

BUENA VISTA COUNTY



Hazard Mitigation Plan 2023-2028





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1 Introduction

Disaster Mitigation Act Requirements: 44CFR§201.6

The local mitigation plan is the representation of the jurisdictions commitment to reduce risks from natural hazards, serving as a guide for decision makers as they commit resources to reducing the effects of natural hazards. Local plans will also serve as the basis for the State to provide technical assistance and to prioritize project funding.

1.1 Executive Summary

The following jurisdictions participated in this 2023 update of the Buena Vista County Hazard Mitigation Plan (HMP):

- Buena Vista County
- City of Albert City
- City of Alta
- City of Lakeside
- City of Linn Grove
- City of Marathon
- City of Newell
- City of Rembrandt
- City of Sioux Rapids
- City of Storm Lake
- City of Truesdale
- Iowa Central Community College
- Buena Vista University
- Albert City-Truesdale School District
- Alta-Aurelia School District
- Newell-Fonda School District
- Sioux Central School District
- Storm Lake School District
- Storm Lake St Mary's Catholic School

The purpose of hazard mitigation is to reduce or eliminate long-term risk to people and property from disasters or hazardous events. Studies have found that hazard mitigation is extremely cost-effective, with every dollar spent on mitigation saving an average of \$6 in avoided future losses. The Federal Emergency Management Agency (FEMA) requires that Hazard Mitigation Plans (HMPs) be updated every five years for the jurisdictions to be eligible for federal mitigation assistance. All sections of the 2018 Buena Vista County HMP were reviewed and updated to address natural and human-caused hazards for the purpose of saving lives and reducing losses from future disasters or hazard events.

The goals of the 2023 Buena Vista County HMP are:

1. Decrease the impact of natural and human-caused hazards on life and private and public property.
2. Protect health, safety, and quality of life for the residents of Buena Vista County.
3. Ensure continued government and emergency functions in the event of a disaster.
4. Provide public education and encourage preparedness.
5. Ensure that public funding is being used efficiently to prevent hazards from occurring or to mitigate their impacts.
6. Utilize planning tools and documents to consider, address, educate, or enforce hazard mitigation actions.

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

This plan was also developed to retain Buena Vista County's and the participating jurisdictions' eligibility for federal grant programs, specifically the FEMA hazard mitigation grants including the Hazard Mitigation

Grant Program (HMGP), Building Resilient Infrastructure and Communities (BRIC) grant program, and Flood Mitigation Assistance (FMA) program.

Chapter 1 contains this Executive Summary, along with the Plan's background and scope.

Chapter 2 describes the Planning Process followed to update the Plan. A broad range of public and private stakeholders, including agencies, local businesses, nonprofits, and other interested parties were invited to participate. Public input was sought throughout the planning process including online surveys and public review of the draft Plan.

Chapter 3 Community Profile describes the planning area, consisting of Buena Vista County and the participating jurisdictions listed above, with updated information on demographics, social vulnerability, and changes in development. Chapter 3 also includes a Capability Assessment that describes programs and policies currently in place across the County to reduce hazard impacts, or that could be used to implement hazard mitigation activities and identifies opportunities to enhance those capabilities.

Chapter 4 Risk Assessment identifies the natural and human-caused hazards of greatest concern to the County and describes the risk from those hazards. The information generated through the risk assessment helps communities to prioritize and focus their efforts on those hazards of greatest concern and those assets or areas facing the greatest risk(s). The best available information on the impacts of changing weather conditions was taken into account for each hazard. The hazards profiled in the 2022 Plan and their assessed significance are listed in Table 1-1.

Table 1-1 Hazard Risk Summary

Hazard	Geographic Extent	Magnitude/Severity	Future Probability	Overall Significance
Animal/Plant/Crop	Extensive	Moderate	Likely	Medium
Drought	Extensive	Moderate	Highly Likely	High
Earthquake	Extensive	Negligible	Unlikely	Low
Expansive Soils	Significant	Negligible	Occasional	Low
Extreme Heat	Extensive	Negligible	Highly Likely	Medium
Flooding	Significant	Critical	Highly Likely	High
Grass/Wildland Fire	Significant	Negligible	Highly Likely	Medium
Hazardous Materials Incident	Significant	Moderate	Highly Likely	Medium
Human Disease	Extensive	Moderate	Likely	Medium
Infrastructure Failure	Significant	Moderate	Highly Likely	Medium
Landslide	Extensive	Negligible	Occasional	Low
Levee/Dam Failure	Limited	Moderate	Unlikely	Low
Severe Winter Storm	Extensive	Moderate	Highly Likely	Medium
Sinkhole	Limited	Negligible	Unlikely	Low
Thunderstorm/Lightning/Hail	Extensive	Critical	Highly Likely	High
Tornado/Windstorm	Extensive	Moderate	Highly Likely	High
Transportation Incident	Significant	Moderate	Highly Likely	Medium

Chapter 5 Mitigation Strategy describes what the County and jurisdictions will do to reduce their vulnerability to the hazards identified in Chapter 4. It presents the goals and objectives of the mitigation



program and details a broad range of targeted mitigation actions to reduce losses from hazard events. It also describes mitigation activities that have been conducted in the last five years.

Chapter 6 Plan Implementation and Maintenance details how the Plan will be implemented, monitored, evaluated, and updated, and how mitigation will be integrated into other planning mechanisms.

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

1.2 Purpose

The purpose of the Buena Vista County Hazard Mitigation Plan (HMP) is to substantially and permanently reduce the county's vulnerability to natural and human-caused hazards. The plan is intended to promote sound public policy designed to protect citizens, critical facilities, infrastructure, private property, and the natural environment. This can be achieved by increasing public awareness, documenting resources for risk reduction and loss-prevention, and identifying activities to guide the community towards the development of a safer, more sustainable community.

1.3 Background and Scope

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

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

Hazard mitigation planning is the process through which hazards that threaten communities are identified, likely impacts of those hazards are determined, mitigation goals are set, and appropriate strategies to lessen impacts are determined, prioritized, and implemented. Buena Vista County and the participating incorporated cities and public school districts initially developed a multi-jurisdictional Hazard Mitigation Plan in 2013, and subsequently began the process to update that plan in 2018. This current planning effort serves to update the 2018 plan.

The 2023 Buena Vista County HMP documents the hazard mitigation planning process undertaken by the Buena Vista 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 throughout Buena Vista County.

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



jurisdiction to be eligible for certain federal disaster assistance and hazard mitigation funding under the Robert T. Stafford Disaster Relief and Emergency Act (Public Law 93-288).

Information in this plan will be used to help guide and coordinate mitigation activities and decisions for local land use policy in the future. Proactive mitigation planning will help reduce the cost of disaster response and recovery to communities and their residents by protecting critical community facilities, reducing liability exposure, and minimizing overall community impacts and disruptions. The Buena Vista 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.

2 Planning Process

Disaster Mitigation Act Requirements: 44CFR§201.6

[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.

An open public involvement process is essential to the development of an effective plan. In order to develop a more comprehensive approach to reducing the effects of natural disasters, the planning process shall include:

- An opportunity for the public to comment on the plan during the drafting stage and prior to plan approval;*
- An opportunity for neighboring communities, local and regional agencies involved in hazard mitigation activities, and agencies that have the authority to regulate development, as well as businesses, academia, and other private and nonprofit interests to be involved in the planning process; and*
- Review and incorporation, if appropriate, of existing plans, studies, reports, and technical information.*

This plan update was collaboratively prepared between July 2022 and May 2023 by Buena Vista County and the participating jurisdictions and stakeholders. Professional planning assistance was provided by WSP USA Environment and Infrastructure (WSP) through a contract held with Iowa Homeland Security and Emergency Management Division. WSP's role was to:

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

2.1 Multi-Jurisdictional Participation

Buena Vista County invited all incorporated cities and public school districts to participate in the plan update process. The jurisdictions that elected to participate in this plan are shown below in Table 2-1; these jurisdictions all participated in the 2018 HMP. 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 the planning process by attending at least one of the three HMPC planning meetings; side-bar meetings and coordination were acceptable for communities with limited staff capacity or unavoidable conflicts.
- Provide data for and assist in the development of the updated risk assessment that describes how various hazards impact their jurisdiction;

- Provide data to describe current capabilities, update existing mitigation actions and identify additional mitigation actions for the plan;
- Review and comment on plan drafts;
- Inform the public, local officials, and other interested parties about the planning process and provide an opportunity for them to comment on the plan; and
- Formally adopt and implement the mitigation plan.

The participating jurisdictions met all these participation requirements. Table 2-1 shows the representation of each participating jurisdiction at the planning meetings, and other ways they participated. Sign-in sheets are included in Appendix C: Planning Process Documentation.

Table 2-1 Jurisdictional Participation in the Planning Process

Jurisdiction	Kick-off Meeting	Meeting #2	Meeting #3	Provided Data
Buena Vista County	X	X	X	X
City of Albert City	X	X	X	X
City of Alta	X	X	X	X
City of Lakeside	X		X	X
City of Linn Grove	X			X
City of Marathon		X	X	X
City of Newell	X	X	X	X
City of Rembrandt		X	X	X
City of Sioux Rapids	X		X	X
City of Storm Lake	X	X	X	X
City of Truesdale				X
Iowa Central Community College	X		X	X
Buena Vista University		X		X
Albert City-Truesdale School District				X
Alta-Aurelia School District	X	X	X	X
Newell-Fonda School District				X
Sioux Central School District				X
Storm Lake School District	X	X	X	X
Storm Lake St Mary's Catholic School	X	X		X

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

Table 2-2 Hazard Mitigation Planning Committee

Jurisdiction/Agency	Title	Name
BV County Conservation	Director	Greg Johnson
BV County Engineer	Engineer	Bret Wilkinson
BV County Environmental Health & Floodplain	Admin	Kim Johnson
BV County Board of Supervisors	Supervisor	Kathy Croker
BV County Board of Supervisors	Supervisor	Tom Huseman
BV County EMA	Emergency Manager	Aimee Barritt
BV County Environmental Health & Zoning	Admin	Ben Mueggenberg
BV County Public Health	PH Preparedness	Dorie Petersen
BV County Public Health	Nurse Administrator	Julie Sather

Jurisdiction/Agency	Title	Name
City of Albert City	Mayor	Dale Skog
City of Alta	Mayor	Kevin Walsh
City of Alta	Clerk	Megan Peterson
City of Lakeside	Public Works Supervisor	Lynn Laursen
City of Linn Grove	Mayor	Aaron Anderson
City of Marathon	Public Works Supervisor	Terry Gunnarson
City of Marathon	Public Works	Tyler Jarvis
City of Marathon	Mayor	Mike White
City of Newell	Mayor	Brian Puhmann
City of Newell	Clerk	Sierra Olsen
City of Rembrandt	City Council	Brent Smith
City of Rembrandt	Mayor	Doyle Engebretson
City of Sioux Rapids	Clerk	Amanda Caraway
City of Storm Lake	Communications Coord	Dana Larsen
City of Storm Lake	Public Works Director	Matt Beckman
City of Storm Lake Floodplain and Building	Building Official	Scott Olesen
City of Storm Lake Public Works	Asst Public Services Supervisor	Brandon Ripke
City of Truesdale	City Clerk	Diane Yang
ICCC	SL Center Director	Chris Cleveland
BVU	Interim Facilities Director	Andy Taylor
Albert City-Truesdale School District	Superintendent	Jeff Dicks
Alta-Aurelia School District	Elementary Principal	Tim Scott
Newell-Fonda School District	Superintendent	Jeff Dicks
Sioux Central School District	Superintendent	Kevin Wood
Storm Lake Public School District	Chief Operating Officer	Jeff Tollefson
Storm Lake St. Mary's School	Director of School Operations	Dan Gaffney
United Community Health Center	Operations Director	Matt Brostad
Upper Des Moines Opportunity	Family & Community Services Director	Alisa Schlieff
Buena Vista Regional Medical Center	Safety Officer	Quin Kelly

2.2 The Planning Steps

WSP and Buena Vista County worked together to establish the framework and process for this planning effort. The plan update followed four general phases:

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

Into this process, WSP integrated the 9-task approach using FEMA's Local Mitigation Planning Handbook (March 2013), along with the 10-step planning process adapted from FEMA's Community Rating System (CRS) and Flood Management Assistance (FMA) programs. Thus, the process used for this plan meets the funding eligibility requirements of the Hazard Mitigation Assistance grants and CRS. Table 2-3 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 2-3 Planning Process Used to Develop the Buena Vista County Hazard Mitigation Plan

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

2.2.1 Phase I Organize Resources

2.2.1.1 Step 1: Organize the Planning Team

The planning process resulting in the preparation of this plan document officially began with an initial coordination conference call on July 7, 2022. Participants of the meeting included the Buena Vista County Emergency Management Coordinator and WSP 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, set tentative planning meeting dates, identify GIS needs and resources, provide recommendations regarding the hazards to be included in the plan update, discuss options for the flood risk assessment methodology, develop an initial public participation strategy, and discuss the plan update format.

The members of the 2018 HMPC list was reviewed and updated to form the basis for the 2023 HMPC. Other regional, local, state, and federal stakeholder organizations were also invited. Stakeholders are listed below in Step 3: Coordinate with Other Departments and Agencies. The HMPC communicated during the planning process with a combination of face-to-face meetings, virtual meetings, phone interviews, and email correspondence. The meeting schedule and topics are listed in Table 2-4. Meeting summaries are included in Appendix C.

Table 2-4 Planning Team Meetings

Meeting	Topic	Date
Coordination call	General overview of planning process/requirements and schedule.	July 7, 2022
Kick-off Virtual meeting	Introduction to DMA, the planning process, hazard identification and public input strategy. Distribution of plan update guide to jurisdictions. Revisit hazard identification. Determine process to monitor, evaluate, and update plan.	August 15, 2022
Planning Meeting #2 In person meeting	Presentation of draft Risk Assessment including vulnerability and critical facility analysis; development of plan goals.	December 13, 2022
Planning Meeting #3 In person meeting	Results of public survey; mitigation action update, development, and prioritization; plan maintenance; next steps in HMGP plan review and final public comment period.	January 23, 2023

During the kick-off meeting, WSP 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 and coordination with other agencies and departments were discussed. WSP 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 Buena Vista County.

Participants were given a Plan Update Guide by WSP 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 WSP. WSP integrated this information into the plan, supporting the update of Chapters 3 and 4.

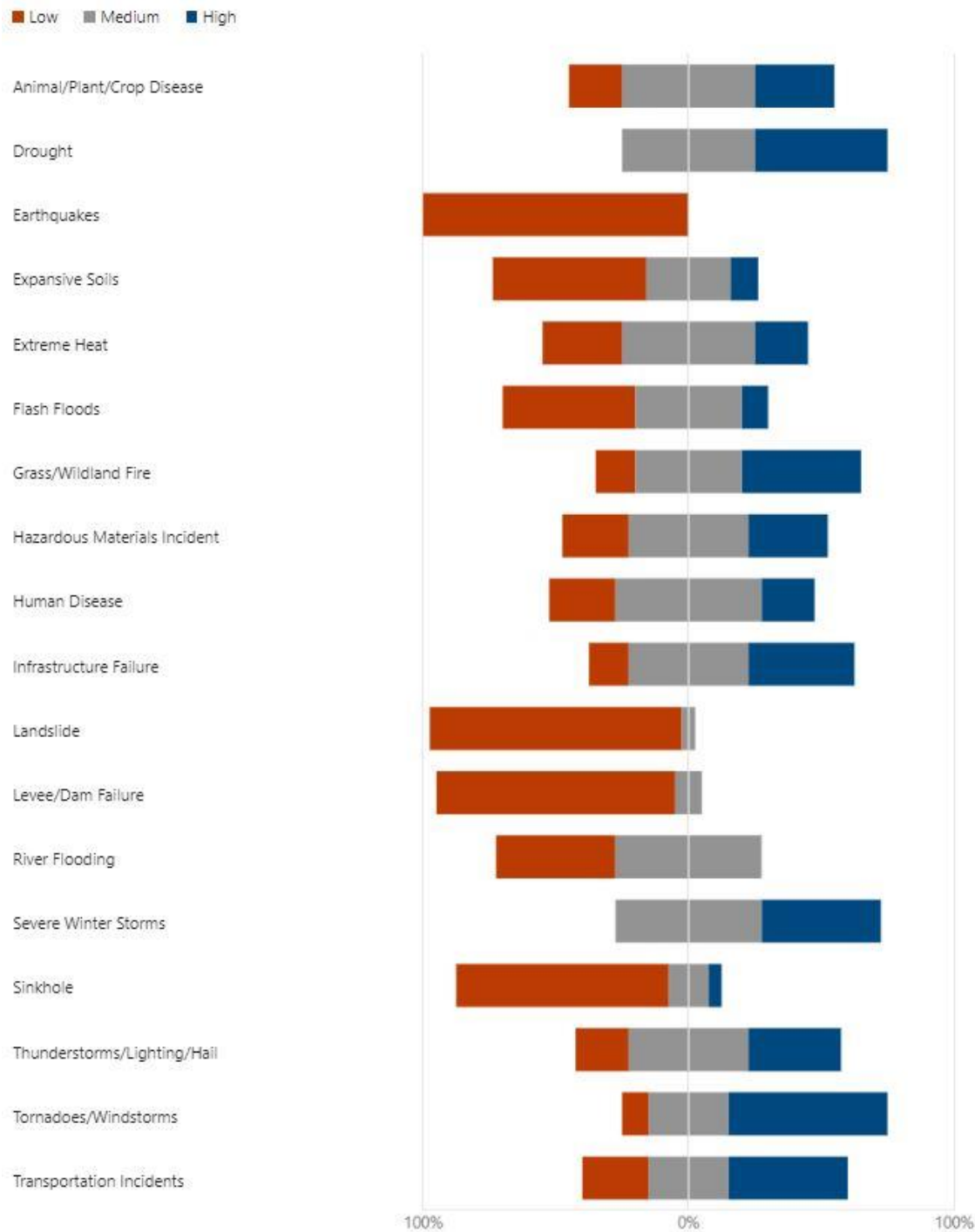
2.2.1.2 Step 2: Plan for Public Involvement

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

A survey was developed specific to the Buena Vista County Mitigation Plan that provided a brief plan summary as well as a questionnaire to capture public and stakeholder input. A press release was posted to the Buena Vista County's website as well as each participating jurisdiction's website and social media (Facebook, Twitter) pages announced the opening of the online survey. The survey was available to the public from November 9th through December 9th, 2022. In all, 21 surveys were completed. Full survey results are provided in Appendix D.

One question asked respondents to rank their perception of which hazards were most significant to the planning area. Figure 2-1 shows the public perception that the most significant hazards are tornado/windstorm and drought, followed by transportation incidents, severe winter storms, and grass/wildland fires.

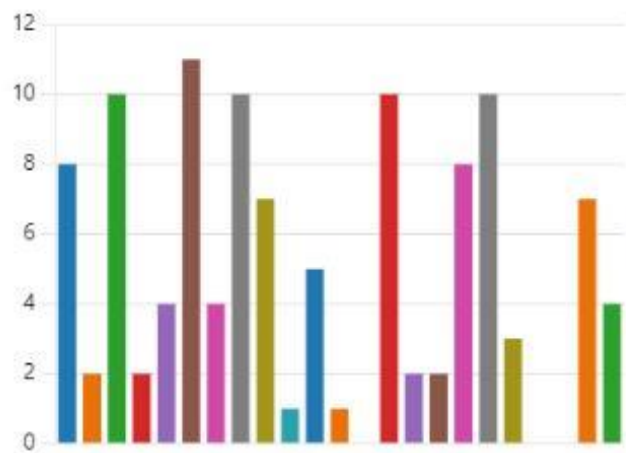
Figure 2-1 Survey Results – Hazard Level of Significance



In the survey, the public was also asked to review 23 types of mitigation actions. The Buena Vista County HMPC also considered these types of projects in the Buena Vista County Multi-Jurisdictional Hazard Mitigation Plan. The survey asked the public to identify mitigation project types that they felt could benefit their community. Figure 2-2 provides the compiled results of this question. The public opinion is that generators for critical facilities, tornado safe rooms, public education/awareness programs, water conservation, and improved reliability of communications would benefit their jurisdictions the most.

Figure 2-2 Survey Results – Types of Mitigation Projects

Expanded Indoor/Outdoor War...	8
Wildfire/Grass Fuels Treatment ...	2
Tornado Safe Rooms	10
Continued Participation in the N...	2
Critical Facilities Resiliency	4
Generators for Critical Facilities	11
Planning/Zoning to avoid impac...	4
Public Education/Awareness on ...	10
Stormwater Drainage Improvem...	7
Forest Health/Watershed Protec...	1
Flood Mitigation for residential ...	5
Education and Discounts on Flo...	1
Floodprone Property Buyout	0
Water Conservation	10
Evacuation route development	2
Dam safety	2
Public health incident prepared...	8
Improve reliability of communic...	10
Lightning protection for critical f...	3
Levees or Levee improvements	0
Flood mitigation for commercial...	0
Additional snow fences	7
Hazardous tree management	4



The public was also asked to comment on any other issues that the Buena Vista 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:

- "Electronic grid, high winds, low housing in rural areas"
- "Maybe each municipality should have own power generator in case power goes out"
- "The carbon containment pipeline"
- "When the lake gets too high and the high wind is out of the west, the shoreline damage"

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. Buena Vista County announced the availability of the entire final draft plan and the two-week final public comment period by a variety of social media platforms listed above. The HMPC also invited targeted stakeholders and neighboring jurisdictions to comment on the draft plan, as described in greater detail in Step 3 below.

The public comment period was conducted from June 5 through June 16, 2023. There were no public comments received.

2.2.1.3 Step 3: Coordinate with Other Departments and Agencies and Incorporate Existing Information

There are organizations whose goals and interests' interface with hazard mitigation in Buena Vista County. Buena Vista County invited neighboring counties, other local, regional, state, and federal departments, and agencies to learn about the hazard mitigation planning initiative. The HMPC developed a list of additional stakeholders involved in hazard mitigation activities, or the authority to regulate development, to invite by email to review and comment on the draft of the Buena Vista 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. Academic institutions include the participating school districts noted previously.

Stakeholders

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

Private and nonprofit organizations

- Buena Vista Regional Medical Center
- Buena Vista University

Adjacent Counties and Cities

- Cherokee County Emergency Management
- Clay County Emergency Management
- Pocahontas County Emergency Management
- Sac County Emergency Management

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

2.2.1.4 Integration of Other Data, Reports, Studies, and Plans

The HMPC solicited input 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);

- Buena Vista County Multi-Jurisdictional Hazard Mitigation Plan (2018);
- Plan Update Guides completed by each jurisdiction;
- FEMA Community Information System, National Flood Insurance Program (NFIP), Repetitive Loss Property Data;
- Dam Inventory and Inspection Reports for Clinton County, Iowa Department of Natural Resources;
- National Drought Mitigation Center Drought Impact Reporter;
- US Drought Monitor;
- Environmental Protection Agency;
- Flood Insurance Administration;
- Hazards US (Hazus);
- Iowa Department of Agriculture and Land Stewardship, Division of Soil Conservation;
- Iowa Department of Education, Bureau of Information and Analysis Services;
- Iowa Department of Public Safety;
- Iowa Department of Transportation (DOT), Office of Traffic and Safety;
- Iowa State University (ISU) Department of Agronomy;
- Iowa Utilities Board;
- National Oceanic and Atmospheric Administration's (NOAA) National Center for Environmental Information;
- National Weather Service;
- Pipeline and Hazardous Materials Safety Administration;
- Buena Vista County Emergency Management;
- Buena Vista County National Flood Hazard Layer;
- US Department of Agriculture, Risk Management Agency;
- US Department of Agriculture, US Forest Service (USFS);
- US Department of Transportation;
- United States Geological Survey

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

2.2.1.5 Integration of the 2018 Plan into Other Planning Mechanisms

The 2018 Hazard Mitigation Plan was incorporated into or cross referenced with other planning mechanisms between 2018-2023, such as the County's and some municipalities Emergency Operations Plans. Strategies and opportunities to do so in the future are outlined in Chapter 6.

2.2.2 Phase 2 Assess Risk

2.2.2.1 Step 4: Assess the Hazard: Identify and Profile Hazards

The HMPC identified the hazards that have impacted or could impact communities in Buena Vista County. The HMPC examined the history of disaster declarations in Buena Vista County. They discussed past hazard events, types of damage, and where additional information might be found. The committee identified 18 natural and human-caused hazards that have the potential to impact the planning area.

The HMPC discussed past events and impacts, analyzed risk assessment data, and came to consensus on the preliminary probability, magnitude, and severity levels on a county-wide basis. Each jurisdiction completed an Update Guide, including information on previous hazard events in their community. Utilizing the information from the Plan Update Guides as well as existing plans, studies, reports, and technical information as well as information available through internet research and GIS analysis, the profile for each hazard identified was updated. Additional information on the hazard identification process and the methodology and resources used to identify and profile the hazards can be found in Chapter 4.

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

Assets for each jurisdiction were identified from the Buena Vista County Assessor's Department which provided public datasets with parcel and building data. The Buena Vista County Emergency Management Coordinator worked with the Buena Vista County GIS Department to populate an inventory of critical facilities in the planning area. Population data was obtained from the US Census Bureau. Methodologies and results of the analyses are provided in Chapter 4.

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 Chapters 3 and 4.

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

After profiling the hazards that could affect Buena Vista 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 3 Buena Vista Community Profile.

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

Taking into consideration the vulnerability and capability assessments, a variety of methods was used to estimate losses for each profiled hazard. For geographic hazards such as river flooding, specific assets at risk and loss estimates were determined through GIS analysis. For other hazards such as weather-related hazards and hazardous materials, loss estimates were developed based on statistical analysis of historic events. For hazards such as dam failure of state-regulated dams, GIS data was not available to identify specific geographic boundaries at risk. Therefore, the risk assessment provides descriptions of the types of

improvements located in approximated risk areas downstream of high and significant hazard dams. For some human-caused hazards and the tornado hazard, loss estimates were scenario-based. The methodologies for each loss estimate are described in detail in Chapter 4. Within each hazard section, the text provides details on how the hazard varies by jurisdiction, where applicable.

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

2.2.3 Phase 3 Develop the Mitigation Plan

2.2.3.1 Step 6: Set Goals

During Meeting #2, the HMPC review the goals of the 2018 State HMP. Common categories of mitigation goals were presented for comparison, along with the goals from the 2018 Iowa State HMP. The HMPC then discussed and updated the goals for the 2023 HMP, as described in Section 5.1.

2.2.3.2 Step 7: Review Possible Activities

Meeting #3 focused on updating the mitigation strategy. The HMPC reviewed mitigation actions from the 2018 Buena Vista County HMP, identified progress that had been made on those actions, and identified any actions that should be deleted from future consideration. The HMPC then identified new actions and prioritized both new and continuing actions. Details on this process can be found in Chapter 5.

2.2.3.3 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 C. A final plan was then created for submittal to the Iowa HSEMD and FEMA for review and approval per the DMA requirements.

2.2.4 Phase 4 Implement the Plan and Monitor Progress

2.2.4.1 Step 9: Adopt the Plan

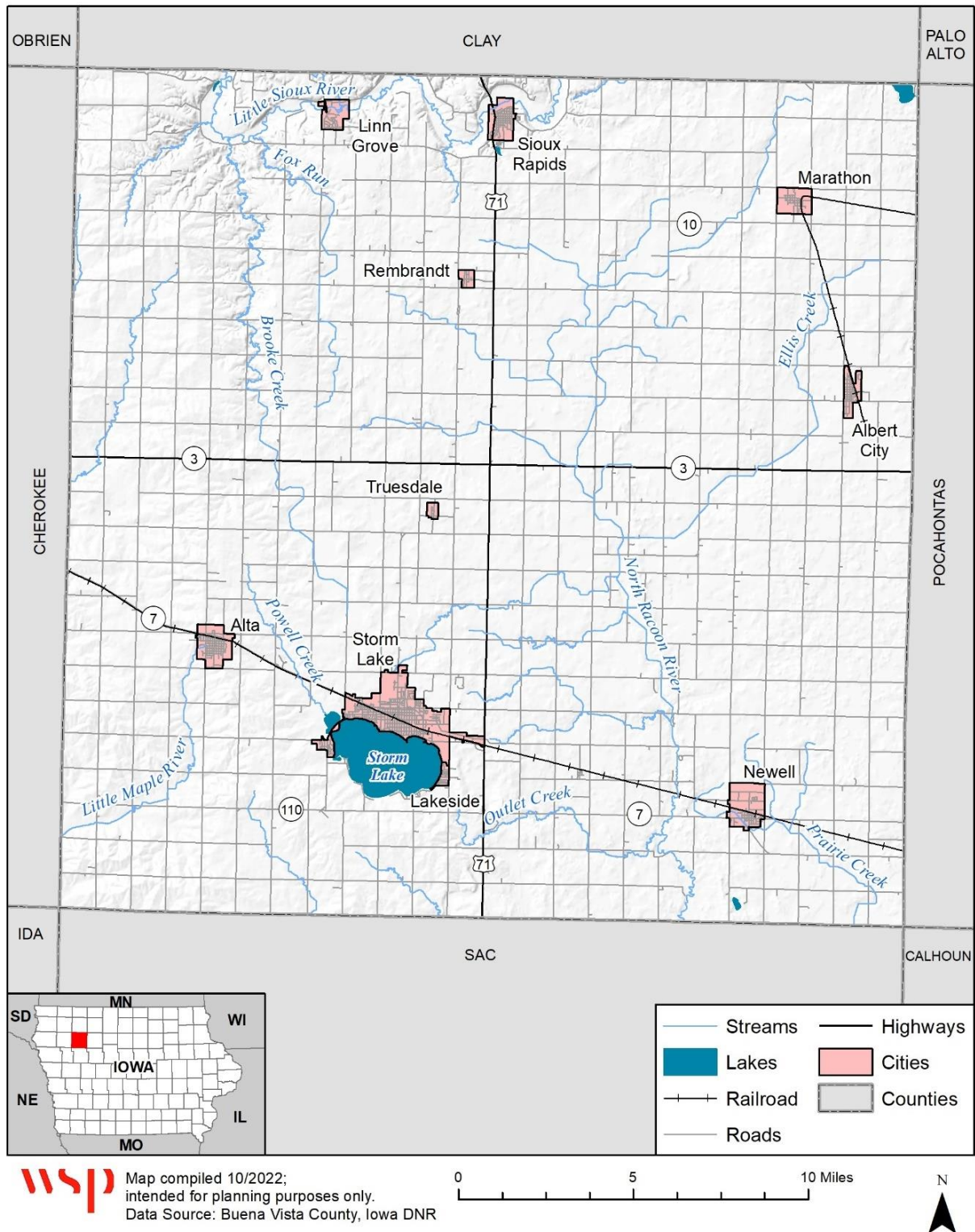
To secure buy-in and officially continue to implement the plan, the governing bodies of each participating jurisdiction re-adopted the plan in 2023. Scanned copies of resolutions of adoption are included in Appendix A.

2.2.4.2 Step 10: Implement, Evaluate, and Revise the Plan

The HMPC developed and agreed upon an overall strategy for plan implementation and for monitoring and maintaining the plan over time during Meeting #3. This updated strategy is described in Chapter 6, Plan Implementation and Maintenance.

3 Buena Vista Community Profile

Figure 3-1 Map of Buena Vista County



3.1 Overview

Buena Vista County is located in northwest Iowa. Adjacent counties are Sac County to the south, Clay County to the north, Pocahontas County to the east, and Cherokee County to the west. Land use within the County of Buena Vista is a mixture of residential, commercial, agricultural, and industrial, with multiple parks, cultural facilities, and open space areas. Table 3-1 provides additional facts and data about Buena Vista.

Buena Vista County was initially part of Dubuque and Buchanan counties. On Jan. 15, 1851, it was named and legally established with 16 townships, taking its name from the Battle of Buena Vista. The first settlement was at Sioux Rapids, which had a trading post for trappers and Indians. In 1856, Abner Bell and others settled in the northern part of the county near Sioux Rapids. In 1860, the county seat was located in Prairieville, which never advanced beyond a paper town. The first official county business was conducted in a log cabin in Sioux Rapids. In 1870, the first courthouse was erected in Sioux Rapids. Storm Lake was founded in 1870, and in 1878, the county seat was moved there after the courthouse in Sioux Rapids burned down.

Table 3-1 Buena Vista Facts and Figures

County of Buena Vista	
Latitude	42.7303° N
Longitude	95.1570° W
Land Area (Square Miles)	574.9
Elevation (Storm Lake)	1,445 ft.
2020 Census Population	20,823
2023 Population (Estimated)	20,991

Source: U.S. Census Bureau; Google Maps

3.2 Geography

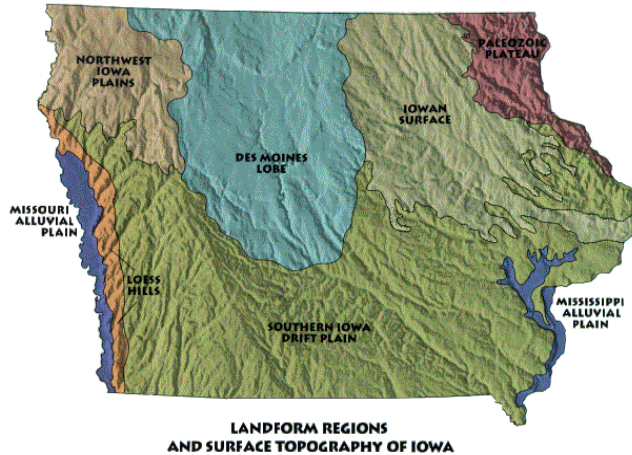
Buena Vista County in Iowa is located in two different landform regions, the Northwest Iowa Plains and the Des Moines Lobe (Iowa Geologic Survey, 2017). The Southern Iowa Drift Plain is dominated by glacial deposits left by ice sheets over 500,000 years ago. These deposits were shaped by streams into steep hills and valleys, with a mantle of loess covering the upper slopes. The Des Moines Lobe was formed by the last glacier to enter Iowa, which advanced in surges and reached its southern limit 14,000 years ago. Today, the region is characterized by poorly drained landscapes underlain by pebbly clay, as well as moraines, ridges, knobby hills, and abundant wetlands. Clear Lake and Storm Lake are situated on the eastern and western borders of the Des Moines Lobe, and the region is also home to smaller prairie potholes or kettle lakes.

Buena Vista County has scattered wetlands that are dominated along the Little Sioux River and in and around Storm Lake. These wetlands include riparian wetlands, playas, basins, potholes, vernal pools, bogs, marshes, wet meadows, swamps, and wooded swamps (County Comprehensive Plan, 2017). Many of these wetlands are seasonal and provide critical habitats for wildlife adapted to breeding exclusively in these areas. They also play a vital role in holding and retaining floodwaters and regulating stream flows during dry periods, providing essential ecosystem services to nearby areas.

The elevation of Buena Vista County varies between 1200 and 1500 feet above sea level.

3.2.1 Geology

The geology of Buena Vista County is almost entirely from the Cretaceous Era (74-102 million years ago), with a small portion in the southeast corner of the county from the Mississippian Era (325- 353 million years ago). Iowa's geologic history lies buried beneath the ground. The deeper, older and least frequently seen portions of this history consist mostly of sedimentary rocks such as sandstone, limestone, dolomite and shale, which are over 3,000 feet thick in places.



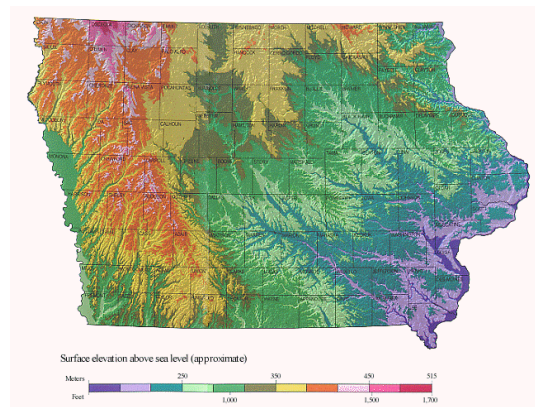
These rocks originated as layers of loose sediment accumulating in shallow seas and along coastal and floodplain environments that occupied Iowa between 74 million years ago (Cretaceous) and 530 million years. With time, this sediment hardened into rock containing fossil remains of past animal and plant life. Bedrock is occasionally exposed along the state's river valleys, at road cuts, and in quarries. Across much of the state, the bedrock surface is covered with younger glacial-age materials. As a result, much of our information about Iowa's bedrock geology comes from rock samples brought up to the land surface during the drilling of wells.

The present land surface across Iowa is dominated by loose materials that are much younger than the bedrock beneath. These materials consist of sediment originating from ice sheets, melt water streams, and strong winds during a series of glacial events between 2.5 million and 10,000 years ago (Quaternary). This familiar "dirt" consists of pebbly clay, sand, gravel, and abundant silt, which over time have weathered into Iowa's productive loamy soils. These easily eroded "Ice Age" deposits account for the gently rolling appearance of much of the Iowa landscape. Differences observed in the landscapes across Iowa are the result of overlapping glacial advances coupled with the effects of erosion and wind.

Buena Vista County lies within two distinct land formations in the State of Iowa. The small northwestern portion of the county, or primarily that land lying west of the Little Sioux River corridor, is located within the "Northwest Iowa Plains" landform region. The larger eastern portion of the county or those properties lying primarily east-southeast of the Little Sioux River is located within the "Des Moines Lobe" region. The Northwest Iowa Plains landform is characterized by vigorous erosion that accompanied the glacial movements, which also produced open rolling hills across the region. Loess type soils are abundant. Land elevation is uniformly higher and precipitation lower than elsewhere in Iowa.

The last glacier to enter the state formed the Des Moines Lobe region between 15,000 and 12,000 years ago. By 12,000 years ago, the ice sheet was gone, leaving behind poorly drained landscape of pebbly deposits from the stagnant decaying ice, sand and gravel from swiftly flowing melt water streams, as well as clay and peat from glacial lakes.

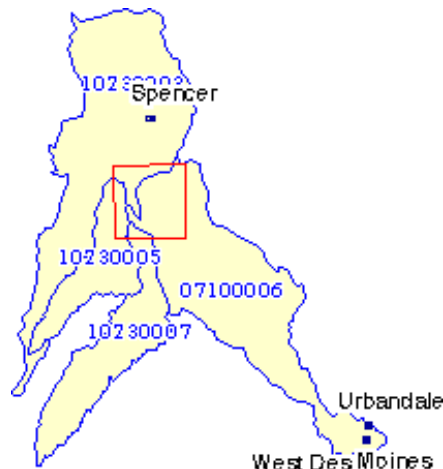
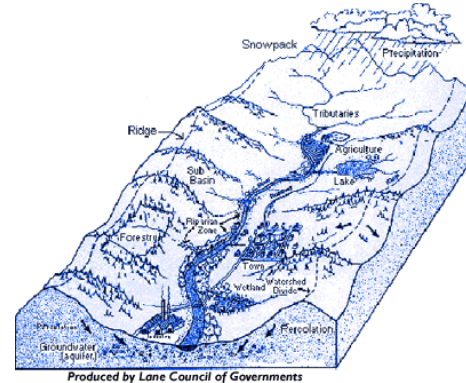
The flow of rivers is the primary geologic process affecting Iowa's landscape. Many valleys, such as the Missouri and Big Sioux River plains, are much wider than the rivers within them, which indicates excavation by flood flows



during glacial melting. Abundant gravel deposits along the valleys also reflect the power of melt water to move coarse material. Even modern floods demonstrate how earth materials are eroded from one portion of a valley, sorted by flowing water, and re-deposited downstream. Such episodes of sediment transport by rivers are an on-going part of the geologic evolution of Iowa. (Adapted from Iowa Geology 1997, Iowa Department of Natural Resources)

3.2.2 Major Rivers and Watersheds

Watersheds are areas in which all water, sediments and dissolved materials flow or drain into a common river, lake or other body of water. Watersheds may vary in size from the largest river basins to just a few acres, but within their boundaries, all living things are linked by their common watercourse. EPA provides a number of different financial and technical resources to support local watershed protection efforts undertaken by state and tribal governments, public interest groups, industry, academic institutions, private landowners and concerned citizens. Through the EPA's Office of Water, many local groups and other federal agencies can integrate solutions and measure success of these efforts through monitoring and other data gathering.



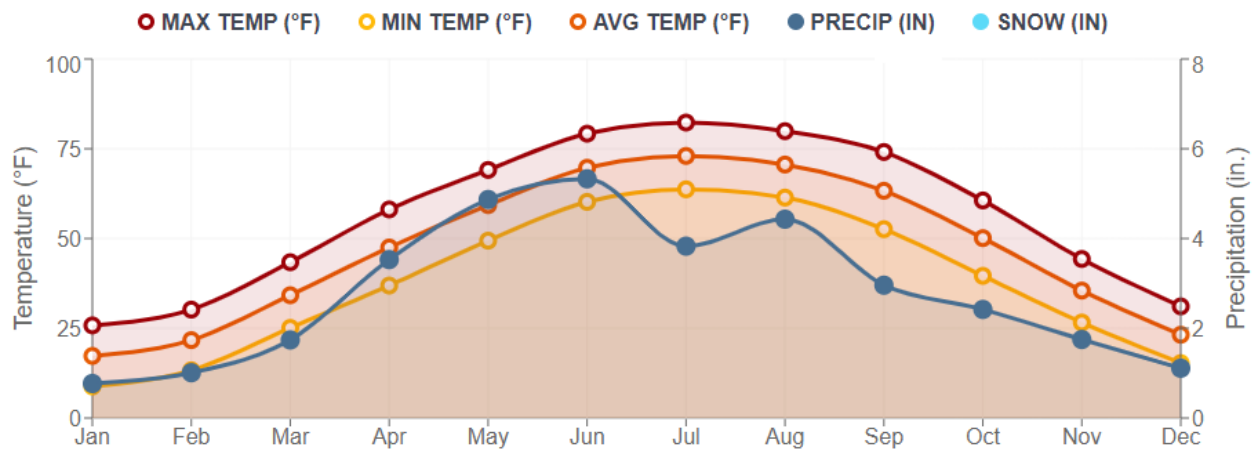
There are four river watersheds within the boundaries of Buena Vista County, shown below: the North Raccoon (0710006), Little Sioux (10230003), Maple (10230005) and Boyer (10230007). The major river watershed for the county is the North Raccoon. It covers the majority of land acres in the county. The remaining three watersheds cover a smaller portion of land in the county. The eastern border of the Little Sioux watershed is near the Iowa divide for streams, creeks, and rivers. In other words, all waterways and rivers in the Little Sioux, Maple and Boyer watersheds flow to the west toward the Missouri River. Conversely, all waterways and rivers located in the North Raccoon watershed in the southeast corner of Buena Vista County flow to the east and southeast toward the Mississippi River basin. (Source: US EPA website)

3.2.3 Climate

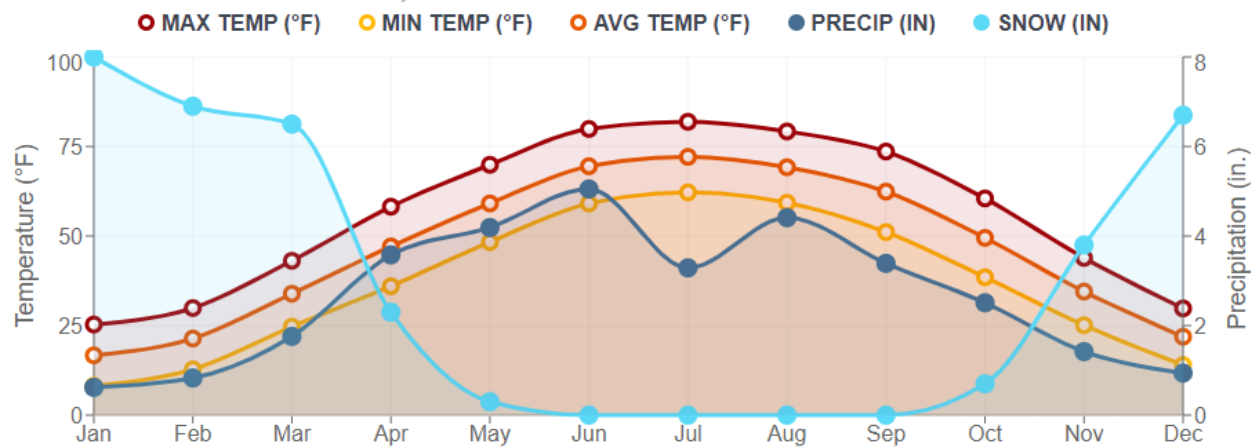
Buena Vista County, Iowa experiences a humid continental climate, which is characterized by four distinct seasons with significant temperature variation. Summers are warm and humid, with average high temperatures in the mid-80s°F and occasional heatwaves. Winters are cold, with average low temperatures in the single digits with occasional snowstorms. Spring and fall are transitional seasons, with mild temperatures and some precipitation. The county receives an average of 33 inches (about 84 cm) of precipitation each year, with rain being the most common form of precipitation. The county is also prone to severe weather events such as thunderstorms, tornadoes, and blizzards, particularly during the warmer months. Figure 3-2 illustrates typical climate conditions for two NCEI weather stations in Buena Vista, Storm Lake and Rapid Falls 4E.

Figure 3-2 NCEI Climate Normals for Buena Vista County

STORM LAKE, IA



SIOUX RAPIDS 4 E, IA



Climate becomes a major factor in hazard mitigation planning when it relates to agricultural production and construction seasons for roads and buildings. Climate limits agricultural, construction and tourism related activities to certain times of the year. In the winter it is generally cold, while quite hot temperatures and occasional cool spells characterize the summer. During the warmer months, the trend of warm, moist air masses from the Gulf of Mexico pushing north from the southern states creating a system of rain and thunderstorm, which are often heavy.

According to Sperling's Best Places website (<http://www.bestplaces.net>) the total annual rainfall precipitation is 29.7 inches, as compared to the national average of 36.5 inches. The average annual snowfall for Buena Vista County is 32.1 inches, which is higher than the national average of 25 inches. The total number of precipitation days in a calendar year is 88. In the winter, the average January low is 7 degrees F. Average highs in July are 84 degrees F. The prevailing wind is from the northwest. The overall climate comfort index ranks Buena Vista County at 43, which compares closely to the national climate index of 44. The climate charts below show averages for Buena Vista County.

3.3 Government

Buena Vista County's government serves as both the regional governing body and the primary provider of essential services for its residents. This includes performing various state administrative functions such as issuing licenses and permits, as well as providing local public services such as establishing zoning ordinances, offering health and indigent care, and managing county jails.

The citizens of Buena Vista County democratically elect an auditor, recorder, attorney, sheriff, treasurer, and a five-member County Board of Supervisors. The County Board of Supervisors serves as the executive branch of the county government and appoints directors to oversee the other offices in the courthouse. While the County Board of Supervisors is responsible for making policies that guide the county, the administration of the government is overseen by a range of elected and appointed officials, as well as various semi-autonomous boards and commissions.

3.4 Demographics

Table 3-2 lists the populations for the County and incorporated cities from 1980 through 2020. The unincorporated areas population was determined by subtracting the populations of the incorporated areas from the overall county population.

Table 3-2 Buena Vista County Population 1980-2020

Jurisdiction	1980	1990	2000	2010	2020	% Change 1980-2020
Buena Vista County	20,774	19,965	20,411	20,260	20,823	0.2%
City of Albert City	818	779	709	699	677	-17.2%
City of Alta	1,720	1,820	1,865	1,883	2,087	21.3%
City of Lakeside	589	522	484	596	700	18.8%
City of Linn Grove	205	194	211	154	163	-20.5%
City of Marathon	442	320	302	237	230	-48.0%
City of Newell	913	1089	887	876	906	-0.8%
City of Rembrandt	291	229	228	203	209	-28.2%
City of Sioux Rapids	897	761	720	775	748	-16.6%
City of Storm Lake	8,814	8,769	10,076	10,600	11,269	27.9%
City of Truesdale	128	132	91	81	69	-46.1%
Unincorporated County	5,957	5,350	4,838	4,156	3,765	-36.8%

Source: US Census Bureau

Table 3-3 provides social and demographic characteristics for Buena Vista County. For comparison, values for the entire State of Iowa and the Country are also included. Tracking social characteristics such as education level, income, and other relevant factors can provide valuable insights into the composition and needs of a population. By understanding these characteristics, policymakers can design targeted programs and policies that address the specific needs and challenges of different groups within the population.

Table 3-3 Buena Vista County Social Characteristics

Indicator	Buena Vista County	State of Iowa	United States
Median Age	35.0	38.3	38.2
% Population under 5	7.2%	6.2%	6.0%
% Population over 65	15.1%	17.1%	16.0%
Housing Occupancy Rate	91.4%	91.2%	90.2%
% Owner Occupied Housing	64.5%	71.2%	64.4%
% Renter Occupied Housing	35.5%	28.8%	35.6%
% Households w/o Vehicles	4.3	5.7%	8.5%
Median Household Income	\$54,014	\$61,836	\$64,994
Per Capita Income	\$69,954	\$80,316	\$91,547
% of Individuals Below Poverty Line	10.9%	11.1%	12.8%
Average Household Size	2.45	2.40	2.60
% Over 25 w/ High School Diploma	30.1%	30.8%	26.7%
% Over 25 w/ bachelor's degree or Higher	20.8%	29.3%	32.9%
% with Disability	9.8%	11.8%	12.7%

Source: US Census Bureau

Table 3-4 presents additional demographic information from Buena Vista County. Demographic information can help to identify trends, patterns, and disparities within a population and are an essential tool for understanding and analyzing social, economic, and health-related issues. The HMPC noted that Buena Vista County is the most racially diverse county in the State of Iowa. The diversity in Buena Vista County is significant when compared to the rest of the state (57.9% white alone), with Crawford County being the second most diverse county in the state (90.7% white alone).

Table 3-4 Buena Vista County Demographics

Indicator	Population Count	Percent of Population
Male	9,903	49.6%
Female	10,047	50.4%
White, not Hispanic	11,556	57.9%
Hispanic or Latino	3,969	15.9%
Black	450	2.3%
Asian	2,099	10.5%
Native American & Alaskan Native	12	0.1%
Native Hawaiian & Pacific Islander	332	1.7%
Some Other Race	1,482	7.4%
Two or More Races	857	4.3%

Source: US Census Bureau

3.4.1 Population Trends

Population analysis plays a critical role in the planning process. Analysis of past trends and current population structure is important in making future population projections. Those projections, along with information about population characteristics such as age, are fundamental in considering the need for current and future mitigation activities and infrastructure improvements. This section will examine past trends, future projections, and current structure, and discuss their impact on the future of Buena Vista County.

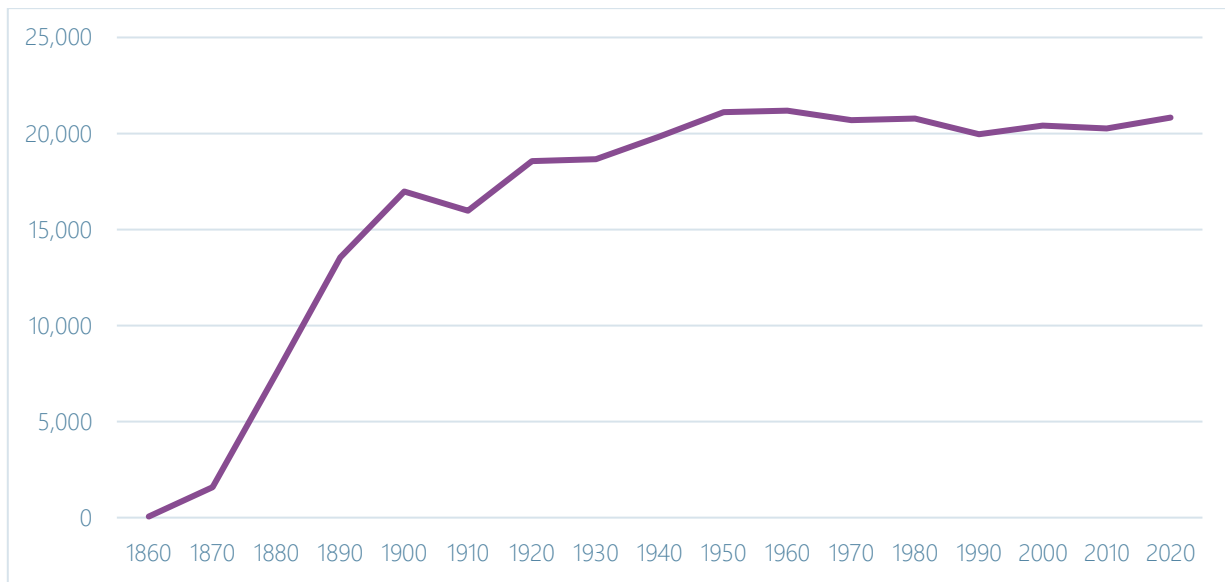
Buena Vista County population trends have not been typically to the trends experienced by many other counties in Northwest Iowa and most other rural counties in Iowa, largely due to the diverse population in the county. While surrounding counties to Buena Vista have experienced shifts in growth and population trends over the past several decades, Buena Vista population has remained steady as seen in Figure 3-3.

Analysis of past trends and current population structure is important in making future population projections. Those projections, along with information about population characteristics such as age and household size, are fundamental in considering the need for future infrastructure improvements and the need for the development of residential, commercial, and industrial areas. This section will examine past trends, current structure, future projections, and discuss their impact on the future of Buena Vista County.

Buena Vista County first recorded an official federal census in 1860 with a county population of 57 residents. However, it did not take long for early settlers to find Buena Vista County. By 1900 the county's population grew to a recorded census of more than 16,975 residents. Over the past 100 years, Buena Vista County has seen periods of growth and decline, however, there have not been extreme fluctuations in the overall population. The changes in population in Buena Vista County were a gradual increase in population until the county reached its high in 1960. The population of Buena Vista County has been experiencing a very gradual decline in population ever since its 1960 peak. While other counties in northwest Iowa saw more severe population declines during the agricultural crises of the 1980's, Buena Vista County's population has remained steady.

As shown in Figure 3-3, Buena Vista County experienced rapid growth from its founding through 1900, followed by more modest growth through 1960, when the population peaked at 21,189. Since then, the population has been steady, with mild losses from 1960 through 1990, followed by a modest increase to 2020.

Figure 3-3 Buena Vista County Demographic Trends, 1860-2020



Source: US Census Bureau

As shown in Table 3-2 above, the population of unincorporated Buena Vista County has decreased 36.8% from 5,957 in 1980 to 3,350 in 2020. Buena Vista County is far from unique in this trend; most northern Iowa counties have experienced a loss of rural population. The continued decline or shifting of the rural population in Buena Vista County will become a key factor for future community and economic development efforts.

The median age of County residents in 2020 was 35.0, slightly down from the 2010 median age of 37.1 years. 25.9% of the county is 18 years old or under, and 15.1% is 65 years or older; both these figures are roughly unchanged from 2010. Men represent 49.6% of the County population, while women represent 50.4%. However, women make up 55.1% of those 65 or older, with men making up 44.9%.

The average family size in Buena Vista County in 2020 was 2.98, down slightly from 3.11 in 2010.

3.4.2 Housing Characteristics and Occupancy

According to the US Census Bureau for Buena Vista County as of July 2021, there were 8,154 housing units. There are 7,506 households out of which 89.1% were persons in households age 1+ year old and the average household size was 2.63.

The median property value in Buena Vista County, IA was \$120,300 in 2020, which is 0.523 times smaller than the national average of \$229,800. Between 2019 and 2020 the median property value increased from \$115,600 to \$120,300, a 4.07% increase. The homeownership rate in Buena Vista County, IA is 64.5%, which is approximately the same as the national average of 64.4%.

For the 10,138 workers 16 years of age and older, the mean commute time was 13.6 minutes, shorter than the normal US worker (26.9 minutes). 69.1% of workers in Buena Vista County drove alone to work, followed by those who carpooled to work (16.5%) and those who walked to work (6.61%). (U.S. Census, 2020).

3.4.3 Education

Within Buena Vista County, there are now five primary public-school districts along with portions of three additional school districts that have their boundaries within Buena Vista County. The six primary school districts of Buena Vista County include the Sioux Central Community School District, Alta-Aurelia Community School District, Albert City-Truesdale School District, Newell- Fonda Community School District, and Storm Lake Community School District. Figure 4-15 shows school locations and district boundaries.

The other community school districts that encroach into Buena Vista County include the Laurens-Marathon Community School District, which covers a small portion of northeastern Buena Vista County. The Galva-Holstein School District, which covers a very small area of land in southwestern Buena Vista County, as does the Schaller-Crestland School District.

Education is a top priority for the residents of Buena Vista County. Students attending either public or private schools in Buena Vista County are sure to find a high quality educational environment in which to learn. Aside from the five public school districts in Buena Vista County, there is also one private Catholic school available to residents: St Mary's Catholic School. In addition to fine academics taught within Buena Vista County public and private schools, these education centers promote and encourage the fine arts, performing arts programs, as well as a variety of traditional athletic programs to stimulate all aspects of a student's education. Following is a listing of all Buena Vista County preschool through grade 12 schools:

- Storm Lake Community Schools (1 Preschools, 1 Early Elementary School, 1 Elementary, Middle, High School)
- Alta-Aurelia Community Schools (Elementary, Middle, High School)
- Albert City-Truesdale Community School (Elementary)
- Newell-Fonda Community Schools (Low Elem, Upper Elem, Middle, High School)
- Sioux Central Community Schools (Elementary, Middle, High School)
- Storm Lake St Mary's Catholic School (Elementary, Middle, High School)

In addition to the private and public K-12 schools in Buena Vista County, the residents of this county are also fortunate to have the local resources of two higher learning institutions. Post-secondary educational opportunities include Iowa Central Community College-Storm Lake Campus and Buena Vista University. Both of these high learning centers are located within the City of Storm Lake.

Iowa Central Community College: Storm Lake Campus: The Storm Lake campus is part of the network of the Iowa Central Community College. With its main campus in Fort Dodge, Iowa Central Community College has satellite campuses in Storm Lake and Webster City. The Storm Lake Center currently offers students a wide range of community college programs. Students can earn a 2-year Associate degree or apply credits toward a 4-year Bachelor's degree in conjunction with Buena Vista University.

Buena Vista University: BVU was founded as Buena Vista College in 1891 and is located on a 60- acre campus on the north side of Storm Lake in the City of Storm Lake. The college received accreditation in 1952. Since receiving a large, anonymous donation in 1980, the college has undergone continued growth, creating a competitive college endowment, expanding its physical facilities, and developing new academic programs. The University supports more than 65 Degree program options (48 majors and 26 pre-professional programs) in five academic schools including business, communication and arts, education, science, and social science/philosophy/religion.

Below is a table listing the educational facilities and current enrollment numbers for the schools of Buena Vista County.

Table 3-5 Buena Vista County Schools and Enrollment

School	Type of Education	Enrollment 2017/18
Albert City-Truesdale Com. Schools	Public PK-6	209
Alta-Aurelia Community Schools	Public PK-12	887
Newell-Fonda Community Schools	Public PK-12	502
Storm Lake Community Schools	Public PK-12	2,702
St Mary's Catholic School	Private PK-12	264
Iowa Central Community College – Total for all Campuses	2 Year Degree /Community College	5,009
Buena Vista University	4 Year Degree/Graduate & Professional Programs	1,959
Sioux Central Community Schools	Public PK-12	660

Source: Iowa Department of Education & Buena Vista University

3.5 Economy

According to the US Census Bureau, the median household income in Buena Vista County is \$54,014. The per capita income for the county is \$52,927. 10.8% of the population were below the poverty line. The average earnings per job was \$60,161. In 2021, the County's unemployment rate was 3.2% compared to US average rate of 5.3%.

In 2020, the top outbound Iowa product (by dollars) was Machinery with \$20.9B, followed by Mixed freight (\$19.9B) and Meat/seafood (\$18.8B). The prominent industries in Buena Vista County include manufacturing, retail trade, agriculture, and education/health sectors. Industries of lesser prominence include information technology, finance/insurance & real estate, and public administration. The industries employing the most people in Buena Vista County are the manufacturing sector.

Other employment sectors in which there are more persons working in the industry on average in Buena Vista County versus the state, include agriculture, construction, and other services, except public administration. Conversely, those employment sections in Buena Vista County in which there are less persons working in the industry on average in comparison to the state include those working in the retail trade, transportation and warehousing, and utilities and public administration sectors. With more than average Buena Vista County residents employed in the traditional "blue collar" industries, when compared to the state and less than average residents employed in traditional "white collar" industries, when compared to the state; it lends one to believe that Buena Vista County would be considered more of a "blue collar" labor force.

Iowa Lakes Corridor Development Corporation is the regional Economic development agency for Buena Vista, Clay, Dickinson and Emmet Counties. They work on behalf of these counties to spur Economic development and work with City and County governments to do so. Their mission is "To foster, encourage, promote aid or otherwise assist in the Economic growth and development of the four-county region." The Iowa Lakes Corridor invites all residents, employers, and visitors to the area to experience all the activities the region has to offer. The glacial lakes region of Iowa boasts some of the most beautiful landscapes, along with offering a blend of commerce, leisure, culture, education, and hospitality that will surely encourage visitors to stay.

3.5.1 Employment

Buena Vista County enjoys a diverse economy with a variety of occupations and employment opportunities, which employs 10.2k people. The largest industries in Buena Vista County are Manufacturing (3,114 people), Educational Services (1,234 people), and Retail Trade (1,070 people), and the highest paying industries are Utilities (\$71,711), Transportation & Warehousing, & Utilities (\$48,125), and Wholesale Trade (\$44,773), according to data from the Iowa Lakes Corridor Development Corporation. The most in-demand skills in the county were for Healthcare, Merchandising, and Machinery. In Buena Vista County, 13.1% of those employed were in government jobs (US average 12%), 6.31% in agriculture (US average 1.29%), 6.3% commodities (US average 2.3%), 8.5% travel/tourism (US average 12.3%). Overall jobs in the county declined by 3.9% from 2015 to 2020.

Males in Iowa have an average income that is 1.33 times higher than the average income of females, which is \$48,102. The income inequality in Iowa (measured using the Gini index) is 0.438, which is lower than the national average, according to Data USA (<https://datausa.io/profile/geo/buena-vista-county-ia/>).

The largest manufacturing companies in Buena Vista County according to data from the Iowa Lakes Corridor Development Corporation are reflected in Table 3-5 below. The educational services, and health care and social assistance employment sector comprises the second largest group of employees in Buena Vista County. Although health and education jobs are important to Buena Vista County, the difference in the percentage as compared to the state's average may be attributed to the fact that there is only one hospital in Buena Vista County, which is located in Storm Lake. Furthermore, of 10 cities in Buena Vista County, only Alta and Storm Lake maintain a population of more than 1,000 residents and have a school district with a sizeable workforce.

Other employment sectors in which there are more persons working in the industry on average in Buena Vista County versus the state include agriculture, wholesale trade, arts, entertainment, and recreation, and accommodation and food services, and other services and except public administration. Conversely, those employment sections in Buena Vista County in which there are less persons working in the industry on average in comparison to the state include those working in the construction, retail trade, transportation and warehousing, and utilities, information, finance and insurance, and real estate and rental leasing, professional, scientific, management, administrative and waste management services, and public administration sectors.

The table below shows employers in Buena Vista County with more than 50 employees. The majority of these workplaces are located in Storm Lake. Most of the larger employers are involved in either value-added agriculture, manufacturing, or financial services.

Table 3-6 Major Employers in Buena Vista County

Employer	Product/Service	Location
Rembrandt Industries	Egg-laying/Egg Products	Rembrandt
Hillshire Brands	Turkey Processing	Storm Lake
Tyson Fresh Meats	Pork Processing	Storm Lake
AgState, Inc.	Animal Feed Products	Newell
Merrill Manufacturing	Valves and pipe fittings	Storm Lake
Meridian	Metal Storage Containers	Storm Lake
RANCO Fertiliservice	Fertilizer blenders, augers, conveyors	Sioux Rapids
Valero Renewables	Ethanol	Albert City
Citizens 1 st National Bank	Financial Services	Storm Lake
First State Bank	Financial Services	Sioux Rapids
Heritage Bank	Financial Services	Storm Lake

Employer	Product/Service	Location
Northwest Bank	Financial Services	Storm Lake
Security Trust & Savings Bank	Financial Services	Storm Lake
Buena Vista University	Higher Education	Storm Lake
BV Regional Medical Center	Medical	Storm Lake
Storm Lake Community Schools	Education	Storm Lake
Super Wal-Mart	General Retailer	Storm Lake
City of Storm Lake	Municipal Government	Storm Lake
Marketlink	Telemarketing	Storm Lake
Buena Vista County	County Government	Storm Lake
Kings Point Resort	Resort Destination	Storm Lake
Harvest International	Agriculture	Storm Lake

Source: Iowa Lake Corridor

3.5.2 Occupations

Table 3- provides occupation statistics for the incorporated cities and the county as a whole. This table can provide insights into the economic health and development of the area, as well as highlight potential opportunities for growth and investment. It can also help identify gaps in the local workforce and inform efforts to develop training and education programs that address these gaps.

Table 3-7 Occupational Statistics

Jurisdiction	Management, business, science, arts	Service occupations	Sales and office occupations	Natural resources, construction, maintenance	Production, transportation, material moving
Iowa	37.6%	15.6%	20.1%	9.6%	17.0%
Buena Vista County	25.9%	12.6%	17.7%	10.0%	33.7%
Alta City	38.3%	14.5%	14.7%	11.3%	21.3%
Lakeside	35.9%	16.0%	8.1%	8.1%	31.8%
Marathon	33.0%	18.6%	6.2%	14.4%	27.8%
Storm Lake	18.5%	12.1%	18.1%	6.9%	44.5%
Truesdale	3.4%	20.3%	57.6%	5.1%	13.6%
Unincorporated Buena Vista County	25.9%	12.6%	17.7%	10.0%	33.7%

3.5.3 Agriculture

Agriculture has historically been and remains one of the primary economic sectors in Buena Vista County. According to the 2017 Census of Agriculture, Buena Vista County had 802 farms spread over 356,640 acres of land. In the same year, farmers from the county harvested 172,343 acres of corn, 143,345 acres of soybeans, and produced 1,015,932 turkeys and 348,357 hogs and pigs. Farms in Buena Vista County have an average size of 445 acres, and the total market value of agricultural products sold in the county in 2017 was approximately \$538 million. The agriculture industry is a significant contributor to the county's economy, providing 1,326 jobs, which is 12.4% of the county's workforce. While crop and livestock production are visible parts of the agricultural economy, many related businesses contribute by

producing, processing, and marketing farm and food products, generating income, employment, and economic activity throughout the region.

Nationwide data shows a continuing trend towards more small and very large farms and fewer mid-sized operations--a trend echoed in Iowa. Overall, the majority of U.S. farms are smaller operations with more than half characterized as residential/lifestyle or retirement farms.

In addition to looking at all aspects of farming, the Census of Agriculture provides a comprehensive look at operator demographics--with 2012 results indicating that farmers continue to become more diverse.

With changing trends in farming experienced in Buena Vista County, northwest Iowa, and the state, continued shifts in farming can be expected in the future. One of the criteria that will have significant impact on future trends in the agricultural economy in Buena Vista County is the value of agricultural land. The land value measure dictates to farmers and farm corporations how much equity they have in their land based against their debt and often is the factor allowing agricultural operations to borrow funds for new equipment and operations. Buena Vista County is fortunate to have some of the most nutrient rich black topsoil in the state, therefore keeping land values higher than statewide averages.

Buena Vista County's primary agricultural commodities include corn, soybeans, hogs, poultry/eggs, and cattle. Market prices for all these commodities have increased over the past ten years. The yields for Buena Vista County corn crops from 2017 was 188 bushels/acre and 56 bushels/acre for soybeans. For corn, the ten-year average is 180 bushels/acre and for soybeans the average is 52 bushels/acre.

3.6 Land Use Patterns and Trends

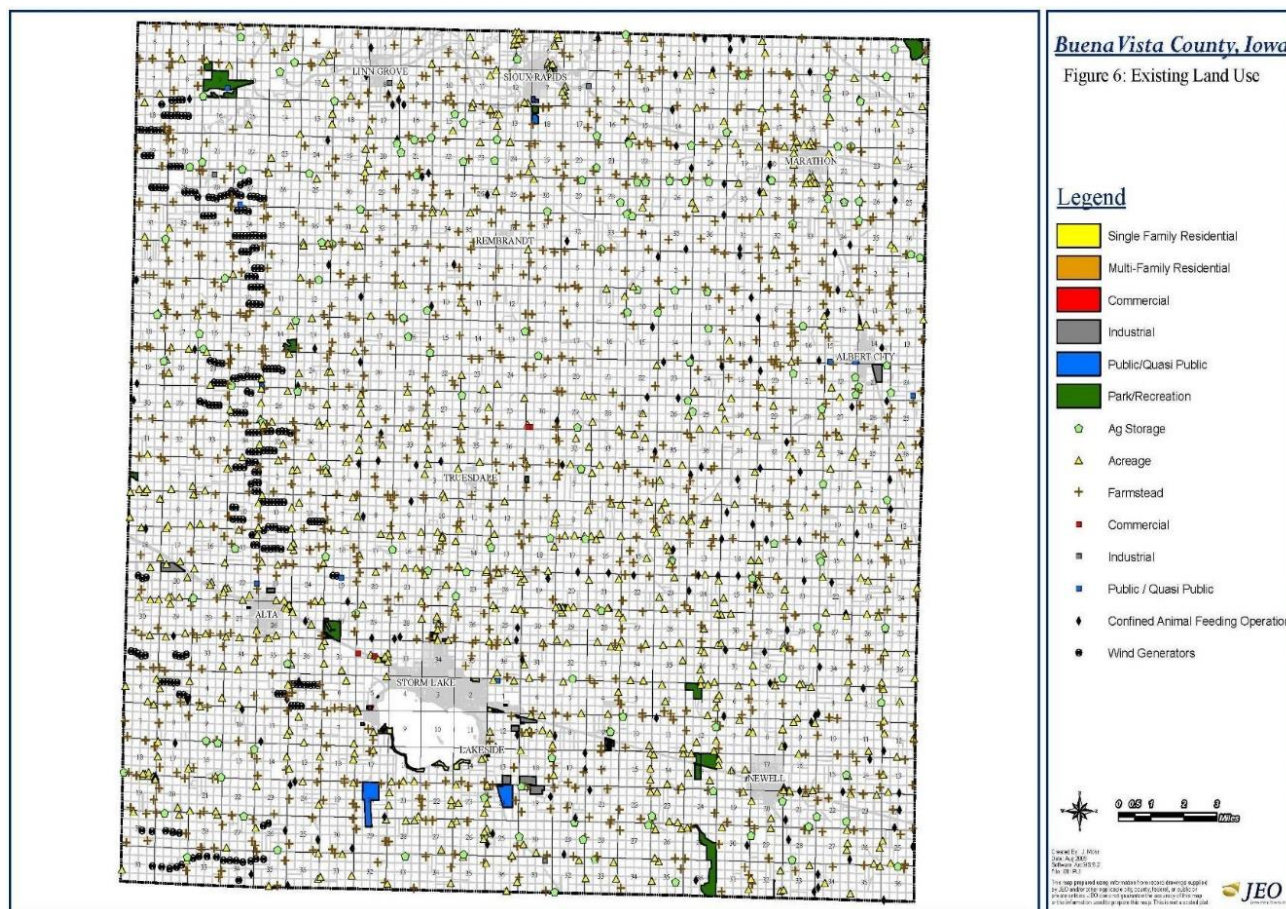
Buena Vista County's physical character is typical of most rural Midwestern counties; rolling hills, rivers, shelter belts, pockets of trees, a lake, and widespread agriculture. Storm Lake is a natural 3,200-acre lake located in the southwest corner of the county. The vast majority of the 367,872 acres of land within the county is used for agricultural production, according to the 2017 Census of Agriculture.

Non-farm rural residential development is a growing trend throughout the State of Iowa over the past several decades. This has been driven by market demand for larger parcels of land and larger homes. In most instances, larger parcels of land are not available within the corporate limits of smaller cities. As a result, the development has occurred in rural areas. This trend should continue to occur throughout the county in the future. It is important for the governing body of Buena Vista County to acknowledge the potential increase in non-farm residents in the future, and design regulations that adequately manage their impact on the existing uses within the county. Acreage development has occurred throughout the entire county; however, the southern half of the county has experienced slightly more acreage growth.

The majority of most commercial operations and businesses are located within the corporate limits of the communities within the county. The major industrial uses in Buena Vista County are located east of the City of Storm Lake and northeast of Lakeside. Other industrial development located in the unincorporated portion the county is outside of Albert City and near Alta. Public/semi-public land uses are located throughout Buena Vista County. These uses are generally located near the major transportation routes of the county, including U.S. Highway 71 and Iowa State Highway 7. There are three public/quasi-public developments south of Storm Lake, including the Storm Lake Municipal Airport.

Buena Vista County at the present time has a considerable amount of land designated as park and recreation development. These twelve recreation areas consist mostly of wildlife reserves, hunting ground, and nature reserves located throughout the county.

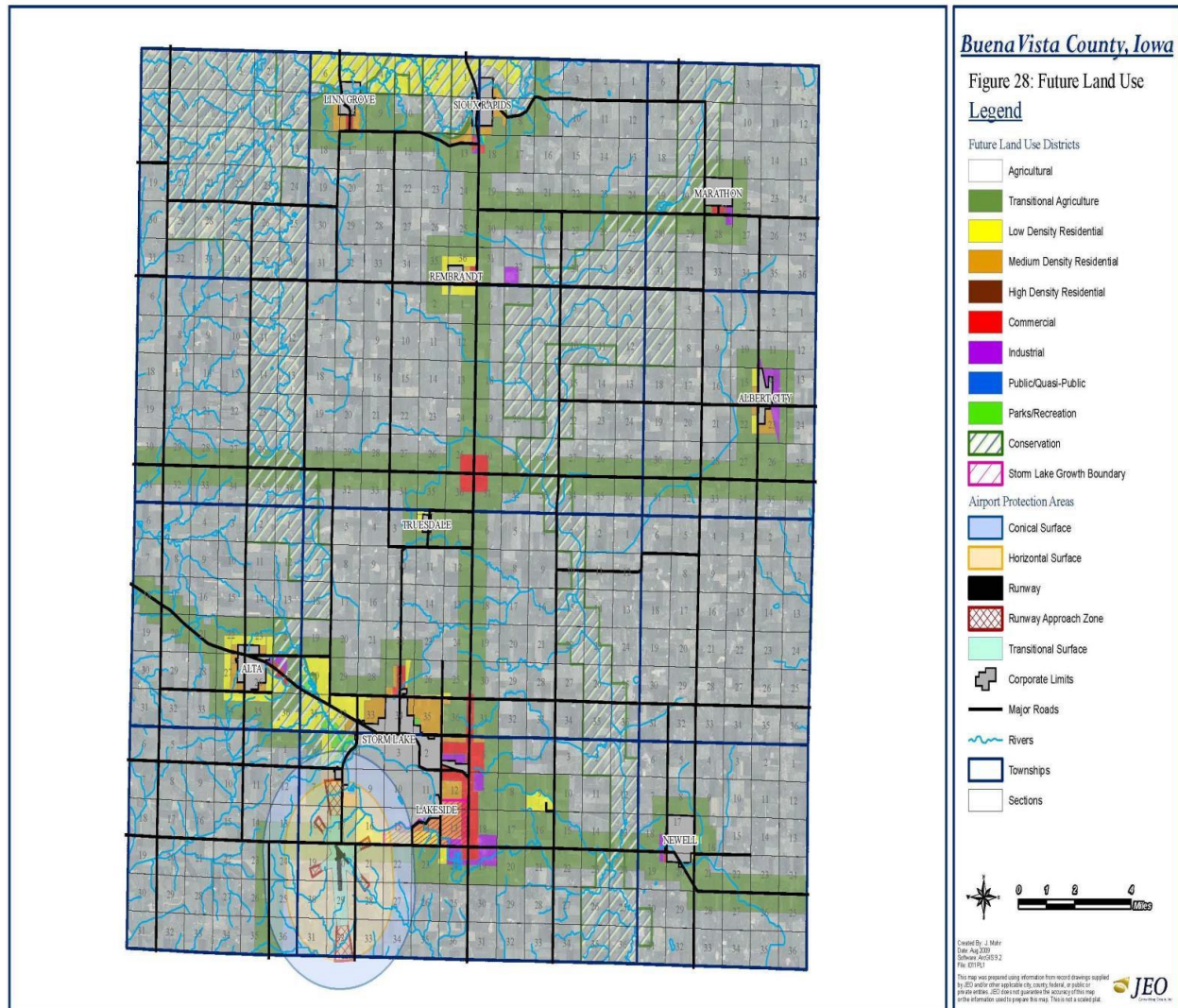
Figure 3-4 Buena Vista County Existing Land Use



Buena Vista County is home to three separate wind turbine farms situated along the west and southwest sides of the county, the Intrepid project and the Storm Lake I & II project. Combined, the projects produce 349-megawatts, enough to power approximately 500k homes. The Intrepid project alone has 122 turbines in service and the Storm Lake projects were recently re-fitted with upgraded technology and hardware.

Overall, the existing land use pattern in Buena Vista County is typical of most agriculturally rich Midwest counties. A heavy confined animal feeding operation (CAFOs) density throughout the county can have a significant effect on establishing locations for additional developments due to issues with air and water pollution, noise, and odor. Residential developments around Storm Lake have created challenges for the county to maintain an adequate level of water quality for the lake. Acreage development has become denser north and east of Storm Lake but has not grown out of control at the time of this planning period. Buena Vista County should establish rural residential development standards as part of a Future Land Use Plan and Zoning Regulations. (Source: Buena Vista County Comprehensive Plan Update 2009)

Figure 3-5 Buena Vista County Future Land Use Projections



Source: Buena Vista County Comprehensive Plan, 2009

3.7 Transportation System

Highways: State highways 10, 3, and 7 (running east-west) and 71 (running north-south) bisect the county and are the major routes of travel through and within the county. According to the Iowa DOT traffic survey of 2019, which records annual average daily traffic on the heavily used sections of roads and intersections, Highway 71 has traffic counts from 3,050 to 5,570 vehicles per day and Highway 3 has traffic counts from 1,350 to 1,950 per day. Highway 7 has traffic counts from 1,250 to 5,570 vehicles per day and Highway 10 has traffic counts from 1,040 to 1,350 vehicles per day.

Streets and Roads: According to the Iowa Department of Transportation as of May 2023, Buena Vista County's secondary roadway network consists of 1,089 total miles. Secondary roads are those roads not classified as either a federal or state highway route. Of these road miles, 87.5 miles are considered rural primary miles and the remaining 1,001.5 miles comprises the secondary roads system. There are 6.5 miles of dirt or unpaved secondary roads, which accounts for only 0.6% of the secondary roads. Additionally,

gravel roads account for 74.2% of all secondary roads in the county, while asphalt or PCC account for nearly 24% of all secondary roads in Buena Vista County.

Public Transit Services: The Regional Transit Authority (RTA) known as RIDES is the local transit provider for Buena Vista County. RIDES is the regional transit provider for a nine-county region in Northwest Iowa. Specifically for Buena Vista County, RIDES provides fixed route and on demand transit services to several communities in Buena Vista County. Anyone living in Buena Vista County can contact the regional transit provider for on-demand taxi service to schedule rides either inter-county or anywhere else within the nine-county service area covered by RIDES. When residents of the county need transportation assistance to healthcare appointments, RIDES provides a safe, reliable form of transportation.

Railroad Services: The Canadian National Railroad Company passes through Buena Vista County. It is a primary railway bisecting the state of Iowa from its eastern to western borders. This rail line travels from Alta in the west, through the City of Storm Lake from the southeast to the northwest, through Sulphur Springs and Newell following the Highway 7 corridor. The rail line is heavily utilized for shipment of agricultural commodities such as grains, refined products, and agricultural chemicals and fertilizers. A short spur of Union Pacific Railroad also connects Marathon to Albert City and continues eastward out of Buena Vista County.

Airports: Of the ten incorporated cities in Buena Vista County there is only one airport to service the needs of the county. The Storm Lake Municipal Airport is located approximately ½ mile south of the southwest corner of the city limits. It is a publicly owned airport operated by the City of Storm Lake and run by the Storm Lake Airport Commission, a five-member, volunteer board of commissioners.

The Storm Lake Municipal Airport is a basic utility airport supplying the corporate, business and personal aviation needs of Buena Vista County. There are no chartered or passenger airline service from the Storm Lake Municipal Airport.

The airport has a total of three runways. Runway 17/35 is 5,000 feet in length and 50 feet wide and runway 13/31 is 3034 feet in length and 50 feet wide. Both runways are concrete. Runway 6/24, a turf runway, is 1855 feet in length and 90 feet wide. According to the resource AirNav.com, there are 20 aircraft based at the airport, with 19 being single engine planes and 1 jet.

3.8 Emergency Services

3.8.1 Fire Protection Services

Buena Vista County Townships are serviced by nine fire departments in an area of 575 square miles. There is one fire department per 2,036 people and per 57 square miles. Listed below are fire departments located in Buena Vista County, and the rural townships served by these departments. The City of Truesdale previously had their own fire department but is now covered by the Storm Lake Fire Department.

Albert City Fire Department: Currently this department has one fire station with volunteer firefighters. Their area of service includes the following townships: parts of Lincoln, Coon, Grant, and all of Fairfield. The Fire Department's services include:

- Fire suppression
- Fire Prevention
- Extrication
- Firefighters trained at Awareness level and Operations level for Hazardous Materials incidents.

Alta Fire Department: Currently, this department has one station. Their area of service includes the following townships: parts of Elk, Nokomis and all of Maple Valley. The Fire Department's services include:

- Fire suppression
- Fire Prevention
- Extrication
- Firefighters trained at Operational level for Hazardous Materials incidents.
- Non-transport, basic level EMS services.

Marathon Fire Department: Currently this department has one fire station in operation with volunteer firefighters. Their area of service includes Poland Township. The Fire Department's services include:

- Fire suppression
- Fire Prevention
- Extrication
- Firefighters trained at Operational level for Hazardous Materials incidents.

Newell Fire Department: This department currently has one fire station with volunteer firefighters. Their area of service includes the following townships: Newell, Providence, part of Grant and part of Coon. The Fire Department's services include:

- Fire suppression
- Fire Prevention
- Extrication
- Firefighters trained at Operational level for Hazardous Materials incidents.

Rembrandt Fire Department: Currently this department has one fire station with volunteer firefighters. The Fire Department's services include:

- Fire suppression
- Fire Prevention
- Extrication
- Firefighters trained at Operational level for Hazardous Materials incidents.

Sioux Rapids Fire Department: Currently this department has one fire station in operation with volunteer firefighters. Sioux Rapids has an agreement with Linn Grove to provide fire protection services. The Fire Department's services include:

- Fire suppression
- Fire Prevention
- Extrication
- Firefighters trained at Operational level for Hazardous Materials incidents.

Storm Lake Fire Department: This department has one fire station in operation with paid, on call firefighters. Their area of service includes the following townships: Storm Lake, Lakeside, Lake Creek, Washington, Grant, Truesdale, and Hayes. The Fire Department's services include:

- Fire suppression
- Fire Prevention
- Extrication
- Aerial Truck operations
- Confined space rescue
- Firefighters trained at Operational level for Hazardous Materials incidents.

3.8.2 Law Enforcement

The Buena Vista County Sheriff's Department is responsible for enforcing the laws of the State of Iowa and the ordinances of Buena Vista County. It provides courthouse security, operates the county jail, provides dive rescue services, and performs civil procedures. Aside from patrolling the unincorporated rural areas of the county, the Sheriff's Office also has 28E agreements in place to patrol all of the communities in Buena Vista County except Storm Lake, Newell and Sioux Rapids.

The other major law enforcement organization in the county is the Storm Lake Police Department. It enforces the law in the City of Storm Lake, which accounts for an estimated 12,500 people – over half the population of the county. The Storm Lake Police Department employs fulltime Police Officers, Civilian Staff and seasonal park rangers.

3.8.3 Emergency Management

As prescribed by Iowa Code, the Buena Vista County Office of Emergency Management Services is overseen by an Emergency Management Commission. It is comprised of the mayor (or their representative) of each community in the county, the Sheriff, and one member of the Board of Supervisors.

The coordinator is appointed by the commission to oversee "the administration and coordination of all civil defense and emergency planning matters throughout the county, both as to human-caused and natural disasters". The Buena Vista County Emergency Management Agency is responsible for the development and maintenance of the County's All Hazards Emergency Operations plan, the Recovery plan, the Mitigation Plan and the Strategic Plan for Emergency Services. The Emergency Management Coordinator plans and facilitates the county-wide disaster exercises. The Agency sponsors critical training opportunities for emergency responders, partner agencies, and the public to ensure that Buena Vista County is prepared to deal with all hazards that may impact it and its citizens.

Buena Vista County and all its communities participate in the Alert Iowa program. Alert Iowa is a statewide mass notification and emergency messaging system. Messages can be sent to the public by state or local authorities via text messaging, emails, and/or voice.

3.8.4 Health Care Facilities & Senior Care

Hospitals, healthcare facilities and long-term care facilities remain an important aspect of the community facilities offered within the Buena Vista County communities. Medical care services are of particular importance to the large number of elderly residents in the County. In addition to the Buena Vista Regional Medical Center, there are three medical clinics in the county. Additional medical facilities can be found in the following adjacent counties: Cherokee (Cherokee Regional Medical Center), Clay (Spencer Hospital), Ida (Horn Memorial Hospital), O'Brien (Baum Harmon Mercy Hospital and Northwest Iowa Health Center), Palo Alto (Palo Alto County Health System), and Pocahontas (Pocahontas Community Hospital).

Hospital: Buena Vista Regional Medical Center (BVRMC), located in Storm Lake, is a full-service, 25 bed critical access hospital. Services include general medical, orthopedics and surgical care for inpatient, as well as obstetrics and a geriatric behavioral health unit. BVRMC has over 400 employees, which includes four physicians and two advanced registered nurse practitioners (ARNP), and has an attached Specialty Clinic with 56 specialist and 23 specialty services. The full-service Emergency Department is a Level IV trauma facility and provides 24 hour physician coverage.

Ambulance Services: BVRMC staff includes Paramedics, Intermediate level, and basic level EMTs. Albert City and Sioux Rapids Ambulance Services are owned and managed by BVRMC. Both are transporting services, occupied by 8 EMTs and 9 certified drivers. Newell Ambulance Service is owned by the City of Newell and managed by the City of Newell. Newell is also a transporting service staffed by EMTs and certified drivers.

Medical Clinics: Buena Vista County has four primary medical clinics serving the residents. These clinics are the UnityPoint Clinic Family Medicine Buena Vista Storm Lake, United Community Health Center, and UnityPoint Clinic Family Health Center in the City of Storm Lake, and the Sioux Rapids Family Care clinic in Sioux Rapids.

The UnityPoint Clinic Family Medicine Buena Vista Storm Lake and UnityPoint Clinic Family Health Center are closely associated with the Buena Vista Regional Medical Center and UnityPoint Health (UPH), based in Des Moines. These facilities offer family practice, internal medicine, and orthopedic services, and are staffed by eight physicians and three nurse practitioners. Both clinics offer care by medical professionals with a variety of specialized clinical interests.

United Community Health Center is a Federally Qualified Health Center and is one of 13 Community Health Centers in Iowa. The facility offers medical, dental, and behavioral/mental health services in one location. The medical clinic offers family practice/primary care services and is staffed by a physician and a nurse practitioner. The dental clinic offers a full range of family dentistry and is staffed by a dentist and a dental hygienist. The behavioral health/mental health services are provided onsite/offsite to our patients using specialized agreements with The Seasons Center and Plains Area Mental Health Center.

The third facility is Sioux Rapids Family Care in Sioux Rapids. This clinic is affiliated with Avera McKennan Hospital and University Health Center in Sioux Falls, South Dakota. The clinic is staffed by several physicians, whose primary specialty is family medicine and is supported by nurse practitioners and physicians' assistants.

Senior Care/Long Term Care Facilities: Senior care facilities provide assisted-living arrangements in an apartment-like setting staffed by persons who various levels of medical knowledge and skills. These facilities are designed to accommodate persons in various health conditions in a setting that provides as much independence as possible to the resident. There are numerous long-term care facilities in Buena Vista County. There are also many additional long-term care facilities located in nearby Pocahontas, O'Brien, Clay and Cherokee Counties. The long-term care facilities of Buena Vista County are listed below. The Good Samaritan Center in the City of Newell and the Pleasant View Home in Albert City have closed since the previous plan update; no senior care or long-term care facilities exist in these jurisdictions at this point.

- Methodist Manor Retirement– Storm Lake
- Well Life-Alta
- Otsego Place-Storm Lake
- Lake Pointe Villa-Storm Lake

3.9 Capability Assessment

The Planning Team performed an inventory and analysis of existing authorities and capabilities called a "capability assessment." A capability assessment creates an inventory of an agency's mission, programs, and policies, and evaluates its capacity to carry them out. lists planning and land management tools



typically used by local jurisdictions to implement hazard mitigation activities and indicates those that are in place in Buena Vista County.

