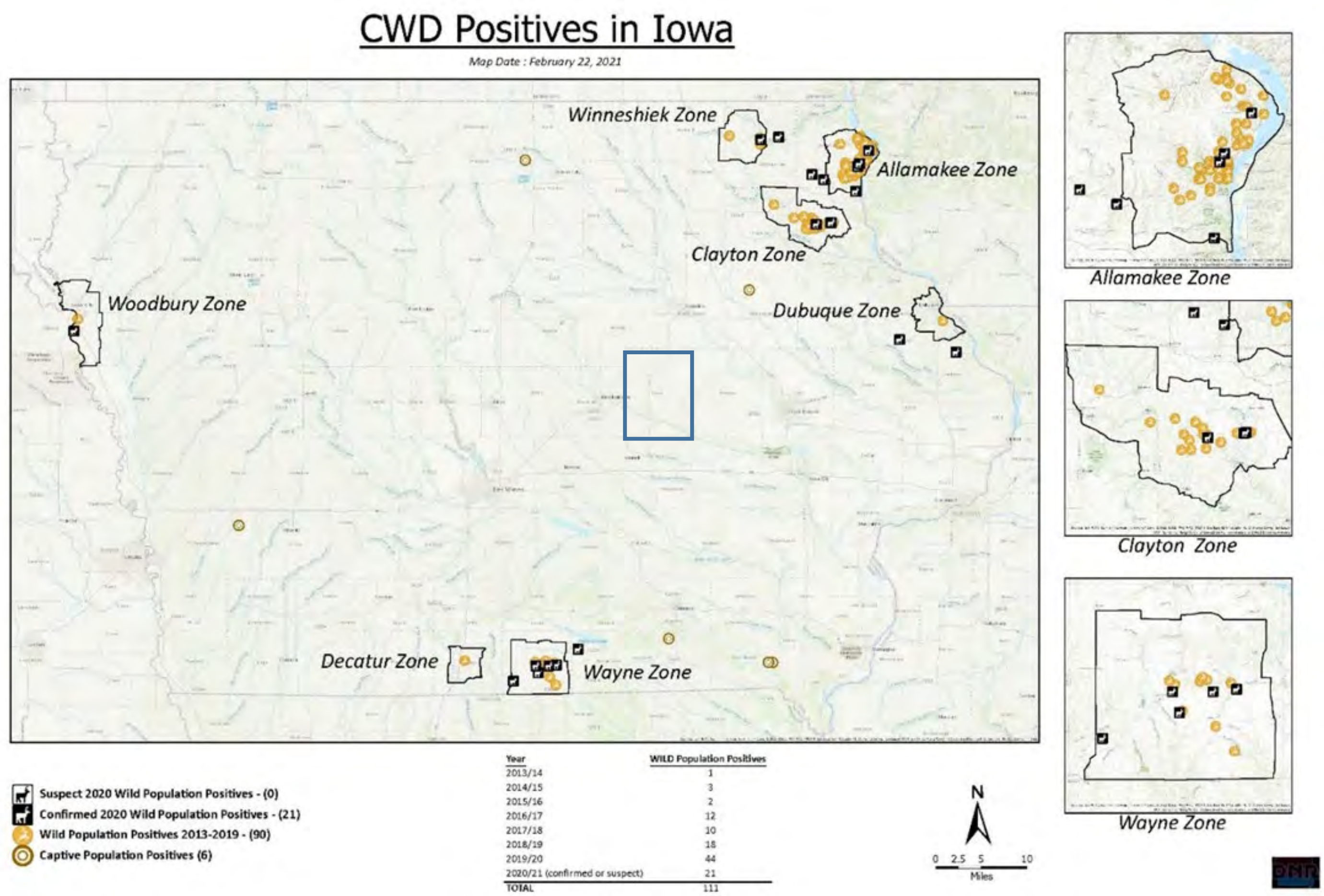
2000s. One disease that may affect Tama County in the future is the Emerald Ash Borer. While the disease has not yet been identified in Tama County, the adjacent counties of Black Hawk and Jasper have had positive identifications of the pest (Iowa DNR 2015).

Avian Influenza, or Bird Flu, was detected in Iowa in the spring of 2015. At the time that this plan was written in June 2015, 70 farm facilities have been affected in 18 counties, resulting in 32.7 million affected chickens or turkeys in Iowa (IDALS 2015). There are no confirmed cases of the disease in Tama County. According to the last Ag Census in 2012, Tama County only had 530 poultry that were sold, which gives the county a low risk for the disease to widely affect the agricultural economy in the county (National Agricultural Statistics Service 2015).

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).

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. Iowa Department of Natural Resources 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; 251 samples were collected in Tama County in this time period (IDNR 2019). No positive cases have been found in Tama County in 2020. In samples collected between 2013 and 202019 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 3-7 Positive CWD Cases in Iowa 2013-2021



Source: Iowa Department of Natural Resources Note: Blue square represents Tama County

Crop/Plant Disease

According to the U.S. Department of Agriculture's Risk Management Agency, between 2009-2017, combined crop insurance payments for damages resulting from insects, and plant disease totaled $71,239 for 1,229 acres lost. Note, records between 2007 and 2020 were searched but no records of events were found in Tama County after 2017. Table 3-6 provides a summary of insured crop losses as a result of crop infestations.

Table 3-6 Crop Insurance Payments for Crop/Plant Diseases, 2009- 2017

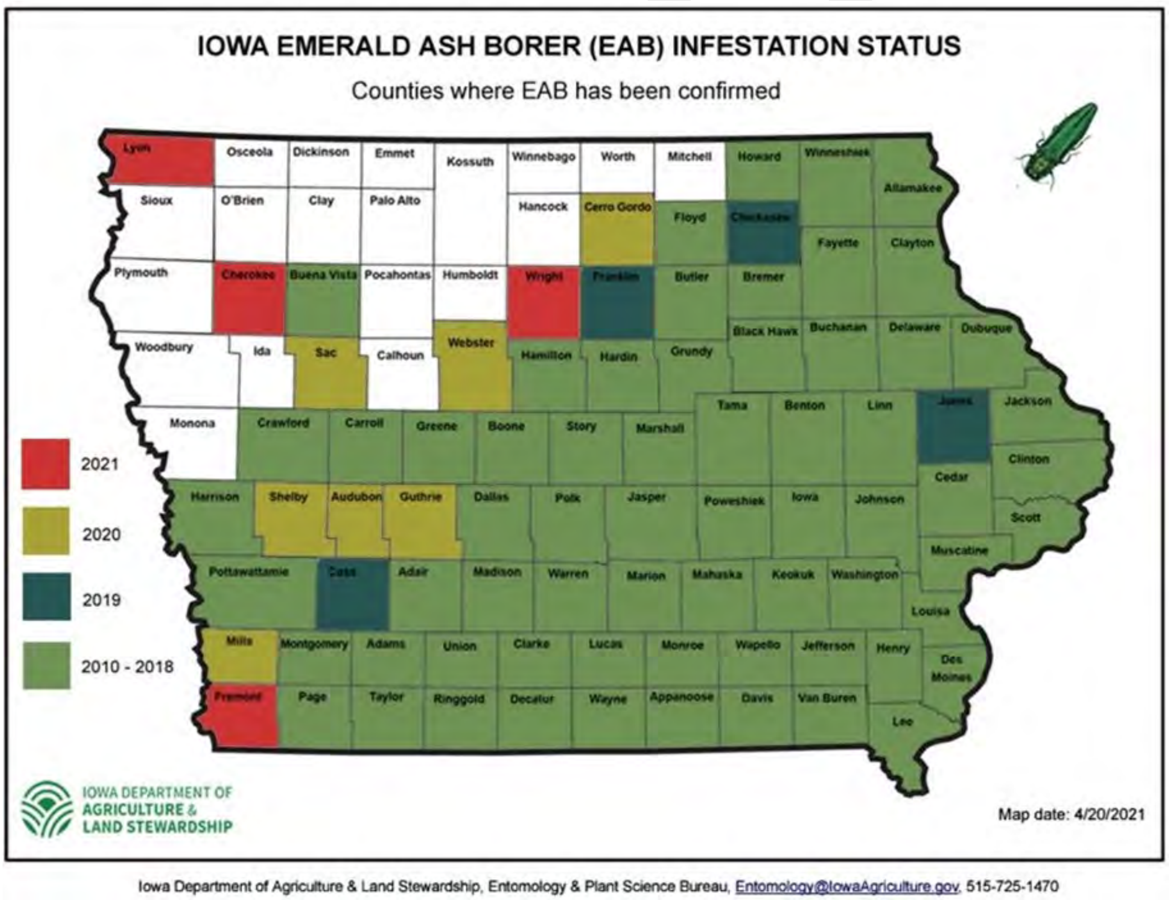
Crop Year	Crop Name	Cause of Loss Description	Acres Lost	Insurance Paid ($)
2009	Hybrid Corn Seed	Plant Disease	539.5	$67,614
2010	Soybeans	Plant Disease	120.4	$13,628
			721.8	$123,327
2011	Corn	Insects	40	$1,924
		Plant Disease	155.63	$10,739
2012	Corn	Insects	82.5	$3,749
		Plant Disease	82.5	$3,749
2015	Corn	Plant Disease	223.5	$26,949
	Soybeans		528.1	$105,410

Crop Year	Crop Name	Cause of Loss Description	Acres Lost	Insurance Paid ($)
2016	Soybeans	Plant Disease	192.4	$7,689
	Soybeans		201.3	$20,413
2017	Soybeans	Plant Disease	196.6	$18,587
Total			**3,084.2**	**$403,778**

Source: USDA Risk Management Agency

As of April 2021, 76 counties in Iowa had confirmed Emerald Ash Borer within their boundaries. Between 2010 and 2018, EAB was confirmed in Tama County, treatment areas continued in 2020. Areas identified in 2018 included rural areas north of Le Grand. While no confirmed cases were found in the County in 2019-2020, there were four counties in the state, Lyon, Cherokee, Wright and Fremont, that did have confirmed cases.

Figure 3-8 Iowa Emerald Ash Borer (EAB) Infestation Status, April 2021



Although there is potential for animal/plant/crop diseases to occur in Tama County, the previous historical occurrence is rare, especially on a scale that has significantly affected the region's economy or public safety. Tama County has had no animal/plant/crop diseases that have affected the county on an epidemic scale. The HMPC determined the county's score to be a 1, with fewer than four hazard events that have affected the county in the last 16 years.

Probability of Future Occurrences

As one of the nation's top producer of corn, soybeans, eggs, and hogs, Iowa farmers and producers know the importance of securing America's food supply. With hundreds of thousands of head of livestock produced and transported in Iowa each year, Iowa could be a rich environment for a disease epidemic to take hold if precautions such as vaccinations and handling procedures are not rigorously followed. However, based on the historical occurrence of animal/plant/crop diseases probability of a future occurrence is low. The Hazard Mitigation Planning Committee (HMPC) determined that Tama County had a less than 10% chance of a significant animal/plant/crop disease occurring.

Magnitude and Severity (Extent)

Severity of Impact

Animal health emergencies can take many forms: disease epidemics, large-scale incidents of feed and water contamination, extended periods without adequate water, harmful exposure to chemical, radiological, or biological agents, and large-scale infestations of disease-carrying insects or rodents, to name a few. One of the principal dangers of disease outbreaks is that they can rapidly overwhelm the animal care system. However, state and federal animal health programs have been very successful in preventing or limiting the scope and magnitude of animal emergencies. The severity of impact would be low if a disease outbreak were to occur due to the safeguards currently in place. An outbreak would cause few, if any, injuries and some property damage. Critical facilities would not be impacted.

Speed of Onset

The private practitioner is the first line of defense and will undoubtedly be the first to witness the symptoms of animal/crop/plant diseases. The United States Department of Agriculture monitors reports submitted by veterinarians and labs to identify patterns. The department is proactive in providing information to the agricultural community on medical concerns. Conditions related to scope and magnitude can escalate quickly in certain circumstances, but farmers would be given at least a 24-hour notice.

Climate Change Considerations

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.

Animal Disease

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.

Crop/Plant Disease

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 (CO2) 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 U.S. 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.

Vulnerability

People

A widespread infestation of animals/livestock and crops could impact the economic base of the county and its communities. According to the USDA 2017 Census of Agriculture, Tama County has 1,072 farms, -5% change from the previous census in 2012. Jobs could be negatively impacted during an agriculture emergency; jobs tangentially tied to the agriculture industry could also be affected.

Animal/Crop/Plant Disease can exacerbate the impacts from other hazards, and an example of this is adverse weather; dead branches can be broken by high winds, and there are reports of these branches falling and causing harm to people.

Property

An infestation of agriculture pests could impact crop yields, potential destroying whole fields. Between 2007 and 2017, insects and crop disease damaged 3,084.2 acres of corn and soybean field causing the RMA paying $403,778 indemnities to farmers.

Critical Facilities and Infrastructure

Animal, crop or plant disease is not expected to have any impacts on critical facilities or infrastructure.

Economy

Nationally, it is estimated that invasive species cost the USA $138 billion per year. As noted above pests and crop disease in Tama County have caused $403,778 of indemnity payments. Average annualized losses due to crop and plant disease is estimated to be $40,378. Economic impacts also include both prevention, response and recovery costs.

Historic, Cultural, and Natural Resources

Invasive species typically harm native species through predation, habitat degradation and competition for shared resources; they can muscle native species out of natural habitats and are a leading cause of population decline and extinction in animals.

Development Trends

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 Emerald Ash Borer, the Iowa Department of Natural Resources recommends that other native tree species be planted in lieu of Ash trees to avoid increasing vulnerability to infestation of the Emerald Ash Borer.

3.3.2 Dam/Levee Failure

Dam Failure – Hazard Score Calculation by Jurisdiction						
Jurisdiction	Historical Occurrence	Probability	Vulnerability	Severity of Impact	Speed Of Onset	Total Score
Chelsea	1	1	1	1	4	8
Clutier	1	1	1	1	4	8
Dysart	1	1	1	1	4	8
Elberon	1	1	1	1	4	8
Garwin	1	1	1	2	4	9
Gladbrook	1	1	1	1	4	8
Lincoln	1	1	1	1	4	8
Montour	1	1	2	2	4	10
Tama	1	1	2	3	4	11
Toledo	1	1	1	1	4	8
Traer	1	1	1	1	4	8
Vining	1	1	1	1	4	8
Tama County	1	1	1	1	4	8
GMG Community SD	1	1	1	1	4	8
North Tama Community SD	1	1	1	1	4	8
South Tama Community SD	1	1	1	1	4	8
Union Community SD	1	1	1	1	4	8

Hazard Profile/Description

The uncontrolled release of water resulting from a structural failure in a dam, wall, dike, berm, or area of elevated soil can cause flooding. Possible causes of the breach could include flooding, earthquakes, blockages, landslides, lack of maintenance, improper operation, poor construction, vandalism, terrorism, erosion, piping, saturation, or under seepage.

Levee failure can occur by overtopping or breaching. Overtopping occurs when a river rises higher than the levee's crown. Breaching can result from the loss of structural integrity of a wall, dike, berm, or elevated soil by erosion, piping, saturation, under seepage, or animal burrows.

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 for flood control or a reservoir for a constant water source. 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.

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 10 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 2 or more square miles in an urban area, or 10 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 3-7). 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 Iowa Department of Natural Resources performs annual inspections on all high hazard dams in the State.

Table 3-7 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: Iowa Department of Natural Resources; *the term "moderate" is used by the Iowa Department of Natural Resources. However, the National Inventory of Dams uses the term "significant" to identify the same general hazard classification

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

Duration Score: 1—Less than 6 hours

Location

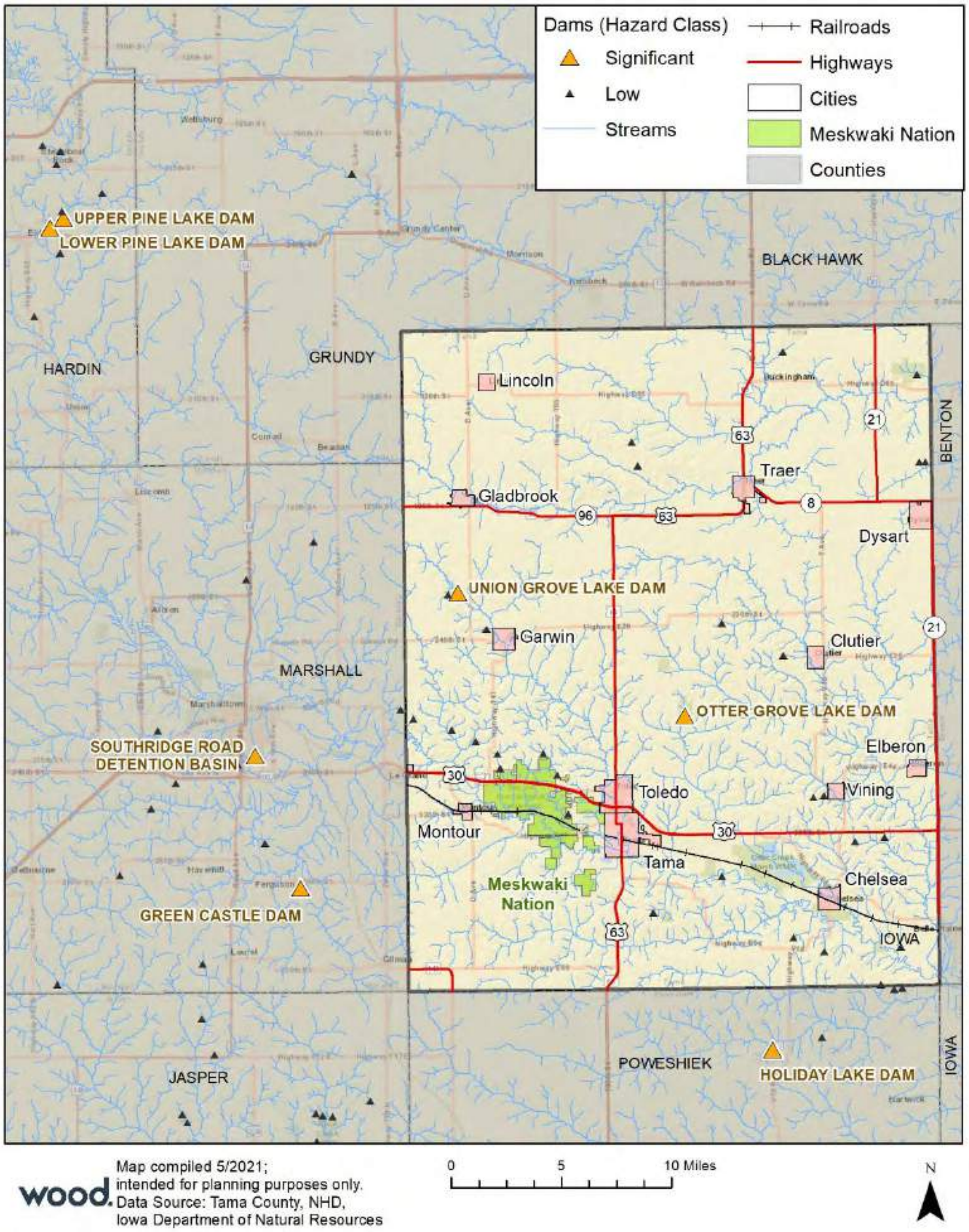
The Iowa Department of Natural Resources tracks all dams in the State of Iowa with a height of at least 25 feet or a total storage of at least 50-acre feet of water. The inventory excludes dams less than 6 feet high, regardless of storage capacity, and dams less than 15-acre feet of storage, regardless of height. Tama County has a total of 30 dams. 28 of these dams are Low Hazard Dams and two are Moderate/Significant

Hazard Dams. The majority of dams (21) in the county were built for the purposes of fire protection, stock or small fishponds. Eight dams were built for the purposes of recreation, and one was built for the purposes for debris control. There are an additional 12 dams within five miles of Tama County boundaries. Three of those dams are moderate classification dams but pose a minimal risk to downstream communities in Tama County. See Figure 3-9 in this plan for a map of dams in Tama County and adjacent counties and Table 3-8 for a list of Significant Hazard dams in Tama County.

Table 3-8 Significant Hazard Dams in Tama County

Dam Name	Hazard Potential	Owner Name	Owner Type	River	Height (ft.)	Maximum Storage (acre feet)	Normal Storage (acre feet)	Dam Length (ft.)	Year Completed
Caputo Dam	Significant	Gerald Caputo	Private	Burnett Creek	21	97	31	650	1978
Conte Dam	Significant	C. W. Conte	Private	Tr – Linn Creek	24	51	26	342	1970

Figure 3-9 Location of Dams in Tama County



According to the National Levee Database, Tama County has one levee which is located in the City of Tama on the north bank of the Iowa River near river mile 188.5 (US Army Corps of Engineers 2015). The levee's length is 2.71 miles, and it protects less than one square mile of the community. The levee was completed in January of 1995 in response to significant flood damages for the City of Tama in the floods of 1993. The most recent periodic inspection of the levee in 2013 resulted in a rating of "Minimally Acceptable," which is the middle ranking in between unacceptable and acceptable. Levees are given a minimally acceptable ranking if they have one item or more from a checklist that does not meet national standards. Citation items were minimal and did not point to an increased risk of levee failure due to operation. Note that the National Levee Database lists all federal levees; however, it is possible that there is more than one levee in Tama County. Any levees not included in the National Levee Database are likely rural, agricultural-related man-made levees, dikes, or berms that protect primarily agricultural lands and communities. A breach or over- topping of these levees would likely not impact any other property than that of the levee owner.

There are 28 other levees within 75 miles of Tama County; however, none of these levees pose a risk to Tama County communities. Many of the levees are not located on the same rivers as those in Tama County (i.e.: levees in Black Hawk, Dallas, Fayette, Polk, Wapello Counties). There are three levees in the City of Tama in Tama County. If a levee breach occurred, damage would still be minimal. Any displaced water would have to travel at least 20 river miles before reaching the nearest Tama County communities located on the Iowa River, which is the City of Tama.

Historical Occurrence

No jurisdictions have any reported incidents of a dam or levee failure in Tama County.

Probability of Future Occurrences

The probability of a major dam failure or levee failure occurring in or affecting any jurisdiction in Tama County is less than 10% in any given year.

Magnitude and Severity (Extent)

Severity of Impact

Most jurisdictions in Tama County determined the severity of impact of a dam failure to be negligible (a score of 1), 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. Garwin and Montour determined their severity of impact to be a 2. Impacts could cause minor or short-term property damage or environmental impacts. The City of Tama determined their severity of impact to be a 3 due to the potential for flood damage from a levee failure that could cause property damage that threatens structural stability in houses and buildings.

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. Al jurisdictions scored speed of onset as a 4.

Vulnerability Assessment

Tama County has a total of 29 dams. 27 of these dams are Low Hazard Dams and two are Moderate Hazard Dams. The majority of dams in the county were built for the purposes of fire protection, stock or small fishponds, or recreation. There are an additional 17 dams upstream of Tama County boundaries. Four of these are significant hazard classification dams but pose a minimal risk to communities in Tama County. See Figure 3-9 for the location of these dams.

The only jurisdiction at risk for levee failure is the City of Tama. There is one levee in Tama that was built for the purpose flood protection following the flooding of 1993. The 3 mile-long-levee protects a mixed residential, commercial, and industrial neighborhood consisting of a population of approximately 3,000 people.

People

There are no dams with a substantial risk of loss of human life in Tama County.

Property

To determine potential losses to existing development, available inundation maps and inspection reports were reviewed from the Iowa Department of Natural Resources.

A failure of a significant 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 (Significant) Hazard where the dam and its impoundment are themselves of public importance, such as dams associated with public water supply systems, industrial water supply or public recreation or which are an integral feature of a private development complex.

Most jurisdictions scored vulnerability as a 1 due to the limited impact of a low hazard dam failure. The HMPC estimated that less than 25% of people and property would be affected. Garwin is located four miles downstream from one of the two significant hazard dams in Tama County. This dam, the Union Grove Lake Dam, has the capacity to hold 2,120-acre feet of water; however, if a dam failure were to occur, limited damage would be expected. Only 9% of Garwin's total parcels are located in the floodplain. 70% of those parcels in the floodplain are classified as agricultural. These factors limit Garwin's vulnerability to a dam failure. Garwin determined that less than 25% of people and property would be impacted if dam failure occurred. The second significant hazard dam in the county, Otter Creek Lake Dam, is not located near any incorporated areas.

The City of Montour scored vulnerability as a 2 because so many dams are upstream and within close proximity. Multiple dam failures, while unlikely, could impact the city to a greater extent. The City of Tama scored vulnerability as a 2 because it has the county's only levee within its jurisdictional boundaries. The levee currently protects 17% of the total parcels in the city, many of which are classified as residential or commercial. The HMPC members from Montour and Tama determined that a worse-case scenario could result in 26-50% of people and property might be affected through property damage, closed roads, or other inconveniences.

Significant Hazard Dams

Otter Creek Lake Dam: The most recent inspection report available from Iowa DNR was from July 17, 2017. The report concluded the dam was in satisfactory condition. The dam was constructed in the late 1960s under approval of the Iowa Natural Resources Council. The Tama County Conservation Board owns the dam and is responsible for its operation and maintenance. Otter Creek Lake is the focal point of a county park at this site.

The dam is classified as a moderate hazard structure primarily because of its importance as a recreational facility. Downstream structures within two miles include a park road and four county roads, one of which is paved. At the time that this inspection report was generated, there was no residential, commercial, or industrial development below the dam which would be affected by a dam breach flood.

Union Grove Lake Dam: The most recent inspection report available from Iowa DNR was from June 18, 2018. The report concluded a "fair" rating for the condition of the dam, due to heavy trees and brush on the dam and some concrete deterioration. This structure is owned by the DNR who is responsible for its operation and maintenance. Union Grove Lake forms an integral part of the state park known by the same name. Little is known of the origin of the dam. The original design or construction plans are not available.

In the 2009 inspection, it was noted that the dam has had problems with excessive water loss from the reservoir. Prior to 2009, a concrete slurry mixture was injected into the dam to help control some of the excessive water loss. The dam is rated a Significant Hazard primarily due to the importance of the structure as a recreational facility in the state park. Downstream structures within one mile include two paved county roads. There is no residential, commercial, or industrial development below the dam that would be affected by a breach flood.

Critical Facilities and Infrastructure

There are no critical facilities at risk to dam failures in Tama County.

There is a total of 12 critical facilities that are within the area protected by levees from 1% annual chance flood hazards in Tama. The FEMA lifelines protected by levees in the city of Tama include Food, Water, Shelter; Hazardous Material; and Safety and Security. See Table 3-9 for a detailed breakdown of critical facility by FEMA lifeline.

Table 3-9 Facilities Within the Area Protected by Levee Flood Hazard

Jurisdiction	Communications	Energy	Food, Water, Shelter	Hazardous Material	Health and Medical	Safety and Security	Transportation	Total
Tama	-	-	5	4	-	3	-	**12**

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.

Historic, Cultural and Natural Resources

A failure of a low hazard dam, which includes the majority of dams in Tama 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.

Development Trends

While Tama County is at a low risk for dam failure, development below a significant hazard dam can change its classification; however, development trends are not anticipated to change risk significantly. Levee failure risk is not expected to change significantly due to development trends.

3.3.3 Drought

Drought – Hazard Score Calculation						
Jurisdiction	**Historical Occurrence**	**Probability**	**Vulnerability**	**Severity of Impact**	**Speed Of Onset**	**Total Score**
Chelsea	3	3	2	2	1	11
Clutier	3	3	2	2	1	11
Dysart	3	3	2	2	1	11
Elberon	3	3	2	2	1	11
Garwin	3	3	2	2	1	11
Gladbrook	3	3	2	2	1	11
Lincoln	3	3	2	2	1	11
Montour	3	3	2	2	1	11
Tama	3	3	2	2	1	11
Toledo	3	3	2	2	1	11
Traer	3	3	2	2	1	11
Vining	3	3	2	2	1	11
Tama County	3	3	2	2	1	11
GMG Community SD	3	3	2	2	1	11
North Tama Community SD	3	3	2	2	1	11
South Tama Community SD	3	3	2	2	1	11
Union Community SD	3	3	2	2	1	11

Description

Drought is generally defined as a condition of moisture levels significantly below normal for an extended period of time 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 on the basis of 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 U.S. 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.

Location

The entire planning area in Tama County is at risk to drought. However, the agricultural use areas are at increased risk due to the dependence of agriculture on adequate precipitation. According to the 2017 USDA Census of Agriculture, 406,984 acres within Tama County is designated agricultural land or cropland, a majority of which (89%) is cropland (USDA 2017). The average farm size in Tama County is 380 acres.

Historical Occurrence

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.

The National Center for Environmental Information (NCEI) data indicates Tama County has suffered ten periods of drought conditions from 2000 to 2020, which gives the hazard a score of 3. While some may have been more severe than others, agricultural areas were affected much more than the metropolitan areas where impacts were indirect.

Table 3-10 Tama County Drought Events From 2000-2020

Date	Property Damage	Crop Damage
8/14/2000		$4,690,000
9/1/2000		$5,030,000
8/1/2001		$11,350,000
8/1/2003	$12,650,000	$0

Date	Property Damage	Crop Damage
7/1/2012		$45,000,000
8/1/2012		$6,000,000
9/1/2012		$0
10/1/2012		$0
8/1/2013		$21,000,000
9/1/2020		$0
Total	**$12,650,000**	**$93,070,000**

Source: NCEI - Marshall (zone) and Tama (zone)

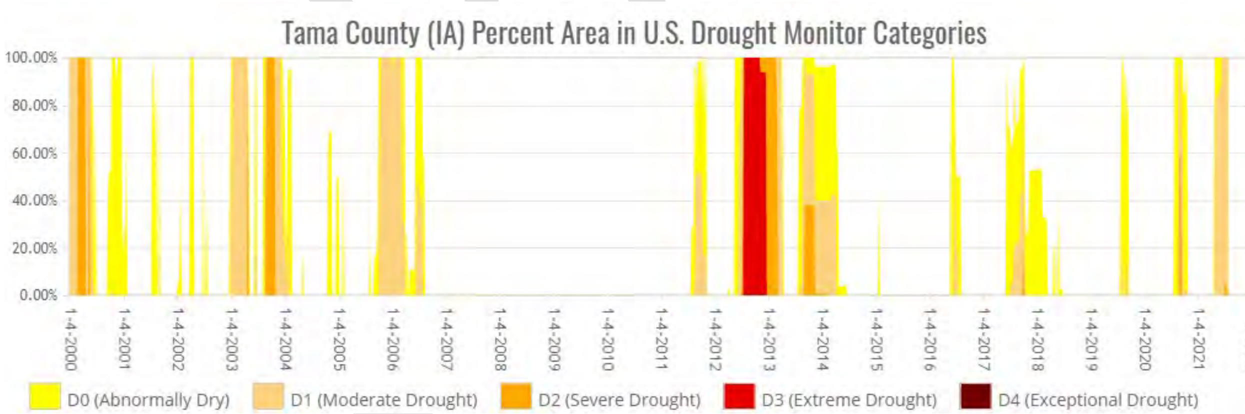
According to the National Drought Mitigation Center's Drought Impact Reporter, between January 1980 and December 31, 2020, Tama County was included in 4 listed drought impacts. The entire State of Iowa was affected by 206 of these impacts. The following are the categories and reported number of impacts. Note: some impacts have been assigned to more than one category:

- Agriculture – 4
- Relief, Response & Restrictions – 2
- Water Supply & Quality – 1

While some past events have been more severe than others, agricultural areas were affected much more than the metropolitan areas where impacts were indirect. The 2012-2013 drought resulted in $21 million for the affected counties in Iowa, according to the previous Hazard Mitigation Plan. No deaths or injuries were reported during any of drought events.

Figure 3-10 below provided by the U.S. Drought Monitor, summarizes the historical drought conditions for Tama County by intensity and percent area from 2000 through January 2021. A portion of the county was in exceptional drought intensity in 2012.

Figure 3-10 Historic Drought Intensity (Percent Area), 2000-January 2021



Tama County was designated in three USDA Secretarial disaster declarations that included drought in 2012 – 2013 to make emergency loans available to producers suffering losses. Note records were searched between 2012 and 2020 but no declarations for drought after 2013 were found.

Table 3-11 USDA Disaster Designations for Drought, Tama County, 2012-2013

Year	Declaration Number
2012	S3310
2013	S3614

Source: USDA

According to the USDA's Risk Management Agency (RMA), payments for insured crop losses in Tama County as a result of drought conditions occurred in nearly every year in the past thirteen years from 2007-2020 and totaled $20,658,390 for a loss of 150,809.74 acres. The following table breaks down the RMA payments by year and crop type.

Table 3-12 Crop Insurance Claims Paid from Drought, 2007-2020

Year	Crop Name	Acres Lost	Insurance Paid
2007	Corn	448.7	$21,710
		10	$550
		70.4	$7,993
2008	Corn	1,022.13	$75,828
	Soybeans	150.6	$28,751
2011	Corn	1,967.28	$287,893
	Corn	88.3	$19,488
	Soybeans	18.81	$3,613
	Soybeans	824.85	$118,746
2012	Forage Production	23	$3,298
	Corn	39.1	$14,262
	Corn	30.1	$3,187
	Corn	45	$2,045
	Corn	807.22	$346,407
	Corn	869	$109,490
	Corn	20,863.67	$4,280,068
	Corn	8	$364
	Hybrid Corn Seed	3,689.32	$960,663
	Soybeans	4.8	$1,150
	Soybeans	280.4	$34,221
	Soybeans	79.6	$59,032
	Soybeans	124.6	$4,691
	Soybeans	9,365.95	$1,043,697
	Forage Production	23	$3,298
2013	Corn	25	$2,020
	Corn	325.1	$83,465
	Corn	39,580.5	$6,607,664
	Corn	1,102.47	$285,542
	Corn	1,594.25	$330,831
	Hybrid Corn Seed	380.7	$180,484
	Hybrid Corn Seed	49.55	$60,831
	Soybeans	23	$705
	Soybeans	41,150.03	$3,457,460
	Soybeans	615.2	$62,741
2014	Corn	2,764.485	$253,591
	Hybrid Corn Seed	103.3	$42,926
	Soybeans	2,610.067	$151,110
2017	Corn	27.58	$3,367
	Corn	52	-$1,952
	Corn	2,034.323	$146,423
	Corn	9.2	$0
	Soybeans	10.5	$3,487

Year	Crop Name	Acres Lost	Insurance Paid
	Soybeans	125.73	$5,557
	Soybeans	113.855	$9,796
	Soybeans	5,564.896	$424,454
2018	Corn	75.6	$7,900
	Soybeans	235.15	$15,606
2019	Soybeans	6.5	$2,437
		9	$435
		75.3	$7,984
2020	Corn	1,584.97	$207,311
	Corn	41.71	$3,162
	Corn	150.66	$6,933
	Corn	59.10	$23,905
	Corn	25.14	$940
	Corn	60.33	$40,475
	Corn	166.57	$34,128
	Corn	20.35	$2,871
	Corn	2,886.80	$329,965
	Corn	72.11	$48,656
	Corn	264.98	$28,075
	Hybrid Corn Seed	52.10	$12,568
	Hybrid Corn Seed	46.85	$472
	Soybeans	4,218.42	$249,363
	Soybeans	259.55	$26,377
	Soybeans	905.78	$46,265
	Soybeans	88.00	$5,650
	Soybeans	0.60	$236
	Soybeans	16.76	$197
	Soybeans	371.84	$15,532
	Total	**150,809.74**	**$20,658,390**

Source: USDA Risk management Agency

Probability of Future Occurrences

Drought is part of normal climate fluctuations. Climatic variability can bring dry conditions to the region for up to years at a time. Research and observations of the El Nino/La Nina climatic events are resulting in more predictable climatic forecasts. The frequency of drought conditions in Iowa may increase with the onset on climate change.

NOAA's National Climatic Data Center uses the U.S. 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.

Based on historic occurrences of drought, Tama County maintains between 26 and 60% chance of drought occurring in any given year.

Magnitude and Severity (Extent)

Those dependent on rain would be the most vulnerable during a drought. This means that agriculture, agribusiness, and consumers would be impacted. A drought limits the ability to produce goods and provide services. Because citizens draw their drinking water from groundwater sources, a prolonged severe drought may impact all citizens if there were to be a dramatic drop in the water table. Fire suppression can also become a problem due to the dryness of the vegetation and possible lack of water. Generally, a drought event may directly or indirectly impact 50-75% of people and property in Tama County. A prolonged drought would have a larger impact.

A period of prolonged abnormally low precipitation that produces severe dry conditions. A chart that classifies drought severity is included in Table 3-13.

Table 3-13 Drought Severity Classification Chart

Description	Possible Impacts	Palmer Drought Index
Abnormally Dry	Going into drought: short-term dryness slowing planting, growth of crops or pastures. Coming out of drought: some lingering water deficits; pastures or crops not fully recovered	-1.0 to -1.9
Moderate Drought	Some damage to crops, pastures; streams, reservoirs, or wells low, some water shortages developing or imminent; voluntary water-use restrictions requested	-2.0 to -2.9
Severe Drought	Crop or pasture losses likely; water shortages common; water restrictions imposed	-3.0 to -3.9
Extreme Drought	Major crop/pasture losses; widespread water shortages or restrictions	-4.0 to -4.9
Exceptional Drought	Exceptional and widespread crop/pasture losses; shortages of water in reservoirs, streams, and wells creating water emergencies	-5.0 or less

Source: The National Drought Mitigation Center, 2015

Severity of Impact

Drought in the U.S. seldom results directly in the loss of life. Deaths associated with drought are usually related to a heat wave. Drought more directly affects agricultural crops, livestock, natural vegetation, and stream flows that include fish and aquatic vegetation. Impacts are costly to the economy, environment, and general population.

Speed of Onset

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

Climate Change Considerations

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 (U.S. Global Change Research Program 2018).

Vulnerability

People

The historical and potential impacts of drought on populations include agricultural sector job loss, secondary economic losses to local businesses and public recreational resources, increased cost to local and state government for large-scale water acquisition and delivery, and water rationing and water wells running dry for individuals and families. Because citizens draw their drinking water from groundwater sources, a prolonged severe drought may impact all citizens if there were to be a dramatic drop in the water table. As drought is often accompanied by prolonged periods of extreme heat, negative health impacts such as dehydration can also occur, where children and elderly are most susceptible. Other public health issues can include impaired drinking water quality, increased incidence of mosquito-borne illness, an increase in wildlife-human confrontations and respiratory complications as a result of declined air quality in times of drought.

Property

No structures will be directly affected by drought conditions, though some structures may become vulnerable to wildfires, which are more likely following years of drought. Droughts can also have significant impacts on landscapes, which could cause a financial burden to property owners. However, these impacts are not considered critical in planning for impacts from the drought hazard.

Critical Facilities and Infrastructure

Drought typically affects crops and cropland more than it affects structures, but all critical facilities in the area could still experience effects. These critical facilities include, but are not limited to, schools, health care facilities, police and fire stations, water towers, lift stations, city and county buildings, and sirens.

Economy

Economic impact will be largely associated with industries that use water or depend on water for their business. For example, landscaping businesses were affected in the droughts of the past as the demand for service significantly declined because landscaping was not watered. Agricultural industries will be impacted if water usage is restricted for irrigation. Table 3-12 shows crop loss data due to drought between 2007 and 2020. Based on information in that table Tama County experiences an average annualized loss of $1,589,107 due to drought.

Historic, Cultural and Natural Resources

If a severe drought event were to occur in Tama County, crops and grassland areas may be more susceptible to fire, water for fire suppression may be limited, and jurisdictions may have to limit water consumption or look for alternative water sources. Cultural facilities would likely not be impacted by drought unless water usage was limited, or a facility was affected by a grass or wildland fire.

Development Trends

Each municipal planning partner in this effort has an established comprehensive plan that includes policies directing land use and dealing with issues of water supply and the protection of water resources. These plans provide the capability at the local municipal level to protect future development from the impacts of drought. All planning partners reviewed their general plans under the capability assessments performed for this effort. Deficiencies identified by these reviews can be identified as mitigation initiatives to increase the capability to deal with future trends in development. Vulnerability to drought will increase as population growth increases, putting more demands on existing water supplies. Future water use planning should consider increases in population as well as potential impacts of climate change.

3.3.4 Flooding

Flash Flood – Hazard Score Calculation by Jurisdiction						
Jurisdiction	Historical Occurrence	Probability	Vulnerability	Severity of Impact	Speed of Onset	Total Score
Chelsea	1	2	4	3	4	14
Clutier	1	1	1	1	4	8
Dysart	1	1	1	1	4	8
Elberon	1	1	1	1	4	8
Garwin	1	1	2	2	4	10
Gladbrook	1	2	1	2	4	10
Lincoln	1	1	1	1	4	8
Montour	4	4	3	3	4	18
Tama	2	3	1	1	4	11
Toledo	1	1	3	2	4	11
Traer	1	1	2	1	4	9
Vining	-	-	-	-	-	-
Tama County	4	4	1	1	4	14
GMG Community SD	1	1	2	2	4	10
North Tama Community SD	1	1	1	1	4	8
South Tama Community SD	2	3	2	2	4	13
Union Community SD	1	1	1	1	4	8

River Flooding – Hazard Score Calculation by Jurisdiction						
Jurisdiction	Historical Occurrence	Probability	Vulnerability	Severity of Impact	Speed of Onset	Total Score
Chelsea	3	4	4	3	2	16
Clutier	1	1	1	1	2	6
Dysart	1	1	1	1	2	6
Elberon	1	1	1	1	2	6
Garwin	1	2	2	2	2	9
Gladbrook	1	2	1	2	2	8
Lincoln	1	1	1	1	2	6
Montour	3	4	4	4	2	17
Tama	4	4	1	1	2	12
Toledo	3	4	2	1	2	12
Traer	1	1	1	1	2	6
Vining	1	1	1	1	2	6
Tama County	4	4	2	3	2	15
GMG Community SD	1	2	2	2	2	9
North Tama Community SD	1	1	1	1	2	6
South Tama Community SD	4	4	2	2	2	13
Union Community SD	1	1	1	1	2	6

Hazard Profile/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", "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. Floodplains are part of a larger entity called a basin, which is defined as all the land drained by a river and its branches.

Flash Flooding is a flood event that occurs with little to no warning where water levels rise at an extremely fast rate. Flash flooding results from intense rainfall over a brief period, sometimes combined with rapid snowmelt, ice jam release, frozen ground, saturated soil, or impermeable surfaces.

Most flash flooding is caused by slow-moving thunderstorms or thunderstorms repeatedly moving over the same area. Flash flooding is an extremely dangerous form of flooding 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 riverine 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 disperse 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.

Location

Each community has its own specific issues pertaining to flooding. There is significant variability among communities in Tama County regarding their proximity to rivers, water bodies, or Special Flood Hazard Areas (SFHAs). Maps showing this variability can be found for the county as a whole and for each incorporated area in Figures 3-11 through 3-24. These figures were created using the Flood Risk Reports for the Middle Cedar and Middle Iowa Watersheds, which together cover the entirety of Tama County, both dated August 31, 2015. These reports feature more recent flood risk analysis than the effective November 18, 2009 study and were used instead of that study.

The cities of Chelsea, Montour, Tama, and Toledo have the highest risk of flooding in Tama County. Major flood stages occur on the Iowa River, and Mud Creek, Deer Creek, and Otter Creek are prone to flash flooding. The City of Tama has a network of levees constructed in the city to protect much of the area when the Iowa River floods, but other portions of the city are still susceptible to flooding. Tama County overall experiences many river flooding events. Portions of the county are vulnerable to road closures due to flooding.

