Kossuth County, Iowa
Multi-Jurisdictional Hazard Mitigation Plan
2018 Update

KOSSUTH
COUNTY

wood.

Kossuth County, Iowa

Multi-Jurisdictional Hazard Mitigation Plan

2018 Plan Update

Developed by Kossuth County with professional assistance from
Wood Environment & Infrastructure Solutions, Inc.
Homeland Security and Emergency Management

SPECIAL THANKS AND ACKNOWLEDGEMENTS

Story County Hazard Mitigation Planning Committee

Jurisdictional Representatives

Name		Title	Department	Jurisdiction/ Organization
Rick	Adams	Buildings and Grounds	Algona CSD	Algona CSD
Philip	Albers	Vice President	School Board	North Kossuth Community School
Michael	Bierstedt			Fenton
Aaron	Boyken	Mayor		Titonka
Sharon	Corwin	Mayor	City of Ledyard	Ledyard
Ron	Covert	Director	Algona Public Works	Algona
John	Crookshank	Fire Chief	Swea City Fire Department	Swea City
Doug	Crouch		Kossuth County Secondary Roads	Kossuth County
Elaine	Davis		Bancroft EMS	Bancroft
Kelly	Fitzgerald	City Clerk	City of Burt	Burt
Marty	Fonley	Superintendent	Algona CSD	Algona CSD
Sue	Golwitzer	Mayor-Pro Tem	City Council	Wesley
Eric	Goodman	Fire Chief	Whittemore Fire Department	Whittemore
Karen	Hamilton	City Clerk	City of Titonka	Titonka
Ryan	Harms	Councilperson	Fenton City Council	Fenton
Jordan	Jahnke	Chief	Burt Volunteer Fire Department	Burt
Royce	Jameson			Lakota
Richard	Knoll		Fenton Public Works	Fenton
Steve	Kollasch	Sheriff	Kossuth County Sheriff's Office	Kossuth County
Edward	Krause	Councilperson	Fenton City Council	Fenton
Don	McGregor	BOS	Kossuth County	Kossuth County
Nick	McGuire	Chief	Burt Fire Department	Burt
Gary	Merrill	EMS	Algona	Algona
Doug	Miller		Engineer	Kossuth County
Alan	Miller	Mayor	Burt	Burt
Merrill	Mueller	Transportation Director	Algona CSD	Algona CSD
Chrysti	Neuman			Bancroft
Dave	Newbrough			Lone Rock
Kendall	Pals	Chief of Police	Algona Police Department	Algona
David	Penton	Coordinator	Kossuth County Emergency Management	Kossuth County
Cory	Rasch	FD	Bancroft FD	Bancroft
Luke	Schneider	GIS Coordinator	Kossuth County	Kossuth County
Debra	Steven	Councilperson	Lakota City Council	Lakota
Chris	Stevens	Maintenance Director	North Kossuth Community School	North Kossuth Community School
Jerry	Thompson	Mayor	City of Lone Rock	Lone Rock
Angie	Thompson	City Clerk	City of Lone Rock	Lone Rock
Stacy	Thompson	Director	Kossuth County HR/Safety	Algona
Roger	Tjarks	County Supervisor	Board of Supervisors	Titonka
David	Trunkhill	Fire Chief	Titonka Fire Department	Titonka
Bill	Weisbrod	Council Member	City Council	Lone Rock
Alycia	Wolterman	City Clerk	Swea City	Swea City
Pam	Wymore	Supervisor	Kossuth County Supervisors	Kossuth County
Brian	Blodgett	Fire Chief Teacher	Buffalo Center Fire Department Physics/Technology	Buffalo Center Fire Department North Iowa Community Schools

Name		Title	Department	Jurisdiction/ Organization
Dar	Elbert	Assistant Administrator/CNO	Kossuth Regional Health Center	Kossuth Regional Health Center
Jim	Kelly	Past Emergency Management Coordinator	N/A	N/A
Rhonda	Sexton	Registered Nurse	Kossuth Regional Health Center	Kossuth Regional Health Center

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EXECUTIVE SUMMARY

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

The Kossuth County Multi-Jurisdictional Hazard Mitigation Plan covers the following jurisdictions that participated in the planning process:

- Kossuth County
- Algona
- Bancroft
- Burt
- Fenton
- Lakota
- Ledyard
- Lone Rock
- Lu Verne
- Swea City
- Titonka
- Wesley
- Whittemore
- Algona Public School District
- LuVerne Public School District
- North Kossuth Public School District

Kossuth County, the incorporated areas, and public school districts listed above developed a *Multi-Jurisdictional Hazard Mitigation Plan* that was approved by FEMA on July 25, 2013 (hereafter referred to as the 2013 Kossuth County Hazard Mitigation Plan). Therefore, this current planning effort serves to update the previous plan.

Additional stakeholders were also invited to participate in the process, to include private businesses, community groups, private non-profit entities, adjacent communities, state and federal agencies, academia, and local regional agencies that have a stake in mitigation planning in Kossuth County.

The plan update process followed a methodology prescribed by FEMA, which began with the assembly of the Hazard Mitigation Planning Committee (HMPC) comprised of representatives from Kossuth County, participating jurisdictions, and stakeholders. The HMPC updated the risk assessment that identified and profiled hazards that pose a risk to the Kossuth County planning area, assessed the vulnerability to these

hazards, and examined the capabilities in place to mitigate them. The planning area is vulnerable to several hazards that are identified, profiled, and analyzed in this plan.

Based upon the risk assessment, the HMPC reviewed the previously developed goals for reducing risk from hazards. The validated goals are listed below:

- Goal 1: Minimize the vulnerability of the people and their property in Kossuth County to the impacts of hazards.
- Goal 2: Protect critical facilities, infrastructure and other community assets from the impacts of hazards.
- Goal 3: Improve education and awareness regarding hazards and risk in Kossuth County.
- Goal 4: Strengthen communication regarding hazard mitigation among agencies and between agencies and the public.

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

PREREQUISITES

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

Note to Reviewers: *When this plan has been reviewed and approved pending adoption by FEMA Region VII the adoption resolutions will be signed by the participating jurisdictions and added to Appendix D. A model resolution is provided.*

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

- Kossuth County
- Algona
- Bancroft
- Burt
- Fenton
- Lakota
- Ledyard
- Lone Rock
- Lu Verne
- Swea City
- Titonka
- Wesley
- Whittemore
- Algona Public School District
- LuVerne Public School District
- North Kossuth Public School District

MODEL RESOLUTION

Resolution # _____

Adopting the Kossuth County Multi-Jurisdictional Local Hazard Mitigation Plan

Whereas, the (Name of Government/District/Organization seeking FEMA approval of hazard mitigation plan) recognizes the threat that natural hazards pose to people and property within our community; and

Whereas, undertaking hazard mitigation actions will reduce the potential for harm to people and property from future hazard occurrences; and

Whereas, the U.S Congress passed the Disaster Mitigation Act of 2000 ("Disaster Mitigation Act") emphasizing the need for pre-disaster mitigation of potential hazards;

Whereas, the Disaster Mitigation Act made available hazard mitigation grants to state and local governments; and

Whereas, an adopted Local Hazard Mitigation Plan is required as a condition of future funding for mitigation projects under multiple FEMA pre- and post-disaster mitigation grant programs; and

Whereas, the (Name of Government/District/Organization) fully participated in the hazard mitigation planning process to prepare this Multi-Jurisdictional Local Hazard Mitigation Plan; and

Whereas, the Iowa Homeland Security and Emergency Management Department and the Federal Emergency Management Agency Region VII officials have reviewed the "Story County Multi-Jurisdictional Local Hazard Mitigation Plan," and approved it contingent upon this official adoption of the participating governing body; and

Whereas, the (Name of Government/District/Organization) desires to comply with the requirements of the Disaster Mitigation Act and to augment its emergency planning efforts by formally adopting the Story County Multi-Jurisdictional Local Hazard Mitigation Plan; and

Whereas, adoption by the governing body for the (Name of Government/District/Organization) demonstrates the jurisdictions' commitment to fulfilling the mitigation goals outlined in this Multi-Jurisdictional Local Hazard Mitigation Plan;

Whereas, adoption of this legitimizes the plan and authorizes responsible agencies to carry out their responsibilities under the plan;

Now, therefore, be it resolved, that the (Name of Government/District/Organization) adopts the "Story County Multi-Jurisdictional Local Hazard Mitigation Plan" as an official plan; and

Be it further resolved, the (Name of Government/District/Organization) will submit this Adoption Resolution to the Iowa Homeland Security and Emergency Management Department and Federal Emergency Management Agency Region VII officials to enable the plan's final approval.

Date: _____

Certifying Official: _____

1 INTRODUCTION AND PLANNING PROCESS

1.1 Purpose

Kossuth County and its participating cities and public school districts prepared this Multi-Jurisdictional Hazard Mitigation Plan update to guide hazard mitigation planning to better protect the people and property of the planning area from the effects of hazard events.

This plan demonstrates each jurisdiction's 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 make Kossuth County and the participating jurisdictions eligible for certain federal grant programs, specifically the Federal Emergency Management Agency's (FEMA) Hazard Mitigation Assistance (HMA) grants including the Hazard Mitigation Grant Program, Pre-Disaster Mitigation Program, and Flood Mitigation Assistance Program.

1.2 Background and Scope

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

Hazard mitigation is defined by FEMA as "any sustained action taken to reduce or eliminate long-term risk to human life and property from a hazard event." The results of a three-year, congressionally mandated independent study to assess future savings from mitigation activities provides evidence that mitigation activities are highly cost-effective. On average, each dollar spent on mitigation saves society $6 in avoided future losses, in addition to saving lives and preventing injuries (National Institute of Building Science Multi-Hazard Mitigation Council 2017).

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. Kossuth County and the incorporated cities and public school districts that participated in this plan update developed a Multi-Jurisdictional Hazard Mitigation Plan that was approved by FEMA on July 25, 2013 (hereafter referred to as the *2013 Kossuth County Hazard Mitigation Plan*). Therefore, this current planning effort serves to update the previous plan.

This plan documents the hazard mitigation planning process undertaken by the Kossuth County Hazard Mitigation Planning Committee (HMPC). It identifies relevant hazards and vulnerabilities in the planning

area and sets forth an updated mitigation strategy to decrease vulnerability and increase resiliency and sustainability in Kossuth County.

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

- Kossuth County
- Algona
- Bancroft
- Burt
- Fenton
- Lakota
- Ledyard
- Lone Rock
- Lu Verne
- Swea City
- Titonka
- Wesley
- Whittemore
- Algona Public School District
- LuVerne Public School District
- North Kossuth Public School District

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.) Additionally, this plan is prepared in accordance with the *2013 Local Mitigation Planning Handbook* published by FEMA.

While the Disaster Mitigation Act emphasized the need for mitigation plans and more coordinated mitigation planning and implementation efforts, the regulations established the requirements that local hazard mitigation plans must meet in order for a local jurisdiction to be eligible for certain federal disaster assistance and hazard mitigation funding under the Robert T. Stafford Disaster Relief and Emergency Act (Public Law 93-288).

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

1.3 Plan Organization

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

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

This is the same general order that was used for the *2013 Kossuth County Hazard Mitigation Plan*. However, several chapters from the previous plan have been condensed for the plan update. **Table 1-1** below provides details on changes that were made to the plan format:

Table 1-1: Changes in Organization 2013 Plan Vs. 2018 Update

2013 Plan	2018 Plan Update
Chapter I: Introduction and Background	Executive Summary Chapter 1: Introduction and Planning Process
Chapter II: Community Profile	Chapter 2: Planning Area Profile and Capabilities
Chapter III: Community Development Information	
Chapter IV: Population and Demographics	
Chapter V: Housing Information	
Chapter VI: Transportation Services	Discussed in Chapter 3, Section 3.5.17: Transportation Incident
VII: Multi-jurisdictional Risk Assessment	Chapter 3: Risk Assessment
VIII: Hazard Analysis	
IX: Hazards Not Considered	
X: Hazard Scoring Summary	
XI: Hazard Prioritization / risk Assessment & Vulnerability	
XII: Inventory of Assets	
XIII: Current Mitigation Activities	Chapter 4: Mitigation Strategy
XIV: Hazard Mitigation Plan Goals	
XV: Mitigation Measure Feasibility	
XVI: Mitigation Measures and Goals	
XVII: Funding of Future Mitigation Measures	
XVIII: Plan Maintenance, Review, and Update	Chapter 5: Plan Implementation and Maintenance
Appendices	
I: Maps	Not Included - Integrated throughout other plan chapters
II: Agendas, Minutes, Resolutions	Appendix B: Planning Process Documentation
III: Planning Committee and Sign-in Sheets	
IV: Letters to Communities	
V: References	Appendix A: References
VI: Acronym List	Not Included – acronyms are defined within the plan where used
VII: Update Sheets	Chapter 4, Section 4.3: Implementation of Mitigation Actions

1.4 Planning Process

44 CFR Requirement 201.6(c)(1): [The plan shall document] the planning process used to develop the plan, including how it was prepared, who was involved in the process, and how the public was involved.

In February 2017, the State of Iowa Homeland Security and Emergency Management Department contracted with Wood Environment & Infrastructure Solutions, Inc. (Wood) to facilitate the update of the Kossuth County Multi-Jurisdictional Local Hazard Mitigation Plan. Wood's role was to:

- Assist in establishing the Hazard Mitigation Planning Committee (HMPC) as defined by the Disaster Mitigation Act (DMA),
- Ensure the updated plan meets the DMA requirements as established by federal regulations and following FEMA's planning guidance,

- Facilitate the entire planning process,
- Identify the data requirements that HMPC participants could provide and conduct the research and documentation necessary to augment that data,
- Assist in facilitating the public input process,
- Produce the draft and final plan update documents, and
- Coordinate the Iowa Homeland Security and Emergency Management Department and FEMA plan reviews.

1.4.1 Multi-Jurisdictional Participation

44 CFR Requirement §201.6(a)(3): Multi-jurisdictional plans may be accepted, as appropriate, as long as each jurisdiction has participated in the process and has officially adopted the plan.

Kossuth County invited the incorporated cities, public school districts, and various other stakeholders in mitigation planning (identified in Appendix B) to participate in the Kossuth County Multi-Jurisdictional Hazard Mitigation Plan update process. The jurisdictions that elected to participate in this plan are listed above in section 1.2. The DMA requires that each jurisdiction that participates in the planning process must officially adopt the multi-jurisdictional hazard mitigation plan. Each jurisdiction that chose to participate in the planning process and development of the plan was required to meet plan participation requirements defined at the first planning meeting, which includes the following:

- Designate a representative to serve on the HMPC;
- Participate in at least one of the three HMPC planning meetings by either direct representation or authorized representation;
- 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;
- Develop/update mitigation actions (at least one) specific to each jurisdiction;
- Provide comments on plan drafts as requested;
- Inform the public, local officials, and other interested parties about the planning process and provide opportunities for them to comment on the plan; and
- Formally adopt the mitigation plan.

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

Table 1-2: Jurisdictional Participation in Planning Process

Jurisdiction	Kick-off Meeting	Planning Meeting #2	Planning Meeting #3	Data Collection Guide	Status of Previous Actions	Mitigation Action Plans	Integration Worksheet
Kossuth County	x	x	x	x	x	x	x
Algona	x	x	x	x	x	x	x
Bancroft	x	x	x	x	x	x	x
Burt	x	x	x	x	x	x	x
Fenton	x	x	x	x	x	x	x
Lakota	x	x		x	x	x	x
Ledyard	x	x		x	x	x	
Lone Rock	x	x	x	x	x	x	x
Lu Verne				x	x	x	x
Swea City	x	x		x	x	x	x
Titonka	x	x	x	x	x	x	x
Wesley	x	x	x	x	x	x	x
Whittemore	x	x		x		x	x
Algona Public School District			x	x	x	x	x
LuVerne Public School District	x			x	N/A	x	
North Kossuth Public School District	x	x		x	N/A	x	

1.4.2 The Planning Steps

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

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

Into this process, Wood integrated a detailed 10-step planning process adapted from FEMA's Community Rating System (CRS) and Flood Mitigation Assistance programs. Thus, the process used for this plan meets the requirements of the Disaster Mitigation Act of 2000 as well as the basic requirements for activity 510 under the Community Rating System. **Table 1-3** shows how the process followed fits into FEMA's original four-phase DMA process as well as the revised Nine Task Process outlined in the *2013 Local Mitigation Planning Handbook* and the 10-step CRS process.

Table 1-3: Mitigation Planning Process Used to Develop the Kossuth County Multi-Jurisdictional Local Hazard Mitigation Plan

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

Phase I Organize Resources

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

The planning process resulting in the preparation of this plan document officially began with an initial coordination Conference Call/Webinar on May 24, 2017. Participants of the meeting included the Kossuth County Emergency Management Coordinator and GIS Coordinator, Iowa Homeland Security and Emergency Management Department GIS Coordinator, and the Wood Mitigation Planners and GIS Technician. The purpose of this meeting was to determine the jurisdictions and other stakeholders that would be invited to participate on the HMPC (Step 1), set tentative planning meeting dates, identify GIS needs and resources, discuss the hazards to be included in the plan update and options for the flood risk assessment methodology, and develop an initial public participation strategy. Detailed meeting minutes are included in Appendix B.

After the initial coordination meeting, a formal Kick-off planning conference call/webinar was held on August 23, 2017 followed by two additional planning meetings held on October 11, 2017 and November 15, 2017. A complete list of all representatives of the agencies and organizations that participated on the Kossuth County HMPC is provided in Appendix B.

The HMPC communicated during the planning process with a combination of webinars, face-to-face meetings, phone interviews, and email correspondence. The meeting schedule and topics are listed in **Table 1-4**. The meeting minutes for each of the meetings are included in Appendix B.

Table 1-4: Schedule of HMPC Meetings

Meeting	Topic	Date
Informational Meeting	General overview of planning process/requirements and schedule.	May 24, 2017
Kick-off Meeting	Introduction to DMA, the planning process, hazard identification and public input strategy. Distribution of data collection guide to jurisdictions. Preliminary hazard data. Discussion critical facility inventory.	August 23, 2017
Planning Meeting #2	Review of draft Risk Assessment, update plan goals, instructions to update status of previous mitigation actions	October 11, 2017
Planning Meeting #3	Development of new mitigation actions, mitigation action planning and prioritization. Determine process to monitor, evaluate, and update plan.	November 15, 2017

During the kick-off meeting Wood presented information on the scope and purpose of the plan, participation requirements of HMPC members, and the proposed project work plan and schedule. Plans for public involvement (Step 2) and coordination with other agencies and departments (Step 3) were discussed. Wood also introduced hazard identification requirements and data needs. The HMPC discussed potential hazards as well as past events and impacts and refined the identified hazards to be relevant to Kossuth County. The hazard ranking methodology utilized by Iowa Homeland Security and Emergency Management Department in the State Hazard Mitigation Plan was introduced and preliminary information was presented for each hazard identified.

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

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

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

At the 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. The survey was announced via the Kossuth County Emergency Management Facebook page. Screenshots of the posting are included in Appendix B.

The public survey was developed specific to the Kossuth County Mitigation Plan and provided a brief plan summary as well as a questionnaire to capture public and stakeholder input. The survey was made available online throughout the County. A copy of the survey is provided in Appendix B.

In addition, to notification through media outlets described above, committee members distributed the survey link to members of the public and key stakeholders in their own jurisdiction. In all, 125 surveys were completed.

The survey asked the public and stakeholders to indicate their opinion on the likelihood for each hazard to impact their jurisdiction. They were asked to rate the probability of each hazard profiled in this plan as 1-unlikely, 2-occasional, 3-likely, and 4-highly likely. The summary results of this question are provided in **Figure 1.1**.

Figure 1.1: Survey Results—Probability of Hazards in Jurisdiction

	UNLIKELY	OCCASIONAL	LIKELY	HIGHLY LIKELY	TOTAL	WEIGHTED AVERAGE
Thunderstorm/Lightning/Hail	0.00% 0	7.20% 9	27.20% 34	65.60% 82	125	3.58
Severe Winter Storm	0.81% 1	11.38% 14	31.71% 39	56.10% 69	123	3.43
Tornado/Windstorm	1.61% 2	16.94% 21	39.52% 49	41.94% 52	124	3.22
Extreme Heat	4.03% 5	39.52% 49	37.90% 47	18.55% 23	124	2.71
Transportation Incident	13.82% 17	34.15% 42	28.46% 35	23.58% 29	123	2.62
Animal/Plant/Crop Disease	14.63% 18	33.33% 41	33.33% 41	18.70% 23	123	2.56
Drought	9.76% 12	44.72% 55	30.08% 37	15.45% 19	123	2.61
Hazardous Materials Incident	19.51% 24	39.84% 49	26.83% 33	13.82% 17	123	2.35
Human Disease	23.39% 29	35.48% 44	29.84% 37	11.29% 14	124	2.29
Flash Flood	22.58% 28	46.77% 58	20.97% 26	9.68% 12	124	2.18
Grass or Wildland fire	26.61% 33	44.35% 55	21.77% 27	7.26% 9	124	2.10
Infrastructure Failure	30.33% 37	42.62% 52	20.49% 25	6.56% 8	122	2.03
River Flooding	39.20% 49	32.00% 40	21.60% 27	7.20% 9	125	1.97
Expansive Soils	50.00% 57	35.09% 40	11.40% 13	3.51% 4	114	1.68
Terrorism	54.47% 67	30.08% 37	10.57% 13	4.88% 6	123	1.66
Sinkholes	57.38% 70	31.97% 39	8.20% 10	2.46% 3	122	1.66
Radiological Incident	73.17% 90	21.95% 27	3.25% 4	1.63% 2	123	1.33
Earthquake	89.52% 111	7.26% 9	2.42% 3	0.81% 1	124	1.16
Dam/Levee Failure	89.34% 109	8.20% 10	1.64% 2	0.82% 1	122	1.14
Landslide	93.44% 114	6.56% 8	0.00% 0	0.00% 0	122	1.07

Source: SurveyMonkey Results

The survey also asked the public and stakeholders to indicate their opinion on the potential magnitude of each hazard on their jurisdiction. They were asked to rate the probability of each hazard profiled in this plan as 1-negligible, 2-limited, 3-critical, and 4-catastrophic. The summary results of this question are provided in **Figure 1.2**.

Figure 1.2: Survey Results—Magnitude of Hazards in Jurisdiction

	NEGLIGIBLE	LIMITED	CRITICAL	CATASTROPHIC	TOTAL	WEIGHTED AVERAGE
Tornado/Windstorm	1.67% 2	22.50% 27	35.00% 42	40.83% 49	120	3.16
Severe Winter Storm	2.52% 3	31.09% 37	45.38% 54	21.01% 25	119	2.86
Thunderstorm/Lightning/Hail	2.50% 3	36.67% 44	45.83% 55	15.00% 18	120	2.73
Drought	9.24% 11	36.97% 44	42.86% 51	10.92% 13	119	2.66
Extreme Heat	9.17% 11	44.17% 53	39.17% 47	7.50% 9	120	2.46
Hazardous Materials Incident	13.33% 16	40.00% 48	35.00% 42	11.67% 14	120	2.46
Animal/Plant/Crop Disease	14.17% 17	46.67% 56	27.50% 33	11.67% 14	120	2.37
Human Disease	18.64% 22	39.83% 47	32.20% 38	9.32% 11	118	2.32
Transportation Incident	17.39% 20	42.61% 49	30.43% 35	9.57% 11	115	2.32
Flash Flood	18.33% 22	45.00% 54	30.83% 37	5.83% 7	120	2.24
Grass or Wildland Fire	21.67% 26	46.67% 56	21.67% 26	10.00% 12	120	2.20
Infrastructure Failure	26.27% 31	38.98% 46	27.97% 33	6.78% 8	118	2.16
Terrorism	39.83% 47	25.42% 30	14.41% 17	20.34% 24	118	2.16
River Flooding	32.50% 39	43.33% 52	20.00% 24	4.17% 5	120	1.96
Radiological Incident	55.83% 67	26.67% 32	9.17% 11	8.33% 10	120	1.70
Expansive Soils	52.17% 60	37.39% 43	7.83% 9	2.61% 3	115	1.61
Sinkholes	62.18% 74	30.25% 36	5.04% 6	2.52% 3	119	1.48
Earthquake	73.95% 88	15.13% 18	6.72% 8	4.20% 5	119	1.41
Dam/Levee Failure	73.33% 88	22.50% 27	1.67% 2	2.50% 3	120	1.33
Landslide	85.00% 102	10.00% 12	1.67% 2	3.33% 4	120	1.23

Source: SurveyMonkey Results

In the survey, the public was also asked to review 11 types of mitigation actions considered by the Iowa Homeland Security and Emergency Management Department for FEMA funding. The Kossuth County HMPC also considered these types of projects in the Kossuth County Multi-Jurisdictional Hazard Mitigation Plan. The survey asked the public to place a check next to the mitigation project types that they felt could benefit their community. **Figure 1.3** provides the compiled results of this question.

Figure 1.3: Survey Results—Types of Projects

ANSWER CHOICES	RESPONSES	
Electrical Utilities Infrastructure Retrofit (i.e. strengthening lines/connections to withstand ice/wind damages, burying power lines)	72.41%	84
Structural Retrofitting of Existing Buildings to Add a Tornado Saferoom	70.69%	82
New Tornado Safe Room Construction	65.52%	76
Minor Localized Flood Reduction Projects (stormwater management or other localized flood control projects)	47.41%	55
Retrofitting of Existing Buildings and Facilities to Prevent Wind Damage	43.97%	51
Soil Erosion Stabilization	33.62%	39
Flood-prone Property Acquisition & Structure Demolition/Relocation	25.86%	30
Flood-prone Structure Elevation	19.83%	23
Wildfire Mitigation	12.07%	14
Floodproofing of Historical and/or Non-residential Structures	11.21%	13
Total Respondents: 116		

Source: SurveyMonkey Results

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

- "a Tornado shelter plan for smaller communities"
- "Terrorism could be with school threats/incidents and of course the weather with crops/electricity/building damage"
- "Electrical outages are better than before but still have them happen"
- "Designate accessible tornado shelters in Algona."
- "Location of railroad tracks and potential derailment/chemical hazard. Potential chemical hazards associated with ag industry located in and near Burt."
- "Large capacity storm shelter."
- "Monolithic Dome facility to care for residents during or after a weather event. Earth shelter also considered. Water filters available"
- "Power generator-we're down one unit. Health issues CPAP or oxygen tanks, dump pumps"
- "EMS must be designated as an essential service and taxpayers supported"
- "How EMS plays an important role of their services to our area. I am concerned with the Federal Government not being realistic on their rulings! They need to look at importance of residents safety of our area!"
- "Loss of electricity"
- "Terrorism"

The public was also given an opportunity to provide input on the final draft of the complete plan. The entire plan draft was made available on Kossuth County Emergency Management website as a PDF

document. In addition, hard copies were made available at the Kossuth County Auditors Office and Bancroft City Hall.

Kossuth County announced the availability of the entire final draft plan and the two-week final public comment period on the County Emergency Management website. Copies of the announcements are provided in Appendix B. The final public comment period was from October 18 to November 6, 2018.

The HMPC invited other targeted stakeholders to comment on the draft plan via an e-mail letter, which is described in greater detail in Step 3: Coordinate with Other Departments and Agencies. No comments were received.

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

44 CFR Requirement 201.6(b): An open public involvement process is essential to the development of an effective plan. In order to develop a more comprehensive approach to reducing the effects of natural disasters, the planning process shall include: (2) An opportunity for neighboring communities, local and regional agencies involved in hazard mitigation activities, and agencies that have the authority to regulate development, as well as businesses, academia and other private and non-profit interests to be involved in the planning process. (3) Review and incorporation, if appropriate, of existing plans, studies, reports, and technical information.

There are numerous organizations whose goals and interests interface with hazard mitigation in Kossuth County. Coordination with these organizations and other community planning efforts is vital to the success of this plan. Many stakeholder agencies were contacted throughout the planning process to obtain data in preparation of the Risk Assessment. This included contact with specific representatives of stakeholder agencies, as well as accessing stakeholder data that has been made available to the public via the internet. These sources have been identified where data is presented. In addition, Kossuth County invited neighboring counties, other local, state, and federal departments and agencies, as well as institutions of higher learning to review and comment on the final draft of the Kossuth County Multi-Jurisdictional Hazard Mitigation Plan prior to final submittal to FEMA. The stakeholders that were invited to comment on the final plan draft are included in **Table 1-5.**

Table 1-5: Stakeholder Involvement

Stakeholder	Type	Provided Data for Risk Assessment	Invited to Comment on Final Draft
Iowa State University, Iowa Flood Center	Academia	x	x
Winnebago County	Adjacent County		x
Hancock County	Adjacent County		x
Humboldt County	Adjacent County		x
Palo Alto County	Adjacent County		x
Emmet County	Adjacent County		x
Martin County, Minnesota	Adjacent County		x
Faribault County, Minnesota	Adjacent County		x
West Bend, Iowa	Adjacent Jurisdiction		x
Buffalo Center Fire Department	Fire Department	x	x
North Iowa Community School District	School District	x	x
Kossuth Regional Health Center	Hospital	x	x
Environmental Protection Agency	Federal Agency	x	x
Federal Emergency Management Agency	Federal Agency	x	x
National Weather Service	Federal Agency	x	x
U.S. Army Corps of Engineers	Federal Agency	x	x
U.S. Geological Survey	Federal Agency	x	x
Iowa Department of Agriculture and Land Stewardship	State Agency	x	x
Iowa Department of Natural Resources	State Agency	x	x
Iowa Homeland Security and Emergency Management	State Agency	x	x

Integration of Other Data, Reports, Studies, and Plans

In addition, input was solicited from many other agencies and organizations that provided information. 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 (September 2013);
- Kossuth County Hazard Mitigation Plan (July 2013);
- National Flood Insurance Program Policy and Loss Statistics;
- Flood Insurance Administration, Repetitive/Severe Repetitive Loss Property Data;
- Flood Insurance Rate Maps for all of Kossuth County;
- Iowa Department of Natural Resources, Dam Safety Program Inventory of Dams for Kossuth County;
- National Inventory of Dams;
- National Levee Database;
- Wildland/Urban Interface and Intermix areas from the SILVIS Lab, Department of Forest Ecology and Management, University of Wisconsin;
- Various local plans such as Comprehensive Plans, Economic Development Plans, Capital Improvement Plans, etc. For a complete list of local plans that were reviewed and incorporated, see Chapter 2;
- US Department of Agriculture's (USDA) Risk Management Agency Crop Insurance Statistics

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

Phase 2 Assess Risk (Handbook Task 5)

Step 4: Assess the Hazard: Identify and Profile Hazards

Wood assisted the HMPC in a process to identify/update the hazards that have impacted or could impact communities in Kossuth County. At the kick-off meeting, the HMPC examined the history of disaster declarations in Kossuth County, the list of hazards considered in the *2013 Iowa State Hazard Mitigation Plan*, and the hazards identified in the previous Kossuth County Hazard Mitigation Plan. The committee then worked through this list of all potential hazards that could affect the planning area. They discussed past hazard events, types of damage, and where additional information might be found. Additional information on the hazard identification process and which hazards were identified for each jurisdiction is provided in Chapter 3.

During the kick-off meeting, the HMPC discussed past events and impacts on a county-wide basis to contribute to the risk assessment update. After the kick-off meeting, each jurisdiction completed a Data Collection Guide, including information on previous hazard events in their community. Utilizing the information from the Data Collection Guides as well as existing plans, studies, reports, and technical information as well as information available through internet research and GIS analysis, a profile was developed for each hazard identified. More information on the methodology and resources used to identify and profile the hazards can be found in Chapter 3.

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

Assets for each jurisdiction were identified through a combination of several resources. Kossuth County supplied datasets with corporate boundaries and transportation layers and the Department of Natural Resources GIS Repository (NRGIS) supplied school district boundaries, and other available GIS layers. Kossuth County building data was extracted from Hazus. Population data was obtained from the U.S. Census Bureau. Critical facilities were supplemented with data available from the NRGIS as well as data available from the Homeland Security Infrastructure Program (HSIP) Freedom 2015 dataset. Methodologies and results of the critical facility analysis are provided in Chapter 3 and Appendix E.

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

The HMPC also analyzed development since the last plan update and future development trends from data provided by each jurisdiction on the Data Collection Guide as well as minutes of the annual review meetings. Data was also obtained from the U.S. Census Bureau and from jurisdictions through other planning mechanisms such as Comprehensive Plans and Future Development Plans.

After profiling the hazards that could affect Kossuth County and identifying assets, the HMPC collected information to describe the likely impacts of future hazard events on the participating jurisdictions. For each hazard, there is a discussion regarding future development as well as climate change impacts regarding how vulnerability to that specific hazard might be impacted in the future.

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

ongoing mitigation initiatives. This information is included in Chapter 2, Planning Area Profile and Capabilities.

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

Taking into consideration the vulnerability and capability assessments, and where sufficient information was available, a variety of methods was used to estimate losses for each profiled hazard. For riverine flooding, Hazus was used to determine assets/areas at risk and determine loss estimates. For other geographic hazards such as fixed chemical facilities and grass/wildland fire, assets/areas at risk were determined through GIS analysis. For other hazards such as weather-related hazards, loss estimates were developed based on statistical analysis of historic events. For some human-caused hazards, loss estimates were scenario-based. The methodologies for each loss estimate are described in detail in Chapter 3. Within each hazard section, the text provides details on how the hazard varies by jurisdiction, where applicable. In addition, at the conclusion of each hazard section, a summary table indicates the specific probability, magnitude, warning time, and duration rating of the hazard for each jurisdiction, to show how the hazard varies. Where applicable, introductory text preceding the table highlights noted variables.

Results of the preliminary risk assessment were presented at Meeting #2 and the Draft Risk Assessment (Chapter 3) was provided to the HMPC for review and comment. Several comments, corrections, and suggestions were provided to Wood and incorporated into the risk assessment as appropriate.

Phase 3 Develop the Mitigation Plan (Handbook Task 6)

Step 6: Set Goals

Wood facilitated a discussion session with the HMPC during Meeting #2 to review and update goals. Common categories of mitigation goals were presented as well as the 2013 State Hazard Mitigation Plan goals.

This planning effort is an update to an existing hazard mitigation plan. As a result, the goals from the *2013 Kossuth County Multi-Jurisdictional Hazard Mitigation Plan* were reviewed.

The revised/validated goals for this plan update are provided below:

- Goal 1: Minimize the vulnerability of the people and their property in Kossuth County to the impacts of hazards.
- Goal 2: Protect critical facilities, infrastructure and other community assets from the impacts of hazards.
- Goal 3: Improve education and awareness regarding hazards and risk in Kossuth County.
- Goal 4: Strengthen communication regarding hazard mitigation among agencies and between agencies and the public.

Step 7: Review Possible Activities

At meeting #2, a handout of previous actions was provided to all jurisdictions with instructions to provide updates for each action. Jurisdictions were encouraged to maintain a focused approach and continue forward only those actions that are aimed at implementing long-term solutions to prevent losses from hazards. The focus of Meeting #3 was to update the mitigation strategy by discussing relevant new actions considered necessary as a result of the updated risk assessment. The HMPC reviewed the following: plan goals, previous actions from the 2013 plan, key issues from the risk assessment, Iowa

Homeland Security and Emergency Management's HMA funding priorities, public opinion survey results on types of actions desired, and FEMA's Mitigation Action Ideas publication.

The group discussed the types of mitigation actions/projects that could be done by the jurisdictions in Kossuth County. Consideration was given to the analysis results provided in the risk assessment and the anticipated success for each project type. Projects relating to emergency response were discussed, but participants were encouraged to focus on long-term mitigation solutions since response-related mitigation actions occur on a routine basis as requirements of other plans. Complex projects that would necessitate use of large numbers of county resources were also discussed. This opportunity to discuss a broad range of mitigation alternatives allowed the jurisdictions to understand the overall priorities of the committee and to allow for discussion of the types of project most beneficial to each jurisdiction. As part of this discussion, consideration was given to the potential cost of each project in relation to the anticipated future cost savings.

The jurisdictions were also provided instructions for completing the Mitigation Action Plan for each continuing and newly developed action. The details from the Action Plan for each Continuing and New action are provided in Chapter 4. The completed and deleted actions are provided in Appendix C. Chapter 4 provides additional details regarding the process undertaken to refine the mitigation strategy to make Kossuth County and its jurisdictions more disaster resistant.

Step 8: Draft an Action Plan

A complete draft of the plan was made available online and in hard copy for review and comment by the public, other agencies and interested stakeholders. This review period was from October 15 through October 26. Methods for inviting interested parties and the public to review and comment on the plan were discussed in Steps 2 and 3, and materials are provided in Appendix B. Comments were integrated into a final draft for submittal to the Iowa Homeland Security and Emergency Management Department and FEMA.

Phase 4 Implement the Plan and Monitor Progress

Step 9: Adopt the Plan (Handbook Task 8)

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

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

The HMPC developed and agreed upon an overall strategy for plan implementation and for monitoring and maintaining the plan over time during Meeting #3. This strategy is described in Chapter 5, Plan Maintenance Process.

2 Planning Area Profile and Capabilities

This chapter provides a general profile of Kossuth County and participating jurisdictions, including details on existing capabilities, plans, and programs that enhance their ability to implement mitigation strategies.

2.1 Kossuth County Planning Area Profile

Figure 2-1 provides a map of the Kossuth County planning area. The planning area boundaries include the unincorporated areas of Kossuth County as well as the following incorporated cities:

- Kossuth County
- Algona
- Bancroft
- Burt
- Fenton
- Lakota
- Ledyard
- Lone Rock
- Lu Verne
- Swea City
- Titonka
- Wesley
- Whittemore

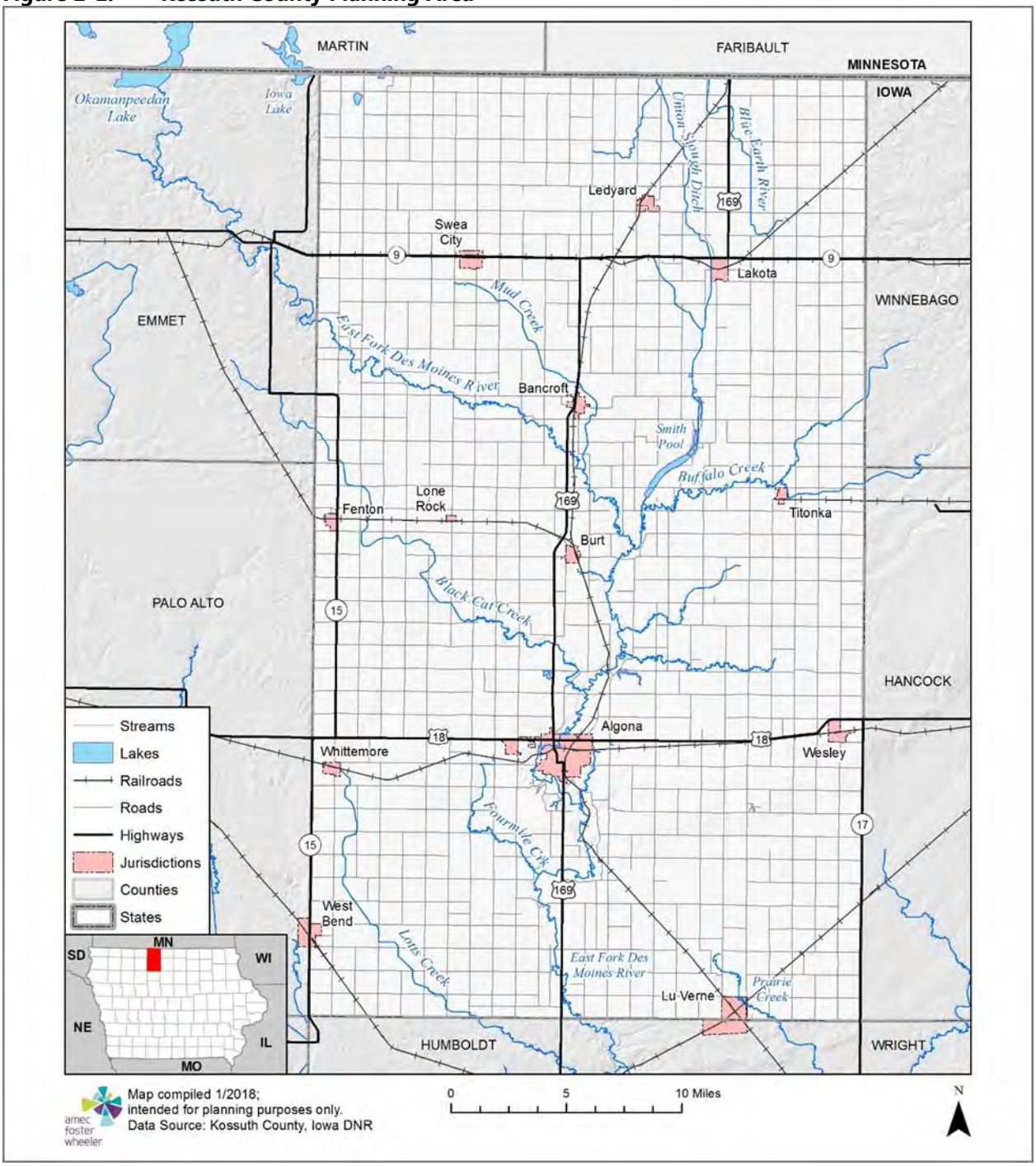
The City of West Bend also has a portion of its corporate limits in Kossuth County. However, this city is considered to be an official city of Palo Alto County and participated in the most recent Palo Alto County Hazard Mitigation Plan. Therefore, West Bend is considered a Stakeholder in the Kossuth County Plan. However, to provide a comprehensive risk assessment, the portion of West Bend that is in Kossuth County is included in the risk assessment.

The following school districts participated in development of this plan are also included in the planning area:

- Algona Public School District
- LuVerne Public School District
- North Kossuth Public School District

The school districts are discussed in additional detail in Section 2.3.

Figure 2-1: Kossuth County Planning Area



2.1.1 Geography and Topography

Kossuth County is a northern tier county in North Central Iowa. Kossuth County is the largest county in Iowa by land area, covering 979 square miles. There are several highways and county roads including highway US 169 which travels north and south through the central portion of the county and through the cities of Algona and Bancroft; US 18 which travels east and west through the southern portion of the county and through the cities of Wesley and Algona, and Iowa Highway 9 which travels east to west

through the northern portion of the county and through the cities of Lakota and Swea City. The rest of the roads in the county are county highways and local roads.

Adjacent counties:

- Martin County, Minnesota (north)
- Faribault County, Minnesota (north)
- Winnebago County (northeast)
- Hancock County (southeast)
- Humboldt County (south)
- Palo Alto County (southwest)
- Emmet County (northwest)

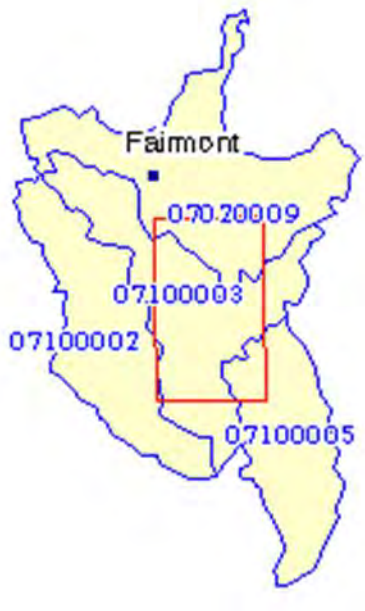
The soils that are found within Kossuth County are well suited to the production of corn and soybeans. These soils are found in upland areas and are nearly level to moderately sloping. Drainage for these soils is moderate to poor.

2.1.2 Major Rivers and Watersheds

The primary waterway features in Kossuth County are the North Buffalo Creek and Kossuth River. As depicted in **Figure 2-2**, Kossuth County crosses four watersheds as follows:

- 07020009 Blue Earth
- 07100002 Upper Des Moines
- 07100003 East Fork Des Moines
- 07100005 Boone

Figure 2-2: Kossuth County, Iowa Watersheds (Kossuth County is red square)



Source: Environmental Protection Agency, https://cfpub.epa.gov/surf/locate/index.cfm

2.1.3 History

Kossuth County was named after the Hungarian Patriot, Lajos (Louis) Kossuth. Between 1820 and 1844, the first white men entered the area with military expeditions. In 1852, the land was surveyed and the state boundary between Iowa and Minnesota was established.

The townships and sections making up the county were surveyed in 1854 and 1855. It was during the surveying of Kossuth County that characteristics such as swamps and sloughs and grasshopper invasions were first noticed by surveying engineers.

The Third General Assembly of 1851 created or established 50 counties in Iowa. When this session closed, every part of Iowa was included in some designated county for the first time. Kossuth County was one of those created by this wholesale legislation. At that time, Kossuth County was about the same size (24 square miles) as the other adjoining counties. Then in January of 1857, the Legislature fixed the present-day boundaries of Kossuth County by removing Bancroft County to the north and adding it to Kossuth County. Early on, Kossuth County was attached to Boone County and later to Webster County for election, judicial and revenue purposes, because few settlers were in the area.

One interesting point in history occurred when in 1870, Crocker County was created on the ruins of old Bancroft County, with Greenwood Center to be the new county seat. However, the act creating Crocker County was declared by the court to be unconstitutional because Crocker County did not contain at least 432 square miles of territory as required by the existing constitution.

Early in 1866, supervisors asked for bids for a courthouse at Algona (originally known as Call's Grove). A small building was constructed at a cost of $775. Lumber for the structure was hauled in from the town of Boonesboro, 90 miles away. This first courthouse was completed and occupied in January of 1867. The building was later sold and moved to another location where it was utilized as a meeting hall and Sunday school.

At an election held September 9, 1947, a proposal to issue $500,000 in bonds to build a new courthouse was carried by a vote of 1693 to 856. The cornerstone of the present courthouse was laid on August 16, 1953 and occupied in February and March of 1955. Total construction costs of $520,605.32 were needed to complete construction of the reinforced concrete structure (Source: *The Counties and Courthouses of Iowa* by LeRoy G. Pratt, 1977).

Figure 2-3: Kossuth County Courthouse

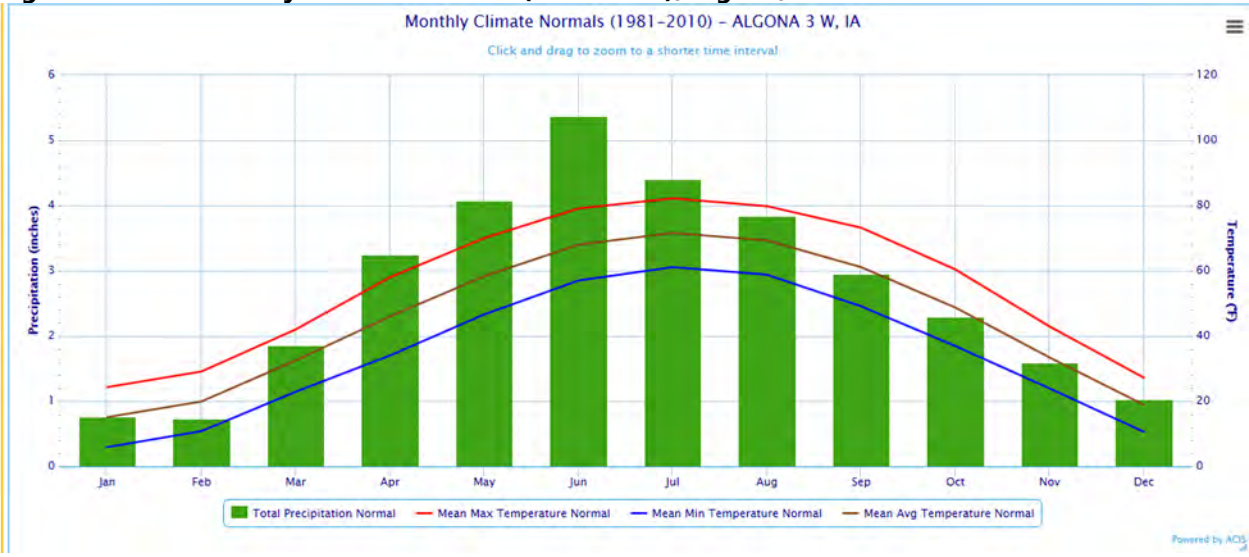
Photo Credit: Brian McMillin, http://iowabackroads.com/kossuth-county-courthouse-algona-iowa/

2.1.4 Climate

The climate in Kossuth County is described as sub-humid and continental with cold winters and hot and humid summers. The average winter temperature is 18 degrees Fahrenheit, with an average snowfall of thirty-seven inches. The average summer temperature is 70 degrees Fahrenheit, with an average annual rainfall of 33 inches.

The coldest winter month is January with an average low of 5.9 degrees Fahrenheit and the hottest summer month is July with an average high of 82.2 degrees Fahrenheit. Seasons fluctuate from being very wet to very dry, and temperatures can fluctuate greatly in spring and autumn months. **Figure 2-4** and **Table 2-1** provide monthly climate normals for Algona, Iowa from 1981 to 2010.

Figure 2-4: Monthly Climate Normals (1981-2010), Algona, IA



Source: High Plains Regional Climate Center, http://climod.unl.edu/

Table 2-1: Monthly Climate Normals (1981-2010), Algona, IA

Month	Total Precipitation Normal (inches)	Mean Max Temperature Normal (°F)	Mean Min Temperature Normal (°F)	Mean Avg Temperature Normal (°F)
January	0.77	24.3	5.9	15.1
February	0.73	29.1	10.8	19.9
March	1.86	42.0	22.9	32.5
April	3.25	58.0	34.0	46.0
May	4.08	70.0	46.6	58.3
June	5.38	79.1	57.0	68.0
July	4.40	82.2	61.1	71.6
August	3.85	79.8	58.8	69.3
September	2.95	73.2	49.1	61.1
October	2.30	60.4	36.9	48.7
November	1.59	42.9	23.9	33.4
December	1.03	27.2	10.6	18.9

Source: High Plains Regional Climate Center, http://climod.unl.edu/

2.1.5 Population/Demographics

According to the U.S. Census Bureau, the Kossuth County population decreased 2.8 percent from 2010 to 2016 overall. The only city that increased in population was the city of Lakota with nearly 12 percent increase. The jurisdiction with the largest decrease was Fenton, with a decrease of 6.5 percent**. Table 2-2** provides the populations for each city and the unincorporated county for the 2010 decennial census and the 2016 Annual Population Estimates with the number and percent change from 2010 to 2016.

Table 2-2: Kossuth County Population 2010-2016 by City

Jurisdiction	2010 Census Population	2016 Population Estimate	# Change 2010-2016	% Change 2010-2016
Algona	5,560	5,515	-45	-0.8%
Bancroft	732	709	-23	-3.1%
Burt	533	505	-28	-5.3%
Fenton	279	261	-18	-6.5%
Lakota	255	285	30	11.8%
Ledyard	130	126	-4	-3.1%
Lone Rock	146	141	-5	-3.4%
Lu Verne	261	252	-9	-3.4%
Swea City	536	516	-20	-3.7%
Titonka	476	448	-28	-5.9%
Wesley	390	378	-12	-3.1%
West Bend*	785	755	-30	-3.8%
Whittemore	504	486	-18	-3.6%
Unincorporated	4,956	4,737	-219	-4.4%
Total	15,543	15,114	-429	-2.8%

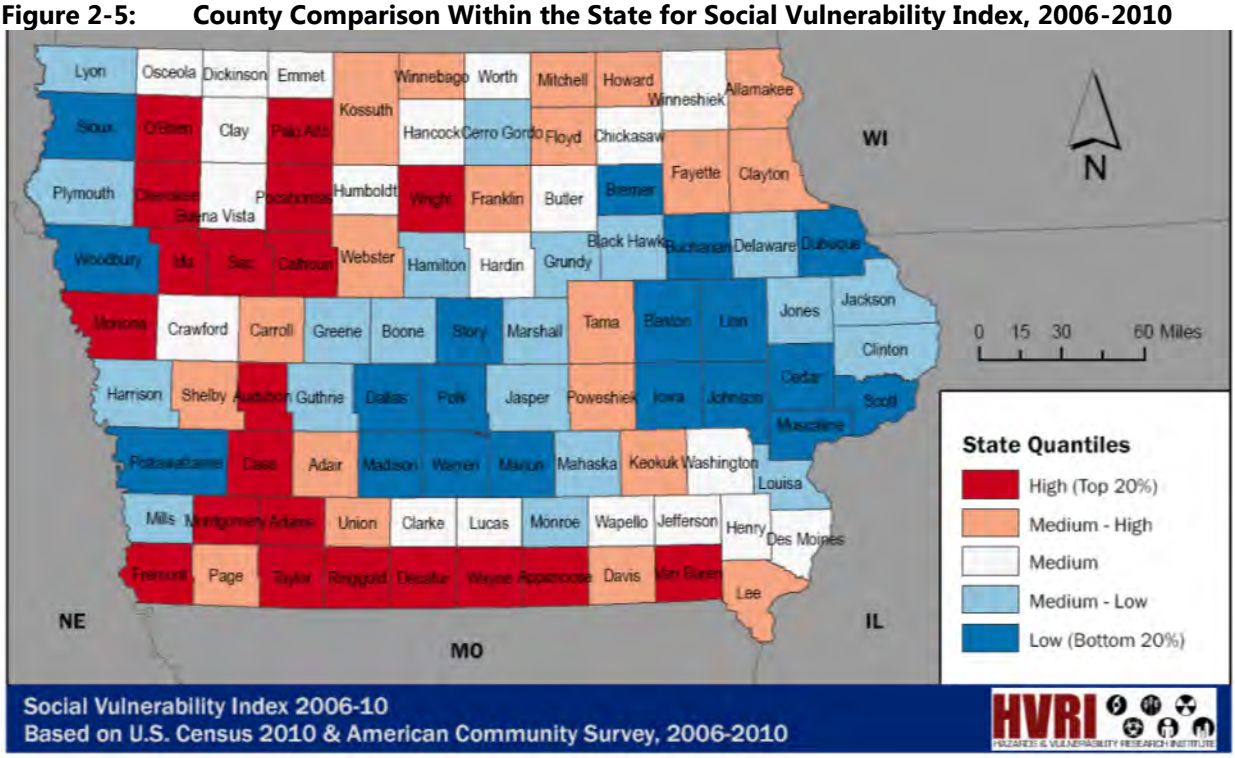
Source: U.S. Census Bureau: 2010 Decennial Census, 2016 Population Estimates. *portions of this city extend into adjacent county – the population total is for the entire corporate limits including portion in adjacent county. Unincorporated Kossuth County Population was estimated by subtracting populations of incorporated cities from the total Kossuth County populations.

According to the July 1, 2016 Population Estimates, 5.7 percent of the population is under age 5 and 22.7 percent of the population is over age 65 in Kossuth County. According to the 2015 American Community Survey, 5-year estimates, there were 6,273 households with an average household size of 2.23 people.

The Hazards and Vulnerability Research Institute at the University of South Carolina developed the Social Vulnerability Index (SoVI ®) to evaluate and rank the ability to respond to, cope with, recover from, and adapt to disasters. The index synthesizes 30 socioeconomic variables, which the research literature suggests contributes to reduction in a community's ability to prepare for, respond to, and recover from hazards. SoVI ® data sources include primarily those from the United States Census Bureau.

Figure 2-5 shows that Kossuth County has a medium-high Social Vulnerability Index. The medium-high index indicates that Kossuth County is generally less able to cope and recover from disasters as counties with a lower index.

Figure 2-5: County Comparison Within the State for Social Vulnerability Index, 2006-2010



Source: Hazards and Vulnerability Research Institute, http://webra.cas.sc.edu/hvri/products/sovi2010_img/PDF/Iowa_0610.pdf
http://webra.cas.sc.edu/hvri/products/sovi2010_data.aspx;

Table 2-3 and **Table 2-4** provide additional demographic and economic indicators for Kossuth County. The Kossuth County values are for all of Kossuth County, including the incorporated cities.

Table 2-3: Unemployment, Income, and Poverty Demographics, Kossuth County, Iowa

Jurisdiction	Population 16 Years and Over	Population 16 Years and Over in the Labor Force	Unemployment Rate	Median Household Income	Percent Below Poverty Level
Kossuth County	12,263	7,959	0.6	$51,496	9
Algona	4,384	2,785	0.8	$50,512	7.4
Bancroft	571	340	2.6	$44,375	12
Burt	420	228	3.1	$39,333	24.4
Fenton	243	162	5.5	$49,583	8
Lakota	204	105	5.6	$30,833	21
Ledyard	105	59	5.1	$34,167	7.7
Lone Rock	119	71	4.5	$45,313	5.9
Lu Verne	255	169	5.7	$34,250	28.9
Swea City	418	279	1.9	$31,522	18.8
Titonka	418	240	4.6	$35,769	13.7
Wesley	283	196	3.1	$46,750	10.5
West Bend*	721	451	1.4	$44,766	11.5
Whittemore	384	273	1.9	$42,500	11

Source: U.S. Census, 2015 American Community Survey, 5-year Estimates, *portions of this city extends into adjacent county – the census data is for the entire corporate limits including portion in adjacent county

Table 2-4: Educational Attainment, Kossuth County, Iowa

Geography	Population 25 years and over	Percent 25 years and over - Less than 9th grade	Percent high school graduate or higher	Percent bachelor's degree or higher
Kossuth County	10,829	1.8	93.9	19.1
Algona	3,987	2	94.4	22.6
Bancroft	479	3.8	91.4	17.1
Burt	346	3.2	87.3	7.8
Fenton	218	3.2	91.7	9.2
Lakota	184	10.3	82.6	10.9
Ledyard	89	0	92.1	11.2
Lone Rock	109	1.8	82.6	11
Lu Verne	216	0	82.4	7.9
Swea City	348	1.4	88.8	16.7
Titonka	331	4.5	85.5	15.4
Wesley	230	4.3	89.6	10.4
West Bend*	632	5.2	92.2	13
Whittemore	338	1.8	97.6	10.4

Source: U.S. Census, 2015 American Community Survey, 5-year Estimates, *portions of this city extend into adjacent county – the census data is for the entire corporate limits including portion in adjacent county.

2.1.6 Occupations/Employers

Table 2-5 provides occupation statistics for the incorporated cities and the county as a whole for the civilian employed population 16 years and over.

Table 2-5: Occupation Statistics, Kossuth County, Iowa

Geography	Civilian employed population 16 years and over	Management, business, science, and arts occupations	Service occupations	Sales and office occupations	Natural resources, construction, and maintenance occupations	Production, transportation, and material moving occupations
Kossuth County	7,788	34	15.6	20.7	11	18.7
Algona	2,759	35.3	17.3	22.4	6.9	18.2
Bancroft	329	29.5	11.9	24.9	13.7	20.1
Burt	217	15.7	22.6	36.4	7.4	18
Fenton	144	27.1	17.4	16	16	23.6
Lakota	101	29.7	17.8	13.9	14.9	23.8
Ledyard	58	31	24.1	20.7	13.8	10.3
Lone Rock	68	19.1	16.2	25	13.2	26.5
Lu Verne	157	14.6	18.5	25.5	13.4	28
Swea City	274	24.8	20.1	20.8	10.6	23.7
Titonka	224	17.4	21.4	28.1	17	16.1
Wesley	190	26.8	20	19.5	14.2	19.5
West Bend*	444	26.4	19.6	20	15.3	18.7
Whittemore	268	20.5	17.9	25.4	12.3	23.9

Source: U.S. Census, 2015 American Community Survey, 5-year Estimates, *portions of these cities extend into adjacent counties – the census data is for the entire corporate limits including portions in adjacent counties.