3.9.1 Mitigation Capabilities – County and Municipal

This section includes the capabilities of each jurisdiction that relate to their ability to implement mitigation opportunities. Table 3-7 and 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 3-7 Buena Vista Capabilities by Jurisdiction

	Buena Vista County	City of Albert City	City of Alta	City of Lakeside	City of Linn Grove	City of Marathon	City of Newell	City of Rembrandt	City of Sioux Rapids	City of Storm Lake	City of Truesdale
City Hall (City Clerk)	Yes	Yes	Yes	No	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Fire Department	No	Yes	Yes	Yes	No	Yes	Yes	Yes	Yes	Yes	Yes
Police Department	Yes	No	No	Yes	No	Yes	Yes	No	Yes	Yes	Yes
Public Works Department	Yes	No	Yes	No	Yes	Yes	Yes	No	Yes	Yes	No
Planning & Zoning Commission	Yes	No	Yes	No	No	No	Yes	No	Yes	No	No
Board of Adjustments	Yes	Yes	Yes	No	No	No	Yes	No	Yes	No	No
Library Board of Trustees	No	Yes	Yes	No	Yes	Yes	Yes	Yes	Yes	No	No
Electric Board of Trustees	No	No	Yes	No	No	No	No	No	No	No	No
Community Center Board	No	No	No	No	No	Yes	No	No	No	No	No
Policies & Ordinances											
Comprehensive/Land Use Plan	Yes	Yes	Yes	No	Yes	Yes	Yes	No	Yes	Yes	Yes
Capital Improvement Plan	Yes	No	Yes	No	No	No	Yes	No	No	Yes	No
Local/County Emergency Plan	Yes	Yes	Yes	No	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Local Mitigation Plan	Yes	Yes	Yes	No	Yes	No	Yes	Yes	No	Yes	No
Flood Mitigation Assistance (FMA) Plan	No	No	No	No	Yes	No	No	No	Yes	Yes	No
Watershed Plan	Yes	No	No	No	No	No	No	No	Yes	Yes	No

	Buena Vista County	City of Albert City	City of Alta	City of Lakeside	City of Linn Grove	City of Marathon	City of Newell	City of Rembrandt	City of Sioux Rapids	City of Storm Lake	City of Truesdale
Critical Facilities Plan (Mitigation/Response/Recovery)	Yes	Yes	Yes	No	Yes	Yes	No	Yes	Yes	Yes	No
Economic Development Plan	Yes	No	No	No	No	No	No	No	No	Yes	No
Transportation Plan	Yes	No	No	No	No	Yes	No	No	No	No	No
Firewise or other fire mitigation plan	No	No	Yes	No	No	No	Yes	No	No	No	No
Zoning Ordinance	Yes	Yes	Yes	No	Yes	No	Yes	No	Yes	Yes	Yes
Restricted Residential District	Yes	Yes	No	No	Yes	No	No	Yes	No	No	No
Subdivision Ordinance	Yes	No	Yes	No	No	No	No	No	Yes	Yes	No
Building Code	Yes	Yes	Yes	No	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Building Permit Ordinance	Yes	Yes	Yes	No	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Floodplain Ordinance	Yes	No	Yes	No	Yes	No	No	No	Yes	Yes	No
Tree Trimming Ordinance	No	Yes	Yes	No	Yes	Yes	Yes	Yes	Yes	Yes	No
Nuisance Ordinance	Yes	Yes	Yes	No	Yes	Yes	Yes	Yes	Yes	Yes	No
Stormwater Ordinance	No	No	No	No	Yes	Yes	Yes	No	Yes	Yes	No
Drainage Ordinance	Yes	No	No	No	No	No	Yes	No	Yes	Yes	No
Site Plan Review Requirements	No	No	Yes	No	No	No	No	No	Yes	Yes	No
Historic Preservation Ordinance	No	No	No	No	No	No	No	No	No	No	No
Landscape Ordinance	No	No	No	No	No	No	No	No	Yes	Yes	No

	Buena Vista County	City of Albert City	City of Alta	City of Lakeside	City of Linn Grove	City of Marathon	City of Newell	City of Rembrandt	City of Sioux Rapids	City of Storm Lake	City of Truesdale
Iowa Wetlands and Riparian Areas Conservation Plan	No	No	No	No	No	No	No	No	No	No	No
Debris Management Plan	Yes	No	No	No	No	No	No	No	Yes	Yes	No
Zoning/Land Use Restrictions	Yes	Yes	Yes	No	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Codes Building Site/Design	Yes	Yes	Yes	No	Yes	No	No	No	No	Yes	Yes
National Flood Insurance Program (NFIP) Participant	Yes	No	Yes	No	Yes	No	No	No	Yes	Yes	No
NFIP Community Rating System (CRS) Participant	No	No	No	No	No	No	No	No	Yes	No	No
Hazard Awareness Program	No	No	No	No	No	No	No	No	Yes	No	No
Planning/Zoning Boards	Yes	Yes	Yes	No	Yes	No	Yes	No	Yes	Yes	Yes
Tree Trimming Program	No	No	No	No	No	No	No	No	No	Yes	No
Engineering Studies for Streams (Local/ County/Regional)	Yes	No	No	No	No	No	No	No	No	No	No
National Weather Service (NWS) Storm Ready	No	Yes	No	No	Yes	Yes	Yes	Yes	Yes	No	No
Building Code Effectiveness Grading (BCEGs)	No	No	No	No	No	No	No	No	No	Yes	No
ISO Fire Rating	Yes	Yes	Yes	No	No	Yes	Yes	Yes	Yes	Yes	No

	Buena Vista County	City of Albert City	City of Alta	City of Lakeside	City of Linn Grove	City of Marathon	City of Newell	City of Rembrandt	City of Sioux Rapids	City of Storm Lake	City of Truesdale
Economic Development Program	Yes	No	No	No	No	No	No	No	Yes	Yes	No
Land Use Program	Yes	No	No	No	No	No	No	No	Yes	Yes	No
Public Education/Awareness	Yes	Yes	Yes	No	No	Yes	No	No	Yes	Yes	No
Property Acquisition	No	No	Yes	No	No	No	No	No	No	No	No
Planning/Zoning Boards	Yes	Yes	Yes	No	No	No	Yes	No	Yes	Yes	No
Stream Maintenance Program	No	No	No	No	No	No	No	No	No	No	No
Tree Trimming Program	No	No	No	No	No	No	No	No	No	Yes	No
Engineering Studies for Streams (Local/County/Regional)	No	No	No	No	No	No	No	No	No	No	No
Mutual Aid Agreements	Yes	Yes	Yes	No	No	Yes	Yes	Yes	Yes	Yes	Yes
Emergency Notification Systems (Sirens, CodeRed, IPAWS/WEA, etc.)	Yes	Yes	Yes	No	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Staff/Department											
Building Code Official	No	Yes	Yes	No	Yes	No	Yes	No	Yes	Yes	No
Building Inspector	No	No	Yes	No	Yes	No	No	No	No	Yes	No
Mapping Specialist (GIS)	Yes	No	Yes	Yes	No	No	No	No	No	Yes	No
Engineer	Yes	No	Yes	No	No	No	No	Yes	No	Yes	No
Public Works Official	No	Yes	No	No	Yes	Yes	Yes	No	Yes	Yes	No

	Buena Vista County	City of Albert City	City of Alta	City of Lakeside	City of Linn Grove	City of Marathon	City of Newell	City of Rembrandt	City of Sioux Rapids	City of Storm Lake	City of Truesdale
Emergency Response Team	Yes	Yes	Yes	No	No	Yes	Yes	Yes	Yes	Yes	No
NFIP Floodplain Administrator	Yes	No	Yes	No	Yes	No	No	No	Yes	Yes	No
Development Planner	No	No	No	Yes	No	No	No	No	No	Yes	Yes
Emergency Management Coordinator	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	No	Yes	No
Emergency Response Team	Yes	Yes	No	No	No	Yes	Yes	Yes	Yes	Yes	No
Hazardous Materials Expert	Yes	No	No	No	No	No	No	No	No	No	No
Local Emergency Planning Committee	Yes	No	No	Yes	No	No	Yes	No	No	Yes	No
County Emergency Management Commission	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	No	Yes	Yes
Sanitation Department	No	No	Yes	No	No	No	Yes	No	Yes	No	No
Transportation Department	Yes	No	No	No	No	No	No	No	No	No	No
Economic Development Department	Yes	No	No	No	No	No	No	No	No	Yes	No
Housing Department	No	No	No	No	No	No	No	No	No	No	No
Planning Consultant	Yes	No	Yes	No	No	No	No	No	No	No	No
Regional Planning Agencies	Yes	Yes	No	No	No	Yes	No	Yes	Yes	No	No
Historic Preservation	No	No	No	No	No	No	No	No	No	No	No
Non-Governmental Organizations (NGOs)											

	Buena Vista County	City of Albert City	City of Alta	City of Lakeside	City of Linn Grove	City of Marathon	City of Newell	City of Rembrandt	City of Sioux Rapids	City of Storm Lake	City of Truesdale
American Red Cross	No	No	Yes	No	No	No	No	No	No	No	No
Salvation Army	Yes	No	Yes	No	No	No	No	No	No	Yes	No
Veterans Groups	Yes	Yes	Yes	No	Yes	Yes	No	No	Yes	Yes	No
Environmental Groups	No	No	No	No	No	No	No	No	No	Yes	No
Homeowner Associations	No	No	No	No	No	No	No	No	No	Yes	No
Neighborhood Associations	No	No	No	No	No	No	No	No	No	No	No
Chamber of Commerce	Yes	Yes	Yes	No	No	No	No	No	Yes	Yes	No
Community Organizations (Lions, Kiwanis, etc.)	Yes	No	Yes	No	No	No	No	No	Yes	Yes	No
Local Funding Availability											
Ability to fund projects through Capital Improvements funding	Yes	Yes	Yes	Yes	Yes	No	Yes	No	No	Yes	No
Ability to incur debt through general obligation bonds	Yes	Yes	Yes	Yes	No	No	Yes	No	Yes	Yes	No
Ability to incur debt through special tax bonds	Yes	Yes	Yes	Yes	No	Yes	Yes	Yes	Yes	Yes	No
Ability to incur debt through private activities	No	No	No	No	No	No	Yes	No	No	Yes	No
Ability to withhold spending in hazard prone areas	Yes	No	No	No	No	No	Yes	No	No	Yes	No

	Buena Vista County	City of Albert City	City of Alta	City of Lakeside	City of Linn Grove	City of Marathon	City of Newell	City of Rembrandt	City of Sioux Rapids	City of Storm Lake	City of Truesdale
Fees for water, sewer, gas, or electric services	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	No
Apply for Community Development Block Grants	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	No
Authority to levy taxes for a specific purpose	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	No
Impact fees for new development	No	No	No	Yes	No	No	Yes	No	Yes	No	No
Other Local Funding Availability	Yes	No	No	Yes	Yes	No	Yes	No	Yes	Yes	No

3.9.2 Mitigation Capabilities – School Districts

Potential capabilities to implement mitigation programs and projects 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.

The school districts rely on county and municipal government for most of the mitigation capabilities listed in Table 3-7. Emergency management and hazard mitigation duties are the responsibility of risk management or safety staff, at the direction of school administration. All the schools have some form of strategic or general plan, most of which address hazard events at some level. All also have some type of emergency notification system that can be used to notify students or staff in case of a hazard event.

The participating schools all have capital improvement budgets and a variety of funding mechanisms that can be used to support mitigation activities. The public schools have the ability to levy taxes or issue bonds, while the private schools raise funds through donations or other private activities.

3.9.3 Summary of Capabilities

Buena Vista County has a paid county emergency management coordinator who oversees countywide programs and operations related to mitigation planning. Other offices address hazard mitigation issues mainly as they pertain to emergency response or infrastructure. The County EM Commission holds quarterly meetings where issues are discussed and business is undertaken. Several jurisdictions participate by sending representatives to the voting board. Regular exercises and trainings are undertaken. The county coordinator acts as the contact between state and federal agencies and the local public and governments in the event of a disaster and has a key role in hazard mitigation planning. This office is in charge of mitigation, preparedness, response, and recovery. Once this plan is in place and greater resources are provided to the county emergency management office, the capacity of the county to undertake mitigation actions should increase.

Implementing the NIMS process, where local elected officials are educated about these issues, should increase interest and likely funding.

The Buena Vista County Emergency Management Coordinator states that the Agency offers several services for all natural disasters, including but not limited to a) assist with finding resources for incident clean up, b) requests for State declaration and equipment c) formal report submission when required by FEMA for a Presidential Declaration, and d) capturing photos and completing basic paperwork. Hazard mitigation coordination with various local entities and agencies is also part of the Coordinator's workload.

Many mitigation activities and some mitigation planning topics, such as hazard identification, are addressed in the countywide emergency operations plan (EOP). Per the state policy, each county emergency management commission must adopt and maintain an EOP. Some parts must be updated and submitted to the State of Iowa annually and other parts must be submitted periodically. Several topics in the EOP relate to hazard mitigation.

The topics addressed in the Buena Vista EOP follow the emergency support functions (ESF) format as required by the State of Iowa. The EOP consists of a basic plan and 15 ESFs, which consists of 1) transportation, 2) communications, 3) public works, 4) firefighting, 5) emergency management/planning, 6) mass care, 7) logistics, 8) public health and medical, 9) search and rescue, 10) hazmat, 11) agriculture and natural resources, 12) energy, 13) public safety, 14) business/infrastructure, and 15) external affairs/public info. The county is required to review ESF 10) hazardous materials annually, plus 20% of the

other ESFs. The EOP helps tie the various resources at the local, county, state, and federal level as to how they collaborate in the emergency management efforts.

The EOP was reviewed briefly as part of this HMP, but both plans are stand-alone documents and details from one plan are not necessarily translated into the other. Many of the planning and emergency response capabilities are addressed adequately in the EOP plan and its implementation by the EMA and local officials in individual jurisdictions. Through many trainings, exercises, and workshops, local officials have a good idea of what resources are available within and to the county to address local needs. Responsibilities and provider descriptions were sufficient for initial mitigation planning purposes. There appears to be sufficient division of duties and elected official oversight. Each section has preparedness and response checklists that can be used before, during, and after an incident and an incident command flow chart. The EOP is current and compliant with the State of Iowa.

The county addresses several hazards with other plans on a multi-jurisdictional level. For example, communications are addressed by a communications plan and by an E-911 board. The Local Emergency Planning Committee (LEPC) addresses hazardous materials. Local fire departments and State agencies monitor and inspect individual hazardous materials sites. State officials lead many hazard mitigation efforts and regulate facilities, such as the Iowa DOT handling transportation incidents, the Iowa DNR and Utilities Board handling pipelines and hazardous materials sites, and the Iowa Dept. of Public Health handling disease incidents.

These other plans address the capabilities to implement the hazard mitigation plan, but they alone are not a hazard mitigation strategy. The EOP and other local plans are still necessary because not all hazards can be prevented, and response, recovery, and preparation are still needed.

3.9.4 Opportunities for Enhancement

The 2023 update process provided the County and participating jurisdictions an opportunity to review and update the capabilities currently in place to mitigate hazards. There are also opportunities for the County and jurisdictions to expand or improve on their policies, programs and fiscal capabilities and further protect the community. Future improvements may include providing training for staff members related to hazards or hazard mitigation grant funding in partnership with the County, City, School Districts, and Iowa Homeland Security and Emergency Management Department (IHSEMD). Additional training opportunities will help to inform County, City, and District staff members on how best to integrate hazard information and mitigation projects into their departments.

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

- The City of Albert City
 - Expand community outreach and increase connections with local NGOs to increase volunteer base
 - Facilitate additional partnerships with area agencies to further develop hazard mitigation programs
 - Consider participating in the National Flood Insurance Program
 - Consider becoming a Firewise community
- The City of Alta
 - Consider becoming an NWS StormReady community
 - Consider becoming a Firewise community
- The City of Lakeside

- Work to increase public awareness of potential hazards and mitigation actions they should take through education outreach programs.
- Consider adopting building codes to improve structure resilience to hazards
- Consider becoming an NWS StormReady community
- Consider participating in the National Flood Insurance Program
- Develop mutual aid agreements with neighboring communities
- The City of Linn Grove
 - Consider developing a Capital Improvements Plan
 - Consider becoming a Firewise community
- The City of Marathon
 - Consider participating in the National Flood Insurance Program
 - Formally adopt a zoning code to protect communities and businesses from unregulated growth
 - Consider becoming a Firewise community
- The City of Newell
 - Consider participating in the National Flood Insurance Program
 - Expand community outreach and increase connections with local NGOs such as the American Red Cross
- The City of Rembrandt
 - Consider becoming a Firewise community
 - Expand community outreach and increase connections with local NGOs such as the American Red Cross
 - Consider developing a Capital Improvements Plan
- The City of Sioux Rapids
 - Consider developing a Capital Improvements Plan
 - Consider becoming a Firewise community
- The City of Storm Lake
 - Facilitate additional partnerships with area agencies, including state patrol, DNR, DOT, and medical facilities to further develop hazard mitigation programs.
 - Implement internal training and interdepartmental communication that focuses on hazard mitigation
 - Consider becoming an NWS StormReady community
- The City of Truesdale
 - Consider becoming an NWS StormReady community
 - Consider becoming a Firewise community
 - Consider participating in the National Flood Insurance Program
- School Districts
 - Improve integration of hazards information into strategic/general plans
 - Develop educational material on hazards for students, staff, and parents
 - Consider becoming NWS StormReady communities

4 Risk Assessment

Disaster Mitigation Act Requirements: 44CFR§201.6

[The plan shall include] A risk assessment that provides the factual basis for activities proposed in the strategy to reduce losses from identified hazards. Local risk assessments must provide sufficient information to enable the jurisdiction to identify and prioritize appropriate mitigation actions to reduce losses from identified hazards. The risk assessment shall include:

- (i) A description of the type, location, and extent of all natural hazards that can affect the jurisdiction. The plan shall include information on previous occurrences of hazard events and on the probability of future hazard events.*
- (ii) A description of the jurisdiction's vulnerability to the hazards described in paragraph (c)(2)(i) of this section. This description shall include an overall summary of each hazard and its impact on the community. The plan should describe vulnerability in terms of:*
 - (A) The types and numbers of existing and future buildings, infrastructure, and critical facilities located in the identified hazard areas;*
 - (B) An estimate of the potential dollar losses to vulnerable structures identified in paragraph (c)(2)(ii)(A) of this section and a description of the methodology used to prepare the estimate;*
 - (C) Providing a general description of land uses and development trends within the community so that mitigation options can be considered in future land use decisions.*
- (ii) For multi-jurisdictional plans, the risk assessment section must assess each jurisdiction's risks where they vary from the risks facing the entire planning area.*

This section of the Buena Vista County Hazard Mitigation Plan (HMP) describes the local Hazard Identification and Risk Assessment (HIRA) undertaken by the County and participating jurisdictions. The risk assessment process identifies and profiles relevant hazards and assesses the exposure of lives, property, and infrastructure to these hazards. The process allows for a better understanding of a jurisdiction's potential risk to hazards and provides a framework for developing and prioritizing mitigation actions to reduce risk from future hazardous events.

A key step to mitigate disaster losses is to develop a comprehensive understanding of the community's hazards, vulnerabilities, and risks. The following terms are used throughout the Plan to facilitate comparisons between communities.

- **Hazard:** Event or physical condition that has the potential to cause fatalities, injuries, property damage, infrastructure damage, agricultural loss, damage to the environment, interruption of business, other types of harm or loss. Hazard may be naturally occurring (flood, tornado, etc.) or human-caused (active threat, hazmat, etc.).
- **Vulnerability:** Degree of susceptibility to physical injury, harm, damage, or economic loss; depends on an asset's construction, contents, and economic value of its functions.
- **Risk:** The potential for damage, loss, or other impacts created by the interaction of hazards with vulnerabilities.

The risk assessment evaluates potential loss from hazards by assessing the vulnerability of the County's population, built environment, critical facilities, and other assets. Environmental and social impacts are also taken into consideration wherever possible. This risk assessment covers the entire geographical area of Buena Vista County. Since this is a multi-jurisdictional plan, the Planning Team also evaluated how the hazards and risks vary from jurisdiction to jurisdiction.

The results of this risk assessment for the planning area as a whole are summarized in Table 4-1.

Table 4-1 Hazard Risk Summary

Hazard	Geographic Extent	Magnitude/Severity	Future Probability	Overall Significance
Animal/Plant/Crop	Extensive	Moderate	Likely	Medium
Drought	Extensive	Moderate	Highly Likely	High
Earthquake	Extensive	Negligible	Unlikely	Low
Expansive Soils	Significant	Negligible	Occasional	Low
Extreme Heat	Extensive	Negligible	Highly Likely	Medium
Flooding	Significant	Critical	Highly Likely	High
Grass/Wildland Fire	Significant	Negligible	Highly Likely	Medium
Hazardous Materials Incident	Significant	Moderate	Highly Likely	Medium
Human Disease	Extensive	Moderate	Likely	Medium
Infrastructure Failure	Significant	Moderate	Highly Likely	Medium
Landslide	Extensive	Negligible	Occasional	Low
Levee/Dam Failure	Limited	Moderate	Unlikely	Low
Severe Winter Storm	Extensive	Moderate	Highly Likely	Medium
Sinkhole	Limited	Negligible	Unlikely	Low
Thunderstorm/Lightning/Hail	Extensive	Critical	Highly Likely	High
Tornado/Windstorm	Extensive	Moderate	Highly Likely	High
Transportation Incident	Significant	Moderate	Highly Likely	Medium
Location/Spatial Extent <u>Extensive:</u> 50-100% of planning area <u>Significant:</u> 10-50% of planning area <u>Limited:</u> Less than 10% of planning area Potential Magnitude/Severity <u>Catastrophic:</u> Multiple deaths, shutdown of facilities for 30 days or more, >50% of property is severely damaged <u>Critical:</u> Multiple severe injuries, shutdown of facilities for at least 2 weeks, >25% of property is severely damaged <u>Moderate:</u> Some injuries, shutdown of critical facilities for more than one week, >10% of property is severely damaged <u>Negligible:</u> Minor injuries, minimal quality-of-life impact, interruption of facilities and services for 24 hours or less, less than 10% of property is severely damaged.		Probability of Future Occurrence <u>Highly Likely:</u> Near 100% probability each year. <u>Likely:</u> Between 10 and 100% probability per year or at least one chance in ten years. <u>Occasional:</u> Between 1 and 10% probability per year or at least one chance in next 100 years. <u>Unlikely:</u> Less than 1% probability in next 100 years. Overall Significance (Based on the preceding three factors) <u>High:</u> widespread potential impact <u>Medium:</u> moderate potential impact <u>Low:</u> minimal potential impact		

The risk for many hazards is not uniform across Buena Vista County. Table 4-2 shows how the risk from hazards varies by jurisdiction.

Table 4-2 Hazard Risk By Jurisdiction

Jurisdiction	Animal/Plant/ Crop Disease	Drought	Earthquake	Expansive Soils	Extreme Heat	Flood	Grass/Wildland Fire	Hazmat Incident	Human Disease	Infrastructure Failure	Landslide	Levee/Dam Failure	Severe Winter Storm	Sinkhole	Thunderstorm/ Lightning/Hail	Tornado/ Windstorm	Transportation Incident
Buena Vista County	M	H	L	L	M	H	M	M	M	M	L	L	M	L	H	H	M
City of Albert City	M	H	L	L	M	L	M	M	M	M	L	L	M	L	H	H	M
City of Alta	M	H	L	L	M	L	M	M	M	M	L	L	M	L	H	H	H
City of Lakeside	M	H	L	L	M	L	M	L	M	M	L	L	M	L	H	H	M
City of Linn Grove	M	H	L	L	M	H	H	M	H	H	L	L	M	L	H	H	M
City of Marathon	M	H	L	L	M	L	M	M	M	M	L	L	M	L	H	H	M
City of Newell	M	H	L	L	M	H	M	M	M	M	L	L	M	L	H	H	H
City of Rembrandt	M	H	L	L	M	L	M	L	M	M	L	L	M	L	H	H	M
City of Sioux Rapids	M	H	L	L	M	H	H	M	M	M	L	L	M	L	H	H	H
City of Storm Lake	M	H	L	L	M	M	M	M	M	M	L	L	M	L	H	H	H
City of Truesdale	M	H	L	L	M	L	M	L	M	M	L	L	M	L	H	H	M
ICC	L	M	L	L	M	L	M	M	M	M	L	L	M	L	H	H	M
Buena Vista University	L	M	L	L	M	L	M	M	M	M	L	L	M	L	H	H	M
Albert City-Truesdale Schools	L	M	L	L	M	L	M	M	M	M	L	L	M	L	H	H	M
Alta-Aurelia Schools	L	M	L	L	M	L	M	M	M	M	L	L	M	L	H	H	M
Newell-Fonda Schools	L	M	L	L	M	L	M	M	M	M	L	L	M	L	H	H	M
Sioux Central Schools	L	M	L	L	M	L	M	M	M	M	L	L	M	L	H	H	M
Storm Lake Schools	L	M	L	L	M	L	M	M	M	M	L	L	M	L	H	H	M
Storm Lake St Mary's Catholic School	L	M	L	L	M	L	M	M	M	M	L	L	M	L	H	H	M

4.1 Hazard Identification

The Hazard Identification and Risk Assessment (HIRA) focuses attention on areas most in need by analyzing the populations and facilities that are most vulnerable to hazards and to what extent damages may occur. The risk assessment identifies how people properties and structures will be damaged due to a hazardous event. If the hazard can harm structures or people, that is considered a vulnerability. Finding weak points in the system include identifying building types that are vulnerable to damage and anticipating the loss in high risk areas. This will help the community to decide what mitigation efforts are required or should be undertaken and how to implement the selected activities.

The HMPC reviewed the 19 natural and human-caused hazards profiled in the 2018 Buena Vista County HMP, along with the 19 natural and human-caused hazards in the 2018 State of Iowa HMP. The HMPC then discussed if there had been any changes since 2018 or any new information that would change the hazards that can affect Buena Vista County. Table 4-3 compares the hazards profiled in these three plans.

Table 4-3 Hazard Comparison Chart

2018 State of Iowa HMP	2018 Buena Vista County HMP	2023 Buena Vista County HMP
Animal/Plant/Crop Disease	Animal/Plant/Crop Disease	Animal/Plant/Crop Disease
Dam/Levee Failure	Levee/Dam Failure	Levee/Dam Failure
Drought	Drought	Drought
Earthquake	Earthquake	Earthquake
Expansive Soils	Expansive Soils	Expansive Soils
Extreme Heat	Extreme Heat	Extreme Heat
Flooding	Flash Flood & River Flood	Flooding
Grass Fire or Wildland Fire	Grass/Wildland Fire	Grass/Wildland Fire
Hazardous Materials	Hazardous Materials Incident	Hazardous Materials Incident
Infrastructure Failure	Infrastructure Failure	Infrastructure Failure
Landslide	Landslide	Landslide
Pandemic Human Disease	Human Disease	Human Disease
Radiological Incident	---	---
Severe Winter Storm	Severe Winter Storm	Severe Winter Storm
Sinkhole	Sinkhole	Sinkhole
Terrorism	---	---
Thunderstorm/Lightning/Hail	Thunderstorm/Lightning/Hail	Thunderstorm/Lightning/Hail
Tornado/Windstorm	Tornado/Windstorm	Tornado/Windstorm
Transportation Incident	Transportation Incident	Transportation Incident

The HMPC determined the following hazards were not relevant to the planning area:

- **Radiological Incident:** Buena Vista County is not located near any nuclear power plants or major radiological materials transportation routes. The 2018 HMPC determined this hazard was not a risk to the County and excluded it from the 2018 Plan. The 2023 HMPC agreed that this was still true.
- **Terrorism:** The 2018 HMPC determined this hazard was not a risk to the County and excluded it from the 2018 Plan. The 2023 HMPC agreed that this was still true.



Additionally, while the 2018 Plan profiled Flash Flood & River Flood separately, the HMPC elected to combine them for the 2023 Plan.

4.1.1 Disaster Declaration History

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

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

Table 4-4 lists the 20 federal disaster declarations that included Buena Vista County for the period from 1952 through 2022.

Table 4-4 FEMA Disaster Declarations that included Buena Vista County, Iowa, 1969-2021

Disaster Number	Declaration Date	Description
DR 4642	2/23/2022	Severe Storms, Straight-line Winds, and Tornadoes
DR 4483 EM 3480	3/23/2020	COVID-19 Pandemic
DR 4421	3/23/2019	Severe Storms and Flooding
DR 4386	8/20/2018	Severe Storms, Tornadoes, Straight-line Winds, and Flooding
DR 4184	7/24/2014	Severe Storms, Tornadoes, Straight-line Winds, and Flooding
DR 4126	7/2/2013	Severe Storms, Tornadoes, and Flooding
DR 1977	5/5/2011	Severe Storms, Tornadoes, and Straight-Line Winds
DR 1930	7/29/2010	Severe Storms, Flooding, and Tornadoes
DR 1880	3/2/2010	Severe Winter Storms
DR 1877	2/25/2010	Severe Winter Storms and Snowstorm
EM 3275	3/30/2007	Snow
EM 3239	9/10/2005	Hurricane Katrina Evacuation
DR 1518	5/25/2004	Severe Storms, Tornadoes, and Flooding
DR 1230	7/2/1998	Severe Weather, Tornadoes and Flooding
DR 996	7/9/1993	Flooding, Severe Storm
DR 928	12/26/1991	Ice Storm
DR 269	8/14/1969	Heavy Rains, Flooding
DR 259	4/25/1969	Flooding
DR 193	4/22/1965	Flooding

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

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

Table 4-5 lists the 14 United States Department of Agriculture (USDA) Secretarial disaster declarations that included Buena Vista County from 2012 through 2022. Note that these 14 declarations occurred in 5 years.

Table 4-5 USDA Secretarial Disaster Declarations Including Buena Vista (2012-2022)

Declaration Number	Approval Date	Description
S5234	7/11/2022	Drought-FAST TRACK
S5254	8/15/2022	Drought-FAST TRACK
S5249	8/8/2022	Drought-FAST TRACK
S5037	8/10/2021	Drought-FAST TRACK
S4980	6/22/2021	Drought-FAST TRACK
S4933	4/2/2021	Drought-FAST TRACK
S4835	10/16/2020	Drought-FAST TRACK
S4804	10/14/2020	Drought-FAST TRACK
S4788	9/8/2020	Drought-FAST TRACK
S4756	8/24/2020	Drought-FAST TRACK
S3614	8/27/2013	Drought-FAST TRACK
S3618	7/15/2013	Drought
S3375	9/5/2012	Drought-FAST TRACK
S3337	8/7/2012	Drought-FAST TRACK

Source: U.S. Department of Agriculture; <https://www.fsa.usda.gov/programs-and-services/disaster-assistance-program/disaster-designation-information/index>

4.1.2 Data Sources

Hazard data was obtained from various federal, state, and local sources such as FEMA, the National Oceanic and Atmospheric Administration (NOAA) National Centers 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.

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

- Digital Flood Insurance Rate Map (DFIRM), FEMA
- Buena Vista County Emergency Management
- Buena Vista County Flood Insurance Study, FEMA



- Data Collection Guides completed by each jurisdiction
- Environmental Protection Agency
- Federal Emergency Management Agency (FEMA)
- 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 Natural Resources
- Iowa Department of Public Safety
- Iowa Department of Transportation, Office of Traffic and Safety
- Iowa State Hazard Mitigation Plan (2018)
- Iowa Utilities Board
- National Drought Mitigation Center Drought Reporter
- National Fire Incident Reporting System (NFIRS)
- National Oceanic and Atmospheric Administration's (NOAA) National Center for Environmental Information (NCEI)
- Pipeline and Hazardous Materials Safety Administration
- U.S. Army Corps of Engineers
- U.S. Department of Agriculture's (USDA) Risk Management Agency Crop Insurance Statistics
- U.S. Department of Transportation
- United States Geological Survey
- Various articles and publications available on the internet (sources are indicated where data is cited)

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 houses or structures, but they may result in flood costs that the county taxpayers and individual property owners must finance.

Data frames 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 used. The ten-year period for this type of data allows people to recall events and problems to the best of their knowledge. Hazards that used a ten-year period include grass or wildland fire, infrastructure failure, terrorism, and transportation incident. Note that some of these hazards used supplementary data in addition to local knowledge; this data also concentrated on a ten-year time frame.

4.1.3 Risk Assessment Methodology

The planning committee's next step was to profile each hazard that was identified from the first step. Through the profiling process the planning committee discussed: historical occurrences; the probability of the hazard occurring again in the future; the vulnerability of the population that will be affected by the hazard; the maximum geographic extent; the magnitude or severity of the hazard in terms of injuries/fatalities, personal property, and infrastructure; the amount of warning time available before the hazard occurs; and the duration of the hazard event.

The economic impact of disasters is a relatively new area of record-keeping and is generally restricted to major disasters involving both state and federal funding. Smaller, less significant events often do not reflect the economic impact of the incident. For these smaller events, there is a greater reliance on local information and records of impacts.

As described in Section 4.1.4 below, the anticipated impacts of climate change on each hazard were also taken into account, to ensure the profiles reflected the likely hazard behavior in the future, rather than just looking at past behavior.

Hazards were profiled and ranked based on the following factors:

- **Location (Spatial Extent):** How much of the planning area is potentially at risk from the hazard?
 - Extensive: 50-100% of planning area.
 - Significant: 10-50% of planning area.
 - Limited: Less than 10% of planning area.
- **Magnitude/Severity:** What are the likely impacts of the hazard?
 - Catastrophic: Multiple deaths, shutdown of facilities for 30 days or more, >50% of property is severely damaged.
 - Critical: Multiple severe injuries, shutdown of facilities for at least 2 weeks, >25% of property is severely damaged.
 - Moderate: Some injuries, shutdown of critical facilities for more than one week, >10% of property is severely damaged.
 - Negligible: Minor injuries, minimal quality-of-life impact, interruption of facilities and services for 24 hours or less, less than 10% of property is severely damaged.
- **Probability of Future Occurrence:** How often is the hazard likely to occur?
 - Highly Likely: Near 100% probability each year.
 - Likely: Between 10 and 100% probability per year or at least one chance in ten years.
 - Occasional: Between 1 and 10% probability per year or at least one chance in next 100 years.
 - Unlikely: Less than 1% probability in next 100 years.
- **Overall Significance:** Based on a combination of the previous three factors.



- High: widespread potential impact.
- Medium: moderate potential impact.
- Low: minimal potential impact.

4.1.4 Climate Change

In accordance with FEMA Administrator Policy 2011-OPPA-01, where possible, this plan update has considered the potential impacts of climate change on the hazards profiled. In 2010, the Iowa Climate Change Advisory Council reported to the Governor and the Iowa General Assembly on Climate Change Impacts in Iowa. The Report summarized the following climate changes 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

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

Agricultural Challenges

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

Habitat Changes

- Plants are leafing out and flowering sooner.
- Birds are arriving earlier in the spring.
- Particular animals are now being sighted farther north than in the past.

Public Health Effects

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

Climate change considerations are further discussed under each hazard profile.

4.2 Assets At Risk

It is important for communities to be prepared and minimize risks from the direct and indirect impacts of natural and manmade hazards. Assessing future development was something that Buena Vista County took into account when looking at their vulnerability to hazards. Critical facilities were identified by the planning team and each jurisdictions vulnerability to hazards are addressed in the hazard profiles. The following table is a generalized inventory of assets broken down by land uses.

4.2.1 Property

Building counts and building exposure values are calculated based on building footprints obtained from Microsoft and parcel data provided by the Buena Vista County Assessor's Office. The methodology employed to extract the summary of building/improvement counts and values from the parcel data is provided below:

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

Building Exposure values are based on Tax Year 2022 parcel data provided by the Buena Vista County GIS Department. Contents Exposure Values were calculated by factoring a multiplier to the Building Exposure Values based on property type. According to the assessor's data, the sum of the actual value improvements in the County (total building exposure) is \$1.3 billion. Contents exposure is added to that, estimated as a percent of the improvement value (specifically, 50% of the improvement value for residential, multi-residential, and agriculture dwelling structures, 150% for industrial structures, 100% for agricultural, commercial, exempt, and mixed use structures), based on standard FEMA methodologies. Together they come to \$2.3 billion in total value.

Table 4-6 below provides a summary of the improved parcel counts and values by usage type. Table 4-7 breaks those values down by property type. Table 4-8 gives structure counts by type per jurisdiction for the 9,279 improved parcels in the planning area.

Table 4-6 Buena Vista County Total Exposure by Jurisdiction Summary

Jurisdiction	Improved Parcel Count	Improved Value	Estimated Contents Value	Total Value
Albert City	370	\$39,075,120	\$30,797,930	\$69,873,050
Alta	844	\$120,493,230	\$75,468,985	\$195,962,215
Lakeside	231	\$29,713,860	\$15,028,420	\$44,742,280
Linn Grove	132	\$6,894,160	\$4,957,935	\$11,852,095
Marathon	203	\$9,697,420	\$7,785,545	\$17,482,965
Newell	441	\$47,562,030	\$36,628,255	\$84,190,285



Jurisdiction	Improved Parcel Count	Improved Value	Estimated Contents Value	Total Value
Rembrandt	122	\$6,500,570	\$3,977,625	\$10,478,195
Sioux Rapids	440	\$33,108,530	\$22,398,995	\$55,507,525
Storm Lake	3,467	\$563,532,570	\$404,175,170	\$967,707,740
Truesdale	59	\$1,421,980	\$811,885	\$2,233,865
Unincorporated	2,970	\$471,966,879	\$370,485,676	\$842,452,555
Total	9,279	\$1,329,966,349	\$972,516,421	\$2,302,482,770

Sources: Buena Vista County Assessor's GIS Office, WSP Analysis

Table 4-7 Buena Vista County Total Exposure By Property Type

Jurisdiction	Property Type	Improved Parcel Count	Improved Value	Estimated Contents Value	Total Value
Albert City	Agricultural	2	\$48,040	\$48,040	\$96,080
	Commercial	45	\$13,003,930	\$13,003,930	\$26,007,860
	Exempt	24	\$6,772,380	\$6,772,380	\$13,544,760
	Industrial	2	\$1,342,920	\$2,014,380	\$3,357,300
	Mixed Use	1	\$10,550	\$10,550	\$21,100
	Multi-Residential	1	\$2,250,490	\$1,125,245	\$3,375,735
	Residential	295	\$15,646,810	\$7,823,405	\$23,470,215
	Total	370	\$39,075,120	\$30,797,930	\$69,873,050
Alta	Agricultural	1	\$6,970	\$6,970	\$13,940
	Agricultural Dwelling	1	\$388,400	\$194,200	\$582,600
	Commercial	110	\$15,081,760	\$15,081,760	\$30,163,520
	Exempt	24	\$13,262,080	\$13,262,080	\$26,524,160
	Industrial	2	\$452,300	\$678,450	\$1,130,750
	Mixed Use	8	\$1,189,330	\$1,189,330	\$2,378,660
	Multi-Residential	13	\$4,614,540	\$2,307,270	\$6,921,810
	Residential	685	\$85,497,850	\$42,748,925	\$128,246,775
	Total	844	\$120,493,230	\$75,468,985	\$195,962,215
Lakeside	Commercial	4	\$342,980	\$342,980	\$685,960
	Exempt	3	\$0	\$0	\$0
	Multi-Residential	1	\$116,220	\$58,110	\$174,330
	Residential	223	\$29,254,660	\$14,627,330	\$43,881,990
	Total	231	\$29,713,860	\$15,028,420	\$44,742,280
Linn Grove	Agricultural	3	\$6,990	\$6,990	\$13,980
	Agricultural Dwelling	3	\$197,940	\$98,970	\$296,910
	Commercial	19	\$2,011,740	\$2,011,740	\$4,023,480
	Exempt	11	\$1,002,980	\$1,002,980	\$2,005,960
	Residential	96	\$3,674,510	\$1,837,255	\$5,511,765
	Total	132	\$6,894,160	\$4,957,935	\$11,852,095
Marathon	Agricultural	4	\$6,440	\$6,440	\$12,880



Jurisdiction	Property Type	Improved Parcel Count	Improved Value	Estimated Contents Value	Total Value
	Commercial	32	\$4,838,420	\$4,838,420	\$9,676,840
	Exempt	13	\$942,680	\$942,680	\$1,885,360
	Industrial	1	\$13,860	\$20,790	\$34,650
	Mixed Use	2	\$58,410	\$58,410	\$116,820
	Multi-Residential	3	\$215,000	\$107,500	\$322,500
	Residential	148	\$3,622,610	\$1,811,305	\$5,433,915
	Total	203	\$9,697,420	\$7,785,545	\$17,482,965
Newell	Agricultural	1	\$3,230	\$3,230	\$6,460
	Agricultural Dwelling	2	\$136,160	\$68,080	\$204,240
	Commercial	51	\$4,602,560	\$4,602,560	\$9,205,120
	Exempt	17	\$7,904,680	\$7,904,680	\$15,809,360
	Industrial	4	\$6,541,770	\$9,812,655	\$16,354,425
	Mixed Use	5	\$100,470	\$100,470	\$200,940
	Multi-Residential	4	\$643,740	\$321,870	\$965,610
	Residential	357	\$27,629,420	\$13,814,710	\$41,444,130
	Total	441	\$47,562,030	\$36,628,255	\$84,190,285
Rembrandt	Agricultural	2	\$5,200	\$5,200	\$10,400
	Commercial	14	\$549,420	\$549,420	\$1,098,840
	Exempt	8	\$900,060	\$900,060	\$1,800,120
	Residential	98	\$5,045,890	\$2,522,945	\$7,568,835
	Total	122	\$6,500,570	\$3,977,625	\$10,478,195
Sioux Rapids	Agricultural	1	\$3,690	\$3,690	\$7,380
	Agricultural Dwelling	1	\$3,870	\$1,935	\$5,805
	Commercial	74	\$4,266,590	\$4,266,590	\$8,533,180
	Exempt	16	\$4,559,580	\$4,559,580	\$9,119,160
	Industrial	7	\$1,387,440	\$2,081,160	\$3,468,600
	Mixed Use	4	\$84,720	\$84,720	\$169,440
	Multi-Residential	2	\$185,120	\$92,560	\$277,680
	Residential	335	\$22,617,520	\$11,308,760	\$33,926,280
	Total	440	\$33,108,530	\$22,398,995	\$55,507,525
Storm Lake	Agricultural Dwelling	1	\$165,120	\$82,560	\$247,680
	Commercial	417	\$117,038,950	\$117,038,950	\$234,077,900
	Exempt	109	\$69,325,880	\$69,325,880	\$138,651,760
	Industrial	23	\$27,291,040	\$40,936,560	\$68,227,600
	Mixed Use	36	\$3,870,860	\$3,870,860	\$7,741,720
	Multi-Residential	69	\$18,315,060	\$9,157,530	\$27,472,590
	Residential	2,812	\$327,525,660	\$163,762,830	\$491,288,490
	Total	3,467	\$563,532,570	\$404,175,170	\$967,707,740
Truesdale	Agricultural Dwelling	1	\$23,430	\$11,715	\$35,145
	Commercial	10	\$201,790	\$201,790	\$403,580

Jurisdiction	Property Type	Improved Parcel Count	Improved Value	Estimated Contents Value	Total Value
	Exempt	5	\$0	\$0	\$0
	Residential	43	\$1,196,760	\$598,380	\$1,795,140
	Total	59	\$1,421,980	\$811,885	\$2,233,865
Unincorporated	Agricultural	857	\$31,683,040	\$15,841,520	\$47,524,560
	Agricultural Dwelling	878	\$126,924,510	\$63,462,255	\$190,386,765
	Commercial	145	\$21,178,170	\$21,178,170	\$42,356,340
	Exempt	40	\$3,435,796	\$3,435,796	\$6,871,592
	Industrial	56	\$122,162,863	\$183,244,295	\$305,407,158
	Mixed Use	1	\$64,780	\$64,780	\$129,560
	Multi-Residential	4	\$228,990	\$114,495	\$343,485
	Residential	989	\$166,288,730	\$83,144,365	\$249,433,095
	Total	2,970	\$471,966,879	\$370,485,676	\$842,452,555
Grand Total		9,279	\$1,329,966,349	\$972,516,421	\$2,302,482,770

Sources: Buena Vista County Assessor's GIS Office, WSP Analysis

Table 4-8 Buena Vista County Structure Counts by Jurisdiction

Jurisdiction	Agricultural	Agricultural Dwelling	Commercial	Exempt	Industrial	Mixed Use	Multi-Residential	Residential	Total
Albert City	2	-	45	24	2	1	1	295	370
Alta	1	1	110	24	2	8	13	685	844
Lakeside	-	-	4	3	-	-	1	223	231
Linn Grove	3	3	19	11	-	-	-	96	132
Marathon	4	-	32	13	1	2	3	148	203
Newell	1	2	51	17	4	5	4	357	441
Rembrandt	2	-	14	8	-	-	-	98	122
Sioux Rapids	1	1	74	16	7	4	2	335	440
Storm Lake	-	1	417	109	23	36	69	2,812	3,467
Truesdale	-	1	10	5	-	-	-	43	59
Unincorporated	857	878	145	40	56	1	4	989	2,970
Total	871	887	921	270	95	57	97	6,081	9,279

Sources: Buena Vista County Assessor's GIS Office, WSP Analysis

4.2.2 People

Population numbers come from the 2020 Census. estimates come from multiplying the number of residences by the average household size for each jurisdiction, as shown in Table 4-9. This allows for the estimation of residents living in hazard areas in the following hazard profiles.

Table 4-9 Buena Vista County Population Data

Jurisdiction	Avg. HH Size	2020 Population
Albert City	2.00	677



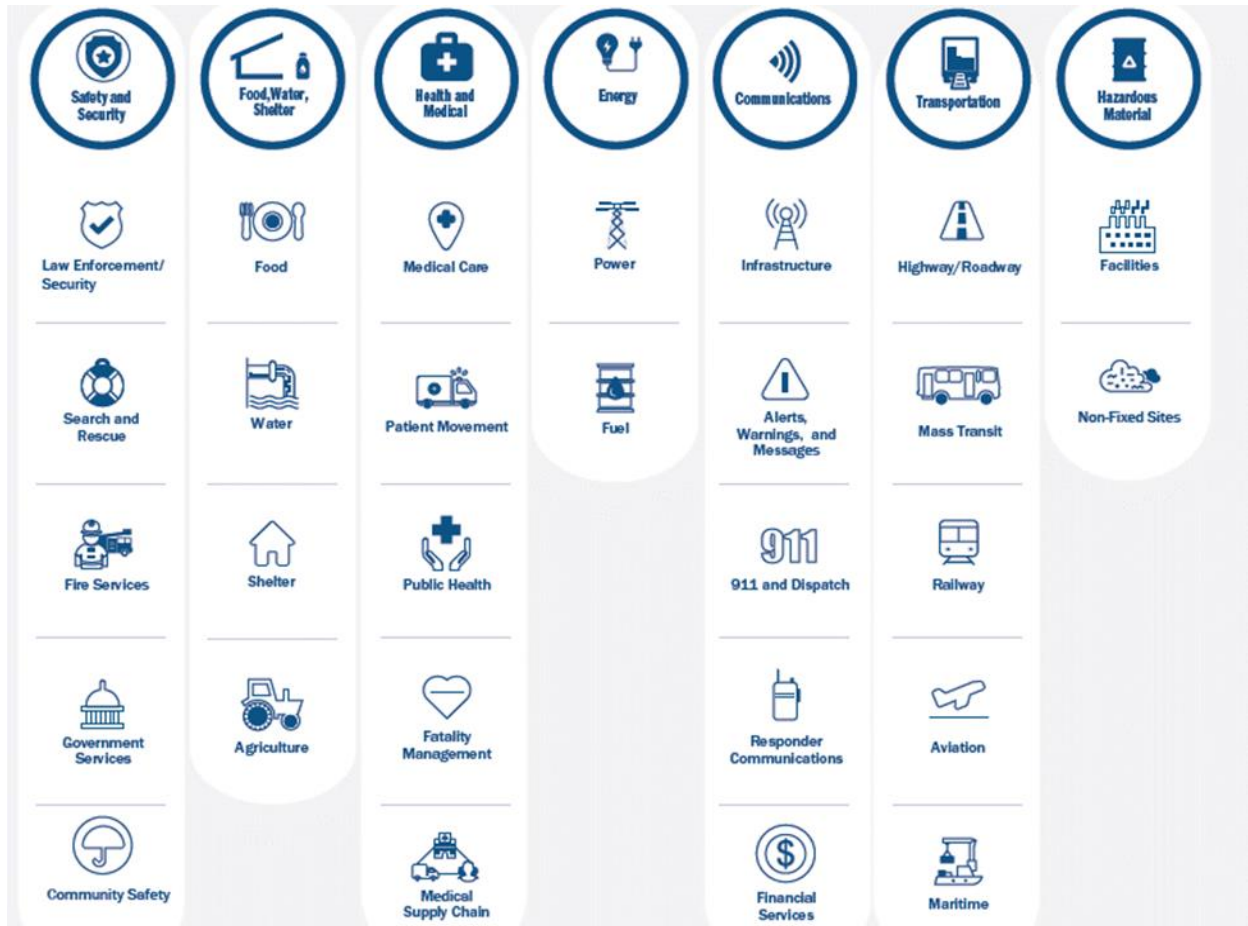
Jurisdiction	Avg. HH Size	2020 Population
Alta	2.59	2,087
Lakeside	3.34	700
Linn Grove	2.19	163
Marathon	2.36	230
Newell	2.36	906
Rembrandt	2.38	209
Sioux Rapids	2.4	748
Storm Lake	2.97	11,269
Truesdale	2.19	69
Unincorporated	2.67	3,765
Total		20,823

Sources: 2020 U.S. Census

4.2.3 Critical Facilities and Infrastructure

For the purposes of this plan, a critical facility is defined as one that is essential in providing utility or direction either during the response to an emergency or during the recovery operation. FEMA organizes critical facilities into seven lifeline categories as shown in Figure 4-1.

Figure 4-1 FEMA Lifeline Categories



Source: FEMA

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

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

To develop a comprehensive list of critical facilities in Buena Vista County, three data sources were compiled and broken down along the three aforementioned critical asset categories.

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

The results of this analysis are summarized in Table 4-10 and broken down by facility type in Table 4-11. A map of critical facilities can be found in Appendix I (not for public release).

Table 4-10 Critical Facilities by Jurisdiction and Lifeline

Jurisdiction	Communications	Energy	Food, Water, Shelter	Hazardous Material	Health and Medical	Safety and Security	Transportation	Total
Albert City	3	-	4	2	2	2	-	13
Alta	5	2	3	2	2	5	-	19
Lakeside	-	-	1	-	-	1	-	2
Linn Grove	-	-	5	2	-	-	1	8
Marathon	-	3	3	5	1	-	-	12
Newell	4	1	4	3	2	9	-	23
Rembrandt	-	-	1	-	1	1	-	3
Sioux Rapids	3	-	6	1	2	3	1	16
Storm Lake	16	2	7	19	6	21	1	72
Truesdale	-	-	1	1	-	1	-	3
Unincorporated	18	286	77	11	-	3	158	553
Total	49	294	112	46	16	46	161	724

Source: Buena Vista County, DNR, HIFLD, National Bridge Inventory, WSP GIS Analysis

Table 4-11 Critical Facilities by Jurisdiction and Facility Type

Jurisdiction	FEMA Lifeline	Facility Type	Count
Albert City	Communications	Microwave Tower	3
	Food, Water, Shelter	Water Treatment Plant	1
		Water Use Well	3
	Hazardous Material	Tier II Facility	2
	Health and Medical	EMS Station	1
		Nursing Home	0
	Safety and Security	Fire Station	1
		Public School	1
Alta	Communications	Cellular Tower	2
		Land Mobile Commercial Tower	1
		Microwave Tower	2
	Energy	Power Plant	1
		Substation	1



Jurisdiction	FEMA Lifeline	Facility Type	Count
	Food, Water, Shelter	Water Treatment Plant	1
		Water Use Well	2
	Hazardous Material	Tier II Facility	2
	Health and Medical	EMS Station	1
		Nursing Home	1
	Safety and Security	Childcare	1
		Fire Station	1
		Police	1
		Public School	2
Lakeside	Food, Water, Shelter	Water Treatment Plant	1
	Safety and Security	Childcare	1
Linn Grove	Food, Water, Shelter	Wastewater Treatment Plant	2
		Water Treatment Plant	1
		Water Use Well	2
	Hazardous Material	Tier II Facility	2
	Transportation	Non-Scour Good Condition Bridge	1
Marathon	Energy	Substation	3
	Food, Water, Shelter	Water Treatment Plant	1
		Water Use Well	2
	Hazardous Material	Contaminated Site	1
		EHS Tier II Facility	1
		Tier II Facility	3
	Health and Medical	EMS Station	1
Newell	Communications	FM Tower	1
		Microwave Tower	3
	Energy	Substation	1
	Food, Water, Shelter	Water Treatment Plant	1
		Water Use Well	3
	Hazardous Material	Tier II Facility	3
	Health and Medical	EMS Station	1
		Nursing Home	0
	Safety and Security	Childcare	4
		Fire Station	1
		Police	1
		Public School	3
Rembrandt	Food, Water, Shelter	Water Treatment Plant	1
	Health and Medical	EMS Station	1
	Safety and Security	Fire Station	1
Sioux Rapids	Communications	Microwave Tower	3
	Food, Water, Shelter	Wastewater Treatment Plant	2



Jurisdiction	FEMA Lifeline	Facility Type	Count
		Water Treatment Plant	1
		Water Use Well	3
	Hazardous Material	EHS Tier II Facility	1
	Health and Medical	EMS Station	1
		Nursing Home	1
	Safety and Security	Childcare	1
		Fire Station	1
		Police	1
	Transportation	Non-Scour Fair Condition Bridge	1
Storm Lake	Communications	Cellular Tower	1
		FM Tower	1
		Land Mobile Commercial Tower	1
		Microwave Tower	13
	Energy	Substation	2
	Food, Water, Shelter	Solid Waste Facility	4
		Water Use Well	3
	Hazardous Material	Contaminated Site	3
		EHS Tier II Facility	5
		Tier II Facility	11
	Health and Medical	Hospital	1
		Nursing Home	3
		Public Health Office	1
		Urgent Care	1
	Safety and Security	Childcare	5
		College	2
		Community College	1
		Courthouse	1
		EOC	2
		Fire Station	1
		Jail	1
		Police	1
		Private School	1
		Public School	5
		Sheriff	1
	Transportation	Non-Scour Good Condition Bridge	1
Truesdale	Food, Water, Shelter	Water Treatment Plant	1
	Hazardous Material	Tier II Facility	1
	Safety and Security	Fire Station	1
Unincorporated	Communications	Cellular Tower	3
		FM Tower	2

Jurisdiction	FEMA Lifeline	Facility Type	Count
		Land Mobile Commercial Tower	1
		Microwave Tower	12
	Energy	Power Plant	2
		Substation	24
		Wind Turbine	260
	Food, Water, Shelter	Open Feedlot	40
		Solid Waste Facility	4
		Wastewater Treatment Plant	12
		Water Treatment Plant	8
		Water Use Well	13
	Hazardous Material	EHS Tier II Facility	7
		Tier II Facility	4
	Safety and Security	Public School	3
	Transportation	Aviation	1
		Non-Scour Fair Condition Bridge	51
		Non-Scour Good Condition Bridge	54
		Non-Scour Poor Condition Bridge	50
		Scour Fair Condition Bridge	1
		Scour Poor Condition Bridge	1

Source: Buena Vista County, DNR, HIFLD, National Bridge Inventory, WSP GIS Analysis

4.2.4 Historic, Cultural, and Natural Resources

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

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

Historic Properties:

The National Register of Historic Places is the official list of the Nation's cultural resources worthy of preservation. Authorized under the National Historic Preservation Act of 1966, the National Register is part of a national program to coordinate and support public and private efforts to identify, evaluate, and protect our historic and archeological resources. The National Register is administered by the National Park Service under the Secretary of the Interior. Properties listed in the National Register include districts, sites, buildings,

structures, and objects that are significant in American history, architecture, archeology, engineering, and culture. Table 4-12 provides the list of Properties on the National Register of Historic Places in Buena Vista County.

Table 4-12 Buena Vista County Properties on the National Register of Historic Places

Property Name	Street & Number	City	Listed Date
Chicago, Milwaukee, and Pacific Railroad-Albert City Station	212 N. 2nd St.	Albert City	10/22/1976
Danish Lutheran Church	113 W. 4th St.	Alta	11/18/2011
Chan-Ya-Ta Site	Address Restricted	Linn Grove	11/21/1978
Allee, Jesse J. and Mary F., House	20006 640 St.	Newell	3/26/1992
Brooke Creek Bridge	470th St. over Brooke Cr.	Sioux Rapids	6/25/1998
Sioux Theatre	218 Main St.	Sioux Rapids	2/21/2012
Harker House	328 Lake Ave.	Storm Lake	12/6/1990
Illinois Central Passenger Depot-Storm Lake	S. of W. Railroad St., between Lake and Michigan Aves.	Storm Lake	9/6/1990
Storm Lake High School	310 Cayuga St.	Storm Lake	1/17/2017
Storm Lake Public Library	E. 5th and Erie Streets.	Storm Lake	5/23/1983

Source: National Park Service, National Register of Historic Places

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

Threatened and Endangered Species

Table 4-13 lists Federally Threatened, Endangered, Proposed and Candidate Species in Buena Vista County, Iowa.

Table 4-13 Threatened and Endangered Species in Buena Vista County

Group	Scientific Name	Common Name	ESA Listing Status
Mammals	Myotis lucifugus	Little brown bat	Under Review
Mammals	Myotis septentrionalis	Northern Long-Eared Bat	Endangered
Mammals	Perimyotis subflavus	Tricolored bat	Proposed Endangered
Insects	Danaus plexippus	Monarch butterfly	Candidate
Insects	Speyeria idalia	Regal fritillary	Under Review
Flowering Plants	Lespedeza leptostachya	Prairie bush-clover	Threatened
Flowering Plants	Platanthera praeclara	Western prairie fringed Orchid	Threatened
Fishes	Notropis topeka (=tristis)	Topeka shiner	Endangered

Source: US Fish and Wildlife Service, <https://ecos.fws.gov/ecp/>

Natural Resources

Buena Vista County Conservation Board manages 17 areas containing over 1200 acres of parks, wildlife refuges, historic sites, and natural areas, as shown in Table 4-14. These areas include developed parks and wildlife habitat areas where the public can enjoy camping, hiking, picnicking, boating, fishing, hunting, trapping, bird watching, and other outdoor activities. The Board strives to provide recreational areas for the public's enjoyment of the great outdoors and to promote conservation, water quality protection, and improvement of wildlife habitat.

Table 4-14 List of Parks and Wildlife Areas in Buena Vista County, Iowa

Park	Location	Acres	Activities
Brooke Wildlife Area	4 Miles West of Linn Grove on 440th St.	60	Hunting, Wildlife Viewed, Trapping
Buena Vista County Conservation Park	4 Miles West of Linn Grove on 440th St.	1	Camping
Buena Vista Swan Restoration Refuge	10 Miles South of Sioux Rapids on Hwy 71	10	Wildlife Exhibit, Wildlife Viewed
Elk Wildlife Area	7 Miles North of Alta on 60th Avenue	65	Hunting, Wildlife Viewed, Trapping
Gabrielson Park & Gustafson Lake	South edge of Sioux Rapids on Hwy 71	36	Fishing, Picnicking, Wildlife Viewed
Gaherty Wildlife Area	4½ Miles East and 1 Mile North of Storm Lake on 580th St.	30	Hunting, Wildlife Viewed, Trapping
Gary Christiansen Wildlife Area	5 Miles West of Linn Grove on 30th Avenue	40	Hunting, Wildlife Viewed, Trapping
Hankens Wildlife Area	4 Miles West, 4 Miles North of Alta on 10th Avenue	26	Fishing, Hunting, Wildlife Viewed, Trapping
Linn Grove Dam Area	Linn Grove	12	Fishing, Picnicking, Wildlife Viewed, Primitive Camping
Newell Catholic Prairie Cemetery	1 Mile West of Newell on 190th Avenue	1	Historic Site
Pheasant Ridge Wildlife Area	2 Miles South of Newell on 660th St.	6	Hunting, Wildlife Viewed
Raccoon River Heritage Wildlife Corridor	2 Miles West of Newell	330	Fishing, Hunting, Wildlife Viewed, Trapping
South Cove Park	South Edge of Storm Lake	3	Fishing, Picnicking
Starr Robbins Wildlife Refuge	Linn Grove	10	Wildlife Viewed
Sturchler Pit Area	1 Mile Northwest of Newell on 620th St.	120	Fishing, Hunting, Picnicking, Wildlife Viewed
Three Waters Wildlife Area	4 Miles Northwest of Newell on 600th St.	85	Fishing, Hunting, Wildlife Viewed, Trapping
Wildlife Display – Buena Vista County Courthouse	East 5th & Erie, Storm Lake, IA	1	Wildlife Exhibit

Source: US Fish and Wildlife Service, <https://buenavistacounty.iowa.gov/departments/conservation/parks/>

4.3 Hazard Profiles

The following hazard profiles are organized as follows:

- **Description:** General description of the hazard and associated problems, followed by details on the hazard specific to Buena Vista County.



- **Location:** Discusses what parts of the County are most likely to be affected by the hazard.
- **Historic Occurrences:** Overview history of the hazard's occurrences, compiled from multiple data sources, to include information provided by the Planning Team and the public. Significant incidents are profiled in greater detail and include scope, severity, and magnitude, and known impacts.
- **Probability of Future Occurrence:** Estimates the likelihood or probability of future occurrences of the hazard.
- **Magnitude/Severity:** Summarizes the anticipated magnitude and severity of a hazard event based largely on previous occurrences and specific aspects of the planning area. Speed of onset and duration are also factored in.
- **Climate Change Considerations:** Discusses how the projected impacts of climate change may affect the likelihood and severity of the hazard in the future.
- **Vulnerability:** Describes the likely impacts of the hazard on people, property, critical infrastructure, government services, the economy, and historical, cultural, and natural resources.
- **Development Trends:** Summarizes how projected trends in land use, and development have the potential to increase or decrease the impact of the hazard.
- **Risk Summary:** Summarizes the key pieces of information for each hazard.

4.3.1 Animal/Plant/Crop Disease

LOCATION	MAGNITUDE/ SEVERITY	FUTURE PROBABILITY	OVERALL SIGNIFICANCE
Significant	Moderate	Highly Likely	Medium

Description

Animal/Crop/Plant Disease is an outbreak of disease transmitted from animal to animal or plant to plant. A disease outbreak will likely have large economic impacts not just locally, but regionally and statewide as well.

"The introduction of some high consequence diseases could significantly limit or eliminate our ability to move, slaughter, and export animals and animal products. An outbreak will have widespread economic and societal implications for our state, the nation, and potentially the world. Response recovery to infectious animal disease outbreaks will be lengthy, and many producers may never be able to return to business. There would also be many indirect effects on our economy. Rumors of an infectious animal disease outbreak could cause significant damage to the markets as was evidenced an incident in Kansas in 2003 where just the rumor of a Foot and Mouth Disease outbreak caused the market to plummet. Further evidence of this occurred in the 2009 H1N1 (Swine Flu) influenza outbreak where lack of understanding about the transmission of the virus caused market loss in Iowa's pork markets. Pest infestations can cause widespread crop/plant loss and resulting economic hardships on farmers, landowners, and related businesses. Once infestation occurs, the pest may become endemic, causing repeated losses subsequent growing years. Loss of production could affect all related industries including fuel, food, synthetics, processors, etc. Every year the Iowa Department of Agriculture and Land Stewardship (IDALS) conduct numerous animal disease investigations." Source: Iowa Homeland Security and Emergency Management



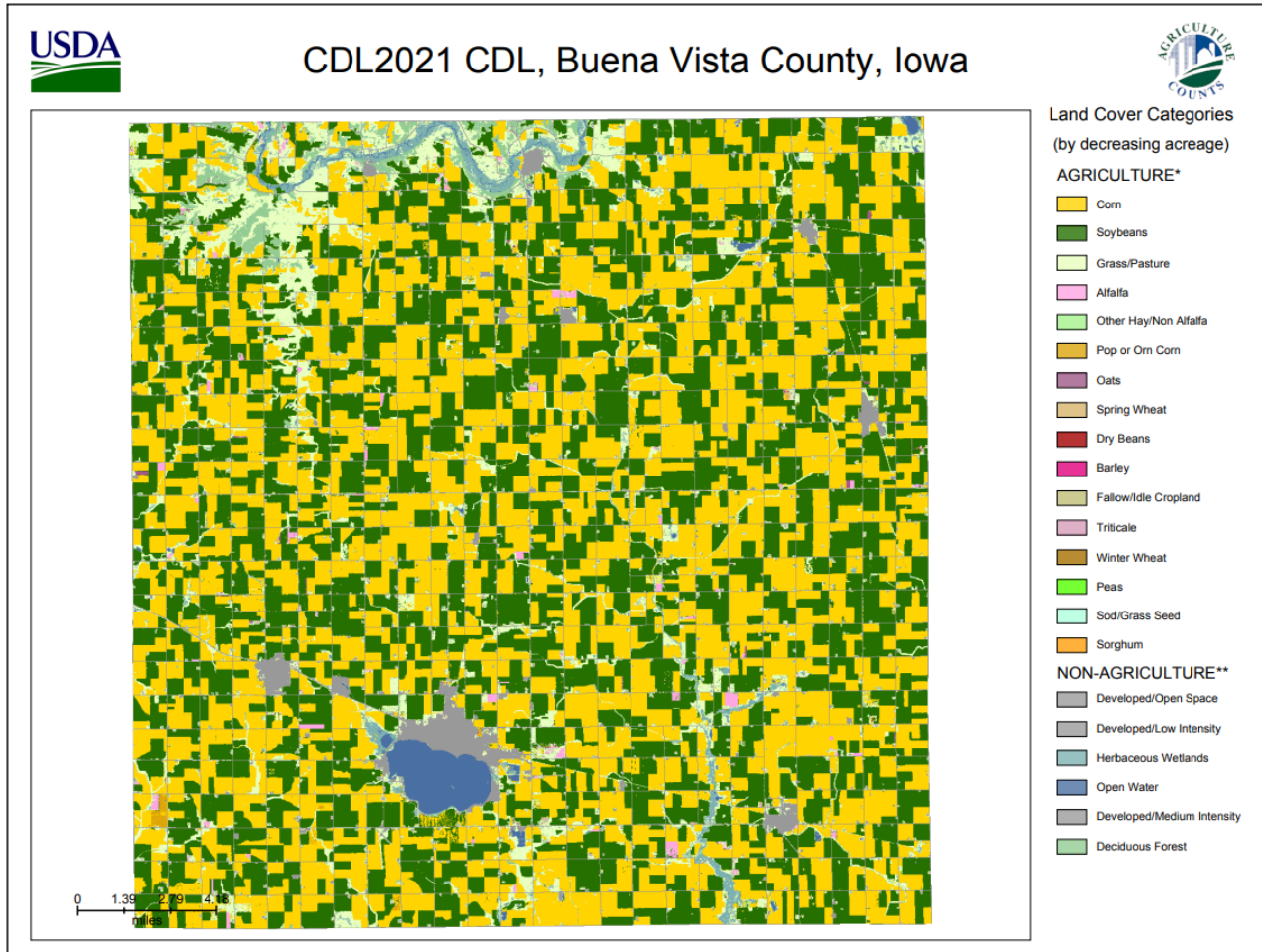
FEMA Photo

Location

All of Buena Vista County is subject to animal/livestock incidents and agricultural infestations. According to the 2017 Census of Agriculture (the most recent year for which data is available), there are 802 farms in the County that cover 356,640 acres of land. This comprises 97% of the county's land area.

As can be seen in the USDA Crop Data Layer (CDL) for 2020 in Figure 4-2, a large amount of land inside the County's boundaries is in agricultural use, with primary crops of corn and soybeans.

Figure 4-2 Buena Vista County Land Use Classification, 2021



Source: USDA Crop Scape

Historic Occurrences

There are several animal/plant/crop diseases that have affected Buena Vista County or have the potential to do so.

Animal Disease

One such 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 neurologic 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.

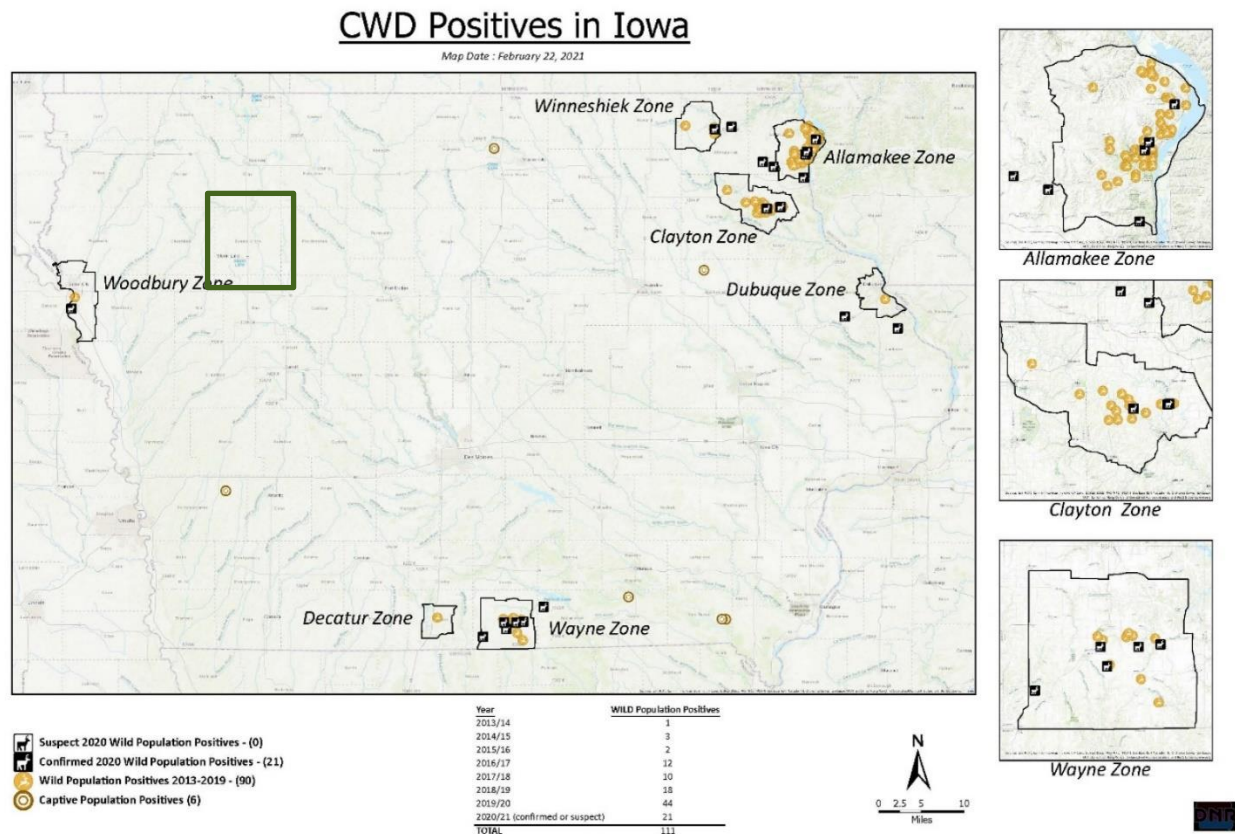
Porcine Epidemic Diarrhea (PED) Virus was confirmed in the US in 2013 (Iowa State University Veterinary Medicine Center 2015). The disease causes severe diarrhea in pigs of all ages; mortality rates in young pigs range from 30 – 100%. This disease's effect on Buena Vista County alone is not clear, but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

At least six confirmed cases of Avian Influenza, or Bird Flu, were detected in Buena Vista County in 2022. According to IDALS. All six detections occurred in commercial turkey lots. Bird flu is highly contagious and can spread through asymptomatic carriers.

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 herds identified in the United States in 2020 (USDA 2020).

The first case of Chronic Wasting Disease (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 89,870 samples were collected between 2002 and the 2021/22 hunting season statewide. No positive cases have been found in Buena Vista County in 2022. In samples collected between 2013 and 2020 from wild deer populations found 163 positives in the state. A majority of the positive cases were found in the state Department of Natural Resources established deer management zones.

Figure 4-3 Positive CWD Cases in Iowa 2013-2021



Crop/Plant Disease

According to the U.S. Department of Agriculture's Risk Management Agency, between 2007-2020, combined crop insurance payments for damages resulting from insects, and plant disease totaled \$3,556

for 106 acres lost. Note that no records of events were found in Buena Vista County after 2012. Table 4-15 shows a summary of insured crop losses as a result of crop infestations.

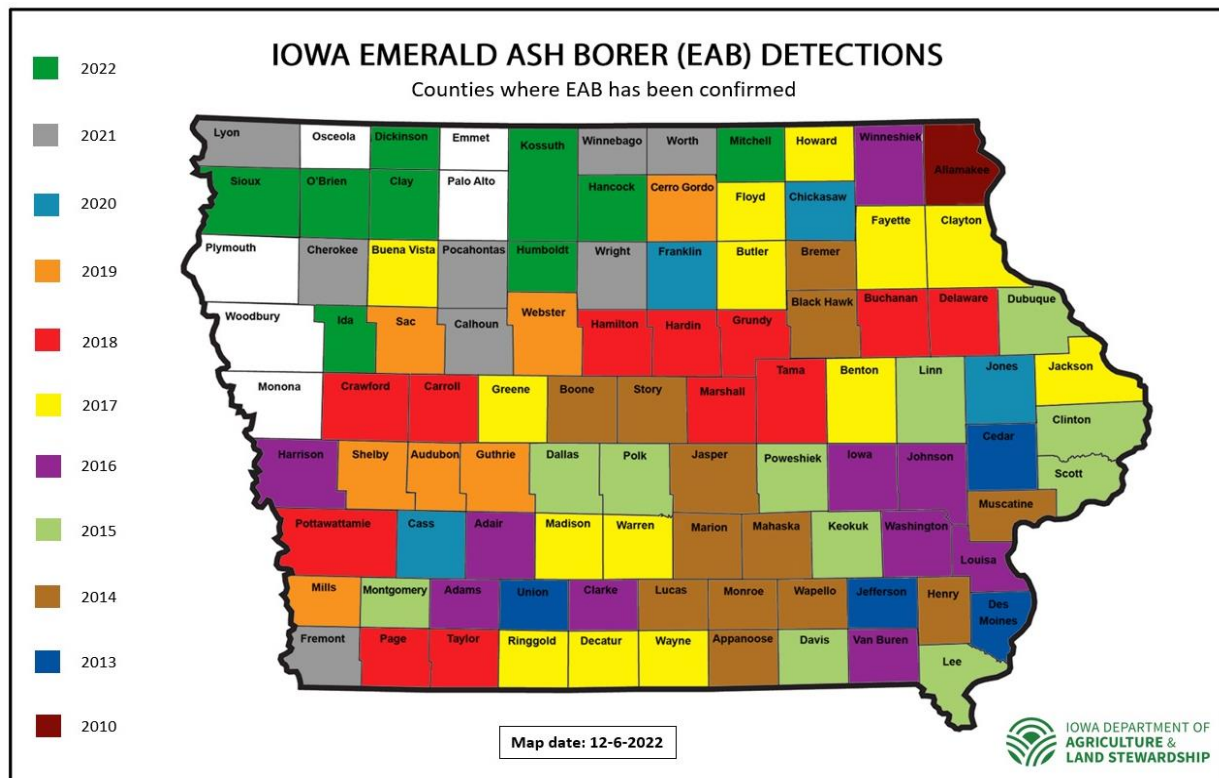
Table 4-15 Crop Insurance Payments for Crop/Pest Disease 2007-2017

Crop Year	Crop Name	Cause of Loss Description	Acres Lost	Insurance Paid
2010	Soybeans	Insects	71	\$1,966
2012	Corn	Insects	35	\$1,590

Source: USDA Risk Management Agency

As of December 2022, 96 counties in Iowa had confirmed Emerald Ash Borer within their boundaries. Between 2010 and 2018, EAB was confirmed in Buena Vista County, and treatment areas continued in 2020.

Figure 4-4 Iowa Emerald Ash Borer Infestation Status, December 2022



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

Source: Iowa Department of Agriculture and Land Stewardship

Probability of Future Occurrence

According to the available data, animal/plant/crop disease are considered **likely** in Buena Vista County. According to data from IDALS, there have been 20 animal disease cases from 2013-2017. Given so many cases of animal disease, the probability of the event occurring again is likely given the agricultural nature of the county.



Magnitude/Severity

Animal/plant/crop disease is considered to have **limited** magnitude and severity. The duration of an animal/plant/crop disease will typically last more than one week. This hazard can take a significant amount of time to manage and stop the disease. The economic impacts of these hazards will be felt for months and years to follow given the agricultural nature of the State of Iowa.

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. If all of these safeguards failed, a disease outbreak might cause injury, illness, or major property damage (in the form of agricultural losses). Critical facilities and emergency services could be shut down or overwhelmed for more than 24 hours.

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 USDA 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.

Crops

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

Regardless of these interactions, it is certain that climate changes will affect future crop production. Greenhouse and growth chamber studies suggest increases in atmospheric carbon dioxide (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.

Animals

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



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

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

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, Buena Vista County has 802 farms. Jobs could be negatively impacted during an agriculture emergency; jobs tangentially tied to the agriculture industry could also be affected. Disease can exacerbate the impacts from other hazards, and an example of this is adverse weather; dead branches weakened by Emerald Ash Borer can be broken by high winds, and there are reports of these branches falling and causing harm to people.

Buena Vista County accounts for 1.5% of Iowa's total pork exports, Any disease outbreak related to hog production would have a significant impact on hog farmers in the County.

Property

An infestation of agriculture pests could impact crop yields, potential destroying whole fields. Between 2007 and 2021, insects and crop disease damaged 106 acres of corn and soybean field causing the RMA paying \$3,556 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

According the 2017 census of agriculture, Buena Vista County is the number one producer of poultry and eggs in the state, and 31st largest producer of hogs and pigs in the Country. A serious illness that affected poultry or pork herds in the county could have a devastating impact on the local economy as well as employment. Nationally, it is estimated that invasive species cost the USA \$138 billion per year. Economic impacts also include both prevention, response and recovery costs.

Environment and Cultural 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.

Differences By Jurisdiction

All jurisdictions have risk from this hazard. While most farmland is in the unincorporated county, the economic impacts would still be significant in the cities. The school districts would likely be less impacted in the short term, although a significant economic downturn could affect their funding.



Risk Summary

- Overall, animal/plant/crop disease is ranked Medium.
- The duration of an animal/plant/crop disease will last more than one week. This hazard can take a significant amount of time to manage and stop the disease.
- Animal/plant/crop disease vulnerability may increase over time as demand for corn, soy, poultry, and pork products grow.
- Climate change may result in an increase in the frequency and severity of animal/plant/crop disease which could severely affect the local economy.
- Related hazards: Extreme Heat, Human Disease.

4.3.2 Drought

LOCATION	MAGNITUDE/ SEVERITY	FUTURE PROBABILITY	OVERALL SIGNIFICANCE
Extensive	Moderate	Highly Likely	High

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.

All four types of drought can 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

Given the regional nature of drought, the spatial extent of drought is **extensive** for Buena Vista County. The entire planning area in Buena Vista County is at risk to drought, and it can be expected that if any portion of the county is experiencing drought conditions, then the entire county is experiencing drought. Of particular note when discussing locations exposed to drought are agricultural areas. According to the 2017 USDA Census of Agriculture, 356,640 acres (approximately 96% of the total area of the county) within Buena Vista County is designated agricultural land or cropland, a majority of which (94%) is cropland (USDA 2017). The extensive agricultural areas in the county place the county at increased risk due to the dependence of agriculture on adequate precipitation.

Historic Occurrences

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

The National Center for Environmental Information (NCEI) reports that Buena County has experienced 32 drought events from 2000 to 2022, causing a reported \$1,557,000 in crop damages. Note that the totals listed for property and crop damage are for all counties affected by this hazard event.

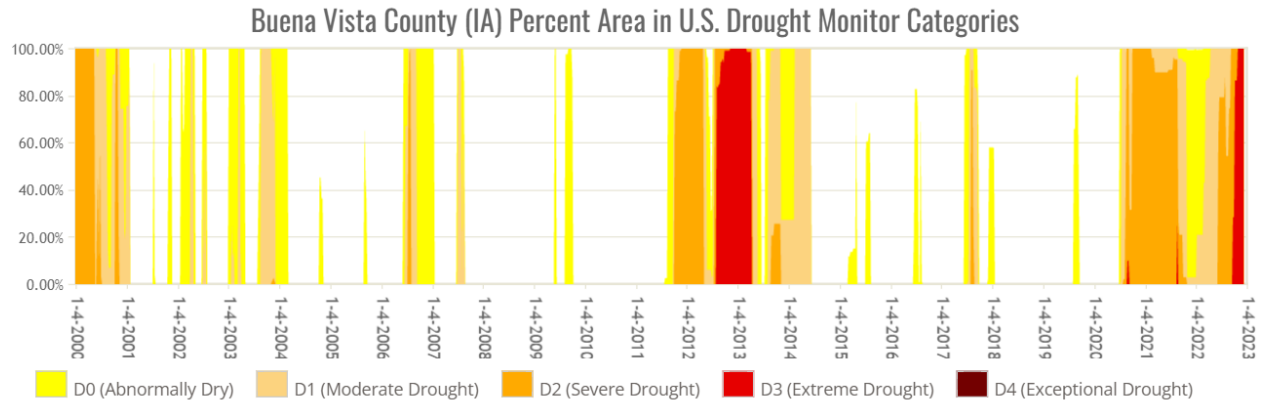
According to the National Drought Mitigation Center's Drought Impact Reporter, between January 2012 and December 15, 2022, Buena Vista County was included in 11 listed drought impacts. The entire State of Iowa was affected by 175 of these impacts throughout the same time frame. The following are the categories and reported number of impacts. Note: some impacts have been assigned to more than one category:

- Agriculture: 7
- Fire: 1
- Plants & Wildlife: 1
- Relief, Response & Restrictions: 5
- Society & Public Health: 1
- Water Supply & Quality: 6

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 \$2.69 billion in crop damages throughout the entire state, according to the 2018 State Hazard Mitigation Plan. No deaths or injuries were reported during any of drought events.

Figure 4-5 below provided by the U.S. Drought Monitor, summarizes the historical drought conditions for Buena Vista County by intensity and percent area from 2000 through January 2023. The county periodically experiences moderate to severe drought; extreme and severe drought intensity was experienced in 2012 and 2013 and again more recently from 2021 to 2022.

Figure 4-5 Historic Drought Intensity (Percent Area), 2000-January 2023



Source: National Drought Mitigation Center, UNL

As shown before in Table 4-5, Buena Vista County was designated in 14 USDA Secretarial disaster declarations for drought in 2012 – 2022 to make emergency loans available to producers suffering losses.

According to the USDA's Risk Management Agency (RMA), payments for insured crop losses in Buena Vista County as a result of drought conditions occurred in nearly every year in the past thirteen years from 2007-2021 and totaled \$32,515,495 for a loss of 244,370 acres. The following table breaks down the RMA payments by year and crop type.

Table 4-16 Crop Insurance Claims Paid from Drought, 2007-2022

Year	Crop Name	Acres Lost	Insurance Paid
2007	Oats	27	\$457
	Corn	9,203	\$657,191
	Soybeans	547	\$54,704
2008	Corn	540	\$51,929
	Soybeans	1,035	\$75,991
2009	Corn	144	\$17,570
	Soybeans	91	\$3,319
2010	Soybeans	356	\$9,852
2011	Corn	1,390	\$189,306
	Soybeans	2,155	\$115,874
2012	Corn	54,054	\$8,306,819
	Popcorn	136	\$3,709
	Hybrid Corn Seed	262	\$21,577
	Soybeans	32,405	\$3,076,792
2013	Corn	67,534	\$14,404,058
	Hybrid Corn Seed	48	\$5,788
	Soybeans	22,455	\$1,682,843
	All Other Crops	76	\$9,044
2014	Corn	32	\$2,620
	Soybeans	39	\$1,723

Year	Crop Name	Acres Lost	Insurance Paid
2017	Corn	17,397	\$1,658,875
	Soybeans	3,742	\$202,956
2018	Corn	21	\$1,495
2020	Corn	20,301	\$1,437,682
	Soybeans	8,828	\$388,967
2021	Corn	650	\$82,148
	Soybeans	903	\$52,209
2022	Corn	6,562	\$684,955
	Soybeans	12,144	\$808,590
	All Other Crops	-	\$9,957
Total:		263,076	\$34,019,000

Source: USDA Risk Management Agency, <https://www.rma.usda.gov/SummaryOfBusiness/CauseOfLoss>

Probability of Future Occurrence

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.

The NCEI database 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 and the documented trend of warmer climate conditions, drought is considered **highly likely** in Buena Vista County. There is roughly a 100% chance of drought occurring in any given year.

Magnitude/Severity

The magnitude of drought in Buena Vista County can be **moderate**. 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 Buena Vista County. A prolonged drought would have a larger impact.

Figure 4-6 Drought Severity Classification Chart

Category	Description	Possible Impacts	Ranges				
			Palmer Drought Severity Index (PDSI)	CPC Soil Moisture Model (Percentiles)	USGS Weekly Streamflow (Percentiles)	Standardized Precipitation Index (SPI)	Objective Drought Indicator Blends (Percentiles)
D0	Abnormally Dry	<p>Going into drought:</p> <ul style="list-style-type: none"> • short-term dryness slowing planting, growth of crops or pastures <p>Coming out of drought:</p> <ul style="list-style-type: none"> • some lingering water deficits • pastures or crops not fully recovered 	-1.0 to -1.9	21 to 30	21 to 30	-0.5 to -0.7	21 to 30
D1	Moderate Drought	<ul style="list-style-type: none"> • Some damage to crops, pastures • Streams, reservoirs, or wells low, some water shortages developing or imminent • Voluntary water-use restrictions requested 	-2.0 to -2.9	11 to 20	11 to 20	-0.8 to -1.2	11 to 20
D2	Severe Drought	<ul style="list-style-type: none"> • Crop or pasture losses likely • Water shortages common • Water restrictions imposed 	-3.0 to -3.9	6 to 10	6 to 10	-1.3 to -1.5	6 to 10
D3	Extreme Drought	<ul style="list-style-type: none"> • Major crop/pasture losses • Widespread water shortages or restrictions 	-4.0 to -4.9	3 to 5	3 to 5	-1.6 to -1.9	3 to 5
D4	Exceptional Drought	<ul style="list-style-type: none"> • Exceptional and widespread crop/pasture losses • Shortages of water in reservoirs, streams, and wells creating water emergencies 	-5.0 or less	0 to 2	0 to 2	-2.0 or less	0 to 2

Source: National Drought Mitigation Center, 2022

A period of prolonged abnormally low precipitation that produces severe dry conditions. A chart that classifies drought severity is included in Figure 4-6. All ranges of drought severity could be experienced, though the droughts in the past 20 years typically range from moderate to severe and occasionally extreme based on the information provided in the Historic Occurrences section.

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.

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. Drought may cause short-term property damage until drought conditions dissipate.

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. 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 4-16 shows crop loss data due to drought between 2007 and 2021. Based on information in that table Buena Vista County experiences an average annualized loss of \$2,322,535 due to drought.

Environment and Cultural Resources

If a drought event were to occur in Buena Vista 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. Currently population is decreasing but vulnerability to drought will increase if population growth increases in the future, putting more demands on existing water supplies. Future water use planning should consider increases in population as well as potential impacts of climate change.

Differences By Jurisdiction

All jurisdictions are vulnerable to drought. The impacts of drought can severely impact the economy of the entire planning area. The school districts would likely be less impacted in the short term, although a significant economic downturn could affect their funding.

Risk Summary

- Overall, drought is ranked High.
- Drought vulnerability may increase over time as demand for water from different sectors increases and as the County plans for economic development around the use of water resources.
- Climate change may result in an increase in the frequency and severity of drought which could lead to impacts to the recreation and tourism industry in the County.
- Extreme heat events are unlikely throughout the County, and the magnitude of heat events is low.
- The effects of recent droughts have exposed the vulnerability of the planning area's economy to drought events.
- Related hazards: Extreme Heat, Wildfire.

4.3.3 Earthquake

LOCATION	MAGNITUDE/ SEVERITY	FUTURE PROBABILITY	OVERALL SIGNIFICANCE
Extensive	Negligible	Unlikely	Low

Description

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

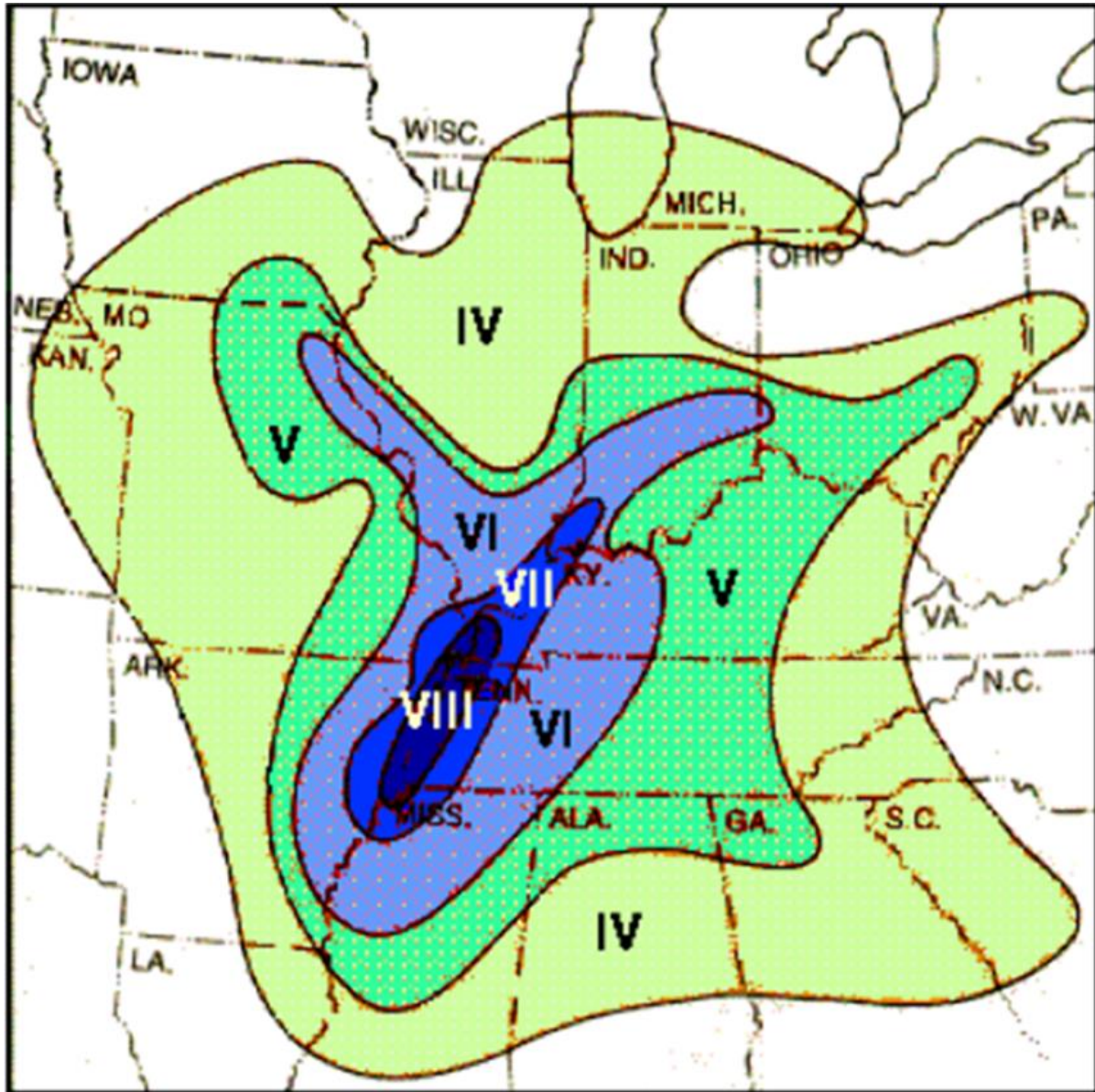
Location

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

Iowa counties are in low-risk zone. The southeastern part of the State is more at risk to earthquake effects from the New Madrid Fault Zone. Figure 4-7 shows the estimated effects of a 6.5 Richter magnitude earthquake scenario along the New Madrid Fault Zone. It suggests that Iowans in four southeast counties could experience trembling buildings, some broken dishes and cracked windows, movement and falling of small unstable objects, abrupt openings or closing doors, and liquids spilling from open containers. About 29 other counties, from Page to Madison to Muscatine, could experience vibrations like the passing of a heavy truck, rattling of dishes and windows, creaking of walls, and swinging of suspended objects. These effects will vary considerably with differences in local geology and construction techniques.

Buena Vista County is in a part of the state that is unlikely to experience significant vibrations from a typical earthquake along the New Madrid Fault Zone. However, a more severe earthquake, such as an 8.0 magnitude or greater, could cause significant damages in Buena Vista County. According to the USGS, the strongest earthquake ever recorded in North America was a magnitude 9.2 earthquake that occurred in Alaska in 1964 and shook the Seattle Space Needle nearly 1,200 miles away.

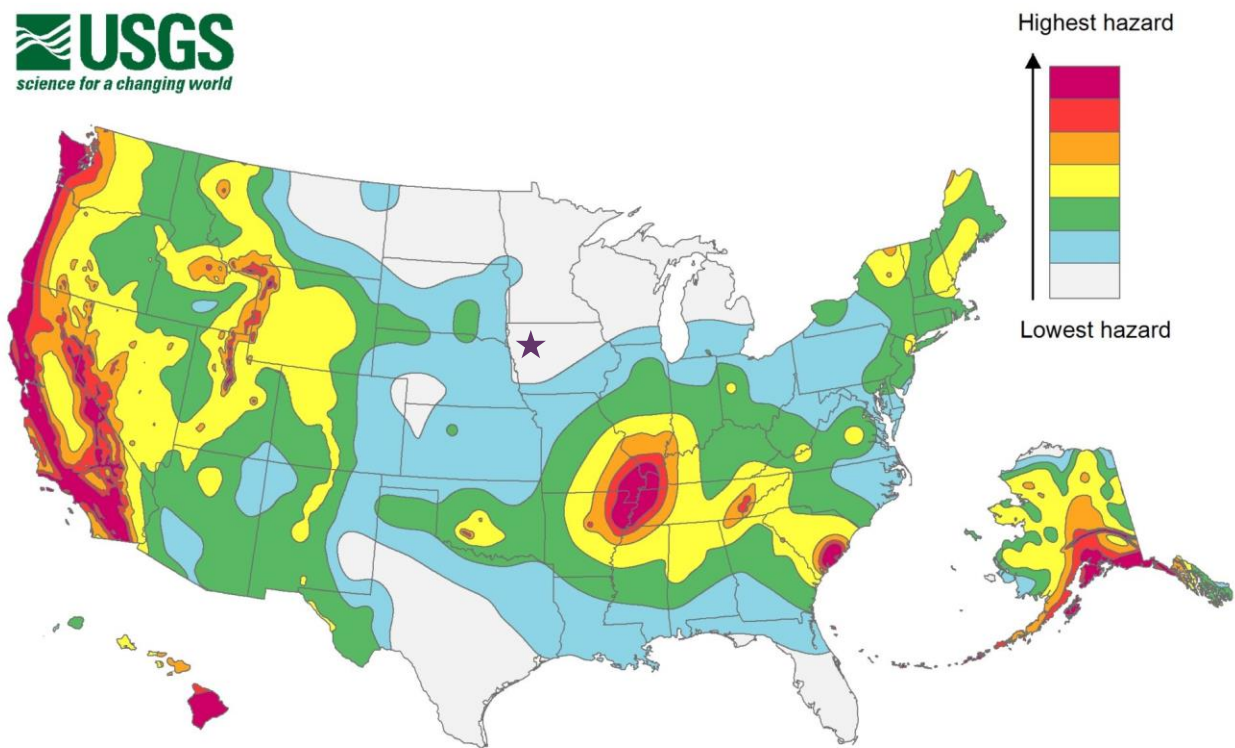
Figure 4-7 6.5 Richter Magnitude Earthquake Scenario, New Madrid Fault Zone



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

Figure 4-8 below displays the USGS earthquake risk map for the United States. The USGS reports that Buena Vista County is in Seismic Zone 0, the lowest risk zone in the United States. While it is highly unlikely for a significant earthquake to occur in Buena Vista County or Northwest Iowa, tremors from a large magnitude earthquake could shake the ground in the County.

Figure 4-8 United States Earthquake Map



Source: United States Geologic Survey (USGS), <https://www.usgs.gov/media/images/2018-long-term-national-seismic-hazard-map>

Historic Occurrences

Iowa has experienced little effects from only a few earthquakes in the past 177 years. The epicenters of 14 earthquakes have been in the State, with the majority along the Mississippi River. The strongest earthquake in Iowa occurred in Davenport in 1934 but resulted in only slight damage according to the State of Iowa Hazard Mitigation Plan 2018.

While more than twenty (20) earthquakes have occurred in or around Iowa over the past 177 years, they have not seriously impacted the state. The USGS reported one earthquake event in Buena Vista County. The earthquake occurred on June 30th, 2021, near the Town of Rembrandt and was rated as Magnitude III Earthquake on the Modified Mercalli Intensity Scale, which can cause noticeable vibrations indoors, especially on upper floors, but may not be recognized as an earthquake. No damages were reported in the County. Details of the 14 Iowa Earthquakes are provided below:

Table 4-17 Iowa Earthquakes 1867-2022

Date	Nearest Town	Mercalli Intensity
6/30/2021	Rembrandt, IA	III
7/16/2004	Shenandoah, IA	III
4/20/1948	Oxford, IA	IV
11/24/1939	Davenport, IA / Rock Island, IL	II-III

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

Source: State of Iowa Hazard Mitigation Plan 2018, USGS <https://earthquake.usgs.gov/earthquakes/map/>

Probability of Future Occurrence

Based on historical occurrence, Buena Vista County has less than a 1% chance of an earthquake occurring in any given year in the county. Future probability is **unlikely**.