Figure 3-11 Tama County FEMA RiskMAP Flood Hazard Areas

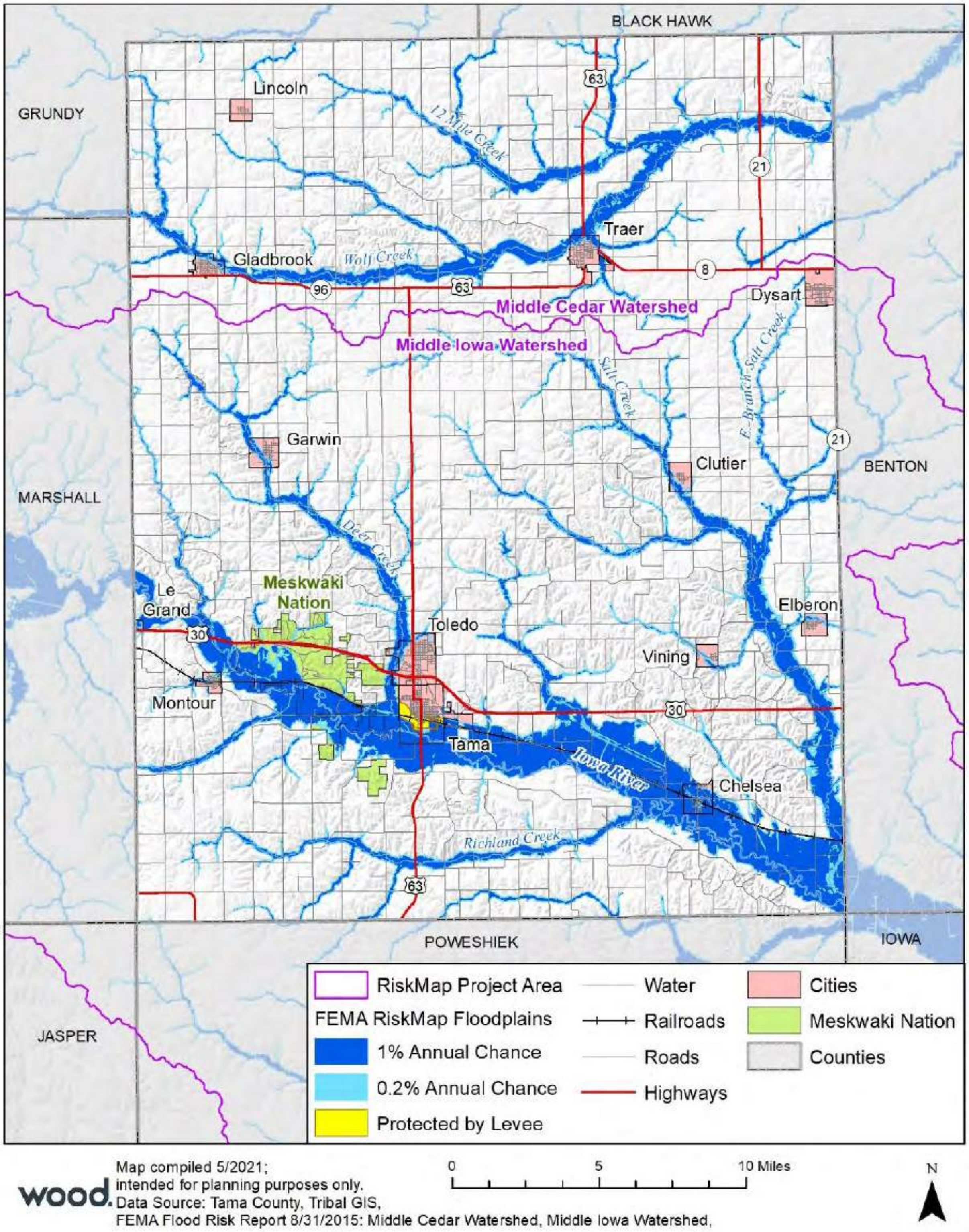


Figure 3-12 Chelsea FEMA RiskMAP Flood Hazard Areas

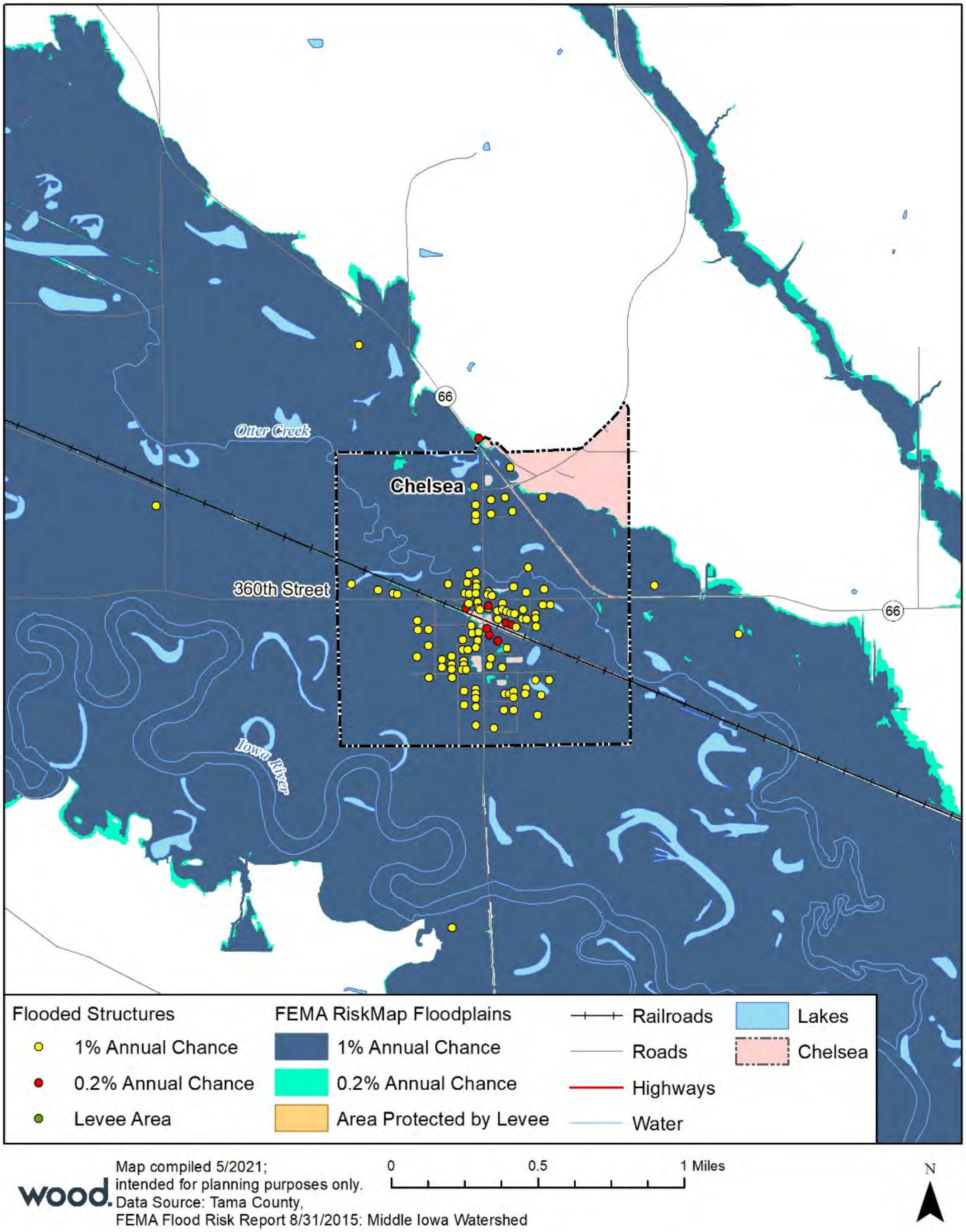


Figure 3-13 Clutier FEMA RiskMAP Flood Hazard Areas

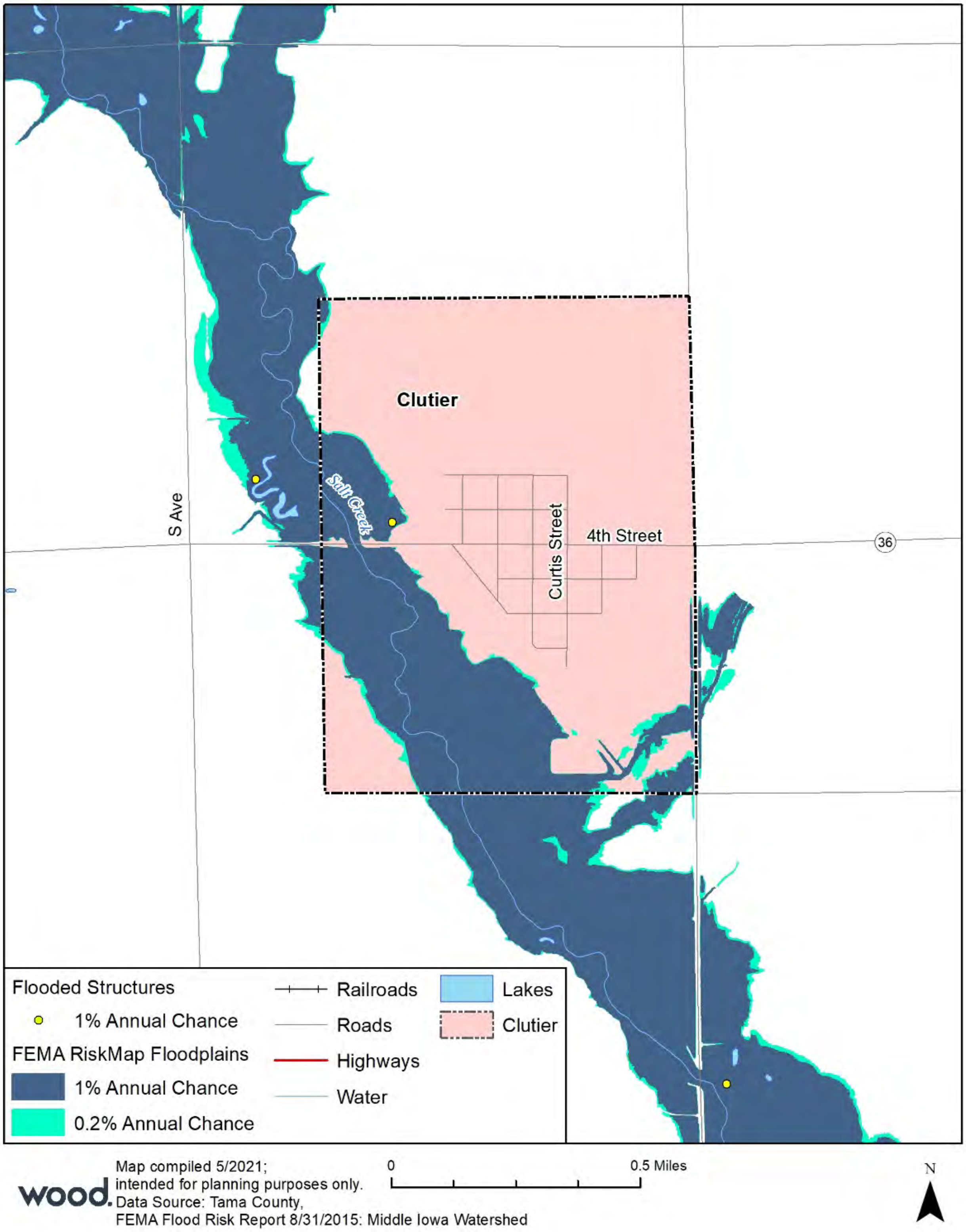


Figure 3-14 Dysart FEMA RiskMAP Flood Hazard Areas

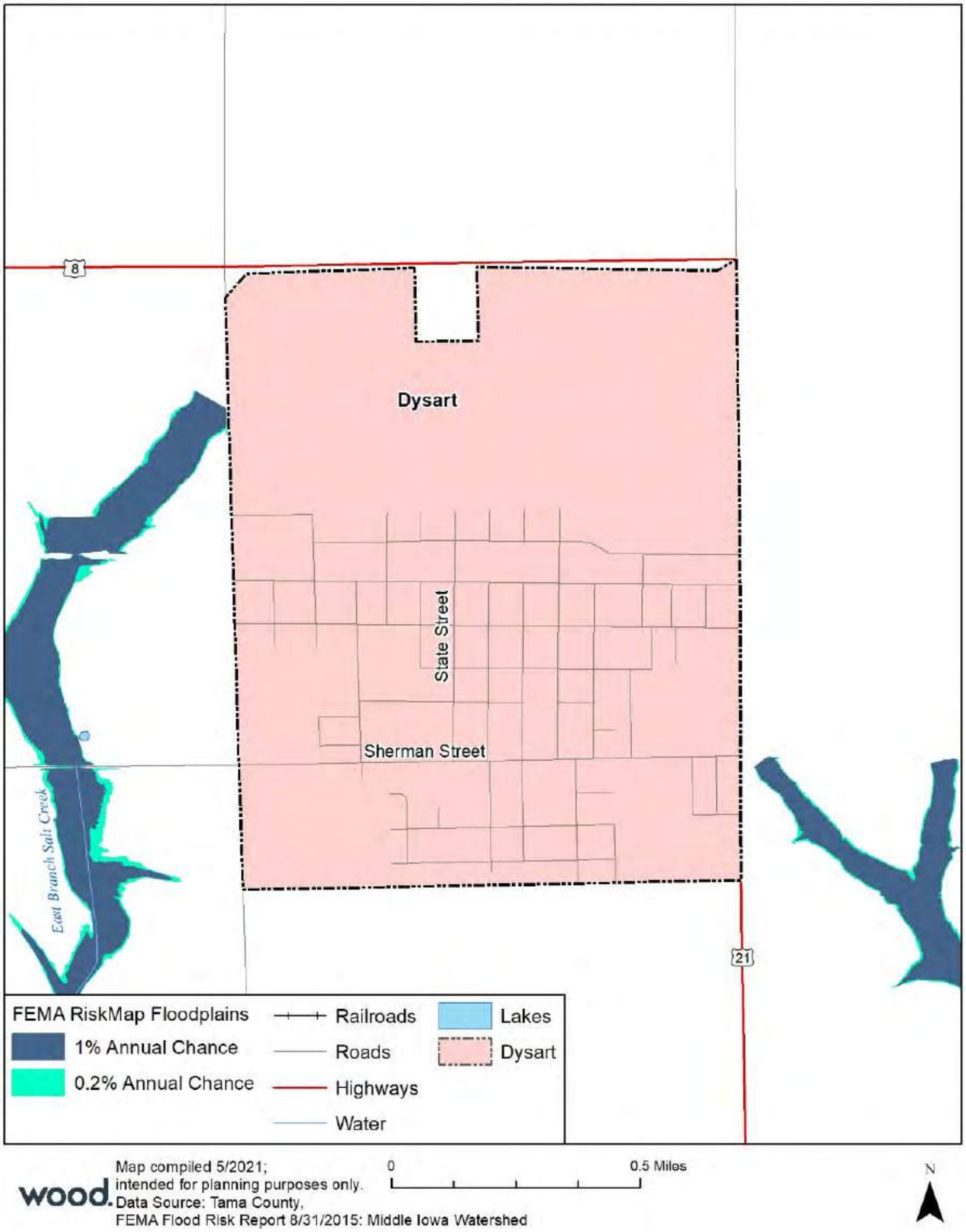


Figure 3-15 Elberon FEMA RiskMAP Flood Hazard Areas

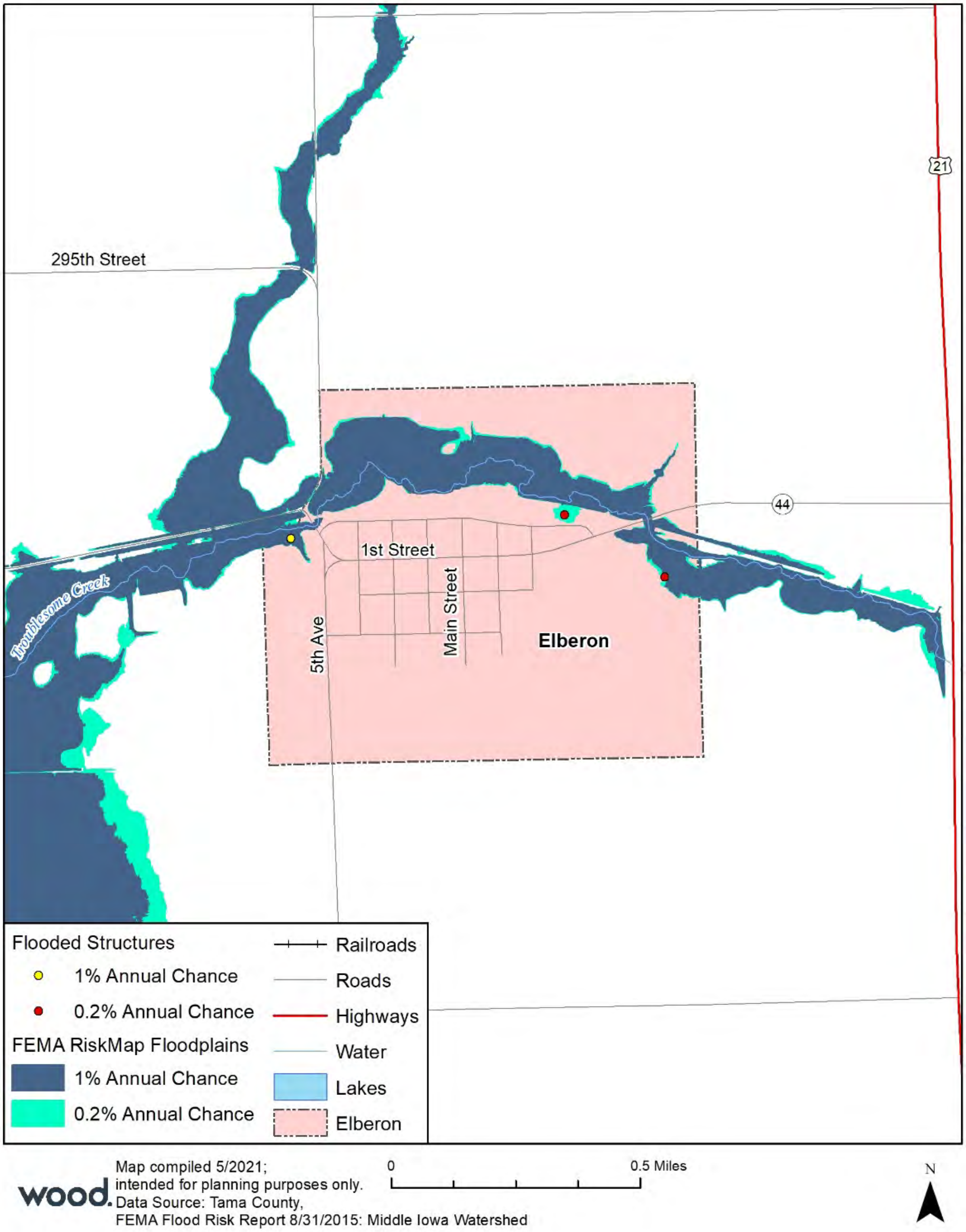


Figure 3-16 Garwin FEMA RiskMAP Flood Hazard Areas

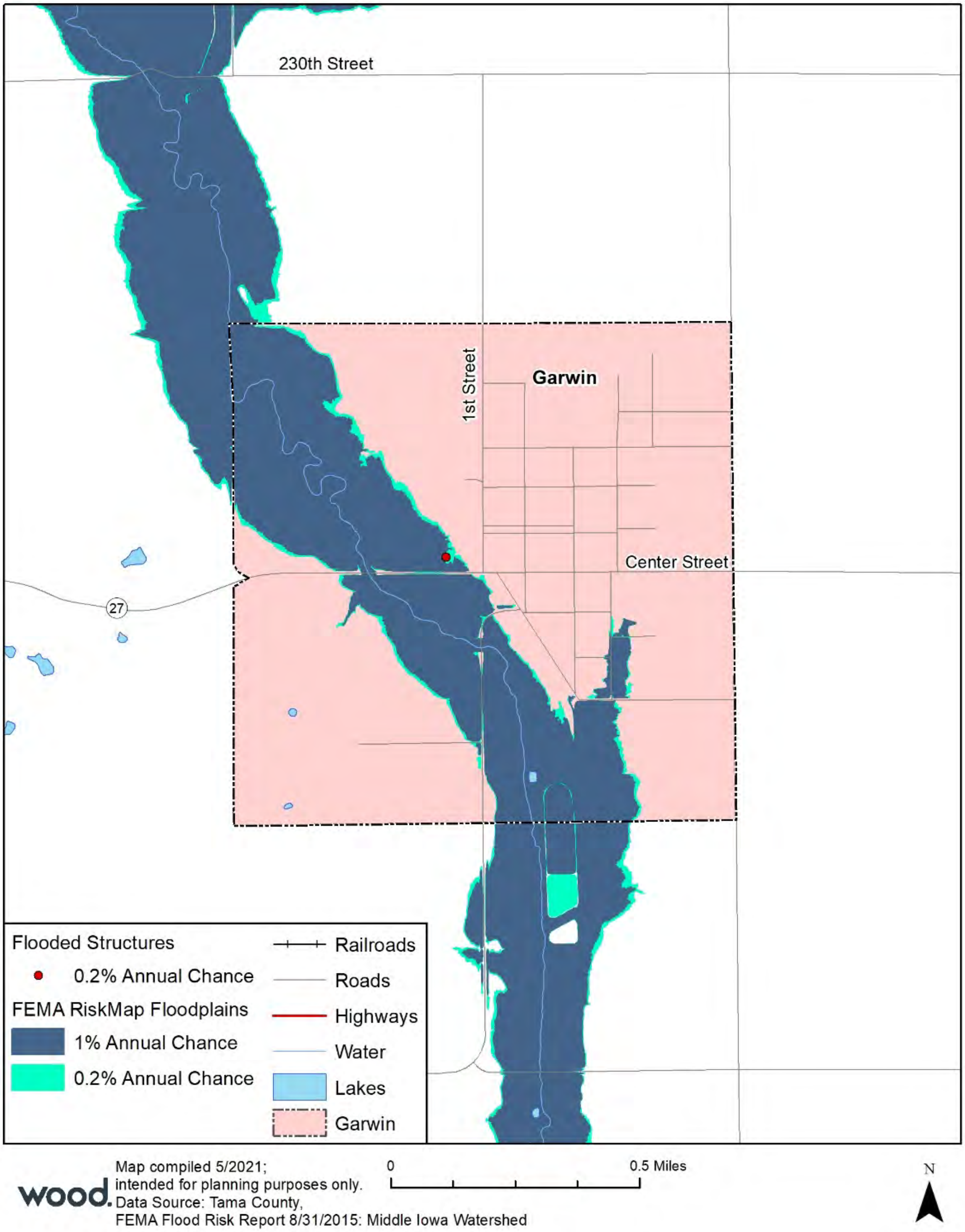


Figure 3-17 Gladbrook FEMA RiskMAP Flood Hazard Areas

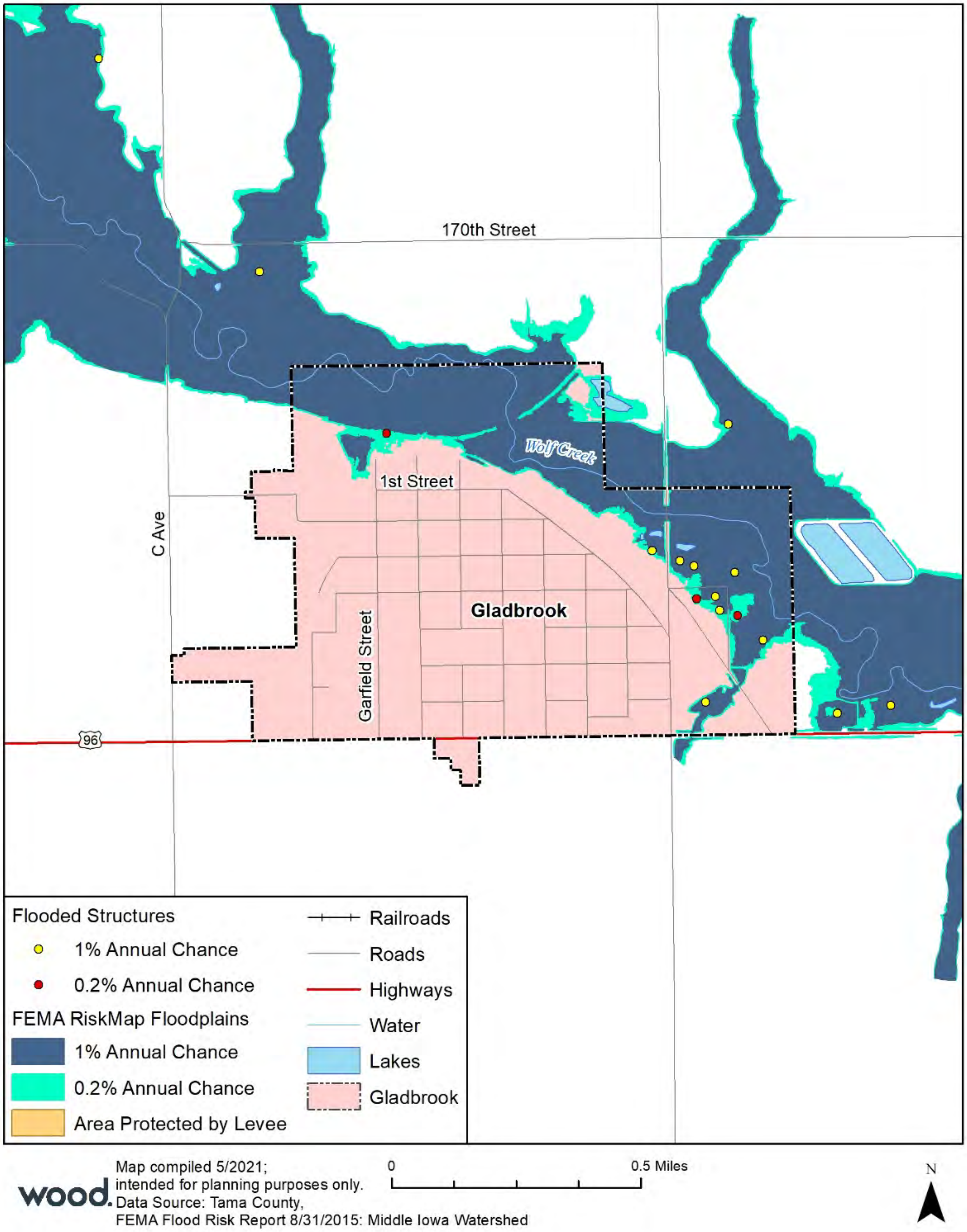


Figure 3-18 LeGrand FEMA RiskMAP Flood Hazard Areas

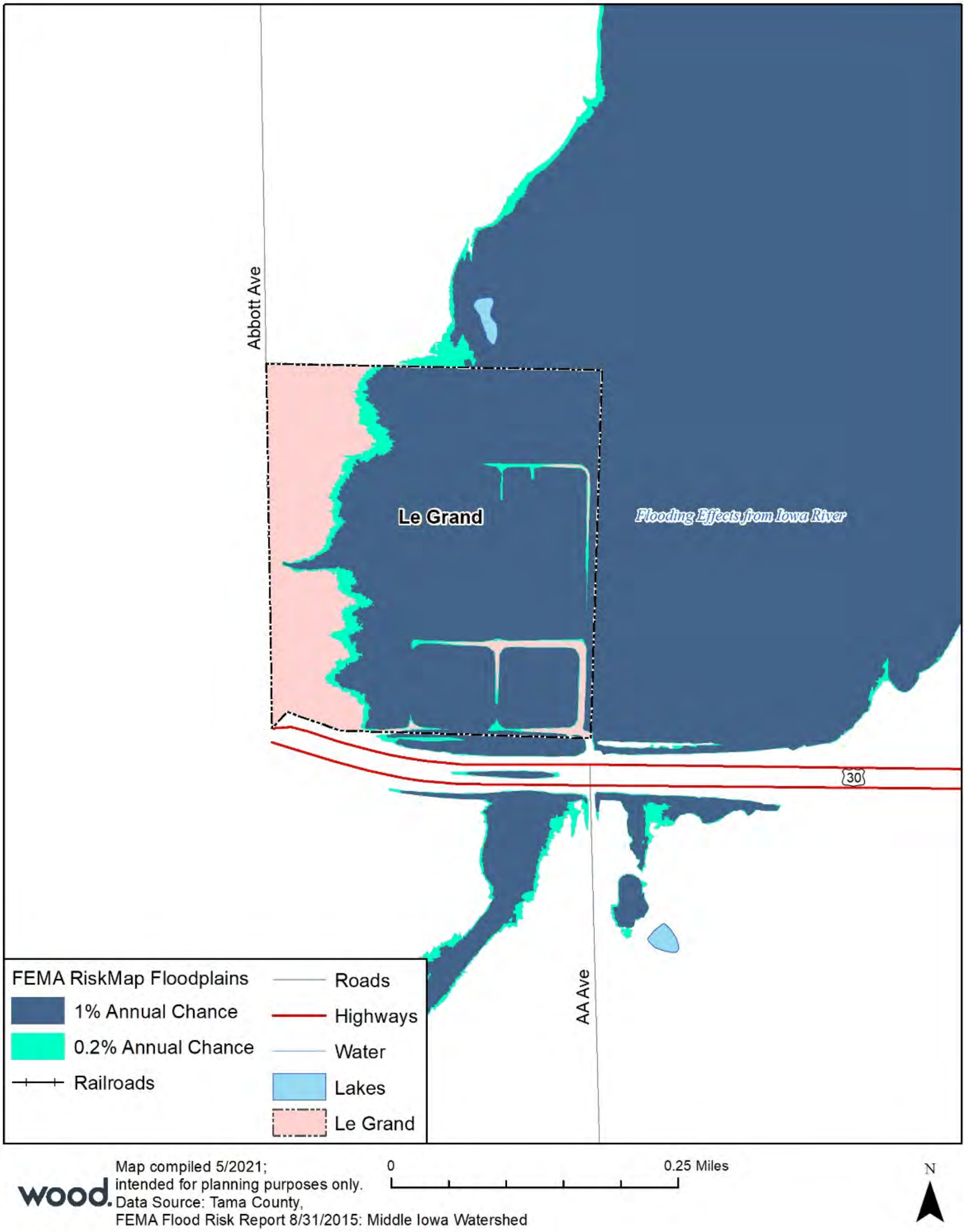


Figure 3-19 Lincoln FEMA RiskMAP Flood Hazard Areas

Figure 3-20 Montour FEMA RiskMAP Flood Hazard Areas

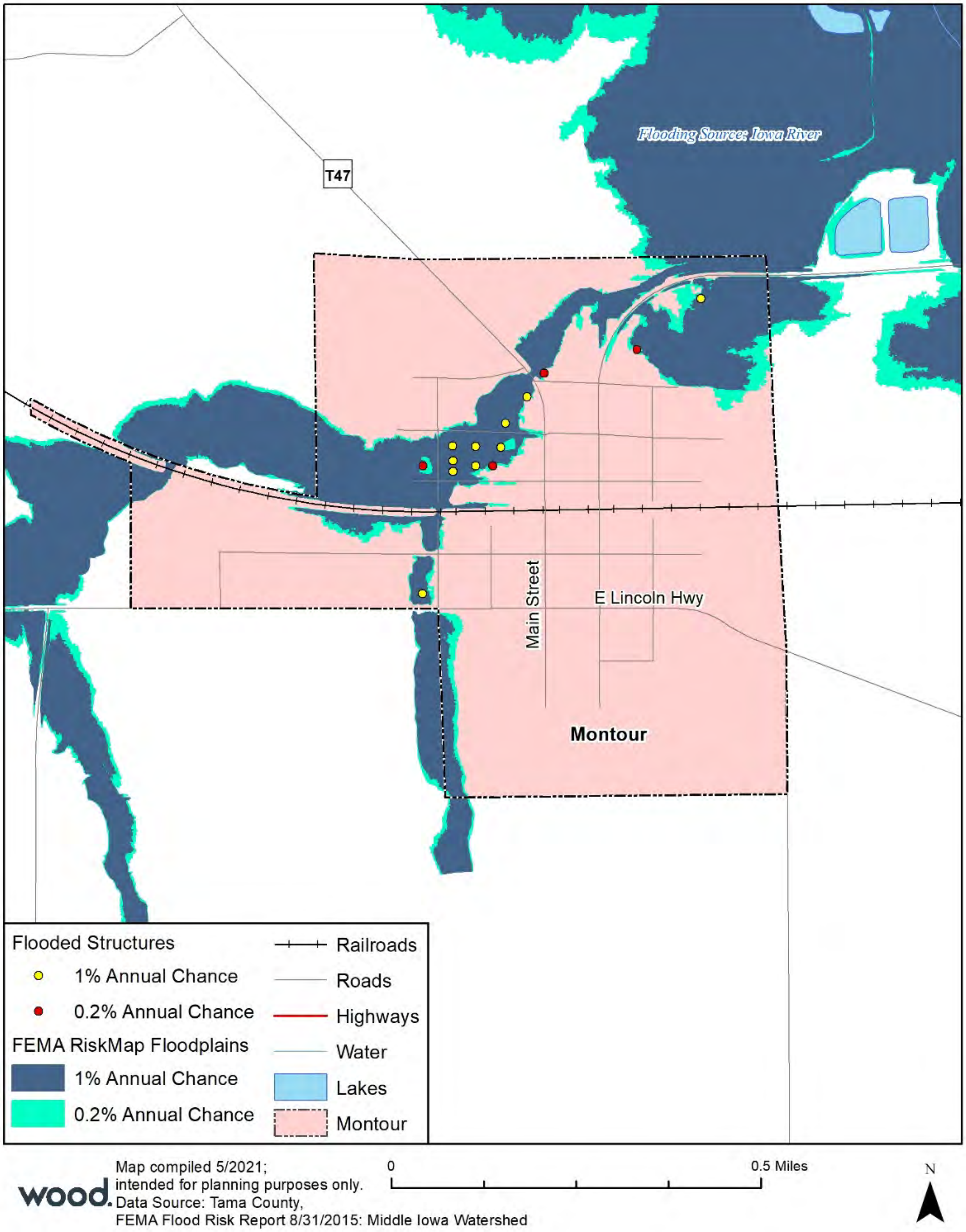


Figure 3-21 Tama FEMA RiskMAP Flood Hazard Areas

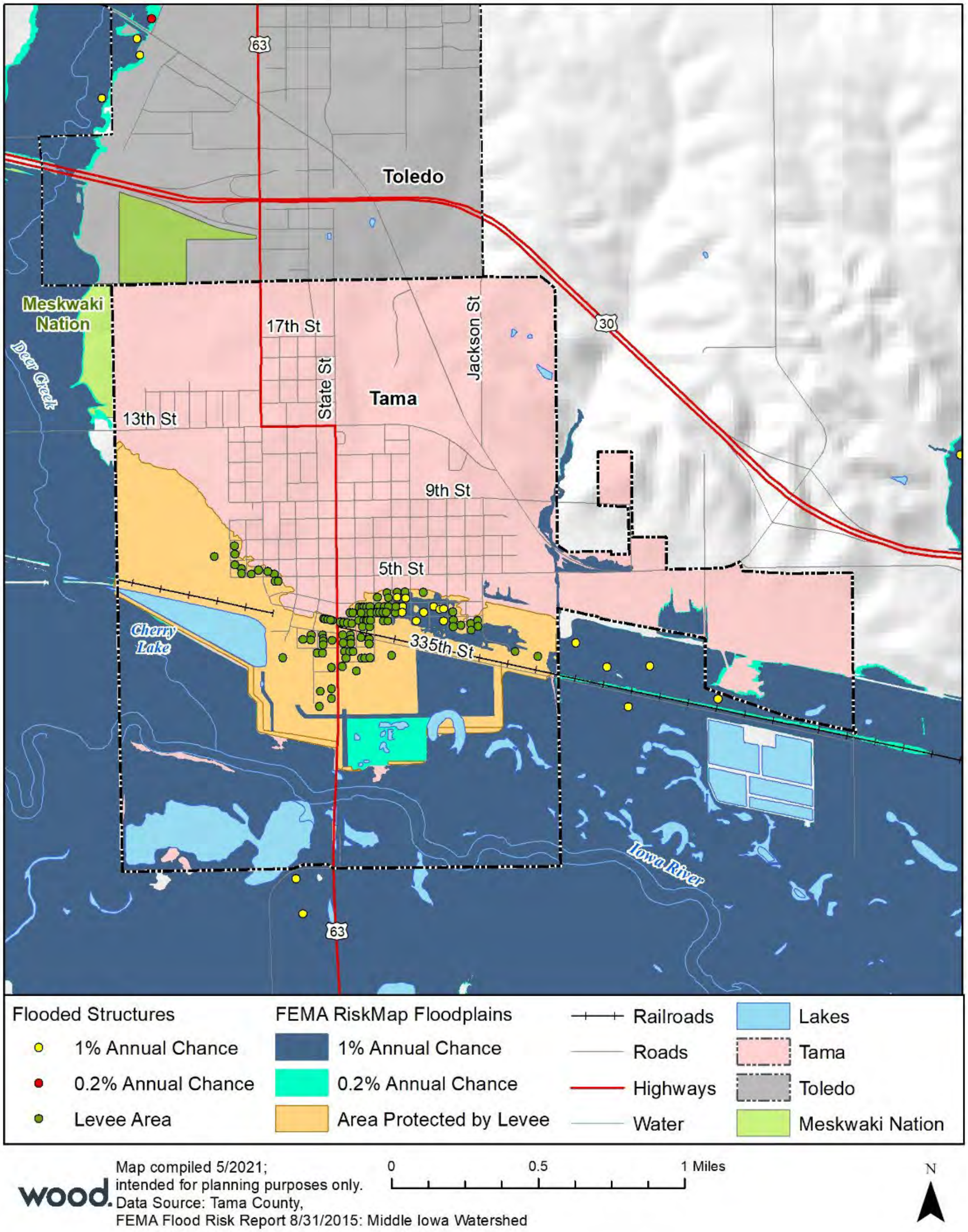


Figure 3-22 Toledo FEMA RiskMAP Flood Hazard Areas

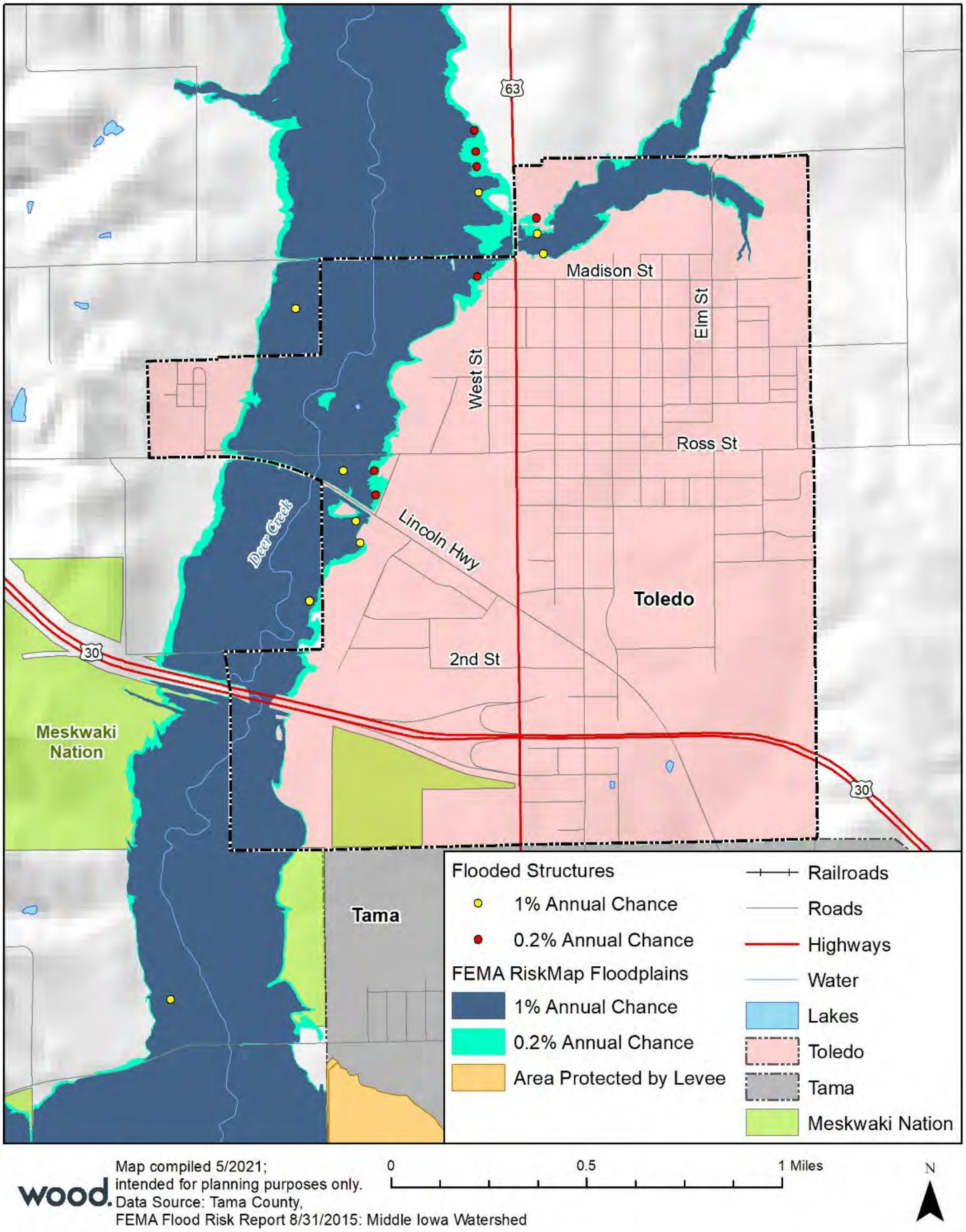


Figure 3-23 Traer FEMA RiskMAP Flood Hazard Areas

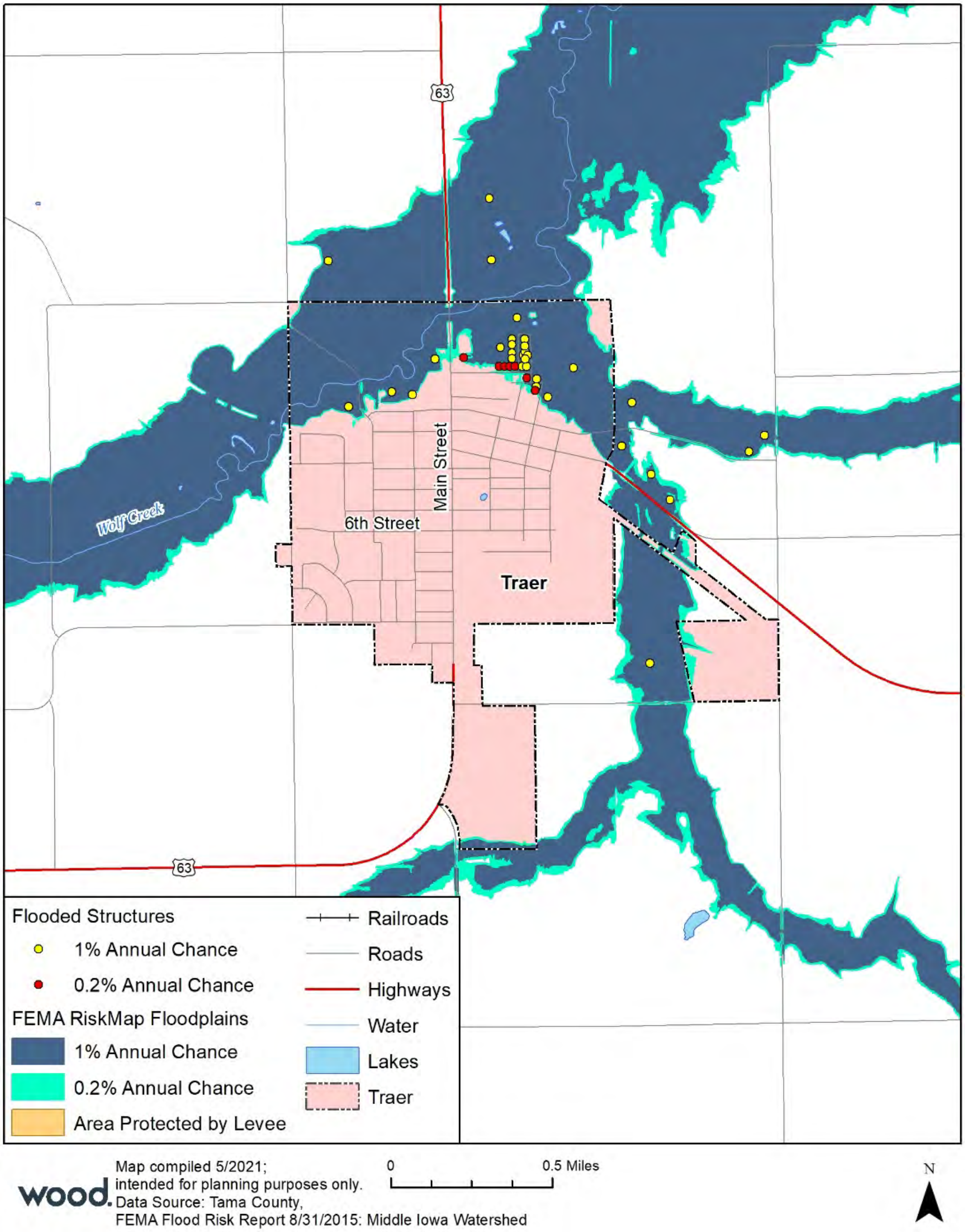
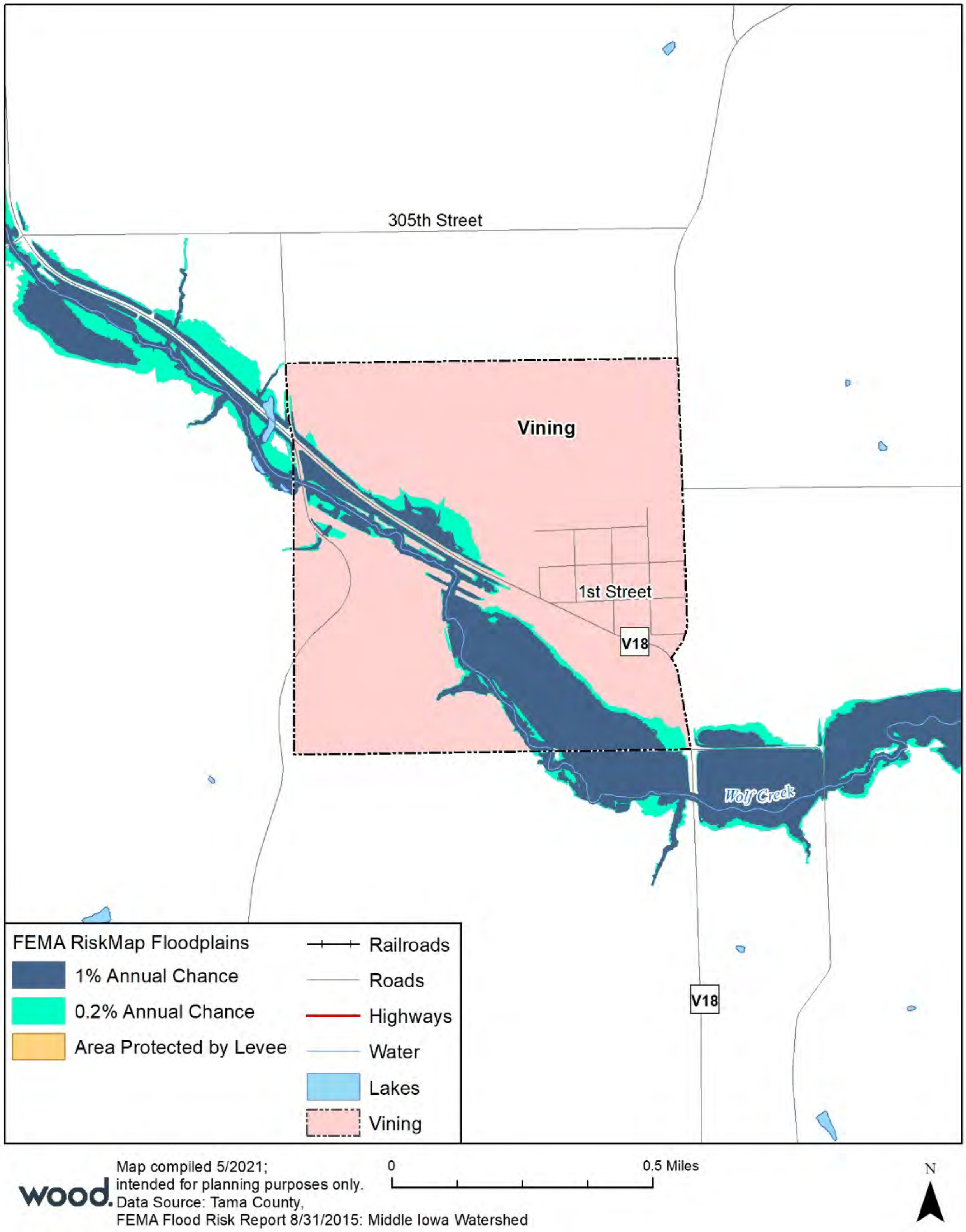


Figure 3-24 Vining FEMA RiskMAP Flood Hazard Areas



Historic Occurrences

The historical occurrence of flooding varies across jurisdictions. According to NCEI data, 54 flooding events have occurred in the county from 1996 to 2020 (the time frame for which data was available). 15 of these events were considered flash flooding and the remaining 39 were river floods. A summary of NCEI data on flooding by jurisdiction is included in Table 3-14. These events have caused a total of $2,971,500 in property damage and $21,253,000 in crop damage. This number for crop damage may be lower for Tama County than stated by the NCEI; the widespread flooding in 2010 is reflected in this number and includes losses for multiple counties in Iowa. Note that some flood events may go unrecorded by NCEI data; these events may not cause substantial damage to houses or structures, but they may result in flood costs that the county taxpayers and individual property owners must finance. A summary of NCEI data on flooding by jurisdiction is included in Table 3-14.

Some communities did not identify flooding as an issue and had no previous occurrences. Clutier, Dysart, Elberon, Garwin, Gladbrook, Lincoln, Traer, and Vining have experienced fewer than four river flooding events from 1996 to 2021. Dysart and Vining noted that flooding has almost never been an issue. Vining is located on a hill and flooding generally does not damage homes or businesses. There is a low-lying floodplain on the southwest side of the city that is predominantly farmland. Clutier has also not had historic issues with river flooding, although it was noted that Salt Creek on the southwestern side of the city does flood occasionally. Elberon, Garwin, Gladbrook, Lincoln, and Traer have all had few occurrences of flooding but did not describe any areas in the city as particularly vulnerable.

2014 was a record level flood along the Iowa River. In 2014, five to six homes in Chelsea had water on the first floor; the amount of water was 12 inches or less. Flooding affects many aspects of the city, including several local businesses that routinely flood (the tavern and antique store) and many basements in homes that fill up with water. The majority of residents have removed their utilities (furnace, hot water heater) from the basement to protect from future damage. Montour is susceptible to some river flooding from the Indian Creek that runs through the western and northern part of town. Larger rain events may cause issues to some agricultural, residential, and commercial properties located in the floodplain. The west and north side of Toledo is affected by river flooding due to Deer Creek and Minnow Creek. 1993 and 2008 were significant years in which flooding affected the city.