Table 2-6: Major Employers, Kossuth County, Iowa

Snap-On Tools Algona Plant	
Location: Algona, Iowa	**Employees:** 440 FT
Product or Service: Industrial tool boxes	**Office function:** branch
Hormel Foods Corp	
Location: Algona, Iowa	**Employees:** 250 FT
Product or Service: meat processing	**Office function:** branch
Pharmacists Mutual Insurance Company	
Location: Algona, Iowa	**Employees:** 235 FT
Product or Service: Insurance Provider	**Office function:** branch
Algona Community School District	
Location: Algona, IA	**Employees:** 200 FT/ 12 PT
Product or Service: Educations	**Office function:** k-12 school
Kossuth Regional Health Ctr	
Location: Algona, Iowa	**Employees:** 177 FT/55 PT/29 Seas
Product or Service: healthcare hospital & clinics	**Office function:** branch
Smithfield Hog Production Division	
Location: Algona, Iowa	**Employees:** 145 FT/ 6 PT
Product or Service: Agriculture	**Office function:** Headquarters
MaxYield Cooperative	
Location: West Bend, IA	**Employees:** 134 FT / 25 PT
Product or Service: Agriculture products	**Office function:** Headquarters
Kossuth County Courthouse	
Location: Algona, Iowa	**Employees:** 131 FT/ 22 PT/4 Seas
Product or Service: County Government	**Office function:** County Courthouse
Aluma Ltd	
Location: Bancroft, IA	**Employees:** 128 FT / 4 PT
Product or Service: Manufacture trailers	**Office function:**
StateLine Cooperative	
Location: Burt, Iowa	**Employees:** 110 FT/8 PT/25 Seas
Product or Service: Agricultural products	**Office function:** Headquarters
Good Samaritan Ctr	
Location: Algona, Iowa	**Employees:** 100 FT/50 PT/10 Seas
Product or Service: Nursing Home	**Office function:** branch
Universal Manufacturing Co	
Location: Algona, Iowa	**Employees:** 84 FT
Product or Service: Motor parts & accessories	**Office function:** headquarters
Exceptional Opportunities Inc	
Location: Burt, Iowa	**Employees:** 79 FT/43 PT/5 Seas.
Product or Service: Facility for the mentally & physically handicapped	**Office function:** headquarters
Brand Fx Body Co	
Location: Swea City, Iowa	**Employees:** 76 FT/ 1 PT
Product or Service: Aluminum trailers	**Office function:**
DuPont Pioneer (Kossuth locations)	
Location: Algona, Iowa	**Employees:** 69 FT/ 5 PT/600 Seas
Product or Service: Seed corn production/research. Data listed is for both plants.	**Office function:** Branch
Bishop Garrigan High School	
Location: Algona, Iowa	**Employees:** 60 FT / 25 PT
Product or Service: Education (Private School)	**Office function:**
Country Maid	
Location: West Bend, Iowa	**Employees:** 66 FT/2 PT/ 5 Seas.
Product or Service: Frozen fruit-filled pastry for fundraising purposes	**Office function:** Headquarters

Ernie Williams	
Location: Algona, Iowa	**Employees:** 32 FT
Product or Service: John Deere and Harley-Davidson dealer	**Office function:** Headquarters
Green Plains Renewable Energy	
Location: Lakota, Iowa	**Employees:** 64 FT
Product or Service: Ethanol Production	**Office function:**
Hy-Vee	
Location: Algona, Iowa	**Employees:** 60 FT/ 170 PT
Product or Service: Grocery Store	**Office function:** branch
Iowa State Bank	
Location: Algona, Iowa	**Employees:** 50 FT
Product or Service: Financial Services	**Office function:** Main Branch/Headquarters
Keuhl & Payer - I & S Group	
Location: Algona, Iowa	**Employees:** 8 FT/2 Seas
Product or Service: Engineering and Surveying	**Office function:**
Kossuth Fabricators (KOFAB)	
Location: Algona, Iowa	**Employees:** 71 FT/2 PT
Product or Service: Food processing equipment	**Office function:** Headquarters
New Cooperative, Inc.	
Location: Bode, IA	**Employees:** 4 FT
Product or Service:	**Office function:**
North Union Community Schools	
Location: Swea City, Iowa	**Employees:** 64 FT/15 PT/30 Seas
Product or Service: Education	**Office function:** Public School
Red Power (Kossuth Locations)	
Location: IA	**Employees:** 20 FT
Product or Service: Farm equipment sales & service	**Office function:**
Stueve Construction	
Location: Algona, Iowa	**Employees:** 14 FT
Product or Service: Design-build construction firm	**Office function:** Single Location
West Bend Mallard School	
Location: West Bend, Iowa (Kossuth/Palo Alto)	**Employees:** 60 FT
Product or Service: Education	**Office function:** School

Source: Mid Iowa Growth Partnership, http://www.midiowagrowth.com/locate-or-expand-here/business-climate/leading-employers/

2.1.7 Agriculture

Because of the fertility of the soils in Kossuth County and the climate conditions, agricultural crops and livestock are important contributors to the economy of Kossuth County.

According to the 2012 Census of Agriculture there were 1,349 farms in the County covering 599,439 acres of land (96.3 percent of the 972.72 sq. miles of land area (622,540.8 acres) in the County). Crop and livestock production are visible parts of the agricultural economy, but many related businesses contribute by producing, processing, and marketing farm and food products. These businesses generate income, employment and economic activity throughout the region. Farms on average were 444 acres. Kossuth County agriculture and agriculture-related industries provide 3,869 jobs, representing 36.4 percent of the County's workforce. Kossuth County agriculture and economy contributions are summarized in additional detail in Section 3.2.2 of Chapter 3.

2.1.8 FEMA Hazard Mitigation Assistance Grants in Planning Area

According to the Iowa Homeland Security and Emergency Management Department, Kossuth County has not received any Hazard Mitigation Assistance Grants since 1996. Data was not available for any grants that may have been received prior to 1996.

2.2 City/County Capabilities

Unincorporated Kossuth County is governed by a five-member Board of Supervisors. Kossuth County has an active Emergency Management Agency that coordinates emergency management capabilities in the County. Kossuth County participates in the Emergency Notification System (CCENS), part of the Alert Iowa system contracted with WENS Inspiron. All jurisdictions within the County have the ability to utilize this service. **Table 2-7** provides additional capability information for the unincorporated county and incorporated cities.

Table 2-7: Mitigation Capabilities

	Kossuth County	Algona	Bancroft	Burt	Fenton	Lakota	Ledyard	Lone Rock	Lu Verne	Swea City	Titonka	Wesley	Whittemore
Planning Capabilities													
Comprehensive Plan	2013	yes	no		2014	no	yes		yes	yes	yes	no	2003
Builder's Plan	no	no	no		N/A	no	yes	2017	yes	no	no	no	
Capital Improvement Plan	no	2016	no		no	no	no	no	no	yes	no	no	
Local Emergency Operations Plan	no	yes	no		yes	no	county	2012	yes	yes	no		
County Emergency Operations Plan	2016	yes	no		yes	yes	yes	yes	yes	yes	yes	yes	2017
Local Recovery Plan	yes	no	no		no	no	yes	yes	yes	no	no	no	
County Recovery Plan	yes	no	no			yes	yes		yes	yes	no	yes	2015
City Mitigation Plan	no	no	no		2013	no	yes	yes	2013	yes	no	yes	2004
County Mitigation Plan	2013	no	no		2013	yes	yes		2013	yes	N/A	yes	2013
Economic Development Plan	yes	no	no		no	no	no		no	yes	no	no	
Transportation Plan	yes	no	no		yes	no	yes		yes	no	no	no	2017
Land-use Plan		no	no		no	no	no		yes	no	no	no	
Flood Mitigation Assistance (FMA) Plan		no	no		yes	no	yes	no	no	yes	no		
Watershed Plan		no	no		no	no	no	no	no	no	no		
Firewise or other fire mitigation plan	no	no	no		no	no	no		no	no	N/A	no	
Critical Facilities Plan (Mitigation/Response/Recovery)	2013	no	no			no	no	no		yes	no		2017

	Kossuth County	Algona	Bancroft	Burt	Fenton	Lakota	Ledyard	Lone Rock	Lu Verne	Swea City	Titonka	Wesley	Whittemore
Policies/Ordinances													
Zoning Ordinance	yes	yes	yes		no	no	yes	no	yes	yes	1999	Restricted residence	yes
Building Code		IBC 2012			2016	no	yes	no	yes	yes	yes		yes
Floodplain Ordinance		1999			1993	no	yes	no	2017	yes	no		
Subdivision Ordinance		yes	yes			no	no	no	no	no	no	no	
Tree Trimming Ordinance	no	yes	yes		2016	yes	no	2017	no	yes	yes	no	2017
Nuisance Ordinance	yes	yes	yes		2016	yes	yes	2017	yes	yes	yes	yes	2017
Storm Water Ordinance	no	no	yes		no	no	no	2017	yes	yes	no	no	2017
Drainage Ordinance	yes	no	yes		no	no	no	2017	yes	yes	no	no	County
Site Plan Review Requirements		yes	yes		N/A	no	no	no	no		N/A	no	
Historic Preservation Ordinance		no	no		N/A	no	no	no	no		no	no	
Landscape Ordinance	no	no	no		N/A	no	no	yes	no		no	no	
Iowa Wetlands and Riparian Areas Conservation Plan		N/A	no		N/A	no	no	no	no		no	no	
Debris Management Plan					yes	no	yes	yes	yes		no	no	
Programs													
Zoning/Land Use Restrictions		yes	no		yes	no	no	no	County		yes	no	
Codes Building Site/Design		yes	no		yes	no	yes	no	no		no	no	
National Flood Insurance Program			no		N/A	no	yes	no			no	no	
		yes	no		yes		no		yes		no	no	
NFIP Community Rating System (CRS) Participating Community	yes	no	no			yes	no	no	no		no	no	

	Kossuth County	Algona	Bancroft	Burt	Fenton	Lakota	Ledyard	Lone Rock	Lu Verne	Swea City	Titonka	Wesley	Whittemore
Hazard Awareness Program	yes		no		N/A	no	yes	no	DNR Tier II		no	no	
National Weather Service (NWS) Storm Ready		no	no		yes	no	yes	yes	County		N/A	no	County
Firewise Community Certification					no								
Building Code Effectiveness Grading (BCEGs)		yes	no		N/A	no	no	no	no		no	no	
ISO Fire Rating		PPC 05/5Y			N/A			7			6	7	Class-05/5X
Economic Development Program		yes	yes		Yes	no	no	no	no		County	no	Yes
Land Use Program		no	yes		Yes	no	no	no	no		no	no	
Public Education/Awareness	no	no	no		N/A	no	no		Fire Prepare dness		no	no	yes
Property Acquisition		no	no		N/A	no	no	no	no		yes	no	
Planning/Zoning Boards		yes	yes		no	no	no	no	yes		yes	no	yes
Stream Maintenance Program		no	no		no	no	no	yes	no		no	no	
Tree Trimming Program	no	yes	yes		yes	no	no	yes	no		no	no	yes
Engineering Studies for Streams (Local/County/Regional)		no	no		no	no	no	yes	no		no	no	Region al Base
Mutual Aid Agreements	yes	yes	yes		yes	yes	yes	no	yes		yes	no	yes
Studies/Reports/Maps													
Hazard Analysis/Risk Assessment (City)	no	no	no		yes	no	yes	yes	yes		no	no	
Hazard Analysis/Risk Assessment (County)	2013	N/A	no		yes	no	yes		yes		no	no	yes
Flood Insurance Maps							yes					no	

	Kossuth County	Algona	Bancroft	Burt	Fenton	Lakota	Ledyard	Lone Rock	Lu Verne	Swea City	Titonka	Wesley	Whittemore
FEMA Flood Insurance Study (Detailed)												no	
Evacuation Route Map	no	no	no		no	no	yes	yes	no		no	no	
Critical Facilities Inventory	2013	no	no		yes	no	Tier II	yes	yes		no	no	yes
Vulnerable Population Inventory	no	no	no		no	no	no		no		no	no	
Land Use Map		yes	no		no	no	no		no		no	no	
Staff/Department													
Building Code Official		yes			N/A	no	no	no	Clerk		no	no	
Building Inspector		yes	no		N/A	no	no	no	no		no	no	
Mapping Specialist (GIS)	yes	no	no		N/A	no	County	no	County		County	no	yes
Engineer	yes	no			N/A	no	County	Water/ Sewer	no		County	no	yes
Development Planner		no	NIACOG		N/A	no	no		no		no	no	
Public Works Official	no	yes	yes		Yes	yes	no	yes	yes		yes	yes	yes
Emergency Management Coordinator	yes	no	County		County	County	yes	Mayor	yes		County	county	yes
NFIP Floodplain Administrator		yes	no		No	no	yes	no	yes		no	no	
Bomb and/or Arson Squad	no	no	no		no	no	no	no	no		no	no	
Emergency Response Team	yes	yes	no		no	yes	no	Yes	no		Yes	yes	yes
Hazardous Materials Expert	yes	Fire – Region -al	no		no	no	EMA	Yes	yes		no	no	Region -al LAPC
Local Emergency Planning Committee	yes	yes	no		County	yes	yes	Yes	yes		no		KEPT
County Emergency Management Commission	yes	yes	no		Yes	yes	yes		yes		no		Region -al LAPC
Sanitation Department	yes	no	County		yes	yes	no	County	yes		Yes	yes	yes
Transportation Department	no	yes	no		no	no	no	no	no		no	no	County

	Kossuth County	Algona	Bancroft	Burt	Fenton	Lakota	Ledyard	Lone Rock	Lu Verne	Swea City	Titonka	Wesley	Whittemore
Economic Development Department	yes	yes	yes		no	no	no	no	no		no	no	County
Housing Department		no	no		no	no	no	no	no		no	no	
Planning Consultant													
Regional Planning Agencies													
Historic Preservation		no	no		no	no	no	no	no		no	no	
Non-Governmental Organizations (NGOs)													
American Red Cross	no	no	no		no	no	yes	no	yes	no	no	no	
Salvation Army	no	no	no		no	no	yes	no	yes	no	no	no	
Veterans Groups	yes	yes	yes		yes	yes	no	yes	no	yes	yes	yes	Yes
Local Environmental Organization	yes	no	no		no	no	no	no	no	KCEDC	no	no	
Homeowner Associations	no	yes	no		no	no	no	no	no	no	no	no	
Neighborhood Associations	no	country club, rural subdivisions	no		no	no	no	no	no	no	no	no	
Chamber of Commerce	yes	yes	yes		no	no	no	no	no	no	no	no	
Community Organizations (Lions, Kiwanis, etc.	yes	yes	yes		no	yes	no	yes	no	yes	yes	yes	Yes
Financial Resources													
Ability to apply for Community Development Block Grants		yes	yes		yes	yes	no	yes	yes	yes	yes	yes	yes
Ability to fund projects through Capital Improvements funding		yes	yes		yes	yes	no	yes	no	yes	no	yes	
Authority to levy taxes for a specific purpose		yes	yes		yes	yes	yes	yes	yes	yes	yes	yes	yes
Fees for water, sewer, gas, or electric services		yes	yes		yes	yes	yes	yes	yes	yes	yes	yes	yes

	Kossuth County	Algona	Bancroft	Burt	Fenton	Lakota	Ledyard	Lone Rock	Lu Verne	Swea City	Titonka	Wesley	Whittemore
Impact fees for new development		yes	no		yes	no	no	no	no	yes	no		
Ability to incur debt through general obligation bonds		yes	yes		yes	yes	no	no	no	yes	yes	yes	yes
Ability to incur debt through special tax bonds		yes	yes		yes	no	no	no	no	yes	yes		
Ability to incur debt through private activities		no	no		yes	no	no	no	no	N/A	no		
Ability to withhold spending in hazard prone areas		yes	no		no	yes	no	yes	no	N/A	no		

2.3 Public School District Profiles and Mitigation Capabilities

This section includes general profile information for three Kossuth County school districts that are participants in this plan. The school districts with buildings in the planning area are as follows.

- Algona Public School District
- LuVerne Public School District
- North Kossuth Public School District

Figure 2-6 provides the boundaries of the school districts in Kossuth County and **Table 2-8** that follows provides location and enrollment information for each school district.

Figure 2-6: Kossuth County, Iowa Public School Districts

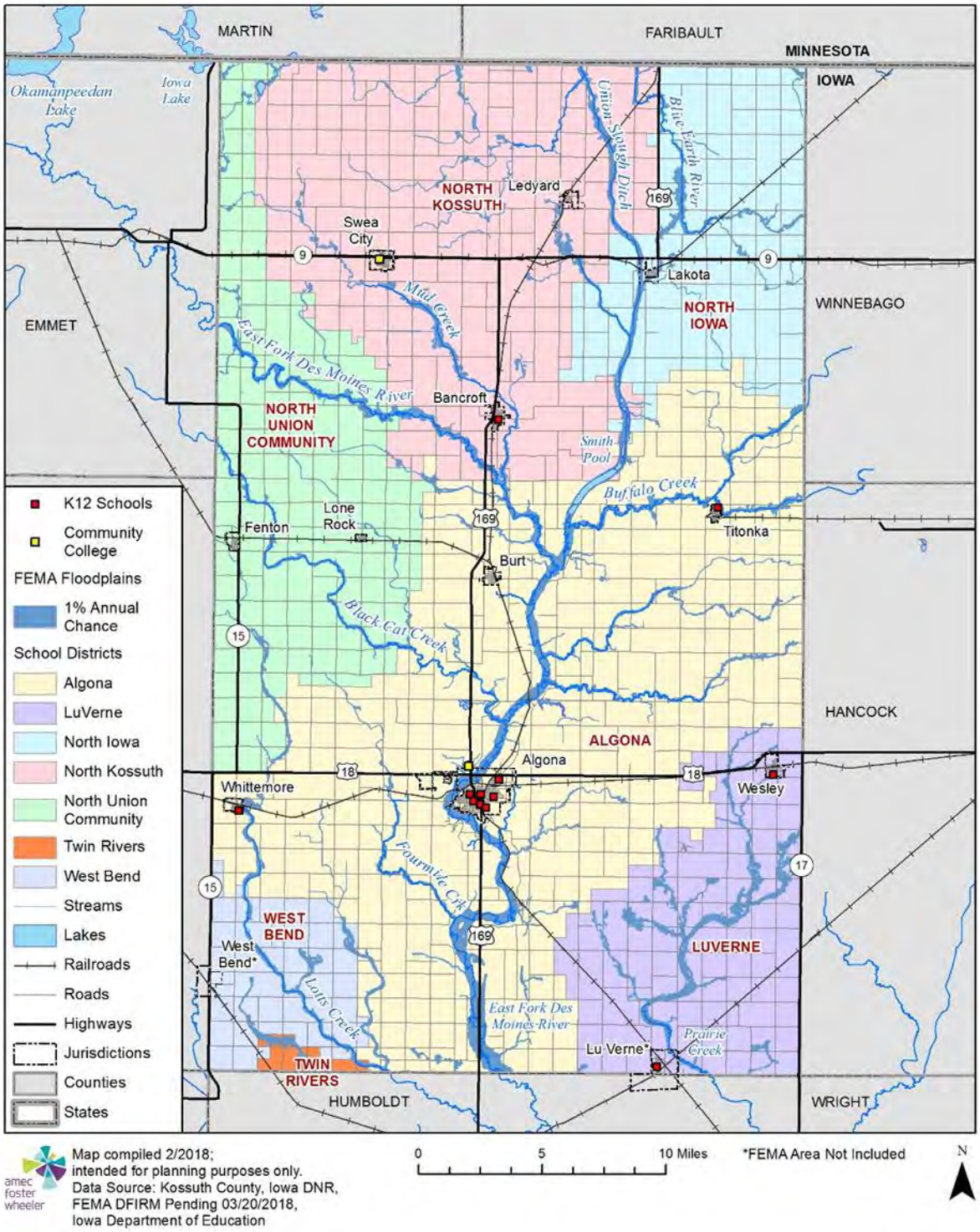


Table 2-8: Kossuth County School Buildings and Enrollment Data, 2015-2016

District Name/Building Name	Total Enrollment
Algona	**1,512**
Algona High School	461
Algona Middle School	409
Bertha Godfrey Elementary School	214
Bryant Elementary School	188
Lucia Wallace Elementary School	214
Seton Preschool	26
LuVerne	**85**
LuVerne Elementary School	85
North Kossuth	**316**
North Kossuth Elementary School	156
North Union Middle School	150
St. John's Elementary Preschool	10
Grand Total	**1,913**

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

Potential capabilities to implement mitigation programs and projects can vary among school districts. To determine mitigation capabilities, each of the participating school districts completed a Data Collection Guide to report planning, personnel, fiscal, and other capabilities related to implementation of mitigation programs and projects. **Table 2-9** provides a summary of the reported capabilities for each participating school district.

Table 2-9: Summary of Mitigation Capabilities, Kossuth County Public School Districts

	Algona CSD	Lu Verne CSD	North Kossuth CSD
Planning Elements			
Master Plan	N/A	No	No
Capital Improvement Plan	Yes	No	Yes
School Emergency Plan	Yes	Yes	Yes
Weapons Policy	Yes	Yes	Yes
Personnel Resources			
Full-time building official (i.e. principal)	Yes	Yes	Yes
Emergency Manager	No	No	Yes
Grant Writer	No	No	Yes
Public Information Officer	No	No	Yes
Financial Resources			
Capital Improvements project funding	Yes	Yes	No
Local funds	Yes	N/A	No
General obligation bonds	Yes	No	No
Special tax bonds	Yes	No	No
Private activities/donations	Yes	Yes	No
State and federal funds	Yes	N/A	No
Other			
Public Address/Emergency Alert System	Yes	Yes	Yes
NOAA Weather Radios	No	No	Yes
Mitigation Programs to reduce losses / Public Education Programs	N/A	N/A	N/A
Tornado Shelter/Saferoom	Yes (not to FEMA standards)	Yes (not to FEMA standards)	Yes (not to FEMA standards)
Campus Police	No	No	No

Source: Data Collection Guides completed by each school district – 2017

3 RISK ASSESSMENT

44 CFR Requirement §201.6(c)(2): [The plan shall include] A risk assessment that provides the factual basis for activities proposed in the strategy to reduce losses from identified hazards. Local risk assessments must provide sufficient information to enable the jurisdiction to identify and prioritize appropriate mitigation actions to reduce losses from identified hazards.

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

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

Step 1 - Describe Hazards

Step 2 - Identify Community Assets

Step 3 - Analyze Risks

Step 4 - Summarize Vulnerability

This chapter is divided into six main parts:

- **Section 3.1 Hazard Identification** identifies the hazards that threaten the planning area and the methodology utilized to score or rank the hazards;
- **Section 3.2 Assets at Risk** provides the planning area's total exposure to natural hazards, considering critical facilities and other community assets at risk;
- **Section 3.3 Development Since 2013 Plan Update** discusses what changes in development have occurred since the previous Hazard Mitigation Plan;
- **Section 3.4 Future Land Use and Development** discusses areas of planned future development;
- **Section 3.5 Hazard Profiles and Vulnerability** for each hazard, this section is divided into two parts: 1) Hazard Profile discusses the threat to the planning area, the geographic location/extent at risk, previous occurrences of hazard events and probability of future occurrence; and 2) Vulnerability Assessment further discusses specific assets at risk as well as loss estimates. Specifically, where data is available, this section defines and quantifies populations, buildings, critical facilities and other community assets at risk to natural hazards with estimates of potential losses to those assets, where possible;
- **Section 3.6 Hazard Analysis Summary** provides a tabular summary of the hazard ranking for each jurisdiction in the planning area.

3.1 Hazard Identification

Requirement §201.6(c)(2)(i): [The risk assessment shall include a] description of the type…of all natural hazards that can affect the jurisdiction.

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

- Animal/Plant/Crop Disease
- Dam Failure

- Drought
- Earthquake
- Extreme Heat
- Flash Flood
- Grass or Wildland Fire
- Hazardous Materials Incident
- Human Disease
- Infrastructure Failure
- Radiological Incident
- River Flooding
- Severe Winter Storm
- Terrorism
- Thunderstorm/Lightning/Hail
- Tornado/Windstorm
- Transportation Incident

Sections 3.1.1 through 3.1.3 describe how these hazards were identified for this plan update.

3.1.1 Review of Existing Mitigation Plans

Prior to 2012, Hazard Mitigation Planning in Kossuth County was implemented on a jurisdictional basis. In 2012 the unincorporated county and incorporated municipalities came together to coordinate multi-jurisdictional mitigation planning for the entire Kossuth County planning area. This coordinated effort resulted in the *Kossuth County, Iowa Multi-Jurisdictional Hazard Mitigation Plan*, approved by FEMA on July 25, 2013. To identify hazards to include in the Risk Assessment update, a comparison was performed between the hazard identification in the *2013 Iowa State Hazard Mitigation Plan* and the *2013 Kossuth County Multi-Jurisdictional Hazard Mitigation Plan*. **Table 3-1** provides the details of the comparison.

Table 3-1: Hazard Comparison Chart

	2013 State Plan	2013 Kossuth County Plan
NATURAL HAZARDS	Animal/Crop/Plant Disease	Animal/Plant/Crop Disease
	Dam/Levee Failure	Not Included
	Drought	Drought
	Earthquake	Earthquake
	Expansive Soils	Not Included
	Extreme Heat	Extreme Heat
	Flash Flood	Flash Flood
	River Flooding	River Flooding
	Grass or Wildland Fire	Grass or Wildland Fire
	Landslide	Not Included
	Severe Winter Storm	Severe Winter Storm
	Sinkholes	Not Included
	Thunderstorm/Lightning/Hail	Hailstorm
		Thunderstorms and Lightning

	Tornado/Windstorm	Tornado
		Windstorm
TECHNOLOGICAL	Hazardous Materials	Hazardous Materials
	Human Disease	Human Disease
	Infrastructure Failure	Infrastructure Failure
	Radiological	Radiological
	Transportation Incident	Transportation Incident
HUMAN CAUSED	Terrorism	Terrorism

3.1.2 Review Disaster Declaration History

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

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

Table 3-2 lists federal disaster declarations that included Kossuth County for the period from 1965 to 2016. Two declarations occurred subsequent to approval of the previous plan; the July 2014 declaration for severe storms, tornadoes, straight-line winds, and flooding, and the October 2016 declaration for severe storms and flooding.

Table 3-2: Disaster Declarations that included Kossuth County, Iowa, 1965-2016

Disaster Number	Declaration Date	Title	Incident Begin Date	Incident End Date
8	6/11/1953	Flood	6/11/1953	6/11/1953
17	6/23/1954	Flood	6/23/1954	6/23/1954
86	7/5/1958	Floods	7/5/1958	7/5/1958
111	3/31/1961	Floods	3/31/1961	3/31/1961
133	9/5/1962	Floods	9/5/1962	9/5/1962
193	4/22/1965	Flooding	4/22/1965	4/22/1965
590	7/1/1979	High Winds & Tornadoes	7/1/1979	7/1/1979
715	6/27/1984	Severe Storms, Tornadoes, Hail & Floods	6/7/1984	6/8/1984
911	7/12/1991	Severe Storms & Flooding	6/1/1991	6/15/1991
928	12/26/1991	Ice Storm	10/31/1991	11/29/1991
986	4/26/1993	Severe Storms & Flooding	3/26/1993	4/12/1993
996	7/9/1993	Severe Storms & Flooding	4/13/1993	10/1/1993
1230	7/2/1998	Severe Storms, Tornadoes and Flooding	6/13/1998	7/15/1998
1518	5/25/2004	Severe Storms, Tornadoes, and Flooding	5/19/2004	6/24/2004
3239	9/10/2005	Hurricane Katrina Evacuation	8/29/2005	10/1/2005
3275	3/30/2007	Snow	2/28/2007	3/2/2007
1763	5/27/2008	Severe Storms, Tornadoes, and Flooding	5/25/2008	8/13/2008
1930	7/29/2010	Severe Storms, Flooding, and Tornadoes	6/1/2010	8/31/2010
4184	7/24/2014	Severe Storms, Tornadoes, Straight-Line Winds, and Flooding	6/14/2014	6/23/2014
4289	10/31/2016	Severe Storms and Flooding	9/20/2016	10/3/2016

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

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

Table 3-3 provides the USDA Secretarial disaster declarations that included Kossuth County from 2012 to 2016. Details on USDA declarations prior to 2012 are not available.

Table 3-3: USDA Secretarial Disaster Declarations Including Kossuth Co. (2012-2016)

County	Crop Disaster Year	Designation Number	Drought	Excessive Rain, Moisture, Humidity	Wind, High Winds	Fire, Wildfire	Heat, Excessive Heat High Temp. (Incl. Low Humidity)	Frost, FREEZE	Insects	Begin Date	Description of Disaster
Kossuth	2012	S3337	1	0	1	1	1	0	1	8/7/2012	Drought-FAST TRACK
Kossuth	2012	S3361	1	0	1	1	1	0	1	8/21/2012	Drought-FAST TRACK
Kossuth	2012	S3375	1	0	1	1	1	0	1	8/28/2012	Drought-FAST TRACK
Kossuth	2012	S3390	1	0	1	1	1	0	1	7/17/2012	Drought-FAST TRACK
Kossuth	2012	S3398	1	0	1	1	1	0	1	7/24/2012	Drought-FAST TRACK
Kossuth	2013	S3498	1	0	1	1	1	0	1	3/15/2013	Drought-FAST TRACK
Kossuth	2013	S3553	0	1	0	0	0	1	0	1/1/2013	Heavy rainfall followed by freezing temperatures, and multiple periods of thawing and refreezing, resulting in winterkill
Kossuth	2013	S3614	1	0	1	1	1	0	1	8/27/2013	Drought-FAST TRACK

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

3.1.3 Research Additional Sources

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

- Kossuth County Flood Insurance Rate Map, FEMA
- Kossuth County Emergency Management
- Kossuth County Preliminary Flood Insurance Study, June 30, 2016 FEMA
- Kossuth County Multi-Jurisdictional Hazard Mitigation Plan, 2013
- 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 (September 2013)
- Iowa Utilities Board
- National Drought Mitigation Center Drought Reporter
- National Oceanic and Atmospheric Administration's (NOAA) National Climatic Data Center
- SILVIS Lab, Department of Forest Ecology and Management, University of Wisconsin
- U.S. Army Corps of Engineers, National Levee Database
- 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)

3.1.4 Hazards Identified

Through the hazard identification review process, it was determined that all hazards profiled in the 2013 plan would be included in the plan update. The hazards identified for this plan update are listed below in alphabetical order

- Animal/Plant/Crop Disease
- Dam Failure
- Drought
- Earthquake
- Extreme Heat
- Flash Flood
- Grass or Wildland Fire
- Hazardous Materials Incident
- Human Disease
- Infrastructure Failure
- Radiological Incident
- River Flooding
- Severe Winter Storm
- Terrorism
- Thunderstorm/Lightning/Hail
- Tornado/Windstorm
- Transportation Incident

Of the 20 hazards identified in the *2013 State Hazard Mitigation Plan*, the following were eliminated from further review. Justification for elimination is also included:

- Levee Failure – Not included in previous plan. There are no known levees in Kossuth County
- Expansive Soils – Not included in previous plan. Level of risk associated with expansive soils is slight with little swelling clay potential
- Landslide – Not included in the previous plan. Any slides that may occur would be small and cause only minor damage with no threats to human safety and minimal threats to property
- Sinkholes – Not included in the previous plan. No or low occurrence in the county according to the committee.

Additionally, to maintain consistency and to facilitate the roll-up or summarization of hazards in the next State Plan Update, it was agreed that the hazard grouping/hazard naming for this update will be consistent with the 2013 State Plan.

3.1.5 Multi-Jurisdictional Risk Assessment

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

The majority of land area and populations in the City of West Bend is in adjacent Palo Alto County. According to Iowa Homeland Security & Emergency Management, this jurisdiction is considered an official city of Palo Alto County and will not be an official plan participant in this Kossuth County Plan. Although West Bend did not officially participate in the Kossuth County Plan, representatives were invited to participate in the planning process and review drafts as a stakeholder participant. Additionally, the portion of corporate limits that is on the Kossuth County side are included in the risk assessment, where data is available. It should be noted however, that since this jurisdiction is not an official participant of this plan, they may not have reviewed this data or provided concurrence.

Although 17 hazards with the potential to significantly affect the planning area were identified and selected for additional analysis, not all hazards impact every jurisdiction. **Table 3-4** provides a summary of the jurisdictions impacted by each hazard. An "x" indicates the jurisdiction is impacted by the hazard. A "N/A" indicates the hazard is not applicable to that jurisdiction.

Table 3-4: Hazards Identified for Each Jurisdiction

Jurisdiction	Animal/Crop/Plant Disease	Dam Failure	Drought	Earthquake	Extreme Heat	Flash Flood	Grass or Wildland Fire	Hazardous Materials Incident	Human Disease	Infrastructure Failure	Radiological Incident	River Flooding	Severe Winter Storm	Terrorism	Thunderstorm/Lightning/Hail	Tornado/Windstorm	Transportation Incident
Kossuth County	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X
Algona	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X
Bancroft	X	N/A	X	X	X	X	X	X	X	X	X	N/A	X	X	X	X	X
Burt	X	N/A	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X
Fenton	X	N/A	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X
Lakota	X	N/A	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X
Ledyard	X	N/A	X	X	X	X	X	X	X	X	X	N/A	X	X	X	X	X
Lone Rock	X	N/A	X	X	X	X	X	X	X	X	X	N/A	X	X	X	X	X
LuVerne	X	N/A	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X
Swea City	X	N/A	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X
Titonka	X	N/A	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X
Wesley	X	N/A	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X
Whittemore	X	N/A	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X
Algona CSD	X	N/A	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X
LuVerne CSD	X	N/A	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X
North Kossuth CSD	X	N/A	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X

3.1.6 Hazard Scoring Methodology

To maintain a reporting format consistent with the *2013 Iowa State Hazard Mitigation Plan*, the Kossuth County Hazard Mitigation Planning Committee (HMPC) used the same methodology to score and prioritize the hazards. This prioritization was based on a hazard scoring system that considers four elements of risk: probability, magnitude/severity, warning time, and duration. **Table 3-5** provides definitions for each of the four elements along with associated rating levels.

Table 3-5: Hazard Score Element Definitions and Rating Scales

Element/Score	Definitions
Probability: Reflects the likelihood of the hazard occurring again in the future, considering both the hazard's historical occurrence and the projected likelihood of the hazard occurring in any given year.	
1—Unlikely	Less than 10% probability in any given year (up to 1 in 10 chance of occurring), history of events is less than 10% likely or the event is unlikely but there is a possibility of its occurrence.
2—Occasional	Between 10% and 20% probability in any given year (up to 1 in 5 chance of occurring), history of events is greater than 10% but less than 20% or the event could possibly occur.
3—Likely	Between 20% and 33% probability in any given year (up to 1 in 3 chance of occurring), history of events is greater than 20% but less than 33% or the event is likely to occur.
4—Highly Likely	More than 33% probability in any given year (event has up to a 1 in 1 chance of occurring), history of events is greater than 33% likely or the event is highly likely to occur.
Magnitude / Severity: Assessment of severity in terms of injuries and fatalities, personal property, and infrastructure and the degree and extent with which the hazard affects the jurisdiction.	
1—Negligible	Less than 10% of property severely damaged, shutdown of facilities and services for less than 24 hours, and/or injuries /illnesses treatable with first aid.
2—Limited	10% to 25% of property severely damaged, shutdown of facilities and services for more than a week, and/or injuries/illnesses that do not result in permanent disability.
3—Critical	25% to 50% of property severely damaged, shutdown of facilities and services for at least 2 weeks, and/or injuries/illnesses that result in permanent disability.
4—Catastrophic	More than 50% of property severely damaged, shutdown of facilities and services for more than 30 days, and/or multiple deaths.
Warning Time: Rating of the potential amount of warning time that is available before the hazard occurs. This should be taken as an average warning time.	
1	More than 24 hours warning time
2	12 to 24 hours warning time
3	6 to 12 hours warning time
4	Minimal or no warning time (up to 6 hours warning)
Duration: A measure of the duration of time that the hazard will affect the jurisdiction.	
1	Less than 6 hours
2	Less than 1 day
3	Less than 1 week
4	More than one week

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

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

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

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

The HMPC determined overview hazard ranking scores for the planning area as a whole. The results of this overview are provided below in **Table 3-6**. Additionally, the hazard ranking overview is provided at the beginning of each hazard profile and vulnerability section. A detailed hazard summary by jurisdiction for

participating jurisdictions is provided at the conclusion of each hazard profile and vulnerability section to provide a summary of how the hazard varies by jurisdiction.

Table 3-6: Kossuth County Planning Area Hazard Ranking Results

Hazard	Probability	Magnitude	Warning Time	Duration	CPRI	Planning Significance
Animal/Plant/Crop Disease	1	3	4	4	2.35	Moderate
Dam Failure	1	1	4	3	1.65	Low
Drought	4	3	1	4	3.25	High
Earthquake	1	1	4	1	1.45	Low
Extreme Heat	3	2	1	3	2.40	Moderate
Flash Flood	4	1	2	1	2.50	Moderate
Grass or Wildland Fire	2	2	4	1	2.20	Moderate
Hazardous Materials Incident	3	1	4	1	2.35	Moderate
Human Disease	2	3	2	4	2.50	Moderate
Infrastructure Failure	4	2	4	3	3.30	High
Radiological Incident	1	1	4	4	1.75	Moderate
River Flooding	4	1	1	4	2.65	Moderate
Severe Winter Storm	4	2	3	4	3.25	High
Terrorism	1	4	4	4	2.65	Moderate
Thunderstorm/Lightning/Hail	4	2	2	2	2.90	Moderate
Tornado/Windstorm	4	4	3	1	3.55	High
Transportation Incident	4	4	4	1	3.70	High

3.1.7 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 increased prevalence of asthma and allergies.

3.2 Assets at Risk

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

3.2.1 Total Exposure of Population and Structures

Unincorporated County and Incorporated Cities

Table 3-7 shows the total population and building/improvement counts and values for the county and each city. Building exposure information was derived from inventory data associated with FEMA's loss estimation software HAZUS-MH contained in Census Blocks. Content values were also included and were estimated as a percentage of building value based on their property type, using FEMA/HAZUS estimated content replacement values. Those content values are 50% for residential, 100% for agriculture, commercial, education, government, and religion, and 150% for industrial. It should be noted that all values are in thousands of dollars and a value of $0 does not necessarily mean $0 but less than $1,000.

The methodology employed to extract the summary of building/improvement counts and values from the Hazus inventory is provided below:

- General Building Stock and Building Count layers were extracted from Hazus by Property Types (Agriculture, Commercial, Education, Government, Industrial, Religion, Residential).
- Census Blocks were spatially attributed based on jurisdiction boundaries.
- Census Blocks were summarized by Building Counts and Improved Values by Jurisdiction and Property Types.

Population data is based on the U.S. Census Bureau's annual population estimates. The contents exposure values were calculated based on usage type. The contents multipliers were derived from HAZUS and are defined below **Table 3-7**. 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).

Table 3-7: Population and Building Exposure by Jurisdiction-Unincorporated County and Incorporated Cities

Jurisdiction & 2016 Population	Property Type	Building Counts	Improved Value*	Content Value	Total Exposed Value
Algona 5,496	Agriculture	35	$6,221	$6,221	$12,442
	Commercial	290	$167,400	$167,400	$334,800
	Education	14	$19,692	$19,692	$39,384
	Government	12	$6,701	$6,701	$13,402
	Industrial	63	$51,710	$77,565	$129,275
	Religion	29	$29,424	$29,424	$58,848
	Residential	2,306	$532,506	$266,253	$798,759
	Total	**2,749**	**$813,654**	**$573,256**	**$1,386,910**
Bancroft 712	Agriculture	4	$932	$932	$1,864
	Commercial	35	$15,378	$15,378	$30,756
	Education	2	$3,528	$3,528	$7,056
	Government	1	$229	$229	$458
	Industrial	11	$10,580	$15,870	$26,450
	Religion	2	$1,653	$1,653	$3,306
	Residential	333	$83,217	$41,609	$124,826
	Total	**388**	**$115,517**	**$79,199**	**$194,716**
Burt 505	Agriculture	2	$238	$238	$476
	Commercial	19	$7,955	$7,955	$15,910
	Education	1	$342	$342	$684
	Government	1	$753	$753	$1,506
	Industrial	1	$119	$179	$298
	Religion	4	$3,034	$3,034	$6,068
	Residential	228	$39,218	$19,609	$58,827
	Total	**256**	**$51,659**	**$32,110**	**$83,769**
Fenton 312	Agriculture	2	$413	$413	$826
	Commercial	14	$2,602	$2,602	$5,204
	Education	0	$0	$0	$0
	Government	2	$320	$320	$640
	Industrial	4	$472	$708	$1,180
	Religion	4	$776	$776	$1,552
	Residential	165	$38,965	$19,483	$58,448
	Total	**191**	**$43,548**	**$24,302**	**$67,850**

Jurisdiction & 2016 Population	Property Type	Building Counts	Improved Value*	Content Value	Total Exposed Value
Lakota 211	Agriculture	3	$784	$784	$1,568
	Commercial	10	$3,990	$3,990	$7,980
	Education	2	$387	$387	$774
	Government	1	$183	$183	$366
	Industrial	3	$1,227	$1,841	$3,068
	Religion	3	$3,745	$3,745	$7,490
	Residential	126	$27,859	$13,930	$41,789
	Total	**148**	**$38,175**	**$24,859**	**$63,034**
Ledyard 100	Agriculture	3	$502	$502	$1,004
	Commercial	8	$2,298	$2,298	$4,596
	Education	1	$208	$208	$416
	Government	1	$903	$903	$1,806
	Industrial	1	$204	$306	$510
	Religion	2	$1,489	$1,489	$2,978
	Residential	79	$17,252	$8,626	$25,878
	Total	**95**	**$22,856**	**$14,332**	**$37,188**
Lone Rock 199	Agriculture	2	$442	$442	$884
	Commercial	8	$2,753	$2,753	$5,506
	Education	0	$0	$0	$0
	Government	0	$0	$0	$0
	Industrial	0	$0	$0	$0
	Religion	3	$1,428	$1,428	$2,856
	Residential	75	$11,563	$5,782	$17,345
	Total	**88**	**$16,186**	**$10,405**	**$26,591**
Lu Verne 317	Agriculture	2	$438	$438	$876
	Commercial	6	$2,251	$2,251	$4,502
	Education	2	$3,022	$3,022	$6,044
	Government	2	$1,427	$1,427	$2,854
	Industrial	4	$745	$1,118	$1,863
	Religion	5	$3,192	$3,192	$6,384
	Residential	129	$30,955	$15,478	$46,433
	Total	**150**	**$42,030**	**$26,925**	**$68,955**

Jurisdiction & 2016 Population	Property Type	Building Counts	Improved Value*	Content Value	Total Exposed Value
Swea City 559	Agriculture	1	$388	$388	$776
	Commercial	22	$6,399	$6,399	$12,798
	Education	2	$2,501	$2,501	$5,002
	Government	3	$3,062	$3,062	$6,124
	Industrial	9	$6,045	$9,068	$15,113
	Religion	8	$4,777	$4,777	$9,554
	Residential	309	$50,077	$25,039	$75,116
	Total	**354**	**$73,249**	**$51,233**	**$124,482**
Titonka 500	Agriculture	2	$340	$340	$680
	Commercial	31	$53,307	$53,307	$106,614
	Education	1	$2,336	$2,336	$4,672
	Government	2	$349	$349	$698
	Industrial	4	$426	$639	$1,065
	Religion	1	$141	$141	$282
	Residential	274	$68,590	$34,295	$102,885
	Total	**315**	**$125,489**	**$91,407**	**$216,896**
Wesley 333	Agriculture	5	$706	$706	$1,412
	Commercial	20	$4,359	$4,359	$8,718
	Education	1	$938	$938	$1,876
	Government	0	$91	$91	$182
	Industrial	5	$563	$845	$1,408
	Religion	2	$2,303	$2,303	$4,606
	Residential	196	$44,780	$22,390	$67,170
	Total	**229**	**$53,740**	**$31,632**	**$85,372**
West Bend* 851	Agriculture	1	$136	$136	$272
	Commercial	4	$4,103	$4,103	$8,206
	Education	0	$0	$0	$0
	Government	1	$212	$212	$424
	Industrial	1	$341	$512	$853
	Religion	0	$0	$0	$0
	Residential	14	$3,434	$1,717	$5,151
	Total	**21**	**$8,226**	**$6,680**	**$14,906**

Jurisdiction & 2016 Population	Property Type	Building Counts	Improved Value*	Content Value	Total Exposed Value
Whittemore 504	Agriculture	4	$766	$766	$1,532
	Commercial	18	$5,987	$5,987	$11,974
	Education	1	$447	$447	$894
	Government	3	$1,744	$1,744	$3,488
	Industrial	2	$1,706	$2,559	$4,265
	Religion	4	$2,487	$2,487	$4,974
	Residential	253	$58,998	$29,499	$88,497
	Total	**285**	**$72,135**	**$43,489**	**$115,624**
Unincorporated 4,627	Agriculture	405	$80,305	$80,305	$160,610
	Commercial	209	$86,458	$86,458	$172,916
	Education	3	$6,748	$6,748	$13,496
	Government	4	$1,173	$1,173	$2,346
	Industrial	65	$13,046	$19,569	$32,615
	Religion	15	$8,351	$8,351	$16,702
	Residential	2,419	$571,605	$285,803	$857,408
	Total	**3,120**	**$767,686**	**$488,407**	**$1,256,093**
Total Pop.: 15,226	**Grand Total**	**8,389**	**$2,244,150**	**$1,498,233**	**$3,742,383**

Note: All values are in thousands of dollars, a value of $0 does not necessarily mean $0 but less than $1,000.

Sources: Population Estimate, U.S. Census Bureau, American Community Survey 2016 5-Year Estimates; Building/Improvement Count and Values, Hazus MH 4.0. Contents Exposure derived by applying multiplier to Building Exposure based on HAZUS MH 2.2 standard contents multipliers per usage type as follows: Residential (50%), Agricultural, Commercial, Education, Government, Religion (100%), Industrial (150%). *portions of these cities extend into adjacent counties – the population totals are for the entire corporate limits including portions in adjacent counties.

Table 3-8: Year Structure Built

Jurisdiction	Total Housing Units	Built 2014 or later	Built 2010 to 2013	Built 2000 to 2009	Built 1990 to 1999	Built 1980 to 1989	Built 1970 to 1979	Built 1960 to 1969	Built 1950 to 1959	Built 1940 to 1949	Built 1939 or earlier
Kossuth County	7,483	1	88	398	398	355	1,185	642	1,002	522	2,892
Algona	2,794	0	27	222	190	154	489	262	419	180	851
Bancroft	347	0	2	25	9	21	78	66	17	15	114
Burt	244	0	0	2	5	11	55	11	19	11	130
Fenton	150	0	0	4	0	6	14	17	26	23	60
Lakota	144	0	0	0	0	2	19	12	29	22	60
Ledyard	87	0	0	11	2	13	7	13	15	10	16
Lone Rock	78	0	0	0	3	4	16	9	14	6	26
Lu Verne	173	0	2	0	4	3	30	12	17	11	94
Swea City	280	0	0	1	0	16	43	32	39	18	131
Titonka	262	0	4	3	0	3	49	18	77	22	86
Wesley	176	0	0	2	3	14	43	21	22	2	69
West Bend	429	0	1	34	31	45	71	50	41	53	103
Whittemore	245	0	0	7	3	4	49	21	35	38	88

Source: U.S. Census Bureau 2015 American Community Survey 5-Year Estimates.

Public School Districts

The 2015-2016 enrolled number of students at the participating public school districts is provided in **Table 3-9**, as well as the number of buildings, building values (building exposure) and contents value (contents exposure).

Table 3-9: Enrollment and Building Exposure by Jurisdiction-Public School Districts

Public School District	Enrollment	Building Count	Building Exposure ($)	Contents Exposure ($)	Total Exposure ($)
Algona CSD	1,512	6	52,341,264	5,279,036	57,620,300
LuVerne CSD	85	1	8,948,662	--	8,948,662
North Kossuth CSD	316	3	11,265,874	4,208,724	15,474,598
Total	1,913	10	72,555,800	9,487,760	82,043,560

Source: Enrollment Statistics from 2015-2016 Iowa Public School PreK-12 Enrollments by District – Iowa Department of Education, Bureau of Information and Analysis Services; Building Count includes schools only. Exposure values includes schools and other assets such as bus barns, ball fields, administrative offices, etc. from Data Collection Guides from Public School Districts

3.2.2 Critical and Essential Facilities and Infrastructure

As part of the update to the *Kossuth County Multi-Jurisdictional Hazard Mitigation Plan*, participating jurisdictions assessed the vulnerability of the following types of facilities below:

- Critical Facilities: Those facilities that are essential in providing utility or direction either during the response to an emergency or during the recovery operation.
- Essential Facilities: Those facilities that if damaged, would have devastating impacts on disaster response and/or recovery.
- High Potential Loss Facilities: Those facilities that would have a high loss or impact on the community.
- Transportation and Lifeline Facilities: Those facilities and infrastructure that are critical to transportation, communications, and necessary utilities.

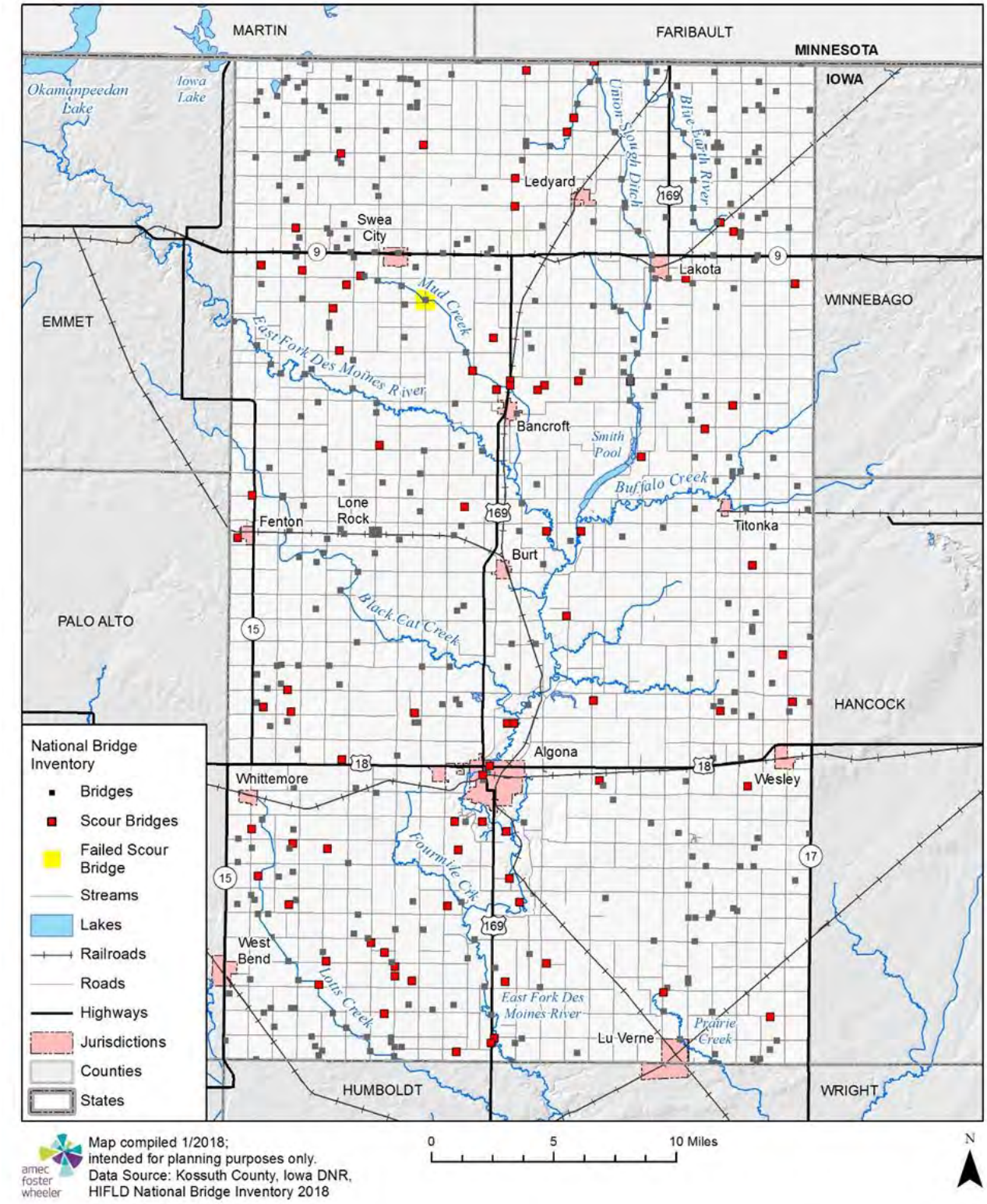
Table 3-10 is a summary of the inventory of critical and essential facilities and infrastructure in the planning area. This list was compiled from several sources, including the *2013 Kossuth County Multi-Jurisdictional Hazard Mitigation Plan*, GIS data provided by Kossuth County, the Iowa Department of Natural Resources GIS Inventory (NRGIS) and the Homeland Security Infrastructure Program (HSIP) Freedom, 2015. The full list of critical facilities is included in Appendix E. This is a non-public appendix and is maintained by Kossuth County Emergency Management.

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

Type of Facility	Unincorporated	Algona	Bancroft	Burt	Fenton	Lakota	Ledyard	Lone Rock	Lu Verne	Swea City	Titonka	Wesley	Whittemore	Grand Total
Airport		1												1
Assisted Living		5	1								1			7
Childcare	1	14	1	2	1					1	1			21
Church	6	13	2			2		1	2	3	2	2	2	35
City Hall		1	1	1	1	1	1	1	1	1	1	1	1	12
Communications	1		1											2
County Shed	2	2	1		1	1	1	1	1	1	1	1		13
Courthouse		2												2
Fire Station		1	1	1	1	1	1	1	1	1	1	1	1	12
Law Enforcement		3	1											4
Lift Station		4	1											5
Medical	1	15	2								2	1		21
National Register	1	3							1					5
Other		1												1
School	1	7							1	1		1	1	12
Substation	15													15
Tier II	15	16	5	4	2	2	1	1	2	2	2	5	2	59
Utility		1												1
Wastewater Treatment	10	1												11
Grand Total	**53**	**90**	**17**	**8**	**6**	**7**	**4**	**5**	**9**	**10**	**11**	**12**	**7**	**239**

There are 478 bridges in Kossuth County. **Figure 3-1** shows the location of all Kossuth County bridges and identifies those that are scour critical.

Figure 3-1: Kossuth County Bridges



Other Assets

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

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

In the planning area, specific assets include the following:

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

Table 3-11: Threatened and Endangered Species in Kossuth County

Common Name	Scientific Name	Status
Northern long-eared bat	Myotis septentrionalis	Threatened
Topeka Shiner	Notropis topeka	Endangered
Poweshiek skipperling	Oarisma poweshiek	Endangered
Prairie bush clover	Lespedeza leptostachya	Threatened
Western prairie fringed orchid	Platanthera praeclara	Threatened

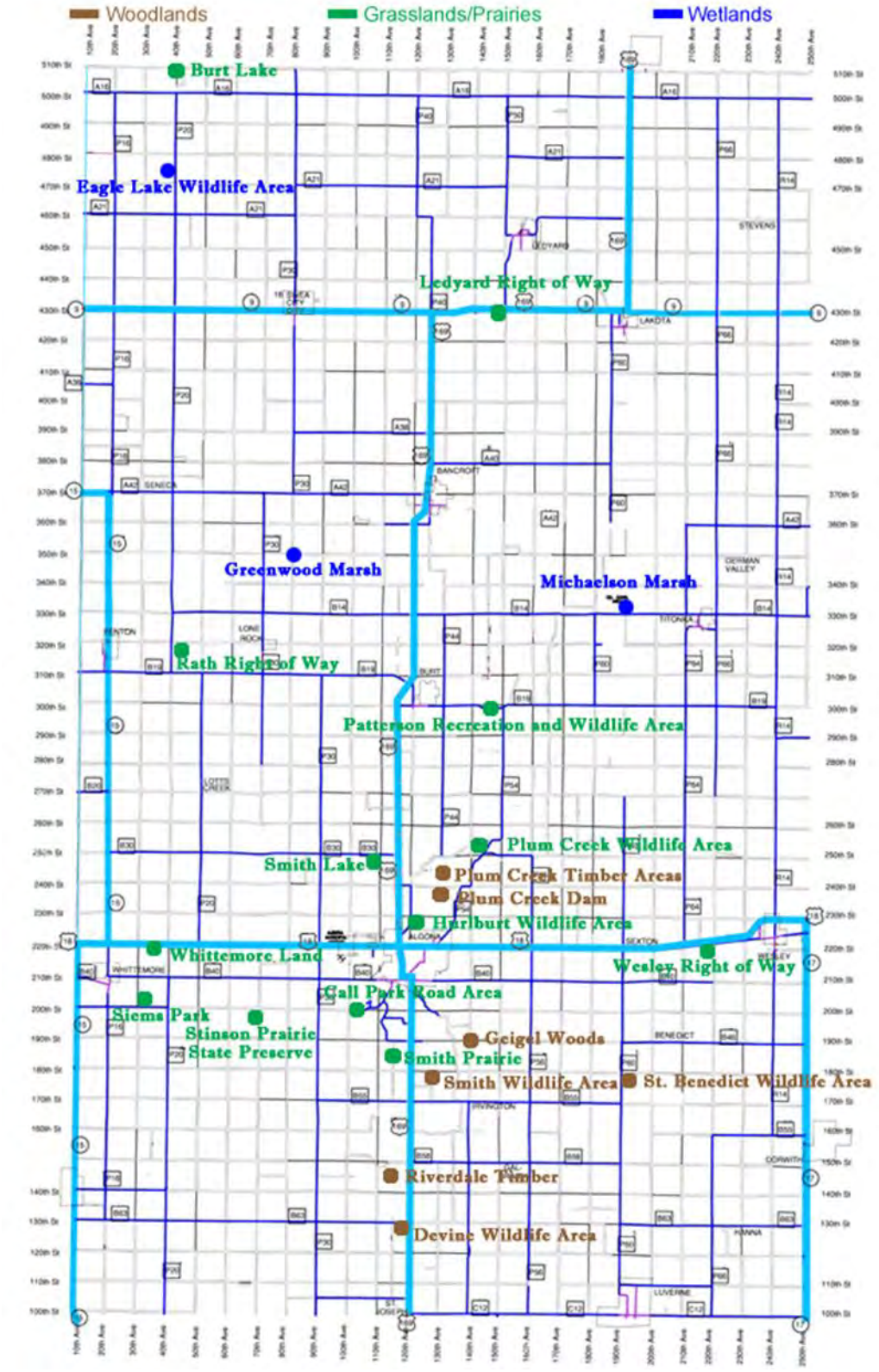
Source: U.S. Fish and Wildlife Service, http://www.fws.gov/midwest/endangered/lists/iowa_cty.html

Natural Resources: The Kossuth County Conservation Board manages 28 areas totaling 2,006 acres for outdoor recreation and wildlife habitat. These areas are bulleted below and shown on the map in **Figure 3-2**.