Seismologists attempt to forecast earthquake size and frequency based on data from previous events. In the New Madrid Fault Zone, this analysis is difficult because there are few historic moderate to large earthquakes, and the active faults are too deeply buried to monitor effectively. Based on recurrence intervals for small earthquakes, scientists estimate a 90% chance of a Richter magnitude 6.0 earthquake in the New Madrid Fault Zone by 2040. A magnitude 6.5 in New Madrid would create a magnitude 4 effect in Iowa resulting in little or no damage or fear.

The cause of the 2021 earthquake that occurred in Buena Vista County was not documented, but with only one earthquake event recorded in the past nearly two centuries, it is unlikely that a similar event will happen again in the near future.

Magnitude/Severity

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

Table 4-18 Earthquake Magnitude: Modified Mercalli Scale and Richter Scale

Modified Mercalli Scale		Level Of Damage	Richter Scale
1-4	Instrumental to Moderate	No damage.	≤ 4.3
5	Rather Strong	Damage negligible. Small, unstable objects displaced or upset; some dishes and glassware broken.	4.4 - 4.8
6	Strong	Damage slight. Windows, dishes, glassware broken. Furniture moved or overturned. Weak plaster and masonry cracked.	4.9 - 5.4

Modified Mercalli Scale		Level Of Damage	Richter Scale
7	Very Strong	Damage slight-moderate in well-built structures; considerable in poorly built structures. Furniture and weak chimneys broken. Masonry damaged. Loose bricks, tiles, plaster, and stones will fall.	5.5 - 6.1
8	Destructive	Structure damage considerable, particularly to poorly built structures. Chimneys, monuments, towers, elevated tanks may fail. Frame houses moved. Trees damaged. Cracks in wet ground and steep slopes.	6.2 - 6.5
9	Ruinous	Structural damage severe; some will collapse. General damage to foundations. Serious damage to reservoirs. Underground pipes broken. Conspicuous cracks in ground; liquefaction.	6.6 - 6.9
10	Disastrous	Most masonry and frame structures/foundations destroyed. Some well-built wooden structures and bridges destroyed. Serious damage to dams, dikes, embankments. Sand and mud shifting on beaches and flat land.	7.0 - 7.3
11	Very Disastrous	Few or no masonry structures remain standing. Bridges destroyed. Broad fissures in ground. Underground pipelines completely out of service. Rails bent. Widespread earth slumps and landslides.	7.4-8.1
12	Catastrophic	Damage nearly total. Large rock masses displace. Lines of sight and level distorted.	>8.1

Source: State of Iowa Hazard Mitigation Plan 2018

Richter Magnitude Scale

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

Modified Mercalli Intensity Scale

The effect of an earthquake on the Earth's surface is called the intensity. The intensity scale consists of a series of certain key responses such as people awakening, movement of furniture, damage to chimneys, and finally total destruction. Although numerous intensity scales have been developed over the last several hundred years to evaluate the effects of earthquakes, the one currently used in the United States is the Modified Mercalli (MM) Intensity Scale. It was developed in 1931 by the American seismologists Harry Wood and Frank Neumann. This scale, composed of 12 increasing levels of intensity that range from imperceptible shaking to catastrophic destruction, is designated by Roman numerals. It does not have a mathematical basis; instead, it is an arbitrary ranking based on observed effects.

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

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

Severity of Impact

Most of Iowa is located in Seismic Zone 0, the lowest risk zone in the United States. Most structures in Iowa are not built to earthquake standards, but because of the relatively low magnitude of the possible quake, property damage would likely be very minimal. The most vulnerable structures are those built on poorly consolidated substrate, especially floodplain materials.

In general, peak ground acceleration (PGA) is a measure of the strength of ground movements. More specifically, the PGA measures the rate in change of motion relative to the established rate of acceleration due to gravity. According to the United States Geological Services, for Buena Vista County, the peak acceleration with a 2% probability of exceeding in 50 years is 2% g, which means the County is under a very small threat in regard to earthquakes. Earthquakes are therefore considered to have **negligible** magnitude and severity for the County, with less than 10% of property severely damaged, shutdown of facilities and services for less than 24 hours, and/or injuries/illnesses treatable with first aid.

Speed of Onset

Earthquake prediction is an inexact science. Even in areas that are well monitored with instruments, such as California's San Andreas Fault Zone, scientists only very rarely predict earthquakes.

Climate Change Considerations

The impacts of global climate change on earthquake intensity and probability are largely unknown, but there is not expected to be a direct correlation.

Vulnerability

People

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

Property

Most structures in Buena Vista County are not built to withstand earthquake shaking, but because of the relatively low magnitude of a possible quake, property damage would likely be very minor damage.

Critical Facilities and Infrastructure

Critical facilities are potentially vulnerable to an earthquake event, but anticipated impacts are likely to be minor and mostly to be to non-structural items.

Economy

Economic impacts due to an earthquake event will be related to both the event and the recovery after the event and are expected to be minor.



Environment and Cultural Resources

Older and historic buildings will typically be more vulnerable to damage in an earthquake. Historic building stock is commonly made of unreinforced masonry, which is more vulnerable to damage from earthquakes.

Development Trends

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

Differences By Jurisdiction

Earthquake risk is uniform across the county.

Risk Summary

Overall, earthquake hazard is ranked as low for the County.

- The overall significance of this hazard in Buena Vista County is **low**.
- Due to the regional nature of earthquakes, the geographic extent is rated as **extensive**.
- Based on historic data, Buena Vista County has only experienced one earthquake event in the past 177 years, therefore, future occurrence is **unlikely**.
- The only earthquake event in Buena Vista County occurred in 2021 and was rated as a magnitude III earthquake, which produces vibrations that may not be noticeable. No injuries or damages were reported; therefore, severity is ranked as **negligible**.
- Impacted properties can require cleanup, but the effects are usually localized during minor events.
- Extended road closures and power outages can result in economic losses and impact tourism.
- Related hazards: Infrastructure failure, transportation incident, sinkhole, landslide, hazmat incident

4.3.4 Expansive Soils

LOCATION	MAGNITUDE/ SEVERITY	FUTURE PROBABILITY	OVERALL SIGNIFICANCE
Significant	Negligible	Occasional	Low

Description

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

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

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

Location

According to the U.S. Geological Survey (USGS), the northwest section of the state has the highest probability of the incidence of expansive soils. That risk is rated as "less than 50 percent of the soil being of the expansive clay" variety. Figure 4-9 below shows the presence of soils with swelling potential throughout the U.S. Figure 4-10 below shows the same information specific to the State of Iowa.

Figure 4-9 Presence of Swelling Clays in the Contiguous United States

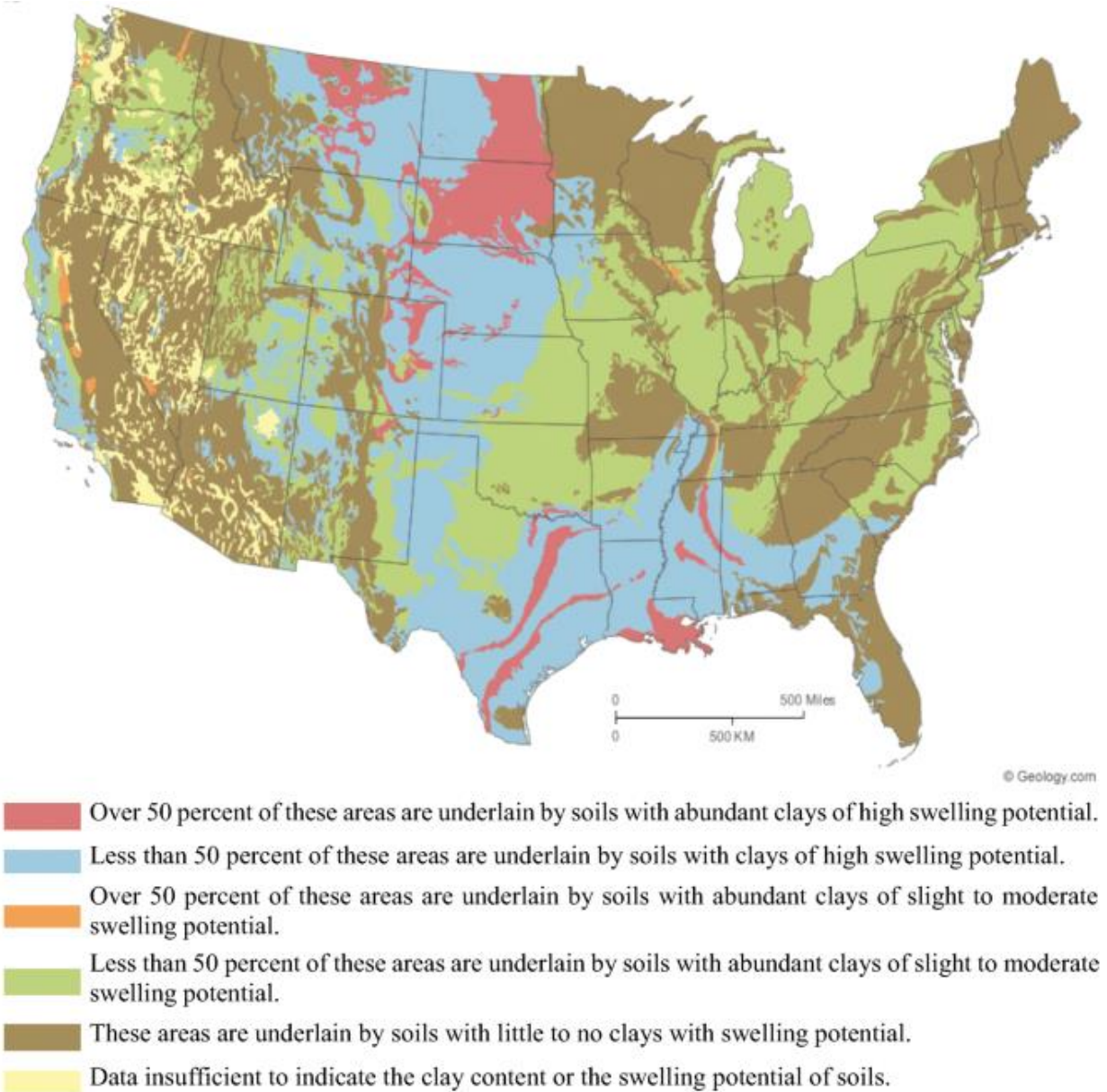
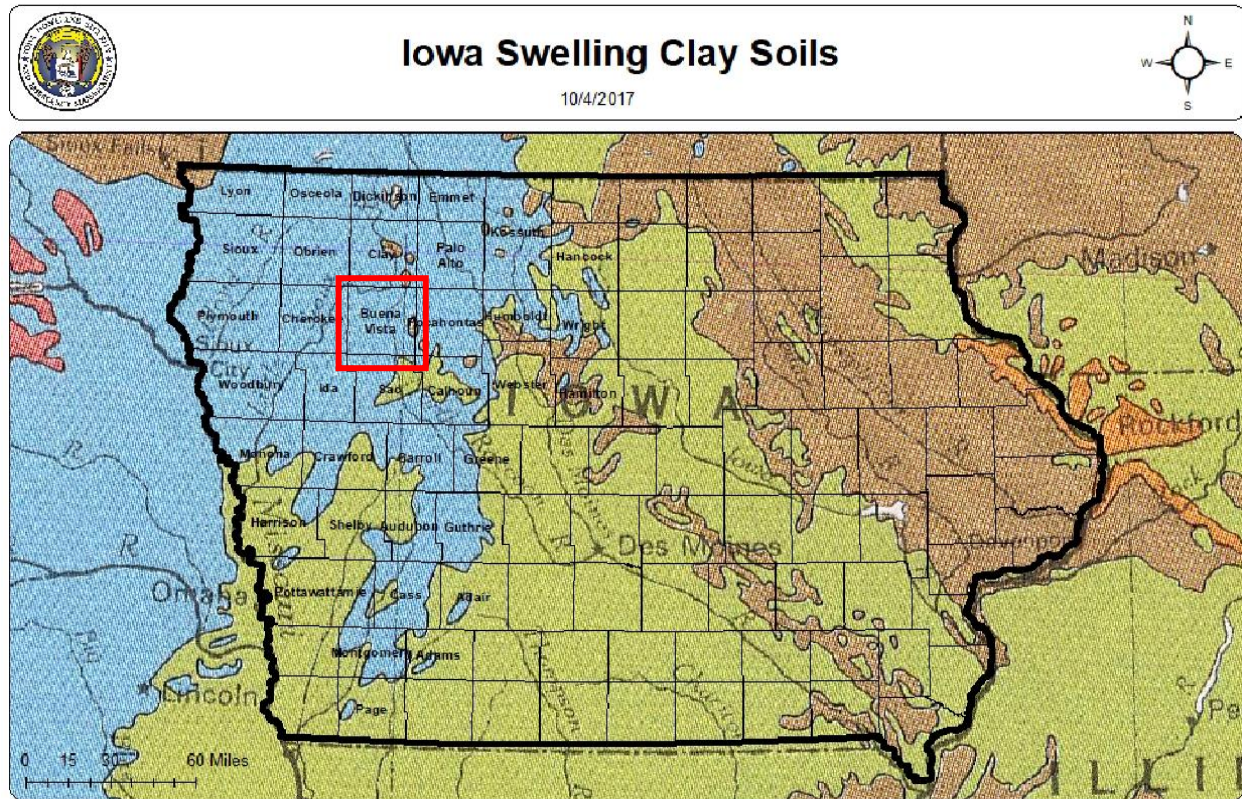


Figure 4-10 Iowa Swelling Clay Soils



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

As shown above, the vast majority of Buena Vista County is marked as “less than 50% of these areas are underlain by soils with clays of high swelling potential”. This means that there are soils with high potential to expand in the County, but these soils cover less than half of the area in the County. This is the second most severe classification of expansive soils in Iowa. The geographic extent is rated **significant**.

Historic Occurrences

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

Probability of Future Occurrence

Since records of specific occurrences are not readily available, it is difficult to estimate the probability of future occurrences. It should be noted that although the planning teams expressed a risk of vulnerability to expansive soils, there hasn’t been any formal record keeping of events or damages, therefore it has been estimated to be **occasional**.



Magnitude/Severity

Expansive soils are considered to have **negligible** magnitude and severity. Less than 10% of property severely damaged, shutdown of facilities and services for less than 24 hours, and/or injuries/illnesses treatable with first aid. Damage from these soils will typically be isolated events, which will cause damage to a small number of buildings or road segments over time, and does not cause complete damage or structure loss, or fatalities or injuries of residents and visitors to Buena Vista County. While maps show that there are areas of the state that may be somewhat susceptible to expansive soils, this is currently not a hazard that has had an impact on Buena Vista County.

Climate Change Considerations

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

Vulnerability

People

The American Society of Civil Engineers estimated that as high as a quarter of the homes in the United States have some level of damage due to expansive soils. While in most cases the damage from expansive soils is minimal and can be remediated if caught early enough, extreme cases of expansive soils can result in total foundation failure of a home and pose risk to any occupants living inside the home.

Property

Older construction may not be resistant to swelling soil conditions and, therefore, may experience expensive and potentially extensive damages. This includes heaving sidewalks, structural damage to walls and basements, the need to replace windows and doors, or dangers and damages caused by ruptured pipelines.

Critical Facilities and Infrastructure

Existing critical facilities impacted expansive soil hazards are of particular concern, as the damages caused to these structures may impact the ability of the planning area to provide critical services to the population.

Economy

The economic cost of this hazard is typically minor in the short term, although over time they can add up to significant impacts. Road closures or detours during expansive soil repairs can result in temporary economic impacts. Most homeowner insurance policies do not cover expansive soils, which could create financial burden for local homeowners who experience home damages.

Environment and Cultural Resources

Expansive soils are a natural environmental process. Nonetheless they have the potential to alter the landscape and can cause damages to historic and cultural resources.



Development Trends

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

Differences By Jurisdiction

Storm Lake and Unincorporated Buena Vista County identified expansive soils as a hazard they are vulnerable to because of their soil composition. The magnitude for those jurisdictions is increased to limited, although the overall risk remains low.

Risk Summary

Overall, expansive soils hazard is ranked as low for the County.

- Buena Vista County is composed of soils with high potential to expand in the County, but these soils cover less than half of the area in the County; therefore, geographic extent is rated as **significant**.
- There are no records of expansive soils damaging property in the County; therefore, probability of future occurrence is ranked as **unlikely**. Lack of records is likely due to damages going unreported or the issue was remediated early on, and no significant damages occurred.
- Damages from expansive soils can impact a small number of buildings or road segments over time, and does not cause complete damage or structure loss, or fatalities or injuries of residents and visitors to Buena Vista County magnitude of expansive soils for Buena Vista County is rated as negligible.
- Economic impacts are typically minimal as damages are localized and can be remediated if caught early.
- Unincorporated Buena Vista County and the City of Storm Lake identified expansive soils as a hazard they are vulnerable to, therefore, the magnitude is rated higher for these jurisdictions.
- Damage from these soils will typically be isolated events.
- Related hazards: Sinkholes

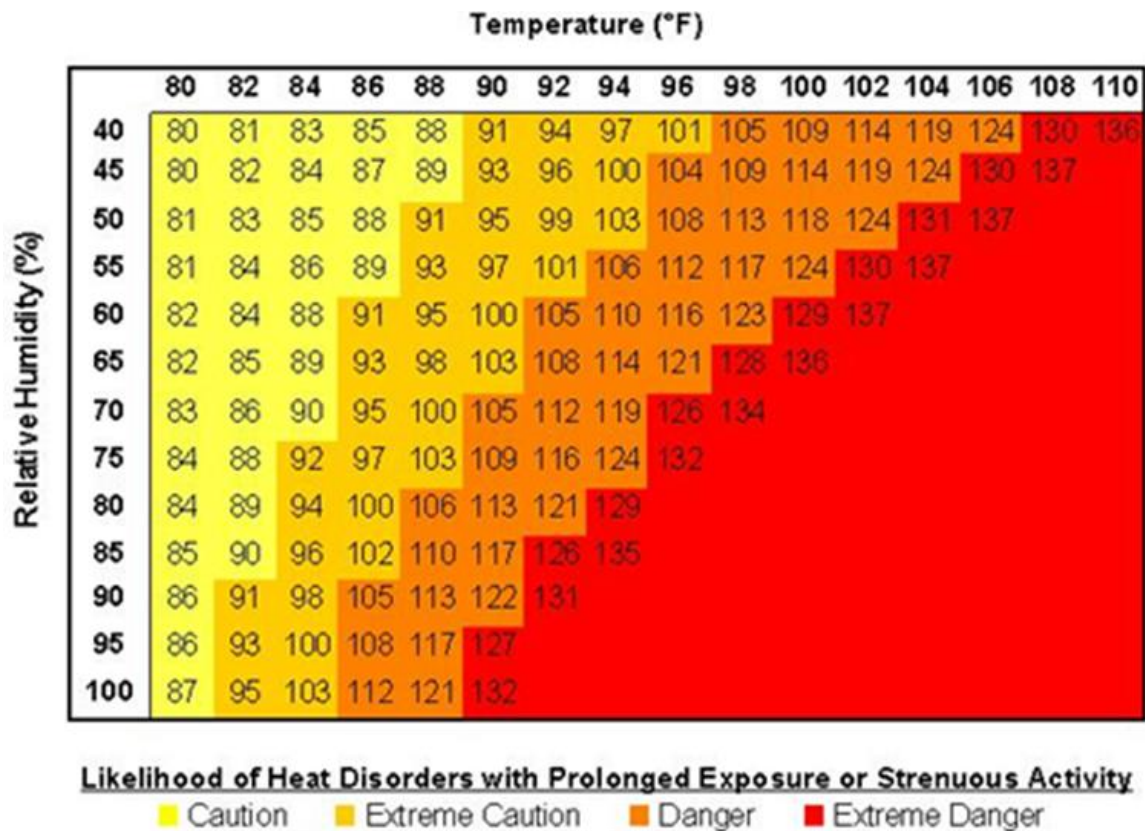
4.3.5 Extreme Heat

LOCATION	MAGNITUDE/ SEVERITY	FUTURE PROBABILITY	OVERALL SIGNIFICANCE
Extensive	Negligible	Highly Likely	Medium

Description

FEMA defines extreme heat 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 is a number in degrees Fahrenheit that tells how hot it really feels when relative humidity is added to the actual air temperature. Exposure to full sunshine can increase the heat index by at least 15°. Extreme heat can impose stress on animals and humans, especially the elderly, sick and young children.

Figure 4-11 Heat Index (HI) Chart



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 and/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. Buildings, structures,

and public facilities are generally not affected by extreme heat directly, unless the magnitude of extreme heat is such to cause an indirect negative impact on the jurisdiction such as loss of power or strain on a community's utilities to keep up with local demand.

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. 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

Given the regional nature of extreme heat, the spatial extent of drought is **extensive** for Buena Vista County. The entire planning area is subject to extreme heat and all participating jurisdictions are affected. Cities are typically more affected by extreme heat than surrounding rural areas due to the urban heat island effect. Table 4-19 lists typical symptoms and health impacts of exposure to extreme heat.

Table 4-19 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.

Historic Occurrences

According to information obtained from the NWS for Buena Vista County Zone on the Iowa Environmental Mesonet, Iowa State University Department of Agronomy website, there have been a combined 64 excessive heat advisories, watches, and warnings between 2005 and 2022. These events are summarized in Table 4-20 below. The greatest number of heat warnings issued in a given year was 6 warnings, which has occurred in 2010, 2011, and every consecutive year since 2019. Historic data tells us that extreme heat is a fairly common occurrence in Buena Vista County.

Table 4-20 Number of Heat Advisories, Watches, and Warnings, 2005-2022 Buena Vista County Zone

Year	Heat Advisory	Excessive Heat Warning	Excessive Heat Watch
2005	0	0	0

Year	Heat Advisory	Excessive Heat Warning	Excessive Heat Watch
2006	3	0	0
2007	0	0	0
2008	0	0	0
2009	1	0	0
2010	4	1	1
2011	4	1	1
2012	4	1	0
2013	1	0	0
2014	3	0	0
2015	2	0	0
2016	3	1	1
2017	3	0	0
2018	5	0	0
2019	4	1	1
2020	4	1	1
2021	5	0	1
2022	6	0	0
Totals	52	6	6

Source: Iowa State University Environmental Mesonet

Figure 4-12 shows the daily maximum temperatures for the Storm Lake, Iowa weather station for the period of record from 1900 to 2020 from the High Plains Regional Climate Center. This data shows that a temperature of 109 °F was reached in 1930 and again in 1936 as the highest recorded temperature during the 122-year timeframe. The months of the year with the highest temperatures are generally July and August. The average maximum temperature for July is 84 °F and August is 82 °F for the planning area.

Figure 4-12 Maximum Temperature, Storm Lake, Iowa (1900-2022)



Source: High Plains Regional Climate Center

Probability of Future Occurrence

Extreme heat is considered **highly likely** in Buena Vista County. More than 33% probability in any given year (event has up to a 1 in 1 chance of occurring), history of events is greater than 33% likely or the event is highly likely to occur. NCEI reports eleven extreme heat events in Buena Vista County from 1999 to 2022. Based on NCEI statistics there is over 47% (11 events/23 year) probability of an extreme heat event occurring annually.

The planning team also noted another method in describing that successive days in excess of 90° F or one day in excess of 100° F occur on an almost annual basis across northwest Iowa and not are all recorded. According to the Southwest Climate and Environmental Information Collaborative (SCENIC), there are an average of 15 days per year with temperatures in excess of 90° F. There have been no deaths resulting from extreme heat reported, however one event in 1999 noted 10 injuries from heat exhaustion. There was no property or crop damage, according to NCEI data.

Magnitude/Severity

Extreme heat is considered to have **negligible** magnitude and severity. This means that less than 10% of property is severely damaged, shutdown of facilities and services for less than 24 hours, and/or injuries/illnesses treatable with first aid. However, it should be noted that it is still possible for extreme heat to cause physical damage to property in the future. Extreme heat events typically occur with ample warning time. Weather forecasters predict heat events several days before they will occur.

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

People

The impacts of extreme heat on health are a consideration in evaluating the overall vulnerability of Buena Vista County. According to the US Census Bureau 2020 American Community Survey estimates, approximately 15.1% of Buena Vista 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.

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, all people and property in Buena Vista County are affected when this type of hazard occurs.

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. 6.6% of all employment in Buena Vista 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 6,698 acres lost to heat resulting in \$1,017,490 in indemnity payments due to insured crop loss. There is an estimated \$67,833 of annualized crop loss due to heat.

Environment and Cultural 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

Buena Vista County is not experiencing significant growth and development, with the population oscillating between 20,000 and 21,000 since 1960. Therefore, the number of people vulnerable to extreme heat is not necessarily 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.

Differences By Jurisdiction

The risk of extreme heat is uniform across the county.

Risk Summary

- The overall significance of extreme heat is **Medium**.
- Climate change may result in an increase in the frequency and severity of extreme heat which could lead to impacts to the agriculture industry in the County.
- Extreme heat events are likely throughout the County, and the magnitude of heat events is low.
- Related hazards: Drought, Wildfire.

4.3.6 Flooding

LOCATION	MAGNITUDE/ SEVERITY	FUTURE PROBABILITY	OVERALL SIGNIFICANCE
Significant	Critical	Highly Likely	High

Description

Riverine and flash flooding are not limited to specific areas of the county. Certain geographical locations may be more prone to annual flooding or a flash flood from a sudden rainfall. For many years, people have built homes and businesses on flood plains, low lying land adjacent to rivers and streams. This increases the likelihood of property damage and loss of life from a flood or flash flood's quick moving, often unexpected, wall of water.

A flood is a high flow or overflow of water from a river or similar body of water, occurring over a period of time too long to be considered a flash flood. Flooding is caused in a variety of ways. Winter or spring rains, coupled with melting snows, can fill river basins too quickly. Torrential rains from decaying hurricanes or other tropical systems can also produce river flooding. Repeated heavy rain from thunderstorms over a period of weeks contributed to the Iowa statewide flood of 1993. Occasionally, floating debris or ice can accumulate at a natural or man-made obstruction and restrict the flow of water. Water held back by the ice jam or debris dam can cause flooding upstream. Subsequent flash flooding can occur downstream if the obstruction should suddenly release. Urban flooding may occur as land is converted from fields or woodland to more paved areas, losing its ability to absorb rainfall. Urbanization increases runoff 2 to 6 times over what would occur on natural terrain. Streets can become instant moving rivers, especially in areas that lack curb and gutter, while basements can fill with water. Floods can be detrimental to a city, causing sewer systems to back up, damaging property, and flooding low-lying areas.



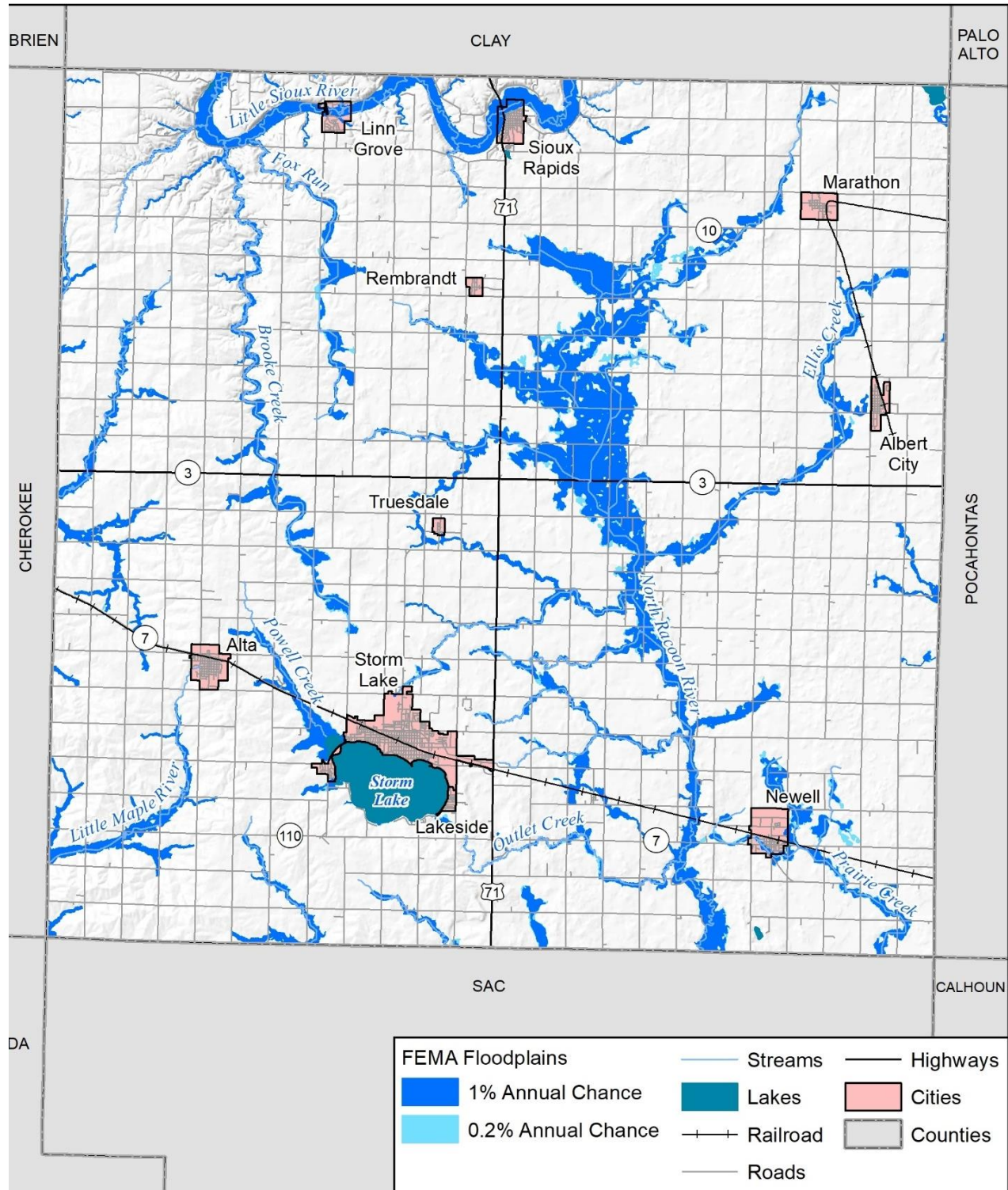
NOAA Photo Library

Location

The geographic extent of flooding in the planning area is **significant**. Buena Vista County is intersected by the North Raccoon River which originates in the northern portion of the county and transects south. Also, the Boyar River is present in the southwestern portion of the study area. Buena Vista County also has the Little Sioux River as a portion of its northern border with Clay County also. These rivers and resulting watersheds are where the majority of flooding hazards and incidents have historically occurred.

These watersheds are the main source of flood problems for the planning area. The smaller channels also can quickly become overwhelmed and overtop their banks. These rivers and creeks are highly subject to snowmelt and rainfall flooding and are showcased in Figure 4-13 below.

Figure 4-13 Buena Vista County FEMA Flood Hazards



Map compiled 10/2022;
intended for planning purposes only.
Data Source: Buena Vista County, Iowa DNR,
FEMA NFHL Effective 10/13/2022

0 5 10 Miles

N



Historic Occurrences

Buena Vista County and its jurisdictions have witnessed several major floods on the North Raccoon River, Boyar River and its tributaries. To date there has been eight federally declared disasters in Buena Vista County due to flooding since 1965, 2.55M in property damages and 1.36M in resulting crop damages also. Some of the more noteworthy floods and recent floods are profiled in the following text and summarized in Table 4-21 below.

- **March 23rd, 2019** - Flooding resulted in extensive damage to public infrastructure including numerous county and township roads, culverts, and some bridges. Rainfall of one to three inches on frozen ground and into a snowpack with between 1 and 3 inches of liquid water equivalent resulted in considerable areal flooding and flooding of small streams. Numerous roads, bridges and homes were compromised by flood water, especially in areas near Hornick, Danbury, Holly Springs, and Merville. Resulting in 1.64M in accumulated property damages.
- **July 1st, 2018** - With river levels already running high due to late June rainfall, additional heavy rainfall of four to nine inches the first few days of July brought extended impacts from flooding to the Little Sioux River and tributaries.
- **July 24th, 2014** - Thunderstorms in northwest Iowa during the late afternoon and evening of June 14th produced heavy rain which caused flash flooding. The thunderstorms also produced damaging winds and hail. The heavy rain caused longer term lowland flooding of fields and other low areas, including roads, that lasted well into the daytime hours of June 15th.
- **July 29th, 2010** - Heavy rain caused minor to moderate flooding to return along the Little Sioux and Ocheyedan Rivers. Agricultural fields, other lowlands, and a few roads were flooded. The river crested at 1.16 feet above flood stage at Linn Grove on July 28th.

Table 4-21 Buena Vista County FEMA Declarations for Flooding, 1965-2022

FEMA Declaration	Declaration Year	Declaration Title
DR-4421-IA	2019	Severe Storms And Flooding
DR-4386-IA	2018	Severe Storms, Tornadoes, Straight-Line Winds, And Flooding
DR-4184-IA	2014	Severe Storms, Tornadoes, Straight-Line Winds, And Flooding
DR-1930-IA	2010	Severe Storms, Tornadoes And Flooding
DR-1230-IA	1998	Severe Storms & Flooding
DR-996-IA	1993	Heavy Rains & Flooding
DR-269-IA	1969	Flooding
DR-259-IA	1969	Flooding
DR-193-IA	1965	Severe Storms, Flooding, And Tornadoes

Source: FEMA.gov

Also, according to the National Centers for Environmental Information (NCEI) there has been 57 flooding events in Buena Vista County recorded from 2002 to 2023. This flooding events resulted in \$2.5 million in property damages and \$1.3 million in crop damage. There has been no recorded deaths or injuries due to any of these events. NCEI flooding events documented in Buena Vista County are summarized in Table 4-22.



Table 4-22 NCEI Flood Events in Buena Vista County 2023-2002

DATE	DESCRIPTION	PROPERTY DAMAGE	CROP DAMAGE	SOURCE
6/1/2019	Heavy Rain	\$0	\$0	River/Stream Gage
6/1/2019	Heavy Rain	\$0	\$1,360,000	Other Federal Agency
5/1/2019	Heavy Rain	\$0	\$0	River/Stream Gage
4/7/2019	Heavy Rain	\$0	\$0	River/Stream Gage
3/14/2019	Heavy Rain / Snow Melt	\$0	\$0	River/Stream Gage
3/13/2019	Heavy Rain / Snow Melt	\$1,640,000	\$0	Emergency Manager
10/9/2018	Heavy Rain	\$0	\$0	River/Stream Gage
10/1/2018	Heavy Rain	\$0	\$0	River/Stream Gage
9/20/2018	Heavy Rain	\$0	\$0	River/Stream Gage
7/1/2018	Heavy Rain	\$0	\$0	River/Stream Gage
6/14/2018	Heavy Rain	\$0	\$0	River/Stream Gage
5/1/2018	Heavy Rain	\$0	\$0	River/Stream Gage
4/17/2018	Heavy Rain / Snow Melt	\$0	\$0	River/Stream Gage
4/1/2018	Heavy Rain / Snow Melt	\$0	\$0	River/Stream Gage
3/30/2018	Heavy Rain / Snow Melt	\$0	\$0	River/Stream Gage
3/19/2018	Heavy Rain / Snow Melt	\$0	\$0	River/Stream Gage
5/1/2016	Heavy Rain	\$0	\$0	River/Stream Gage
4/26/2016	Heavy Rain	\$0	\$0	River/Stream Gage
6/16/2014	Heavy Rain	\$0	\$0	River/Stream Gage
6/16/2014	Heavy Rain	\$50,000	\$0	Law Enforcement
6/15/2014	Heavy Rain	\$0	\$0	Law Enforcement
6/14/2014	Heavy Rain	\$100,000	\$0	Newspaper
6/6/2013	Heavy Rain	\$0	\$0	River/Stream Gage
5/26/2013	Heavy Rain	\$0	\$0	River/Stream Gage
5/26/2013	Heavy Rain	\$500,000	\$0	Emergency Manager
5/29/2012	Heavy Rain	\$0	\$0	River/Stream Gage
7/12/2011	Heavy Rain	\$0	\$0	River/Stream Gage
6/26/2011	Heavy Rain	\$0	\$0	Emergency Manager
6/18/2011	Heavy Rain	\$0	\$0	River/Stream Gage
5/22/2011	Heavy Rain	\$0	\$0	River/Stream Gage
10/1/2010	Heavy Rain	\$0	\$0	COOP Observer
9/26/2010	Heavy Rain	\$0	\$0	COOP Observer



DATE	DESCRIPTION	PROPERTY DAMAGE	CROP DAMAGE	SOURCE
8/8/2010	Heavy Rain	\$0	\$0	COOP Observer
7/24/2010	Heavy Rain	\$0	\$0	COOP Observer
7/22/2010	Heavy Rain	\$50,000	\$0	Amateur Radio
6/24/2010	Heavy Rain	\$0	\$0	COOP Observer
4/1/2010	Heavy Rain / Snow Melt	\$0	\$0	COOP Observer
3/11/2010	Heavy Rain / Snow Melt	\$0	\$0	COOP Observer
7/6/2008	Heavy Rain	\$0	\$0	Public
6/11/2008	Heavy Rain	\$0	\$0	Emergency Manager
6/1/2008	Heavy Rain	\$0	\$0	COOP Observer
5/31/2008	Heavy Rain	\$0	\$0	COOP Observer
5/6/2008	Heavy Rain	\$0	\$0	COOP Observer
8/22/2007	Heavy Rain	\$0	\$0	COOP Observer
8/22/2007	Heavy Rain	\$0	\$0	Law Enforcement
8/4/2007	Heavy Rain	\$0	\$0	Trained Spotter
8/4/2007	Heavy Rain	\$0	\$0	Trained Spotter
6/16/2007	Heavy Rain	\$0	\$0	Law Enforcement
5/6/2007	Heavy Rain	\$0	\$0	Emergency Manager
5/6/2007	Heavy Rain	\$0	\$0	COOP Observer
4/2/2007	Heavy Rain	\$0	\$0	COOP Observer
3/13/2007	Heavy Rain / Snow Melt	\$0	\$0	COOP Observer
5/2/2006		\$0	\$0	COOP Station
4/1/2006		\$0	\$0	COOP Station
6/24/2005		\$200,000	\$0	Law Enforcement
7/9/2003		\$10,000	\$0	Law Enforcement
8/22/2002		\$0	\$0	Broadcast Media
Total		\$2,550,000	\$1,360,000	

Source: NCEI

Probability of Future Occurrence

River floods are considered **highly likely** in Buena Vista County. There is a more than 33% in any given year. The history of events is greater than 33% likely or the event is highly likely to occur. NCEI reports 57 flood events in Buena Vista County between 2002 and 2023. Based on NCEI statistics there is an over 100% (57 events/21 years) probability of a flood on an annual basis. Using the above statistics, it can be estimated that 2.7 flood events will occur annually in Buena Vista County.

Magnitude/Severity

Magnitude and severity can be described or evaluated in terms of a combination of the different levels of impact that a community sustains from a hazard event. Specific examples of negative impacts from flooding on Buena Vista County span a comprehensive range and are summarized as follows:

- Floods cause damage to private property that often creates financial hardship for individuals and families.
- Floods cause damage to public infrastructure resulting in increased public expenditures and demand for tax dollars;
- Floods cause loss of personal income for agricultural producers that experience flood damages;
- Floods cause loss of income to businesses relying on recreational uses of County waterways;
- Floods cause emotional distress on individuals and families; and
- Floods can cause injury and death.

The magnitude and severity of the flood hazard is usually determined by not only the extent of impact it has on the overall geographic area, but also by identifying the most catastrophic event in the previous flood history. Sometimes it is referred to as the “event of record.” The flood of record is almost always correlated to a peak discharge at a gage, but that event may not have caused the worst historic flood impact in terms of property damage, loss of life, etc. The flooding in Buena Vista County in 2019 is the flood of record. This event resulted in an estimated \$1.640M in damages (in 2022 dollars). There also is potential for larger floods to occur in the region.

In recent years, NCEI notes that Buena Vista County experienced 56 flooding events between 1997 and 2022. These events generated \$2,550,000 in property damages, which equates to an average of \$102,000 per year. There also has been \$1,360,000 in crop damages which averages to \$54,400 in 25 years of record keeping.

The impact of a flood event can vary based on geographic location to waterways, soil content and ground cover, and construction. The extent of the damage of flooding ranges from very narrow to widespread based on the type of flooding and other circumstances such as previous rainfall, rate of precipitation accumulation, and the time of year.

The HMPC estimates that the potential magnitude for a flood event in Buena Vista County is **critical**. An event of critical magnitude would result in multiple severe injuries, complete shutdown of critical facilities and services for at least two weeks, and severe damage to more than 25% of property in the planning area. Roads closed due to floods can result in serious transportation disruptions due to the limited number of roads in the County. Mud and debris flow also often accompany floods.

Warning Time

River floods often occur with more than 24 hours of warning time. For a river flood to occur rain will be continually occurring of a period of time and forecasters will be able to predict if the river will flood. Rivers rise slowly and over time, when they flood occurs and citizens will have warning time before the flood occurs.

Duration

The duration of river floods varies, but they generally last more than a week. This all depends on how much rain has been received recently as to how long the flooding will last.

Climate Change Considerations

Use of historical hydrologic data has long been the standard of practice for designing and operating water supply and flood protection projects. For example, historical data are used for flood forecasting models and to forecast snowmelt runoff for water supply. This method of forecasting assumes that the climate of the future will be similar to that of the period of historical record. However, the hydrologic record cannot be used to predict changes in frequency and severity of extreme climate events such as floods. Climate change is already impacting water resources, and resource managers have observed the following:

- Historical hydrologic patterns can no longer be solely relied upon to forecast the water future.
- Precipitation and runoff patterns are changing, increasing the uncertainty for water supply and quality, flood management, and ecosystem functions.
- Extreme climatic events will become more frequent, necessitating improvement in flood protection, drought preparedness, and emergency response.

The amount of snow is critical for water supply and environmental needs, but so is the timing of snowmelt runoff into rivers and streams. Rising snowlines caused by climate change will allow more mountain area to contribute to peak storm runoff. High frequency flood events (e.g., 10-year floods) in particular will likely increase with a changing climate. Along with reductions in the amount of the snowpack and accelerated snowmelt, scientists project greater storm intensity, resulting in more direct runoff and flooding. Changes in watershed vegetation and soil moisture conditions will likewise change runoff and recharge patterns. As stream flows and velocities change, erosion patterns will also change, altering channel shapes and depths, possibly increasing sedimentation behind dams, and affecting habitat and water quality. With potential increases in the frequency and intensity of wildfires due to climate change, there is potential for more floods following fire, which increase sediment loads and water quality impacts.

Vulnerability

A flood vulnerability assessment was performed for Buena Vista County using Geographic Information Systems (GIS). The flood vulnerability assessment was performed for Buena Vista County using the following GIS methodology. The County's parcel layer, building footprint data, and associated assessor's building improvement valuation data were provided by the County and were used as the basis for the inventory. GIS was used to spatially join the building footprint layer to the County parcel layer to obtain the number of buildings per parcel. Only parcels with improvement values greater than zero were used in the analysis, this method assumes that improved parcels have a structure of some type. The National Flood Hazard Layers (NFHL) were then overlaid in GIS on the building footprint layer to identify structures that would likely be inundated during a 1% annual chance and 0.2% annual chance flood event.

The flood zones were overlaid in GIS on the building point data to identify structures that would likely be inundated during a 1% annual chance and 0.2% annual chance flood event. Building improvement values for those points were then extracted from the parcel/assessor's data and summed for each jurisdiction in the study area. Contents values were estimated for the buildings based on their occupancy type, based on FEMA values. This includes 100% of the structure value for commercial and agricultural structures, 50% for residential structures, and 100% for industrial structures. Building and contents values were totaled, and a 25% loss factor was applied to the totals, also based on FEMA depth damage functions, assuming a two-foot-deep flood.

People

With the analysis performed it was estimated that the exposed population for the entire county is 136 people within the 100-year floodplain. For the unincorporated portions of the county, it is estimated that the exposed population consist of 109 people within the 100-year floodplain. For the City of Newell

County, it is estimated the exposed population to the 100-year floodplain is 21. Table 4-23 summarizes the total area and number of structures in the 100-year floodplains by municipality.

Table 4-23 Buena Vista County Population at Risk to 1% Annual Chance of Flooding

Jurisdiction	Population
Linn Grove	4
Newell	21
Sioux Rapids	2
Unincorporated	109
Total	136

Sources: Buena Vista County Assessor's GIS Office, WSP Analysis

The 0.2% annual chance of flooding or the 500-year floodplain Buena Vista County has a total of 55 people in the Zone X(Shaded) flood zone. With 10 being located in Sioux Rapids and also 35 being in the unincorporated parts of the county. These areas are not regulated but subject to lower premiums for flood insurance. Summarizes the total amount of structures in the 500-year annual chance of flooding flood zone by jurisdiction. An illustration of the structures located in the 1% Annual Chance of flooding for Newell is shown in Table 4-24 below. These structures within the Special Flood Hazard Area directly reflect the people at risk due to flooding hazards.

Table 4-24 Buena Vista County Population at Risk to 0.2% Annual Chance of Flooding

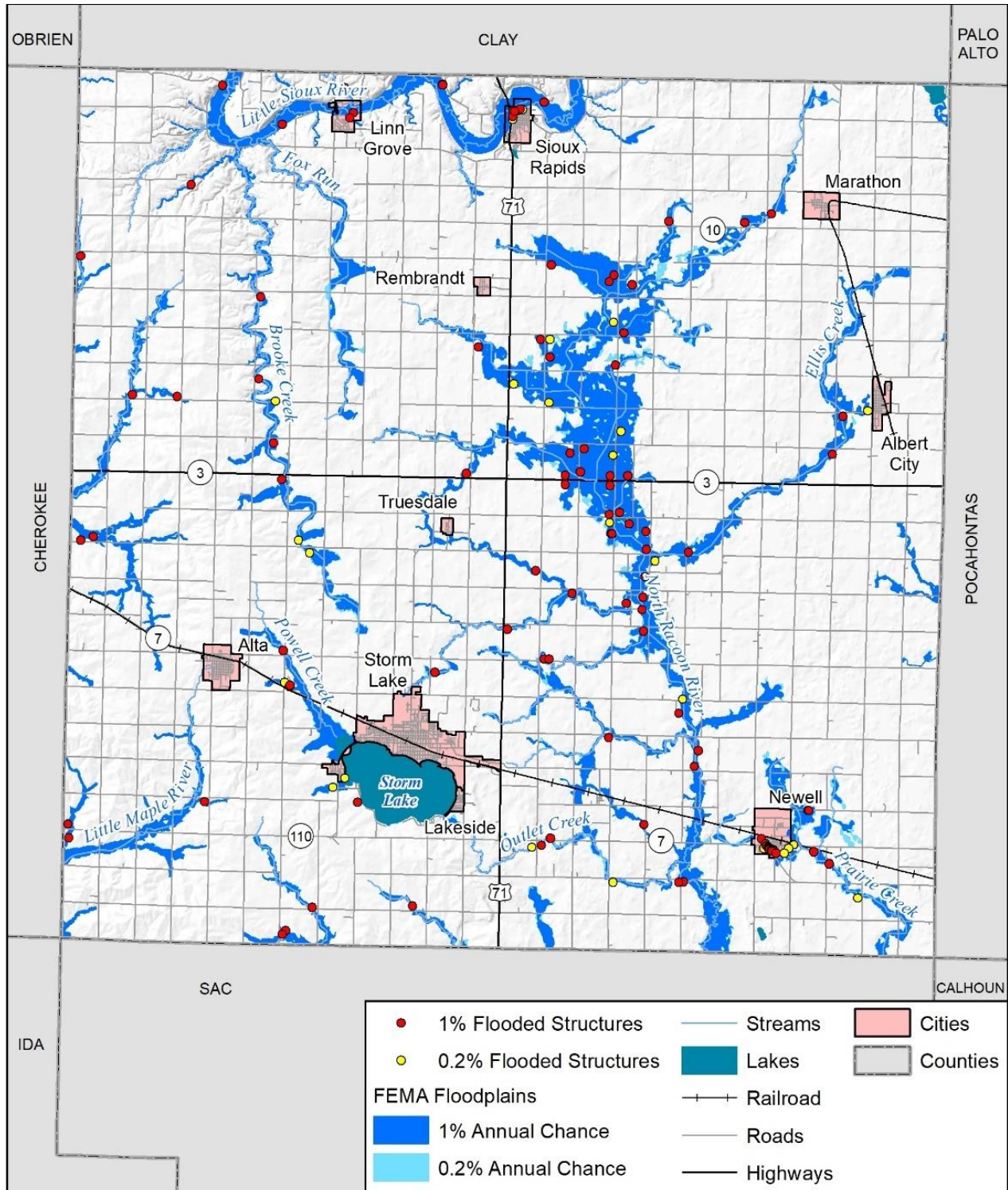
Jurisdiction	Population
Newell	7
Sioux Rapids	10
Storm Lake	3
Unincorporated	35
Total	55

Sources: Buena Vista County Assessor's GIS Office, WSP Analysis

Property

A flood vulnerability assessment was performed for Buena Vista County using Geographic Information Systems (GIS). The flood vulnerability assessment was performed for Buena Vista County using the following GIS methodology. The County's parcel layer, and associated assessor's building improvement valuation data were provided by the County and were used as the basis for the inventory. GIS was used to convert the parcels into centroids to represent structures for analysis. Only parcels with improvement values greater than zero were used in the analysis except for Exempt properties with government structures which don't have improved values sometimes, this method assumes that improved parcels have a structure of some type. The National Flood Hazard Layers (NFHL) were then overlaid in GIS on the parcel centroid layer to identify structures that would likely be inundated during a 1% annual chance and 0.2% annual chance flood event.

Figure 4-14 Buena Vista County Structures Located in the FEMA Floodplain

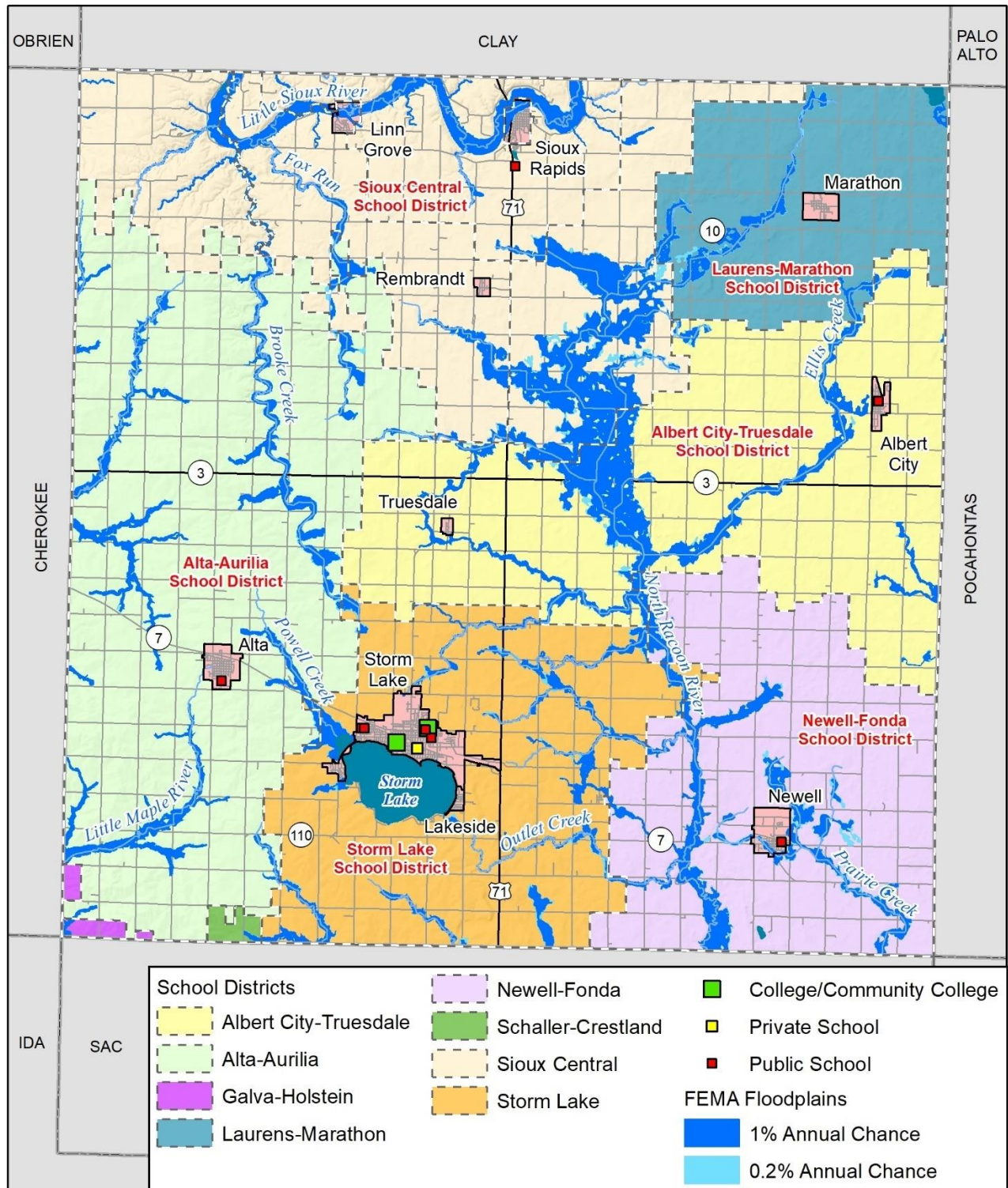


Map compiled 10/2022;
intended for planning purposes only.
Data Source: Buena Vista County, Iowa DNR,
FEMA NFHL Effective 10/13/2022

0 5 10 Miles



Figure 4-15 Buena Vista County School Districts and Floodplains



Map compiled 10/2022;
intended for planning purposes only.
Data Source: Buena Vista County, Iowa DNR,
FEMA NFHL Effective 10/13/2022

0 5 10 Miles



As noted in Figure 4-14 above and Table 4-25 below there is a substantial amount of property value within Buena Vista County's flood hazard areas. There is a total of \$13,461,460 in total property value with the largest amount being located in the residential and commercial sectors within Buena Vista's 1% floodplain. Buena Vista's unincorporated areas possesses the highest amounts of total values with \$10,723,680, again with the highest amount being in the agricultural dwelling sectors within the 1% floodplain. Buena Vista's unincorporated areas also have the highest amount of property types located within the floodplain. Along with the highest loss estimations amounting to \$2,680,920 total.

Table 4-25 Buena Vista County Properties at Risk to FEMA 1% Annual Chance of Flooding

Jurisdiction	Property Type	Improved Parcels	Improved Value	Estimated Contents Value	Total Value	Loss Estimate
Linn Grove	Residential	2	\$39,580	\$19,790	\$59,370	\$14,843
	Total	2	\$39,580	\$19,790	\$59,370	\$14,843
Newell	Commercial	1	\$7,360	\$7,360	\$14,720	\$3,680
	Industrial	1	\$343,740	\$515,610	\$859,350	\$214,838
	Residential	9	\$847,470	\$423,735	\$1,271,205	\$317,801
	Total	11	\$1,198,570	\$946,705	\$2,145,275	\$536,319
Sioux Rapids	Commercial	2	\$19,120	\$19,120	\$38,240	\$9,560
	Exempt	2	\$247,080	\$247,080	\$494,160	\$123,540
	Residential	1	\$490	\$245	\$735	\$184
	Total	5	\$266,690	\$266,445	\$533,135	\$133,284
Unincorporated	Agricultural	35	\$376,450	\$376,450	\$752,900	\$188,225
	Agricultural Dwelling	29	\$3,214,660	\$3,214,660	\$6,429,320	\$1,607,330
	Commercial	4	\$439,600	\$439,600	\$879,200	\$219,800
	Exempt	1	\$0	\$0	\$0	\$0
	Residential	12	\$1,774,840	\$887,420	\$2,662,260	\$665,565
	Total	81	\$5,805,550	\$4,918,130	\$10,723,680	\$2,680,920
	Grand Total	99	\$7,310,390	\$6,151,070	\$13,461,460	\$3,365,365

Sources: Buena Vista County Assessor's GIS Office, WSP Analysis

Similar to the 100-year floodplain Buena Vista's 0.2% Annual Chance floodplain, Newell has \$4,658,405 in total property value with the largest amount in the residential sector. Buena Vista's unincorporated areas possesses the highest amounts of total values with \$2,410,080, again with the highest amount being in the agricultural dwelling sectors of Buena Vista's 0.2% floodplain. It estimated that the largest loss estimations would be sustained within Newell with \$1,164,601 in potential losses. Followed by unincorporated Buena Vista County having \$602,520 in potential losses due to the 500-year chance of flooding as well and is shown in Table 4-26 below.

Table 4-26 Buena Vista County Properties at Risk to FEMA 0.2% Annual Chance of Flooding

Jurisdiction	Property Type	Improved Parcels	Improved Value	Estimated Contents Value	Total Value	Loss Estimate
Newell	Exempt	1	\$1,972,660	\$1,972,660	\$3,945,320	\$986,330
	Residential	3	\$475,390	\$237,695	\$713,085	\$178,271
	Total	4	\$2,448,050	\$2,210,355	\$4,658,405	\$1,164,601
Sioux Rapids	Commercial	4	\$418,630	\$418,630	\$837,260	\$209,315
	Total	4	\$418,630	\$418,630	\$837,260	\$209,315
Storm Lake	Residential	1	\$147,700	\$73,850	\$221,550	\$55,388
	Total	1	\$147,700	\$73,850	\$221,550	\$55,388
Unincorporated	Agricultural	7	\$97,990	\$97,990	\$195,980	\$48,995
	Agricultural Dwelling	7	\$809,370	\$404,685	\$1,214,055	\$303,514
	Commercial	5	\$159,410	\$159,410	\$318,820	\$79,705
	Residential	6	\$454,150	\$227,075	\$681,225	\$170,306
	Total	25	\$1,520,920	\$889,160	\$2,410,080	\$602,520
Grand Total		34	\$4,535,300	\$3,591,995	\$8,127,295	\$2,031,824

Sources: Buena Vista County Assessor's GIS Office, WSP Analysis

NFIP Participation

Table 4-27 lists the communities in Buena Vista County that are participating in the NFIP and or have special flood hazard areas. Table 4-28 lists additional information for the participating communities.

Table 4-27 Buena Vista County NFIP Participation Data

Jurisdictions	Special Flood Hazard Areas	Participation in NFIP	Current Map
Buena Vista County	Yes	Yes	10/13/22
Albert City	No	No	N/A
Alta	No	Yes	10/13/2022
Lakeside	Yes	No	10/13/2022
Linn Grove	Yes	Yes	10/13/2022
Marathon	No	No	N/A
Newell	Yes	No	10/13/22
Rembrandt	No	No	N/A
Sioux Rapids	Yes	Yes	10/13/22
Storm Lake	Yes	Yes	10/13/22
Truesdale	Yes	No	10/13/22

Source: FEMA

Table 4-28 Buena Vista County NFIP Participating Jurisdictions

Jurisdiction	Adoption of NFIP Min. Floodplain Management Criteria	Adoption of Latest Effective FIRM	Implementation & Enforcement Of Local Flood-Plain Regulation On Development in SFHAs	Designee/ Agency to Implement NFIP Requirements	Describe How Jurisdiction Implements Substantial Improvement/ Substantial Damage Provision
Buena Vista County	Yes	Adoption of 10/13/2022 FIRM in progress	Yes (floodplain ordinance)	County Zoning Administrator	The County floodplain ordinance treats substantially improved/ substantially damaged properties the same as new construction for purposes of meeting floodplain requirements.
Alta	Yes	Adoption of 10/13/2022 FIRM in progress	Yes (floodplain ordinance)	City Clerk	The City does not have any SFHA or NFIP-insured structures.
Linn Grove	Yes	Adoption of 10/13/2022 FIRM in progress	Yes (floodplain ordinance)	City Administration	The City floodplain ordinance treats substantially improved/ substantially damaged properties the same as new construction for purposes of meeting floodplain requirements.
Sioux Rapids	Yes	Adoption of 10/13/2022 FIRM in progress	Yes (floodplain ordinance)	City Administration	The City floodplain ordinance treats substantially improved/ substantially damaged properties the same as new construction for purposes of meeting floodplain requirements.
Storm Lake	Yes	Adoption of 10/13/2022 FIRM in progress	Yes (floodplain ordinance)	Building Official	Building improvements determined to be a SI/SD based on an improvement of 50% of market value or damaged more than 50% of market value are required to submit a floodplain application to be reviewed and approved prior to a floodplain construction permit being issued.

Source: HMPC

In support of the NFIP, FEMA identifies flood hazard areas through the US and its territories by producing Flood Hazard Boundary Maps (FHNMs), Flood Insurance Maps (FIRMs) and Flood Boundary and Floodway Maps (FBFMs). Several areas of flood hazards are commonly identified on these maps. One of these areas is the Special Flood Hazard Area (SFHA) or high-risk area defined as any land that would be inundated by a flood having a 1% chance of occurring any given year (also referred to as the base flood level).

Participation in the NFIP is completely voluntary (although some states require NFIP participation as part of their flood plain management program) by cities and participation is on a community rather than an individual basis. Participating in the program allows those who want to purchase flood insurance for their insurable property, whether it is a home or other property. Almost every type of walled and roofed building that is principally above ground and not entirely over water may be insured if it is in a participating community.

The Cities of Albert City, Lakeside, Marathon, Newell, Rembrandt, and Truesdale do not currently participate in the NFIP. Of those cities, Newell, Truesdale, and Lakeside have mapped SFHA, and are exploring joining the NFIP. For the other jurisdictions, the low flood hazard does not make joining the NFIP a priority given limited staff and resources.

Repetitive Loss Properties and the National Flood Insurance

The National Flood Insurance Program (NFIP) is a federal program enabling property owners in participating communities to purchase insurance protection against flood losses. If a community chooses to adopt and enforce adequate floodplain development and management regulations, the Federal Government will make flood insurance available to property owners. The U.S. Congress created the NFIP in 1968 with the passage of the National Flood Insurance Act of 1968 and has further been modified with through other legislative measures. The intent was to reduce future flood damage by promoting the adoption of community floodplain management ordinances. Without community oversight of building activities in the floodplain, the best efforts of some to reduce future flood losses could be undermined or nullified by the careless building of others. Unless the community as a whole participates, the potential for loss will not be reduced sufficiently to affect disaster relief efforts. Insurance rates would then reflect the probable higher losses that would result without local floodplain management enforcement activities.

Repetitive loss properties are defined by FEMA, includes every NFIP (National Flood Insurance) insured property that, since 1978 and regardless of any change(s) of ownership during that period, has experienced:

- Four or more paid flood losses of more than \$1,000 each; or
- Two paid flood losses within a 10-year period that, in the aggregate, equal or exceed the current value of the insured property; or
- Three or more paid losses that, in the aggregate, equal or exceed the current value of the insured property.

Per consultations with FEMA, it has been determined that there are no repetitive loss or severe repetitive loss properties currently identified in Buena Vista County.

Special Flood Hazard Areas

The following chart describes each of the cities and the rural Buena Vista County that have special flood hazard areas. A special flood hazard area (SFHA) is described as a FEMA-identified high-risk flood area where flood insurance is mandatory for properties. An area having special flood, mudflow, or flood-related erosion hazards, and shown on a Flood Hazard Boundary Map or a Flood Insurance Rate Map as Zone A, AO, A1-A30, AE, A99, AH, AR, AR/A, AR/AE, AR/AH, AR/AO, AR/A1-A30, V1-V30, VE, or V. The only jurisdictions that have floodplain maps are Linn Grove, Sioux Rapids and Buena Vista County. Albert City, Lakeside, Marathon, Newell, Rembrandt, Storm Lake and Truesdale do not have any identified special flood hazard areas and are not included in the following table. Alta is identified as participating in the national flood insurance program but has no floodplain map available.

Insurance Overview

Although Alta, Linn Grove and Sioux Rapids are participating in the National Flood Insurance Program (according to FEMA), only a rural Buena Vista County resident has flood insurance policies. Below are the details of insurance information from FEMA as of October 2017.

Table 4-29 NFIP Data

Jurisdiction	Albert City	Alta	Lakeside	Linn Grove	Newell	Sioux Rapids	Storm Lake	Buena Vista County
CID	190540	190545	190931	190032	190334	190033	190936	190849
Status	Not Participating	Participating	Not Participating	Participating	Not Participating	Participating	Not Participating	Participating
Status Effective	03/25/1999	03/25/1999	03/25/1999	04/20/1994	07/05/1993	06/18/1987	03/25/1999	11/15/1977
Initial FIRM	N/A	N/A	N/A	03/01/1997	09/01/1986	06/18/1987	N/A	N/A
Initial FHBM	N/A	N/A	N/A	08/16/1974	09/01/1986	05/10/1974	N/A	11/15/1978
Study Underway	No	No	No	No	No	No	No	No
Policies in Force	0	0	0	0	0	0	0	1
Insurance in Force	\$0	\$0	\$0	\$0	\$0	\$0	\$0	\$45,000
# of Paid Losses	0	0	0	0	0	7	0	0
Total Losses Paid	\$0	\$0	\$0	\$0	\$0	\$0	\$0	\$0

Source: FEMA

Critical Facilities and Infrastructure

Key support facilities and structures most necessary to withstand the impacts of, and respond to, natural disasters are referred to as critical facilities. Examples of these critical facility types include utilities, transportation infrastructure, and emergency response and services facilities. Failures of components along major lifelines or even closures or inaccessibility to key emergency facilities could limit if not completely cut off transmission of commodities, essential services, and lead to other potentially catastrophic repercussions. Shown in Table 4-30 and Table 4-31 below are the critical facilities that are located within Buena Vista County. There are 62 transportation facilities located in the 1% annual chance floodplain and 9 facilities located in the 0.2% annual chance floodplain. This sector has the highest critical facilities total located with the Special Flood Hazard Area. Road and bridge infrastructure are vital to Buena Vista County. There are a limited number of highways and local roads in the County. When these roads are rendered impassable by an event such as a flood, ingress or egress can be severely limited. These bridges have been impacted by previous flooding in the past.

Table 4-30 Buena Vista Critical Facilities with 1% Annual Chance of Flooding Risk

Jurisdiction	Communications	Energy	Food, Water, Shelter	Hazardous Material	Health & Medical	Safety & Security	Transportation	Total
Linn Grove	-	-	1	-	-	-	-	1
Sioux Rapids	-	-	1	-	-	-	-	1
Unincorporated	2	-	7	-	-	-	62	71
Total	2	0	9	0	0	0	62	73

Source: Buena Vista County, DNR, HIFLD, National Bridge Inventory, FEMA NFHL Effective 10/13/2022, WSP GIS Analysis

Table 4-31 Buena Vista Critical Facilities with 0.2% Annual Chance of Flooding Risk

Jurisdiction	Communi- cations	Energy	Food, Water, Shelter	Hazardous Material	Health & Medical	Safety & Security	Transport- ation	Total
Linn Grove	0	0	1	0	0	0	0	1
Newell	0	0	1	1	0	0	0	2
Sioux Rapids	0	0	1	0	0	0	0	1
Unincorporated	0	0	0	0	0	0	9	9
Total	0	0	3	1	0	0	9	13

Source: Buena Vista County, DNR, HIFLD, National Bridge Inventory, FEMA NFHL Effective 10/13/2022, WSP GIS Analysis

Economy

Flooding can have a major economic impact on the economy, including indirect losses such as business interruption, lost wages, and other downtime costs. Flooding often coincides with the busy summer tourism months in Buena Vista County. Even the threat of flooding can have an impact. This was observed during the flooding event in 2019 when local business was down more than normal due to anticipated flooding.

Environment and Cultural Resources

Next to people and property, natural resources impact from flooding could be severe. Flooding events are common and naturally occurring phenomenon in forested areas and can benefit forest health in many respects. Yet the trend for more flooding can make it more difficult for the environment to recover, and lead to even more increased flood hazards. This can severely impact water quality and watershed health for years following.

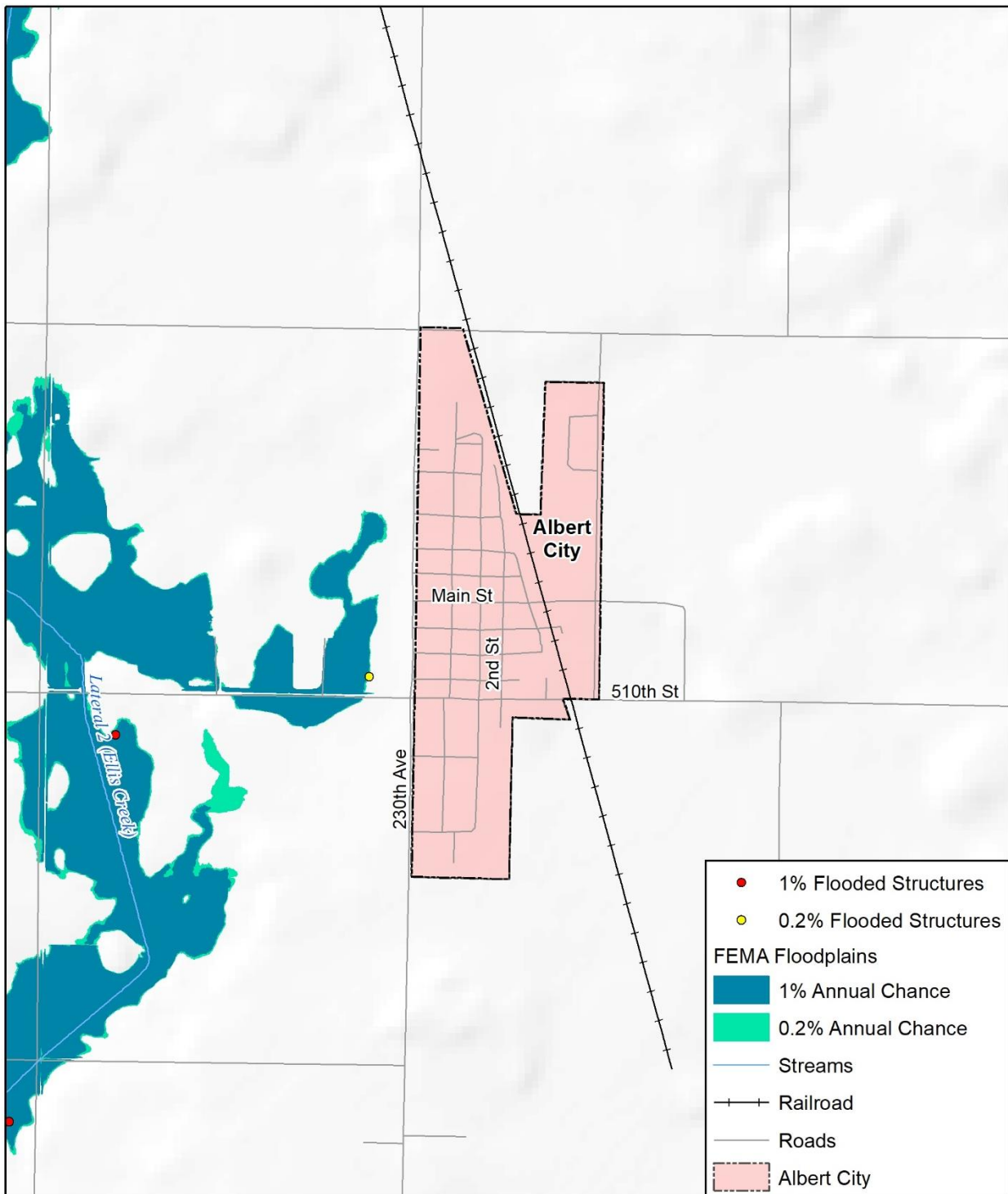
Development Trends

Most development that has occurred has been residential and built to the local floodplain management regulations (lowest floor 1 foot above the base flood elevation). Vulnerability to floods greater than the 1% annual chance flood (base flood), such as the 0.2% flood, has increased due to this development.

Differences By Jurisdiction

As discussed above, the Cities of Linn Grove, Newell, Sioux Rapids, and the unincorporated County all have properties in the 1% floodplain. The City of Storm Lake has properties in the 0.2% floodplain. None of the school districts have school buildings in floodplains. However, as previously stated, flash flooding can occur anywhere, so while the risk is lower for the other communities, some risk still exists. Flood hazard areas are mapped in Figure 4-16 through Figure 4-25 below.

Figure 4-16 City of Albert City FEMA Flood Hazards

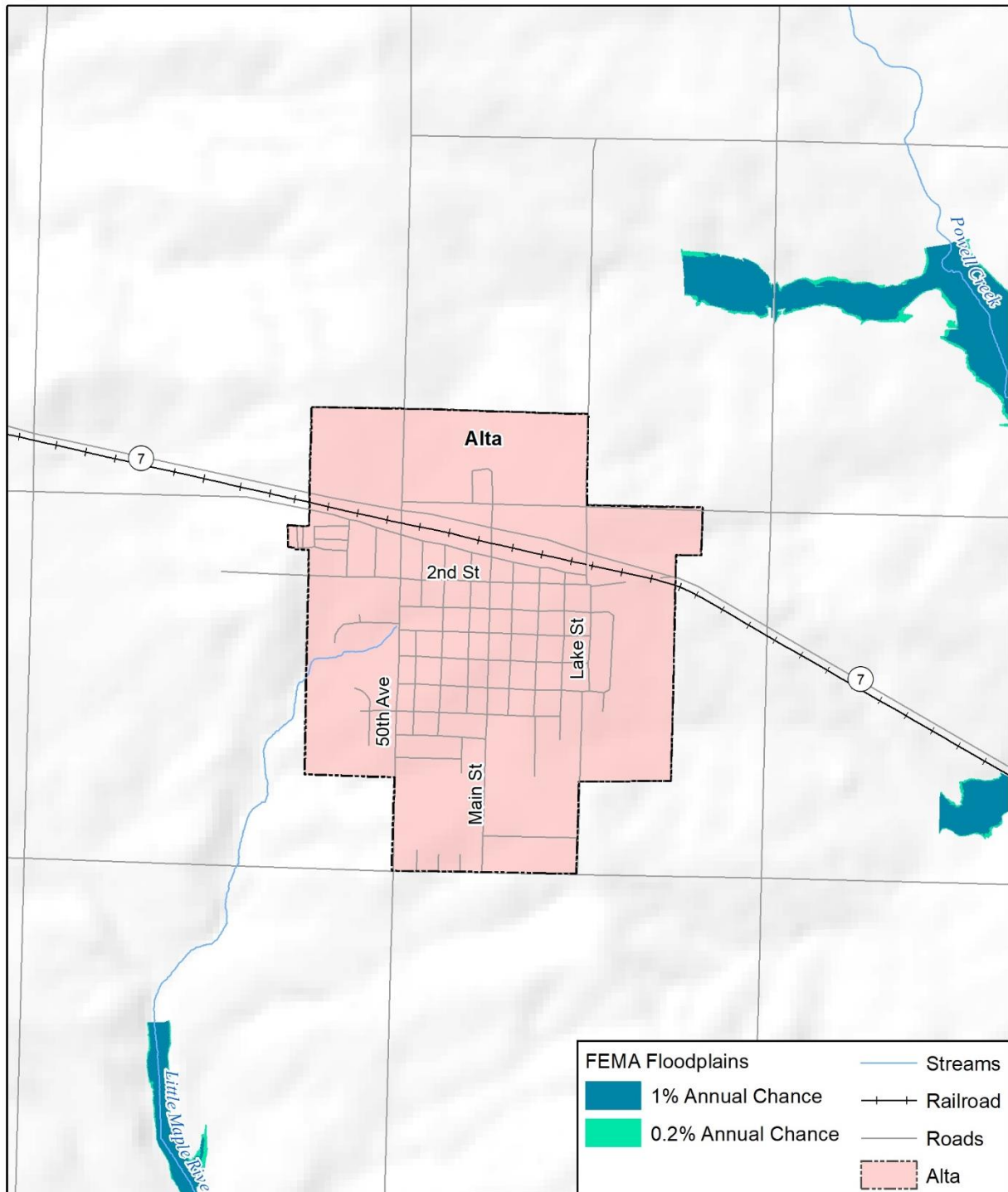


Map compiled 10/2022;
intended for planning purposes only.
Data Source: Buena Vista County, Iowa DNR,
FEMA NFHL Effective 10/13/2022

0 0.5 1 Miles



Figure 4-17 City of Alta FEMA Flood Hazards

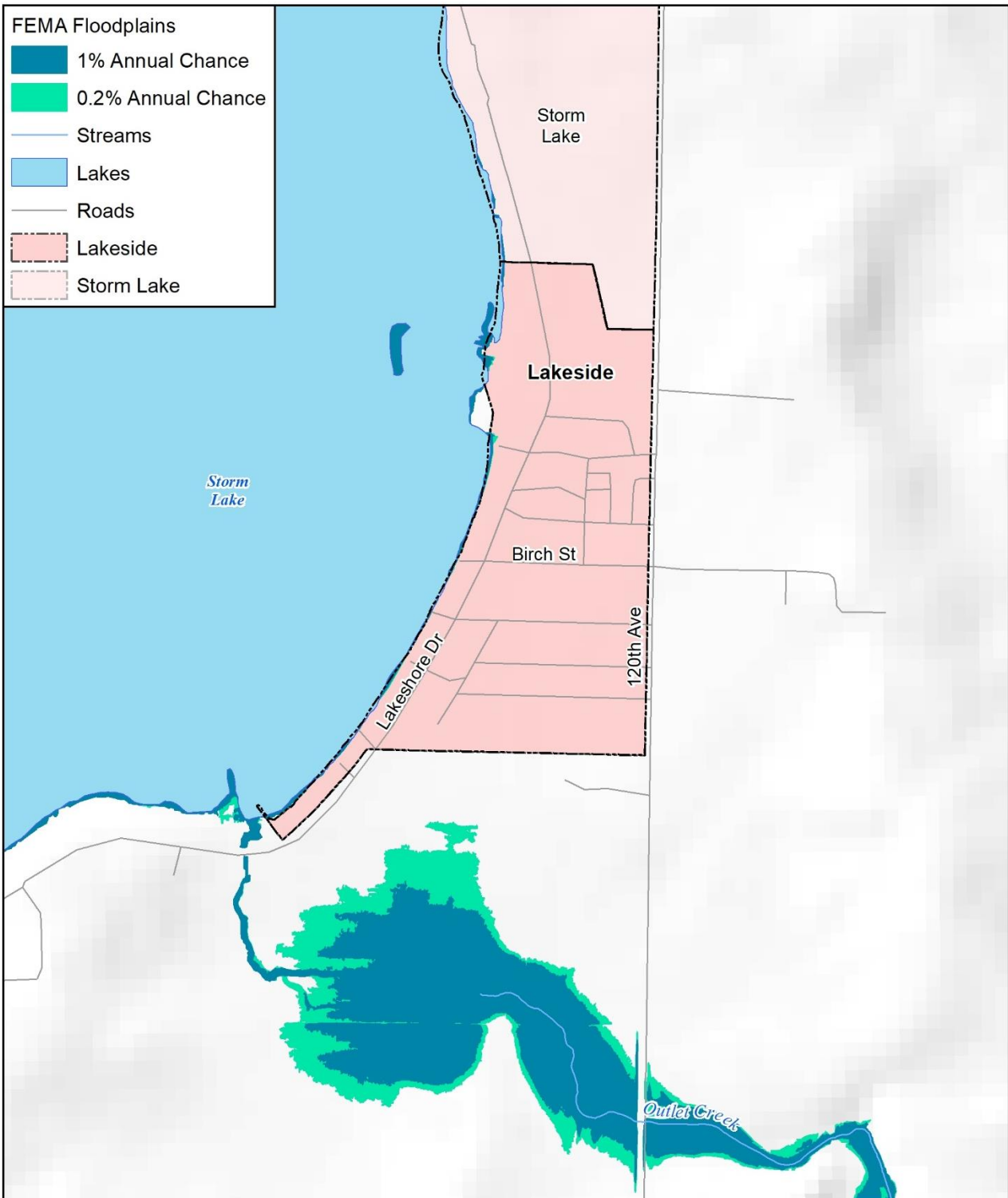


Map compiled 10/2022;
intended for planning purposes only.
Data Source: Buena Vista County, Iowa DNR,
FEMA NFHL Effective 10/13/2022

0 0.5 1 Miles



Figure 4-18 City of Lakeside FEMA Flood Hazards

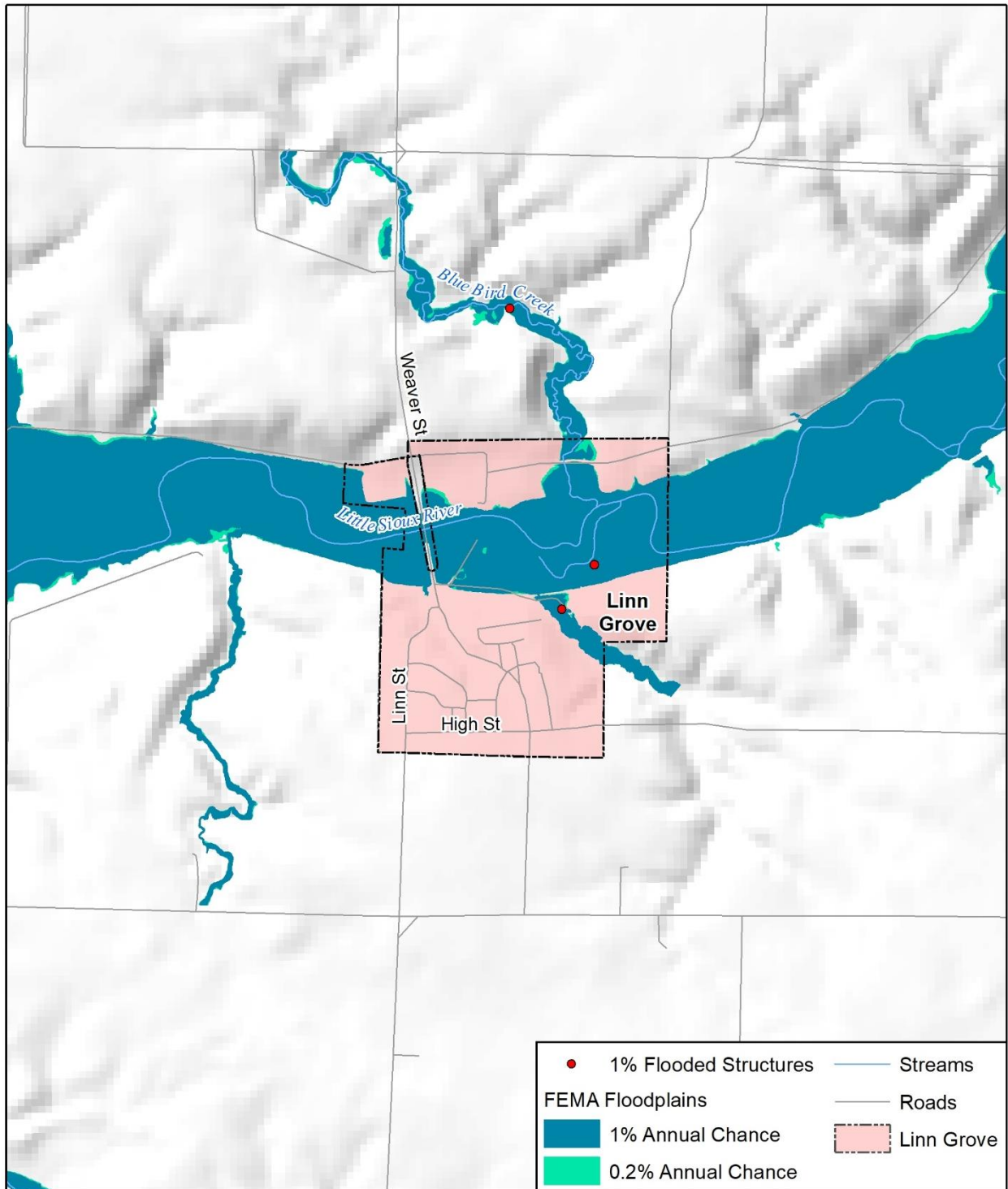


Map compiled 10/2022;
intended for planning purposes only.
Data Source: Buena Vista County, Iowa DNR,
FEMA NFHL Effective 10/13/2022

0 0.25 0.5 Miles



Figure 4-19 City of Linn Grove FEMA Flood Hazards

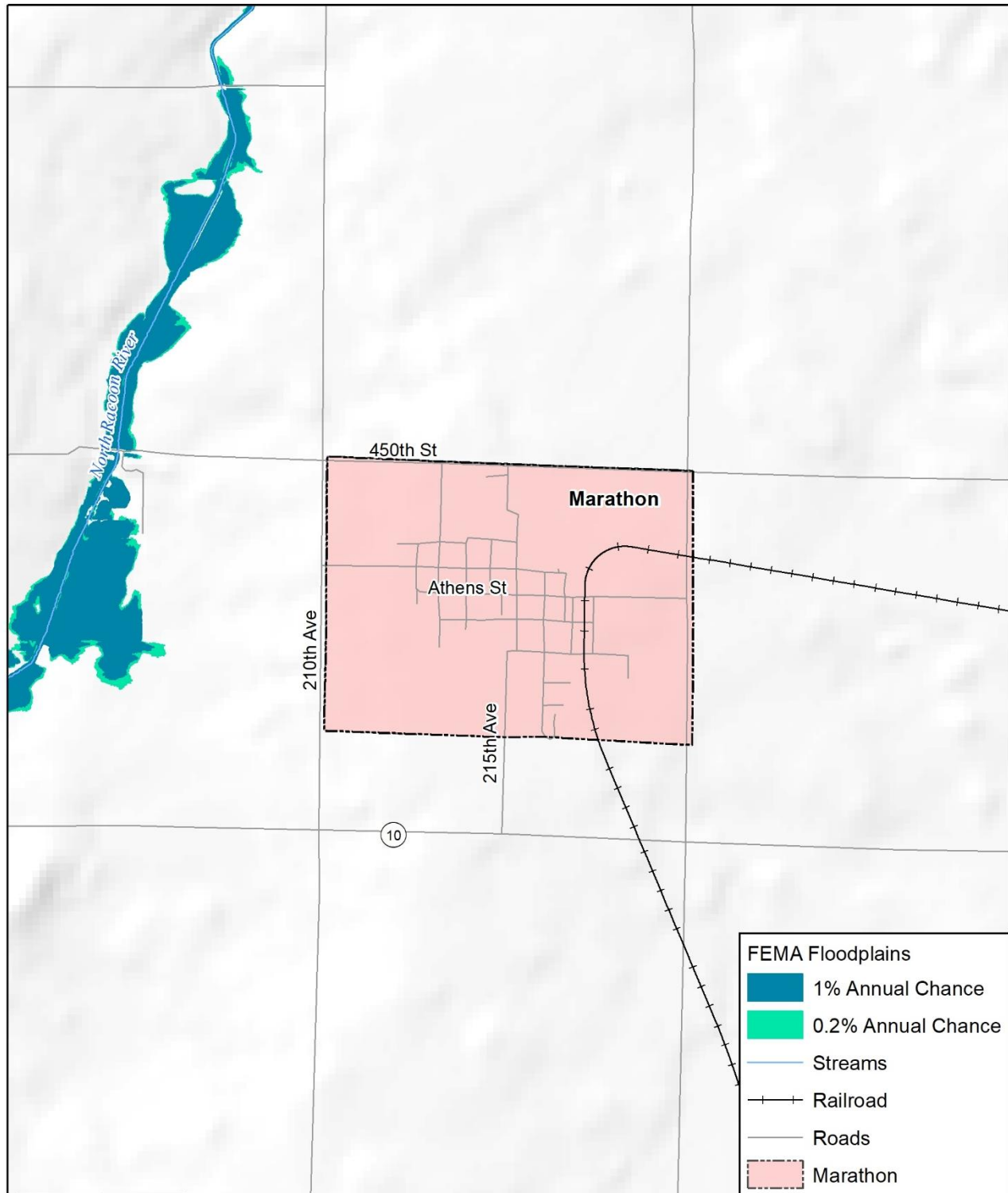


Map compiled 10/2022;
intended for planning purposes only.
Data Source: Buena Vista County, Iowa DNR,
FEMA NFHL Effective 10/13/2022

0 0.5 1 Miles



Figure 4-20 City of Marathon FEMA Flood Hazards

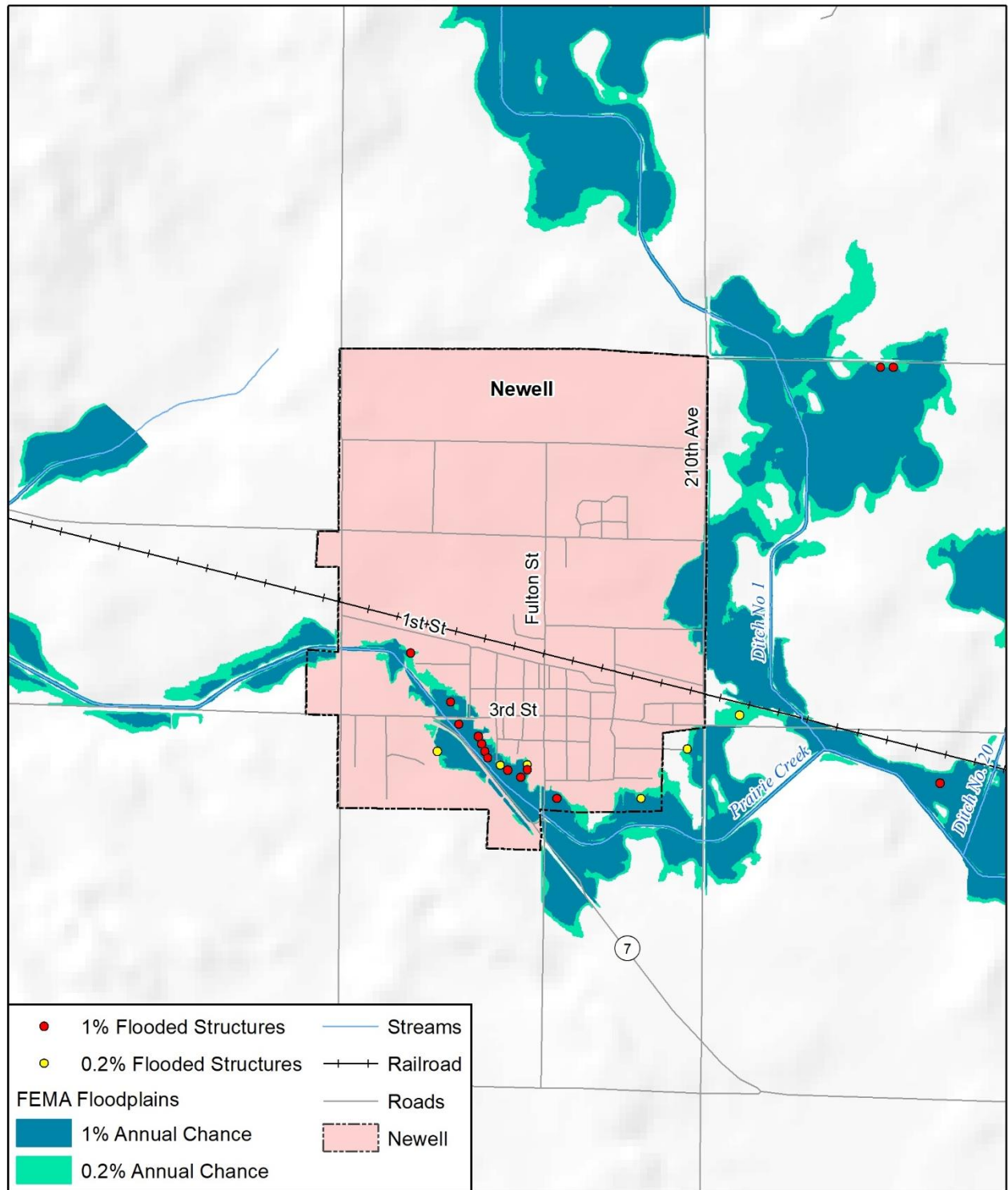


Map compiled 10/2022;
intended for planning purposes only.
Data Source: Buena Vista County, Iowa DNR,
FEMA NFHL Effective 10/13/2022