Tama and Tama County experienced many river flooding events. The City of Tama has a levee that was built in 1995 to protect the community from a 1% annual chance flood event in the Iowa River and Deer Creek. Although the eastern and southern areas of the City are within the 1% annual chance floodplain, the only difficulty incurred by the river flooding in 2008 was the debris that was deposited in the City's wells by the flood waters. Since the levee has been constructed, no homes have sustained flood damage in the city. Tama County experiences flooding in much of the designation SFHA. In addition, flooding closes many roads in the county.

Regardless of historical occurrence according to NCEI, jurisdictions throughout Tama County experience flooding problems including homes inundated by water, wastewater backups in homes, flooded roads, and flooded agricultural land due to river flooding.

NCEI data shows that the City of Chelsea had one flash flood event, but the HMPC recalled that flash flooding affected the city roughly once every 5 years. Flash flooding mainly occurred in the southern portion of the city near the Iowa River.

The City of Tama similarly chose to add flash flooding events in addition to the NCEI data. According to the NCEI, the City of Tama experienced 1 flash flood event, but the HMPC recalled at least 7 events. The city experienced some flash flooding problems near the levee during major rain events and prolonged wet weather. The city has two pumps in the dike that they use to pump water and bypass sewers if this flooding occurs. This flooding impacts residential basements. Major flash flooding events have also occurred downtown where water has collected to a depth that was over the curbs after torrential downpours. South Tama Community School District also received a score of 2 for historical occurrence.

The City of Montour stated that flash flooding occurred as regularly as once every year, and they could recall more than 12 different flood events, resulting in a historical occurrence score of 4. In the western part of town, a creek can quickly rise due to field runoff. In past years, flash flooding has surrounded the lift station and the lagoon. Even during short periods of heavy rainfall, residents have reported sewer backups in their homes.

According to the NCEI, Tama County experienced 2 flash flood events, but flash flooding was reported as frequently as every year to every other year. The HMPC recalled flash flooding instances at least 10 times in addition to the events reported through NCDC. Flash flooding occurs in areas that are in the identified Special Flood Hazard Area.

Specific jurisdictions in Tama County that identified areas of their city that are prone to flash flooding include Dysart, Garwin, Montour, Tama, Toledo, and Traer.

Table 3-14 NCEI Data on Flooding in Tama County

Jurisdiction	# of	Type of Event(s)	Total Damages
Chelsea	1	Flash Flood	$100,000 (Property)
Clutier	2	River Flood (1), Flash Flood (1)	$20,000 (Property)
Dysart	2	River Flood	$410,000 (Property)
Elberon	1	River Flood	$10,000 (Property)
Garwin	1	Flash Flood	$50,000 (Property)
Gladbrook	4	River Flood (3), Flash Flood (1)	$55,000 (Property)
Lincoln	3	River Flood	$200,000 (Property)
Montour	11	River Flood (10), Flash Flood (1)	$160,000 (Property)
Tama	4	River Flood (3), Flash Flood (1)	$130,000 (Property)
Toledo	2	River Flood (1), Flash Flood (1)	$110,000 (Property)
Traer	5	River Flood (2), Flash Flood (3)	$480,000 (Property)
Vining	0		---
Tama County		River Flood (16), Flash Flood (2)	$1,190,000 (Property)

Probability and Future Occurrences

With the history of flooding in the planning area, it is likely that flooding of various levels will continue to occur. Montour, Tama, Traer, Gladbrook, and the unincorporated areas of Tama County have the highest risk of flooding due to river flooding or flash flooding events. Riverine flooding probability is often defined by the 1%- and 0.2%-annual-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 off of the 54 total flooding events in Tama County in the 24-year span from 1996-2020, there is a 100% Annual Chance of flooding of some magnitude in Tama County, and on average 2/year.

Magnitude and Severity

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 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 flash flooding situations. In Iowa, there have been 643 flash flood events since 1993, and there have been four deaths and eight injuries.

Clutier, Dysart, Elberon, Lincoln, Tama, Traer, Tama County, North Tama Community School District, and Union Community School District rated severity of impact as a 1, as most of these jurisdictions would experience little to no property damage such as the items described in the previous paragraph during flash flooding. These jurisdictions also did not see environmental impacts or interruptions in critical facilities as likely to occur. Garwin, Gladbrook, Toledo, GMG Community School District, and South Tama Community School District rated severity of impact as a 2; mainly, there may be short term property damage. Chelsea and Montour rated severity of impact as a 3. When flash flooding occurs in these cities, it can cause property damage that sometimes threatens structural stability.

Speed of Onset

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 National Weather Service forecasts the height of floods crests, the data, and time the flow is expected to occur at a particular location.

Gages along streams and rain gages throughout the state provide for an early flood warning system. River flooding usually develops over the course of several hours or even days depending on the basin characteristics and the position of the particular reach of the stream. The National Weather Service provides flood forecasts for Iowa. Flood warnings are issued over emergency radio and television messages as well as the NOAA weather radios. Jurisdictions in Tama County would likely have at least 12-24 hours of warning time if a river flooding event was imminent.

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.

In 2018, the U.S. 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

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.

The risk of flooding is prevalent within all regions of Tama 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 countywide risk analysis intended to identify the vulnerability of population, property, and infrastructure. The vulnerability analysis was performed through the use of 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.

All Tama County communities are prone to flash flooding. Clutier, Dysart, Elberon, Gladbrook, Lincoln, Tama, Tama County, North Tama Community School District, and Union Community School District all determined that less than 25% of people and property might be affected, resulting in a vulnerability score of 1. Most of these communities do not have widespread flash flooding issues that affect a large amount of people. Garwin, Traer, GMG Community School District, and South Tama Community School District determined that 26 to 50% of people and property might be affected by flash flooding, which resulted in a score of 2. Traer is surrounded by waterways on the west, north, and east which could impact many people if flash flooding occurs. Garwin can experience flash flooding near the Deer Creek floodplain and it can affect a large portion of people in town. Montour and Toledo determined that 51 to 75% of people and property might be affected by flash flooding, resulting in a score of 3. Many Montour residents experience flooding in their basements from backed up sewer systems. Toledo cited Wolf Creek as a significant vulnerability for the city that may cause future flash flooding events. Lastly, Chelsea determined that more than 76% of the city's people and property would be affected by flash flooding events. A vast majority of the city is located in the Iowa River floodplain. Many cities in Tama County are affected by flash flooding due to their current sewer systems, which cannot handle large amounts of water in a short period of time.

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.

Property

The potential losses to existing development 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 cities were generated using the 03/15/2019 Preliminary FEMA NFHL layer, two FEMA Flood Risk Reports for the two watersheds encompassing Tama County, and the Tama County parcels layer provided by Tama County. GIS analysis was conducted to determine the number and values of buildings at risk to the 1-percent and 0.2 percent annual chance flood hazards.

GIS was used to overlay NFHL flood data on Tama County parcel centroids. The analysis assumes that every parcel with an improvement value greater than zero is improved in some way. Improved parcel counts were provided for the 1%-annual-chance and 0.2%-annual-chance flood hazard areas. The result is an inventory of the number and types of parcels and buildings subject to the hazards. Results are presented by unincorporated county and incorporated jurisdictions in Figure 3-11 through Figure 3-24 in the location section. Table 3-15 and Table 3-16 show counts of improved parcels/structures and land use type (Agricultural, Commercial, Industrial, Multi-Residential, and Residential) within the 1% and 0.2% annual chance flood hazard areas.

Flood Risk Reports for the Middle Cedar and Middle Iowa Watersheds, which together cover 100% of the geographical area of Tama County, were used to assess the property value at risk due to flooding. These reports are both dated August 31, 2015. When a flood occurs, seldom does the event cause total destruction of an area. Potential losses from flooding are related to a variety of factors including flood depth, flood velocity, building type and construction. Based on FEMA Flood Insurance Administration (FIA) flood depth-damage curves, the percent of damage is directly related to the flood depth. FEMA's HAZUS flood loss estimation tool and the flood benefit/cost module both use this simplified approach to model flood damage based on building type and flood depth. A damage estimation of 25 percent of the total value was used based on FIA depth-damage curves for a one-story structure with no basement flooded to two feet. While there are several limitations to this model, it does present a methodology to estimate potential damages. This model may include structures within the 1-percent annual chance floodplain that may be elevated above the level of the base flood elevation, according to local floodplain development requirements, and thus mitigate the risk. Additionally, structures with finished basements and commercial properties would likely sustain a higher percentage of damage.

The Flood Risk Report tables from the RiskMAP (Risk Mapping, Assessment, and Planning) Report summarize the property risk to each community within Tama County. These results are summarized in Table 3-15 through Table 3-28.

Table 3-15 Improved Properties at Risk to 1% Annual Chance Flood Hazard by Jurisdiction

Jurisdiction	Property Type	Improved Parcels/Structures
Chelsea	Commercial	8
	Residential	91
	Total	**99**
Clutier	Residential	1
	Total	**1**
Elberon	Residential	1
	Total	**1**
Gladbrook	Commercial	3
	Residential	5
	Total	**8**
Montour	Residential	10
	Total	**10**
Tama	Residential	11
	Total	**11**
Toledo	Commercial	4
	Industrial	1
	Total	**5**
Traer	Commercial	1
	Residential	21
	Total	**22**
Unincorporated	Agricultural	28
	Commercial	6
	Industrial	3
	Residential	62
	Total	**99**
	Grand Total	**256**

Table 3-16 Improved Properties at Risk to 0.2% Annual Chance Flood Hazard by Jurisdiction

Jurisdiction	Property Type	Improved Parcels/Structures
Chelsea	Commercial	4
	Residential	3
	Total	**7**
Elberon	Agricultural	1
	Residential	1
	Total	**2**
Garwin	Residential	1

Jurisdiction	Property Type	Improved Parcels/Structures
	Total	**1**
Gladbrook	Industrial	1
	Residential	2
	Total	**3**
Montour	Residential	4
	Total	**4**
Toledo	Agricultural	2
	Commercial	1
	Industrial	1
	Total	**4**
Traer	Commercial	1
	Residential	6
	Total	**7**
Unincorporated	Commercial	1
	Residential	17
	Total	**18**
	Grand Total	**46**

Table 3-17 Loss Estimate for Tama County & Incorporated Areas (FEMA RiskMAP)

Type	Inventory Estimated Value	% of Total	10% (10-yr) Dollar Losses	10% Loss Ratio	2% (50-yr) Dollar Losses	2% Loss Ratio	1% (100-yr) Dollar Losses	1% Loss Ratio	0.2% (500-yr) Dollar Losses	0.2% Loss Ratio	Annualized Losses ($/yr)	Ann. Loss Ratio
Residential Building & Contents	$158,900,000	71%	$600,000	N/A	$1,400,000	1%	$1,700,000	1%	$2,500,000	2%	$100,000	N/A
Commercial Building & Contents	$25,100,000	11%	$500,000	2%	$800,000	3%	$800,000	3%	$1,000,000	4%	$70,000	N/A
Other Building & Contents	$41,700,000	18%	$300,000	1%	$400,000	1%	$500,000	1%	$600,000	1%	$30,000	N/A
Total Building & Contents	$225,700,000	100%	$1,400,000	1%	$2,600,000	1%	$3,000,000	1%	$4,100,000	2%	$200,000	N/A
Business Disruption	$0	N/A	$40,000	N/A	$70,000	N/A	$80,000	N/A	$100,000	N/A	$0	N/A
TOTAL	**$225,700,000**	**N/A**	**$1,400,000**	**1%**	**$2,300,000**	**1%**	**$3,100,000**	**1%**	**$4,200,000**	**2%**	**$200,000**	**N/A**

Table 3-18 Loss Estimate for City of Chelsea (FEMA RiskMAP)

Type	Inventory Estimated Value	% of Total	10% (10-yr) Dollar Losses[1]	10% Loss Ratio[2]	2% (50-yr) Dollar Losses[1]	2% Loss Ratio[2]	1% (100-yr) Dollar Losses[1]	1% Loss Ratio[2]	0.2% (500-yr) Dollar Losses[1]	0.2% Loss Ratio[2]	Annualized Losses[1] ($/yr)	Ann. Loss Ratio[2]
Residential Building & Contents	$22,500,000	76%	$300,000	1%	$800,000	4%	$1,100,000	5%	$2,500,000	11%	$60,000	N/A
Commercial Building & Contents	$2,400,000	8%	$400,000	17%	$500,000	22%	$600,000	26%	$700,000	31%	$50,000	2%
Other Building & Contents	$4,600,000	16%	$60,000	1%	$600,000	13%	$900,000	19%	$1,400,000	31%	$30,000	1%
Total Building & Contents[3]	$29,500,000	100%	$800,000	3%	$1,900,000	7%	$2,600,000	9%	$4,600,000	16%	$100,000	N/A
Business Disruption[4]	$0	N/A	$30,000	N/A	$200,000	N/A	$200,000	N/A	$300,000	N/A	$10,000	N/A
TOTAL[5]	$29,500,000	N/A	$800,000	3%	$2,100,000	7%	$2,800,000	9%	$4,900,000	17%	$200,000	1%

Source: Hazus analysis results stored as the Flood Risk Assessment Dataset in the Flood Risk Database.

[1]Losses shown are rounded to nearest $10,000 for values under $100,000 and to the nearest $100,000 for values over $100,000.
[2]Loss ratio = Dollar Losses ÷ Estimated Value. Loss Ratios are rounded to the nearest integer percent.
[3]Total Building and Contents = Residential Building and Contents + Commercial Building and Contents + Other Building and Contents.
[4]Business Disruption = Inventory Loss + Relocation Cost + Income Loss + Rental Income Loss + Wage Loss + Direct Output Loss.
[5]Total = Total Building and Contents + Business Disruption

Table 3-19 Loss Estimate for City of Clutier (FEMA RiskMAP)

Type	Inventory Estimated Value	% of Total	10% (10-yr) Dollar Losses[1]	10% Loss Ratio[2]	2% (50-yr) Dollar Losses[1]	2% Loss Ratio[2]	1% (100-yr) Dollar Losses[1]	1% Loss Ratio[2]	0.2% (500-yr) Dollar Losses[1]	0.2% Loss Ratio[2]	Annualized Losses[1] ($/yr)	Ann. Loss Ratio[2]
Residential Building & Contents	$16,900,000	63%	$40,000	N/A	$50,000	N/A	$50,000	N/A	$70,000	N/A	$0	N/A
Commercial Building & Contents	$6,200,000	23%	$200,000	3%	$200,000	4%	$300,000	4%	$300,000	5%	$20,000	N/A
Other Building & Contents	$3,800,000	14%	$0	N/A	$20,000	N/A	$20,000	1%	$30,000	1%	$0	N/A
Total Building & Contents[3]	$26,900,000	100%	$200,000	1%	$300,000	1%	$400,000	1%	$400,000	2%	$20,000	N/A
Business Disruption[4]	$0	N/A	$10,000	N/A	$10,000	N/A	$10,000	N/A	$10,000	N/A	$0	N/A
TOTAL[5]	$26,900,000	N/A	$300,000	1%	$300,000	1%	$400,000	1%	$400,000	2%	$20,000	N/A

Source: Hazus analysis results stored as the Flood Risk Assessment Dataset in the Flood Risk Database.

[1]Losses shown are rounded to nearest $10,000 for values under $100,000 and to the nearest $100,000 for values over $100,000.
[2]Loss ratio = Dollar Losses ÷ Estimated Value. Loss Ratios are rounded to the nearest integer percent.
[3]Total Building and Contents = Residential Building and Contents + Commercial Building and Contents + Other Building and Contents.
[4]Business Disruption = Inventory Loss + Relocation Cost + Income Loss + Rental Income Loss + Wage Loss + Direct Output Loss.
[5]Total = Total Building and Contents + Business Disruption

Table 3-20 Loss Estimate for City of Elberon (FEMA RiskMAP)

Type	Inventory Estimated Value	% of Total	10% (10-yr) Dollar Losses[1]	10% Loss Ratio[2]	2% (50-yr) Dollar Losses[1]	2% Loss Ratio[2]	1% (100-yr) Dollar Losses[1]	1% Loss Ratio[2]	0.2% (500-yr) Dollar Losses[1]	0.2% Loss Ratio[2]	Annualized Losses[1] ($/yr)	Ann. Loss Ratio[2]
Residential Building & Contents	$18,900,000	71%	$0	N/A	$0	N/A	$0	N/A	$10,000	N/A	$0	N/A
Commercial Building & Contents	$1,800,000	7%	$20,000	1%	$30,000	2%	$30,000	2%	$40,000	2%	$0	N/A
Other Building & Contents	$5,700,000	22%	$0	N/A	$0	N/A	$0	N/A	$0	N/A	$0	N/A
Total Building & Contents[3]	$26,500,000	100%	$20,000	N/A	$30,000	N/A	$30,000	N/A	$50,000	N/A	$0	N/A
Business Disruption[4]	$0	N/A	$0	N/A	$0	N/A	$0	N/A	$0	N/A	$0	N/A
TOTAL[5]	$26,500,000	N/A	$20,000	N/A	$30,000	N/A	$30,000	N/A	$50,000	N/A	$0	N/A

Source: Hazus analysis results stored as the Flood Risk Assessment Dataset in the Flood Risk Database.

[1]Losses shown are rounded to nearest $10,000 for values under $100,000 and to the nearest $100,000 for values over $100,000.
[2]Loss ratio = Dollar Losses ÷ Estimated Value. Loss Ratios are rounded to the nearest integer percent.
[3]Total Building and Contents = Residential Building and Contents + Commercial Building and Contents + Other Building and Contents.
[4]Business Disruption = Inventory Loss + Relocation Cost + Income Loss + Rental Income Loss + Wage Loss + Direct Output Loss.
[5]Total = Total Building and Contents + Business Disruption

Table 3-21 Loss Estimate for City of Garwin (FEMA RiskMAP)

Type	Inventory Estimated Value	% of Total	10% (10-yr) Dollar Losses[1]	10% Loss Ratio[2]	2% (50-yr) Dollar Losses[1]	2% Loss Ratio[2]	1% (100-yr) Dollar Losses[1]	1% Loss Ratio[2]	0.2% (500-yr) Dollar Losses[1]	0.2% Loss Ratio[2]	Annualized Losses[1] ($/yr)	Ann. Loss Ratio[2]
Residential Building & Contents	$49,700,000	83%	$20,000	N/A	$30,000	N/A	$40,000	N/A	$80,000	N/A	$0	N/A
Commercial Building & Contents	$3,100,000	5%	$0	N/A	$0	N/A	$0	N/A	$0	N/A	$0	N/A
Other Building & Contents	$7,300,000	12%	$300,000	4%	$400,000	6%	$500,000	7%	$600,000	8%	$40,000	1%
Total Building & Contents[3]	$60,100,000	100%	$300,000	1%	$400,000	1%	$500,000	1%	$700,000	1%	$40,000	N/A
Business Disruption[4]	$0	N/A	$90,000	N/A	$100,000	N/A	$100,000	N/A	$100,000	N/A	$10,000	N/A
TOTAL[5]	$60,100,000	N/A	$400,000	1%	$500,000	1%	$600,000	1%	$800,000	1%	$50,000	N/A

Source: Hazus analysis results stored as the Flood Risk Assessment Dataset in the Flood Risk Database.

[1]Losses shown are rounded to nearest $10,000 for values under $100,000 and to the nearest $100,000 for values over $100,000.
[2]Loss ratio = Dollar Losses ÷ Estimated Value. Loss Ratios are rounded to the nearest integer percent.
[3]Total Building and Contents = Residential Building and Contents + Commercial Building and Contents + Other Building and Contents.
[4]Business Disruption = Inventory Loss + Relocation Cost + Income Loss + Rental Income Loss + Wage Loss + Direct Output Loss.
[5]Total = Total Building and Contents + Business Disruption

Table 3-22 Loss Estimate for City of Gladbrook (FEMA RiskMAP)

Type	Inventory Estimated Value	% of Total	10% (10-yr) Dollar Losses[1]	10% Loss Ratio[2]	2% (50-yr) Dollar Losses[1]	2% Loss Ratio[2]	1% (100-yr) Dollar Losses[1]	1% Loss Ratio[2]	0.2% (500-yr) Dollar Losses[1]	0.2% Loss Ratio[2]	Annualized Losses[1] ($/yr)	Ann. Loss Ratio[2]
Residential Building & Contents	$98,000,000	77%	$300,000	N/A	$700,000	1%	$800,000	1%	$1,000,000	1%	$50,000	N/A
Commercial Building & Contents	$17,600,000	14%	$200,000	1%	$200,000	1%	$200,000	1%	$200,000	1%	$20,000	N/A
Other Building & Contents	$11,600,000	9%	$100,000	1%	$200,000	1%	$200,000	2%	$200,000	2%	$10,000	N/A
Total Building & Contents[3]	$127,200,000	100%	$600,000	N/A	$1,100,000	1%	$1,200,000	1%	$1,400,000	1%	$80,000	N/A
Business Disruption[4]	$0	N/A	$20,000	N/A	$20,000	N/A	$30,000	N/A	$30,000	N/A	$0	N/A
TOTAL[5]	$127,200,000	N/A	$600,000	N/A	$1,100,000	1%	$1,200,000	1%	$1,400,000	1%	$80,000	N/A

Source: Hazus analysis results stored as the Flood Risk Assessment Dataset in the Flood Risk Database.

[1]Losses shown are rounded to nearest $10,000 for values under $100,000 and to the nearest $100,000 for values over $100,000.
[2]Loss ratio = Dollar Losses ÷ Estimated Value. Loss Ratios are rounded to the nearest integer percent.
[3]Total Building and Contents = Residential Building and Contents + Commercial Building and Contents + Other Building and Contents.
[4]Business Disruption = Inventory Loss + Relocation Cost + Income Loss + Rental Income Loss + Wage Loss + Direct Output Loss.
[5]Total = Total Building and Contents + Business Disruption

Table 3-23 Loss Estimate for City of Montour (FEMA RiskMAP)

Type	Inventory Estimated Value	% of Total	10% (10-yr) Dollar Losses[1]	10% Loss Ratio[2]	2% (50-yr) Dollar Losses[1]	2% Loss Ratio[2]	1% (100-yr) Dollar Losses[1]	1% Loss Ratio[2]	0.2% (500-yr) Dollar Losses[1]	0.2% Loss Ratio[2]	Annualized Losses[1] ($/yr)	Ann. Loss Ratio[2]
Residential Building & Contents	$16,300,000	66%	$100,000	1%	$100,000	1%	$200,000	1%	$200,000	1%	$10,000	N/A
Commercial Building & Contents	$3,400,000	14%	$80,000	2%	$100,000	4%	$200,000	5%	$200,000	7%	$10,000	N/A
Other Building & Contents	$5,100,000	20%	$400,000	8%	$700,000	14%	$800,000	16%	$1,000,000	20%	$60,000	1%
Total Building & Contents[3]	$24,800,000	100%	$600,000	2%	$900,000	4%	$1,200,000	5%	$1,400,000	6%	$80,000	N/A
Business Disruption[4]	$0	N/A	$50,000	N/A	$100,000	N/A	$100,000	N/A	$100,000	N/A	$10,000	N/A
TOTAL[5]	$24,800,000	N/A	$600,000	3%	$1,000,000	4%	$1,300,000	5%	$1,500,000	7%	$90,000	N/A

Source: Hazus analysis results stored as the Flood Risk Assessment Dataset in the Flood Risk Database.

[1]Losses shown are rounded to nearest $10,000 for values under $100,000 and to the nearest $100,000 for values over $100,000.
[2]Loss ratio = Dollar Losses ÷ Estimated Value. Loss Ratios are rounded to the nearest integer percent.
[3]Total Building and Contents = Residential Building and Contents + Commercial Building and Contents + Other Building and Contents.
[4]Business Disruption = Inventory Loss + Relocation Cost + Income Loss + Rental Income Loss + Wage Loss + Direct Output Loss.
[5]Total = Total Building and Contents + Business Disruption

Table 3-24 Loss Estimate for Sac & Fox Tribe of the Mississippi (FEMA RiskMAP)

Type	Inventory Estimated Value	% of Total	10% (10-yr) Dollar Losses[1]	10% Loss Ratio[2]	2% (50-yr) Dollar Losses[1]	2% Loss Ratio[2]	1% (100-yr) Dollar Losses[1]	1% Loss Ratio[2]	0.2% (500-yr) Dollar Losses[1]	0.2% Loss Ratio[2]	Annualized Losses[1] ($/yr)	Ann. Loss Ratio[2]
Residential Building & Contents	$32,100,000	63%	$500,000	2%	$1,000,000	3%	$1,200,000	4%	$1,700,000	5%	$80,000	N/A
Commercial Building & Contents	$13,700,000	27%	$400,000	3%	$600,000	4%	$600,000	5%	$800,000	6%	$50,000	N/A
Other Building & Contents	$5,000,000	10%	$60,000	1%	$70,000	1%	$80,000	2%	$90,000	2%	$10,000	N/A
Total Building & Contents[3]	$50,800,000	100%	$1,000,000	2%	$1,700,000	3%	$1,900,000	4%	$2,600,000	5%	$100,000	N/A
Business Disruption[4]	$0	N/A	$20,000	N/A	$30,000	N/A	$30,000	N/A	$40,000	N/A	$0	N/A
TOTAL[5]	$50,800,000	N/A	$1,000,000	2%	$1,700,000	3%	$1,900,000	4%	$2,600,000	5%	$100,000	N/A

Source: Hazus analysis results stored as the Flood Risk Assessment Dataset in the Flood Risk Database.

[1]Losses shown are rounded to nearest $10,000 for values under $100,000 and to the nearest $100,000 for values over $100,000.
[2]Loss ratio = Dollar Losses ÷ Estimated Value. Loss Ratios are rounded to the nearest integer percent.
[3]Total Building and Contents = Residential Building and Contents + Commercial Building and Contents + Other Building and Contents.
[4]Business Disruption = Inventory Loss + Relocation Cost + Income Loss + Rental Income Loss + Wage Loss + Direct Output Loss.
[5]Total = Total Building and Contents + Business Disruption

Table 3-25 Loss Estimate for City of Tama (FEMA RiskMAP)

Type	Inventory Estimated Value	% of Total	10% (10-yr) Dollar Losses[1]	10% Loss Ratio[2]	2% (50-yr) Dollar Losses[1]	2% Loss Ratio[2]	1% (100-yr) Dollar Losses[1]	1% Loss Ratio[2]	0.2% (500-yr) Dollar Losses[1]	0.2% Loss Ratio[2]	Annualized Losses[1] ($/yr)	Ann. Loss Ratio[2]
Residential Building & Contents	$185,600,000	63%	$50,000	N/A	$90,000	N/A	$200,000	N/A	$200,000	N/A	$10,000	N/A
Commercial Building & Contents	$55,300,000	19%	$400,000	1%	$500,000	1%	$700,000	1%	$800,000	1%	$50,000	N/A
Other Building & Contents	$54,300,000	18%	$1,800,000	3%	$2,200,000	4%	$2,700,000	5%	$3,000,000	5%	$200,000	N/A
Total Building & Contents[3]	$295,200,000	100%	$2,300,000	1%	$2,800,000	1%	$3,600,000	1%	$4,000,000	1%	$300,000	N/A
Business Disruption[4]	$0	N/A	$500,000	N/A	$600,000	N/A	$700,000	N/A	$700,000	N/A	$50,000	N/A
TOTAL[5]	$295,200,000	N/A	$2,800,000	1%	$3,400,000	1%	$4,300,000	1%	$4,700,000	2%	$300,000	N/A

Source: Hazus analysis results stored as the Flood Risk Assessment Dataset in the Flood Risk Database.

[1]Losses shown are rounded to nearest $10,000 for values under $100,000 and to the nearest $100,000 for values over $100,000.
[2]Loss ratio = Dollar Losses ÷ Estimated Value. Loss Ratios are rounded to the nearest integer percent.
[3]Total Building and Contents = Residential Building and Contents + Commercial Building and Contents + Other Building and Contents.
[4]Business Disruption = Inventory Loss + Relocation Cost + Income Loss + Rental Income Loss + Wage Loss + Direct Output Loss.
[5]Total = Total Building and Contents + Business Disruption

Table 3-26 Loss Estimate for City of Toledo (FEMA RiskMAP)

Type	Inventory Estimated Value	% of Total	10% (10-yr) Dollar Losses[1]	10% Loss Ratio[2]	2% (50-yr) Dollar Losses[1]	2% Loss Ratio[2]	1% (100-yr) Dollar Losses[1]	1% Loss Ratio[2]	0.2% (500-yr) Dollar Losses[1]	0.2% Loss Ratio[2]	Annualized Losses[1] ($/yr)	Ann. Loss Ratio[2]
Residential Building & Contents	$195,900,000	64%	$400,000	N/A	$900,000	N/A	$1,000,000	1%	$1,500,000	1%	$70,000	N/A
Commercial Building & Contents	$80,500,000	26%	$200,000	N/A	$300,000	N/A	$400,000	N/A	$600,000	1%	$30,000	N/A
Other Building & Contents	$29,300,000	10%	$100,000	N/A	$200,000	1%	$200,000	1%	$300,000	1%	$10,000	N/A
Total Building & Contents[3]	$305,800,000	100%	$700,000	N/A	$1,400,000	N/A	$1,600,000	1%	$2,400,000	1%	$100,000	N/A
Business Disruption[4]	$0	N/A	$20,000	N/A	$30,000	N/A	$50,000	N/A	$60,000	N/A	$0	N/A
TOTAL[5]	$305,800,000	N/A	$700,000	N/A	$1,400,000	N/A	$1,700,000	1%	$2,500,000	1%	$100,000	N/A

Source: Hazus analysis results stored as the Flood Risk Assessment Dataset in the Flood Risk Database.

[1]Losses shown are rounded to nearest $10,000 for values under $100,000 and to the nearest $100,000 for values over $100,000.
[2]Loss ratio = Dollar Losses ÷ Estimated Value. Loss Ratios are rounded to the nearest integer percent.
[3]Total Building and Contents = Residential Building and Contents + Commercial Building and Contents + Other Building and Contents.
[4]Business Disruption = Inventory Loss + Relocation Cost + Income Loss + Rental Income Loss + Wage Loss + Direct Output Loss.
[5]Total = Total Building and Contents + Business Disruption

Table 3-27 Loss Estimate for City of Traer (FEMA RiskMAP)

Type	Inventory Estimated Value	% of Total	10% (10-yr) Dollar Losses[1]	10% Loss Ratio[2]	2% (50-yr) Dollar Losses[1]	2% Loss Ratio[2]	1% (100-yr) Dollar Losses[1]	1% Loss Ratio[2]	0.2% (500-yr) Dollar Losses[1]	0.2% Loss Ratio[2]	Annualized Losses[1] ($/yr)	Ann. Loss Ratio[2]
Residential Building & Contents	$143,200,000	62%	$400,000	N/A	$800,000	1%	$1,100,000	1%	$1,500,000	1%	$60,000	N/A
Commercial Building & Contents	$61,700,000	27%	$600,000	1%	$700,000	1%	$800,000	1%	$900,000	1%	$70,000	N/A
Other Building & Contents	$26,400,000	11%	$40,000	N/A	$80,000	N/A	$100,000	N/A	$100,000	N/A	$10,000	N/A
Total Building & Contents[3]	$231,300,000	100%	$1,000,000	N/A	$1,600,000	1%	$2,000,000	1%	$2,500,000	1%	$100,000	N/A
Business Disruption[4]	$0	N/A	$20,000	N/A	$30,000	N/A	$40,000	N/A	$40,000	N/A	$0	N/A
TOTAL[5]	$231,300,000	N/A	$1,100,000	N/A	$1,600,000	1%	$2,000,000	1%	$2,500,000	1%	$100,000	N/A

Source: Hazus analysis results stored as the Flood Risk Assessment Dataset in the Flood Risk Database.

[1]Losses shown are rounded to nearest $10,000 for values under $100,000 and to the nearest $100,000 for values over $100,000.
[2]Loss ratio = Dollar Losses ÷ Estimated Value. Loss Ratios are rounded to the nearest integer percent.
[3]Total Building and Contents = Residential Building and Contents + Commercial Building and Contents + Other Building and Contents.
[4]Business Disruption = Inventory Loss + Relocation Cost + Income Loss + Rental Income Loss + Wage Loss + Direct Output Loss.
[5]Total = Total Building and Contents + Business Disruption

Table 3-28 Loss Estimate for City of Vining (FEMA RiskMAP)

Type	Inventory Estimated Value	% of Total	10% (10-yr) Dollar Losses[1]	10% Loss Ratio[2]	2% (50-yr) Dollar Losses[1]	2% Loss Ratio[2]	1% (100-yr) Dollar Losses[1]	1% Loss Ratio[2]	0.2% (500-yr) Dollar Losses[1]	0.2% Loss Ratio[2]	Annualized Losses[1] ($/yr)	Ann. Loss Ratio[2]
Residential Building & Contents	$7,200,000	93%	$0	N/A	$10,000	N/A	$10,000	N/A	$10,000	N/A	$0	N/A
Commercial Building & Contents	$600,000	7%	$0	N/A	$0	N/A	$0	N/A	$0	N/A	$0	N/A
Other Building & Contents	$0	N/A	$0	N/A	$0	N/A	$0	N/A	$0	N/A	$0	N/A
Total Building & Contents[3]	$7,700,000	100%	$0	N/A	$10,000	N/A	$10,000	N/A	$10,000	N/A	$0	N/A
Business Disruption[4]	$0	N/A	$0	N/A	$0	N/A	$0	N/A	$0	N/A	$0	N/A
TOTAL[5]	$7,700,000	N/A	$0	N/A	$10,000	N/A	$10,000	N/A	$10,000	N/A	$0	N/A

Source: Hazus analysis results stored as the Flood Risk Assessment Dataset in the Flood Risk Database.

[1]Losses shown are rounded to nearest $10,000 for values under $100,000 and to the nearest $100,000 for values over $100,000.
[2]Loss ratio = Dollar Losses ÷ Estimated Value. Loss Ratios are rounded to the nearest integer percent.
[3]Total Building and Contents = Residential Building and Contents + Commercial Building and Contents + Other Building and Contents.
[4]Business Disruption = Inventory Loss + Relocation Cost + Income Loss + Rental Income Loss + Wage Loss + Direct Output Loss.
[5]Total = Total Building and Contents + Business Disruption

Critical Facilities and Infrastructure

There is a total of 200 critical facilities categorized as FEMA Lifelines within the 1% Annual Chance Flood Hazard Area in Tama County, and 20 critical facilities categorized as FEMA Lifelines within the 0.2% Annual Chance Flood Hazard Area. Table 3-29 and Table 3-30 break down these facilities by FEMA Lifeline category.

Table 3-29 Critical Facilities Within the 1% Annual Chance Flood Hazard Area

Jurisdiction	FEMA Lifeline	Facility Type	Count
Chelsea	Transportation	Bridge	2
	Total		**2**
Elberon	Transportation	Bridge	2
	Total		**2**
Gladbrook	Transportation	Bridge	1
	Total		**1**
Montour	Transportation	Bridge	3
	Total		**3**
Tama	Hazardous Material	EHS Tier II Facility	1
	Hazardous Material	EPA RMP Facility	1
	Hazardous Material	Tier II Facility	1
	Safety and Security	Solid Waste Facility	1
	Transportation	Bridge	2
	Total		**6**
Toledo	Food, Water, Shelter	Water Use Well	1
	Transportation	Bridge	4
	Total		**5**
Traer	Transportation	Bridge	1
	Total		**1**
Unincorporated	Food, Water, Shelter	Water Treatment Plant	4
	Food, Water, Shelter	Water Use Well	13
	Hazardous Material	EHS Tier II Facility	1
	Hazardous Material	EPA RMP Facility	1
	Hazardous Material	Tier II Facility	2
	Safety and Security	DHS Childcare	1
	Safety and Security	Solid Waste Facility	2
	Transportation	Bridge	156
	Total		**180**
	Grand Total		**200**

Table 3-30 Critical Facilities Within the 0.2% Annual Chance Flood Hazard Area

Jurisdiction	FEMA Lifeline	Facility Type	Count
Chelsea	Safety and Security		1
	Transportation		1
	Total		**2**
Tama	Food, Water, Shelter		1
	Total		**1**
Traer	Hazardous Material		1
	Transportation		1
	Total		**2**
Unincorporated	Food, Water, Shelter		1
	Hazardous Material		1
	Transportation		13
	Total		**15**
	Grand Total		**20**

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 damage. Participation in the NFIP helps flood-prone communities reduce their economic risk to flooding.

Flood Insurance in Tama County

According to the FEMA Community Information System, as of October 2021, in Tama County Unincorporated Areas there are 20 total flood insurance policies. The premiums amount to $32,582 and the insurance in force amounts to $1,456,300. There have been 10 total closed paid losses and the total dollar amount of closed paid losses is $135,268. There has been one (1) Substantial Damage closed paid loss.

In the City of Chelsea, there are 17 total flood insurance policies. The premiums amount to $10,885 and the insurance in force amounts to $755,800. There have been 103 closed paid losses and the dollar amount of closed paid losses is $1,128,579. There have been 6 ICC closed paid losses amounting to $160,369. There have been 6 Substantial Damage closed paid losses.

In the City of Montour, there are 4 total flood insurance policies. The premiums amount to $1,164 and the insurance in force amounts to $98,100. There have been 4 closed paid losses and the dollar amount of closed paid losses is $9,182.

In the City of Tama, there is 1 total flood insurance policy. The premium amounts to $1,818 and the insurance in force amounts to $400,000. There have been 30 closed paid losses and the dollar amount of closed paid losses is $249.700. There have been 3 Substantial Damage closed paid losses.

In the City of Toledo, there is 1 total flood insurance policy. The premium amounts to $374 and the insurance in force amounts to $70,000. There have been 0 closed paid losses.

In the City of Traer, there are 2 total flood insurance policies. The premiums amount to $899 and the insurance in force amounts to $560,000. There has been 1 closed paid loss amounting to $8,049.

No other communities in Tama County have flood insurance policies.

Repetitive Loss in Tama County

A Repetitive Loss (RL) property is any insurable building for which two or more claims of more than $1,000 were paid by the NFIP within any rolling ten-year period, since 1978. 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 Tama County Unincorporated Areas, there are two total RL properties. One of these properties is insured. These properties have had 4 total repetitive losses, with $65,148 in building loss payments and $679 in contents loss payments. The total repetitive loss payment amounts to $65,827.

In the City of Chelsea, there are 35 total RL properties. 6 of these properties are insured. There have been 62 total repetitive losses, 13 of which were insured. This has amounted to $557,731 in building loss payments and $31,177 in contents loss payments. The total repetitive loss payments amount to $588,909.

In the City of Tama, there is 1 total RL property. 6 of these properties are insured. There have been 3 total repetitive losses. This has amounted to $32,874 in building loss payments and $10,500 in contents loss payments. The total repetitive loss payments amount to $43,374.

No other communities in Tama County have RL properties.

Severe Repetitive Loss in Tama County

A Severe Repetitive Loss (SRL) property is a single family property (consisting of 1 to 4 residences) that is covered under flood insurance by the NFIP and has incurred flood-related damage for which 4 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 amount of such claims payments exceeding $20,000; or for which at least 2 separate claims payments have been made with the cumulative amount of such claims exceeding the reported value of the property. The following SRL information is from the FEMA Community Information System, as of October 2021.

In Tama County, there is one SRL building which has 2-3 losses greater than the building value. There are no insured buildings with 4 or more losses.

In the City of Chelsea, there are 4 SRL buildings. One of these is a building with 4 or more losses, and the other three are buildings with 2-3 losses greater than the building value.

No other communities in Tama County have SRL properties.

Historic, Cultural, and Natural Resources

A flood could damage cultural and historic facilities in Tama County if they are in the floodplain. Cultural facilities include restaurants, parks, community centers, museums and businesses. Natural resources such as streams, vegetative buffer zones and crops could also be at risk to damage and destruction by floodwaters.

Development Trends

The changes in land use associated with urban development affect flooding in many ways. Removing vegetation and soil, grading the land surface, and constructing drainage networks increase runoff to streams from rainfall and snowmelt. As a result, the peak discharge, volume, and frequency of floods increase in nearby streams. Changes to stream channels during urban development can limit their capacity to convey floodwaters. Roads and buildings constructed in flood-prone areas are exposed to increased flood hazards, including inundation and erosion, as new development continues.

There is a correlation between increased population growth and development and increased risk to more intense flooding. However, Tama County has overall experienced a population decrease of about 4.1% since 2000. Population growth is not a significant factor contributing to Tama County's flood risk. Communities that are mapped and participating in the NFIP who implement their floodplain ordinances 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 reduced the floodwater storage areas of large events.

3.3.5 Extreme Heat

Extreme Heat – Hazard Score Calculation						
Jurisdiction	Historical Occurrence	Probability	Vulnerability	Severity of Impact	Speed Of Onset	Total Score
Chelsea	4	4	4	1	1	14
Clutier	4	4	4	1	1	14
Dysart	4	4	4	1	1	14
Elberon	4	4	4	1	1	14
Garwin	4	4	4	1	1	14
Gladbrook	4	4	4	1	1	14
Lincoln	4	4	4	1	1	14
Montour	4	4	4	1	1	14
Tama	4	4	4	1	1	14
Toledo	4	4	4	1	1	14
Traer	4	4	4	1	1	14
Vining	4	4	4	1	1	14
Tama County	4	4	4	1	1	14
GMG Community SD	4	4	4	1	1	14
North Tama Community SD	4	4	4	1	1	14
South Tama Community SD	4	4	4	1	1	14
Union Community SD	4	4	4	1	1	14

Hazard Profile/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 3-25 uses both of these factors to produce a guide for the apparent temperature or relative intensity of heat conditions.

Figure 3-25 Heat Index (HI) Chart

Temperature (°F)

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

Likelihood of Heat Disorders with Prolonged Exposure or Strenuous Activity

Caution Extreme Caution Danger Extreme Danger

Source: National Weather Service (NWS)

Note: Exposure to direct sun can increase Heat Index 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 difficulties cooling through the normal method of the evaporation of perspiration. 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, an average of 702 heat-related deaths occurred annually nationwide 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. 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.

Location

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. Table 3-31 lists typical symptoms and health impacts of exposure to extreme heat.

Table 3-31 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 Heat Index Program, https://www.weather.gov/safety/heat-index

The NWS has a system in place to initiate alert procedures (advisories or warnings) when the Heat Index 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 Heat Index is expected to equal or exceed 105 degrees Fahrenheit (°F) and the nighttime minimum Heat Index 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.

Historical Occurrences

According to information obtained from the NWS for Tama County Zone on the Iowa Environmental Mesonet, Iowa State University Department of Agronomy website, there have been a combined 43 excessive heat advisories, watches, and warnings between 2005 and 2020. These events are summarized in Table 3-32 below. The greatest number of heat advisories in a given year was 2018, with 6 advisories and 1 warning. Historic data tells us that extreme heat is a fairly common occurrence in Tama County.

Table 3-32 Number of Heat Advisories, Watches, and Warnings, 2005-2020 Tama County Zone

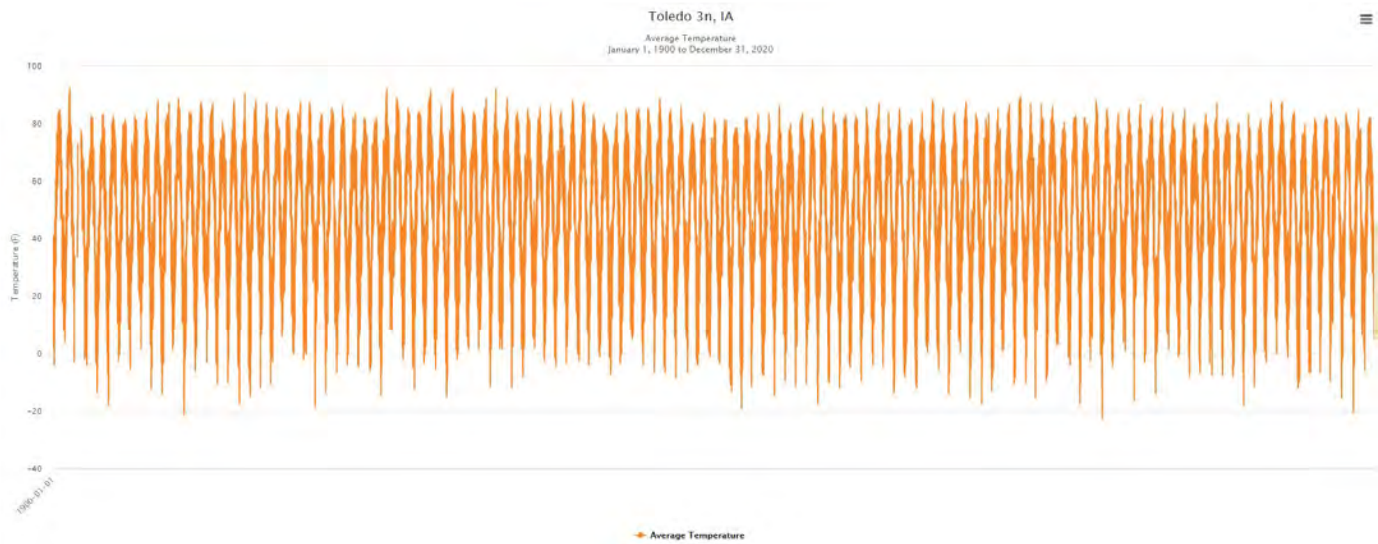
Year	Heat Advisory	Excessive Heat Warning	Excessive Heat Watch
2005	1	0	0
2006	2	0	0
2007	0	0	0
2008	0	0	0
2009	1	0	0
2010	3	0	0
2011	4	1	1
2012	3	2	0
2013	1	0	0
2014	1	0	0
2015	1	0	0
2016	1	1	1
2017	3	0	1
2018	6	1	0
2019	2	1	1
2020	4	0	0
Totals	33	6	4

Source: Iowa State University Environmental Mesonet

Figure 3-26 provides the daily maximum temperatures for the Toledo, Iowa weather station for the period of record from 1900 to 2020 from the High Plains Regional Climate Center. Data from the High Plains

Regional Climate Center show that a temperature of 109 °F was reached in 1901 as the highest recorded temperature during the 120-year timeframe. The months of the year with the highest temperatures are generally July and August. The average maximum temperature for July is 85 °F and August is 83 °F for the planning area.

Figure 3-26 Average Temperature, Toledo, Iowa (1893-2020)



Source: High Plains Regional Climate Center, Station Data Explorer

The NCEI reported three regional heat and excessive heat events in and around Tama County during the period from 2005 to 2020. The heat event of record occurred July 15-28, 2011. Temperatures rose into the 90s each day, but it was the dew point and overnight lows that were very significant. Low temperatures during most of the nights were in the 70s, with many of the nights in the mid to upper 70s. These conditions caused considerable stress on livestock. Statewide reports indicated that at least 4,000 head of cattle and thousands of turkeys were killed by the suffocating heat. Livestock losses were estimated in the $5 to $10 million dollar range. In Tama County specifically, NCEI records indicate this event resulted in approximately $135,000 of property damage.

Historical Occurrences Score: 4

Probability of Future Occurrences

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 43 heat advisories over the 15-year period from 2005 to 2020 only 15 of the episodes lasted for two or more days. This translates to a 100 percent probability, or a highly likely rate of occurrence, in any given year of an extreme heat event.

Probability Score: 4—Highly Likely

Magnitude and Severity

Severity of Impact

Extreme heat has broad impacts for Tama County. On the whole, many communities in Tama County have learned to adapt to extreme heat and periods of hot weather during the summer months through the use of air conditioned spaces, which makes the severity of extreme heat for Tama County low, as long as people have access to a cool place. However, extreme heat spells can and do result in serious injury or death. One negative impact of air conditioning is that it increases demand for electricity, which can outstrip supply and cause city infrastructure to fail. These types of incidents, however, can usually be resolved in less than four hours.