- Burt Lake – 105 acres
- Call Park Road Habitat Area – 2 acres
- Daubendiek Prairie – 1 acre
- Devine Wildlife Area – 41 acres
- Eagle Lake Wildlife Area – 180 acres
- Geigel Woods – 14 acres
- Greenwood Marsh – 7 acres
- H.M. and Eva Smith Prairie – 9.44 acres
- Hurlburt Wildlife Area – 180 acres
- Ledyard R.O.W. – 16 acres
- Michaelsen Marsh – 95 acres

- Plum Creek Dam – 7 acres
- Plum Creek Timber – 23 acres
- Plum Creek Timber Addition – 31 acres
- Plum Creek Wildlife Area – 70 acres
- Rath Right of Way – 24 acres
- Riverdale Timber – 16 acres
- Siems Park – 41 acres
- Smith Lake County Park – 124 acres
- Smith Wildlife Area – 144 acres
- St. Benedict Wildlife Area – 94 acres
- Stinson Prairie – 32 acres
- Wesley Right of Way – 48 acres
- Whittemore Land – 4 acres

Figure 3-2: Kossuth County Conservation Parks and Recreations Map



Source: http://co.kossuth.ia.teamem.com/parks-and-wildlife-areas.php

Additional details about managed areas listed below can be found at:
http://www.co.kossuth.ia.us/conservation-board.php

Historic Resources: The National Register of Historic Places is the official list of the Nation's cultural resources worthy of preservation. Authorized under the National Historic Preservation Act of 1966, the National Register is part of a national program to coordinate and support public and private efforts to identify, evaluate, and protect our historic and archeological resources. The National Register is administered by the National Park Service under the Secretary of the Interior. Properties listed in the National Register include districts, sites, buildings, structures and objects that are significant in American history, architecture, archeology, engineering and culture. **Table 3-12** provides the list of properties on the National Register in Kossuth County.

Table 3-12: Properties/Landmarks on the National Register of Historic Places, Kossuth County

City	Resource	Address	Year Listed
Algona	Dau, William C. and Hertha, House	315 S. Dodge St.	1993
Algona	Land and Loan Office Building	123 W. State St.	1998
Algona	G.A.R. Memorial Hall	122 S. Dodge St.	2014
Algona	Algona Junior and Senior High School Building and High School Building Annex	213 & 301 S. Harlan St.	2014
Lu Verne	Lu Verne City Jail	307 Third St.	1992
Swea City	Des Moines River Bridge	Co. Rd. P14 over East Fork of Des Moines R.	1998

Source: National Park Service, https://www.nps.gov/nr/research/index.htm

Agriculture and the Economy: Agriculture plays an important role in the Kossuth County economy (see **Table 3-13**).

Table 3-13: Agricultural Statistics for Kossuth County

2012 Census of Agriculture	
Total Land in Farms (acres)	599,439
Number of Farms	1,349
Average Farm Size (acres)	444
Average Age of Farmers	58.7
Market Value of All Farm Products	$722,309,000
Market Value of All Crops	$463,598,000
Market Value of All Livestock	$258,711,000
Production Expenses	$498,959,000
Hogs & Pigs Inventory (head)	609,437
Cattle as of January 1, 2015	
All Cattle and Calves (State Rank 52 (tied))	29,500
Crops-2014 Acreage, Yield, and Production	**Harvested Acres**
Corn for Grain (State Rank 1)	324,000
Soybeans (State Rank 3)	214,500

Source: Iowa Agricultural Statistics Bulletin, USDA, National Agricultural Statistics Service, http://www.nass.usda.gov/Statistics_by_State/Iowa/Publications/Annual_Statistical_Bulletin/2015/115_15.pdf

3.3 Development Since 2013 Plan Update

This section provides information on development that has occurred since the *2013 Kossuth County Multi-Jurisdictional Hazard Mitigation Plan Update*.

According to the U.S. Census Bureau, the Kossuth County population decreased .2.8 percent from 2010 to 2016 overall. The only city that increased in population was the city of Lakota with nearly 12 percent increase. **Table 3-14** provides the population change statistics for all cities in Kossuth County as well as the county as a whole.

Table 3-14: Kossuth County Population Change, 2010-2016

Jurisdiction	2010 Census Population	2016 Population Estimate	# Change 2010-2016	% Change 2010-2016
Algona	5,560	5,515	-45	-0.8%
Bancroft	732	709	-23	-3.1%
Burt	533	505	-28	-5.3%
Fenton	279	261	-18	-6.5%
Lakota	255	285	30	11.8%
Ledyard	130	126	-4	-3.1%
Lone Rock	146	141	-5	-3.4%
Lu Verne	261	252	-9	-3.4%
Swea City	536	516	-20	-3.7%
Titonka	476	448	-28	-5.9%
Wesley	390	378	-12	-3.1%
West Bend*	785	755	-30	-3.8%
Whittemore	504	486	-18	-3.6%
Unincorporated Kossuth County	4,956	4,737	-219	-4.4%
Total	**15,543**	**15,114**	**-429**	**-2.8%**

Source: U.S. Census Bureau: 2010 Decennial Census, 2016 Population Estimates. *portions of this city extend into adjacent county – the population total is for the entire corporate limits including portion in adjacent county. Unincorporated Kossuth County Population was estimated by subtracting populations of incorporated cities from the total Kossuth County populations.

Table 3-15 provides the change in numbers of housing units in the planning area from 2010 to 2015.

Table 3-15: Change in Housing Units, 2010-2015

Jurisdiction	2010 Housing Units	2015 Housing Units	# Change 2010-2015	% Change 2010-2015
Algona	2,711	2,794	83	3.06%
Bancroft	360	347	-13	-3.61%
Burt city	232	244	12	5.17%
Fenton	168	150	-18	-10.71%
Lakota	136	144	8	5.88%
Ledyard	82	87	5	6.10%
Lone Rock city	82	78	-4	-4.88%
Lu Verne	152	173	21	13.82%
Swea City	314	280	-34	-10.83%
Titonka	264	262	-2	-0.76%
Wesley	197	176	-21	-10.66%
West Bend	396	429	33	8.33%
Whittemore	250	245	-5	-2.00%
Unincorporated Kossuth County	2,142	2,074	-68	-3.17%
Total	**7,486**	**7,483**	**-3**	**-0.04%**

Source: U.S. Census Bureau: 2010 Decennial Census and 2015 American Community Survey, 5-year Estimates

Note: Unincorporated Kossuth County Housing Units were estimated by subtracting housing units of incorporated cities from the total Kossuth County populations.

According to the U.S. Census Bureau, there were no privately-owned residential building permits issued in Kossuth County from 2012-2016.

Since the last plan update, the following development was reported by participating school districts.

Algona CSD
A Performing Arts Center was developed on South Sample Street.

LuVerne CSD
None reported.

North Kossuth CSD
None reported.

3.4 Future Land Use and Development

The following sections provide details regarding future growth, land use and development. The information in this section comes from the *Kossuth County 2013 Multi-jurisdictional Hazard Mitigation Plan*, information provided by each of the participating jurisdictions as well as other sources, cited throughout. Where available, maps are provided to facilitate consideration of hazard areas in future development plans as well as any potential growth area.

Table 3-16 provides the Population projections for Kossuth County by Woods & Poole Economics, Inc. According to these projections, the population of Kossuth County will continue to decline through the year 2040.

Kossuth County

Table 3-16: Kossuth County 2010 Population and Population Projections, 2010-2040

2010 Population	2020 Population Projection	2025 Population Projection	2030 Population Projection	2035 Population Projection	2040 Population Projection
15,543	15,258	15,207	15,160	15,116	15,076

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

Unincorporated County
None reported.

Algona
The City of Algona expects that the areas in the east of the city that have experienced a slow growth of housing over the past five years will continue to experience residential development. No development in these expected growth areas would be occurring in the 100-year floodplain.

Additionally, the City of Algona is planning for construction of a new City Hall within the next five years.

Bancroft
Development has stagnated in the City of Bancroft over the past five years, and the City does not anticipate any new growth areas to emerge nor for any annexation to occur. The City is planning for potential development of a new fire station and a lagoon expansion one mile north of the city within the next five years.

Burt
None reported.

Fenton
The City of Fenton does not anticipate major development in the next five years but is planning for the construction of a water tower and main.

Lakota
No expected development was reported by the City of Lakota, but the City may begin planning construction of a new water plant in 2018.

Ledyard
None reported.

Lone Rock City
None reported.

LuVerne
No expected development was reported by the City of LuVerne, but the City is planning for a new fire station with the addition of EMS.

Swea City
None reported.

Titonka
None reported.

Wesley
The City of Wesley did not report any anticipated new development but did note that the Gold Eagle Co-op moved their corn storage facilities east of town which has resulted in less semi traffic and the they are expected to move their anhydrous ammonia storage facility east of town as well.

Whittemore
None expected.

School Districts' Future Development
None of the participating school districts reported any plans for remodeling or construction of any buildings within the next five years. Additionally, all three school districts indicated that they expected enrollment to remain relatively constant over the next five years.

3.5 Hazard Profiles and Vulnerability

Hazard Profiles

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

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

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

Hazard Description
This section consists of a general description of the hazard and the types of impacts it may have on a community. It also includes the ratings assigned to the hazard relative to typical warning times and duration of hazard events as described in **Table 3-5**.

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

Previous Occurrences
This section includes information on historic incidents and their impacts.

Probability of Future Occurrence
The frequency of past events is used to gauge the likelihood of future occurrences. Where possible, the probability or chance of occurrence was calculated based on historical data. Probability was determined by dividing the number of events observed by the number of years and multiplying by 100. This gives the percent chance of the event happening in any given year. An example would be three droughts occurring over a 30-year period, which suggests a 10 percent chance of a drought occurring in any given year. For each hazard, the probability is assigned a rating as defined in **Table 3-5**.

3.6 Vulnerability Assessments

Requirement §201.6(c)(2)(ii): [The risk assessment shall include 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.

Requirement §201.6(c)(2)(ii)(A): The plan should describe vulnerability in terms of the types and numbers of existing and future buildings, infrastructure, and critical facilities located in the identified hazard areas.

Requirement §201.6(c)(2)(ii)(B): [The plan should describe vulnerability in terms of an] estimate of the potential dollar losses to vulnerable structures identified in paragraph (c)(2)(i)(A) of this section and a description of the methodology used to prepare the estimate.

Requirement §201.6(c)(2)(ii)(C): [The plan should describe vulnerability in terms of] 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.

Requirement §201.6(c)(2)(ii): (As of October 1, 2008) [The risk assessment] must also address National Flood Insurance Program (NFIP) insured structures that have been repetitively damaged in floods.

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

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

Vulnerability Overview
This section consists of a general overview narrative of the planning area's vulnerability to the hazard. Within this section, the magnitude/severity of the hazard is discussed. The magnitude of the impact of a

hazard event (past and perceived) is related directly to the vulnerability of the people, property and the environment it affects. This is a function of when the event occurs, the location affected, the resilience of the community and the effectiveness of the emergency response and disaster recovery efforts.

For each hazard, the magnitude/severity is assigned a rating as defined in **Table 3-5**.

Potential Losses to Existing Development

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

Future Development

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

Climate Change Impacts

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

Hazard Summary by Jurisdiction

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

3.6.1 Animal/Plant/Crop Disease

Hazard Score Calculation					
Probability	**Magnitude/Severity**	**Warning Time**	**Duration**	**Weighted Score**	**Level**
1	3	4	4	2.35	Moderate

Profile

Hazard Description

Agricultural infestation is the naturally occurring infection of vegetation, crops or livestock with insects, vermin, or diseases that render the crops or livestock unfit for consumption or use. Because of Iowa's overall substantial agricultural industry and related facilities and locations, the potential for infestation of crops or livestock poses a significant risk to the economy of the State. Iowa cropland is vulnerable to disease and other agricultural pests.

Some level of agricultural infestation is normal in Iowa. The concern is when the level of an infestation escalates suddenly, or a new infestation appears, overwhelming normal control efforts. The levels and types of agricultural infestation appear to vary by many factors, including cycles of heavy rains and drought.

Animal Disease

Agricultural incidents are naturally occurring infection of livestock with insects, vermin, or diseases that render the livestock unfit for consumption or use. The livestock inventory for the state of Iowa includes nearly 4 million cattle and calves. According to the USDA National Agricultural Statics Service, as of January 1, 2015, Kossuth County ranked 36th in the state with 29,500 head of cattle and calves. According to the 2012 Census of Agriculture, there were also 609,437 heads of hogs and pigs in Kossuth County.

With the substantial agricultural industry and related facilities throughout the County, the potential for infestation of livestock poses a significant risk to the economy in the planning area.

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

- Avian Influenza
- Bovine Spongiform Encephalopathy (BSE) Disease
- Chronic Wasting Disease
- Exotic Newcastle Disease
- Foot and Mouth Disease
- Johne's Disease
- Pseudo rabies
- Scrapie, and
- West Nile Virus.

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

Avian influenza continues to be of concern in Iowa as the State is number one in poultry egg layers (approximately 40 million). Source: Iowa Poultry Association, 2014.

Bovine Spongiform Encephalopathy (BSE) "mad cow" disease is a chronic, degenerative disease affecting the central nervous system of cattle. Cases have been found world-wide since 1986, but in Canada and the U.S. only a single cow was reported with BSE in 2003.

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

Exotic Newcastle disease (END) is a contagious and fatal viral disease affecting all species of birds. There was an epidemic of END in California in 2003 that is resulting in the death of millions of chickens and other birds, and costing millions of dollars. END is probably one of the most infectious diseases of poultry in the world. END is so virulent that many birds die without showing any clinical signs.

Johne's (yo-knees) disease is a contagious, chronic and eventually fatal infection that affects the small intestine of ruminants, including cattle, sheep and goats. Johne's, also called Para tuberculosis, is a slow progressive wasting disease with an incubation period of usually 2 or more years. Johne's is a reportable disease, but not a quarantinable disease.

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

Scrapie is a fatal, degenerative disease affecting the central nervous system of sheep and goats that is very similar to BSE (mad cow disease), although it does not cause disease in humans, and has been present in the U.S. for over 50 years. Infected flocks that contain a high percentage of susceptible animals can experience significant production losses. In these flocks, over a period of several years, the number of infected animals increases and the age at onset of clinical signs decreases making these flocks

economically unviable. Animals sold from infected flocks spread scrapie to other flocks. The presence of scrapie in the U.S. also prevents the export of breeding stock, semen and embryos to many other countries. Currently there is a national program underway to eradicate scrapie in the U.S.

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

Crop Pests/Diseases

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

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

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

Emerald Ash Borer

The Hazard Mitigation Planning Team is also aware of the emerald ash borer pest that threatens Iowa's forests and urban landscape. This pest is a slender, emerald green beetle that is ½ inch long, and responsible for the destruction of approximately 20 million ash trees in Ohio, Michigan, Indiana, Illinois, and Ontario, Canada. Emerald Ash Borer has made its way into Iowa and has become an increasing threat.

Wildlife

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

Warning Time Score: 4 - minimal or no warning time

Duration Score: 4 - more than 1 week

Geographic Location/Extent

All of Kossuth County is subject to animal/livestock incidents and agricultural infestations. According to the 2012 Census of Agriculture there were 1,349 farms in the County covering 599,439 acres of land (96.3 percent of the 972.72 Sq. miles of land area (623,360 acres) in the County).

Table 3-17 provides a summary of the value of agricultural products sold in the planning area. Agricultural infestation of crops or livestock in the planning area would severely affect the economy.

Table 3-17: Market Value of Agricultural Products Sold, 2012 - Kossuth County, IA

Market Value of Products Sold	$722,309,000
Market Value of Crops	$463.6 million (64.2 percent)
Market Value of Livestock	$258.7 million. (35.8 percent)
Average Per Farm	$545,433

Source: USDA National Agricultural Statistics Service, 2012 Census of Agriculture.

Animal Location/Extent

In addition to the animal farm operations, there are also confined and open feeding operations in Kossuth County. According to data from the Iowa NRGIS Repository, there are 271 Animal Feeding Operations listed in the Iowa Department of Natural Resources Animal Feeding Operations Database. This includes 253 Confined Animal Feeding Operations and 11 Open Feedlots, and seven combination Confined/Open feedlot. There are also nine registered Captive Cervid Herd in Kossuth County (deer and elk).

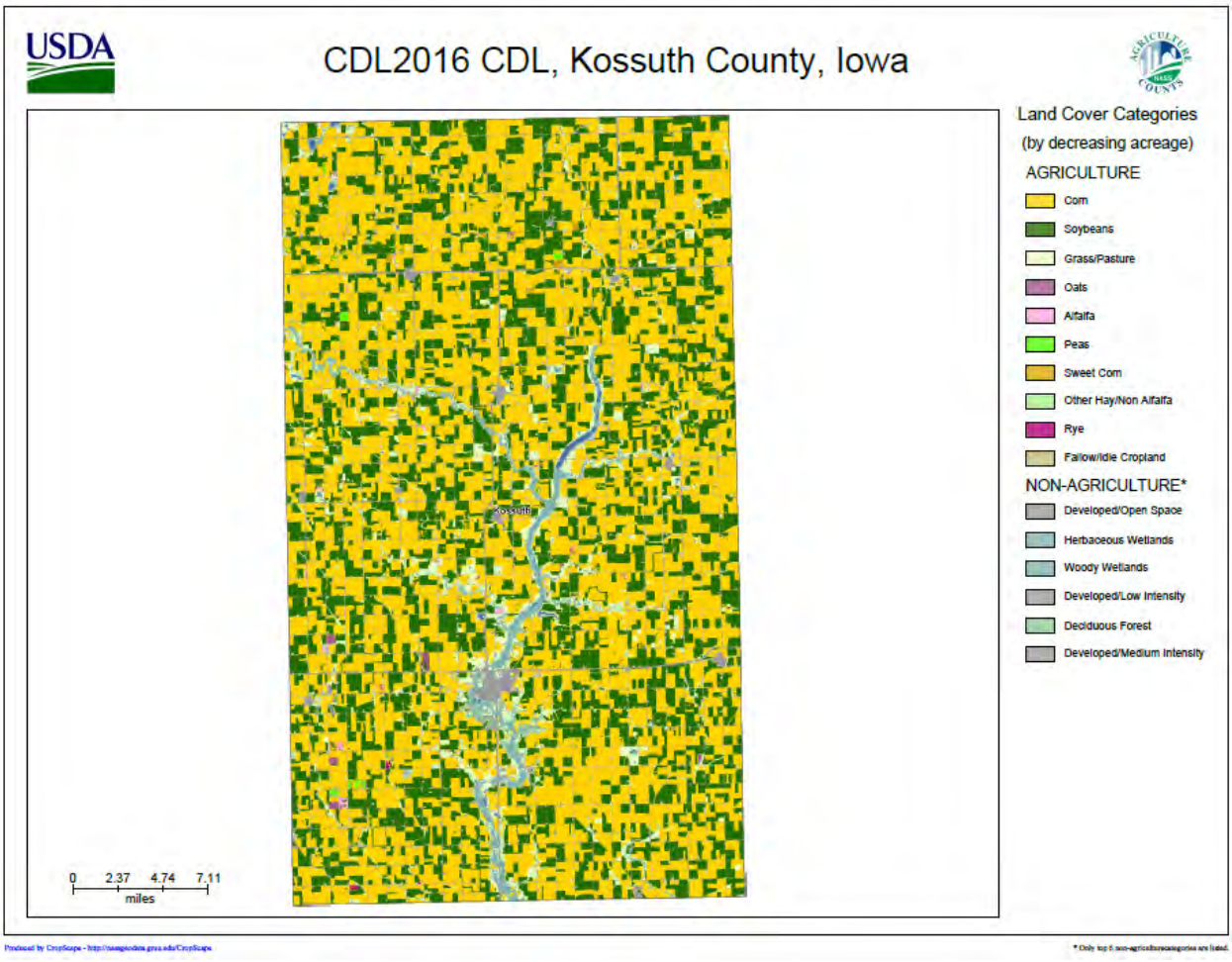
Crop Location/Extent

According to the 2012 Census of Agriculture, Kossuth County's top crop items included the following:

- Corn for Grain (State Rank 1)-324,480 acres harvested
- Soybeans (State Rank 1)-217,337 acres harvested

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

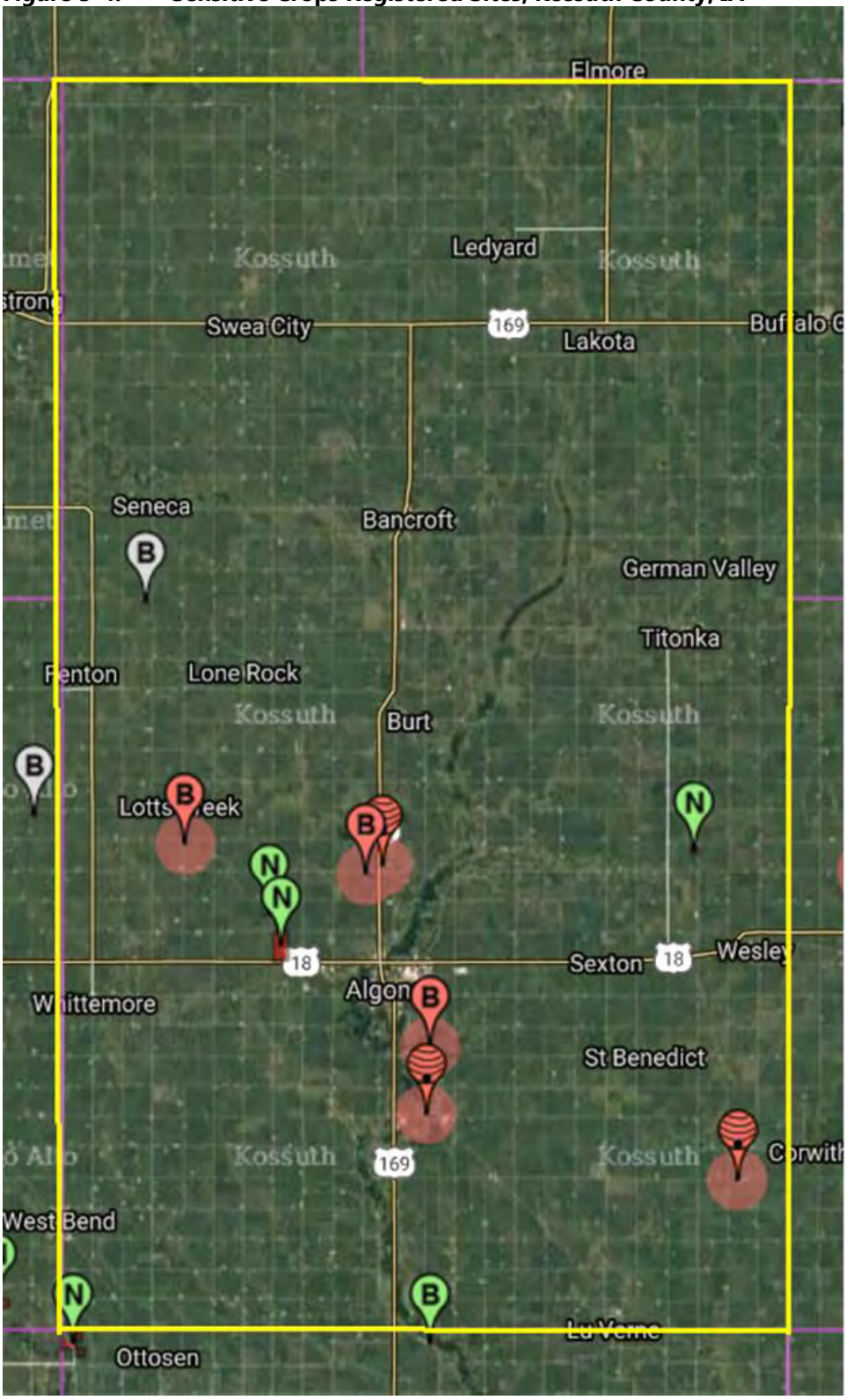
Figure 3-3: Kossuth County Cropland Data Layer



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

Figure 3-4 provides the locations of the sites included on the Sensitive Crops Registry according to the Iowa Department of Agriculture and Land Stewardship, Pesticide Bureau. The types of sensitive crops in the county include berries, orchard, non-specified organic, and beehives.

Figure 3-4: Sensitive Crops Registered Sites, Kossuth County, IA

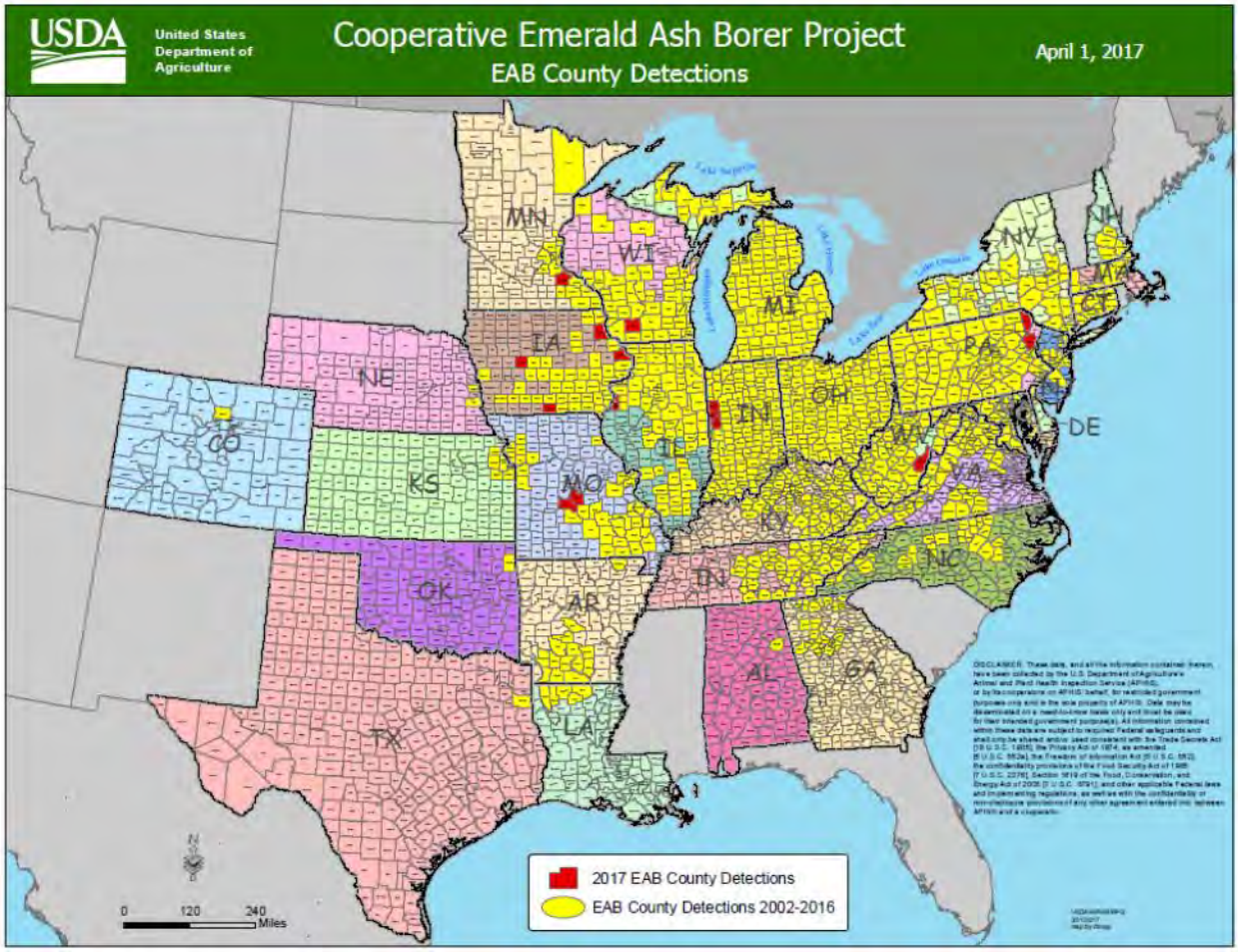


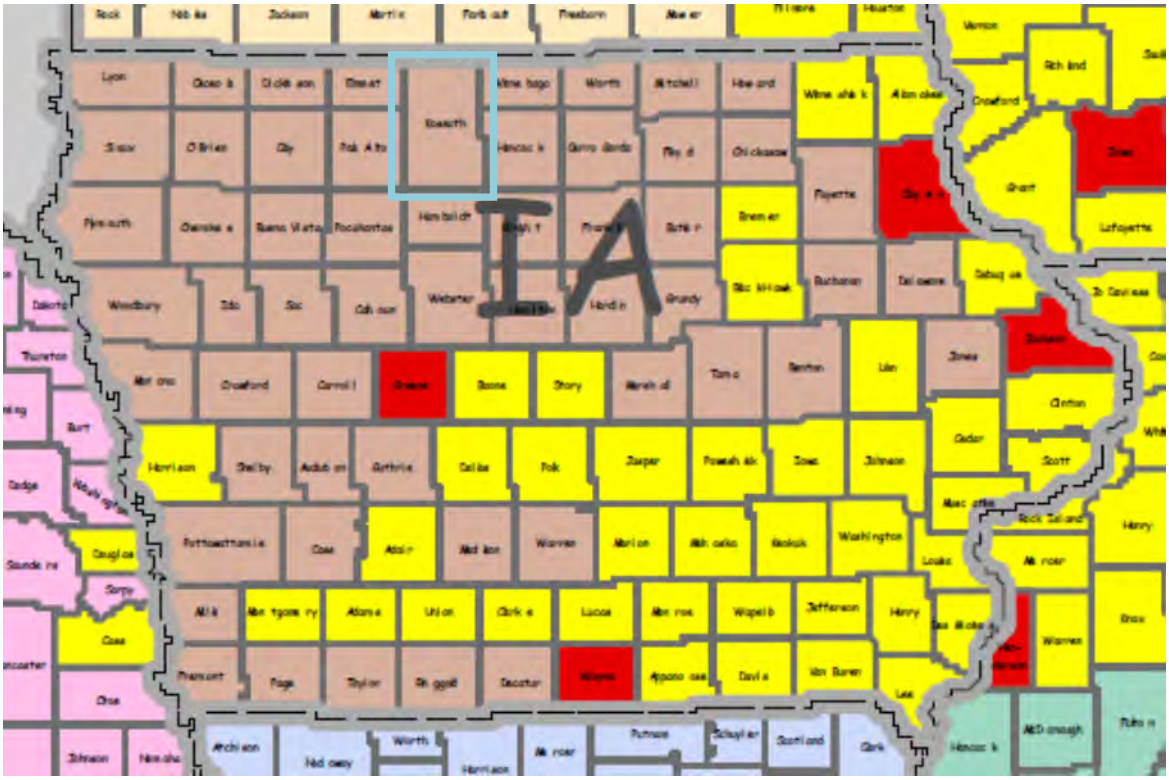
Source: Iowa Specialty Crop Site Registry, https://ia.driftwatch.org/map

Emerald Ash Borer Location/Extent

Figure 3-5 shows the counties in the U.S. in which the Emerald Ash Borer has been detected. The counties where the Emerald Ash Borer has been detected are indicated by the yellow shading. As of April 1, 2017, the Emerald Ash Borer has not been detected in Kossuth County. However, the Ash Borer can be easily travel and therefore important to understand the geographic extent of the issue.

Figure 3-5: USDA Emerald Ash Borer County Detection Map



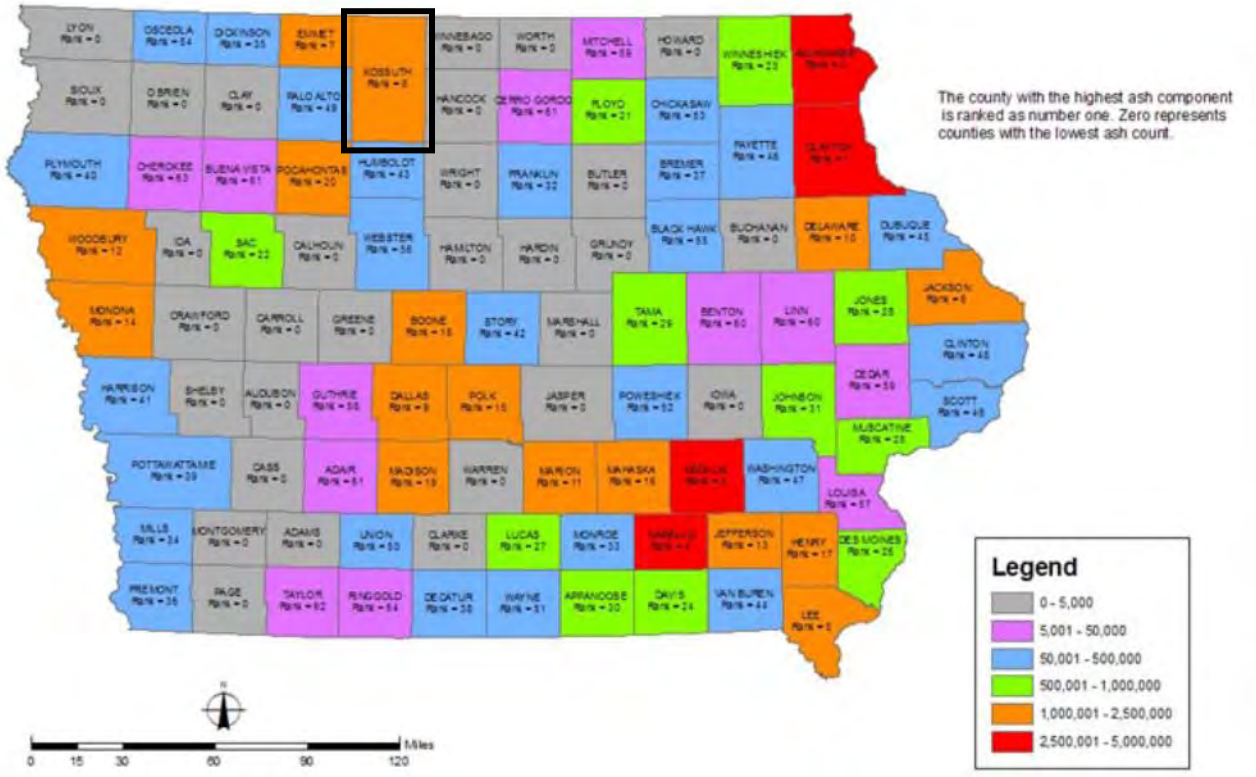


Source: http://www.aphis.usda.gov/plant_health/plant_pest_info/emerald_ash_b/index.shtml;
Blue square identifies Kossuth County

It is estimated by the Iowa Department of Natural Resources – Forestry Bureau that approximately 15-20 percent of public trees in Iowa cities are green ash. In some communities, ash comprises more than 60 percent of the public trees. Statewide, there are over 50 million ash trees (green, white and black) in bottomland and upland forests (2005 USDA Forest Service, Forest Inventory Data) and another 30 million urban ash trees (Iowa Department of Natural Resources – Forestry Bureau).

As seen in **Figure 3-6** below, Kossuth County ranks 8th in the state with between 1,000,000 and 2,500,000 ash trees in the County according to data from the U.S. Forest Service. Also, a cooperative state and federal effort has developed the "Iowa Emerald Ash Borer Readiness Plan" (Source: http://www.extension.iastate.edu/pme/EAB%20other%20forms/IA%20EAB%20Readiness%20Plan%2010MAY2010.pdf) to help stop this pest by education, monitoring, surveillance, containment and communication.

Figure 3-6: Distribution of Ash Trees in Iowa



Source: Iowa State University Extension Office
http://www.extension.iastate.edu/pme/EAB%20other%20forms/Iowa%20Ash%20Tree%20Distribution%202006%20map.jpg

Note: Kossuth County is outlined in black.

Previous Occurrences

Beginning in April of 2015, there were a significant number of confirmed diagnoses of avian influenza in the State of Iowa. As a result, on Friday May 1, 2015, Governor Branstad declared a state of emergency. The last positive flock was detected on June 16, 2015. Kossuth County is included in the list of counties with confirmed cases. Additional locations include: Buena Vista, Calhoun, Cherokee, Clay, Hamilton, Lyon, Madison, O'Brien, Osceola, Palo Alto, Plymouth, Pocahontas, Sac, Sioux, and Webster. Infected flocks were depopulated and composted and clean up and disinfection occurred. There were 77 total premises and 34 million birds affected. This included 35 commercial turkey flocks, 22 commercial egg production flocks, 13 pullet flocks, 1 breeding flock for a mail order hatchery, and 6 backyard flocks. More than 2,300 USDA staff and contractors were dispatched to Iowa to assist with the response to the avian influenza situation, including a USDA Incident Management Team (IMT). More than 300 state employees also participated in the disaster response (http://www.iowaagriculture.gov/ AvianInfluenza.asp).

Bovine Spongiform Encephalopathy (BSE) (A.K.A. Mad Cow Disease)

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

Chronic Wasting Disease

The first case of CWD in Iowa was found in 2012 on a hunting preserve in the southeastern part of the state. In that case, it was determined the CWD-positive mature buck had been transferred to the hunting preserve from a deer farm in north central Iowa. Subsequent testing found CWD at the deer farm. The farm was placed under quarantine, but the owners sued for compensation. The litigation prevented the farm from being depopulated of deer until August 2014. The Iowa Department of Agriculture and Land Stewardship conducted testing. Results were released in early October 2014, stating that 284 of 356 deer (80 percent) from a captive herd in north-central Iowa tested positive for chronic wasting disease. This finding represents the highest number of CWD-positive animals detected at a facility, according to wildlife health officials (Milwaukee-Wisconsin Journal Sentinel, October 4, 2014). In 2014, the first case of CWD was found in a wild deer in Allamakee County. Then in 2015, two wild deer tested positive for CWD in Allamakee County.

Scrapie

There has been a total of 37 sheep flocks in Iowa that have been found to be infected with Scrapie since the accelerated national Scrapie Eradication Program started in November 2001. Of those, 10 have been depopulated and 27 have completed, or are currently completing a genetic flock plan. Iowa's last infected flock was found in June 2010.

Rabies

According to the Iowa Department of Public Health, Center for Acute Disease Epidemiology, there were12 confirmed animal rabies cases in Iowa in 2015. In 2014, there were 15. In 2013, there were 12. In 2012, there were 31 and in 2011 there were 25. In 2016, there were 16 confirmed cases in the state.

In Kossuth County, there has been one confirmed case of rabies since 2011. **Table 3-18** summarizes the occurrence of rabies in Kossuth County from 2011-2016.

Table 3-18: Rabies Cases in Kossuth County, 2011-2016

Year	Confirmed Rabies Cases #/Animal
2016	0
2015	0
2014	0
2013	0
2012	1/Bat
2011	0

Source: Iowa Department of Public Health, Center for Acute Disease Epidemiology, https://idph.iowa.gov/rabies/resources

According to the U.S. Department of Agriculture's Risk Management Agency, during the 10-year period from 2007-2016, combined crop insurance payments for damages resulting from insects, plant disease and wildlife totaled $39,516.97 in Kossuth County. The Iowa Statewide average for insurable crop acres with insurance is 89 percent (USDA Risk Management Agency, 2015 Iowa Crop Insurance Profile. **Table 3-19** provides a summary of insured crop losses as a result of crop infestations.

Table 3-19: Crop Insurance Payments for Crop Pests/Diseases 2007-2016

Damage Cause	Sum of Indemnity Amount	Sum of Determined Acres
Asian Soybean Rust	**$0**	**$0**
Insects	**$16,934.00**	**159**
2010	$16,164.00	143
2011	$770.00	16
Plant Disease	**$22,582.97**	**20**
2010	$6,250.00	20
2012	$2,929.00	20
2014	$7,746.00	20
2015	$5,108.30	20
2016	$549.67	20
Wildlife	**$0**	**$0**
Grand Total	**$39,516.97**	**531**

Source: USDA Risk Management Agency

Probability of Future Occurrence

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

Probability Score: 1 - Unlikely

Vulnerability

Overview

A widespread infestation of animals/livestock and crops could impact the economy of the County. According to the USDA 2012 Census of Agriculture, Kossuth County agriculture provides 3,869 jobs representing 36.4 percent of Kossuth County's total workforce (Source: Coalition to Support Iowa's Farmers, http://www.supportfarmers.com/Assets/2014/cntydata/Kossuth.pdf).

In 2012 the total market value of Kossuth County's crops and livestock products sold was $722.3 million. With this contribution of agriculture to the economy, a wide-scale agricultural infestation could severely impact the economic stability of the County.

Magnitude Score: 3 - Critical

Potential Losses to Existing Development

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

Rough estimates of potential direct losses from a maximum threat event fall in a range of 1-75 percent of livestock receipts. The market value of all livestock in Kossuth County in 2012 was $258,700,000. Based on a worst-case scenario where 75 percent of livestock is lost in a given year due to agricultural infestations, the total direct costs could exceed $194 million.

Table 3-20 provides the annual crop losses for insurable crops. The insurable loss is adjusted to estimate losses to all insurable crops by considering that 89 percent of insurable crops in the State were insured (2015 Iowa Crop Insurance Profile from USDA's Risk Management Agency).

Table 3-20: Estimated Insurable Crop Losses Resulting from Disease, Infestation, and Wildlife

Crop Insurance Paid-10 yrs.	Adjusted 10-year Losses	Annual Estimated Losses
$39,516.97	$44,401.09	$4,884.12

Source: USDA Risk Management Agency; adjust loss calculation by Wood

Rough estimates of potential direct losses from a maximum threat event fall in a range of 1-50 percent of annual crop receipts. The market value of all crops sold in Kossuth County in 2012 was $463,600,000. Based on a worst-case scenario where 50 percent of crop production is lost in a given year due to agricultural infestations, the total direct costs could exceed $231.8 million.

The U.S. Forest Service estimates that Kossuth County has up to 2,500,000 ash trees in the County. Removal of debris if an infestation would occur would be challenging and costly. If only 10 percent of the Ash trees were impacted in Kossuth County that could translate to 250,000. It is estimated that it costs $682 to replace each Ash tree. In Kossuth County, this translates to over $170 million

Future Development

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

Climate Change Impacts

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

Crops

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

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

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

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

The current changes in precipitation, temperature, wind speeds, solar radiation, dew-point temperatures, and cloud cover imply less ventilation of crops and longer dew periods. Soybean plants in particular

readily absorb moisture, making harvest problematic. One adaptive approach to these conditions involves farmers purchasing larger harvesting equipment to speed harvest, compensating for the reduced daily time suitable for soybean harvest.

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

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

Animals

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

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

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

Animal/Crop/Plant Disease Hazard Summary by Jurisdiction

The magnitude determinations discussed in the vulnerability overview sections were factored into the following hazard summary table to show how this hazard varies by jurisdiction. It has been determined that the magnitude of animal/crop/plant disease would be slightly less in the cities and for the school districts due to less agriculture within city limits. However, an infestation of the Emerald Ash Borer would likely have a larger impact in the incorporated areas and the economy of incorporated areas is heavily dependent on agriculture. As a result, the magnitude in the unincorporated area was determined to be a 3 and the magnitude in the incorporated areas was determined to be a 2. School districts would have limited Ash trees to dispose of in the event of infestation. Therefore, the magnitude was determined to be a 1.

Jurisdiction	Probability	Magnitude	Warning Time	Duration	Score	Level
Kossuth County, Iowa	1	3	4	4	2.35	Moderate
City of Algona	1	2	4	4	2.05	Moderate
City of Bancroft	1	2	4	4	2.05	Moderate
City of Burt	1	2	4	4	2.05	Moderate
City of Fenton	1	2	4	4	2.05	Moderate
City of Lakota	1	2	4	4	2.05	Moderate
City of Ledyard	1	2	4	4	2.05	Moderate
City of Lone Rock	1	2	4	4	2.05	Moderate
City of Lu Verne	1	2	4	4	2.05	Moderate
City of Swea City	1	2	4	4	2.05	Moderate
City of Titonka	1	2	4	4	2.05	Moderate
City of Wesley	1	2	4	4	2.05	Moderate
City of Whittemore	1	2	4	4	2.05	Moderate
Algona School District	1	1	4	4	1.75	Low
Lu Verne School District	1	1	4	4	1.75	Low
North Kossuth School District	1	1	4	4	1.75	Low

3.6.2 Dam Failure

Hazard Score Calculation					
Probability	**Magnitude/Severity**	**Warning Time**	**Duration**	**Weighted Score**	**Level**
1	1	4	3	1.65	Low

Profile

Hazard 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 the risk of dam failure impacting Kossuth County. Although there may be undocumented agricultural levees in Kossuth County, there are no levees accredited by FEMA or in the USACE National Levee Safety Program. Additionally, the planning indicated that there is no known risk to levee failure impacting the planning area. Therefore, levee failure is not further analyzed in this plan.

Dam Failure

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

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

Duration Score: 3 - Less than 1 week

Geographic Location/Extent

Dams in Planning Area

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

In rural areas:

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

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

c. *Any dam across a stream draining more than 10 square miles.*

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

In urban areas:

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

Low head dams:

Any low head dam on a stream draining 2 or more square miles in an urban area, or 10 or more square miles in a rural area.

Dams are classified by the State of Iowa into three categories based on the potential risk to people and property in the event of failure (see **Table 3-21**). The classification can change over time due to changes in development downstream from the dam. In addition, older dams may not have been built to the standards of their updated classification when this occurs. The Iowa Department of Natural Resources performs annual inspections on all high hazard dams in the State.

Table 3-21: Dam Hazard Classification Definitions

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

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

For this plan update, both the National Inventory of Dams as well as the State-regulated dam inventory were consulted, and this information was verified by the HMPC. According to both sources, there are seven dams inside the county boundaries of Kossuth County. Representatives of the HMPC noted that one of these structures is no longer present. Of the remaining six dams, two are Significant Hazard dams, and four are Low Hazard dams.

Table 3-22 provides the names, locations, and other pertinent information for the seven dams in the planning area. The Vulnerability Analysis section provides additional information about the dams based on data that was extracted from available inspection reports.

Table 3-22: Dams in the Kossuth County Planning Area

Dam Name	NIDID	Owner Type	River	NID Height (ft.)	NID Storage (acre ft.)	Normal Storage (acre ft.)	Dam Length (ft.)	Year Completed	Hazard
Lake Smith Dam	IA00570	Local Government	Tr-Black Cat Creek	21.0	463.0	245.0	570.0	1965	S
Oak Lake Dam	IA00569	Private	Tr-East Fork Des Moines River	50.0	2015.0	815.0	1260.0	1971	S
Deal Dam	IA02686	Private	Tr- East Fork Des Moines River	31.0	45.0	29.0	0.0	1976	L
Hurlburt Dam	IA02716	Private	Tr- Purcell Creek	24.0	53.0	27.0	200.0	1975	L
Kossuth County Roadgrade Dam 16-100-30	IA03213	Local Government	South Creek	11.0	135.0	33.0	900.0	1999	L
Maudsley Dam	IA02215	Private	Tr- Purcell Cr.	37.0	37.0	30.0	273.0	1983	L

Source: Iowa Department of Natural Resources; S=Significant Hazard, L=Low Hazard

Aerial images of the significant hazard dams are provided in **Figure 3-7** and **Figure 3-8**.

Figure 3-7: Lake Smith Dam

Source: National Inventory of Dams

Figure 3-8: Oak Lake Dam

Source: National Inventory of Dams

Dams Upstream of Planning Area

According to the Iowa Department of Natural Resources, there are no dams upstream of Kossuth County that pose a threat to the planning area in the event of failure.

Previous Occurrences

To determine previous occurrences of dam failure within Kossuth County, the *2013 Kossuth County Multi-Jurisdictional Hazard Mitigation Plan*, the *Iowa State Hazard Mitigation Plan*, and the Stanford University's National Performance of Dams Program (https://npdp.stanford.edu/) were reviewed for historical dam failures. No record of dam failure within Kossuth County boundaries was found.

Probability of Future Occurrence

Based on past performance, the Hazard Mitigation Planning Committee determined that the probability of future occurrence of dam failure is unlikely.

Probability Score: 1 - Unlikely

Vulnerability

Overview

Dam failure is typically an additional or secondary impact of another disaster such as flooding or earthquake.

The most recent inspection reports were provided and reviewed for the two Significant Hazard dams in the planning area:

- Lake Smith Dam
- Oak Lake Dam

A magnitude rating of "negligible" is appropriate as less than 10% of property would be severely damaged and any shutdown of facilities and services would be less than 24 hours. Since Significant Hazard dams to not generally have the potential for the loss of life, it is reasonable to estimate that injuries would be treatable with first aid. The primary purpose of both Significant Hazard dams is recreation. So, failure would not cause the loss of water supply or other utility.

Magnitude/Severity Score: 1 - Negligible

Potential Losses to Existing Development

The unincorporated county and the City of Algona are the jurisdictions that would be impacted by failure of the Significant hazard dams. Algona is four miles downstream from Lake Smith Dam and five miles downstream from Oak Lake Dam.

Based on the available inspection reports for the most recent inspections for Lake Smith Dam and Oak Lake Dam conducted on July 13, 2017, both dams received a rating of "satisfactory". This means that the dams are expected to have safe performance under all anticipated loading conditions. Additionally, the inspection reports confirmed that there are no changes in downstream land use that would impact the Significant hazard classifications of these dams.

Critical Facilities and Infrastructure at Risk to Levee Failure

No critical facilities were identified as being at risk to the failure of dams.

Future Development

Future development located downstream from dams in floodplains or inundation zones would increase vulnerability to dam or levee failure. Both the unincorporated county and the City of Algona decreased in population from 2010-2016. However, Algona did have an increase of 83 housing units from 2010 to 2015. During this time-period, the unincorporated county had a decrease in housing units.

Climate Change Impacts

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

Dam/Levee Failure Hazard Summary by Jurisdiction

The magnitude of "limited" was assigned to the two jurisdictions downstream of the two significant hazard dams. For jurisdictions that could be impacted by failure of low hazard dams or no dams, this hazard was determined to be "not applicable".

Jurisdiction	Probability	Magnitude	Warning Time	Duration	Score	Level
Kossuth County, Iowa	1	1	4	3	1.65	Low
City of Algona	1	1	4	3	1.65	Low
City of Bancroft	N/A	N/A	N/A	N/A	N/A	N/A
City of Burt	N/A	N/A	N/A	N/A	N/A	N/A
City of Fenton	N/A	N/A	N/A	N/A	N/A	N/A
City of Lakota	N/A	N/A	N/A	N/A	N/A	N/A
City of Ledyard	N/A	N/A	N/A	N/A	N/A	N/A
City of Lone Rock	N/A	N/A	N/A	N/A	N/A	N/A
City of Lu Verne	N/A	N/A	N/A	N/A	N/A	N/A
City of Swea City	N/A	N/A	N/A	N/A	N/A	N/A
City of Titonka	N/A	N/A	N/A	N/A	N/A	N/A
City of Wesley	N/A	N/A	N/A	N/A	N/A	N/A
City of Whittemore	N/A	N/A	N/A	N/A	N/A	N/A
Algona School District	N/A	N/A	N/A	N/A	N/A	N/A
Lu Verne School District	N/A	N/A	N/A	N/A	N/A	N/A
North Kossuth School District	N/A	N/A	N/A	N/A	N/A	N/A

3.6.3 Drought

Hazard Score Calculation					
Probability	**Magnitude/Severity**	**Warning Time**	**Duration**	**Weighted Score**	**Level**
4	3	1	4	3.25	High

Profile

Hazard Description

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

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

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

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

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

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

The National Drought Mitigation Center (NDMC) located at the University of Nebraska in Lincoln provides a clearinghouse for information on the effects of drought, based on reports from media, observers and other sources. NDMC's website is found at http://www.drought.unl.edu/. Specific drought impacts by county are recorded at http://droughtreporter.unl.edu/.

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

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

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

Warning Time Score: 1 - 24+ Hours

Duration Score: 4 - more than 1 week

Geographic Location/Extent

According to the 2012 Census of Agriculture, of the 972.72 square miles (622,540.8 acres) of land area in Kossuth County, 96.3 percent (599,439 acres) is utilized for agricultural purposes. There were 1,349 farms with an average size of 444 acres per farm. Although the entire planning area in Kossuth County is at risk to drought, the agricultural areas are more vulnerable to the immediate effects of drought. The map in **Figure 3-5** in the Animal/Plant/Crop Disease hazard section displays the locations of various cropland uses in Kossuth County.

Previous Occurrences

According to the Iowa Environmental Mesonet, the mean annual precipitation for Kossuth County is 30.09 inches. In average years, this represents enough rainfall to prevent drought; however, successive years of below-average rainfall are the cause drought impacts in the planning area.

Table 3-23 provides the rainfall history at the Algona weather station from 1951 to October 2017. Complete years with less than 30 inches of rain include 1952, 1953, 1955, 1956, 1957, 1958, 1960, 1963, 1966, 1967, 1970, 1971, 1972, 1974, 1975, 1976, 1977, 1979, 1980, 1981, 1985, 1987, 1988, 1989, 1996, 1997, 2002, 2003, 2011, and 2012. The lowest annual precipitation on record occurred in 1958 with 16.66 inches.

Table 3-23: Monthly and Annual Precipitation Totals, 1951 to October 2017, Algona, Iowa Weather Station

Year	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	Ann
1951	0.28	2.41	3.77	4.16	3.67	7.06	3.68	5.32	2.28	1.87	0.33	0.78	35.61
1952	1.98	0.39	1.97	1.11	3.47	5.86	5.24	3.6	0.26	0	0.98	0.61	25.47
1953	0.97	0.75	2.74	2.19	1.97	5.54	3.89	4.19	0.87	0.3	1.77	0.88	26.06
1954	0.43	1.39	2.18	3.66	5.16	10.57	3.16	5.12	2	3.7	0.07	0.78	38.22
1955	0.11	0.79	0.54	3.88	2.08	3.93	3.24	3.37	1.37	0.81	0.28	0.56	20.96
1956	0.38	0.13	1.81	0	3.44	3.58	3.44	2.21	0.55	1.37	2.58	0.35	19.84
1957	0.56	0.25	0.78	0.82	4.75	2.45	2.48	3.14	1.8	1.39	2.87	0.57	21.86
1958	0	0.39	0.6	1.55	1.85	3.5	4.33	2.06	1.09	0.51	0.57	0.21	16.66
1959	0.5	1.81	2.72	1.92	10.07	2.56	0.43	8.6	3.08	1.63	1.65	1.41	36.38
1960	0.48	0.72	1.43	1.84	6.18	3.35	0.91	4.57	2.66	0.54	0.84	1.01	24.53
1961	0.11	2.32	5.23	1.96	2.66	3.42	4.95	5.03	4.3	3.33	0.89	0	34.2
1962	0.18	2.51	0.15	2.49	3.08	3.38	5.66	9.13	2.69	1.77	0.3	0.18	31.52
1963	0.99	0.77	1.39	1.82	3.2	2.9	7.4	1.54	2.31	0.83	0.46	0.32	23.93
1964	0	0.15	0.95	7.17	3.33	3.94	5.55	4.18	7.39	0.48	0.99	1.2	35.33
1965	0.53	2.35	4.15	3.7	4.6	3.62	2.42	6.14	11.47	0.96	1.06	0.61	41.61
1966	0.96	0.69	1.81	1.75	3.29	4.94	3.01	1.83	1.03	0.74	0.13	1.18	21.36
1967	0.67	0.51	0.43	2.09	3.18	7.65	1.35	2.39	1.61	1.46	0.13	0.84	22.31
1968	0.92	0.17	0.4	4.93	1.82	3.67	3.82	2.15	4.82	5.27	3.32	2.76	34.05
1969	1.87	0.94	1.05	0.84	3.96	6.55	6.93	2.54	1.43	2.89	0.7	1.74	31.44

Year	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	Ann
1970	0.66	0.03	1.26	1.21	5.02	1.69	1.68	1.84	4.16	4.64	2.12	0.4	24.71
1971	0.17	3.45	0.98	0.71	2.54	6.18	2.62	0.69	1.26	5.47	2.91	1.06	28.04
1972	0.47	1.05	0	2.44	3.7	2.25	4.89	2.13	6.35	3.21	1.53	1.92	29.94
1973	0	0.83	3.36	3.36	5.79	3.65	5.32	0.95	7.21	1.72	4.53	0.5	37.22
1974	0.09	0.04	1.27	2.81	4.77	3.72	2.15	4.65	0.8	1.28	1.18	0.45	23.21
1975	2.45	0.87	1.34	5.07	3.3	4.9	1.3	4.39	1	0.27	3.29	0.68	28.86
1976	0.17	0.46	3.85	1.31	2.97	3.17	2.7	1.02	0.95	0	0.02	0.21	16.83
1977	0.47	0	2.57	2.83	3.26	3.07	2.2	6.77	2.64	2.77	0.89	0.54	28.01
1978	0.53	0.95	0.55	2.69	2.24	2.19	8.97	3.45	5.77	1.12	1.28	0.56	30.3
1979	0	0.43	4.68	1.72	1.53	2.52	4.42	0	0.56	2.97	2.17	0.63	21.63
1980	0.88	0.94	0.98	0.85	4.3	1.29	2.45	8.1	2.69	1.29	0.6	0.3	24.67
1981	0	0.9	0.66	1.61	3.12	8.93	3.4	2.81	1.16	2.63	0.58	0.93	26.73
1982	1.71	0.25	1.19	2.35	7.77	4.91	4.6	3.62	4.08	3.1	2.42	3.41	39.41
1983	0.53	0.9	3.88	1.91	3.47	8.14	1.82	1.75	5.97	2.82	3.63	0.82	35.64
1984	0.47	0.62	0.73	5.66	3.81	8.79	3.43	0.71	0.79	4.71	2.39	2.23	34.34
1985	0.41	0	1.99	4.89	2.57	3.01	2.1	5.92	6.68	1.16	0.53	0.26	29.52
1986	0.36	0.34	2.03	4.71	3.44	2.58	6.69	3.56	3.66	4.62	1.09	0.39	33.47
1987	0.06	0.07	1.7	2.24	2.77	1.98	6.48	3.65	2.3	1.16	2.43	0.67	25.51
1988	0.72	0.93	0.53	3.15	2.53	2.44	1.8	4.02	3.4	0.39	2.24	0.2	22.35
1989	0.33	0.29	0.26	2.17	3.43	2.27	3.88	1.7	1.77	0.68	0.32	0.08	17.18
1990	0.34	0.23	3.22	2.6	4.2	7.22	3.5	5.21	1.26	1.62	0.39	0.72	30.51
1991	0.46	0.47	4.52	5.76	6.79	8.02	3.75	5.57	2.49	1.1	5.62	1.06	45.61
1992	0.96	0.84	3.13	2.33	2.54	3.99	7.27	2.56	3.94	3.3	2.04	2.24	35.14
1993	1.3	1.95	2.35	3.61	6.09	9.62	7.26	7.19	2.53	0.81	1.04	0.95	44.7
1994	1.14	0.98	0.02	3.12	2.2	11.02	6.68	1.91	4.03	2.86	1.72	0.73	36.41
1995	0.54	0.04	4.16	4.26	4.94	3.26	1.75	6.53	4.76	2.44	0.36	0.48	33.52
1996	1.79	0.09	1.5	1.15	3.67	4.73	3.39	5.06	1.5	2.04	2.79	0.97	28.68
1997	1.08	1.01	1.21	1.44	4.07	2.12	6.34	1.47	2.32	1.88	0.85	0.6	24.39
1998	1.37	1.19	1.88	5.42	4.15	8.5	1.88	3.26	1.98	3.81	0.91	0.17	34.52
1999	1.05	0.68	0.6	7.37	3.72	8.44	5.69	0.33	0.87	1	0.71	0.49	30.95
2000	1.08	0.73	0.94	2.7	3.02	5.2	4.49	4.7	0.49	3.06	2.34	2.1	30.85
2001	0.85	0.73	0.95	4.01	7.69	3.03	5.84	2.34	2.71	0.78	2.46	0.45	31.84
2002	0.21	0.67	1.07	2.81	2.42	2.32	4.14	7.8	1.53	3.7	0.25	0.04	26.96
2003	0.26	0.42	1.73	2	3.81	6.56	3.91	1.48	1.34	0.35	0.89	0.7	23.45
2004	0.81	1.3	3.34	2.31	7.36	3.62	5.6	1.05	4.98	0.85	1.61	0.24	33.08
2005	0.85	1.39	1.92	4.42	8.04	4.29	4.6	4.21	6.17	0.91	2	1.41	40.22
2006	0.36	0.52	3.23	4.71	1.36	2.52	3.21	8.3	3.91	0.82	1.69	1.69	32.32
2007	1.24	1.93	2.49	3.64	4.18	3.84	1.79	13.64	2.73	5.5	0.04	1.22	42.24
2008	0.56	0.29	0.4	3.45	6.36	7.2	4.17	1.04	1.95	2.71	1.75	1.45	31.34
2009	1.24	0.55	1.91	2.28	4.19	3.04	5.57	2.47	2.23	6.77	1.46	2.34	34.06
2010	1.34	1.29	1.8	3.74	1.96	9.62	5.75	2.57	4.42	0.43	2.1	0.78	35.81
2011	1.19	1.11	0.79	5.04	5.15	6.46	3.92	2.19	1.65	0.29	0.43	1.28	29.51
2012	0.73	1.87	2.02	3.55	3.14	3.36	2.47	1.97	1.3	1.64	0.57	1.33	23.95
2013	0.3	0.8	1.54	6.76	9.66	4.35	1.15	2.88	0.83	2.23	1.15	0.64	32.29
2014	0.28	1.29	0.77	3.61	3.81	13.11	2.13	5.01	4.99	2.65	0.35	1.22	39.22
2015	0.48	1.05	0.43	4.92	6.22	4.32	4.64	8.42	2.25	1.25	4.99	2.81	41.78
2016	0.38	1.01	2.29	2.83	4.71	3.11	4.89	5.01	10.65	3.15	1.12	1.78	40.94
2017	1.66	2.06	2.58	2.85	6.43	3.42	1.06	9.18	2.79	****	****	****	32.03
MEAN	0.75	0.93	1.65	2.88	4.09	4.58	3.5	3.89	3.38	2	1.51	0.97	30.09

Source: Iowa Environmental Mesonet, Report generated March 28, 2016, Site information: IA0133, Algona, https://mesonet.agron.iastate.edu/climodat/index.phtml?network=IACLIMATE&station=IA1541&report=17

According to the National Drought Mitigation Center's Drought Impact Reporter, during the 10-year period from January 2007 through December 2016, 86 listed drought impacts were noted for the State of Iowa. Of these impacts, 8 were reported to affect Kossuth County. 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
- Relief, Response & Restrictions – 6
- Society & Public Health - 1
- Water Supply & Quality – 2

Impacts of recent drought periods in Iowa that affected Kossuth County are provided below. Unless otherwise indicated, these impacts are from the National Climatic Data Center.