0 0.5 1 Miles



Figure 4-21 City of Newell FEMA Flood Hazards

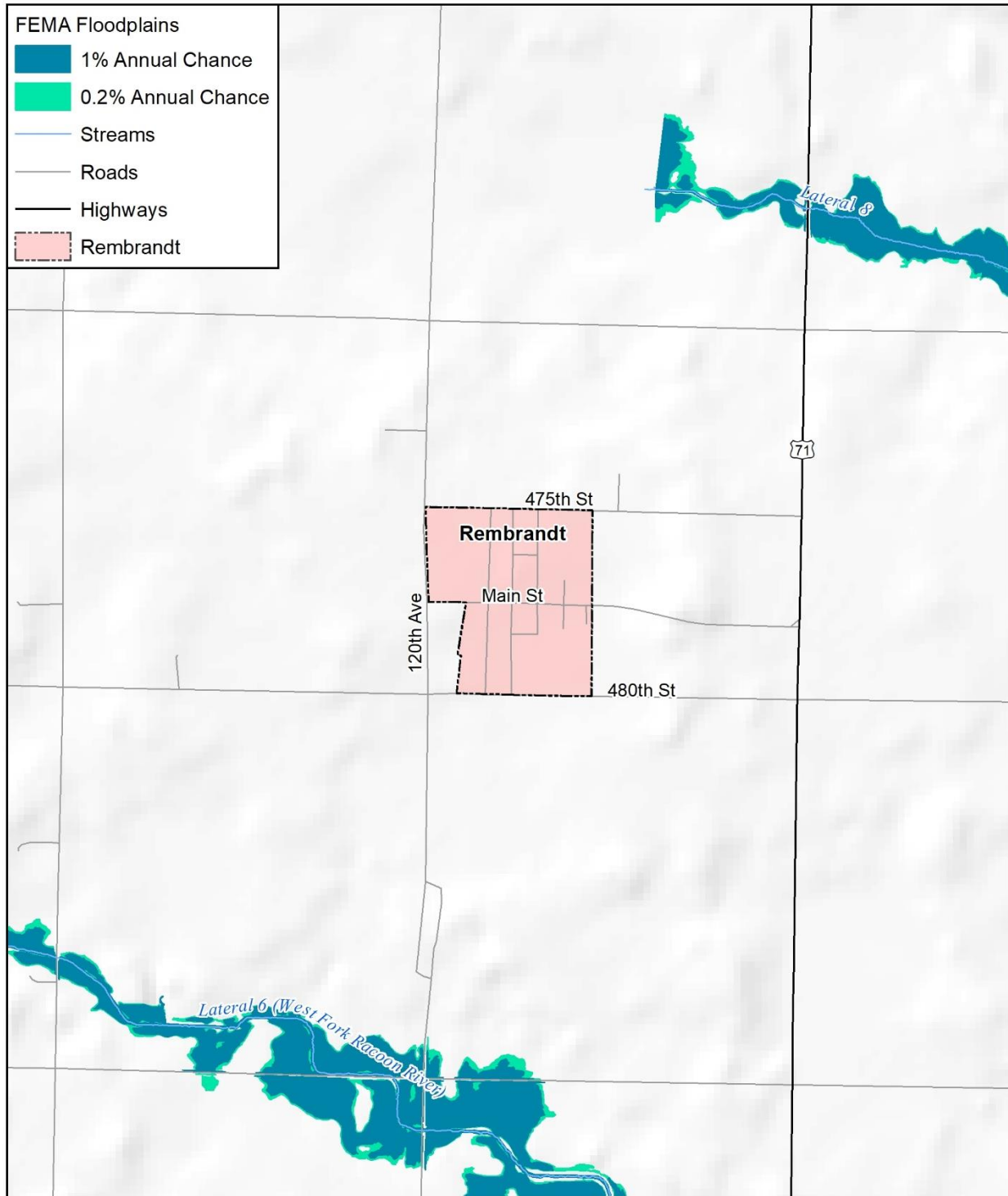


Map compiled 10/2022;
intended for planning purposes only.
Data Source: Buena Vista County, Iowa DNR,
FEMA NFHL Effective 10/13/2022

0 0.5 1 Miles



Figure 4-22 City of Rembrandt FEMA Flood Hazards

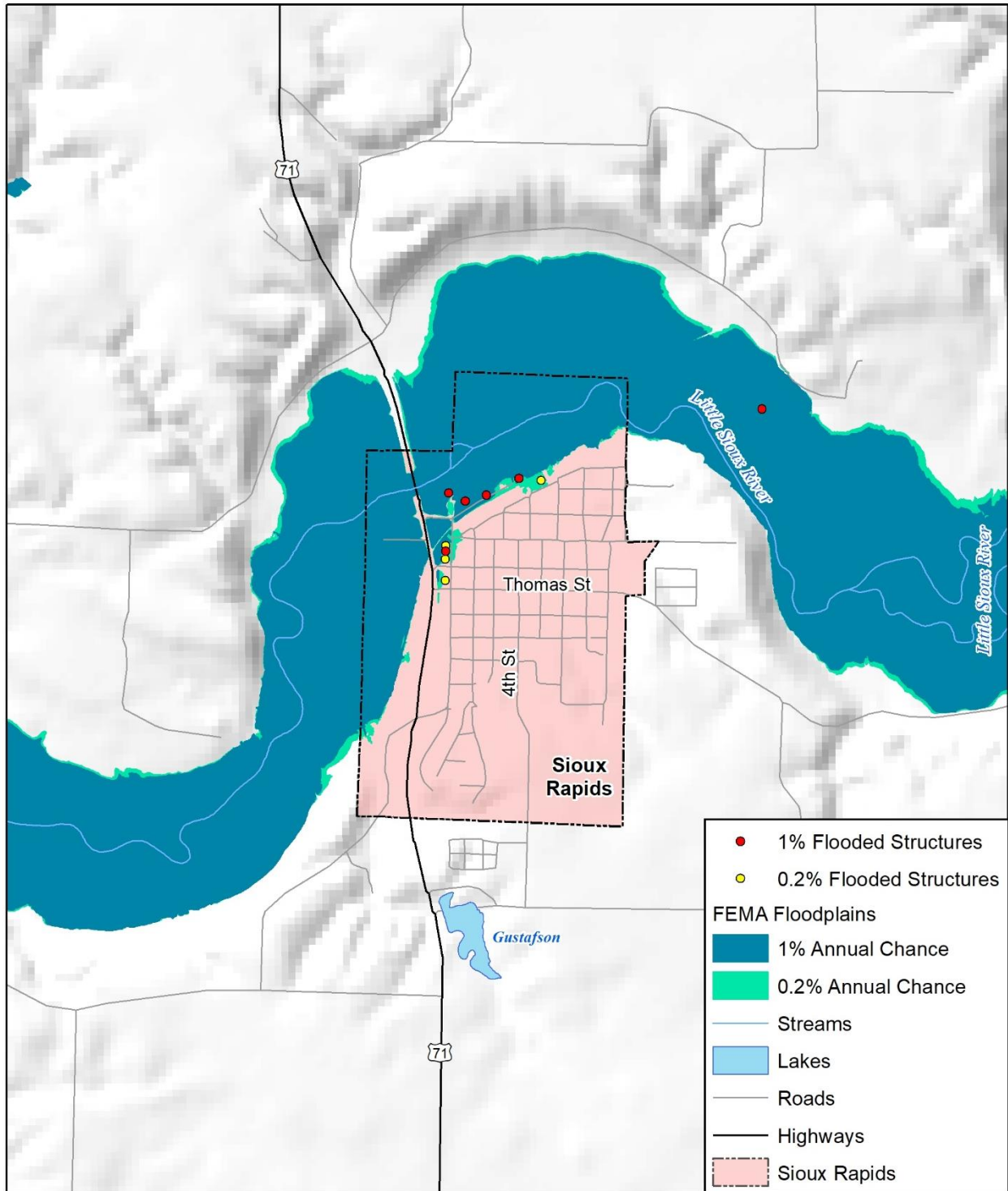


Map compiled 10/2022;
intended for planning purposes only.
Data Source: Buena Vista County, Iowa DNR,
FEMA NFHL Effective 10/13/2022

0 0.5 1 Miles



Figure 4-23 City of Sioux Rapids FEMA Flood Hazards

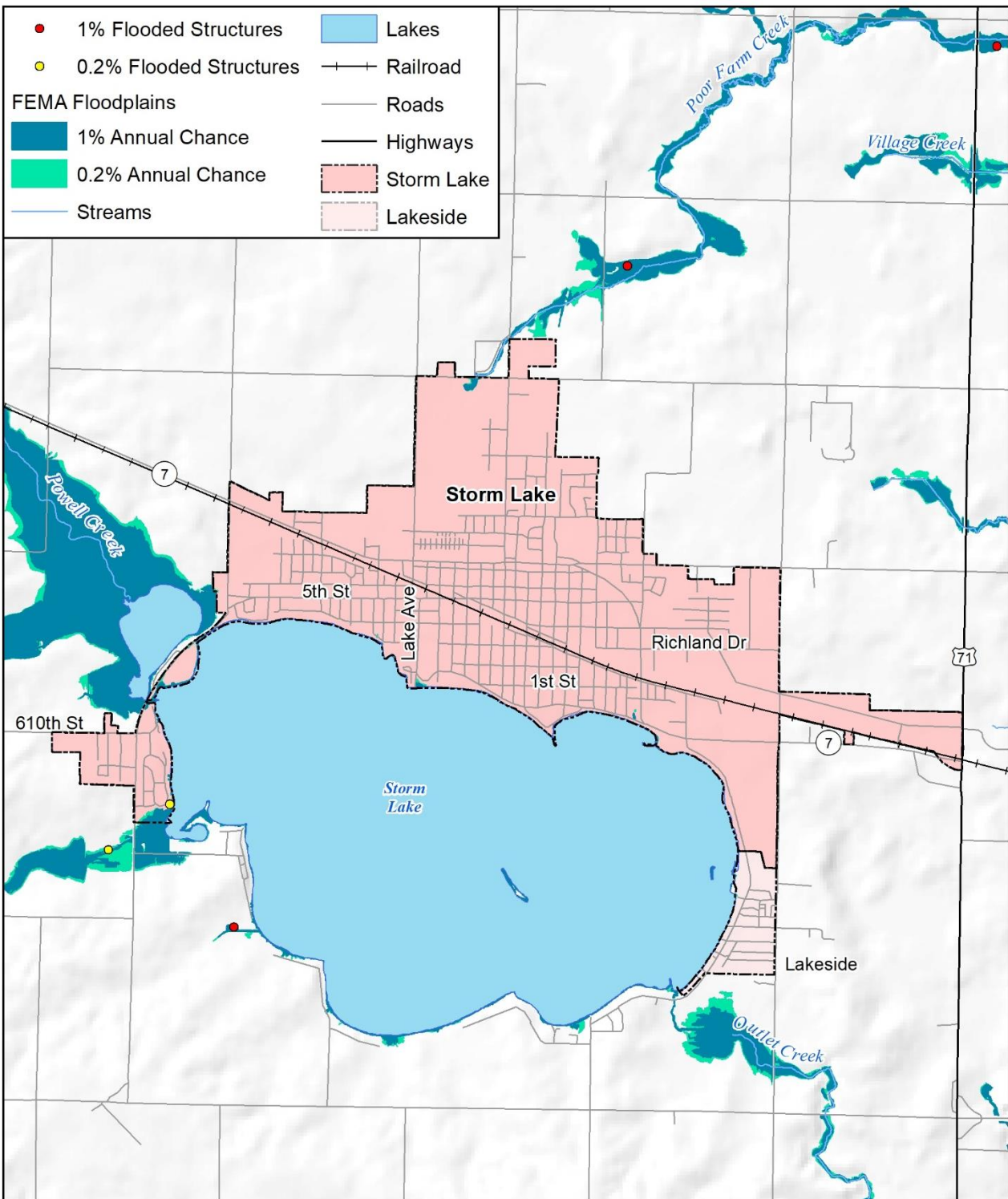


Map compiled 10/2022;
intended for planning purposes only.
Data Source: Buena Vista County, Iowa DNR,
FEMA NFHL Effective 10/13/2022

0 0.5 1 Miles



Figure 4-24 City of Storm Lake FEMA Flood Hazards

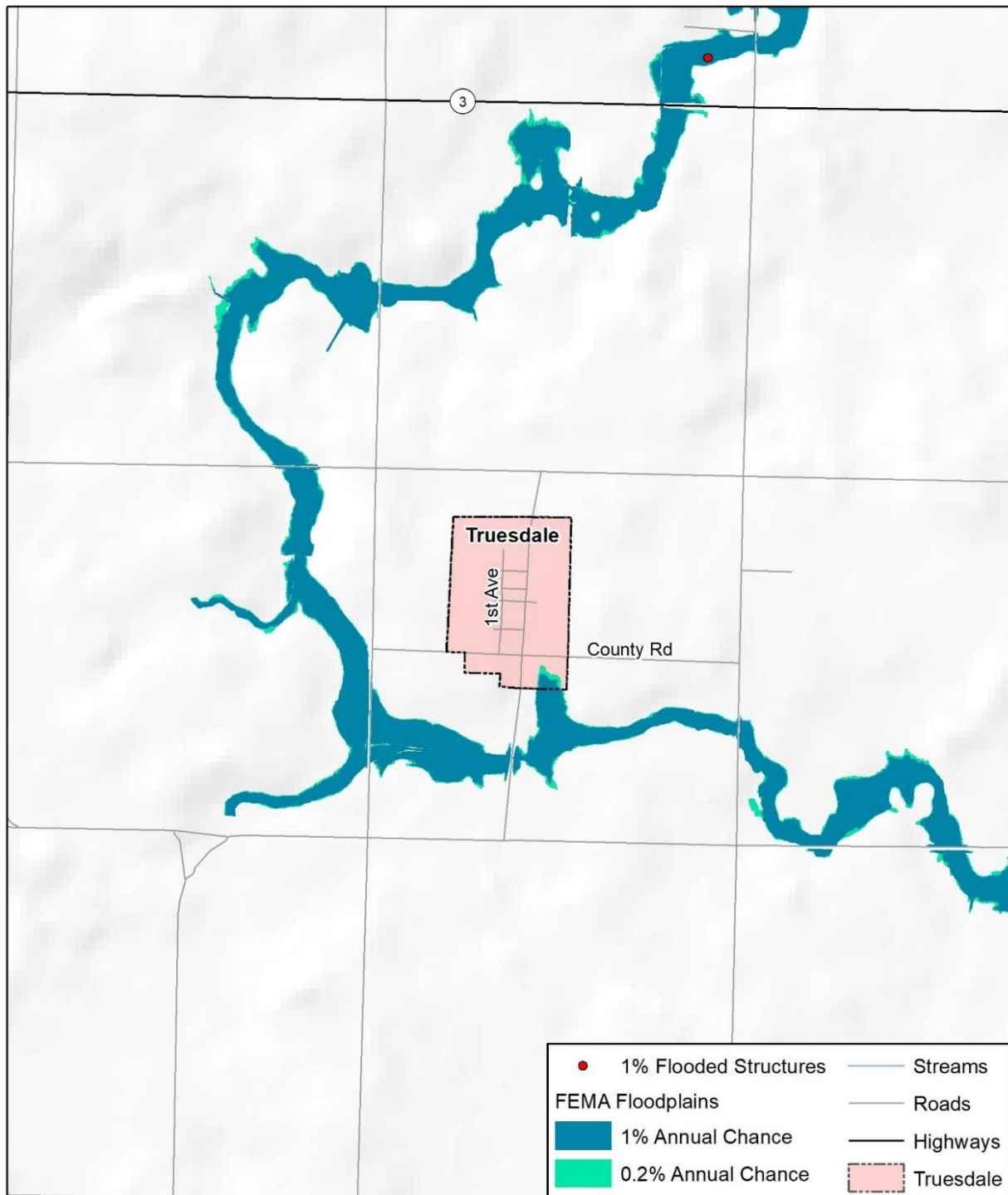


Map compiled 10/2022;
intended for planning purposes only.
Data Source: Buena Vista County, Iowa DNR,
FEMA NFHL Effective 10/13/2022

0 1 2 Miles



Figure 4-25 City of Truesdale FEMA Flood Hazards



Map compiled 10/2022;
intended for planning purposes only.
Data Source: Buena Vista County, Iowa DNR,
FEMA NFHL Effective 10/13/2022

0 0.5 1 Miles





Risk Summary

- The overall significance of flooding is **High**. However, there is significant variation between communities.
- Linn Grove, Newell, Sioux Rapids, Storm Lake, and the unincorporated County all have properties in the floodplain.
- Flash flooding that occurs with little or no warning will continue to impact the planning area.
- Flooding may be exacerbated by other hazards, such as wildfires.
- Flooding frequently causes other related hazards, such as erosion and mudflows.
- There are \$13 million worth of property in the 1% and 0.2% floodplain, with potential losses estimated at \$3.3 million.
- Related hazards: Drought, Levee/Dam Failure, Wildfire.

4.3.7 Grass/Wildland Fire

LOCATION	MAGNITUDE/ SEVERITY	FUTURE PROBABILITY	OVERALL SIGNIFICANCE
Significant	Negligible	Highly Likely	Medium

Description

Iowa's urban/rural interface (areas where development occurs within or immediately adjacent to wildland, near fire-prone trees, brush, and/or other vegetation), is growing as metro areas expand into natural forest, prairies, and agricultural areas that are in permanent vegetative cover through the Conservation Reserve Program (CRP). The State has the largest number of CRP contracts in the nation, totaling over 1.5 million acres. Most of this land is planted in cool and warm season grass plantings, tree plantings and riparian buffer strips. There is an additional 230,000 acres in federal ownership and conservation easements.

Wildfires are frequently associated with lightning and drought conditions, as dry conditions make vegetation more flammable. As new development encroaches into the wildland/urban interface more and more structures and people are at risk. On occasion, ranchers and farmers intentionally set fire to vegetation to restore soil nutrients or alter the existing vegetation growth. Also, individuals in rural areas frequently burn trash, leaves, and other vegetation debris. These fires have the potential to get out of control and turn into wildfires.

The risk of wildfires is a real threat to landowners across the State. The NWS monitors the conditions supportive of wildfires in the State daily so that wildfires can be predicted, if not prevented.

The risk factors considered are:

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

Grass and wildland fire can occur when conditions are favorable, such as during periods of drought when natural vegetation would be drier and more combustible. Most communities in Buena Vista County are surrounded by agricultural land. Parcels located on the outskirts of incorporated areas and parcels in unincorporated Buena Vista County are most likely to experience effects from this hazard.

Location

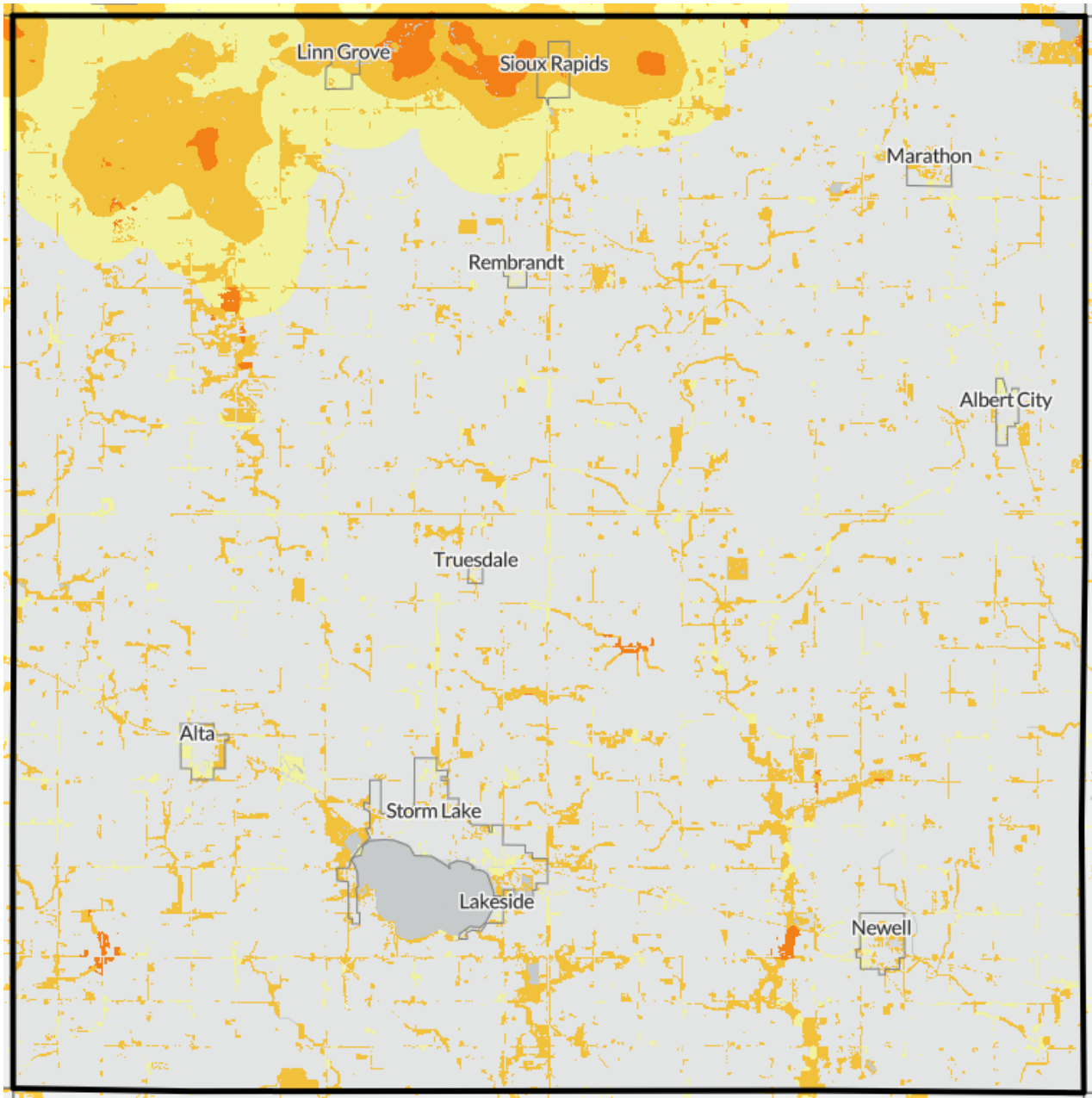
The USDA Forest Service, under the direction of Congress in the 2018 Consolidated Appropriations Act (H.R. 1625, Section 210), developed a nationwide wildfire risk assessment. The Wildfire Risk to Communities study results were used to assess risk to Wildfire in Buena Vista County. Wildfire Risk to Communities 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 4-26 shows the Risk to Homes within Buena Vista County and Figure 4-27 displays the legend. Which 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. Buena Vista County has a lower Risk to Homes than 64% of other counties within the

State. The greatest risk to homes in the County is in the northwestern portion, located along the Little Sioux River and in the Cities of Linn Grove and Sioux Rapids.

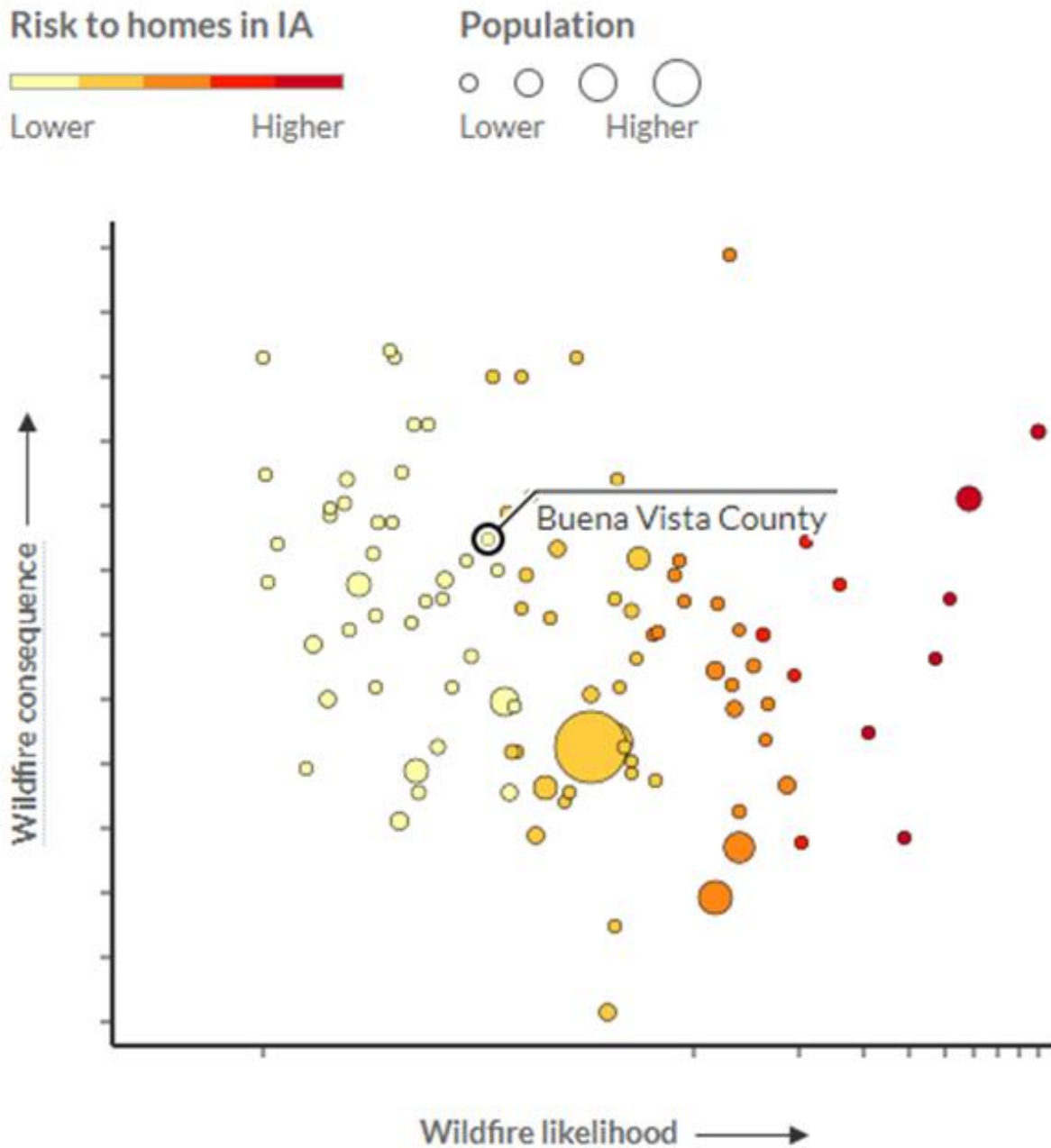
Risk to Homes combines wildfire likelihood and intensity with generalized results to a home within the planning area. The Risk to Homes data integrates wildfire likelihood and wildfire intensity from simulation modeling to represent wildfire hazard. Wildfire Risk to Communities uses a generalized concept 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 4-26 Buena Vista County Wildfire Risk



Source: Wildfire Risk to Communities, <https://wildfirerisk.org>

Figure 4-27 Buena Vista County Wildfire Risk Relative to Other Iowa Counties



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

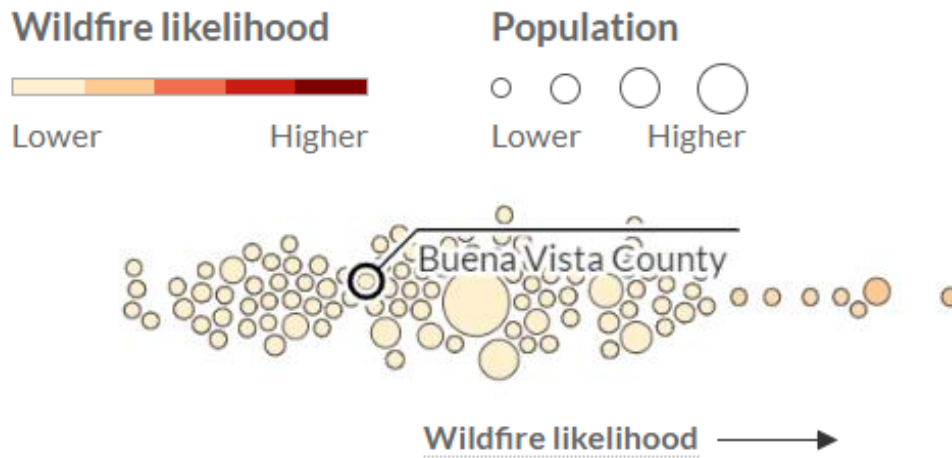
Figure 4-28 shows the Wildfire Likelihood in Buena Vista County and Figure 4-29 displays the legend, which represents where the planning area is in relation to the other counties in Iowa. Like the Wildfire Risk maps, the size of the circles in the legend is a proportional representation of the county's population compared to other counties in the state. Buena Vista County has a lower likelihood of wildfire than 65% of other counties within the State. Like wildfire risk, the greatest likelihood of wildfire in the County is in the northwestern portion, located along the Little Sioux River and in the Cities of Linn Grove and Sioux Rapids. A **significant** portion of the county is at risk.

Figure 4-28 Buena Vista County Wildfire Likelihood



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

Figure 4-29 Buena Vista County Wildfire Likelihood Relative to Other Iowa Counties



Source: Wildfire Risk to Communities, <https://wildfirerisk.org>

Historic Occurrences

According to the NCEI database there were no wildland or forest fire events with significant impact that have been reported in Buena Vista County from 1996 to 2022, however, this does not account for small or contained grass fires that may not have been reported. The Buena Vista County Communication Center reports 115 grassland fire events were logged in Buena Vista County between April 8th of 2019 and May 9th of 2023. The County Communication Center did not report any logged wildfires in the County.

These fires rarely result in any damage to property; however, cropland is at a higher risk. In addition, many communities in Buena Vista County have adequate fire gear, or have standing mutual aid agreements, to respond to most grassland fires and do not consider small grassland fires significant hazard events. Unincorporated Buena Vista County is the jurisdiction with the highest likelihood of grassfire because of the large amount of cropland and open space.

Probability of Future Occurrence

Grassland fires are considered **highly likely** in Buena Vista County. Based on Buena Vista County Communication Center statistics, there is over 100% (115 events/4 years) probability of a grassland fire event occurring annually. Using the above statistics, it can be estimated that an average of twenty-eight grassland fire events will occur annually in Buena Vista County. Wildland fires are still possible in Buena Vista County,

Over the past 5 years, there have been no deaths or injuries reported resulting from grass and wildland fires. There is no known figure for how much in monetary damages grass and wildland fires have caused.

In terms of the location of the hazard, the planning teams in each jurisdiction said the entire jurisdiction could potentially be vulnerable to grass and wildland fires. Due to the rural nature of the jurisdictions, there is often grass and wildlands within jurisdictions and surrounding the city limits, making grass and wildland fires potentially dangerous as they could be within and surrounding a city.

Magnitude/Severity

Severity of Impact

Grass and wildland fire is considered to have **negligible** magnitude and severity. Less than 10% of property severely damaged, shutdown of facilities and services for less than 24 hours, and/or injuries/illnesses treatable with first aid. 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.

Due to the size of the county, the planning team thought it wouldn't be accurate to determine vulnerability in terms of structures.

Speed of Onset

Grass and wildland fire events often occur with minimal or no warning (up to 6 hours warning). Certain conditions could be the right mix for a grass or wildland fire to occur, but often these incidents cannot be predicted ahead of time. The rate at which fires can travel depends upon conditions at the time such as moisture, wind, and land cover.

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°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 Buena Vista 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.

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 due to wildland fire is a rare occurrence in Buena Vista County. According to the USDA Forest Service wildfire risk tool referenced above, populated areas in Buena Vista County have, on average, a greater risk to homes than 36% 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.

Some jurisdictions in Buena Vista County are more vulnerable to grass or wildland fires than others due to the large amount of cropland in the surrounding areas. The City of Storm Lake has the highest concentration of critical facilities and infrastructure but is less likely to experience a wildland or grassland fire than Linn Grove and Sioux Rapids. A list of critical infrastructure by City and their value can be found above in Table 4-25 and Table 4-26.

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.

Environment and Cultural 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

As stated in the Hazard Description section, Iowa’s urban/rural interface is generally growing, however specific to Buena Vista County the overall population is decreasing in recent years. Any future development in the wildland-urban interface/intermix areas could increase the planning areas vulnerability to this hazard, but not by a significant degree.

Differences By Jurisdiction

The future probability and potential magnitude are highest in Linn Grove and Sioux Rapids but is still significant in the other jurisdictions.

Risk Summary

Overall, grass/wildland hazard is ranked as **medium** for the County.

- Buena Vista County has a lower likelihood to experience a wildfire than 65% of other counties in Iowa and lower risk to Homes than 64% of other counties within the State. However, small grassland fires are not uncommon in the County. Therefore, this hazard is ranked as **likely** for probability of future occurrence.
- The greatest risk to homes and highest likelihood in the County is in the northwestern portion, located along the Little Sioux River and in the Cities of Linn Grove and Sioux Rapids. These jurisdictions are rated as higher magnitude than the rest of the County.
- Less than half of the area in the County is vulnerable to grass/wildland fires; therefore, extent is rated as significant.
- The Buena Vista County Communication Center reports 115 grassland fires between April 8th of 2019 and May 9th of 2023
- 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.
- 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.
- Fire suppression may result in increased costs to local and state government for water acquisition and delivery.
- Environmental impacts from wildfire include soil erosion, destroyed habitats, and soil sterilization.
- Related hazards: Drought, Extreme Heat, Infrastructure Failure, Lightning, Windstorm

4.3.8 Hazmat Incident

LOCATION	MAGNITUDE/ SEVERITY	FUTURE PROBABILITY	OVERALL SIGNIFICANCE
Significant	Limited	Highly Likely	Medium

Description

A hazmat incident is an unintentional hazardous materials release from a fixed site, pipeline, or in transportation. This 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 possibly requiring evacuation.



FEMA Photo

Location

The geographic extent of hazmat incidents is **significant**. A hazardous materials incident in the more population dense areas of Buena Vista County such as Storm Lake could have severe consequences. It is more likely that an event would occur in the areas located near U.S. Highway 71, Iowa Highway 3, Iowa Highway 7, Iowa Highway 10 and Iowa Highway 110. Where the potential for trucking accidents is higher. Unincorporated and incorporated areas along these highways are the most probable potential sites of hazardous materials transportation accidents.

Historic Occurrences

According to the National Response Center, Buena Vista County has experienced multiple hazardous material incidents. So, it is reasonably safe to assume that the study area can typically experience approximately two hazardous materials incidents each year. This record of events suggests that Buena Vista County's primary hazardous materials concern is transportation accidents involving trucks carrying hazardous materials such as fuel. The five state highways within the county can be particularly dangerous to travel during winter months when the roads can be snowy and icy. Inappropriate storage of hazardous materials on private and commercial property also can be an issue. Table 4-32 catalogues hazardous materials events reported in Buena Vista County from 2010 to 2022.

Table 4-32 Hazardous Materials Incidents in Buena Vista County, 2010-2022

Incident Date	Description of Incident	Incident Cause	Nearest City	Location	Materials
2/18/2010	A transformer discharged an unknown amount of mineral oil. The maximum capacity is 350 gallons, but the full capacity is not believed to have discharged. The cause is unknown at this time.	Unknown	Alta		Oil, Misc: Mineral
7/28/2010	Caller is reporting a release of ammonia due to a safety valve venting on the roof of their facility.	Unknown	Storm Lake	1009 Richland St	Ammonia, Anhydrous
6/2/2011	A cooling tower pressure relief valve failed below the rated pressure, resulting in a release of anhydrous ammonia.	Equipment Failure	Storm Lake	1009 Richland Street	Ammonia, Anhydrous



Incident Date	Description of Incident	Incident Cause	Nearest City	Location	Materials
6/3/2011	Caller stated that there was a release of 244 pounds of anhydrous ammonia from four different pop off valves, the cause was due to the cooling pumps shut off.	Equipment Failure	Storm Lake	1009 Richland Street	Ammonia, Anhydrous
6/5/2011	Caller is reporting that anhydrous ammonia is releasing from a hsc1 pump due to unknown causes.	Unknown	Storm Lake	315 Zilas Rd.	Ammonia, Anhydrous
10/28/2011	Caller reported 2 nurse tanks rolled into a ditch which caused one of the tanks to leak material. Caller stated amount released is unknown but a high estimation is 850 pounds. Caller stated the tank was listed as empty but there is residual material in the tank.	Operator Error	Storm Lake	90th Ave	Ammonia, Anhydrous
11/3/2011	Caller is reporting that anhydrous ammonia released from a set of nurse tanks due to unknown causes at this time. The caller stated that an unknown amount of private citizens were evacuated as a precautionary.	Unknown			Ammonia, Anhydrous
11/3/2011	Caller reported 1600 gallons of anhydrous ammonia released from a set of nurse tanks due to unknown causes at this time. 04 November 2011 caller is reporting that the amount released is 800 gallons not the 1600 gallons reported in NRC report#994506. Caller also states an unknown amount of private citizens were evacuated as a precautionary measure.	Unknown		See Below	Ammonia, Anhydrous
3/7/2012	Truck overturned on highway 7 at intersection of M54, east of Newell, IA, Truck was carrying various chemical products. At this time it is known that a spill of approximately 5000 lbs of sodium hydroxide occurred. And possibly a spill of over 100 lbs sodium hypochlorite, which is not confirmed at this time.	Transport Accident		Intersection Of Highway 7 And M54 East O	Sodium Hydroxide
9/6/2012	Caller is reporting a release of 100 gallons of anhydrous ammonia from a 6 inch transmission pipeline due to a pinhole leak in the line.	Equipment Failure		See Lat And Long	Ammonia, Anhydrous
8/25/2013	Caller stated that they had a truck roll over and the cap came off of the trailer and discharged a mixture of endigo zc onto the ground.	Other		4773 240th St	Endigo Zc/ Water Mixture
3/22/2014	Caller is making a report involving a fire in the dark meat section of the plant. It is unknown exactly what caught on fire at this time.	Unknown		315 Vilas Rd.	Ammonia, Anhydrous
4/17/2015	Caller is reporting a release of anhydrous ammonia into the atmosphere from a nurse tank while it was being filled due to a leaking valve.	Equipment Failure		First Street	Ammonia, Anhydrous



Incident Date	Description of Incident	Incident Cause	Nearest City	Location	Materials
12/18/2015	Caller is reporting the "potential to discharge ammonia from a frosted over valve" caller reports no known release only the discovery of a frosted valve.	Equipment Failure		315 Vilas Road	Ammonia, Anhydrous
8/7/2016	Caller reported that there was a discharge of motor oil into storm lake due to the pumping out of the bilge on the work boat.	Operator Error		See Lat - Long	Oil, Misc: Motor
11/14/2016	Caller stated there was a release of anhydrous ammonia from a nurse tank out in the field due to equipment failure. Caller stated the hose came loose from the applicator which goes to the nurse tank.	Equipment Failure			Ammonia, Anhydrous
6/6/2017	Caller stated due to unknown causes there is a release of anhydrous ammonia from an unknown source at the facility.	Unknown		Flint & Richland	Ammonia, Anhydrous
6/6/2017	Caller stated that an ammonia refrigeration unit began discharging anhydrous ammonia to the atmosphere after a fan fell and punctured the coil.	Equipment Failure		1009 Richland St.	Ammonia, Anhydrous
8/16/2017	Caller reported a release of pork blood from a tanker truck during a heavy rainstorm. The caller stated that the blood flowed over secondary containment and impacted a nearby storm drain. The estimated amount released is expected to exceed 110 gallons. The caller stated the product may potentially affect storm lake. The incident is under investigation.	Unknown		1009 Richland St	Pork Blood
10/22/2017	Caller stated anhydrous ammonia released from a relief valve on a chilling silo due to an equipment malfunction.	Equipment Failure		1419 480th St.	Ammonia, Anhydrous
6/17/2018	Ammonia released from a chiller seal due to a malfunction.	Equipment Failure		315 Vilas Rd.	Ammonia, Anhydrous
6/20/2018	Caller is reporting the release of ammonia to the atmosphere due to equipment failure.	Equipment Failure		1009 Richland Dr	Ammonia, Anhydrous
7/4/2018	Caller reports a discharge of approximately 20 gallons of non-PCB transformer oil onto the ground with an unknown amount into a storm drain caused by damage to a transformer during a storm.	Natural Phenomenon		403 1st Street	Oil, Misc: Transformer
4/15/2019	Caller is reporting a pickup truck with a trailer carrying anhydrous ammonia was involved in an accident, as the truck was headed north bound on west highway a motorcycle collided with the truck resulting in 1 fatality. There was no damage to the tank, the incident occurred yesterday so at the time of report the threat of a potential release is gone.	Operator Error		13 North Main	Oil: Crude

Incident Date	Description of Incident	Incident Cause	Nearest City	Location	Materials
8/14/2019	Caller due to a pipe that corroded there is a release of anhydrous ammonia at the food processing facility.	Equipment Failure		315 Vilas Road	Battery Acid Un2794
8/24/2019	Caller is reporting a release of an unknown amount of anhydrous ammonia into the air at the incident location. Release was from a compressor, due to unknown causes.	Unknown		1009 Richland Drive	Methyl Methacrylate
7/7/2020	Caller is reporting the discovery of mercury in the iron filter wet well from an unknown source.	Unknown		207 East Second St	
10/6/2021	Caller is reporting the derailment of 1 rail car at the incident location. The derailment occurred during a shoving operation at the rail yard. During the operation they lost control of the car, and it went out onto the main line and collided with two tank cars carrying ethanol that were part of a freight train. No spill of materials occurred. The rail car that derailed was the one being shoved at the yard.	Derailment			

Source: National Response Center, www.nrc.uscg.mil/

Probability of Future Occurrence

According to the available data, hazmat incidents are considered **likely** in Buena Vista County. There is a more than 33% probability in any given year. According to data from the Iowa Department of Natural Resources and Buena Vista County Emergency Management, there have been 65 hazmat spills from 1990-2022. Based on available data, there is an over 100% (65 events/ 32 years) probability of a hazmat incident event occurring twice annually. Using the above statistics, it can be estimated that two hazmat incident events will occur annually in Buena Vista County.

Magnitude/Severity

Hazmat incidents have **limited** magnitude in Buena Vista County. This means that 10% to 25% of property severely damaged, shutdown of facilities and services for more than a week, and/or injuries/illnesses that do not result in permanent disability. Although DNR and Buena Vista County Emergency Management did report the number of hazmat incidents, there were no economic losses associated with the hazard impacting Buena Vista County.

Warning Time

Hazmat incidents often occur with minimal or no warning (up to 6 hours warning). You can prepare and practice how to respond to a hazmat incident, but there is often no warning time when an incident occurs.

Duration

The duration of a hazmat incident is less than one week. Depending on the spill, it can take more than a day to clean it up, but they generally don't take more than a week to clean up.

Climate Change Considerations

There are not expected to be climate change impacts on human-caused hazards such as hazardous materials incidents.

Vulnerability

People

Hazardous materials events could potentially threaten public safety. To date there has been one death from a hazardous material incident that has occurred within Buena Vista County. That occurred 04/15/2019 and is detailed in Table 4-32 above. It is important to note that schools and most of the County and Town's population are located within a one-mile corridor of U.S. Highway 71, Iowa Highway 3, Iowa Highway 7, Iowa Highway 10 and Iowa Highway 110 and are therefore potentially exposed to the dangers of hazardous materials incidents. Six of the hazardous material spills within Buena Vista County resulted in people needing to be evacuated. This can have a material adverse impact on more vulnerable populations when emergency evacuations and movements are required.

Property

The impact of a fixed hazardous facility, such as a chemical processing facility is typically localized to the property where the incident occurs. The impact of a small spill (i.e. liquid spill) may also be limited to the extent of the spill and remediated if needed. A blanket answer for potential impacts is hard to quantify, as different chemicals may present different impacts and issues. Property within a half mile in either direction of designated hazardous materials routes is at increased risk of impacts. While cleanup costs from major spills can be significant, they do not typically cause significant long-term impacts to property. However, some larger incidents involving pipelines, railroads, or explosive materials may cause significant and overwhelming damage to the surrounding communities.

Critical Facilities and Infrastructure

There is a total of 28 Tier II Facilities and 14 EHS Facilities within Buena Vista County as showcased in Table 4-33 below. A Tier II facility is one that has greater than or equal to 10,000 pounds of any hazardous chemical as defined by OSHA criteria. An EHS Facility stands for Environment, Health, and Safety. It's a general term used to refer to laws, rules, regulations, professions, programs, and workplace efforts to protect the health and safety of employees and the public as well as the environment from hazards associated with the workplace. Eleven of these Tier II facilities are located in Storm Lake, along with five EHS facilities.

Table 4-33 Tier II and EHS Facilities in Buena Vista County

Jurisdiction	Tier II Facilities	EHS Facilities
Albert City	2	-
Alta	2	-
Lakeside	-	-
Linn Grove	2	-
Marathon	3	1
Newell	3	-
Rembrandt	-	-
Sioux Rapids	-	1
Storm Lake	11	5
Truesdale	1	-
Unincorporated	4	7
Total	28	14



Source: Buena Vista County, DNR, HIFLD, National Bridge Inventory, WSP GIS Analysis

Economy

Hazardous materials incidents can also interrupt transportation and delivery services, potentially resulting in economic losses.

Environment and Cultural Resources

The potential impact to the environment is often related to public safety issues such as air and water quality.

Development Trends

The number of hazardous materials that are stored, used, and transported across the county are not anticipated to increase over the next five years based on regional growth trends.

Differences By Jurisdiction

The largest concentration of Tier II or EHP facilities are in Storm Lake, which increases their risk. The Cities of Lakeside, Rembrandt, and Sioux Rapids have no Tier II or EHP facilities.

Cities located along major transportation routes are also at increased risk of hazmat incidents, to include Albert City, Alta, Marathon, Newell, Sioux Rapids, and Storm Lake.

Risk Summary

- The overall significance of hazardous materials incidents in the planning area is medium.
- There were 24 hazmat incidents reported between 2010-2022, an average of 1.8 incidents per year.
- Half of these incidents were at fixed facility sites.
- Only nine incidents resulted in any injuries (5), fatalities (1), or evacuations (131 people total).
- There are 89 Tier II facilities in the planning area, a majority are located in Thornton.
- Related Hazards: Terrorism, Dam Failure, Transportation Incident, Earthquake, Flood, Thunderstorms, Tornado, Wildfire

4.3.9 Human Disease

LOCATION	MAGNITUDE/ SEVERITY	FUTURE PROBABILITY	OVERALL SIGNIFICANCE
Extensive	Limited	Likely	Medium

Description

Human disease is a medical, health, or sanitation threat to the general public including contamination, epidemics, plagues, or infestations. Public health action to control infectious diseases in the 21st century is based on the 19th century discovery of microorganisms as the cause of many serious diseases (e.g., cholera and TB). Disease control resulted from improvements in sanitation and hygiene, the discovery of antibiotics, and the implementation of universal childhood vaccination programs. Scientific and technologic advances played a major role in each of these areas and are the foundation for today's disease surveillance and control systems.



Source: World Health Organization

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 several 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.

Vaccine Preventable Disease

In the U.S., there are common infectious diseases that include polio, measles, diphtheria, pertussis, rubella, mumps, tetanus and Hemophilus 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 (CDC). Vaccine preventable diseases continue to threaten the health of Iowans when children, adolescents and adults are un-immunized or under-immunized.

Influenza

Influenza (flu) is a viral infection of the nose, throat, bronchial tubes, and lungs. There are two main types of viruses: 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 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.

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.

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.

Since March 2020, Buena Vista 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, a 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.



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. According to the Iowa Department of Public Health, as of December 13, 2022, Buena Vista has experienced 6,823 cases of COVID-19 and 64 deaths.

Historic Occurrences

The World Health Organization tracks and reports on epidemics and other public health emergencies through the Global Alert and Response. 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 December 16, 2022, over 647 million cases have been reported around the world, resulting in over 6.6 million deaths, including over 98 million cases and 1 million deaths in the U.S.
- **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 to be 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.

Probability of Future Occurrence

According to data from the Iowa Department of Public Health, there have been 223 human disease cases from 2013-2016. These diseases included cryptosporidiosis, cyclosporiasis, giardiasis, salmonellosis, gonorrhea, chlamydia, and syphilis. Additionally, 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 therefore **likely** that human diseases will occur in Buena Vista County on an annual basis.

Magnitude/Severity

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.

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. These safeguards work to limit the severity of impact of human disease.

Human disease is considered to have **limited** magnitude and severity. This means that 10% to 25% of property severely damaged, shutdown of facilities and services for more than a week, and/or injuries/illnesses that do not result in permanent disability.

Warning Time

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 Buena Vista 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. These diseases take time to spread, and they are often discovered as more and more people are impacted.

Duration

The duration of a human disease will last more than one week. This hazard can take a significant amount of time to manage and stop the disease.

Climate Change Considerations

As the Earth's climate continues to warm, researchers predict wild animals will be forced to relocate their habitats — likely to regions with large human populations — dramatically increasing the risk of a viral jump to humans that could lead to the next pandemic. In addition, rising temperatures caused by climate change will impact bats, which account for the majority of novel viral sharing. Bats' ability to fly will allow them to travel long distances and share viruses in geographically dispersed places.

Vulnerability

People

Although infectious diseases do not respect geographic boundaries, several populations in Buena Vista 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. However, risk groups cannot be predicted with certainty – the elderly, people with underlying medical conditions, and young children are usually at higher risk, but this is not always true. 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.

Property

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

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. Some indirect consequences may be the diversion of resources that may be otherwise available.

The impact of the COVID-19 pandemic and associated closures has been significant, triggering a recession and high unemployment. The national unemployment rate jumped from 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. 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 –more than doubled from 14% in 2018 to 32% in July 2020.

Environment and Cultural 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 epidemic 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. While the population in Buena Vista County is not increasing, with 15.0% percent of the population over 65 years old the County has a large percent of population more susceptible to disease.

Differences By Jurisdiction

The risk of Human Disease is uniform across the county.

Risk Summary

- Overall, Human Disease is ranked **Medium**.
- The duration of a human disease epidemic will last more than one week. This hazard can take a significant amount of time to manage and stop the disease.
- Given the history of epidemics in Iowa and pandemics in the United States, probability of a future disease outbreak is **likely**.
- Advances in sanitation practices and medicine has decreased the likely severity of human disease. However, it is impossible to predict with certainty the severity of future outbreaks. Based on historical events, the severity of human disease in Buena Vista is **limited**.



- While human disease tends to have the most severe effect on the old and young, recent outbreaks have shown that human disease can have detrimental effects on all people, therefore its extent is **significant**.
- Related hazards: Animal/Plant/Crop Disease

4.3.10 Infrastructure Failure

LOCATION	MAGNITUDE/ SEVERITY	FUTURE PROBABILITY	OVERALL SIGNIFICANCE
Significant	Moderate	Highly Likely	Medium

Description

Critical infrastructure involves several different types of facilities and systems including electric power, transportation routes, natural gas and oil pipelines, water and sewer systems, storage networks, and internet/telecommunications systems. Failure of utilities or other components of the infrastructure in the planning area can seriously impact public health, functioning of communities and the economy. Disruption of any of these services could result from most of the natural, technological, and manmade hazards described in this plan. In addition to a secondary or cascading impact from another primary hazard, utilities and infrastructure can fail 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.

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 Failure

Energy failure includes interruption of service to electric, petroleum, or natural gas. Disruption of electric power supply can be a cascading impact of several other hazards. Electric power is the type of energy failure that is most often a secondary impact of other hazard events. The most common hazards analyzed in this plan that disrupt power supply are flood, tornado, windstorm, and winter weather as these hazards can cause major damage to power infrastructure. To a lesser extent, extreme temperatures, dam failure, lightning, and terrorism can disrupt power. Extreme heat can disrupt power supply when air conditioning use spikes during heat waves which can cause brownouts. Dam failure is like flood in that infrastructure can be damaged or made inaccessible by water. Lightning strikes can damage substations and transformers but is usually isolated to small areas of outage. Many forms of terrorism could impact power supply either by direct damage to infrastructure or through cyber terrorism targeting power supply networks.

Primary hazards that can impact natural gas and oil pipelines are earthquake, expansive soils, land subsidence, landslide, and terrorism.

Other Utility Failure

Interruption of other utilities such as water and sewer systems can be a devastating, costly impact. The primary hazards that can impact water supply systems are drought, flood, hazardous materials, and terrorism. Winter storm can also impact water supply if low temperatures cause failure/breakage of water infrastructure. The primary hazard that impacts sewer systems is flood.

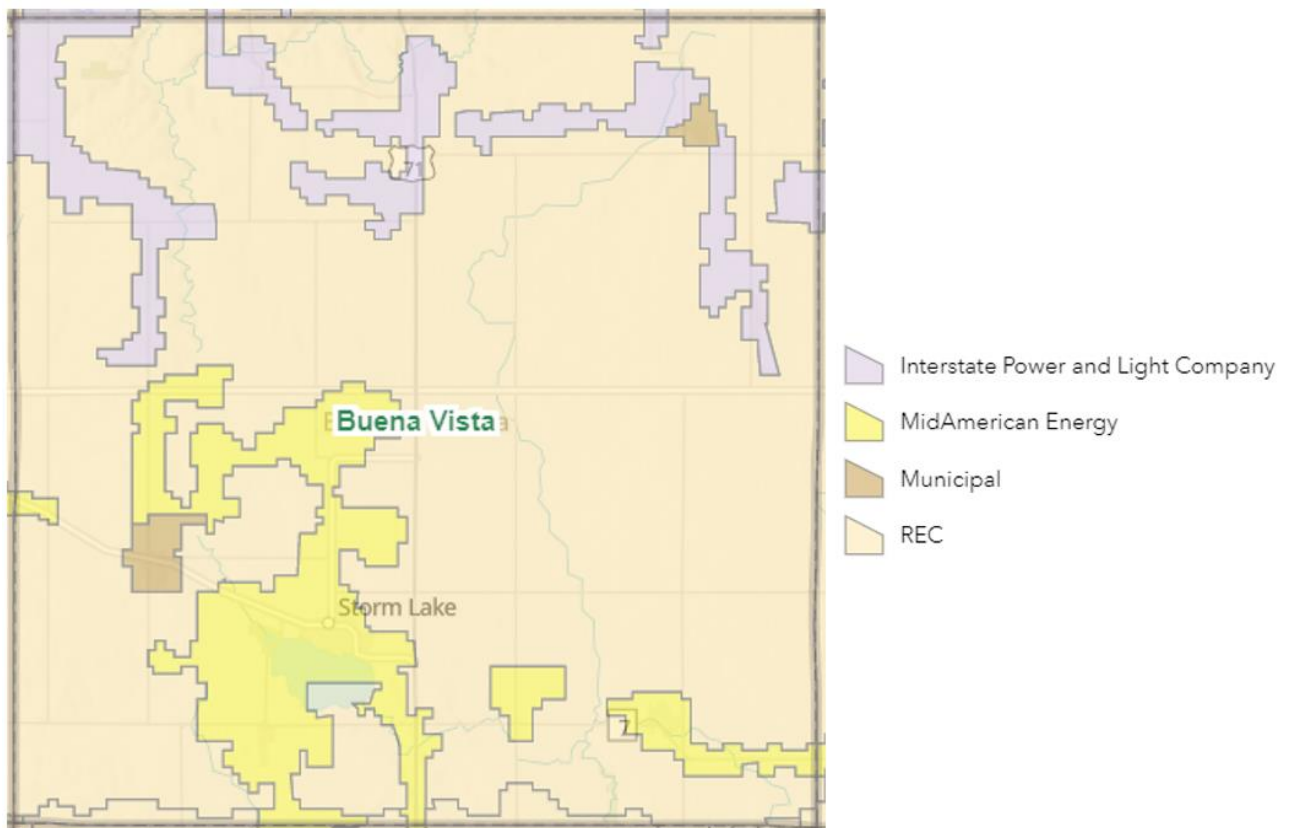
Location

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.

Power outages can occur in outlying areas with more frequency than in more developed areas. A loss of electric power can also interrupt your supply of water from a well. You may also lose food in freezers or refrigerators and power outages can cause problems with computers as well.

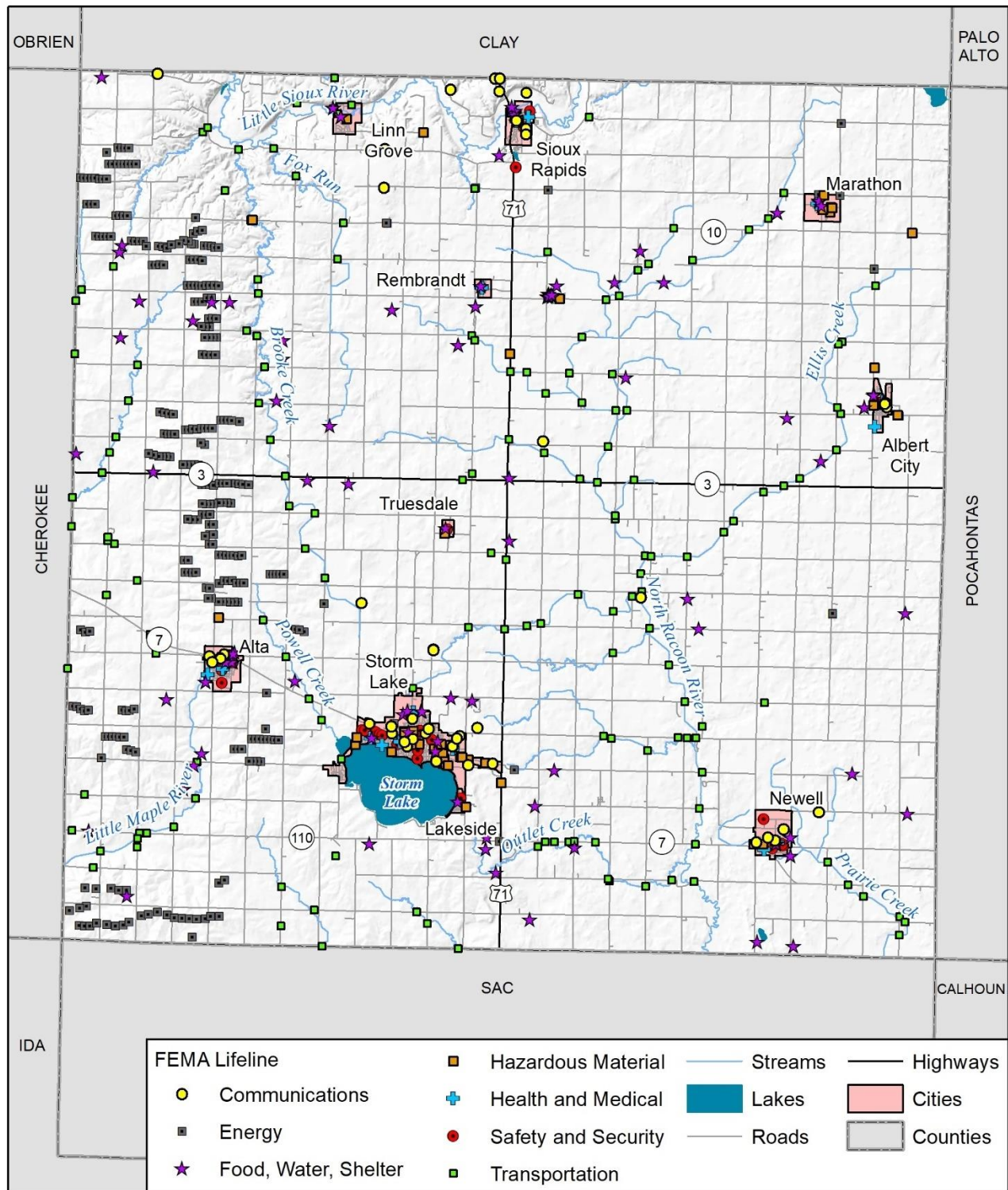
Figure 4-30 is a snip of Buena Vista County from the online electrical service area boundary map for the State of Iowa, managed and updated continuously with current data by the Iowa Utilities Board. In Buena Vista County, most of the electric services area are controlled by the Rural Electric Company (REC), followed by MidAmerican Energy and Interstate Power and Light Company.

Figure 4-30 Electric Services Area in Buena Vista County



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

Figure 4-31 Buena Vista County Critical Facilities



Map compiled 10/2022;
intended for planning purposes only.
Data Source: Buena Vista County, Iowa DNR,
National Inventory of Bridges, HIFLD

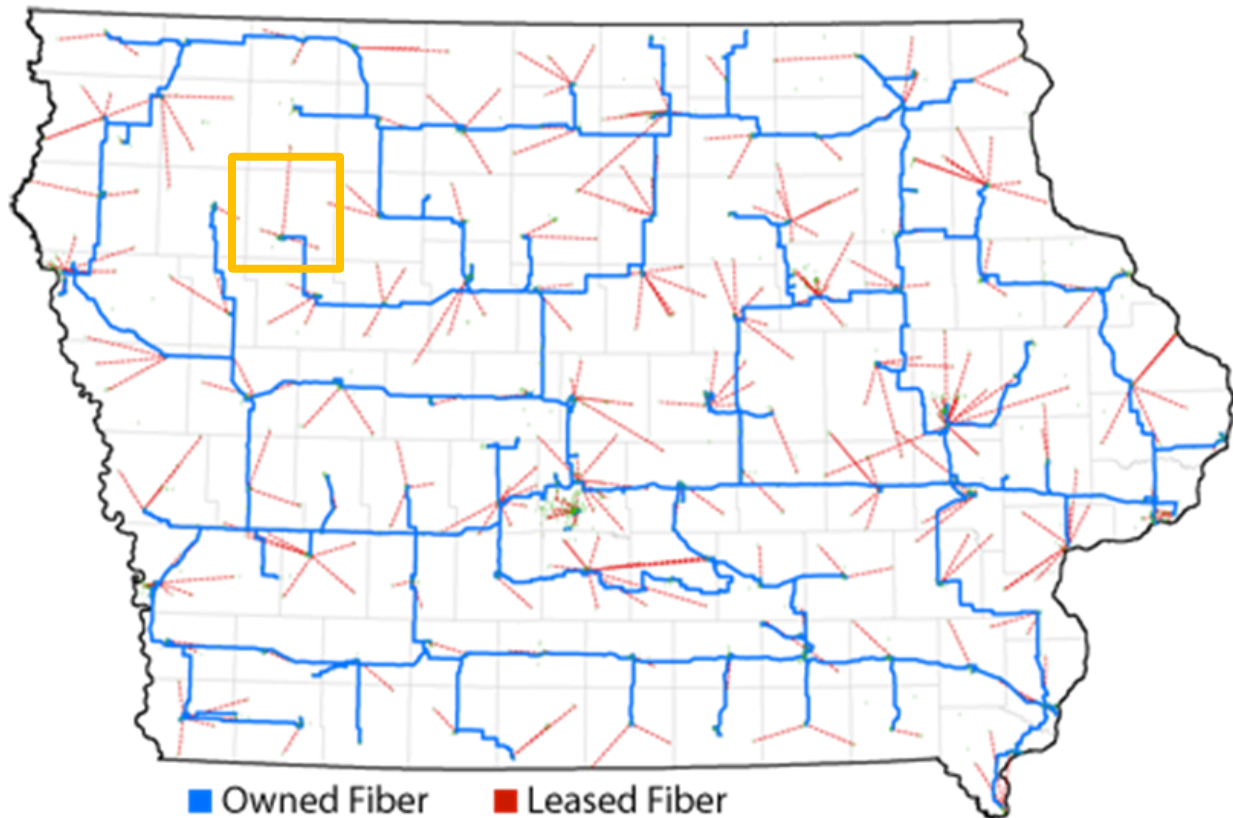
0 5 10 Miles



Figure 4-31 above shows the distribution of critical facilities across the County. Most of the energy facilities in the County are in the western quarter, and the City of Storm Lake has the greatest concentration of critical facilities in the County.

Figure 4-32 shows the Iowa Communications Network (ICN) that administers Iowa's statewide fiber optic telecommunications network from 2019.

Figure 4-32 Map of Iowa Communication Network 2019



Source: Iowa Communication Network
Note: Orange box outlines Buena Vista County.

Historic Occurrences

As indicated in the Hazard Description Section, Infrastructure Failure often occurs as a secondary impact to other hazard events. For specific descriptions associated with other hazard events, please see the Previous Occurrences Section of the Thunderstorm with Lighting and Hail, Severe Winter Storm and Tornado/Windstorm hazard profiles. Similarly, some incidents related to natural gas events may be found under the Hazardous Materials Incidents profile.

Infrastructure failure can also occur as a stand-alone event. The following incidents were shared by the HMPC. Updated information on total communication failures.

- **March 2019:** The City of Marathon reported localized damage to streets on the Bernice and Sewer Plant Road when gravel roads were washed out and required temporary road closures.

- **March 13th, 2019:** Heavy rain caused rapid snow melt and flooding, resulting in significant damages to the roads and bridges in Buena Vista County. There were many road closures throughout the county. A presidential declaration was made to provide deferral disaster relief.
- **December 15th, 2021:** Derecho spawned 3 tornadoes that hit BV County in the unincorporated areas causing damage to utilities, homes, infrastructure, and businesses. Resulted in damage to the rural electric power system and damages to county roads.
- **March 2020-present:** The COVID-19 pandemic closed schools in the County for the remainder of the spring 2020 school year. Many restrictions were placed on local businesses and operations.
- **2021-2022:** The City of Storm Lake reported serious drought conditions over past two summers, a factor in making water use restrictions necessary and straining water reserves. This resulted in an over-taxed well that require repairs. This strained local heavy-use water business such as lawn care and power washing.

Probability of Future Occurrence

According to the available data, infrastructure failure is considered highly likely in Buena Vista County. history of events is greater than 33% likely or the event is highly likely to occur. According to data from the Buena Vista County Communication Center, there have been 2,695 infrastructure failures from 2013-2017. There are data limitations on the number of the events that have been kept track of by the Buena Vista County Communications Center. They keep track of events such as like water main breaks, bridges out, highways buckling, sink holes on gravel roads, etc., but those calls are grouped in with things like stop signs down, trees across roadways, sewer backing up into basements. Those are all considered infrastructure failures so there is no way to break down the data to be more accurate to actual infrastructure failing.

Magnitude/Severity

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, bridge failures, and dam failures could potentially cause serious injury and major property damage that threatens structural stability.

Speed of Onset

Infrastructure failure cannot be predicted. There would be minimal or no warning time if an infrastructure failure occurred.

Climate Change Considerations

Please refer to the Climate Change Impacts sections of the following primary hazards that can cause a cascading or secondary impact of infrastructure failure: River Flood, Severe Winter Storm, Tornado/Windstorm, Thunderstorm/Lightning Hail, Extreme Heat, Flash Flood, and Terrorism.

Vulnerability

All jurisdictions have identified infrastructure failure as a hazard that they are vulnerable to and that could occur annually.

People

People can be impacted by critical infrastructure in many ways. In the case of road or bridge failure, transportation routes can be closed or altered, preventing people from easily leaving an area. Additionally,

supply chain issues can occur during road closures, preventing the transportation of goods in and out of the County. Communication infrastructure failures can result in delayed first responders and public warning messages. Damages to energy infrastructure jeopardize individuals who are dependent on electricity to survive.

Property

Damaged critical infrastructure can cause damage to property in some situations. For instance, poor roadway or railway conditions can cause damage to the vehicles. Structural fires can completely destroy homes and buildings. Water main breaks can result in local flooding.

Critical Facilities and Infrastructure

As mentioned above, critical infrastructure failure can result from a hazard or on its own. One infrastructure failure can result in other infrastructure failures. 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. Power losses and sewer backups can affect businesses and recreational facilities. Redundancies within these systems can prevent losses during period of damaged critical infrastructure.

Economy

Since utility/infrastructure failure is generally a secondary or cascading impact of other hazards, it is not possible to quantify estimated potential losses specific to this hazard due to the variables associated with affected population, duration of outages, etc.

Although the variables make it difficult to estimate specific future losses, FEMA has developed standard loss of use estimates in conjunction with their Benefit-Cost Analysis methodologies to estimate the cost of lost utilities on a per-person, per-use basis (See Table 4-34).

Table 4-34 FEMA Standard Values for Loss of Service for Utilities and Roads/Bridges

Loss of Electric Power	Cost of Complete Loss of Service
Total Economic Impact	\$126 per person per day
Loss of Potable Water Service	Cost of Complete Loss of Service
Total Economic Impact	\$93 per person per day
Loss of Wastewater Service	Cost of Complete Loss of Service
Total Economic Impact	\$41 per person per day
Loss of Road/Bridge Service	Cost of Complete Loss of Service
Vehicle Delay Detour Time	\$38.15 per vehicle per hour
Vehicle Delay Mileage	\$0.55 per mile (or current federal mileage rate)

Source: FEMA BCA Reference Guide, June 2009, Appendix C

Environment and Cultural Resources

Some critical infrastructure failures can have significant impacts on the environment. Sewer backups and water main breaks can pollute the environment. Dam failures can result in erosion, sedimentation, threaten local fish populations, and impact the local fishing economy.

Development Trends

Increases in development and population growth would increase the demand for utilities and use of infrastructure. As technological advances are made, and systems become more and more automated and dependent on power and communications infrastructure. As a result, the impacts of infrastructure failure could increase even though population is decreasing.

Differences By Jurisdiction

All participating jurisdictions are at risk of infrastructure failure.

Risk Summary

Overall, infrastructure failure hazard is ranked as high for the County.

- The entire County is vulnerable to communication and energy failure; therefore, the geographic area is **significant**. Other types of infrastructure failures, such as a dam and bridge failures, typically impact a more localized area.
- It is **highly likely** that infrastructure failures will happen again in the future.
- Historically the vast majority of infrastructure failures in Buena Vista County have had negligible impacts. However, the potential magnitude of infrastructure failure can be catastrophic. Communication failures can prevent emergency responders from assisting the community and spreading warning messages to residents. Power failures can jeopardize the health and safety of residents who depend on electricity to survive. Road and bridge failures can injure commuters.
- Property, particularly vehicles, can be damaged due to road and bridge failure. Significant damages to buildings can occur as a result of structure fire.
- Infrastructure failure can create loss of revenue from halted business. FEMA found that loss of electricity costs, on average, \$126 per person per day.
- Environmental impacts from infrastructure failure include erosion and sedimentation (dam failure and water main break), as well as polluting the environment with debris (dam failure, bridge failure, and structure fire)
- Related hazards: All hazards

4.3.11 Landslide

LOCATION	MAGNITUDE/ SEVERITY	FUTURE PROBABILITY	OVERALL SIGNIFICANCE
Extensive	Negligible	Occasional	Low

Description

A landslide is a general term for a variety of mass movement processes that generate a downslope movement of soil, rock, and vegetation under gravitational influence. Landslides are a serious geologic hazard common to almost every state in the United States. It is estimated that nationally they cause up to \$2 billion in damages and from 25 to 50 deaths annually. Some landslides move slowly and cause damage gradually, whereas others move so rapidly that they can destroy property and take lives suddenly and unexpectedly. Gravity is the force driving landslide movement. Factors that allow the force of gravity to overcome the resistance of earth material to landslide include saturation by water, erosion or construction, alternate freezing or thawing, earthquake shaking, and volcanic eruptions.

Landslides are typically associated with periods of heavy rainfall or rapid snow melt and tend to worsen the effects of flooding that often accompanies these events. In areas burned by forest and brush fires, a lower threshold of precipitation may initiate landslides. Generally significant land sliding follows periods of above-average precipitation over an extended period, followed by several days of intense rainfall. It is on these days of intense rainfall that slides are most likely.

Areas that are generally prone to landslide hazards include existing old landslides; the bases of steep slopes; the bases of drainage channels; and developed hillsides where leach-field septic systems are used. Landslides are often a secondary hazard related to other natural disasters. Landslide triggering rainstorms often produce damaging floods. Earthquakes often induce landslides that can cause additional damage.

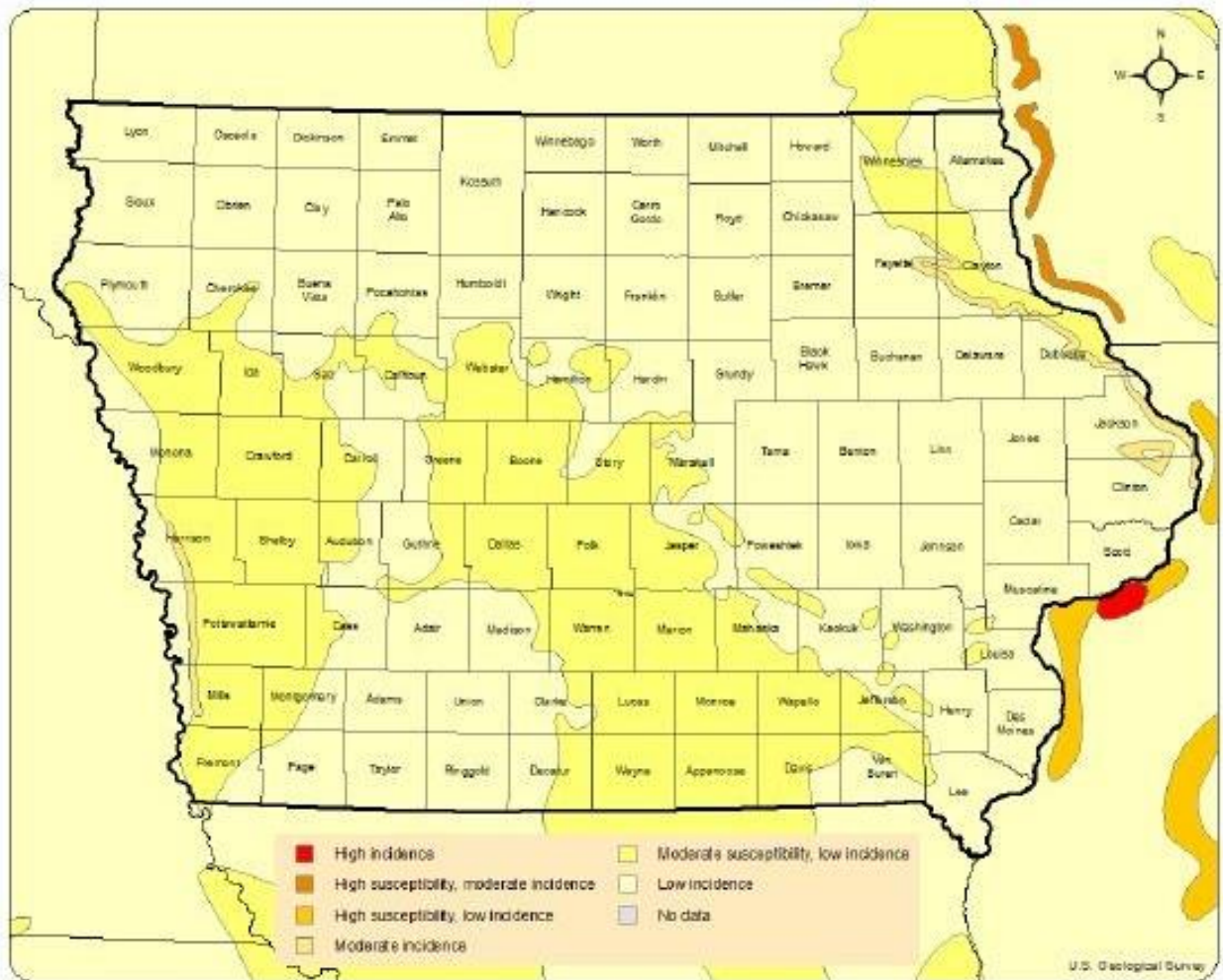
Slope failures are capable of damaging or destroying portions of roads and railroads, sewer and water lines, homes and public buildings, and other utility lines. Even small-scale landslides are expensive due to clean up costs that may include debris clearance from streets, drains, streams and reservoirs; new or renewed support for road and rail embankments and slopes; minor vehicle and building damage; personal injury; and livestock, timber, crop and fencing losses and damaged utility systems. Specific to Iowa and Buena Vista County, landslides are primarily very small, non-damaging events.

Location

A portion of the State is moderately susceptible to landslides. In northeastern Iowa, along the Silurian Escarpment, you can find blocks of dolomite slumped onto the underlying Maquoketa shale. In the hilly terrain of central Iowa, areas of Pennsylvanian shale are susceptible to slides where it is overlain by loess or till. Susceptible areas are found along the adjacent steep terrain associated with the major river valleys such as the Mississippi, Missouri, Des Moines, and Iowa and in the Loess Hills of western Iowa.

While locations of areas more susceptible than others are mapped (see Figure 4-33 below), the likelihood or probability of landslides is not well understood in Iowa. The entirety of Buena Vista County is shown as having low incidence of landslides.

Figure 4-33 Landslide Susceptibility in Iowa



Source: Iowa State Hazard Mitigation Plan, 2018

Historic Occurrences

No specific previous occurrences of landslide were reported by the HMPC or discovered during research. However, it was reported that during periods of heavy rain, some areas across the County on steep slopes have become saturated with water and slide onto roadways. There have also been no reported landslide events in Iowa resulting in injury or death. The geographic extent of the documented historic events has been limited to less than a city block in size and has run out over the stretch of less than 100 yards. However, as no State agency documents historical data on landslides in Iowa, there may be undocumented past events that were larger.

Probability of Future Occurrence

The probability of a landslide causing damage in Buena Vista County is difficult to determine because of the lack of historic data on past events. Due to the limited presence of steep slopes and areas susceptible to landslides throughout the planning area, impacts of landslides will not likely create measurable impacts on the County. The lack of recorded instances implies the probability of future landslides is **occasional** at best.

Magnitude and Severity

As mentioned throughout this chapter, the majority of this hazard's significance is drawn from the exposure of existing development to areas susceptible to landslide. There is very limited, essentially non-existent, extent of this hazard throughout Buena Vista County. As such, losses to existing development from landslides is **negligible**.

Speed of Onset

The speed of onset is greatly dependent on the type of landslide, ranging from slow and continuous movement such as in lateral spreads and very rapid occurrence in debris flows and rock falls. The latter of these forms of landslides is much less likely in Iowa due to the lack of steep slopes typically needed for these rapid landslides to occur. Of more likelihood for Buena Vista County is smaller slides triggered by slight slopes oversaturated with heavy rain.

Climate Change Considerations

Increased temperatures are projected to contribute to more water evaporation making drought more common, which could increase the probability of wildfire, reducing the vegetation that helps to support steep slopes. Additionally, increases in the occurrence of extreme precipitation events could lead to oversaturated hillsides, which are at increased risk of landslide.

Vulnerability

People

Exposure to landslide risk is the greatest danger to people. However, a landslide of sufficient magnitude to cause death or injury is very unlikely in Buena Vista County. As mentioned previously, there have been no reported landslide events in Iowa resulting in injury or death.

Property

Due to the lack of information regarding previous occurrences of this hazard, it is not possible to estimate potential losses. There is very little exposure of property to landslide hazards in Buena Vista County.

Critical Facilities and Infrastructure

No critical facilities are found in the highest landslide-prone areas or in areas of previous landslide events.

Economy

The most likely economic impact of landslides in Buena Vista County would be the blocking of roads with debris, which can isolate residents and businesses and delay commercial, public, and private transportation. This scenario would likely be very short lived in duration but would require resources to clear and reopen roads.

Historic, Cultural, and Natural Resources

Landslides are a natural environmental process. Environmental impacts can include the removal of vegetation, soil, and rock. Landslides that fall into streams may significantly impact fish and wildlife habitat, as well as affecting water quality. Hillsides that provide wildlife habitat can be lost for prolonged periods of time.



Development Trends

Due to the lack of hazard exposure to landslides and the lack of new development, exposure and vulnerability to landslides is unlikely to change.

Differences By Jurisdiction

Landslide risk is uniformly low across the county.

Risk Summary

- The overall significance of landslides is **low**.
- There is little history of damaging landslides, and also little mapping of landslide risk in the County.
- No critical facilities are found in landslide-prone areas or in areas of previous landslide events.
- Related hazards: Expansive Soil, Flooding

4.3.12 Levee/Dam Failure

LOCATION	MAGNITUDE/ SEVERITY	FUTURE PROBABILITY	OVERALL SIGNIFICANCE
Limited	Limited	Unlikely	Low

Description

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

Levee failure is defined by the loss of structural integrity of a wall, dike, berm, or elevated soil by erosion, piping, saturation, or under seepage causing water to inundate normally dry areas. Levees constructed of compacted clay with a high plasticity tend to crack during cycles of long dry spells. During heavy rainfalls that follow the dry spells, water fills the cracks and fissures. In addition to increasing the hydrostatic forces, the water is slowly absorbed by the clay. The effect of the absorbed water is an increase in the unit weight of the clay as well as a decrease in its shear strength.

Dam failure is considered a break in, or imposed threat from, any water retention fixture that may endanger population downstream of the containment area. Dams are constructed for a variety of uses, including flood control, erosion control, water supply impoundment, hydroelectric power generation, and recreation.



Source: FEMA

Location

Dams in Planning Area

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

In Rural Areas:

- 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.
- Any dam designed to provide permanent storage in excess of 18 acre-feet and which has a height of 5 feet or more.
- Any dam across a stream draining more than ten square miles.

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

In Urban Areas:

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

Low Head Dams:

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

Dams are classified by the State of Iowa into three categories based on the potential risk to people and property in the event of failure (see Table 4-35). The classification can change over time due to changes in development downstream from the dam. In addition, older dams may not have been built to the standards of their updated classification when this occurs. The IDNR performs annual inspections on all high hazard dams in the State.

Table 4-35 Dam Hazard Classification Definitions

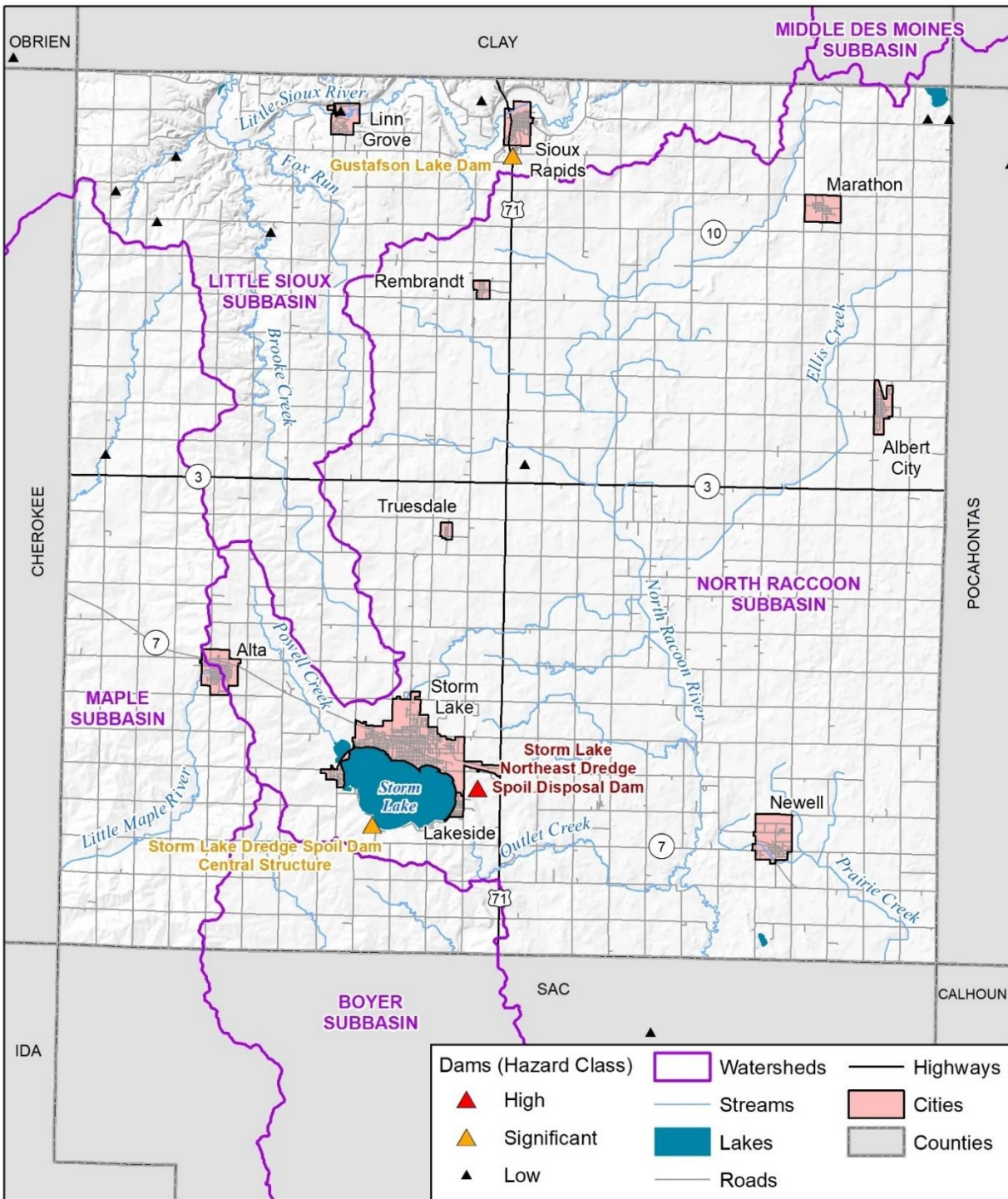
Hazard Class	Definition
High	A structure shall be classified as high hazard if located in an area where failure may create a serious threat of loss of human life or result in serious damage to residential, industrial, or commercial areas, important public utilities, public buildings, or major transportation 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 life is considered unlikely.

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

For this plan update, both the National Inventory of Dams as well as the State-regulated dam inventory were consulted. All 14 dams within the County are state-regulated dams. Of the 14 state-regulated dams, one is High Hazard dams, two are Significant Hazard Dams, and the rest of them are Low Hazard dams.

Figure 4-34 shows the locations of all dams in Buena Vista County. Table 4-36 lists information on these dams.

Figure 4-34 Dam Locations in Buena Vista County



Map compiled 10/2022;
intended for planning purposes only.
Data Source: Buena Vista County, Iowa DNR,
National Inventory of Dams

0 5 10 Miles



Table 4-36 Dams in Buena Vista County

Name State ID#	Owners	Hazard Level	Nearest City	Dam Ht. (feet)	Max. Storage (acre-ft)
Anderson Dam 1937	Bruce Anderson	Low	Linn Grove	27	44
Dudycha WRP #1 3581	David W. Dudycha	Low	Fonda	7	150
Dudycha WRP #1 3582	David W. Dudycha	Low	Fonda	12	125
Garton Subwatershed M-4619, 2753	Buena Vista County SWCD	Low	Cherokee	27	89
Gerlach Dam 2103	Duane Gerlach	Low	Linn Grove	31	47
Guftafson Lake Dam 2159	Iowa Department of Transportation	Significant	Sioux Rapids	49	176
Haroldsen Dam 1492	Paul Haroldsen	Low	Linn Grove	35	130
Iowa Noname66 1493	MW Christian Children's H	Low	Linn Grove	27	42
Linn Grove Mill Dam 2088	Buena Vista Co Conservation Board	Low	Linn Grove	9	416
Sioux Rapids Golf Club Dam 2088	Sioux Rapids Golf Club	Low	Sioux Rapids	41	51
Storm Lake- Northeast Dredge Disposal Dam 3546	Lake Improvement Commission	High	Storm Lake	49	295
Storm Lake Dredge Spoil Disposal Dam 3546	Sophie E. Wetherell Revocable Trust	Significant	Storm Lake	24	489
White Dam 4355	Buena Vista County Conservation Board	Low	Storm Lake	9	57
Young Dam 2186	Dwight Young	Low	Maple River	29	22

The one high hazard dam in the county is Storm Lake- Northeast Dredge Disposal Dam 3546. In the event of failure of that dam, the only jurisdiction that would be impacted is the City of Storm Lake.

Dams Upstream of Planning Area

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

Levees in Planning Area

The National Levee Database and the FEMA DFIRM were consulted to identify levees in the planning area. However, no levee was found in these two databases. Since the location and number of levees are unknown, their conditions and what risk they could pose to nearby buildings and infrastructure are unknown. Nevertheless, according to the 2018 County's HMP, the planning team back then indicated there are agricultural-type levees located along the Little Sioux River in Sioux Rapids and scattered throughout Unincorporated Buena Vista County. The portions most vulnerable if such a levee fails are then in the Unincorporated County.

Historic Occurrences

Dam Failure

To determine previous occurrences of dam failure within Buena Vista County, the 2018 Buena Vista County Hazard Mitigation Plan, the Iowa State Hazard Mitigation Plan, and Stanford University's National Performance of Dams Program (<https://npdp.stanford.edu/>) were reviewed for historical dam failures. No record of dam failure within Buena Vista County boundaries was found.

Levee Failure

As mentioned previously, according to the National Levee Database and the FEMA DFIRM, no levee was found to be within the County's boundary. Also, there have been no reported levee failure incidents since the last plan update.

Probability of Future Occurrence

There is no reported history of dam or levee failure in Buena Vista County. High Hazard dams are routinely inspected by the IDNR. As a result, there is an overall low probability of dam or levee failures impacting Buena Vista County. Therefore, the probability rating has been determined to be **Unlikely**.

Magnitude and Severity

A failure of a low hazard dam, which includes most dams in Buena Vista 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 the property beyond where the dam is located. The loss of human life is considered highly unlikely.

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

A failure of a high hazard dam creates a serious threat of loss of human life or would result in serious damage to residential, industrial, or commercial areas, important public utilities, public buildings, or major transportation facilities. The County could be at risk of high hazard dam failure since Storm Lake- Northeast Dredge Disposal Dam 3546 is rated as high hazard.

Of all the dams located within the County, only Storm Lake- Northeast Dredge Disposal Dam 3546 is rated as high hazard. Also, the City of Storm Lake and the Unincorporated County are the only areas that could be impacted by the unlikely failure of the Storm Lake-Northeast Dredge Disposal Dam 3546. The remaining jurisdictions are not at risk. Meanwhile, dam inundation data is not available for any of the dams located in the County for further vulnerability assessment. Therefore, magnitude is **limited**.

Storm Lake- Northeast Dredge Disposal Dam 3546 – High Hazard Dam

This dam was designed by Kuel & Pyaer, Ltd and is owned by Lake Improvement Commission, which is a local government. The dam was constructed in 2005 and is inspected every two years. It was last inspected on June 26, 2020, and received "Satisfactory" as its condition assessment result. A "Satisfactory" rating means "no existing or potential dam safety deficiencies recognized. Safe performance is expected under all anticipated loading conditions, including such events as infrequent hydrologic and/or seismic events."

Gustafson Lake Dam – Significant Hazard Dam

This dam was designed and also is owned by the Iowa Department of Transportation. The dam was constructed in 1974 and was last inspected in 1979 with no rating. This dam is primarily for recreation.

Storm Lake Dredge Spoil Dam - Central Structure – Significant Hazard Dam

This dam is owned by Sophie E Wetherell Revocable Trust and was constructed in 2002.

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.

Climate Change Impacts

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

Vulnerability

People

Persons located underneath or downstream of a dam are at risk of a dam failure, though the level of risk can be tempered by topography (specifically where populations are located within the inundation path of a dam), amount of water in the reservoir and time of day of the breach. Injuries and fatalities can occur from debris, bodily injury, and drowning. Once a dam has breached, standing water presents all the same hazards to people as floodwater from other sources. People in the inundation area may need to be evacuated, cared for, and possibly permanently relocated. Impacts could include thousands of evacuations and likely hundreds of casualties, depending on the dam involved.

The populations most vulnerable are those that have the least time to evacuate and need assistance. Populations that may need assistance to evacuate include the elderly, disabled and young. The vulnerable population also includes those who may not have an adequate warning about evacuation from emergency notification systems. The loss of life is impacted by the amount of early warning time first responders and the public has prior to the incident.

However as mentioned above, dam inundation data is not available for the dams located in the County. Therefore, specific GIS analysis on the population that may be at risk of dam incidents is not performed.

Property

In the event of failure of the high hazard dam or levees, the jurisdiction that would be impacted is the City of Storm Water and the Unincorporated County. Based on the definition of high hazard dams, failure of these dams could create a serious threat of loss of human life or result in serious damage to residential, industrial, or commercial areas, important public utilities, public buildings, or major transportation facilities. However, catastrophic failure or flood release of water from multiple dams at a single point in time is considered to be extremely unlikely.

In general, communities located below a high or significant hazard dam and along a waterway are potentially exposed to the impacts of a dam failure. Inundation maps that identify anticipated flooded areas (which may not coincide with known floodplains) are typically produced for all high hazard dams and included in the Emergency Action Plan (EAP) required for each dam.

However as mentioned above, dam inundation data is not available for the dams located in the County. Therefore, specific GIS analysis on the property that may be at risk of dam incidents is not performed.

A total dam failure can cause catastrophic impacts to areas downstream of the water body, including critical infrastructure. Any critical asset located under the dam in an inundation area would be susceptible to the impacts of a dam failure. Of particular risk would be roads and bridges that could be vulnerable to washouts, further complicating response and recovery by cutting off impacted areas. Impacts to cities would affect key infrastructure including hospitals, fire stations, clinics, and businesses.

However as mentioned above, dam inundation data is not available for the dams located in the County. Therefore, specific GIS analysis on the critical facilities and infrastructure that may be at risk of dam incidents is not performed.

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. However, due to the lack of dam inundation data, an estimate of economic damages that could result from dam incidents is then not available.

Historic, Cultural, and Natural Resources

A dam failure event in Buena Vista County could cause damage to agricultural land or recreational facilities. No historic or cultural resources were noted, however, a failure of the Storm Lake- Northeast Dredge Disposal Dam 3546 could cause damage to historic or cultural sites if they are in the path of the floodwaters.

Development Trends

While Buena Vista County does contain one high hazard dam, the county overall is at low risk for dam failure. However, development below this dam or other significant hazard dams could change this classification. Development trends are not anticipated to change risk significantly.

Differences By Jurisdiction

Storm lake is the only jurisdiction with the possibility of significant impacts from a levee or dam failure. However the low probability of such an event means the overall risk is still low.