Regarding agriculture, livestock and other animals can become stressed and adversely impacted by extreme heat. High temperatures at the wrong time can also inhibit crop yields. The demand for water increases sharply during periods of extreme heat, which may contribute to fire suppression problems for both urban and rural fire departments. In extreme cases, transportation impacts include the loss of lift for aircrafts, softening of asphalt roads, buckling of highways and railways, and stress on automobiles and trucks (increase in mechanical failures).

Severity of Impact Score: 2 – Limited

Speed of Onset

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

Speed of Onset Score: 1—More than 24 hours warning time.

Climate Change Considerations

According to the Iowa Department of Natural Resources, 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 Department of Natural Resources 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.

Vulnerability

Elderly people, small children, chronic invalids, those on certain medications or drugs (especially tranquilizers and anticholinergics), and persons with weight and alcohol problems are particularly susceptible to heat reactions. Healthy individuals working outdoors in the sun and heat are vulnerable as well. Individuals and families with low budgets as well as inner city dwellers can also be susceptible due to poor access to air-conditioned housing. Generally, more than 75% of people and property in Tama County are affected when this type of hazard occurs.

Vulnerability Score: 4 – Greater than 75% of people and property affected

People

The impacts of extreme heat on health are a consideration in evaluating the overall vulnerability of Tama County. According to the US Census Bureau 2019 American Community Survey estimates, approximately 19.5% of Tama 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.

Property

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.

Critical Facilities and Infrastructure

Prolonged heat exposure can have significant impacts on infrastructure. Another type of infrastructure damage that can occur as a result 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.

Economy

Extreme heat impacts on the economy may be more indirect compared to other hazards. 7.4% of all employment in Tama County is in the agriculture 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 RMA Indemnity Report, since 2007 there have been 1,647 acres lost to heat resulting in $186,816 in indemnity payments due to insured crop loss. There is an estimated $14,370 of annualized crop loss due to heat.

Historic, Cultural, and Natural Resources

Extreme heat may cause temporary drought-like conditions. For example, several weeks of extreme heat increases evapotranspiration and reduces moisture content in vegetation, leading to higher wildfire vulnerability for that time period even if the rest of the season is relatively moist.

Development Trends

Since Tama County is experiencing slight population decline, the number of people vulnerable to extreme heat is not increasing. Structures are not usually directly impacted by extreme heat; therefore, continued development is less impacted by this hazard than others in the plan. Public education efforts should continue to help the population understand the risks and vulnerabilities of outdoor activities, property maintenance, and regular exposures during periods of extreme heat.

3.3.6 Grass or Wildland Fire

Grass or Wildland Fire – Hazard Score Calculation						
Jurisdiction	Historical Occurrence	Probability	Vulnerability	Severity of Impact	Speed of Onset	Total Score
Chelsea	4	1	1	1	4	10
Clutier	4	1	1	1	4	10
Dysart	4	1	1	1	4	10
Elberon	4	1	1	1	4	10
Garwin	4	1	1	1	4	10
Gladbrook	4	1	1	1	4	10
Lincoln	4	1	1	1	4	10
Montour	4	1	1	1	4	10
Tama	4	1	1	1	4	10
Toledo	4	1	1	1	4	10
Traer	4	1	1	1	4	10
Vining	4	1	1	1	4	10
Tama County	4	1	1	1	4	10
GMG Community SD	4	1	1	1	4	10
North Tama Community SD	4	1	1	1	4	10
South Tama Community SD	4	1	1	1	4	10
Union Community SD	4	1	1	1	4	10

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 on a daily basis so that wildfires can be predicted, if not prevented.

The risk factors considered are:

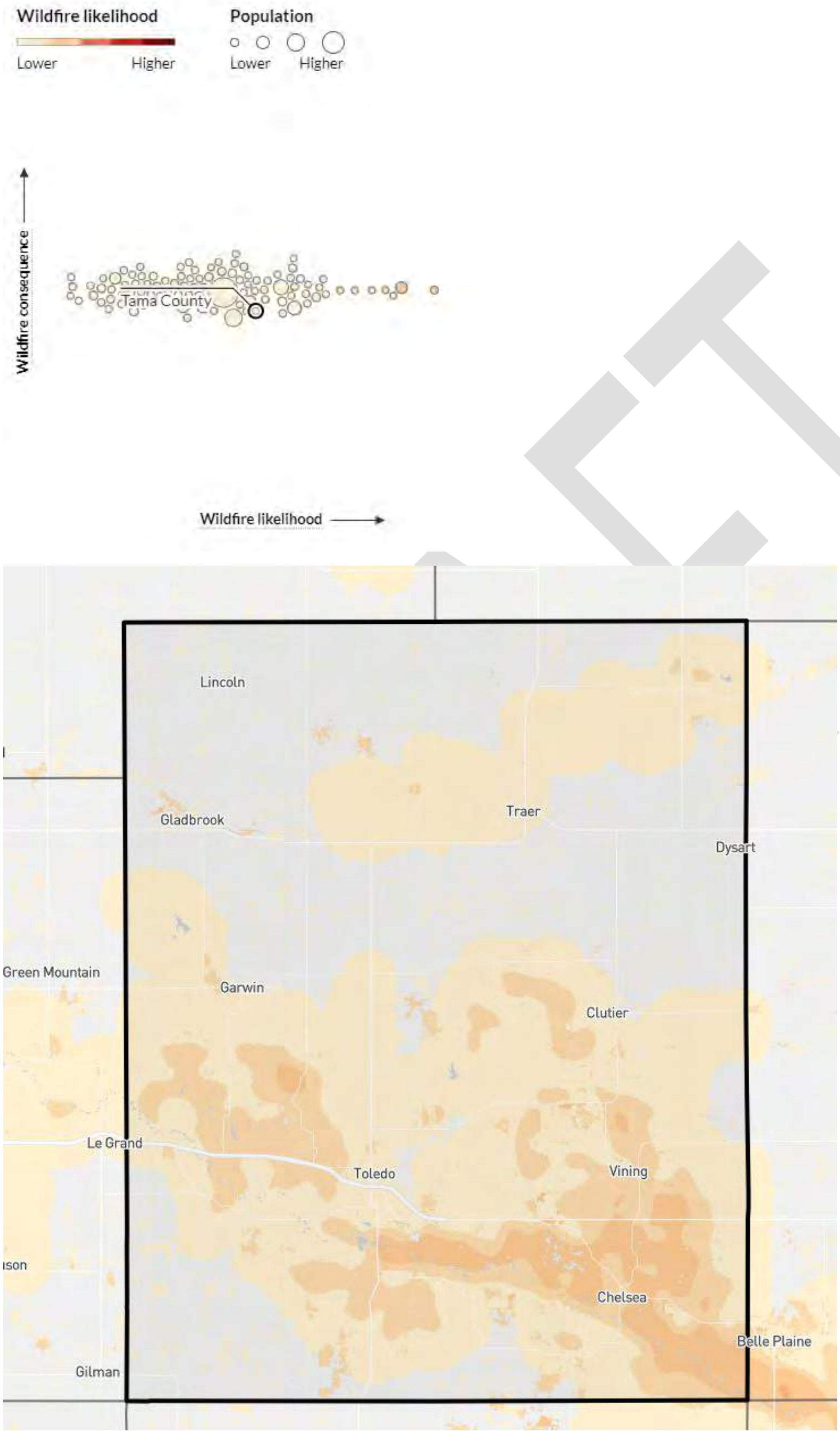
- High temperature
- High wind speed
- Fuel moisture (greenness of vegetation)
- Low humidity
- Little or no cloud cover

Location

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 Tama 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 3-27 shows the Wildfire Likelihood in Tama County and the legend represents 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.

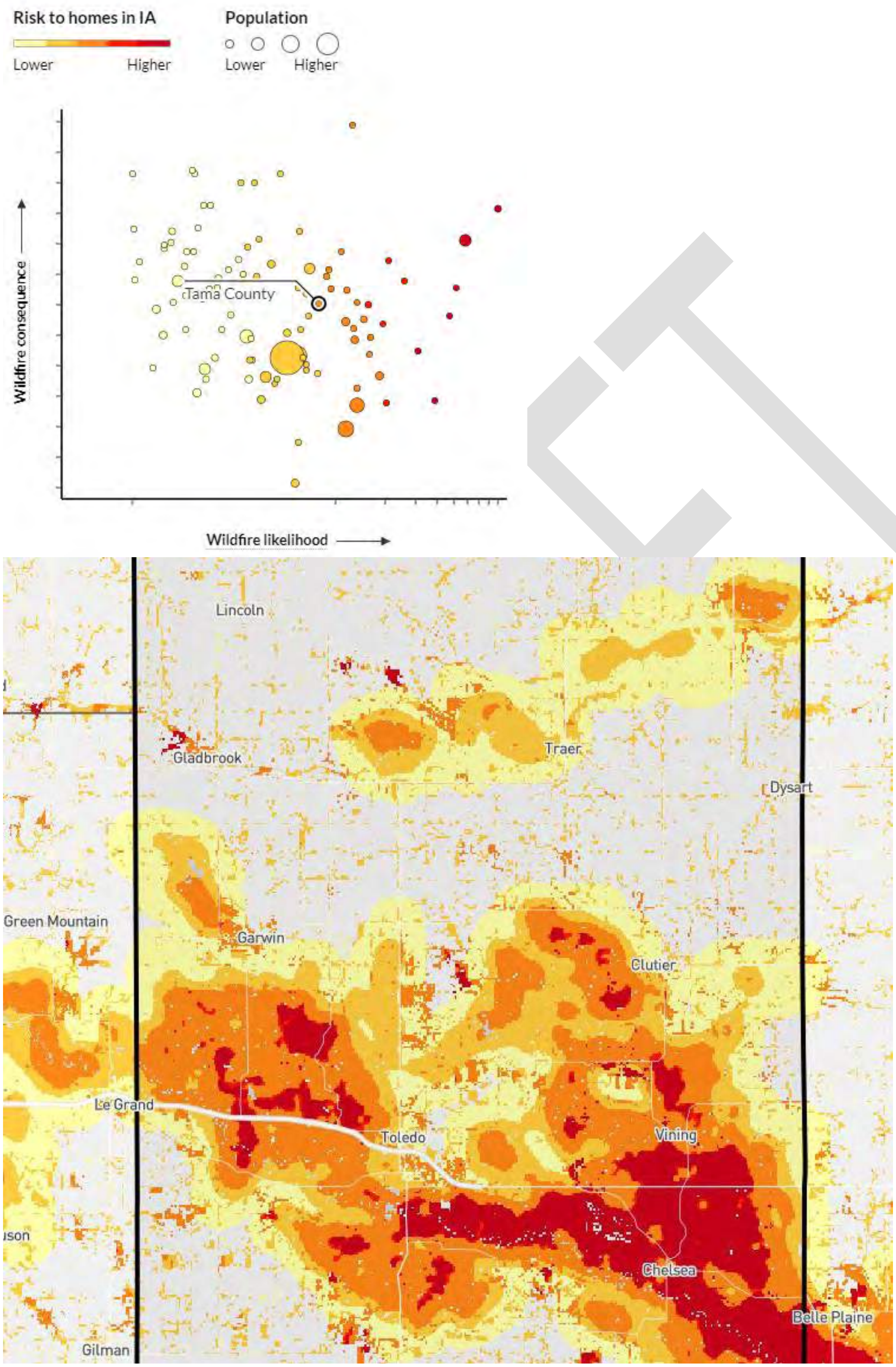
Figure 3-27 Tama County Wildfire Likelihood Relative to Other Iowa Counties



Source: Wildfire Risk to Communities, https://wildfirerisk.org/explore/0/19/19121/

Figure 3-28 shows the Risk to Homes within Tama County and the legend represents 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. Tama County has a Moderate Risk to Homes compared to other counties within the State. The size of the circles in the legend is a proportional representation of the county's population compared to other counties in 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 3-28 Tama County Wildfire Risk to Homes Relative to Other Iowa Counties



Source: Wildfire Risk to Communities, https://wildfirerisk.org/explore/0/19121/

Historical Occurrence

According to the NCEI database, there were no wildland or forest fire events with significant impact that have been reported in Tama County. This does not account for small or contained grass fires that may not have been reported. According to information received from the City of Elberon, the Elberon Fire Department typically responds to 3-5 grass years per year. While there is a lack of available data for the other jurisdictions in the county, it can be assumed that smaller fires such as this occur at a similar rate throughout the planning area. The HMPC has estimated that, for most jurisdictions, the number of fires that have occurred within city limits in the last ten years is minimal (one or less). In addition, many communities in Tama 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.

Historical Occurrence Score: 4

Probability of Future Occurrence

Updated 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. HMPC

Probability Score: 1—Unlikely

Magnitude and Severity

Severity of Impact

Most grass fires burn only the grasses, crops, or other low land cover. Injuries and deaths from fighting the fire most often occur by natural causes such as heart attack or stroke. Property damage is usually limited to grass, small trees, and other vegetative matter. Occasionally, a house or outbuilding can be damaged or destroyed. All jurisdictions in Tama County scored severity of impact as a 1.

Severity of Impact Score: 1 – Negligible

Speed of Onset

Most grassfires occur without warning and travel at a moderate rate. This situation depends upon conditions at the time such as moisture, wind, and land cover. Generally, grass and wildland fires occur with minimal to no warning time. All jurisdictions in Tama County scored speed of onset as a 4.

Speed of Onset Score: 4 – Minimal or no warning.

Climate Change Considerations

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.

Vulnerability

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 Tama 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 Tama County community.

All jurisdictions in Tama County scored vulnerability as a 1.

People

Smoke and air pollution from wildfires can be a severe health hazard, especially for sensitive populations, including children, the elderly, and those with respiratory and cardiovascular diseases. Smoke generated by wildfire consists of visible and invisible emissions that contain particulate matter (soot, tar, water vapor, and minerals), gases (carbon monoxide, carbon dioxide, nitrogen oxides), and toxics (formaldehyde, benzene). Emissions from wildfires depend on the type of fuel, the moisture content of the fuel, the efficiency (or temperature) of combustion, and the weather. Public health impacts associated with wildfire include difficulty in breathing, odor, and reduction in visibility.

Wildfire may also threaten the health and safety of those fighting the fires. First responders are exposed to the dangers from the initial incident and after-effects from smoke inhalation and heat stroke.

Property

Direct property damage and losses of buildings is a rare occurrence in Tama County. However, according to the USDA Forest Service wildfire risk tool referenced above, populated areas in Tama County have, on average, a greater risk to homes than 71% of counties in Iowa.

Critical Facilities and Infrastructure

Critical facilities of wood frame construction are especially vulnerable during grass or wildland fire events. Power lines in the unincorporated areas of the county are the most at risk from wildfire because most poles are made of wood and susceptible to burning. Fires can create conditions that block or prevent access and can isolate residents and emergency service providers.

Economy

Fire suppression may result in increased costs to local and state government for water acquisition and delivery, especially during periods of drought when water resources are scarce. Fires can also cause direct economic losses in the destruction of buildings and their contents, or indirectly through the forced closures of businesses.

Historic, Cultural, and Natural Resources

Fire is a natural and critical ecosystem process in most terrestrial ecosystems, dictating in part the types, structure, and spatial extent of native vegetation. However, severe wildfires can cause negative environmental impacts:

- **Soil Erosion**—The protective covering provided by foliage and dead organic matter is removed, leaving the soil fully exposed to wind and water erosion. Accelerated soil erosion occurs, causing landslides and threatening aquatic habitats.
- **Spread of Invasive Plant Species**—Non-native woody plant species frequently invade burned areas. When weeds become established, they can dominate the plant cover over broad landscapes, and become difficult and costly to control.
- **Disease and Insect Infestations**—Unless diseased or insect-infested trees are swiftly removed, infestations and disease can spread to healthy forests and private lands. Timely active management actions are needed to remove diseased or infested trees.
- **Destroyed Endangered Species Habitat**—Catastrophic fires can have devastating consequences for endangered species.
- **Soil Sterilization**—Topsoil exposed to extreme heat can become water repellant, and soil nutrients may be lost. It can take decades or even centuries for ecosystems to recover from a fire. Some fires burn so hot that they can sterilize the soil.

Many ecosystems are adapted to historical patterns of fire occurrence. These patterns, called “fire regimes,” include temporal attributes (e.g., frequency and seasonality), spatial attributes (e.g., size and spatial complexity), and magnitude attributes (e.g., intensity and severity), each of which have ranges of natural variability. Ecosystem stability is threatened when any of the attributes for a given fire regime diverge from its range of natural variability.

Development Trends

Future development in the wildland-urban interface/intermix areas would increase vulnerability to this hazard.

3.3.7 Severe Winter Storm

Drought – Hazard Score Calculation						
Jurisdiction	**Historical Occurrence**	**Probability**	**Vulnerability**	**Severity of Impact**	**Speed Of Onset**	**Total Score**
Chelsea	4	4	4	2	1	15
Clutier	4	4	4	2	1	15
Dysart	4	4	4	2	1	15
Elberon	4	4	4	2	1	15
Garwin	4	4	4	2	1	15
Gladbrook	4	4	4	2	1	15
Lincoln	4	4	4	2	1	15
Montour	4	4	4	2	1	15
Tama	4	4	4	2	1	15
Toledo	4	4	4	2	1	15
Traer	4	4	4	2	1	15
Vining	4	4	4	2	1	15
Tama County	4	4	4	2	1	15
GMG Community SD	4	4	4	2	1	15
North Tama Community SD	4	4	4	2	1	15
South Tama Community SD	4	4	4	2	1	15
Union Community SD	4	4	4	2	1	15

Hazard Profile/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 National Weather Service (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.

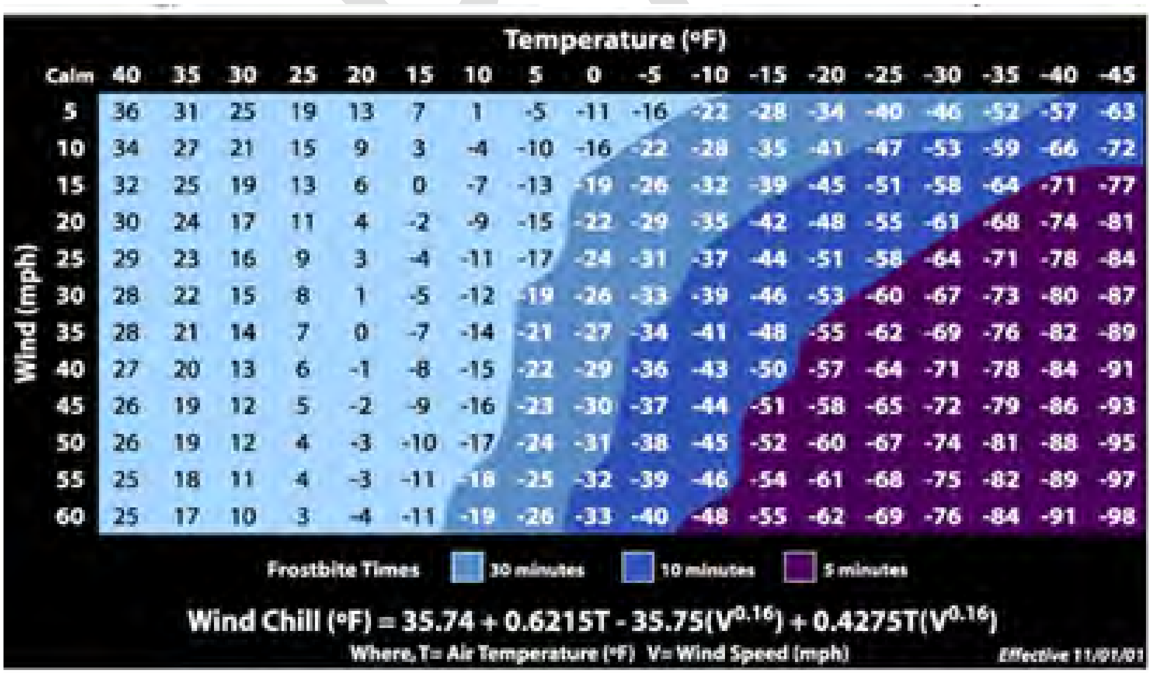
Extreme cold often accompanies severe winter storms and can lead to hypothermia and frostbite in people who are exposed to the weather without adequate clothing protection. Cold can cause fuel to congeal in storage tanks and supply lines, stopping electric generators. Cold temperatures can also overpower 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 NWS, Figure 3-29 below shows the relationship of wind speed to apparent temperature and typical time periods for the onset of frostbite.

Figure 3-29 Wind Chill Chart



Temperature (°F)

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

Frostbite Times: 30 minutes, 10 minutes, 5 minutes

$$\text{Wind Chill (°F)} = 35.74 + 0.6215T - 35.75(V^{0.16}) + 0.4275T(V^{0.16})$$

Where, T= Air Temperature (°F) V= Wind Speed (mph) *Effective 11/01/01*

Source: NWS

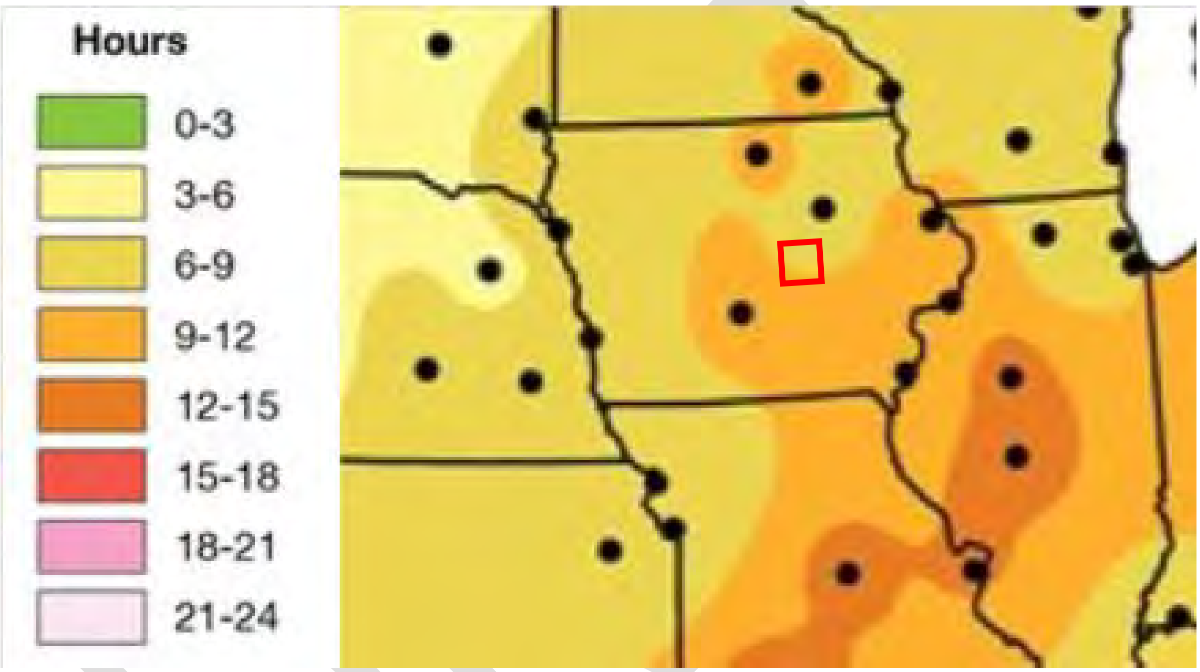
Location

According to the Southwest Climate and Environmental Information Collaborative (SCENIC), the planning area has a January average high temperature normal of 28 degrees (F), a January average low temperature normal of 9 degrees (F), and the annual average snowfall of 33.69 inches from 1900 to 2020.

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 3-30 shows that the entire planning area (approximated within the red square) is in the yellow and orange-shaded areas that receive from 6-12 hours of freezing rain per year.

Figure 3-30 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.

Historical Occurrences

From 1996 to 2020, the NCEI database reported 10 blizzard events, 7 extreme cold/wind chill events, 20 heavy snow events, 13 ice storm events, and 24 winter storm events in Tama County. This results in a total of 74 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 $1.65 million in property damages and $2.6 million in crop damages. This translates to an average of approximately three winter storm events per year.

NOAA's National Weather Service has issued 447 Advisory, Watch, and/or Warnings concerning winter weather phenomena in the planning area between 2005 and 2020. This data is housed by the Iowa Environmental Mesonet, Iowa State University Department of Agronomy website.

Table 3-33 NWS Issuances for Winter Weather in Tama County, Iowa, 2005-2020

Phenomena	Significance	Number Issued between 2005 and 2020
Blizzard	Watch	9

Phenomena	Significance	Number Issued between 2005 and 2020
Blizzard	Warning	11
Blowing Snow	Advisory	7
Freeze	Watch	9
Freeze	Warning	26
Freezing Rain	Advisory	7
Frost	Advisory	19
Ice Storm	Warning	3
Snow	Advisory	13
Snow and Blowing Snow	Advisory	6
Wind Chill	Advisory	85
Wind Chill	Watch	3
Wind Chill	Warning	12
Winter Storm	Watch	54
Winter Storm	Warning	45
Winter Weather	Advisory	136
Total		447

Source: Environmental Mesonet, Iowa State University Department of Agronomy website, http://mesonet.agron.iastate.edu/vtec/search.php

Historical Occurrence Score: 4

Probability of Future Occurrences

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, Tama County can expect to experience 3 winter storm events per year, giving a rating of Highly Likely.

Probability Score: 4—Highly Likely

Magnitude and Severity

Severity of Impact

Certain areas may experience local variations in storm intensity and quantity of snow or ice. The Iowa Department of Transportation, county road departments, and local public works agencies are responsible for the removal of snow and treatment of snow and ice with sand and salt on the hundreds of miles of streets and highways in the area. Poor road conditions, immobilized transportation and downed trees and electrical wire can impair snow removal on roads and road treatment.

Building and communication tower collapse and bodily injury or death are just a few of the impacts of a severe winter storm. Vehicle batteries and diesel engines are stressed, and the fuel often gels in extreme cold weather. This impacts transportation, trucking, and rail traffic. Rivers and lakes freeze, and subsequent ice jams threaten bridges and can close major highways. Ice jams can also create flooding problems when temperatures begin to rise.

An ice coating at least ¼ inch in thickness is heavy enough to damage trees, overhead wires, and similar objects and to produce widespread power outages. Buried water pipes can burst causing massive ice problems, loss of water, and subsequent evacuations during sub-zero temperatures.

Fire during winter storms presents a great danger because water supplies may freeze, and firefighting equipment may not function effectively, or personnel and equipment may be unable to get to the fire. If power is out, interiors of homes become very cold, causing pipes to freeze and possibly burst.

Cold temperature impacts on agriculture are frequently discussed in terms of frost and freeze impacts early or late in growing seasons and on unprotected livestock. The cost of snow removal, repairing damage, and loss of business can have large economic impacts on a community.

Severity of Impact Score: 2 – Limited

Speed of Onset

The National Weather Service has developed effective weather advisories that are promptly and widely distributed. Radio, television, and Weather Alert Radios provide the most immediate means to do this. Accurate information is made available to public officials and the public at least 12-24 hours in advance as storms form and totals are estimated. Several notifications made by the National Weather Service include winter storm warning, blizzard warning, winter weather advisory, and a frost/freeze advisory.

Speed of Onset Score: 1

Climate Change Considerations

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.

Vulnerability

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.

Vulnerability Score: 4 – Greater than 75% of people and property affected

People

The threat to public safety is typically the greatest concern when it comes to impacts of winter storms. The highest risk will be to travelers that attempt to drive during adverse conditions. People can also become isolated from essential services in their homes and vehicles. While virtually all aspects of the population are vulnerable to the potential indirect impacts of a winter storm, others may be more vulnerable, such as individuals with access and functional needs, who may become isolated to essential services.

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 19.5% of Tama County's population is over the age of 65. Additionally, the US Department of Health and Human Services estimates that there are 214 electricity-dependent Medicare beneficiaries in the county. These individuals are extremely vulnerable during power outages, which commonly accompany severe winter storm events.

Property

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. In general, heavy winter storms increase wear and tear on roadways though the cost of such damages is difficult to determine. 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.

Critical Facilities and Infrastructure

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.

Economy

Closure of major transportation routes during severe winter storms could temporarily isolate communities in Tama County and further isolate the more remote areas of the County. Depending on the length of the closure it could also hinder the local economy by disrupting tourism and out of county visitors, and as well as the potential impacts to shipping delays from a closure of any of the highways which traverse the county. Snow removal costs can also impact budgets significantly. Power outages may lead to business closures as well, with impacts possibly lasting for multiple days. According to FEMA standard values for loss of service for utilities reported in the 2009 Benefit Cost Analysis Reference Guide, the economic impact as a result of loss of power is $126 per person per day of lost service.

Historic, Cultural, and Natural Resources

Natural resources may be damaged by the severe winter weather, including broken trees and death of wildlife and livestock. Unseasonable storms may damage or kill plants and wildlife, which may impact natural food chains until the next growing seasons. Most of these impacts would be short-term. As noted previously, older, historic buildings could potentially be more vulnerable to roof and structural damage from heavy snow.

Development Trends

Future development could potentially increase vulnerability to this hazard by increasing demand on the utilities and increasing the exposure of infrastructure networks.

3.3.8 Thunderstorms, Lightning, and Hail

Drought – Hazard Score Calculation						
Jurisdiction	Historical Occurrence	Probability	Vulnerability	Severity of Impact	Speed Of Onset	Total Score
Chelsea	4	4	3	2	4	17
Clutier	4	4	3	2	4	17
Dysart	4	4	3	2	4	17
Elberon	4	4	3	2	4	17
Garwin	4	4	3	2	4	17
Gladbrook	4	4	3	2	4	17
Lincoln	4	4	3	2	4	17
Montour	4	4	3	2	4	17
Tama	4	4	3	2	4	17
Toledo	4	4	3	2	4	17
Traer	4	4	3	2	4	17
Vining	4	4	3	2	4	17
Tama County	4	4	3	2	4	17
GMG Community SD	4	4	3	2	4	17
North Tama Community SD	4	4	3	2	4	17
South Tama Community SD	4	4	3	2	4	17
Union Community SD	4	4	3	2	4	17

Hazard Profile/Description

A thunderstorm is defined as a storm that contains lightning and thunder which is caused by unstable atmospheric conditions. When the upper air which is cold sinks and the 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.

Thunderstorms are created from a combination of moisture, rapidly raising warm air, and the lifting mechanism such as that caused when warm and cold air masses collide. Thunderstorms are hazards unto themselves, but can cause other hazards such as flash flooding, river flooding, and tornadoes/windstorms. Hailstorms are a product of a severe thunderstorm in which pellets or lumps of ice (of most concern when greater than 1 inch in diameter) fall with rain.

The National Weather Service 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 strike 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 National Weather Service, 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 National Oceanic and Atmospheric Administration (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 down 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 commonly damaged by hail. Hail has been known to cause injury to humans, occasionally fatal injury.

Based on information provided by the Tornado and Storm Research Organization, Table 3-34 below describes typical damage impacts of the various sizes of hail.

Table 3-34 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

Intensity Category	Diameter (mm)	Diameter (inches)	Size Description	Typical Damage Impacts
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

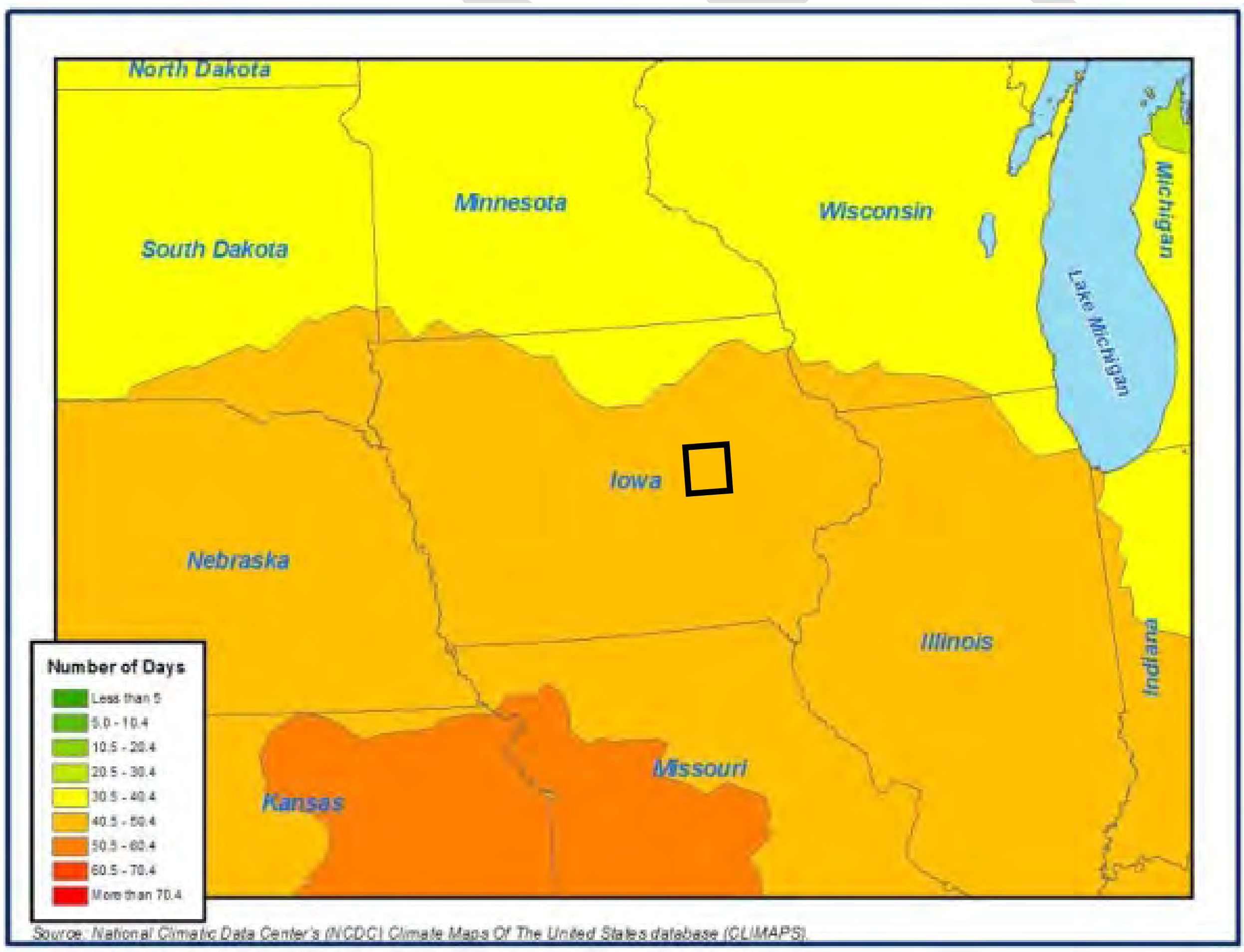
Source: Tornado and Storm Research Organization (TORRO), Department of Geography, Oxford Brookes University

Notes: In addition to hail diameter, factors including number and density of hailstones, hail fall speed and surface wind speeds affect severity

Location

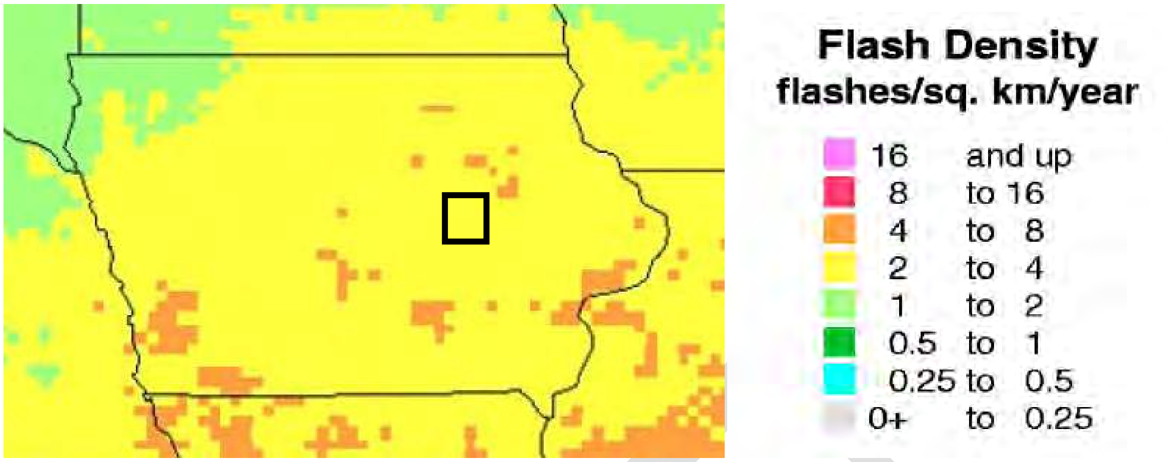
Thunderstorms and the associated hail and lightning impact the entire County with relatively similar frequency. Although, these events occur similarly throughout the planning area, they are more frequently reported in more urbanized areas. In addition, damages are more likely to occur in more densely developed urban areas. Figure 3-31 displays the average number of days with thunder experienced throughout different areas of the county each year, showing the County experiences between 40.5 to 50.4 days with thunder per year. Figure 3-32 shows 2 to 4 lightning strikes per square kilometer per year in the yellow shaded areas.

Figure 3-31 Distribution and Frequency of Thunderstorms



Note: Black Square indicates approximate location of Tama County

Figure 3-32 Location and Frequency of Lightning in Iowa



Source: NWS, www.lightningsafety.noaa.gov/lightning_map.htm
Note: Black Square indicates approximate location of Tama County

Historical Occurrence

Since 1970, Tama County has been included in 12 Presidential Disaster Declarations that included severe storms (see Table 3-35). Some of the damages that resulted in the declarations were from tornadoes and flooding that accompanied the severe weather.

Table 3-35 Presidential Disaster Declarations for Severe Storms that included Tama County (1970-2020)

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
4187	8/5/2014	6/26/2014 to 7/7/2014	Severe Storms, Tornadoes, Straight-line Winds, and Flooding
4126	7/2/2013	5/19/2013 to 6/14/2013	Severe Storms, Tornadoes, and Flooding
4016	8/24/2011	7/9/2011 to 7/14/2011	Severe Storms, Straight-line Winds, and Flooding
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
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
911	7/12/1991	6/1/1991 to 6/15/1991	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

Source: FEMA

According to NCEI data, Tama County has experienced 59 events of hail or lightning from 1961 to 2020 (the time frame for which data was available). In total, these events have caused $194,000 in property damages and $459,000 in crop damages. From 1986 to 2020, the Iowa State Environmental Mesonet Database reported 514 Severe Thunderstorm Warnings from the National Weather Service issued for Tama County. Overall, the county occurrence is high; however, there are variations among jurisdictions when it comes to the severity and impact of individual events.

Table 3-36 Historical Occurrence of Thunderstorms, Lightning, and Hail in Tama County

Hazard type	Total Events	Events with Damage	Property Damage	Crop Damage	Injuries	Fatalities
Hail	57	33	$384,000	$459,000	0	0
Lightning	3	0	$110,000	0	0	0
Totals	59	33	$194,000	$459,000	0	0

Data Source: NCEI Storm Events Database 2020

Historical Occurrence Score: 4

Probability of Future Occurrences

Thunderstorms occur annually throughout the planning area, many times each 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 58 separate hail events producing hail 0.75 inches and larger in a 69-year period, resulting in an approximate likelihood of 84% annual chance for a severe hail event in Tama County. When limiting the probability analysis to hail events producing hail 1.75 inches and larger, there have 14 separate events (separate days) in a 46-year period. Based on this history, the probability of a destructive hail event in any given year is 30 percent. Based on this history, there can be a severe hail event almost every year making the probability for damaging hail "highly likely" in any given year. When considering the frequencies of severe thunderstorms, as discussed in the historical occurrences section, there are an average of 15 per year, meaning a severe thunderstorm occurring in a given year is certain

Probability Score: 4—Highly Likely

Magnitude and Severity

Severity of Impact

It is possible for the entire county to be affected by a large thunderstorm and lightning event that moves across the entire county, but effects are often localized. Thunderstorms can bring large hail that can damage homes and businesses, break glass, destroy vehicles, and cause bodily injury to people, pets, and livestock. One or more severe thunderstorms occurring over a short period can lead to flooding and cause extensive damage, power and communication outages, and agricultural damage.

In extreme or isolated circumstances, severe thunderstorms can bring straight-line winds in excess of 100 mph. Straight-line winds are responsible for most thunderstorm damage. High winds can damage trees, homes (especially mobile homes), and businesses and can knock vehicles off of the road. The power of lightning's electrical charge and intense heat can electrocute people and livestock on contact, split trees, ignite fires, and cause electrical failures.

Communities considered these risks and common occurrences when scoring severity of impact. Communities that scored impacts lower (little to no, minimal property damage, minimal environmental impacts, short-term effects on critical facilities operation) considered the effects of an average storm for their city. Communities that scored impacts higher (significant property damage, serious injury, shutdown of critical facilities for days), they considered a worst-case scenario storm.

Severity of Impact Score: 2 – meaning that effects would generally cause only minor injuries or illness, minor property damage, and a shutdown of critical facilities for between 4 to 24 hours.

Speed of Onset

Some thunderstorms can be seen approaching, while others hit with minimal warning. The National Weather Service issues severe thunderstorm watches and warnings as well as statements about severe weather and localized storms. These messages are broadcast over NOAA Weather Alert Radios and area television and radio stations. Advances in weather prediction and surveillance have increased warning times. Weather forecasting and severe weather warnings issued by the National Weather Service usually provide residents and visitors alike adequate time to prepare, but isolated problems arise when warnings are ignored. Warnings in the 20 to 30-minute range are usually available prior to the occurrence of the storm. Jurisdictions scored speed of onset as a 4, meaning that there is usually less than 6 hours warning time regarding the specific path, duration, or intensity of a thunderstorm, lightning, event, or hailstorm.

Speed of Onset Score: 1

Vulnerability

In general, assets in the County are vulnerable to thunderstorm winds, lightning, and hail including people, crops, livestock, 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.

Hail can also do considerable damage to vehicles and buildings. Hail only rarely results in loss of life directly, although injuries can occur.

The county ranked vulnerability to a thunderstorm, lightning, or hail event as a 3, meaning that between 51-75% of people and property might be affected. Effects of such an event could range from minimal property damage that was not significant or widespread to significant property damage affects a large portion of a jurisdiction. In addition to routine damage, several jurisdictions in the county do not currently have safe rooms available for their residents. These factors could affect each community' vulnerability to thunderstorm, lightning, and hail events.

Vulnerability Score: 2

People

People in unprotected areas, mobile homes, or automobiles during a storm are especially at risk of thunderstorm, lightning, and hailstorms. Sudden strong winds often accompany a severe thunderstorm and may blow down trees across roads and power lines. Lightning presents the greatest immediate danger to people and livestock during a thunderstorm. It is the second most frequent weather-related killer in the U.S. with nearly 100 deaths and 500 injuries each year. Floods and flash floods are the number one cause of weather-related deaths in the U.S. Hail only rarely results in loss of life directly, although injuries can occur.

Livestock and people who are outdoors, especially under a tree or other natural lightning rods, in or on water, or on or near hilltops are at risk from lightning. Hail can be very dangerous to people, pets, and livestock if shelter is not available. Flash floods and tornadoes can develop during thunderstorms as well. People who are in automobiles or along low-lying areas when flash flooding occurs and people who are in mobile homes are vulnerable to the impacts of thunderstorms.

Property

Hail can also do considerable damage to vehicles and buildings. According to the NCEI Storm Events Database, between 1950 and 2020 approximately $194,000 in property damages and $459,000 in crop damages occurred in Tama County from hail and lightning. Further detail on damage figures is provided in Table 3-36 above. As mentioned throughout this section, these damages are often insured

Critical Facilities and Infrastructure

Hail can lead to the temporary incapacitation of roads when small hail stones build up so deep, they block roads. Hail has also been observed to block storm drains and prevent proper runoff, potentially resulting in flooding as a secondary hazard. Most structures, including the County's critical facilities, should be able to provide adequate protection from hail but the structures could suffer broken windows and dented exteriors. Those facilities with back-up generators are better equipped to handle a severe weather situation should the power go out. Critical facilities and infrastructure can potentially be damaged by a direct lightning strike. The effect of wind, combined with lightning, rain and hail, on power delivery is a significant factor when assessing current development exposure.

Economy

The economic impact of a severe thunderstorm is typically short term. Lightning and high wind events can cause power outages and fires. Generally, long-term economic impacts center more around hazards that cascade from a severe thunderstorm, including wildfires ignited by lightning. Similarly, with the previous sections, lightning can cause structural damage or damage to electrical systems to private buildings as well as critical infrastructure. Hail and high wind damage can also force the temporary or extended closure of businesses, resulting in lost income and wages in addition to the recovery costs of repairing damage. Agricultural crops such as corn and beans are particularly vulnerable to hailstorms stripping the plant of its leaves.

Historic, Cultural, and Natural Resources

While hail and lightning are natural environmental processes, it can cause significant environmental damage, breaking tree limbs, damaging trees and other plants in bloom, and destroying crops. Some cultural and historic properties may also potentially be at risk of damage from hail.

Development Trends

All future development in Tama County will be affected by thunderstorms, hail, and lightning. The ability to withstand and adapt to impacts lies in sound land use practices and consistent enforcement of codes and regulations for new construction. Land use policies should be identified in master plans and enforced through zoning code and the permitting process as well to address the secondary impacts of this hazard. With these tools, the planning partnership will be well equipped to deal with future growth and the associated impacts of severe weather.

3.3.9 Tornado

Tornado – Hazard Score Calculation						
Jurisdiction	**Historical Occurrence**	**Probability**	**Vulnerability**	**Severity of Impact**	**Speed Of Onset**	**Total Score**
Chelsea	4	3	3	2	4	16
Clutier	4	3	3	2	4	16
Dysart	4	3	3	2	4	16
Elberon	4	3	3	2	4	16
Garwin	4	3	3	2	4	16
Gladbrook	4	3	3	2	4	16
Lincoln	4	3	3	2	4	16
Montour	4	3	3	2	4	16
Tama	4	3	3	2	4	16
Toledo	4	3	3	2	4	16
Traer	4	3	3	2	4	16
Vining	4	3	3	2	4	16
Tama County	4	3	3	2	4	16
GMG Community SD	4	3	3	2	4	16
North Tama Community SD	4	3	3	2	4	16
South Tama Community SD	4	3	3	2	4	16
Union Community SD	4	3	3	2	4	16

Description

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.

Location

Tornadoes can occur in the entire planning area. Figure 3-33 shows the location of past tornado events in Tama County between 1955 and 2019.

Historical Occurrence

Tama County has had 5 federal disaster declarations for tornadoes since 1965. According to the National Climatic Data Center, Tama County has experienced a total of 37 tornadoes from 1953 to 2011 (the earliest data available to the cutoff of 2013 for the purposes of data collection before the planning process began). These events caused a total of $30.55 million in property damage and $9,000 in crop damage. The intensity of these tornadic events ranged from an EF 0 to an EF 4 (May of 1989 in

Unincorporated Tama County 7 miles west of Traer). For a summary of tornadic events in Tama County according to NCEI data, see Table 3-37.