- **August 1, 2001** - In what became a rather tough growing season, drought developed in Iowa during the month of July, and became serious in August. During the early part of the growing season, excessive rainfall caused significant planting delays across the state. Once the crop was planted, cool and cloudy weather settled into the state slowing crop maturation. Once the warm weather finally arrived, rainfall tailed off significantly. Very little rainfall was reported during the month of July, however crops flourished with the moisture that was available. During the last half of July, temperatures began to soar into the 90s quite regularly. Temperatures were in the 90s to around 100 for most of the first 10 to 12 days of August with virtually no rainfall. Moisture reserves ran out during the critical time of pod filling for the soybeans and at the tasseling for the corn. Another factor that complicated the situation was the soil moisture profile over central and southwest Iowa. After two years of drought, rain began falling during the last fall of 2000 and continued into the spring of 2001. Though soil moisture was replenished in part, a layer of dry soil remained below the moistened layer, preventing root development below the moist layer. Reports indicate losses estimated between one third and one half in parts of central and southwest Iowa. A few locations had verifiable corn crop losses approaching 80%. Overall, losses for the season were closer to the 15% range. Damage to the corn crop was a little over $350 million, with about $225 million in losses to the soybean crop, and about a two million dollar loss to the oat crop.
- **August 1, 2003** - Dry weather settled in over Iowa during the month. The last widespread rain occurred on 09 July. With the increasingly dry conditions became a primary concern as the month progressed. An extended period of heat and humidity from the 15th to 25th saw highs into the 90s to over 100 degrees F. in some locations. By month's end drought indices had worsened to severe to extreme drought across south central Iowa and at least moderate drought over the remainder of the HSA. Waterloo had its driest August on record, Des Moines its 3rd driest and Ottumwa its 8th driest. A cold front brought only a brief respite from the intense heat, as temperatures rebounded into the 90s to near 100 degrees F. on the 24-26th. Des Moines Airport reached the century mark for the first time since July 29, 1999, reaching 100 F. on the 24th and 101 F. on the 25th. This was followed by a slow cool down as several pushes of cooler air traversed the state. Unfortunately, there was only widely scattered convection across the HSA on the 27th and 28th, providing little significant drought relief. Light to moderate rainfall on the 31st fell across primarily the southern one half of the HSA, with the heaviest amounts in the southeast. The end of the month saw numerous records approached or established for an all-time record dry August. At Waterloo the 0.08" broke the previous dry August record of 0.37" set in 1955, while Des Moines had its 3rd driest August ever with 0.31" (driest 0.14" in 1909). Many stations had from 10 to 25 percent of normal rainfall. The drought in south central Iowa

as shown by the Palmer Drought Index reached the Extreme category (-4.09) for the first time in this event by August 30th. Statewide NWS Cooperative station data compiled by the Iowa State Climatologist's office showed August temperatures averaged 74.3 F. or 3.0 degrees above the 30-year (1971-2000) mean, ranking as the 18th warmest in 131 years. Precipitation statewide was 0.96" or 3.23" below than normal, ranking as the driest August on record. For the summer as a whole (June-August) it was the 65th warmest (72.0 F. or 0.4 degrees above normal) and the 18th driest (9.55" or 1.93" below normal). The dry conditions caused deterioration in the states crops. Estimates place yield reductions of about 10% on the corn crop, or a loss of about $210 million. Losses on the soybean crop were around 30%, or a loss of about $435 million.

- **July 1, 2012** - Very warm and dry weather that began in the spring continued into the summer. Temperatures warmed sharply the last few days of June. The heat persisted into July. Temperatures for the month of July were among the warmest on record. In Des Moines, the monthly mean temperature was the second highest of record, only eclipsed by July of 1936. Rainfall was in short supply across the state. Much of the state recorded less than 50% of normal rainfall for the month, with a few locations under 10% of normal. In addition, extended periods of temperatures above 95 F resulted in problems with pollination of the crops. Rapid deterioration of the corn and soybean crop took place with several periods of temperatures in excess of 100 degrees. By the end of the month, officials estimated that 20% of the crop yield had been lost to the drought. At the current price, the loss total was in excess of $2.25 billion. As of 31 July, the USDA reported that Secretarial Primary Drought Designations had been listed for 21 counties in the Des Moines CWA, with 11 receiving Contiguous Designation. The primary counties were Butler, Bremer, Hamilton, Hardin, Grundy, Black Hawk, Boone, Story, Marshall, Tama, Polk, Jasper, Poweshiek, Marion, Mahaska, Lucas, Monroe, Wapello, Wayne, Appanoose, and Davis. Contiguous counties included Wright, Franklin, Webster, Greene, Dallas, Madison, Warren, Clarke, Taylor, Ringgold, and Taylor. The drought conditions continued into August.
- **August 1, 2012** - Drought conditions that began in late June continued through July and into August. Very warm and dry weather that began in the spring continued through the summer. Temperatures warmed sharply the last few days of June. The heat persisted into August. Temperatures for the month of August were cooler than July, and in fact, just above normal. For the three summer months of June, July, and August, temperatures were among the top 10 warmest on record. Rainfall was in short supply across the state. Much of the state recorded less than 50% of normal rainfall for the month, with a few locations under 25% of normal. The south quarter fared a little better with a few locations receiving close to normal rainfall for the month. In addition, extended periods of temperatures above 90 F combined with dewpoint temperatures falling into the 50s at times, resulted in additional stress. The rapid deterioration of the corn and soybean crop that took place in July slowed as much of the damage had already occurred in July. By the end of the month, officials estimated that 15% of the soybean crop and 20% of the corn crop yield had been lost to the drought. At the current price, the loss total was in excess of $2.6 billion. As of 31 August, the USDA reported that Secretarial Primary Drought Designations had been listed for 42 of the counties in the Des Moines CWA, with the remaining 9 receiving Contiguous Designations. The drought conditions continued into September.
- **September 1, 2012** - Drought conditions that began in late June continued through the summer and into September. Very warm and dry weather that began in the spring continued through the summer. Temperatures remained well above normal into August but began to temper during the latter portion of the month. September began well above normal for the first week, but the fall transition began after that. For the month of September, temperatures averaged fairly close to normal. Rainfall was in short supply across the state. Much of the state recorded less than 50% of normal rainfall for the

month, with a few locations under 25% of normal. The rapid deterioration of the corn and soybean crop that took place in July slowed as much of the damage had already occurred in July. No significant damage occurred in September in spite of the dry conditions and early freeze of much of the state on the 23rd. Harvest activities were more than 2 weeks ahead of normal. Indications were that yields of the corn crop were around 140 bu/ac and 43.5 bu/ac for the bean crop. These values were about 20% and 15% below normal for corn and beans respectively. At the current price, the loss total was in excess of $2.6 billion. As of 03 October, the USDA reported that Secretarial Primary Drought Designations had been listed for all 51 of the counties in the Des Moines CWA. The drought conditions continued into October.

- **October 1, 2012** - Drought conditions that began in late June continued through the summer and into October. Very warm and dry weather that began in the spring continued through the summer. Temperatures remained well above normal into August but began to temper during the latter portion of the month. Temperatures cooled in October with the month averaging near to a little below normal. It was the first cooler than normal month in 13 months across the CWA. More widespread rainfall began by the middle of the month with a fairly widespread event on the 13th. The rapid deterioration of the corn and soybean crop that took place in July slowed as much of the damage had already occurred in July. No significant damage occurred in September in spite of the dry conditions and early freeze across much of the state on the 23rd. Harvest activities continued at a fast pace with nearly all activities complete by the middle of October. This was three to four weeks ahead of normal. Indications were that yields of the corn crop were around 140 bu/ac and 43.5 bu/ac for the bean crop. These values were about 20% and 15% below normal for corn and beans respectively. At the current price, the loss total was in excess of $2.6 billion. By late September, the USDA reported that Secretarial Primary Drought Designations had been listed for all 51 of the counties in the Des Moines CWA. The drought conditions continued through the month and into November as it will take many months to recharge the soil. No significant damage occurred in October and it is unlikely that water restrictions would occur before the spring, thus this will be the final entry unless conditions worsen.
- **August 1, 2013** - Serious drought conditions gripped the state through the summer months. Initial sub-soil moisture was good at the beginning of the growing season. The recharged soil was sufficient to maintain the crops through a good part of the summer. Rainfall remained low through August as well and crops deteriorated rapidly under the warmer than normal and very dry conditions. Rainfall for the summer was between 1/3 and 2/3rds of normal across much of the Des Moines CWA. A large part of the CWA received under 5% of normal rainfall in August, with most areas under 20%. Crop loss through the month was around 10%. This translated to over $600 million in crop loss for the corn crop, and about $350 million for soybeans.

Table 3-24 below provided by the U.S. Drought Monitor, summarizes the historical drought conditions for Iowa by intensity and percent area from 2007 through 2016. Portions of Iowa were in exceptional drought intensity in 2012 and 2013 during this 10-year timeframe.

Table 3-24: Historic Drought Intensity (Percent Area) Iowa 2007-2016

Drought Intensity	2007	2008	2009	2010	2011	2012	2013	2014	2015	2016	2007-2016 Average
None	69.51	81.32	24.41	100.00	71.05	25.97	27.55	64.37	88.57	89.42	64.22
D0 Abnormally Dry	24.61	15.01	16.77	0.00	14.58	12.51	18.97	15.57	10.91	9.02	13.79
D1 - Moderate	5.44	3.18	29.59	0.00	8.28	13.24	27.15	16.21	0.52	1.57	10.52
D2 - Severe	0.44	0.50	28.38	0.00	6.09	24.53	17.99	3.85	0.00	0.00	8.18
D3 - Extreme	0.00	0.00	0.86	0.00	0.00	23.11	8.11	0.00	0.00	0.00	3.21
D4 - Exceptional	0.00	0.00	0.00	0.00	0.00	0.64	0.24	0.00	0.00	0.00	0.09

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

According to the USDA's Risk Management Agency, payments for insured crop losses in Kossuth County as a result of drought conditions occurred in all ten years from 2007-2016 and totaled $19,537,671.80 (see **Table 3-25**). With the extensive drought conditions during the years of 2013, over 50 percent of the 10-year crop losses came from this year alone.

Table 3-25: Crop Insurance Claims Paid from Drought, 2007-2016

Year	Insurance Paid
2007	$796,518.00
2008	$662,603.00
2009	$44,114.00
2011	$921,890.00
2012	$5,749,728.00
2013	$11,257,954.00
2014	$72,649.80
2015	$32,215.00
Insurance Paid	**$19,537,671.80**

Source: USDA Risk Management Agency

Probability of Future Occurrence

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

The following are the indices:

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

In the past 10 years, there have been eight years with crop insurance claims as a result of drought in Kossuth County. If this trend continues, this results in a probability of 80% of agricultural impacts as a result of drought in any given year. The probability rating for this hazard is "Highly Likely".

Probability Score: 4 - Highly Likely

Vulnerability

Overview

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

Kossuth County has 1,349 farms in the County that cover 599,439 acres of land. This translates to 96.3 percent of the surface land in the County being used for agriculture. Therefore, the planning area has a high exposure to this hazard. Aside from agricultural impacts, other losses related to drought include increased costs of fire suppression and damage to roads and structural foundations due to the shrink dynamic of expansive soils during excessively dry conditions. Drought also presents hazards to public health in extreme cases, where drinking water production cannot keep up with demand. Water wells become less productive during drought and a failure of remaining productive wells (due to power outage, etc.) can cause public drinking water supplies to become compromised.

According to the *2013 Iowa Hazard Mitigation Plan*, of the 8 hazards for which data was available to estimate annualized losses, drought ranked 2nd with $424 million in annualized losses based on data spanning an 18-year period. Losses associated with this hazard can be very high, particularly associated with agriculture. Crop insurance coverage mitigates the adverse economic impacts somewhat.

Magnitude Score: 3 - Critical

Potential Losses to Existing Development

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

According to the ten-year period from USDA's Risk Management Agency, the amount of claims paid for crop damage as a result of drought in Kossuth County was $19,537,672. According to the 2015 Iowa Crop Insurance Profile from USDA's Risk Management Agency, 89 percent of the insurable crops in Iowa are insured with USDA Crop Insurance. To factor in estimated losses to insurable crops that are not insured, the 89 percent crop insurance coverage was factored in to provide an adjusted estimate of losses. According to this calculation, estimated annualized losses total $2,195,244 (see **Table 3-26**).

Considering the value of crops from the 2012 Census of Agriculture as baseline crop exposure, the estimated annual losses from drought was determined minimal compared to the value of the insurable crops.

Table 3-26: Estimated Insurable Annual Crops Lost Resulting from Drought

10-Year Drought Insurance Paid	Adjusted 10-Year Drought Losses (considering 89% insured)	Estimated Annualized Losses	2012 Value of Crops	Annualized Crop Loss Ratio (Losses/Value)
$19,537,672	$21,952,440	$2,195,244	$463,598,000	0.47%

Source: Crop value is from USDA 2012 Census of Agriculture; Crop Insurance Paid is from the USDA's Risk Management Agency for 2007-2016.; Crop Insurance Coverage is from USDAs 2015 State Crop Insurance Profile for Iowa

Future Development

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

Climate Change Impacts

For the most part, climate change studies have shown increases in precipitation, rather than decreases. However, drought cycles still continue. Climate change studies have also shown some increases in average temperatures. If this occurs during a drought cycle, the drought impacts will be exacerbated and increased agricultural losses will be sustained.

Drought Hazard Summary by Jurisdiction

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

Jurisdiction	Probability	Magnitude	Warning Time	Duration	Score	Level
Kossuth County, Iowa	4	3	1	4	3.25	High
City of Algona	4	3	1	4	3.25	High
City of Bancroft	4	3	1	4	3.25	High
City of Burt	4	3	1	4	3.25	High
City of Fenton	4	3	1	4	3.25	High
City of Lakota	4	3	1	4	3.25	High
City of Ledyard	4	3	1	4	3.25	High
City of Lone Rock	4	3	1	4	3.25	High
City of Lu Verne	4	3	1	4	3.25	High
City of Swea City	4	3	1	4	3.25	High
City of Titonka	4	3	1	4	3.25	High
City of Wesley	4	3	1	4	3.25	High
City of Whittemore	4	3	1	4	3.25	High
Algona School District	4	3	1	4	3.25	High
Lu Verne School District	4	3	1	4	3.25	High
North Kossuth School District	4	3	1	4	3.25	High

3.6.4 Earthquake

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

Profile

Hazard Description

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

Warning Time Score: 4 - less than 6 hours

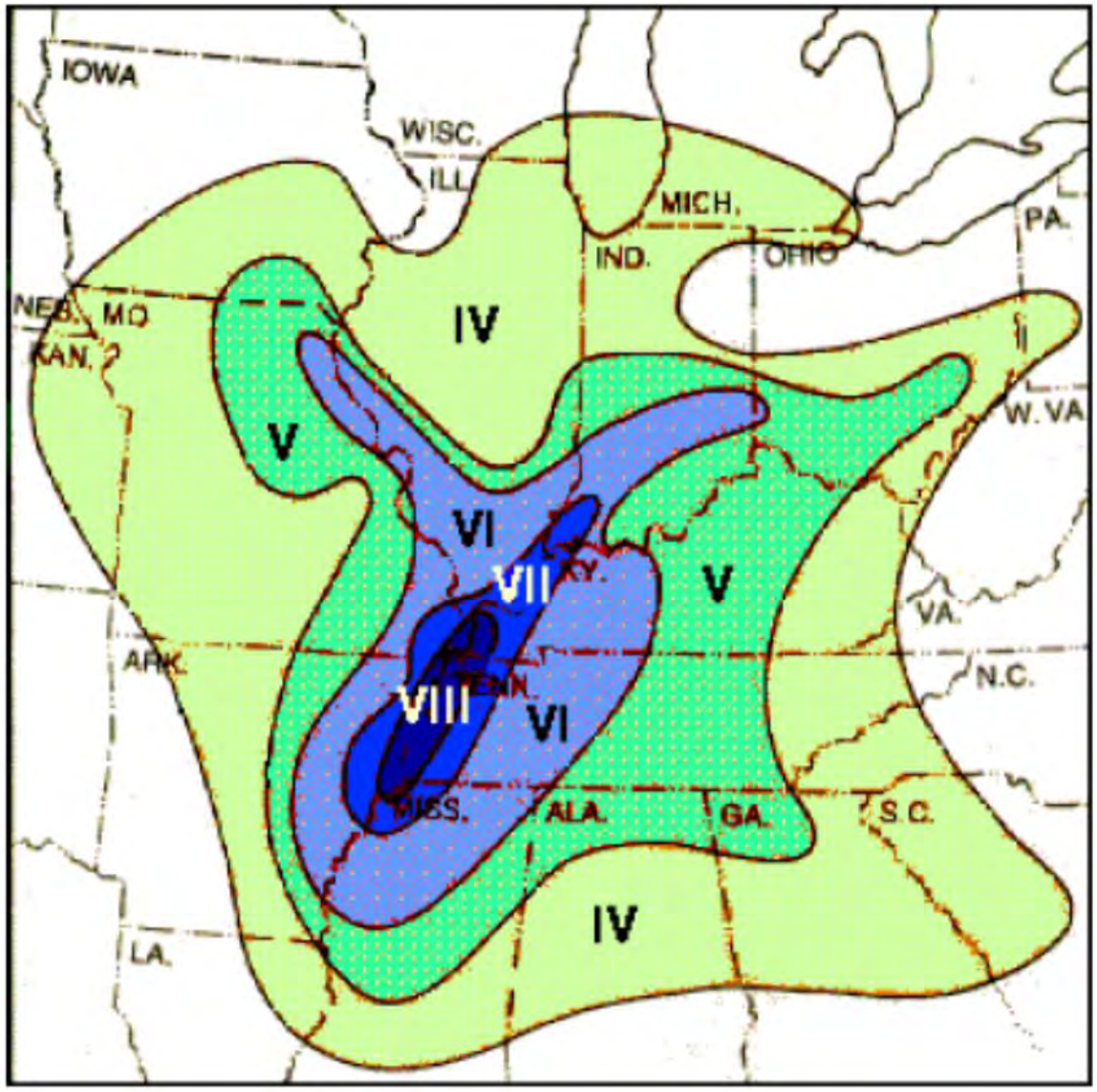
Duration Score: 1 - less than 6 hours

Geographic Location/Extent

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

Iowa counties are located in low risk zones as a whole. The southeastern part of the State is more at risk to earthquake effects from the New Madrid Fault Zone. **Figure 3-9** shows the estimated effects of a 6.5 Richter magnitude earthquake scenario along the New Madrid Fault Zone. It suggests that Iowans in four southeast counties could experience trembling buildings, some broken dishes and cracked windows, movement and falling of small unstable objects, abrupt openings or closing doors, and liquids spilling from open containers. About 29 other counties, from Page to Polk to Muscatine, could experience vibrations similar to the passing of a heavy truck, rattling of dishes and windows, creaking of walls, and swinging of suspended objects. These effects will vary considerably with differences in local geology and construction techniques. There is also a minor fault in Southwest Iowa located near Fremont County.

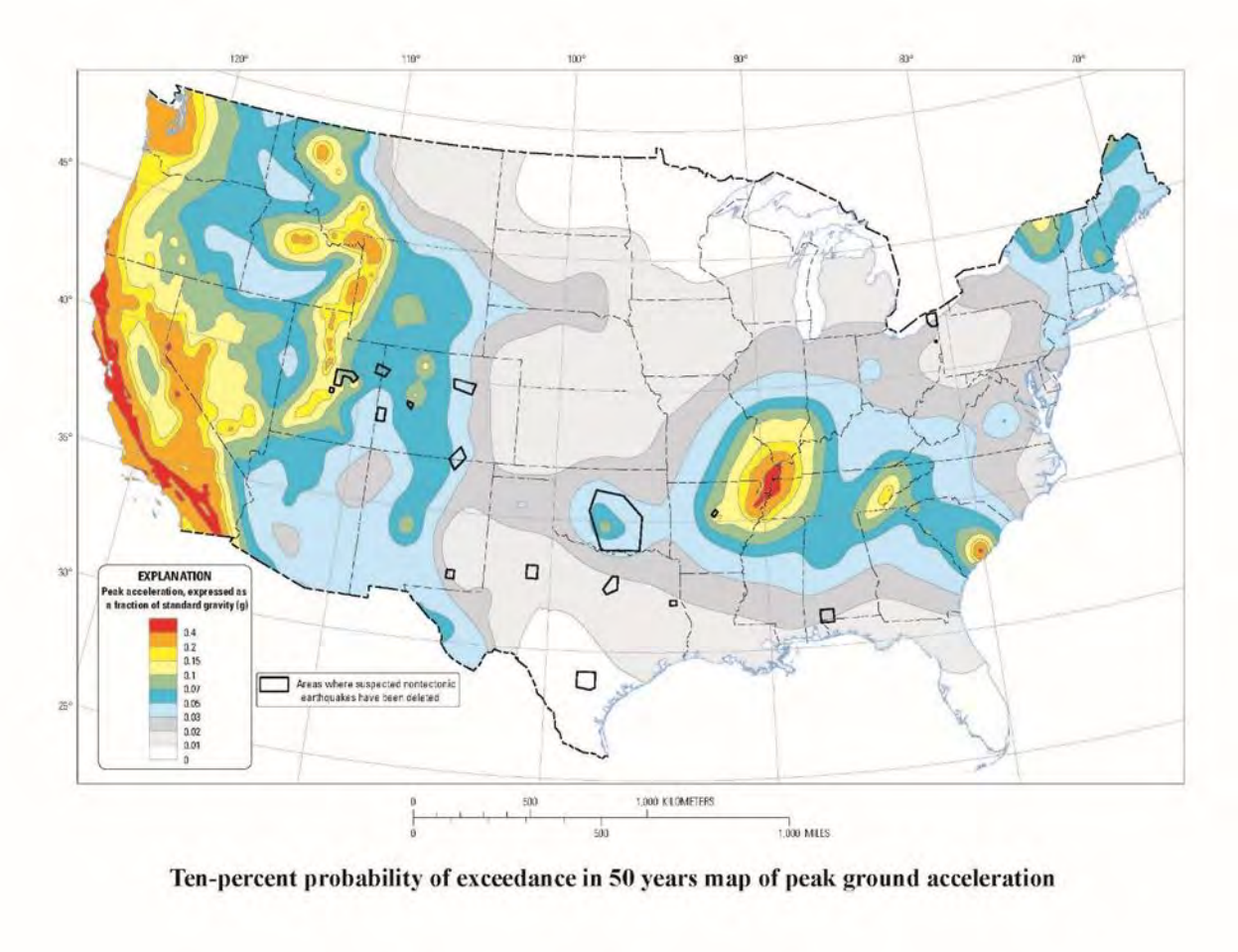
Figure 3-9: 6.5 Richter Magnitude Earthquake Scenario, New Madrid Fault Zone



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

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

Figure 3-10: United States Seismic Hazard Map



Ten-percent probability of exceedance in 50 years map of peak ground acceleration

Source: United States Geological Survey, https://earthquake.usgs.gov/hazards/hazmaps/conterminous/index.php#2014

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

Richter Magnitude Scale

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

Modified Mercalli Intensity Scale

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

The 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 actually experienced.

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

Previous Occurrences

Iowa has experienced little impact from only a few earthquakes in the past 175 years. The epicenters of 13 earthquakes have been located in the State, with the majority occurring along the Mississippi River. The strongest earthquake in Iowa occurred in Davenport in 1934, which is located in Scott County; the earthquake resulted in only slight damage. The closest earthquake to Kossuth County was located in Black Hawk County, approximately 137 miles southeast in 1925. (Source: *State of Iowa Hazard Mitigation Plan*, 2013). Details of the 13 Iowa earthquakes are provided below:

Table 3-27: Historical Earthquakes in Iowa

Date	Nearest Town	Mercalli Intensity
7/16/2004	Shenandoah, IA	III
4/20/1948	Oxford, IA	IV
11/24/1939	Davenport, IA / Rock Island, IL	II-III
11/8/1938	Dubuque, IA	-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, 2013

Probability of Future Occurrence

Figure 3-10 shows that Kossuth County would have a very low Peak Ground Acceleration when considering a 10 percent probability of exceedance in 50 years. The probability of a significant earthquake in any given year is "Unlikely"

Probability Score: 1 - Unlikely

Vulnerability

Overview

As discussed above, the probability of a significant earthquake in Kossuth County is unlikely. Although a damaging event is unlikely, if an earthquake with even minor ground shaking were to occur, the potential impacts would be costlier in the urban areas of the county. However, because of the relatively low magnitude of a possible quake, property damage would likely be very minor damage.

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

Magnitude Score: 1 - Negligible

Potential Losses to Existing Development

FEMA's loss estimation software, HAZUS was utilized to analyze a 2,500-year probabilistic scenario earthquake event. This earthquake scenario is equivalent to a 2 percent probability of exceedance in 50 years. The earthquake scenario utilized is based on a probabilistic scenario, rather than a deterministic scenario. Therefore, this is not a magnitude-based scenario, but is rather based on ground shaking using the probabilistic mapping done by USGS (see http://earthquake.usgs.gov/hazards/products/conterminous/). The HAZUS Earthquake module reports earthquake damage by census tract. As a result, it is not possible to separate the resulting damage amounts by incorporated area, as the census tract boundaries are not the same as the incorporated area boundaries. **Table 3-28** below provides the results of the HAZUS analysis for Kossuth County. This analysis estimates that the total direct structural damage would be $680,000. The combined building, contents and related economic losses such as lost wages, rental, and relocation costs calculated to be just over $3 million.

Table 3-28: Kossuth County, Iowa Estimated Economic Losses—2,500 Year Probabilistic Earthquake Event

Category	Area	Single Family	Other Residential	Commercial	Industrial	Others	Total
Income Losses							
	Wage	$0	$10,000	$180,000	$10,000	$30,000	$230,000
	Capital-Related	$0	$10,000	$160,000	$10,000	$10,000	$190,000
	Rental	$30,000	$30,000	$120,000	$0	$10,000	$190,000
	Relocation	$100,000	$20,000	$160,000	$20,000	$100,000	$400,000
	Subtotal	**$130,000**	**$70,000**	**$620,000**	**$40,000**	**$150,000**	**$1,010,000**
Capital Stock Losses		$0	$0	$0	$0	$0	$0
	Structural	$210,000	$40,000	$210,000	$40,000	$190,000	$690,000
	Non-structural	$570,000	$80,000	$250,000	$50,000	$130,000	$1,080,000
	Content	$110,000	$10,000	$80,000	$30,000	$50,000	$280,000
	Inventory	$0	$0	$0	$10,000	$0	$10,000
	Subtotal	$890,000	$130,000	$540,000	$130,000	$370,000	$2,060,000
Total		**$1,020,000**	**$200,000**	**$1,160,000**	**$170,000**	**$520,000**	**$3,070,000**

Source: HAZUS-MH 4.0, October 2017

Table 3-29 provides the anticipated numbers of buildings by type and damage category that would result according to the HAZUS analysis. The estimated building types and counts are from the HAZUS damage outputs utilizing census block data. According to this analysis, no buildings would suffer complete damage, four buildings would have extensive damage, 36 would have moderate damage and 139 would have slight damage. The majority of buildings in the planning area (over 8,000) would not be damaged.

Table 3-29: Expected Building Damage by Building Occupancy Type

	None	Slight	Moderate	Extensive	Complete
Agriculture	447	17	6	1	0
Commercial	661	24	8	1	0
Education	29	1	0	0	0
Government	32	1	0	0	0
Industrial	165	6	2	0	0
Other Residential	254	9	3	0	0
Religion	78	3	1	0	0
Single Family	6,544	79	15	1	0
Total	**8,209**	**139**	**36**	**4**	**0**

Source: HAZUS-MH 4.0

Based on the estimate of 16 single-family and 3 other residential buildings with moderate, extensive, or complete damage, and considering the average household size in the county of 2.14, the displaced population would be approximately 41 people.

Future Development

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

Climate Change Impacts

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

Earthquake Hazard Summary by Jurisdiction

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

Jurisdiction	Probability	Magnitude	Warning Time	Duration	Score	Level
Kossuth County, Iowa	1	1	4	1	1.45	Low
City of Algona	1	1	4	1	1.45	Low
City of Bancroft	1	1	4	1	1.45	Low
City of Burt	1	1	4	1	1.45	Low
City of Fenton	1	1	4	1	1.45	Low
City of Lakota	1	1	4	1	1.45	Low
City of Ledyard	1	1	4	1	1.45	Low
City of Lone Rock	1	1	4	1	1.45	Low
City of Lu Verne	1	1	4	1	1.45	Low
City of Swea City	1	1	4	1	1.45	Low
City of Titonka	1	1	4	1	1.45	Low
City of Wesley	1	1	4	1	1.45	Low
City of Whittemore	1	1	4	1	1.45	Low
Algona School District	1	1	4	1	1.45	Low
Lu Verne School District	1	1	4	1	1.45	Low
North Kossuth School District	1	1	4	1	1.45	Low

3.6.5 Extreme Heat

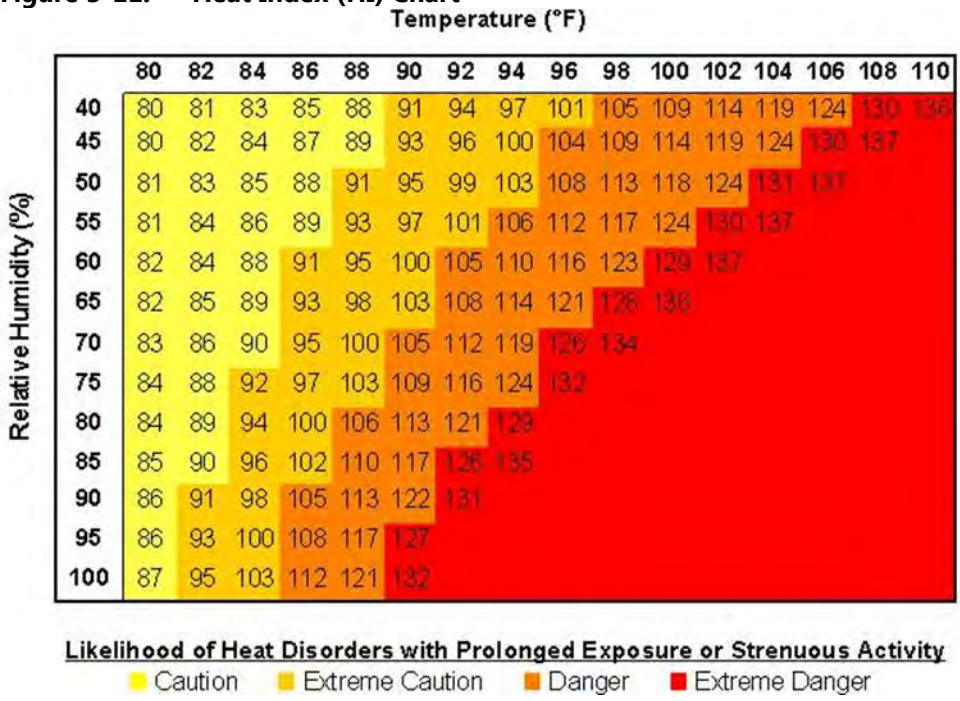
Hazard Score Calculation					
Probability	**Magnitude/Severity**	**Warning Time**	**Duration**	**Weighted Score**	**Level**
3	2	1	3	2.40	Moderate

Profile

Hazard Description

According to information provided by FEMA, extreme heat is defined as temperatures that hover 10 degrees or more above the average high temperature for the region and last for several weeks. Ambient air temperature is one component of heat conditions, with relative humidity being the other. The relationship of these factors creates what is known as the apparent temperature. The Heat Index Chart in **Figure 3-11** uses both of these factors to produce a guide for the apparent temperature or relative intensity of heat conditions.

Figure 3-11: Heat Index (HI) Chart



Source: National Weather Service (NWS) http://www.nws.noaa.gov/os/heat/heat_index.shtml

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.

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

Table 3-30 lists typical symptoms and health impacts of exposure to extreme heat.

Table 3-30: 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: National Weather Service Heat Index Program, www.weather.gov/os/heat/index.shtml

The National Weather Service 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 night time 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.

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

Duration Score: 3 - Less than one week

Geographic Location/Extent

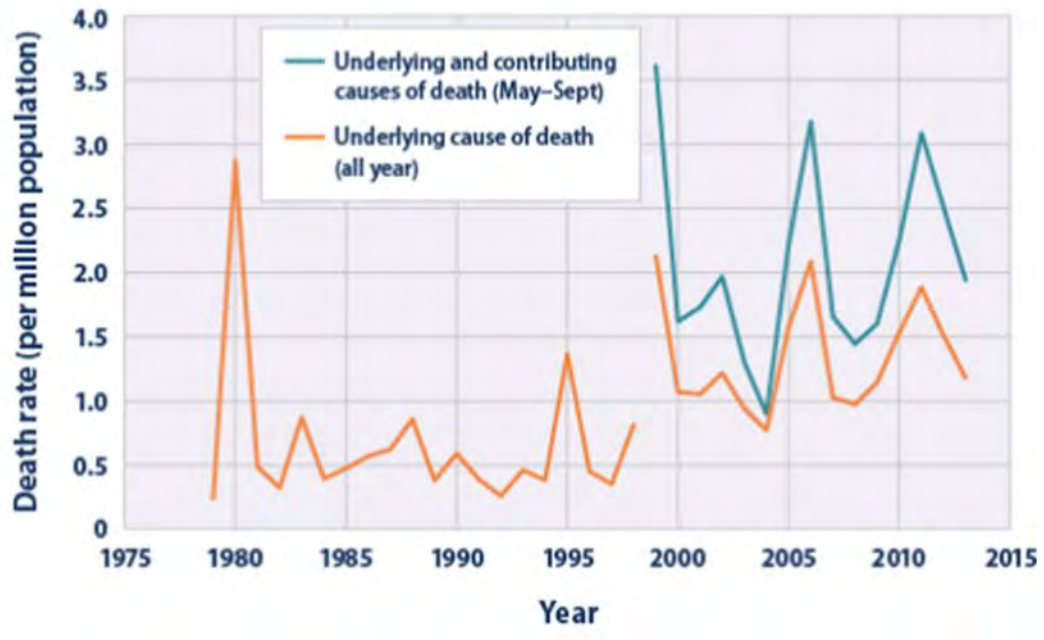
The entire planning area is subject to extreme heat and all participating jurisdictions are affected.

Previous Occurrences

Figure 3-12 shows heat-related deaths in the United States using two methodologies. One method shows deaths for which excessive natural heat was stated as the underlying cause of death from 1979 to 2013. The other data series shows deaths for which heat was listed as either the underlying cause or a contributing cause, based on a broader set of data that at present can only be evaluated back to 1999. For example, in a case where cardiovascular disease was determined to be the underlying cause of death, heat could be listed as a contributing factor because it can make the individual more susceptible to the effects of this disease. Because excessive heat events are associated with summer months, the 1999–2013 analysis was limited to May through September.

According to the National Weather Service, in 2015, 45 people died nationally as a result of extreme heat. In 2014, there were 20 heat-related deaths. In 2013 there were 92 and in 2012, there were 155 deaths. The 10-year average for heat related fatalities is 124. Only one heat-related death has been reported for Iowa within the last 10 years, occurring in 2006. (Source: http://www.nws.noaa.gov/om/hazstats.shtml).

Figure 3-12: Deaths Classified as "Heat Related" in the United States, 1979-2013



Source: Environmental Protection Agency, https://www3.epa.gov/climatechange/pdfs/print_heat-deaths-2015.pdf

On average, the hottest months of the year are July and August. According to the High Plains Regional Climate Center, the average temperature in Kossuth County for the month of July is 72.02 degrees Fahrenheit (°F) with an average maximum temperature of 79.28 °F; and the average temperature for the month of August is 69.54 °F with an average maximum temperature of 82.60 °F. (Source: http://www.hprcc.unl.edu/datasets.php?set=CountyData#)

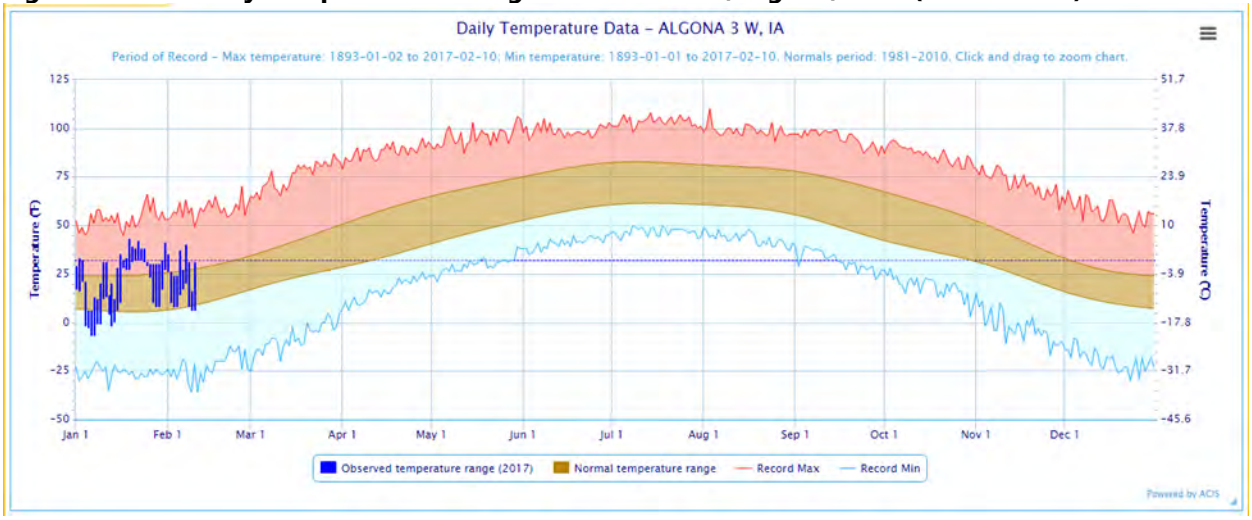
From 1993 to 2016, there were 27 days with temperatures 95 degrees Fahrenheit or above (at least 10 degrees above normal). When looking at only those events with a high temperature of 95 degrees Fahrenheit and higher that lasted for 3 consecutive days or more, there was one occurrence during the 24-year period from 1993 to 2016.

The following summarizes the National Weather Service Advisories, Watches, and Warnings for Heat or Excessive Heat in Kossuth County from 1986 to 2016 (31 years of data)

- 14 Advisories
- 4 Watches
- 3 Warnings

Figure 3-13 provides the daily temperature averages and extremes the Algona, Iowa weather station for the period from 1981 to 2010 from the High Plains Regional Climate Center. This graph also shows the observed temperature range for 2017 to-date as of February 13, 2017.

Figure 3-13: Daily Temperature Averages and Extremes, Algona, Iowa (1981 – 2010)



Source: High Plains Regional Climate Center, http://climod.unl.edu/

The National Climatic Data Center reported one regional heat events and two regional excessive heat events in and around the Kossuth County planning area:

- **August 5, 2001** - Regional Heat Event - Very warm and humid conditions that began in the last part of July continued into August. Temperatures during the day warmed into the 90s, with overnight lows remaining in the 70s. Dew point temperatures held in the mid-70s to low-80s through most of the time. An elderly woman passed away in Des Moines on the 5th. She was found in her home with the windows closed and temperatures in the house in excess of 100 degrees F. She had succumbed to the heat.
- **July 15, 2011** - Regional Excessive Heat Event - A large area of high pressure developed in the upper atmosphere by the middle of July. Heat built up over Iowa, aided by the severe drought to the south across Kansas, Oklahoma, and Texas. Temperatures rose into the 90s each day through the period. Though most days did not see 100-degree heat, the dewpoint and overnight lows were very significant. Low temperatures during most of the nights were in the 70s, with many of the nights in the mid to upper 70s. Dewpoint temperatures failed to fall below 70 through most of the period, with frequent excursions in the upper 70s to low 80s. These conditions caused considerable stress on livestock. Reports indicated that at least 4000 head of cattle and thousands of turkeys were killed by the suffocating heat. Livestock losses were estimated in the $5 to $10 million dollar range.
- **July 20, 2016** - Regional Excessive Heat Event - A warm front lifted through the state on the 20th, allowing southerly winds to bring about high temperatures in the low 90s along with dew points in the upper 70s to 80 at times. As a result, heat index values easily eclipsed the 100-105-degree range and at times exceeded 110. Additionally, overnight lows did not provide much in the way of relief with many areas seeing lows in the mid and even upper 70s at times.

According to the USDA's Risk Management Agency, insured payments in Kossuth County for damages to crops as a result of heat and hot wind from 2007-2016 totaled $378,722.00. **Table 3-31** shows the insurable crop insurance claims paid in Kossuth County as a result of heat and hot wind.

Table 3-31: Claims Paid in Kossuth County for Crop Loss as a Result of Heat and Hot Wind (2007-2016)

Year	Insurance Paid for Hot Wind	Insurance Paid for Heat
2008		$11,652.00
2009		$20,448.00
2010		$2,430.00
2011		$98,704.00
2012	$11,898.00	$61,606.00
2013		$135,435.00
2015		$24,117.00
2016		$12,432.00
Insurance Paid	**$11,898.00**	**$366,824.00**
Total Insurance Paid		**$378,722.00**

Source: Crop Insurance Paid is from the USDA's Risk Management Agency for 2007-2016;

Note: There were no claims paid as a result of Hot Wind from 2007-2011 or 2013-2016; or Heat in 2007 or 2014.

Probability of Future Occurrence

Based on seven (7) National Weather Service Heat/Excessive Heat Warnings and Watches from 1986 to 2016 (31 years), the probability of occurrence is 22.6 percent. This translates to a probability rating of "Likely"

Probability Score: 3 - Likely

Vulnerability

Overview

Those at greatest risk for heat-related illness and deaths include people 65 years of age and older, people who are overweight, and people who are ill or on certain medications. To determine jurisdictions within the planning area with populations that may be more vulnerable to extreme heat, demographic data was obtained from the U.S. Census Bureau on numbers of people in each jurisdiction that are over the age of 65 are seen in **Table 3-32**. Data was not available for overweight individuals and those on certain medications.

Overall, Iowa is already older than the country as a whole. About 15 percent of its population is over 65 years, compared with 13 percent nationally. Kossuth County's population over 65 years is higher than the national and state average at 22.1 percent. The participating jurisdictions with the highest percent of adults 65 and over in descending order are the cities of Lone Rock, Lakota, Titonka, Algona, Ledyard, Bancroft, Burt, Fenton, Whittemore, Swea City, Wesley, and Lu Verne.

Table 3-32: Kossuth County Population 65 years and Over, 2011-2015 American Community Survey 5-Year Estimates

Jurisdiction	Total Population	Population 65 yrs. and over	Percent 65 yrs. and over
Kossuth County, Iowa	15,280	3,377	22.10%
City of Algona	5,494	1,423	25.90%
City of Bancroft	409	92.025	22.50%
City of Burt	550	112.75	20.50%
City of Fenton	325	64.025	19.70%
City of Lakota	101	32.623	32.30%
City of Ledyard	117	29.016	24.80%
City of Lone Rock	136	50.048	36.80%
City of Lu Verne	336	37.968	11.30%
City of Swea City	525	99.225	18.90%
City of Titonka	500	141	28.20%
City of Wesley	354	54.87	15.50%
City of Whittemore	474	92.904	19.60%

Source: U.S. Census Bureau, 2011-2015 American Community Survey 5-Year Estimates

Magnitude Score: 2 - Limited

Estimated Losses to Existing Development

According to the ten-year period from USDA's Risk Management Agency, the amount of claims paid for crop damages as a result of heat was $378,722. According to the 2015 Iowa Crop Insurance Profile Report issued by the USDA's Risk Management Agency, 89 percent of Iowa insurable crops were insured. To factor in estimated losses to insurable crops that are not insured, the 89 percent crop insurance coverage was factored in to provide an adjusted estimate of losses. According to this calculation, estimated annualized losses total $42,553 (see **Table 3-33**).

Considering the value of crops from the 2012 Census of Agriculture as baseline crop exposure, the estimated annual losses from heat was determined to be minimal (0.01%) compared to the value of the insurable crops.

Table 3-33: Estimated Insurable Annual Crops Lost Resulting from Heat

10-Year Extreme Heat Insurance Paid	Adjusted 10-Year Heat Losses (considering 89% insured)	Estimated Annualized Losses	2012 Value of Crops	Annualized Crop Loss Ratio (Losses/Value)
$378,722	$425,530	$42,553	$463,598,000	0.01%

Source: Crop value is from USDA 2012 Census of Agriculture; Crop Insurance Paid is from the USDA's Risk Management Agency for 2007-2016.; Crop Insurance Coverage is from USDAs 2015 State Crop Insurance Profile for Iowa

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

Future Development

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

Climate Change Impacts

The following climate change impacts relative to Extreme Heat were included in the 2010 Climate Change Impacts on Iowa report developed by the Iowa Climate Change Impacts Committee.

- 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.

Both impacts could increase the number extreme heat events in the planning area as well as the potential for negative impacts on people and agriculture.

Extreme Heat Hazard Summary by Jurisdiction

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

Jurisdiction	Probability	Magnitude	Warning Time	Duration	Score	Level
Kossuth County, Iowa	3	2	1	3	2.40	Moderate
City of Algona	3	2	1	3	2.40	Moderate
City of Bancroft	3	2	1	3	2.40	Moderate
City of Burt	3	2	1	3	2.40	Moderate
City of Fenton	3	2	1	3	2.40	Moderate
City of Lakota	3	2	1	3	2.40	Moderate
City of Ledyard	3	2	1	3	2.40	Moderate
City of Lone Rock	3	2	1	3	2.40	Moderate
City of Lu Verne	3	2	1	3	2.40	Moderate
City of Swea City	3	2	1	3	2.40	Moderate
City of Titonka	3	2	1	3	2.40	Moderate
City of Wesley	3	2	1	3	2.40	Moderate
City of Whittemore	3	2	1	3	2.40	Moderate
Algona School District	3	2	1	3	2.40	Moderate
Lu Verne School District	3	2	1	3	2.40	Moderate
North Kossuth School District	3	2	1	3	2.40	Moderate

3.6.6 Flash Flooding

Hazard Score Calculation					
Probability	Magnitude/Severity	Warning Time	Duration	Weighted Score	Level
4	1	2	1	2.50	Moderate

Profile

Hazard Description

A flash flood is an event that occurs when water levels rise at an extremely fast rate as a result of intense rainfall over a brief period, sometimes combined with rapid snowmelt, ice jam release, frozen ground, saturated soil or impermeable surfaces.

Ice jam flooding is a form of flash flooding that occurs when ice breaks up in moving waterways, and then stacks on itself where channels narrow. This creates a natural dam, often causing flooding within minutes of the dam formation.

Riverine Flooding is discussed separately in Section 3.6.12 and flooding caused by dam failure is discussed in Section 3.6.2.

Most flash flooding is caused by slow-moving thunderstorms or thunderstorms repeatedly moving over the same area. Flash flooding is an extremely dangerous form of flooding which can reach full peak in only a few minutes and allows little or no time for protective measures to be taken by those in its path. Flash flood waters move at very fast speeds and can move boulders, tear out trees, scour channels, destroy buildings, and obliterate bridges. Flash flooding often results in higher loss of life, both human and animal, than slower developing river and stream flooding.

In some cases, flooding may not be directly attributable to a river, stream, or lake overflowing its banks. Rather, it may simply be the combination of excessive rainfall or snowmelt, saturated ground, and inadequate drainage. With no place to go, the water will find the lowest elevations–areas that are often not in a floodplain. This type of flooding, often referred to as sheet flooding, is becoming increasingly prevalent as development outstrips the ability of the drainage infrastructure to properly carry and disburse the water flow.

In certain areas, aging storm sewer systems are not designed to carry the capacity currently needed to handle the increased storm runoff. Typically, the result is water backing into basements, which damages mechanical systems and can create serious public health and safety concerns. This combined with rainfall trends and rainfall extremes all demonstrate the high probability, yet generally unpredictable nature of flash flooding in the planning area.

Although flash floods are somewhat unpredictable, there are factors that can point to the likelihood of flash floods occurring. Weather surveillance radar is being used to improve monitoring capabilities of intense rainfall. This, along with knowledge of the watershed characteristics, modeling techniques, monitoring, and advanced warning systems increases the warning time for flash floods.

Warning Time Score: 2—12-24 hours warning time. This refers to the period of time prior to the event with heightened awareness that a flash flood could occur, not the issuance of a “flash flood warning” by the National Weather Service.

Duration Score: 1 - Less than 6 hours

Geographic Location/Extent

According to the current effective Flood Insurance Study for Kossuth County, the land drained by the East Fork Des Moines River above Algona is flat to gently rolling farmland. Vegetal cover is typically pastureland grass or row crops with some timber, especially near streams. Soil in the Algona vicinity

consists of a small amount of glacial drift underlain by the Dakota aquifer and Silurian-Devonian aquifer. The Dakota sandstone comprises the chief bedrock aquifer in northwest and north-central Iowa. The Silurian-Devonian aquifer is composed of relatively dense limestone and dolomite.

The East Fork Des Moines River, which flows near the west half of the city, originates in southernmost Minnesota and flows generally south through north-central Iowa before joining the West Fork Des Moines River in Humboldt County.

Flash flooding occurs in those locations of the planning area that are low-lying and/or do not have adequate drainage to carry away the amount of water that falls during intense rainfall events. According to NCDC and specific reports from planning committee members, the following locations have a history of flash flooding events:

- Unincorporated County
- Algona
- Bancroft
- Burt
- Lone Rock
- Lu Verne
- Swea City

The National Weather Service has various flash flooding products that are issued to the public to provide information regarding upcoming and current flash flood threats; see **Table 3-34**.

Table 3-34: National Weather Service Flash Flooding Products

Product	What It Means	You Should…
Hazardous Weather Outlook	Will there be any threat of flash flooding in the next several days?	If there is a threat of flash flooding, check back later for updated forecasts and possible watches and warnings.
Flash Flood Watch	There is a threat of flash flooding within the next 48 hours, either as a result of heavy rain, ice jams, or the threat of a dam break.	Monitor weather conditions closely, especially if you live in an area prone to flash flooding.
Flash Flood Warning	There is an immediate threat for flash flooding in the warned area, especially in low-lying and poor drainage areas.	Flash Flood Warning
A *Flash Flood Emergency* may be declared when a severe threat to human life and catastrophic damage from a flash flood is imminent or ongoing. The declaration of a Flash Flood Emergency would typically be found in either a Flash Flood Warning or Flash Flood Statement. People are strongly encouraged to avoid the geographic area of concern in a Flash Flood Emergency. The Flash Flood Emergency wording is used very rarely and is reserved for exceptionally rare and hazardous events.		
Areal Flood Warning	The threat of flash flooding is over, but there is still significant standing water in the affected area.	Areal flood warnings will typically list locations and roads impacted by the flooding. Try to avoid these locations until the water has receded.

Source: National Weather Service, website accessed 8/26/2013 http://www.crh.noaa.gov/dmx/?n=prepareflashproducts

Previous Occurrences

Table 3-35 provides details regarding the flashflood and areal flood watches and warnings issued for Kossuth County and the Kossuth County forecast zone by National Weather Service. Areal flooding is a type of flash flooding that is generally over a large area usually due to the amount and duration of rainfall.

Table 3-35: Flash Flood-Related National Weather Service Watches and, Warnings Issued for Kossuth County and, Kossuth County, Iowa Forecast Zone (1986 to 2016)

Type of Flood / Product Issued	2006	2007	2008	2009	2010	2011	2012	2013	2014	2015	2016	Grand Total
AREAL FLOOD												
Advisory			2		3							5
Warning			9						1			10
Watch	4	3										7
FLASH FLOOD												
Advisory												0
Warning			1		2			1	2		1	7
Watch	1	7	8		10			6	8	3	6	49
Grand Total	**5**	**10**	**20**	**0**	**15**	**0**	**0**	**7**	**11**	**3**	**7**	**78**

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

As discussed in the Description Section, flash flooding can be caused by intense rainfall over a brief period. **Table 3-36** provides the top 30 rainfall events at the Algona Climate Station from January 1, 1950 to October 5, 2017.

Table 3-36: Top 30 Rainfall Events, Algona Climate Station, 1950 to 2017

Date	Amount (inches)
1962-08-31	7.17
2006-08-02	6.9
1954-06-18	6.18
1941-09-08	5.43
1959-08-22	5.2
1926-09-18	5.1
1981-06-24	5.09
1978-07-06	4.7
1944-06-12	4.29
1978-09-13	4.25
1937-08-17	4.07
1906-08-08	3.98
1977-08-16	3.87
2008-06-12	3.82
1932-06-17	3.8

Date	Amount (inches)
1915-06-23	3.8
1901-09-08	3.75
1922-04-11	3.72
1964-07-31	3.7
2007-08-18	3.7
1945-08-13	3.61
1906-09-16	3.57
1908-08-16	3.5
1959-05-21	3.49
1923-09-30	3.45
1994-06-23	3.4
1991-06-04	3.4
1955-04-24	3.38
2017-08-22	3.38
1925-09-30	3.37

Source: Iowa State University Department of Agronomy
http://mesonet.agron.iastate.edu/climodat/index.phtml?network=IACLIMATE&station=IA1954&report=02

Information from the NCDC was obtained from 1996 to June 2017 to determine previous occurrences for flash flood in the planning area. This search did not reveal any flash flood incidents recorded from 1996 to 1997. Between 1998 and June 2017, there were 16 flash flood events and 16 heavy rain events. When counting only events that occurred on separate days, there were 20 events. During this time-frame, there were no injuries or deaths reported. Total property damages for these events were estimated to be $1,150,000. **Table 3-37** provides a summary of the NCDC data.