Risk Summary

- The overall significance of this hazard is Low.
- The only high hazard dam in the county is Storm Lake- Northeast Dredge Disposal Dam 3546, upstream of City of Storm Lake.
- Related hazards: Flooding, Earthquake, Landslide

4.3.13 Severe Winter Storm

LOCATION	MAGNITUDE/ SEVERITY	FUTURE PROBABILITY	OVERALL SIGNIFICANCE
Extensive	Limited	Highly Likely	Medium

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 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.

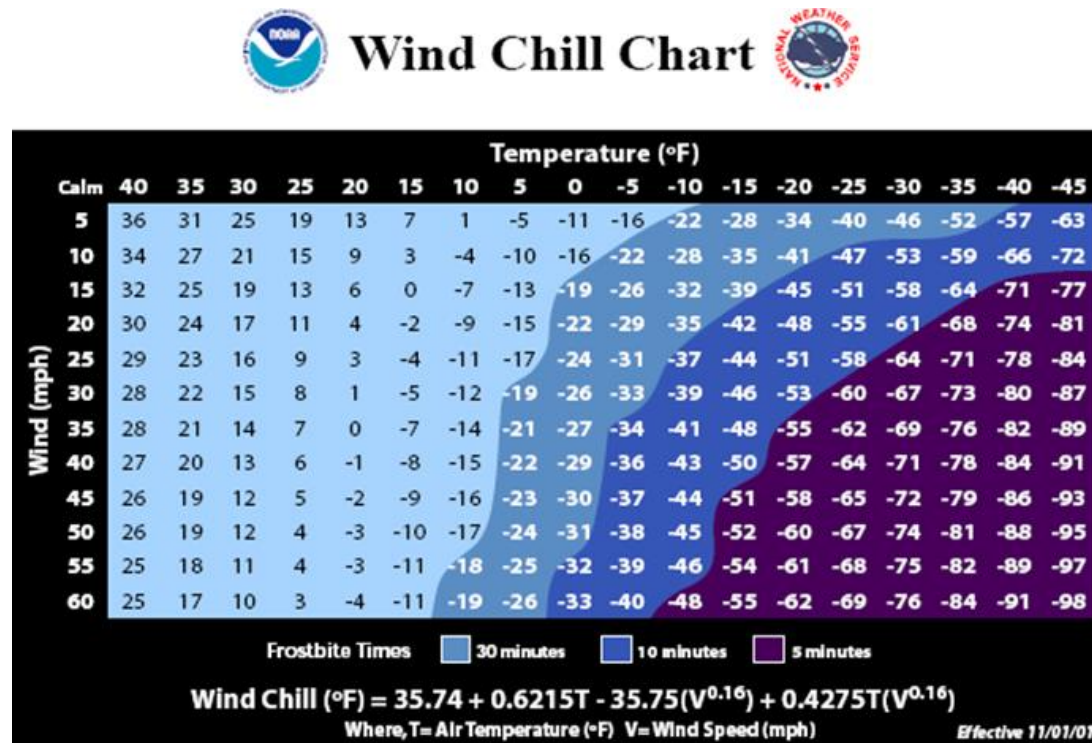
Extreme cold often accompanies severe winter storms and can lead to hypothermia and frostbite in people who are exposed to the weather without adequate clothing protection. Cold can cause fuel to congeal in storage tanks and supply lines, stopping electric generators. Cold temperatures can also overpower 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. Figure 4-35 below shows the relationship of wind speed to apparent temperature and typical time periods for the onset of frostbite.

Figure 4-35 NOAA Wind Chill Chart



Source: National Weather Service & NOAA Vulnerability

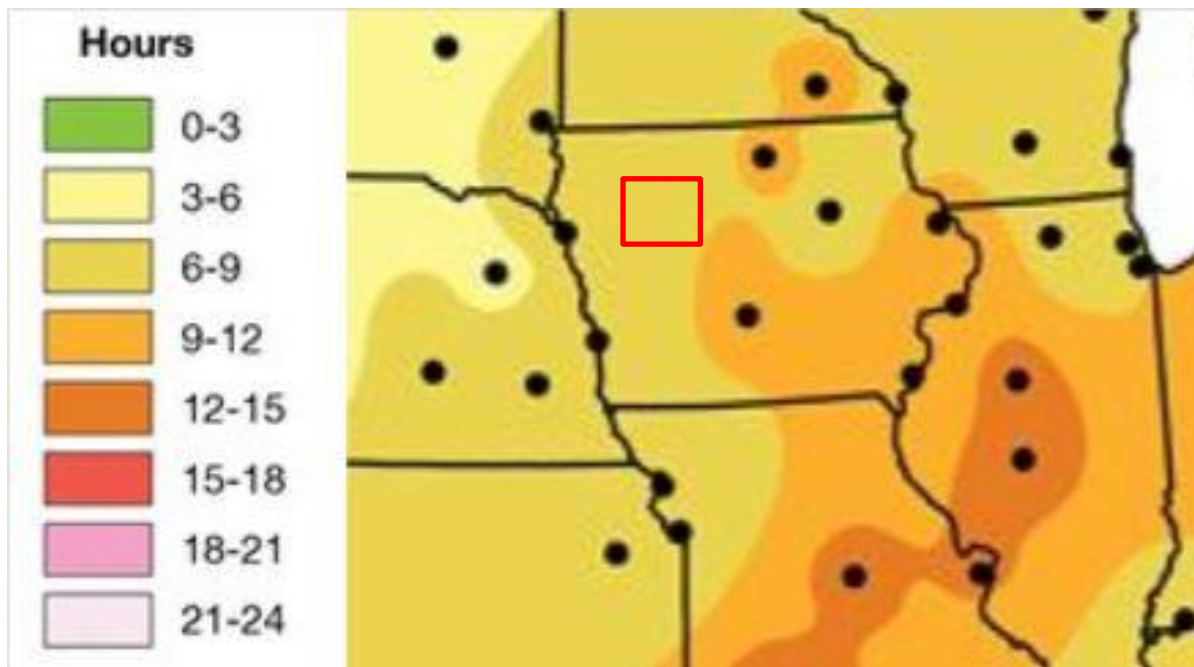
Location

According to the High Plains Regional Climate Center (<http://climod.unl.edu/>) and based on the Colo Weather Station, the planning area has an average high temperature of 52 degrees Fahrenheit in December, 47 degrees Fahrenheit in January, and 54 degrees Fahrenheit in February. Average lows for those same three months are 32, 34, and 38 degrees Fahrenheit, respectively. Average snowfall is highest in December, January, and February with an annual average of 26.8 inches.

The entire state of Iowa is vulnerable to heavy snow, extreme cold temperatures, and freezing rain. Generally, winter storms occur between the months of November and March but can occur as early as October and as late as April.

Figure 4-36 shows that the planning area (approximated within the red square) is mostly in the light-brown shaded area that receives 6-9 hours of freezing rain per year. Figure 4-37 shows that the planning area (approximated within the red square) has an average 5 days per year with freezing rain.

Figure 4-36 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.

Figure 4-37 Average Number of Days per Year with Freezing Rain



Historic Occurrences

From 1996 to December 2022, the NCEI database reported 19 blizzard events, 10 extreme cold/wind chill events, 12 heavy snow events, 4 ice storm events, and 34 winter storm events in Buena Vista County. This results in a total of 79 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 \$2,273,000 in property damages. These events did not result in any crop damages as well, according to NCEI. This frequency translates to an average of approximately 3 winter storm events per year.

Historically, there has been one Major Disaster Declaration for severe ice storm in January 1991 and then an Emergency Declaration for snowstorm in 2007 for Buena Vista County since 1953.

NOAA's National Weather Service has issued 461 Advisory, Watch, and/or Warnings concerning winter weather phenomena in the planning area between 2005 and December 2022. This data is housed by the Iowa Environmental Mesonet, Iowa State University Department of Agronomy website and the summary of these issuances can be found below in Table 4-37.

Table 4-37 National Weather Service Issuances for Winter Weather in Buena Vista County, IA

Phenomena	Significance	Incidents 2005-2021
Blizzard	Warning	18
Blizzard	Watch	11
Blowing Snow	Advisory	1
Freeze	Warning	16
Freeze	Watch	3
Freezing Fog	Advisory	2
Freezing Rain	Advisory	5
Frost	Advisory	25
Heavy Snow	Warning	1
Ice Storm	Warning	2
Snow	Advisory	17
Snow and Blowing	Advisory	1
Wind Chill	Advisory	112
Wind Chill	Warning	15
Wind Chill	Watch	4
Winter Storm	Warning	32
Winter Storm	Watch	43
Winter Storm	Advisory	153
Total		461

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

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 according to the NCEI database, Buena Vista County can expect to experience 3 winter storm events per year, giving a rating of **Highly Likely**.

Magnitude/Severity

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.

Speed of Onset

The National Weather Service has developed effective weather advisories that are promptly and widely distributed. Radio, television, and All-hazard 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.

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 Assessment*, referenced in the 2018 Iowa State Hazard Mitigation Plan, average winter temperatures

in Iowa have trended 0.031 F° 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 food, 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.

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 15.1% of Buena Vista County's population is over the age of 65. Additionally, the US Department of Health and Human Services estimates that there are 254 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 Buena Vista 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. There would also be the potential impacts to shipping delays from a closure of any of the highways that 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. Cultural facilities in Buena Vista County can shut down as a result of severe winter weather. Cultural facilities include restaurants, parks, community centers, museums, and businesses.

Future Development

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

Differences By Jurisdiction

Although crop loss as a result of winter storm occurs more in the unincorporated portions of the planning area, the crops losses are not high since corn and soybeans are not in the ground during winter months and only get affected from unusual weather events. The density of vulnerable populations is higher in the cities. Transportation incidents related to winter storm could also impact all jurisdictions. With these vulnerabilities that apply to both urban and rural jurisdictions, the magnitude of this hazard is relatively equal. The factors of probability, warning time, and duration are also equal across the planning area. This hazard does not substantially vary by jurisdiction.

Risk Summary

- The overall significance of winter storms is **medium**.
- Winter storms of varying severity can be expected to impact the planning area multiple times each year.
- Winter storms have not historically caused significant damage or casualties in Buena Vista County, however the potential for these issues exists.
- There is a significant risk for vehicle accidents and stranded motorists, who may be unprepared to protect themselves from exposure, during winter storms.
- The largest impacts typically involve utility and transportation disruptions.
- Related hazards: Flooding, Windstorm.

4.3.14 Sinkhole

LOCATION	MAGNITUDE/ SEVERITY	FUTURE PROBABILITY	OVERALL SIGNIFICANCE
Limited	Negligible	Unlikely	Low

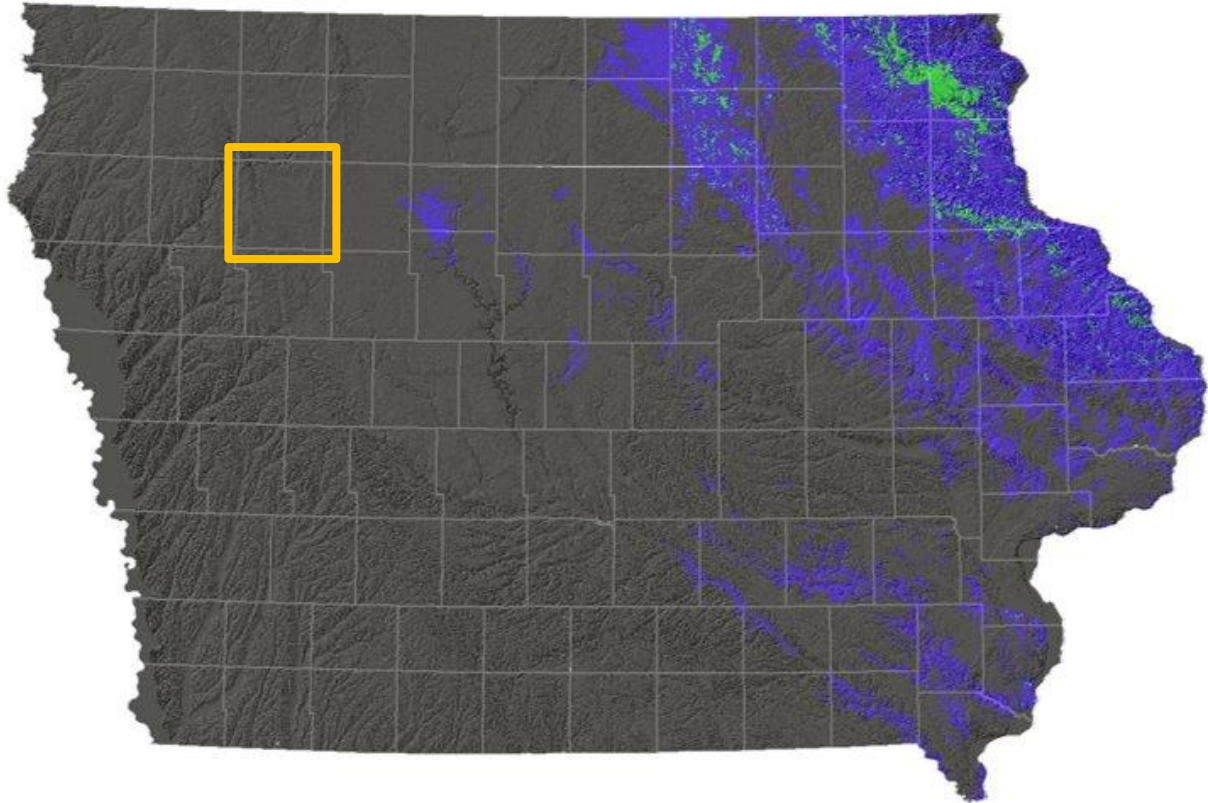
Description

According to the definition of “sinkhole” in the Iowa State Hazard Mitigation Plan, this phenomenon is caused from the loss of surface elevation due to the removal of subsurface support. The primary cause of sinkholes or subsidence is human caused; likely a result of underground mining, groundwater or petroleum withdraw, or drainage of organic soils. Sinkholes may destroy buildings, roads, and utilities.

Location

There is no information indicating that sinkholes have any significant impact in Buena Vista County. Figure 4-38 displays a map from the Iowa DNR that displays sinkhole potential across the State of Iowa. While this figure does not display any potential risk in Buena Vista County due to natural causes, human caused sinkholes are still possible throughout the County, particularly where water mains are located under the soil.

Figure 4-38 Sinkhole Potential in Iowa



Source: Iowa GIS Service Bureau, Data from the Iowa DNR
Note: Orange box outlines Buena Vista County.

Historic Occurrences

There has been no recorded history of injuries, deaths, or monetary damages that sinkholes have caused in Buena Vista County. While there is no detailed historical documentation of major sinkhole events in Buena Vista County, details from several sinkholes in Iowa have been documented by the USGS and the Iowa DoT:

- **April 2016:** A sinkhole occurred in Des Moines, Iowa, due to sediment caving into an abandoned coal mine. Nobody was injured.
- **April 2014:** A water main broke under a street in Burlington, Iowa, causing the road to cave in on itself. Nobody was injured, but the road required repairs.
- **October 2013:** A sinkhole along I-80 in Council Bluffs resulted in significant damages to the road.

Probability of Future Occurrence

Sinkholes are considered **unlikely** in Buena Vista County. Less than 10% probability in any given year (up to 1 in 10 chance of occurring), history of events is less than 10% likely or the event is unlikely but there is a possibility of its occurrence. Even though there is no detailed history of sinkholes to base probability off, the scenario the county planning team used to estimate probability is having one sinkhole a year over a ten-year period would have a 10% of occurring.

Magnitude/Severity

Sinkholes are considered to have **negligible** magnitude. Less than 10% of property severely damaged, shutdown of facilities and services for less than 24 hours, and/or injuries/illnesses treatable with first aid. There were no injuries, deaths, or property damages due to sinkholes in the County.

Climate Change Considerations

Increased flooding and drought conditions can contribute to sinkhole activity. During periods of extreme drought, water levels can drop, leaving space for soil and ground to fall into and create sinkholes. Sinkhole activity can also be accelerated by extreme flooding and rainstorms when water washes away sediment and causes erosion which contributes to sinkholes.

Vulnerability

People

Large sinkholes can kill and injure people when cars, buses, and homes are engulfed. A person can be harmed when stepping into an existing sinkhole or when the ground beneath gives way during a sinkhole's collapse. Sinkholes can also cause residential displacement when a sinkhole causes the destruction of homes forcing the homeowners to relocate. Due to the County having no history of sinkholes, it is rare that a significant sinkhole event would occur that causes injury or death.

Property

All property is vulnerable to sinkholes. Sinkholes can destroy homes, roads, and other infrastructure. Depending on the size of the sinkholes, which can vary greatly from tens to hundreds of meters, damages can be rather localized or swallow entire buildings.

Critical Facilities and Infrastructure

Critical infrastructure is vulnerable to sinkholes. Like property, any critical infrastructure building in the planning area could be structurally weakened by a sinkhole. Roadways and highways can be significantly damaged or destroyed by sinkholes, which poses risk to commuters.

Economy

Economic damages from sinkholes would most likely impact structures located on or near the sinkhole. The USGS reported that over the last 15 years, sinkholes have caused an estimated \$300 million in damages annually in the United States. However, there is no standard method for tracking losses due to sinkholes, so the estimated losses are likely to be lower than actual cost.

Environment and Cultural Resources

Sinkholes can pose a threat to the environment by reducing water quality and polluting aquifers with sediment.

Development Trends

While sinkholes are not likely to occur in the County, all new infrastructure built in the County is equally vulnerable to the possibility of sinkholes. Sinkholes caused by watermain breaks will be the most likely cause of sinkholes in the future. The development of new sinkholes has been correlated to land-use practices, most commonly from groundwater pumping related to construction.

Differences By Jurisdiction

Only Linn Grove, Sioux Rapids, Storm Lake, and Unincorporated Buena Vista County have identified sinkholes as a hazard that they are vulnerable to.

Risk Summary

Overall, sinkhole hazard is ranked as low for the County.

- The Iowa DNR found that Buena Vista County is not vulnerable to naturally occurring sinkholes. However, it is possible for sinkholes to occur due to abandoned mines and local watermain break; therefore, geographic area is rated as **limited**.
- There is no history of sinkholes occurring in Buena Vista County; therefore, the probability of future occurrence is rated as **unlikely**.
- The magnitude of sinkholes in the County is **negligible**. Damages are typically localized to a single area. Unincorporated Buena Vista County, Linn Grove, Sioux Rapids, and Storm Lake identified sinkholes as a hazard they are vulnerable to; therefore, the rating of magnitude for these jurisdictions is higher.
- Sinkholes can displace homeowners and disrupt roadway travel. Injury and death due to sinkholes is uncommon but is possible if a person falls into a sinkhole.
- In severe cases that result in very large sinkholes, whole buildings and cars can be swallowed. However, this is very rare and unlikely to happen in Buena Vista.
- The USGS reported that over the last 15 years, sinkholes have caused an estimated \$300 million in damages annually in the United States.
- Related hazards: Earthquake, Floods, Infrastructure failure, Levee/Dam Failure

4.3.15 Thunderstorms/Lightning/Hail

LOCATION	MAGNITUDE/ SEVERITY	FUTURE PROBABILITY	OVERALL SIGNIFICANCE
Extensive	Critical	Highly Likely	High

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. All thunderstorms are dangerous, according to FEMA. Associated dangers of thunderstorms include tornados, strong winds, hail, and flash flooding. Flash flooding is responsible for the most deaths. Dry thunderstorms that do not produce rain that reaches the ground are most prevalent in the western United States. Falling raindrops evaporate, but lightning can still reach the ground and can start wildfires.

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.

Location

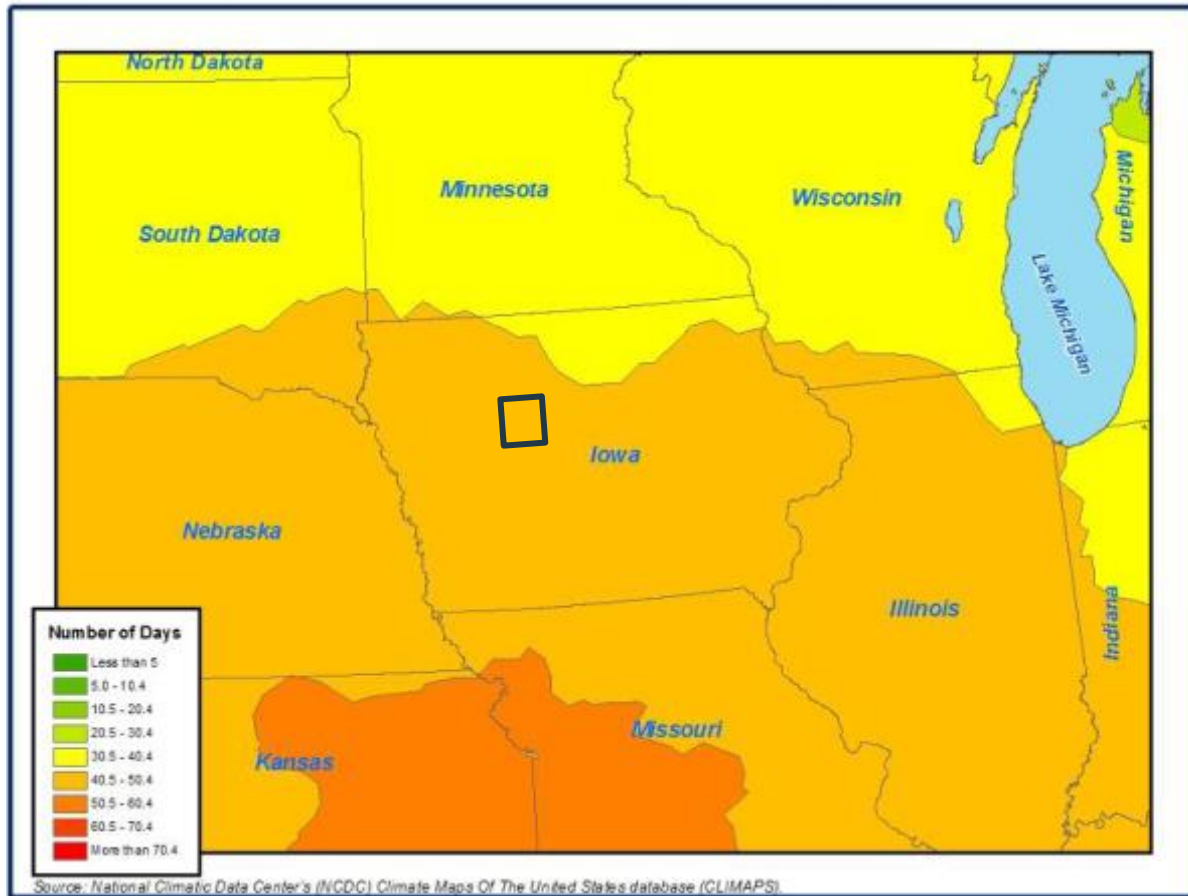
Thunderstorms and the associated hail and lightning impact the entire County with relatively similar frequency. Although, these events occur similarly throughout the planning area, they are more frequently reported in more urbanized areas. In addition, damages are more likely to occur in more densely developed urban areas.

Historic Occurrences

According to NCEI data, Buena Vista County has experienced 145 events of hail or lightning from 1960 to 2021 (the time frame for which data was available). In total, these events have caused \$137,000 in property damages and \$365,000 in crop damages. From 1986 to 2022, the Iowa State Environmental Mesonet Database reported 704 Severe Thunderstorm Watches and Warnings from the National Weather Service issued for Tama County.

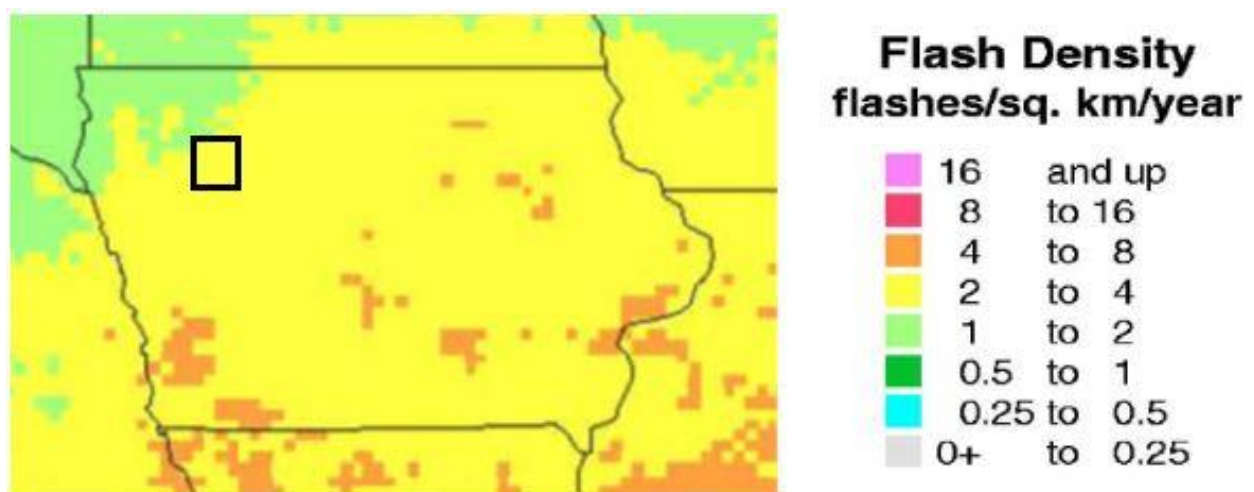
Figure 4-39 displays the average number of days with thunder experienced throughout different areas of the county each year, showing the County experiences between 40.5 to 50.4 days with thunder per year. Figure 4-40 shows 2 to 4 lightning strikes per square kilometer per year in the yellow shaded areas. Figure 4-41 below illustrates past recorded instances of notable hail throughout the county since 1955 by size of the hailstone. Overall, the county occurrence is high, and thunderstorms will continue to occur annually; however, there are variations among jurisdictions when it comes to the severity and impact of individual events.

Figure 4-39 Distribution and Frequency of Thunderstorms



Note: Black Square indicates approximate location of Buena Vista County

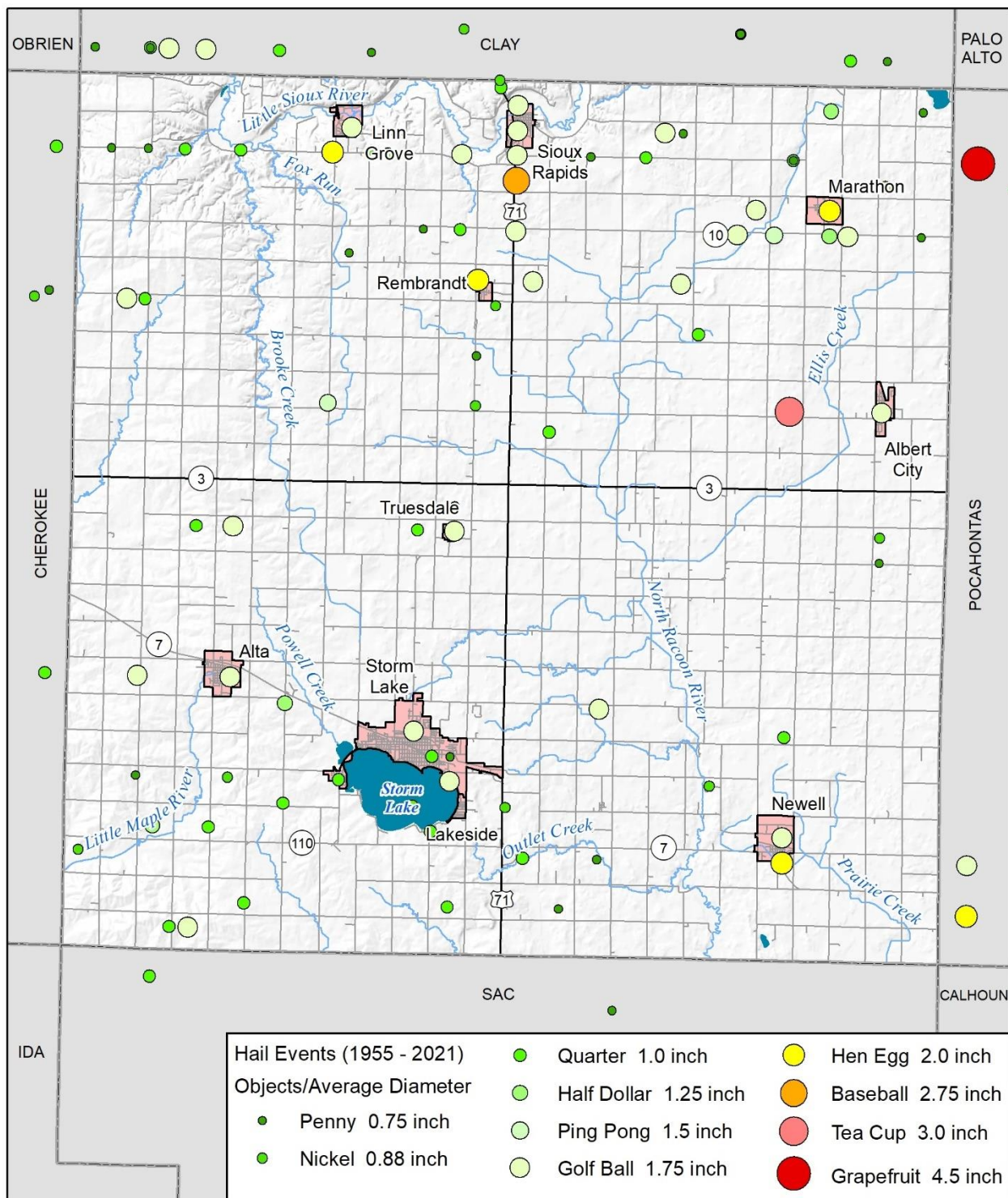
Figure 4-40 Location and Frequency of Lightning in Iowa



Source: NWS, www.lightningsafety.noaa.gov/lightning_map.htm

Note: Black Square indicates approximate location of Buena Vista County

Figure 4-41 Buena Vista County Historic Hail Occurrences, 1955-2021



Map compiled 10/2022;
intended for planning purposes only.
Data Source: Buena Vista County, Iowa DNR,
NOAA, National Weather Service SVRGIS 2021

0 5 10 Miles



Probability of Future Occurrence

Thunderstorms/lightning/hail are considered **highly likely** in Buena Vista County. Based on the number of Severe Thunderstorm Watches and Warnings issued since 1986, the county can expect to see an average of 8 to 9 severe thunderstorms per year. This means there is essentially a 100% chance of a thunderstorm/lightning/hail event on an annual basis.

Magnitude/Severity

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.

Based on information provided by the Tornado and Storm Research Organization, Table 4-38 below describes typical damage impacts of the various sizes of hail.

Table 4-38 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

Climate Change Considerations

Climate change presents a significant challenge for risk management associated with severe weather. The frequency of severe weather events has increased steadily over the last century. The number of weather-related disasters during the 1990s was four times higher than in the 1950s, and cost 14 times as much in economic losses. Historical data shows that the probability for severe weather events increases in a warmer climate. The changing hydrograph caused by climate change could have a significant impact on the intensity, duration, and frequency of storm events. All of these impacts could have significant economic consequences.

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.

Effects of this hazard 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.

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 \$137,000 in property damages and \$365,000 in crop damages occurred in Buena Vista County from hail and lightning. 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.

Additionally, the USDA Risk Management Agency reports that 12,545 acres of crops have been damaged by hail since 2007, resulting in \$1,655,716 in crop indemnity payments made. Agricultural crops such as corn and beans are particularly vulnerable to hailstorms stripping the plant of its leaves.

Environment and Cultural 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 Buena Vista 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.

Differences By Jurisdiction

The risk of thunderstorms, hail, and lightning is uniform across the county.

Risk Summary

- Thunderstorms, hail, and lightning have an overall significance of **High**.



- There have been 145 recorded hail and lightning events in Buena Vista County since 1960, according to NCEI. The actual number of events is likely much higher, with an average of 8-9 Severe Thunderstorm Watches and Warnings issued per year.
- 8% of Medicare beneficiaries in the County rely on electricity-dependent medical equipment to live independently in their own homes making them vulnerable to lightning and severe wind events that may result in power outages.
- Related hazards: Flooding, Wildfire, Tornado/Windstorm.

4.3.16 Tornado/Windstorm

LOCATION	MAGNITUDE/ SEVERITY	FUTURE PROBABILITY	OVERALL SIGNIFICANCE
Extensive	Moderate	Highly Likely	High

Description

This hazard section discusses both tornados and straight-line windstorms.

Tornado

The NWS defines a tornado as a violently rotating column of air extending from a thunderstorm to the ground. It is usually spawned by a thunderstorm and produced when cool air overrides a layer of warm air, forcing the warm air to rise rapidly. Often, vortices remain suspended in the atmosphere as funnel clouds. When the lower tip of a vortex touches the ground, it becomes a tornado and a force of destruction.

Tornadoes are the most violent of all atmospheric storms and are capable of tremendous destruction. Wind speeds can exceed 250 miles per hour, and damage paths can be more than one mile wide and 50 miles long. Tornadoes have been known to lift and move objects weighing more than 300 tons a distance of 30 feet, toss homes more than 300 feet from their foundations, and siphon millions of tons of water from water bodies. Tornadoes also generate a tremendous amount of flying debris or "missiles," which often become airborne shrapnel that causes additional damage. If wind speeds are high enough, missiles can be thrown at a building with enough force to penetrate windows, roofs, and walls. However, the less spectacular damage is much more common.

Iowa is located in "Tornado Alley", which consists of Texas, Oklahoma, Kansas, Missouri, Nebraska, and Iowa. Tornadoes have been known to lift and move huge objects, destroy, or move whole buildings long distances, and siphon large volumes from bodies of water. Historically, 40 - 50 tornadoes are confirmed in Iowa per year. Developed areas occupy a growing portion of Iowa and stand a likely chance of having a tornado occur in the next ten years. Those most at risk from tornadoes include people living in mobile homes, campgrounds and other dwellings without secure foundations or basements. People in automobiles are also very vulnerable. 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 watches and warnings due to language barriers are also at risk.

Windstorm

Windstorms for purposes of this plan refer to other non-tornadic damaging winds of thunderstorms including downbursts, microbursts, and straight-line winds. Downbursts are localized currents of air blasting down from a thunderstorm, which induce an outward burst of damaging wind on or near the ground. Microbursts are minimized downbursts covering an area of less than 2.5 miles across. They include a strong wind shear (a rapid change in the direction of wind over a short distance) near the surface. Microbursts may or may not include precipitation and can produce winds at speeds of more than 150 miles per hour. Straight-line winds are generally any thunderstorm wind that is not associated with rotation. It is these winds, which can exceed 100 mph, which represent the most common type of severe weather and are responsible for most wind damage related to thunderstorms. Since thunderstorms do not have narrow tracks like tornadoes, the associated wind damage can be extensive and affect entire (and multiple) counties. Objects like trees, barns, outbuildings, high-profile vehicles, and power lines/poles can be toppled or destroyed, and roofs, windows, and homes can be damaged as wind speeds increase.

Another form of windstorm common along the great plains is a derecho, which 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 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.

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.

The Enhanced Fujita Tornado Scale

According to data obtained from the NCEI website, the original F-scale was reclassified after the deadly tornadoes in Jarrell, TX in May 1997 and Moore/Oklahoma City in May 1999. Some meteorologists believed the wind estimates in the original F-scale may be too high, based upon the amount of damage being discovered after certain tornado events. In addition to the limitations of weak structures in conveying strong tornado damage, the original Fujita scale has several other weaknesses. For instance, rankings were subjective and based solely on the damage caused by a tornado. Another reason for reconfiguring the F-scale was that it became difficult to apply a F-scale rating with no damage indicators (if a tornado hits no structures, large trees, etc.), as well as limited accountability for construction quality and variability along with no definitive correlation between damage and wind speed.

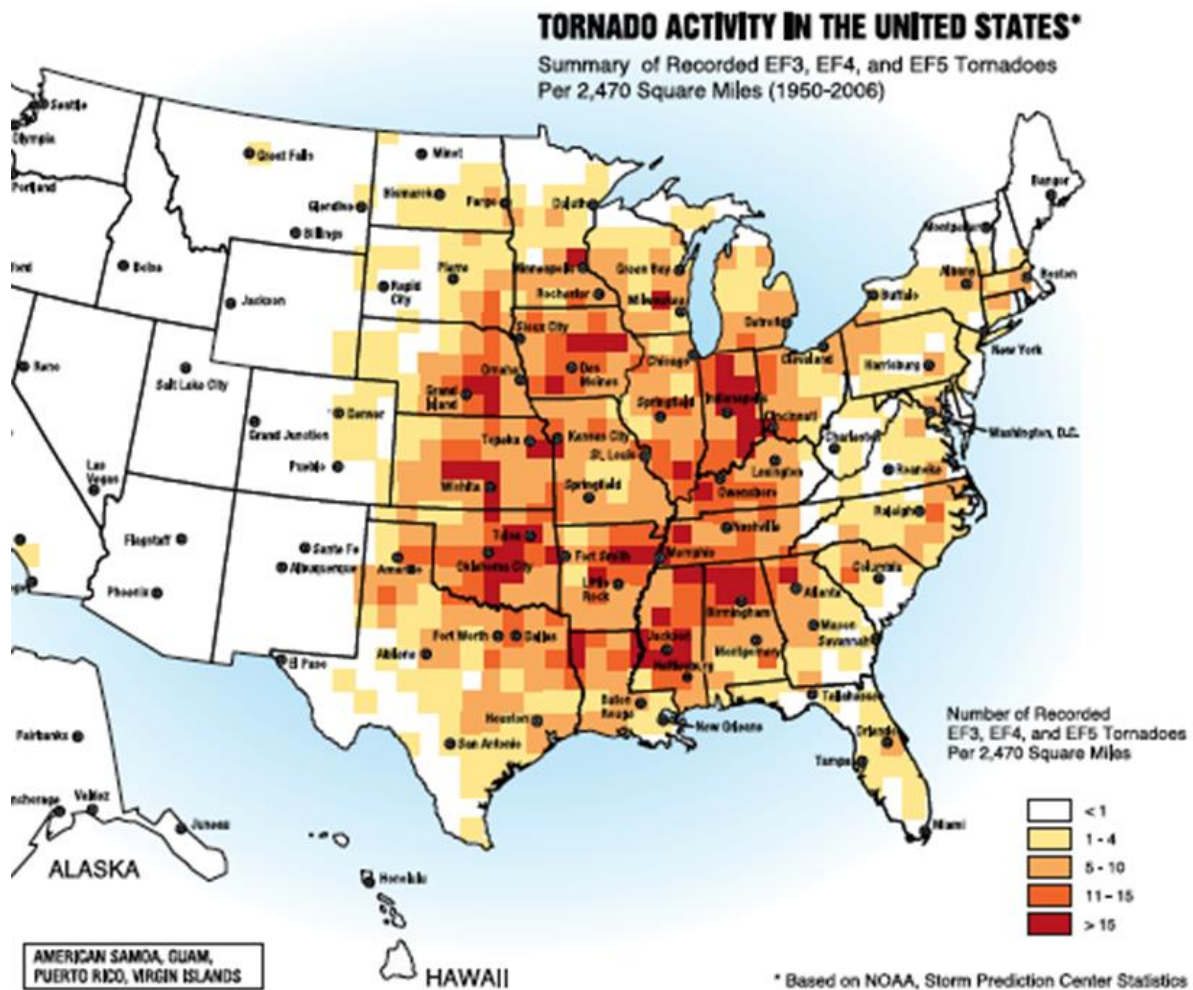
The new EF-scale was unveiled by the National Weather Service to the public in 2006. In February 2007, the Enhanced Fujita scale replaced the original Fujita scale in all tornado damage surveys in the United States. Below is a table comparing the estimated winds in the original F-scale and the operational EF-scale that is currently in use by the National Weather Service.

Location

As mentioned above, 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. According to the National Weather Service, an additional 114 tornadoes occurred in 2021 and 42 in 2022. Only one EF5 rated tornado has occurred in Iowa during this timeframe (Parkersburg in 2008).

Most tornadoes occur in May and June, but they can occur during any month. Also, midafternoon until around sunset is the peak time of day for tornado activity. There have been 830 injuries and 30 deaths attributable to tornadoes from 1980 through 2019. (NWS, Iowa Tornado Climatology Report 1980-2019). Tornadoes can occur throughout the entire planning area. Figure 4-42 illustrates the number of F3, F4, and F5 tornadoes recorded in the United States per 3,700 square miles between 1950 and 2006. Buena Vista County is within the section indicating between 5-15 tornadoes of this magnitude during this 57-year period.

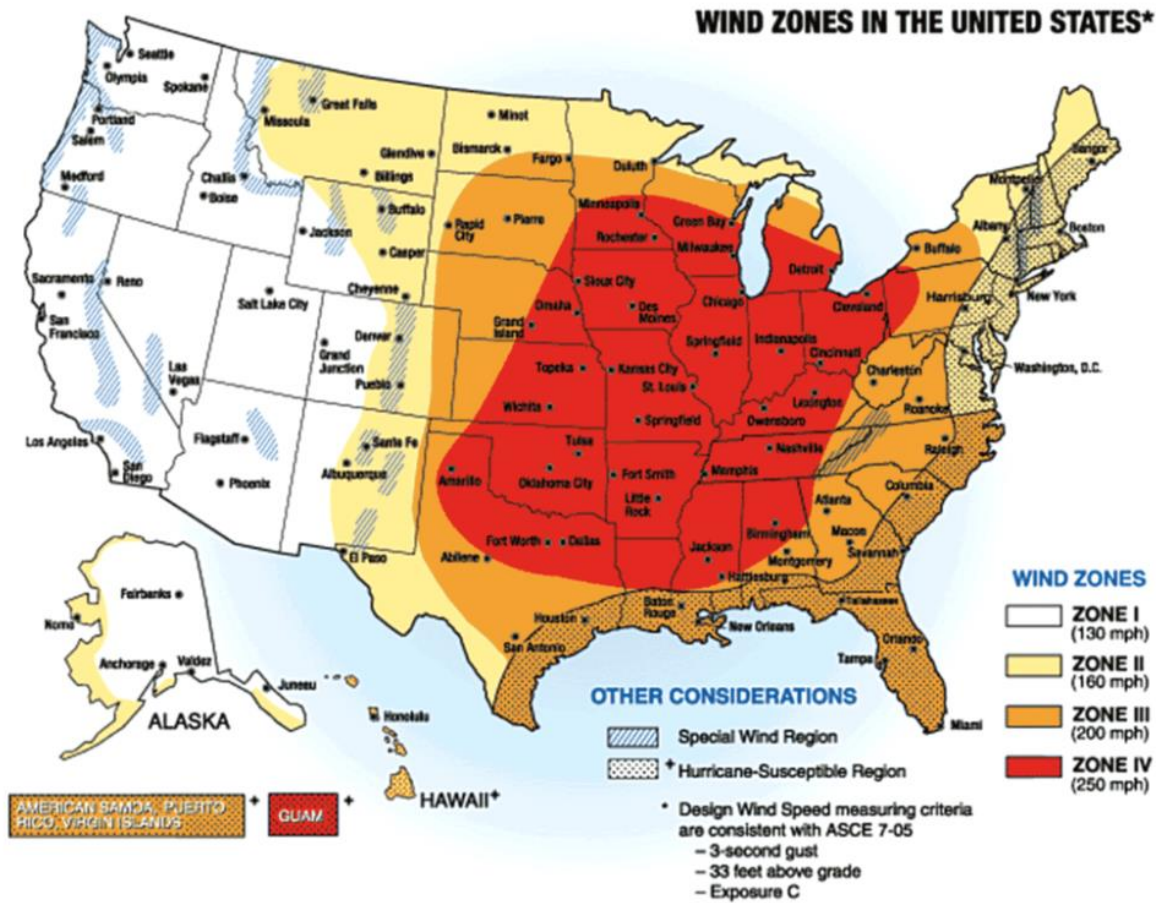
Figure 4-42 Tornado Activity in the United States



Source: FEMA 320, Taking Shelter from the Storm, 3rd Edition

Similar to tornadoes, all of Buena Vista County is susceptible to high wind events. 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 4-43 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 4-43 Wind Zones in the United States



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

Historic Occurrences

Tornadoes

According to NCEI records Buena Vista County had 24 recorded tornado events from 1958 to 2022. During this time frame, there was \$6.15 million in property damages, \$5,000 in crop damage, and three injuries (all from the same tornado in 1984). Many of the local jurisdictions have been directly impacted by tornadoes, especially the rural area. Table 4-39 summarizes these events. The map in Figure 4-44 shows the paths of the events in the table above that were from 1950 to 2021. Note: Not all events had available latitude and longitude coordinates. As a result, not all events are displayed.

Table 4-39 Recorded Tornadoes in Buena Vista County, 1958-2022

Date	Magnitude	Fatalities	Injuries	Property Damages	Crop Damages	Begin Location	End Location
8/5/1958	F2	0	0	\$2,500	\$0		
7/11/1960	F1	0	0	\$250,000	\$0		
6/11/1964	F1	0	0	\$25,000	\$0		
8/8/1969	F2	0	0	\$250,000	\$0		

Date	Magnitude	Fatalities	Injuries	Property Damages	Crop Damages	Begin Location	End Location
7/5/1978	Unknown	0	0	\$25,000	\$0		
5/29/1980	F1	0	0	\$25,000	\$0		
6/7/1984	F2	0	3	\$2,500,000	\$0		
6/16/1990	F1	0	0	\$250,000	\$0		
6/5/1994	F1	0	0	\$50,000	\$5,000	Sulphur Springs	
5/28/1998	F0	0	0	\$0	\$0	Albert City	Albert City
5/28/1998	F0	0	0	\$0	\$0	Marathon	Marathon
6/11/2004	F0	0	0	\$0	\$0	Marathon	Marathon
4/9/2011	EF0	0	0	\$0	\$0	Sulphur Springs	Sulphur Springs
4/9/2011	EF2	0	0	\$1,000,000	\$0	Newell	Newell
4/9/2011	EF1	0	0	\$10,000	\$0	Newell	Newell
4/9/2011	EF2	0	0	\$10,000	\$0	Newell	Newell
4/9/2011	EF0	0	0	\$0	\$0	Alta	Alta
4/9/2011	EF0	0	0	\$0	\$0	Alta	Alta
10/4/2013	EF1	0	0	\$1,200,000	\$0	Hanover	Alta
8/5/2018	EF0	0	0	\$0	\$0	Linn Grove	Linn Grove
8/8/2021	EF0	0	0	\$0	\$0	Albert City	Albert City
12/15/2021	EF1	0	0	\$200,000	\$0	Hanover	Alta
12/15/2021	EF1	0	0	\$100,000	\$0	Alta	Linn Grove
12/15/2021	EF2	0	0	\$250,000	\$0	Rembrandt	Sioux Rapids
	Total	0	3	\$6,147,500	\$5,000		

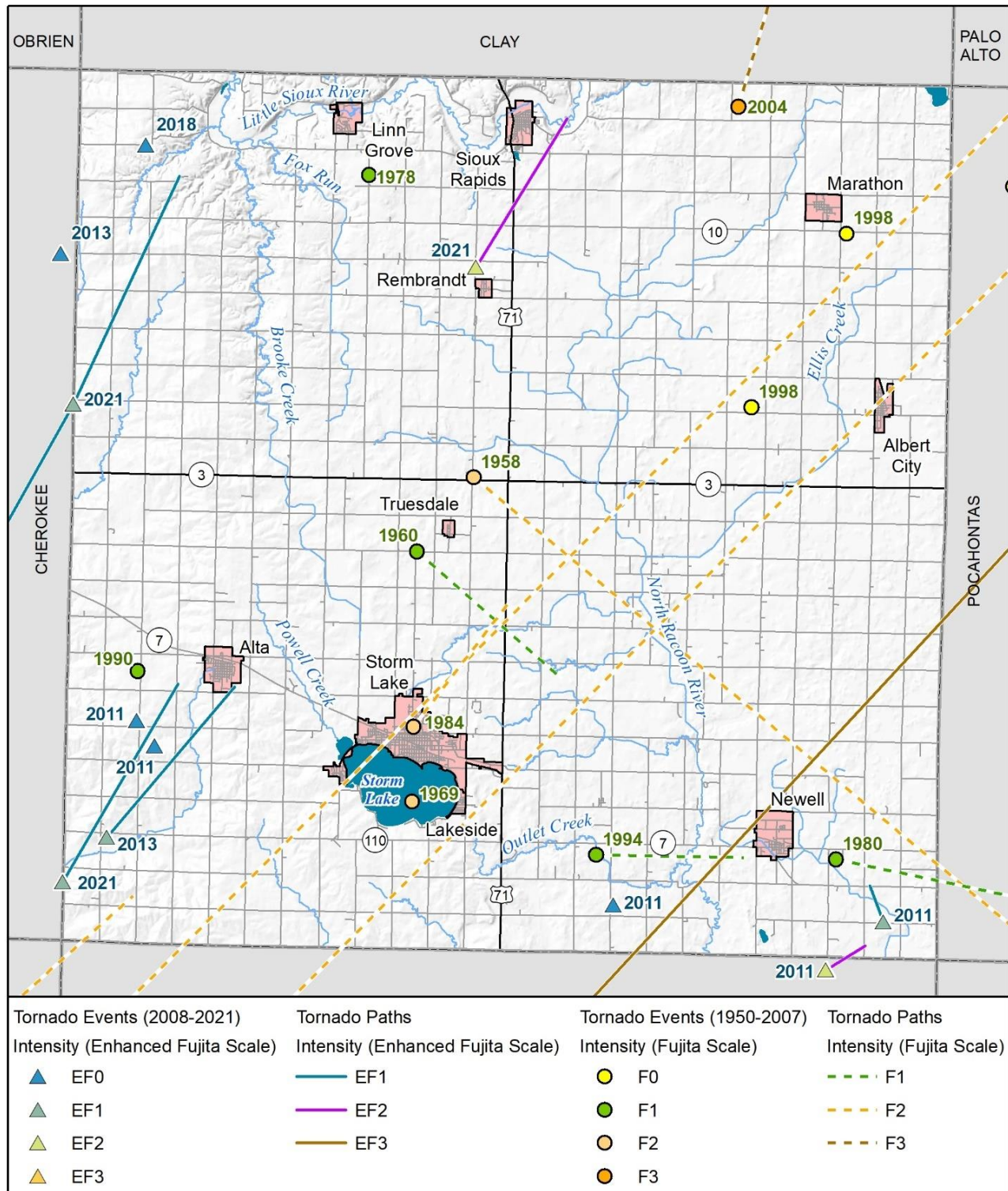
Source: NCEI Storm Events Database

Windstorms

According to the NCEI database, there have been 140 wind events in Buena Vista County from 1957 to 2022. During this time period there were five injuries and no deaths reported. There was an estimated \$1.2 million in property damages and \$13,000 in crop damages. It is difficult to determine from the NCEI data how much of the high wind damage is located in Buena Vista County, due to the large area such wind events often cover. Figure 4-45 shows the locations and wind speeds of notable wind events in the county since 1955.

Over the recent history of Buena Vista County, windstorms have affected all jurisdictions and have caused widespread damage to trees, crops, buildings, and property in yards and on farms. According to the USDA Risk Management Agency, between 2007 and 2021 Buena Vista County has sustained 2,276 acres of damaged crops and \$236,763 indemnity payments due to windstorm events.

Figure 4-44 Tornado Paths in Buena Vista County, 1950-2021

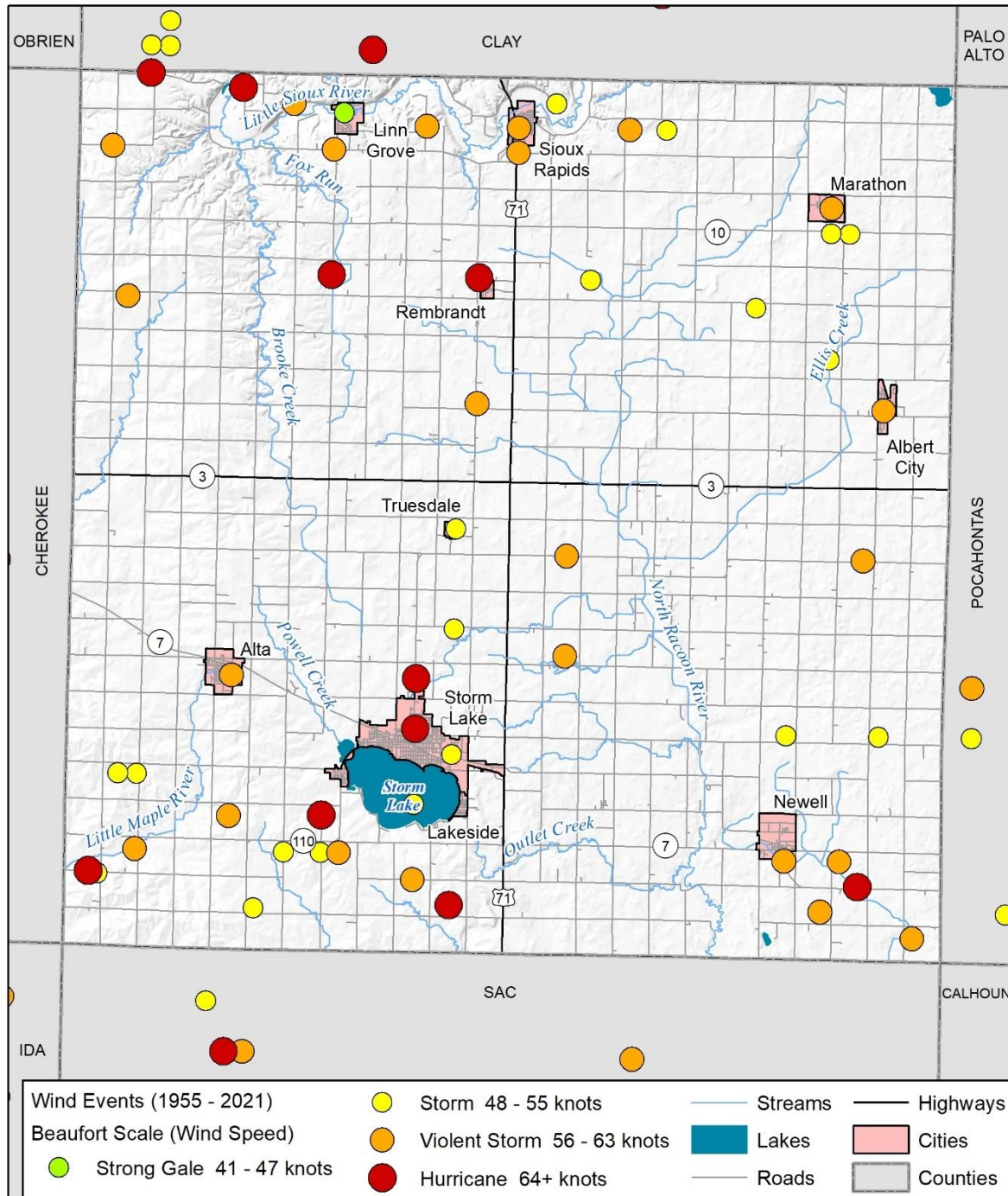


Map compiled 10/2022;
intended for planning purposes only.
Data Source: Buena Vista County, Iowa DNR,
NOAA, National Weather Service SVRGIS 2021

0 5 10 Miles



Figure 4-45 Buena Vista County Wind Events, 1955-2021



Map compiled 10/2022;
intended for planning purposes only.
Data Source: Buena Vista County, Iowa DNR,
NOAA, National Weather Service SVRGIS 2021

0 5 10 Miles



Probability of Future Occurrence

According to the available data, tornados/windstorms are considered **highly likely** in Buena Vista County. There is a more than 33% probability in any given year. NCEI reports 24 tornado and 140 windstorm events

in Buena Vista County between 1958 and 2022. Based on these statistics there is a 38% (24 events/64 years) probability of a tornado occurring and over a 100% chance of a high wind event occurring annually.

Magnitude/Severity

Historically, tornadoes and windstorms in Buena Vista County have been of **moderate** magnitude. However larger and more damaging tornadoes and windstorms have occurred within Iowa, and remain possible in the planning area.

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 Fujita Scale (see Table 4-40) 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. Tornadoes up through EF 5 are possible in the planning area.

Table 4-40 Enhanced Fujita Scale

EF-Scale	Wind Speed	Classification	Type of Damage Done
EF-0	65-85 mph (105-137 km/h)	Light damage	Peels surface off some roofs; some damage to gutters or siding; branches broken off trees; shallow-rooted trees pushed over.
EF-1	86-110 mph (138-178 km/h)	Potential damage	Roofs severely stripped; mobile homes overturned or badly damaged; loss of exterior doors; windows and other glass broken.
EF-2	111-135 mph (179-218 km/h)	Considerable damage	Roofs torn off houses; foundations of frame homes shifted; mobile homes completely destroyed; large trees snapped or uprooted; light-object missiles generated; cars lifted off ground.
EF-3	136-165 mph (219-266 km/h)	Severe damage	Entire stories 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.
EF-4	166-200 mph (267-322 km/h)	Devastating damage	Well-constructed houses and whole frame houses completely leveled; cars thrown, and small missiles generated.
EF-5	200 mph + (322 km +)	Total destruction	Strong frame houses leveled off foundations and swept away; automobile- sized missiles fly through the air in excess of 100 m (109 yd); steel reinforced concrete structure badly damaged; high-rise buildings have significant structural deformation; incredible phenomena will occur.

Source: Tornado EF Scale.com

Since the Enhanced Fujita Scale was introduced on February 1, 2007, there have only been two EF5 tornados recorded in the United States. The most recent one occurred in Parkersburg, Iowa on May 25, 2008 and leveled half the city.

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.

Similar to tornadoes, there are various scales to measure and convey the intensity of windstorms. 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 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.

Table 4-41 shows The Beaufort Wind Scale used to measure windstorm strength.

Table 4-41 The Beaufort Wind Scale

Force	Wind (Knots)	WMO Classification	Appearance of Wind Effects	
			On the Water	On Land
0	Less than 1	Calm	Sea surface smooth & mirror-like	Calm, smoke rises vertically
1	1-3	Light Air	Scaly ripples, no foam crests	Smoke drift indicates wind direction, still wind vanes
2	4-6	Light Breeze	Small wavelets, crests glassy, no breaking	Wind felt on face, leaves rustle, vanes begin to move
3	7-10	Gentle Breeze	Large wavelets, crests begin to break, scattered whitecaps	Leaves and small twigs constantly moving, light flags extended
4	11-16	Moderate Breeze	Small waves 1-4 ft. becoming longer, numerous whitecaps	Dust, leaves, and loose paper lifted, small branches move
5	17-21	Fresh Breeze	Moderate waves 4-8 ft taking longer form, many whitecaps, some spray	Small trees in leaf begin to sway
6	22-27	Strong Breeze	Larger waves 8-13 ft, whitecaps common, more spray	Larger tree branches moving, whistling in wires
7	28-33	Near Gale	Sea heaps up, waves 13-20 ft, white foam streaks off breakers	Whole trees moving, resistance felt walking against wind
8	34-40	Gale	Moderately high (13-20 ft) waves of greater length, crests begin to break into spindrift, foam blown in streaks	Whole trees in motion, resistance felt walking against wind
9	41-47	Strong Gale	High waves (20 ft), sea begins to roll, dense streaks of foam, spray may reduce visibility	Slight structural damage occurs, slate blows off roofs
10	48-55	Storm	Very high waves (20-30 ft) with overhanging crests, densely blown foam, heavy rolling, lowered visibility	Seldom experienced on land, trees broken or uprooted, considerable structural damage
11	56-63	Violent Storm	Exceptionally high (30-45 ft) waves, foam patches cover sea, visibility more reduced	
12	64+	Hurricane	Air filled with foam, waves over 45 ft, sea completely white with driving spray, visibility greatly reduced	

Source: Storm Prediction Center & NOAA

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.

The influence of climate change on wind is not fully understood at this time. While there have been several significant wind events in recent years, there is not enough observations to determine if there are any long-term trends in frequency of severity of events (US Global Change Research Program 2018).

Vulnerability

Those most at risk from tornadoes and windstorms include people living in mobile homes, campgrounds, and other dwellings without secure foundations or basements. People in automobiles are also very vulnerable to this hazard. 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. The likely effects include downed trees, power outages, and structural damage to houses and automobiles.

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, 8% 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 and 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 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.

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 3.6% of total housing (U.S. Census). Buena Vista fairs better than the state average, with 2.3% of total housing units being mobile homes. These still represent a vulnerability in the county to be addressed.

According to NCEI data, Buena Vista County experienced 24 tornado events from 1958 – 2022. These events caused a total of \$6,147,000 in property damage. The NCEI data also reports a total of 140 wind events from 1957 – 2022, causing a total of \$1,200,000 in property damages. The USDA RMA also reports that 2,276 acres of crops have been lost and \$236,763 in indemnity payments have been made in the county since 2007.

Critical Facilities and Infrastructure

All critical facilities and infrastructure are likely exposed to tornadoes and windstorms, though the likelihood of damage to any critical facilities or infrastructures from this hazard 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 and windstorms 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. Loss of electricity and phone connection would leave certain populations isolated because residents would be unable to call for assistance. 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

As mentioned above, tornadoes and windstorms 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.

Based on reported losses from NCEI and the USDA RMA detailed in the property section above, tornadoes and windstorms result in a combined annualized loss of approximately \$116,673 in crop and property damages.

Environment and Cultural 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

All future development will be affected by this hazard, particularly development that occurs at lower elevations. Any future development will need to meet regulations that require safe rooms, basements, or other structures that reduce risk to people would decrease vulnerability. This hazard is primarily a public safety and economic concern, and the planning area is located in a region with very high frequency of occurrence. Although this hazard occurs 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.

Differences By Jurisdiction

The risk of tornadoes and windstorms is uniform across the county.

Risk Summary

- Tornadoes and windstorms have an overall significance of **High**.
- There have been 24 recorded tornado events since 1958, and 140 recorded windstorm events in Buena Vista County since 1957, according to NCEI. The actual number of events is likely much higher, with an average of 3 tornado watches and 2 tornado warnings issued per year, as well as high wind events occurring annually.
- The strongest tornado recorded in the county have been F2/EF2 in magnitude. However, tornadoes up to EF5 have been recorded in the State of Iowa and are possible in the planning area.
- 8% of Medicare beneficiaries in the County rely on electricity-dependent medical equipment to live independently in their own homes making them vulnerable to high wind events that may result in power outages.
- Related hazards: Flooding, Wildfire, Thunderstorm/Lightning/Hail.

4.3.17 Transportation Incident

LOCATION	MAGNITUDE/ SEVERITY	FUTURE PROBABILITY	OVERALL SIGNIFICANCE
Significant	Moderate	Highly Likely	Medium

Description

Transportation incidents include any transportation accident involving any mode of transportation that directly threatens life, property damage, injury, or adversely impacts a community's capabilities to provide emergency services. A transportation incident can occur with air transportation, highway transportation, railway transportation, and waterways.

An air transportation incident may involve a military, commercial, or private aircraft. Air transportation is playing a more prominent role in transportation as a whole; airplanes, 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.

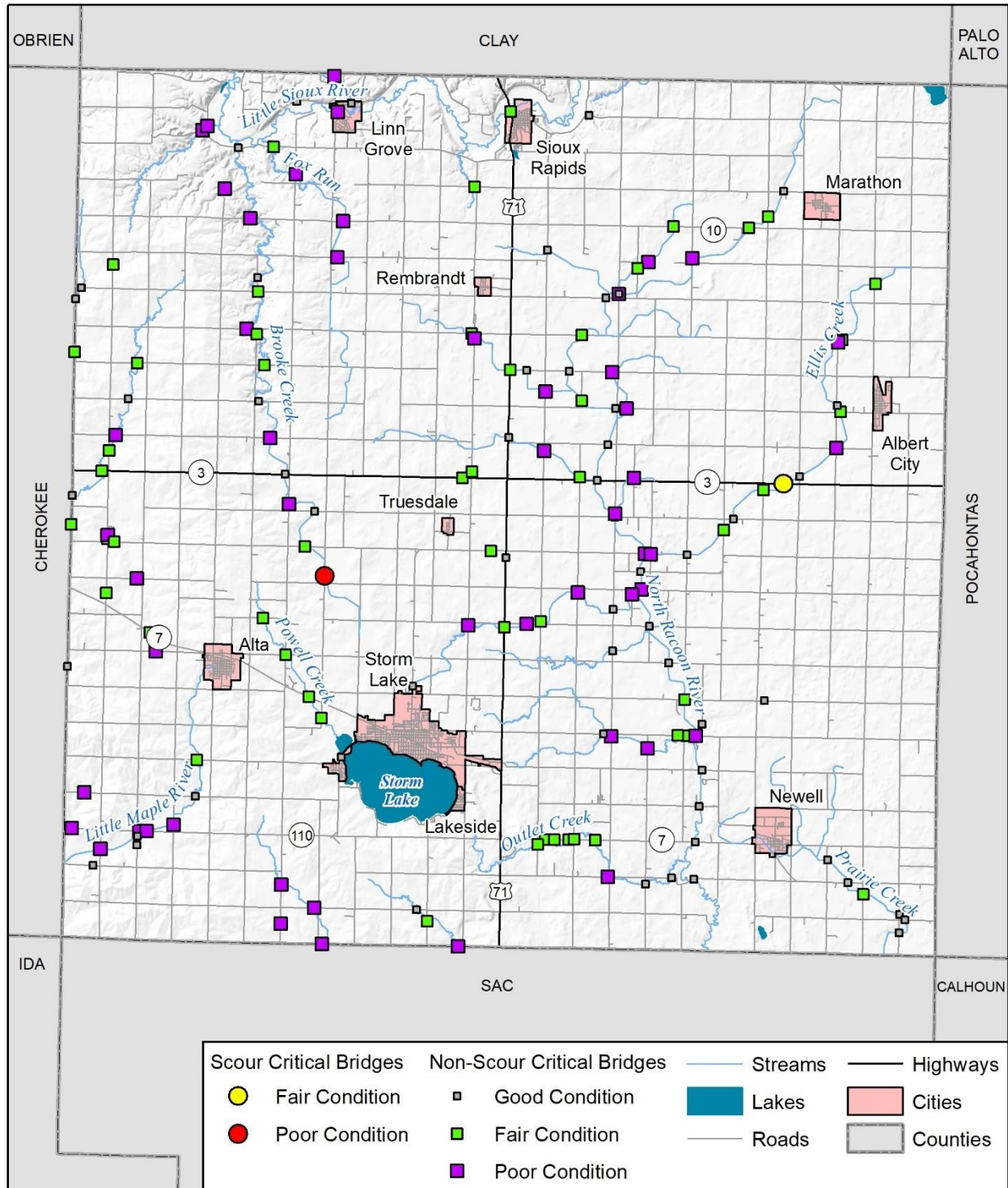
Location

The entire planning area is subject to transportation incidents and all participating jurisdictions are affected. The major transportation routes include U.S. Highway 71 and Iowa Highways 3, 7, 10, and 110. One airport, the Storm Lake Municipal Airport, exists in Buena Vista County in the City of Storm Lake. Storm Lake Marina, located in the City of Storm Lake, provides a popular boating destination for tourists and locals.

Railway incidents may include derailments, collisions, and highway/rail crossing accidents. Buena Vista County has two main rail lines in the county. The Union Pacific Railroad runs through the Cities of Marathon and Albert City and the Chicago, Central, & Pacific R.R. Co. runs along Highway 7, through the Town of Newell.

Figure 4-46 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.

Figure 4-46 Buena Vista County Bridges



Map compiled 10/2022;
intended for planning purposes only.
Data Source: Buena Vista County, Iowa DNR,
National Inventory of Bridges

0 5 10 Miles



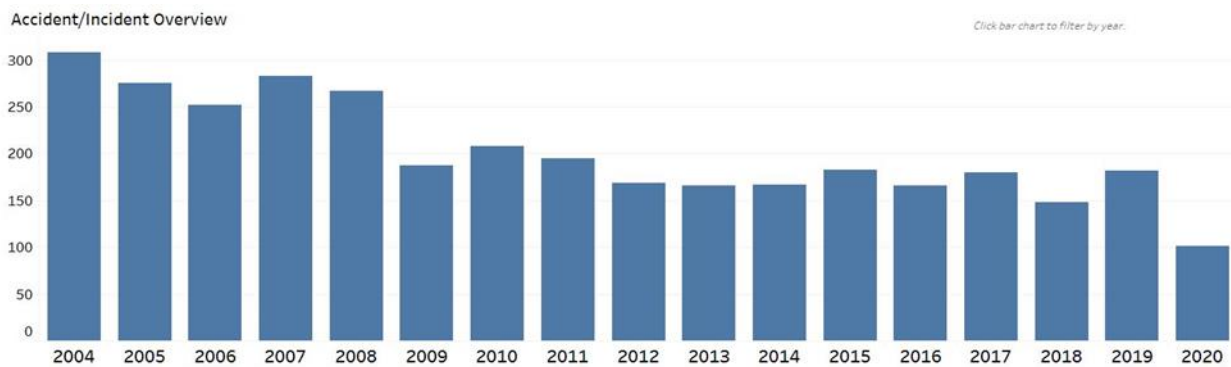
The National Bridge Inventory includes a scour index, which is used to quantify the vulnerability of a bridge to scour from flood or erosion. Bridges with a scour index between 1 and 3 are considered scour critical, or a bridge with a foundation element determined to be unstable for the observed or evaluated scour condition. There are only two scour critical bridges within the planning area, one of which is rated as being in fair condition and the other of which is rated in poor condition.

Historic Occurrences

Railway transportation incidents involving derailments have become a more common, and dangerous, occurrence with the increased shipment of oil and oil products. The Federal Railway Administration reported 22 railway accidents from 2001-2021. Of these accidents, 18 were highway-rail incidents. In total, six fatalities and 8 injuries were documented. One incident was reported in Buena Vista County on June 13, 2018, when an agricultural sprayer collided with a train when the sprayer attempted to turn northbound to cross the railroad tracks. The operator of the sprayer was pronounced dead at the scene (KICD News). The Federal Railroad Administration reported no train derailments in the County in the past decade.

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 4-47). Iowa has 5,157 public highway-rail crossings in the State on state, city and county highways.

Figure 4-47 Iowa Railway Accidents/Incidents, 2004-2020



Source: U.S. Department of Transportation Federal Railroad Administration, Overview Reports

There were four aviation incidents reported to the National Transportation Safety Board (NTSB) in Buena Vista County from 1967-2021. The oldest record occurred on November 28th, 1984, near the City of Storm Lake. On July 26th, 2008, an Air Tractor AT-401 plane crashed near Lakeview when a pilot contacted the top wire on a set of power lines while he was spraying crops. On June 21, 2010, a pilot and five passengers were in an aircraft accident when the aircraft was unable to come to a complete stop on the runway while landing due to poor weather conditions and high wind. The incident resulted in substantial damage to the nose and main landing gear. Nobody was injured. On July 11th, 2021, a crop duster plane crashed two miles north of Newell. Emergency crews were called to the scene. The pilot was not injured.

The Sioux City Journal reported a boating accident that occurred in Buena Vista County on the Little Sioux River, which occurred on June 29th, 2013, when a man fell into the river while working with a boat and never resurfaced.

Highway transportation incidents are likely throughout the county. According to vehicle crash data from the Iowa Department of Transportation, between 2012 and 2022, Buena Vista County experienced a total

of 3,098 total traffic crashes involving 6,775 occupants. The DoT reported that 447 minor injuries, 75 serious injuries, and 23 fatalities resulted from these accidents in the County.

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 noted 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.

Probability of Future Occurrence

According to the available data, transportation incidents are considered **highly likely** in Buena Vista County. However, when considering all forms of transportation incidents, it is rare that an incident will occur in the County other than roadway traffic accidents. In total, there was one railway incident, four aviation incidents, and one reported waterway incident in recent years. The data from the Iowa Department of Transportation reported that there have been 3,098 roadway traffic incidents from 2012-2022.

Magnitude/Severity

Historically, most transportation incidents in Buena Vista County have been of at most **moderate** magnitude. However larger and more serious incidents have occurred within Iowa, and remain possible in the planning area.

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.

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.

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

All have a state or county highway running through their jurisdiction and have the potential for a transportation incident.

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 Buena Vista County is higher. This is also true before and after major gatherings such as sporting events, concerts, and conventions. Pedestrians and citizens of the community are less vulnerable but still not immune from the impacts of a highway incident.

For railway transportation incidents, people, and property near the railway lines, crossing, sidings, switching stations, and loading/unloading points are most at risk. Those away from railroad tracks and facilities are vulnerable only to large-scale incidents including those in which hazardous materials are involved.

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. 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 4-42.

Table 4-42 Costs of a Traffic Crash

Severity	Cost per injury (in 2020 dollars \$)
Fatal	\$4,632,233
Evident Injury	\$64,139
Possible Injury	\$33,851
Property Damage Only	\$3,563

Source: 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.

Environment and Cultural Resources

Historic and cultural resources are equally vulnerable to transportation accidents as other types of property.

Development Trends

While development is not increased any increase in housing units in the future may increase the number of vehicles that cross the railroad at highway-railroad crossings in these jurisdictions. Increasing roadway infrastructure and the number of cars on the road will likely result in an increase in the number of transportation accidents in the Western Region. Increase in air travel is likely to continue and therefore the increase in number of aircraft disasters. Construction and re-routing of local roads also increases the chances of a traffic accident.

Differences By Jurisdiction

Transportation accidents are possible throughout the county, but are highest along the highways and rail lines. Jurisdictions with a higher risk of transportation accidents include Alta, Newell, Sioux Rapids, and Storm Lake.

Risk Summary

Overall, transportation incident hazard is ranked as **Medium** for the County.

- Historic records show 22 railway accidents (2001-2021), four aviation accidents (1967-2021), one boating accident (2012-2022), and 3,098 roadway traffic accidents (2012-2022). There are hundreds of road transportation accidents in the County every year, therefore, probability of future occurrence is ranked as **highly likely**.
- While airplane incidents can occur anywhere in the County, most transportation accidents are most likely to occur along roadways and railways; therefore, geographic area is ranked as **significant**.
- Most transportation incidents in Buena Vista County have been of **moderate** magnitude. However larger and more serious incidents have occurred within Iowa, and remain possible in the county.
- There have been 31 fatalities in the County due to roadway, railway, airway, and waterway incidents. Most of these deaths were due to roadway accidents.
- Transportation incidents can disrupt the distribution of goods and delay first responders.
- Significant economic impacts can result from transportation incidents. The U.S. Department of Transportation Federal Highway Administration estimated the cost of a fatality from a transportation incident totaled \$4,632,233.
- Related hazards: Infrastructure Failure, Severe Winter Weather, Hazmat Incident

5 Mitigation Strategy

44 CFR Requirement §201.6(c)(3):

[The plan shall include] a mitigation strategy that provides the jurisdiction's blueprint for reducing the potential losses identified in the risk assessment, based on existing authorities, policies, programs and resources, and its ability to expand on and improve these existing tools. This section shall include:

- (i) A description of mitigation goals to reduce or avoid long-term vulnerabilities to the identified hazards.*
- (ii) A section that identifies and analyzes a comprehensive range of specific mitigation actions and projects being considered to reduce the effects of each hazard, with particular emphasis on new and existing buildings and infrastructure.*
- (iii) An action plan describing how the actions identified in section (c)(3)(ii) will be prioritized, implemented, and administered by the local jurisdiction. Prioritization shall include a special emphasis on the extent to which benefits are maximized according to a cost benefit review of the proposed projects and their associated costs.*

This section presents the mitigation strategy updated by the HMPC based on the updated risk assessment. The mitigation strategy was developed through a collaborative group process and consists of validated general goal statements to guide the jurisdictions in efforts to lessen disaster impacts as well as specific mitigation actions that can be put in place to directly reduce vulnerability to hazards and losses. The following definitions are based upon those found in FEMA's 2013 Local Mitigation Planning Handbook:

- **Goals** are broad policy statements that explain what the community wants to achieve with the plan.
- **Objectives** are optional strategies to attain the goals and are more specific and measurable.
- **Mitigation Actions** are specific actions that help achieve goals.

5.1 Mitigation Goals & Objectives

The HMPC reviewed the goals and objectives from the 2018 HMP, and determined they still captured what the jurisdictions want to accomplish. Some minor wordsmithing was made to a couple goals, but no major revisions.

The Goals and related Objectives of the 2023 Buena Vista County HMP are:

- **Goal 1: Decrease impact of natural and human-caused hazards on life and private and public property.**
 - Objective 1.1: Use the most effective approaches to protect buildings and people from hazards.
 - Objective 1.2: Enact and enforce regulatory measures to ensure that new structures do not increase threats to existing properties.
 - Objective 1.3: Seek future projects to reduce threat of potential damages or injuries to residents and property in Buena Vista County.
- **Goal 2: Protect health, safety, and quality of life for the residents of Buena Vista County.**
 - Objective 2.1: Prioritize mitigation projects, policies, and programs. Start with those that address the greatest threats to health and safety of the residents as well as those that address threats to property. Utilize any disaster recovery plans existing after a disaster occurs.
 - Objective 2.2: Help property owners maintain and improve their properties by providing information on hazards and how they can mitigate against losses.
- **Goal 3: Ensure continued government and emergency functions in the event of a disaster.**

- Objective 3.1: Coordinate planning with the appropriate agencies in Buena Vista County to be prepared in the event of a disaster.
- Objective 3.2: Have exercises and have meetings that online roles and responsibilities of agencies handle which situations in the case of a disaster.
- **Goal 4: Provide public education and encourage preparedness.**
 - Objective 4.1: Helping people obtain resources that are important in a disaster situation.
 - Objective 4.2: Hold hazard awareness weeks to notify the public of the dangers can occur in all disaster situations.
 - Objective 4.3: Conduct hazard-specific public awareness campaigns.
 - Objective 4.4: Encourage the use of a family preparedness kit that will provide the adequate supplies during a disaster situation.
- **Goal 5: Ensure that public funding is being used efficiently to prevent hazards from occurring or to mitigate their impacts.**
 - Objective 5.1: Use public funding appropriately to protect critical facilities and public services.
 - Objective 5.2: Use public funds for projects on private property where the benefits to the public exceed the costs of the project.
 - Objective 5.3: Maximize the use of outside sources of funding, such as grant opportunities.
 - Objective 5.4: Encourage owner participation in mitigation efforts to protect their properties
- **Goal 6: Utilize planning tools and documents to consider, address, educate or enforce hazard mitigation actions.**
 - Objective 6.1: Use planning tools as a means to enforce hazard mitigation actions on both the city and county level.
 - Objective 6.2: Include mitigation actions in all new planning documents, and on planning document updates as a means of reiterating the important of the actions.

5.2 Progress on Previous Mitigation Actions

The jurisdictions reviewed and updated the status of each mitigation action identified in the 2018 HMP. Actions were listed as Not Started, In Progress, Continuous Implementation, Completed, or Deleted. As shown in Table 5-1, of the 368 actions in the 2018 HMP, 46 actions have been completed showing that the jurisdictions are making good progress in implementing mitigation activities. An additional 21 actions were determined to no longer be relevant and were deleted. The remaining 299 actions were continued over into the 2023 HMP, along with 55 new actions.

Table 5-1 Completed and Deleted Actions

Jurisdiction	#	Mitigation Action	Hazards Addressed	Comments
Albert City	4	Purchase and install backup generators.	Animal/Plant Disease, Drought, Earthquake, Exp. Soil, Ext. Heat, Flash Flood, Grass/Wildfire, Hazmat, Human Disease, Infra. Failure, Landslide, Levee/Dam, River Flood, Winter Storm, Sinkhole, Terrorism, Thunderstorm, Tornado/Wind, Transp. Incident	Completed in 2018
All School Districts	9	Install air conditioning for critical facilities and schools.	Extreme Heat	Deleted, not needed.
All School Districts	11	Equipping first responders so they can quickly respond to a terrorism incident.	Terrorism	Deleted, not mitigation.
Alta	4	Purchase and install backup generators.	Animal/Plant Disease, Drought, Earthquake, Exp. Soil, Ext. Heat, Flash Flood, Grass/Wildfire, Hazmat, Human Disease, Infra. Failure, Landslide, Levee/Dam, River Flood, Winter Storm, Sinkhole, Terrorism, Thunderstorm, Tornado/Wind, Transp. Incident	Completed 2021. The Alta Municipal Utilities purchased and installed backup generators a few years ago. If I understand correctly, they are set up to run half of the town at a time, so we would alternate between the halves of town during an emergency.
Alta	8	Construction of a public tornado safe room.	Flash Flood, River Flood, Winter Storm, Thunderstorm, Tornado/Wind	Completed 2018. The Alta Elementary school added on a tornado safe room, and it will be open to the public in the case of severe weather.
Alta	9	Construction of tornado safe rooms in schools and other critical facilities.	Flash Flood, River Flood, Winter Storm, Thunderstorm, Tornado/Wind	Completed 2018. See above
Alta	14	Purchasing and installing backup generators at lift stations.	Flash Flood, River Flood	Deleted. DNR said that our main generator at our sewer plant acts as the backup generator for the lift stations.
Buena Vista County	6	Purchase, install and maintain warning sirens.	Drought, Earthquake, Expansive Soil, Extreme Heat, Flash Flood, Landslide, River Flood, Severe Winter Storm, Thunderstorms/Lightning/Hail, Tornado/Windstorm, and Transportation Incident	Completed. BVCCB installed warning siren in the major campground in the county



Jurisdiction	#	Mitigation Action	Hazards Addressed	Comments
Buena Vista County	8	Purchase equipment necessary to run shelters during disaster situations.	Animal/Plant/Crop Disease, Drought, Earthquake, Expansive Soil, Extreme Heat, Flash Flood, Grass/Wildland Fire, Hazmat Incident, Human Disease, Infrastructure Failure, Landslide, Levee/Dam Failure, River Flood, Severe Winter Storm, Sinkhole, Terrorism, Thunderstorms, Tornado/Windstorm, Transportation Incident	Completed. We have a shelter trailer stocked with cots, blankets and comfort kits.
Buena Vista County	11	Complete and update floodplain maps.	Flash Flood and River Flood	Completed. FEMA completed mapping of the county in 2021 and maps became active.
Buena Vista County	12	Relocate critical facilities out of flood prone areas.	Flash Flood and River Flood	Deleted. We don't have any critical county facilities in flood plain.
Buena Vista County	19	Purchasing sandbags and equipment.	Flash Flood, River Flood, Thunderstorms/Lightning/Hail	Deleted as not needed.
Buena Vista County	28	Enforcement of burn bans.	Drought, Grass/Wildland Fire, Hazmat Incident	Deleted. This is only situational when needed.
Buena Vista County	34	Enforcement of water restrictions for residents when necessary.	Drought	Deleted - not a county responsibility.
Buena Vista County	41	Clean and enlarge sewage lagoons.	Flash Flood, River Flood	Deleted - not a county responsibility.
Buena Vista County	42	Construct sewer lift station.	Flash Flood, River Flood	Deleted - not a county responsibility.
Buena Vista County	43	Replace sewer lines.	Flash Flood, River Flood	Deleted - not a county responsibility.
Buena Vista County	50	Elevate structures in the identified floodplain.	River Flood	Deleted - not a county responsibility.
Buena Vista County	65	Purchasing and installing backup generators at lift stations.	Flash Flood, River Flood	Deleted - not a county responsibility.
Buena Vista County	66	Install upgrades to all Emergency Operations Centers.	Animal/Plant/Crop Disease, Drought, Earthquake, Expansive Soil, Extreme Heat, Flash Flood, Grass/Wildland Fire, Hazmat Incident, Human Disease, Infrastructure Failure, Landslide, Levee/Dam Failure, River Flood, Severe Winter Storm, Sinkhole, Terrorism, Thunderstorms/Lightning/Hail, Tornado/Windstorm, and Transportation Incident	Completed. In 2021 the EOC was completely upgraded with new AV equipment, camera system to facilitate online meetings, and new furniture.
Buena Vista County	69	Increase water storage at water towers.	Drought	Deleted - not a county responsibility.
Buena Vista County	70	Rescue equipment for sinkhole incidents.	Sinkhole	Deleted, not needed.

Jurisdiction	#	Mitigation Action	Hazards Addressed	Comments
BVU	2	Purchase and install backup generators.	Animal/Plant Disease, Drought, Earthquake, Exp. Soil, Ext. Heat, Flash Flood, Grass/Wildfire, Hazmat, Human Disease, Infra. Failure, Landslide, Levee/Dam, River Flood, Winter Storm, Sinkhole, Terrorism, Thunderstorm, Tornado/Wind, Transp. Incident	Completed. Smaller generators have been purchased for single equipment use. We currently have some building backed up by generators
BVU	3	Maintain and upgrade snow removal equipment.	Winter Storm	Completed. BVU has purchased new equipment and continues to replace older items
BVU	6	Construction of tornado safe rooms in schools and other critical facilities.	Flash Flood, River Flood, Winter Storm, Thunderstorm, Tornado/Wind	Completed. Our underground building provides these safe areas.
BVU	7	Non-structural retrofitting of public structures.	Animal/Plant Disease, Drought, Earthquake, Exp. Soil, Ext. Heat, Flash Flood, Grass/Wildfire, Hazmat, Human Disease, Infra. Failure, Landslide, Levee/Dam, River Flood, Winter Storm, Sinkhole, Terrorism, Thunderstorm, Tornado/Wind, Transp. Incident	Deleted.
BVU	8	Improved emergency communication equipment.	Animal/Plant Disease, Drought, Earthquake, Exp. Soil, Ext. Heat, Flash Flood, Grass/Wildfire, Hazmat, Human Disease, Infra. Failure, Landslide, Levee/Dam, River Flood, Winter Storm, Sinkhole, Terrorism, Thunderstorm, Tornado/Wind, Transp. Incident	Completed. Our campus uses text/mass notifications through phones. No upgraded needed
BVU	10	Purchase LED/portable signage to help direct traffic when there is any kind of incident.	Transportation Incident	Deleted, not needed.
BVU	11	Equipping first responders so they can quickly respond to a terrorism incident.	Terrorism	Deleted, not needed.
ICC	4	Underground burial of power lines.	Earthquake, Flash Flood, Infra. Failure, River Flood, Winter Storm, Thunderstorm, Tornado/Wind	Completed. No overhead lines on site.
ICC	7	Non-structural retrofitting of public structures.	Animal/Plant Disease, Drought, Earthquake, Exp. Soil, Ext. Heat, Flash Flood, Grass/Wildfire, Hazmat, Human Disease, Infra. Failure, Landslide, Levee/Dam, River Flood, Winter Storm, Sinkhole, Terrorism, Thunderstorm, Tornado/Wind, Transp. Incident	Deleted, not needed.
ICC	9	Purchase LED/portable signage to help direct traffic when there is any kind of incident.	Transportation Incident	Deleted, not needed.
Lakeside	1	Purchasing and encouraging the use of NOAA weather radios.	Drought, Earthquake, Exp. Soil, Ext. Heat, Flash Flood, Landslide, River Flood, Winter Storm, Thunderstorm, Tornado/Wind, Transp. Incident	Completed.

Jurisdiction	#	Mitigation Action	Hazards Addressed	Comments
Lakeside	2*	Purchasing protective equipment to utilize during storm events	Drought, Earthquake, Exp. Soil, Ext. Heat, Flash Flood, Landslide, River Flood, Winter Storm, Thunderstorm, Tornado/Wind, Transportation Incident	Delete.
Lakeside	3	Purchase and install backup generators.	Animal/Plant Disease, Drought, Earthquake, Exp. Soil, Ext. Heat, Flash Flood, Grass/Wildfire, Hazmat, Human Disease, Infra. Failure, Landslide, Levee/Dam, River Flood, Winter Storm, Sinkhole, Terrorism, Thunderstorm, Tornado/Wind, Transp. Incident	Completed. Bought new one for the lift station
Lakeside	4	Purchase, install and maintain warning sirens.	Drought, Earthquake, Exp. Soil, Ext. Heat, Flash Flood, Landslide, River Flood, Winter Storm, Thunderstorm, Tornado/Wind, Transp. Incident	Completed. Installed new siren
Lakeside	5	Designate shelter locations throughout the county and in cities and make that list available to the public.	Animal/Plant Disease, Drought, Earthquake, Exp. Soil, Ext. Heat, Flash Flood, Grass/Wildfire, Hazmat, Human Disease, Infra. Failure, Landslide, Levee/Dam, River Flood, Winter Storm, Sinkhole, Terrorism, Thunderstorm, Tornado/Wind, Transp. Incident	Completed. City Hall is the tornado shelter
Lakeside	6	Maintain and upgrade snow removal equipment.	Winter Storm	Completed.
Lakeside	7	Improved communication with power companies.	Flash Flood, Infra. Failure, River Flood, Winter Storm, Terrorism, Thunderstorm, and Tornado/Wind	Completed.
Lakeside	8	Continue Hazmat and fire Dept training.	Grass/Wildfire, Hazmat, Infra. Failure	Completed. No Fire Dept. Contract with SL Fire Dept.
Lakeside	9	Encourage the development of mobile home shelters to protect from storm events.	Thunderstorm, Tornado/Wind	Deleted. No Longer have mobile homes. Have 2 campgrounds and they are aware of where to go in case of bad weather.
Lakeside	10	Backup record keeping for important documents and files for Buena Vista County and Incorporated cities.	Animal/Plant Disease, Drought, Earthquake, Exp. Soil, Ext. Heat, Flash Flood, Grass/Wildfire, Hazmat, Human Disease, Infra. Failure, Landslide, Levee/Dam, River Flood, Winter Storm, Sinkhole, Terrorism, Thunderstorm, Tornado/Wind, Transp. Incident	Completed. We have a server and paper copies.
Lakeside	11	Encourage or establish a tree trimming ordinance.	Thunderstorm, Tornado/Wind	Completed. Per dead or diseased
Lakeside	13	Investigate storm water issues and determine what the best solutions are to alleviate water issues	Flash Flood, River Flood	Completed. Had it televised and fixed broken pipe issues, etc.
Lakeside	14	Continue incident command training.	Animal/Plant Disease, Drought, Earthquake, Exp. Soil, Ext. Heat, Flash Flood, Grass/Wildfire, Hazmat, Human Disease, Infra. Failure, Landslide, Levee/Dam, River Flood, Winter Storm, Sinkhole, Terrorism, Thunderstorm, Tornado/Wind, Transp. Incident	Completed. Public Works attends meetings.



Jurisdiction	#	Mitigation Action	Hazards Addressed	Comments
Newell	4	Purchase, install and maintain warning sirens.	Drought, Earthquake, Exp. Soil, Ext. Heat, Flash Flood, Landslide, River Flood, Winter Storm, Thunderstorm, Tornado/Wind, Transp. Incident	Completed.
Newell	6	Complete and update floodplain maps.	Flash Flood and River Flood	Completed.
Newell	12	Construction of tornado safe rooms in schools and other critical facilities.	Flash Flood, River Flood, Winter Storm, Thunderstorm, Tornado/Wind	Deleted.
Newell	15	Clean and enlarge sewage lagoons.	Flash Flood, River Flood	Completed.
Newell	17	Encouraging buyouts (acquisition) of properties located in floodplains and/or are repetitive losses.	Flash Flood, River Flood	Deleted.
Newell	19	Install new storm water and sanitary sewer systems and update any current storm water and sanitary sewer systems.	Flash Flood	Deleted.
Storm Lake	3	Conducting a severe weather awareness week to educate the public about natural hazards.	Drought, Earthquake, Exp. Soil, Ext. Heat, Flash Flood, Landslide, River Flood, Winter Storm, Thunderstorm, Tornado/Wind, Transp. Incident	Completed.
Storm Lake	11	Complete and update floodplain maps.	Flash Flood and River Flood	Completed.
Storm Lake	21	Developing a watershed study.	Flash Flood, River Flood	Completed. Study will need to be updated or amended in the future
Storm Lake Schools	1	Purchasing and encouraging the use of NOAA weather radios.	Drought, Earthquake, Exp. Soil, Ext. Heat, Flash Flood, Landslide, River Flood, Winter Storm, Thunderstorm, Tornado/Wind, Transp. Incident	Completed.
Storm Lake Schools	4	Underground burial of power lines.	Earthquake, Flash Flood, Infra. Failure, River Flood, Winter Storm, Thunderstorm, Tornado/Wind	Completed.
Storm Lake Schools	9	Install air conditioning for critical facilities and schools.	Ext. Heat	Completed.

5.3 Identification and Analysis of Mitigation Actions

To identify and select mitigation measures to support the mitigation goals, each hazard identified in Chapter 4 was evaluated. The HMPC analyzed a comprehensive set of viable mitigation alternatives for both new and existing buildings and infrastructure that would support identified goals and objectives.