Table 3-37 Historical Occurrence of Tornadoes in Tama County, 1953-2020

Date	Location	Magnitude	Fatalities	Injuries	Property Damage	Crop Damage
3/21/1953	Tama Co.	F2	0	0	$25,000	$0
5/10/1953	Tama Co.	F2	0	0	$25,000	$0
4/26/1956	Tama Co.	F2	0	0	$2,500	$0
7/14/1958	Tama Co.	F2	0	0	$25,000	$0
5/9/1959	Tama Co.	F2	0	0	$25,000	$0
4/23/1961	Tama Co.	F3	1	6	$2,500,000	$0
6/22/1964	Tama Co.	F1	0	0	$250,000	$0
6/27/1965	Tama Co.	F2	0	0	$2,500	$0
4/19/1966	Tama Co.	F3	0	4	$250,000	$0
5/31/1971	Tama Co.	F3	0	0	$250,000	$0
9/21/1973	Tama Co.	F1	0	0	$25,000	$0
11/9/1975	Tama Co.	F3	0	0	$2,500,000	$0
5/4/1977	Tama Co.		0	0	$250,000	$0
6/5/1979	Tama Co.	F1	0	0	$250,000	$0
6/29/1983	Tama Co.	F1	0	0	$250,000	$0
5/24/1989	Tama Co.	F4	0	0	$25,000,000	$0
9/1/1989	Tama Co.	F0	0	0	$25,000	$0
6/10/1991	Tama Co.	F0	0	0	$2,500	$0
9/12/1991	Chelsea	F0	0	0	$250	$0
6/27/1998	Tama	F0	0	0	$0	$0
8/8/1998	Garwin	F0	0	0	$0	$0
6/13/2000	Elberon	F0	0	0	$10,000	$0
4/8/2001	Chelsea	F0	0	0	$0	$0
5/10/2001	Gladbrook/ Buckingham/ Traer	F2	0	0	$35,000	$0
6/26/2002	Tama	F0	0	0	$0	$0
5/10/2003	Clutier	F0	0	0	$0	$0
5/22/2004	Garwin	F0	0	0	$0	$1,000
8/19/2005	Garwin	F0	0	0	$0	$1,000
4/13/2006	Toledo	F0	0	0	$0	$0
7/17/2006	Tama	F0	0	0	$1,000	$2,000
6/21/2011	Clutier	EF0	0	0	$75,000	$5,000
6/30/2014	Traer	EF2	0	0	$150,000	$25,000
7/6/2014	Lincoln	EF0	0	0	$0	$1,000
7/6/2014	Buckingham	EF1	0	0	$25,000	$200,000
10/9/2018	Haven	EF0	0	0	$0	$0
8/10/2020	Gladbrook	EFU	0	0	$0	$1,000
		Total	**1**	**10**	**$31,695,750**	**$236,000**

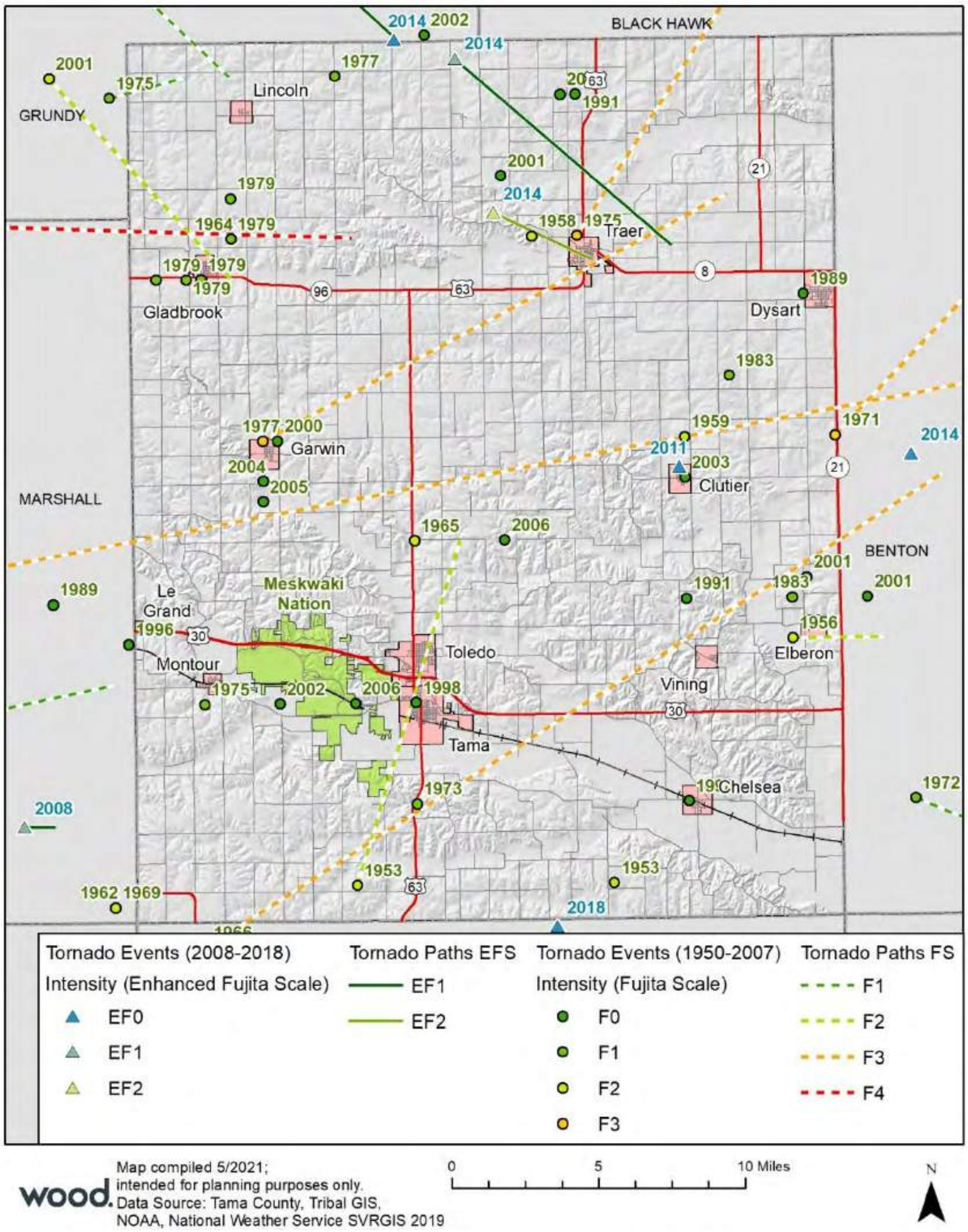
Source: NCEI

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.

The Iowa Environmental Mesonet through the Iowa State University Department of Agronomy tracks NWS watches, warnings, and advisories for counties and parishes across in the U.S. According to the database on average the County experiences 2 tornado watches and 1.6 warnings per year.

Figure 3-33 Past Tornado Events in Tama County, 1955-2019



As a whole, county-wide tornadic events in Tama County received a score of 3, meaning that well over 12 tornadoes occurred during the time frame for which data was available. NCEI data before roughly 1990 does not always provide the location of a tornadic event. The NCEI event notes were analyzed in an attempt to better identify a location of an event for events that were only labeled as occurring within Tama County. As many events as possible were counted as within the appropriate location in which they occurred; the locations are reflected in Table 3-37.

Probability of Future Occurrence

Based on NCEI data, Tama County has a 54% chance of a tornadic event occurring in any given year, which results in a score of 3. Even though the probability of an individual jurisdiction is low, there is almost always risk of a tornado event somewhere in the county every year. It can be difficult to pinpoint the exact location of a tornado, so risk remains high for a large area when conditions for tornadoes are present. Historically, 30-40 tornadoes are confirmed in Iowa per year.

Magnitude and Severity (Extent)

Iowa is located 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 occur in the spring and summer months, but twisters can and have occurred in every month of the year. Late afternoon to evening hour tornadoes are the most common, but they can occur at any time of the day. There have been 830 injuries and 30 deaths attributable to tornadoes from 1980 through 2019. (NWS, Iowa Tornado Climatology Report 1980-2019). The greatest rated tornado in Tama County was a F4 on May 24,1989 and resulted in $25,000,000 in property damages (Table 3-37).

Tornadoes are classified according to the EF- Scale (the original F – Scale was developed by Dr. Theodore Fujita, a renowned severe storm researcher). The Enhanced F- Scale (see Table 3-38) attempts to rank tornadoes according to wind speed based on the damage caused. This update to the original F scale was implemented in the U.S. on February 1, 2007.

Table 3-38 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
4	208-260	210-261	4	168-199	4	166-200
5	261-318	262-317	5	200-234	5	Over 200

Source: 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 3-39. 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 3-39 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 completely 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

Severity of Impact

The severity of damage from tornadoes can be very high. Impacts can range from broken tree branches, shingle damage to roofs, and some broken windows all the way to complete destruction and disintegration of well-constructed structures, infrastructure, and trees. Injury or death related to tornadoes most often occurs when buildings collapse; people are hit by flying objects or are caught trying to escape the tornado in a vehicle. Communities in Tama County scored the severity of impact from a tornado as a 2, meaning that more common, less severe damages from tornadoes such as broken tree branches and windows would be the most likely to occur. These jurisdictions considered the potential for catastrophic effects due to a tornado.

Speed of Onset

Tornadoes strike with an incredible velocity. Wind speeds may approach 300 mph and the storm can travel across the ground at more than 70 mph. These winds can uproot trees and structures and turn harmless objects into deadly missiles, all in a matter of seconds. The advancement in weather forecasting has allowed tornado watches to be delivered to those in the path of these storms up to hours in advance. The best lead-time for a specific severe storm and tornado is about 30 minutes. Tornadoes have been known to change paths very rapidly, thus limiting the time in which to take shelter. Tornadoes may not be visible on the ground due to blowing dust or driving rain and hail. Communities would have minimal to no warning time in the event of a tornado.

Climate Change Considerations

Climate change impacts on the frequency and severity of tornadoes are unclear at this time due to the events occur over a much shorter time periods and tend to impact smaller areas compared to other extreme events such as heat waves and droughts (U.S. 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.

Vulnerability

Tama County scored vulnerability to tornadoes as a 3, meaning that between 51-75% of people and property might be affected. Communities in Tama County considered the extent of their vulnerability to tornadoes in various ways depending on the extent of the tornado. Some jurisdictions considered their vulnerability low, noting that the destructive path of a tornado is often only a couple hundred feet in width and would not impact a large area of the community. While a large-scale event could be devastating, Tama County has the highest probability of experiencing an F0 tornado based on past occurrences. Other communities considered large, destructive tornado events when scoring vulnerability. Stronger tornadoes can leave a path of devastation up to a mile wide. Normally, a tornado will stay on the ground for no more than 20 minutes; however, one tornado can touch ground several times in different areas. Large hail, strong straight-line winds, heavy rains, flash flooding, and lightning are also associated with severe storms and may cause significant damage to a wider area. The county as a whole determined their vulnerability score to be a 3, meaning that between 51-75% of people and property might be affected.

People

It can be assumed that the entire planning area is exposed to some extent to tornadoes. Certain areas are more exposed due to geographic location and local weather patterns. Likelihood of injuries and fatalities would increase if warning time was limited before the event or if residents were unable to find adequate shelter.

Vulnerable populations are the elderly, low income or 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. Isolation of these populations is a significant concern. These populations face isolation and exposure after tornado events and could suffer more secondary effects of the hazard. According to the U.S. Health and Human Services emPOWER database, 6% of Medicare Beneficiaries in the County rely on electricity-dependent medical equipment to be able to live independently in their homes. These populations face isolation and exposure after tornado events and could suffer more secondary effects of the hazard. These populations face isolation and exposure after tornado events and could suffer more secondary effects of the hazard.

Individuals caught in the path of a tornado who are unable to seek appropriate shelter are especially vulnerable. This may include individuals who are out in the open, in cars, or who do not have access to basements, cellars, or safe rooms.

Property

All property is vulnerable during tornado events, but properties in poor condition or in particularly vulnerable locations may risk the most damage. Mobile homes are more vulnerable to the impacts of a tornado event compared to housing types due to methods of construction. Statewide, mobile homes represent about 3.7% of total housing (U.S. Census). Toledo, Montour, and Lincoln have the greatest percentage of mobile homes. Table 3-40 shows the percentage of mobile homes in each jurisdiction.

Table 3-40 Percentage of Mobile Homes in Tama County and Jurisdictions

Jurisdiction	Total Housing Units	Total Mobile Homes	Percentage of Mobile Homes
Tama County	7,794	334	4.3%
Chelsea	107	0	0.0%
Clutier	126	0	0.0%
Dysart	606	16	2.6%
Elberon	72	2	2.8%
Garwin	286	7	2.4%
Gladbrook	490	6	1.2%
Lincoln	85	6	7.1%
Montour	131	14	10.7%
Tama	1,136	10	0.9%
Toledo	1,089	126	11.6%
Traer	751	0	0.0%
Vining	37	1	2.7%

Source: U.S. Census Bureau, American Community Survey 2015-2019

According to NCEI data, Tama County experienced 36 tornado events from 1953 – 2020. These events caused a total of $31,695,750 in property damage and $236,000 in crop damage. Using this data, an average annual countywide loss estimate was calculated as follows:

Total Tornado Damage History ($31,695,750) / Number of Years of Record (67 years) = Average Annual Countywide Loss Estimate ($$473,070.90). Based on previous data, Tama County may experience $473,070.90 in damages related to tornados in any given year.

Critical Facilities and Infrastructure

All critical facilities and infrastructure are likely exposed to tornadoes, though the likelihood of damage to any critical facilities or infrastructures from a tornado is extremely limited. The most common problems associated with this hazard are utility losses. Downed power lines can cause blackouts, leaving large areas isolated. Phone, water, and sewer systems may not function. Roads may become impassable due to downed trees or other debris.

Tornadoes can cause significant damage to trees and power lines, blocking roads with debris, incapacitating transportation, isolating population, and disrupting ingress and egress. Of particular concern are roads providing access to isolated areas and to the elderly. Any facility that is in the path of a tornado is likely to sustain damage.

Additionally, fires may result from damages to natural gas infrastructure. Hazardous materials may be released if a structure is damaged that houses such materials or if such a material is in transport.

Economy

Tornadoes can impact exposed critical infrastructure; depending on the impact and the function, this could cause a short-term economic disruption. The most common problems associated with tornadoes and damaging winds are loss of utilities. Downed power lines can cause power outages, leaving large parts of the County isolated, and without electricity, water, and communication. Damage may also limit timely emergency response and the number of evacuation routes.

Historic, Cultural, and Natural Resources

Environmental features are exposed to tornado risk, although damages are generally localized to the path of the tornado however, if tornadoes impact facilities that store HAZMAT areas impacted by material releases may be especially vulnerable. Historic buildings built prior to modern building codes would be more prone to damage. Cultural facilities could also be temporarily shut down until debris is cleaned and residents are accounted for. Some cultural facilities such as community centers, parks, or gas stations may be turned into impromptu emergency centers where emergency supplies can be distributed, and emergency personnel can organize.

Development Trends

Population trends in the unincorporated county, Clutier and Elberon have been decreasing in the past 10 years and increased development in these areas are not anticipated in these areas. While trends in Chelsea, Dysart, Garwin, Gladbrook, Montour and Vining have been increasing. Any future development in these areas will be affected by tornadoes, particularly development that occurs at lower elevations. Development regulations that require safe rooms, basements, or other structures that reduce risk to people would decrease vulnerability.

3.3.10 Windstorm

Windstorm – Hazard Score Calculation						
Jurisdiction	**Historical Occurrence**	**Probability**	**Vulnerability**	**Severity of Impact**	**Speed Of Onset**	**Total Score**
Chelsea	4	4	2	2	4	16
Clutier	4	4	2	2	4	16
Dysart	4	4	2	2	4	16
Elberon	4	4	2	2	4	16
Garwin	4	4	2	2	4	16
Gladbrook	4	4	2	2	4	16
Lincoln	4	4	2	2	4	16
Montour	4	4	2	2	4	16
Tama	4	4	2	2	4	16
Toledo	4	4	2	2	4	16
Traer	4	4	2	2	4	16
Vining	4	4	2	2	4	16
Tama County	4	4	2	2	4	16
GMG Community SD	4	4	2	2	4	16
North Tama Community SD	4	4	2	2	4	16
South Tama Community SD	4	4	2	2	4	16
Union Community SD	4	4	2	2	4	16

Description

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.

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 are capable of producing 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 recreational vehicles and leading to death or injury from falling trees, tree limbs, and other flying debris. Neighboring Marshall County experienced a severe derecho in the summer of 2020 (Refer to Historical Occurrence of Tornadoes in Tama County, 1953-2020).

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.

Location

All of Tama County is susceptible to high wind events and tornadoes. The County is located in Wind Zone IV, which is susceptible to winds up to 250 mph. All of the participating jurisdictions are vulnerable to this hazard. Figure 3-34 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 3-34 Wind Zones in the United States

Source: FEMA: http://www.fema.gov/plan/prevent/saferoom/tsfs02_wind_zones.shtm

Historical Occurrence

According to NCEI data, Tama County has counted 118 thunderstorm and high wind events that occurred between 1962 and 2020. Wind speeds during these windstorms ranged from zero miles per hour to 100 miles per hour. No deaths were reported during these windstorm events; 25 injuries were reported from one event on August 14, 1993, but NCEI does not provide further details on the event. These events caused $5,462,110 in property damage and $1,737,700 in crop damage (note further discussion on insured crop loss is shown in Table 3-42). Refer to Table 3-41 for impacts (i.e., casualties, property and/or crop damages) from past windstorm events in Tama County.

The August 10, 2020, Derecho event is the greatest recorded wind event at 87 miles per hour (mph) in the Storm Events Database. The Derecho travelled a total of 770 miles in 14 hours from the southeast from South Dakota to Ohio. Tama County experienced countywide impacts, including damages to both buildings and acres of corn and soybean crops. The event resulted in a Federal Disaster Declaration, DR-4557. The 2020 Derecho event is estimated to the costliest ($11.2 Billion) thunderstorm disaster in U.S. history (NOAA). While the NCEI database did not include impacts from 2020 Derecho event, the Planning Team noted the following impacts from the event.

- Countywide Impacts
  - long-term power outages,
  - crop loss,
  - street closures and road damages,
  - downed trees,
  - business closures
- City of Chelsea
  - City Hall/Library los part of roof
- City of Elberon –
  - City buildings damaged
- City of Tama
  - Cemetery buildings damaged
  - Water plant roof damaged
  - Civic Center partial damages
- City of Vining
  - Lost over 80% of trees
  - Every home sustained damage. Three homes were destroyed completely.

Table 3-41 Impacts from Severe Wind Events in Tama County

Date	Location	Magnitude (mph)	Injuries	Property Damage	Crop Damages
8/9/1993	Chelsea	50	0	$5,000	$50
8/14/1993	Tama	50	25	$5,000	$50
4/14/1994	Dysart	50	0	$5,000	$0
6/19/1994	Tama	80	0	$500,000	$500
7/4/1995	Gladbrook/Toledo	50	0	$55,000	$3,000
7/19/1995	Lincoln/Traer	52	0	$78,000	$6,000
5/19/1996	Tama/Garwin/Traer/Toledo	57	0	$10,000	$0
6/20/1997	Gladbrook	69	0	$75,000	$15,000
4/12/1998	Tama (Zone)	Unknown	0	$50,000	$0
5/15/1998	Gladbrook/Garwin/Tama	52	0	$35,000	$0
6/18/1998	Montour/Tama/Dysart	78	0	$50,000	$5,000
6/29/1998	Gladbrook/Traer/Tama/Toledo/Tama	69	0	$1,265,000	$194,000
11/10/1998	Tama (Zone)	61	0	$300,000	$5,100
3/17/1999	Tama (Zone)	50	0	$30,000	$0

Date	Location	Magnitude (mph)	Injuries	Property Damage	Crop Damages
7/20/1999	Tama	55	0	$10,000	$0
3/8/2000	Tama (Zone)	50	0	$10,000	$0
6/13/2000	Gladbrook/Buckingham	61	0	$26,000	$2,000
4/7/2001	Tama (Zone)	50	0	$50,000	$0
7/8/2001	Tama/Dysart	65	0	$35,000	$8,000
3/9/2002	Tama (Zone)/Garwin/ Traer/Dysart	56	0	$50,000	$0
6/25/2003	Tama	52	0	$10,000	$0
7/5/2003	Garwin	50	0	$2,000	$0
11/12/2003	Tama (Zone)	50	0	$50,000	$0
3/7/2004	Tama (Zone)	36	0	$10,000	$0
4/18/2004	Tama (Zone)	35	0	$80,000	$0
4/27/2004	Tama (Zone)	35	0	$75,110	$0
5/21/2004	Traer/Clutier	57	0	$7,000	$0
5/22/2004	Garwin	57	0	$10,000	$0
5/24/2004	Tama (Zone)	40	0	$25,000	$0
7/11/2004	Gladbrook	50	0	$2,000	$0
8/3/2004	Montour/Toledo	52	0	$10,000	$0
8/26/2004	Gladbrook/Tama	57	0	$5,000	$1,000
12/12/2004	Tama (Zone)	35	0	$50,000	$0
1/22/2005	Toledo	35	0	$10,000	$0
6/4/2005	Clutier	52	0	$2,000	$0
6/8/2005	Tama (Zone)	50	0	$20,000	$0
6/29/2005	Tama	52	0	$5,000	$0
11/15/2005	Tama (Zone)	35	0	$30,000	$0
1/24/2006	Tama (Zone)	37	0	$10,000	$0
5/27/2006	Tama (Zone)	50	0	$10,000	$0
6/22/2007	Tama	68	0	$50,000	$0
7/18/2007	Garwin/Buckingham	57	0	$25,000	$13,000
7/22/2007	Dysart	50	0	$2,000	$0
6/6/2008	Tama	55	0	$1,000	$0
6/14/2008	Toledo	57	0	$5,000	$0
6/15/2008	Gladbrook	50	0	$2,000	$0
6/25/2008	Toledo	52	0	$1,000	$0
7/7/2008	Toledo	52	0	$5,000	$0
10/26/2008	Tama (Zone)	35	0	$25,000	$25,000
6/7/2009	Montour	57	0	$25,000	$0
6/19/2009	Tama/Toledo	54	0	$28,000	$60,000
8/9/2009	Chelsea	52	0	$3,000	$0
6/18/2010	Garwin	52	0	$5,000	$0
6/27/2010	Tama	61	0	$2,000	$0
8/10/2010	Montour	50	0	$2,000	$0
8/31/2010	Tama	52	0	$5,000	$0
5/29/2011	Tama	52	0	$2,000	$0
7/11/2011	Montour/Toledo/ Garwin/Clutier/ Gladbrook/Dysart	100	0	$1,950,000	$1,325,000
3/29/2012	Tama (Zone)	50	0	$1,000	$0
6/29/2012	Chelsea	52	0	$2,000	$0
8/7/2013	Chelsea	52	0	$5,000	$0
9/19/2013	Chelsea	54	0	$50,000	$0

Date	Location	Magnitude (mph)	Injuries	Property Damage	Crop Damages
1/26/2014	Tama (Zone)	51	0	$25,000	$0
5/20/2014	Tama	53	0	$2,000	$0
6/16/2014	Dysart	52	0	$0	$0
6/27/2014	Toledo	52	0	$2,000	$0
6/28/2014	Traer	60	0	$20,000	$0
6/29/2014	Lincoln	52	0	$2,000	$0
6/30/2014	Chelsea	61	0	$45,000	$25,000
7/28/2015	Chelsea	60	0	$25,000	$50,000
3/6/2017	Chelsea	61	0	$40,000	$0
7/10/2017	Buckingham/Traer	56	0	$20,000	$0
6/30/2018	Traer Muni Airport	56	0	$3,000	$0
6/15/2019	Gladbrook/Montour	56	0	$10,000	$0
9/18/2019	Dyart	52	0	$5,000	$0
		Total	**25**	**$5,462,110**	**$1,737,700**

Source: NCEI

Figure 3-35 Past Severe Wind Events in Tama County, 1955-2019

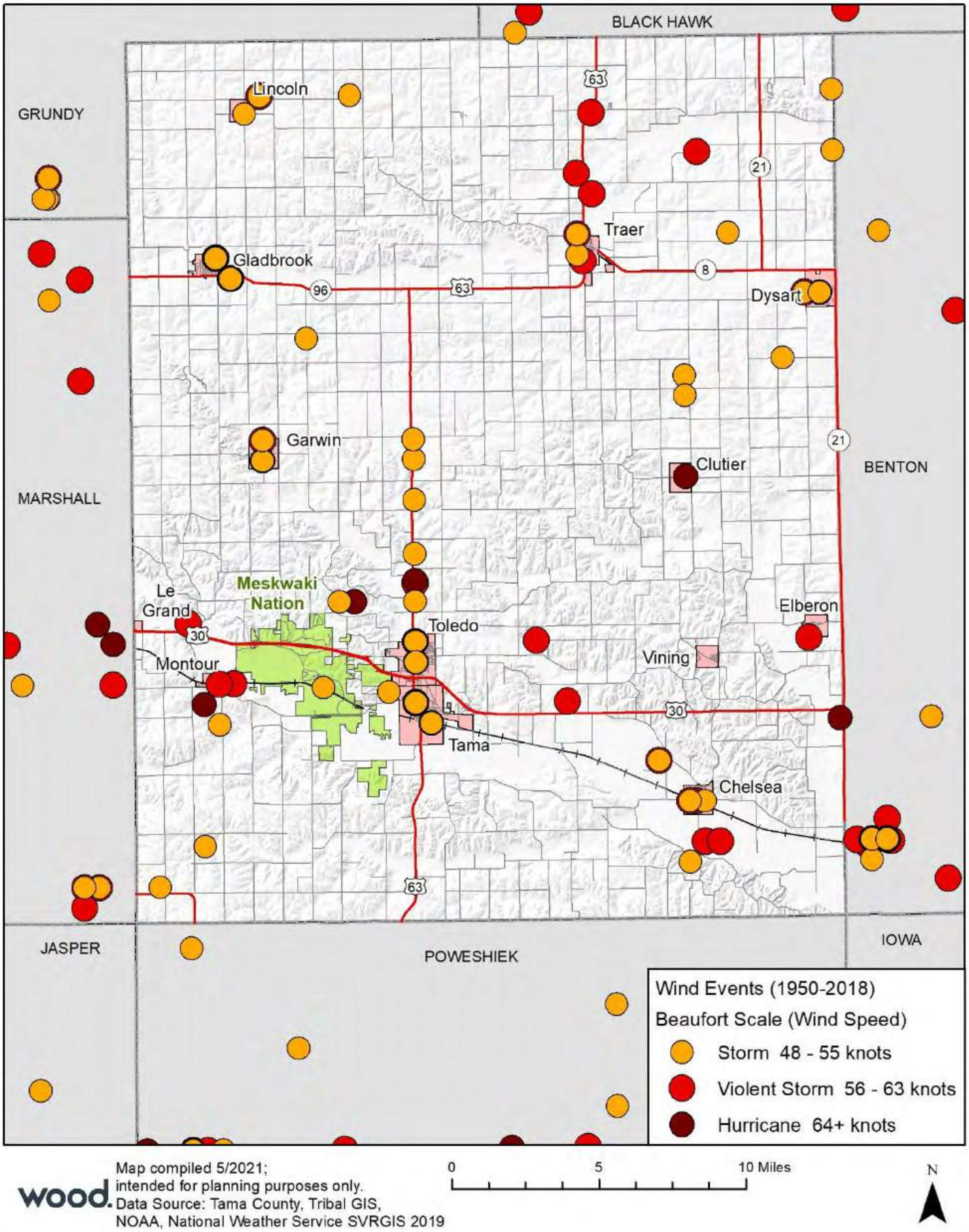
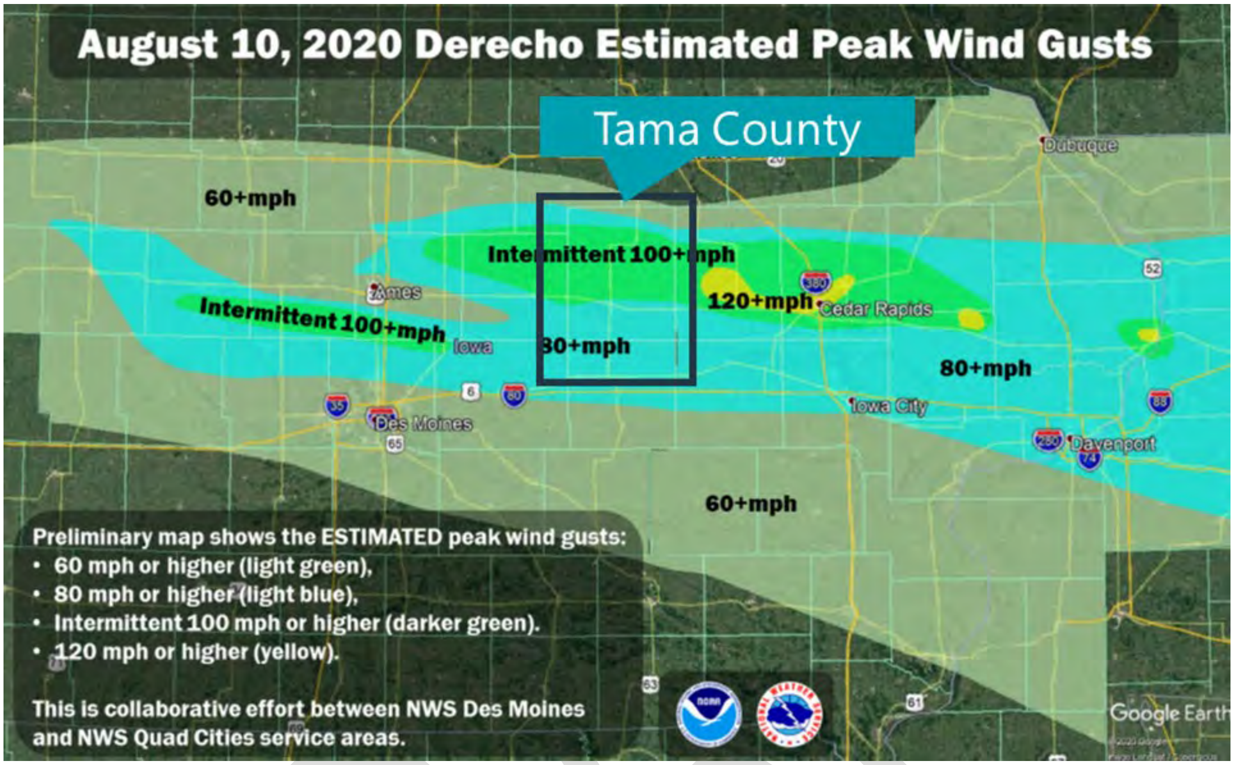


Figure 3-36 shows the path of the 2020 Derecho through Iowa and Tama County.

Figure 3-36 Path of August 2020 Derecho



Source: National Weather Service

Table 3-42 shows the insurable crop insurance claims paid in Tama County as a result of windstorms. Between 2007 and 2020 Tama County lost 130,182 acres of crops and $38,548,632 indemnity payments due to severe wind.

Table 3-42 Crop Insurance Claims Paid in Tama County from Windstorms, 2007-2020

Year	Crop Name	Acres Lost	Insurance Paid
2007	Corn	802.8	$128,973
		73.4	$11,646
	Hybrid Corn Seed	1,731.8	$1,049,433
		2,020.9	$181,886
2008	Corn	25.0	$3,555
		72.3	$26,013
		24.0	-$245
		32.0	$10,886
2009	Corn	40.8	$10,625
	Hybrid Corn Seed	72.5	$2,063
2010	Corn	33.9	$10,602
2011	Corn	4.1	$712
		18,437.8	$2,117,474
		222.5	$28,496
		332.0	$33,801
		60.4	$12,009
		3,527.4	$3,245,196
		6,806.9	$2,602,426
		1,162.2	$223,634

Year	Crop Name	Acres Lost	Insurance Paid
2013	Corn	440.2	$54,266
	Hybrid Corn Seed	51.4	$63,981
2014	Corn	752.3	$64,167
		93.2	$5,631
	Hybrid Corn Seed	58.3	$43,408
	Soybeans	36.5	$6,167
2015	Corn	44.3	$4,313
		1.5	$0
		194.5	$22,256
		1,193.2	$58,197
	Hybrid Corn Seed	236.0	$220,781
2016	Soybeans	5.3	$313
	Hybrid Corn Seed	47.7	$31,554
2018	Oats	153.2	$13,902
	Corn	21.7	$4,766
	Hybrid Corn Seed	72.3	$1,342
2019	Corn	114.1	-$17,549
		308.3	$25,052
		4,147.5	$143,610
	Soybeans	36.7	$49
		73.8	$4,076
2020	Corn	8	$1,969
		773	$155,188
		211	$145,802
		404	$50,004
		583	$407,955
		23,420	$16,181,715
		279	$68,172
		22	$13,402
		54,867	$10,416,541
		20	$2,871
		321	$202,578
		88	$17,893
		95	$28,771
	Hybrid Corn Seed	226	$21,987
	Soybeans	5,264	$377,455
		2	$707
		35	$6,155
	Total	**130,182.7**	**$38,548,632**

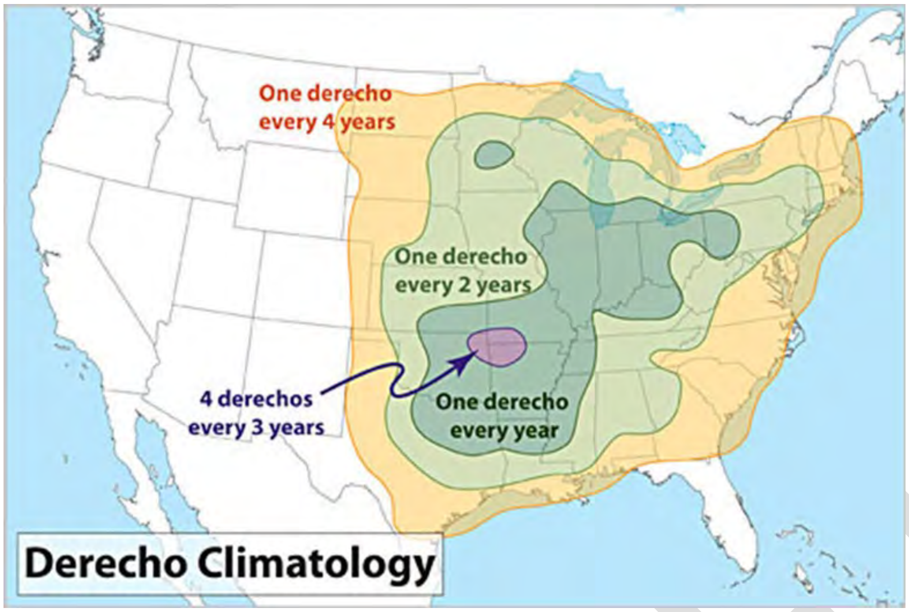
Source: USDA RMA

Probability of Future Occurrence

Based on historical data, an average of 7.3 wind advisories area issued for Tama County a year and a 49 percent annual chance of a wind event. Because it is difficult to separate a windstorm from other hazard events such as a thunderstorm there could be occurrences of high winds that may not necessarily be considered a windstorm.

Figure 3-37 shows the probability of a derecho in the U.S. Tama County is on the edge between within the region of the U.S. which can expect to experience a derecho one to two derechos every year.

Figure 3-37 Annual Derecho Probability in the United States



Source: National Weather Service https://www.weather.gov/jetstream/derecho_climo

Magnitude and Severity (Extent)

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 are life-threatening.
- High Wind Warning—The 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.

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 3-43 shows The Beaufort Wind Scale. The replication of the scale only reflects land-based effects.

Table 3-43 The Beaufort Wind Scale

Beaufort Number	Description	Windspeed (Knots)	Land Conditions
0	Calm	<1	Calm. Smoke rises vertically.
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.

Beaufort Number	Description	Windspeed (Knots)	Land Conditions
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

Severity of Impact

The severity of damage from windstorms can vary. Impacts can range from broken tree branches, shingle damage to roofs, and some broken windows, all the way to complete destruction and disintegration of well-constructed structures, infrastructure, and trees. The windstorms that Tama County has experienced have caused minor injuries or illness and minor property damage. Crop damage is often associated with windstorms, laying down crops, breaking stalks, and twisting plants, thus reducing the yield and making it difficult to harvest.

Speed of Onset

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

Climate Change Considerations

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 (U.S. Global Change Research Program 2018).

Vulnerability

Those most at risk from windstorms include people living in mobile homes, campgrounds, and other dwellings without secure foundations or basements. People in automobiles are also very vulnerable to windstorms. The elderly, very young, and the physically and mentally handicapped are most vulnerable because of the lack of mobility to escape the path of destruction. People who may not understand broadcasted watches and warnings due to language barriers are also at risk. In general, the HMPC determined that between 25-50% of the population in Tama County are vulnerable to adverse effects from windstorms.

People

Windstorms can cause injury and death in Tama 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 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 Tama County, 6% of Medicare Beneficiaries (214 of

3,925 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.

Property

All property is vulnerable during high wind events, but properties in poor condition or in particularly vulnerable locations may risk the most damage. Generally, damage is minimal and goes unreported. Property located at higher elevations and on ridges may be more prone to wind damage. Property located under or near overhead lines or near large trees may be damaged in the event of a collapse. Wind pressure can create a direct and frontal assault on a structure, pushing walls, doors, and windows inward. Conversely, passing currents can create lift and suction forces that act to pull building components and surfaces outward. The effects of winds are magnified in the upper levels of multi-story structures. As positive and negative forces impact the building's protective envelope (doors, windows, and walls), the result can be roof or building component failures and considerable structural damage.

Critical Facilities and Infrastructure

All critical facilities in all jurisdictions are vulnerable to this hazard. These critical facilities include, but are not limited to, schools, health care facilities, police and fire stations, water towers, lift stations, city and county buildings, and sirens. A shutdown of critical facilities could occur for days if damage to utility infrastructure is significant.

High winds can cause significant damage to trees and power lines, blocking roads with debris, incapacitating transportation, isolating population, and disrupting ingress and egress. Of particular concern are roads providing access to isolated areas and to the elderly. Severe windstorms and downed trees can create serious impacts on power and above-ground communication lines. Loss of electricity and phone connection would leave certain populations isolated because residents would be unable to call for assistance.

Economy

According to NCEI data, Tama County experienced 118 windstorm events from 1962 – 2020 (the time frame for which data was available). These events caused a total of $5,462,100 in property damage and $1,737,700 in crop damage. Using this data, an average annual countywide loss estimate was calculated as follows:

Total Windstorm Damage History ($5,462,100) / Number of Years of Record (58 years) = Average Annual Countywide Loss Estimate ($96,914)

Based on previous data, Tama County may experience $96,914 in damages related to windstorms in any given year.

Historic, Cultural and Natural Resources

Cultural facilities in Tama County could also be affected by a power outage as a result of a windstorm that causes a significant outage that takes times to be repaired. Cultural facilities include restaurants, parks, community centers, museums, and businesses. The environment is highly exposed to high winds. Environmental impacts include the downing of trees and localized flattening of plants by high wind. Natural habitats such as streams and trees risk major damage and destruction.

Development Trends

Windstorm is primarily a public safety and economic concern, and the planning area is located in a region with very high frequency of occurrence. 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.

3.4 Other Hazards

3.4.1 Hazardous Materials Incident

Hazardous Materials Incident – Hazard Score Calculation						
Jurisdiction	Historical Occurrence	Probability	Vulnerability	Severity of Impact	Speed Of Onset	Total Score
Tama County	4	4	1	1	4	14

Description

Hazardous materials incidents can occur with fixed hazardous materials, pipeline transportation, and transportation of hazardous materials. Incidents can include the accidental release of flammable or combustible, explosive, toxic, noxious, corrosive, oxidizable, irritant or radioactive substances or mixtures that can pose a risk to life, health, or property and possibly require an evacuation. A hazardous substance is one that may cause damage to persons, property, or the environment when released to soil, water, or air. Chemicals are manufactured and used in ever-increasing types and quantities. As many as 500,000 products pose physical or health hazards and can be defined as "hazardous chemicals." Each year, over 1,000 new synthetic chemicals are introduced and transported across the county via semi-truck and train. Hazardous substances are categorized as toxic, corrosive, flammable, irritant, or explosive. Hazardous materials incidents generally affect a localized area, and the use of planning and zoning can minimize the area of impact.

The U.S. Department of Transportation (DOT), U.S. 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 U.S. 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.

Location

According to the Iowa Department of Natural Resources, as of 2020, there were 19 sites in Tama 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. 25 sites reported materials that are considered to be "Extremely Hazardous Substances" (EHS).

Table 3-44 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 Tama County GIS Department to determine the number of facilities in each jurisdiction. Figure 3-38 that follows is a map showing the locations of Tier II Facilities, including those with EHS.

Table 3-44 Number of Tier II Facilities and EHS Facilities by Jurisdiction

Jurisdiction	Tier II Facilities	EHS Facilities
Clutier	-	1
Dysart	1	2
Garwin	-	1
Gladbrook	1	1
Lincoln	1	1
Tama	3	3
Toledo	-	3

Jurisdiction	Tier II Facilities	EHS Facilities
Traer	4	2
Unincorporated	9	11
Total	**19**	**25**

Source: Iowa Department of Natural Resources; Tama County GIS Data

Figure 3-38 Tier II Facilities in Tama County

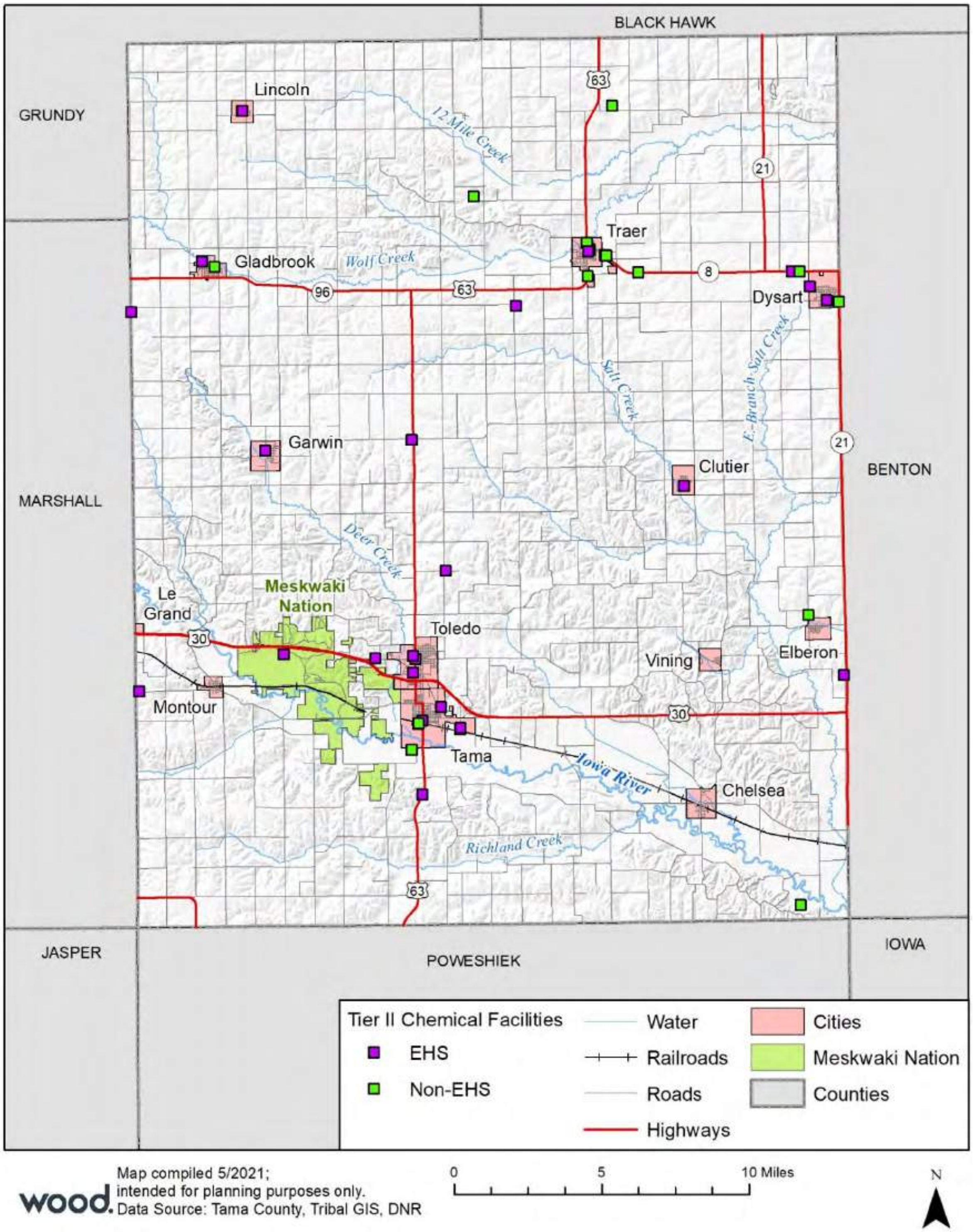
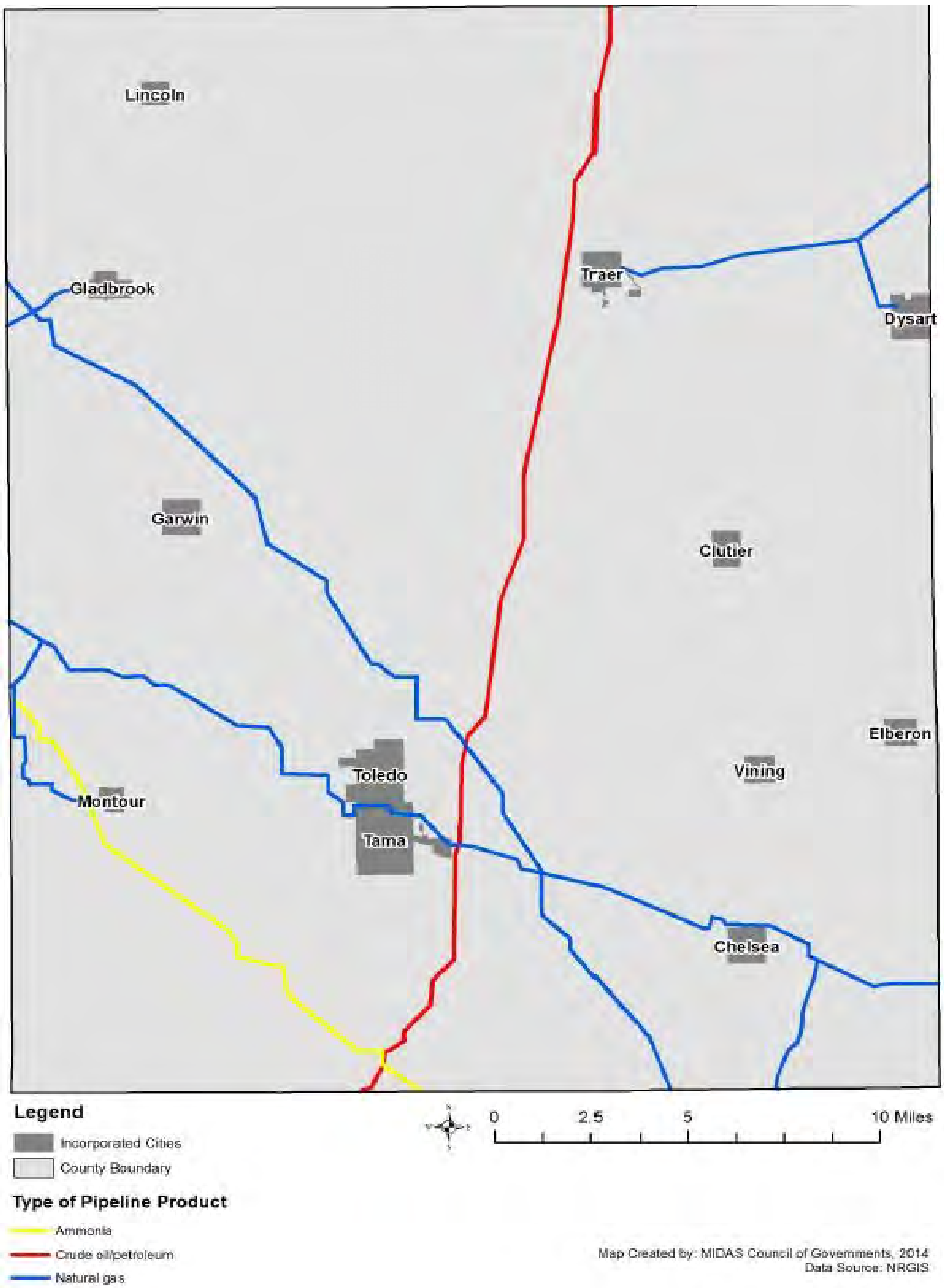


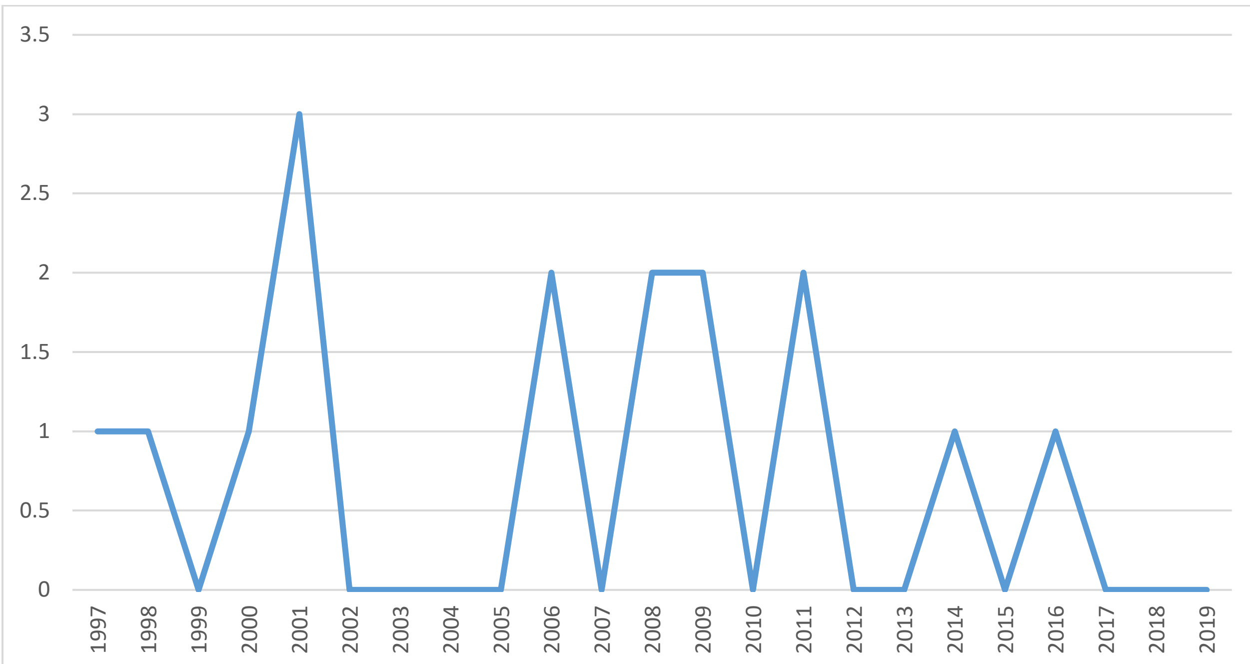
Figure 3-39 Pipelines in Tama County



Historical Occurrence

According to the Iowa DNR, hazardous materials spills throughout Tama County are fairly common. From 1997 to 2019, the county experienced a total of 16 hazardous spills. 31% of these events involved fixed facility incidents, 38% involved storage tanks and 19% involved railroad incidents. Other incident types included pipeline and unknown. Certain jurisdictions are more prone to these types of hazards than others depending on the location of these facilities and the level or amount of hazardous materials these facilities handle.