Table 3-37: NCDC Kossuth County, Iowa Flash Flood Events Summary, 1996-June 2017

Date	Property Loss	# Events
Flash Flood		
6/23/1998	$120,000	1
7/9/2000	$500,000	1
5/21/2004	$100,000	1
6/11/2004	$50,000	1
9/14/2004	$25,000	1
5/8/2005	$25,000	1
8/1/2006	$100,000	1
6/8/2008	$30,000	2
6/11/2008	$75,000	2
6/26/2010	$25,000	1
6/1/2014	$0	1
6/18/2014	$100,000	3
Total	**$1,150,000**	**16**
Heavy Rain		
5/30/2008	$0	1
6/11/2008	$0	1
5/3/2012	$0	1
5/17/2013	$0	1
6/1/2014	$0	3
7/25/2014	$0	2
11/11/2015	$0	1
9/6/2016	$0	3
9/15/2016	$0	2
9/22/2016	$0	1
Total	**$0**	**16**
Grand Total	**$1,150,000**	**32**

Source: NCDC

Flash flood events with significant property loss (>$100,000) include the following:

- **June 23, 1998 Flash Flood** - Once again, a warm frontal boundary was located to the south of Iowa with very warm and unstable air just to the south of the front. Dew point temperatures were in the low 70s in the warm air. This moisture was drawn north over the frontal boundary, into Iowa. A large mesoscale convective system developed over northwest Iowa and moved east during the evening hours. Initially, the system produced hail over an inch in diameter, but the main severe weather associated with the storms was high winds. Some building damage was reported in Palmer in Pocahontas County. Winds of 65 to 80 MPH were common in many areas. Wind damage on a farm near Clear Lake allowed a herd of cattle to escape. A man driving a van on U.S. highway 18 hit and killed six of the cattle. Damage from around the Clear Lake area was placed at nearly $1,000,000. Little damage occurred as it touched down in open country. Numerous buildings were damaged by the high winds and several outbuildings and barns were nearly destroyed. The other major concern was with flooding. Iowa soil was nearly saturated at the time when heavy rainfall ensued. Numerous roads were closed by high water and knee-deep water was reported in much of the town. Three to five inches of rain occurred in Sac and parts of Kossuth Counties as well. Most of the other areas where flash flooding was reported received 2 to 3 inches of rain in less than three hours.
- **July 9, 2000 Flash Flood** - A nearly stationary frontal boundary was located to the north of Iowa during the day on the 9th. Very rich air was pumped north into the state with surface dew point

temperatures reaching the mid-70s to low 80s by the late afternoon and evening hours. The front began to sag south during the evening. Thunderstorms erupted along the front with a training effect setting up over the northern part of the state. Severe weather was limited with the storms and occurred mainly during the early life of the developing mesoscale convective system. There were several reports of winds around 60 MPH over northern Iowa during the evening hours as the storms moved in initially. The main event with these storms was the very heavy rain. Some of the heaviest rainfall occurred in southern Kossuth County, where as much as 10 inches of rain was measured. About 40 homes in the town of LuVerne were damaged by the wind driven rain with numerous basements flooded. Nearly all the county blacktop roads were under water at one point. There were numerous reports of debris being swept onto roads. Numerous roads were reported in a multi-county area. In addition to flooded roads, numerous basements were flooded. In Kossuth County for example, many houses were reporting anywhere from two to six feet of water in the basements. Crop damage occurred as farm fields were flooded by the heavy rainfall. This seemed ironic considering much of Iowa was in the grips of the worst drought since the 80s as recently as three weeks prior to this event. As the thunderstorms moved through Kossuth County, lightning struck a house north of Bancroft. The lightning knocked out the electricity to the house and causing some minor appliance damage.

- **May 21, 2004 Flash Flood** - A very unstable airmass was over Iowa and helped kick off the season's first severe weather outbreak. At the surface, a warm frontal boundary extended nearly east to west across the state and provided the focus for thunderstorm development. By the late afternoon, lifted indices were approaching -10 C. with CAPE values around 5000 J/kg over western Iowa. Surface temperatures warmed into the upper 80s with dew points in the low to mid 70s. A southwest surface wind of 15 to 25 kts pushed over the front. Northeast of the frontal boundary winds were easterly around 10 to 15 kts. Actually, the surface boundary was further enhanced by outflow from convective complexes during the day, further sharpening the contrast. Thunderstorms continued to fire along and north of the boundary through the afternoon and into the evening. This resulted in widespread flash flooding as very heavy rains fell on areas that had had significant rainfall the previous night. There were reports in north central into northeast Iowa of 2 to 4 inches of rainfall in a little more than an hour's time.
- **August 1, 2006 Flash Flood** - A cold front advanced toward Iowa from the northwest during the evening hours of the 1st. The cold front by late evening extended from southern Nebraska, across far northwest Iowa, into northwest Wisconsin. Ahead of the front the airmass was quite unstable, albeit quite warm. Temperatures at the 700 mb level were around +12 C. with the freezing level approaching 16,000 feet. Lifted indices were around -6 C. The LCL was quite high, around 2000 meters, which limited the threat of tornadoes. With the warm temperatures aloft, hail was also limited. Severe thunderstorms were able to form and maintain themselves as the shear environment was favorable with zero to 3 km shear in the 30 to 40 kt range. Precipitable water values were approaching 2 inches, so the airmass was quite tropical in nature with the warm cloud depth nearly 4 kms. Temperatures in the afternoon warmed into the upper 80s to low 90s, combined with dew point values in the mid-70s. This provided approximately 3000 J/kg of CAPE. There was a significant amount of downdraft CAPE available with DCAPE values around 1100 J/kg during the early evening. Thunderstorms developed during the late afternoon and evening hours and produced heavy rain and some high winds. A 62 MPH wind gust was recorded at the Denison AWOS station and high winds blew a semi-tractor trailer over in Interstate 35 in Cerro Gordo County. Widespread wind damage was reported across Worth and Franklin Counties. Winds estimated up to 70 MPH buffeted these two areas as what appears to be a large-scale collapse took place. Flash flooding was reported in Emmet

and Kossuth Counties with water 2 to 3 feet deep on the highways. U.S. Highway 169 was closed in Kossuth County by 2-foot-deep water.

- **July 18, 2014 Flash Flood** - Almost all streets in town were under water due to the combination of three inches of rain and the sewer system being overwhelmed. Many homes and businesses had water in the basement.

The US Army Corps of Engineers, Cold Regions Research and Engineering Laboratory (CRREL) maintains a database of historic ice jams. According to a query of that database from 1950 to the present, there has been one ice jam the Kossuth County planning area, located in Algona. (Source: http://rsgisias.crrel.usace.army.mil/apex/f?p=524:1).

Probability of Future Occurrence

The frequency of past events is used to gauge the likelihood of future occurrences. The events from NCDC that occurred on the same day were combined to determine the total number of 20 flash flooding events in the planning area over the 21.5-year period from 1996 to June 2017. This translates to a 93 percent likelihood of flash flooding somewhere in the planning area in any given year. Therefore, the probability rating is "Highly Likely".

Probability Score: 4 - Highly Likely

Vulnerability

Vulnerability Overview

Water over low-lying roads and bridges is the most frequent impact associated with flash flooding that has occurred in the planning area. This can cause wash out of bridge abutments and erosion/scour damage on roads. There is potential for loss of life if motorists drive into moving water. However, public education campaigns have helped to educate citizens about not driving through moving water. Building damage is generally limited to water in basements where rain is too intense for drainage systems and natural drainage to carry water away from the structure. In addition, when combined storm/sanitary sewer systems are overloaded, this can result in sewer back-up. Generally, flash-flooding is short in duration and government services and business operations are not impacted.

Magnitude Score: 1 - Negligible. The magnitude was determined to be negligible.

Potential Losses to Existing Development

When roads and bridges are inundated by water, damage often occurs as the water scours materials around bridge abutments and gravel roads. At this time, there are 84 bridges in Kossuth County that are classified as "scour critical" bridges, including one bridge that has failed and is closed to traffic due to scouring. See **Figure 3-1** in Section 3.2.2 for a map of all bridges in Kossuth County.

The water can also cause erosion undermining road beds. In some instances, steep slopes that are saturated with water may cause mud or rock slides onto roadways. These damages can cause costly repairs for state, county, and city road/bridge maintenance departments. When sewer back-up occurs, this can result in costly clean-up for home and business owners as well as present a health hazard.

Based on loss estimates reported by NCDC, property losses averaged $53,488 per year over the 21.5-year period from 1996 to June 2017.

Future Development

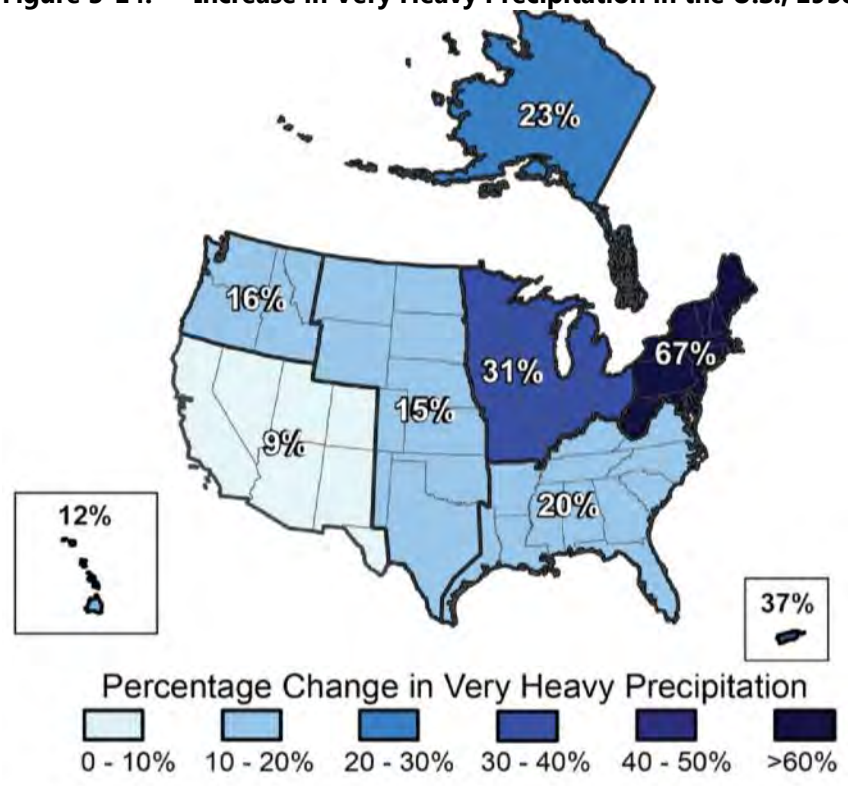
In planning future development, jurisdictions in the planning area should avoid development in low-lying areas near rivers and streams or where interior drainage systems are not adequate to provide drainage

during heavy rainfall events. Future development should also take into consideration the impact of additional impervious surfaces to water run-off and drainage capabilities during heavy rainfall events.

Climate Change Impacts

One of the climate change impacts noted in the *2010 Climate Change Impacts on Iowa* report by the Iowa Climate Change Impacts Committee is the increase in frequency of severe precipitation events. **Figure 3-14** shows that all of Iowa is in the region with a 31% increase in very heavy precipitation from 1958 to 2007. For this study, very heavy precipitation was defined as the heaviest 1% of all events.

Figure 3-14: Increase in Very Heavy Precipitation in the U.S., 1958-2007



Source: Karl, T.R., J.M. Melillo, and T.C. Peterson(eds). 2009. Global Climate Change Impacts in the United States. U.S. Global Climate Change Research Program. Cambridge University Press and http://www.globalchange.gov/publications/reports/scientific-assessments/us-impacts as cited in the 2010 Climate Change Impacts on Iowa report by the Iowa Climate Change Impacts Committee

If this trend increases, flash flooding events and their associated impacts will likely occur more often in the planning area.

Flash Flood Hazard Summary by Jurisdiction

For the jurisdictions indicated in previous flash flood events reported to NCDC, mentioned in the episode narrative, or that indicated specific flash flooding previous events, the probability was determined to be "highly likely" (4). For the remaining jurisdictions, the probability was determined to be "occasional" (2). For the school districts, the probability was also determined to be "occasional". Although impacts were not mentioned for some cities or the school districts, flash flooding can still occur in the future if the amount of rainfall received in a given time exceeds the capability of drainage features and natural drainage to carry the water away.

Jurisdiction	Probability	Magnitude	Warning Time	Duration	Score	Level
Kossuth County, Iowa	4	1	2	1	2.50	Moderate
City of Algona	4	1	2	1	2.50	Moderate
City of Bancroft	4	1	2	1	2.50	Moderate
City of Burt	4	1	2	1	2.50	Moderate
City of Fenton	2	1	2	1	1.60	Low
City of Lakota	4	1	2	1	2.50	Moderate
City of Ledyard	2	1	2	1	1.60	Low
City of Lone Rock	4	1	2	1	2.50	Moderate
City of Lu Verne	4	1	2	1	2.50	Moderate
City of Swea City	4	1	2	1	2.50	Moderate
City of Titonka	2	1	2	1	1.60	Low
City of Wesley	4	1	2	1	2.50	Moderate
City of Whittemore	2	1	2	1	1.60	Low
Algona School District	2	1	2	1	1.60	Low
Lu Verne School District	2	1	2	1	1.60	Low
North Kossuth School District	2	1	2	1	1.60	Low

3.6.7 Grass or Wildland Fire

Hazard Score Calculation					
Probability	**Magnitude/Severity**	**Warning Time**	**Duration**	**Weighted Score**	**Level**
2	2	4	1	2.20	Moderate

Profile

Hazard Description

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

Wildfires are frequently associated with lightning and drought, 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 National Weather Service monitors the conditions that might be conducive to wildfires in the State on a daily basis so that wildfires can be predicted, and hopefully prevented.

The risk factors considered are:

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

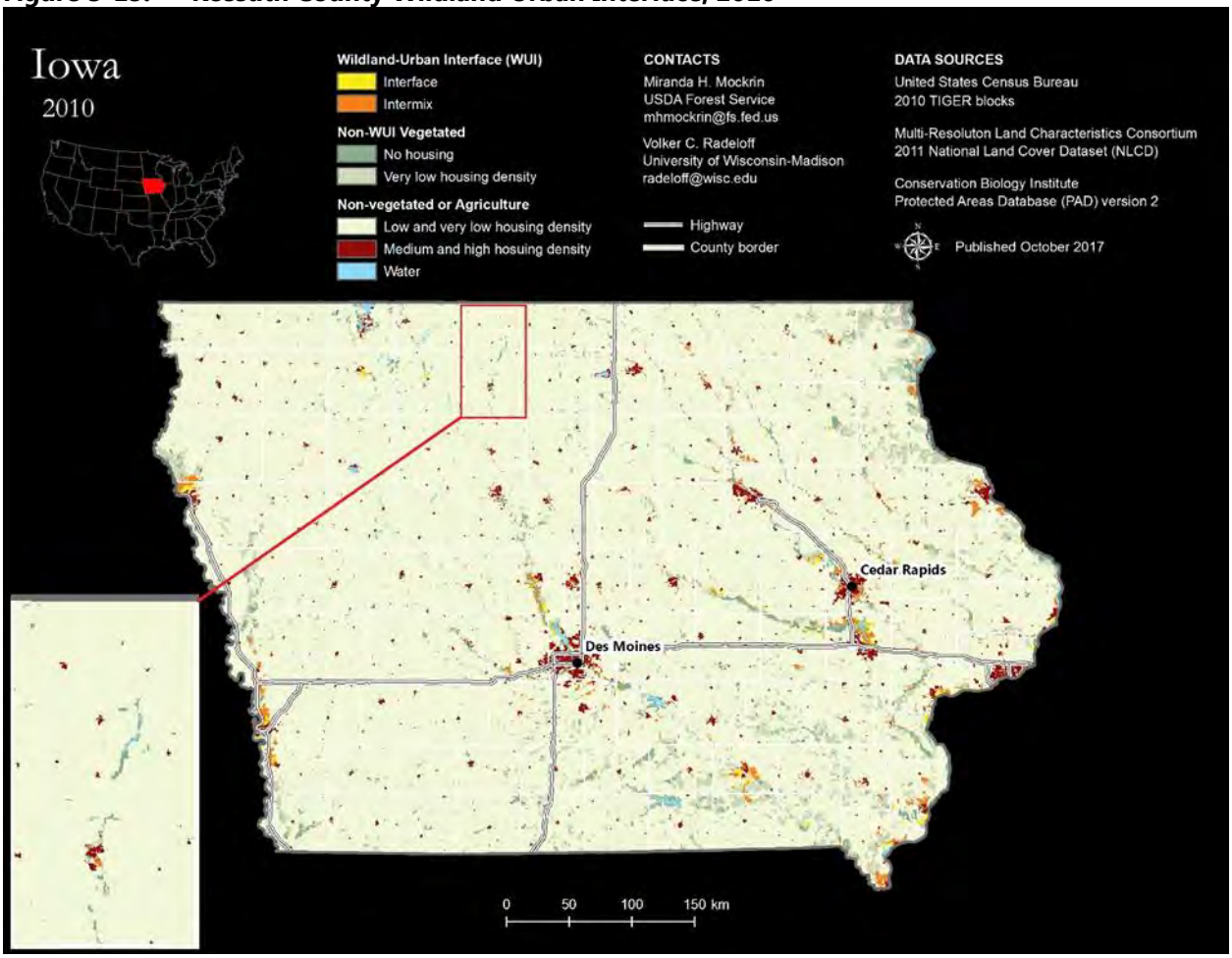
Warning Time Score: 4 - Minimal or no warning time.

Duration Score: 1 - Less than 6 hours

Geographic Location/Extent

Wildland/Grass fires are most likely to occur in the Wildland Urban Interface (WUI). This is the area where houses meet or intermingle with undeveloped wildland vegetation. Within the WUI, there are two specific areas identified: 1) Interface and 2) Intermix. The interface areas are those areas that abut wildland vegetation and the Intermix areas are those areas that intermingle with wildland areas. As can be seen in **Figure 3-15**, Kossuth County has a slight amount of intermix areas (red) near Algona. These intermix areas are also adjacent to some areas of medium and high-density housing. There are no identified interface areas the county.

Figure 3-15: Kossuth County Wildland Urban Interface, 2010



Source: SILVIS Lab, Department of Forest Ecology and management, University of Wisconsin-Madison; WUI 2010, http://silvis.forest.wisc.edu/data/wui_change

Previous Occurrences

According to the Hazard Mitigation Planning Committee, the fire departments in Kossuth County respond to at least 2-3 grass fires per year. Generally, these fires are extinguished rapidly. Although local records were not available, committee members stated that no historically significant wildfire has occurred in the planning area.

Data was requested from the Iowa Department of Public Safety, State Fire Marshal Division to provide information on previous occurrences of grass/wildland fires in the planning area. Through the National Fire Incident Reporting System (NFIRS), the Iowa State Fire Marshal's Office collects and reports fire incidents throughout the State. NFIRS is a repository of statistical data reported by participating fire departments. The State Fire Marshal's Division was unable to provide the historical grass/wildland fire data at this time.

Probability of Future Occurrence

Updated historical data was not available to document the average number of wildland/grass fires per year. However, the planning committee reported an average of 2-3 grass fires per year. Since updated statistical data was unavailable to determine a quantitative probability, a qualitative probability is based on the anecdotal descriptions from the HMPC. Additionally, although grass/wildland fires do occur

annually, events that cause any notable damages occur less frequently. Therefore, the probability rating for damaging events for this hazard is "Occasional".

Probability Score: 2 - Occasional

Vulnerability

Overview

Areas that are most vulnerable to wildfire are agricultural areas where land is burned, rural areas where trash and debris are burned, and the wildland-urban interface/intermix areas.

To demonstrate how vulnerability to this hazard varies by jurisdiction, the 2010 spatial data indicating acreage of Wildland Urban Interface/Intermix areas from the SILVIS Lab, Department of Forest Ecology and Management, University of Wisconsin-Madison was compared against the corporate boundary layer for the planning area. **Table 3-38** and **Table 3-39** provide additional details.

Table 3-38: Kossuth County Wildland/Urban Interface and Intermix Acres

Jurisdiction	Intermix (acres)	Interface (acres)
Algona	106	-
Ledyard	31	-
Luverne	27	-
Swea City	16	-
Unincorporated	622	-
Total	**803**	**0**

Source: SILVIS Lab, Department of Forest Ecology and management, University of Wisconsin-Madison; WUI 2010, http://silvis.forest.wisc.edu/maps/wui/2010/download

Table 3-39: Wildland Urban Intermix / Interface Acreage by WUI Class

WUI Class	Acres
High Density Interface	0
High Density Intermix	0.6
Medium Density Interface	0
Medium Density Intermix	216
Low Density Interface	0
Low Density Intermix	587
Total	**803**

Source: SILVIS Lab, Department of Forest Ecology and management, University of Wisconsin-Madison; WUI 2010, http://silvis.forest.wisc.edu/maps/wui/2010/download

Potential Losses to Existing Development

Wildfires can be responsible for extensive damage to crops, the environment and occasionally residential or business facilities. Homes built in rural areas are more vulnerable since they are in closer proximity to land that is burned, and homeowners are more likely to burn trash and debris in rural locations. The vulnerability of structures in rural areas is exacerbated due to the lack of hydrants in these areas for firefighting and the distance required for firefighting vehicles and personnel to travel to respond. Potential losses to crops and rangeland are additional concerns.

Magnitude Score: 2 - Limited

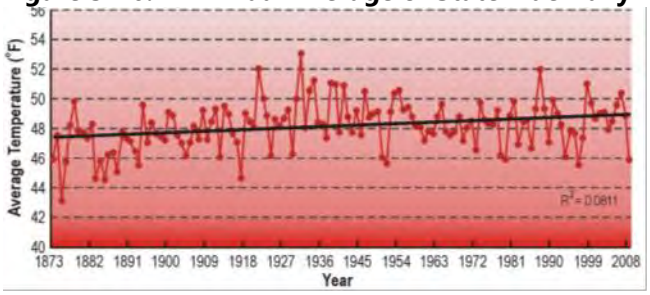
Future Development

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

Climate Change Impact

According to the *2010 Climate Change Impacts on Iowa* report, by the Iowa Climate Change Impacts Committee, the annual average temperature has been increasing over the last 136 years. **Figure 3-16** shows this data graphically.

Figure 3-16: Annual Average of Statewide Daily Average Temperatures (0 F)



Source: 2010 Climate Change Impacts on Iowa report, by the Iowa Climate Change Impacts Committee, Data from the Iowa Climatology Bureau, 2010

If Iowa were to experience a severe drought, as has occurred frequently in the past, the slow and steady rise in statewide annual mean temperature, masked in summer by moist surface conditions during non-drought years, could lead to an abrupt switch to extreme summer heat comparable to the summers of 1983 or 1988. If these conditions occur, the occurrence of wildfire would be expected to increase as was seen recently in 2012.

Grass or Wildland Fires Hazard Summary by Jurisdiction

Grass or Wildland fires can occur in all jurisdictions. However, the magnitude is potentially worse in jurisdictions with more wildland/urban intermix areas. Since the unincorporated county and City of Algona have Wildland-Urban Intermix areas, the magnitude for these jurisdictions is 2 – Limited. For all other jurisdictions, the magnitude is negligible. Wildland/Grass Fires occur more frequently in the unincorporated portions of Kossuth County and these areas are more vulnerable to wildland/grass fires due to more homes built in rural areas in closer proximity to land/trash/debris that is burned. Also, homes in these more rural areas do not have hydrants in most cases and are farther from firehouses. Wildland/Grass fires can occur in city limits. However, the magnitude is generally lower due to proximity to firefighting services. There is less potential for wildland/grass fires impacting schools due to general locations away from Wildland Urban Interface Areas. Again, if a wildland/grass fire were to occur near school buildings, the magnitude would be lower due to close proximity to firefighting services.

Jurisdiction	Probability	Magnitude	Warning Time	Duration	Score	Level
Kossuth County, Iowa	2	2	4	1	2.20	Moderate
City of Algona	2	2	4	1	2.20	Moderate
City of Bancroft	2	1	4	1	1.90	Low
City of Burt	2	1	4	1	1.90	Low
City of Fenton	2	1	4	1	1.90	Low
City of Lakota	2	1	4	1	1.90	Low
City of Ledyard	2	1	4	1	1.90	Low
City of Lone Rock	2	1	4	1	1.90	Low
City of Lu Verne	2	1	4	1	1.90	Low
City of Swea City	2	1	4	1	1.90	Low
City of Titonka	2	1	4	1	1.90	Low
City of Wesley	2	1	4	1	1.90	Low
City of Whittemore	2	1	4	1	1.90	Low
Algona School District	2	1	4	1	1.90	Low
Lu Verne School District	2	1	4	1	1.90	Low
North Kossuth School District	2	1	4	1	1.90	Low

3.6.8 Hazardous Materials

Hazard Score Calculation					
Probability	**Magnitude/Severity**	**Warning Time**	**Duration**	**Weighted Score**	**Level**
3	1	4	1	2.35	Moderate

Profile

Hazard Description

A hazardous substance is one that may cause damage to persons, property, or the environment when released to soil, water, or air. Chemicals are manufactured and used in increasing types and quantities. Each year over 1,000 new synthetic chemicals are introduced and as many as 500,000 products pose physical or health hazards and can be defined as "hazardous chemicals". Hazardous substances are categorized as toxic, corrosive, flammable, irritant, or explosive. Hazardous material incidents generally affect a localized area.

Fixed Hazardous Materials Incident

A fixed hazardous materials incident is the accidental release of chemical substances or mixtures during production or handling at a fixed facility.

Transportation Hazardous Materials Incident

A transportation hazardous materials incident is the accidental release of chemical substances or mixtures during transport. Transportation Hazardous Materials Incidents in Kossuth County can occur during highway or air transport. Highway accidents involving hazardous materials pose a great potential for public exposures. Both nearby populations and motorists can be impacted and become exposed by accidents and releases. If airplanes carrying hazardous cargo crash, or otherwise leak contaminated cargo, populations and the environment in the impacted area can become exposed.

Pipeline Incident

A pipeline transportation incident occurs when a break in a pipeline creates the potential for an explosion or leak of a dangerous substance (oil, gas, etc.) possibly requiring evacuation. An underground pipeline incident can be caused by environmental disruption, accidental damage, or sabotage. Incidents can range from a small, slow leak to a large rupture where an explosion is possible. Inspection and maintenance of the pipeline system along with marked gas line locations and an early warning and response procedure can lessen the risk to those near the pipelines.

Warning Time Score: 4 - Less than six hours warning time

Duration Score: 1 - Less than 6 hours

Geographic Location/Extent

This section provides geographic locations within Kossuth County impacted by each type of potential hazardous materials incident.

Fixed Hazardous Materials Incident

According to the Iowa Department of Natural Resources, there are 54 sites in Kossuth County that because of the volume or toxicity of the materials on site were designated as Tier II Facilities under the Superfund Amendments and Reauthorization Act.

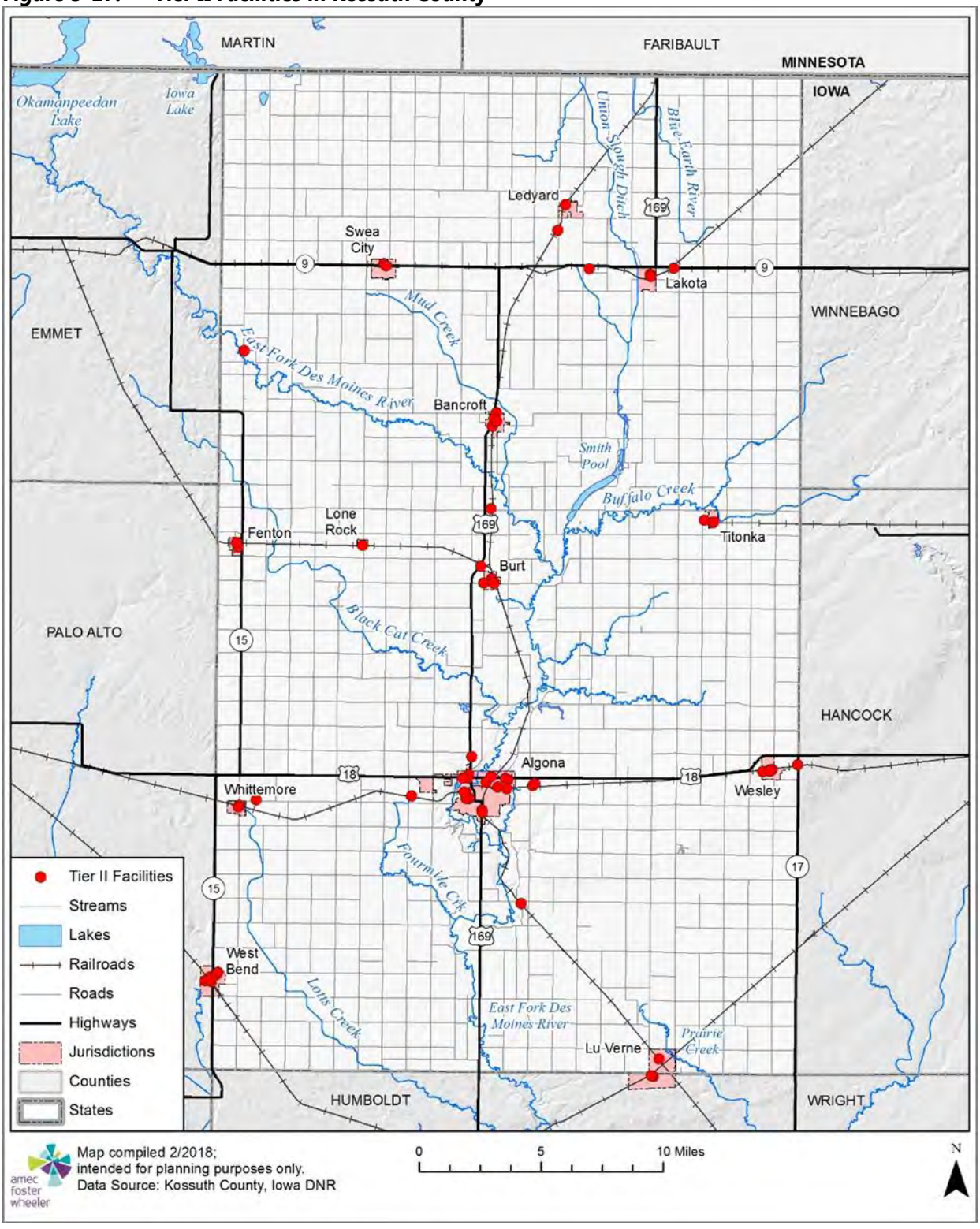
Table 3-40 provides the number of Tier II Facilities for each jurisdiction in the planning area. Note: The jurisdiction is assigned from the address. Some facilities do fall within the unincorporated areas but are identified with the nearest city. **Figure 3-17** is a map showing the locations of Tier II Facilities.

Table 3-40: Number of Tier II Facilities by Jurisdiction

Jurisdiction	# of Facilities	# of EHS Facilities
Algona	18	9
Bancroft	6	2
Burt	6	3
Fenton	2	1
Lakota	4	2
Ledyard	2	1
Lone Rock	1	1
Lu Verne	3	3
Swea City	2	1
Titonka	3	1
Wesley	5	2
Whittemore	2	1
Total	**54**	**27**

Source: Department of Natural Resources, NRGIS

Figure 3-17: Tier II Facilities in Kossuth County



Transportation Hazardous Materials Incident

The transport of hazardous materials in Kossuth County occurs via trucks on the highways/roads and airplanes carrying hazardous cargo.

Truck Transport

Hazardous materials can be transported on any of the roads in Kossuth County. Main conduits of transport include U.S Highway 169, U.S Highway 18, Iowa State Highway 9, State Highway 44, State Highway 15, and State Highway 44. Agriculture is important to the economy of Kossuth County As a result, chemicals utilized in agriculture are frequently transported along county and local roadways.

Figure 3-18: Kossuth County Highways

Source: Google Maps

Rail Transport

Union Pacific Railroad (UP) operates in Kossuth County with a line running east-west in the northern portion of the County through Swea City and Lakota. Additionally, a line runs through Burt in the north, through Algona, and south through Lu Verne. Dakota, Minnesota and Eastern R.R. Co. (DME) also operates in the County, with a line that runs east-west through Whittemore, Algona, and Wesley

Air Freight

Algona Municipal Airport is a publicly owned airport located 2 miles west of the city of Algona. The airport contains two runways with an average of 19 flights per day. For more information, see Section 3.6.17.

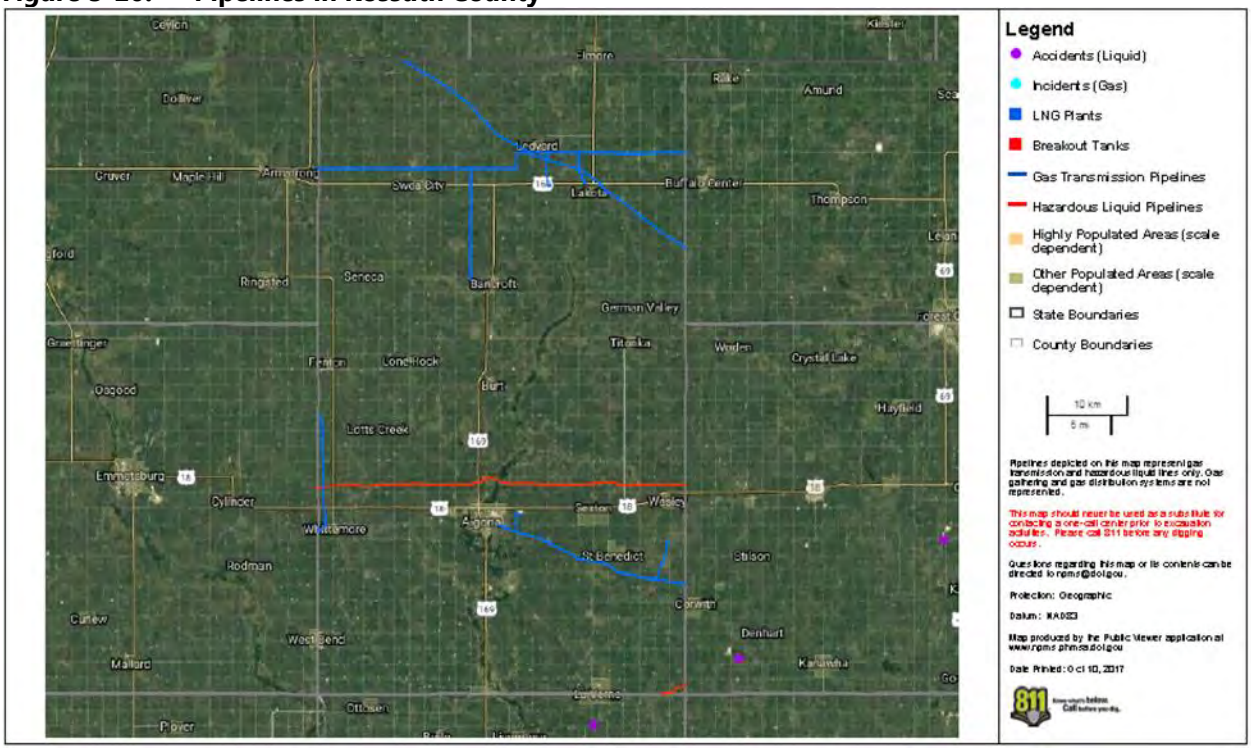
Figure 3-19: Algona Municipal Airport

Source: Iowa Department of Transportation, http://www.iowadot.gov/aviation/airports/municipal.aspx

Pipeline Incident

Figure 3-20 provides the locations of pipelines in Kossuth County. The data for this map consists of gas transmission pipelines and hazardous liquid trunklines. It does not contain gathering or distribution pipelines, such as lines which deliver gas to a customer's home. Therefore, not all pipelines in the County will be visible.

Figure 3-20: Pipelines in Kossuth County



Source: Pipeline and Hazardous Materials Safety Administration, National Pipeline Mapping System, https://www.npms.phmsa.dot.go/PublicViewer/

Any type of hazardous materials incident within a city that includes a large release of hazardous materials could affect large areas of the city in the right conditions, possibly even the entire city. This could necessitate evacuation of large areas. In the rural unincorporated areas where population densities are low, even in the event of a large release the number of homes that may need to be evacuated would be significantly lower than in an urban environment.

Immediate dangers from hazardous materials include fires and explosions. The release of some toxic gases may cause immediate death, disablement, or sickness if absorbed through the skin, injected, ingested, or inhaled. Contaminated water resources may be unsafe and unusable, depending on the amount of contaminant. Some chemicals cause painful and damaging burns if they come in direct contact with skin. Contamination of air, ground, or water may result in harm to fish, wildlife, livestock, and crops. The release of hazardous materials into the environment may cause debilitation, disease, or birth defects over a long period of time. Loss of livestock and crops may lead to economic hardships within the community. The occurrence of a hazmat incident many times shuts down transportation corridors for hours at a time while the scene is stabilized, the product is off-loaded, and reloaded on a replacement container.

Previous Occurrences

In Iowa, hazardous materials spills are reported to the Department of Natural Resources. According to Iowa Administrative Code Chapter 131, *Notification of Hazardous Conditions*, any person manufacturing, storing, handling, transporting, or disposing of a hazardous substance must notify the Department of Natural Resources and the local police department or the office of the sheriff of the affected county of the occurrence of a hazardous condition as soon as possible but not later than six hours after the onset of the hazardous condition or the discovery of the hazardous condition. The Department of Natural Resources maintains a database of reported spills.

According to the DNR database, from 2000 to 2016 (17 years), there have been 256 hazardous materials spills reported in Kossuth County. **Table 3-41** provides a summary of the reported spills during this time period for each jurisdiction indicated in the database as well as the mode of the spill. According to this data, the most spills occurred in the Algona (50) and most spills involved manure (141). **Table 3-42** below summarizes the spills by material type. Inorganic chemical is the most common material type spilled with 80 spills of this type.

Table 3-41: Kossuth County Hazardous Materials Spills Reported to Iowa DNR, 2000-2016 by Jurisdiction and Mode

Jurisdiction	Dumping	Handling and Storage	Manure	Other	Pipeline	Theft	Transformer	Transportation	Not Reported	Grand Total
Algona	1	17	19	2			1	10	1	51
Bancroft		4	21					4		29
Burt		4	4				1	7		16
Fenton			13				2			15
Lakota		8	7					4		19
Ledyard								2		2
Lone Rock		3	2							5
Lu Verne		6	9							15
Swea City			15				1	2		18
Titonka		4	11			1		1		17
Wesley			13				1	5		19
West Bend		1	11							12
Whittemore		2	15	4	1		1	2		25
Not Reported		2	1					8	2	13
Grand Total	**1**	**51**	**141**	**6**	**1**	**1**	**7**	**45**	**3**	**256**

Source: Iowa Department of Natural Resources, http://www.iowadnr.gov/InsideDNR/RegulatoryLand/EmergencyPlanningEPCRA/SpillReporting.aspx

Table 3-42: Kossuth County Hazardous Materials Spills Reported to Iowa DNR, 2000-2016 by Material Type

Jurisdiction	Acids/Bases	Animal/Vegetable Product	Fertilizer/Pesticide	Inorganic Chemical	Manure	Organic Chemical	Petroleum	Propane/LPG/Natural Gas	Transformer oil/PCB	Not Reported	Grand Total
Algona		1	2	10	5	2	19		1	11	51
Bancroft	1		1	12	2		3	1		9	29
Burt		1	3	2	1		7		1	1	16
Fenton				7	2				2	4	15
Lakota		1	2	4	2	5	2			3	19
Ledyard			2								2
Lone Rock		2		1			1			1	5
Lu Verne			5	6						4	15
Swea City				10	2		1		1	4	18
Titonka				5	2		3			7	17
Wesley			1	7	2		4		1	4	19
West Bend				8	1					3	12
Whittemore		1	5	8	1		3		1	6	25
Not Reported			4		1	1	6			1	13
Grand Total	**1**	**6**	**25**	**80**	**21**	**8**	**49**	**1**	**7**	**58**	**256**

Source: Iowa Department of Natural Resources, http://www.iowadnr.gov/InsideDNR/RegulatoryLand/EmergencyPlanningEPCRA/SpillReporting.aspx

Pipelines

The U.S. Department of Transportation (DOT) Pipeline and Hazardous Materials Safety Administration maintains a database of pipeline incidents and mileage reports. From 1996 to 2015, there were no reported pipeline incidents in Kossuth County.

Probability of Future Occurrence

From 2000 to 2016 (17 years), there have been 256 spills reported to Iowa DNR. This computes to an annual average of over 15 hazardous materials spills per year. Therefore, the probability of future occurrence of hazardous materials incidents is determined to be "Highly Likely".

Probability Score: 4 - Highly Likely

Vulnerability

Vulnerability Overview

A hazardous materials incident can occur almost anywhere; all jurisdictions are considered to have at least some vulnerability to this hazard. People, pets, livestock, and vegetation in close proximity to facilities producing, storing, or transporting hazardous substances are at higher risk. Populations downstream, downwind, and downhill of a released substance are particularly vulnerable. Depending on the characteristics of the substance released, more people, in a larger area may be in danger from explosion, absorption, injection, ingestion, or inhalation.

Most of the hazardous materials incidents that have occurred in Kossuth County are localized and are quickly contained or stabilized. Depending on the characteristic of the hazardous material or the volume of product involved, the affected area can be as small as a room in a building or as large as 5 square miles or more. Many times, additional regions outside the immediately affected area are evacuated for precautionary reasons. More widespread effects occur when the product contaminates the municipal water supply or water system such as river, lake, or aquifer. Spills can be costly to clean up due to the specialized equipment and training, and disposal sites that are necessary. Since the majority of spills in the county are small and quickly maintained within existing capabilities, the magnitude was determined to be "Negligible".

Magnitude Score: 1 - Negligible

Potential Losses to Existing Development

The impact of this type of disaster will likely be localized to the immediate area surrounding the incident. The initial concern will be for people, then the environment. If contamination occurs, the spiller is responsible for the cleanup actions and will work closely with responders in the local jurisdiction, the Iowa Department of Natural Resources, and the Environmental Protection Agency to ensure that cleanup is done safely and in accordance with federal and state laws.

As mentioned, it is difficult to determine the potential losses to existing development because of the variable nature of a hazardous materials spill. For example, a spill of a toxic airborne chemical in a populated area could have greater potential for loss of life. By contrast a spill of a very small amount of a chemical in a remote rural area would be much less costly and possibly limited to remediation of soil.

Data provided by the Iowa Department of Natural Resources did not provide information relative to costs associated with cleaning up any of the spills or of any property damage that occurred. Without data on costs of previous events, it is not possible to determine potential costs associated with future spills.

To analyze critical facilities at risk in the planning area, the inventory of critical and essential facilities and infrastructure in the planning area was compiled from various sources including Kossuth County, the Department of Natural Resources NRGIS, and HSIP Freedom 2015. The compiled inventory consisted of 239 critical facilities. A comparison was made of the critical facilities with the locations of Tier II Facilities to determine those critical/essential facilities/functions (other than Tier II facilities themselves) that are within ½ mile of Tier II fixed chemical facilities. This analysis revealed 139 critical or essential facilities within ½ mile of fixed chemical facilities with the Tier II reporting requirement. Appendix E contains the results of analysis. This Appendix is redacted from the public version of this plan. To obtain access for official use, contact the Kossuth County Emergency Manager.

Future Development

The number and types of hazardous chemicals stored and transported through Kossuth County will likely continue to increase. As populations grow, this also increases the number of people vulnerable to the impacts of hazardous materials spills. Population and business growth along major transportation corridors increases the vulnerability to transportation hazardous materials spills.

Hazardous Materials Hazard Summary by Jurisdiction

Although spills do occur in the unincorporated area, they are primarily recorded in the database associated with the nearest city. The probability score was based on the number of spills for each jurisdiction during this period. Jurisdictions that recorded more than 20 spills correspond to a probability score of 4, 10-20 spills correspond to a score of 3, 0-10 spills correspond to a score of 2, and jurisdictions with no spills receive a score of 1. The magnitude was determined to be "negligible" based on the general types and quantities of spills that have occurred. Probability and magnitude for the schools and community college were unlikely and negligible as hazardous materials are not generally stored on site.

Jurisdiction	Probability	Magnitude	Warning Time	Duration	Score	Level
Kossuth County, Iowa	3	1	4	1	2.35	Moderate
City of Algona	4	1	4	1	2.80	High
City of Bancroft	4	1	4	1	2.80	High
City of Burt	3	1	4	1	2.80	High
City of Fenton	3	1	4	1	1.90	Low
City of Lakota	3	1	4	1	2.35	Moderate
City of Ledyard	2	1	4	1	1.90	Moderate
City of Lone Rock	2	1	4	1	1.90	Low
City of Lu Verne	3	1	4	1	2.35	Moderate
City of Swea City	3	1	4	1	2.35	Moderate
City of Titonka	3	1	4	1	2.35	Moderate
City of Wesley	3	1	4	1	2.35	Moderate
Whittemore	4	1	4	1	2.80	High
Algona School District	1	1	4	1	1.45	Low
Lu Verne School District	1	1	4	1	1.45	Low
North Kossuth School District	1	1	4	1	1.45	Low

3.6.9 Human Disease

Hazard Score Calculation					
Probability	**Magnitude/Severity**	**Warning Time**	**Duration**	**Weighted Score**	**Level**
2	3	2	4	2.50	Moderate

Profile

Hazard Description

A human disease outbreak is a medical, health or sanitation threat to the general public (such as contamination, epidemic, plague and insect infestation). The outbreak may be spread by direct contact with an infected person or animal, ingesting contaminated food or water, vectors such as mosquitoes or ticks, contact with contaminated surroundings such as animal droppings, infected droplets, or by aerosolization.

Iowa's public health and health care communities work to protect Iowans from infectious diseases and preserve the health and safety of Iowans by rapidly identifying and containing a wide range of biological agents. Local public health departments and the Iowa Department of Public Health, Center for Acute Epidemiology investigate disease "outbreaks" of routine illnesses. There are a number of biological diseases/agents that are of concern to the State of Iowa such as vaccine preventable disease, foodborne disease and community associated infections having significant impact on the morbidity of Iowans. The following descriptions are general, and it should be noted that individuals may experience more or less severe consequences.

Vaccine Preventable Disease

In the U.S., there are common infectious diseases that include polio, measles, diphtheria, pertussis, rubella, mumps, tetanus and *Haemophilus influenzae* type b that are now rare because of widespread use of vaccines. Routine childhood immunizations have helped protect both individuals and communities each year saving nearly $14 billion in direct medical costs and $69 billion in costs to society according to the U.S. Department of Health and Human Services, Centers for Disease Control and Prevention.

The immunization rates for Iowa are provided in **Figure 3-21**. Vaccine preventable diseases continue to threaten the health of Iowans when children, adolescents and adults are un-immunized or under-immunized.

Influenza

Influenza (flu) is a viral infection of the nose, throat, bronchial tubes, and lungs. There are two main types of virus: A and B. Each type includes many different strains, which tend to change each year. In Iowa, influenza occurs most often in the winter months. Illnesses resembling influenza may occur in the summer months, but these are usually the result of other viruses that exhibit symptoms commonly referred to as influenza-like illness or ILI.

Influenza is highly contagious and is easily transmitted through contact with droplets from the nose and throat of an infected person during coughing and sneezing. Typical symptoms include headache, fever, chills, cough, and body aches. Although most people are ill for only a few days some may have secondary infections, such as pneumonia, and may need to be hospitalized. Anyone can get influenza, but it is typically more serious in the elderly and people with chronic illnesses such as cancer, emphysema, or diabetes or weak immune systems. It is estimated that thousands of people die each year in the United States from flu or related complications.

In 2011, influenza and pneumonia combined was the 8th leading causes of death in Iowa with 657 deaths. In 2008, there were over 800 influenza/pneumonia deaths. See **Table 3-44** under Previous Occurrence for the number of deaths and rate from 2002-2014.

Pandemic Influenza

A pandemic is a global disease outbreak. A pandemic flu is a human flu that causes a global outbreak, or pandemic, of serious illness. A flu pandemic occurs when a new influenza virus emerges for which people have little or no immunity, and for which there is no vaccine.

This disease spreads easily person-to-person, causing serious illness, and can sweep across the country and around the world in a very short time. The Centers for Disease Control and Prevention (CDC) has been working closely with other countries and the World Health Organization to strengthen systems to detect outbreaks of influenza that might cause a pandemic and to assist with pandemic planning and preparation.

During 2009 and 2010, health professionals around the globe worked to combat the H1N1 influenza virus. This relatively mild and stable influenza virus circulated across the globe and caused one of the most robust worldwide vaccination campaigns since the 1970s. Health professionals continue to monitor the possibility of an avian (bird) flu pandemic associated with a highly pathogenic avian H5N1 virus. Since 2003, avian influenza has been spreading through Asia. A growing number of human H5N1 cases contracted directly from handling infected poultry have been reported in Asia, Europe, and Africa, and more than half the infected people have died. There has been no sustained human-to-human transmission of the disease, but the concern is that H5N1 will evolve into a virus capable of human-to-human transmission.

An especially severe influenza pandemic could lead to high levels of illness, death, social disruption, and economic loss. Impacts could range from school and business closings to the interruption of basic services such as public transportation, health care, and the delivery of food and essential medicines.

Pandemics are generally thought to be the result of novel strains of viruses. Because of the process utilized to prepare vaccines, it is impossible to have vaccine pre-prepared to combat pandemics. A portion of the human and financial cost of a pandemic is related to lag time to prepare a vaccine to prevent future spread of the novel virus. In some cases, current vaccines may have limited activity against novel strains.

Foodborne Disease

There are several agents that can cause illness when consumers eat contaminated food, beverages or water. Foodborne illness (food poisoning) can also be spread person-to-person as well as from contact with animals. **Table 3-43** is a list of common foodborne diseases.

Table 3-43: Common Foodborne Diseases

Organism	Onset of Symptoms	Associated Food(s)
Botulism	12 - 36 hours	Canned fruits and vegetables
Campylobacter	2 - 5 days, range 1 - 10 days	Undercooked chicken or pork, unpasteurized milk
Cholera	12 - 72 hours	Undercooked or raw seafood, especially oysters
Cryptosporidium	7 days, range 1 - 12 days	Unpasteurized beverages, contaminated food or water, person-to-person
E. coli (shiga-toxin)	3 - 4 days, range 2 - 10 days	Undercooked ground meats, unpasteurized milk, contaminated fruits or vegetables, person-to-person
Giardia	7 - 10 days, range 3 - 25 days	Contaminated water, person-to-person
Hepatitis A	28 - 30 days, range 15 - 50 days	Raw produce, undercooked foods, person-to-person
Listeria	3 weeks, range 3 - 70 days	Soft cheeses, unpasteurized milk, ready-to-eat deli meats, hot dogs, undercooked poultry, unwashed raw vegetables
Norovirus	24 - 48 hours, range 10 - 50 hours	Contaminated ready-to-eat food, undercooked shellfish, person-to-person
Salmonella	12 - 36 hours, range 6 - 72 hours	Contaminated eggs, poultry, beef, raw fruits and vegetables, unpasteurized milk or juice, cheese
Shigella	1 - 3 days, range 12 - 96 hours	Contaminated food or water, person-to-person
Trichinosis	8 - 15 days, range 5 - 45 days	Raw or undercooked pork or wild game meat

Source: Iowa Department of Public Health, Center for Acute Disease Epidemiology http://www.idph.state.ia.us/Cade/Foodborne.aspx).

Warning Time Score: 2 - 12-24 hours

Duration Score: 4 - More than 1 week

Geographic Location/Extent

A human disease outbreak has no geographic boundaries. Because of our highly mobile society, disease can move rapidly through a school, business and across the nation within days, weeks or months. Many of the infectious diseases that are designated as notifiable at the national level result in serious illness if not death. Some are treatable, for others only the symptoms are treatable.

Previous Occurrences

The World Health Organization tracks and reports on epidemics and other public health emergencies through the Global Alert and Response (see historic epidemics at www.who.int/en/).

There have been four acknowledged pandemics in the past century:

- **2009 H1N1 Influenza** - The 2009 H1N1 Pandemic Influenza caused 659 hospitalizations with lab confirmed H1N1 since 9/1/09 and resulting in 41 fatalities. Typically, people who became ill were the elderly, the very young and people with chronic medical conditions and high-risk behaviors.
- **1968–69 Hong Kong flu (H3N2)** - This strain caused approximately 34,000 deaths in the United States and more than 700,000 deaths worldwide. It was first detected in Hong Kong in early 1968 and spread to the United States later that year. Those over age 65 were most likely to suffer fatal consequences. This virus returned in 1970 and 1972 and still circulates today.
- **1957–58 Asian flu (H2N2)** - This virus was quickly identified because of advances in technology, and a vaccine was produced. Infection rates were highest among school children, young adults and pregnant women. The elderly had the highest rates of death. A second wave developed in 1958. In total, there were about 70,000 deaths in the United States. Worldwide deaths were estimated between one and two million.

- **1918–19 Spanish flu (H1N1)** - This flu is estimated to have sickened 20-40 percent of the world's population. Over 20 million people lost their lives. Between September 1918 and April 1919, 500,000 Americans died. The flu spread rapidly; many died within a few days of infection, others from secondary complications. The attack rate and mortality was highest among adults 20-50 years old; the reasons for this are uncertain.

Other Reportable Diseases

Table 3-44 shows the 10-year historical reported deaths in Kossuth County from Influenza and Pneumonia as well as Infective and Parasitic Disease.

Table 3-44: Deaths by Year 2007-2016, Influenza and Pneumonia and Infective and Parasitic Disease, Kossuth County and State of Iowa

Year	Influenza/Pneumonia Deaths, Kossuth County	Influenza/Pneumonia Deaths, Iowa	Infective/Parasitic Disease Deaths, Kossuth County	Infective/Parasitic Disease Deaths, Iowa
2016	*	483	*	429
2015	6	592	*	488
2014	*	549	*	448
2013	*	755	*	511
2012	8	656	*	511
2011	8	657	*	464
2010	-	557	*	441
2009	-	633	*	457
2008	6	825	*	493
2007	5	748	7	427

Source: Iowa Department of Public Health, Bureau of Health Statistics-Vital Statistics of Iowa in Brief, http://idph.iowa.gov/health-statistics/data: * = fewer than three deaths, number suppressed to protect confidentiality

Table 3-45 provides the number of common reportable diseases in Kossuth County from 2010 to 2015 from the Iowa Department of Public Health, Center for Acute Epidemiology Annual Reports. The 2015 report measures a variety of different reportable diseases, which is why the numbers differ from the 2010-2014 reports. AIDS/HIV, Chlamydia, Rabies, and TB are reported in 2010-2014, and omitted in 2015. Infant botulism, Brucellosis, Dengue fever, Q Fever, and Typhoid fever are reported in 2015.

Table 3-45: Iowa Common Reportable Diseases by Year in Kossuth County

2010	2011	2012	2013	2014	2015
27	32	27	43	46	13

Source: Iowa Department of Public Health, Center for Acute Disease Epidemiology Annual Reports. 2010-2015, http://idph.iowa.gov/CADE

Probability of Future Occurrence

For purposes of determining probability of future occurrence, the HMPC defined "occurrence" of human disease outbreak as a medical, health or sanitation threat to the general public (such as contamination, epidemic, or plague). In the last century, there have been four pandemic flu events. With the swine flu (H1N1) outbreak in 2009-2010 within the last 10 years), the HMPC determined the possibility of a human disease outbreak causing a threat to the general public to be "Occasional", with between 10% and 20% probability of occurring.

Probability Score: 2 - Occasional

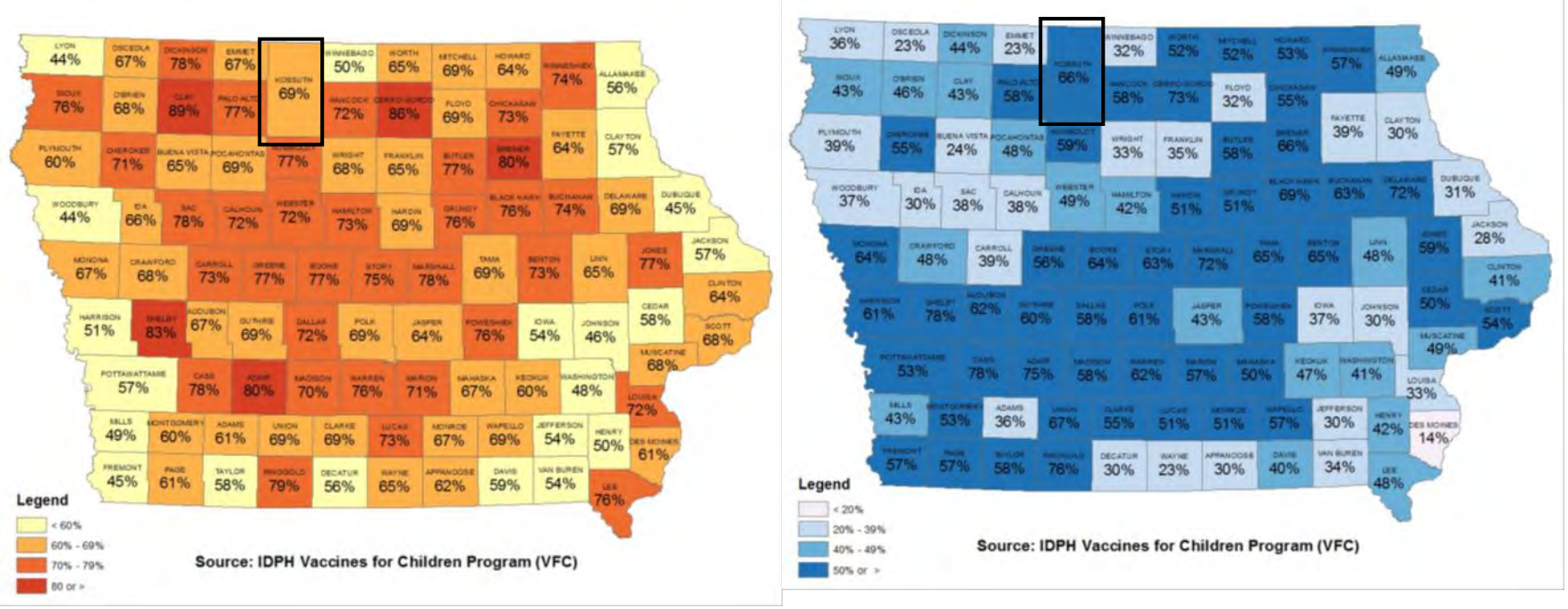
Vulnerability

Overview

Although infectious diseases do not respect geographic boundaries, several populations in Kossuth 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. The following institutional facilities exist in Kossuth County: 7 assisted living facilities, 21 childcare facilities, 12 schools, and 21 medical facilities.

According to the Iowa Department of Public Health –2015 Immunization Program Audit Report The 2-year-old county immunization rate for the 4-3-1-3-3-1-4 series (4 DTaP, 3 Polio, 1 MMR, 3Hib, 3 Hep B, 1 Varicella, 4 PCV by 24 months of age was 64 percent while the adolescent, 13-15-year-old, county immunization rate for the 3-1-2-1-2 (3 Hep B, 1 Meningococcal, 2 MMR, 1 Td or Tdap, 2 Varicella) series) was 53 percent (see **Figure 3-21**).

Figure 3-21: County Immunization Assessment Maps (2-year Old Coverage-left, 13-15-year Old Coverage-right), Selected Vaccination Series



Source: Iowa Department of Public Health, Iowa Immunization Program Annual Report 2015 County Immunization Assessment, https://idph.iowa.gov/Portals/1/userfiles/39/2015%20Immunization%20Annual%20Report.pdf

The HMPC ranked human disease outbreak as critical based on a widespread scenario. The magnitude of an infectious disease outbreak is related to the ability of the public health and medical communities to stop the spread of the disease. Most disease outbreaks that cause critical numbers of deaths are communicable in nature, meaning that they are spread from person to person. The key to reducing the critical nature of the event is to stop the spread of disease. This is generally done in three ways: (1) identification and isolation of the ill, (2) quarantine of those exposed to the illness to prevent further spread, and (3) education of the public about methods to prevent transmission. The public health and health care providers in Kossuth County routinely utilize all three methods to reduce morbidity and mortality from infectious disease.