Potential mitigation measures were considered as part of the following six categories:

Prevention: Government administrative or regulatory measures or processes that influence the way land and buildings are developed and built. These measures also include public activities to reduce hazard losses. Examples include:

- Planning and zoning
- Hazard mapping
- Building codes
- Subdivision regulations
- Studies/data collection and analysis to support prevention measures
- Floodplain regulations
- Storm water management regulations
- Multi-jurisdictional agreements that reduce hazard risks
- Other regulatory measures or processes that reduce hazard risks

Property Protection: Measures that involve modifying existing buildings or structures to protect them from a hazard, or removing buildings or structures from the hazard area, or providing insurance to cover potential losses. Examples include:

- Acquisition, elevation, or relocation of hazard-prone property
- Safe room/storm shelter retrofits
- Security retrofits
- Critical facility protection
- Risk reduction retrofits (modifications) to hazard prone properties
- Studies/data collection and analysis to develop property protection measures
- National Flood Insurance Program (NFIP) participation

Structural Projects: Measures that involve the construction and maintenance of structures and infrastructure that will reduce the impact of a hazard or redirect the impact away from people and property. Examples include:

- Channel modification/maintenance
- Dam and reservoir construction/maintenance
- Levee and floodwall construction and maintenance
- Safe room construction
- Infrastructure construction and maintenance – roads and bridges
- Infrastructure construction and maintenance – utility systems
- Infrastructure construction and maintenance – urban and rural drainage systems
- Studies and data collection to develop structural projects

Natural Resource Protection: Measures that, in addition to minimizing hazard losses; preserve or restore the functions of natural systems. Examples include:

- Sediment and erosion control
- Stream corridor restoration, watershed management
- Forest and vegetation management

- Wetland restoration and preservation

Public Education and Awareness: Measures to inform and educate citizens, elected officials, and property owners about the hazards and potential ways to mitigate them. Examples include:

- Programs to improve awareness of hazard risk
- Programs to improve awareness of hazard risk prevention and reduction
- Education programs directed toward specialized audience, i.e., buildings, developers, and hazard prone neighborhoods

Emergency Services: Measures taken before, during and after a hazard event to protect people, and property; although these measures are not typically considered “mitigation, they significantly minimize the events impact and preserve the community’s health and safety. Examples include:

- Emergency/response facilities and personnel
- Hazard warning systems and equipment
- Health/safety/environmental risk prevention/reduction
- Emergency/response infrastructure
- Emergency/response planning
- Emergency/response training
- Emergency/response vehicles, equipment, and protective gear
- Emergency/response services studies and data collection
- Emergency/response communication systems

The HMPC reviewed the hazards and vulnerabilities covered in Section 5, and looked for ways to reduce losses from those hazards by achieving the four ‘A’s’ of mitigation:

- **Alter** the physical nature of the hazard: wildfire defensible space and fuels treatments, snow fences etc.
- **Avert** the hazard away from people, buildings, and infrastructure: engineered solutions, drainage, and channel improvements, floodproofing, fuel breaks.
- **Adapt** to the hazard: land use planning, building codes and design standards, warning systems etc.
- **Avoid** the hazard: natural systems protection, open space, acquisition, or relocation of properties out of hazardous areas.

To facilitate the brainstorming process, the HMPC referred to a matrix of typical mitigation alternatives organized by CRS category for the hazards identified in the plan, in addition to a handout that explains the categories and provided examples. HMPC members were encouraged to develop mitigation alternatives that would protect future, as well as existing, development from hazards per the DMA 2000 regulations. With an understanding of the alternatives, a brainstorming session was conducted to generate a list of preferred mitigation actions. The result was new and updated project ideas with the intent of meeting the identified goals and mitigating identified hazards.

5.3.1 Prioritization Process

The Planning Team discussed a wide range of possible mitigation actions and employed the STAPLEE methodology (see description below) to evaluate and prioritize each proposed action. For each recommended action, the Planning Team developed a project summary that included a description of the action, the department or agency responsible for implementing it, and an estimated timeframe for completion. While STAPLEE provided a template for the Planning Team to evaluate a range of specific mitigation actions and projects, the results of the risk assessment were also considered (i.e., probability and severity of impacts for each hazard). Planning Team members also weighed the pros and cons of proposed actions based on their judgement, subject matter expertise and experience with local hazards.

STAPLEE criteria were used as one method for evaluating the effectiveness of each action item. STAPLEE considers social, technical, administrative, political, legal, economic, and environmental constraints and benefits of a proposed activity.

- **Social:** Does the measure treat people fairly?
- **Technical:** Will it work? Does it solve the problem? Is it feasible?
- **Administrative:** Is there capacity to implement and manage the project?
- **Political:** Who are the stakeholders? Did they get to participate? Is there public support? Is political leadership willing to support the project?
- **Legal:** Does your organization have the authority to implement? Is it legal? Are there liability implications?
- **Economic:** Is it cost-beneficial? Is there funding? Does it contribute to the local economy or economic development? Does it reduce direct property losses or indirect economic losses?
- **Environmental:** Does it comply with environmental regulations or have adverse environmental impacts?

In accordance with the DMA requirements, an emphasis was placed on the importance of a benefit-cost analysis in determining project priority (the economic factor of STAPLEE). Other criteria used to recommend what actions might be more important, more effective, or more likely to be implemented than another included:

- Does the action protect lives?
- Does the action address hazards or areas with the highest risk?
- Does the action protect critical facilities, infrastructure, or community assets?
- Does the action meet multiple goals or address multiple hazards?

At the mitigation strategy meeting, the HMPC reviewed and discussed the STAPLEE considerations to determine which of the identified actions were most likely to be implemented and effective. Prioritization of previous mitigation actions identified in the 2018 HMP that are continuing in the updated plan were revisited during a HMPC meeting. New actions identified for 2023 also were prioritized based on discussions and review with the STAPLEE considerations in mind.

5.3.2 Financial Resources

The availability of funding can play a significant role in the formulation, implementation, and proposed project mitigation actions. There are a wide variety of Federal grant programs that can potentially be used to fund local mitigation activities, to include the following FEMA grants:

- **Hazard Mitigation Grant Program (HMGP):** Post-disaster multi-hazard mitigation funding for federally declared disasters. HMGP Post Fire funds are available for FMAG declarations.
- **Building Resilient Infrastructure & Communities (BRIC):** Pre-disaster/annual cycle addressing all natural hazards, with an emphasis on infrastructure & lifelines.
- **Flood Mitigation Assistance (FMA) Program:** Pre-disaster/annual cycle for repetitive flood loss property reduction and projects that mitigate losses to NFIP insured properties.
- **High Hazard Potential Dam Program (HHPD):** Pre-disaster/annual cycle, for non-Federal dams in Unsatisfactory conditions.

A more inclusive list of federal grant programs is included in Appendix F.

5.3.3 Continued Compliance with the National Flood Insurance Program

As described in Section 4.3.12, Buena Vista County, and the Cities of Alta, Linn Grove, and Sioux Rapids all participate in the NFIP. All these jurisdictions will continue to participate and comply with NFIP standards. The City of Newell is currently sanctioned and is working to come back into compliance.

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 Buena Vista County and all NFIP-participating jurisdictions. As NFIP participants, these communities have and will continue to make every effort to remain in good standing with NFIP. This includes continuing to comply with the NFIP's standards for updating and adopting floodplain maps and maintaining and updating the floodplain zoning ordinance. There are several action items identified in that address specifics related to NFIP continued compliance. Other details related to NFIP participation are noted in Chapter 2 under the Jurisdictional Capabilities Section 2.4 and the flood vulnerability discussion in Section 3.5.6.

5.4 Mitigation Action Plan

This section outlines the development of the updated mitigation action plan. The action plan consists of the specific projects, or actions, designed to meet the plan's goals. As noted in Section 5.2, a number of mitigation activities have already been completed or are in progress. Over time the implementation of new and continuing projects will be tracked as a measure of demonstrated progress on meeting the plan's goals.

The total number of actions identified by each jurisdiction is summarized in Table 5-2, as well as those actions completed, deleted, or continued from the 2018 HMP.

Table 5-2 Mitigation Action Plan Summary

Jurisdiction	2018 Actions	Actions Completed	Actions Deleted	Actions Continued	New Actions	Total 2023 Actions
Buena Vista County	81	4	10	65	11	76
City of Albert City	14	1	0	13	3	16
City of Alta	15	3	1	11	2	13
City of Lakeside	14	11	3	0	6	6
City of Linn Grove	24	0	0	24	6	30
City of Marathon	15	0	0	15	1	16
City of Newell	21	3	3	15	1	16
City of Rembrandt	11	0	0	11	1	12
City of Sioux Rapids	15	0	0	15	1	16
City of Storm Lake	52	3	0	49	8	57
City of Truesdale	10	0	0	10	2	12
Iowa Central Community College	12	2	0	10	2	12
Buena Vista University	12	4	3	5	3	8
Albert City-Truesdale School District	12	2	0	10	1	11
Alta-Aurelia School District	12	4	0	8	1	9
Newell-Fonda School District	12	2	0	10	1	11

Jurisdiction	2018 Actions	Actions Completed	Actions Deleted	Actions Continued	New Actions	Total 2023 Actions
Sioux Central School District	12	2	0	10	1	11
Storm Lake School District	12	3	1	8	2	10
Storm Lake St Mary's Catholic School	12	2	0	10	1	11
Total	368	46	21	299	55	353

The results of the project identification and prioritization exercise for each participating jurisdiction are summarized in Table 5-3 through Table 5-21 below. These projects detail specific actions for reducing future hazard-related losses within Buena Vista County. The projects are organized by jurisdiction and include notes about the department and partners necessary to implement the project, estimated cost, potential funding sources, timeline, which goal(s) that the projects support, and their relative level of priority high, medium, and low.

The tables also provide status/implementation notes that describe progress made on the actions so far, using the following categories, and, where applicable, notes if there were changes in the priority level from the previous plan:

- **Not Started:** Work has not begun.
- **In Progress:** Work has begun but not completed.
- **Continuous:** Ongoing annually with no specific end date.
- **Completed:** The action has been finished.
- **Deleted:** The action is no longer relevant due to changing priorities, lack of funds, etc.

Many of these mitigation actions are intended to reduce impacts to existing development. Those that protect future development from hazards 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 5-3 Buena Vista County Mitigation Actions

Action #	Mitigation Action	Hazards Addressed	Lead and Support Agency	Estimated Cost & Potential Funding	Timeline	Priority	Status, Implementation Notes & Comments
A1	Purchasing and encouraging the use of NOAA weather radios.	Drought, Earthquake, Expansive Soil, Extreme Heat, Flash Flood, Landslide, River Flood, Severe Winter Storm, Thunderstorms, Tornado/Windstorm, Transportation Incident	Emergency Management	\$50 per radio, local grant sources, local budget	2023	Medium	Continuous. BVEMA received a grant to purchase and distribute some radios. PH also purchased some radios. BVCCB installed weather radios in overnight rental facilities, office, and shop This is an ongoing project as radios age and new technology becomes available change cost to \$70 per radio
A2	Education materials given out to the public to improve awareness of all hazards.	Animal/Plant/Crop Disease, Drought, Earthquake, Expansive Soil, Extreme Heat, Flash Flood, Grass/Wildland Fire, Hazmat Incident, Human Disease, Infrastructure Failure, Landslide, Levee/Dam Failure, River Flood, Severe Winter Storm, Sinkhole, Terrorism, Thunderstorms, Tornado/Windstorm, Transportation Incident	Emergency Management	\$1,000 per year local budget, state provided materials	2023	Medium	Continuous. This is an ongoing process and a function of many agencies.
A3	Conducting a severe weather awareness week to educate the public about natural hazards.	Drought, Earthquake, Expansive Soil, Extreme Heat, Flash Flood, Landslide, River Flood, Severe Winter Storm, Thunderstorms, Tornado/Windstorm, Transportation Incident	Emergency Management	N/A	2023	Medium	Continuous. BV County participates in the Iowa Severe Weather Awareness week and the State-wide tornado drill to increase awareness of severe summer weather events.
A4	Promote storm spotter training and recruit new or additional storm spotters.	Drought, Earthquake, Expansive Soil, Extreme Heat, Flash Flood, Landslide, River Flood, Severe Winter Storm, Thunderstorms, Tornado/Windstorm, Transportation Incident	Emergency Management	\$500 per year local budget	2023	Medium	Continuous. BV County participates annually in co-hosting storm spotter training with other counties.
A5	Purchase and install backup generators.	Animal/Plant/Crop Disease, Drought, Earthquake, Expansive Soil, Extreme Heat, Flash Flood, Grass/Wildland Fire, Hazmat Incident, Human Disease, Infrastructure Failure, Landslide, Levee/Dam Failure, River Flood, Severe Winter Storm, Sinkhole, Terrorism, Thunderstorms, Tornado/Windstorm, Transportation Incident	Emergency Management	\$40,000-\$100,000, BRIC grant, local budget	2023	High	Continuous. BV County would like to see all critical facilities and potential shelter sites either have back up generation or be wired to accept a mobile generator. BVCCB wants to install generators at overnight rental facilities, office, and shop areas
A6	Designate shelter locations throughout the county and in cities and make that list available to the public.	Animal/Plant/Crop Disease, Drought, Earthquake, Expansive Soil, Extreme Heat, Flash Flood, Grass/Wildland Fire, Hazmat Incident, Human Disease, Infrastructure Failure, Landslide, Levee/Dam Failure, River Flood, Severe Winter	Emergency Management	N/A	2023	Medium	Continuous. We have shelter designations, however there is no need to make them public unless needed for an event. Not sure why the "make the list public" is in there. Sheltering is situationally dependent.

Action #	Mitigation Action	Hazards Addressed	Lead and Support Agency	Estimated Cost & Potential Funding	Timeline	Priority	Status, Implementation Notes & Comments
		Storm, Sinkhole, Terrorism, Thunderstorms, Tornado/Windstorm, Transportation Incident					
A7	Utilize BV Alerts system to notify residents of severe weather.	Drought, Earthquake, Expansive Soil, Extreme Heat, Flash Flood, Landslide, River Flood, Severe Winter Storm, Thunderstorms, Tornado/Windstorm, Transportation Incident	Emergency Management	\$5000 per year, local budget	2023	High	Continuous.
A8	Special needs registration with the city to keep track of the most vulnerable populations.	Animal/Plant/Crop Disease, Drought, Earthquake, Expansive Soil, Extreme Heat, Flash Flood, Grass/Wildland Fire, Hazmat Incident, Human Disease, Infrastructure Failure, Landslide, Levee/Dam Failure, River Flood, Severe Winter Storm, Sinkhole, Terrorism, Thunderstorms, Tornado/Windstorm, Transportation Incident	Emergency Management	\$10,000, local budget	2023	Low	Not started.
A9	Maintain NFIP participation by enforcing floodplain ordinances and educating residents about the benefits of purchasing flood insurance.	Flash Flood and River Flood	Emergency Management	N/A	2023	Medium	Continuous.
A10	Maintain and upgrade snow removal equipment.	Severe Winter Storm	Emergency Management	\$50,000 to \$100,000, local budget	2023	Medium	In Progress. BVCCB purchased snowplow for maintenance truck, skid loader, and dump truck with plow. Also have tractor
A11*	Purchase equipment and hire personnel for cleanup after a disaster event.	Animal/Plant/Crop Disease, Drought, Earthquake, Expansive Soil, Extreme Heat, Flash Flood, Grass/Wildland Fire, Hazmat Incident, Human Disease, Infrastructure Failure, Landslide, Levee/Dam Failure, River Flood, Severe Winter Storm, Sinkhole, Terrorism, Thunderstorms, Tornado/Windstorm, Transportation Incident	Emergency Management	\$50,000-\$200,000, local budget, state disaster funding, FEMA disaster funding	2023	Medium	Continuous. BVCCB purchased woodchipper, tree shear, grapple, and stump grinder attachments for skidloader to respond to storm events.
A12	Underground burial of power lines.	Earthquake, Flash Flood, Infrastructure Failure, River Flood, Severe Winter Storm, Thunderstorms, Tornado/Windstorm	Utility Company	\$1 million, utilities	2023	Medium	Not Started. Certain areas in parks need to have electric moved underground.
A13	Purchase and install portable water pumps at critical facilities.	Flash Flood, River Flood, Thunderstorms	Buildings & Grounds	\$10,000 to \$60,000, local funding, BRIC grant, HSEMD funding	2023	Medium	Continuous. We have 2 that we keep for the state that are placed in Sioux Rapids and Storm Lake. BVCCB purchased small Honda trash pump. Also have hydroseeder that has capability to draft from stream/creeks and transport 900 gallons.

Action #	Mitigation Action	Hazards Addressed	Lead and Support Agency	Estimated Cost & Potential Funding	Timeline	Priority	Status, Implementation Notes & Comments
A14	Purchase portable high-capacity water pumps.	Flash Flood, River Flood, Thunderstorms	Emergency Management	\$20,000, BRIC grant, HSEMD funding	2023	Medium	Continuous.
A15	Develop a watershed study.	Flash Flood, River Flood	Conservation	\$20,000, FEMA disaster, local budget	2023	Medium	In Progress. BVCCB completed H&H study for the area around the Linn Grove Dam
A16	Installing rip rap.	River Flood	Public Works	\$10,000, FEMA, local budget	2023	Medium	In Progress. BVCCB plans to modify the Linn Grove Dam with an arch rock rapids structure to remove the hydraulic drop. Project includes installing riprap on over 2500 feet for river bank.
A17	Installing larger culverts and increasing the capacity of current culverts.	Flash Flood, River Flood	Public Works	\$20,000, local budget, BRIC	2023	Low	Not started.
A18	Improving and inspecting storm water drainage.	Flash Flood, River Flood	Public Works	N/A	2023	Low	Not started.
A19	Construction of a public tornado safe room.	Flash Flood, River Flood, Severe Winter Storm, Thunderstorms, Tornado/Windstorm	Emergency Management	\$200,000- \$1 million, FEMA BRIC	2023	Medium	In Progress. BVCCB installed a fully concrete shower house in Linn Grove Campground. Rated for 250mph winds. We would like to have tornado safe rooms for all county parks and campgrounds. Additionally, we would like to have a saferoom at the Buena Vista County Courthouse.
A20	Construction of tornado safe rooms in schools and other critical facilities.	Flash Flood, River Flood, Severe Winter Storm, Thunderstorms, Tornado/Windstorm	Emergency Management	\$200,000- \$1 million FEMA and BRIC funding with local funds	2023	Low	Not Started.
A21	Having a site available as a warming or cooling site.	River Flood, Thunderstorms	Emergency Management	N/A	2023	Low	Not started.
A22	Utilizing the media in announcing weather advisories.	Drought, Earthquake, Expansive Soil, Extreme Heat, Flash Flood, Landslide, River Flood, Severe Winter Storm, Thunderstorms, Tornado/Windstorm, Transportation Incident	Emergency Management	N/A	2023	Low	Continuous.
A23*	Replace, upgrade and purchase fire equipment.	Animal/Plant/Crop Disease, Drought, Earthquake, Expansive Soil, Extreme Heat, Flash Flood, Grass/Wildland Fire, Hazmat Incident, Human Disease, Infrastructure Failure, Landslide, Levee/Dam Failure, River Flood, Severe Winter	Fire Department	\$20,000 to \$500,000, local budgets, DNR grants, Assistance to FF grant	2023	Medium	In Progress. BVCCB purchased a 250 gallon wildfire skid unit for pickup. Purchased 85 gallon wildfire skid unit for UTV that includes a spine board location for rescues. Trained three staff as FFT2 according to National Wildfire Coordinating Group guidelines. Trained two

Action #	Mitigation Action	Hazards Addressed	Lead and Support Agency	Estimated Cost & Potential Funding	Timeline	Priority	Status, Implementation Notes & Comments
		Storm, Sinkhole, Terrorism, Thunderstorms, Tornado/Windstorm, Transportation Incident					staff as FFT1 (squad boss) according to National Wildfire Coordinating Group guidelines. Attend annual RT-130 refresher trainings. Purchased multiple wildfire hand tools.
A24	Mutual aid between fire departments.	Animal/Plant/Crop Disease, Drought, Earthquake, Expansive Soil, Extreme Heat, Flash Flood, Grass/Wildland Fire, Hazmat Incident, Human Disease, Infrastructure Failure, Landslide, Levee/Dam Failure, River Flood, Severe Winter Storm, Sinkhole, Terrorism, Thunderstorms, Tornado/Windstorm, Transportation Incident	Fire Department	N/A	2023	Medium	In Progress. The Fire Depts in BV County currently have mutual aid agreements, which we fully support. The BVCCB has worked with some VFD's to conduct Rx burns. Would like to assist in setting up trainings for VFD's in relation to wildfires and prescribed (Rx) burning.
A25	Determine level of fire suppression needed to respond to incidents and determine potential alternatives.	Grass/Wildland Fire, Hazmat Incident	Fire Department	N/A	2023	Medium	In Progress. The BVCCB works internally with staff on sizing up fires and response, developing appropriate Rx Burn Plans, assist in training for VFDs on sizing up wildland fires and suppression techniques
A26	Utilize the National Weather Service when inclement weather occurs.	Drought, Earthquake, Expansive Soil, Extreme Heat, Flash Flood, Landslide, River Flood, Severe Winter Storm, Thunderstorms, Tornado/Windstorm, Transportation Incident	Emergency Management	N/A	2023	Medium	In Progress. The NWS Sioux Falls is utilized daily by many agencies in Buena Vista County for planning purposes and when inclement weather threatens. BVCCB utilizes Spot Weather forecasts from NWS when planning and conducting Rx burns and during severe weather. BVCCB carries Kestels when conducting Rx Burns and reads weather every hour and reports back to NWS to assist in developing their models. Work with EM/ VFD on accessing Spot forecasts during responses.
A27	Utilize soil suitability rating when new issuing permits.	Landslide, Sinkhole	Zoning	N/A	2023	Low	Not started.
A28	Inspection of pump wells.	Flash Flood, River Flood	Public Works	N/A	2023	Low	Not started.
A29	Identify portions of older drainage districts that could be at risk and repair/maintain them.	Flash Flood, River Flood	Public Works	\$50,000 to \$500,000 local budget	2023	Low	Not started.
A30	Identify levee/dam inundation in case of dam failure.	Levee/Dam Failure	Emergency Management	N/A	2023	Low	Not started.

Action #	Mitigation Action	Hazards Addressed	Lead and Support Agency	Estimated Cost & Potential Funding	Timeline	Priority	Status, Implementation Notes & Comments
A31	Monitor the dam at Linn Grove during high-risk times.	Levee/Dam Failure	Emergency Management	N/A	2023	High	In progress. Continue to monitor Dam. During major Flood events in 2018,2019 the area received major damage. Working with Engineers and FEMA on repairs that reduce long term maintenance and effectively remove the hydraulic drop from the dam by installing a rock arch rapids design.
A32	Make sure levees are certified and have preventative maintenance performed.	Levee/Dam Failure	Public Works	\$20,000 local budget	2023	Low	Not started.
A33*	Continue hazmat and fire department training.	Grass/Wildland Fire, Hazmat Incident, Infrastructure Failure	Fire Department	\$5,000 per year local budget and LEPC funding	2023	High	Continuous. Training for hazmat occurs annually for emergency responders, secondary roads, and conservation.
A34	Install dry hydrants.	Grass/Wildland Fire, Hazmat Incident, Infrastructure Failure	Fire Department	\$15,000, Iowa DNR grants	2023	Medium	In progress. There are a minimum of two dry hydrants installed in different parks for use by VFD's. One could be added at Sturchler for Newell VFD
A35*	Purchase paramedic and emergency response equipment.	Animal/Plant/Crop Disease, Drought, Earthquake, Expansive Soil, Extreme Heat, Flash Flood, Grass/Wildland Fire, Hazmat Incident, Human Disease, Infrastructure Failure, Landslide, Levee/Dam Failure, River Flood, Severe Winter Storm, Sinkhole, Terrorism, Thunderstorms, Tornado/Windstorm, Transportation Incident	Fire Department	\$50,000 to \$500,000 local budget	2023	Medium	In progress. BVCCB purchased AED's, tourniquets, and first aid kits that are carried in vehicles and placed in the office.
A36	Having markers that clearly identify where fire hydrants are.	Grass/Wildland Fire, Hazmat Incident, Infrastructure Failure	Fire Department	\$5,000, local budgets	2023	Low	Not started.
A37	Encourage buyouts (acquisition) of properties located in floodplains and/or are repetitive losses.	Flash Flood, River Flood	Emergency Management	N/A	2023	Low	Not started.
A38	Monitor river levels and reevaluate if protection from river waters is inadequate.	River Flood	Emergency Management,	N/A	2023	Low	Not started.
A39	Complete FIRM (Flood Insurance Rate Map).	River Flood	Emergency Management	N/A	2023	Low	Not started.
A40	Encourage citizens to create a family preparedness kit that will provide food and resources in times of a disaster.	Animal/Plant/Crop Disease, Drought, Earthquake, Expansive Soil, Extreme Heat, Flash Flood, Grass/Wildland Fire, Hazmat Incident, Human Disease, Infrastructure Failure, Landslide,	Emergency Management	N/A	2023	Medium	Continuous. Public awareness of the need to be prepared is a continuous issue.

Action #	Mitigation Action	Hazards Addressed	Lead and Support Agency	Estimated Cost & Potential Funding	Timeline	Priority	Status, Implementation Notes & Comments
		Levee/Dam Failure, River Flood, Severe Winter Storm, Sinkhole, Terrorism, Thunderstorms, Tornado/Windstorm, Transportation Incident					
A41	Upgrading of critical facilities to make capable of serving as a temporary shelter from storms or for post disaster services.	Animal/Plant/Crop Disease, Drought, Earthquake, Expansive Soil, Extreme Heat, Flash Flood, Grass/Wildland Fire, Hazmat Incident, Human Disease, Infrastructure Failure, Landslide, Levee/Dam Failure, River Flood, Severe Winter Storm, Sinkhole, Terrorism, Thunderstorms, Tornado/Windstorm, Transportation Incident	Emergency Management	\$100,000 BRIC, local budget, local grants	2023	Low	Not started.
A42	Encourage the development of mobile home shelters to protect from storm events.	Thunderstorms, Tornado/Windstorm	Emergency Management	N/A	2023	High	Continuous.
A43	Identify known sinkholes to property owners.	Landslide, Sinkhole	Public Works	N/A	2023	Low	Not started.
A44	Maintain and replace deteriorating bridges and culverts.	Flash Flood, River Flood	Public Works	Up to \$5 million DOT funding, local budgets	2023	Low	Not started.
A45	Non-structural retrofitting of public structures.	Animal/Plant/Crop Disease, Drought, Earthquake, Expansive Soil, Extreme Heat, Flash Flood, Grass/Wildland Fire, Hazmat Incident, Human Disease, Infrastructure Failure, Landslide, Levee/Dam Failure, River Flood, Severe Winter Storm, Sinkhole, Terrorism, Thunderstorms, Tornado/Windstorm, Transportation Incident	Buildings & Grounds	\$1 million, BRIC. Local budget	2023	Medium	In Progress. Refurbished and updated multiple building facilities within the park system in the last 5 years.
A46*	Improved emergency communication equipment.	Animal/Plant/Crop Disease, Drought, Earthquake, Expansive Soil, Extreme Heat, Flash Flood, Grass/Wildland Fire, Hazmat Incident, Human Disease, Infrastructure Failure, Landslide, Levee/Dam Failure, River Flood, Severe Winter Storm, Sinkhole, Terrorism, Thunderstorms, Tornado/Windstorm, Transportation Incident	Emergency Management	\$100,000, local budget	2023	High	Continuous. BVCCB purchased multiple two-way radios to be utilized during Rx burns and to communicate with emergency responders. We do not have repeaters, so we cannot communicate with the COM Center. Could use a few more radios
A47	Backup record keeping for important documents and files for Buena Vista County and Incorporated cities.	Animal/Plant/Crop Disease, Drought, Earthquake, Expansive Soil, Extreme Heat, Flash Flood, Grass/Wildland Fire, Hazmat Incident, Human Disease, Infrastructure Failure, Landslide, Levee/Dam Failure, River Flood, Severe Winter	Recorder	\$25,000 per year ARPA	2023	High	In Progress. BV County has paid to have important county records digitized and available online. This project is in progress and should be completed by 1/1/24.

Action #	Mitigation Action	Hazards Addressed	Lead and Support Agency	Estimated Cost & Potential Funding	Timeline	Priority	Status, Implementation Notes & Comments
		Storm, Sinkhole, Terrorism, Thunderstorms, Tornado/Windstorm, Transportation Incident					
A48*	Flood rescue equipment.	Flash Flood, River Flood	Fire Department	\$20,000 local budget	2023	Low	Not started.
A49	Cleaning and rehabilitating drainage ditches.	Flash Flood, River Flood	Drainage Engineer	\$30,000 per year, USDA	2023	Low	Not started.
A50	Install new storm water and sanitary sewer systems and update any current storm water and sanitary sewer systems.	Flash Flood	Drainage Engineer	\$200,000	2023	Low	Not started.
A51	Cleaning and repairing culverts.	Flash Flood, River Flood	Drainage Engineer	\$50,000 local budget	2023	Low	Not started.
A52	Encourage or establish a tree trimming ordinance.	Thunderstorms, Tornado/Windstorm	Conservation	N/A	2023	Medium	In Progress. Removing diseased ash trees. BVCCB evaluates annually campground areas for dead limbs and removes to mitigate any falling branches during the camping season.
A53*	Purchasing protective equipment to utilize during storm events	Drought, Earthquake, Expansive Soil, Extreme Heat, Flash Flood, Landslide, River Flood, Severe Winter Storm, Thunderstorms, Tornado/Windstorm, Transportation Incident	Emergency Management	\$25,000 HSEMD, HSGP, local budget	2023	High	Not started.
A54*	Purchasing equipment to use for search and rescue.	Animal/Plant/Crop Disease, Drought, Earthquake, Expansive Soil, Extreme Heat, Flash Flood, Grass/Wildland Fire, Hazmat Incident, Human Disease, Infrastructure Failure, Landslide, Levee/Dam Failure, River Flood, Severe Winter Storm, Sinkhole, Terrorism, Thunderstorms, Tornado/Windstorm, Transportation Incident	Fire Department	\$100,000 local budgets, HSGP	2023	Low	In progress. BV County has purchased a trailer and equipment to use for SAR after storm events.
A55	Install air conditioning for critical facilities and schools.	Extreme Heat	Buildings & Grounds	Delete	2023	Low	This would be for locals not county
A56	Keeping a detailed history of sinkhole/trench incidents throughout the county.	Landslide, Sinkhole	Emergency Management	N/A	2023	Low	Not started.
A57*	Purchase earth moving equipment.	Landslide, Sinkhole	BVCCB	Up to \$500,000, local budget	2023	Medium	In progress. BVCCB has purchased a tractor, a skid loader with bucket attachments, and a dump truck since last plan.
A58	Encourage appropriate landscaping and terracing to address land subsidence issues.	Landslide, Sinkhole	Zoning	N/A	2023	Low	Not started.
A59	Investigate storm water issues and determine what the best solutions are to alleviate water issues	Flash Flood, River Flood	Drainage Engineer	Up to \$1 million USDA, NRCS	2023	High	Continuous.

Action #	Mitigation Action	Hazards Addressed	Lead and Support Agency	Estimated Cost & Potential Funding	Timeline	Priority	Status, Implementation Notes & Comments
A60*	Purchase personal protection equipment to deal with animal/plant/crop diseases.	Animal/Plant/Crop Disease	Emergency Management	\$50,000 USDA, IDALS, local budget	2023	High	Continuous.
A61	Install drop arms and other safety measures on rail lines to help reduce transportation incidents.	Transportation Incident	Railroad companies	\$100,000 DOT, Railroads	2023	Medium	Continuous.
A62	Purchase LED/portable signage to help direct traffic when there is any kind of incident.	Transportation Incident	Emergency Management	\$30,000 HSGP, local budget	2023	Low	Continuous. 2 non-electronic signs have been purchased that say, "incident scene ahead". They are folding signs. An LED sign would be nice for longer duration incidents.
A63	Conduct a public awareness campaign to help teach residents how to identify a terrorism incident.	Terrorism	Emergency Management	N/A	2023	Low	Not started.
A64*	Continue incident command training.	Animal/Plant/Crop Disease, Drought, Earthquake, Expansive Soil, Extreme Heat, Flash Flood, Grass/Wildland Fire, Hazmat Incident, Human Disease, Infrastructure Failure, Landslide, Levee/Dam Failure, River Flood, Severe Winter Storm, Sinkhole, Terrorism, Thunderstorms, Tornado/Windstorm, Transportation Incident	Emergency Management	\$4,000 annually, LEPC grant funds	2023	High	Continuous. BVCCB received NIMS training through our FFT1 and FFT2 training along with the occasional County sponsored training. Continue to utilize system during Rx burns. Major experience for staff in the Command System stems from our annual "Burn Co-Op". This weeklong event brings multiple local, state, and federal agencies together to conduct Rx burns, where the ICS structure is heavily used.
A65*	Equip first responders so they can quickly respond to a terrorism incident.	Terrorism	Emergency Management	\$250,000, HSGP, local budgets	2023	Low	Not started.
A66	Enhance security infrastructure and install safety cameras.	Terrorism	Buildings & Grounds	\$200,000, local budgets	2023	Low	Not started.
A67	Separate BVCCB Office/Shop operations. Split office/shop operations to have better COG. In the event of a disaster. All BVCCB operations and equipment are house outside of Peterson, IA. Splitting operations/shop between Peterson and Storm Lake would allow Continuity of Government for BVCCB to continue to some extent in the event of a disaster. Would take over marina from IDNR to create office and shop space	Severe Winter Storm, Thunderstorms, Tornado/Windstorm	BVCCB	\$1M. Destination Iowa Grant local ARPA funds	2023-2025	Medium	New in 2023.

Action #	Mitigation Action	Hazards Addressed	Lead and Support Agency	Estimated Cost & Potential Funding	Timeline	Priority	Status, Implementation Notes & Comments
A68	Back Up Generator for Rental Facilities and Office/Shop. Install Generators to supply back up power to overnight rental facilities and the office/shop for the Conservation Board. Currently BV Park has no back up power in the event of lost electricity. Loss of power in the winter could result in frozen pipes and additional damage. In the overnight rental facilities, users may be left without heat. Long term power loss for the office/shop would prohibit BVCCB from conducting response to a disaster and from conducting operations.	Severe Winter Storm, Thunderstorms, Tornado/Windstorms, Infrastructure Failure	BVCCB	\$50,000-\$75,000; Grants	2026	Medium	New in 2023.
A69	Installation of a storm shelter at BV Park. BV Park is the most utilized park in the County System. The park has over 35 campsites and multiple overnight rental facilities. The park on a busy weekend in the summer can see well over 500 people utilizing the area at a given time. Recently there have been some significant severe weather events that has put park users at risk by not having a shelter accessible at all times. The current restroom facilities are "stick built" with no basement and do not provide protection during a tornado/windstorm event. The office does have a basement and it is opened for park users if a staff member is present, which is not always the case. Bur Oak Campground within BV park is slated to receive a new restroom in FY 2024 that will be a pre-cast concrete structure that is rated to withstand 250 mph winds. However, the structure is not of sufficient size to provide shelter for all areas of the park. A second shelter of	Tornado/Windstorms, Infrastructure Failure	BVCCB	\$200,000; grants	2028	Medium	New in 2023.

Action #	Mitigation Action	Hazards Addressed	Lead and Support Agency	Estimated Cost & Potential Funding	Timeline	Priority	Status, Implementation Notes & Comments
	sufficient size should be installed in Timber Ridge Campground.						
A70	Public Health equipment, staffing, and communication materials. Needed to safety and effectively provide needed information/items/medications/vaccination to all BV CO residents.	Human Disease	Public Health, EMA, Co Board of Supervisors	\$10B. grants, state, federal	Until pandemic ends	High	New in 2023.
A71	Update County 2D Base Level Engineering Floodplain Maps. Iowa DNR working on a new program to create statewide two-dimensional (2D) flood hazard data. Update into arc GIS	River Flood	Department of Natural Resources	No cost to County; Iowa DNR project in progress.	2024	Medium	New in 2023.
A72	Backup generators for shelters. Install backup generators at all locations planned for use as shelter location	Extreme Heat, Severe Winter Storm, Thunderstorms, Tornado/Windstorm	Buildings & Grounds	\$45,000 per site. BRIC, local budgets	2026	Medium	New in 2023.
A74	Linn Grove Dam modification. The purpose of the proposed project is to modify and retrofit the currently compromised dam structure with a hybrid "Rock Arch Rapid" and step pool design that effectively buries the dam and replaces the hydraulic drops with an ecologically sound engineered rock riffle structure. The newly eroded channel south of the dam will be fitted with a similar structure to convert the entire dam and former park area into a wider and more sustainable spillway structure in high flow events. Banks along the new channel south of the dam and the former river channel will be stabilized with sustainable slopes, toe rock, and native vegetation above the bank full elevation. The floodplain island between the two channels will be an auxiliary overflow route for larger flood events. An existing floodplain slough southwest of the dam site will be restored to provide an emphasis on fish habitat and	Levee/Dam Failure	BVCCB	\$7.5M; BRIC Grant	2028	High	New in 2023.

Action #	Mitigation Action	Hazards Addressed	Lead and Support Agency	Estimated Cost & Potential Funding	Timeline	Priority	Status, Implementation Notes & Comments
	fishing access. During normal baseflow the two channels would be designed to safely accommodate fish passage and fishing access, as well as safe passage of recreational paddle craft in the north channel. The overall design returns the river to a more ecologically sound, sustainable, and safe public amenity. This project effectively involves dam modification via rock arch rapid design, stream bank stabilization, and physical placement of habitat. Both engineering firms that have been working on the design have utilized Iowa's River Restoration Toolbox and have been in constant contact with Iowa DNR's Floodplain, Fisheries, and Rivers Program staff on overall design and planning.						
A75	Work with Storm Lake Radio KAYL to install a generator or at a minimum connection for a mobile generator so they can continue to provide emergency information during a power outage.	Infrastructure Failure	EMA; Storm Lake Radio	\$45,000; public-private funding	2026	Medium	New in 2023.
A76*	Purchasing large agricultural tractor, which could assist with 3 already existing mitigation actions: 1. Maintain and upgrade snow removal equipment 2. Purchasing portable high-capacity water pumps. 3. Purchase and install backup generators. A large agricultural tractor could be used to power all 3 of these device types, making the purchase cost of each much less. The tractor could be used on a large snow blower to open roads for emergency vehicles, on a high capacity water pump to move water to a	Animal/Plant/Crop Disease, Drought, Earthquake, Expansive Soil, Extreme Heat, Flash Flood, Grass/Wildland Fire, Hazmat Incident, Human Disease, Infrastructure Failure, Landslide, Levee/Dam Failure, River Flood, Severe Winter Storm, Sinkhole, Terrorism, Thunderstorms, Tornado/Windstorm, Transportation Incident	Secondary Road Department	\$500,000; USDA grants	2028	High	New in 2023.

Action #	Mitigation Action	Hazards Addressed	Lead and Support Agency	Estimated Cost & Potential Funding	Timeline	Priority	Status, Implementation Notes & Comments
	more desirable area, and on a backup generator in the event of power loss or power needed in a remote location. As stand-alone units, all these types of units are more expensive and only used for one type of need. An agricultural tractor would be used for multiple things.						

Table 5-4 Albert City Mitigation Actions

Action #	Mitigation Action	Hazards Addressed	Lead & Support Agencies	Estimated Cost & Potential Funding	Timeline	Priority	Status, Implementation Notes & Comments
B1	Purchasing and encouraging the use of NOAA weather radios.	Drought, Earthquake, Exp. Soil, Ext. Heat, Flash Flood, Landslide, River Flood, Winter Storm, Thunderstorm, Tornado/Wind, Transp. Incident	Emergency Management;	\$50 per radio; Grant	2028	Medium	Continuous.
B2	Education materials given out to the public to improve awareness of all hazards.	Animal/Plant Disease, Drought, Earthquake, Exp. Soil, Ext. Heat, Flash Flood, Grass/Wildfire, Hazmat, Human Disease, Infra. Failure, Landslide, Levee/Dam, River Flood, Winter Storm, Sinkhole, Terrorism, Thunderstorm, Tornado/Wind, Transp. Incident	Emergency Management, Fire Dept, Police/Sheriff	\$1,000 per year; Grant, Staff Time	2028	Medium	Continuous.
B3	Promote storm spotter training and recruit new or additional storm spotters.	Drought, Earthquake, Exp. Soil, Ext. Heat, Flash Flood, Landslide, River Flood, Winter Storm, Thunderstorm, Tornado/Wind, Transp. Incident	Emergency Management; Fire Dept	\$500 per year; Grant, Staff Time	2028	Medium	Continuous.
B4	Purchase, install and maintain warning sirens.	Drought, Earthquake, Exp. Soil, Ext. Heat, Flash Flood, Landslide, River Flood, Winter Storm, Thunderstorm, Tornado/Wind, Transp. Incident	Emergency Management; Fire Dept	\$20,000; Grant, Local Budget	2028	High	In Progress. Replace damaged siren from windstorm December 2022
B5*	Maintain and upgrade snow removal equipment.	Winter Storm	City Public Works	\$50,000 to \$100,000; Local Budget	2028	High	Continuous. Purchase new payloaders December 2022
B6	Purchasing and installing portable water pumps at critical facilities.	Flash Flood, River Flood, Thunderstorm	City Public Works	\$10,000 to \$60,000; Grant, Local Budget	2028	High	Continuous.
B7	Improving and inspecting storm water drainage.	Flash Flood, River Flood	City Public Works	N/A; Grant, Local Budget	2028	High	Continuous. Budgeted FY23-24 for drainage maintenance

Action #	Mitigation Action	Hazards Addressed	Lead & Support Agencies	Estimated Cost & Potential Funding	Timeline	Priority	Status, Implementation Notes & Comments
B8*	Continue Hazmat and Fire Dept training.	Grass/Wildfire, Hazmat, Infra. Failure	Emergency Management, Fire Dept	\$5,000 per year; Grant	2028	High	Continuous.
B9	Clean and enlarge sewage lagoons.	Flash Flood, River Flood	City Public Works	\$100,000; Grant, Local Budget	2028	High	Continuous.
B10	Replace sewer lines.	Flash Flood, River Flood	City Public Works	\$50,000 to \$100,000; Grant, Local Budget	2028	High	Continuous.
B11	Install new storm water and sanitary sewer systems and update any current storm water and sanitary sewer systems.	Flash Flood	City Public Works	\$200,000; Grant, Local Budget	2028	High	Continuous.
B12	Investigate storm water issues and determine what the best solutions are to alleviate water issues	Flash Flood, River Flood	City Public Works	Up to \$1 million; Grant, Local Budget	2028	High	Continuous.
B13*	Continue incident command training.	Animal/Plant Disease, Drought, Earthquake, Exp. Soil, Ext. Heat, Flash Flood, Grass/Wildfire, Hazmat, Human Disease, Infra. Failure, Landslide, Levee/Dam, River Flood, Winter Storm, Sinkhole, Terrorism, Thunderstorm, Tornado/Wind, Transp. Incident	Emergency Management;	\$4,000 annually; Grant, Local Budget	2028	High	Continuous.
B14	CO2 Pipeline Public Awareness. A new CO2 pipeline has been proposed that will run adjacent to the City of Albert City. Develop notification system and conduct public awareness campaign to notify residents of the hazard, and where/how to evacuate in the event of a pipeline emergency.	Hazmat Incident	Fire Dept; Sheriff's Office, City Leadership	\$100,000 - \$5M Homeland Security Grants, local funds	2028	High	New in 2023.
B15	Purchase equipment and hire personnel for cleanup after a disaster event.	Animal/Plant Disease, Drought, Earthquake, Exp. Soil, Ext. Heat, Flash Flood, Grass/Wildfire, Hazmat, Human Disease, Infra. Failure, Landslide, Levee/Dam, River Flood, Winter Storm, Sinkhole, Terrorism, Thunderstorm, Tornado/Wind, Transp. Incident	City Manager, Emergency Management	\$50,000-\$200,000 Homeland Security, Local funds	2028	Medium	New in 2023.
B16	Purchase and install backup generators at City Hall and the Fire Station.	Earthquake, Exp. Soil, Ext. Heat, Flash Flood, Grass/Wildfire, Infra. Failure, Landslide, Levee/Dam, River Flood, Winter Storm,	City Manager, Emergency Management, Fire Dept	\$100,000 Grants and City Budget	2028	Medium	New 2023.

Action #	Mitigation Action	Hazards Addressed	Lead & Support Agencies	Estimated Cost & Potential Funding	Timeline	Priority	Status, Implementation Notes & Comments
		Terrorism, Thunderstorm, Tornado/Wind, Transp. Incident					

Table 5-5 City of Alta Mitigation Actions

Action #	Mitigation Action	Hazards Addressed	Lead & Support Agencies	Estimated Cost & Potential Funding	Timeline	Priority	Status, Implementation Notes & Comments
C1	Purchase and encourage the use of NOAA weather radios.	Drought, Earthquake, Exp. Soil, Ext. Heat, Flash Flood, Landslide, River Flood, Winter Storm, Thunderstorm, Tornado/Wind, Transp. Incident	Emergency Management;	\$50 per radio; Grant	2028	Medium	Continuous.
C2	Education materials given out to the public to improve awareness of all hazards.	Animal/Plant Disease, Drought, Earthquake, Exp. Soil, Ext. Heat, Flash Flood, Grass/Wildfire, Hazmat, Human Disease, Infra. Failure, Landslide, Levee/Dam, River Flood, Winter Storm, Sinkhole, Terrorism, Thunderstorm, Tornado/Wind, Transp. Incident	Emergency Management, Fire Dept, Police/Sheriff	\$1,000 per year; Grant, Staff Time	2028	Medium	Continuous.
C3	Promote storm spotter training and recruit new or additional storm spotters.	Drought, Earthquake, Exp. Soil, Ext. Heat, Flash Flood, Landslide, River Flood, Winter Storm, Thunderstorm, Tornado/Wind, Transp. Incident	Emergency Management; Fire Dept	\$500 per year; Grant, Staff Time	2028	Medium	Continuous.
C4	Purchase, install and maintain warning sirens.	Drought, Earthquake, Exp. Soil, Ext. Heat, Flash Flood, Landslide, River Flood, Winter Storm, Thunderstorm, Tornado/Wind, Transp. Incident	Emergency Management; Fire Dept	\$20,000; Grant, Local Budget	2028	High	Continuous. A new siren was installed in 2014, but we continue to maintain the current warning sirens. The City of Alta has 2.
C5	Maintain NFIP participation by enforcing floodplain ordinances and educating residents about the benefits of purchasing flood insurance.	Flash Flood and River Flood	Floodplain Admin; Emergency Management	N/A; Staff Time	2028	Medium	Continuous.
C6	Maintain and upgrade snow removal equipment.	Winter Storm	Public Works	\$50,000 to \$100,000; Local Budget	2028	High	Continuous.
C7*	Continue hazmat and fire department training.	Grass/Wildfire, Hazmat, Infra. Failure	Emergency Management, Fire Dept	\$5,000 per year; Grant	2028	High	Continuous.
C8	Replace sewer lines.	Flash Flood, River Flood	Public Works	\$50,000 to \$100,000; Grant, Local Budget	2028	High	In Progress. The City of Alta is doing a \$1.5 million sewer lining project.

Action #	Mitigation Action	Hazards Addressed	Lead & Support Agencies	Estimated Cost & Potential Funding	Timeline	Priority	Status, Implementation Notes & Comments
C9	Install new storm water and sanitary sewer systems and update any current storm water and sanitary sewer systems.	Flash Flood	Public Works	\$200,000; Grant, Local Budget	2028	High	In Progress.
C10	Investigate storm water issues and determine what the best solutions are to alleviate water issues	Flash Flood, River Flood	Public Works	Up to \$1 million; Grant, Local Budget	2028	Medium	Continuous.
C11*	Continue incident command training.	Animal/Plant Disease, Drought, Earthquake, Exp. Soil, Ext. Heat, Flash Flood, Grass/Wildfire, Hazmat, Human Disease, Infra. Failure, Landslide, Levee/Dam, River Flood, Winter Storm, Sinkhole, Terrorism, Thunderstorm, Tornado/Wind, Transp. Incident	Emergency Management;	\$4,000 annually; Grant, Local Budget	2028	High	Continuous.
C12	Tornado safe room at Westview trailer court. The trailer court on the west side of town does not have anywhere safe to go in an emergency. The nearest safe room is too far away.	Winter Storm, Thunderstorm, Tornado/Wind	Emergency Management; Property owner	\$750,000; BRIC grant, local budget	2025	High	New in 2023.
C13	Upgrade and enhance backup power generators. The Alta Municipal Utilities would upgrade their generators to have the ability to run the entire town at one time during an emergency. They can currently only run ½ of town at a time during an emergency.	Animal/Plant Disease, Drought, Earthquake, Exp. Soil, Ext. Heat, Flash Flood, Grass/Wildfire, Hazmat, Human Disease, Infra. Failure, Landslide, Levee/Dam, River Flood, Winter Storm, Sinkhole, Terrorism, Thunderstorm, Tornado/Wind, Transp. Incident	Emergency Management	\$250,000 Local budget, grant	2030	High	New in 2023.

Table 5-6 City of Lakeside Mitigation Actions

Action #	Mitigation Action	Hazards Addressed	Lead & Support Agencies	Estimated Cost & Potential Funding	Timeline	Priority	Status, Implementation Notes & Comments
D1	Sewer Lining. Older pipes down middle of roads setting ground water infiltration	Infrastructure Failure	Public Works, ISG Engineering firm	\$100,000; Grant, Local Budget	2030	High	New in 2023. Pipe restoration and stop ground water infiltration.
D2	Equip City Hall with backup generator. Currently, City Hall and saferoom are on a battery backup.	Earthquake, Exp. Soil, Ext. Heat, Flash Flood, Grass/Wildfire, Hazmat, Human Disease, Infra. Failure, Landslide, Levee/Dam, River Flood, Winter Storm, Sinkhole, Terrorism, Thunderstorm, Tornado/Wind, Transp. Incident	Public Works	\$100,000; Grant, Local Budget	2030	Medium	New in 2023.

Action #	Mitigation Action	Hazards Addressed	Lead & Support Agencies	Estimated Cost & Potential Funding	Timeline	Priority	Status, Implementation Notes & Comments
D3	Improve storm water intakes and piping for better drainage near the Lakeside Campground, Marina, and the Cobblestone.	Flash Flood, River Flood	Public Works	\$15,000; Grants, Local Budget	2030	Medium	New in 2023.
D4	Identify and replace leaky water pipes.	Drought	Public Works	\$10,000 - \$100,000; Grants Capital Budget	2030	Low	New in 2023.
D5	Fire Hydrant Replacements. Replaced aged fire hydrants that are no longer operational or aged to a point that they are no longer reliable.	Drought	Public Works, Fire Department	\$1M; Grants Capital Budget	2030	Low	New in 2023.
D6	Water reuse strategies. Implementation and construction of facilities to allow for water reuse to help eliminate the demand for potable water.	Drought, Flash Flood	Public Works	Over \$1M; Grants Capital Budget	2030	Low	New in 2023.

Table 5-7 City of Linn Grove Mitigation Actions

Action #	Mitigation Action	Hazards Addressed	Lead & Support Agencies	Estimated Cost & Potential Funding	Timeline	Priority	Status, Implementation Notes & Comments
E1	Purchasing and encouraging the use of NOAA weather radios.	Drought, Earthquake, Exp. Soil, Ext. Heat, Flash Flood, Landslide, River Flood, Winter Storm, Thunderstorm, Tornado/Wind, Transp. Incident	Emergency Management;	\$50 per radio; Grant	2028	Medium	Not Started
E2	Education materials given out to the public to improve awareness of all hazards.	Animal/Plant Disease, Drought, Earthquake, Exp. Soil, Ext. Heat, Flash Flood, Grass/Wildfire, Hazmat, Human Disease, Infra. Failure, Landslide, Levee/Dam, River Flood, Winter Storm, Sinkhole, Terrorism, Thunderstorm, Tornado/Wind, Transp. Incident	Emergency Management, Fire Dept, Police/Sheriff	\$1,000 per year; Grant, Staff Time	2028	Medium	Not Started
E3	Promote storm spotter training and recruit new or additional storm spotters.	Drought, Earthquake, Exp. Soil, Ext. Heat, Flash Flood, Landslide, River Flood, Winter Storm, Thunderstorm, Tornado/Wind, Transp. Incident	Emergency Management; Fire Dept	\$500 per year; Grant, Staff Time	2028	Medium	Not Started
E4	Purchase and install backup generators.	Animal/Plant Disease, Drought, Earthquake, Exp. Soil, Ext. Heat, Flash Flood, Grass/Wildfire, Hazmat, Human Disease, Infra. Failure, Landslide, Levee/Dam, River Flood, Winter Storm, Sinkhole,	Public Works; Emergency Management, Fire	\$40,000-\$100,000; Grant, Local Budget	2028	High	Not Started

Action #	Mitigation Action	Hazards Addressed	Lead & Support Agencies	Estimated Cost & Potential Funding	Timeline	Priority	Status, Implementation Notes & Comments
		Terrorism, Thunderstorm, Tornado/Wind, Transp. Incident	Dept, Police/Sheriff				
E5	Purchase, install and maintain warning sirens.	Drought, Earthquake, Exp. Soil, Ext. Heat, Flash Flood, Landslide, River Flood, Winter Storm, Thunderstorm, Tornado/Wind, Transp. Incident	Emergency Management; Fire Dept, Public Works	\$20,000; Grant, Local Budget	2028	High	Not Started
E6	Purchase equipment necessary to run shelters during disaster situations.	Animal/Plant Disease, Drought, Earthquake, Exp. Soil, Ext. Heat, Flash Flood, Grass/Wildfire, Hazmat, Human Disease, Infra. Failure, Landslide, Levee/Dam, River Flood, Winter Storm, Sinkhole, Terrorism, Thunderstorm, Tornado/Wind, Transp. Incident	Public Works; Emergency Management	\$50,000; Grant, Local Budget	2028	Medium	Not Started
E7	Complete and update floodplain maps.	Flash Flood and River Flood	Floodplain Administrator	N/A; Grant	2028	High	Not Started
E8	Relocate critical facilities out of flood prone areas.	Flash Flood and River Flood	Floodplain Administrator	\$100,000 to \$1 million; Grant	2028	Medium	Not Started
E9	Maintain NFIP participation by enforcing floodplain ordinances and educating residents about the benefits of purchasing flood insurance.	Flash Flood and River Flood	Floodplain Administrator; Emergency Management	N/A; Staff Time	2028	High	Not Started
E10	Maintain and upgrade snow removal equipment.	Winter Storm	Public Works	\$50,000 to \$100,000; Local Budget	2028	High	Not Started
E11	Purchasing sandbags and equipment.	Flash Flood, River Flood, Thunderstorm	Public Works	\$15,000; Local Budget	2028	High	Not Started
E12	Developing a watershed study.	Flash Flood, River Flood	Public Works	\$20,000; Grant, Local Budget	2028	High	Not Started
E13	Mutual aid between fire Depts.	Animal/Plant Disease, Drought, Earthquake, Exp. Soil, Ext. Heat, Flash Flood, Grass/Wildfire, Hazmat, Human Disease, Infra. Failure, Landslide, Levee/Dam, River Flood, Winter Storm, Sinkhole, Terrorism, Thunderstorm, Tornado/Wind, Transp. Incident	Emergency Management; Fire Dept	N/A; Staff Time	2028	High	Not Started
E14	Utilize soil suitability rating when new issuing permits.	Landslide, Sinkhole	Planning Department	N/A; Local Budget, Staff Time	2028	High	Not Started
E15	Monitor the dam at Linn Grove during high-risk times.	Levee/Dam	Emergency Management, Police/Sheriff;	N/A; Staff Time	2028	High	Not Started

Action #	Mitigation Action	Hazards Addressed	Lead & Support Agencies	Estimated Cost & Potential Funding	Timeline	Priority	Status, Implementation Notes & Comments
E16*	Continue Hazmat and fire Dept training.	Grass/Wildfire, Hazmat, Infra. Failure	Emergency Management; Fire Dept	\$5,000 per year; Grant	2028	High	Not Started
E17	Replace sewer lines.	Flash Flood, River Flood	Public Works	\$50,000 to \$100,000; Grant, Local Budget	2028	High	Not Started
E18	Purchase paramedic and emergency response equipment.	Animal/Plant Disease, Drought, Earthquake, Exp. Soil, Ext. Heat, Flash Flood, Grass/Wildfire, Hazmat, Human Disease, Infra. Failure, Landslide, Levee/Dam, River Flood, Winter Storm, Sinkhole, Terrorism, Thunderstorm, Tornado/Wind, Transp. Incident	Emergency Management; Fire Dept	\$50,000 to \$500,000; Grant, Local Budget	2028	High	Not Started
E19	Encouraging buyouts (acquisition) of properties located in floodplains and/or are repetitive losses.	Flash Flood, River Flood	Emergency Management;	N/A; Grant	2028	Medium	Not Started
E20	Install new storm water and sanitary sewer systems and update any current storm water and sanitary sewer systems.	Flash Flood	Public Works	\$200,000; Grant, Local Budget	2028	High	Not Started
E21	Increase water storage at water towers.	Drought	Public Works	\$50,000; Grant, Local Budget	2028	High	Not Started
E22	Encourage appropriate landscaping and terracing to address land subsidence issues.	Landslide, Sinkhole	Emergency Management; Fire Dept, Public Works	N/A; Staff Time	2028	High	Not Started
E23	Investigate storm water issues and determine what the best solutions are to alleviate water issues	Flash Flood, River Flood	Public Works	Up to \$1 million; Grant, Local Budget	2028	High	Not Started
E24*	Continue incident command training.	Animal/Plant Disease, Drought, Earthquake, Exp. Soil, Ext. Heat, Flash Flood, Grass/Wildfire, Hazmat, Human Disease, Infra. Failure, Landslide, Levee/Dam, River Flood, Winter Storm, Sinkhole, Terrorism, Thunderstorm, Tornado/Wind, Transp. Incident	Emergency Management;	\$4,000 annually; Grant, Local Budget	2028	High	Not Started
E25	Connect Linn Grove to a safe drinkable water source.	Drought	Public Works	Unknown; Grants, CIP Budget	2028	High	New in 2023
E26	Replace entire water distribution network in the city, assuring no lead pipes.	Drought, Human Disease	Public Works	Over \$1 million; Grants, CIP Budget	2028	Medium	New in 2023

Action #	Mitigation Action	Hazards Addressed	Lead & Support Agencies	Estimated Cost & Potential Funding	Timeline	Priority	Status, Implementation Notes & Comments
E27	Reinforce berms and continue to monitor them.	Flash Flood, River Flood	Public Works	Unknown; Grants, CIP Budget	2028	Low	New in 2023
E28	Work with National Resource Conservation Service and Iowa Dept. of Natural Resources to determine areas prone to landslides and implement mitigation and protective measures as feasible.	Landslide, Sinkhole	Public Works	To be determined as mitigation measures are identified; Grants, CIP Budget	2028	Medium	New in 2023
E29	Create a water runoff natural filtration area.	Flash Flood, River Flood	Public Works	Up to \$1 million; Grants, CIP Budget	2028	Low	New in 2023
E30	Add a river gage at Linn Grove to monitor levels.	River Flood	Public Works	\$10,000; Grants, CIP Budget	2028	Medium	New in 2023

Table 5-8 City of Marathon Mitigation Actions

Action #	Mitigation Action	Hazards Addressed	Lead & Support Agencies	Estimated Cost & Potential Funding	Timeline	Priority	Status, Implementation Notes & Comments
F1	Purchasing and encouraging the use of NOAA weather radios.	Drought, Earthquake, Exp. Soil, Ext. Heat, Flash Flood, Landslide, River Flood, Winter Storm, Thunderstorm, Tornado/Wind, Transp. Incident	Emergency Management;	\$50 per radio; Grant	2028	Medium	Not Started
F2	Education materials given out to the public to improve awareness of all hazards.	Animal/Plant Disease, Drought, Earthquake, Exp. Soil, Ext. Heat, Flash Flood, Grass/Wildfire, Hazmat, Human Disease, Infra. Failure, Landslide, Levee/Dam, River Flood, Winter Storm, Sinkhole, Terrorism, Thunderstorm, Tornado/Wind, Transp. Incident	Emergency Management, Fire Dept, Police/Sheriff	\$1,000 per year; Grant, Staff Time	2028	Medium	Not Started
F3	Promote storm spotter training and recruit new or additional storm spotters.	Drought, Earthquake, Exp. Soil, Ext. Heat, Flash Flood, Landslide, River Flood, Winter Storm, Thunderstorm, Tornado/Wind, Transp. Incident	Emergency Management; Fire Dept	\$500 per year; Grant, Staff Time	2028	Medium	Not Started
F4	Purchase and install backup generators.	Animal/Plant Disease, Drought, Earthquake, Exp. Soil, Ext. Heat, Flash Flood, Grass/Wildfire, Hazmat, Human Disease, Infra. Failure, Landslide, Levee/Dam, River Flood, Winter Storm, Sinkhole, Terrorism, Thunderstorm, Tornado/Wind, Transp. Incident	Public Works; Emergency Management, Fire Dept, Police/Sheriff	\$40,000-\$100,000; Grant, Local Budget	2028	High	Not Started

Action #	Mitigation Action	Hazards Addressed	Lead & Support Agencies	Estimated Cost & Potential Funding	Timeline	Priority	Status, Implementation Notes & Comments
F5	Purchase, install and maintain warning sirens.	Drought, Earthquake, Exp. Soil, Ext. Heat, Flash Flood, Landslide, River Flood, Winter Storm, Thunderstorm, Tornado/Wind, Transp. Incident	Emergency Management; Fire Dept	\$20,000; Grant, Local Budget	2028	High	Not Started
F6	Designate shelter locations throughout the county and in cities and make that list available to the public.	Animal/Plant Disease, Drought, Earthquake, Exp. Soil, Ext. Heat, Flash Flood, Grass/Wildfire, Hazmat, Human Disease, Infra. Failure, Landslide, Levee/Dam, River Flood, Winter Storm, Sinkhole, Terrorism, Thunderstorm, Tornado/Wind, Transp. Incident	Emergency Management; Fire Dept	N/A; Staff Time	2028	Medium	Not Started
F7	Utilize ALERT Iowa system to notify residents of severe weather.	Drought, Earthquake, Exp. Soil, Ext. Heat, Flash Flood, Landslide, River Flood, Winter Storm, Thunderstorm, Tornado/Wind, Transp. Incident	Emergency Management, Fire Dept, Police/Sheriff	50000; Grant, Local Budget	2028	High	Not Started
F8	Improved communication with power companies.	Flash Flood, Infra. Failure, River Flood, Winter Storm, Terrorism, Thunderstorm, and Tornado/Wind	Public Works; Emergency Management, Fire Dept, Police/Sheriff	N/A; Staff Time	2028	Medium	Not Started
F9	Construction of a public tornado safe room.	Flash Flood, River Flood, Winter Storm, Thunderstorm, Tornado/Wind	Public Works; Emergency Management	\$200,000- \$1 million; Grant	2028	High	Not Started
F10	Mutual aid between fire Depts.	Animal/Plant Disease, Drought, Earthquake, Exp. Soil, Ext. Heat, Flash Flood, Grass/Wildfire, Hazmat, Human Disease, Infra. Failure, Landslide, Levee/Dam, River Flood, Winter Storm, Sinkhole, Terrorism, Thunderstorm, Tornado/Wind, Transp. Incident	Emergency Management; Fire Dept	N/A; Staff Time	2028	High	Not Started
F11*	Continue Hazmat and fire department training.	Grass/Wildfire, Hazmat, Infra. Failure	Emergency Management, Fire Dept	\$5,000 per year; Grant	2028	High	Not Started
F12	Upgrading of critical facilities to make capable of serving as a temporary shelter from storms or for post disaster services.	Animal/Plant Disease, Drought, Earthquake, Exp. Soil, Ext. Heat, Flash Flood, Grass/Wildfire, Hazmat, Human Disease, Infra. Failure, Landslide, Levee/Dam, River Flood, Winter Storm, Sinkhole, Terrorism, Thunderstorm, Tornado/Wind, Transp. Incident	Emergency Management, Facilities	\$100,000; Grant, Local Budget	2028	High	Not Started

Action #	Mitigation Action	Hazards Addressed	Lead & Support Agencies	Estimated Cost & Potential Funding	Timeline	Priority	Status, Implementation Notes & Comments
F13	Backup record keeping for important documents and files for Buena Vista County and Incorporated cities.	Animal/Plant Disease, Drought, Earthquake, Exp. Soil, Ext. Heat, Flash Flood, Grass/Wildfire, Hazmat, Human Disease, Infra. Failure, Landslide, Levee/Dam, River Flood, Winter Storm, Sinkhole, Terrorism, Thunderstorm, Tornado/Wind, Transp. Incident	Emergency Management, Fire Dept, Police/Sheriff	\$25,000 per year; Grant, Local Budget	2028	High	Not Started
F14	Investigate storm water issues and determine what the best solutions are to alleviate water issues	Flash Flood, River Flood	Public Works	Up to \$1 million; Grant, Local Budget	2028	High	Not Started
F15*	Continue incident command training.	Animal/Plant Disease, Drought, Earthquake, Exp. Soil, Ext. Heat, Flash Flood, Grass/Wildfire, Hazmat, Human Disease, Infra. Failure, Landslide, Levee/Dam, River Flood, Winter Storm, Sinkhole, Terrorism, Thunderstorm, Tornado/Wind, Transp. Incident	Emergency Management;	\$4,000 annually; Grant, Local Budget	2028	High	Not Started
F16	Storm Water Upgrade. Upgrade storm water sewer going out of town.	Flash Flooding	Public Works; W Streets	\$1.5 M to \$20M;	2028	Medium	New in 2023

Table 5-9 City of Newell Mitigation Actions

Action #	Mitigation Action	Hazards Addressed	Lead & Support Agencies	Estimated Cost & Potential Funding	Timeline	Priority	Status, Implementation Notes & Comments
G1	Purchasing and encouraging the use of NOAA weather radios.	Drought, Earthquake, Exp. Soil, Ext. Heat, Flash Flood, Landslide, River Flood, Winter Storm, Thunderstorm, Tornado/Wind, Transp. Incident	Emergency Management;	\$50 per radio; Grant	2028	Low	Not Started.
G2	Promote storm spotter training and recruit new or additional storm spotters.	Drought, Earthquake, Exp. Soil, Ext. Heat, Flash Flood, Landslide, River Flood, Winter Storm, Thunderstorm, Tornado/Wind, Transp. Incident	Emergency Management; Fire Dept	\$500 per year; Grant, Staff Time	2028	Medium	Continuous. Continue to storm spot, call comm center when going out.
G3	Purchase and install backup generators.	Animal/Plant Disease, Drought, Earthquake, Exp. Soil, Ext. Heat, Flash Flood, Grass/Wildfire, Hazmat, Human Disease, Infra. Failure, Landslide, Levee/Dam, River Flood, Winter Storm, Sinkhole, Terrorism, Thunderstorm, Tornado/Wind, Transp. Incident	Public Works, Emergency Management, Fire Dept, Police/Sheriff	\$40,000-\$100,000; Grant, Local Budget	2028	Low	Not started. Have a backup generator.

Action #	Mitigation Action	Hazards Addressed	Lead & Support Agencies	Estimated Cost & Potential Funding	Timeline	Priority	Status, Implementation Notes & Comments
G4	Purchase equipment necessary to run shelters during disaster situations.	Animal/Plant Disease, Drought, Earthquake, Exp. Soil, Ext. Heat, Flash Flood, Grass/Wildfire, Hazmat, Human Disease, Infra. Failure, Landslide, Levee/Dam, River Flood, Winter Storm, Sinkhole, Terrorism, Thunderstorm, Tornado/Wind, Transp. Incident	Emergency Management	50000; Grant, Local Budget	2028	Low	Continuous. Purchase NOAA weather radios, update disaster and hazard plans according to needs.
G5	Relocate critical facilities out of flood prone areas.	Flash Flood and River Flood	Floodplain Administrator; Emergency Management	\$100,000 to \$1 million; Grant	2028	High	In progress. Working to finish with IDNR.
G6	Join the National Flood Insurance Program (NFIP) by adopting the October 2023 FIRM.	Flash Flood and River Flood	Floodplain Administrator; Emergency Management	N/A; Staff Time	2028	High	In progress. Working to finish this.
G7	Maintain and upgrade snow removal equipment.	Winter Storm	Public Works	\$50,000 to \$100,000; Local Budget	2028	Low	In progress. New dump truck acquired in 2021, approved for USDA grant \$50k towards road grader/plow until 6/30/24
G8	Underground burial of power lines.	Earthquake, Flash Flood, Infra. Failure, River Flood, Winter Storm, Thunderstorm, Tornado/Wind	Utility Company;	\$1 million; Local Budget	2028	Low	Not started.
G9	Improving and inspecting storm water drainage.	Flash Flood, River Flood	Public Works	N/A; Grant, Local Budget	2028	Medium	In progress. Added tile from e 3rd street, continue to find storm water drainage relief. Add new: upgrade and/or storm water intakes and catch basins to allow for proper storm water drainage
G10	Mutual aid between fire Depts.	Animal/Plant Disease, Drought, Earthquake, Exp. Soil, Ext. Heat, Flash Flood, Grass/Wildfire, Hazmat, Human Disease, Infra. Failure, Landslide, Levee/Dam, River Flood, Winter Storm, Sinkhole, Terrorism, Thunderstorm, Tornado/Wind, Transp. Incident	Emergency Management; Fire Dept	N/A; Staff Time	2028	High	Continuous. 28-E agreements in place with surrounding areas
G11*	Continue Hazmat and fire department training.	Grass/Wildfire, Hazmat, Infra. Failure	Emergency Management, Fire Dept	\$5,000 per year; Grant	2028	High	Continuous.
G12	Replace sewer lines.	Flash Flood, River Flood	Public Works	\$50,000 to \$100,000; Grant, Local Budget	2028	Medium	Not Started.

Action #	Mitigation Action	Hazards Addressed	Lead & Support Agencies	Estimated Cost & Potential Funding	Timeline	Priority	Status, Implementation Notes & Comments
G13	Discourage development in the floodplain or flood prone areas.	Flash Flood, River Flood	Floodplain Administrator	N/A; Staff Time	2028	Medium	Continuous.
G14	Investigate storm water issues and determine what the best solutions are to alleviate water issues	Flash Flood, River Flood	Public Works	Up to \$1 million; Grant, Local Budget	2028	Medium	Continuous.
G15*	Continue incident command training.	Animal/Plant Disease, Drought, Earthquake, Exp. Soil, Ext. Heat, Flash Flood, Grass/Wildfire, Hazmat, Human Disease, Infra. Failure, Landslide, Levee/Dam, River Flood, Winter Storm, Sinkhole, Terrorism, Thunderstorm, Tornado/Wind, Transp. Incident	Emergency Management;	\$4,000 annually; Grant, Local Budget	2028	Medium	Continuous.
G16	Storm Water Mitigation. Replace or add intakes to allow for proper drainage of standing water. Add/replace tiling and drainage outlets where more development is happening (schools/residential).	Flash Flood	Public Works	\$100,000; HMA grants, CIP	2028	Medium	New in 2023.

Table 5-10 City of Rembrandt Mitigation Actions

Action #	Mitigation Action	Hazards Addressed	Lead & Support Agencies	Estimated Cost & Potential Funding	Timeline	Priority	Status, Implementation Notes & Comments
H1	Purchasing and encouraging the use of NOAA weather radios.	Drought, Earthquake, Exp. Soil, Ext. Heat, Flash Flood, Landslide, River Flood, Winter Storm, Thunderstorm, Tornado/Wind, Transp. Incident	Emergency Management;	\$50 per radio; Grant	2028	Medium	Continuous.
H2	Education materials given out to the public to improve awareness of all hazards.	Animal/Plant Disease, Drought, Earthquake, Exp. Soil, Ext. Heat, Flash Flood, Grass/Wildfire, Hazmat, Human Disease, Infra. Failure, Landslide, Levee/Dam, River Flood, Winter Storm, Sinkhole, Terrorism, Thunderstorm, Tornado/Wind, Transp. Incident	Emergency Management, Fire Dept, Police/Sheriff	\$1,000 per year; Grant, Staff Time	2028	Medium	Continuous.
H3	Purchase and install backup generators.	Animal/Plant Disease, Drought, Earthquake, Exp. Soil, Ext. Heat, Flash Flood, Grass/Wildfire, Hazmat, Human Disease, Infra. Failure, Landslide, Levee/Dam, River Flood, Winter	Emergency Management, Fire Dept, Police/Sheriff	\$40,000-\$100,000; Grant, Local Budget	2028	High	In Progress. Sewer lagoon generator to be installed by Fall 2023

Action #	Mitigation Action	Hazards Addressed	Lead & Support Agencies	Estimated Cost & Potential Funding	Timeline	Priority	Status, Implementation Notes & Comments
		Storm, Sinkhole, Terrorism, Thunderstorm, Tornado/Wind, Transp. Incident					
H4	Purchase, install and maintain warning sirens.	Drought, Earthquake, Exp. Soil, Ext. Heat, Flash Flood, Landslide, River Flood, Winter Storm, Thunderstorm, Tornado/Wind, Transp. Incident	Emergency Management; Fire Dept	\$20,000; Grant, Local Budget	2028	High	Continuous.
H5	Designate shelter locations throughout the county and in cities and make that list available to the public.	Animal/Plant Disease, Drought, Earthquake, Exp. Soil, Ext. Heat, Flash Flood, Grass/Wildfire, Hazmat, Human Disease, Infra. Failure, Landslide, Levee/Dam, River Flood, Winter Storm, Sinkhole, Terrorism, Thunderstorm, Tornado/Wind, Transp. Incident	Emergency Management; Fire Dept	N/A; Staff Time	2028	High	In Progress.
H6	Purchase equipment necessary to run shelters during disaster situations.	Animal/Plant Disease, Drought, Earthquake, Exp. Soil, Ext. Heat, Flash Flood, Grass/Wildfire, Hazmat, Human Disease, Infra. Failure, Landslide, Levee/Dam, River Flood, Winter Storm, Sinkhole, Terrorism, Thunderstorm, Tornado/Wind, Transp. Incident	Emergency Management	\$50,000; Grant, Local Budget	2028	Medium	Not Started.
H7	Maintain and upgrade snow removal equipment.	Winter Storm	Public Works	\$50,000 to \$100,000; Local Budget	2028	High	Continuous.
H8	Construction of a public tornado safe room.	Flash Flood, River Flood, Winter Storm, Thunderstorm, Tornado/Wind	Public Works	\$200,000- \$1 million; Grant	2028	High	Not Started.
H9*	Continue hazmat and fire department training.	Grass/Wildfire, Hazmat, Infra. Failure	Emergency Management, Fire Dept	\$5,000 per year; Grant	2028	High	Continuous.
H10	Investigate storm water issues and determine what the best solutions are to alleviate water issues	Flash Flood, River Flood	Public Works	Up to \$1 million; Grant, Local Budget	2028	High	Continuous.
H11*	Continue incident command training.	Animal/Plant Disease, Drought, Earthquake, Exp. Soil, Ext. Heat, Flash Flood, Grass/Wildfire, Hazmat, Human Disease, Infra. Failure, Landslide, Levee/Dam, River Flood, Winter Storm, Sinkhole, Terrorism, Thunderstorm, Tornado/Wind, Transp. Incident	Emergency Management	\$4,000 annually; Grant, Local Budget	2028	High	Continuous.
H12	Lagoon Generator. Purchase and install new generator for Lagoon to prevent backup during flooding/power loss.	Flash Flood, Infrastructure failure	Emergency Management, Public Works	\$22,000; City budget	2028	High	New in 2023.

Table 5-11 City of Sioux Rapids Mitigation Actions

Action #	Mitigation Action	Hazards Addressed	Lead & Support Agencies	Estimated Cost & Potential Funding	Timeline	Priority	Status, Implementation Notes & Comments
I 1	Purchasing and encouraging the use of NOAA weather radios.	Drought, Earthquake, Exp. Soil, Ext. Heat, Flash Flood, Landslide, River Flood, Winter Storm, Thunderstorm, Tornado/Wind, Transp. Incident	Emergency Management;	\$50 per radio; Grant	2028	Medium	Continuous
I 2	Education materials given out to the public to improve awareness of all hazards.	Animal/Plant Disease, Drought, Earthquake, Exp. Soil, Ext. Heat, Flash Flood, Grass/Wildfire, Hazmat, Human Disease, Infra. Failure, Landslide, Levee/Dam, River Flood, Winter Storm, Sinkhole, Terrorism, Thunderstorm, Tornado/Wind, Transp. Incident	Emergency Management, Fire Dept, Police/Sheriff	\$1,000 per year; Grant, Staff Time	2028	Medium	Continuous
I 3	Purchase and install backup generators.	Animal/Plant Disease, Drought, Earthquake, Exp. Soil, Ext. Heat, Flash Flood, Grass/Wildfire, Hazmat, Human Disease, Infra. Failure, Landslide, Levee/Dam, River Flood, Winter Storm, Sinkhole, Terrorism, Thunderstorm, Tornado/Wind, Transp. Incident	Emergency Management, Fire Dept, Police/Sheriff	\$40,000-\$100,000; Grant, Local Budget	2028	High	Continuous
I 4	Purchase, install and maintain warning sirens.	Drought, Earthquake, Exp. Soil, Ext. Heat, Flash Flood, Landslide, River Flood, Winter Storm, Thunderstorm, Tornado/Wind, Transp. Incident	Emergency Management; Fire Dept	\$20,000; Grant, Local Budget	2028	High	Continuous
I 5	Maintain NFIP participation by enforcing floodplain ordinances and educating residents about the benefits of purchasing flood insurance.	Flash Flood and River Flood	City Hall, Emergency Management	N/A; Staff Time	2028	High	Continuous
I 6	Improving and inspecting storm water drainage.	Flash Flood, River Flood	Public Works, Emergency Management	N/A; Grant, Local Budget	2028	High	Continuous
I 7	Construction of a public tornado safe room.	Flash Flood, River Flood, Winter Storm, Thunderstorm, Tornado/Wind	Public Works, Emergency Management	\$200,000- \$1 million; Grant	2028	High	Continuous

Action #	Mitigation Action	Hazards Addressed	Lead & Support Agencies	Estimated Cost & Potential Funding	Timeline	Priority	Status, Implementation Notes & Comments
I 8*	Replace, upgrade and purchase fire equipment.	Animal/Plant Disease, Drought, Earthquake, Exp. Soil, Ext. Heat, Flash Flood, Grass/Wildfire, Hazmat, Human Disease, Infra. Failure, Landslide, Levee/Dam, River Flood, Winter Storm, Sinkhole, Terrorism, Thunderstorm, Tornado/Wind, Transp. Incident	Emergency Management, Fire Dept	\$20,000 to \$500,000; Grant	2028	High	Continuous
I 9*	Continue Hazmat and fire department training.	Grass/Wildfire, Hazmat, Infra. Failure	Emergency Management, Fire Dept	\$5,000 per year; Grant	2028	High	Continuous
I 10	Clean and enlarge sewage lagoons.	Flash Flood, River Flood	Public Works	\$100,000; Grant, Local Budget	2028	High	Continuous
I 11	Replace sewer lines.	Flash Flood, River Flood	Public Works	\$50,000 to \$100,000; Grant, Local Budget	2028	High	Continuous
I 12	Non-structural retrofitting of public structures.	Animal/Plant Disease, Drought, Earthquake, Exp. Soil, Ext. Heat, Flash Flood, Grass/Wildfire, Hazmat, Human Disease, Infra. Failure, Landslide, Levee/Dam, River Flood, Winter Storm, Sinkhole, Terrorism, Thunderstorm, Tornado/Wind, Transp. Incident	Public Works	\$1 million; Grant, Local Budget	2028	High	Continuous
I 13	Install new storm water and sanitary sewer systems and update any current storm water and sanitary sewer systems.	Flash Flood	Public Works	\$200,000; Grant, Local Budget	2028	High	Continuous
I 14	Investigate storm water issues and determine what the best solutions are to alleviate water issues	Flash Flood, River Flood	Public Works	Up to \$1 million; Grant, Local Budget	2028	High	Continuous
I 15*	Continue incident command training.	Animal/Plant Disease, Drought, Earthquake, Exp. Soil, Ext. Heat, Flash Flood, Grass/Wildfire, Hazmat, Human Disease, Infra. Failure, Landslide, Levee/Dam, River Flood, Winter Storm, Sinkhole, Terrorism, Thunderstorm, Tornado/Wind, Transp. Incident	Emergency Management;	\$4,000 annually; Grant, Local Budget	2028	High	Continuous
I 16	Replacing Waterlines. Old outdated/build waterline too small break cause flooding, damage to personal property. Replace section by section a little at a time	Flash Flood	Public Works;	\$100,000 to \$2M;	2040	Medium	New in 2023

Table 5-12 City of Storm Lake Mitigation Actions

Action #	Mitigation Action	Hazards Addressed	Lead & Support Agencies	Estimated Cost & Potential Funding	Timeline	Priority	Status, Implementation Notes & Comments
J1	Purchasing and encouraging the use of NOAA weather radios.	Drought, Earthquake, Exp. Soil, Ext. Heat, Flash Flood, Landslide, River Flood, Winter Storm, Thunderstorm, Tornado/Wind, Transp. Incident	Emergency Management;	\$100 per radio; Grant	2028	Medium	Continuous.
J2	Education materials given out to the public to improve awareness of all hazards.	Animal/Plant Disease, Drought, Earthquake, Exp. Soil, Ext. Heat, Flash Flood, Grass/Wildfire, Hazmat, Human Disease, Infra. Failure, Landslide, Levee/Dam, River Flood, Winter Storm, Sinkhole, Terrorism, Thunderstorm, Tornado/Wind, Transp. Incident	City of Storm Lake Police and Fire Departments, BV Emergency Management	\$1,000 per year; Grant, Staff Time	2028	Medium	Continuous.
J3	Purchase and install backup generators.	Animal/Plant Disease, Drought, Earthquake, Exp. Soil, Ext. Heat, Flash Flood, Grass/Wildfire, Hazmat, Human Disease, Infra. Failure, Landslide, Levee/Dam, River Flood, Winter Storm, Sinkhole, Terrorism, Thunderstorm, Tornado/Wind, Transp. Incident	City of Storm Lake Police and Fire Departments, BV Emergency Management	\$40,000-\$100,000; Grant, Local Budget	2028	High	Continuous. New and replacements as needed.
J4	Purchase, install and maintain warning sirens.	Drought, Earthquake, Exp. Soil, Ext. Heat, Flash Flood, Landslide, River Flood, Winter Storm, Thunderstorm, Tornado/Wind, Transp. Incident	Emergency Management; Fire Dept	\$20,000; Grant, Local Budget	2028	High	Continuous. Replacements and additional as needed
J5	Special needs registration with the city to keep track of the most vulnerable populations.	Animal/Plant Disease, Drought, Earthquake, Exp. Soil, Ext. Heat, Flash Flood, Grass/Wildfire, Hazmat, Human Disease, Infra. Failure, Landslide, Levee/Dam, River Flood, Winter Storm, Sinkhole, Terrorism, Thunderstorm, Tornado/Wind, Transp. Incident	Storm Lake City administration	\$10,000; Staff Time	2028	High	Continuous.
J6	Maintain and upgrade snow removal equipment.	Winter Storm	Storm Lake City Admin, and Public Works	\$50,000 to \$100,000; Local Budget	2028	High	Continuous. Purchase additional/replacement as needed
J7	Purchasing equipment and hiring personnel for cleanup after a disaster event.	Animal/Plant Disease, Drought, Earthquake, Exp. Soil, Ext. Heat, Flash Flood, Grass/Wildfire, Hazmat, Human Disease, Infra. Failure, Landslide, Levee/Dam, River Flood, Winter Storm, Sinkhole, Terrorism, Thunderstorm, Tornado/Wind, Transp. Incident	City Emergency Management, Buena Vista County,	\$50,000-\$200,000; Grant	2028	Medium	Continuous.

Action #	Mitigation Action	Hazards Addressed	Lead & Support Agencies	Estimated Cost & Potential Funding	Timeline	Priority	Status, Implementation Notes & Comments
J8	Underground burial of power lines.	Earthquake, Flash Flood, Infra. Failure, River Flood, Winter Storm, Thunderstorm, Tornado/Wind	MidAmerican Energy	\$1 million; Local Budget	2028	Medium	Not Started. Would require utility company involvement
J9	Purchasing and installing portable water pumps at critical facilities.	Flash Flood, River Flood, Thunderstorm	Water dept.	\$10,000 to \$60,000; Grant, Local Budget	2028	Medium	Continuous.
J10	Purchasing portable high-capacity water pumps.	Flash Flood, River Flood, Thunderstorm	Emergency Management;	\$20,000; Grant, Local Budget	2028	Medium	Continuous.
J11	Improving and inspecting storm water drainage.	Flash Flood, River Flood	Emergency Management	N/A; Grant, Local Budget	2028	High	Continuous.
J12	Construction of a public tornado safe room.	Flash Flood, River Flood, Winter Storm, Thunderstorm, Tornado/Wind	Public Works Storm Lake Fire Dept, Emergency Management	\$200,000- \$1 million; Grant	2028	High	Not Started.
J13*	Replace, upgrade and purchase fire equipment.	Animal/Plant Disease, Drought, Earthquake, Exp. Soil, Ext. Heat, Flash Flood, Grass/Wildfire, Hazmat, Human Disease, Infra. Failure, Landslide, Levee/Dam, River Flood, Winter Storm, Sinkhole, Terrorism, Thunderstorm, Tornado/Wind, Transp. Incident	Storm Lake Fire Department	\$20,000 to \$500,000; Grant	2028	High	Continuous.
J14*	Continue Hazmat and fire department training.	Grass/Wildfire, Hazmat, Infra. Failure	Storm Lake Fire Department	\$5,000 per year; Grant	2028	High	Continuous.
J15	Replace sewer lines.	Flash Flood, River Flood	City Water Dept.	\$50,000 to \$100,000; Grant, Local Budget	2028	High	Continuous.
J16*	Purchase paramedic and emergency response equipment.	Animal/Plant Disease, Drought, Earthquake, Exp. Soil, Ext. Heat, Flash Flood, Grass/Wildfire, Hazmat, Human Disease, Infra. Failure, Landslide, Levee/Dam, River Flood, Winter Storm, Sinkhole, Terrorism, Thunderstorm, Tornado/Wind, Transp. Incident	Storm Lake Fire Dept., Regional Medical Center	\$50,000 to \$500,000; Grant, Local Budget	2028	High	Continuous.
J17	Upgrading of critical facilities to make capable of serving as a temporary shelter from storms or for post disaster services.	Animal/Plant Disease, Drought, Earthquake, Exp. Soil, Ext. Heat, Flash Flood, Grass/Wildfire, Hazmat, Human Disease, Infra. Failure, Landslide, Levee/Dam, River Flood, Winter Storm, Sinkhole, Terrorism, Thunderstorm, Tornado/Wind, Transp. Incident	City Manager, Emergency Management	\$100,000; Grant, Local Budget	2028	High	Not Started.

Action #	Mitigation Action	Hazards Addressed	Lead & Support Agencies	Estimated Cost & Potential Funding	Timeline	Priority	Status, Implementation Notes & Comments
J18	Maintain and replace deteriorating bridges and culverts.	Flash Flood, River Flood	Public Works, Buena Vista County	Up to \$5 million; Grant, Local Budget	2028	Medium	Not Started. Replacement as needed
J19	Non-structural retrofitting of public structures.	Animal/Plant Disease, Drought, Earthquake, Exp. Soil, Ext. Heat, Flash Flood, Grass/Wildfire, Hazmat, Human Disease, Infra. Failure, Landslide, Levee/Dam, River Flood, Winter Storm, Sinkhole, Terrorism, Thunderstorm, Tornado/Wind, Transp. Incident	City of Storm Lake building dept.	\$1 million; Grant, Local Budget	2028	Medium	Not Started.
J20*	Improved emergency communication equipment.	Animal/Plant Disease, Drought, Earthquake, Exp. Soil, Ext. Heat, Flash Flood, Grass/Wildfire, Hazmat, Human Disease, Infra. Failure, Landslide, Levee/Dam, River Flood, Winter Storm, Sinkhole, Terrorism, Thunderstorm, Tornado/Wind, Transp. Incident	Emergency Management, City Police and Fire Departments	\$100,000; Grant, Local Budget	2028	High	Continuous.
J21	Backup record keeping for important documents and files for Buena Vista County and Incorporated cities.	Animal/Plant Disease, Drought, Earthquake, Exp. Soil, Ext. Heat, Flash Flood, Grass/Wildfire, Hazmat, Human Disease, Infra. Failure, Landslide, Levee/Dam, River Flood, Winter Storm, Sinkhole, Terrorism, Thunderstorm, Tornado/Wind, Transp. Incident	City Administration, police/fire departments, Emergency Management	\$25,000 per year; Grant, Local Budget	2028	High	Continuous.
J22	Install new storm water and sanitary sewer systems and update any current storm water and sanitary sewer systems.	Flash Flood	City Administration, Storm Lake Wastewater Dept.	\$200,000; Grant, Local Budget	2028	High	Continuous.
J23*	Purchasing protective equipment to utilize during storm events	Drought, Earthquake, Exp. Soil, Ext. Heat, Flash Flood, Landslide, River Flood, Winter Storm, Thunderstorm, Tornado/Wind, Transportation Incident	Emergency Management	25000; Grant, Local Budget	2028	High	Continuous.
J24	Purchasing and installing backup generators at lift stations.	Flash Flood, River Flood	City water dept.	\$40,000 each; Grant, Local Budget	2028	High	Continuous.
J25	Install upgrades to all Emergency Operations Centers.	Animal/Plant Disease, Drought, Earthquake, Exp. Soil, Ext. Heat, Flash Flood, Grass/Wildfire, Hazmat, Human Disease, Infra. Failure, Landslide, Levee/Dam, River Flood, Winter	County Communications, Emergency Management	\$50,000; Grant, Local Budget	2028	High	Continuous.

Action #	Mitigation Action	Hazards Addressed	Lead & Support Agencies	Estimated Cost & Potential Funding	Timeline	Priority	Status, Implementation Notes & Comments
		Storm, Sinkhole, Terrorism, Thunderstorm, Tornado/Wind, Transp. Incident					
J26*	Purchasing equipment to use for search and rescue.	Animal/Plant Disease, Drought, Earthquake, Exp. Soil, Ext. Heat, Flash Flood, Grass/Wildfire, Hazmat, Human Disease, Infra. Failure, Landslide, Levee/Dam, River Flood, Winter Storm, Sinkhole, Terrorism, Thunderstorm, Tornado/Wind, Transp. Incident	City Administration, Police/fire departments, Emergency Management	\$100,000; Grant, Local Budget	2028	High	Continuous. New and replacements as needed.
J27	Purchase earth moving equipment.	Landslide, Sinkhole	City Administration	Up to \$500,000; Local Budget	2028	High	Continuous. New and replacements as needed.
J28	Investigate storm water issues and determine what the best solutions are to alleviate water issues	Flash Flood, River Flood	City Administration, City Wastewater Dept.	Up to \$1 million; Grant, Local Budget	2028	High	Continuous. Many projects have been done, there will be additional needs in the future,
J29*	Purchase personal protection equipment to deal with Animal/Plant Diseases.	Animal/Plant Disease	Emergency Management;	\$50,000; Grant	2028	High	Continuous. Avian flu has become a large local issue.
J30	Install drop arms and other safety measures on rail lines to help reduce transportation incidents.	Transportation Incident	Railroad companies;	\$100,000; Grant	2028	Medium	Continuous. Most in the community are done, may be additional or replacement in the future.
J31	Purchase LED/portable signage to help direct traffic when there is any kind of incident.	Transportation Incident	Emergency Management, City Police and Fire Departments	\$30,000; Grant, Local Budget	2028	High	Continuous.
J32	Conduct a public awareness campaign to help teach residents how to identify a terrorism incident.	Terrorism	Emergency Management; Police/Sheriff	N/A; Staff Time	2028	Medium	Not Started.
J33*	Continue incident command training.	Animal/Plant Disease, Drought, Earthquake, Exp. Soil, Ext. Heat, Flash Flood, Grass/Wildfire, Hazmat, Human Disease, Infra. Failure, Landslide, Levee/Dam, River Flood, Winter Storm, Sinkhole, Terrorism, Thunderstorm, Tornado/Wind, Transportation Incident	Emergency Management;	\$4,000 annually; Grant, Local Budget	2028	High	Continuous.
J34*	Equipping first responders so they can quickly respond to a terrorism incident.	Terrorism	Emergency Management; Fire Dept, Police/Sheriff	\$200,000; Grant, Local Budget	2028	Medium	Continuous.

Action #	Mitigation Action	Hazards Addressed	Lead & Support Agencies	Estimated Cost & Potential Funding	Timeline	Priority	Status, Implementation Notes & Comments
J35	Enhance security infrastructure and install safety cameras.	Terrorism	City Administration	\$200,000; Grant, Local Budget	2028	High	Continuous.
J36	Sewer Main Replacement and CIPP Lining. Implement sewer main replacement and CIPP lining projects to reduce the impacts of stormwater within the sanitary sewer collection system.	Flash Flood	City Administration, City Wastewater Dept.	\$1M; Grant, Local Budget	2028	High	Continuous. Added by Resolution August 16, 2021.
J37	Reconstruction and Lining of Sewer Manholes. Implement reconstruction and lining of sanitary sewer manholes to eliminate infiltration and inflow of stormwater within the sanitary sewer collection system.	Flash Flood	City Administration, City Wastewater Dept.	\$5M; Grant, Local Budget	2028	High	Continuous. Added by Resolution August 16, 2021.
J38	Rehabilitation and Construction of Lift Stations to ensure they are capable of handling peak flows due to flash flooding, infiltration, and inflow within the sanitary sewer collection system. Lift stations should be constructed to ensure redundancy and have onsite backup power supplies to ensure continued operations.	Flash Flood	City Administration, City Water and Public Works Dept.	\$2M; Grant, Local Budget	2028	High	Continuous. Added by Resolution August 16, 2021.
J39	Facilities to filter and slow stormwater flows. Construct environmentally friendly facilities that can provide filtration and slowing of stormwater flows while also providing positive impacts to the natural lake and other naturally sensitive areas within the community.	Flash Flood	City Administration, City wastewater dept.	\$2M; Grant, Local Budget	2028	High	Continuous. Added by resolution August 16, 2021. Several projects completed; more may be needed in the future.
J40	Protective facilities for public and private sewer and hazardous material spills. Construct facilities and systems to provide added protection from spills, leaks, and failures of both private and public sanitary sewer and hazardous materials facilities.	Flash Flood	City Administration, Storm Lake Fire Dept., City Wastewater Dept., Emergency Management	\$1M; Grant, Local Budget	2028	High	Continuous. Added by Resolution August 16, 2021.
J41	Nutrient reduction strategies. Implement nutrient reduction strategies, both point source and non-point source, to protect the	Flash Flood, Human Disease	City Administration, Iowa DNR	\$5M; Grant, Local Budget	2031	High	Continuous. Added by Resolution August 16, 2021.