Figure 3-40 Hazardous Materials Incidents in Tama County, 1997-2019



Source: National Response Center

Certain jurisdictions are more prone to these types of hazards than others depending on the location of these facilities and the level or amount of hazardous materials these facilities handle. Approximately 38% (six) of these incidents occurred in Unincorporated Tama County. A summary table illustrating the differences in historical occurrence of hazardous materials spills is included in Table 3-45.

Table 3-45 Summary of Hazardous Spills in Tama County, 1997-2019

			Incident Type					
Jurisdiction	**Time Period**	**# of Events**	**Fixed**	**Trans.**	**RR**	**Storage**	**Unknown**	**Pipeline**
Chelsea	1997 – 2019 (23 years)	1	0	0	1	0	0	0
Clutier		1	1	0	0	0	0	0
Dysart		1	0	0	0	1	0	0
Elberon		0	0	0	0	0	0	0
Garwin		0	0	0	0	0	0	0
Gladbrook		1	1	0	0	0	0	0
Lincoln		1	0	0	0	1	0	0
Montour		1	0	0	0	1	0	0
Tama		2	1	0	0	0	0	1
Toledo		0	0	0	0	0	0	0

			Incident Type					
Jurisdiction	**Time Period**	**# of Events**	**Fixed**	**Trans.**	**RR**	**Storage**	**Unknown**	**Pipeline**
Traer		2	1	0	0	1	0	0
Vining		0	0	0	0	0	0	0
Unincorporated County		6	1	0	2	2	1	0

Source: National Response Center

According to the USDOT Pipeline and Hazardous Materials Safety Administration (2014), Tama County experienced one pipeline incident in the last 20 years. It was not specified where in the county the incident occurred, but excavation damage occurred to the Northern Natural Gas Pipeline in October of 1998 causing $52,000 in damages but not resulting in any injuries or significant spills. Other than this incident, the county has had no pipeline incidents. For a map displaying the location of pipelines in the county, see Figure 3-39.

Probability of Future Occurrence

Large quantities of hazardous materials are transported daily on Iowa streets, highways, interstates, and railways. Roadways are a common site for the release of hazardous materials. Railways are another source for hazardous materials releases. The Department of Transportation regulates routes and speed limits used by carriers and monitor the types of hazardous materials crossing state lines. Despite increasing safeguards, more and more potentially hazardous materials are being used for commercial, agricultural, and domestic uses and are being transported on Iowa roads and railways. Oil, natural gas, and ammonia pipelines exist in Tama County, further adding to the risk of a hazardous materials spill event.

According to the NRC data cited above, there is an approximate 73% chance of a hazardous materials incident occurring somewhere in the County in a given year. This results in a probability rating if highly likely.

Magnitude and Severity (Extent)

Severity of Impact

Severity of impact due to a hazardous materials spill is varied across jurisdictions. The severity of the impact depends first and foremost on the type and amount of material that is part of a spill.

Most hazardous materials incidents are localized and are quickly contained or stabilized by highly trained fire departments and hazardous materials teams. Tama County depends on the Waterloo or Cedar Rapids Fire Department for these incidents because their firemen are trained for hazardous materials incidents. Other jurisdictions are working with Tama County Emergency Management to train their fire department for hazardous materials events. Depending on the characteristic of the hazardous material or the volume of product involved, the affected area can be as small as a room in a building or as large as 5 square miles or more.

For most incidents, the severity of impact would be limited with minor injuries and illness, minor short-term property damage, and minor short-term environmental impacts. Chelsea, Tama, and Montour are the only cities in the county to have rail lines within or near their jurisdictions. Chelsea, Gladbrook, Dysart, Montour, Tama, Toledo, and Traer each have a pipeline in or near their jurisdiction. Dysart, Gladbrook, Tama, Toledo, and Traer each have a major highway which traverses their city limits. Hazardous materials incidents involving a highway, train, or pipeline could cause minor property damage. An incident involving Tier II or EHS facilities may cause minor property damage or minor injuries. Overall, the jurisdictions have a relatively small severity of impact.

Speed of Onset

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

Vulnerability

A hazardous materials incident can occur almost anywhere, so any area is considered vulnerable to an accident. People, pets, livestock, and vegetation in close proximity to transportation corridors, pipelines, and populations downstream, downwind, and downhill of a released substance are particularly vulnerable. Depending on the characteristics of the substance released, a larger area may be in danger from explosion, absorption, injection, ingestion, or inhalation. Occupants of areas previously contaminated may be harmed directly or through consumption of contaminated food and water.

An underground pipeline incident can be caused by environmental disruption, accidental damage, or sabotage. Incidents can range from a small slow leak that is not ignited, to a large rupture in which the gas is ignited. 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 in proximity to the pipelines.

Many of the jurisdictions have few hazardous materials facilities within their jurisdictional boundaries or few facilities that pose significant risk to a large amount of people (i.e.: underground storage tanks, water treatment facilities, etc.). For these jurisdictions, less than 25% of people or property would be affected in the event of a hazardous materials event.

People

A hazardous materials incident can occur almost anywhere, so any area is considered vulnerable to an accident. People, pets, livestock, and vegetation in close proximity to transportation corridors, pipelines, and populations downstream, downwind, and downhill of a released substance are particularly vulnerable. Depending on the characteristics of the substance released, a larger area may be in danger from explosion, absorption, injection, ingestion, or inhalation. Occupants of areas previously contaminated may be harmed directly or through consumption of contaminated food and water.

Property

Property impacts are difficult to estimate and depends on the nature and type of incident. Property impacts are typically limited to contamination or fires that may result from an incident.

Critical Facilities and Infrastructure

Emergency service personnel would likely be tasked to respond to a hazardous materials incident. Specific critical facilities may be considered vulnerable to this hazard, depending on proximity to transportation routes or fixed facilities. Access to facilities and infrastructure in the area of the incident may be denied until decontamination is complete.

Economy

Workplace closures could also result from an incident and have temporary economic impacts.

Historic, Cultural, and Natural Resources

Natural and cultural resources and facilities could also be impacted by a hazardous materials incident. Everyday recreation activities that exist throughout the county such as a bike trails, recreation trails, and city park recreation areas could also be affected.

An underground pipeline incident can be caused by environmental disruption, accidental damage, or sabotage. Incidents can range from a small slow leak that is not ignited, to a large rupture in which the gas is ignited, to a large rupture in which the gas is ignited. 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 in proximity to the pipelines.

Development Trends

Due to Tama County's gradual decrease in population, development trends are not anticipated to increase vulnerability. The siting of new hazardous materials facilities should be considered carefully to avoid creating a new vulnerability. The siting of other new buildings with potentially vulnerable populations such as schools and nursing homes, should also consider the presence of hazardous materials facilities or routes to avoid creating a vulnerability.

3.4.2 Human Disease

Human Disease – Hazard Score Calculation						
Jurisdiction	Historical Occurrence	Probability	Vulnerability	Severity of Impact	Speed of Onset	Total Score
Chelsea	2	2	2	2	2	10
Clutier	2	2	2	2	2	10
Dysart	2	2	2	2	2	10
Elberon	2	2	2	2	2	10
Garwin	2	2	2	2	2	10
Gladbrook	2	2	2	2	2	10
Lincoln	2	2	2	3	2	11
Montour	2	2	2	2	2	10
Tama	2	2	2	3	2	11
Toledo	2	2	2	2	2	10
Traer	2	2	2	2	2	10
Vining	2	2	2	2	2	10
Tama County	2	2	3	2	2	11
GMG Community SD	2	2	2	4	2	12
North Tama Community SD	2	2	2	4	2	12
South Tama Community SD	2	2	2	4	2	12
Union Community SD	2	2	2	4	2	12

Description

A human disease outbreak is a medical, health or sanitation threat to the general 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.

Prior to the CVOID-19 Pandemic, historical occurrence and likelihood of a human disease epidemic occurring in Tama County was low.

Vaccine Preventable Disease

In the U.S., 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 U.S. Department of Health and Human Services, Centers for Disease Control and Prevention.

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.

Pandemic

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 Centers for Disease Control and Prevention (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, Tama 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 3-46 is a list of common foodborne diseases.

Table 3-46 Common Foodborne Disease

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
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).

Location

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. Tama County has reported 13,564 cases and 72 deaths, as of August 6, 2021. 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.

Historical Occurrence

The World Health Organization 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 August 6, 2021, 201,237,468 cases have been reported around the world with over 4,272,786 deaths, including nearly 35,460,711 cases and 615,419 deaths in the U.S. Tama County has reported 13,564 cases and 72 deaths. The pandemic is expected to continue through 2021, although vaccines were approved at the end of 2020 and were starting to be dispersed during this plan update process, variants of the COVD-19, specifically the delta variant, are beginning to become the main source of infection.

- 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 were highest among adults 20-50 years old; the reasons for this are uncertain.

Other Reportable Diseases

Table 3-47 shows the historical reported deaths in Tama County from Influenza and Pneumonia.

Table 3-47 Influenza and Pneumonia Deaths by Year 2002-2019, Tama County

Year	Influenza Number	Influenza Rate per 100,000 population	Pneumonia Number	Pneumonia Rate per 100,000 population
2019	<5	<5	7	41.5
2018	<5	<5	6	35.5
2017	<5	<5	<5	<5
2016	<5	<5	7	40.4
2015	<5	<5	<5	<5
2014	<5	<5	<5	<5
2013	<5	<5	6	34.1
2012	<5	<5	<5	<5
2011	<5	<5	8	45.2
2010	<5	<5	4	22.6
2009	<5	<5	<5	<5
2008	<5	<5	<5	<5
2007	<5	<5	<5	<5
2006	<5	<5	5	27.9
2005	<5	<5	<5	<5
2004	<5	<5	4	22.3
2003	<5	<5	9	23.0
2002	4	10.1	13	32.9

Source: Iowa Department of Public Health, Bureau of Health Statistics. Note: Counts of 5 or less are suppressed to protect confidentiality

Table 3-48 provides the number of common reportable diseases in Tama County from 2011 to 2017 from the Iowa Department of Public Health, Center for Acute Epidemiology Annual Reports. Note, reports were not available after 2018.

Table 3-48 Iowa Common Reportable Diseases by Year in Tama County

Year	2017	2016	2015	2014	2013	2012	2011
Campylobacteriosis	3	6	10	5	2	3	3
Chlamydia	N/A	N/A	N/A	57	62	63	72
Cryptosporidiosis	4	2	1	1	3	0	1
Cyclosporiasis	0	0	0	N/A	N/A	N/A	N/A
Cholera	N/A	0	N/A	N/A	N/A	N/A	N/A
CRE	1	0	N/A	N/A	N/A	N/A	N/A
E. Coli	1	3	0	5	0	0	2
Giardia	0	2	0	1	0	3	1
Gonorrhea	N/A	N/A	N/A	11	3	2	4
Hemolytic Uremic Syndrome	0	0	0	0	0	0	0
Hep A	0	0	0	0	0	0	0
Hep B, Acute	0	0	0	0	0	0	0
Hep B, Chronic	0	1	1	0	2	0	0
Legionella	0	0	0	0	0	0	0
Listeria	0	0	0	0	0	0	0
Lyme Disease	2	0	0	0	0	0	0
Meningococcal Disease	0	0	0	0	0	0	0
Mumps	2	2	0	0	0	0	0
Pertussis	0	3	19	0	1	2	1
Q fever (acute)	0	0	0	N/A	N/A	N/A	N/A
Rabies (Animal)	0	N/A	N/A	0	0	0	0
Rocky Mountain Spotted Fever	0	0	0	0	0	0	0
Salmonella	8	8	4	4	4	4	5
Shigella	3	1	0	0	0	0	0
Syphilis	N/A	N/A	N/A	1	0	0	0
Tuberculosis	N/A	N/A	N/A	0	1	0	0
Tularemia	0	0	N/A	N/A	N/A	N/A	0
West Nile Virus	0	1	1	0	0	0	0
Total by Year	**24**	**29**	**36**	**85**	**78**	**77**	**89**

Source: Iowa Department of Public Health, Center for Acute Disease Epidemiology Annual Reports. 2011-2017
http://www.idph.state.ia.us/cade/default.aspx

For all jurisdictions in the county, historical occurrence was scored as a 1, while the Covid-19 pandemic has been ongoing during this planning process, historically human disease epidemics occurred less than 4 time in the past 10 years.

Probability of Future Occurrences

For purposes of determining probability of future occurrence, the HMPC defined "occurrence" of human disease outbreak as a medical, health or sanitation threat to the general public (such as contamination, epidemic, or plague). Although legally reportable diseases occurred annually in Tama County, none in have reached the threshold of being a medical, health, or sanitation threat to the general 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. It is highly likely that human diseases will occur in Tama County on an annual basis. However, it is far less likely that a human disease epidemic will result from these occurrences. Based on historical occurrence, the probability of a human disease epidemic occurring anywhere in Tama County is an occasional event in any given year.

Magnitude and Severity (Extent)

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.

Severity of Impact

Improvements in sanitation and hygiene, the discovery of antibiotics, and the implementation of universal childhood vaccination programs have decreased the number and severity of human diseases. IDPH also provides consultation to county and local health agencies on diseases requiring public health intervention, collaborates with Centers for Diseases Control and Prevention by weekly reporting of nationally reportable diseases, and offers health education opportunities. Programs guide community-based prevention planning, monitor current infectious disease trends, prevent transmission of infectious disease, provide early detection and treatment for infected persons, and ensure access to health care for refugees in Iowa. All of these safeguard work to limit the severity of impact of human disease epidemics.

Communities with a larger population have the risk of a highly communicable disease spreading more quickly. Jurisdictions that ranked severity of impact higher considered the worst-case scenario of a human disease epidemic. Most jurisdictions stated that the safeguards that the County and State departments of public health had in place would prevent most serious injuries of illnesses from occurring.

Speed of Onset

Generally, health care practitioners would be the first to know of a human disease epidemic. It is expected that, if a highly contagious disease were diagnosed in Tama County, appropriate safety measures would be taken and further spread of the disease would be reduced. The community would be given at least 24 hours warning time.

Vulnerability

Although infectious diseases do not respect geographic boundaries, several populations in Tama 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.

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.

People

While everyone is vulnerable to human diseases, the elderly, young, and people with medical conditions tend to be affected most. The Task Force members in most jurisdictions estimated that fewer than 25% of the people in Tama County are vulnerable to a pandemic human disease, which resulted in a score of 1 for vulnerability. Tama County estimated their vulnerability with a score of 2, meaning that 25-50% of people or property might be affected. Vulnerable populations including the elderly, young, and people with medical conditions tend to be affected most. The HMPC members in most jurisdictions estimated that fewer than 25% of the people in Tama County are vulnerable to a pandemic human disease.

As noted under Previous Occurrences, the COVID-19 pandemic, as of August 6, 2021, 201,237,468 cases have been reported around the world with over 4,272,786 deaths, including nearly 35,460,711 cases and 615,419 deaths in the U.S. Tama County has reported 13,564 cases and 72 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.

Property

Human disease epidemics generally do not cause structural damage, and there is no historical data for previous structural losses due to human disease epidemics. Therefore, a loss estimate was not completed for this hazard. This hazard was also not spatially analyzed because it does not typically cause structural damage.

Critical Facilities and Infrastructure

Health care facilities and emergency service personnel would likely be affected in the event of a human disease epidemic. 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.

Economy

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.

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 U.S. employers an estimated $530 billion. During a pandemic, that figure would likely be considerably high and could trigger a recession or even a depression.

Historical, Cultural and Natural Resources

Impacts to these resources are typically minimal. However, reduced tourism during outbreaks could lead to additional economic impacts.

Development Trends

Population growth and development contribute the greatest to pandemic exposure. As populations increase and the cost of health care climbs, potential losses can be expected to rise. It is possible that infrastructure may not be able to be maintained as necessary during a pandemic because of a significantly decreased workforce. The population in Tama County is gradually increasing and thus there are more people to potentially be ill from a human disease. With 19.5% percent of the population over 65 years old, the County has a large percent of population more susceptible to disease.

3.4.3 Infrastructure Failure

Infrastructure Failure – Hazard Score Calculation						
Jurisdiction	Historical Occurrence	Probability	Vulnerability	Severity of Impact	Speed of Onset	Total Score
Chelsea	1	1	1	3	4	10
Clutier	1	1	1	1	4	8
Dysart	1	1	2	2	4	10
Elberon	1	1	2	2	4	10
Garwin	1	2	2	2	4	11
Gladbrook	1	2	3	3	4	13
Lincoln	1	1	4	3	4	16
Montour	2	4	4	3	4	17
Tama	1	1	1	1	4	8
Toledo	2	2	4	4	4	16
Traer	1	1	1	1	4	8
Vining	1	1	1	1	4	8
Tama County	1	2	1	2	4	10
GMG Community SD	1	2	2	2	4	11
North Tama Community SD	1	1	1	1	4	8
South Tama Community SD	1	1	1	1	4	8
Union Community SD	1	1	3	3	4	12

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 the majority 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 as a result of faulty equipment, lack of maintenance, degradation over time, or accidental damage such as damage to buried lines or pipes during excavation.

Some cities in Tama County have infrastructure vulnerabilities related to key city services like power delivery, water delivery, and wastewater treatment; however, not all cities are financially capable of providing matching funds for large infrastructure projects at this time. Therefore, even though infrastructure problems exist, not all problems described in this section were able to be addressed by the mitigation actions covered in this plan.

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, 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

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 City of Garwin is vulnerable to infrastructure failure due to their old transmission lines for power delivery. 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 similar to 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.

One of the most common causes of infrastructure failure in Tama County is related to sewer and water systems. Most of the municipalities in Tama County have older sewer systems. During prolonged wet weather periods with substantial rainfall, sewer systems can experience too much inflow and infiltration, which causes system overloading. This forces cities to bypass the treatment facility and pump untreated wastewater into open streams. Dysart, Gladbrook, Montour, Tama, Toledo, and Traer described issues with the sewer system overflowing and causing system overloads. Some cities are able to pump the system in order to relieve pressure and not cause flooding into residential homes; not all cities currently have the capacity to pump. Vining does not have a centralized sewage collection and treatment service. Many lots in the city are too small for compliant on-site sewage treatment systems.

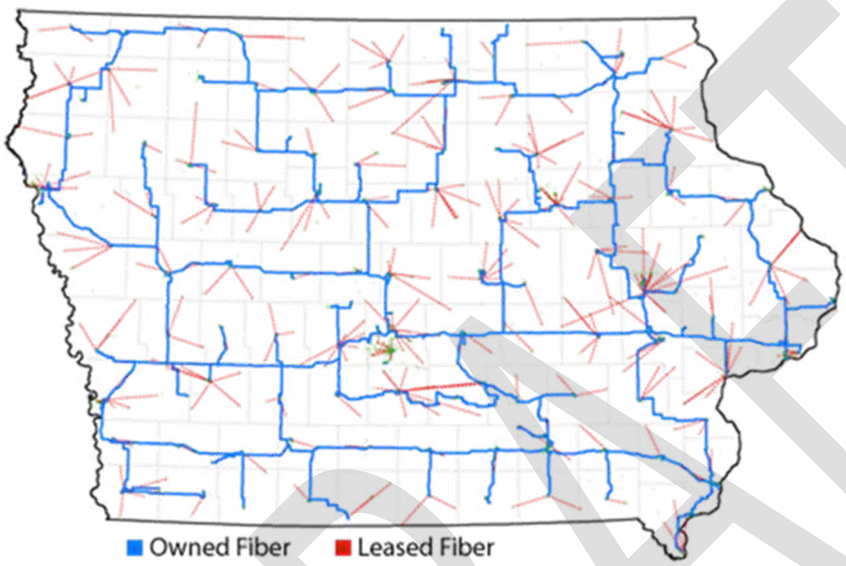
Montour has experienced a significant amount of infrastructure failure related to sewer system overloading. The city had their sewer system replaced roughly two years ago, but they still need to replace their water treatment plant, which was built in 1947. Some lines in the treatment plant are only ¾ of an inch, which creates water sludge buildup in pipes. The city has to flush their hydrant at least once a year because of this. Toledo’s water and sewer system dates back to the 1800s, according to the Superintendent of Public Works for Toledo. Chelsea must perform road, sewer, and water system maintenance more often because the city is extremely vulnerable to river flooding from the Iowa River.

Tama County at large experiences a risk of infrastructure failure due to the condition of old county bridges. These bridges would likely fail due to old age and poor condition; a disaster event may cause a weak structure to fail. Bridges are routinely inspected and closed if there are problems. The county recalled one particular instance in 2014 when the Abbott Ave. Bridge failed near the Marshall County/Tama County line. The City of Chelsea has several bridges in need of repair, but the city also experiences infrastructure failure due to flooding.

Location

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.

Figure 3-41 Iowa Communication Network



Source: http://icn.iowa.gov/about-icn/agency-information-icn-story

Historical Occurrence

Historical occurrence of infrastructure failure varies across jurisdiction. There is no NCEI data available for this hazard, but the HMPC was able to identify instances of infrastructure failure in the last 10 years. Most jurisdictions scored the historical occurrence of infrastructure failure as a 1, meaning that there were less than four events in the last 10 years that they could recall. Montour and Toledo scored historic occurrence as a 2, meaning that 4 to 7 infrastructure failure events have occurred in the last 10 years. Both of these cities have issues with their sewer and water systems (although Montour just replaced their sewer system two years ago). It is important to note that although infrastructure failure data was based on local knowledge, most jurisdictions had public works officials and fire department officials involved in the planning process by either being members of the HMPC at meetings or by consulting with these representatives outside of meetings before risk assessment scores and mitigation actions were finalized.

All four school districts included in the plan update rated historical occurrences as a 1. GMG Community School District mentioned downed power lines, water shutdowns, and water main breaks as potential events that could affect the school district.

Probability of Future Occurrences

Based on the number of historical occurrences, the HMPC determined the following scores for each jurisdiction. Chelsea, Clutier, Dysart, Elberon, Lincoln, Tama, Traer, and Vining received scores of 1, meaning that each jurisdiction had a less than 10% probability of occurring in any given year. North Tama Community School District, South Tama Community School District, and Union Community School District also determined their probability score to be 1. These jurisdictions had no events, or potentially one event that they could recall but weren't sure if it was significant enough to count as an occurrence.

Garwin, Gladbrook, Toledo, and Tama County received a probability score of 2, meaning that an infrastructure failure had a 10-25% chance of occurring. GMG Community School district also received a score of 2. These jurisdictions had one to two events that they could remember occurring and that were significant.

Montour received a probability score of 4, meaning that a chance of an infrastructure failure occurring was greater than 60%. Montour recalled at least 7 instances of infrastructure failure that have occurred in the last 10 years. Mainly, these events are related to the sewer and water system issues that were described in previous paragraphs.

Magnitude and Severity (Extent)

Severity of Impact

Severity of impact is dependent on the event. Energy disruptions and communications failures generally do not result in injuries or illnesses, have a limited impact on property damage, and results in a brief interruption of essential facilities or services. Structural fires could potentially cause serious injury and major property damage that threatens structural stability.

Clutier, Tama, Traer, and Vining scored severity of impact as a 1, meaning that injuries and property damage would be very insignificant, if they would occur at all. North Tama Community School District and South Tama Community School District also scored severity of impact as a 1.

Dysart, Elberon, Garwin, and Tama County scored severity of impact as a 2, meaning that some property damage or injuries could occur in an event, but these occurrences would be limited. Any property damage would not threaten the structural stability of buildings. GMG Community School District also scored severity of impact as a 2.

Chelsea, Gladbrook, Lincoln, and Montour scored severity of impact as a 3, meaning that major property damage could occur from infrastructure failure events. These communities were worried less about injuries and estimated that injuries would still be minimal or minor. Union Community School District also scored severity of impact as a 3.

Toledo scored severity of impact as a 4, meaning that property could be damaged or destroyed beyond repair in the event of infrastructure failure. The city had such a high score because of its old water and sewer systems. In the worst-case scenario, significant property damage has the possibility to occur.

Speed of Onset

Infrastructure failure cannot be predicted. There would be minimal or no warning time if an infrastructure failure occurred.

Climate Change Considerations

Refer to the Climate Change Considerations sections of the following primary hazards that can cause a cascading or secondary impact of infrastructure failure: Flood, Severe Winter Storm, Tornado/Windstorm, Thunderstorm, Lightning Thunderstorm, Lightning, Hail, and Extreme Heat.

Vulnerability

Chelsea, Clutier, Tama, Traer, Vining, and Tama County scored vulnerability as a 1, meaning that less than 25% of people and property would be affected in the event of infrastructure failure. Many of the homes that may be flooded due to sewer backups are the homes in lower areas of the city or along a certain path related to the infrastructure. For these communities, not all residents are affected by an event. For the average event, effects are localized. North Tama Community School District, Union Community School District also scored vulnerability as a 1.

Dysart, Elberon, and Garwin scored vulnerability as a 2, meaning that 25-50% of people and property might be affected. These cities' sewer and water system issues could affect a larger amount of people. Garwin also cited aging power lines as a concern for power outages that could affect portions of the city. GMG Community School District also scored vulnerability as a 2, citing the potential for water main breaks and downed power lines near school district facilities.

Gladbrook and Union Community School District scored vulnerability as a 3, meaning that 51-75% of people and property could be affected by an event. Lincoln, Montour, and Toledo scored vulnerability as a 4, meaning that more than 75% of people and property could be affected by an event. Many of the communities with a score of 3 or 4 considered significant flood events and power outages to be possible.

In general, all critical facilities in all jurisdictions could be vulnerable to an infrastructure failure. A power failure could impact police stations and emergency service personnel's ability to respond to emergencies. Failure of bridges or other road infrastructure could increase response times or limit transportation options or affect delivery of emergency supplies for all residents. Cultural facilities in Tama County are also vulnerable to infrastructure failures. Power losses and sewer backups can affect businesses and recreational facilities.

Development Trends

Increases in development and population growth increase the demand for utilities and use of infrastructure as well as the level of impacts when the utilities or infrastructure fail.

3.4.4 Radiological

Radiological – Hazard Score Calculation					
Historical Occurrence	Probability	Vulnerability	Severity of Impact	Speed of Onset	Total Score
1	1	2	2	2	8

Definition

An incident resulting in the release of radiological material at a fixed facility on in transit. This hazard includes power plants, hospitals, and laboratories.

Description

Tama County is located within a 50-mile buffer of the Duane Arnold Energy Center near Palo, Iowa in Linn County. Emergency classifications defined by the United States Nuclear Regulatory Commission are divided into four categories (Iowa Emergency Management Association 2014). Each calls for a certain level of response from plant and government personnel. From least to most severe, the classifications are:

- **Unusual Event** - Events that are in process or have occurred which indicate potential degradation in the level of safety of the plant. No release of radioactive material requiring offsite response or monitoring is expected unless further degradation occurs.
- **Alert** - Events are in process or have occurred that involve an actual or potential substantial degradation in the level of safety of the plant. Any releases of radioactive material from the plant are expected to be limited to a small fraction of the Environmental Protection Agency (EPA) protective action guides (PAGs).
- **Site Area Emergency** - Events in process or which have occurred that result in actual or likely major failures of plant functions needed for protection of the public. Any releases of radioactive material are not expected to exceed the EPA PAGs except near the site boundary.
- **General Emergency** - Actual or imminent substantial core damage or melting of reactor fuel with the potential for loss of containment integrity. Radioactive releases during a general emergency can reasonably be expected to exceed the EPA PAGs for more than the immediate site area.

The Duane Arnold facility has experienced seven Unusual Events, one Alert, and no Site Area Emergencies or General Emergencies. None of these occurrences qualify as a radiological hazard event. Additionally, it should be noted that the Duane Arnold Energy Center was shut down in 2021. This reduces the vulnerability of the county to radiological incidents originating from this facility.

Historical Occurrence

There have been no occurrences of a radiological incident since the facility began operating in 1974.

Probability

The probability of a radiological incident occurring is very low in any given year (less than 10%).

Vulnerability

While Tama County is nearly 50 miles away from the facility, communities in Tama County are still vulnerable. HMPC members estimated that if a radiological event did occur, more than 75% of people and property would be affected in Tama County. Effects would include increased vehicle traffic, as the portion of Highway 30 that runs through Tama County is part of the emergency evacuation route in the event of a general emergency at the plant. Depending on the extent of the radiological incident, property in Tama County could also be affected.

Severity of Impact

The HMPC determined that a radiological event could cause serious injury and illness, major or long-term property damage, a shutdown of critical facilities for 24 to 72 hours, and a minor short- term environmental impact.

Speed of Onset

Radiological events cannot be predicted. Tama County would have no warning time to prepare for a radiological incident.

3.4.5 Terrorism

Terrorism – Hazard Score Calculation						
Jurisdiction	**Historical Occurrence**	**Probability**	**Vulnerability**	**Severity of Impact**	**Speed of Onset**	**Total Score**
Chelsea	1	1	1	3	4	10
Clutier	-	-	-	-	-	-
Dysart	1	1	1	1	4	8
Elberon	1	1	1	2	4	9
Garwin	1	1	3	2	4	11
Gladbrook	1	1	4	4	4	14
Lincoln	1	1	4	3	4	13
Montour	1	1	1	1	4	8
Tama	1	1	1	1	4	8
Toledo	1	1	1	1	4	8
Traer	1	1	1	1	4	8
Vining	1	1	1	1	4	8
Tama County	1	1	1	2	4	9
GMG Community SD	1	1	3	2	4	11
North Tama Community SD	-	-	-	-	-	-
South Tama Community SD	1	1	1	1	4	8
Union Community SD	1	1	1	1	4	8

Definition

A wide variety of human-caused threats including enemy attack, biological terrorism, agro- terrorism, chemical terrorism, conventional terrorism, cyber terrorism, radiological terrorism, and public disorder. This hazard includes the use of multiple outlets to 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.

Description

Types of terrorism that communities considered include:

- **Enemy Attack** – an incident that would cause massive destruction and extensive casualties.
- **Public Disorder** – Mass demonstrations, or direct conflict by large groups of citizens, as in marches, protest rallies, riots, and non-peaceful strikes.
- **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 Agent**s may pose viable threats from hours to years depending upon the agent and the conditions in which it exits.
- **Agro-Terrorism** – Causing intentional harm to an agricultural product or vandalism of an agricultural/animal related facility is agro-terrorism.
- **Chemical Terrorism** – Liquid/aerosol or dry contaminants can be dispersed using sprayers or other aerosol generators; liquids vaporizing from puddles/containers; or munitions.
- **Conventional Terrorism** – Suspicious package, explosive device, etc.
- **Cyber Attack** – Electronic attack using one computer system against another in order to intimidate people or disrupt other systems is a cyber-attack

- **Radiological Terrorism** – 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.

It should be noted that the City of Clutier and North Tama Community School District chose to remove terrorism from its risk assessment. Clutier is a city of 213 people as of the 2010 census and has never had any historical occurrence or threat of a terroristic event. North Tama Community School District is a small district with a small student population that has also never had any historical occurrences. The school district has emergency plans in place that could address terrorism in the unlikely event of such an event occurring.

Historical Occurrence

There have been no known incidences of terrorism in Tama County.

Probability

Based on historical occurrence, the probability for a terroristic event in Tama County is low in any given year (less than 10%).

Vulnerability

The HMPC from each jurisdiction considered their vulnerability to a terrorism event in their community and scored vulnerability in a variety of ways. Most jurisdictions decided that a terroristic event would affect less than 25% of people and property. They considered an event and determined that any likely event would be small and would affect only a small portion of the city if it happened at all. A protest was a common event that was cited as an example. Most cities in Tama County have a small population and have never experienced unrest or terroristic threats.

Garwin, Gladbrook, Lincoln, and GMG Community School District ranked their community's vulnerability to a terror event slightly higher than others at a 3, meaning that 51-75% of people and property may be affected by an event. Elberon, Lincoln, Tama, and Union Community School

District scored vulnerability as a 4, meaning that more than 75% of people or property might be affected. Communities with a score of 3 and 4 considered the worst-case scenario of a terroristic event, such as a large explosion or other action that may cause property damage, destroy buildings, or close roads and other facilities for an extended period of time.

Severity of Impact

The severity of impact varies tremendously depending on the form of terrorism. The HMPC determined that, although some terroristic activity could result in serious injury and major property damage, the most likely terroristic threat that Tama County would experience would involve little to no injuries, illness, or property damage, or minor injuries, illness, or property damage.

Jurisdictions that ranked severity of impact as a 1 include Dysart, Montour, Tama, Toledo, Traer, Vining, South Tama Community School District, and Union Community School District, Jurisdictions that ranked this category as a 2 include Elberon, Garwin, Tama County, and GMG Community School District. The majority of these cities mentioned public disorder or threats against persons or property as potential terrorism events. These events would likely not cause more than minor property damage or minor injuries.

Several jurisdictions ranked severity of impact higher, including Chelsea (3), Lincoln (3), and Gladbrook (4). These cities considered significant terrorist events such as bomb detonations or agro-terrorism that may cause serious injuries or death.

Speed of Onset

Terrorism occurs with minimal or no warning. No jurisdiction in Tama County would have advanced notice of a terrorism event.

3.4.6 Transportation Incident

Transportation Incident – Hazard Score Calculation						
Jurisdiction	**Historical Occurrence**	**Probability**	**Vulnerability**	**Severity of Impact**	**Speed of Onset**	**Total Score**
Chelsea	1	2	2	2	4	11
Clutier	-	-	-	-	-	-
Dysart	1	1	1	1	4	8
Elberon	1	1	1	1	4	8
Garwin	1	1	2	2	4	10
Gladbrook	1	1	1	1	4	8
Lincoln	1	1	2	2	4	10
Montour	1	1	3	3	4	12
Tama	4	4	1	2	4	15
Toledo	1	1	3	2	4	11
Traer	1	1	1	1	4	8
Vining	1	1	2	2	4	9
Tama County	2	3	2	2	4	13
GMG Community SD	1	1	2	2	4	10
North Tama Community SD	1	1	1	2	4	9
South Tama Community SD	1	1	1	1	4	8
Union Community SD	1	1	1	1	4	8

Description

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

A highway transportation incident can be a single or multi-vehicle requiring responses exceeding normal day-to-day capabilities. An extensive surface transportation network exists in Iowa; local residents, travelers, business, and industry rely on this network on a daily basis. Weather conditions play a major factor in the ability of traffic to flow safely in and through the state as does the time of day (rush hour) and day of week. Incidents involving buses and other high-occupancy vehicles could trigger a response that exceeds the normal day-to-day capabilities of response agencies.

A railway transportation incident is a train accident that directly threatens life and/or property, or adversely impacts a community's ability 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 the many miles of track in Iowa, vehicles must cross the railroad tracks at numerous at-grade crossings.

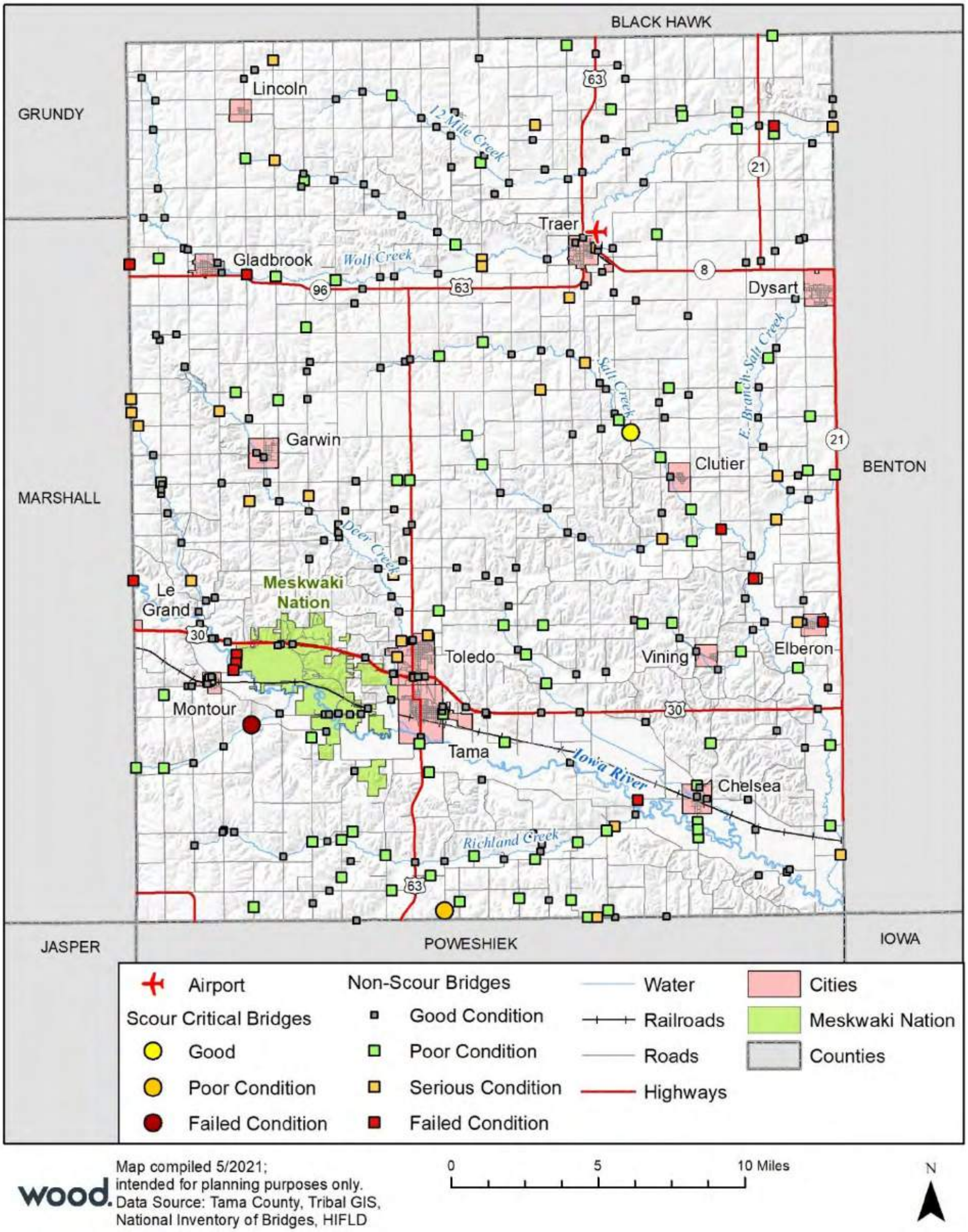
Location

The entire planning area is subject to transportation incidents and all participating jurisdictions are affected. Tama County has two US highways that run through it: US Highway 30 and US Highway 63. The county also has several state highways, including 146, 21, 229, 8 and 96. One airport is located in Tama County and near the City of Traer.

Tama County has one main rail line (the Union Pacific Railroad) that runs through the southern portion of the county. The following jurisdictions have train tracks running within their jurisdictional boundaries and are susceptible to an incident involving a train derailment: Chelsea (through the center of the city), Montour (through the center of the city), Tama (through the southern portion of the city), and Tama County (through the southern portion of the county).

Figure 3-42 shows the major transportation routes including 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. There are three bridges identified as scour critical within the planning area. Of which one is considered to be in failed condition and one in poor condition.

Figure 3-42 Major Transportation Routes and Location of Bridges

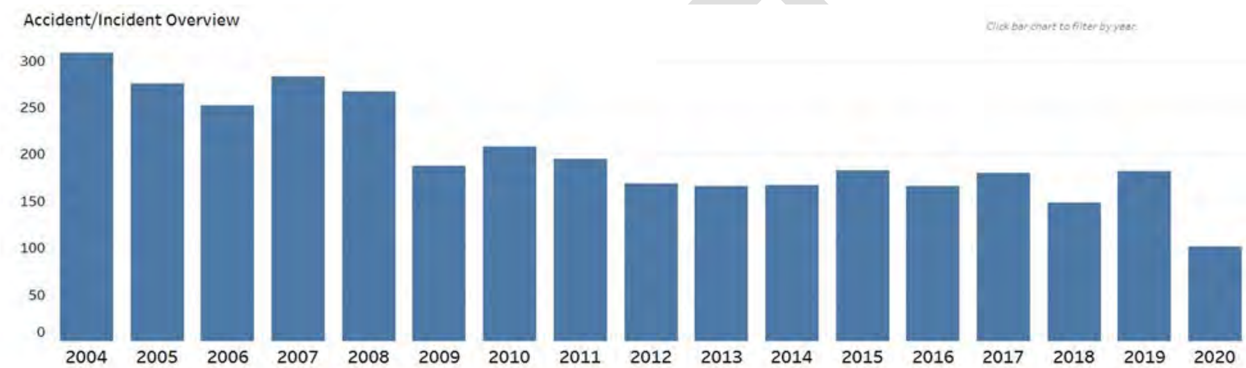


Historical Occurrence

Railway incidents may include derailments, collisions, and highway/rail crossing accidents. Railway transportation incidents involving derailments have become a more common, and dangerous, occurrence with the increased shipment of oil and oil products. According to the Federal Railroad Administration, 136 railways accidents or incidents in the last 43 years in Tama County. Of these incidents 48 were highway-rail incidents and 71 were not at grade-crossings. These incidents are represented in each jurisdiction's risk assessment scores for historical occurrence and probability.

Throughout Iowa, rail car traffic has increased but the number of derailments in relationship to the traffic is trending downward according to the Iowa Department of Transportation (see Figure 3-43). Iowa has 5,157 public highway-rail crossings in the State on state, city and county highways.

Figure 3-43 Iowa Railway Accidents/Incidents, 2004-2020



Source: U.S. Department of Transportation Federal Railroad Administration, Overview Reports

There were three aviation incidents reported to the National Transportation Safety Board (NTSB) between 1982 and 2012 in Tama County. The oldest record occurred in June 1982 outside of Tama. Table 3-49 lists the air transportation incidents by date and location.

Table 3-49 Air Transportation Incidents, 1982 - 2012

Date	Nearest City
June 5, 1982	Tama
February 9, 1983	Garwin
July 12, 1998	Traer
November 28, 2012	Clutier

Source: http://planecrashmap.com/list/ia/

Highway transportation incidents are likely throughout the county, although transportation incidents are more likely to occur in areas with higher annual average daily transportation (AADT) counts. AADT uses a formula and historic data to determine average traffic flows for a given area. According to vehicle crash data from the Iowa Department of Transportation, between 2009 and 2018, Tama County experienced 40 fatal crashes.

Because this data does not measure the extent of each crash and how significantly it affected the community, the HMPC were asked to recall vehicle transportation incidents at planning meetings. They were asked how many crashes affected their community in the last 10 years that exceeded normal day-to-day capacities of emergency personnel and/or caused significant road closures or injuries. Most jurisdictions could not recall a single incident in the last 10 years that caused significant road closures or overwhelmed the capacities of emergency personnel. The HMPC said it was common with Highway 30 running through town to have, on average, one large accident per year that stopped traffic and affected the community.

When considering all forms of transportation incidents, most jurisdictions reported no transportation incidents. Tama County reported approximately 4 (all highway transportation incidents), and the City of Tama reported 14 (4 railway transportation incidents and approximately 10 highway transportation incidents).

Probability of Future Occurrences

There are 24 railroad crossings in Tama County. The miles of railroad track in the county combined with the large number of street and highway crossings make Tama County vulnerable to a potential highway/rail collision. Derailments are also possible, while a major derailment would occur less frequently.

Since probability is based on historical occurrence, most jurisdictions scored 1 for probability, meaning that there is a less than 10% chance of a transportation incident occurring in any given year. Tama County scored 3, meaning that there is between a 25-60% probability, and the City of Tama scored 4, meaning that there is a greater than 60% chance of a transportation event occurring in any given year.