Magnitude Score: 3 - Critical

Potential Losses to Existing Development

According to *the annual impact of seasonal influenza in the US: Measuring disease burden and costs* by Molinari et al., nationally the economic burden of influenza medical costs, medical costs plus lost earnings, and the total economic burden was $10.4 billion, $26.8 billion and $87.1 billion respectively. The financial burden of healthcare-associated infections nationally has been estimated at $33 billion annually. Specific amounts for Kossuth County are not available.

The pandemic predictions for Iowa from the *Iowa Pandemic Influenza Annex*, 2006 are that 15-35 percent of the population may be affected with a "medium level" case scenario with no vaccine and no antiviral drugs could cause 900-2,000 deaths and 3,000-7,000 hospitalizations statewide. Also, the predictions state that if a pandemic were to occur, it is likely that it would not be a worst-case scenario. Most agricultural-related jobs could continue, and school and other congregating activities could be cancelled, resulting in less spreading of a disease outbreak.

The U.S. Centers for Disease Control and Prevention (CDC) estimates 76 million people suffer foodborne illnesses each year in the United States, accounting for 325,000 hospitalizations and more than 5,000 deaths. Foodborne disease is extremely costly. Health experts estimate that the yearly cost of all foodborne diseases in this country is $5 to $6 billion in direct medical expenses and lost productivity. Infections with the bacteria *Salmonella* alone account for $1 billion yearly in direct and indirect medical costs.

Buildings, infrastructure, and critical facilities are not vulnerable to this hazard. It affects only persons susceptible to the illness. The impacts and potential losses are largely economic and are dependent on the type, extent and duration of the illness.

Future Development

The population in Kossuth County is declining and thus there are not as many people to potential ill from a human disease. However, 22.1 percent of the population is over 65 years old, and those over 65 are more susceptible to health complications as a result of disease.

Climate Change Impacts

The following is an excerpt from the *2010 Climate Change Impacts on Iowa* report.

> *Investigations of the past two decades indicate that the health effects of climate change can be serious. The World Health Organization estimated that in 2002, 2.4% of worldwide diarrhea cases, 6% of malaria cases, 7% of dengue fever cases, and 170,000 deaths (0.3% of worldwide deaths) were attributed to climate change (Beggs and Bambrick 2005, WHO 2002). A major 2010 study included a range of diseases in its listing of potential effects of climate change, ranging from obvious illnesses such as asthma and vector-borne disease to less obvious cancer and neurological disease (Portier 2010).*

The report details the following as climate change contributors to negative consequences for public health in Iowa:

- Extreme Precipitation Events, Rising Humidity, and Associated Disease
- Illness and Death Associated with Extreme Heat and Heat Waves
- Warming, Air Quality and Respiratory Problems
- Pollen Production and Allergies
- Diseases Transferred by Food, Water, and Insects

Human Disease Hazard Summary by Jurisdiction

Due to disease spreading more quickly in areas with high density, cities, the public school districts were given a magnitude of 3. The unincorporated county and cities with smaller populations were given a magnitude of 2. The rest of the elements are not varied across jurisdictions.

Jurisdiction	Probability	Magnitude	Warning Time	Duration	Score	Level
Kossuth County, Iowa	2	2	2	4	2.20	Moderate
City of Algona	2	2	2	4	2.20	Moderate
City of Bancroft	2	2	2	4	2.20	Moderate
City of Burt	2	2	2	4	2.20	Moderate
City of Fenton	2	2	2	4	2.20	Moderate
City of Lakota	2	2	2	4	2.20	Moderate
City of Ledyard	2	2	2	4	2.20	Moderate
City of Lone Rock	2	2	2	4	2.20	Moderate
City of Lu Verne	2	2	2	4	2.20	Moderate
City of Swea City	2	2	2	4	2.20	Moderate
City of Titonka	2	2	2	4	2.20	Moderate
City of Wesley	2	2	2	4	2.20	Moderate
City of Whittemore	2	2	2	4	2.20	Moderate
Algona School District	2	3	2	4	2.50	Moderate
Lu Verne School District	2	3	2	4	2.50	Moderate
North Kossuth School District	2	3	2	4	2.50	Moderate

3.6.10 Infrastructure Failure

Hazard Score Calculation					
Probability	**Magnitude/Severity**	**Warning Time**	**Duration**	**Weighted Score**	**Level**
4	2	4	3	3.30	High

Profile

Hazard Description

Critical infrastructure involves several different types of facilities and systems including: electric power, transportation routes, natural gas and oil pipelines, water and sewer systems, storage networks and internet/telecommunications systems. Failure of utilities or other components of the infrastructure in the planning area can seriously impact public health, functioning of communities and the economy. Disruption of any of these services could result from the majority of the natural, technological, and manmade hazards described in this plan. In addition to a secondary or cascading impact from another primary hazard, utilities and infrastructure can fail as a result of faulty equipment, lack of maintenance, degradation over time, or accidental damage such as damage to buried lines or pipes during excavation.

To maintain consistency with the state plan, this hazard encompasses a variety of different types of infrastructure failure, including communications failure, energy failure, structural failure, and structural fire.

Communications Failure

Communications failure is the widespread breakdown or disruption of normal communication capabilities. This could include major telephone outages, internet interruption, loss of cellular telephone service, loss of local government radio facilities, long-term interruption of electronic broadcast services, or emergency 911. Law enforcement, fire, emergency medical services, 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 similar to flood in that infrastructure can be damaged or made inaccessible by water. Lightning strikes can damage substations and transformers but is usually isolated to small areas of outage. Many forms of terrorism could impact power supply either by direct damage to infrastructure or through cyber-terrorism targeting power supply networks.

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

Other Utility Failure

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

Structural Failure / Structure Fire

The collapse (partial or total) of any structure including roads, bridges, towers, and buildings is considered a structural failure. A road, bridge, or building may collapse due to the failure of the structural components or because the structure was overloaded. Natural events such as heavy snow may also cause the roof of a building to collapse (under the weight of snow). In 1983 a KWWL television tower collapsed due to ice buildup. Heavy rains and flooding can undercut and washout a road or bridge. This occurred twice in 2008 when railway bridges failed in Waterloo and Cedar Rapids due to flooding. The age of the structure is sometimes independent of the cause of the failure. Enforcement of building codes can better guarantee that structures are designed to hold-up under normal conditions. Routine inspection of older structures may alert inspectors to weak points. The level of damage and severity of the failure is dependent on factors such as the size of the building or bridge, the number of occupants of the building, the time of day, day of week, amount of traffic on the road or bridge, and the type, and amount of products stored in the structure. There have been structural failures across the state in the past as mentioned above. They have included homes, commercial structures, and communications towers. There is no central collection point for this information, but news articles document infrastructure failure.

A structural fire is an uncontrolled fire in a populated area that threatens life and property and is beyond normal day-to-day response capability. Structural fires present a far greater threat to life and property and the potential for much larger economic losses. Modern fire codes and fire suppression requirements in new construction and building renovations, coupled with improved fire-fighting equipment, training, and techniques lessen the chance and impact of a major urban fire. Most structural fires occur in residential structures, but the occurrence of a fire in a commercial or industrial facility could affect more people and pose a greater threat to those near the fire or fighting the fire because of the volume or type of the material involved. Less severe structural fires are almost a common occurrence in some communities.

Warning Time Score: 4 - less than six hours warning time

Duration Score: 3 - less than 1 week

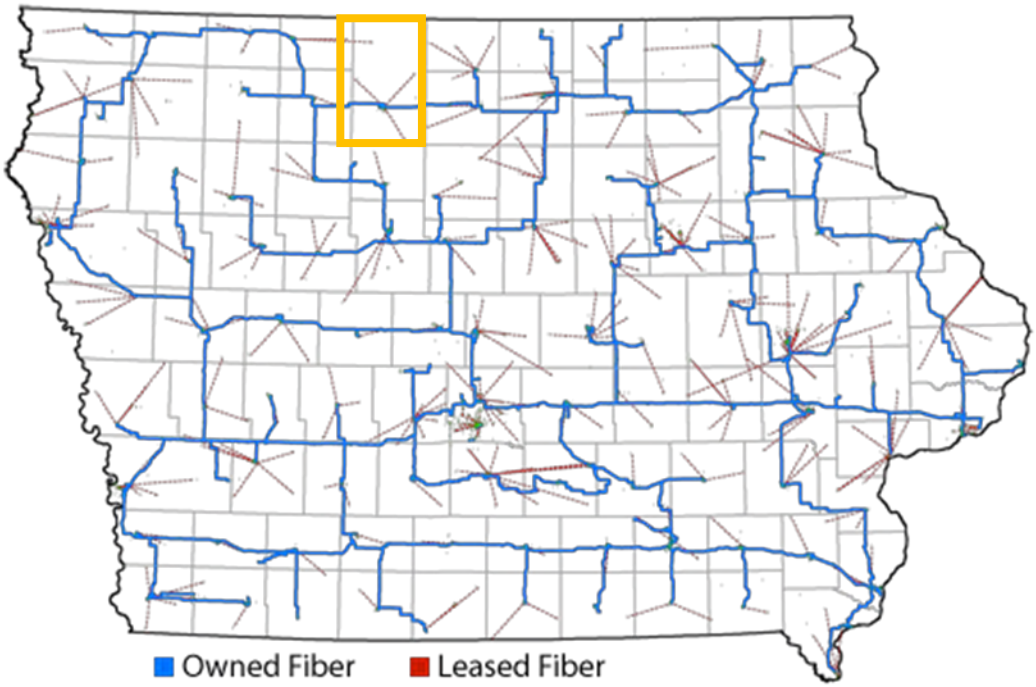
Geographic Location/Extent

The entire planning area is at risk to all types of infrastructure failure included in the hazard description section, either from primary failure due to malfunction, degradation, or accidental or intentional damage or as a result of a secondary impact related to another hazard event.

Communications

Figure 3-22 shows the Iowa Communications Network (ICN) that administers Iowa's statewide fiber optic telecommunications network.

Figure 3-22: Map of Iowa Communication Network



Source: http://icn.iowa.gov/about-icn/agency-information-icn-story

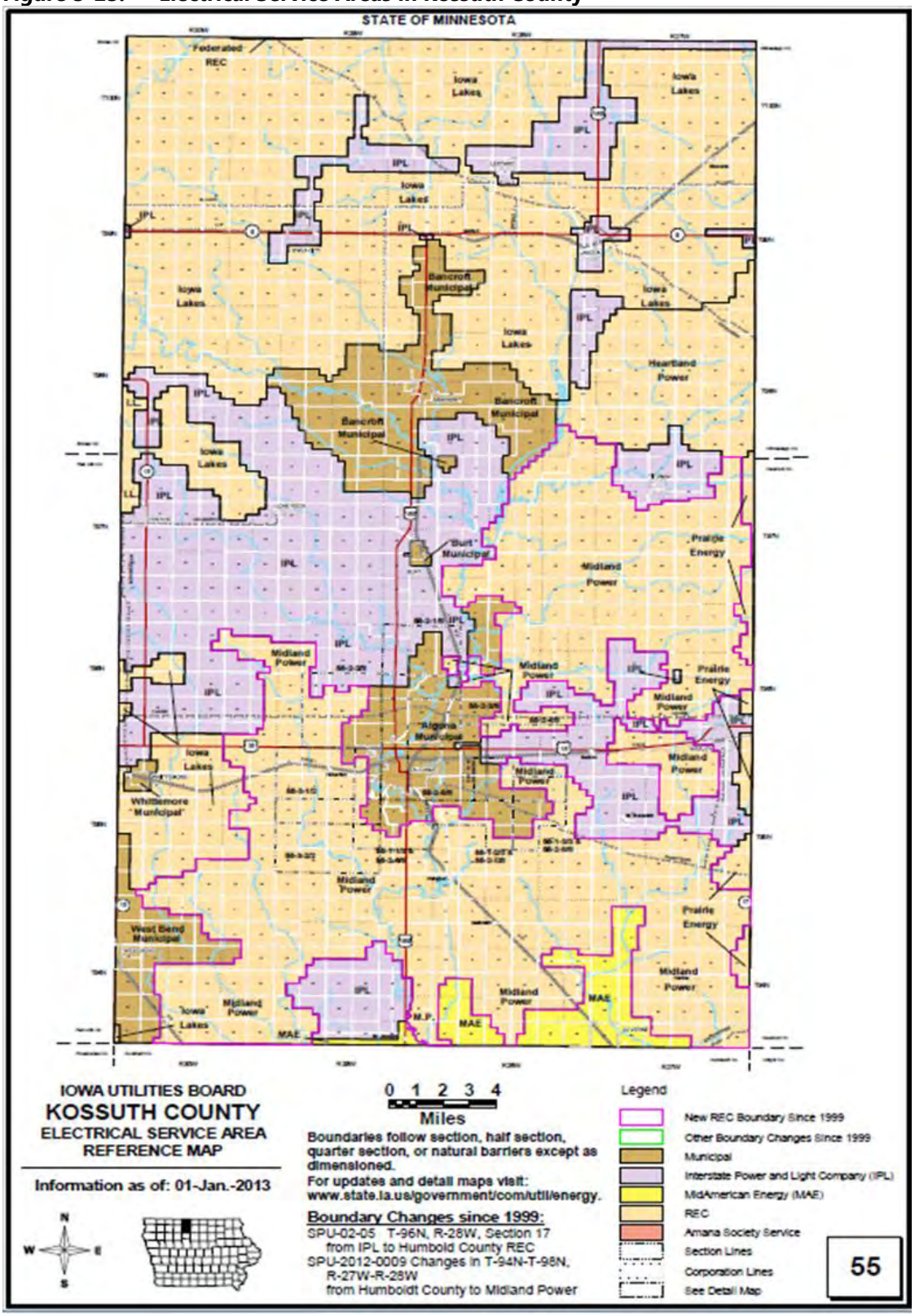
Note: Orange box outlines Kossuth County.

Energy

Power outages can occur in outlying areas with more frequency than in more developed areas. A loss of electric power can also interrupt supply of water from a well. Food in freezers or refrigerators may also be lost. Power outages can cause problems with computers and other devices as well.

Figure 3-23 is the electrical service area map for Kossuth County.

Figure 3-23: Electrical Service Areas in Kossuth County



Source: http://www.iowadot.gov/maps/msp/electrical/electrical.html

Other Utilities (Water/Sewer)

Water

There are 16 Water Supply Systems in Kossuth County, Iowa as follows:

- Algona Municipal Utilities (Serves 5,731 people)
- Bancroft Water Supply (Serves 808 people)
- Swea City Water Supply (Serves 642 people)
- Titonka Water Supply (Serves 584 people)
- Burt Water Supply (Serves 556 people)
- Wesley Water Supply (Serves 467 people)
- Fenton Municipal Water Supply (Serves 317 people)
- Lu Verne Water Supply (Serves 299 people)
- Lakota Water Supply (Serves 255 people)
- Lone Rock Water Supply (Serves 157 people)
- Ledyard Water Supply (Serves 147 people)
- Oak Lake Maintenance, Inc. (Serves 100 people)
- Woodlyn Hills (Serves 73 people)
- Southdale Home Owners Association (Serves 72 people)
- Western Hills (Serves 60 people)
- South Oaks Estates (Serves 50 people)

(Source: https://www.nytimes.com/interactive/projects/toxic-waters/contaminants/ia/Kossuth/index.html)

Sewer

There are 18 permitted wastewater treatment discharge sites in Kossuth County, Iowa according to the Department of Natural Resources (see **Table 3-46**).

Table 3-46: Permitted Wastewater Sites in Kossuth County

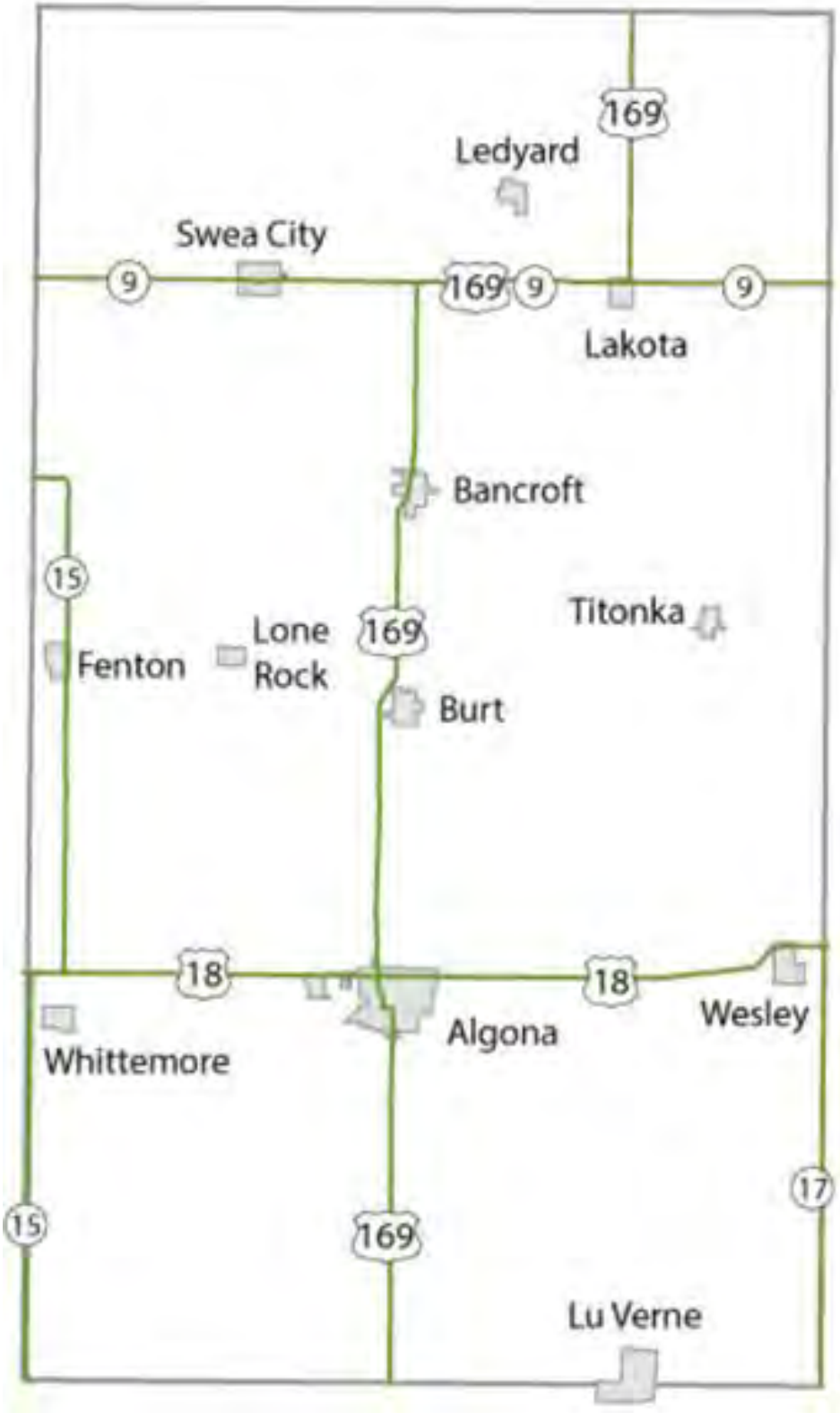
Facility Name	Facility City	Permit Type	Class	SIC Code	Treatment Type
Adel City Of STP	Adel	Municipal	Major	4952	Aerated Lagoon
Adel-Desoto-Minburn Community School District	Adel	Industrial	Minor	8211	No Treatment
Beneventi Chevrolet - Oasis Laser Wash	Granger	Operation Permit	Minor	5511	Other
Kossuth Center City Of STP	Kossuth Center	Municipal	Minor	4952	Aerated Lagoon
AG Processing, Inc. -Algona	Algona	Industrial	Minor	2869	Waste Stabilization Lagoon
Algona City of STP	Algona	Municipal	Major	4952	Trickling Filter
Bancroft City of STP	Bancroft	Municipal	Minor	4952	Waste Stabilization Lagoon
Burt City of STP	Burt	Municipal	Minor	4952	Waste Stabilization Lagoon
Fenton City of STP	Fenton	Municipal	Minor	4952	Waste Stabilization Lagoon
Green Plains Lakota, LLC	Lakota	Industrial	Minor	2869	Other
Lakota City of STP	Lakota	Municipal	Minor	4952	Waste Stabilization Lagoon
Lone Rock, City of STP	Lone Rock	Municipal	Minor	4952	Waste Stabilization Lagoon
Lu Verne, City of STP	Lu Verne	Municipal	Minor	4952	Waste Stabilization Lagoon
Murphy Farms, LLC	Algona	Industrial	Minor	2048	No Treatment
North Union Community School District	Fenton	Semi-Public	Minor	8211	Septic Tank Sand Filter
Oak Lake Maintenance, Inc.	Algona	Semi-Public	Minor	6552	Aerated Lagoon
South Oak Estates MHP	Algona	Semi-Public	Minor	6515	Activated Sludge
Southdale Addition	Algona	Semi-Public	Minor	4952	Activated Sludge
Swea City of STP	Swea City	Municipal	Minor	4952	Waste Stabilization Lagoon
Titonka City of STP	Titonka	Municipal	Minor	4952	Waste Stabilization Lagoon
Wesley City of STP	Wesley	Municipal	Minor	4952	Waste Stabilization Lagoon
Whittemore City of STP	Whittemore	Municipal	Minor	4952	Waste Stabilization Lagoon

Source: Iowa Department of Natural Resources, http://www.iowadnr.gov/Environmental-Protection/Water-Quality/NPDES-Wastewater-Permitting/Current-NPDES-Permits

Infrastructure/Structures

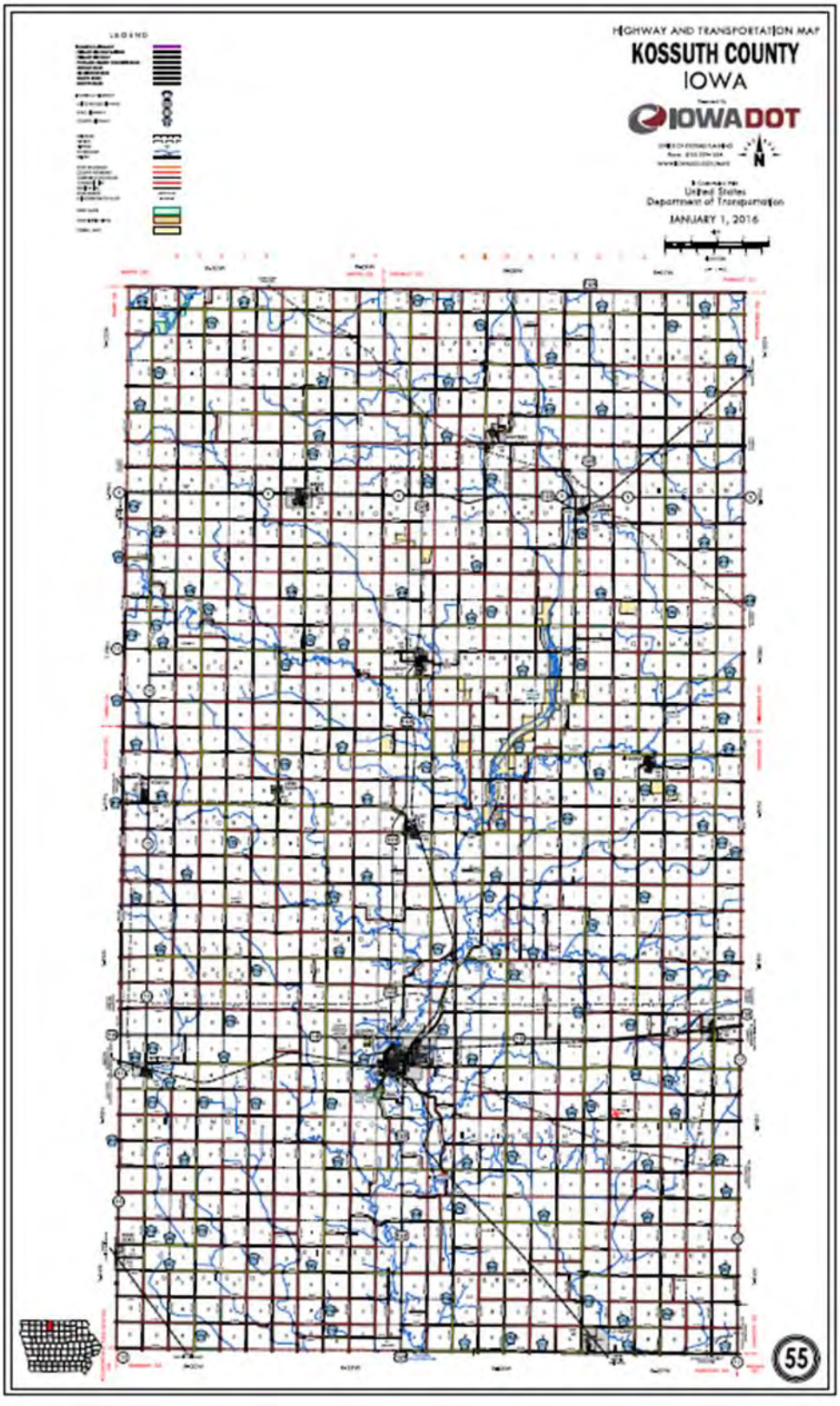
The Highway map for Kossuth County is provided in **Figure 3-24**. The detailed Highway and Transportation Map that includes other transportation infrastructure in the county is provided in **Figure 3-25**.

Figure 3-24: Kossuth County Highway Map



Source: Iowa Department of Transportation, http://www.iowadot.gov/maps/msp/pdfview/counties.html

Figure 3-25: Kossuth County Transportation Map



Source: Iowa Department of Transportation, http://www.iowadot.gov/maps

There is a total of 278 bridge structures in the County as follows:

- 19 State-owned Bridges.
- 259 county-owned bridges
- 0 city-owned bridges

Previous Occurrences

As indicated in the Hazard Description Section, Infrastructure Failure often occurs as a secondary impact to other hazard events. For specific descriptions, please see the Previous Occurrences section of the other hazards included in this plan. In addition to failure/impacts as a result of other hazard events, Infrastructure Failure can also occur as a result of lack of maintenance, human error, and age deterioration.

The structural fires that have occurred in Kossuth County have been within the normal day-to-day response capability, including use of pre-arranged mutual aid and do not fall into the category of uncontrolled fires in a populated area that threatens life and property.

Probability of Future Occurrences

As discussed in other hazard sections in this plan, infrastructure failure occurs as a secondary or cascading impact from several primary hazards such as winter storm, wind storm, and tornado as well as lack of maintenance and age deterioration and other human-caused incidents such as human error, and various forms of terrorism. Structure fire events also occur annually. Therefore, the HMPC determined the probability of future occurrence of this hazard to be "Highly likely".

Probability Score: 4 - Highly Likely

Vulnerability

Vulnerability Overview

Iowa is almost entirely dependent on out-of-state resources for energy. Iowans purchase oil, coal, and natural gas from outside sources. As a result, world and regional fuel disruptions are felt in Iowa.

Every community in the planning area is at risk to some type of utility/infrastructure failure. Business and industry in the urban areas are reliant on electricity to power servers, computers, automated systems, etc. Rural areas of the County are vulnerable as well, as modern agricultural practices are reliant on energy; such as electric milking machines and irrigation pivots.

Generally, the smaller utility suppliers such as small electrical suppliers have limited resources for mitigation. This could mean greater vulnerability in the event of a major, widespread disaster, such as a major flood, severe winter storm or ice storm. The municipal utilities that exist in the County purchase power on the wholesale market for resale to their customers. This may make them more vulnerable to regional shortages of power as well.

In the event of a large-scale event impacting water supply or wastewater treatment homes and businesses with, well-supplied water and septic systems for waste treatment would be largely unaffected. However, these systems may be prone to individual failure and do not have back-up systems in place in the event of failure as larger systems might.

The Iowa Department of Transportation has conducted inspections of bridges in the state. **Table 3-47** provides a summary of the condition of the 278 bridges in Kossuth County.

Table 3-47: Kossuth County Bridge Condition, SDFO Ratings, Weight Restrictions

Condition Index Rating—State-Owned Bridges		
Good	Fair	Poor
12	7	0
Condition Index Rating-County-Owned Bridges		
Good	Fair	Poor
116	138	5
Condition Index Rating-City-Owned Bridges		
Good	Fair	Poor
0	0	0
Condition Index Rating—All Bridges in Kossuth County		
Good	Fair	Poor
128	145	5
Structurally Deficient/Functionally Obsolete (SDFO) Rating—All Bridges in Kossuth County		
Not Deficient	Structurally Deficient	Functionally Obsolete
239	38	0
Weight Restrictions—All Bridges in Kossuth County		
Unrestricted	Restricted	Closed
246	29	2

Source: Iowa Department of Transportation, http://iowadot.maps.arcgis.com/apps/MapSeries/index.html?appid=db6cb43313354a4f85505089ab317e7a

Magnitude Score: 2 - Limited

Potential Losses to Existing Development

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

Although the variables make it difficult to estimate specific future losses, FEMA has developed standard loss of use estimates in conjunction with their Benefit-Cost Analysis methodologies to estimate the cost of lost utilities on a per-person, per-use basis (See **Table 3-48**).

Table 3-48: FEMA Standard Values for Loss of Service for Utilities and Roads/Bridges

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

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

Future Development

Increases in development and population growth would increase the demand for utilities and use of infrastructure as well as the level of impacts when the utilities or infrastructure fail. Kossuth County has seen an overall population decrease of about 1.8 percent in the last five years. As technological advances are made, and systems become more and more automated and dependent on power and communications infrastructure, the impacts of infrastructure failure could increase even though population is decreasing slightly.

Climate Change Impacts

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

Infrastructure Failure Incident Hazard Summary by Jurisdiction

All jurisdictions within the planning area are at risk to infrastructure failure.

Jurisdiction	Probability	Magnitude	Warning Time	Duration	Score	Level
Kossuth County, Iowa	4	2	4	3	3.30	High
City of Algona	4	2	4	3	3.30	High
Algona School District	4	2	4	3	3.30	High
City of Bancroft	4	2	4	3	3.30	High
City of Burt	4	2	4	3	3.30	High
City of Fenton	4	2	4	3	3.30	High
City of Lakota	4	2	4	3	3.30	High
City of Ledyard	4	2	4	3	3.30	High
City of Lone Rock	4	2	4	3	3.30	High
City of Lu Verne	4	2	4	3	3.30	High
City of Swea City	4	2	4	3	3.30	High
City of Titonka	4	2	4	3	3.30	High
City of Wesley	4	2	4	3	3.30	High
City of Whittemore	4	2	4	3	3.30	High
Algona School District	4	2	4	3	3.30	High
Lu Verne School District	4	2	4	3	3.30	High
North Kossuth School District	4	2	4	3	3.30	High

3.6.11 Radiological Incident

Hazard Score Calculation					
Probability	**Magnitude/Severity**	**Warning Time**	**Duration**	**Weighted Score**	**Level**
1	1	4	4	1.75	Low

Profile

Hazard Description

A radiological incident is an occurrence resulting in the release of radiological material at a fixed facility (such as power plants, hospitals, laboratories, etc.) or in transit.

Radiological incidents related to transportation are described as an incident resulting in a release of radioactive material during transportation. Transportation of radioactive materials through Iowa over the interstate highway system is considered a radiological hazard. The transportation of radioactive material by any means of transport is licensed and regulated by the federal government. As a rule, there are two categories of radioactive materials that are shipped over the interstate highways:

1. Low level waste consists of primarily of materials that have been contaminated by low level radioactive substances but pose no serious threat except through long-term exposure. These materials are shipped in sealed drums within placarded trailers. The danger to the public is no more than a wide array of other hazardous materials.
2. High level waste, usually in the form of spent fuel from nuclear power plants, is transported in specially constructed casks that are built to withstand a direct hit from a locomotive.

Warning Time Score: 4 - less than six hours warning time

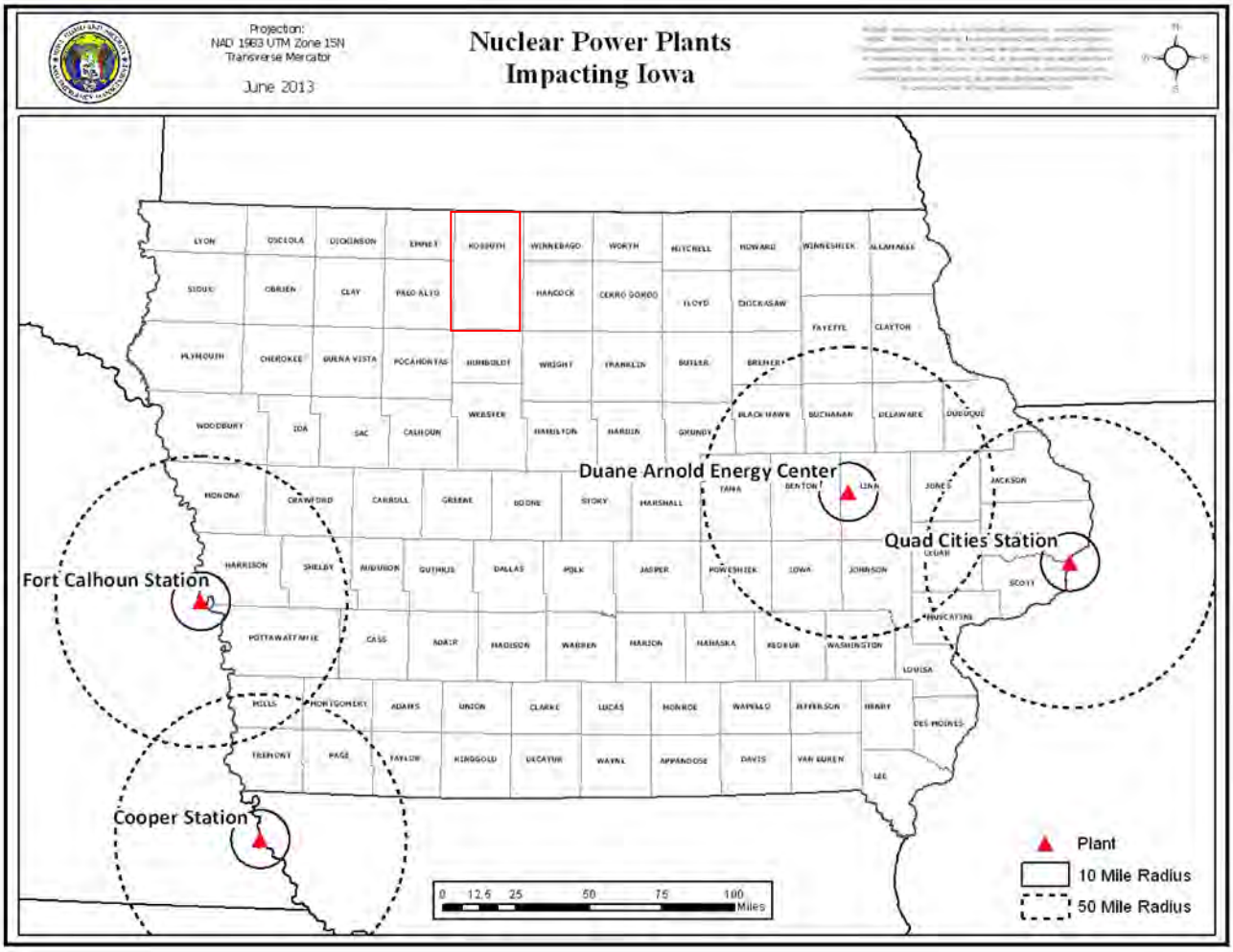
Duration Score: 4 - More than 1 week

Geographic Location/Extent

Fixed Facilities

An incident resulting in a release of radiological material at a fixed facility is a fixed radiological incident. There is one nuclear power plant located within Iowa: the Duane Arnold Energy Center near Palo in Linn County. There are three additional nuclear facilities in adjacent states with planning buffer zones that cross into Iowa: Ft. Calhoun Nuclear Power Plant north of Omaha, Nebraska, Cooper Nuclear Power Plant south of Nebraska City, Nebraska, and Quad Cities Nuclear Power Plant in Cordova, Illinois. None of these powerplants are in close proximity to Kossuth County.

Figure 3-26: Map of Nuclear Power Plants Impacting Iowa



Source: Iowa Homeland Security and Emergency Management; red rectangle is approximate boundary of Kossuth County.

Hospitals and some Industrial facilities are other types of fixed facilities that may house radioactive materials. Sources of radioactive materials may include medical products, radioactive waste from hospitals and laboratories, and industrial products. Small amounts of industrial, medical, and lab materials exist in a few locations, all within buildings. Trained people use the equipment and it is properly handled and stored. A few to a few dozen people, in a lab in a hospital, for example, may be impacted by an immediate release with a small amount of contamination.

Transportation Radiological Incidents

There is also potential for the transport of radioactive waste within Kossuth County.

Since 1990, hundreds of shipments of radiological materials have been made through Iowa. There have been no occurrences of radiological incidents in Iowa. Generally, small or minor shipments will go through the community in support of Kossuth Regional Health Center or medical facilities with radiology services and other small quantity users. Other major roads near hospitals may have small and rare shipments. The Union Pacific or Canadian Pacific railroads might also carry radiological shipments, but data is not confirmed

Previous Occurrences

According to the Iowa State Hazard Mitigation Plan, 2013, there have been no occurrences of a radiological transportation incident in Iowa since 1990. The events that have occurred in other states have been limited; there have been no known serious radiation exposures resulting from a transportation incident because the nature of the materials being transported, and the use of protective packaging is commensurate with the potential hazard of the radioactive materials contained.

Probability of Future Occurrence

Operators of facilities that use radioactive materials and transporters of radioactive waste are trained in the packaging, handling, and shipment of the radioactive waste; and, since they are closely regulated by a variety of federal, state, and local organizations, the likelihood of an incident is remote. When these materials are moved across Iowa highways, Iowa officials are notified and appropriate escorts are provided. The planning team, in light of the tight regulations on transport and the amount of fuels transported, put the annual risk of an incident requiring outside intervention is at less than 1%.

Probability Score: 1 - Unlikely

Vulnerability

Vulnerability Overview

In general, danger to the public in the planning area is less than a wide array of other hazardous materials. Those working with or near sources of radiation are at a greater risk than the general citizens in the planning area. Those responding to a radiological incident should be trained in recognizing a radiological incident and minimize exposure to radioactive materials. The amounts shipped in the county are likely very low and would not cause significant loss. The impact would be a few blocks at best (1,000 feet from the transportation route). Handling of materials at Kossuth Regional Health Center during unloading may present the highest risk.

Magnitude Score: 1 - Negligible

Potential Losses to Existing Development

Responding to the effects of a radiological incident in the planning area would be variable depending on the type and quantity of release. Response may require resources and assistance from several state and federal agencies to determine and evaluate the threat to life and the environment. Due to the variable nature of this hazard, it is not possible to quantify potential losses.

Future Development

Increased development in the planning buffer zones and along transportation corridors would increase the number of people vulnerable to this hazard in the planning area.

Climate Change Impacts

Although, Kossuth County is not in the Emergency Planning Zones for any nuclear reactors, generally speaking, drought can impact water levels for intake pipes that carry water from the Mississippi River to cool the reactors. See Section 3.6.3 for discussion of Climate Change Impacts for Drought.

Radiological Incident Hazard Summary by Jurisdiction

Kossuth County is not within the 50-mile planning buffer of any power plants. Because the County and jurisdictions are outside the planning buffer, it is extremely unlikely that they would have negative impacts from an event at these fixed facilities. Any events at the hospital or other medical facilities with radiology services would be isolated events with minimal exposure areas. The magnitude for the unincorporated county and jurisdictions is 1.

Jurisdiction	Probability	Magnitude	Warning Time	Duration	Score	Level
Kossuth County, Iowa	1	1	4	4	1.75	Low
City of Algona	1	1	4	4	1.75	Low
City of Bancroft	1	1	4	4	1.75	Low
City of Burt	1	1	4	4	1.75	Low
City of Fenton	1	1	4	4	1.75	Low
City of Lakota	1	1	4	4	1.75	Low
City of Ledyard	1	1	4	4	1.75	Low
City of Lone Rock	1	1	4	4	1.75	Low
City of Lu Verne	1	1	4	4	1.75	Low
City of Swea City	1	1	4	4	1.75	Low
City of Titonka	1	1	4	4	1.75	Low
City of Wesley	1	1	4	4	1.75	Low
City of Whittemore	1	1	4	4	1.75	Low
Algona School District	1	1	4	4	1.75	Low
Lu Verne School District	1	1	4	4	1.75	Low
North Kossuth School District	1	1	4	4	1.75	Low

3.6.12 River Flooding

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

Profile

Hazard Description

Many of the communities were settled and developed largely because of their proximity to water resources. A flood is partial or complete inundation of normally dry land areas. Heavy precipitation can cause flooding either in the region of precipitation or in areas downstream. Heavy accumulations of ice or snow can also cause flooding during the melting stage. These events are complicated by the freeze/thaw cycles characterized by moisture thawing during the day and freezing at night. There are two main types of flooding in the planning area: riverine flooding and flash flooding which includes ice jam flooding. Flash flooding is discussed separately in Section 3.6.6. A specific type of flash flooding can occur as a result of dam failure or levee failure. Flooding caused by dam failure is discussed in Section 3.6.2. There are no documented levees in Kossuth County.

Riverine flooding is defined as the overflow of rivers, streams, drains and lakes due to excessive rainfall, rapid snowmelt or ice melt. The areas adjacent to rivers and stream banks that carry excess floodwater during rapid runoff are called floodplains. A floodplain is defined as the lowland and relatively flat area adjoining a river or stream. The terms "base flood" and "100-year flood" refer to the area in the floodplain that is subject to a one percent or greater chance of flooding in any given year. Floodplains are part of a larger entity called a basin, which is defined as all the land drained by a river and its branches.

Gauges along streams and rain gauges throughout the state provide for an early flood warning system. River flooding usually develops over the course of several hours or even days depending on the basin characteristics and the position of the particular reach of the stream. There is a river gage on the Des Moines River in Algona that provides for an early flood warning system. The National Weather Service provides flood forecasts for Iowa. Flood warnings are issued over emergency radio and television messages as well as the NOAA Weather Radio. People in the paths of river floods may have time to take appropriate actions to limit harm to themselves and their property.

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

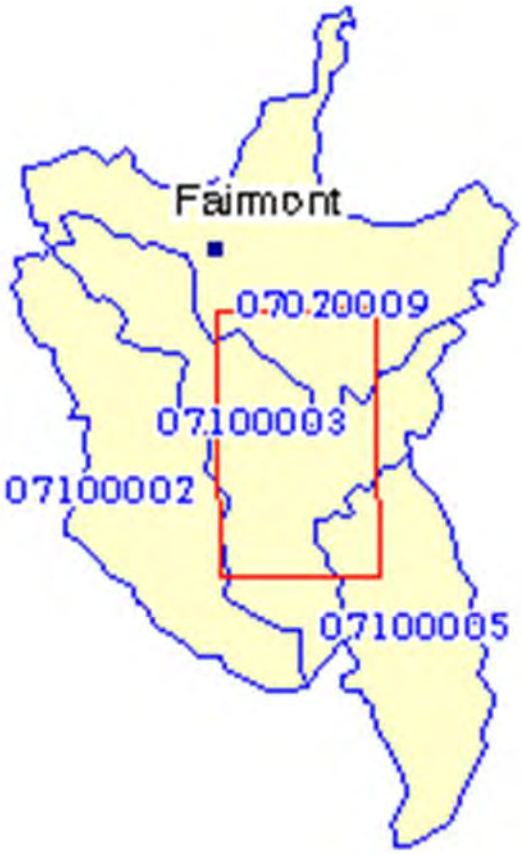
Duration Score: 4 - More than 1 week

Geographic Location/Extent

Kossuth County crosses four HUC-8 watersheds as follows (see **Figure 3-27**):

- 07020009 Blue Earth; state(s): IA, MN
- 07100002 Upper Des Moines; state(s): IA, MN
- 07100003 East Fork Des Moines; state(s): IA, MN
- 07100005 Boone; state(s): IA.

Figure 3-27: Kossuth County, Iowa Watersheds (Kossuth County is red square)



Source: https://cfpub.epa.gov/surf/county.cfm?fips_code=19109

For purposes of this hazard profile and vulnerability analysis, the geographic location/extent for river flooding will be considered as those areas at risk to the 100-year flood (also known as the 1-percent annual chance flood). The 1-percent annual chance flood has been adopted by FEMA as the base flood for floodplain management purposes. At the time, this plan update was prepared, Kossuth County had been issued preliminary Flood Insurance Rate Maps dated June 30, 2016. The maps will become effective in 2018. The flood maps are available in Digital format and were used as the best available data for this plan update.

Jurisdictional Flood Hazard Maps

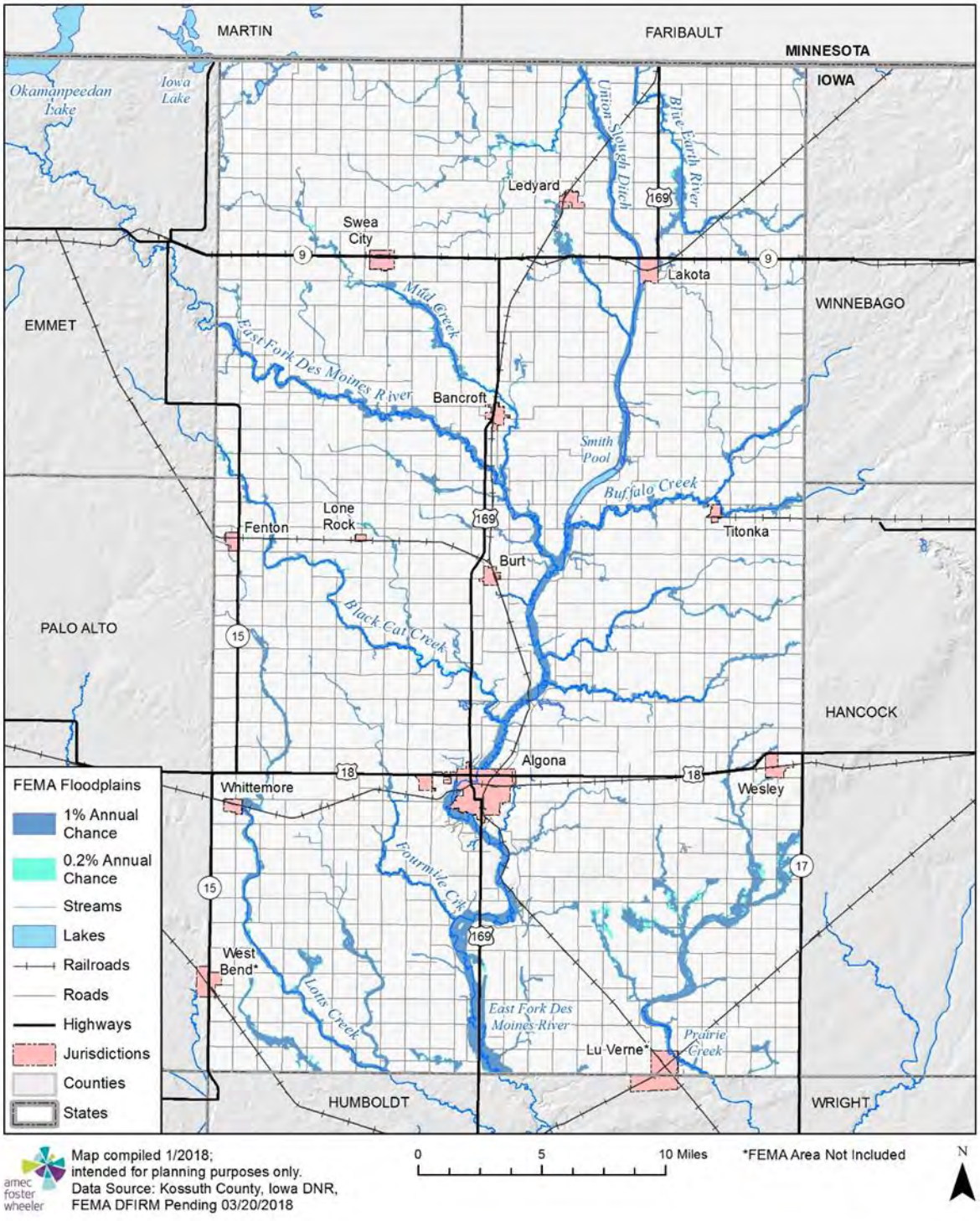
FEMA has identified Special Flood Hazard Areas on the preliminary maps for the unincorporated county and all incorporated jurisdictions with the exception of Bancroft, Burt, Ledyard, Lone Rock, and Swea City.

Figure 3-28 to **Figure 3-37** provide the 1-percent annual chance floodplain for all jurisdictions in the planning area according to the preliminary FEMA Flood Insurance Rate Maps dated June 30, 2016. The county-level map is provided first, and the remaining maps are provided in alphabetical order by city. The School District maps are provided after the city maps. Preceding each map is a general description of the flooding sources/issues for each jurisdiction. The map for West Bend depicts the portion of this city on the Kossuth County side of their corporate limits. West Bend is not an "official" plan participant" of this Kossuth County Multi-Jurisdictional Hazard Mitigation Plan. They are included as "official" plan participants in the Palo Alto County, Iowa Hazard Mitigation Plan.

Kossuth County

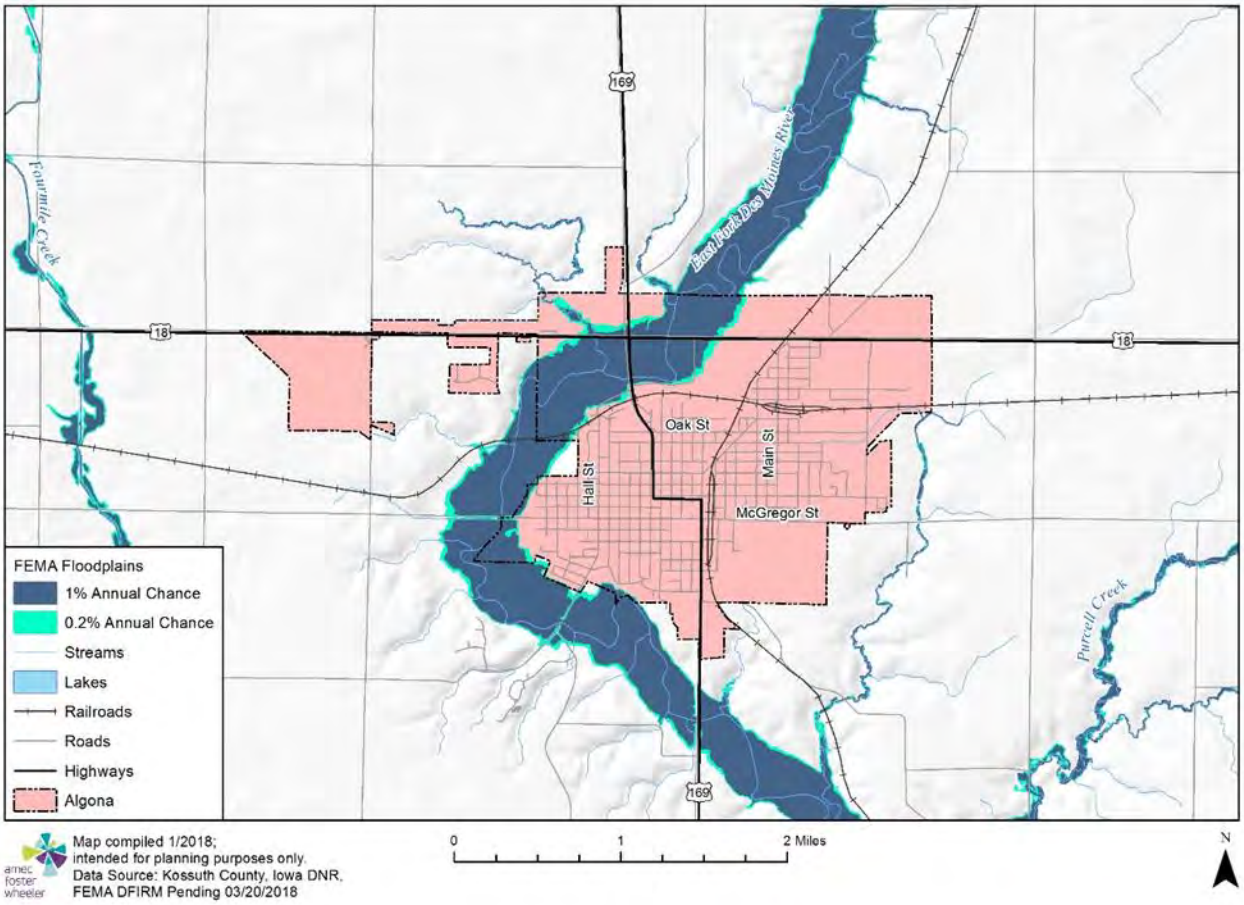
The main flooding sources in Kossuth County include the Des Moines River, Plum Creek, Coon Creek, Blue Earth River and their tributaries.

Figure 3-28: Kossuth County 1-Percent Annual Chance Floodplain (Preliminary DFIRM)



Algona

Figure 3-29: City of Algona 1-Percent Annual Chance Floodplain (Preliminary DFIRM)



Bancroft

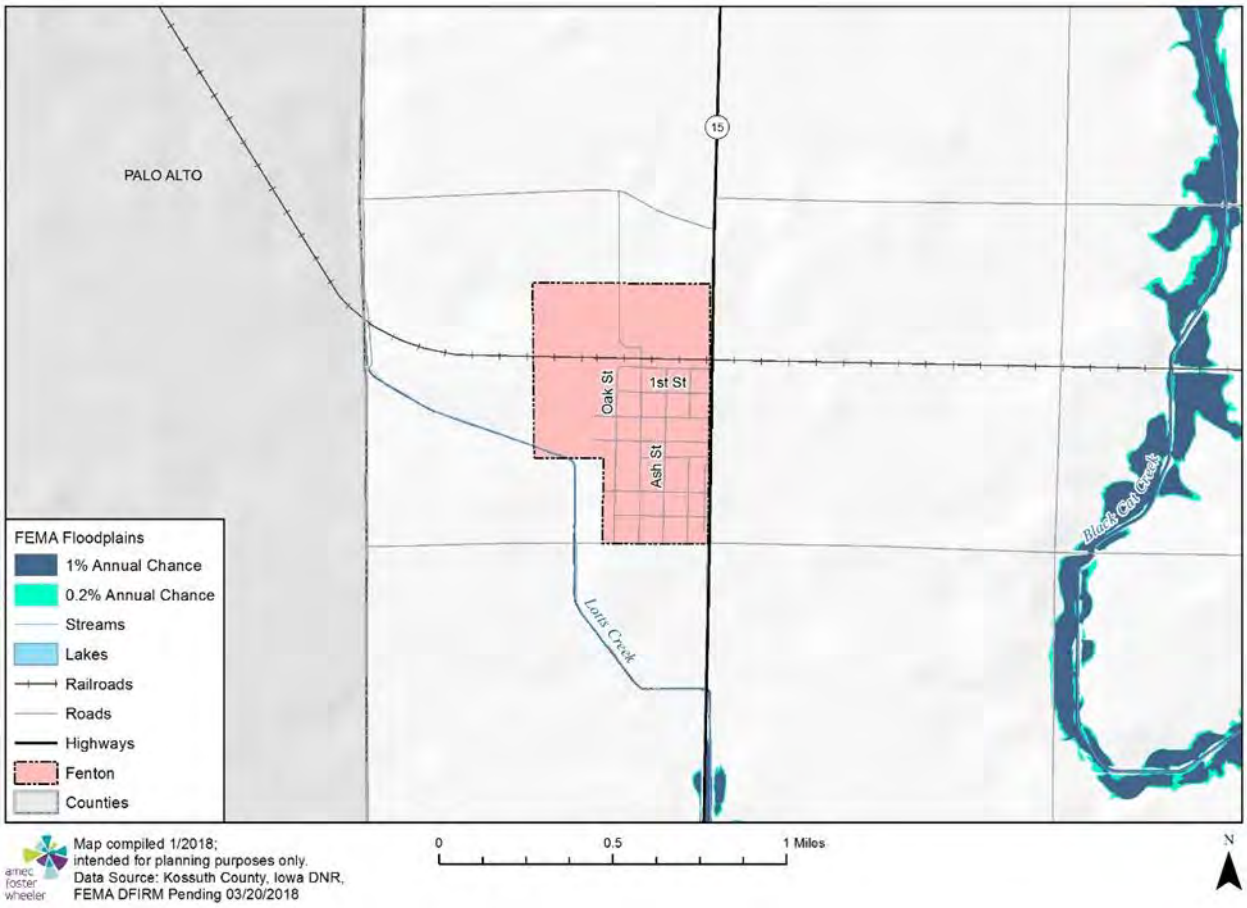
According to the June 2016 Preliminary Flood Insurance Study, the City of Bancroft does not have any Special Flood Hazard Areas.

Burt

According to the June 2016 Preliminary Flood Insurance Study, the City of Burt does not have any Special Flood Hazard Areas.