Action #	Mitigation Action	Hazards Addressed	Lead & Support Agencies	Estimated Cost & Potential Funding	Timeline	Priority	Status, Implementation Notes & Comments
	natural environment of the local ecosystem as well as regional, state, and national ecosystems.						
J42	New Water Mains. Construct new water mains to ensure compliance with modern standards and to reduce the impacts of reduced capacity and flows due to aged pipes to ensure adequate flow and pressures to provide adequate fire protection and water quality within the entire community.	Drought	City Administration, city water department	\$2M; Grant, Local Budget	2031	High	Continuous. Added by Resolution August 16, 2021.
J43	Fire Hydrant Replacements. Replaced aged fire hydrants that are no longer operational or aged to a point that they are no longer reliable.	Drought	City Administration, Fire department	\$1M; Grant, Local Budget	2028	High	Continuous. Added by Resolution August 16, 2021.
J44	Primary water main replacement. Replace the City's primary water main running across the City to ensure long term reliability, adequate fire protection, and water quality to all residents and businesses within the service area.	Drought	City Administration, city water department	\$1M; Grant, Local Budget	2028	High	Continuous. Added by Resolution August 16, 2021.
J45	New Wells. Construct new wells in multiple aquifers to protect against drought impacts on the City's existing water sources.	Drought	City Administration, city water department	\$3M; Grant, Local Budget	2028	High	Continuous. Added by Resolution August 16, 2021.
J46	Raw water main. Installation of a secondary raw water main from the existing northern wells to ensure maximum use of wells during drought conditions.	Drought	City Administration, city water department	\$1M; Grant, Local Budget	2028	High	Continuous. Added by Resolution August 16, 2021.
J47	Water treatment plant improvements. Implementation of water treatment improvements to ensure adequate treatment of new raw water sources which due to depth of the source may have new or more stringent needs for treatment different from the City's current water source mix.	Drought	City Administration, city water department, Iowa DNR	\$1M; Grant, Local Budget	2031	High	Continuous. Added by Resolution August 16, 2021.

Action #	Mitigation Action	Hazards Addressed	Lead & Support Agencies	Estimated Cost & Potential Funding	Timeline	Priority	Status, Implementation Notes & Comments
J48	Water tower. Construction of a new water tower to ensure adequate storage in times of disaster such as fire, plant failure, and drought conditions.	Drought	City Administration, city water department	\$1M; Grant, Local Budget	2031	High	Continuous. Added by Resolution August 16, 2021.
J49	Water reuse strategies. Implementation and construction of facilities to allow for water reuse to help eliminate the demand for potable water.	Drought, Flash Flood	City Administration, city water department, Iowa DNR	\$1M; Grant, Local Budget	2031	High	Continuous. Added by Resolution August 16, 2021.
J50	Emergency Fuel Supply. Emergency fuel supply on site in case of failure at fueling station. (Power Outage) used for snow removal, fire, police, water, wastewater vehicles and generators	Infrastructure failure, Winter Storm, terrorism, Thunderstorm	Public Services;	\$20,000; Grants, local budget	2028	High	New in 2023.
J51	Solar Panels WWTP. Adding solar panels to help relief strain on power grid.	Infrastructure failure	Public Works;	\$100,000; Grants, local budget	2026	Medium	New in 2023.
J52	Develop Public Outreach on floodplain rules. add to GIS, since the floodplain has recently been adopted, we need to provide information to the public on flood mitigation and the NFIP add layer to GIS for planning purpose	River Flood	Building Dept;	\$5,000 to \$10,000; Stormwater funds	2024	High	New in 2023.
J53	Fire station/Saferoom. The City is in need of a larger fire station including specific equipment for new threats csoy crush plant, oil and co2 pipelines. This could incorporate a tornado safe room/disaster center, which does not currently exist in the community.	Winter Storm, Thunderstorm, Tornado/Wind,	Fire Dept; Emergency Management	\$15 M; Assistance to Firefighters, CIP	2028	High	New in 2023.
J54	Cyber security. Targeting of computer systems is an increasing threat. Security of services and personal information is crucial. Additional equipment, training, software and protective services may be needed, as well as recovery services in the event of an incident.	Infrastructure failure	City IT; All City agencies	\$500,000 - \$1M; Homeland Security Grants, local funds	2028	High	New in 2023.

Action #	Mitigation Action	Hazards Addressed	Lead & Support Agencies	Estimated Cost & Potential Funding	Timeline	Priority	Status, Implementation Notes & Comments
J55*	Hazmat preparation for newly emerging hazards. Development underway for new projects in the area will create additional hazards to be addressed for the first time. These projects include a large soybean oil production company, and a high-pressure CO2 pipeline, in addition to an oil pipeline now operational. Additional training and equipment will be necessary.	Hazmat incident, Transportation incident	Fire Dept; Emergency Management	\$100,000 - \$5M; Homeland Security Grants, local funds	2028	High	New in 2023.
J56*	Pandemic preparation. The 2020 COVID outbreak was particularly harmful in the local area. It is a call to action to prepare to handle any future health emergencies. The jurisdiction should be prepared to distribute crucial information, assist in providing sites for health services, and have plans and training in place to ensure continuity of services in a health emergency situation.	Human Disease	Communications; County public health, hospitals and clinics	\$100,000; CDC Grants, local funds	2028	High	New in 2023.
J57	Tornado safe room at trailer courts.	Winter Storm, Thunderstorm, Tornado/Wind	Emergency Management; Property owner	\$750,000; BRIC grant, local budget	2028	Medium	New in 2023.

Table 5-13 City of Truesdale Mitigation Actions

Action #	Mitigation Action	Hazards Addressed	Lead & Support Agencies	Estimated Cost & Potential Funding	Timeline	Priority	Status, Implementation Notes & Comments
K1	Purchasing and encouraging the use of NOAA weather radios.	Drought, Earthquake, Exp. Soil, Ext. Heat, Flash Flood, Landslide, River Flood, Winter Storm, Thunderstorm, Tornado/Wind, Transp. Incident	Emergency Management;	\$50 per radio; Grant	2028	Medium	Not Started
K2	Education materials given out to the public to improve awareness of all hazards.	Animal/Plant Disease, Drought, Earthquake, Exp. Soil, Ext. Heat, Flash Flood, Grass/Wildfire, Hazmat, Human Disease, Infra. Failure, Landslide, Levee/Dam, River Flood, Winter Storm, Sinkhole, Terrorism, Thunderstorm, Tornado/Wind, Transp. Incident	Emergency Management, Fire Dept, Police/Sheriff	\$1,000 per year; Grant, Staff Time	2028	Medium	Not Started

Action #	Mitigation Action	Hazards Addressed	Lead & Support Agencies	Estimated Cost & Potential Funding	Timeline	Priority	Status, Implementation Notes & Comments
K3	Purchase and install backup generators.	Animal/Plant Disease, Earthquake, Exp. Soil, Ext. Heat, Flash Flood, Grass/Wildfire, Hazmat, Human Disease, Infra. Failure, Landslide, Levee/Dam, River Flood, Winter Storm, Sinkhole, Terrorism, Thunderstorm, Tornado/Wind, Transp. Incident	Emergency Management, Public Works, Fire Dept, Police/Sheriff	\$40,000-\$100,000; Grant, Local Budget	2028	High	Not Started
K4	Purchase, install and maintain warning sirens.	Drought, Earthquake, Exp. Soil, Ext. Heat, Flash Flood, Landslide, River Flood, Winter Storm, Thunderstorm, Tornado/Wind, Transp. Incident	Emergency Management; Fire Dept	\$20,000; Grant, Local Budget	2028	High	Not Started
K5	Maintain NFIP participation by enforcing floodplain ordinances and educating residents about the benefits of purchasing flood insurance.	Flash Flood and River Flood	Floodplain Administrator; Emergency Management	N/A; Staff Time	2028	High	Not Started
K6	Maintain and upgrade snow removal equipment.	Winter Storm	Public Works	\$50,000 to \$100,000; Local Budget	2028	High	Not Started
K7	Purchase equipment and hire personnel for cleanup after a disaster event.	Animal/Plant Disease, Earthquake, Exp. Soil, Ext. Heat, Flash Flood, Grass/Wildfire, Hazmat, Human Disease, Infra. Failure, Landslide, Levee/Dam, River Flood, Winter Storm, Sinkhole, Terrorism, Thunderstorm, Tornado/Wind, Transp. Incident	Public Works; Emergency Management	\$50,000-\$200,000; Grant	2028	High	Not Started
K8	Improve and inspect storm water drainage.	Flash Flood, River Flood	Public Works	N/A; Grant, Local Budget	2028	High	Not Started
K9	Construction of a public tornado safe room.	Flash Flood, River Flood, Winter Storm, Thunderstorm, Tornado/Wind	Public Works; Emergency Management	\$200,000- \$1 million; Grant	2028	High	Not Started
K10	Maintain and replace deteriorating bridges and culverts.	Flash Flood, River Flood	Public Works	Up to \$5 million; Grant, Local Budget	2028	Medium	Not Started
K11	Train personnel as weather spotters.	Ext. Heat, Flash Flood, Grass/Wildfire, River Flood, Winter Storm, Thunderstorm, Tornado/Wind	Emergency Management; Fire Dept	N/A; Staff Time	2028	Medium	New in 2023.
K12	Develop/enhance MOUs with neighboring communities and county to provide aid and resources during and after a disaster.	Animal/Plant Disease, Earthquake, Exp. Soil, Ext. Heat, Flash Flood, Grass/Wildfire, Hazmat, Human Disease, Infra. Failure, Landslide, Levee/Dam, River Flood, Winter Storm,	Emergency Management, Public Works, Fire Dept, Police/Sheriff	N/A; Staff Time	2028	Medium	New in 2023.

Action #	Mitigation Action	Hazards Addressed	Lead & Support Agencies	Estimated Cost & Potential Funding	Timeline	Priority	Status, Implementation Notes & Comments
		Sinkhole, Terrorism, Thunderstorm, Tornado/Wind, Transp. Incident					

Table 5-14 Iowa Central Community College Mitigation Actions

Action #	Mitigation Action	Hazards Addressed	Lead & Support Agencies	Estimated Cost & Potential Funding	Timeline	Priority	Status, Implementation Notes & Comments
L1	Purchasing and encouraging the use of NOAA weather radios.	Drought, Earthquake, Exp. Soil, Ext. Heat, Flash Flood, Landslide, River Flood, Winter Storm, Thunderstorm, Tornado/Wind, Transp. Incident	Emergency Management;	\$50 per radio; Grant	2025	Low	Currently not utilizing NOAA radios. Would need to determine feasibility with local EMA.
L2	Purchase and install backup generators.	Animal/Plant Disease, Earthquake, Exp. Soil, Ext. Heat, Flash Flood, Grass/Wildfire, Hazmat, Human Disease, Infra. Failure, Landslide, Levee/Dam, River Flood, Winter Storm, Sinkhole, Terrorism, Thunderstorm, Tornado/Wind, Transp. Incident	ICCC Administration	\$40,000-\$100,000; Local Budget	2024	Medium	Constructing new building on site in 2023-2024. Upon completion in 2024, we will have a better knowledge of power needs to determine proper size if generator.
L3	Maintain and upgrade snow removal equipment.	Winter Storm	ICCC Administration	\$50,000 to \$100,000; Local Budget	2026	Low	Continuous
L4	Underground burial of power lines.	Earthquake, Flash Flood, Infra. Failure, River Flood, Winter Storm, Thunderstorm, Tornado/Wind	Alliant/MidAmerican Energy/ICCC Administration	\$1 million	2023	Low	Complete. No overhead lines on site.
L5	Improving and inspecting storm water drainage.	Flash Flood, River Flood	City of Storm Lake, Buena Vista County, ICCC Administration	N/A; Grant, Local Budget	2024	Medium	New building being constructed on site in 2023-2024 that will impact water retention and runoff in the area. Full plan will be assessed upon completion of structure in 2024.
L6	Construction of tornado safe rooms in schools and other critical facilities.	Flash Flood, River Flood, Winter Storm, Thunderstorm, Tornado/Wind	ICCC Administration	\$200,000- \$1 million, ICCC	2024	High	Constructing new building on site in 2023-2024 that will have areas within to provide shelter in such hazard.
L8*	Improved emergency communication equipment.	Animal/Plant Disease, Drought, Earthquake, Exp. Soil, Ext. Heat, Flash Flood, Grass/Wildfire, Hazmat, Human Disease, Infra. Failure, Landslide, Levee/Dam, River Flood, Winter Storm, Sinkhole, Terrorism, Thunderstorm, Tornado/Wind, Transp. Incident	Emergency Management, Fire Dept, Police/Sheriff, ICCC Administration	\$100,000; Grant, Local Budget	2024	High	Partially completed. Currently utilize mass messaging system to alert staff and students of potential threats, weather and otherwise.

Action #	Mitigation Action	Hazards Addressed	Lead & Support Agencies	Estimated Cost & Potential Funding	Timeline	Priority	Status, Implementation Notes & Comments
L10	Enhance security infrastructure and install safety cameras.	Terrorism	ICCC Administration	\$200,000; Homeland Security Grant, Local Budget	2023	Medium	Submitted grant in early 2023 to enhance security infrastructure. Unknown status of grant at time of plan update.
L11	Construction of critical facilities capable of serving as a temporary shelter from storms or for post-disaster services.	Animal/Plant/Crop Disease, Drought, Earthquake, Expansive Soil, Extreme Heat, Flash Flood, Grass/Wildland Fire, Hazmat Incident, Human Disease, Infrastructure Failure, Landslide, Levee/Dam Failure, River Flood, Severe Winter Storm, Sinkhole, Terrorism, Thunderstorms, Tornado/Windstorm, Transportation Incident	ICCC Administration	\$9,700,000; Local Budget	2024	High	New in 2023. A new facility on this site will be completed in August 2024. Beyond that, it will offer a facility for temporary shelter during, or post disaster.
L12	Purchase lightning detection equipment to protect students, faculty, and staff by providing more accurate and timely notifications.	Thunderstorm, Winter Storm	ICCC Administration	\$5,000; School budget; HMA grants	2028	Medium	New in 2023.

Table 5-15 Buena Vista University Mitigation Actions

Action #	Mitigation Action	Hazards Addressed	Lead & Support Agencies	Estimated Cost & Potential Funding	Timeline	Priority	Status, Implementation Notes & Comments
M1	Purchasing and encouraging the use of NOAA weather radios.	Drought, Earthquake, Exp. Soil, Ext. Heat, Flash Flood, Landslide, River Flood, Winter Storm, Thunderstorm, Tornado/Wind, Transportation Incident	Emergency Management	\$50 per radio; Grant	2028	Medium	Not Started.
M2	Underground burial of power lines.	Earthquake, Flash Flood, Infra. Failure, River Flood, Winter Storm, Thunderstorms/ Lightning/Hail, Tornado/Wind	Utility Company	\$1 million; Local Budget	2028	Low	Not Started. Campus primary power is underground
M3	Improving and inspecting storm water drainage.	Flash Flood, River Flood	University Administration	N/A; Grant, Local Budget	2028	High	Not Started. We do not plan on any future change unless building footprints change.
M4	Install air conditioning for critical facilities and schools.	Ext. Heat	University Administration; Emergency Management	Up to \$1 million; Grant, Local Budget	2028	High	Continuous. Campus is always changing and safety camera along with building access is always in need of upgrading.

Action #	Mitigation Action	Hazards Addressed	Lead & Support Agencies	Estimated Cost & Potential Funding	Timeline	Priority	Status, Implementation Notes & Comments
M5	Enhance security infrastructure and install safety cameras.	Terrorism	University Administration	\$200,000; Grant, Local Budget	2028	Medium	Continuous. Campus is always changing and safety camera along with building access is always in need of upgrading.
M6	Identify a building/area that could benefit from using an external generator (non-BVU) that could be used in emergency. Identify the cost of designing and installation of switching gear.	Earthquake, Ext. Heat, Flash Flood, Landslide, River Flood, Winter Storm, Thunderstorm, Tornado/Wind, Transportation Incident	University Administration	Local Budget	2028	Medium	New in 2023.
M7	Update our campus awareness plan to include safe zones and egress routes away from these hazards to ensure students, faculty, and staff know how to protect themselves. Ensure that our current mass notification system can also include these types of hazards that could require immediate evacuation from certain areas.	Grass/Wildfire, Levee/Dam, and Sinkhole	University Administration	Local Budget	2025	Low	New in 2023.
M8	Purchase lightning detection equipment to protect students, faculty, and staff by providing more accurate and timely notifications.	Thunderstorm, Winter Storm	University Administration	\$5,000; School budget; HMA grants	2028	Medium	New in 2023.

Table 5-16 Albert City-Truesdale School District Mitigation Actions

Action #	Mitigation Action	Hazards Addressed	Lead & Support Agencies	Estimated Cost & Potential Funding	Timeline	Priority	Status, Implementation Notes & Comments
N1	Purchasing and encouraging the use of NOAA weather radios.	Drought, Earthquake, Exp. Soil, Ext. Heat, Flash Flood, Landslide, River Flood, Winter Storm, Thunderstorm, Tornado/Wind, Transp. Incident	School Administration	\$50 per radio; Grant	2028	Medium	Not Started
N2	Purchase and install backup generators.	Animal/Plant Disease, Earthquake, Exp. Soil, Ext. Heat, Flash Flood, Grass/Wildfire, Hazmat, Human Disease, Infra. Failure, Landslide, Levee/Dam, River Flood, Winter Storm, Sinkhole, Terrorism, Thunderstorm, Tornado/Wind, Transp. Incident	School Administration	\$40,000-\$100,000; School budget; HMA grants	2028	High	Not Started

Action #	Mitigation Action	Hazards Addressed	Lead & Support Agencies	Estimated Cost & Potential Funding	Timeline	Priority	Status, Implementation Notes & Comments
N3	Maintain and upgrade snow removal equipment.	Winter Storm	School Administration	\$50,000 to \$100,000; School Budget	2028	High	Not Started
N4	Underground burial of power lines.	Earthquake, Flash Flood, Infra. Failure, River Flood, Winter Storm, Thunderstorm, Tornado/Wind	School Administration	\$1 million; School budget	2028	Low	Not Started
N5	Improving and inspecting storm water drainage.	Flash Flood, River Flood	School Administration	Staff time; School budget	2028	High	Not Started
N6	Construction of tornado safe rooms in schools and other critical facilities.	Flash Flood, River Flood, Winter Storm, Thunderstorm, Tornado/Wind	School Administration	\$200,000- \$1 million; BRIC Grant	2028	High	Not Started
N7	Non-structural retrofitting of public structures.	Animal/Plant Disease, Drought, Earthquake, Exp. Soil, Ext. Heat, Flash Flood, Grass/Wildfire, Hazmat, Human Disease, Infra. Failure, Landslide, Levee/Dam, River Flood, Winter Storm, Sinkhole, Terrorism, Thunderstorm, Tornado/Wind, Transp. Incident	School Administration	\$1 million; School budget; HMA grants	2028	High	Not Started
N8*	Improved emergency communication equipment.	Animal/Plant Disease, Earthquake, Exp. Soil, Ext. Heat, Flash Flood, Grass/Wildfire, Hazmat, Human Disease, Infra. Failure, Landslide, Levee/Dam, River Flood, Winter Storm, Sinkhole, Terrorism, Thunderstorm, Tornado/Wind, Transp. Incident	School Administration	\$100,000; School budget; HMA grants	2028	High	Not Started
N9	Purchase LED/portable signage to help direct traffic when there is any kind of incident.	Transportation Incident	School Administration	\$30,000; School budget; HMA grants	2028	High	Not Started
N10	Enhance security infrastructure and install safety cameras.	Terrorism	School Administration	\$200,000; School budget; HMA grants	2028	Medium	Not Started
N11	Purchase lightning detection equipment to protect students, faculty, and staff by providing more accurate and timely notifications.	Thunderstorm, Winter Storm	School Administration	\$5,000; School budget; HMA grants	2028	Medium	New in 2023.

Table 5-17 Alta-Aurelia School District Mitigation Actions

Action #	Mitigation Action	Hazards Addressed	Lead & Support Agencies	Estimated Cost & Potential Funding	Timeline	Priority	Status, Implementation Notes & Comments
O1	Purchasing and encouraging the use of NOAA weather radios.	Drought, Earthquake, Exp. Soil, Ext. Heat, Flash Flood, Landslide, River Flood, Winter Storm, Thunderstorm, Tornado/Wind, Transp. Incident	School Administration	\$50 per radio; Grant	2028	Medium	Not started
O2	Maintain and upgrade snow removal equipment.	Winter Storm	School Administration	\$50,000 to \$100,000; School Budget	2028	High	Not started
O3	Underground burial of power lines.	Earthquake, Flash Flood, Infra. Failure, River Flood, Winter Storm, Thunderstorm, Tornado/Wind	School Administration	\$1 million; School budget	2028	Low	Ongoing
O4	Improving and inspecting storm water drainage.	Flash Flood, River Flood	School Administration	Staff time; School budget	2028	High	Not started
O5	Non-structural retrofitting of public structures.	Animal/Plant Disease, Drought, Earthquake, Exp. Soil, Ext. Heat, Flash Flood, Grass/Wildfire, Hazmat, Human Disease, Infra. Failure, Landslide, Levee/Dam, River Flood, Winter Storm, Sinkhole, Terrorism, Thunderstorm, Tornado/Wind, Transp. Incident	School Administration	\$1 million; School budget; HMA grants	2028	High	Not started
O6	Improved emergency communication equipment.	Animal/Plant Disease, Earthquake, Exp. Soil, Ext. Heat, Flash Flood, Grass/Wildfire, Hazmat, Human Disease, Infra. Failure, Landslide, Levee/Dam, River Flood, Winter Storm, Sinkhole, Terrorism, Thunderstorm, Tornado/Wind, Transp. Incident	School Administration	\$100,000; School budget; HMA grants	2028	High	Ongoing
O7	Purchase LED/portable signage to help direct traffic when there is any kind of incident.	Transportation Incident	School Administration	\$30,000; School budget; HMA grants	2028	High	Ongoing
O8	Enhance security infrastructure and install safety cameras.	Terrorism	School Administration	\$200,000; School budget; HMA grants	2028	Medium	Ongoing
O9	Purchase lightning detection equipment to protect students, faculty, and staff by providing more accurate and timely notifications.	Thunderstorm, Winter Storm	School Administration	\$5,000; School budget; HMA grants	2028	Medium	New in 2023.

Table 5-18 Newell-Fonda School District Mitigation Actions

Action #	Mitigation Action	Hazards Addressed	Lead & Support Agencies	Estimated Cost & Potential Funding	Timeline	Priority	Status, Implementation Notes & Comments
P1	Purchasing and encouraging the use of NOAA weather radios.	Drought, Earthquake, Exp. Soil, Ext. Heat, Flash Flood, Landslide, River Flood, Winter Storm, Thunderstorm, Tornado/Wind, Transp. Incident	School Administration	\$50 per radio; Grant	2028	Medium	Not started
P2	Purchase and install backup generators.	Animal/Plant Disease, Earthquake, Exp. Soil, Ext. Heat, Flash Flood, Grass/Wildfire, Hazmat, Human Disease, Infra. Failure, Landslide, Levee/Dam, River Flood, Winter Storm, Sinkhole, Terrorism, Thunderstorm, Tornado/Wind, Transp. Incident	School Administration	\$40,000-\$100,000; School budget; HMA grants	2028	High	Not started
P3	Maintain and upgrade snow removal equipment.	Winter Storm	School Administration	\$50,000 to \$100,000; School Budget	2028	High	Not started
P4	Underground burial of power lines.	Earthquake, Flash Flood, Infra. Failure, River Flood, Winter Storm, Thunderstorm, Tornado/Wind	School Administration	\$1 million; School budget	2028	Low	Not started
P5	Improving and inspecting storm water drainage.	Flash Flood, River Flood	School Administration	Staff time; School budget	2028	High	Not started
P6	Construction of tornado safe rooms in schools and other critical facilities.	Flash Flood, River Flood, Winter Storm, Thunderstorm, Tornado/Wind	School Administration	\$200,000- \$1 million; BRIC Grant	2028	High	Not started
P7	Non-structural retrofitting of public structures.	Animal/Plant Disease, Drought, Earthquake, Exp. Soil, Ext. Heat, Flash Flood, Grass/Wildfire, Hazmat, Human Disease, Infra. Failure, Landslide, Levee/Dam, River Flood, Winter Storm, Sinkhole, Terrorism, Thunderstorm, Tornado/Wind, Transp. Incident	School Administration	\$1 million; School budget; HMA grants	2028	High	Not started
P8*	Improved emergency communication equipment.	Animal/Plant Disease, Earthquake, Exp. Soil, Ext. Heat, Flash Flood, Grass/Wildfire, Hazmat, Human Disease, Infra. Failure, Landslide, Levee/Dam, River Flood, Winter Storm, Sinkhole, Terrorism, Thunderstorm, Tornado/Wind, Transp. Incident	School Administration	\$100,000; School budget; HMA grants	2028	High	Not started
P9	Purchase LED/portable signage to help direct traffic when there is any kind of incident.	Transportation Incident	School Administration	\$30,000; School budget; HMA grants	2028	High	Not started

Action #	Mitigation Action	Hazards Addressed	Lead & Support Agencies	Estimated Cost & Potential Funding	Timeline	Priority	Status, Implementation Notes & Comments
P10	Enhance security infrastructure and install safety cameras.	Terrorism	School Administration	\$200,000; School budget; HMA grants	2028	Medium	Not started
P11	Purchase lightning detection equipment to protect students, faculty, and staff by providing more accurate and timely notifications.	Thunderstorm, Winter Storm	School Administration	\$5,000; School budget; HMA grants	2028	Medium	New in 2023.

Table 5-19 Sioux Central School District Mitigation Actions

Action #	Mitigation Action	Hazards Addressed	Lead & Support Agencies	Estimated Cost & Potential Funding	Timeline	Priority	Status, Implementation Notes & Comments
Q1	Purchasing and encouraging the use of NOAA weather radios.	Drought, Earthquake, Exp. Soil, Ext. Heat, Flash Flood, Landslide, River Flood, Winter Storm, Thunderstorm, Tornado/Wind, Transp. Incident	School Administration	\$50 per radio; Grant	2028	Medium	Not started
Q2	Purchase and install backup generators.	Animal/Plant Disease, Earthquake, Exp. Soil, Ext. Heat, Flash Flood, Grass/Wildfire, Hazmat, Human Disease, Infra. Failure, Landslide, Levee/Dam, River Flood, Winter Storm, Sinkhole, Terrorism, Thunderstorm, Tornado/Wind, Transp. Incident	School Administration	\$40,000-\$100,000; School budget; HMA grants	2028	High	Not started
Q3	Maintain and upgrade snow removal equipment.	Winter Storm	School Administration	\$50,000 to \$100,000; School Budget	2028	High	Not started
Q4	Underground burial of power lines.	Earthquake, Flash Flood, Infra. Failure, River Flood, Winter Storm, Thunderstorm, Tornado/Wind	School Administration	\$1 million; School budget	2028	Low	Not started
Q5	Improving and inspecting storm water drainage.	Flash Flood, River Flood	School Administration	Staff time; School budget	2028	High	Not started
Q6	Construction of tornado safe rooms in schools and other critical facilities.	Flash Flood, River Flood, Winter Storm, Thunderstorm, Tornado/Wind	School Administration	\$200,000- \$1 million; BRIC Grant	2028	High	Not started
Q7	Non-structural retrofitting of public structures.	Animal/Plant Disease, Drought, Earthquake, Exp. Soil, Ext. Heat, Flash Flood, Grass/Wildfire, Hazmat, Human Disease, Infra. Failure, Landslide, Levee/Dam, River Flood, Winter	School Administration	\$1 million; School budget; HMA grants	2028	High	Not started

Action #	Mitigation Action	Hazards Addressed	Lead & Support Agencies	Estimated Cost & Potential Funding	Timeline	Priority	Status, Implementation Notes & Comments
		Storm, Sinkhole, Terrorism, Thunderstorm, Tornado/Wind, Transp. Incident					
Q8*	Improved emergency communication equipment.	Animal/Plant Disease, Earthquake, Exp. Soil, Ext. Heat, Flash Flood, Grass/Wildfire, Hazmat, Human Disease, Infra. Failure, Landslide, Levee/Dam, River Flood, Winter Storm, Sinkhole, Terrorism, Thunderstorm, Tornado/Wind, Transp. Incident	School Administration	\$100,000; School budget; HMA grants	2028	High	Not started
Q9	Purchase LED/portable signage to help direct traffic when there is any kind of incident.	Transportation Incident	School Administration	\$30,000; School budget; HMA grants	2028	High	Not started
Q10	Enhance security infrastructure and install safety cameras.	Terrorism	School Administration	\$200,000; School budget; HMA grants	2028	Medium	Not started
Q11	Purchase lightning detection equipment to protect students, faculty, and staff by providing more accurate and timely notifications.	Thunderstorm, Winter Storm	School Administration	\$5,000; School budget; HMA grants	2028	Medium	New in 2023.

Table 5-20 Storm Lake School District Mitigation Actions

Action #	Mitigation Action	Hazards Addressed	Lead & Support Agencies	Estimated Cost & Potential Funding	Timeline	Priority	Status, Implementation Notes & Comments
R1	Purchase and install backup generators.	Animal/Plant Disease, Drought, Earthquake, Exp. Soil, Ext. Heat, Flash Flood, Grass/Wildfire, Hazmat, Human Disease, Infra. Failure, Landslide, Levee/Dam, River Flood, Winter Storm, Sinkhole, Terrorism, Thunderstorm, Tornado/Wind, Transp. Incident	School Administration	\$40,000-\$100,000; Grant, Local Budget	2025	High	Not Started.
R2	Maintain and upgrade snow removal equipment.	Winter Storm	School Administration	\$50,000 to \$100,000; Local Budget	2025	High	Ongoing
R3	Improving and inspecting storm water drainage.	Flash Flood, River Flood	School Administration	N/A; Grant, Local Budget	2025	High	Ongoing
R4	Construction of tornado safe rooms in schools and other critical facilities.	Flash Flood, River Flood, Winter Storm, Thunderstorm, Tornado/Wind	School Administration	\$200,000- \$1 million; Grant	2025	High	Not Started
R5	Non-structural retrofitting of public structures.	Animal/Plant Disease, Drought, Earthquake, Exp. Soil, Ext. Heat, Flash Flood, Grass/Wildfire,	School Administration	\$1 million; Grant, Local Budget	2025	High	Not Started

Action #	Mitigation Action	Hazards Addressed	Lead & Support Agencies	Estimated Cost & Potential Funding	Timeline	Priority	Status, Implementation Notes & Comments
		Hazmat, Human Disease, Infra. Failure, Landslide, Levee/Dam, River Flood, Winter Storm, Sinkhole, Terrorism, Thunderstorm, Tornado/Wind, Transp. Incident					
R6	Improved emergency communication equipment.	Animal/Plant Disease, Drought, Earthquake, Exp. Soil, Ext. Heat, Flash Flood, Grass/Wildfire, Hazmat, Human Disease, Infra. Failure, Landslide, Levee/Dam, River Flood, Winter Storm, Sinkhole, Terrorism, Thunderstorm, Tornado/Wind, Transp. Incident	School Administration	\$100,000; Grant, Local Budget	2025	High	Ongoing
R7	Purchase LED/portable signage to help direct traffic when there is any kind of incident.	Transportation Incident	School Administration	30000; Grant, Local Budget	2025	High	Not Started
R8	Enhance security infrastructure and install safety cameras.	Terrorism	School Administration	\$200,000; Grant, Local Budget	2025	Medium	Ongoing
R9	EOP Planning, Response, and Disaster Recovery. Enhance collaboration and coordination between the District, local governments, businesses, and citizens to prepare for and recover from emergencies and disasters. Enhance emergency planning to facilitate effective response and rapid recovery.	Animal/Plant Disease, Drought, Earthquake, Exp. Soil, Ext. Heat, Flash Flood, Grass/Wildfire, Hazmat, Human Disease, Infra. Failure, Landslide, Levee/Dam, River Flood, Winter Storm, Sinkhole, Terrorism, Thunderstorm, Tornado/Wind, Transp. Incident	School Administration; Local police, Fire, Emergency Management	\$500; District Budget	2025	Medium	New in 2023.
R10	Purchase lightning detection equipment to protect students, faculty, and staff by providing more accurate and timely notifications.	Thunderstorm, Winter Storm	School Administration	\$5,000; School budget; HMA grants	2028	Medium	New in 2023.

Table 5-21 Storm Lake St Mary's Catholic School Mitigation Actions

Action #	Mitigation Action	Hazards Addressed	Lead & Support Agencies	Estimated Cost & Potential Funding	Timeline	Priority	Status, Implementation Notes & Comments
S1	Purchasing and encouraging the use of NOAA weather radios.	Drought, Earthquake, Exp. Soil, Ext. Heat, Flash Flood, Landslide, River Flood, Winter Storm, Thunderstorm, Tornado/Wind, Transp. Incident	School Administration	\$50 per radio; Grant	2028	Medium	Continuous...will look into purchasing a NOAA weather radio for school office.

Action #	Mitigation Action	Hazards Addressed	Lead & Support Agencies	Estimated Cost & Potential Funding	Timeline	Priority	Status, Implementation Notes & Comments
S2	Purchase and install backup generators.	Animal/Plant Disease, Earthquake, Exp. Soil, Ext. Heat, Flash Flood, Grass/Wildfire, Hazmat, Human Disease, Infra. Failure, Landslide, Levee/Dam, River Flood, Winter Storm, Sinkhole, Terrorism, Thunderstorm, Tornado/Wind, Transp. Incident	School Administration	\$40,000-\$100,000; School budget; HMA grants	2028	High	Not started.
S3	Maintain and upgrade snow removal equipment.	Winter Storm	School Administration	\$50,000 to \$100,000; School Budget	2028	High	Purchased new tractor for snow removal in 2022.
S4	Underground burial of power lines.	Earthquake, Flash Flood, Infra. Failure, River Flood, Winter Storm, Thunderstorm, Tornado/Wind	School Administration	\$1 million; School budget	2028	Low	Not started.
S5	Improving and inspecting storm water drainage.	Flash Flood, River Flood	School Administration	Staff time; School budget	2028	High	Summer of 2022 had main storm water drain line professionally cleared to street.
S6	Construction of tornado safe rooms in schools and other critical facilities.	Flash Flood, River Flood, Winter Storm, Thunderstorm, Tornado/Wind	School Administration	\$200,000- \$1 million; BRIC Grant	2028	High	School is all brick building. We already have designated tornado shelter areas.
S7	Non-structural retrofitting of public structures.	Animal/Plant Disease, Earthquake, Exp. Soil, Ext. Heat, Flash Flood, Grass/Wildfire, Hazmat, Human Disease, Infra. Failure, Landslide, Levee/Dam, River Flood, Winter Storm, Sinkhole, Terrorism, Thunderstorm, Tornado/Wind, Transp. Incident	School Administration	\$1 million; School budget; HMA grants	2028	High	Not started.
S8*	Improved emergency communication equipment.	Animal/Plant Disease, Drought, Earthquake, Exp. Soil, Ext. Heat, Flash Flood, Grass/Wildfire, Hazmat, Human Disease, Infra. Failure, Landslide, Levee/Dam, River Flood, Winter Storm, Sinkhole, Terrorism, Thunderstorm, Tornado/Wind, Transp. Incident	School Administration	\$100,000; School budget; HMA grants	2028	High	In progress. Waiting on delivery of a Motorola APX 8500 radio thru the state from Motorola.
S9	Purchase LED/portable signage to help direct traffic when there is any kind of incident.	Transportation Incident	School Administration	\$30,000; School budget; HMA grants	2028	High	Not started.
S10	Enhance security infrastructure and install safety cameras.	Terrorism	School Administration	\$200,000; School budget; HMA grants	2028	Medium	In progress. Working on SLFRF grant through state of Iowa for new external security entrances and internal cameras.
S11	Purchase lightning detection equipment to protect students, faculty, and staff by providing more accurate and timely notifications.	Thunderstorm, Winter Storm	School Administration	\$5,000; School budget; HMA grants	2028	Medium	New in 2023.



6 Plan Implementation and Maintenance

DMA Requirement §201.6(c)(4)(ii):

[The plan shall include] a plan maintenance process that includes:

- (i) A section describing the method and schedule of monitoring, evaluating, and updating the mitigation plan within a five-year cycle.*
- (ii) A process by which local governments incorporate the requirements of the mitigation plan into other planning process by which local governments incorporate the requirements of the mitigation plan into other planning mechanisms such as comprehensive or capital improvement plans, when appropriate.*
- (iii) Discussion on how the community will continue public participation in the plan maintenance process.*

This chapter provides an overview of the overall strategy for plan maintenance and outlines the method and schedule for monitoring, updating, and evaluating the plan. The chapter also discusses incorporating the plan into existing planning mechanisms and how to address continued public involvement.

6.1 Monitoring, Evaluating, and Updating the Plan

6.1.1 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 Buena Vista County Emergency Management Coordinator, agree to:

- Meet annually to review the Hazard Mitigation Plan;
- Act as a forum for hazard mitigation issues;
- Disseminate hazard mitigation ideas and activities to all participants;
- Pursue the implementation of high priority, low- or no-cost recommended actions;
- Maintain vigilant monitoring of multi-objective, cost-share, and other funding opportunities to help the community implement the plan's recommended actions for which no current funding exists;
- Monitor and assist in implementation and update of this plan;
- Keep the concept of mitigation in the forefront of community decision making by identifying plan recommendations when other community goals, plans, and activities overlap, influence, or directly affect increased community vulnerability to disasters;
- Report on plan progress and recommended changes to the governing bodies of participating jurisdictions; and
- Inform and solicit input from the public.

The HMPC is an advisory body and can only make recommendations to county, city, town, or district elected officials. Its primary duty is to see the plan successfully carried out and to report to the community governing boards and the public on the status of plan implementation and mitigation opportunities. Other duties include reviewing and promoting mitigation proposals, hearing stakeholder concerns about hazard mitigation, passing concerns on to appropriate entities, and posting relevant information in areas accessible to the public.

The HMPC meets annually in February to review the mitigation plan and evaluate the progress of the mitigation program.

6.1.2 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 Buena Vista County Emergency Management Coordinator will be responsible for initiating the plan reviews in conjunction with the County Commissioners' meeting and inviting the school superintendents to the meeting.

In coordination with the other participating jurisdictions, a five-year written update of the plan will be submitted to the Iowa Homeland Security and Emergency Management Department and FEMA Region VII per Requirement §201.6(c)(4)(i) of the DMA of 2000, unless disaster or other circumstances (e.g., changing regulations) require a change to this schedule. During the third interim annual meeting, the HMPC will outline steps to begin the next plan update process so that the effort can be completed during year four and five; this will ensure there is time for completion, approval, and re-adoption within the five-year time frame.

6.1.3 Plan Maintenance Process

Evaluation of progress can be achieved by monitoring changes in vulnerabilities identified in the plan. Changes in vulnerability can be identified by noting:

- Decreased vulnerability as a result of implementing recommended actions,
- Increased vulnerability as a result of failed or ineffective mitigation actions, and/or
- Increased vulnerability as a result of new development (and/or annexation).

The annual reviews and updates to this plan will:

- Consider changes in vulnerability due to action implementation,
- Document success stories where mitigation efforts have proven effective,
- Document areas where mitigation actions were not effective,
- Document any new hazards that may arise or were previously overlooked,
- Incorporate new data or studies on hazards and risks,
- Incorporate new capabilities or changes in capabilities,
- Incorporate growth and development-related changes to inventories, and
- Incorporate new action recommendations or changes in action prioritization.

To best evaluate the mitigation strategy during plan review and update, the participating jurisdictions will follow the following process:

- A representative from the responsible office identified in each mitigation action will be responsible for tracking and reporting the action status on an annual basis to the jurisdictional HMPC member and providing input on any completion details or whether the action still meets the defined objectives and is likely to be successful in reducing vulnerabilities.
- If the action does not meet identified objectives, the jurisdictional HMPC member will determine what additional measures may be implemented, and an assigned individual will be responsible for defining action scope, implementing the action, monitoring success of the action, and making any required modifications to the plan.

Changes will be made to the plan to accommodate for actions that have failed or are not considered feasible after a review of their consistency with established criteria, time frame, community priorities, and/or funding resources. Actions that were not ranked high but were identified as potential mitigation activities will be reviewed as well during the monitoring and update of this plan to determine feasibility of future implementation. Updating of the plan will be by written changes and submissions, as the Buena Vista

County HMPC deems appropriate and necessary, and as approved by the Buena Vista County Board of Supervisors and the governing boards of the other participating jurisdictions.

6.2 Incorporation into Existing Planning Mechanisms

Where possible, plan participants will use existing plans and/or programs to implement hazard mitigation actions. This plan builds upon the some of the previous related efforts and recommends implementing actions, where possible, through the following means:

- Comprehensive plans of participating jurisdictions
- Ordinances of participating jurisdictions
- Building codes
- Capital improvements plans and budgets
- School district facilities plans
- Mutual aid agreement (28E Agreement)
- Other community plans within the county either in existence or developed in the future such as water conservation plans, storm water management plans, and parks and recreation plans

The governing bodies of the jurisdictions adopting this plan will encourage all other relevant planning mechanism under their authority to consult this plan to ensure minimization of risk to natural and manmade hazards as well as coordination of activities.

The Board of Supervisors or the governing board of the participating jurisdictions involved in the plan update will be responsible for encouraging the integration of goals and information in the mitigation plan as appropriate. The Board of Supervisors is also responsible for monitoring this integration and incorporating the appropriate information into the five-year update of the plan.

The City of Storm Lake is Buena Vista County's biggest city. The City is also in the process of updating its 2040 General Plan. The County could consider incorporating the hazard profiles and overall hazard mitigation related information into this new General Plan. Many of the smaller jurisdictions in Buena Vista County also have standing formal planning mechanisms such as a Comprehensive Plan or Capital Improvements Plan through which formal integration of mitigation actions can be documented. Other activities that occur in these relatively smaller communities are developed through, annual budget planning, regular City Council Meetings, and other community forums. Planning mechanisms that do exist within the participating jurisdictions include:

- Comprehensive Plans—Cities of Albert City, Alta, Lakeside, Linn Grove, Newel, Rembrandt, Sioux Rapids, Storm Lake and Truesdale;
- Various ordinances of participating jurisdictions, including floodplain management ordinances in NFIP-participating communities;
- Buena Vista County Emergency Operations Plan;
- Buena Vista County Debris Management Plan; and
- Capital Improvement Plans—Cities of Buena Vista and DeWitt and public school districts.

For a detailed summary of planning mechanisms and other mitigation-related capabilities, see Table 2.8 in Chapter 2 Planning Process.

In the period since the adoption of the 2017 Buena Vista County Hazard Mitigation Plan, it was incorporated into several existing planning mechanisms as follows:

- Buena Vista County Emergency Management incorporated portions of the 2017 HMP into annual emergency management training, planning, and purchasing plans.

- The County's Emergency Management Grant Fund was set up to address the mitigation action need of additional generators in the County.
- Portions of the Risk Assessment were incorporated in the County Emergency Operations Plan.

With the 2022-2023 update of the HMP, committee members have made a renewed commitment to use existing plans and/or programs to implement hazard mitigation actions, where possible. Based on the capability assessments of the participating jurisdictions, communities in Buena Vista 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 6-1.

Table 6-1 Integration Strategies for Hazard Mitigation Plan Update

Jurisdiction	Integration Process for Plan Update
Buena Vista County	<ul style="list-style-type: none"> - Incorporate into annual emergency management training, planning, and purchasing plans. - Continue coordination of mitigation strategy with County's Emergency Management Grant Fund as well as seek additional funding sources - Continue the integration of the Risk Assessment into future updates of the County's Comprehensive Plan. - Continue integration of the Risk Assessment in future updates of the Comprehensive Emergency Operations Plan. - Integrate risk information in future updates of the Local Emergency Plan. - Integrate risk information into future updates to the Floodplain Ordinance. - Integrate risk information into future updates to the Capital Improvement Plan. - Integrate risk information into subdivision ordinances and site plan review requirements.
Albert City	<ul style="list-style-type: none"> - Integrate mitigation strategy into the annual budget planning process. - Integrate risk information into the development of zoning, subdivision, and floodplain ordinances. - Continue the integration of the Risk Assessment into future updates of the City's Comprehensive Development Plan.
Alta	<ul style="list-style-type: none"> - Integrate mitigation strategy into the annual budget planning process. - Integrate risk information into the development of zoning, subdivision, and floodplain ordinances. - Continue the integration of the Risk Assessment into future updates of the City's Comprehensive Development Plan.
Lakeside	<ul style="list-style-type: none"> - Integrate mitigation strategy into the annual budget planning process. - Integrate risk information into the development of zoning, subdivision, and floodplain ordinances. - Continue the integration of the Risk Assessment into future updates of the City's Comprehensive Development Plan.
Linn Grove	<ul style="list-style-type: none"> - Integrate mitigation strategy into the annual budget planning process. - Integrate risk information into the development of zoning, subdivision, and floodplain ordinances. - Continue the integration of the Risk Assessment into future updates of the City's Comprehensive Development Plan.
Marathon	<ul style="list-style-type: none"> - Integrate mitigation strategy into the annual budget planning process. - Integrate risk information into the development of zoning, subdivision, and floodplain ordinances. - Continue the integration of the Risk Assessment into future updates of the City's Comprehensive Development Plan.

Jurisdiction	Integration Process for Plan Update
Newell	<ul style="list-style-type: none"> -Integrate mitigation strategy into the annual budget planning process. -Integrate risk information into the development of zoning, subdivision, and floodplain ordinances.
Rembrandt	<ul style="list-style-type: none"> -Integrate mitigation strategy into the annual budget planning process. -Integrate risk information into the development of zoning, subdivision, and floodplain ordinances. -Continue the integration of the Risk Assessment into future updates of the City's Comprehensive Development Plan.
Sioux Rapids	<ul style="list-style-type: none"> -Integrate mitigation strategy into the annual budget planning process. -Integrate risk information into the development of zoning, subdivision, and floodplain ordinances. -Continue the integration of the Risk Assessment into future updates of the City's Comprehensive Development Plan.
Storm Lake	<ul style="list-style-type: none"> -Integrate risk assessment and mitigation strategy into the 2040 update of the Comprehensive Plan -Integrate mitigation strategy into the annual updates of the Capital Improvement Plan -Integrate mitigation strategy into the annual updates of the City Infrastructure Plan -Integrate mitigation strategy into the annual updates of the City Strategic Plan -Integrate risk information into the development of zoning, subdivision, and floodplain ordinances.
Truesdale	<ul style="list-style-type: none"> -Integrate mitigation strategy into the annual budget planning process. -Integrate risk information into the development of zoning, subdivision, and floodplain ordinances. -Continue the integration of the Risk Assessment into future updates of the City's Comprehensive Development Plan.

6.3 Continued Public Involvement

The update process provides an opportunity to publicize success stories from the plan's implementation and seek additional public comment. Information about the annual reviews will be posted on the County website following each annual review of the mitigation plan. When the HMPC reconvenes for the update, it will coordinate with all stakeholders participating in the planning process, including those who joined the HMPC after the initial effort, to update and revise the plan. Public notice will be posted, at a minimum, through available website postings, social media, and press releases to local media outlets, primarily newspapers. Public participation in the next plan update will be done in accordance with DMA 2000 requirements, by providing an opportunity for the public to comment on the plan during the drafting stage and prior to plan approval. This may be accomplished through public surveys, social media notices, public meetings, discussing the plan at public forums etc.

APPENDIX A: PLAN ADOPTION AND APPROVAL

This appendix contains the adoption records from the participating jurisdictions, as well as the FEMA Approval letter and final Plan Review Tool.

Buena Vista County, Iowa

Resolution Adopting Hazard Mitigation Plan

Resolution No. 2023-6-27-E

A RESOLUTION OF THE COUNTY BOARD OF SUPERVISORS OF BUENA VISTA COUNTY,
IOWA ADOPTING A HAZARD MITIGATION PLAN FOR BUENA VISTA COUNTY

WHEREAS, the Board of Supervisors of Buena Vista County, Iowa has authorized the development of a Multi-Jurisdictional Hazard Mitigation Plan for Buena Vista County;
And,

WHEREAS, a Public Hearing has been held in the Buena Vista County Administration Building for the purposes of obtaining citizen input on the Multi-Jurisdictional Hazard Mitigation Plan.

NOW THEREFORE BE IT RESOLVED that the Board of Supervisors of Buena Vista County, Iowa, herewith adopts said plan, incorporating citizen comment and recommendations.

PASSED AND ADOPTED THIS 27 OF JUNE, 2023

SIGNED:



Kelly Snyder, Board of Supervisors Chair

ATTEST:



Susan Lloyd, County Auditor

RESOLUTION NO. 23-17

**A RESOLUTION OF THE CITY COUNCIL OF ALTA, IOWA ADOPTING A HAZARD
MITIGATION PLAN FOR BUENA VISTA COUNTY**

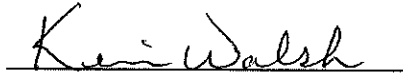
WHEREAS, the City council of Alta, Iowa has authorized the development of a Multi-Jurisdictional Hazard Mitigation Plan for Buena Vista County; and,

WHEREAS, a Public Hearing has been held in the City Hall for the purposes of obtaining citizen input on the Multi-Jurisdictional Hazard Mitigation Plan.


NOW THEREFORE BE IT RESOLVED, that the City Council of Alta, Iowa, herewith adopts said plan, incorporating citizen comment and recommendations.

PASSED AND ADOPTED THIS 7TH DAY OF AUGUST, 2023.

SIGNED:


Kevin Walsh, Mayor

ATTEST:


Megan Peterson, City Clerk

City of Sioux Rapids, Iowa

Resolution Adopting Hazard Mitigation Plan

Resolution No. 871

**A RESOLUTION OF THE CITY COUNCIL OF SIOUX RAPIDS, IOWA ADOPTING A HAZARD
MITIGATION PLAN FOR BUENA VISTA COUNTY**

WHEREAS the City council of Sioux Rapids, Iowa has authorized the development of a Multi-Jurisdictional Hazard Mitigation Plan for Buena Vista County; and,

WHEREAS, a Public Hearing has been held in the City Hall for the purposes of obtaining citizen input on the Multi-Jurisdictional Hazard Mitigation Plan.

NOW THEREFORE BE IT RESOLVED that the City Council of Sioux Rapids, Iowa, herewith adopts said plan, incorporating citizen comment and recommendations.

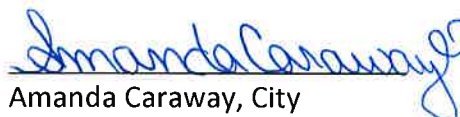
PASSED AND ADOPTED THIS 9th DAY OF AUGUST 2023.

SIGNED:



Jim Wise, Mayor
Clerk

ATTEST:



Amanda Caraway, City

City of Storm Lake, Iowa

Resolution Adopting Hazard Mitigation Plan

Resolution No. 04-R-2023-2024

**A RESOLUTION OF THE CITY COUNCIL OF STORM LAKE, IOWA
ADOPTING A HAZARD MITIGATION PLAN FOR BUENA VISTA COUNTY**

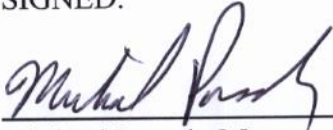
WHEREAS, the City council of Storm Lake, Iowa has authorized the development of a Multi-Jurisdictional Hazard Mitigation Plan for Buena Vista County; and,

WHEREAS, a Public Hearing has been held in the City Hall for the purposes of obtaining citizen input on the Multi-Jurisdictional Hazard Mitigation Plan.

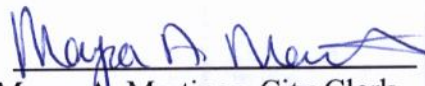
NOW THEREFORE BE IT RESOLVED, that the City Council of Storm Lake, Iowa, herewith adopts said plan, incorporating citizen comment and recommendations.

PASSED AND ADOPTED THIS 21ST DAY OF AUGUST 2023.

SIGNED:


Michael Porsch, Mayor

ATTEST:


Mayra A. Martinez, City Clerk



U.S. Department of Homeland Security
FEMA Region 7
11224 Holmes Road
Kansas City, MO 64131

FEMA

August 24, 2023

Director Benson
Iowa Department of Homeland Security and Emergency Management
7900 Hickman Rd. Suite 500
Windsor Heights, IA 50234

Subject: Approval of the Buena Vista County Hazard Mitigation Plan

Director Benson:

In accordance with applicable¹ laws, regulations and policy, the Risk Analysis Branch of the Federal Emergency Management Agency (FEMA) Region 7 has approved the Buena Vista County Hazard Mitigation Plan. The attached Local Mitigation Plan Review Tool lists participants receiving approval that have submitted required adoption documentation.

The approval period for this plan is from August 23, 2023 through August 22, 2028. The same official plan expiration date applies to all participating jurisdictions, regardless of adoption date.

An approved mitigation plan is one of the conditions for applying for and receiving FEMA mitigation grants from the following programs:

- Hazard Mitigation Grant Program (HMGP)
- HMGP Post-Fire
- Building Resilient Infrastructure and Communities
- Flood Mitigation Assistance
- High Hazard Potential Dams Grant Program (HHPD)

Having an approved mitigation plan does not mean that mitigation grant funding will be awarded. Specific application and eligibility requirements for the programs listed above can be found in each FEMA grant program's respective policies and annual Notice of Funding Opportunities, as applicable.

To avoid a lapsed plan, the next plan update must be approved before the end of the approval period, including adoption by the participating jurisdictions. Before the end of the approval period, please allow sufficient time to secure funding for the update, including the review and approval process. Please include time for any revisions, if needed, and for the jurisdiction to formally adopt the plan after the review, if not adopted prior to submission. This will enable them to remain eligible to

¹ Robert T. Stafford Disaster Relief and Emergency Assistance Act, as amended; the National Flood Insurance Act of 1968, as amended; and National Dam Safety Program Act, as amended; 44 CFR Part 201, Mitigation Planning; and the Local Mitigation Planning Policy Guide (FP 206-21-0002) effective April 19, 2023.

Director Benson

Approval of the Buena Vista County Hazard Mitigation Plan

Page 2

apply for and receive funding from FEMA's mitigation grant programs with a mitigation plan requirement. Local governments, including special districts, with a plan status of "Approvable Pending Adoption" are not eligible for FEMA's mitigation grant programs with a mitigation plan requirement.

We look forward to discussing options for implementing this mitigation plan. If you should have any questions or concerns, please contact Joe Chandler, Planning Team Lead, at (816) 808-9016 or joe.chandler@fema.dhs.gov.

Sincerely,

BRIAN P
WOLTZ

Digitally signed by BRIAN
P WOLTZ
Date: 2023.08.24
12:52:08 -05'00'

Brian Woltz, Acting Director
Mitigation Division

Attachment: Local Mitigation Plan Review Tool

Local Mitigation Plan Review Tool

Cover Page

The Local Mitigation Plan Review Tool (PRT) demonstrates how the local mitigation plan meets the regulation in 44 CFR § 201.6 and offers states and FEMA Mitigation Planners an opportunity to provide feedback to the local governments, including special districts.

1. The Multi-Jurisdictional Summary Sheet is a worksheet that is used to document how each jurisdiction met the requirements of the plan elements (Planning Process; Risk Assessment; Mitigation Strategy; Plan Maintenance; Plan Update; and Plan Adoption).
2. The Plan Review Checklist summarizes FEMA's evaluation of whether the plan has addressed all requirements.

For greater clarification of the elements in the Plan Review Checklist, please see Section 4 of the Local Mitigation Planning Policy Guide. Definitions of the terms and phrases used in the PRT can be found in Appendix E of this guide.

Plan Information	
Jurisdiction(s)	Buena Vista County, IA
Title of Plan	2023 Buena Vista County Hazard Mitigation Plan
New Plan or Update	Update
Single- or Multi-Jurisdiction	Multi-jurisdiction
Date of Plan	6/21/2023
Local Point of Contact	
Title	Aimee Barritt, Emergency Manager
Agency	Buena Vista County Emergency Management
Address	411 Expansion Blvd Storm Lake, Iowa 50588
Phone Number	712.749.2705
Email	aimee.barritt@bvema.com

Additional Point of Contact	
Title	
Agency	
Address	
Phone Number	
Email	

Review Information	
State Review	
State Reviewer(s) and Title	Jack Stinogel, Hazard Mitigation Planner
State Review Date	6/23/2023
FEMA Review	
FEMA Reviewer(s) and Title	Collette Linder, FEMA R7 Community Planner
Date Received in FEMA Region	6/22/2023; 8/7/2023; 8/18/2023
Plan Not Approved	8/2/2023
Plan Approvable Pending Adoption	
Plan Approved	8/23/2023

Multi-Jurisdictional Summary Sheet

In the boxes for each element, mark if the element is met (Y) or not met (N).

#	Jurisdiction Name	A. Planning Process	B. Risk Assessment	C. Mitigation Strategy	D. Plan Maintenance	E. Plan Update	F. Plan Adoption	G. HHPD (Optional)
1	Buena Vista County - adopted 6/27/2023	Y	Y	Y	Y	Y	Y	N
2	City of Albert City	Y	Y	Y	Y	Y	N	N/A
3	City of Alta – adopted 8/7/2023	Y	Y	Y	Y	Y	Y	N/A
4	City of Lakeside	Y	Y	Y	Y	Y	N	N/A
5	City of Linn Grove	Y	Y	Y	Y	Y	N	N/A
6	City of Marathon	Y	Y	Y	Y	Y	N	N/A
7	City of Newell	Y	Y	Y	Y	Y	N	N/A
8	City of Rembrandt	Y	Y	Y	Y	Y	N	N/A
9	City of Sioux Rapids – adopted 8/9/2023	Y	Y	Y	Y	Y	Y	N/A
10	City of Storm Lake – Adopted 8/21/2023	Y	Y	Y	Y	Y	Y	N
11	City of Truesdale	Y	Y	Y	Y	Y	N	N/A
12	Iowa Central Community College	Y	Y	Y	Y	Y	N	N/A
13	Buena Vista University	Y	Y	Y	Y	Y	N	N/A
14	Albert City-Truesdale School District	Y	Y	Y	Y	Y	N	N/A
15	Alta-Aurelia School District	Y	Y	Y	Y	Y	N	N/A
16	Newell-Fonda School District	Y	Y	Y	Y	Y	N	N/A
17	Sioux Central School District	Y	Y	Y	Y	Y	N	N/A
18	Storm Lake School District	Y	Y	Y	Y	Y	N	N/A
19	Storm Lake St Mary's Catholic School	Y	Y	Y	Y	Y	N	N/A

Plan Review Checklist

The Plan Review Checklist is completed by FEMA. States and local governments are encouraged, but not required, to use the PRT as a checklist to ensure all requirements have been met prior to submitting the plan for review and approval. The purpose of the checklist is to identify the location of relevant or applicable content in the plan by element/sub-element and to determine if each requirement has been “met” or “not met.” FEMA completes the “required revisions” summary at the bottom of each element to clearly explain the revisions that are required for plan approval. Required revisions must be explained for each plan sub-element that is “not met.” Sub-elements in each summary should be referenced using the appropriate numbers (A1, B3, etc.), where applicable. Requirements for each element and sub-element are described in detail in Section 4: Local Plan Requirements of this guide.

Plan updates must include information from the current planning process.

If some elements of the plan do not require an update, due to minimal or no changes between updates, the plan must document the reasons for that.

Multi-jurisdictional elements must cover information unique to all participating jurisdictions.

*** Comments in blue for Elements A and G, were provided by the local planner in response to original request for revisions.**

Element A: Planning Process

Element A Requirements	Location in Plan (section and/or page number)	Met / Not Met
A1. Does the plan document the planning process, including how it was prepared and who was involved in the process for each jurisdiction? (Requirement 44 CFR § 201.6(c)(1))	Section 2 (p2-1 to 2-11) Appendices B & C	
A1-a. Does the plan document how the plan was prepared, including the schedule or time frame and activities that made up the plan’s development, as well as who was involved?	Section 2 (p2-1 to 2-11) Appendices B & C	Met
A1-b. Does the plan list the jurisdiction(s) participating in the plan that seek approval, and describe how they participated in the planning process?	Section 2.1 (p2-1 to 2-3) Appendices B & C	Met

Element A Requirements	Location in Plan (section and/or page number)	Met / Not Met
A2. Does the plan document 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? (Requirement 44 CFR § 201.6(b)(2))	Section 2.2.1.3 (p2-8 to 2-9)	
A2-a. Does the plan identify all stakeholders involved or given an opportunity to be involved in the planning process, and how each stakeholder was presented with this opportunity?	Section 2.2.1.3 (p2-8 to 2-9), Appendix C	Met
A3. Does the plan document how the public was involved in the planning process during the drafting stage and prior to plan approval? (Requirement 44 CFR § 201.6(b)(1))	Section 2.2.1.2 (p2-5 to 2-8), Appendix D	
A3-a. Does the plan document how the public was given the opportunity to be involved in the planning process and how their feedback was included in the plan?	Section 2.2.1.2 (p2-5 to 2-8), Appendix D	Met
A4. Does the plan describe the review and incorporation of existing plans, studies, reports, and technical information? (Requirement 44 CFR § 201.6(b)(3))	Section 2.2.1.2 (p2-8 to 2-9), Appendix F	
A4-a. Does the plan document what existing plans, studies, reports and technical information were reviewed for the development of the plan, as well as how they were incorporated into the document?	Section 2.2.1.2 (p2-8 to 2-9), Appendix F	Met

ELEMENT A REQUIRED REVISIONS

Required Revision: **None**

Strengths:

- The planning process is well documented, and the plan does a good job of outlining how the jurisdictions took part in the plan.
- A wide variety of stakeholders particularly at the county level participated in the planning process.
- The community survey yielded good information on wants/needs and perceived hazard threats.

Opportunities for Improvement:

- The plan should document how the public's feedback was incorporated into the plan. The survey results were added to the Appendix but there could be more feedback in future updates/changes as to how the survey results were incorporated into the risk assessment or mitigation strategy.
- There are several organizations and agencies identified in the community capabilities Table 3-7 Buena Vista Capabilities by Jurisdiction (p3-22 to 3-28), for instance non-profits or other non-governmental community organizations, which support vulnerable or at-risk populations

ELEMENT A REQUIRED REVISIONS

and other community stakeholder groups which should be included in the planning process, and the opportunity to participate should be clearly detailed in the plan.

- The County would benefit to include these groups in the next plan update. *

Element B: Risk Assessment

Element B Requirements	Location in Plan (section and/or page number)	Met / Not Met
B1. Does the plan include a description of the type, location, and extent of all natural hazards that can affect the jurisdiction? Does the plan also include information on previous occurrences of hazard events and on the probability of future hazard events? (Requirement 44 CFR § 201.6(c)(2)(i))	Section 4 (p4-1 to 4-153)	
B1-a. Does the plan describe all natural hazards that can affect the jurisdiction(s) in the planning area, and does it provide the rationale if omitting any natural hazards that are commonly recognized to affect the jurisdiction(s) in the planning area?	Section 4.1 (p4-4 to 4-5)	Met
B1-b. Does the plan include information on the location of each identified hazard?	Section 4.3 (p4-22 to 4-153), "Location" subsections	Met
B1-c. Does the plan describe the extent for each identified hazard?	Section 4.3 (p4-22 to 4-153), "Magnitude/Severity" subsections	Met
B1-d. Does the plan include the history of previous hazard events for each identified hazard?	Section 4.3 (p4-22 to 4-153), "Historic Occurrences" subsections	Met
B1-e. Does the plan include the probability of future events for each identified hazard? Does the plan describe the effects of future conditions, including climate change (e.g., long-term weather patterns, average temperature and sea levels), on the type, location and range of anticipated intensities of identified hazards?	Section 4.3 (p4-22 to 4-153), "Probability of Future Occurrence" subsections	Met

Element B Requirements	Location in Plan (section and/or page number)	Met / Not Met
B1-f. For participating jurisdictions in a multi-jurisdictional plan, does the plan describe any hazards that are unique to and/or vary from those affecting the overall planning area?	Section 4.3 (p4-22 to 4-153), "Differences By Jurisdiction" subsections	Met
B2. Does the plan include a summary of the jurisdiction's vulnerability and the impacts on the community from the identified hazards? Does this summary also address NFIP-insured structures that have been repetitively damaged by floods? (Requirement 44 CFR § 201.6(c)(2)(ii))	Section 4.3 (p4-22 to 4-153), "Vulnerability" subsections	
B2-a. Does the plan provide an overall summary of each jurisdiction's vulnerability to the identified hazards?	Section 4.3 (p4-22 to 4-153), "Vulnerability" subsections	Met
B2-b. For each participating jurisdiction, does the plan describe the potential impacts of each of the identified hazards on each participating jurisdiction?	Section 4.3 (p4-22 to 4-153), "Vulnerability" and "Differences By Jurisdiction" subsections	Met
B2-c. Does the plan address NFIP-insured structures within each jurisdiction that have been repetitively damaged by floods?	Section 4.3.6 (p4-66)	Met

ELEMENT B REQUIRED REVISIONS

Required Revision: **None**

Strengths:

- The hazard profiles are well-defined and there is detailed information about the context of the hazards and the risks they present to the community
- The plan does a good job of incorporating climate and future conditions into the risk assessments.
- Tables, graphs, and information throughout have been updated and are generally well-presented.

Opportunities for Improvement:

- Some of the maps are difficult to read (e.g., Figures 3-4 and 3-5); consider using a larger scale or using maps of smaller segments of the planning area to show detail more clearly.

Element C: Mitigation Strategy

Element C Requirements	Location in Plan (section and/or page number)	Met / Not Met
C1. Does the plan document each participant's existing authorities, policies, programs and resources and its ability to expand on and improve these existing policies and programs? (Requirement 44 CFR § 201.6(c)(3))	Section 3.9 (p3-20 to 3-31)	
C1-a. Does the plan describe how the existing capabilities of each participant are available to support the mitigation strategy? Does this include a discussion of the existing building codes and land use and development ordinances or regulations?	Section 3.9 (p3-20 to 3-31)	Met
C1-b. Does the plan describe each participant's ability to expand and improve the identified capabilities to achieve mitigation?	Section 3.9.4 (p3-30 to 3-31)	Met
C2. Does the plan address each jurisdiction's participation in the NFIP and continued compliance with NFIP requirements, as appropriate? (Requirement 44 CFR § 201.6(c)(3)(ii))	Section 3.9.3 (p3-24); Section 4.3.6 (p4-65 to 4-67)	
C2-a. Does the plan contain a narrative description or a table/list of their participation activities?	Section 3.9.3 (p3-24); Section 4.3.6 (p4-65 to 4-67)	Met
C3. Does the plan include goals to reduce/avoid long-term vulnerabilities to the identified hazards? (Requirement 44 CFR § 201.6(c)(3)(i))	Section 5.1 (p5-1 to 5-2)	
C3-a. Does the plan include goals to reduce the risk from the hazards identified in the plan?	Section 5.1 (p5-1 to 5-2)	Met
C4. Does the plan identify and analyze a comprehensive range of specific mitigation actions and projects for each jurisdiction being considered to reduce the effects of hazards, with emphasis on new and existing buildings and infrastructure? (Requirement 44 CFR § 201.6(c)(3)(ii))	Section 5.4 (p5-11 to 5-57)	
C4-a. Does the plan include an analysis of a comprehensive range of actions/projects that each jurisdiction considered to reduce the impacts of hazards identified in the risk assessment?	Section 5.4 (p5-11 to 5-57)	Met
C4-b. Does the plan include one or more action(s) per jurisdiction for each of the hazards as identified within the plan's risk assessment?	Section 5.4 (p5-11 to 5-57)	Met

Element C Requirements	Location in Plan (section and/or page number)	Met / Not Met
C5. Does the plan contain an action plan that describes how the actions identified will be prioritized (including a cost-benefit review), implemented, and administered by each jurisdiction? (Requirement 44 CFR § 201.6(c)(3)(iv)); (Requirement §201.6(c)(3)(iii))	Section 5.3.1 (p5-9 to 5-10); Section 5.4 (p5-11 to 5-57)	
C5-a. Does the plan describe the criteria used for prioritizing actions?	Section 5.3.1 (p5-9 to 5-10)	Met
C5-b. Does the plan provide the position, office, department or agency responsible for implementing/administrating the identified mitigation actions, as well as potential funding sources and expected time frame?	Section 5.4 (p5-11 to 5-57) "Lead & Support Agency," "Estimated Cost & Potential Funding" and "Timeline" columns; Appendix G	Met

ELEMENT C REQUIRED REVISIONS

Required Revision: **None**

Strengths:

- The plan provides a good description of the jurisdictions' capabilities.
- Table 4-28 on page 4-67 provides a good description of how jurisdictions implement substantial damage improvement and/or substantial damage provisions.

Opportunities for Improvement:

- Listing funding sources should go beyond federal, state and local. Many of the actions simply state "Grant." Specify whether the funding would be from a specific grant such as the Hazard Mitigation Grant Program or a funding source such as a Capital Improvement Plan budget. Staff time can even be quantified for the local match effort to make sure the level of effort for completing the action is understood and feasible.

Element D: Plan Maintenance

Element D Requirements	Location in Plan (section and/or page number)	Met / Not Met
D1. Is there discussion of how each community will continue public participation in the plan maintenance process? (Requirement 44 CFR § 201.6(c)(4)(iii))	Section 6.3 (p6-5); Appendix H	
D1-a. Does the plan describe how communities will continue to seek future public participation after the plan has been approved?	Section 6.3 (p6-5); Appendix H	Met

Element D Requirements	Location in Plan (section and/or page number)	Met / Not Met
D2. Is there a description of the method and schedule for keeping the plan current (monitoring, evaluating and updating the mitigation plan within a five-year cycle)? (Requirement 44 CFR § 201.6(c)(4)(i))	Section 6 (p6-1 to 6-5)	
D2-a. Does the plan describe the process that will be followed to track the progress/status of the mitigation actions identified within the Mitigation Strategy, along with when this process will occur and who will be responsible for the process?	Section 6.1 (p6-1 to 6-3); Appendix H	Met
D2-b. Does the plan describe the process that will be followed to evaluate the plan for effectiveness? This process must identify the criteria that will be used to evaluate the information in the plan, along with when this process will occur and who will be responsible.	Section 6.1 (p6-1 to 6-3); Appendix H	Met
D2-c. Does the plan describe the process that will be followed to update the plan, along with when this process will occur and who will be responsible for the process?	Section 6.1 (p6-1 to 6-3); Appendix H	Met
D3. Does the plan describe a process by which each community will integrate the requirements of the mitigation plan into other planning mechanisms, such as comprehensive or capital improvement plans, when appropriate? (Requirement 44 CFR § 201.6(c)(4)(ii))	Section 6.2 (p6-3 to 6-5)	
D3-a. Does the plan describe the process the community will follow to integrate the ideas, information and strategy of the mitigation plan into other planning mechanisms?	Section 6.2 (p6-3 to 6-5)	Met
D3-b. Does the plan identify the planning mechanisms for each plan participant into which the ideas, information and strategy from the mitigation plan may be integrated?	Section 6.2 (p6-3 to 6-5)	Met
D3-c. For multi-jurisdictional plans, does the plan describe each participant's individual process for integrating information from the mitigation strategy into their identified planning mechanisms?	Section 6.2 (p6-3 to 6-5)	Met

ELEMENT D REQUIRED REVISIONS

Required Revision: **None**

Strengths:

- The plan describes a process for annual review and updates to the plan, to track progress on the mitigation strategy, and incorporate new data and information.

Opportunities for Improvement:

- The plan maintenance section and meeting agendas reference documenting success stories—consider expanding more on the process. This a great way to build into plan updates as well as gain interest and feedback from the public, if properly advertised.

Element E: Plan Update

Element E Requirements	Location in Plan (section and/or page number)	Met / Not Met
E1. Was the plan revised to reflect changes in development? (Requirement 44 CFR § 201.6(d)(3))	Section 3.6 (p3-14 to 3-16); Section 4.3 (p4-21 to 4-153) “Development Trends” subsection	
E1-a. Does the plan describe the changes in development that have occurred in hazard-prone areas that have increased or decreased each community’s vulnerability since the previous plan was approved?	Section 3.6 (p3-14 to 3-16); Section 4.3 (p4-21 to 4-153) “Development Trends” subsection	Met
E2. Was the plan revised to reflect changes in priorities and progress in local mitigation efforts? (Requirement 44 CFR § 201.6(d)(3))		
E2-a. Does the plan describe how it was revised due to changes in community priorities?	Section 1.3 (p1-3 to 1-4); Section 2.2 (p2-3 to 2-11)	Met
E2-b. Does the plan include a status update for all mitigation actions identified in the previous mitigation plan?	Section 5.2 (p5-2 to 5-7); Section 5.4 (p5-11 to 5-57)	Met

Element E Requirements	Location in Plan (section and/or page number)	Met / Not Met
E2-c. Does the plan describe how jurisdictions integrated the mitigation plan, when appropriate, into other planning mechanisms?	Section 6.2 (p6-3 to 6-4)	Met
ELEMENT E REQUIRED REVISIONS		
<p>Required Revision: None</p> <p>Strengths:</p> <ul style="list-style-type: none"> Table 6-1 provides a nice summary of opportunities for plan integration for the participating jurisdictions. 		

Element F: Plan Adoption

Element F Requirements	Location in Plan (section and/or page number)	Met / Not Met
F1. For single-jurisdictional plans, has the governing body of the jurisdiction formally adopted the plan to be eligible for certain FEMA assistance? (Requirement 44 CFR § 201.6(c)(5))		
F1-a. Does the participant include documentation of adoption?	Appendix A	Not Met
F2. For multi-jurisdictional plans, has the governing body of each jurisdiction officially adopted the plan to be eligible for certain FEMA assistance? (Requirement 44 CFR § 201.6(c)(5))		
F2-a. Did each participant adopt the plan and provide documentation of that adoption?	Appendix A	Not Met
ELEMENT F REQUIRED REVISIONS		
<p>Required Revision: As indicated in the Multi-Jurisdictional Summary Sheet on page 3 of this Local Mitigation Plan Review Tool, only Buena Vista County, the cities of Alta, Storm Lake, and Sioux Rapids, have provided written proof of formal adoption of the plan and are approved. All other participating jurisdictions are considered Approvable Pending Adoption (APA).</p> <ul style="list-style-type: none"> Written proof that all jurisdictions' governing bodies have formally adopted the plan (usually a resolution) must be submitted to FEMA. If the plan is not adopted by a participating jurisdiction, that jurisdiction would not be eligible for project grants under the following hazard mitigation assistance programs: HMGP, BRIC, FMA, and HHPD. NOTE: Participating jurisdictions that adopt the plan more than one year after APA status has been issued must either: <ul style="list-style-type: none"> Validate that their information in the plan remains current with respect to both the risk assessment (no recent hazard events, no changes in development) and their mitigation strategy (no changes necessary); or 		

ELEMENT F REQUIRED REVISIONS

- Make the necessary updates before submitting the adoption resolution to FEMA.

Element G: High Hazard Potential Dams (Optional)

HHPD Requirements	Location in Plan (section and/or page number)	Met / Not Met
HHPD1. Did the plan describe the incorporation of existing plans, studies, reports and technical information for HHPDs?		
HHPD1-a. Does the plan describe how the local government worked with local dam owners and/or the state dam safety agency?	Section 2.2.1.3 (p2-8); Section 4.3.12 (p4-111 to 4-117)	Not Met
HHPD1-b. Does the plan incorporate information shared by the state and/or local dam owners?	Section 2.2.1.4 (p2-8 to 2-9); Section 4.3.12 (p4-111 to 4-117); Appendix F	Met
HHPD2. Did the plan address HHPDs in the risk assessment?		
HHPD2-a. Does the plan describe the risks and vulnerabilities to and from HHPDs?	Section 4.3.12 (p4-111 to 4-117);	Met
HHPD2-b. Does the plan document the limitations and describe how to address deficiencies?	Section 4.3.12 (p4-111 to 4-117);	Met
HHPD3. Did the plan include mitigation goals to reduce long-term vulnerabilities from HHPDs?		
HHPD3-a. Does the plan address how to reduce vulnerabilities to and from HHPDs as part of its own goals or with other long-term strategies?	Section 4.3.12 (p4-111 to 4-117);	Met
HHPD3-b. Does the plan link proposed actions to reducing long-term vulnerabilities that are consistent with its goals?	Section 5.1 (p5-1 to 5-2); Section 5.4 (p5-11 to 5-57)	Met

HHPD Requirements	Location in Plan (section and/or page number)	Met / Not Met
HHPD4-a. Did the plan include actions that address HHPDs and prioritize mitigation actions to reduce vulnerabilities from HHPDs?		
HHPD4-a. Does the plan describe specific actions to address HHPDs?	Section 5.4 (p5-11 to 5-57)	Met
HHPD4-b. Does the plan describe the criteria used to prioritize actions related to HHPDs?	Section 5.3.1 (p5-9 to 5-10)	Met
HHPD4-c. Does the plan identify the position, office, department or agency responsible for implementing and administering the action to mitigate hazards to or from HHPDs?	Section 5.4 (p5-11 to 5-57) “Lead & Support Agency” column	Met
HHPD Required Revisions		
<p>Required Revision:</p> <ul style="list-style-type: none"> HHPD1-a: While the plan describes the data and sources used to assess risks and vulnerabilities associated with dams including the one identified high hazard potential dam in the planning area, it is not clear how or if the local government coordinated with local dam owners and/or the state dam safety agency, as required by HHPD1-a. Although listed as optional, Element G: High Hazard Potential Dams required elements must be met to be eligible for the HHPD Grant Program. <ul style="list-style-type: none"> At this time, Buena Vista County is not seeking HHPD approval. We weren’t successful in including dam owners in this update process, but we plan to reach out to them in the coming year as part of Action A30. Once that has been accomplished, we intend to submit an amended plan that meets HHPD requirements. * <p>Strengths:</p> <ul style="list-style-type: none"> The plan documents limitations and deficiencies in inundation data and includes actions to “Identify levee/dam inundation.” Additional actions could include working with the dam owners and communities to ensure emergency action plans are in place and/or up to date. 		

Element H: Additional State Requirements (Optional)

Element H Requirements	Location in Plan (section and/or page number)	Met / Not Met
This space is for the State to include additional requirements.		

Plan Assessment

These comments can be used to help guide your annual/regularly scheduled updates and the next plan update.

Element A. Planning Process

Strengths

-

Opportunities for Improvement

- State Reviewer Comment: For future plan updates, note that the Iowa Department of Homeland Security and Emergency Management (HSEMD) is no longer a division.

Element B. Risk Assessment

Strengths

-

Opportunities for Improvement

-

Element C. Mitigation Strategy

Strengths

-

Opportunities for Improvement

- State Reviewer Comment: Although the Mitigation Action Plan meets the requirements with other actions, there are some actions with a tenuous relationship with the hazards they are meant to address. For instance, warning sirens and storm spotters are not likely to apply to drought, extreme heat, or landslides (unless, for instance, the sirens are capable of conveying public announcements and the storm spotters are actually trained to address non-storm natural hazards). In the next plan update, please ensure that the list of hazards addressed by actions is an accurate reflection of the intended use for these actions/resources.

Element D. Plan Maintenance

Strengths

-

Opportunities for Improvement

-

Element E. Plan Update

Strengths

-

Opportunities for Improvement

-

Element G. HHPD Requirements (Optional)

Strengths

-

Opportunities for Improvement

-

Element H. Additional State Requirements (Optional)

Strengths

-

Opportunities for Improvement

-

APPENDIX B: Hazard Mitigation Planning Committee

Name	Agency/Jurisdiction	Title	Meetings Attended
Buena Vista County			
Greg Johnson	Buena Vista County	Director	Kickoff, Meeting #3
Bret Wilkinson	Buena Vista County	Engineer	Kickoff, Meeting #2, Meeting #3
Kim Johnson	Buena Vista County	Administration	Kickoff, Meeting #2
Kathy Croker	Buena Vista County	Supervisor	Meeting #3
Tom Huseman	Buena Vista County	Supervisor	Kickoff
Aimee Barritt	Buena Vista County	Emergency Manager	Kickoff, Meeting #2, Meeting #3
Ben Mueggenberg	Buena Vista County	Administration (replaced Kim J)	Meeting #3
Dorie Petersen	Buena Vista County	PH Preparedness	Kickoff, Meeting #2, Meeting #3
Julie Sather	Buena Vista County	Nurse Administrator	Kickoff, Meeting #2
City of Albert City			
Dale Skog	City of Albert City	Mayor	Kickoff, Meeting #2, Meeting #3
City of Alta			
Kevin Walsh	City of Alta	Mayor	Kickoff, Meeting #3
Megan Peterson	City of Alta	Clerk	Kickoff
City of Lakeside			
Lynn Laursen	City of Lakeside	Public Works Supervisor	Kickoff, Meeting #3
City of Linn Grove			
Aaron Anderson	City of Linn Grove	Mayor	Kickoff
City of Marathon			
Terry Gunnarson	City of Marathon	Public Works Supervisor	Meeting #2
Tyler Garvis	City of Marathon	Public Works	Meeting #3
Mike White	City of Marathon	Mayor	Meeting #2
City of Newell			
Brian Puhrmann	City of Newell	Mayor	Kickoff,

Name	Agency/Jurisdiction	Title	Meetings Attended
			Meeting #2
Sierra Olsen	City of Newell	Clerk	Kickoff, Meeting #3
City of Rembrandt			
Brent Smith	City of Rembrandt	City Council	Meeting #2, Meeting #3
Doyle Engebretson	City of Rembrandt	Mayor	Meeting #2
City of Sioux Rapids			
Amanda Caraway	City of Sioux Rapids	Clerk	Kickoff, Meeting #3
City of Storm Lake			
Dana Larsen	City of Storm Lake	Communications Coord	Meeting #2, Meeting #3
Matt Beckman	City of Storm Lake	Public Works Director	Meeting #2, Meeting #3
Scott Olesen	City of Storm Lake Floodplain and Building	Building Official	Kickoff, Meeting #2, Meeting #3
Brandon Ripke	City of Storm Lake Public Works	Assistant Public Services Supervisor	Kickoff, Meeting #3
City of Truesdale			
Diane Yang	City of Truesdale	City Clerk	None (coordinated with individually after meetings)
Iowa Central Community College			
Chris Cleveland	ICCC	SL Center Director	Kickoff, Meeting #3
Buena Vista University			
Andy Taylor	BVU	Interim facilities dir.	Meeting #2
Albert City-Truesdale School District			
Jeff Dicks	Albert City-Truesdale School District	Superintendent	Kickoff, Meeting #2, Meeting #3
Alta-Aurelia School District			
Tim Scott	Elementary Principal	Interim Facilities Director	Kickoff, Meeting #2, Meeting #3
Newell- Fonda School District			
Jeff Dicks	Newell-Fonda School District	Superintendent	Kickoff, Meeting #2, Meeting #3
Sioux Central School District			

Name	Agency/Jurisdiction	Title	Meetings Attended
Kevin Wood	Sioux Central Schools	Superintendent	Kickoff, Meeting #2, Meeting #3
Storm Lake School District			
Jeff Tollefson	Storm Lake Public Schools	Chief Operating Officer	Kickoff, Meeting #2, Meeting #3
Storm Lake St Mary's Catholic School			
Dan Gaffney	Storm Lake St. Mary's School	Dir School Operations	Kickoff, Meeting #2
United Community Health Center			
Matt Brostad	United Community Health Center		Kickoff, Meeting #2
Upper Des Moines Opportunity			
Alisa Schlieff	Upper Des Moines Opportunity	UDMO family and community services director	Kickoff

APPENDIX C: Planning Process Documentation



Buena Vista County Hazard Mitigation Plan Update

Hazard Mitigation Planning
Committee Kick-off Meeting

April 27, 2021 – 1:00-3:00 pm CST

Please enter your name, title,
and affiliation in the chat.

slido



Join at [slido.com](https://slido.com/join/2840913)
#2840913



Agenda



1. Introductions
2. Hazard Mitigation Overview
3. Mitigation Planning Process and Requirements
4. Overview of 2018 Hazard Mitigation Plan
5. Coordination with Other Agencies, Related Planning Efforts, & Recent Studies
6. Planning for Public Involvement
7. Project Schedule and Next Steps
8. Questions

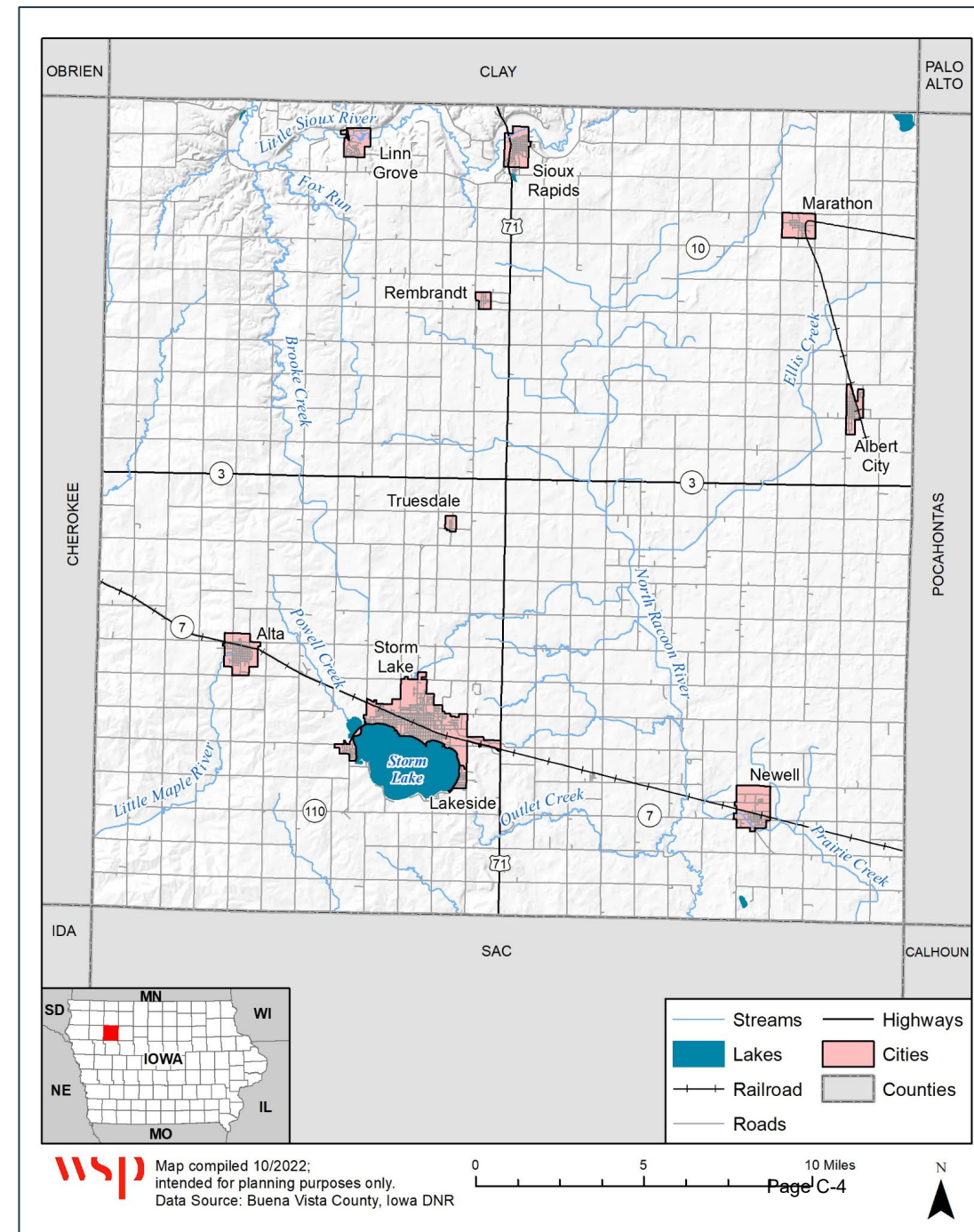


Buena Vista County Iowa Hazard Mitigation Plan 2023 Update

Hazard Mitigation Planning Committee
Meeting #2 – Risk Assessment

December 13, 2022 – 1:00-3:30 p.m. CST

**Please type your name, title,
and agency in the Chat.**



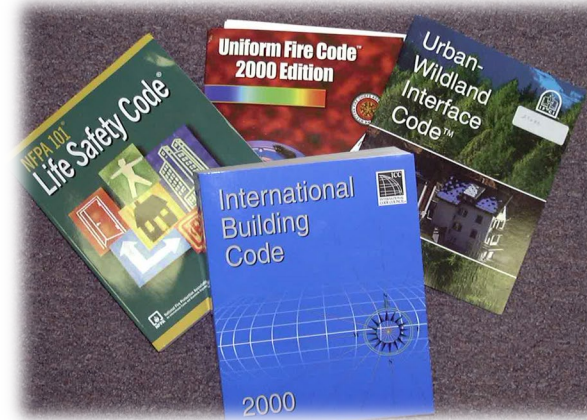
Agenda

- Introductions
- Hazards and Risk Assessment Update
- Capability Assessment Update
- Mitigation Strategy Update
- Next Steps
- Questions and Answers



Buena Vista County Hazard Mitigation Plan 2023 Update

Hazard Mitigation Planning Committee –
Meeting #3 – Mitigation Strategy Update
January 23, 2023 – 1 pm CT



Agenda

1. Introductions
2. Planning Process Review
3. Updated Goals & Objectives
4. Progress on 2018 Mitigation Actions
5. Review of Mitigation Action Categories and Alternatives
6. Potential Funding Sources
7. Identification of New Mitigation Actions
8. Plan Implementation and Maintenance
9. Next Steps

Buena Vista County, Iowa Multi-Jurisdictional Hazard Mitigation Plan 2023 Update

Kick-Off Meeting Summary

Thursday, August 8, 2022

12:00 – 1:30 pm MST

Teams Virtual Meeting

Introductions and Opening Remarks

This document summarizes the kickoff meeting for the 2023 Buena Vista County Hazard Mitigation Plan update. The meeting was facilitated by Wood Environment & Infrastructure Solutions, Inc. (Wood) the consulting firm working under a contract with Buena Vista County to facilitate the planning process and develop the updated County plan. This was a hybrid meeting with some people attending in person and others attending virtually. The following people attended virtually:

Matthew Beckman	Public Works Director	City of Storm Lake
Mike White		City of Marathon
Terry Gunnarson		City of Marathon
Julie Sather	Public Health Administrator	Buena Vista County
Matt Brostad	Operations Director	United Community Health Center
Rob Robinson		
Scott Field	Project Manager	Wood Consulting
Jeff Brislawn	Hazard Mitigation Lead	Wood Consulting
Natalie Schoen	Hazard Mitigation Planner	Wood Consulting
Cameron Nelson	Hazard Mitigation Planner	Wood Consulting

The sign-in sheet for those who attended in person is attached.

Scott Field, Project Manager with Wood, began the meeting with a brief introduction of the plan update and emphasized the importance of maintaining a current Hazard Mitigation Plan (HMP), which is necessary for jurisdictions that seek FEMA grant funding before or after disasters.

Scott then explained the importance of jurisdictions participating in the planning process for the HMP update and thanked everyone for attending. Scott began by asking those attending to virtually introduce themselves by stating their name, title, and agency/jurisdiction using the Chat feature on Zoom.

Following introductions Scott discussed the agenda items; the key discussion is summarized below, and additional details are within the meeting PowerPoint presentation. Additionally, an interactive polling tool called Slido was used to gather feedback from the group throughout the meeting. Responses to this poll are attached.

The following jurisdictions are expected to participate in 2023 and will need to re-adopt the plan:

- Buena Vista County
- City of Albert
- City of Alta
- City of Lakeside
- City of Linn Grove
- City of Marathon
- City of Newell
- City of Rembrandt
- City of Sioux Rapids
- City of Storm Lake
- City of Truesdale
- Iowa Central Community College
- Buena Vista University
- Albert City-Truesdale School District
- Alta-Aurelia School District
- Newell-Fonda School District
- Storm Lake School District
- Storm Lake St Mary's Catholic School

Hazard Mitigation Overview

Mitigation is any sustained action taken to reduce or eliminate long-term risk to human life and property from natural or human-caused hazards. Mitigation Planning guides mitigation activities in a coordinated and economic manner to make communities more disaster resilient. An example of a hazard mitigation strategy is the practice of elevating homes located near a river, so the house stays above rising water during a flooding event and therefore minimizes damages to the home. The FEMA definition of mitigation does not include purchasing emergency vehicles or radios for communication, because those resources would be used to respond to a disaster, not prevent one.