Magnitude and Severity (Extent)

Severity of Impact

Highway incidents threaten the health and lives of people in the vehicles, pedestrians, and citizens of the community if hazardous materials are involved. Mass casualty events can occur if mass transit vehicles are involved. Community bus and school buses have a good safety record, but accidents can and do occur. Numerous injuries are a realistic possibility in situations involving mass transit vehicles. Property damage would be limited to vehicles and cargo involved; roads, bridges, and other infrastructure; utilities such as light and power poles; and third-party property adjacent to the accident scene such as buildings and yards.

Railway incidents can result in death, injury, and property damage. Deaths and injuries can range from those directly involved, to citizens in the community affected by hazardous materials.

Depending on the materials involved, evacuations may occur, moving residents away from dangerous products and the possibility of explosion. Gases, liquids, and solids can contaminate air, soil, and water in and near the incident scene. If a railway incident occurred in an urban area, the health and welfare of thousands of people could be put in jeopardy. Damage may be limited to the train, railcars, and cargo involved, but it can also include loss of production, business disruption due to evacuations, and business disruptions of those served by the railroad. Business and traffic disruptions could last several days until the clean-up efforts are complete.

Dysart, Elberon, Gladbrook, Traer, South Tama Community School District, and Union Community School District scored severity of impact as a 1, meaning that injuries, damages, and impacts related to the shutdown of critical facilities would be minimal. These jurisdictions are not significantly vulnerable to transportation incidents. They have limited vehicle traffic on the roads and highways nearby, and they are not located near railroad tracks.

Chelsea, Garwin, Lincoln, Tama, Toledo, Vining, Tama County, GMG Community School District, and North Tama Community School District scored severity of impact as a 2, meaning that injuries, damages, and impacts related to the shutdown of critical facilities would be limited. Critical facilities could be impaired for up to 24 hours. These communities have a slightly elevated risk to transportation incidents, and an accident could cause more damage in a community. A railway transportation incident in Chelsea could cause injuries. Tama and Toledo could experience a highway car accident that causes multiple injuries and a shutdown of critical facilities or roads. Garwin, Lincoln, or Vining could experience a car crash that causes injuries and ties up their emergency responders indefinitely.

Montour scored severity of impact as a 3, meaning that the community anticipated a worst-case scenario if a transportation incident occurred. Serious injury and major property damage that threatens structural stability of buildings could be possible. These impacts are particularly possible since Montour is one of three cities in Tama County through which the Union Pacific rail line runs. This rail line is located near City Hall and the Fire Station.

Speed of Onset

There is usually no warning of highway incidents. During snowstorms and other weather events that may impede travel, travelers, response agencies, and hospitals alike can be notified of hazardous travel conditions. All jurisdictions in Tama County scored this hazard as a 4, meaning that there would be little to no warning time for a transportation incident.

Climate Change Considerations

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.

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 Tama 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 in close proximity to 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. Jurisdictions in Tama County have varying vulnerabilities to transportation incidents. There are 25 railroad crossings in Tama County. The miles of railroad track in the county combined with the large number of street and highway crossings make Tama County vulnerable to a potential highway/rail collision. Derailments are also possible, while a major derailment would occur less frequently.

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 incident. 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.

Dysart, Elberon, Gladbrook, Tama, Traer, Vining, North Tama Community School District, South Tama Community School District, and Union Community School District scored vulnerability as a 1, meaning that less than 25% of people and property would be affected in the event of a transportation incident. These jurisdictions viewed a transportation incident as affecting a small portion of the community. For some of these communities, highway accidents are fairly routine, and emergency personnel have the capability of handling most types and sizes of accidents that are likely to occur.

Chelsea, Garwin, Lincoln, Tama County, and GMG Community School District scored vulnerability as a 2, meaning that 25-50% of people and property would be affected in the event of a transportation incident. Chelsea anticipated at least 25% of people would be affected in the event of a railway transportation event. Lincoln and Garwin do not have major highways or railways running through their communities, but they determined that a transportation incident on a road could impact at least 25% of the community. Tama County considered the proximity of Highways 63 and 30 within the county. If an incident occurred on these highways, it could affect at least 25% of people in the county who use these highways to travel for work, school, or leisure.

Montour and Toledo scored vulnerability as a 3, meaning that 51-75% of people and property would be affected in the event of a transportation incident. In Toledo, Highways 30 and 63 intersect. This intersection increases the vulnerability of the community to more highway accidents. A significant accident could affect more than 50% of people in the city through closed roads, detours, or hazardous materials.

People

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 Tama 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 in close proximity to 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.

Property

No countywide or jurisdictional loss estimate 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.

Critical Facilities and Infrastructure

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 incident. Chelsea's City Hall and Fire Station are located next to the tracks; an incident occurring within city limits could limit the city's ability to respond to the situation. Similarly, Montour has the Union Pacific rail line running through town. In addition, Montour's City Hall and Fire Station are within one block of the tracks. A transportation incident involving a derailment near these facilities could significantly impact the jurisdiction's ability to respond to such an event. 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.

Economy

The U.S. Department of Transportation 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 3-50.

Table 3-50 Costs of Traffic Crash

Severity	Cost per injury (in 2020 dollars $)
Fatal	$4,632,233
Evident Injury	$64,139

Severity	Cost per injury (in 2020 dollars $)
Possible Injury	$33,851
Property Damage Only	$3,563

Source: U.S. Department of Transportation Federal Highway Administration Technical Advisory T 7570.2, 1994. Adjusted to 2020 dollars.

Estimated losses as a result of air transportation and railway transportation are not available for this analysis.

Historic, Cultural, and Natural Resources

Generally, all critical facilities and cultural facilities could be impacted by such an event, but impacts would be small, targeted, and would likely not last for a long period of time.

Development Trends

As housing units increase in the unincorporated county, this may increase the number of vehicles that cross the railroad at highway-railroad crossings in these jurisdictions.

4 Mitigation Strategy

44 CFR Requirement §201.6(c)(3):
[The mitigation strategy shall include 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.

This section presents the mitigation strategy updated by the Hazard Mitigation Planning Committee (HMPC) based on the risk assessment. The mitigation strategy was developed through a collaborative group process and consists of updated 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 the FEMA Local Mitigation Planning Handbook, March 2013:

- Goals are general guidelines that explain what the planning committee wants to achieve with the plan. They are usually broad policy-type statements that are long-term and represent visions for reducing or avoiding losses from the identified hazards.
- Mitigation Actions are specific projects and activities that help achieve the goals.

4.1 Goals

44 CFR Requirement §201.6(c)(3)(i):
[The hazard mitigation strategy shall include a] description of mitigation goals to reduce or avoid long-term vulnerabilities to the identified hazards.

This planning effort is an update to an existing hazard mitigation plan. Therefore, the 4 goals from the 2015 Tama County Hazard Mitigation Plan were reviewed to determine if they are still valid. Wood facilitated a discussion session with the HMPC during their second meeting 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 keep the 2015 goals with some minor alterations to the wording in goals 1 and 4, but maintaining the same intent, as written below:

1. Minimize losses to existing and future structures within hazard areas with an emphasis on critical facilities, lifelines, and identified assets.
2. Protect the health and safety of Tama County residents and visitors.
3. Educate Tama County citizens about the dangers of hazards and how they can be prepared.
4. Ensure the continuity of county and local operations will not be significantly disrupted by disasters in Tama County

4.2 Identification and Analysis of Mitigation Actions

44 CFR Requirement §201.6(c)(3)(ii):
The mitigation strategy shall include 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.

During the second meeting of the HMPC, the results 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 on-going 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,
- State Priorities for Hazard Mitigation Assistance Grants,
- Public Opinion from Surveys, and
- FEMA Mitigation Ideas, 2013.

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. They were also provided a link to the publication, FEMA Mitigation Action Ideas, 2013. This document was developed by FEMA to provide a resource that communities can use to identify and evaluate a range of potential mitigation alternatives/actions for reducing risk to natural hazards and disasters. Then for comparison, the results of the public survey were provided, which included typical mitigation actions that the public might support

4.2.1 Prioritization Process

To provide a mechanism for jurisdictions to prioritize actions, a modified STAPLEE worksheet was completed by the jurisdictions for each new and continued action submitted for the updated mitigation strategy. The modified STAPLEE worksheet includes elements to consider protection of life and reduction of damages. Although a similar STAPLEE method was a component of the prioritization method utilized for the 2015 plan, the scoring elements were slightly different. For the plan update, the modified STAPLEE worksheet was chosen to re-evaluate all continuing and new actions, as this was deemed a more simplified approach and ensured a consistent methodology for all continuing and new actions.

The STAPLEE prioritization method in general is a tool used to assess the costs, benefits, and overall feasibility of mitigation actions. STAPLEE stands for the following:

- **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 Tama 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 2015 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 150 actions in the previous plan, 10 have been completed, 7 were deleted, and 133 were continued in the plan update. Table 4-2 contains the actions that were either completed or deleted from the mitigation strategy, along with any applicable comments, from the 2015 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

Jurisdiction	Completed	Delete	Continue In-Progress	Continue Not Started	New Actions 2021
Tama County	1	1	26	3	2
City of Chelsea	0	0	1	2	1
City of Clutier	0	0	3	6	
City of Dysart	4	0	4	0	
City of Elberon	0	0	0	9	1
City of Garwin	2	0	2	3	1
City of Gladbrook	3	2	6	0	
City of Lincoln	0	0	0	6	
City of Montour	0	0	6	8	
City of Tama	0	0	1	9	2
City of Toledo	0	0	5	4	
City of Traer	0	0	4	4	
City of Vining	0	0	1	8	
GMG Community School District	0	0	4	1	
North Tama Community School District	0	0	0	1	
South Tama Community School District	0	3	0	0	1
Union Community School District	0	1	5	1	
Total	**10**	**7**	**68**	**65**	**8**

Table 4-2 Completed and Deleted Actions

Jurisdiction	Hazard(s) Mitigated	Mitigation Action Title	Goals Addressed	Comments
Tama County	All	Establish advance warning system for recreational areas	2	**Completed.**
Tama County	All	Create list of disaster supplies and suppliers	1	**Deleted.**
Dysart	All	Construct a safe room	2	**Completed.** Completed with community building in 2018 which includes use as shelter
Dysart	All	Maintain Alert Iowa participation	2	**Completed.** Completed but ongoing to ensure all citizens are up to date with most current alert system.

Jurisdiction	Hazard(s) Mitigated	Mitigation Action Title	Goals Addressed	Comments
Dysart	All	Prepare education flyers about storm procedures to go to all homes in Dysart	3	**Completed.** This has been completed by continues to be done through a timely newsletter sent out with city bills during the spring. Information is also posted to the city of Dysart website and city department Facebook pages.
Dysart	All	Purchase new rescue equipment for city shop and fire department	1	**Completed.** New equipment has been purchased by Fire Department (rescue truck, new turn out gear) public works has purchased new generators for lift stations during power outages.
Garwin	Drought	Update water metering system	1	**Completed.**
Garwin	All	Purchase new SCDA air tanks for the fire department	1	**Completed.**
Gladbrook	Severe Winter Storm	Purchase generators to help prevent critical site damage from freezing temperatures	1	**Completed.**
Gladbrook	Infrastructure Failure	Grand Street bridge improvements	1	**Completed.**
Gladbrook	All	Maintain Alert Iowa participation and educate citizens	2	**Deleted.**
Gladbrook	All	Work with school district to isolate west side of school so that it could be designated as an emergency shelter	2	**Deleted.**
Gladbrook	Infrastructure Failure	Water source research and potential increase of supply	4	**Completed.** Switched to rural water.
South Tama CSD	Tornado, Thunderstorm, Windstorm	Build a storm shelter	1	**Deleted.** District was hoping to get money from FEMA to make this happen. As of right now, this has not happened.

Jurisdiction	Hazard(s) Mitigated	Mitigation Action Title	Goals Addressed	Comments
				The focus has been shifted to a middle school project.
South Tama CSD	All	Purchase generators	2	**Deleted.**
South Tama CSD	All	Communicate crisis plan to parents, officials, and the public.	3	**Deleted.**
Union CSD	All	Construct a safe room	1	**Deleted.**

4.4 Mitigation Action Plan

44 CFR Requirement §201.6(c)(3)(ii):
The mitigation strategy shall include an action strategy describing how the actions identified in paragraph (c)(2)(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 benefits review of the proposed projects and their associated costs.

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. The Disaster Mitigation Act regulations state that benefit-cost review is the primary method by which mitigation projects should be prioritized. 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, will primarily consist of a qualitative 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.

4.4.1 Continued Compliance with the National Flood Insurance Program

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 Tama County and all NFIP participating jurisdictions including Chelsea, Clutier, Dysart, Garwin, Gladbrook, Montour, Tama, Toledo, Traer, and Vining. 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 4-3 that address specifics related to NFIP continued compliance. Elberon does not participate in the NFIP but have mapped special flood hazard areas and is sanctioned in the NFIP. Sanction designation means that residents that have a federally-backed mortgage cannot get access to flood insurance. Reasons Elberon does not participate has been due to the fact that they have minimal flood risk and are not facing development pressures in flood hazard areas. Other details related to NFIP participation are noted in Chapter 2 under the community capabilities section (Table 2-6 and Table 2-7) and the flood vulnerability discussion in Chapter 3.

4.4.2 Updated Mitigation Action Plan

The mitigation action summary table presenting the 2022 mitigation action plan, which includes continuing and new mitigation actions for each jurisdiction is provided in Table 4-3, and is representative of the current priorities of each jurisdiction. In addition to the 133 actions that were continued from the previous plan, 8 new actions were identified, for a combined total of 141 actions in this updated mitigation strategy. Each continued and new action has been assigned an Action ID for tracking purposes. Action ID's 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 4-3 Mitigation Action Summary – Continuing and New Actions

ID	Goal	Hazard(s) Mitigated	Action Description/Background/Benefits	Lead Agency and Partners	Potential Funding	Cost Estimate	Priority	Timeline	Status/ Implementation Notes
Tama Co-01	1	Extreme Heat, Severe Winter Storm, Thunderstorm, Tornado, Windstorm	Enhance building codes. Improve upon existing building codes by adding requirements that may help to reduce the adverse effects hazards may have on buildings	Tama County Planning and Zoning, Tama County Emergency Management, Tama County Supervisors	Tama County Planning and Zoning	$9,999 or less	Medium	2021	Continue - In Progress
Tama Co-02	1	Flooding	Elevate roads. Where needed, elevate roads. As funding allows, the county elevates roads that are prone to flooding; however, elevating roads is expensive, and the action is currently funded with local money.	Tama County Engineer, TBD	Tama County Engineer, FEMA HMPG, others to be identified	$300,000 or more	Medium	Ongoing	Continue - In Progress
Tama Co-03	1	Grassland/ Wildland Fire	Implementation of burn bans Improve the implementation of burn bans throughout the county. Tama County Emergency Management is working with individual jurisdictions throughout the county to get burn bans in place when needed.	Individual Fire Departments in Tama County, Tama County Emergency Management	Tama County, Individual Fire Departments, others to be identified	$9,999 or less	High	Ongoing	Continue - Annual Implementation
Tama Co-04	1	Thunderstorm, Lightning, and Hail	Install steel roofs on government buildings to protect from hail and other hazards. Systematically replace county building roofs with steel or another durable material to protect them from	Tama County Board of Supervisors TBD	Tama County Board of Supervisors, others to be identified	$300,000 or more	Low	2025	Continue - In Progress

ID	Goal	Hazard(s) Mitigated	Action Description/Background/Benefits	Lead Agency and Partners	Potential Funding	Cost Estimate	Priority	Timeline	Status/ Implementation Notes
			hail and other hazards. The county just replaced the roof on one building in the last year with shingles and will not pursue a steel roof unless a significant hazard occurs, and it would need to be replaced.						
Tama Co-05	1	Flooding	Update zoning in critical areas. Update zoning in critical areas of the county i.e. discouraging development in floodplain or flood-prone areas, ensure proper development near critical facilities, etc. For flood-prone areas, the county already works with the DNR to ensure that unregulated development does not occur in flood-prone areas.	Tama County Planning and Zoning Department, TBD	Tama County	$9,999 or less	Medium	Ongoing	Continue - In Progress
Tama Co-06	1	Infrastructure Failure	Maintenance of vegetation near power lines. Maintain proper distance between vegetation and power lines to help avoid damages to both the vegetation and electrical infrastructure. This action is ongoing as maintenance is needed.	Electric companies (Brooklyn REC, East Central Iowa Coop, Alliant Energy) and Tama County TBD	Tama County, electric companies, others to be identified	$100,000 - $299,999	Medium	Annual Implementation	Continue - Annual Implementation
Tama Co-07	1	Flooding	Flood assessment requirement for building permit. The county has	Tama County Planning and Zoning	Tama County Planning	$9,999 or less	Medium	Annual Implementation	Continue - In Progress

ID	Goal	Hazard(s) Mitigated	Action Description/Background/Benefits	Lead Agency and Partners	Potential Funding	Cost Estimate	Priority	Timeline	Status/ Implementation Notes
			established a flood assessment requirement to receive a building permit in the floodplain. The county collaborates with Iowa DNR for each permit to make sure all requirements are met. The county will continue this ongoing effort as they receive requests to build in flood-prone areas.	Department TBD	and Zoning Department, others to be identified				
Tama Co-08	1	Flooding, Severe Winter Storm, Thunderstorm, Tornado, Windstorm, Infrastructure Failure, Transportation Incident	Improve the capital improvements planning process for the county and also increase public awareness of this type of planning	Tama County Board of Supervisors, all county departments, others to be identified	Tama County Board of Supervisors	$9,999 or less	Medium	2025	Continue - In Progress
Tama Co-09	1	Flooding, Infrastructure Failure, Severe Winter Storms, Thunderstorm, Windstorm	Improve regular assessment and maintenance on county structures. Identify ways to improve the assessment and maintenance on county structures, possibly make information available to the public about planned maintenance and current condition	Tama County Maintenance Department, Other Tama County departments, others to be identified	Tama County	$9,999 or less	Medium	2025	Continue - In Progress

ID	Goal	Hazard(s) Mitigated	Action Description/Background/Benefits	Lead Agency and Partners	Potential Funding	Cost Estimate	Priority	Timeline	Status/ Implementation Notes
Tama Co-10	1	Infrastructure Failure	Create fire extinguisher and fire alarm safety program. Create a program to encourage Tama County residents and businesses to keep and maintain fire extinguishers and smoke detectors/fire alarms and teach them proper use and safety. Individual fire departments have made varied progress on this action and continue to implement the safety program.	Individual Fire Departments in Tama County, Tama County Emergency Management	Individual Fire Departments	$10,000 - $99,999	Low	Annual Implementation	Continue - In Progress
Tama Co-11	2	Infrastructure Failure	Train emergency responders in search and rescue for structural failure situations. Create a program or incentives for emergency responders to be trained in search and rescue in structural failure situations. Each individual fire department is responsible for this training.	Individual Fire Departments in Tama County, Tama County Emergency Management	Individual Fire Departments, Assistance to Firefighters Grant, others to be identified	$100,000 - $299,999	Medium	Annual Implementation	Continue - In Progress
Tama Co-12	2	Extreme Heat	Establish cooling centers Establish one or multiple cooling centers to be located throughout the county. The county will assist communities that wish to establish cooling centers and help them to get resources	Tama County Emergency Management, Local city government, others to be identified	Tama County EMA, FEMA HMA	$9,999 or less	Medium	2023	Continue - In Progress

ID	Goal	Hazard(s) Mitigated	Action Description/Background/Benefits	Lead Agency and Partners	Potential Funding	Cost Estimate	Priority	Timeline	Status/ Implementation Notes
Tama Co-13	2	Grassland/ Wildland Fire	Train fire departments for grass fires and maintain needed equipment. Create a program or incentives for firemen to be trained for grass fires and purchase or maintain the needed equipment. Each individual fire department is responsible for this training.	Individual Fire Departments in Tama County, Tama County Emergency Management	Assistance to Firefighters Grant, others to be identified	$100,000 - $299,999	Medium	Annual Implementation	Continue - In Progress
Tama Co-14	2	Extreme Heat, Severe Winter Storm, Thunderstorm, Tornado, Windstorm	Establish community shared shelters. Explore the option of creating or consolidating shelters to be shared between communities.	Tama County Emergency Management, Individual Jurisdictions TBD	TBD	$9,999 or less	Medium	2023	Continue - Not Started
Tama Co-15	2	Thunderstorm, Tornado, Windstorm	Construct safe rooms in communities and recreational areas. Where needed most, construct safe rooms in Tama County communities and recreational areas.	Individual Jurisdictions, Tama County Emergency Management (for County Parks), Tama County Conservation, others to be identified	FEMA HMA and PDM, Tama County Emergency Management, Individual Jurisdictions, CDBG, and others to be identified	$300,000 or more	Low	2027	Continue - Not Started
Tama Co-16	2	Transportation Incident	Require and enforce maintenance of vegetation near traffic signs. Make	Tama County Engineers, Tama County	Tama County Engineers,	$9,999 or less	Low	2023	Continue - In Progress

ID	Goal	Hazard(s) Mitigated	Action Description/Background/Benefits	Lead Agency and Partners	Potential Funding	Cost Estimate	Priority	Timeline	Status/ Implementation Notes
			requirements and enforce maintenance of vegetation near traffic signs	Secondary Roads, Tama County Emergency Management, Tama County Planning and Zoning, others to be identified	County Secondary Roads, others to be identified				
Tama Co-17	2	Grass and Wildland Fire, Infrastructure Failure	Improve fire code enforcement. Identify how fire code enforcement can be improved and implement the improvements. Tama County will assist individual communities as needed. Individual jurisdictions are responsible for completing this action.	Individual Fire Departments in Tama County, Tama County Planning and Zoning Department TBD	Individual Fire Departments	$9,999 or less	Medium	2027	Continue - In Progress
Tama Co-18	2	Animal/Plant / Crop Disease	Establish communication between emergency management and vets regarding animal/crop/plant diseases. Establish communication between emergency management and vets regarding animal/crop/plant diseases.	Tama County Emergency Management, Veterinarians throughout Tama County	Tama County Emergency Management, others to be identified	$9,999 or less	Medium	2025	Continue – in Progress This action falls under an emergency support function of Tama County Emergency Management. It was last completed in 2013 and is

ID	Goal	Hazard(s) Mitigated	Action Description/Background/Benefits	Lead Agency and Partners	Potential Funding	Cost Estimate	Priority	Timeline	Status/ Implementation Notes
									updated every five years. The action undergoes an annual evaluation.
Tama Co-19	3	Extreme Heat, Drought, Flooding, Severe Winter Storm, Thunderstorm, Tornado, Windstorm, Hazardous Materials Incident, Infrastructure Failure, Radiological, Transportation Incident	Extreme heat, severe weather, pipeline safety, thunderstorms and lightning, etc. info, PSAs, and information on County website. The county includes information about hazards including extreme heat, severe weather, and other hazards on their website, through public service announcements, and also via social media (Facebook). The county will continue to provide this information through a variety of sources so that it can reach as many people as possible.	Tama County Emergency Management, Tama County Public Health, other county departments, others to be identified	Tama County, others to be identified	$9,999 or less	High	2023	Continue - In Progress
Tama Co-20	3	Infrastructure Failure, Grass and Wildland Fire	Public education program about general fire prevention and prevention of grass and wildland fires. Create a separate program to educate the public about grass fires. Individual communities are responsible for implementing	Tama County Emergency Management, Tama County Conservations, city fire departments, others to be identified	Tama County Emergency Management, city fire departments, others to be identified	$9,999 or less	Medium	2023	Continue - In Progress

ID	Goal	Hazard(s) Mitigated	Action Description/Background/Benefits	Lead Agency and Partners	Potential Funding	Cost Estimate	Priority	Timeline	Status/ Implementation Notes
			this action. The county will assist as needed.						
Tama Co-21	3	Animal/Plant/Crop Disease, Drought, Flooding, Extreme Heat, Grass or Wildland Fire, Severe Winter Storm, Thunderstorm, Tornado, Windstorm	Encourage farmers to invest in crop insurance. Through education or some sort of incentive program, encourage Tama County farmers to invest in crop insurance. This action is part of an emergency support function through Tama County EMA.	Tama County Emergency Management Tama County departments, others to be identified	Tama County Emergency Management, others to be identified	$9,999 or less	Low	2027	Continue – in Progress An update of the action was last completed in 2013. It is updated every 5 years.
Tama Co-22	3	Transportation Incident	Education on dangers of highway transportation incidents and how to avoid collisions. Initiate some sort of special education program about the dangers of highway transportation incidents and how to avoid collisions. T	Tama County Emergency Management, Tama County Sherriff's Department, DOT, others to be identified	Tama County Emergency Management, others to be identified	$9,999 or less	Medium	2027	Continue - In Progress his action falls under an Emergency Support Function of Tama County EMA. It was last updated in 2014.
Tama Co-23	4	Severe Winter Storm, Thunderstorm, Tornado,	Complete government continuity planning for all Tama County departments.	Tama County Emergency Management and Board of Supervisors,	Tama County	$9,999 or less	Medium	2024	Continue - In Progress This action is part of an ongoing

ID	Goal	Hazard(s) Mitigated	Action Description/Background/Benefits	Lead Agency and Partners	Potential Funding	Cost Estimate	Priority	Timeline	Status/ Implementation Notes
		Windstorm, Infrastructure Failure, Human Disease, Terrorism		all county departments, others to be identified					process that is administered by Tama County EMA.
Tama Co-24	4	Flooding, Grass or Wildland Fire, Severe Winter Storm, Thunderstorm, Tornado, Windstorm, Hazardous Materials Incident, Transportation Incident	Establish an impact assessment form for communities. Establish an information gathering/impact assessment form for Tama County cities to use immediately following a disaster	Tama County Emergency Management, Tama County cities, disaster relief-related organizations	Tama County Emergency Management	$9,999 or less	Medium	2022	Continue - In Progress
Tama Co-25	4	Extreme Heat, Severe Winter Storm, Thunderstorm, Tornado, Windstorm	Purchase generators for critical facilities. Identify critical facilities with the greatest vulnerability and purchase generators to be used in them during an extended power outage.	Tama County Maintenance Department, Tama County Emergency Management	FEMA HMPG, Tama County Emergency Management, others to be identified	$100,000 - $299,999	Medium	2027	Continue - In Progress A generator has already been purchased for the building that houses the Sheriff's Office and the EMA Office. The county still needs to

ID	Goal	Hazard(s) Mitigated	Action Description/Background/Benefits	Lead Agency and Partners	Potential Funding	Cost Estimate	Priority	Timeline	Status/ Implementation Notes
									purchase generators for additional facilities, including the North Building that houses the Assessor's Office
Tama Co-26	4	Infrastructure Failure, Tornado, Thunderstorm, Lightning, and Hail, Severe Winter Storm, Windstorm	Bury utility lines. Collaborate with power providers to identify areas that would benefit the most from burying electrical infrastructure and actually bury the power lines	Power providers (Brooklyn REC, East Central Iowa Coop, Alliant Energy), Tama County Emergency Management Tama County Engineer, others to be identified	Power provider, others to be identified	$300,000 or more - Approximately $10 or more per foot of power line	Low	2023	Continue - In Progress
Tama Co-27	4	Infrastructure Failure	Budget and plan for communication failures. Find an alternate location for the 911 PSAP—plan for how to acquire computers, radio consoles, phone equipment and predetermine a facility to relocate and secure.	Tama County Emergency Management Other Tama County departments	Tama County Emergency Management, others to be identified	$9,999 or less	Medium	2022	Continue – In progress Tama County Emergency Management has made this an ongoing action that is continuously

ID	Goal	Hazard(s) Mitigated	Action Description/Background/Benefits	Lead Agency and Partners	Potential Funding	Cost Estimate	Priority	Timeline	Status/ Implementation Notes
									being worked on.
Tama Co-28	4	Severe Winter Storm, Thunderstorm, Tornado, Windstorm, Infrastructure Failure	Establish procedure for community to notify Tama County Emergency Management after Energy failure occurs. Establish procedure for community to notify Emergency Management after Energy failure occurs	Tama County Emergency Management City Governments	Tama County Emergency Management	$9,999 or less	Medium	2022	Continue - In Progress
Tama Co-29	4	Flooding, Extreme Heat, Severe Winter Storm, Thunderstorm, Tornado, Windstorm	Create emergency fuel supply and map other sources. Create a small emergency fuel supply for county vehicles and map other sources of fuel	Tama County Emergency Management, Tama County departments	Tama County Emergency Management	$9,999 or less	Medium	2023	Continue - Not Started
Tama Co-30	2	Tornado, Windstorm	Tornado Shelter for Camper and for Nature Center, Backup Generator for Nature Center	Tama County Conservation	FEMA HMA, State	$100,000 - $299,999	Medium	2024	New Action
Tama Co-31	2	Tornado, Windstorm	Establish storm shelters at the County Lake Park and County Fairgrounds	Tama County EMA	FEMA HMA, State	$100,000 - $299,999	Low	2024	New Action
Chelsea-01	1	Flooding	Acquisition and elevation of structures. The city will continue to acquire or elevate structures that are damaged by flooding. During flooding on the Iowa River in	City of Chelsea City Council, City Clerk, Mayor, Region 6 Planning	FEMA HMA, State	$300,000 or more	Medium	2024	Continue – In Progress The city completed three owner-occupied

ID	Goal	Hazard(s) Mitigated	Action Description/Background/Benefits	Lead Agency and Partners	Potential Funding	Cost Estimate	Priority	Timeline	Status/ Implementation Notes
			2014, five homes had flood waters on the first floors. These properties and other repetitive loss properties may be targeted for elevation or acquisition.	Commission, FEMA, State					buyouts on properties in Chelsea and elevated an additional five houses using a combination of NFIP and private funds.
Chelsea-02	1	Flooding	Maintain existing culverts and add new culverts. Keep existing culverts in good condition and add new culverts where they are needed in the city.	City of Chelsea, Engineering firm, others to be identified	City General Funds, County, State	$10,000 to $99,999	Low	Annual Implementation	Continue - Not Started
Chelsea-03	1	Flooding	Construct a levee to protect the community from flood waters.	City of Chelsea City Council, City Clerk, Mayor, Region 6 Planning Commission, FEMA, State, Army Corps of Engineers	FEMA HMA, USACE, City of Chelsea Local Options Sales Tax	$300,000 or more	Low	2027	Continue - Not Started
Chelsea-04	2	Tornado	Identify location for storm shelter for residents without basements	City of Chelsea, Clark/Council	City General Funds	$10,000 to $99,999	Low	2025	New Action
Clutier-01	1	Flooding	Add a lift station to the City's sanitary sewer when and where it is needed.	City of Clutier Sewer Department, TBD	FEMA HMA, City of Clutier General Fund, and	$300,000 or more	Medium	2025	Continue - Not Started

ID	Goal	Hazard(s) Mitigated	Action Description/Background/Benefits	Lead Agency and Partners	Potential Funding	Cost Estimate	Priority	Timeline	Status/ Implementation Notes
					others to be identified				
Clutier-02	1	Flooding	Add culverts where needed in Clutier	City of Clutier Sewer Department, TBD	FEMA HMA, City of Clutier General Funds, and others to be identified	$300,000 or more	Medium	2025	Continue - Not Started
Clutier-03	1	Flooding	Elevate all City roads or those that are identified as problematic or critical during and immediately following flood events	City of Clutier Street Department, Iowa Department of Transportation, Tama County Engineer, others to be identified	FEMA HMA, City of Clutier General Fund, and others to be identified	$300,000 or more	High	2025	Continue - Not Started
Clutier-04	1	Flooding, Severe Winter Storm, Thunderstorm, Tornado, Windstorm, Hazardous Materials Incident,	Construct a large shed for the City to store equipment and materials. The city plans to allocate funds from its budget and research additional grant funding. It will also establish a location for the shed that has quick and efficient access and will consider what materials an	City of Clutier Street Department, Sewer Department, and Maintenance Department TBD	City of Clutier General Funds, FEMA HMA, and others to be identified	$10,000 - $99,999	Low	2017	Continue - Not Started

ID	Goal	Hazard(s) Mitigated	Action Description/Background/Benefits	Lead Agency and Partners	Potential Funding	Cost Estimate	Priority	Timeline	Status/ Implementation Notes
		Human Disease	equipment should be stored in the shed.						
Clutier-05	2	Tornado, Thunderstorms, Windstorm	Construct safe room Construct a safe room in Clutier. Vulnerable populations in the city do not currently have access to a safe place in the event of inclement weather or tornado warnings	City of Clutier City Council, TBD	City of Clutier General Funds, FEMA HMA, others to be identified	$10,000 - $99,999	Medium	2020	Continue - Not Started
Clutier-06	2	Dam/Levee Failure, Flooding, Extreme Heat, Grass or Wildland Fire, Severe Winter Storm, Thunderstorm, Tornado, Windstorm, Hazardous Materials incident, Infrastructure Failure, Terrorism, Transportation Incident	Recruit and train new firemen and EMTs among Clutier residents. This action has already begun and will continue for the fire department. This action will also focus on First Responders.	City of Clutier Fire Department, First Responders TBD	City of Clutier General Funds, City of Clutier Fire Department, Assistance to Firefighters Grants, and others to be identified	$9,999 or less	Medium	Ongoing	Continue - In Progress

ID	Goal	Hazard(s) Mitigated	Action Description/Background/Benefits	Lead Agency and Partners	Potential Funding	Cost Estimate	Priority	Timeline	Status/ Implementation Notes
Clutier-07	3	Animal/Crop /Plant Disease, Dam/Levee Failure, Drought, Flooding, Extreme Heat, Grass or Wildland Fire, Severe Winter Storm, Thunderstorm, Tornado, Windstorm, Hazardous Materials incident, Infrastructure Failure, Terrorism, Transportation Incident	Public education program Create a program to educate Clutier residents about the dangers of hazard and how to prepare through informational flyers, meetings, or other interactive media like drills and workshops.	City of Clutier City Council To be identified, possibly other Tama County jurisdictions	City of Clutier General Funds and others to be identified	$9,999 or less	Medium	Ongoing	Continue - In Progress
Clutier-08	4	Dam/Levee Failure, Flooding, Extreme Heat, Grass or Wildland Fire, Severe Winter Storm,	Create a list of emergency contacts for City personnel to use during and immediately following a hazard event like Tama County Emergency Management, power company, other utility providers, etc.	City of Clutier City Council, Fire Department	None	None	Low	Ongoing	Continue - In Progress

ID	Goal	Hazard(s) Mitigated	Action Description/Background/Benefits	Lead Agency and Partners	Potential Funding	Cost Estimate	Priority	Timeline	Status/ Implementation Notes
		Thunderstorm, Tornado, Windstorm, Hazardous Materials incident, Infrastructure Failure, Terrorism, Transportation Incident							
Clutier-09	4	Flooding, Extreme Heat, Severe Winter Storm, Thunderstorm, Tornado, Windstorm, Terrorism	The city plans to develop an emergency command center with a safe room. The city will reach out to residents and make them aware that a safe room is available for use in case of emergency. The city will purchase a backup generator for this facility so that it can operate in the event of a power loss. The city will also develop a means of communication in the event of a disaster such as a phone tree for city officials and emergency personnel and a back-up door-to-door system.	City of Clutier City Council, Fire Department	None	None	Low	2017	Continue - Not Started
Dysart-01	1	Flooding, Severe Winter Storm,	Purchase new rescue equipment for City Shop and Fire Department. The city will update or replace	City of Dysart, Fire Department Chief, Public	City of Dysart Fire Department ,	$300,000 or more	Low	2025	Continue - In Progress. New equipment has been

ID	Goal	Hazard(s) Mitigated	Action Description/Background/Benefits	Lead Agency and Partners	Potential Funding	Cost Estimate	Priority	Timeline	Status/ Implementation Notes
		Thunderstorm, Tornado, Windstorm, Hazardous Materials Incident	substandard equipment for the City and Fire Department. The city continues to purchase equipment as department heads bring the needs before the City Council. Dysart maintains a savings account and plan for future purchases of these large ticket items.	Works Director TBD	Federal/State Grants, City General Fund, County Foundation				purchased by Fire Department (rescue truck new turn out gear, Public works has purchased new generators for lift stations during power outages
Dysart-02	2	Tornadoes, Thunderstorms, Windstorms	Update the City's emergency action plan and complete training. The city will make needed updates to the Dysart Emergency Action Plan and train City personnel and the public to make the updates effective. The city has implemented safety meetings six times per year that add to the emergency action plan and discuss other safety-related issues that affect the city. These meetings have all city department heads, the fire chief, the Mayor, and City Council members in attendance.	City of Dysart, City Clerk, Ambulance Director, Fire Chief All City of Dysart Departments, others to be identified	City of Dysart General Fund	$9,999 or less	Low	2022	Continue - In Progress. Changed to ongoing with the new plan being completed by 2022

ID	Goal	Hazard(s) Mitigated	Action Description/Background/Benefits	Lead Agency and Partners	Potential Funding	Cost Estimate	Priority	Timeline	Status/ Implementation Notes
Dysart-03	2	Tornadoes, Thunderstorms, Windstorms	Use siren to warn Dysart residents of severe weather. The city purchased a new siren in 2014. The city will use this siren to warn Dysart residents of severe weather situations.	City of Dysart Fire Department, Tama County Emergency Management	City of Dysart General Funds, Federal/State Grants, County Foundation	$9,999 or less	High	2024	Continue - In Progress. 3 sirens are available throughout the town for outdoor warning system with large city-wide siren for storms with can be set off by Fire Chief on mobile or by personnel within the fire station
Dysart-04	4	Flooding, Severe Winter Storm, Thunderstorm, Tornado, Windstorm, Hazardous Materials Incident, Infrastructure Failure, Radiological, Terrorism,	Purchase new communications equipment. The city will update or replace substandard communication equipment in all City departments. New radios were purchased for the police department in 2014. Until new equipment is purchased for other department, cell phones are used by public works, ambulance personnel, the police department, and City Hall when needed.	City of Dysart EMS/Ambulance, Fire Department TBD	City of Dysart General Fund, Federal and State Grants, County Foundation	$9,999 or less	High	2024	Continue - In Progress. Tama County Communications will be provider of new equipment to ambulance, fire and police with a change in communications county wide. The city

ID	Goal	Hazard(s) Mitigated	Action Description/Background/Benefits	Lead Agency and Partners	Potential Funding	Cost Estimate	Priority	Timeline	Status/ Implementation Notes
		Transportation Incident							of Dysart will look at purchasing 2-3 additional radios for the purpose of EOC communication during an event with department head who have been provided county equipment
Elberon-01	1	Flooding	Add culverts where needed in Elberon. The city plans to add several new culverts on the southwest side of town beginning in the summer of 2015.	City of Elberon, City Council, TBD	City of Elberon General Funds, others to be identified	$10,000 - $99,999	Low	2025	Continue - Not Started
Elberon-02	2	Infrastructure Failure	Update County-owned bridges and inspect annually. The City with possibly collaboration with the county engineer - will inspect bridges in and near the community on an annual basis. The city plans to take out a bridge located on the	City of Elberon, City Council, Tama County Engineer, others to be identified	City of Elberon General Funds, Tama County Engineer, others to be identified	$10,000 - $99,999	Medium	2022	Continue - Not Started

ID	Goal	Hazard(s) Mitigated	Action Description/Background/Benefits	Lead Agency and Partners	Potential Funding	Cost Estimate	Priority	Timeline	Status/ Implementation Notes
			east side of town and install a large culvert in that area.						
Elberon-03	2	Flooding, Severe Winter Storm, Thunderstorm, Tornado, Windstorm	Enforce building codes. The City will work on improving enforcement of building codes throughout Elberon	City of Elberon City Council, TBD	City of Elberon General Funds	Less than $10,000	Low	Annual Implementation	Continue - Not Started
Elberon-04	3	Infrastructure Failure	Smoke detector program. A program has been created that encourages residents to use and maintain smoke detector.	City of Elberon Fire Department, TBD	City of Elberon Fire Department, Assistance to Firefighters Grant	Less than $10,000	Low	2022	Continue - Not Started
Elberon-05	3	Animal/Crop/Plant Disease, Dam/Levee Failure, Drought, Flooding, Extreme Heat, Grass or Wildland Fire, Severe Winter Storm, Thunderstorm, Tornado, Windstorm,	Educate residents about disaster kits and encourage them to build one. Create a program or host meeting/workshop to teach Elberon residents about the benefits of disaster kits and the basic items needed to build one for their family and home. The city will include this information in water bills and put up posters near the garage, elevator, and the bar.	City of Elberon City Council, Fire Department, Tama County Emergency Management, others to be identified	City of Elberon General Funds, Fire Department, Tama County EMA	Less than $10,000	Low	2022	Continue - Not Started

ID	Goal	Hazard(s) Mitigated	Action Description/Background/Benefits	Lead Agency and Partners	Potential Funding	Cost Estimate	Priority	Timeline	Status/ Implementation Notes
		Hazardous Materials incident, Human Disease, Infrastructure Failure, Radiological, Terrorism, Transportation Incident							
Elberon-06	3	Animal/Crop /Plant Disease, Dam/Levee Failure, Drought, Flooding, Extreme Heat, Grass or Wildland Fire, Severe Winter Storm, Thunderstorm, Tornado, Windstorm, Hazardous Materials incident, Human Disease, Infrastructure	Distribute NOAA All-Hazard Radios to all Elberon residents. Create a program or secure funding to provide NOAA All-Hazard Radios to all Elberon residents	City of Elberon City Council, Tama County Emergency Management, others to be identified	City of Elberon General Funds, Fire Department, Tama County EMA	Less than $10,000	Low	2023	Continue - Not Started

ID	Goal	Hazard(s) Mitigated	Action Description/Background/Benefits	Lead Agency and Partners	Potential Funding	Cost Estimate	Priority	Timeline	Status/ Implementation Notes
		Failure, Radiological, Terrorism, Transportation Incident							
Elberon-07	4	Dam/Levee Failure, Drought, Flooding, Grass or Wildland Fire, Severe Winter Storm, Thunderstorm, Tornado, Windstorm, Hazardous Materials incident, Infrastructure Failure, Radiological, Terrorism, Transportation Incident	Construct new fire station with generators. Replace the existing fire station and install generators to maintain communication with County EMS and Sherriff's Department during a hazard event. The city has already formed a committee to evaluate a station remodel or new build. The city purchased a generator during the last plan. The generator is housed at the current fire station until the new fire station is built.	City of Elberon Fire Department, City Council, TBD	City of Elberon General Funds, Fire Department, County Foundation, FEMA HMA	$100,000 - $299,999	Medium	2023	Continue - Not Started
Elberon-08	4	Flooding, Severe Winter Storm, Thunderstorm, Tornado, Windstorm	Create a citywide plan for cleaning up after hazard events that cause trees, housing materials, and other debris to block roadways	City of Elberon City Council, Fire Department, Tama County Emergency Management,	City of Elberon General Funds, Fire Department, Tama	Less than $10,000	Low	2023	Continue - Not Started

ID	Goal	Hazard(s) Mitigated	Action Description/Background/Benefits	Lead Agency and Partners	Potential Funding	Cost Estimate	Priority	Timeline	Status/ Implementation Notes
				others to be identified	County EMA				
Elberon-09	4	Animal/Crop /Plant Disease, Dam/Levee Failure, Drought, Flooding, Extreme Heat, Grass or Wildland Fire, Severe Winter Storm, Thunderstorm, Tornado, Windstorm, Hazardous Materials incident, Human Disease, Infrastructure Failure, Radiological, Terrorism, Transportation Incident	Establish a command center. Decide where a command center for the city will be located if a major disaster occurs.	City of Elberon City Council, Fire Department, Tama County EMA	City of Elberon General Funds, Fire Department, Tama County EMA	Less than $10,000	Low	2024	Continue - Not Started
Elberon-10	2, 3	Winter Storm	Develop Winter Storm Plan - Shelter Location / Moving People to Loc. / Food and	Elberon City Council	City funds	Less than $10,000	Low	2024	New Action

ID	Goal	Hazard(s) Mitigated	Action Description/Background/Benefits	Lead Agency and Partners	Potential Funding	Cost Estimate	Priority	Timeline	Status/ Implementation Notes
			Sleeping Arrangements, Medications,						
Garwin-01	1	Flooding, Grass or Wildland Fire, Severe Winter Storm, Thunderstorm, Tornado, Windstorm, Hazardous Materials incident, Transportation Incident	Build a new fire station. The city's fire station needs an updated building that will include more storage space for more equipment.	City of Garwin City Council, Fire Department Tama County Emergency Management, others to be identified	City of Garwin Property Taxes, FEMA HMA, others to be identified	$300,000 or more	High	2023	Continue - In Progress. Location secured, construction planned for 2022-2023
Garwin-02	1	Tornado, Thunderstorm, Windstorm	Construct a safe room for Garwin residents and visitors to use during severe weather. The location of the safe room is still to be determined, but it could potentially be located at the High School. A new disaster plan includes plans to build the safe room and command center. A verbal agreement with the school is in place, and the city will work to create a written agreement with the school.	City of Garwin City Council, GMG Community School District GMG Community School District, others to be identified	City of Garwin Property Taxes, Federal and State Grants, FEMA HMA	$300,000 or more	Medium	2019	Continue - Not Started.

ID	Goal	Hazard(s) Mitigated	Action Description/Background/Benefits	Lead Agency and Partners	Potential Funding	Cost Estimate	Priority	Timeline	Status/ Implementation Notes
Garwin-03	1	Animal/Crop /Plant Disease, Dam/Levee Failure, Drought, Flooding, Extreme Heat, Grass or Wildland Fire, Severe Winter Storm, Thunderstorm, Tornado, Windstorm, Hazardous Materials incident, Human Disease, Infrastructure Failure, Radiological, Terrorism, Transportation Incident	Encourage residents to sign up for Alert Iowa. The city will change over to a new alert system, Alert Iowa, and will encourage residents to sign up for the system so that they can be notified in a timely manner when the city issues boil orders and other important notices or warnings.	City of Garwin City Clerk Tama County Emergency Management, others to be identified	N/A	Less than $10,000	High	Annual Implementation	Continue - Annual Implementation
Garwin-04	2	Dam/Levee Failure, Flooding, Grass or Wildland Fire, Severe	Establish and plan for a particular location to be Garwin's command center if a disaster were to occur. The location of the command center could potentially be	City of Garwin City Council, GMG Community School District Tama County	None	Less than $10,000	Medium	2022	Continue - Not Started.

ID	Goal	Hazard(s) Mitigated	Action Description/Background/Benefits	Lead Agency and Partners	Potential Funding	Cost Estimate	Priority	Timeline	Status/ Implementation Notes
		Winter Storm, Thunderstorm, Tornado, Windstorm, Human Disease, Infrastructure Failure, Radiological, Terrorism, Transportation Incident	located at the Fire Station or the High School. A new disaster plan includes plans to build the safe room and command center. A verbal agreement with the school is in place, and the city will work to create a written agreement with the school.	Emergency Management, others to be identified					
Garwin-05	3	Flooding	Create ditches and repair culverts. The city plans to improve its drainage system by creating ditches and repairing existing culverts. Better drainage will decrease flooding and street erosion.	City of Garwin, City Maintenance Manager Tama County Emergency Management, others to be identified	City of Garwin Property Tax, Road Use Tax	\$10,000 - \$99,999 the community estimated the cost to be close to \$25,000	Medium	2024	Continue - Not Started.
Garwin-06	2	Extreme Heat, Severe Winter Storm, Thunderstorm, Tornado, Windstorm, Infrastructure Failure	Generator / Back-Up power for Library - Serve as Emergency Shelter and Cooling Center	Garwin City Council	FEMA HMA	\$10,000 - \$99,999	High	2024	New Action

ID	Goal	Hazard(s) Mitigated	Action Description/Background/Benefits	Lead Agency and Partners	Potential Funding	Cost Estimate	Priority	Timeline	Status/ Implementation Notes
Gladbrook-01	2	Tornado	The city will relocate a smaller tornado siren to the east side of town so that residents in this area can better hear the siren. The city will also pursue the addition of wireless/radio control capacity of the siren so that it can be activated remotely.	City of Gladbrook City Council, Clerk, Public Works, Tama County Emergency Management	City of Gladbrook General Funds, additional grant sources to be identified	$9,999 or less	Medium	2022	Continue – In Progress
Gladbrook-02	3	Animal/Crop /Plant Disease, Dam/Levee Failure, Drought, Flooding, Extreme Heat, Grass or Wildland Fire, Severe Winter Storm, Thunderstorm, Tornado, Windstorm, Hazardous Materials incident, Human Disease, Infrastructure Failure, Radiological,	Develop emergency procedures with assistance. The City of Gladbrook will develop emergency procedures for the city with guidance of an emergency management professional	City of Gladbrook City Council, Fire Department Tama County Emergency Management, some sort of emergency management organization or consultant, others to be identified	City of Gladbrook General Fund, Property Tax	$9,999 or less	Low	2022	Continue - Annual Implementation.