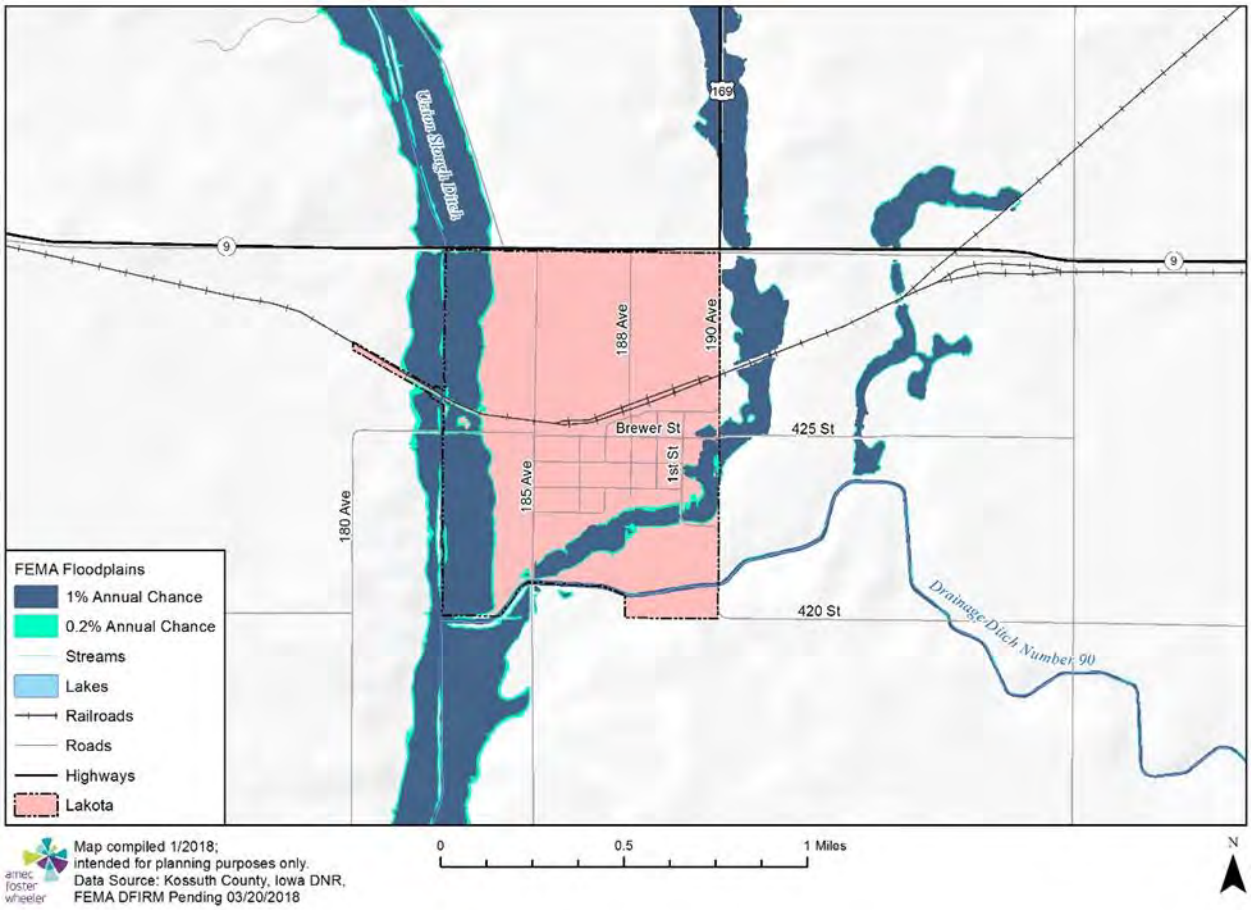
Fenton

Figure 3-30: City of Fenton 1-Percent Annual Chance Floodplain (Preliminary DFIRM)



Lakota

Figure 3-31: City of Lakota 1-Percent Annual Chance Floodplain (Preliminary DFIRM)



Ledyard

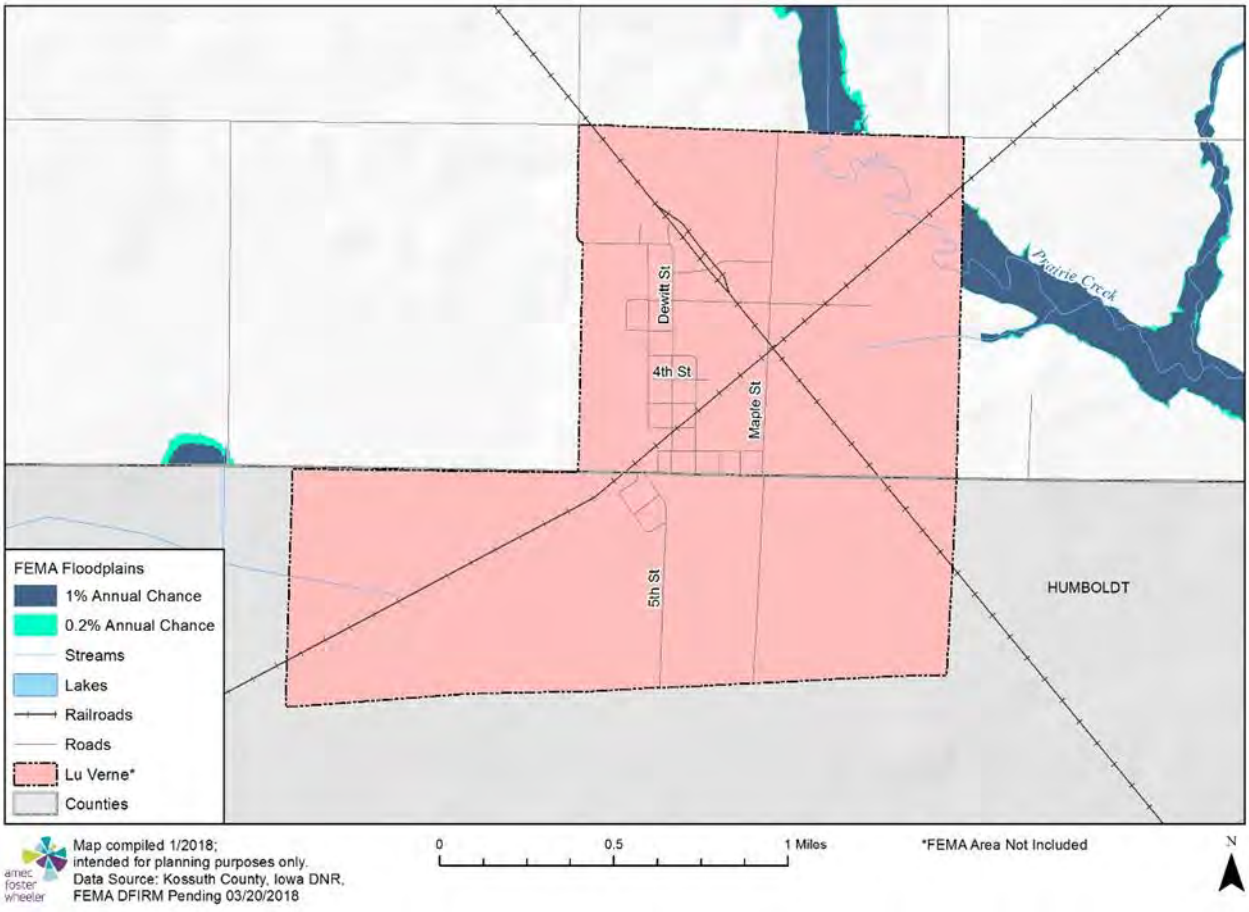
According to the June 2016 Preliminary Flood Insurance Study, the City of Ledyard does not have any Special Flood Hazard Areas.

Lone Rock

According to the June 2016 Preliminary Flood Insurance Study, the City of Lone Rock does not have any Special Flood Hazard Areas.

LuVerne

Figure 3-32: City of LuVerne 1-Percent Annual Chance Floodplain (Preliminary DFIRM)

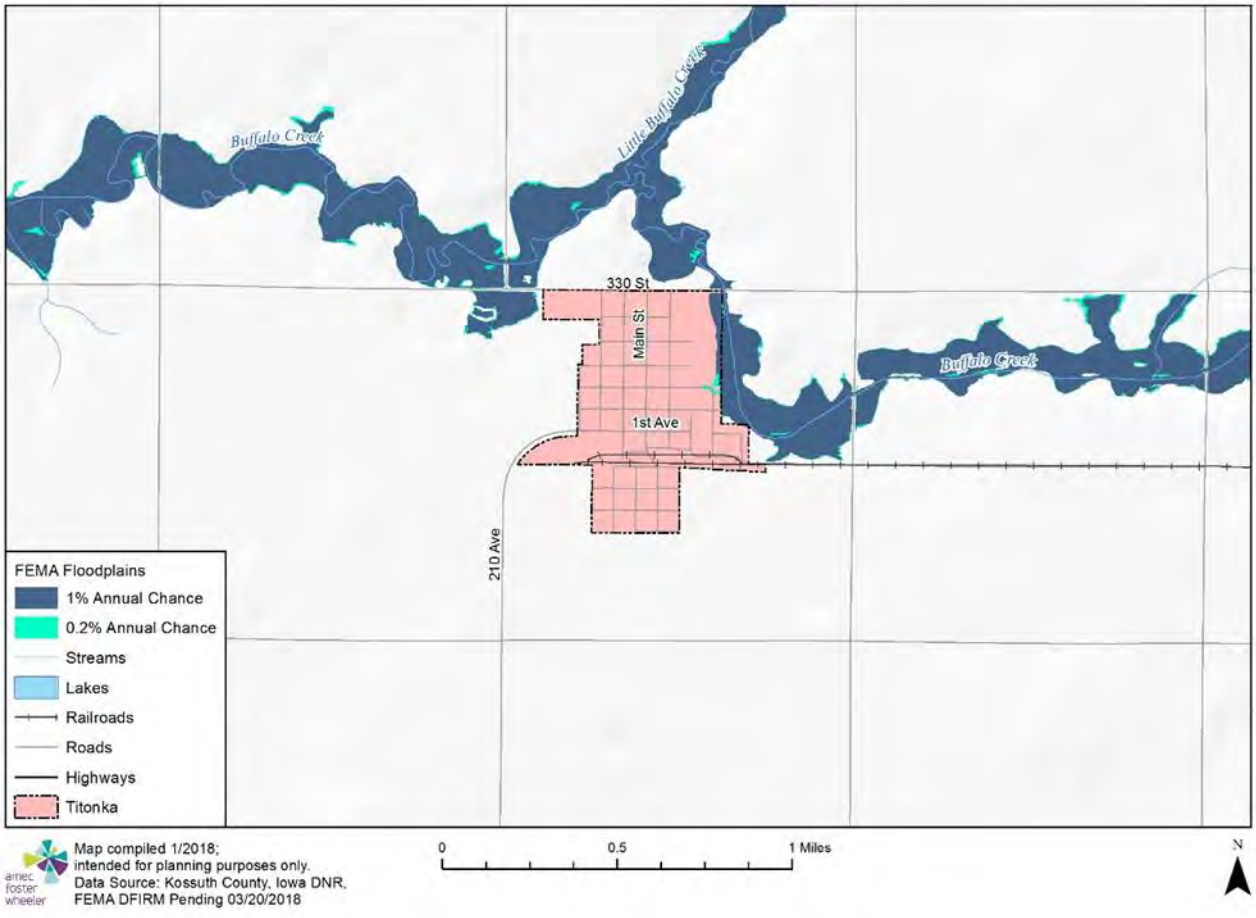


Swea City

According to the June 2016 Preliminary Flood Insurance Study, the City of Swea City does not have any Special Flood Hazard Areas.

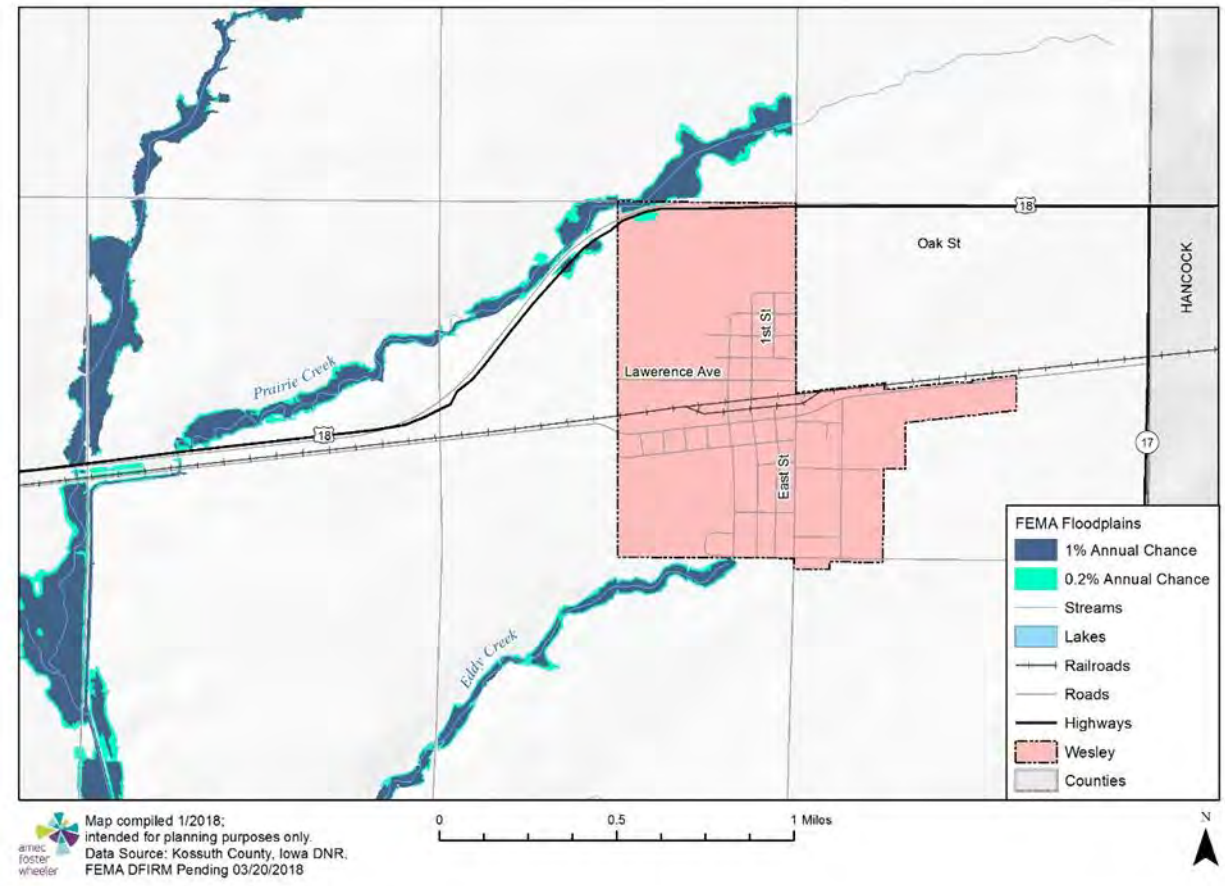
Titonka

Figure 3-33: City of Titonka 1-Percent Annual Chance Floodplain (Preliminary DFIRM)



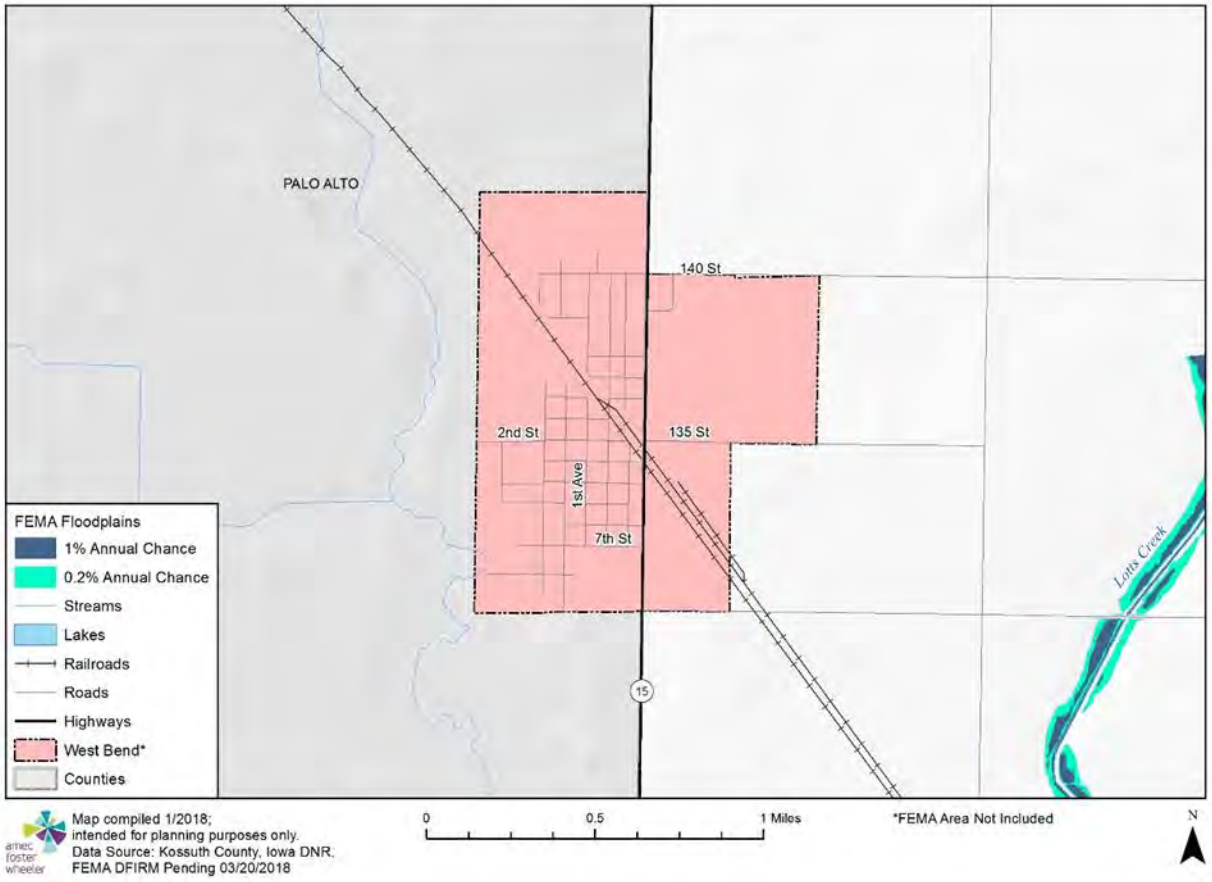
Wesley

Figure 3-34: City of Wesley 1-Percent Annual Chance Floodplain (Preliminary DFIRM)



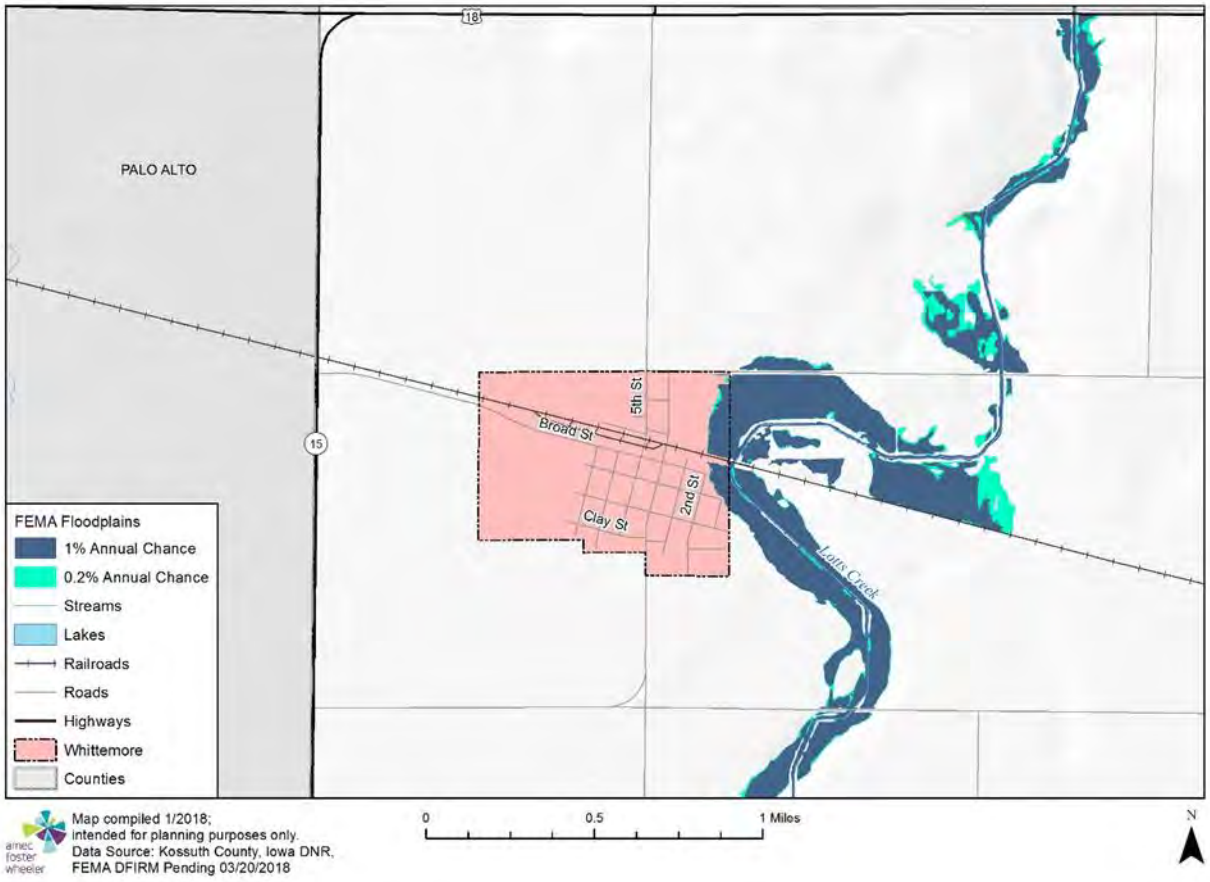
West Bend (Kossuth County Portion Only)

Figure 3-35: City of West Bend 1-Percent Annual Chance Floodplain (Preliminary DFIRM)



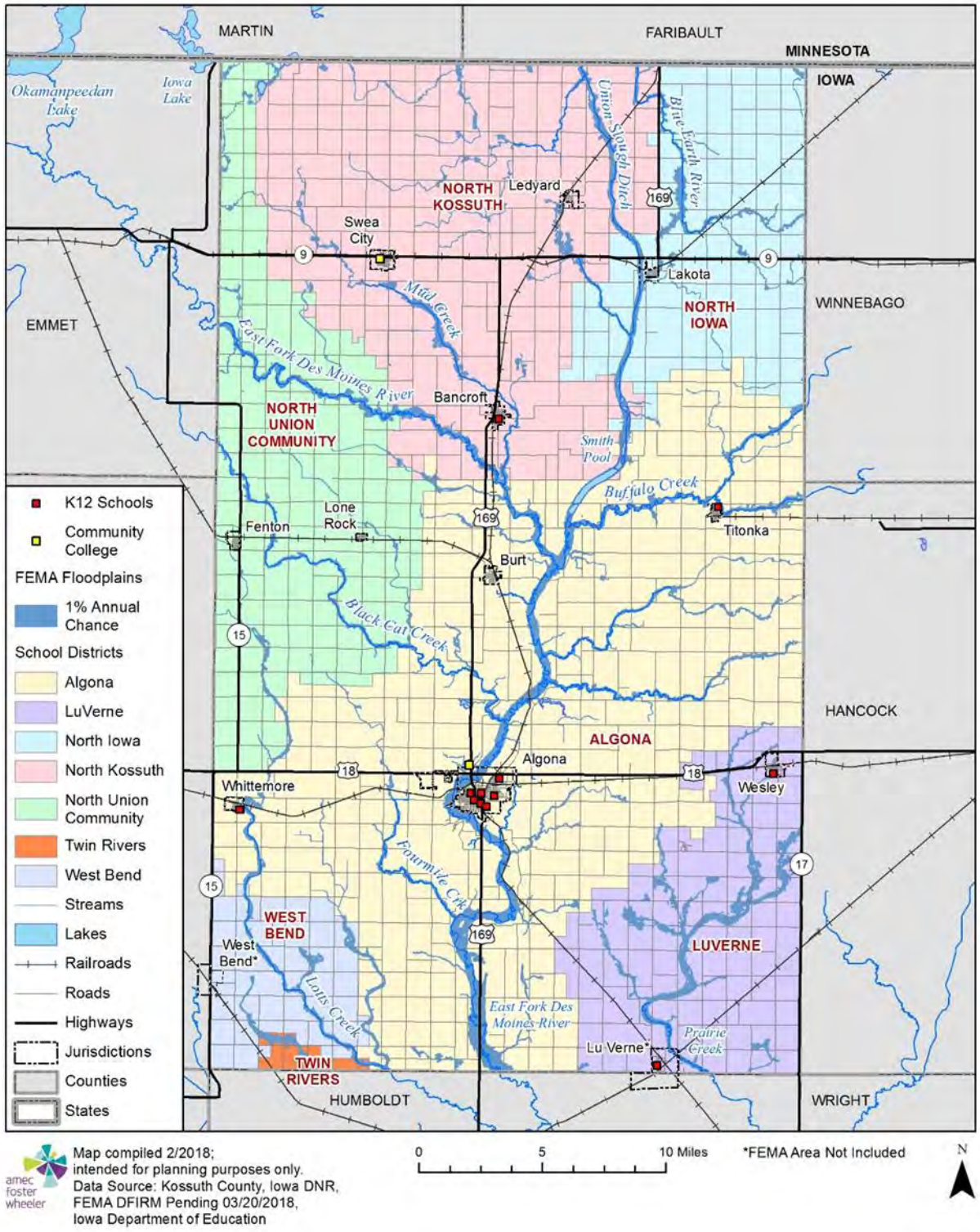
Whittemore

Figure 3-36: City of Whittemore 1-Percent Annual Chance Floodplain (Preliminary DFIRM)



Kossuth County School Districts

Figure 3-37: Kossuth County School Districts and the 1-Percent Annual Chance Floodplain (Preliminary DFIRM)



Previous Occurrences

This section provides information on previous occurrences of riverine flooding in the planning area.

Presidential Declarations for Flooding in Planning Area

Since 1965 there have been 10 Presidential Disaster Declarations that included flooding in the planning area. Additional details of the flood-related disaster declarations are provided in **Table 3-2** in the Hazard Identification Section.

According to the National Climatic Data Center, there were 52 separate reported flood events from 1996-June 2017. When combining events reported less than 10 days apart, there were 42 separate flood events. Details are provided below in **Table 3-49**.

Table 3-49: NCDC Flood Events in Kossuth County, 1996-2016

Year	Number of Flood Events Reported	Deaths	Injuries	Property Damages
1997	4	0	0	$0
1998	3	0	0	$115,000
1999	6	0	0	$417,000
2001	5	0	0	$287,500
2003	4	0	0	$25,000
2004	2	0	0	$150,000
2005	4	0	0	$75,000
2006	1	0	0	$5,000
2007	4	0	0	$135,000
2008	5	0	0	$1,190,000
2009	1	0	0	$0
2010	5	0	0	$425,000
2011	7	0	0	$275,000
2016	1	0	0	$0
Grand Total	**52**	**0**	**0**	**$3,099,500**

Source: NCDC

Additional details are provided below to describe previous events for specific jurisdictions, where available:

Jurisdictional Previous Occurrence Details

The following section provides details on a selection of previous occurrences of flooding within the planning area as reported in NCDC. First, historical events for the county are described, followed by reported events for each city, where available.

Kossuth County

- **March 9, 1997** - Temperatures for the month of March were slightly above normal with slightly below normal precipitation. Preliminary information provided by the State Climatologist Harry Hillaker of the Iowa Department of Agriculture and Land Stewardship indicated a statewide average of 1.41 inches of precipitation for the month. This was about 64% of normal. Although the month was rather dry, there was a good deal of snowpack at the start of the month. The snow melted in earnest beginning in the second week of the month. This caused minor to moderate flooding over much of the Iowa and Cedar River basins. Damage was relatively limited as rivers crested only a foot or two above flood stage.
- **May 16, 1998** - Spotty heavy rainfall on the 15th and 16th lead to significant rises on the Des Moines and Raccoon River Basins. The flooding was once again minor and restricted to low lying and

agricultural lands. Flood crest were only two feet or less above flood stage and duration was not very long. This limited damage.

- **May 21, 1999** - Once again, heavy rainfall struck Iowa. Heavy rainfall over parts of southwest and central Iowa early on the morning of the 21st led to rapid rises on the Raccoon River through Des Moines and on metro area streams and creeks. Rainfall of 1 to 3 inches in several hours caused the Raccoon river at Van Meter to rise over 5 feet in 6 hours, causing a crest of 18.21 feet on the afternoon of the 21st (flood stage is 13 feet). The downstream crest at Fleur Drive in Des Moines was 16.0 feet (flood stage is 12 feet) early on the 22nd. This flooded several roads along the river in Des Moines. Walnut Creek, which begins in Dallas County and runs through West Des Moines and Des Moines, rose very rapidly but remained just below flood stage in Des Moines, though was well out of its banks over western Polk and Dallas Counties. Fourmile Creek, on the east side of the city, also rose rapidly and exceeded its flood stage of 12 feet by almost one half foot. Though serious, this flood event was not as serious as the event that took place around mid-month. According to data provided by the Iowa State Climatology Office, statewide precipitation was 4.92 inches, or .94 inches above normal. Regionally, northeast and southwest Iowa were the wettest parts of the state, while parts of northwest and southeast had below average rainfall. The month ranked the 33rd wettest May in the 127 years of record-keeping. Temperatures were near normal statewide, averaging 61.2 degrees, which is .3 degrees above the 1961-1990 normal. For the 3 spring months (March, April, and May), statewide precipitation averaged 12.23 inches, making this the 17th wettest spring in the past 127 years.
- **September 15, 2004** - Very heavy rain struck northwest and extreme northern Iowa at mid-month. An area of thunderstorms, bringing mostly 1 to 2 inch rain amounts, fell across northwest Iowa on the night of the 13th and morning of the 14th. This was soon followed by a procession of thunderstorms from mid-day on the 14th to sunrise on the 15th when additional 6 or more inches of rain fell on a wide area from O'Brien and Cherokee Counties northeast into southeast Minnesota. At Spencer (7.13, Estherville (6.45) and Swea City (6.82) the rainfall for the 24 hour period ending at 0600 CST on 15 September was the heaviest ever recorded for a 24-hour period. Official 24-hour totals peaked at 8.71 inches at the Estherville Airport with unofficial amounts reported of as much as a foot of rain. Still more rain fell in the area on the 17th and 21st. Official monthly rainfall totals included 15.62 inches at Spencer Airport with 14.43 inches of it falling from the night of the 13th to the morning of the 22nd. This easily broke the previous Spencer record for precipitation for any month of 12.13 inches in August of 1975. These were the heaviest rains reported in Iowa since June of 1998. The heavy rainfall caused several rivers to overflow their banks. This caused some damage due to flooded property and drown crops along the river bank. Flooding was reported in the East Fork Des Moines, Des Moines, Winnebago, Shell Rock, and Cedar River systems.
- **April 1, 2006** - Minor flooding tool place over a large part of northwest and north central Iowa during the month. In actuality, the far northern sites in the upper reaches of the Des Moines River Basin remained above flood stage through the entire month. A significant rainfall event of 2 to 4 inches over a several day period from late March through the 2nd of April resulted in minor flooding along many of the main stem rivers in the northwest and north central counties. The flooding was limited lowland agricultural areas. Damage was very minor. Much of the flooding had subsided by the middle of the month.

Algona

- **March 14, 2007** - The March 1st blizzard, combined with very heavy snow from another storm on February 23-25, resulted in a snow cover of 20 to 30 inches over much of northern Iowa. Temperatures suddenly warmed after the 8th of the month over the south half of the state, and by

the 9th and 10th across the north. The snow pack held 3-5 inches of water and this would become a problem when temperatures warmed in the middle of the month. The last of the snow cover did not melt until the 22nd. Ice covered nearly all of the rivers and creeks in Iowa through the first part of the month, due to the very cold temperatures from February. As temperatures warmed in March, melting of snow cover exceeded the melting of ice on the rivers, and the ice started to move. Ice jams caused flooding along the Des Moines River from Estherville through Fort Dodge and flooded some of the neighborhoods in Fort Dodge as it backed up streamflow on the Des Moines River on March 14th. Another ice jam would move down the Raccoon River, with flooding reported along Highway 169 near Adel. This ice would bring moderate rises along the Raccoon River all the way to its confluence with the Des Moines River, however the effect on the Des Moines River was negligible, due in part to the Saylorville Reservoir. General flooding was fairly widespread; however, damage was limited for the most part.

- **April 2, 2007** - Soil conditions were nearly saturated across northern Iowa from the snow melt of the previous month. An elevated convection event took place with thunderstorms producing hail and heavy rainfall. Much of the rain that fell ran off, resulting in some minor flooding along the upper reaches of rivers in northern Iowa. Flooding was relatively minor and restricted to agricultural land.
- **October 3, 2007** - A wet weather pattern continued into the month of October. A large rain event occurred on the 2nd, with 2.25 inches of rain falling at New Hampton. The antecedent soil conditions were quite wet, and this helped the East Fork of the Des Moines River to flood quite easily. The flooding was relatively minor with the river cresting about a foot over flood stage.

Burt

- **March 8, 2008** - Warming temperature continued to melt snow rapidly over southern Minnesota and northern Iowa. The rapid snow melt caused the East Fork of the Des Moines River to rise above flood stage in Algona. Ice action along the river resulted in flooding in Kossuth County.
- **June 8, 2008** - Heavy rain fell once again across a large part of Iowa, especially across the north and northeast. This rain fell on rivers that were already close to flood stage as they were just beginning to fall after the flooding from earlier in the month. The rainfall of the first week of June set the state for what would become record flooding over a large part of the northeast half of Iowa, even eclipsing the records set just 15 years previous in 1993. Damage became widespread, both to property and infrastructure as well as agriculturally. More details of the record rains will be included with the next event, which occurred just a couple days later.

Lu Verne

- **July 1, 2010** - Warming temperature continued to melt snow rapidly over southern Minnesota and northern Iowa. The rapid snow melt caused the East Fork of the Des Moines River to rise above flood stage in Algona. Ice action along the river resulted in flooding in Kossuth County.

Swea City

- **May 15, 1998** – A widespread outbreak of severe weather took place over Iowa. The situation became complex during the afternoon as several bands of severe thunderstorms developed. The rapid movement of the storms prevented a lot of the flooding that would have otherwise occurred. Repeat thunderstorms passing over Kossuth County did cause some urban flooding. Damage was relatively minor, however several homes reported minor flooding.

Previous Agricultural Impacts

Flooding and excess moisture take a toll on crop production in the planning area. According to the USDA's Risk Management Agency, payments for insured crop losses in the planning area as a result of excess moisture and flood conditions from 2007-2016 totaled $67,842,529.61. This translates to an annual average of $6,784,253. According to USDA Risk Management Agency's 2015 Iowa Crop Insurance Profile, 89 percent of insurable crops in Iowa were insured. **Table 3-50** summarizes the claims paid by year.

Table 3-50: Crop Insurance Claims Paid in Kossuth County for Crop Loss as a result of Excess Moisture/Precipitation/Rain and Flood (2007-2016)

Damage Cause	Sum of Indemnity Amount	Sum of Determined Acres
Excess Moisture/Precip/Rain	**$67,687,781.61**	**415,341**
2007	$80,056.00	915
2008	$7,326,845.00	70,410
2009	$38,624.00	1,023
2010	$591,656.00	5,200
2011	$852,274.00	8,146
2012	$188,363.00	4,305
2013	$38,979,479.00	165,404
2014	$19,087,920.11	153,406
2015	$287,595.95	2,353
2016	$254,968.55	4,180
Flood	**$154,748.00**	**1,115**
2007	$26,134.00	102
2008	$20,161.00	209
2010	$14,144.00	98
2011	$50,828.00	516
2013	$8,649.00	57
2014	$1.00	10
2015	$10,083.00	25
2016	$24,748.00	97
Grand Total	**$67,842,529.61**	**416,456**

Source: USDA Risk Management Agency

National Flood Insurance Program (NFIP) Participation

Table 3-51 provides details on NFIP participation for the communities in the planning area as well as the number of policies in force, amount of insurance in force, number of closed losses, and total payments for each jurisdiction, where applicable. The claims information is for the period from January 1, 1978 to July 31, 2017.

Repetitive Loss/Severe Repetitive Loss Properties

Repetitive Loss: Repetitive Loss Properties are those properties with at least two flood insurance payments of $5,000 or more in a 10-year period.

Severe Repetitive Loss (SRL): SRL properties are defined it as "a single family property" (consisting of one-to-four residences) that is covered under flood insurance by the NFIP and has incurred flood-related damage for which four or more separate claims payments have been paid under flood insurance coverage with the amount of each claim payment exceeding $5,000 and with cumulative amounts of such claims payments exceeding $20,000; or for which at least two separate claims payments have been made with the cumulative amount of such claims exceeding the reported value of the property.

According to the Iowa Department of Natural Resources, Floodplain Management Section, there are no Repetitive Loss or Severe Repetitive Loss properties in Kossuth County.

Probability of Future Occurrence

With the history of flooding in the planning area, it is likely that flooding of various levels will continue to occur. According to NCDC, in the 21.5-year time-frame from 1993-2016, there were 42 events (multiple events less than 10 days apart counted as one event). This translates to approximately 2 events per year. Therefore, the probability rating is "Highly Likely".

Probability Score: 4 - Highly Likely

Table 3-51: NFIP Participation, Policy and Claim Statistics

Community Name	NFIP Participant	Curr Eff Map Date	Reg Emer Date	Policies In-force	Insurance In-force	Closed Losses	Total Payments
Kossuth County	Yes	5/1/1992	5/1/1992	2	$410,000	0	$0
Algona	Yes	6/1/1983	6/1/1983	14	$4,374,500	0	$0
Bancroft	Yes	9/1/1987	9/1/1987	1	$67,000	0	$0
Burt	No – No Special Flood Hazard Area on 2016 Preliminary Map			N/A	N/A	N/A	N/A
Fenton	Yes	7/1/1997	7/1/1997	1	$210,000	0	$0
Lakota	No – No Effective Map			N/A	N/A	N/A	N/A
Ledyard	No – No Special Flood Hazard Area on 2016 Preliminary Map			N/A	N/A	N/A	N/A
Lone Rock	No – No Special Flood Hazard Area on 2016 Preliminary Map			N/A	N/A	N/A	N/A
Lu Verne	Yes	5/1/2011	5/1/2011	0	$0	0	$0
Swea City	No – No Special Flood Hazard Area on 2016 Preliminary Map			N/A	N/A	N/A	N/A
Titonka	Yes	9/1/1987	9/1/1987	1		1	$1,103.50
Wesley	No – No Effective Map			N/A	N/A	N/A	N/A
Whittemore	No—No Effective Map			N/A	N/A	N/A	N/A

Source: Participation details from NFIP Community Status Book, 4/12/2017; https://www.fema.gov/national-flood-insurance-program-community-status-book; M= No elevation determined – all Zone A, C, and X: NSFHA = No Special Flood Hazard Area; E=Emergency Program: Policy and Loss Statistics from BureauNet, http://bsa.nfipstat.fema.gov/reports/reports.html; *Closed Losses are those flood insurance claims that resulted in payment. Loss statistics are for the period from January 1, 1978 to July 31, 2017.

Vulnerability

Overview

To determine vulnerability of people and property to riverine flood, an enhanced flood risk analysis was performed utilizing FEMA's HAZUS software. The analysis used for Davis County is a Level 1 Plus which is a standard Level 1 process but with Depth Grids imported to enhance the accuracy of flood risk modelling within HAZUS. Depth grids were provided by the Iowa Flood Center (IFC) at the University of Iowa. The Depth grids provided by the IFC were used as the best available data since older FEMA depth grids are difficult to obtain and using the IFC data complements analysis that the Iowa Homeland Security and Emergency Management Department is conducting for the State Hazard Mitigation Plan. It should be noted that, while the IFC depth grids are very similar to the effective FEMA products, there are however some differences in the detailed areas for the 1-percent annual chance floodplain.

Default HAZUS inventories were left intact and the flood depth grids were imported as User Data into HAZUS. After the flood depth grids were imported into HAZUS, analysis was completed to determine potential losses as a result of a 1-percent annual chance flood. The following jurisdictions would have losses as a result of a 1-percent annual chance flood: Bloomfield, Floris, and Unincorporated Davis County. The most losses would occur in the Unincorporated areas. The cities of Drakesville and Pulaski did not have any estimated losses. The detailed results of this analysis are provided in the following section on Potential Losses to Existing Development.

For the planning area ranking, the HMPT determined the magnitude of river flooding to be "Limited". Individual jurisdictional ratings are provided at the end of this hazard section.

Magnitude Score: 2 - Limited

Potential Losses to Existing Development

The potential losses to existing development will be provided for the following categories of losses:

- Building/Contents Losses;
- Estimated Population Displaced;
- Agricultural Impacts; and
- Critical Facilities and Infrastructure at Risk.
- Building/Contents Losses

Figure 3-38 displays the 1-percent annual chance floodplain depth grids, **Table 3-52** provides the summary of potential flood loss estimates and impacted population for the 1-percent annual chance flood by jurisdiction. These results are based on the HAZUS Level 1 Plus Analysis described in the Overview section above.

Figure 3-38: Davis County 1-Percent Annual Chance Floodplain with Depth Grids

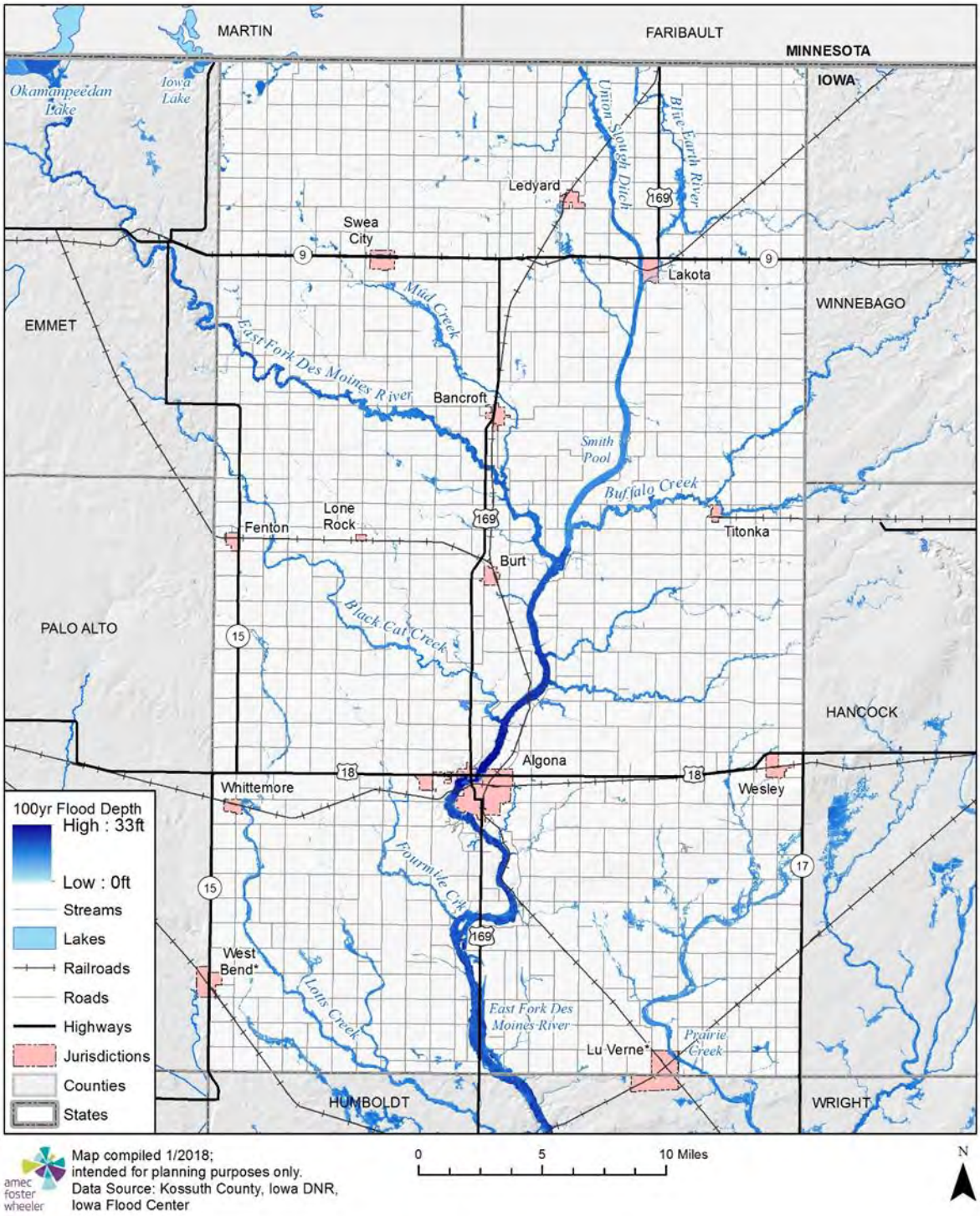


Table 3-52: Potential Flood Loss Estimates, 1-Percent Annual Chance Flood

Jurisdiction	Building Counts	Building Loss*	Contents Loss*	Inventory Loss*	Relocation Cost*	Income Loss*	Rental Income Loss*	Wage Loss*	Total Loss*	Loss Ratio*
Algona	6	$941	$3,445	$205	$8	$58	$7	$51	$4,715	0.34%
Lakota	0	$28	$11	$0	$0	$0	$0	$1	$40	0.06%
Titonka	0	$1	$0	$0	$0	$0	$0	$0	$1	0.00%
Whittemore	7	$65	$24	$0	$0	$0	$0	$2	$91	0.08%
Unincorporated	18	$965	$868	$19	$1	$3	$0	$4	$1,860	0.15%
Total	**31**	**$2,000**	**$4,348**	**$224**	**$9**	**$61**	**$7**	**$58**	**$6,707**	**0.18%**

*All values are in thousands of dollars, a value of $0 does not necessarily mean $0 but less than $1,000.

Estimated Population Displaced

To estimate population displaced by a 1-percent annual chance flood, the estimated number of residential structures impacted was multiplied by the average household size for each jurisdiction. According to the analysis, there would be a total of 25 residential structures impacted. **Table 3-53** provides the estimated population impacted for each jurisdiction that would have flood losses.

Table 3-53: Estimated Displaced Population

Jurisdiction	Residential Properties Impacted	Average Household Size	Estimated Displaced Population
Algona	0	2.2	0
Lakota	0	2.1	0
Titonka	0	2.0	0
Whittemore	7	2.3	16.1
Unincorporated	18	2.15	38.7
Total	**25**		**54.8**

Agricultural Impacts

Additionally, USDA crop insurance claims for excess moisture/precipitation/rain and flood conditions for the ten-year period from 2007-2016 totaled $67,842,530. Considering that 89 percent of insurable crops are insured in Iowa (2015 Iowa Crop Insurance Profile, USDA, RMA), the adjusted losses calculate to $16,650,591 for all insurable crops for the period. This results in an average annual loss estimate of $1,665,059 to insurable crops as a result of excess moisture/precipitation/rain and flood conditions affecting agriculture.

Critical Facilities and Infrastructure at Risk

To analyze critical facilities at risk in the planning area, the inventory of critical and essential facilities and infrastructure in the planning area was compiled from various sources including the *2013 Kossuth County Multi-Jurisdictional Hazard Mitigation Plan*, Kossuth County, HSIP Freedom 2015 and the Iowa Department of Natural Resources (NRGIS). A comparison was made of the 239 facilities in GIS format with preliminary DFIRM layer to determine those facilities that would be damaged in the 1-percent and 0.2-percent annual chance flood events. This analysis determined that three critical facilities and infrastructure sites are at risk to the 1-percent annual chance flood and one facility is vulnerable to the 0.2-percent annual chance flood, as detailed in **Table 3-54** and **Table 3-55**, below.

Table 3-54: Critical Facilities at risk to 1-percent Annual Chance Flood (Preliminary DFIRM)

Jurisdiction	Facility Type	Facility Name
Algona	Lift Station	Algona Lift Station 3
Algona	Tier II	Algona Crossroads
Unincorporated	Medical	Iowa Health Systems

Source: HSIP Freedom 2015, FEMA NFHL

Table 3-55: Critical Facilities at risk to 0.2 -percent Annual Chance Flood (Preliminary DFIRM)

Jurisdiction	Facility Type	Facility Name
Algona	Tier II	American Concrete Algona Plant

Source: HSIP Freedom 2015, FEMA NFHL

Appendix E provides the list of critical facilities that were inventoried and analyzed. This Appendix is redacted from the public version of this plan. To obtain access for official use, contact the Kossuth County Emergency Management Agency.

Future Development

Any future development in floodplains would increase risk in those areas. For those communities that participate in the National Flood Insurance Program, enforcement of the floodplain management regulations will ensure mitigation of future construction in those areas. With new regulatory flood maps in process of becoming effective, additional communities with designated Special Flood Hazard Areas may join the National Flood Insurance Program, including regulation of development in their floodplains.

Climate Change Impacts

One of the climate change impacts noted in the *2010 Climate Change Impacts on Iowa* report by the Iowa Climate Change Impacts Committee is the increase in frequency of severe precipitation events. This climate change impact was also noted in the Flash Flood hazard analysis. Although very heavy precipitation does not always result in riverine flooding, it can if/when the very heavy precipitation occurs frequently without enough time for the watershed to drain away as much water is coming in due to precipitation in the watershed or upstream watersheds.

Figure 3-14 in the Flash Flood section shows that all of Iowa is in the region with a 31% increase in very heavy precipitation from 1958 to 2007. For this study, very heavy precipitation was defined as the heaviest 1% of all events. If this trend increases, riverine flooding events and their associated impacts will likely occur more often in the planning area.

River Flooding Hazard Summary by Jurisdiction

To demonstrate how river flooding varies additionally by jurisdiction, all jurisdictions that had any structural improvements in the 1-percent annual chance floodplain received a rating of 4 for probability. Magnitude for the county and incorporated cities was based on the loss ratio estimates. Jurisdictions with a loss ratio of less than 1 percent received a magnitude of negligible (1), a loss ratio between 1 percent and 10 percent received a magnitude of limited (2) and a loss ratio over 10 percent received a magnitude of critical (3). For those jurisdictions with no Special Flood Hazard Areas, all elements indicate Not Applicable (N/A) unless other specific infrastructure has been identified as vulnerable in the floodplain or past occurrences indicate probability and vulnerability. To determine the rankings for the school districts, the critical facility layer of school buildings was compared against the Flood Insurance Rate Map. This analysis did not reveal any public k-12 school buildings in the 1-percent or 0.2-percent annual chance floodplains, however there are flood risk areas within each district; therefore, flood risk was still considered applicable to the school districts, and the magnitude was considered negligible (1).

The warning time and duration were considered to be 1 and 4 respectively for all jurisdictions to which the flood hazard applies.

Jurisdiction	Probability	Magnitude	Warning Time	Duration	Score	Level
Kossuth County, Iowa	4	1	1	4	2.65	Moderate
City of Algona	4	1	1	4	2.65	Moderate
City of Bancroft	N/A	N/A	N/A	N/A	N/A	N/A
City of Burt	1	1	1	4	1.30	Low
City of Fenton	1	1	1	4	1.30	Low
City of Lakota	4	1	1	4	2.65	Moderate
City of Ledyard	N/A	N/A	N/A	N/A	N/A	N/A
City of Lone Rock	N/A	N/A	N/A	N/A	N/A	N/A
City of Lu Verne	1	1	1	4	1.30	Low
City of Swea City	1	1	1	4	1.30	Low
City of Titonka	4	1	1	4	2.65	Moderate
City of Wesley	1	1	1	4	1.30	Low
City of Whittemore	4	1	1	4	2.65	Moderate
Algona School District	1	1	1	4	1.30	Low
Lu Verne School District	1	1	1	4	1.30	Low
North Kossuth School District	1	1	1	4	1.30	Low

3.6.13 Severe Winter Storm

Hazard Score Calculation					
Probability	**Magnitude/Severity**	**Warning Time**	**Duration**	**Weighted Score**	**Level**
4	2	3	4	3.25	High

Profile

Hazard Description

Severe winter storms are an annual occurrence in Iowa. A major winter storm can last for several days and be accompanied by high winds, freezing rain or sleet, heavy snowfall, cold temperatures and drifting snow creating blizzards. The 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.

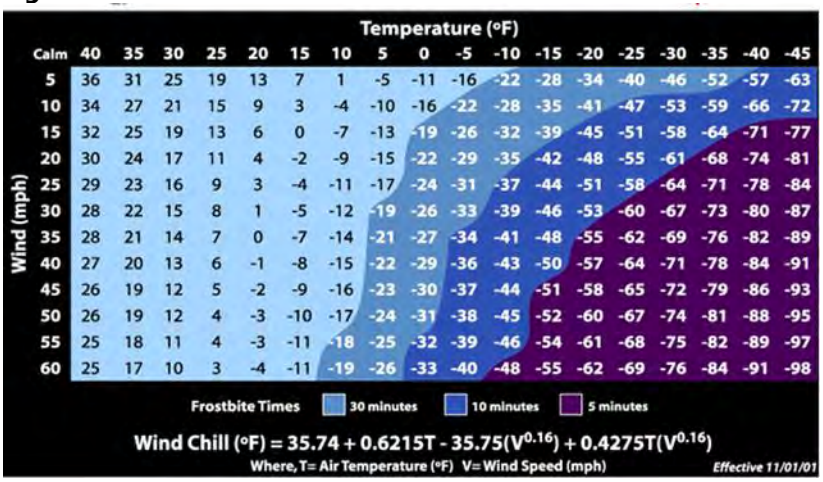
The National Institute on Aging estimates that more than 2.5 million Americans are especially vulnerable to hypothermia, with the isolated elderly being most at risk. About 10 percent of people over the age of

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. Provided by the National Weather Service, **Figure 3-39** below shows the relationship of wind speed to apparent temperature and typical time periods for the onset of frostbite.

Figure 3-39: Wind Chill Chart



Source: National Weather Service

Warning Time Score: 3 - 6-12 hours

Duration Score: 4 - more than 1 week

Geographic Location/Extent

According to the High Plains Regional Climate Center and based on the Algona Weather Station, the planning area has an average maximum temperature of 27.67°F in December,

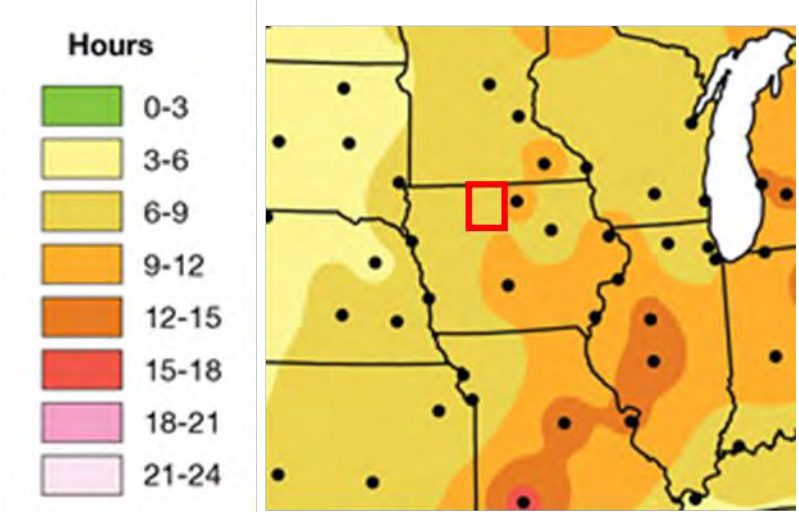
24.43°F in January, and 29.19°F in February. Average minimum temperatures for those same three months are 10.70°F, 6.35°F and 11.27°F. Average snowfall is highest in December (8.5 inches), January (8.2 inches), and February (8.2 inches) with an annual average of 24.4 inches.

(Source: http://www.hprcc.unl.edu/datasets.php?set=CountyData#)

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

Figure 3-40 shows that the planning area (approximated within the red square) is in the dark yellow-shaded area that receives 6-9 hours of freezing rain per year.

Figure 3-40: Average Number of Hours per Year with Freezing Rain



Source: Midwestern Regional Climate Center; http://mcc.sws.uiuc.edu/living_wx/icestorms/index.html

Note: Red square provides approximate location of planning area.

Previous Occurrences

Historically, there has been two Presidential Disaster Declarations for Severe Winter Storms that included Kossuth County since 1965 (See **Table 3-2** in the Hazard Identification Section).

From 1996 through June 2017, the National Climatic Data Center reports the following 93 severe winter weather events:

- 27- Blizzard
- 8 - Cold/Wind Chill
- 4 - Extreme Cold/Wind Chill
- 20 - Heavy Snow
- 12 - Ice Storm
- 21 - Winter Storm
- 1 - Winter Weather

During this 21.5-year period, this translates to 4.3 winter storm/cold temperature events each year. The total property damage for these 93 events was $1,781,725.

NOAA's National Weather Service has issued 403 Advisory, Watch, and/or Warnings concerning winter weather phenomena between 1986 and 2016 (see **Table 3-56**). The data is kept with Iowa Environmental Mesonet, Iowa State University Department of Agronomy website, (http://mesonet.agron.iastate.edu/vtec/search.php).

Table 3-56: National Weather Service Issuances for Winter Weather in Kossuth County, IA (1986-2016)

Phenomenon/Significance	Advisory	Warning	Watch	Total
Blizzard		16	9	25
Blowing Snow	9			9
Freeze		18	4	22
Freezing Fog	1			1
Freezing Rain	8			8
Frost	16			16
Heavy Snow		2		2
Snow	15			15
Snow and Blowing Snow	8			8
Wind Chill	96	17	2	115
Winter Storm		34	38	72
Winter Weather	110			110
Grand Total	**263**	**87**	**53**	**403**

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

Agricultural Impacts

Winter storms, cold, frost and freeze take a toll on crop production in the planning area. According to the USDA's Risk Management Agency, payments for insured crop losses in the planning area as a result of cold conditions and snow from 2007-2016 totaled $1,359,853 (see **Table 3-57**).

Table 3-57: Crop Insurance Claims Paid in Kossuth County as a Result of Cold Conditions and Snow (2007-2016)

Year	Cold Wet Weather	Cold Winter	Freeze	Frost	Total Insurance Paid
2008	$45,259.00			$6,285.00	$51,544.00
2009	$342,015.00	$1,360.00	$288.00		$343,663.00
2010	$10,596.00		$14,831.00	$20,424.00	$45,851.00
2011	$17,316.00			$286,214.00	$303,530.00
2012	$2,760.00				$2,760.00
2013	$123,070.00	$205.00		$1,378.00	$124,653.00
2014	$332,518.40		$4,591.10	$122,728.00	$459,837.50
2015	$9,149.00				$9,149.00
2016	$16,980.00		$1,195.00	$690.00	$18,865.00
Total	**$899,663.40**	**$1,565.00**	**$20,905.10**	**$437,719.00**	**$1,359,852.50**

Probability of Future Occurrence

According to NCDC, during the 21.5-year period from 1996 through June 2017, the planning area experienced 93 total blizzards, winter storms, ice storms frost/freeze, and extreme cold events. This translates to an annual probability of 4.3 blizzard, winter/ice storm, or extreme cold events per year. Therefore, the probability rating is "Highly Likely".

Probability Score: 4 - Highly Likely

Vulnerability

Vulnerability Overview

The entire planning area is vulnerable to the effects of winter storm. Hazardous driving conditions due to snow and ice on highways and bridges lead to many traffic accidents and can impact the response of emergency vehicles. The leading cause of death during winter storms is transportation accidents. About 70 percent of winter-related deaths occur in automobiles due to traffic accidents and about 25 percent

are from people caught outside in a storm. Emergency services such as police, fire, and ambulance are unable to respond due to road conditions. Emergency needs of remote or isolated residents for food or fuel, as well as for feed, water and shelter for livestock are unable to be met. The probability of utility and infrastructure failure increases during winter storms due to freezing rain accumulation on utility poles and power lines. People, pets, and livestock are also susceptible to frostbite and hypothermia during winter storms. Those at risk are primarily either engaged in outdoor activity (shoveling snow, digging out vehicles, or assisting stranded motorists), or are the elderly. Schools often close during extreme cold or heavy snow conditions to protect the safety of children and bus drivers. Citizens' use of kerosene heaters and other alternative forms of heating may create other hazards such as structural fires and carbon monoxide poisoning.

According to the *2013 Iowa Hazard Mitigation Plan*, of the 8 hazards for which data was available to estimate annualized losses, severe winter storm ranked 6th with $2.2 million in annualized losses based on data spanning a 13-year period.