The U.S. Disaster Mitigation Act of 2000 requires state and local governments to adopt a hazard mitigation plan, updated every five years, to maintain eligibility for pre- and post-disaster FEMA mitigation assistance grants. There are two main types of benefits a community gain from having a FEMA approved hazard mitigation plan (HMP); (1) bringing people together in the community; (2) having an HMP approved by FEMA makes a community eligible for FEMA mitigation grants. Any funding requests from FEMA needs to be based on the hazards and mitigation strategy in the HMP. Information from the hazard mitigation plan, specifically the vulnerability assessment and mitigation strategy, can be used in other hazard related plans such as an emergency operations plan. FEMA has several mitigation grant programs, including the Building Resilient Infrastructure and Communities (BRIC), Flood Mitigation Assistance (FMA), Hazard Mitigation Grant Program (HMGP), and the High Hazard Potential Dam Program (HHPD). There are several other federal, state, local, and private sources for funding that exist as well.

There are trends resulting in increased costs for disaster response and recovery related to population growth and the increase in the types of events we experience as a community. We need these plans for several reasons because they reduce future recovery costs, we can plan around predictive events, and they guide mitigation activities in a coordinated manner. Studies have shown that on average for every \$1 spent on mitigation an average of \$6 is saved during disaster response, so mitigation efforts are very economically beneficial. Scott concluded this section by asking the group if they had participated in the 2018 HMP update, to which 67% said no and 33% said yes.

Hazard Mitigation Planning Process and Requirements

The updated HMP is not a regulatory document and there is no penalty for jurisdictions who are not able to meet all the hazard mitigation goals. This plan will be used to outline the goals and actions that will help the communities better prepare for and respond to disaster events. This HMP is a multi-jurisdiction plan.

Any jurisdiction who would like to receive FEMA funding must actively participate in the planning process by attending meetings or providing data/input to the Wood team or Buena Vista County Emergency Management.

A Hazard Mitigation Planning Committee (HMPC) will be established to provide relevant information to and collaborate with the Wood team. Scott reviewed the Disaster Mitigation Act (DMA) of 2000 Requirements and explained that the Buena Vista County Multi-Jurisdictional Hazard Mitigation Plan (HMP) will be updated in accordance with these requirements. The original FEMA planning process involves a 4 Phase approach, with the Kickoff meeting serving as the first step in the process:

1. **Get Organized:** This is a commitment from jurisdictions to participate in planning and determine the Hazard Mitigation Planning Committee (HMPC). The HMPC includes county, municipalities, and special districts. Scott emphasized that local input and participation from HMPC members is required for full FEMA approval. Stakeholders include other local, state, and federal agencies with a stake in hazard mitigation in the County or may include academic institutions and local business and industry. Neighboring counties were also notified about the update and will be given an opportunity to provide input into the process. The group was asked what other key stakeholders should be involved in this process. The responses include:
 - Railroad rep
 - Farm Bureau for farmers
 - Fire chiefs
 - Tyson's
 - Health care
 - Local engineering firms
 - Farmers
2. **Risk Assessment:** The hazard identification and risk assessment (HIRA) is used to describe hazards, identify community assets, analyze risk based on gaps in assets, and summarize vulnerability. Conducting a risk assessment is a key aspect of a hazard mitigation plan and involves two components; hazard identification (what can happen here) and the vulnerability assessment (what will be affected). The HMP update will be based on existing documents and studies, with the 2018 Buena Vista County HMP providing the baseline for identified hazards and the groundwork for goals, policies, and actions for hazard mitigation. Data on hazards from the past five years will be used to conduct the risk assessment, using sources such as GIS-based maps, historic records, insurance data, etc. Then a vulnerability assessment will be conducted to identify infrastructure and groups of people who will be more likely to experience losses.
3. **Develop a Mitigation Plan:** The steps to develop a mitigation strategy include reviewing goals and objectives from the 2018 Buena Vista HMP, reviewing mitigation alternatives to expand or improve previous goals, and then drafting an action Any participating jurisdiction with a mitigation project in mind should make sure that the project is included in this Buena Vista County HMP update. Several types of mitigation projects are eligible for FEMA funding, including wildfire, flooding, winter storms, landslides, generator installation, climate resilience activities, etc.
4. **Adoption, Monitoring, & Implementation:** The public will provide input on the draft HMP before the official adoption of the plan by the governing board occurs. Once the plan is officially adopted, the designated project manager will integrate the plan into existing structures and track progress of the

mitigation actions. The HMP will be revised as necessary to keep the plan current. The four drafts that will be developed over this planning process are:

1. HMPC (Internal) review
2. Public review
3. State review
4. FEMA review

Overview of 2018 Hazard Mitigation Plan:

Based on hazards from the 2018 County HMP, the list of potential hazards was reviewed. Scott showed a slide that listed the hazards in the 2018 HMP and the significance ranking for each hazard.

- | | |
|--------------------------------|--------------------------------|
| • Animal/Plant/Crop Disease | • Infrastructure Failure |
| • Drought | • Landslide |
| • Earthquake | • Levee/Dam Failure |
| • Expansive Soils | • River Flooding |
| • Extreme Heat | • Severe Winter Storms |
| • Flash Floods | • Sinkhole |
| • Grass/Wildland Fire | • Thunderstorms/Lightning/Hail |
| • Hazardous Materials Incident | • Tornado/Windstorms |
| • Human Disease | • Transportation Incidents |

The group discussed what other hazards should be considered that were not included in the 2018 plan. The responses are as follows:

- Water supply or contamination
- Economic downturns

The group then discussed what growth and development trends in the past 5 years may have increased or decreased vulnerability to hazards, such as more development in the wildland urban interface (WUI). Responses include:

- Field drainage tile leading to more flooding
- Soybean crushing facility
- Crude oil pipeline
- CO2 pipeline
- Loss of cropland

Scott then reviewed the goals and mitigation actions from the 2018 Buena Vista HMP. There are 258 total mitigation actions from the 2018 HMP between Buena Vista County and its jurisdictions. The goals from the 2018 HMP are as follows:

Goal 1: Decrease impact of severe weather and natural occurrences on both private and public property and life

Goal 2: Protect health, safety, and quality of life for the residents of Buena Vista County

Goal 3: Ensure continued government and emergency functions in the event of a disaster.

Goal 4: Provide public education and encourage preparedness

Goal 5: Ensure that public funding is being used efficiently to prevent hazards from occurring

Goal 6: Utilize planning tools and documents to consider, address, educate or enforce hazard mitigation actions

Coordination with Other Agencies, Related Planning Efforts, and Recent Studies:

The group discussed recent studies of hazards in other documents and reports that are related to the Buena Vista County HMP. Some examples include the 2018 State of Iowa HMP, as well as hazard risk studies, scientific studies, and Flood Insurance Rate Map Updates. The group was asked if existing plans, reports, or studies should be reviewed for this planning process. The responses include:

- Coordination with the Iowa DNR
- Process to communicate or inform the public in an emergency

Planning For Public Involvement:

A survey will be developed to gather input from the public on hazard concerns and mitigation ideas. It is advantageous to involve the public in the planning process to strengthen local support for the plan and ensure that the mitigation actions outlined in the HMP will better suit local needs. Advertisement of the public survey will be through public information channels, official websites, social media, email blasts etc. The group was asked about upcoming opportunities for outreach at scheduled public meetings or events. The responses include:

- | | |
|-------------------------|------------------------------|
| - Church leaders | - County supervisor meetings |
| - City Council meetings | - YouTube targeted ads |
| - School board meetings | - SALUD Multicultural agency |

Project Schedule and Next Steps:

The HMP will be updated over the next ten months, with at least two more meetings with the Hazard Mitigation Planning Committee and a predicted final approval date for the HMP in June of 2023. Wood will be updating the Hazard Identification and Risk Assessment (HIRA) in the next couple of months, with input from the HMPC. Four drafts of the HMP will be created: the first for internal review by the HMPC, a second for public review, and a third for State review, and the final for FEMA review. The first draft for HMPC review is targeted for January of 2023, a public review draft in February followed by a review by Iowa DHSEM in March and then tentatively approved by FEMA in June 2023.

Scott discussed a slide with initial information needs and next steps. Scott encouraged the group to send by email information on:

- Recent hazard events (since 2018) – damages, incident logs, damage assessments, etc.
- Growth and development trends

- Recent updated plans and policies

A Plan Update Guide will be sent to all participating jurisdictions. Jurisdictions should review the hazard identification and ranking and fill out the status of actions from the previous HMP and return the Plan Update Guide to Wood of Buena Vista County OEM.

The County will provide the meeting summary, handouts, presentation, and sign in sheet by email so that other HMPC members that could not attend today's meeting could get up to speed. Wood will begin work on the Hazard Identification and Risk Assessment update and develop a public survey that can be used online. The next HMPC meeting will be following the update of the Hazard Identification and Risk Assessment section of the plan. The specific date will be shared when available.

It is essential that all jurisdictions stay involved in the planning process to get full FEMA approval of the HMP and ensure that the plan is suited to local needs. Participation includes the following for the **Hazard Mitigation Planning Committee (HMPC)**:

- Attend meetings and participate in the planning process
- Provide requested information to update or develop jurisdictional information
- Review drafts and provide comments
- Identify mitigation projects specific to jurisdiction, provide status
- Assist with and participate in the public input process
- Coordinate formal adoption

Participation for **participating jurisdictions**:

- Participate in the County HMPC (previous slide)
- Coordinate with other departments/agencies from your jurisdiction
- Update jurisdictional information
- Identify new mitigation actions
- Complete and return Plan Update Guide
- Coordinate formal adoption

Participation for **stakeholders**:

- Coordinate formal adoption
- Attend HMPC meetings or stay in loop via email list
- Provide data/information
- Partner on mitigation efforts
- Assist with Public Input Process
- Review and comment draft plan

Adjourn

Scott ended the meeting by thanking everyone for their attendance and active participation throughout the meeting. The meeting adjourned at 1:30 pm MST.



Buena Vista County Kickoff Meeting_08152022.pptx

18 - 24 Aug 2022

Poll results

Table of contents

- If you didn't have to be here today, what would you rather be doing?
- Did you participate in the 2018 HMP update?
- What other stakeholders should be involved in this process?
- What other hazards should be considered?
- What other existing plans, reports, or processes should we review or coordinate with?
- What growth and development trends in the past 5 years may have increased or decreased vulnerability to hazards (i.e. more homes in wildland urban interface, floodplain development pressure etc.)?
- Are there upcoming opportunities for outreach at scheduled public meetings or events?

If you didn't have to be here today, what would you rather be doing?

008

Fishing

Youth football Golfing Biking

Camping

Did you participate in the 2018 HMP update?

0 1 2

Yes



No



What other stakeholders should be involved in this process?

006

- Railroad rep
- Farm Bureau for farmers
- Fire chiefs
- Tyson's
- Health care
- Local engineering firms
- Farmers

What other hazards should be considered?

002

- Water supply or contamination
- Economic downturns

What other existing plans, reports, or processes should we review or coordinate with?

002

- Processes to communicate or inform the public in an emergency
- Consider coordination with the Iowa DNR

003

What growth and development trends in the past 5 years may have increased or decreased vulnerability to hazards (i.e. more homes in wildland urban interface, floodplain development pressure etc.)?

- Field drainage tile
- Soybean crushing facility Crude oil pipeline CO2 pipeline
- More field tile has led to more flooding
- Loss of crp grounds

Are there upcoming opportunities for outreach at scheduled public meetings or events?

004

- Salud
- salad, sorry
- salad multicultural agency
- YouTube targeted ads
- City council or county supervisor meetings
- City council meetings School board meetings
- Church leaders

P = in person V = virtual

Name	Agency	email	Meet 1	Meet 2	Meet 3
Aimee Barritt	BVEMA	aimee.barritt@bvema.com	P	P	✓
Jeff Tollefson	SL Public Schools	jtollefson@slcsd.org	P	P	✓
Kevin Wood	Sioux Central	Kwood@siouxcentral.org			
Scott Olesen	SL Floodpln/bldg	olesen@stormlake.org	P	P	✓
Brandon Ripke	SL Public works	ripke@stormlake.org	P		✓
Dana Larsen	City of SL	larsen@stormlake.org		P	✓
Matt Beckman	City of SL	beckman@stormlake.org	P	V	✓
Alisa Schlieff	UDMO	aschlieff@udmmo.com	V		✓
Greg Johnson	BV CO Cons	director@bvcountyparks.com	P		✓
Tim Scott	AA School District	tscott@alta-aurelia.k12.ia.us	P	V	✓
Quin Kelly	BVRMC	kelly.quin@bvrnc.org	P		✓
Julie Sather	BV CO PH	jsather@bvcountyiowa.com	P	V	✓
Lynn Laursen	City of Lakeside	lakesideiowacd@siouxland.com	P		✓
Ryan Berg	SL ST. Mary's school	rberg@stmarys-storm.pvt.k12.ia.us	P		
Dan Gaffney	SL ST. Mary's school	dgaffney@stormlakecatholic.com	P	V	
Matt Brostad	UCHC	matt@uchcs.com	P	V	
Chris Cleveland	ICCC	cleveland@iowacentral.edu	P		✓
Andy Taylor	BVU	TaylorA@bv.u.edu	P	V	
Kim Johnson	BV EH&floodpln	kjohnson@bvcountyiowa.com	P	V	
Bret Wilkinson	BV Co Engineer	bwilkinson@bvcountyiowa.com	P	P	✓
Tom Huseman	BV Co BofS	thuseman@bvcountyiowa.com	V		
Don Altena	BV Co BofS	daltena@bvcountyiowa.com			
Megan Peterson	Alta City Clerk	cityclerk@alta-tec.net	P	V	✓
Kevin Walsh	Alta Mayor	mayor@alta-tec.net	V		✓
Angie Nielsen	Albert City Clerk	acity@ncn.net			
Luke Ehlers	Albert City	ehlersluke@rocketmail.com			
Angela Crewther	Linn Grove Clerk	lg51033@iowatelecom.net			
Mike White	Marathon Mayor	mikewhite@windstream.net		V	
Brenda Sundblad	Marathon Clerk	marathoncity@iowatelecom.net			
Brian Puhmann	Newell Mayor	Mayor@newelliowa.com	P	V	
Sierra Olsen	Newell Clerk	CityClerk@newelliowa.com	P		✓
Diane Yang	Truesdale Clerk	dianeyang915@yahoo.com			
Amanda Caraway	Sioux Rapids Clerk	cityofsiouxrapids@gmail.com	P		✓
Jim Wise	Sioux Rapids Mayor	siouxjaw@netscape.net			
Angie Nielsen	Rembrandt Clerk	rembrandt@evertek.net			
Doyle Engebretson	Rembrandt Mayor	doyle.ace99@gmail.com		V	

✓ Dale Skog	Albert City Mayor	dianeskog@hotmail.com	✓	✓	✓
✓ Aaron Anderson	LG Mayor	aandersonme@hotmail.com	✓		

Brent Smith Rembrandt City Council

— ✓ ✓

Tyler Jarvis Marathon

— — ✓

Cameron Nelson

✓ ✓ —

Ferry Gunnarson Marathon

— ✓ ✓

Dorie Pedersen Public Health
BV CO

✓ ✓ ✓

Ben Mueggenberg BV CO
Env. Health +
Zoning

— — ✓

Kathy Croker BV CO
Supervisor

— — ✓

From: Aimee Barritt [BVEMA]
Sent: Wednesday, January 4, 2023 11:53 AM
To: Keri Navratil <Navratil@stormlake.org>; 'olesen@stormlake.org' <olesen@stormlake.org>; 'ripke@stormlake.org' <ripke@stormlake.org>; 'Dana Larsen' <Larsen@stormlake.org>; 'beckman@stormlake.org' <beckman@stormlake.org>; Lynn Laursen - Lakeside EMC Rep (publicworks@lakesideia.com) <publicworks@lakesideia.com>; Diane Yang (truesdalecityclerk@gmail.com) <truesdalecityclerk@gmail.com>; Lakeside City Clerk <clerk@lakesideia.com>; Linn Grove City Clerk <lg51033@iowatelecom.net>; Marathon City Clerk (marathoncity@iowatelecom.net) <marathoncity@iowatelecom.net>; Maya Martinez <martinez@stormlake.org>; Megan Peterson <cityclerk@alta-tec.net>; Newell City Clerk (CityClerk@newelliowa.com) <CityClerk@newelliowa.com>; Nielsen Angie <acity@ncn.net>; Rembrandt City Clerk <rembrandt@evertek.net>; Sioux Rapids City Clerk <cityofsiouxrapids@gmail.com>; Aaron Anderson <aandersonme@hotmail.com>; Brian Puhrmann (mayor@newelliowa.com) <mayor@newelliowa.com>; Dale Skog <dianeskog@hotmail.com>; Doyle Engebretson (doyle.ace99@gmail.com) <doyle.ace99@gmail.com>; Jim Wise <siouxjaw@netscape.net>; Kevin Walsh <mayor@alta-tec.net>; Mike Porsch <mdporsch@gmail.com>; Mike White (mikewhite@windstream.net) <mikewhite@windstream.net>; Roger Pomrenke (r.pomrenke@mchsi.com) <r.pomrenke@mchsi.com>
Subject: final mitigation planning meeting

Hello!

I am happy to let you know that the final hazard mitigation planning meeting will be held on Monday, January 23, 2023 at 1pm at the Prairie Lakes AEA meeting room located at 824 Flindt Dr, Storm Lake. This will be an in-person meeting only and the planning contractor will be present. Everyone has an assignment for this meeting. Please look over the mitigation actions for your city and make sure they are still valid and also determine if you have completed any of the actions listed. Also, per FEMA, each entity needs to come up with 1 new mitigation action. So please be prepared to share that info. If you can't make the meeting, please try to send someone. If that doesn't work, let me know if the mitigation actions are valid, the mitigation actions you have accomplished, and what the new one is. I have cut and pasted each city's section of the plan for you to review. They are alphabetical in the attached word document.

Thanks for being part of this planning process. The end is near!

Aimee

Sioux Central is watching the meetings now. Please add that to the attendance.

Thanks,

Aimee

Aimee Barritt | Buena Vista County Emergency Management | 411 Expansion Blvd | Storm Lake, Iowa 50588 | 712.749.2705 | Cell 712.299.4114

From: Kevin Wood <kwood@siouxcentral.org>

Sent: Wednesday, February 8, 2023 10:16 AM

To: Aimee Barritt [BVEMA] <aimee.barritt@bvema.com>

Subject: Re: hazard mitigation plan

Watching it right now. Thank you for the reminder.

Kevin Wood

On Wed, Feb 8, 2023 at 10:14 AM Aimee Barritt [BVEMA] <aimee.barritt@bvema.com> wrote:

Good morning,

We are trying to get the mitigation plan wrapped up and I want to ensure your entities are included to keep you eligible for funding. Could you please go to the link and watch the first 2 meetings? Please let me know when you do and I will let Scott know. When the plan is updated, we will be bringing it back to each entity for approval.

Thanks!

Aimee

Four jurisdictions haven't attended any meetings. In order to show participation, it would be nice if we could at least get them to watch the recordings of the first 2 meeting, which I've uploaded to the Google Drive.

- Truesdale
- Albert City-Truesdale School District
- Newell-Fonda School District
- Sioux Central School District

It's a rainy day here, so everyone must be watching videos.
I think all have watched now.

Aimee Barritt | Buena Vista County Emergency Management | 411 Expansion Blvd | Storm Lake, Iowa 50588 | 712.749.2705 | Cell 712.299.4114

From: Jeff Dicks <dicksj@newell-fonda.k12.ia.us>
Sent: Tuesday, February 14, 2023 2:14 PM
To: Aimee Barritt [BVEMA] <aimee.barritt@bvema.com>
Cc: Kevin Wood <kwood@siouxcentral.org>; Diane Yang (truesdalecityclerk@gmail.com) <truesdalecityclerk@gmail.com>; Aaron Anderson <aandersonme@hotmail.com>
Subject: Re: hazard mitigation plan

Aimee,

I have been through both videos for AC-T and Newell-Fonda.

On Wed, Feb 8, 2023 at 10:14 AM Aimee Barritt [BVEMA] <aimee.barritt@bvema.com> wrote:

Good morning,

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- Truesdale
- Albert City-Truesdale School District
- Newell-Fonda School District
- Sioux Central School District

Linn Grove just watched meeting 2.

Aimee Barritt | Buena Vista County Emergency Management | 411 Expansion Blvd | Storm Lake, Iowa 50588 | 712.749.2705 | Cell 712.299.4114

From: Aaron Anderson <aandersonme@hotmail.com>

Sent: Tuesday, February 14, 2023 2:11 PM

To: Aimee Barritt [BVEMA] <aimee.barritt@bvema.com>; Kevin Wood <kwood@siouxcentral.org>; Jeff Dicks <dicksj@newell-fonda.k12.ia.us>; Diane Yang (truesdalecityclerk@gmail.com) <truesdalecityclerk@gmail.com>

Subject: Re: hazard mitigation plan

Aimee,

Just went through meeting #2 Hazards for the city of Linn Grove.

Thanks

Aaron Anderson
Mayor, Linn Grove

From: Aimee Barritt [BVEMA] <aimee.barritt@bvema.com>

Sent: Wednesday, February 8, 2023 10:14:54 AM

To: Kevin Wood <kwood@siouxcentral.org>; Jeff Dicks <dicksj@newell-fonda.k12.ia.us>; Diane Yang (truesdalecityclerk@gmail.com) <truesdalecityclerk@gmail.com>; Aaron Anderson <aandersonme@hotmail.com>

Subject: hazard mitigation plan

Good morning,

We are trying to get the mitigation plan wrapped up and I want to ensure your entities are included to keep you eligible for funding. Could you please go to the link and watch the first 2 meetings? Please let me know when you do and I will let Scott know. When the plan is updated, we will be bringing it back to each entity for approval.

Thanks!

Aimee

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- Truesdale
- Albert City-Truesdale School District
- Newell-Fonda School District
- Sioux Central School District

From: Aimee Barritt [BVEMA]
Sent: Tuesday, July 26, 2022 1:11 PM
To: Jeff Tollefson <jtollefson@slcsd.org>; 'Kwood@siouxcentral.org' <Kwood@siouxcentral.org>; 'olesen@stormlake.org' <olesen@stormlake.org>; 'ripke@stormlake.org' <ripke@stormlake.org>; 'larsen@stormlake.org' <larsen@stormlake.org>; 'beckman@stormlake.org' <beckman@stormlake.org>; 'aschliief@udmmo.com' <aschliief@udmmo.com>; Greg Johnson - Conservation Director <director@bvcountyparks.com>; 'tscott@alta-aurelia.k12.ia.us' <tscott@alta-aurelia.k12.ia.us>; 'kelly.quin@bvrnc.org' <kelly.quin@bvrnc.org>; 'jsather@bvcountyiowa.com'; 'lakesideiowacd@siouxland.com' <lakesideiowacd@siouxland.com>; 'rberg@stmarys-storm.pvt.k12.ia.us' <rberg@stmarys-storm.pvt.k12.ia.us>; 'dgaffney@stormlakecatholic.com' <dgaffney@stormlakecatholic.com>; 'matt@uchcsl.com' <matt@uchcsl.com>; Chris Cleveland <cleveland@iowacentral.edu>; 'TaylorA@bvu.edu' <TaylorA@bvu.edu>; Johnson Kim <kjohnson@bvcountyiowa.com>; Bret Wilkinson <bwilkinson@bvcountyiowa.com>; Huseman Tom (thuseman@bvcountyiowa.com) <thuseman@bvcountyiowa.com>; Altena Don (daltena@bvcountyiowa.com) <daltena@bvcountyiowa.com>; Megan Peterson <cityclerk@alta-tec.net>; Kevin Walsh <mayor@alta-tec.net>; Nielsen Angie <acity@ncn.net>; 'ehlersluke@rocketmail.com' <ehlersluke@rocketmail.com>; Linn Grove City Clerk <lg51033@iowatelecom.net>; Mike White (mikewhite@windstream.net) <mikewhite@windstream.net>; Marathon City Clerk (marathoncity@iowatelecom.net) <marathoncity@iowatelecom.net>; Brian Puhrmann (mayor@newelliowa.com) <mayor@newelliowa.com>; Newell City Clerk (CityClerk@newelliowa.com) <CityClerk@newelliowa.com>; 'dianeyang915@yahoo.com' <dianeyang915@yahoo.com>; Sioux Rapids City Clerk <cityofsiouxrapids@gmail.com>; Jim Wise <siouxjaw@netscape.net>; Rembrandt City Clerk <rembrandt@evertek.net>; Doyle Engebretson (doyle.ace99@gmail.com) <doyle.ace99@gmail.com>; Dale Skog <dianeskog@hotmail.com>; Aaron Anderson <aandersonme@hotmail.com>
Subject: hazard mitigation plan meeting Aug 18

Good afternoon!
Buena Vista County Hazard Mitigation Plan Update Kickoff Meeting

This meeting will kick off the update process for the Buena Vista County Hazard Mitigation Plan, which must be updated every 5 years to remain eligible for FEMA funding. All participating jurisdictions need to have someone attend.

Date: Thursday August 18th
Time: 1:00-3:00pm Central time
Location: This will be a hybrid meeting: you can attend virtually through the link below or in person at Buena Vista County Sheriff's Office, 411 Expansion Blvd, Storm Lake, IA.
****Please let me know if you will be attending in person so I can ensure the room is set up with enough chairs****

Team link: https://teams.microsoft.com/l/meetup-join/19%3ameeting_NDRkOWZjMDMtNTkyMy00NTkzLWI2NTgtYzUwZjAxMGU2ZjM5%40thread.v2/0?context=%7b%22id%22%3a%220843acec-fd3e-49be-bd54-18c6048a3fd0%22%2c%22oid%22%3a%221af7d331-902d-4752-9987-ea455d99ec99%22%7d
Meeting ID: 222 596 662 946
Passcode: u4coQz
Call-in Number: +1 281-810-1627,,495208594#

I look forward to having you all join the meeting in person or online on Aug 18. Thank you for serving on the planning committee!

Aimee

Example Mitigation Actions by Hazard

Alternative Mitigation Actions	Dam Incidents	Floods	Epidemic/ Pandemic HazMat	Expansive Soils, Land Subsidence	Weather Extremes: (drought and extreme temps; hail, lightning, severe wind; tornado)	Earthquakes	Fire	Winter Storm
PLANS and REGULATIONS								
Building codes and enforcement		■		■	■	■	■	■
Comprehensive Watershed Tax		■						
Density controls	■	■		■			■	
Design review standards		■		■		■	■	
Easements		■		■			■	
Environmental review standards		■		■		■	■	
Floodplain development regulations	■	■						
Hazard mapping	■	■		■			■	
Fluvial Hazard Zone mapping and regulations		■		■				
Floodplain zoning	■	■						
Forest fire fuel reduction							■	
Housing/landlord codes					■			
Slide-prone area/grading/hillside development regulations				■			■	
Manufactured home guidelines/regulations		■			■	■		
Multi-Jurisdiction watershed protection	■	■						
Open burning regulations							■	
Open space preservation	■	■		■			■	
Performance standards	■	■		■	■	■	■	■
Special use permits	■	■		■			■	
Stormwater management regulations		■						
Subdivision and development regulations	■	■		■		■	■	
Surge protectors and lightning protection					■			
Tree Management					■		■	■
Transfer of development rights		■		■			■	
Utility location		■		■	■		■	■

Alternative Mitigation Actions	Dam Incidents	Floods	Epidemic/ Pandemic HazMat	Expansive Soils, Land Subsidence	Weather Extremes: (drought and extreme temps; hail, lightning, severe wind; tornado)	Earthquakes	Fire	Winter Storm
STRUCTURE AND INFRASTRUCTURE PROJECTS								
Acquisition of hazard prone structures	■	■		■			■	
Facility inspections/reporting	■	■				■		
Construction of barriers around structures	■	■						
Elevation of structures	■	■						
Relocation out of hazard areas	■	■		■			■	
Structural retrofits (e.g., reinforcement, floodproofing, bracing, etc.)		■	■	■	■	■	■	■
Channel maintenance		■		■				
Dams/reservoirs (including maintenance)	■	■						
Levees and floodwalls (including maintenance)		■						
Safe room/shelter					■	■		■
Secondary containment system								
Site reclamation/restoration/revegetation		■		■				
Snow fences					■			■
Water supply augmentation					■			
Debris Control/Debris basins		■		■				
Defensible Space							■	
Stream stabilization		■		■				
Biomass Plant							■	
Microgrids	■	■			■	■	■	■
Power line hardening/burial	■	■			■	■	■	■

Alternative Mitigation Actions	Dam Incidents	Floods	Epidemic/Pandemic HazMat	Expansive Soils, Land Subsidence	Weather Extremes: (drought and extreme temps; hail, lightning, severe wind; tornado)	Earthquakes	Fire	Winter Storm
EDUCATION AND AWARENESS								
Flood Insurance	■	■						
Hazard information centers	■	■	■	■	■	■	■	■
Public education and outreach programs	■	■	■	■	■	■	■	■
Real estate disclosure	■	■		■	■	■	■	■
Crop Insurance					■	■		
Lightning detectors in public areas					■			
Disease contact tracing protocols and tools			■					
NATURAL SYSTEMS PROTECTION								
Best Management Practices (BMPs)		■		■	■		■	
Forest and vegetation management	■	■		■	■		■	■
Hydrological Monitoring	■	■		■	■			
Sediment and erosion control regulations	■	■		■				
Stream corridor restoration		■		■				
Stream dumping regulations		■						
Urban forestry and landscape management		■		■	■		■	■
Wetlands development regulations		■		■			■	
Aquifer recharge/recovery					■			
EMERGENCY SERVICES								
Critical facilities protection	■	■	■	■	■	■	■	■
Emergency response services	■	■	■	■	■	■	■	■
Facility employee safety training programs	■	■	■	■	■	■	■	■
Hazard threat recognition	■	■	■	■	■	■	■	■
Hazard warning systems (community sirens, NOAA weather radio)	■	■	■	■	■	■	■	■
Health and safety maintenance	■	■	■	■	■	■	■	■
Post-disaster mitigation	■	■		■	■	■	■	■
Evacuation planning	■	■	■	■			■	

Mitigation Action Selection and Prioritization Criteria

- Does the proposed action protect lives?
- Does the proposed action address hazards or areas with the highest risk?
- Does the proposed action protect critical facilities, infrastructure, or community assets?
- Does the proposed action meet multiple objectives (multi-objective management)?
- Is there a strong advocate for the action or project that will support the action's implementation?
- Does the project address equity or protect vulnerable populations?

STAPLE/E

Developed by FEMA, this method of applying evaluation criteria enables the planning team to consider in a systematic way the social, technical, administrative, political, legal, economic, and environmental opportunities and constraints of implementing a particular mitigation action. For each action, the HMPC should ask, and consider the answers to, the following questions:

Social - Does the measure treat people fairly (different groups, different generations)? Does it consider social equity, disadvantaged communities, or vulnerable populations?

Technical - Will it work? (Does it solve the problem? Is it feasible?)

Aministrative - Is there capacity to implement and manage project?

Political - Who are the stakeholders? Did they get to participate? Is there public support? Is political leadership willing to support it?

Legal - Does your organization have the authority to implement? Is it legal? Are there liability implications?

Economic - Is it cost-beneficial? Is there funding? Does it contribute to the local economy or economic development? Does it reduce direct property losses or indirect economic losses?

Environmental - Does it comply with environmental regulations or have adverse environmental impacts?

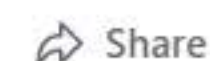
2023 Buena Vista County Hazard Mitigation Plan Update New Mitigation Action Worksheet

Use this sheet to record new potential mitigation projects (1 form per project) identified during the planning process. Provide as much detail as possible and use additional pages as necessary.

Mitigation Action/Project Title	
Project Description, Issue/Background/Benefit	
Hazards Mitigated (Include all that apply)	
Goal(s) Addressed	
Priority (High, Medium, Low)	
Responsible Department/ Agency and partners	
Timeline for Completion	
Cost Estimate	
Potential Funding	
Which infrastructure lifelines does this project address?	

Prepared by: _____
 Jurisdiction: _____
 Title/Dept: _____
 Phone: _____
 Email: _____


Please return worksheets by email to:
Natalie Schoen
natalie.schoen@wsp.com
Phone: 563 581-4283












100

cloudy ^ [Icons: Monitor, Fork, Monitor, Speaker, Pencil, Document] Page 135 10:41 AM 11/7/2022 [Icon: Chat]

 Buena Vista County Emergency
Management Agency

 Home

Professional Tools

-  Professional dashboard
-  Insights
-  Ad Center
-  Create ads
-  Create Automated Ads
-  Boost Post
-  Boost Instagram Post
-  Link WhatsApp
-  Meta Business Suite



Buena Vista County Emergency Management Agency



Hide comments from repeat offenders

Now Moderation Assist can automatically hide the comments of people who frequently post harmful content on your Page.

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Intro

The Buena Vista County Emergency Management Agency works with responders, public officials, private

[Edit bio](#)

Page · Government organization

411 Expansion Blvd, Storm Lake, IA, United States, Iowa

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 aimee.barritt@bvema.com

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Buena Vista County Emergency Management Agency

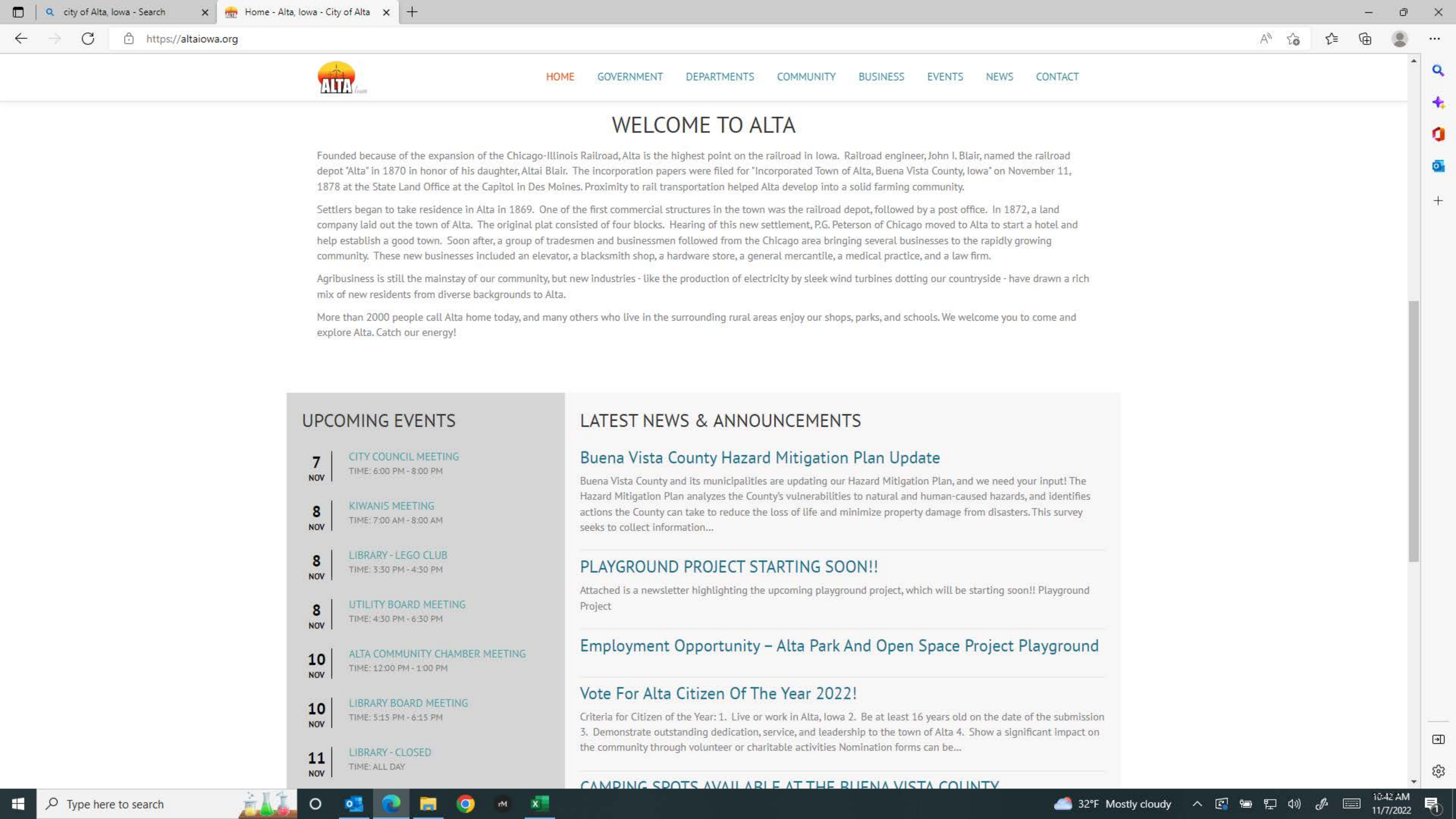
Published by BV Ema · November 5 at 2:18 PM ·

Buena Vista County and its municipalities are updating our Hazard Mitigation Plan, and we need your input! The Hazard Mitigation Plan analyzes the County's vulnerabilities to natural and human-caused hazards, and identifies actions the County can take to reduce the loss of life and minimize property damage from disasters. This survey seeks to collect information from the public to help us better understand your concerns about hazards in Buena Vista County, as well as your ideas... [See more](#)

FORMS.OFFICE.COM

Fill | Buena Vista County Hazard Planning Public Input Survey

The survey will take approximately 5 minutes to complete. Buena Vista County is updating its ...



WELCOME TO ALTA

Founded because of the expansion of the Chicago-Illinois Railroad, Alta is the highest point on the railroad in Iowa. Railroad engineer, John I. Blair, named the railroad depot "Alta" in 1870 in honor of his daughter, Alta Blair. The incorporation papers were filed for "Incorporated Town of Alta, Buena Vista County, Iowa" on November 11, 1878 at the State Land Office at the Capitol in Des Moines. Proximity to rail transportation helped Alta develop into a solid farming community.

Settlers began to take residence in Alta in 1869. One of the first commercial structures in the town was the railroad depot, followed by a post office. In 1872, a land company laid out the town of Alta. The original plat consisted of four blocks. Hearing of this new settlement, P.G. Peterson of Chicago moved to Alta to start a hotel and help establish a good town. Soon after, a group of tradesmen and businessmen followed from the Chicago area bringing several businesses to the rapidly growing community. These new businesses included an elevator, a blacksmith shop, a hardware store, a general mercantile, a medical practice, and a law firm.

Agribusiness is still the mainstay of our community, but new industries - like the production of electricity by sleek wind turbines dotting our countryside - have drawn a rich mix of new residents from diverse backgrounds to Alta.

More than 2000 people call Alta home today, and many others who live in the surrounding rural areas enjoy our shops, parks, and schools. We welcome you to come and explore Alta. Catch our energy!

UPCOMING EVENTS

- 7** NOV | [CITY COUNCIL MEETING](#)
TIME: 6:00 PM - 8:00 PM
- 8** NOV | [KIWANIS MEETING](#)
TIME: 7:00 AM - 8:00 AM
- 8** NOV | [LIBRARY - LEGO CLUB](#)
TIME: 3:30 PM - 4:30 PM
- 8** NOV | [UTILITY BOARD MEETING](#)
TIME: 4:30 PM - 6:30 PM
- 10** NOV | [ALTA COMMUNITY CHAMBER MEETING](#)
TIME: 12:00 PM - 1:00 PM
- 10** NOV | [LIBRARY BOARD MEETING](#)
TIME: 5:15 PM - 6:15 PM
- 11** NOV | [LIBRARY - CLOSED](#)
TIME: ALL DAY

LATEST NEWS & ANNOUNCEMENTS

[Buena Vista County Hazard Mitigation Plan Update](#)

Buena Vista County and its municipalities are updating our Hazard Mitigation Plan, and we need your input! The Hazard Mitigation Plan analyzes the County's vulnerabilities to natural and human-caused hazards, and identifies actions the County can take to reduce the loss of life and minimize property damage from disasters. This survey seeks to collect information...

[PLAYGROUND PROJECT STARTING SOON!!](#)

Attached is a newsletter highlighting the upcoming playground project, which will be starting soon!! Playground Project

[Employment Opportunity - Alta Park And Open Space Project Playground](#)

[Vote For Alta Citizen Of The Year 2022!](#)

Criteria for Citizen of the Year: 1. Live or work in Alta, Iowa 2. Be at least 16 years old on the date of the submission 3. Demonstrate outstanding dedication, service, and leadership to the town of Alta 4. Show a significant impact on the community through volunteer or charitable activities Nomination forms can be...

[CAMPING SPOTS AVAILABLE AT THE BUENA VISTA COUNTY](#)

APPENDIX D: Public Input

Public and stakeholder input was collected at the beginning of the planning process through an online survey in December 2022. The survey was advertised by the County and participating jurisdictions through social media.

The survey provided an opportunity for public input during the planning process prior to finalization of the plan update. The public survey received responses from 21 individuals. Responses to the survey are shown on the following pages. Based on this survey, the public perceives the most significant hazards to be tornadoes/windstorms, followed by drought, grassland/wildland fire, severe winter storms, and transportation accidents.

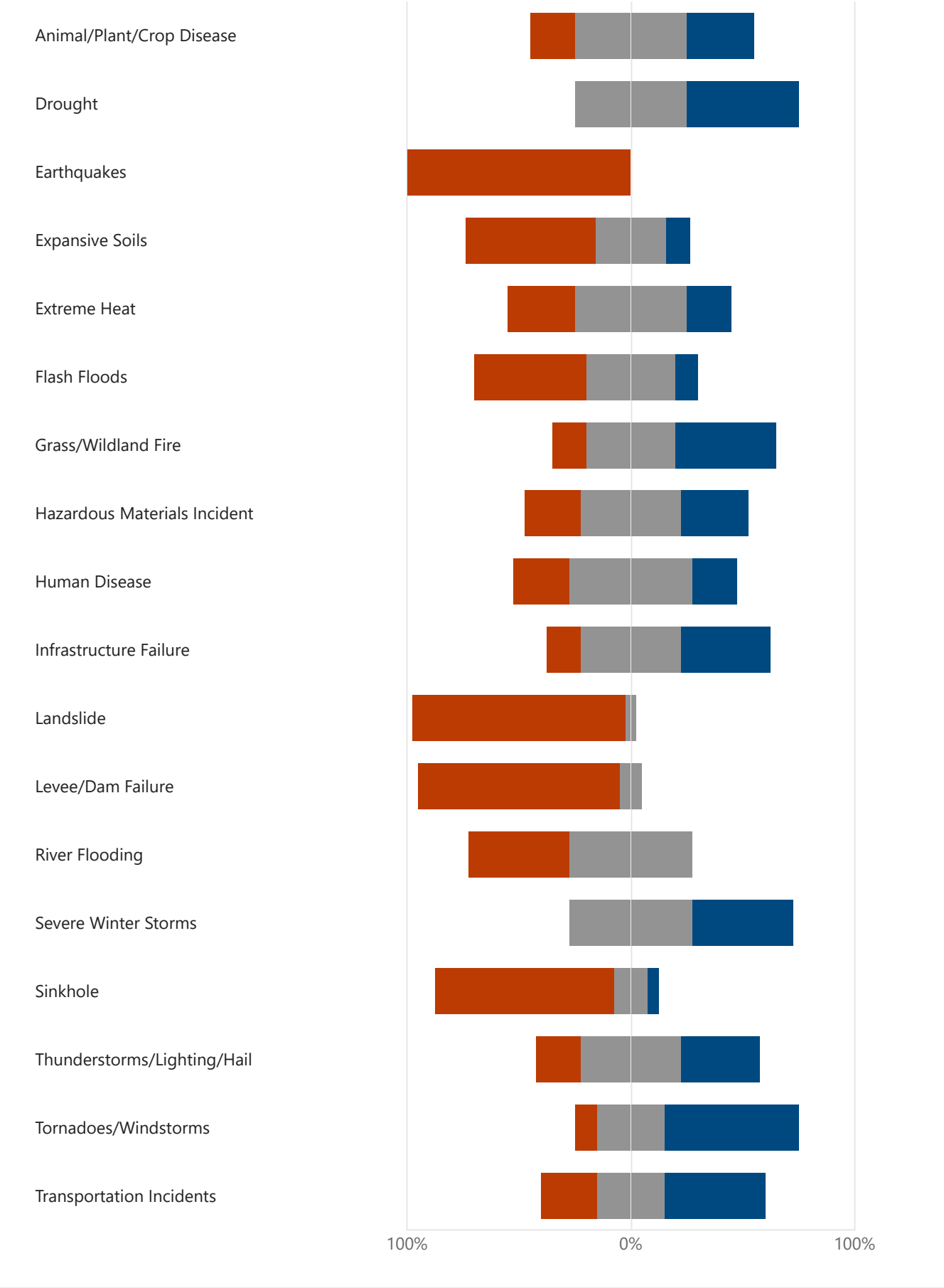
The public was also given an opportunity to review and comment on the completed draft plan in June 2023. The draft plan was made available on the County website, along with an online comment form. The plan was advertised by the County through social media and their websites. The public was given a two-week period to review and provide comments. No public comments were received on the draft plan.

Buena Vista County Hazard Planning Public Input Survey

21	07:08	Active
Responses	Average time to complete	Status

1. The hazards addressed in the Buena Vista County Hazard Mitigation Plan update are listed below. Please indicate the level of significance in Buena Vista County that you perceive for each hazard.

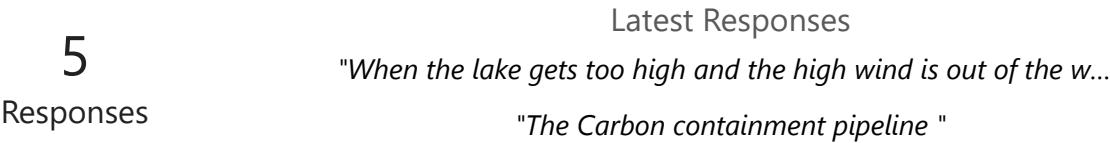
Low Medium High



2. How many times has a natural hazard disrupted your daily life in the last five years?



3. Do you have information on specific hazard issues/problem areas that you would like the planning committee to consider? Note the jurisdiction to which it applies:



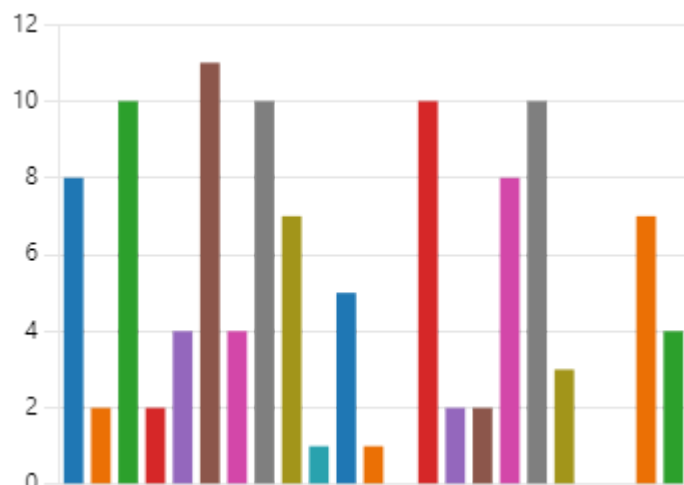
2 respondents (40%) answered **high winds** for this question.



4. Mitigation is any activity taken to reduce or eliminate the long-term risk to hazards.

The following types of mitigation actions may be considered in Buena Vista County. Please indicate the types of mitigation actions that you think should have the highest priority in the Buena Vista County Hazard Mitigation Plan.

Expanded Indoor/Outdoor War...	8
Wildfire/Grass Fuels Treatment ...	2
Tornado Safe Rooms	10
Continued Participation in the N...	2
Critical Facilities Resiliency	4
Generators for Critical Facilities	11
Planning/Zoning to avoid impac...	4
Public Education/Awareness on ...	10
Stormwater Drainage Improvem...	7
Forest Health/Watershed Protec...	1
Flood Mitigation for residential ...	5
Education and Discounts on Flo...	1
Floodprone Property Buyout	0
Water Conservation	10
Evacuation route development	2
Dam safety	2
Public health incident prepared...	8
Improve reliability of communic...	10
Lightning protection for critical f...	3
Levees or Levee improvements	0
Flood mitigation for commercial...	0
Additional snow fences	7
Hazardous tree management	4



5. Please comment on any other pre-disaster strategies that the planning committee should consider for reducing future losses caused by natural disasters:

4

Responses

Latest Responses

6. What have you personally done to prepare for a disaster or emergency?

7

Responses

Latest Responses

"We have a tornado shelter in the town, new tornado siren."

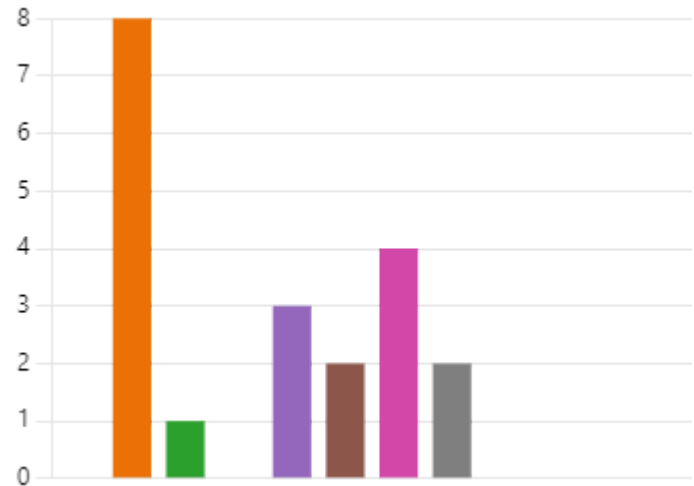
"stock up on medical and emergency supplies, added generator"

2 respondents (29%) answered **tornado** for this question.

stock safety communicates way medical and emerg
shelter in the town **tornado** Food safe
generator tornado shelter Food prep tornado siren n

7. Please indicate the community where you live

City of Albert City	0
City of Alta	8
City of Lakeside	1
City of Linn Grove	0
City of Marathon	3
City of Newell	2
City of Rembrandt	4
City of Sioux Rapids	2
City of Storm Lake	0
City of Truesdale	0
Unincorporated County	0
Other	0



8. How long have you lived in this community?

Less than 1 year	0
1-5 years	4
5-10 years	1
Over 10 years	15



9. Optional: Provide your name and email address if you would like to be added to a distribution list for upcoming activities related to the planning process:

4

Responses

Latest Responses

"City of Lakeside- Lynn Laursen- clerk@lakesideia.com"

APPENDIX E: Acronyms and Definitions

ACRONYMS

ARNP	Advanced Registered Nurse Practitioners
BRIC	Building Resilient Infrastructure and Communities
BV	Buena Vista
BVEMA	Buena Vista Emergency Management Agency
BVRMC	Buena Vista Regional Medical Center
BVU	Buena Vista University
CDC	Centers for Disease Control and Prevention
CFR	Code of Federal Regulations
CIP	Capital Improvement Plan
CIPP	Cured-in-place Pipe
CDL	Crop Data Layer
COOP	Continuity of Operations Plan
COVID-19	Coronavirus Disease 2019
CRP	Conservation Reserve Program
CRS	Community Rating System
CWD	Chronic Wasting Disease
DFIRM	Digital Flood Insurance Rate Maps
DHSEM	Division of Homeland Security and Emergency Management
DMA	Disaster Mitigation Act
DNR	Iowa Department of Natural Resources
DOT	Iowa Department of Transportation
DR	(Major) Disaster Declaration
EAB	Emerald Ash Borer
EAP	Emergency Action Plan
EF	Enhanced Fujita
EM	Emergency Declarations
EMA	Emergency Management Agency
EMAC	Emergency Management Assistance Compact

EMS	Emergency Medical Services
EMPG	Emergency Management Performance Grant
EOC	Emergency Operations Center
EOP	Emergency Operations Plan
EPA	U.S. Environmental Protection Agency
ESF	Emergency Support Functions
FEMA	Federal Emergency Management Agency
FIRM	Flood Insurance Rate Map
FIS	Flood Insurance Study
FMA	Flooding Mitigation Assistance
FMAG	Fire Management Assistance Grants
FSA	Farm Service Agency
GIS	Geographic Information System
HAZMAT	Hazardous Materials
Hazus-MH	Hazards, United States-Multi Hazard
HI	Heat Index
HHPD	High Hazard Potential Dam
HMA	Hazard Mitigation Assistance
HMGP	Hazard Mitigation Grant Program
HMP	Hazard Mitigation Plan
HMPC	Hazard Mitigation Planning Committee
HMPT	Hazard Mitigation Planning Team
HIRA	Hazard Identification and Risk Assessment
HSEMD	Iowa Homeland Security and Emergency Management
IA	Iowa
ICC	International Code Council
ICCC	Iowa Central Community College
IDALS	Iowa Department of Agriculture and Land Stewardship
IDNR	Iowa Department of Natural Resources
IHSEMD	Iowa Homeland Security and Emergency Management Department
IPAWS	Integrated Public Alert & Warning System

ISO	Insurance Services Office
ISU	Iowa State University
LEPC	Local Emergency Planning Committee
LHMP	Local Hazard Mitigation Plan
MPH	Miles per Hour
NCEI	National Centers for Environmental Information
NDMC	National Drought Mitigation Center
NFDRS	National Fire Danger Rating System
NFHL	National Flood Hazard Layer
NFIP	National Flood Insurance Program
NFPA	National Fire Protection Association
NEPA	National Environmental Policy Act
NID	National Inventory of Dams
NIMS	National Incident Management System
NOAA	National Oceanic and Atmospheric Administration
NRC	U.S. Coast Guard's National Response Center
NRP	Natural Resource Protection
NWS	National Weather Service
OEM	Office of Emergency Management
OSHA	Occupational Safety and Health Administration
PCC	Portland Cement Concrete
PED	Porcine Epidemic Diarrhea
PGA	Peak Ground Acceleration
RMA	Risk Management Agency
RTA	Regional Transit Authority (RIDES)
SCENIC	Southwest Climate and Environmental Information Collaborative
SFHA	Special Flood Hazard Area
STAPLEE	(Social, Technical, Administrative, Political, Legal, Economic, Environmental)
SWCD	Soil and Water Conservation District
THIRA	Threat and Hazard Identification and Risk Assessment
TORRO	Tornado and Storm Research Organization

UPH	UnityPoint Health
USDA	U.S. Department of Agriculture
USFS	U.S. Forest Service
USGS	U.S. Geological Survey
WEA	Water Environment Association
WNV	West Nile Virus

DEFINITIONS

100-Year Flood: The term “100-year flood” can be misleading. The 100-year flood does not necessarily occur once every 100 years. Rather, it is the flood that has a 1% chance of being equaled or exceeded in any given year. Thus, the 100-year flood could occur more than once in a relatively short period of time. The Federal Emergency Management Agency (FEMA) defines it as the 1% annual chance flood, which is now the standard definition used by most federal and state agencies and by the National Flood Insurance Program (NFIP).

Acre-Foot: An acre-foot is the amount of water it takes to cover 1 acre to a depth of 1 foot. This measure is used to describe the quantity of storage in a water reservoir. An acre-foot is a unit of volume. One acre foot equals 7,758 barrels; 325,829 gallons; or 43,560 cubic feet. An average household of four will use approximately 1 acre-foot of water per year.

Active Threat: A dynamic, quickly evolving situation involving an individual (or individuals) using deadly physical force, such as firearms, bladed weapons, or a vehicle.

Active Shooter: One or more individuals actively engaged in killing or attempting to kill people in a populated area. The terms active threat and active shooter are often used interchangeably.

Asset: An asset is any man-made or natural feature that has value, including, but not limited to, people; buildings; infrastructure, such as bridges, roads, sewers, and water systems; lifelines, such as electricity and communication resources; and environmental, cultural, or recreational features such as parks, wetlands, and landmarks.

Base Flood: The flood having a 1% chance of being equaled or exceeded in any given year, also known as the “100-year” or “1% chance” flood. The base flood is a statistical concept used to ensure that all properties subject to the NFIP are protected to the same degree against flooding.

Basin: A basin is the area within which all surface water—whether from rainfall, snowmelt, springs, or other sources—flows to a single water body or watercourse. The boundary of a river basin is defined by natural topography, such as hills, mountains, and ridges. Basins are also referred to as “watersheds” and “drainage basins.”

Benefit: A benefit is a net project outcome and is usually defined in monetary terms. Benefits may include direct and indirect effects. For the purposes of benefit/cost analysis of proposed mitigation measures, benefits are limited to specific, measurable risk reduction factors, including reduction in expected property losses (buildings, contents, and functions) and protection of human life.

Benefit/Cost Analysis: A benefit/cost analysis is a systematic, quantitative method of comparing projected benefits to projected costs of a project or policy. It is used as a measure of cost effectiveness.

Building: A building is defined as a structure that is walled and roofed, principally aboveground, and permanently fixed to a site. The term includes manufactured homes on permanent foundations on which the wheels and axles carry no weight.

Capability Assessment: A capability assessment provides a description and analysis of a community's current capacity to address threats associated with hazards. The assessment includes two components: an inventory of an agency's mission, programs, and policies, and an analysis of its capacity to carry them out. A capability assessment is an integral part of the planning process in which a community's actions to reduce losses are identified, reviewed, and analyzed, and the framework for implementation is identified. The following capabilities were reviewed under this assessment:

- Legal and regulatory capability
- Administrative and technical capability
- Fiscal capability

Community Rating System (CRS): The CRS is a voluntary program under the NFIP that rewards participating communities (provides incentives) for exceeding the minimum requirements of the NFIP and completing activities that reduce flood hazard risk by providing flood insurance premium discounts.

Conflagration: A fire that grows beyond its original source area to engulf adjoining regions. Wind, extremely dry or hazardous weather conditions, excessive fuel buildup, and explosions are usually the elements behind a wildfire conflagration.

Critical Area: An area defined by state or local regulations as deserving special protection because of unique natural features or its value as habitat for a wide range of species of flora and fauna. A sensitive/critical area is usually subject to more restrictive development regulations.

Critical Facility: Facilities and infrastructure that are critical to the health and welfare of the population. These become especially important after any hazard event occurs. For the purposes of this plan, critical facilities include:

- Structures or facilities that produce, use, or store highly volatile, flammable, explosive, toxic or water reactive materials.
- Hospitals, nursing homes, and housing likely to contain occupants who may not be sufficiently mobile to avoid death or injury during a hazard event.
- Police stations, fire stations, vehicle and equipment storage facilities, and emergency operations centers that are needed for disaster response before, during, and after hazard events.
- Public and private utilities, facilities and infrastructure that are vital to maintaining or restoring normal services to areas damaged by hazard events.
- Government facilities.

Cyber Attack: A deliberate exploitation of computer systems, technology-dependent enterprises, and networks. The term encompasses a variety of malicious activities, as defined in the text.

Dam: A man-made barrier, together with appurtenant structures, constructed above the natural surface of the ground for the purpose of impounding water.

Dam Failure: Dam failure refers to a partial or complete breach in a dam (or levee) that impacts its integrity. Dam failures occur for a number of reasons, such as flash flooding, inadequate spillway size, mechanical failure of valves or other equipment, freezing and thawing cycles, earthquakes, and intentional destruction.

Dam Incident: Situations at dams that require an immediate response by dam safety engineers. These are episodes that without intervention will likely result in a dam failure.

High Hazard Dam: Dams where failure or operational error will probably cause loss of human life.

Significant Hazard Dam: Dams where failure or operational error will result in no probable loss of human life but can cause economic loss, environmental damage, or disruption of lifeline facilities, or can impact other concerns. Significant hazard dams are often located in rural or agricultural areas but could be located in areas with population and significant infrastructure.

Low-Hazard Dam: No probable loss of human life and low economic or environmental losses; losses are principally limited to the owner's property.

Low Head Dam: Engineered structures built into and across stream and river channels for a variety of purposes. Water flows over the dams continuously, as they span from one riverbank to the other. Low head dams generally range in height from 1-15 feet.

Debris Flow: Dense mixtures of water-saturated debris that move down-valley; looking and behaving much like flowing concrete. They form when loose masses of unconsolidated material are saturated, become unstable, and move down slope. The source of water varies but includes rainfall, melting snow or ice, and glacial outburst floods.

Debris Slide: Debris slides consist of unconsolidated rock or soil that has moved rapidly down slope. They occur on slopes greater than 65%.

Disaster Mitigation Act of 2000 (DMA): The DMA is Public Law 106-390 and is the latest federal legislation enacted to encourage and promote proactive, pre-disaster planning as a condition of receiving financial assistance under the Robert T. Stafford Act. The DMA emphasizes planning for disasters before they occur. Under the DMA, a pre-disaster hazard mitigation program and new requirements for the national post-disaster Hazard Mitigation Grant Program (HMGP) were established.

Drainage Basin: A basin is the area within which all surface water—whether from rainfall, snowmelt, springs or other sources—flows to a single water body or watercourse. The boundary of a river basin is defined by natural topography, such as hills, mountains and ridges. Drainage basins are also referred to as **watersheds** or **basins**.

Drought: Drought is a period of time without substantial rainfall or snowfall from one year to the next. Drought can also be defined as the cumulative impacts of several dry years or a deficiency of precipitation over an extended period of time, which in turn results in water shortages for some activity, group, or environmental function. A hydrological drought is caused by deficiencies in surface and subsurface water supplies. A socioeconomic drought impacts the health, well-being, and quality of life or starts to have an adverse impact on a region. Drought is a normal, recurrent feature of climate and occurs almost everywhere.

Earthquake: A sudden slip on a fault, volcanic or magmatic activity, and sudden stress changes in the earth that result in ground shaking and radiated seismic energy.

Epicenter: The point on the earth's surface directly above the hypocenter of an earthquake. The location of an earthquake is commonly described by the geographic position of its epicenter and by its focal depth.

Fault: A fracture in the earth's crust along which two blocks of the crust have slipped with respect to each other.

Focal Depth: The depth from the earth's surface to the hypocenter.

Hypocenter: The region underground where an earthquake's energy originates.

Liquefaction: Loosely packed, water-logged sediments losing their strength in response to strong shaking, causing major damage during earthquakes.

Emergency Action Plan: A document that identifies potential emergency conditions at a dam and specifies actions to be followed to minimize property damage and loss of life. The plan specifies actions the dam owner should take to alleviate problems at a dam. It contains procedures and information to assist the dam owner in issuing early warning and notification messages to responsible downstream emergency management authorities. It also contains inundation maps to show emergency management authorities the critical areas for action in case of an emergency.

Epidemic: An infectious disease outbreak affecting a large number of people in a given population in a short period of time.

Erosion: The removal and simultaneous transportation of soil or other earth materials from one location to another by water, wind, waves, or moving ice. Deposition is the placing of eroded material in a new location.

Expansive Soil: Expansive or swelling soils are made up of layers of clay and can expand up to 20% by volume when exposed to water causing more property damage than any other natural hazard.

Exposure: Exposure is defined as the number and dollar value of assets considered to be at risk during the occurrence of a specific hazard.

Extent: The extent is the size of an area affected by a hazard.

Extreme Heat: Summertime weather that is substantially hotter or more humid than average for a location at that time of year.

Fire Behavior: Fire behavior refers to the physical characteristics of a fire and is a function of the interaction between the fuel characteristics (such as type of vegetation and structures that could burn), topography, and weather. Variables that affect fire behavior include the rate of spread, intensity, fuel consumption, and fire type (such as underbrush versus crown fire).

Fire Frequency: Fire frequency is the broad measure of the rate of fire occurrence in a particular area. An estimate of the areas most likely to burn is based on past fire history or fire rotation in the area, fuel conditions, weather, ignition sources (such as human or lightning), fire suppression response, and other factors.

Flood: The inundation of normally dry land resulting from the rising and overflowing of a body of water.

Flash Flood: A flash flood occurs with little or no warning when water levels rise at an extremely fast rate

Flood Insurance Rate Map (FIRM): FIRMs are the official maps on which the Federal Emergency Management Agency (FEMA) has delineated the Special Flood Hazard Area (SFHA).

Flood Insurance Study: A report published by the Federal Insurance and Mitigation Administration for a community in conjunction with the community's FIRM. The study contains such background data as the base flood discharges and water surface elevations that were used to prepare the FIRM. In most cases, a community FIRM with detailed mapping will have a corresponding flood insurance study.

Floodplain: Any land area susceptible to being inundated by flood waters from any source. A FIRM identifies most, but not necessarily all, of a community's floodplain as the SFHA.

1% Annual Chance Floodplain or 100-Year Floodplain: The area flooded by a flood that has a 1% chance of being equaled or exceeded each year. This is a statistical average only; a 100-year flood can occur more than once in a short period of time. The 1% annual chance flood is the standard used by most federal and state agencies.

0.1% Annual Chance Floodplain or 500-Year Floodplain: The area flooded by a flood that has a 0.1% chance of being equaled or exceeded each year. This is a statistical average only; a 500-year flood can occur more than once in a short period of time.

Floodway: Floodways are areas within a floodplain that are reserved for the purpose of conveying flood discharge without increasing the base flood elevation more than 1 foot. Generally speaking, no development is allowed in floodways, as any structures located there would block the flow of floodwaters.

Floodway Fringe: Floodway fringe areas are located in the floodplain but outside of the floodway. Some development is generally allowed in these areas, with a variety of restrictions. On maps that have identified and delineated a floodway, this would be the area beyond the floodway boundary that can be subject to different regulations.

Freeboard: Freeboard is the margin of safety added to the base flood elevation.

Freezing Rain: The result of rain occurring when the temperature is below the freezing point. The rain freezes on impact, resulting in a layer of glaze ice up to an inch thick. In a severe ice storm, an evergreen tree 60 feet high and 30 feet wide can be burdened with up to 6 tons of ice, creating a threat to power and telephone lines and transportation routes.

Frequency: For the purposes of this plan, frequency refers to how often a hazard of specific magnitude, duration, or extent is expected to occur on average. Statistically, a hazard with a 100-year frequency is expected to occur about once every 100 years on average and has a 1% chance of occurring any given year. Frequency reliability varies depending on the type of hazard considered.

Fujita Scale of Tornado Intensity: Tornado wind speeds are sometimes estimated on the basis of wind speed and damage sustained using the Fujita Scale. The scale rates the intensity or severity of tornado events using numeric values from F0 to F5 based on tornado wind speed and damage. An F0 tornado (wind speed less than 73 miles per hour [mph]) indicates minimal damage (such as broken tree limbs), and an F5 tornado (wind speeds of 261 to 318 mph) indicates severe damage.

Goal: A goal is a general guideline that explains what is to be achieved. Goals are usually broad-based, long-term, policy-type statements and represent global visions. Goals help define the benefits that a plan is trying to achieve. The success of a hazard mitigation plan is measured by the degree to which its goals have been met (that is, by the actual benefits in terms of actual hazard mitigation).

Geographic Information System (GIS): GIS is a computer software application that relates data regarding physical and other features on the earth to a database for mapping and analysis.

Hazard: A hazard is a source of potential danger or adverse condition that could harm people or cause property damage.

Hazard Mitigation Grant Program (HMGP): Authorized under Section 202 of the Robert T. Stafford Disaster Relief and Emergency Assistance Act, the HMGP is administered by FEMA and provides grants to states, tribes, and local governments to implement hazard mitigation actions after a major disaster declaration. The purpose of the program is to reduce the loss of life and property due to disasters and to enable mitigation activities to be implemented as a community recovers from a disaster

Hazards U.S. Multi-Hazard (Hazus-MH) Loss Estimation Program: Hazus-MH is a GIS-based program used to support the development of risk assessments as required under the DMA. The Hazus-MH software program assesses risk in a quantitative manner to estimate damages and losses associated with natural hazards. Hazus-MH is FEMA's nationally applicable, standardized methodology and software program and contains modules for estimating potential losses from earthquakes, floods, and wind hazards. Hazus-MH has also been used to assess vulnerability (exposure) for other hazards.

Hydrology: Hydrology is the analysis of waters of the earth. For example, a flood discharge estimate is developed by conducting a hydrologic study.

Intensity: For the purposes of this plan, intensity refers to the measure of the effects of a hazard.

Inventory: The assets identified in a study region comprise an inventory. Inventories include assets that could be lost when a disaster occurs and community resources are at risk. Assets include people, buildings, transportation, and other valued community resources.

Landslide: Landslides can be described as the sliding movement of masses of loosened rock and soil down a hillside or slope. Fundamentally, slope failures occur when the strength of the soils forming the slope exceeds the pressure, such as weight or saturation, acting upon them.

Lightning: Lightning is an electrical discharge resulting from the buildup of positive and negative charges within a thunderstorm. When the buildup becomes strong enough, lightning appears as a "bolt," usually within or between clouds and the ground. A bolt of lightning instantaneously reaches temperatures approaching 50,000°F. The rapid heating and cooling of air near lightning causes thunder. Lightning is a major threat during thunderstorms. In the United States, 75 to 100 Americans are struck and killed by lightning each year (see <http://www.fema.gov/hazard/thunderstorms/thunder.shtm>).

Local Government: Any county, municipality, city, town, township, public authority, school district, special district, intrastate district, council of governments (regardless of whether the council of governments is incorporated as a nonprofit corporation under State law), regional or interstate government entity, or agency or instrumentality of a local government; any Indian tribe or authorized tribal organization, or Alaska Native village or organization; and any rural community, unincorporated town or village, or other public entity.

Magnitude: Magnitude is the measure of the strength of an earthquake, and is typically measured by the Richter scale. As an estimate of energy, each whole number step in the magnitude scale corresponds to the release of about 31 times more energy than the amount associated with the preceding whole number value.

Mass Movement: A collective term for landslides, debris flows, falls and sinkholes.

Mitigation: A preventive action that can be taken in advance of an event that will reduce or eliminate the risk to life or property.

Mitigation Initiatives (or Mitigation Actions): Mitigation initiatives are specific actions to achieve goals and objectives that minimize the effects from a disaster and reduce the loss of life and property.

Mudslide, Mudflow, or Debris Flow: A river of rock, earth, organic matter, and other materials saturated with water.

Objective: For the purposes of this plan, an objective is defined as a short-term aim that, when combined with other objectives, forms a strategy or course of action to meet a goal.

Pandemic: An epidemic that has spread across multiple continents or worldwide, affecting a substantial number of individuals.

Peak Ground Acceleration: Peak Ground Acceleration (PGA) is a measure of the highest amplitude of ground shaking that accompanies an earthquake, based on a percentage of the force of gravity.

Preparedness: Preparedness refers to actions that strengthen the capability of government, citizens, and communities to respond to disasters.

Presidential Disaster Declaration: These declarations are typically made for events that cause more damage than state and local governments and resources can handle without federal government assistance. Generally, no specific dollar loss threshold has been established for such declarations. A Presidential Disaster Declaration puts into motion long-term federal recovery programs, some of which are matched by state programs, designed to help disaster victims, businesses, and public entities.

Probability of Occurrence: The probability of occurrence is a statistical measure or estimate of the likelihood that a hazard will occur. This probability is generally based on past hazard events in the area and a forecast of events that could occur in the future. A probability factor based on yearly values of occurrence is used to estimate probability of occurrence.

Repetitive Loss Property: Any NFIP-insured property that, since 1978 and regardless of any changes of ownership during that period, has experienced:

- Four or more paid flood losses in excess of \$1000.00; or
- Two paid flood losses in excess of \$1000.00 within any 10-year period since 1978 or
- Three or more paid losses that equal or exceed the current value of the insured property.

Return Period (or Mean Return Period): This term refers to the average period of time in years between occurrences of a particular hazard (equal to the inverse of the annual frequency of occurrence).

Riparian Zone: The area along the banks of a natural watercourse.

Riverine: Of or produced by a river. Riverine floodplains have readily identifiable channels. Floodway maps can only be prepared for riverine floodplains.

Risk: Risk is the estimated impact that a hazard would have on people, services, facilities, and structures in a community. Risk measures the likelihood of a hazard occurring and resulting in an adverse condition that causes injury or damage. Risk is often expressed in relative terms such as a high, moderate, or low likelihood of sustaining damage above a particular threshold due to occurrence of a specific type of hazard. Risk also can be expressed in terms of potential monetary losses associated with the intensity of the hazard.

Risk Assessment: Risk assessment is the process of measuring potential loss of life, personal injury, economic injury, and property damage resulting from hazards. This process assesses the vulnerability of people, buildings, and infrastructure to hazards and focuses on (1) hazard identification; (2) impacts of hazards on physical, social, and economic assets; (3) vulnerability identification; and (4) estimates of the cost of damage or costs that could be avoided through mitigation.

Robert T. Stafford Act: The Robert T. Stafford Disaster Relief and Emergency Assistance Act, Public Law 100-107, was signed into law on November 23, 1988. This law amended the Disaster Relief Act of 1974, Public Law 93-288. The Stafford Act is the statutory authority for most federal disaster response activities, especially as they pertain to FEMA and its programs.

Severe Local Storm: Small-scale atmospheric systems, including tornadoes, thunderstorms, windstorms, ice storms, and snowstorms. These storms may cause a great deal of destruction and even death, but their impact is generally confined to a small area. Typical impacts are on transportation infrastructure and utilities.

Sinkhole: A collapse depression in the ground with no visible outlet. Its drainage is subterranean. It is commonly vertical-sided or funnel-shaped.

Special Flood Hazard Area: The base floodplain delineated on a FIRM. The SFHA is mapped as a Zone A in riverine situations. The SFHA may or may not encompass all of a community's flood problems

Stakeholder: Business leaders, civic groups, academia, non-profit organizations, major employers, managers of critical facilities, farmers, developers, special purpose districts, and others whose actions could impact hazard mitigation.

Steep Slope: Different communities and agencies define it differently, depending on what it is being applied to, but generally a steep slope is a slope in which the percent slope equals or exceeds 25%. For this study, steep slope is defined as slopes greater than 33%.

Subsidence: The sinking of the ground over human-caused or natural underground voids, or the settlement of native low-density soils.

Thunderstorm: A thunderstorm is a storm with lightning and thunder produced by cumulonimbus clouds. Thunderstorms usually produce gusty winds, heavy rains, and sometimes hail. Thunderstorms are usually short in duration (seldom more than 2 hours). Heavy rains associated with thunderstorms can lead to flash flooding during the wet or dry seasons.

Tornado: A tornado is a violently rotating column of air extending between and in contact with a cloud and the surface of the earth. Tornadoes are often (but not always) visible as funnel clouds. On a local scale, tornadoes are the most intense of all atmospheric circulations, and winds can reach destructive speeds of more than 300 mph. A tornado's vortex is typically a few hundred meters in diameter, and damage paths can be up to 1 mile wide and 50 miles long.

Vulnerability: Vulnerability describes how exposed or susceptible an asset is to damage. Vulnerability depends on an asset's construction, contents, and the economic value of its functions. Like indirect damages, the vulnerability of one element of the community is often related to the vulnerability of another. For example, many businesses depend on uninterrupted electrical power. Flooding of an electric substation would affect not only the substation itself but businesses as well. Often, indirect effects can be much more widespread and damaging than direct effects.

Watershed: A watershed is an area that drains downgradient from areas of higher land to areas of lower land to the lowest point, a common drainage basin.

Wildfire: Wildfire refers to any uncontrolled fire occurring on undeveloped land that requires fire suppression. The potential for wildfire is influenced by three factors: the presence of fuel, topography, and air mass. Fuel can include living and dead vegetation on the ground, along the surface as brush and small trees, and in the air such as tree canopies. Topography includes both slope and elevation. Air mass includes temperature, relative humidity, wind speed and direction, cloud cover, precipitation amount, duration, and the stability of the atmosphere at the time of the fire. Wildfires can be ignited by lightning and, most frequently, by human activity including smoking, campfires, equipment use, and arson.

Wildland Urban Interface (WUI) Area: An area susceptible to wildfires and where wildland vegetation and urban or suburban development occur together. An example would be smaller urban areas and dispersed rural housing in forested areas.

Windstorm: Windstorms are generally short-duration events involving straight-line winds or gusts exceeding 50 mph. These gusts can produce winds of sufficient strength to cause property damage. Windstorms are especially dangerous in areas with significant tree stands, exposed property, poorly constructed buildings, mobile homes (manufactured housing units), major infrastructure, and

aboveground utility lines. A windstorm can topple trees and power lines; cause damage to residential, commercial, critical facilities; and leave tons of debris in its wake.

Winter Storm: A storm having significant snowfall, ice, or freezing rain; the quantity of precipitation varies by elevation.

Zoning Ordinance: The zoning ordinance designates allowable land use and intensities for a local jurisdiction. Zoning ordinances consist of two components: a zoning text and a zoning map.

APPENDIX F: References

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- Hazards Vulnerability Research Institute, Social Vulnerability Index
- Iowa Climate Change Advisory Council
- Iowa Communication Network
- Iowa Department of Agriculture
- Iowa Department of Agriculture and Land Stewardship, Division of Soil Conservation
- Iowa Department of Agriculture and Land Stewardship, Pesticide Bureau
- Iowa Department of Education, Bureau of Information and Analysis Services
- Iowa Department of Education & Buena Vista University
- Iowa Department of Health Center for Acute Disease Epidemiology
- Iowa Department of Natural Resources, Animal Feeding Operations
- Iowa Department of Natural Resources, Dam Safety Program
- Iowa Department of Natural Resources, Deer Disease Information, Deer Disease Monitoring in Iowa
- Iowa Department of Natural Resources, Emergency Response and Homeland Security Unit, Tier II Chemical Facilities
- Iowa Lake Corridor
- Iowa Department of Public Health, Bureau of Health Statistics
- Iowa Department of Public Safety, State Fire Marshal Division
- Iowa Department of Transportation's Office of Traffic and Safety, Crash Facts Reports
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- Iowa State University Department of Economics
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- National Fire Incident Reporting System (NFIRS)

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- National Oceanic and Atmospheric Administration, Storm Prediction Center
- National Park Service, National Register of Historic Places
- National Response Center
- National Severe Storms Laboratory
- National Weather Service
- NFIP Community Status Book
- NWS Heat Index Program
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- U.S. Nuclear Regulatory Commission
- Wildfire Risk to Communities
- World Health Organization

APPENDIX G: Federal Mitigation Grants

Agency	Grant	Purpose of Funding
BIA	Tribal Wildfire Prevention	Provides leadership, training, and guidance to develop strategies to reduce the number of human-caused fires on Indian Reservations. The Fuels Management Program provides funding to reduce hazardous vegetation both in and outside the WUI.
Bureau of Reclamation	Water2025 Challenge Grant Program for Western States	Up to \$250,000 for projects that can be completed within 24 months and that reduce conflicts through water conservation, efficiency, and markets
Bureau of Reclamation	Water Conservation Field Services Program	Up to \$25,000 for projects that improve water use efficiency and improve water management practices
Bureau of Reclamation	WaterSMART – Drought Response Program	Provides for contingency planning, resiliency projects, and emergency response actions.
CDC	Public Health Emergency Preparedness (PHEP) Cooperative Agreement	Helps health departments build and strengthen their abilities to effectively respond to a range of public health threats, including infectious diseases, natural disasters, and biological, chemical, nuclear, and radiological events. Preparedness activities funded by the PHEP cooperative agreement specifically target the development of emergency-ready public health departments that are flexible and adaptable.
Corporation for National & Community Service	AmeriCorps	Provides funding for volunteers to serve communities, including disaster prevention. AmeriCorps/Vista has assisted local communities with wildfire mitigation projects.
Department of Homeland Security	Homeland Security Grant Program (HSGP)	Homeland security activities identified in the state and local strategic plans. Funding supports threat & hazard and risk identification for natural, technological, and human-caused hazards. Some prevention activities may be considered mitigation.
Department of Homeland Security	State and Local Cybersecurity Grant Program (SLCGP)	Better equip state, local, and tribal gov'ts to address cybersecurity risks, strengthen the cybersecurity of their critical infrastructure, and ensure resilience against persistent cyber threats for the services SLT governments provide their communities.
DOJ, OJP	US Department of Justice (DOJ) Office of Justice Programs (OJP)	DOJ-ODP provides a number of grants and awards focused on crime prevention to state and local law enforcement agencies and other eligible recipients.
EPA	Clean Water Act Section 319 Grants	Provides grants for a wide variety of activities related to non-point source pollution runoff mitigation.
FEMA	Assistance to Firefighters program - Fire Prevention & Safety (FP&S) Grants	Fire Prevention & Safety (FP&S) Grants support projects that enhance the safety of the public and firefighters from fire and related hazards.

Agency	Grant	Purpose of Funding
FEMA	Building Resilient Infrastructure & Communities (BRIC)	Pre-disaster/annual cycle addressing all natural hazards, emphasis on infrastructure & lifelines
FEMA	Emergency Management Performance Grant (EMPG)	The EMPG program provides a yearly allocation of funding to support state and local emergency management programs. This has included providing some funding for local mitigation plans, mitigation-oriented studies, and related activities.
FEMA	Fire Management Assistance Grants (FMAG)	Provides fire suppression support to states when loss of life and property is imminent. Wildfire mitigation is also eligible under emergency protection if life is in imminent danger.
FEMA	Flood Mitigation Assistance (FMA) Program	Repetitive flood loss property reduction and projects that mitigate losses to NFIP-insured properties.
FEMA	Hazard Mitigation Grant Program (HMGP)	Post-disaster multi-hazard mitigation funding for federally-declared disasters. HMGP Post Fire funds are available for FMAG declarations.
FEMA	High Hazard Potential Dam Program (HHPD)	Pre-disaster/annual cycle, for non-Federal high-hazard dams rated Unsatisfactory. Local match varies.
FEMA	National Earthquake Hazards Reduction Program (NEHRP)	Provides money to support enhanced earthquake risk assessments in local hazard mitigation plans and other earthquake hazard mitigation and preparedness activities.
FEMA, NFIP	Community Assistance Program (CAP)	Product-oriented financial assistance program directly related to the flood loss reduction objectives of the NFIP.
FEMA, NFIP	Risk MAP Program	Establishes or updates floodplain mapping and multi-hazard risk products.
FEMA	Individual Assistance (IA)	Following a disaster, funds can be used to mitigate hazards when repairing individual and family homes.
FEMA	Public Assistance (PA) Section 406 funds	Following a disaster, funds can be used to mitigate hazards when repairing damages to a public structure or infrastructure. Wildfire mitigation is also eligible under emergency protection if life is in imminent danger.
FHWA	Highway Bridge Replacement and Rehabilitation Program	Provides funding to enable states to improve the condition of highway bridges through replacement, rehabilitation, and systematic preventive maintenance. Also includes the National Historic Covered Bridge Preservation Program.
FHWA	Surface Transportation Block Grant (STBG) Program	This program replaces the former Transportation Enhancement (TE) and Transportation Alternatives Program (TAP) grants. STBG provides funding for transportation alternatives and environmental mitigation projects.

Agency	Grant	Purpose of Funding
HUD	Community Development Block Grant – Disaster Recovery (CDBG-DR)	Often following a disaster, the state may receive a CDBG-DR Supplement intended for mitigation and disaster recovery projects in the affected areas. Funding can be used to acquire properties in hazard-prone areas. Since CDBG funds lose their federal identity they can also be used to supplement state or local match requirements on other funds such as FEMA HMA grants. Funding also supports public facilities including water and wastewater.
HUD	Various grants	Provides a number of grants related to safe housing initiatives.
NIFC	Rural Fire Assistance Grant	Funds fire mitigation activities in rural communities.
NOAA	Hydrologic Research Grants	Up to \$125,000 to conduct joint research and development on pressing surface water hydrology issues common to national, regional, and local operational offices. Eligible applicants are federally recognized agencies of state or local governments, quasi-public institutions such as water supply or power companies, hydrologic consultants and companies involved in using and developing hydrologic forecasts.
NOAA - NWS	National Weather Service (NWS)	NWS offers storm spotter training, along with weather and flooding safety guides. They can also sometimes provide funding to support severe weather signage in parks or other public places.
SBA	Pre-Disaster Mitigation Loan Program	Provides low-interest loans to small businesses for mitigation projects.
U.S. DOC, EDA	Economic Development Administration Grants and Investments	Invests and provides grants for community construction projects, including mitigation activities.
US DOT - FHWA	Emergency Relief (ER) Program	Provides funds for roads and bridges on Federal-aid highways that are damaged as a direct result of a natural disaster or catastrophic failure from an external cause.
USACE	In-Lieu Fee Program Mitigation Projects	Restoration, establishment, enhancement, and/or preservation of aquatic resources through funds paid to a governmental or non-profit natural resources management entity to satisfy compensatory mitigation requirements for Department of the Army permits.
USACE	Mitigation Banks*	Mitigation Banks are sites approved by the Corps to sell compensatory mitigation credits for projects resulting in unavoidable impacts to the waters of the U.S. When a permit is issued that requires compensatory mitigation, the permit will specify how many credits are required to be purchased at an approved mitigation bank.
USACE	Planning Assistance to States	Provides assistance to states in planning for the development, utilization, and conservation of water and related land resources.

Agency	Grant	Purpose of Funding
USACE	Small Flood Control Projects (USACE Section 205)	Authorizes use of USACE to do feasibility and construction of small flood control projects
USACE	Silver Jackets	Can provide funding for flood-related studies, public awareness, risk analysis, and flood response plans. Construction of small flood control projects.
USCG	United States Coast Guard (USCG)	USCG administers two grant programs designed to promote boating safety.
USDA	Community Fire Protection Program	Mitigation delivered via USDA Forest Service and Private Forestry Coop Fire Program.
USDA	Emergency Community Water Assistance Grants	\$150,000 to \$500,000 available to rural communities with populations over 10,000 people with a median household income of less than \$65,900. Provides assistance to communities who have experienced a decline in quantity or quality of drinking water as a result of an emergency including drought.
USDA	Watershed Processes and Water Resources	\$100,000 available. Sponsors research that addresses two areas: (1) understanding fundamental watershed processes; and (2) developing appropriate technology and management practices for improving the effective use of water (consumptive and nonconsumptive) and protecting or improving water quality for agriculture and forestry production
USDA	Watershed Processes and Water Resources – National Research Initiative Standard Research (Part T)	\$500,000 available. Innovative research in understanding fundamental processes that affect the quality and quantity of water resources at diverse spatial and temporal scales, ways on improving water resource management in agriculture, forested, and rangeland watersheds, and developing appropriate technology to reach those goals.
USDA, DOI	National Fire Plan	Provides pre-disaster funding for primarily wildland fire mitigation, but also planning for all hazards.
USDA, NRCS	Emergency Watershed Protection (EWP)	Provides funding and technical assistance for emergency measures such as floodplain easements in impaired watersheds. Funding available through the Simplified Acquisition Procedures (SAP) ranges from \$25K to \$100K. Funded through contracts between project sponsors and the NRCS. There are no grants. The NRCS pays 75% of the costs.
USDA, NRCS	Environmental Quality Incentives Program (EQUIP)	Provides funding and technical assistance to farmers and ranchers to promote agricultural production and environmental quality as compatible goals.
USDA, NRCS	Forest Land Enhancement Program	Provides educational, technical, and financial assistance to help landowners implement sustainable forestry management objectives

Agency	Grant	Purpose of Funding
USDA, NRCS	NRCS Conservation Programs	Provides funding through a number of programs for the conservation of natural resources.
USDA-Rural Development	Rural Development Grants	Provides grants and loans for infrastructure and public safety development and enhancement in rural areas. Provides \$100,000 or 75% of the total project, whichever is less.
USDA-Rural Development	Rural Utilities Service (RUS)	RUS administers programs that provide much-needed infrastructure or infrastructure improvements to rural communities. These include water and waste treatment, electric power, and telecommunications services.
USFS	Forest Legacy Program	Program providing funding to protect private forest lands that are environmentally, economically, and socially critical. This program reduces development in the wildland-urban interface.
USFWS	National Wildlife Wetland Refuge System	Provides funding for the acquisition of lands into the federal wildlife refuge system.
USFWS	North American Wetland Conservation Fund	Provides funding for wetland conservation projects.
USFWS	Partners for Fish and Wildlife	Provides financial and technical assistance to landowners for wetland restoration projects in "Focus Areas" of the state.
USGS	State Water Resources Research Act Program	USGS in cooperation with the National Institutes for Water Resources supports an annual call for proposals to focus on water problems and issues that are of a regional or interstate nature or relate to a specific program priority identified by the Secretary of the Interior and the Institutes.
USGS	United States Geological Survey (USGS)	USGS issues competitive grants and cooperative agreements to support research in earthquake hazards, the physics of earthquakes, earthquake occurrence, and earthquake safety policy.

APPENDIX H: Sample Annual Progress Meeting Agenda and Report

Buena Vista County Hazard Mitigation Plan Annual Progress Meeting Agenda

- 1. Discussion on hazard events and impacts that occurred during the performance period**
- 2. Review of progress on mitigation action implementation**
- 3. Discussion on success stories**
- 4. Recommendations for new actions/projects**
- 5. Review of funding options and grant opportunities**
- 6. Review of changes in plan maintenance or implementation**
- 7. Review of continuing public involvement**

Buena Vista County Hazard Mitigation Plan Annual Progress Report Template

Reporting Period:

Background: Buena Vista County, along with the City of Albert City, City of Alta, City of Lakeside, City of Linn Grove, City of Marathon, City of Newell, City of Rembrandt, City of Sioux Rapids, City of Storm Lake, and City of Truesdale, as well as Iowa Central Community College, Buena Vista University, Albert City-Truesdale School District, Alta-Aurelia School District, Newell-Fonda School District, Sioux Central School District, Storm Lake School District, and Storm Lake St Mary's Catholic School, developed a hazard mitigation plan to reduce risk from all hazards by identifying resources, information, and strategies for risk reduction. The federal Disaster Mitigation Act of 2000 requires state and local governments to develop hazard mitigation plans as a condition for federal disaster grant assistance. To prepare the plan, the participating partners organized resources, assessed risks from natural hazards within the County, developed planning goals and objectives, reviewed mitigation alternatives, and developed an action plan to address probable impacts from natural hazards. By completing this process, this jurisdiction maintained compliance with the Disaster Mitigation Act, achieving eligibility for mitigation grant funding opportunities afforded under the Robert T. Stafford Act. The plan can be viewed online at:

<https://buenavistacounty.iowa.gov/departments/emergency-management/>

Summary Overview of the Plan's Progress: The performance period for the Hazard Mitigation Plan became effective on ____, 2023, with the final approval of the plan by FEMA. The initial performance period for this plan will be 5 years, with an anticipated update to the plan to occur before ____, 2028. The *Buena Vista County Hazard Mitigation Plan* has targeted 350 hazard mitigation activities to be pursued during the 5-year performance period. As of the reporting period, the following overall progress can be reported:

__ out of __ initiatives (__%) reported ongoing action toward completion.

__ out of __ initiatives (__%) were reported as being complete.

__ out of __ initiatives (__%) reported no action taken.

Purpose: The purpose of this report is to provide an annual update on the implementation of the action plan identified in the *Buena Vista County Hazard Mitigation Plan*. The objective is to ensure that there is a continuing and responsive planning process that will keep the hazard mitigation plan dynamic and responsive to the needs and capabilities of the partner jurisdictions. This report discusses the following:

- Natural hazard events that have occurred within the last year
- Changes in risk exposure within the planning area (all of Buena Vista County)
- Mitigation success stories
- Review of the action plan
- Changes in capabilities that could impact plan implementation
- Recommendations for changes/enhancement

The Hazard Mitigation Planning Committee: The Hazard Mitigation Planning Committee, made up of planning partners and stakeholders within the planning area, reviewed and approved this progress report at its annual meeting held on ____, 202_. It was determined through the plan's development process that the HMPC would remain in service to oversee the maintenance of the plan. At a minimum, the HMPC will provide technical review and oversight on the development of the annual progress report. It is anticipated that there will be turnover in the membership annually, which will be documented in the progress reports. For this reporting period, the HMPC membership present at the meeting is as indicated in Table 1.

Table 1		
Name	Title	Jurisdiction/Agency

Hazard Events within the Planning Area: During the reporting period, there were _____ hazard events in the planning area that had a measurable impact on people or property. A summary of these events is as follows:

Changes in Risk Exposure in the Planning Area: *(Insert brief overview of any natural hazard event in the planning area that changed the probability of occurrence or ranking of risk for the hazards addressed in the hazard mitigation plan)*

Mitigation Success Stories: *(Insert brief overview of mitigation accomplishments during the reporting period)*

Review of the Action Plan: Table 2 reviews the action plan, reporting the status of each initiative. Reviewers of this report should refer to the *Buena Vista County Hazard Mitigation Plan* for more detailed descriptions of each initiative and the prioritization process.

Address the following in the "status" column of the following table:

Was any element of the initiative carried out during the reporting period?

If no action was completed, why?

Is the timeline for implementation for the initiative still appropriate?

If the initiative was completed, does it need to be changed or removed from the action plan?

ID	Title and Description	Hazards Mitigated	Goals & Lifelines	Lead Agency & Partners	Cost Estimate & Potential Funding	Priority	Timeline	Status & Implementation Notes
Buena Vista County Mitigation Actions								

Changes That May Impact Implementation of the Plan:

(Insert brief overview of any significant changes in the planning area that would have a profound impact on the implementation of the plan. Specify any changes in technical, regulatory, and financial capabilities identified during the plan's development)

Recommendations for Changes or Enhancements: Based on the review of this report by the Hazard Mitigation Planning Committee, the following recommendations will be noted for future updates or revisions to the plan:

Public review notice: The contents of this report are considered to be public knowledge and have been prepared for total public disclosure. Copies of the report have been provided to the governing boards of all planning partners and to local media outlets and the report is posted on the Buena Vista County Hazard Mitigation Plan website. Any questions or comments regarding the contents of this report should be directed to:

Insert Contact Info Here