ID	Goal	Hazard(s) Mitigated	Action Description/Background/Benefits	Lead Agency and Partners	Potential Funding	Cost Estimate	Priority	Timeline	Status/ Implementation Notes
		Terrorism, Transportation Incident							
Gladbrook-03	3	Animal/Crop /Plant Disease, Dam/Levee Failure, Drought, Flooding, Extreme Heat, Grass or Wildland Fire, Severe Winter Storm, Thunderstorm, Tornado, Windstorm, Hazardous Materials incident, Human Disease, Infrastructure Failure, Radiological, Terrorism, Transportation Incident	Once emergency procedures are developed, create a program to inform Gladbrook residents about their details and execution	City of Gladbrook City Council, City Clerk, Fire Department Tama County Emergency Management, others to be identified	City of Gladbrook General Fund, Property Tax	$9,999 or less	Low	Within 1 year of plan adoption	Continue - In Progress.
Gladbrook-04	3	Animal/Crop /Plant Disease,	Daycare/Pre-School age hazard education. Create a	City of Gladbrook City Council,	City of Gladbrook General	$9,999 or less	Low	Within 1 year of plan adoption	Continue - Annual

ID	Goal	Hazard(s) Mitigated	Action Description/Background/Benefits	Lead Agency and Partners	Potential Funding	Cost Estimate	Priority	Timeline	Status/ Implementation Notes
		Dam/Levee Failure, Drought, Flooding, Extreme Heat, Grass or Wildland Fire, Severe Winter Storm, Thunderstorm, Tornado, Windstorm, Hazardous Materials incident, Human Disease, Infrastructure Failure, Radiological, Terrorism, Transportation Incident	hazard education program that targets a youth audience.	Fire Department Private Businesses, Tama County Emergency Management, others to be identified	Fund, Local Grant				Implementation
Gladbrook-05	4	Flooding, Infrastructure Failure	Complete storm drainage improvements	City of Gladbrook City Council, Public Works TBD	City of Gladbrook Local Options Sales Tax, General Fund, Road Use Tax	$100,000 or more	Medium	5 or more years from plan adoption	Continue - Annual Implementation

ID	Goal	Hazard(s) Mitigated	Action Description/Background/Benefits	Lead Agency and Partners	Potential Funding	Cost Estimate	Priority	Timeline	Status/ Implementation Notes
Gladbrook-06	4	Infrastructure Failure, Severe Winter Storm, Thunderstorm, Tornado, Windstorm,	Sewer improvements and purchase generator for backup. General storm & sanitary sewer improvements. Improve inflow and infiltration issues in lagoon. Replace or clean and line sewer mains and manholes.	City of Gladbrook Public Works TBD	City of Gladbrook Sewer Fund, Capital Projects Fund, Local Grant Project Fund	$10,000 - $99,999	Medium	Within 1 year of plan adoption	Continue - Annual Implementation
Lincoln-01	1	Severe Winter Storm	Purchase equipment for snow and debris removal. The city currently has sufficient equipment, but they might make a purchase in the next five years.	City of Lincoln Fire Department, City Council TBD	City of Lincoln General Funds	$10,000 - $99,999	Low	2026	Continue - Not Started
Lincoln-02	2	Infrastructure Failure, Grass and Wildland Fire	Update the Lincoln Fire Department's equipment. The city currently has sufficient equipment at this time, but they might make a purchase in the next five years. A large grant in the last several years allowed the city to purchase special fire suits and other items.	City of Lincoln Fire Department, City Council TBD	City of Lincoln General Funds, grants	$10,000 - $99,999	Low	2025	Continue - Not Started
Lincoln-03	2	Tornado	Update emergency siren. The siren currently works, but it is old and could fail. As long as it remains in working order, the city will not prioritize its replacement. If the city does need to replace the siren,	City of Lincoln Fire Department, City Council Tama County Emergency Management	FEMA HMA, City of Lincoln General Funds	$10,000 - $99,999. New sirens can cost up to $25,000, used sirens are	High	2022	Continue - Not Started

ID	Goal	Hazard(s) Mitigated	Action Description/Background/Benefits	Lead Agency and Partners	Potential Funding	Cost Estimate	Priority	Timeline	Status/ Implementation Notes
			they would search for an updated model with backup power and a switch that allows remote triggering so that Tama County Emergency Management can activate the siren when appropriate.			sometimes available for purchase, which helps reduce the cost			
Lincoln-04	2	Dam/Levee Failure, Drought, Flooding, Extreme Heat, Grass or Wildland Fire, Severe Winter Storm, Thunderstorm, Tornado, Windstorm, Hazardous Materials incident, Human Disease, Infrastructure Failure, Radiological, Terrorism, Transportation Incident	Train a local citizen to be an EMT Recruit and train a new Emergency Medical Technician who is a Lincoln resident. The training itself will rely on assistance from the fire department and ambulance services. The volunteer citizen will not be compensated.	City of Lincoln Fire Department, City Council, Ambulance Service Gladbrook Emergency Medical Response, others to be identified	City of Lincoln Fire Department	Less than $9,999	Low	2023	Continue - Not Started

ID	Goal	Hazard(s) Mitigated	Action Description/Background/Benefits	Lead Agency and Partners	Potential Funding	Cost Estimate	Priority	Timeline	Status/ Implementation Notes
Lincoln-05	2	Flooding, Extreme Heat, Severe Winter Storm, Thunderstorm, Tornado, Windstorm	Remodel Amvet Hall for community shelter. The Amvet Hall has already been used as a shelter in the past during the ice storm in 2007. The building has a backup generator available and plenty of space. The city will work with the Amvet Hall to make sure that it can continue to be used as a shelter in the future. The whole building could use update improvements (new roof, updated ceiling, plumbing, insulation, etc.). Amvet has already taken steps to fund some of these improvements; the organization got a grant from the Tama County Foundation to replace the roof. Any future funding for updates (and associated work) would be the responsibility of the Amvet Hall.	City of Lincoln City Council, Amvet Hall TBD	City Foundation, County Foundation, FEMA HMA	$10,000 - $99,999	Medium	2024	Continue - Not Started
Lincoln-06	3	Animal/Crop/Plant Disease, Dam/Levee Failure, Drought, Flooding,	Create an emergency, strategic plan of action for disasters i.e. determine who makes the call to open a shelter, when should the shelter be opened, etc. Create a plan of action for disasters	City of Lincoln Fire Department All City Departments, Tama County Emergency	City of Lincoln General Funds, Fire Department	Less than $9,999	Low	2022	Continue - Not Started

ID	Goal	Hazard(s) Mitigated	Action Description/Background/Benefits	Lead Agency and Partners	Potential Funding	Cost Estimate	Priority	Timeline	Status/ Implementation Notes
		Extreme Heat, Grass or Wildland Fire, Severe Winter Storm, Thunderstorm, Tornado, Windstorm, Hazardous Materials incident, Human Disease, Infrastructure Failure, Radiological, Terrorism, Transportation Incident	determining who makes the call to open a shelter, when should the shelter be opened, etc. This plan should also consider the actions that would be taken in the event of an accident at the Heartland Coop with anhydrous or grain.	Management, and others to be identified					
Montour-01	1	Flooding	Create a committee that is responsible for organizing sandbagging efforts when they are needed	City of Montour Fire Department, Mayor, City Council, Tama County Emergency Management, interested citizen volunteers	Tama County EMA	$9,999 or less	Low	2023	Continue - Not Started

ID	Goal	Hazard(s) Mitigated	Action Description/Background/Benefits	Lead Agency and Partners	Potential Funding	Cost Estimate	Priority	Timeline	Status/ Implementation Notes
Montour-02	1	Flooding	Keep existing culverts in good condition through regular inspection and maintenance	City of Montour City Council, TBD	City of Montour General Fund, others to be identified	$9,999 or less	Low	Annual Implementation	Continue – in Progress
Montour-03	1	Flooding	Regular debris removal from waterways. Create a community wide or city government initiative to regularly inspect waterways and remove debris	City of Montour Water Department, Safety Committee, others to be identified	City of Montour Property Taxes, volunteer labor	$9,999 or less	Low	Annual Implementation	Continue – in Progress
Montour-04	1	Flooding, Infrastructure Failure	Annually inspect roads, culverts, creeks, and city facilities. Annually inspect the City's physical and natural assets i.e. infrastructure, buildings, waterways, etc.	City of Montour Public Works, Tama County, Safety Committee, Volunteers	City of Montour Property Taxes	$9,999 or less	Low	Annual Implementation	Continue – in Progress
Montour-05	1	Severe Winter Storm, Thunderstorm, Tornado, Windstorm, Infrastructure Failure	Install surge protection. The city would like to install surge protection in critical places such as the office of the City Clerk and the lift station.	City of Montour City Council, Tama County Emergency Management, others to be identified	City of Montour Local Options Sales Tax, FEMA HMA, others to be identified	$10,000 - $99,999	Medium	2024	Continue - Not Started

ID	Goal	Hazard(s) Mitigated	Action Description/Background/Benefits	Lead Agency and Partners	Potential Funding	Cost Estimate	Priority	Timeline	Status/ Implementation Notes
Montour-06	1	Infrastructure Failure	Look into backflow rebate forms. The city will look into backflow rebate forms for residents who experience flooding from sewer backups. It would be beneficial to residents to have backflow valves for individual homeowners. The city will research the possibility of a rebate program for residents who wish to purchase the backflow valve	City of Montour City Council, Tama County Emergency Management, others to be identified	City of Montour Local Options Sales Tax, FEMA HMA, others to be identified	$10,000 - $99,999	Low	2024	Continue - Not Started
Montour-07	2	Thunderstorm, Tornado, Windstorm, Hazardous Materials Incident, Radiological	A new siren warning system should include an audio system that can give Montour residents more information about the warning for which the siren warning system is being used.	City of Montour City Council, TBD	City of Montour Local Options Sales Tax, FEMA HMA, others to be identified	$10,000 - $99,999	Medium	2025	Continue - Not Started
Montour-08	2	Thunderstorm, Tornado, Windstorm, Hazardous Materials Incident, Radiological	Purchase generator / battery for warning siren and install hookup. This backup power source would be used for the current warning siren or the new siren system if the city is able to update the system.	City of Montour City Council, TBD	City of Montour General Fund, FEMA HMA, others to be identified	$10,000 - $99,999	Medium	2026	Continue - Not Started
Montour-09	2	Flooding, Extreme Heat, Severe	The city would like to purchase a backup generator for the City Shed	City of Montour City Council, TBD	FEMA HMA, City of Montour	$10,000 - $99,999	Medium	2024	Continue - Not Started

ID	Goal	Hazard(s) Mitigated	Action Description/Background/Benefits	Lead Agency and Partners	Potential Funding	Cost Estimate	Priority	Timeline	Status/ Implementation Notes
		Winter Storm, Thunderstorm, Tornado, Windstorm I			General Fund, others to be identified				
Montour-10	2	Hazardous Materials Incident, Radiological	County firefighter training for Montour fire department. The city would like to train its firefighters on issues related to hazardous materials and anhydrous ammonia.	City of Montour City Council, Tama County Emergency Management, others to be identified	City of Montour General Fund, FEMA HMA	$10,000 - $99,999	Medium	Annual Implementation	Continue – in Progress
Montour-11	2	Hazardous Materials	Create hazard manual for Montour fire department. The city would like to create a hazard manual for the fire department	City of Montour Fire Department, Tama County Emergency Management, others to be identified	City of Montour Fire Department	$9,999 or less	Low	2024	Continue - Not Started
Montour-12	3	Animal/Crop /Plant Disease, Dam/Levee Failure, Drought, Flooding, Extreme Heat, Grass or Wildland Fire, Severe Winter	Active safety committee. Keep the newly formed safety committee active in the community	City of Montour Fire Department, TBD	City of Montour Fire Department	$9,999 or less	Low	Annual Implementation	Continue – in Progress

ID	Goal	Hazard(s) Mitigated	Action Description/Background/Benefits	Lead Agency and Partners	Potential Funding	Cost Estimate	Priority	Timeline	Status/ Implementation Notes
		Storm, Thunderstorm, Tornado, Windstorm, Hazardous Materials incident, Human Disease, Infrastructure Failure, Radiological, Terrorism, Transportation Incident							
Montour-13	3	Animal/Crop /Plant Disease, Dam/Levee Failure, Drought, Flooding, Extreme Heat, Grass or Wildland Fire, Severe Winter Storm, Thunderstorm, Tornado, Windstorm, Hazardous Materials	Maintain participation in Alert Iowa. The city will implement a new warning system, Alert Iowa, and will maintain participation in that program and encourage Montour residents to register and keep their contact information up to date.	City of Montour, Tama County Emergency Management	None	None	High	Annual Implementation	Continue – in Progress

ID	Goal	Hazard(s) Mitigated	Action Description/Background/Benefits	Lead Agency and Partners	Potential Funding	Cost Estimate	Priority	Timeline	Status/ Implementation Notes
		incident, Human Disease, Infrastructure Failure, Radiological, Terrorism, Transportation Incident							
Montour-14	3	Animal/Crop /Plant Disease, Dam/Levee Failure, Drought, Flooding, Extreme Heat, Grass or Wildland Fire, Severe Winter Storm, Thunderstorm, Tornado, Windstorm, Hazardous Materials incident, Human Disease, Infrastructure Failure, Radiological,	The city would like to plan a community meeting that would inform Montour residents of the risk of hazards and other dangerous situations	City of Montour City Council, Community Clubs and Organizations	City of Montour General Fund	$9,999 or less	Low	Annual Implementation	Continue - Not Started

ID	Goal	Hazard(s) Mitigated	Action Description/Background/Benefits	Lead Agency and Partners	Potential Funding	Cost Estimate	Priority	Timeline	Status/ Implementation Notes
		Terrorism, Transportation Incident							
Tama-01	1	Infrastructure Failure	Community smoke detector program. Create a program to encourage Tama residents to properly maintain smoke detectors in their homes. This project has been established and is currently funded by the city, but additional grant funding sources need to be identified so that the program can continue.	Tama Fire Department, City of Tama, others to be identified	Tama Fire Department, City of Tama, Fundraising, others to be identified	$10,000 - $99,999	Low	Annual Implementation	Continue – In Progress
Tama-02	1	Flooding, Severe Winter Storm, Thunderstorm, Tornado, Windstorm, Terrorism	Scan and maintain critical records	City of Tama City Clerk, TBD	City of Tama Property Tax	$9,999 or less	Low	2023	Continue - Not Started
Tama-03	1	Flooding, Infrastructure Failure	Continue annual maintenance of dikes, dike pumps, and dike gates. Continue annual maintenance of dikes, dike pumps, and dike gates	City of Tama Public Works Department, TBD	City of Tama Property Taxes	$100,00 - $299,999	Medium	Annual Implementation	Continue - Not Started
Tama-04	1	Dam/Levee Failure, Flooding, Extreme Heat, Severe Winter	Purchase generator and generator hookup. There is no generator if electricity fails to the dike pumps. The purchase of a generator and generator hookup would	City of Tama Sewer Department, TBD	City of Tama Utility Revenue	$9,999 or less	High	2023	Continue - Not Started

ID	Goal	Hazard(s) Mitigated	Action Description/Background/Benefits	Lead Agency and Partners	Potential Funding	Cost Estimate	Priority	Timeline	Status/ Implementation Notes
		Storm, Thunderstorm, Tornado, Windstorm, Infrastructure Failure	keep the dike pumps up and running in the event of a power loss.						
Tama-05	1	Infrastructure Failure, Drought	Create a plan for backup water supply if the water treatment facility fails. Determine and plan how city would cope if a disaster occurred that took out the water treatment facility.	City of Tama Water Department, TBD	City of Tama Utility Revenue	$100,000 - $299,999	Low	2022	Continue - Not Started
Tama-06	2	Dam/Levee Failure, Flooding, Tornado, Hazardous Materials Incident, Radiological, Terrorism	Establish a citywide evacuation plan for situations when large scale evacuation is needed. Once the evacuation plan has been established, the city will perform outreach to residents to inform them of the plan.	City of Tama Fire Department, Tama County Emergency Management, others to be identified	City of Tama Property Tax	$9,999 or less	Low	2023	Continue - Not Started
Tama-07	3	Dam/Levee Failure, Flooding, Extreme Heat, Grass or Wildland Fire, Severe Winter Storm, Thunderstorm, Tornado,	Training for fire department and emergency medical services. Fire Department and EMS update or complete additional training	City of Tama Fire Department and EMS, City of Tama, others to be identified	City of Tama Fire Department, EMS, Assistance to Fire Fighter Grant, others to be identified	$10,000 - $99,999	Low	Annual Implementation	Continue - Not Started

ID	Goal	Hazard(s) Mitigated	Action Description/Background/Benefits	Lead Agency and Partners	Potential Funding	Cost Estimate	Priority	Timeline	Status/ Implementation Notes
		Windstorm, Hazardous Materials incident, Human Disease, Infrastructure Failure, Radiological, Terrorism, Transportation Incident							
Tama-08	3	Hazardous Materials Incident	Inform residents of evacuation plan for hazardous materials incidents. Create an informational campaign about the evacuation plan for a hazardous materials incident	City of Tama Fire Department, Tama County Emergency Management, others to be identified	City of Tama Property Taxes, others to be identified	$9,999 or less	Low	2022	Continue - Not Started
Tama-09	3	Animal/Crop/Plant Disease, Dam/Levee Failure, Drought, Flooding, Extreme Heat, Grass or Wildland Fire, Severe Winter Storm,	Public outreach about hazards through mailings or Facebook. Create short articles and publish the different hazards that the community may face either through a mailing or Facebook post, or through local papers.	City of Tama City Clerk, TBD	City of Tama Property Taxes	$9,999 or less	Medium	Annual Implementation	Continue - Not Started

ID	Goal	Hazard(s) Mitigated	Action Description/Background/Benefits	Lead Agency and Partners	Potential Funding	Cost Estimate	Priority	Timeline	Status/ Implementation Notes
		Thunderstorm, Tornado, Windstorm, Hazardous Materials incident, Human Disease, Infrastructure Failure, Radiological, Terrorism, Transportation Incident							
Tama-10	4	Dam/Levee Failure, Flooding, Extreme Heat, Severe Winter Storm, Thunderstorm, Tornado, Windstorm, Infrastructure Failure, Radiological, Terrorism	Purchase generator for City Hall. The city has identified City Hall as the communications station during a disaster. Because of this designation, it is important that this building have access to a backup power source in the event of a power outage.	City of Tama Public Works, TBD	City of Tama Property Tax, FEMA HMA, and others to be identified	$10,000 - $99,999	High	2023	Continue - Not Started
Tama-11	2	Flooding, Extreme Heat, Severe Winter Storm,	Generator for shelter and cooling center	Tama Town Council	City of Tama Property Tax, FEMA HMA, and	$10,000 - $99,999	Medium	2023	New Action

ID	Goal	Hazard(s) Mitigated	Action Description/Background/Benefits	Lead Agency and Partners	Potential Funding	Cost Estimate	Priority	Timeline	Status/ Implementation Notes
		Thunderstorm, Tornado, Windstorm, Infrastructure Failure,			others to be identified				
Tama-12	1	Flooding,	Generator at Flood Pumps	Tama Town Council	City of Tama Property Tax, FEMA HMA, and others to be identified	$10,000 - $99,999	Low	2023	New Action
Toledo-01	1	Flooding	Demolish current structures in Deer Creek flood hazard area Limit and gradually reduce the amount of development in the Deer Creek flood hazard area.	City of Toledo Public Works, TBD	City of Toledo Property Tax, FEMA HMA	$100,000 - $299,999	Medium	Annual Implementation	Continue - Annual Implementation. Have been closely evaluating any development near Deer Creek flood area
Toledo-02	2	Tornado, Thunderstorm, Windstorm	Construct safe room for combined mobile home park, Reinig Center, and daycare Construct a safe room near the mobile home park, Reinig Center, and daycare	City of Toledo EMS, Fire Department, Public Works Department TBD	FEMA HMA and PDM, City of Toledo Property Tax, others to be identified	$10,000 - $99,999	Medium	2024	Continue - Not Started. Kids Corner Day Care has a safe room for its occupants.

ID	Goal	Hazard(s) Mitigated	Action Description/Background/Benefits	Lead Agency and Partners	Potential Funding	Cost Estimate	Priority	Timeline	Status/ Implementation Notes
Toledo-03	3	Animal/Crop /Plant Disease, Dam/Levee Failure, Drought, Flooding, Extreme Heat, Grass or Wildland Fire, Severe Winter Storm, Thunderstorm, Tornado, Windstorm, Hazardous Materials incident, Human Disease, Infrastructure Failure, Radiological, Terrorism, Transportation Incident	Subsidize individual purchase of NOAA All-Hazard radios Create a program to help Toledo residents purchase radios at a discount or with a rebate	City of Toledo EMS, Police Department Tama County Emergency Management, others to be identified	City of Toledo Property Tax, Federal Grants, others to be identified	$100,000 - $299,999	Medium	2023	Continue - Not Started.
Toledo-04	3	Animal/Crop /Plant Disease, Dam/Levee Failure, Drought,	Establish monthly publicity campaigns to remind residents of seasonal hazards through radio, newspaper, or other media risks i.e. cooling centers in the summer,	City of Toledo City Council, City Clerk Tama County Emergency Management	City of Toledo Local Option Sales Tax, Tama	$9,999 or less	Medium	2024	Continue - Not Started.

ID	Goal	Hazard(s) Mitigated	Action Description/Background/Benefits	Lead Agency and Partners	Potential Funding	Cost Estimate	Priority	Timeline	Status/ Implementation Notes
		Flooding, Extreme Heat, Grass or Wildland Fire, Severe Winter Storm, Thunderstorm, Tornado, Windstorm, Hazardous Materials incident, Human Disease, Infrastructure Failure, Radiological, Terrorism, Transportation Incident	shelter during power outage, using NOAA All-Hazard radios, etc. The city has already begun this campaign through the local newspaper and will continue it into the next plan	(could possibly be countywide program)	County, others to be identified				
Toledo-05	3	Flooding, Extreme Heat, Severe Winter Storm, Thunderstorm, Tornado, Windstorm	Homeowner inspections. Provide vulnerability checklists to homeowners	City of Toledo City Council, Fire Department Tama County Emergency Management, others to be identified	City of Toledo, Tama County, FEMA HMA, others to be identified	$9,999 or less	Medium	2025	Continue - Not Started.
Toledo-06	3	Drought	Develop drought plan. Work with experts to develop of drought plan for the city and	City of Toledo City Council, US Army	Tama County Conservatio	$10,000 - $99,999	Medium	2022	Continue - In Progress.

ID	Goal	Hazard(s) Mitigated	Action Description/Background/Benefits	Lead Agency and Partners	Potential Funding	Cost Estimate	Priority	Timeline	Status/ Implementation Notes
			discourage unnecessary water usage.	Corps of Engineers, NRCS Tama County Emergency Management, County Conservation	n, others to be identified				
Toledo-07	3	Drought	Water conservation. Encourage homeowners to perform regular checks for water leaks	City of Toledo City Council, US Army Corps of Engineers, NRCS Tama County Emergency Management, others to be identified	Tama County Conservation, others to be identified	$10,000 - $99,999	Low	Annual Implementation	Continue – In Progress
Toledo-08	4	Flooding, Extreme Heat, Grass or Wildland Fire, Severe Winter Storm, Thunderstorm, Tornado, Windstorm, Infrastructure Failure, Terrorism	Purchase generators for water/sewer plant and Reining Center. Purchase generator for critical facilities and complete needed steps to make generator use possible in these facilities. A generator has already been purchased for the water/sewer plant.	City of Toledo City Council Tama County Economic Development, others to be identified	FEMA HMA, City of Toledo General Fund, others to be identified	$10,000 - $99,999	High	Ongoing	Continue - In Progress. Reining Center, Water Plant, Sewer Plant, Lift Station, Police Station, Fire Station and Day Care all have generator back up. Need Generators for

ID	Goal	Hazard(s) Mitigated	Action Description/Background/Benefits	Lead Agency and Partners	Potential Funding	Cost Estimate	Priority	Timeline	Status/ Implementation Notes
									the Bostian Lift Station and City shop.
Toledo-09	4	Flooding, Extreme Heat, Severe Winter Storm, Thunderstorm, Tornado, Windstorm, Infrastructure Failure	Purchase portable generation equipment and wiring for critical facilities like gas stations and grocery store.	Private Property Owners Critical facilities wanting to participate	Private businesses, Federal/State Grants	$100,000 - $299,999	Low	2024	Continue – In Progress.
Traer-01	1	Flooding, Extreme Heat, Severe Winter Storm, Thunderstorm, Tornado, Windstorm, Infrastructure Failure	The city would like to construct a shelter facility at the school or other location. The city is currently considering building a new public safety building in the next five years that would replace its fire station, ambulance and public works buildings with one common building. All of these structures are too small for their current equipment. Current buildings were constructed in the 1930s. The city would hope to have a safe room constructed as a multi-use safe room / training facility at the new building	North Tama County School Board, Traer City Council TBD	FEMA HMA, City of Traer Bond	$100,000 - $299,999	High	2025	Continue - In Progress. The City Council is currently discussing these plans, and hopes to talk more on this topic

ID	Goal	Hazard(s) Mitigated	Action Description/Background/Benefits	Lead Agency and Partners	Potential Funding	Cost Estimate	Priority	Timeline	Status/ Implementation Notes
Traer-02	1	Dam/Levee Failure, Flooding, Extreme Heat, Severe Winter Storm, Thunderstorm, Tornado, Windstorm	Require and create emergency plans for vulnerable populations in Traer	City of Traer City Council, Organizations serving vulnerable populations, Tama County Emergency Management, others to be identified	City of Traer General Funds, Grants, Organizations serving vulnerable populations, others to be identified	Less than $9,999	Low	2023	Continue – Not Started.
Traer-03	1	Tornado, Thunderstorm, Windstorm	Purchase a siren to serve residents on the west side of the city.	City of Traer City Council, Fire Dept. Tama County Emergency Management, others to be identified	FEMA HMA, City of Traer Bond, others to be identified	$10,000 to $99,999 – The city estimated the cost to be between $15,000 and $18,000	Medium	2023	Continue - Not Started.
Traer-04	2	Flooding, Severe Winter Storm, Thunderstorm, Tornado, Windstorm, Infrastructure Failure	Purchase generator for critical facilities and complete needed steps to make generator use possible in these facilities.	City of Traer Utility Board TBD	FEMA HMA, Tama County Foundation, others to be identified	Less than $9,999	High	2022	Continue – In Progress. The city has already purchased several small generators but need more.
Traer-05	2	Flooding, Extreme Heat, Severe	Construct safe room for local government operations and Traer residents. The safe	City of Traer City Council, Fire,	FEMA HMA and PDM, City of	$300,000 or more	High	2022	Continue - In Progress.

ID	Goal	Hazard(s) Mitigated	Action Description/Background/Benefits	Lead Agency and Partners	Potential Funding	Cost Estimate	Priority	Timeline	Status/ Implementation Notes
		Winter Storm, Thunderstorm, Tornado, Windstorm	room will be housed within a new building to park the city's ambulances. The city would like to complete this action before the next cycle of ambulance purchases in six or more years so that the new ambulances will have a garage that fits them.	Ambulance, TBD	Traer Bond, others to be identified				
Traer-06	2	Flooding, Extreme Heat, Severe Winter Storm, Thunderstorm, Tornado, Windstorm, Hazardous Materials Incident, Transportation Incident	Purchase additional emergency equipment i.e. fire, ambulance, etc. Assess City's Departments' needs and purchase additional equipment i.e. emergency equipment for fire and ambulance	City of Traer Fire Department, Ambulance Department All City Departments	Assistance to Firefighter Grants, FEMA HMPG, City Fire Department, others to be identified	$10,000 to $99,999	Medium	2023	Continue – Not Started
Traer-07	2	Dam/Levee Failure, Flooding, Extreme Heat, Severe Winter Storm, Thunderstorm, Tornado, Windstorm, Hazardous	Create Police Department. There is interest in creating a Traer Police Department or sharing some services with the City of Dysart. The City of Traer currently relies on the county for police services. The city is already using operating funds to fund this service from the county. Traer would like to put these	City of Traer City Council Tama County Sherriff's Department, City of Dysart, others to be identified	City of Traer General Funds, FEMA HMA, others to be identified	$10,000 to $99,999 (currently covered by operating costs)	Low	2024	Continue – Not Started

ID	Goal	Hazard(s) Mitigated	Action Description/Background/Benefits	Lead Agency and Partners	Potential Funding	Cost Estimate	Priority	Timeline	Status/ Implementation Notes
		Materials Incident, Terrorism, Transportation Incident	operating funds into funding its own police department. The city may seek out additional grant funding for one-time equipment purchase to get the department up and running.						
Traer-08	3	Flooding, Extreme Heat, Severe Winter Storm, Thunderstorm, Tornado, Windstorm	Replace the existing fire and ambulance building that are also safe rooms	City of Traer City Council, Fire Department, Ambulance Department TBD	FEMA HMA, Assistance to Firefighter Grants, City of Traer Bond, others to be identified	$300,000 or more	Medium	2022	Continue - In Progress. Starting the process of talking and looking at potential space in 2021.
Vining-01	1	Animal/Crop/Plant Disease, Dam/Levee Failure, Drought, Flooding, Extreme Heat, Grass or Wildland Fire, Severe Winter Storm, Thunderstorm, Tornado, Windstorm,	Hold Red Cross first aid classes and encourage attendance. Coordinate with the Red Cross to hold first aid classes for the public and encourage the public to attend. The city holds these classes every two years so that people can become recertified	City of Vining Fire Department, Local Red Cross Chapter, others to be identified	City of Vining Fire Department, Citizens	$25/person – attendees cover their own cost	Low	Every 2 years	Continue - In Progress

ID	Goal	Hazard(s) Mitigated	Action Description/Background/Benefits	Lead Agency and Partners	Potential Funding	Cost Estimate	Priority	Timeline	Status/ Implementation Notes
		Hazardous Materials incident, Human Disease, Infrastructure Failure, Radiological, Terrorism, Transportation Incident							
Vining-02	1	Animal/Crop/Plant Disease, Dam/Levee Failure, Drought, Flooding, Extreme Heat, Grass or Wildland Fire, Severe Winter Storm, Thunderstorm, Tornado, Windstorm, Hazardous Materials incident, Human Disease, Infrastructure	Write a letter with shelter information to distribute to all homes in Vining	City of Vining Mayor, Pastor of the Church, Tama County Emergency Management, local volunteers, others to be identified	City of Vining General Funds	$9,999 or less - Printing costs plus postage or volunteers could deliver to all homes	Low	Annual Implementation	Continue - Not Started

ID	Goal	Hazard(s) Mitigated	Action Description/Background/Benefits	Lead Agency and Partners	Potential Funding	Cost Estimate	Priority	Timeline	Status/ Implementation Notes
		Failure, Radiological, Terrorism, Transportation Incident							
Vining-03	2	Dam/Levee Failure, Flooding, Extreme Heat, Severe Winter Storm	Create a call list for the City to use to check on vulnerable populations during and immediately following a hazard event	City of Vining City Clerk, Local volunteers, others to be identified	City of Vining General Funds	$9,999 or less	Low	2022	Continue - Not Started
Vining-04	3	Grass of Wildland Fire, Severe Winter Storm, Thunderstorm, Hazardous Materials Incident	Upgrade fire department equipment. Identify the Fire Department's specific needs and make the needed upgrades	City of Vining Fire Department, Other City Departments	Iowa Economic Development Grant, Alliant Energy, City General Funds, Assistance to Firefighter grants, others TBD	$3,000 - $5,000 per year	Low	2024	Continue - Not Started
Vining-05	3	Flooding	Crown and grade streets. Make needed street improvements when funding becomes available	City of Vining City Council, Engineering firm, others to be identified	City of Vining Road Use Tax	$150,000 every 10 years	Medium	2025	Continue - Not Started
Vining-06	3	Grass/Wildland Fire	Enforce a burn ban during dry weather	City of Vining City Council, Fire Department,	City of Vining General Funds	$9,999 or less	High	Annual Implementation	Continue - Not Started

ID	Goal	Hazard(s) Mitigated	Action Description/Background/Benefits	Lead Agency and Partners	Potential Funding	Cost Estimate	Priority	Timeline	Status/ Implementation Notes
				Tama County Emergency Management					
Vining-07	4	Flooding	Replace or improve existing culverts with new culverts. We can only replace what funding will allow.	City of Vining City Council, TBD	FEMA HMPG, City of Vining Road Use Tax, others to be identified	$3,000-$5,000 per time that they are replaced	High	2024	Continue - Not Started
Vining-08	4	Flooding, Extreme Heat, Severe Winter Storm, Thunderstorm, Tornado, Windstorm, Infrastructure Failure, Radiological, Terrorism	Encourage residents to have a battery-operated radio. Create an informational campaign to encourage Vining residents to keep a battery-operated radio in their home in case of power outage	City of Vining City Council, TBD	City of Vining General Fund	$9,999 or less – City estimated this cost to be less than $1,000	Low	2022	Continue - Not Started
Vining-09	4	Tornado, Thunderstorm	Switch to a remote triggered warning siren. Switch from primarily local control to a remote triggered system in which Tama County Emergency Management controls the warning siren	City of Vining City Council, Fire Department, Tama County Emergency Management	FEMA HMA, City of Vining General Funds, others to be identified	$10,000 - $99,999	Medium	2022	Continue - Not Started
GMG-01	1	Severe Winter Storm,	Purchase generator for high school in Garwin. The high school in Garwin is	GMG Community School District	FEMA HMA, GMG School	$10,000 - $99,999	High	2025	Continue - In Progress.

ID	Goal	Hazard(s) Mitigated	Action Description/Background/Benefits	Lead Agency and Partners	Potential Funding	Cost Estimate	Priority	Timeline	Status/ Implementation Notes
		Thunderstorm, Tornado, Windstorm	designated as a safe area and command center for the town. It would be great to have the building powered during a disaster.	Board, City of Garwin City Council Tama County Emergency Management	District Funds, City of Garwin Local Options Sales Tax				
GMG-02	2	Infrastructure Failure, Windstorm, Thunderstorm, Tornado, Severe Winter Storms	Bury overhead electrical lines near school. These wires are a safety issue during high winds and snow	GMG Community School District Board, City of Garwin City Council Tama County Emergency Management, others to be identified	City of Garwin Utility Revenue, FEMA HMA, HSEMD	$100,000 - $299,999	High	2025	Continue - In Progress. We are working with the electronic company to determine which wires need to be stabilized.
GMG-03	2	Windstorm, Thunderstorm, Tornado	Build safe room Connect a safe room to the high school. This shelter would be used by school students, staff, and city residents and visitors.	GMG Community School District Board, City of Garwin City Council Tama County Emergency Management	School District, FEMA HMA, HSEMD	$300,000 or more	High	2027	Continue - Not Started.
GMG-04	3	Hazardous Materials Incident	Hazardous material drop off program. Work with County and Community to offer a hazardous material drop off day. This event will help to safely remove hazardous chemicals and materials.	City of Garwin City Council, GMG Community School District Board Tama County EMA,	School district, FEMA HMA, others to be identified	$9,999 or less	High	Annual Implementation.	Continue - Annual Implementation. GMG CSD continues to work with hazardous

ID	Goal	Hazard(s) Mitigated	Action Description/Background/Benefits	Lead Agency and Partners	Potential Funding	Cost Estimate	Priority	Timeline	Status/ Implementation Notes
				others to be identified					materials and transporting these materials to the proper deposal implementation areas
GMG-05	3	Extreme Heat, Infrastructure Failure	Plant trees around school to shade parking and school area. Increased shade on school grounds can help to keep school building cooler during summer months and help prevent infrastructure failure.	GMG Community School District Board TBD	School District Funds, Local and State Grants	$10,000 - $99,999	Medium	Annual Implementation	Continue - Annual Implementation. Tree were planted at the Elementary in the summer of 2021. They are being watered and maintained
North Tama CSD-01	1	Severe Winter Storm, Windstorm, Thunderstorm, Tornado	Build a safe room for students, staff, and community members. The school district is currently planning to purchase property that is across the street from their current facilities. With this property, the district would provide an additional parking lot and build a new, free-standing safe room building. This action is important to the district because there is	North Tama Community School District Board City of Traer and Tama County	FEMA HMA, Local Options Sales Tax, City Bonds, others to be identified	$300,000 or more	Medium	2027	Continue - Not Started. Property has been purchased. District is considering a safe room along with other possibilities as part of a long-term

ID	Goal	Hazard(s) Mitigated	Action Description/Background/Benefits	Lead Agency and Partners	Potential Funding	Cost Estimate	Priority	Timeline	Status/ Implementation Notes
			currently no safe room in the City of Traer. The safe room would be available for the entire community to use. The purchase of the property would cost roughly $85,000. Additional costs would include demolition of a house that is currently on the property, leveling of the site, and the construction of the new building. The district would rely primarily on grant funding. For any match money, LOST or bonding would be required in collaboration with the City of Traer. The school recently funded a multi-million-dollar project with bonding, so any additional fundraising for a match would be several years away.						infrastructure plan.
South Tama CSD-01	1	Severe Winter Storm, Thunderstorm, Tornado, Windstorm	Evaluate potential opportunity to Incorporate tornado safe room into the design and construction of the new Middle School Project.	South Tama Community School District Board, Tama County	Bonds, FEMA HMA,	$300,000 or more	Medium	2024	New Action
Union CSD-01	1	Severe Winter Storm, Thunderstorm	Improve communication systems. Identify and implement ways to improve	Union Community School District Board TBD	Capital Improvement Funds, others to	$10,000 to $99,999	High	2025	Continue - In Progress. We are having telephones

ID	Goal	Hazard(s) Mitigated	Action Description/Background/Benefits	Lead Agency and Partners	Potential Funding	Cost Estimate	Priority	Timeline	Status/ Implementation Notes
		m, Tornado, Windstorm, Hazardous Materials incident, Human Disease, Infrastructure Failure, Terrorism, Transportation Incident	the district's communication systems		be identified				installed throughout the district. This will assist with crisis management plans and overall communications.
Union CSD-02	1	Dam/Levee Failure, Flooding, Grass or Wildland Fire, Severe Winter Storm, Thunderstorm, Tornado, Windstorm, Hazardous Materials incident, Human Disease, Infrastructure Failure, Radiological, Terrorism,	Complete crisis planning. Complete crisis planning for the entire school district	Union Community School District Board County Emergency Management, local fire, law enforcement, and emergency response personnel, and possibly a consultant to aid in plan development and writing if not handled by schools	Union Community School District Funds	$9,999 or less	Medium	Annual Implementation	Continue - Annual Implementation. We need to conduct a larger scale review of the procedures. Fire and tornado drills are conducted as required, but we need to revisit other areas of crisis planning.

ID	Goal	Hazard(s) Mitigated	Action Description/Background/Benefits	Lead Agency and Partners	Potential Funding	Cost Estimate	Priority	Timeline	Status/ Implementation Notes
		Transportation Incident							
Union CSD-03	2	Extreme Heat, Severe Winter Storm, Thunderstorm, Tornado, Windstorm	Make roof improvements to school district buildings	Union Community School District Board TBD	Capital Improvement Funds, others to be identified	$100,000 to $299,999	Low	2025	Continue - In Progress. This mitigation action will take several years to complete.
Union CSD-04	3	Dam/Levee Failure, Flooding, Grass or Wildland Fire, Severe Winter Storm, Thunderstorm, Tornado, Windstorm, Hazardous Materials incident, Human Disease, Infrastructure Failure, Radiological, Terrorism	Crisis planning and drills. Complete practice drills based on crisis planning for the school district	Union Community School District Board County Emergency Management, local fire, law enforcement, and emergency response personnel, and possibly a consultant to aid in plan development and writing if not handled by schools	Union Community School District Funds, others to be identified	$10,000 to $99,999	Medium	Annual Implementation.	Continue - Annual Implementation. We had plans to conduct larger scale drills and rehearsals, but due to the pandemic, drills were canceled. I would like to reschedule these for the fall of 2022.
Union CSD-05	3	Animal/Crop/Plant Disease,	Safety education. Create and implement a safety education program to teach students	Union Community School District	Union Community School	$9,999 or less	Medium	Annual Implementation.	Continue - In Progress. The pandemic put

ID	Goal	Hazard(s) Mitigated	Action Description/Background/Benefits	Lead Agency and Partners	Potential Funding	Cost Estimate	Priority	Timeline	Status/ Implementation Notes
		Dam/Levee Failure, Drought, Flooding, Extreme Heat, Grass or Wildland Fire, Severe Winter Storm, Thunderstorm, Tornado, Windstorm, Hazardous Materials incident, Human Disease, Infrastructure Failure, Radiological, Terrorism, Transportation Incident	about many different safety issues	Board Organizations with expertise in certain safety issues, local fire, law enforcement, and emergency response personnel	District Funds, others to be identified				a pause to several training opportunities, but we will resume annual trainings with local agencies and farm safety days.
Union CSD-06	4	Flooding, Severe Winter Storm, Thunderstorm, Tornado, Windstorm, Infrastructure Failure	Purchase generators and install hookups for school district buildings	Union Community School District Board Tama County Emergency Management	FEMA HMPG, Capital Improvement Funds, others to be identified	$100,000 to $299,999	Low	2025	Continue - Not Started.

ID	Goal	Hazard(s) Mitigated	Action Description/Background/Benefits	Lead Agency and Partners	Potential Funding	Cost Estimate	Priority	Timeline	Status/ Implementation Notes

5 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

44 CFR Requirement §201.6(c)(4):
The plan maintenance process shall include a section describing the method and schedule of monitoring, evaluating, and updating the mitigation plan within a five-year cycle.

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 Tama County Emergency Management Coordinator, agree to:

- Meet annually, and after a disaster event, to monitor and evaluate the implementation of the 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 Tama County Board of Supervisors and 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, 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.

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 Tama County Emergency Management Director will be responsible for initiating the plan reviews in conjunction with the County Commissioner's meeting and also invite 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 Disaster Mitigation Act of 2000, unless disaster or other circumstances (e.g., changing regulations) require a change to this schedule. *It is recommended 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.

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).

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.

In order to best evaluate any changes in vulnerability as a result of plan implementation, 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 on an annual basis to the jurisdictional HMPC member on action status and providing input on whether the action as implemented 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 Madison County HMPC deems appropriate and necessary, and as approved by the Tama County Board of Supervisors and the governing boards of the other participating jurisdictions.

5.2 Incorporation into Existing Planning Mechanisms

44 CFR Requirement §201.6(c)(4)(ii):
[The plan shall include a] 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.

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:

- General or mater 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

In the period since adoption of the 2015 Tama County Multi-jurisdictional Hazard Mitigation Plan, it was not incorporated into existing planning mechanisms. With the update of this plan, 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 Tama 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 Other Planning Mechanisms

Jurisdiction	Integration Process/Opportunities
Unincorporated County	- Incorporate into annual emergency management training, planning, and purchasing plans. - 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.
Chelsea	- Integrate mitigation strategy into the annual budget planning process. - Integrate risk information into the development of zoning, subdivision, and floodplain ordinances.
Clutier	- Integrate mitigation strategy into the annual budget planning process. - Integrate risk information into the development of zoning, subdivision, and floodplain ordinances.
Dysart	- Integrate mitigation strategy into the annual budget planning process. - Integrate risk information into the development of zoning, subdivision, and floodplain ordinances. - Integrate mitigation strategy and risk information into future updates to the Local Mitigation Plan.
Elberon	- Integrate mitigation strategy into the annual budget planning process. - Integrate mitigation strategy into the development of a Comprehensive Plan. - Integrate risk information into the development of zoning, subdivision, and floodplain ordinances.
Garwin	- Integrate mitigation strategy into the annual budget planning process.

Jurisdiction	Integration Process/Opportunities
	- Integrate risk information into the development of zoning, subdivision, and floodplain ordinances.
Gladbrook	- Integrate risk information into future updates to the watershed plan. - Integrate mitigation strategy into tree trimming program. - Integrate risk information into building permit ordinance. - Integrate risk information into zoning/land use restrictions.
Lincoln	- Integrate mitigation strategy into the annual budget planning process. - Integrate risk information into the development of zoning, subdivision, and floodplain ordinances.
Montour	- Integrate mitigation strategy into the annual budget planning process. - Integrate risk information into the development of zoning and subdivision ordinances. - Integrate risk information into tree trimming program. - Integrate risk information and mitigation strategy into future updates to stormwater and drainage ordinances.
Tama	- Integrate risk information into future updates to the Comprehensive Plan. - Integrate risk information and mitigation strategy into the zoning, subdivision, building permit, and floodplain ordinances. - Integrate risk information into creation of site plan review requirements. - Integrate mitigation strategy into the Capital Improvements Plan. - Integrate risk information into creation of Debris Management Plan and Tree Trimming Ordinance.
Toledo	- Integrate risk information into zoning ordinance. - Integrate risk information and mitigation strategy into subdivision ordinance. - Integrate risk information into tree trimming program. - Integrate risk information and mitigation strategy into future updates to stormwater and drainage ordinances. - Integrate mitigation strategy into the annual budget planning process.
Traer	- Integrate mitigation strategy into the annual budget planning process. - Integrate risk information into the development of zoning, subdivision, and floodplain ordinances.
Vining	- Integrate mitigation strategy into the annual budget planning process. - Integrate risk information and mitigation strategy into future updates to stormwater and drainage ordinances.
GMG CSD	- Integrate risk information and mitigation strategy into Capital Improvement Plan and school safety plans.
North Tama CSD	- Integrate risk information and mitigation strategy into Capital Improvement Plan and school safety plans.
South Tama CSD	- Integrate risk information and mitigation strategy into Capital Improvement Plan and school safety plans.
Union CSD	- Integrate risk information and mitigation strategy into Capital Improvement Plan and school safety 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 the findings actions of 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 County is potentially updating the Comprehensive plan in the 2021-2026 time period which will provide an opportunity to cross-reference the Hazard Mitigation Plan

HMPC members involved in updating these existing planning mechanisms will be responsible for integrating the findings and actions of the mitigation plan, as appropriate. The HMPC is also responsible for monitoring this integration and incorporating the appropriate information into the five-year update of the multi-jurisdictional hazard mitigation plan.

Additionally, after the annual review of the Hazard Mitigation Plan, the Tama County Emergency Management Coordinator will provide the updated Mitigation Strategy with current status of each mitigation action to the County Commission as well as all Mayors, City Clerks, and School District Superintendents requesting that the mitigation strategy be incorporated, where appropriate, in other planning mechanisms.

5.3 Continued Public Involvement

44 CFR Requirement §201.6(c)(4)(iii):
[The plan maintenance process shall include a] discussion on how the community will continue public participation in the plan maintenance process.

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.