Magnitude Score: 2 - Limited

Potential Losses to Existing Development

Vulnerable Buildings, Infrastructure, and Critical Facilities

Buildings with overhanging tree limbs are more vulnerable to damage during winter storms. Businesses experience loss of income as a result of closure during power outages. In general, heavy winter storms increase wear and tear on roadways though the cost of such damages is difficult to determine. Businesses can experience loss of income as a result of closure during winter storms.

Loss of Use

Overhead power lines and infrastructure are also vulnerable to damages from winter storms, in particular ice accumulation during winter storm events can cause damages to power lines due to the ice weight on the lines and equipment as well as damage caused to lines and equipment from falling trees and tree limbs weighted down by ice. Potential losses would include cost of repair or replacement of damaged facilities and lost economic opportunities for businesses. Secondary effects from loss of power could include burst water pipes in homes without electricity during winter storms. Public safety hazards include risk of electrocution from downed power lines. Specific amounts of estimated losses are not available due to the complexity and multiple variables associated with this hazard.

The electric power loss of use estimates provided in **Table 3-58** were calculated using FEMA's Standard Values for Loss of Service for Utilities published in the June 2009 BCA Reference Guide. These figures are used to provide estimated costs associated with the loss of power in relation to the populations in Kossuth County's jurisdictions. The loss of use estimates for power failure associated with winter storms is provided as the loss of use cost per person, per day of loss. The estimated loss of use provided for each jurisdiction represents the loss of service of the indicated utility for one day for 10 percent of the population. It is understood that in rural areas, the typical loss of use may be for a larger percentage of the population for a longer time during weather extremes. These figures do not take into account physical damages to utility equipment and infrastructure.

Table 3-58: Loss of Use Estimates for Power Failure (One Day)

Jurisdiction	2015 Population Estimate	Estimated Affected Population 10%	Electric Loss of Use Estimate ($126 per person per day)
City of Algona	5,494	549.4	$69,224
City of Bancroft	409	40.9	$5,153
City of Burt	550	55	$6,930
City of Fenton	325	32.5	$4,095
City of Lakota	101	10.1	$1,273
City of Ledyard	117	11.7	$1,474
City of Lone Rock	136	13.6	$1,714
City of Lu Verne	336	33.6	$4,234
City of Swea City	525	52.5	$6,615
City of Titonka	500	50	$6,300
City of Wesley	354	35.4	$4,460
City of Whittemore	474	47.4	$5,972
Unincorporated Kossuth County	5,959	595.9	$75,083
Total	**15,280**	**1528**	**$192,528**

Source: Loss of Use Estimates from FEMA BCA Reference Guide, 2009; Population Estimates, U.S. Census Bureau, 5-year American Community Survey

Property Losses

The total property loss reported by the NCDC for a total of 93 winter events that impacted the planning area during the 21.5-year time-period from 1996 through June 2017 was $1,781,725. However, damages for winter and ice storms are reported for all weather zones impacted. So, it is extremely difficult to determine the damages from these events that apply specifically to Kossuth County.

USDA crop insurance claims for cold conditions and snow for the ten-year period of 2007-2016 totaled $$1,359,852.50. The 2015 Iowa Crop Insurance Profile from USDA, RMA shows that 89 percent of crops are insured in Iowa and the adjusted losses calculate to $1,527,924 for the period and $152,792 in estimated annualized losses.

Considering the $464 million market value of crops from the 2012 Census of Agriculture as baseline crop exposure, the estimated annual losses from cold conditions and snow was determined minimal (0.03%) compared to the value of the insurable crops.

Increased Risk Populations

Elderly populations are considered to be at increased risk to Winter Storms and associated extreme cold events. **Table 3-32** in the Extreme Heat Profile Section provides the number of population over 65 in each jurisdiction in the planning area.

Future Development

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

Climate Change Impacts

According to the 2010 report on Climate Change Impacts on Iowa, Iowa has experienced a long-term upward trend in temperature

- Long-term winter temperatures have increased six times more than summer temperatures.
- Nighttime temperatures have increased more than daytime temperatures since 1970.

- Since 1970, daily minimum temperatures have increased in summer and winter; daily maximum temperatures have risen in winter but declined substantially in summer.

If this trend continues, future occurrences of the extreme cold/wind chill aspects of winter storms should decrease. In addition, higher winter temperatures bring higher probability of rain, rather than snow. As a result, the amount of precipitation falling as snow should decrease.

Severe Winter Storm Hazard Summary by Jurisdiction

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

Jurisdiction	Probability	Magnitude	Warning Time	Duration	Score	Level
Kossuth County, Iowa	4	2	3	4	3.25	High
City of Algona	4	2	3	4	3.25	High
City of Bancroft	4	2	3	4	3.25	High
City of Burt	4	2	3	4	3.25	High
City of Fenton	4	2	3	4	3.25	High
City of Lakota	4	2	3	4	3.25	High
City of Ledyard	4	2	3	4	3.25	High
City of Lone Rock	4	2	3	4	3.25	High
City of Lu Verne	4	2	3	4	3.25	High
City of Swea City	4	2	3	4	3.25	High
City of Titonka	4	2	3	4	3.25	High
City of Wesley	4	2	3	4	3.25	High
City of Whittemore	4	2	3	4	3.25	High
Algona School District	4	2	3	4	3.25	High
Lu Verne School District	4	2	3	4	3.25	High
North Kossuth School District	4	2	3	4	3.25	High

3.6.14 Terrorism

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

Profile

Hazard Description

This hazard encompasses the following sub-hazards: enemy attack, biological terrorism, agro-terrorism, chemical terrorism, conventional terrorism, cyber terrorism, radiological terrorism and public disorder. These hazards can occur anywhere and demonstrate unlawful force, violence, and/or threat against persons or property causing intentional harm for purposes of intimidation, coercion or ransom in violation of the criminal laws of the United States. These actions may cause massive destruction and/or extensive casualties. The threat of terrorism, both international and domestic, is ever present, and an attack can occur when least expected.

Enemy attack is an incident that could cause massive destruction and extensive casualties throughout the world. Some areas could experience direct weapons' effects: blast and heat; others could experience indirect weapons' effect. International political and military activities of other nations are closely monitored by our federal government and the State of Iowa would be notified of any escalating military threats.

The use of biological agents against persons or property in violation of the criminal laws of the United States for purposes of intimidation, coercion or ransom can be described as biological terrorism. Liquid or solid contaminants can be dispersed using sprayers/aerosol generators or by point of line sources such as munitions, covert deposits and moving sprayers. Biological agents vary in the amount of time they pose a threat. They can be a threat for hours to years depending upon the agent and the conditions in which it exists.

Agro-terrorism consists of acts to intentionally contaminate, ruin, or otherwise make agricultural products unfit or dangerous for consumption or further use. Agriculture is an important industry in Iowa and Kossuth County. The introduction of a biological agent into the population of 20,500 cattle and calves, or the 57,290 hogs and pigs, or the 141,000 acres of corn in Kossuth County would be financially devastating and would have a major impact on the food supply of the state and the nation. A major attack involving the nation's food supply could be launched in a rural area that has little capacity to respond. Potential terrorists' targets for livestock disease introduction would be concentration points, such as the County's licensed feedlots or livestock markets discussed later in the Geographic Location section.

Chemical terrorism involves the use or threat of chemical agents against persons or property in violation of the criminal laws of the United States for purposes of intimidation, coercion or ransom. Effects of chemical contaminants are similar to biological agents.

Use of conventional weapons and explosives against persons or property in violation of the criminal laws of the United States for purposes of intimidations, coercion, or ransom is conventional terrorism. Hazard affects are instantaneous; additional secondary devices may be used, lengthening the time duration of the hazard until the attack site is determined to be clear. The extent of damage is determined by the type and quantity of explosive. Effects are generally static other than cascading consequences and incremental structural failures. Conventional terrorism can also include tactical assault or sniping from remote locations.

Electronic attack using one computer system against another in order to intimidate people or disrupt other systems is a cyber-attack. All governments, businesses and citizens that conduct business utilizing

computers face these threats. Cyber-security and critical infrastructure protection are among the most important national security issues facing our country today. As such, the Iowa Division of Criminal Investigation has a Cyber Crime Unit tasked with analysis and retrieval of digital information for investigations.

Radiological terrorism is the use of radiological materials against persons or property in violation of the criminal laws of the United States for purposes of intimidation, coercion or ransom. Radioactive contaminants can be dispersed using sprayers/aerosol generators, or by point of line sources such as munitions, covert deposits and moving sprayers or by the detonation of a nuclear device underground, at the surface, in the air or at high altitude.

Mass demonstrations, or direct conflict by large groups of citizens, as in marches, protect rallies, riots, and non-peaceful strikes are examples of public disorder. These are assembling of people together in a manner to substantially interfere with public peace to constitute a threat, and with use of unlawful force or violence against another person, or causing property damage or attempting to interfere with, disrupting, or destroying the government, political subdivision, or group of people. Labor strikes and work stoppages are not considered in this hazard unless they escalate into a threat to the community. Vandalism is usually initiated by a small number of individuals and limited to a small target or institution. Most events are within the capacity of local law enforcement.

The Southern Poverty Law Center reported in 2017 there were four active hate groups in Iowa:

- National Socialist Movement – a Neo-Nazi group
- Gallows Tree Wotansvolk Alliance – a Neo-Nazi group
- The Daily Stormer – a Neo-Nazi Group
- ACT for America – an Anti-Muslim Group

Source: https://www.splcenter.org/hate-map

Warning Time Score: 4 - Minimal or no warning

Duration Score: 4 - More than 1 week

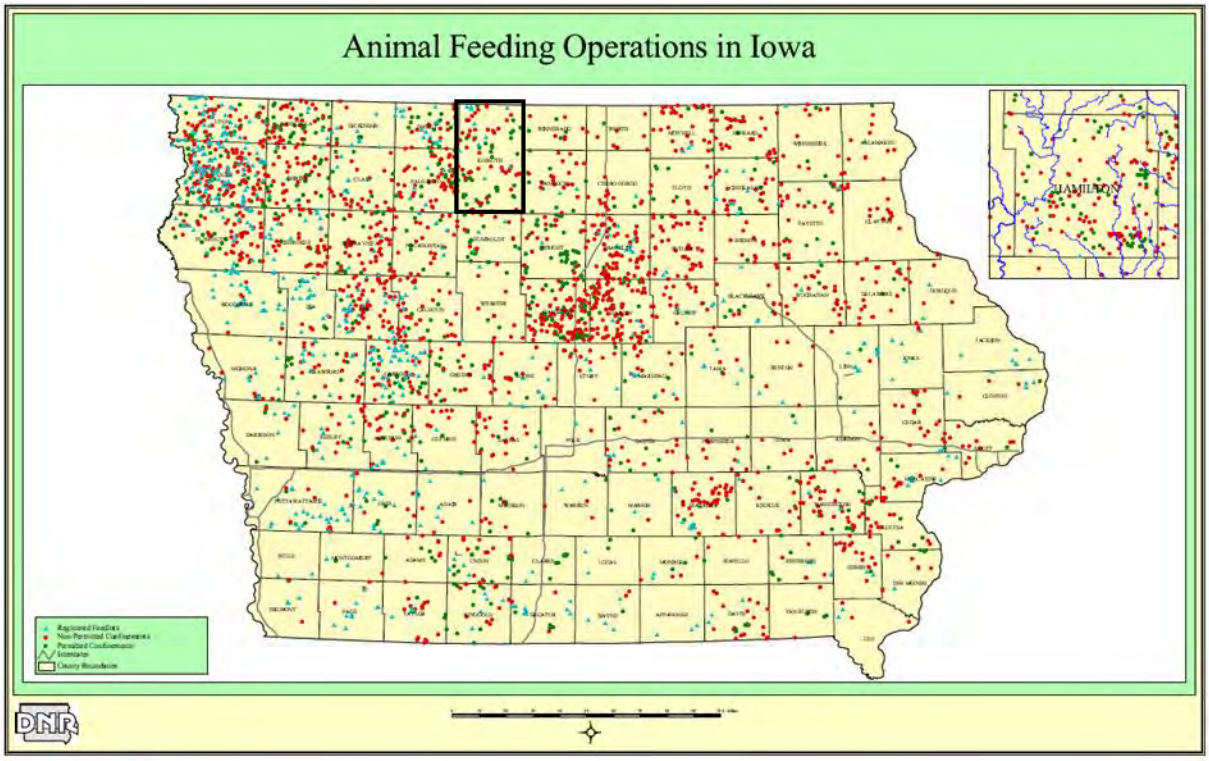
Geographic Location/Extent

The entire planning area has a low potential for terrorist activity. However, any venue with a large gathering of people could be a potential target for terrorists. The most likely targets of a conventional terrorism attack in Kossuth County include public school system facilities the Kossuth County Courthouse and law enforcement centers within Kossuth County.

In terms of cyber-terrorism, our society is highly networked and interconnected. An attack could be launched from anywhere on earth and could range in impacts from small and localized to a far-reaching global scale. Depending on the attack vector and parameters, a cyber-attack could impact all of Kossuth County and its associated municipal jurisdictions.

For agro-terrorism planning, **Figure 3-41** shows the locations of animal feeding operations in Kossuth County. Additional agricultural assets are discussed in Section 3.6.1, Animal/Plant/Crop Disease.

Figure 3-41: Animal Feeding Operations in Iowa



Source: Department of Natural Resources
Black square indicates Kossuth County

Previous Occurrences

There have not been any large-scale enemy attacks or acts of radiological terrorism in Iowa. There have been biological and chemical agent threats, animal rights activists' vandalism and many bomb threats. In 2002, pipe bombs were found in 18 states including Iowa and six people were injured in the bombings in Iowa and Illinois. In 2005 and 2006, pipe bombs were used in attempted murder cases in two Iowa cities.

The Iowa Department of Public Safety issued a 2009 Iowa Uniform Crime Report showing 18 hate/bias crimes were reported statewide in 2009, with an average of 33 hate/bias crimes statewide from 2000-2009.

Probability of Future Occurrence

While difficult to estimate, the probability for a terrorist event is "Unlikely" within the next 10 years in Kossuth County.

Probability Score: 1 - Unlikely

Vulnerability

Overview

A terrorism event could occur in either limited area of a jurisdiction or over the entire jurisdiction at once. This hazard has the ability to directly cause substantial structural losses and potentially loss of life.

Magnitude Score: 4 - Catastrophic

Potential Losses to Existing Development

Potential losses from Terrorism include fatalities to people, damage to property, infrastructure, critical facilities, crops, and animals. The degree of impact would be directly related to the type of incident and the target. Potential losses could include cost of repair or replacement of damaged facilities, lost economic opportunities for businesses, loss of human life, injuries to persons, loss of food supplies, disruption of the food supply chain, and immediate damage to the surrounding environment. Secondary effects of infrastructure failure could include public safety hazards, spread of disease, increased morbidity and mortality among the local and distant populations, public panic and long-lasting damage to the environment. Terrorism events are rare occurrences and specific amounts of estimated losses for previous occurrences are not available due to the complexity and multiple variables associated with these types of hazards. In some instances, information about these events is secure and unavailable to the public in order to maintain national security and prevent future attacks.

As discussed previously, it is difficult to quantify potential losses in terms of the jurisdictions most threatened by CBRNE (chemical, biological, radiological, nuclear, and high yield explosive) attack events due to the many variables and human element. Therefore, for the purposes of this plan, the loss estimates will take into account a hypothetical scenario. The attack scenario is staged at a Friday night high school football game. The hypothetical football stadium has approximately 500 persons in the stadium and concession areas on any home football game nights during the fall.

Analysis of vulnerable populations is aided by a program developed by Johns Hopkins University in 2006 called Electronic Mass Casualty Assessment and Planning Scenarios (EMCAPS) http://www.hopkins-cepar.org/EMCAPS/EMCAPS.html which utilizes scenarios developed by the Department of Homeland Security.

*****THE FOLLOWING HYPOTHETICAL SCENARIO IS FOR INSTRUCTIONAL AND ILLUSTRATIVE PURPOSES ONLY*****

Chemical Attack – Toxic Gas – Chlorine Release

Scenario Overview: A bomb is attached to a truck trailer tanker carrying compressed chlorine and enters the high school football stadium parking lot. The entire contents of the tank escape to the atmosphere and the plume spreads to the stadium and the immediate surrounding parking lot area. This particular type of attack would cause harm to humans and could render portions of the stadium unusable for a short time period in order to allow for a costly clean-up. There might also be a fear by the public of long-term contamination of the stadium and the high school subsequent closing the high school.

Assumptions: (1) The population density is approximately 500 persons around the high school stadium (2) Chlorine is toxic and may damage eyes, skin and respiratory tract. (3) The rate of "worried well" is equal to 9 times the number of infected cases or the full exposed population, whichever is least.

Table 3-59: Described Losses from a Chemical Attack – Chlorine Scenario

Eye pain & swelling, headache, restricted airflow – difficulty breathing, possible chemical burns	22 persons
Eye pain & swelling, headache, rapid breathing, skin irritation	42 persons
Eye pain & swelling, headache, rapid breathing, coughing, chest pain, skin irritation	86 persons
Eye irritation, headache, throat irritation, coughing, skin irritation	119 persons
Eye irritation, headache, coughing, skin irritation	82 persons
Total "Worried Well" Cases (total exposed population)	500 persons
Deaths	16 persons
Cost of Decontamination @ $12/person (assumes all persons with skin injuries will require decontamination and approximately 1/10 of the worried well will demand to be decontaminated) - total persons =417	$5,004

Notes: Victims will require decontamination and both long and short-term treatment.

Improvised Explosive Device Attack – ANFO

Scenario Overview: An Improvised Explosive Device (IED) utilizing an ammonium nitrate/fuel oil (ANFO) mixture is carried in a panel van to a high school parking area at the beginning of a home football game when people are leaving their cars and entering the stadium. Potential losses with this type of scenario include both human and structural assets.

Assumptions: (1) The population density in the parking lot during the beginning and ending of the game is high, at least 1 person /1 square feet. (2) The quantity of ANFO used is 500 lbs.

Table 3-60: Described Losses from an Improvised Explosive Device Attack – ANFO

Total Dead	86 persons
Total Traumatic Injuries	151 persons
Total Urgent Care Injuries	745 persons
Injuries not Requiring Hospitalization	279 persons
Structures and Other Physical Assets (Damages would certainly occur to vehicles and depending on the proximity of other structures, damages would occur to the stadium complex itself. The exact amount of these damages is difficult to predict because of the large numbers of factors, including the type of structures nearby and the amount of insurance held by vehicle owners.)	Vehicles – Replacement cost for approximately 350 vehicles @ $10,000 per vehicle inside the 200 ft. BATF described Lethal Air Blast range = $ 3,500,000 Repair / repainting cost for approximately 70 vehicles @ $ 4,000 per vehicle inside the BATF described Falling Debris Hazard = $280,000

Note: These are the numbers of persons that could be injured from an IED Attack if they are in the area.

Future Development

As public events are held at various venues in the County, the potential may exist for these locations to become targets of attack. With human-caused hazards such as this that can have multiple variables involved, increases in development is not always a factor in determining risk, although the physical damages of the event may increase with the increased or newly developed areas.

Climate Change Impacts

There are no known climate change impacts relevant to this hazard.

Terrorism Hazard Summary by Jurisdiction

The overall rating for any type of terrorism in the County is 2.65 "Moderate". This rating score applies to all jurisdictions in the planning area due to the variables and unknowns involved in terrorism events. If a wide scale event occurred in any jurisdiction, it could have devastating consequences.

Jurisdiction	Probability	Magnitude	Warning Time	Duration	Score	Level
Kossuth County, Iowa	1	4	4	4	2.65	Moderate
City of Algona	1	4	4	4	2.65	Moderate
City of Bancroft	1	4	4	4	2.65	Moderate
City of Burt	1	4	4	4	2.65	Moderate
City of Fenton	1	4	4	4	2.65	Moderate
City of Lakota	1	4	4	4	2.65	Moderate
City of Ledyard	1	4	4	4	2.65	Moderate
City of Lone Rock	1	4	4	4	2.65	Moderate
City of Lu Verne	1	4	4	4	2.65	Moderate
City of Swea City	1	4	4	4	2.65	Moderate
City of Titonka	1	4	4	4	2.65	Moderate
City of Wesley	1	4	4	4	2.65	Moderate
City of West Bend	1	4	4	4	2.65	Moderate
City of Whittemore	1	4	4	4	2.65	Moderate
Algona School District	1	4	4	4	2.65	Moderate
Lu Verne School District	1	4	4	4	2.65	Moderate
North Kossuth School District	1	4	4	4	2.65	Moderate

3.6.15 Thunderstorm with Lightning and Hail

Hazard Score Calculation					
Probability	**Magnitude/Severity**	**Warning Time**	**Duration**	**Weighted Score**	**Level**
4	2	2	2	2.90	Moderate

Profile

Hazard Description

A thunderstorm is defined as a storm that contains lightning and thunder which is caused by unstable atmospheric conditions. When the colder upper air sinks and warm moist air rises, storm clouds or 'thunderheads' develop, resulting in thunderstorms. This can occur singularly, in clusters or in lines. Severe thunderstorms most often occur in Iowa in the spring and summer, during the afternoon and evenings, but can occur at any time. Other hazards associated with thunderstorms and lightning include: heavy rains causing flash flooding (discussed separately in Section 3.6.6) and tornadoes and windstorms (discussed further in Section 3.6.16).

Lightning

All thunderstorms produce lightning, which often strikes outside of the area where it is raining and is known to fall more than 10 miles away from the rainfall area. Thunder is simply the sound that lightning makes. Lightning is a huge discharge of electricity. When lightning strikes, electricity shoots through the air and causes vibrations creating the sound of thunder. Nationwide, lightning kills 75 to 100 people each year. 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, these injuries can be fatal.

Table 3-61 below describes typical damage impacts of the various sizes of hail.

Table 3-61: Tornado and Storm Research Organization Hailstorm Intensity Scale

Intensity Category	Diameter (mm)	Diameter (inches)	Size Description	Typical Damage Impacts
Hard Hail	5-9	0.2-0.4	Pea	No damage
Potentially Damaging	10-15	0.4-0.6	Mothball	Slight general damage to plants, crops
Significant	16-20	0.6-0.8	Marble, grape	Significant damage to fruit, crops, vegetation
Severe	21-30	0.8-1.2	Walnut	Severe damage to fruit and crops, damage to glass and plastic structures, paint and wood scored
Severe	31-40	1.2-1.6	Pigeon's egg > squash ball	Widespread glass damage, vehicle bodywork damage
Destructive	41-50	1.6-2.0	Golf ball > Pullet's egg	Wholesale destruction of glass, damage to tiled roofs, significant risk of injuries
Destructive	51-60	2.0-2.4	Hen's egg	Bodywork of grounded aircraft dented, brick walls pitted
Destructive	61-75	2.4-3.0	Tennis ball > cricket ball	Severe roof damage, risk of serious injuries
Destructive	76-90	3.0-3.5	Large orange > Soft ball	Severe damage to aircraft bodywork
Super Hailstorms	91-100	3.6-3.9	Grapefruit	Extensive structural damage. Risk of severe or even fatal injuries to persons caught in the open
Super Hailstorms	>100	4.0+	Melon	Extensive structural damage. Risk of severe or even fatal injuries to persons caught in the open

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

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

The onset of thunderstorms with lightning and hail is generally rapid. However, advancements in meteorological forecasting allow for some advance warning.

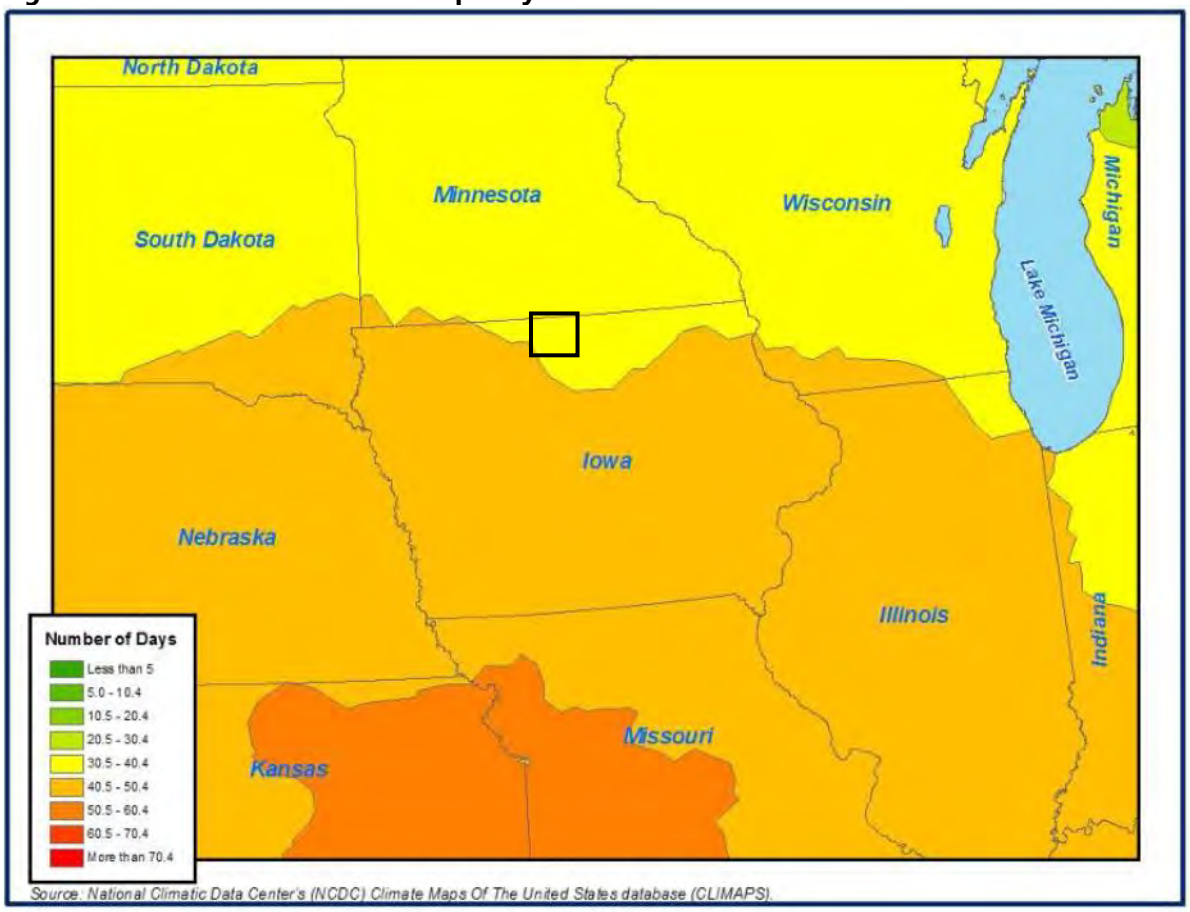
Warning Time Score: 2 - 12-24 hours

Duration Score: 2 - Less than 1 day

Geographic Location/Extent

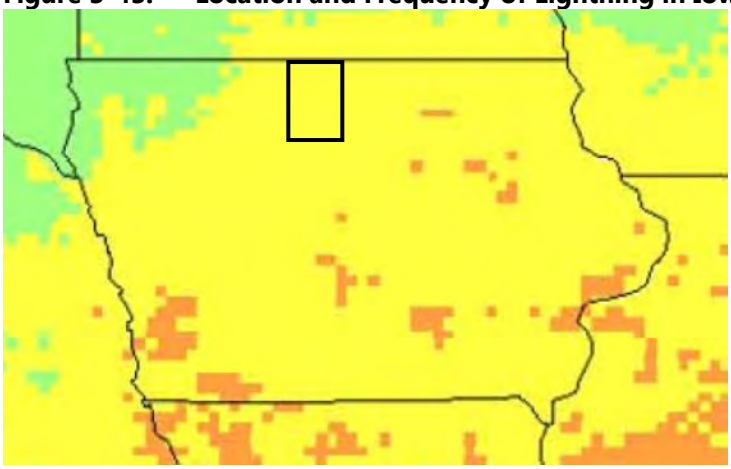
Thunderstorms and the associated hail and lightning impact the entire County with relatively similar frequency. Although, these events occur similarly throughout the planning area, they are more frequently reported in more urbanized areas. In addition, damages are more likely to occur in more densely developed urban areas as well as to cropland. **Figure 3-42** displays the average number of days with thunder experienced throughout different areas of the county each year, showing the County experiences between 30.5 to 40.4 days with thunder per year per the yellow shaded area. shows two to four lightning strikes per square kilometer per year with the yellow shaded area.

Figure 3-42: Distribution and Frequency of Thunderstorms



Note: Black Square indicates approximate location of Kossuth County

Figure 3-43: Location and Frequency of Lightning in Iowa



Source: National Weather Service, www.lightningsafety.noaa.gov/lightning_map.htm

Note: Black Square indicates approximate location of Kossuth County

Previous Occurrences

Since 1965, Kossuth County has been included in 10 presidential disaster declarations that included severe storms/weather (see **Table 3-2** in the Hazard Identification Section). However, some of the damages that resulted in the declarations were from tornadoes and flooding that accompanied the severe weather.

The NCDC reported 239 total hail, lightning, and thunderstorm wind events for the Kossuth County planning area from January 1996 through June 2017.

Table 3-62: Thunderstorm Summary for Kossuth County (1996-June,2017)

Hazard type	Total Events	Events with Damage	Property Damage	Injuries	Fatalities
Hail	132	98	$602,000	0	0
Lightning	3	3	$14,000	0	0
Thunderstorm Wind	104	86	$2,938,000	0	0
Totals	**239**	**187**	**$3,554,000**	**0**	**0**

Source: NCDC

Hail

Table 3-63 shows the number of hail events 0.75 inches and larger by the size of the hail.

Table 3-63: Hail Events Summarized by Hail Size

Hail Size (inches)	# of Events 1996-June,2017
3.00	1
2.75	1
2.50	0
2.00	3
1.75	17
1.50	5
1.25	5
1.00	53
0.88	28
0.75	19
Grand Total	**132**

Source: NCDC

Thunderstorm Winds

Information concerning tornadoes and windstorms, separate from thunderstorms, can be found in Section 3.6.16.

The National Weather Service (NWS) will issue a Severe Thunderstorm Warning whenever a thunderstorm is forecasted to produce wind gusts to 58 miles per hour (50 knots) or greater and/or hail size one inch (quarter-size) diameter which can produce significant damage (source: http://www.nws.noaa.gov/oneinchhail/). The data is kept on Iowa Environmental Mesonet, Iowa State University Department of Agronomy website, (http://mesonet.agron.iastate.edu/vtec/search.php). During this 31-year period, there were 71 severe thunderstorm warnings. This calculates to an annual average of 2.3 warnings.

Although NCDC provides estimates of crop losses, crop insurance payment statistics are considered a more accurate resource for this data. According to the USDA Risk Management Agency, insured crop losses in Kossuth County as a result of hail from 2007 to 2016 totaled $2,361,194 (see **Table 3-64**) and $1,474,050 from windstorms. There was no crop damage reported from lightning.

Table 3-64: Crop Insurance Claims Paid in Kossuth County from Hailstorms and Windstorms, 2007-2016

Hazard type	Total Events	Events with Damage	Property Damage	Injuries	Fatalities
Hail	132	98	$602,000	0	0
Lightning	3	3	$14,000	0	0
Thunderstorm Wind	104	86	$2,938,000	0	0
Totals	**239**	**187**	**$3,554,000**	**0**	**0**

Source: NCDC

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1.75	17
1.50	5
1.25	5
1.00	53
0.88	28
0.75	19
Grand Total	**132**

Source: NCDC

Thunderstorm Winds

Information concerning tornadoes and windstorms, separate from thunderstorms, can be found in Section 3.5.16.

The National Weather Service (NWS) will issue a Severe Thunderstorm Warning whenever a thunderstorm is forecasted to produce wind gusts to 58 miles per hour (50 knots) or greater and/or hail size one inch (quarter-size) diameter which can produce significant damage (source: http://www.nws.noaa.gov/oneinchhail/). The data is kept on Iowa Environmental Mesonet, Iowa State University Department of Agronomy website, (http://mesonet.agron.iastate.edu/vtec/search.php). During this 31-year period, there were 71 severe thunderstorm warnings. This calculates to an annual average of 2.3 warnings.

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Table 3-66: Crop Insurance Claims Paid in Kossuth County from Hailstorms and Windstorms, 2007-2016

Year	Hail	Wind/Excess Wind	Insurance Paid
2007	$6,662.00	$298,289.00	$304,951.00
2008	$105,981.00	$275,069.00	$381,050.00
2009	$78,123.00	$41.00	$78,164.00
2010	$90,166.00		$90,166.00
2011	$632,309.00	$425,715.00	$1,058,024.00
2012	$63,125.00	$104,031.00	$167,156.00
2013	$845,281.00	$177,557.00	$1,022,838.00
2014	$407,638.26	$106,252.50	$513,890.76
2015	$21,310.00	$45,879.05	$67,189.05
2016	$110,598.80	$41,216.20	$151,815.00
Total	**$2,361,194.06**	**$1,474,049.75**	**$3,835,243.81**

Source: USDA Risk Management Agency

Probability of Future Occurrence

NCDC-reported damaging lightning events occurred three (3) times from 1993 through June 2017. Since lightning accompanies thunderstorms, it can be assumed that lightning occurs more often than damages are reported. These rates of occurrence are expected to continue in the future.

Based on NCDC data, there have been 98 damaging hail events and 86 damaging thunderstorm wind events. This translates to an annual average of 4.6 and 4.0 damaging events per year, respectively. Based on this history, damaging hail and thunderstorm wind occur in the planning area multiple times each year making the probability for damaging events "Highly Likely" in any given year.

Probability Score: 4 - Highly Likely

Vulnerability

Overview

In general, assets in the County are vulnerable to thunderstorms, winds, lightning and hail including people, crops, vehicles, and built structures. According to the 2013 Iowa Hazard Mitigation Plan, of the 8 hazards for which data was available to estimate annualized losses, thunderstorm with lightning and hail ranked 4th with $30 million in annualized losses based on data spanning a 17-year period. Although this hazard results in high annual losses, generally private property insurance and crop insurance cover the majority of losses. Considering insurance coverage as a recovery capability and therefore mitigation of devastating impacts to the economy, the overall impact on jurisdictions is reduced; therefore, this hazard's magnitude score to the planning area is "limited".

Magnitude Score: 2 - Limited

Potential Losses to Existing Development

Most lightning damages occur to electronic equipment located inside buildings. But structural damage can also occur when a lightning strike causes a building fire. In addition, lightning strikes can cause damages to crops if fields light on fire. Communications equipment and warning transmitters and receivers can also be knocked out by lightning strikes. There have not been any fatalities in Kossuth County from lightning strikes.

Thunderstorm winds and hail can cause damage to property, vehicles, trees, and crops.

Property and Crop Losses

Table 3-67 provides the estimated annualized property damages resulting from Thunderstorms, including lightning, hail and wind. This annualized damage has been compared to the total building exposure for Kossuth County and the level of damage is minimal compared to the value of building exposure.

Table 3-67: Estimated Annualized Property Damages Resulting from Severe Thunderstorms (Hail/Lightning/Wind, 1996-June,2017)

Hail/Lightning/Thunderstorm Wind Property Damages		Annualized Property Damages
Hail	$602,000	
Lightning	$14,000	
Thunderstorm Wind	$2,938,000	
Total	**$3,554,000**	**$165,302**

Source: Hail, Lightning, & Thunderstorm Wind Property Damage from NCDC records

Table 3-68 provides the insured crop losses for resulting from hail and wind. The insured loss has been adjusted to estimate losses to all insurable crops by considering that 89 percent of insurable crops in the State were insured (2015 Iowa Crop Insurance Profile from USDA's Risk Management Agency).

Table 3-68: Estimated Insurable Annualized Crop Damages Resulting from Severe Thunderstorms (Hail//Wind)

Crop Exposure (2012)	Insurance Paid (2007-2016)		Adjusted Crop Damages Considering 89% Insured	Annualized Adjusted Crop Damages
$463,598,000	Hail	$2,361,194.06	$4,309,263	$430,926
	Wind/Excess Wind	$1,474,049.75		
	Total	**$3,835,243.81**		

Source: Crop exposure value is from USDA 2012 Census of Agriculture; Crop Insurance Paid is from the USDA's Risk Management Agency for 2007-2016.; Crop Insurance Coverage is from USDAs 2015 State Crop Insurance Profile for Iowa

Future Development

Any additional future development will result in more property being vulnerable to damages from severe thunderstorms, lightning and hail. To minimize vulnerability, protective measures could be implemented such as wind-resistant construction, lightning rods, surge protection, and use of materials less prone to hail/wind damage.

Climate Change Impacts

According to the *2010 Climate Change Impacts on Iowa* report, growing evidence points to stronger summer storm systems in the Midwest. Studies have not been done to conclusively say that severe storms, including hail, lightning, and strong winds, are increasing. However, with summer temperatures becoming warmer and humidity levels increasing, an increase in the likelihood of these hazards is plausible.

Thunderstorm, Lightning and Hail Hazard Summary by Jurisdiction

The following hazard summary table shows that this hazard does not vary significantly by jurisdiction. Although structural property damages are higher in the urban areas, the rural areas have higher damages to agriculture.

Jurisdiction	Probability	Magnitude	Warning Time	Duration	Score	Level
Kossuth County, Iowa	4	2	2	2	2.90	Moderate
City of Algona	4	2	2	2	2.90	Moderate
City of Bancroft	4	2	2	2	2.90	Moderate
City of Burt	4	2	2	2	2.90	Moderate
City of Fenton	4	2	2	2	2.90	Moderate
City of Lakota	4	2	2	2	2.90	Moderate
City of Ledyard	4	2	2	2	2.90	Moderate
City of Lone Rock	4	2	2	2	2.90	Moderate
City of Lu Verne	4	2	2	2	2.90	Moderate
City of Swea City	4	2	2	2	2.90	Moderate
City of Titonka	4	2	2	2	2.90	Moderate
City of Wesley	4	2	2	2	2.90	Moderate
City of Whittemore	4	2	2	2	2.90	Moderate
Algona School District	4	2	2	2	2.90	Moderate
Lu Verne School District	4	2	2	2	2.90	Moderate
North Kossuth School District	4	2	2	2	2.90	Moderate

3.6.16 Tornado/Windstorm

Hazard Score Calculation					
Probability	**Magnitude/Severity**	**Warning Time**	**Duration**	**Weighted Score**	**Level**
4	4	3	1	3.55	High

Profile

Hazard Description

This hazard section discusses both tornado and windstorm.

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

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

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

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 NWS can issue High Wind Watch, High Wind Warning, and Wind Advisory to the public. The following are the definitions of these issuances:

- **High Wind Watch** - This is issued when there is the potential of high wind speeds developing that may pose a hazard or is are life-threatening.

- **High Wind Warning** - The 1-minute surface winds of 35 knots (40 mph) or greater lasting for one hour or longer, or winds gusting to 50 knots (58 mph) or greater, regardless of duration, that are either expected or observed over land.
- **High Wind Advisory** - This is issued when high wind speeds may pose a hazard. Sustained winds 25 to 39 mph and/or gusts to 57 mph.

Warning Time Score: 3—6 t - 12 hours

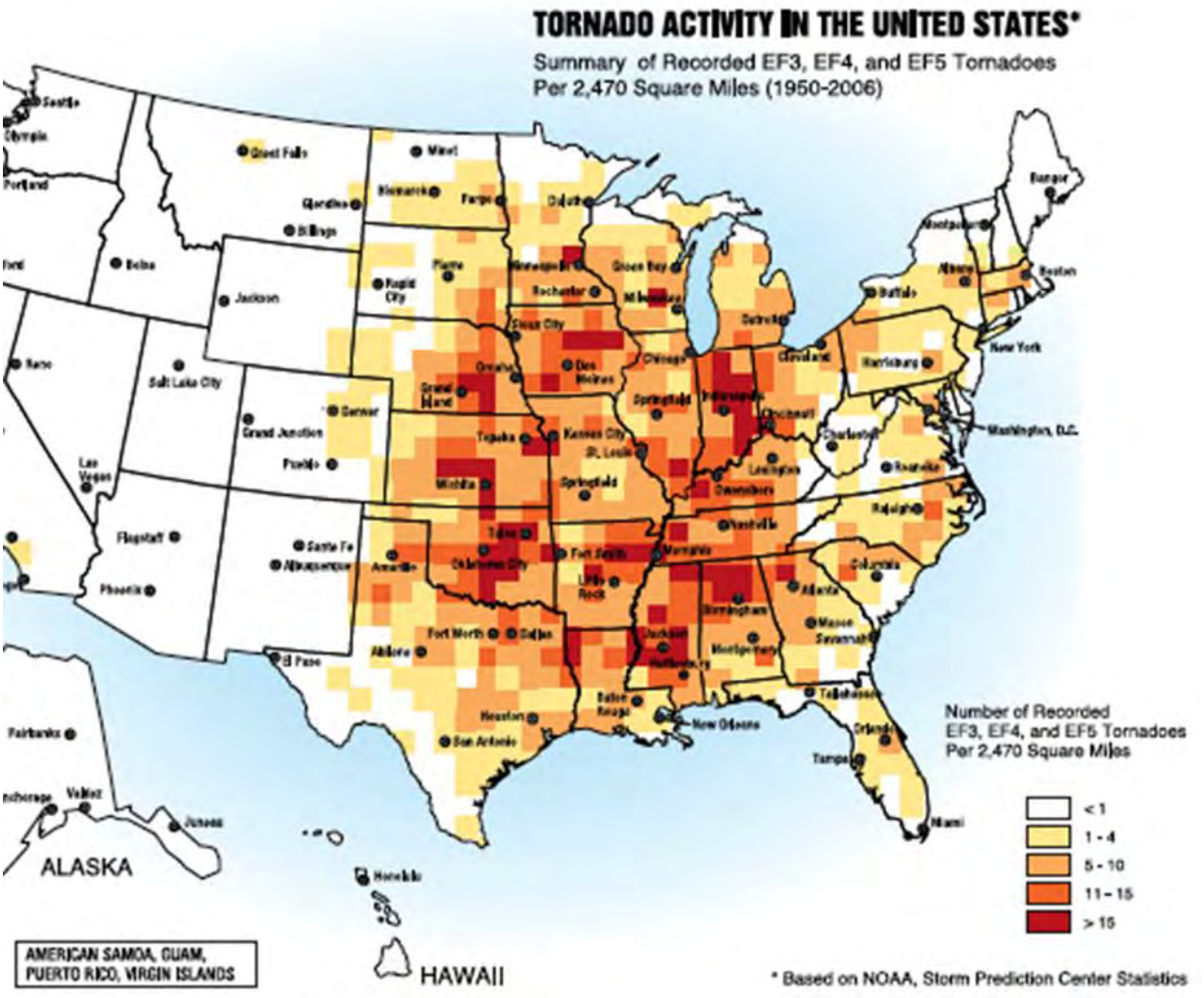
Duration Score: 1 - less than 6 hours

Geographic Location/Extent

Iowa is located in a part of the United States where tornadoes are a common occurrence. Iowa has experienced 1,517 tornadoes from 1980 through 2011 (32-year period) with 86 percent of them being rated F0 and F1, 14 percent rated F2 through F5. Only one F5 rated tornado has occurred in Iowa during this timeframe (Parkersburg in 2008). Since 1980, there have been on average 47 tornadoes per year in Iowa. Most tornadoes occurred in May and June but can occur during any month. Also, mid-afternoon until around sunset is the peak time of day for tornado activity. There have been 763 injuries and 26 deaths attributable to tornadoes (source: National Weather Service, Iowa Tornado Climatology Report 1980-2011).

Tornadoes can occur in the entire planning area. **Figure 3-44** illustrates the number of F3, F4, and F5 tornadoes recorded in the United States per 3,700 square miles between 1950 and 2006. Kossuth County is in the section with light orange shading, indicating between 5 and 10 tornadoes of this magnitude during this 57-year period.

Figure 3-44: Tornado Activity in the United States, 1950-2006



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

Note: Blue arrow is approximate location of Kossuth County

Tornadoes are classified according to the EF-Scale. The Enhanced F- Scale (see **Table 3-69**) attempts to rank tornadoes according to wind speed based on the damage caused. This update to the original F scale was implemented in the U.S. on February 1, 2007.

Table 3-69: Enhanced F Scale for Tornado Damage

Fujita Scale			Derived EF Scale		Operational EF Scale	
F Number	Fastest 1/4-mile (mph)	3 Second Gust (mph)	EF Number	3 Second Gust (mph)	EF Number	3 Second Gust (mph)
0	40-72	45-78	0	65-85	0	65-85
1	73-112	79-117	1	86-109	1	86-110
2	113-157	118-161	2	110-137	2	111-135
3	158-207	162-209	3	138-167	3	136-165
4	208-260	210-261	4	168-199	4	166-200
5	261-318	262-317	5	200-234	5	Over 200

Source: The National Weather Service, www.spc.noaa.gov/faq/tornado/ef-scale.html

The wind speeds for the EF scale and damage descriptions are based on information on the NOAA Storm Prediction Center as listed in **Table 3-70**. The damage descriptions are summaries. For the actual EF scale, it is necessary to look up the damage indicator (type of structure damaged) and refer to the degrees of damage associated with that indicator. Information on the Enhanced Fujita Scale's damage indicators and degrees of damage is located online at www.spc.noaa.gov/efscale/ef-scale.html.

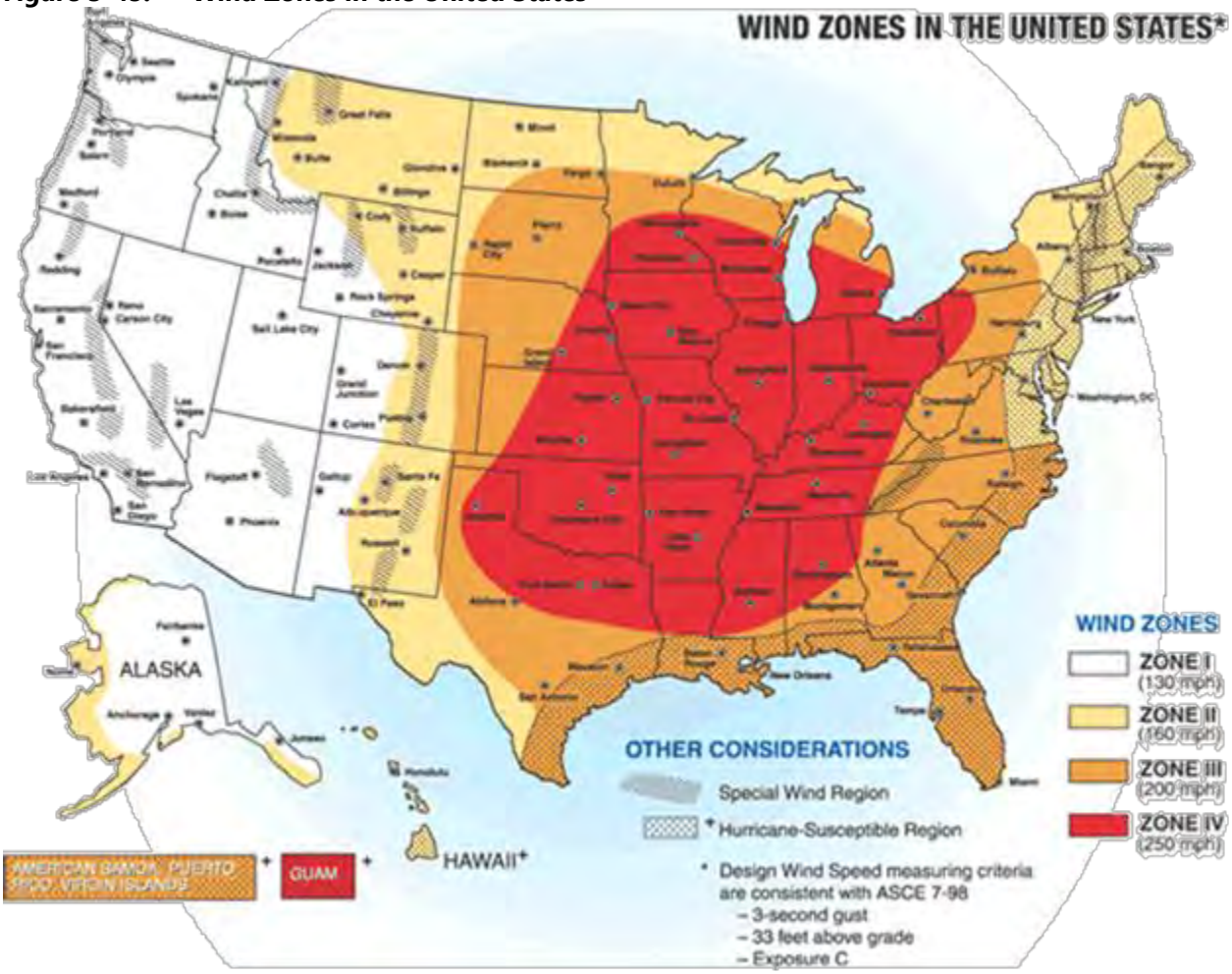
Table 3-70: Enhanced Fujita Scale with Potential Damage

Scale	Wind Speed (mph)	Relative Frequency	Potential Damage
EF0	65-85	53.5%	Light. Peels surface off some roofs; some damage to gutters or siding; branches broken off trees; shallow-rooted trees pushed over. Confirmed tornadoes with no reported damage (i.e. those that remain in open fields) are always rated EF0).
EF1	86-110	31.6%	Moderate. Roofs severely stripped; mobile homes overturned or badly damaged; loss of exterior doors; windows and other glass broken.
EF2	111-135	10.7%	Considerable. Roofs torn off well constructed houses; foundations of frame homes shifted; mobile homes complete destroyed; large trees snapped or uprooted; light object missiles generated; cars lifted off ground.
EF3	136-165	3.4%	Severe. Entire stores of well-constructed houses destroyed; severe damage to large buildings such as shopping malls; trains overturned; trees debarked; heavy cars lifted off the ground and thrown; structures with weak foundations blown away some distance.
EF4	166-200	0.7%	Devastating. Well-constructed houses and whole frame houses completely levelled; cars thrown and small missiles generated.
EF5	>200	<0.1%	Explosive. Strong frame houses levelled off foundations and swept away; automobile-sized missiles fly through the air in excess of 300 ft.; steel reinforced concrete structure badly damaged; high rise buildings have significant structural deformation; incredible phenomena will occur.

Source: NOAA Storm Prediction Center

All of Kossuth 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 3-45** shows the wind zones of the United States based on maximum wind speeds; the entire state of Iowa is located within wind zone IV, the highest inland category.

Figure 3-45: Wind Zones in the United States



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

Note: Black square indicates approximate location of Kossuth County

The advancement in weather forecasting has provided for the ability to predict severe weather that is likely to produce tornadoes days in advance. Tornado watches can be delivered to those in the path of these storms several hours in advance. Lead time for actual tornado warnings is about 30 minutes. Tornadoes have been known to change paths very rapidly, thus limiting the time in which to take shelter. Tornadoes may not be visible on the ground if they occur after sundown or due to blowing dust or driving rain and hail.

Previous Occurrences

Tornadoes

According to NOAA statistics Kossuth County had 37 recorded tornado events from 1950 to June 2017. Of these, one was an F4; two were an F3; six were an F2; 13 were an F1/EF1; and 13 were and F0/EF0. These tornadoes caused 2 fatalities, 42 injuries, and over $62 million in property damages. Note that this data is a compilation of event reports and not all reports include information on property or crop damages; actual damage totals may be higher. **Table 3-71** summarizes these events.

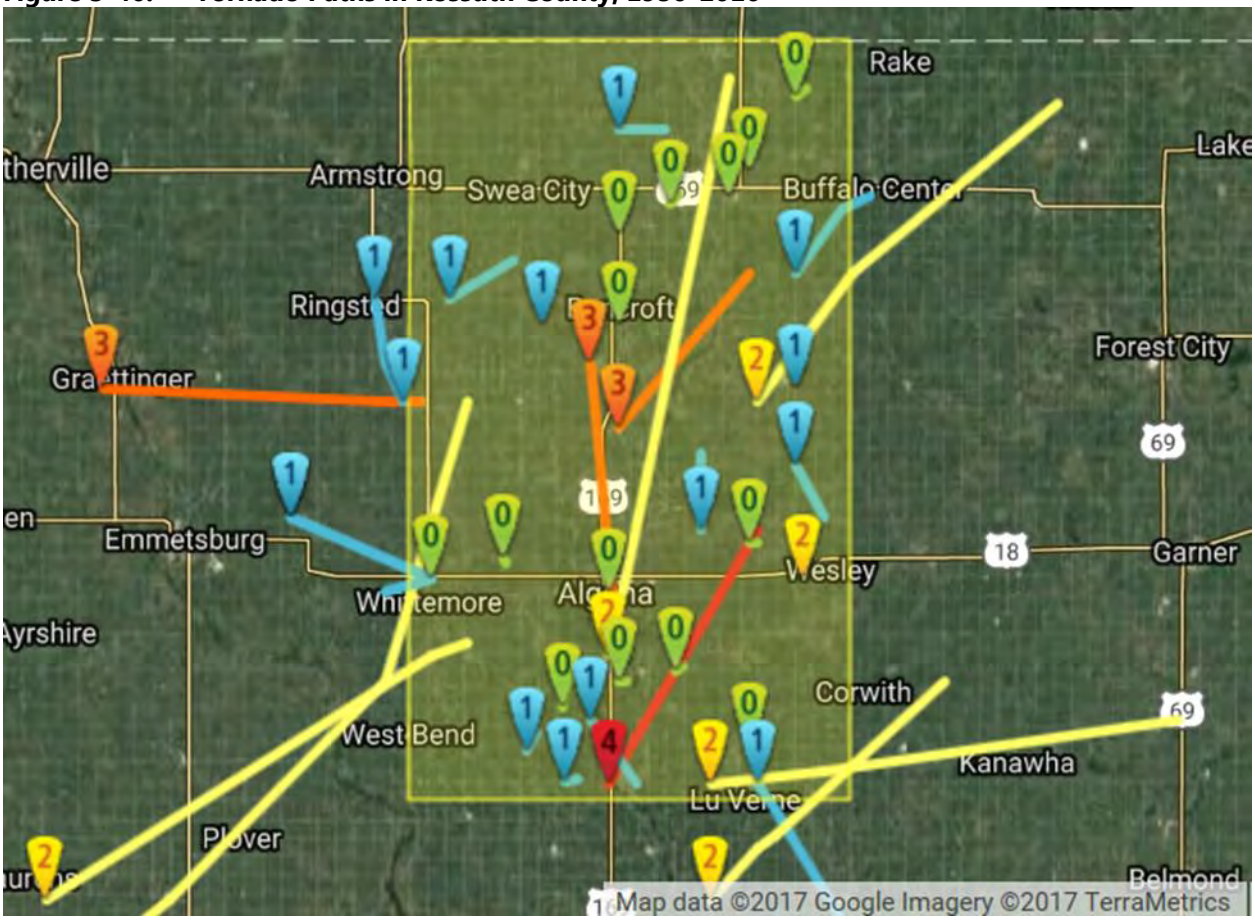
Table 3-71: Recorded Tornadoes in Kossuth County, 1950 - June 2017

Date	Magnitude	Deaths	Injuries	Property Damages	Crop Damages	Length	Width
8/29/1964	F4	0	2	$250,000	$0	15.8	100
5/26/1972	F1	0	0	$25,000	$0	0	200
7/1/1972	F1	0	0	$25,000	$0	2	200
7/1/1972	F1	0	0	$25,000	$0	0	200
6/9/1974	F2	0	0	$250,000	$0	0	33
6/10/1977		0	0	$25,000	$0	1.9	33
6/10/1977		0	0	$25,000	$0	0	33
6/14/1978	F1	0	0	$25,000	$0	1	17
7/14/1978	F1	0	0	$25,000	$0	1.3	33
7/14/1978	F1	0	0	$25,000	$0	1.3	33
6/28/1979	F1	0	0	$25,000	$0	0	40
6/28/1979	F3	2	34	$25,000,000	$0	15.9	300
6/28/1979	F1	0	0	$25,000	$0	3.6	33
6/28/1979	F1	0	0	$250,000	$0	0	300
7/19/1980	F2	0	0	$2,500,000	$0	0	33
9/3/1980	F0	0	0	$25,000	$0	0.3	30
9/3/1980	F0	0	0	$25,000	$0	1	30
9/20/1980	F2	0	0	$2,500,000	$0	5.2	80
5/17/1982	F1	0	0	$25,000	$0	4	30
6/7/1984	F3	0	5	$25,000,000	$0	9	150
6/7/1984	F2	0	0	$2,500,000	$0	1	150
6/7/1984	F2	0	1	$2,500,000	$0	8	150
6/16/1984	F0	0	0	$0	$0	0	33
7/11/1987	F1	0	0	$250,000	$0	3	20
6/18/1994	F0	0	0	$5,000	$50	0.5	60
5/15/1998	F2	0	0	$1,000,000	$75,000	31.3	175
8/3/1998	F0	0	0	$0	$0	0.2	25
7/25/2005	F0	0	0	$30,000	$2,000	1	40
4/24/2008	EF0	0	0	$0	$0	0.1	30
7/9/2008	EF0	0	0	$0	$0	0.47	25
7/19/2008	EF0	0	0	$5,000	$1,000	0.59	30
6/17/2010	EF0	0	0	$0	$5,000	0.69	20
6/17/2010	EF0	0	0	$0	$0	0.67	20
4/9/2011	EF1	0	0	$150,000	$0	0.79	100
6/20/2011	EF1	0	0	$200,000	$10,000	1.18	75
7/27/2016	EF0	0	0	$0	$1,000	0.36	15
7/30/2016	EF0	0	0	$0	$1,000	0.47	30
TOTAL		**2**	**42**	**$62,715,000**	**$95,050**		

Source: NOAA

The map in **Figure 3-46** shows the paths of the events in the table above. Note: Not all events had available latitude and longitude coordinates. As a result, not all events are displayed.

Figure 3-46: Tornado Paths in Kossuth County, 1950-2016



Source: TornadoHistoryProject.com, http://www.tornadohistoryproject.com/tornado/Iowa/Kossuth/map

Kossuth County has been included in seven Presidential Disaster Declarations that involved tornadoes since 1965. See **Table 3-2** in the Hazard Identification Section for additional details.

Windstorms

Previous Occurrences

According to the NCDC database, there were 40 high wind events in Kossuth County from 1996 to June 2017. During this time period, there were no reported deaths or injuries. There was an estimated $1,640,740 in property damages. Recorded wind gusts ranged from a high of 61 knots to a low of 35 knots. Table 3-72 provides a summary of the wind speeds reported for the wind events.

Table 3-72: Reported Wind Speeds, NCDC Events from 1996 to June 2017

Wind Speed	# of Events
35	9
36	2
37	1
50	6
51	1
52	3
54	2
55	3
56	2
57	4
61	5
Not Reported	2
Total	**40**

Source: NCDC

Probability of Future Occurrence

NOAA reported 37 tornadoes in Kossuth County in a 67.5-year time period, which calculates to

55-percent chance of a tornado in any given year. Therefore, it is a high probability that some portion of Kossuth County will experience tornado activity in any given year.

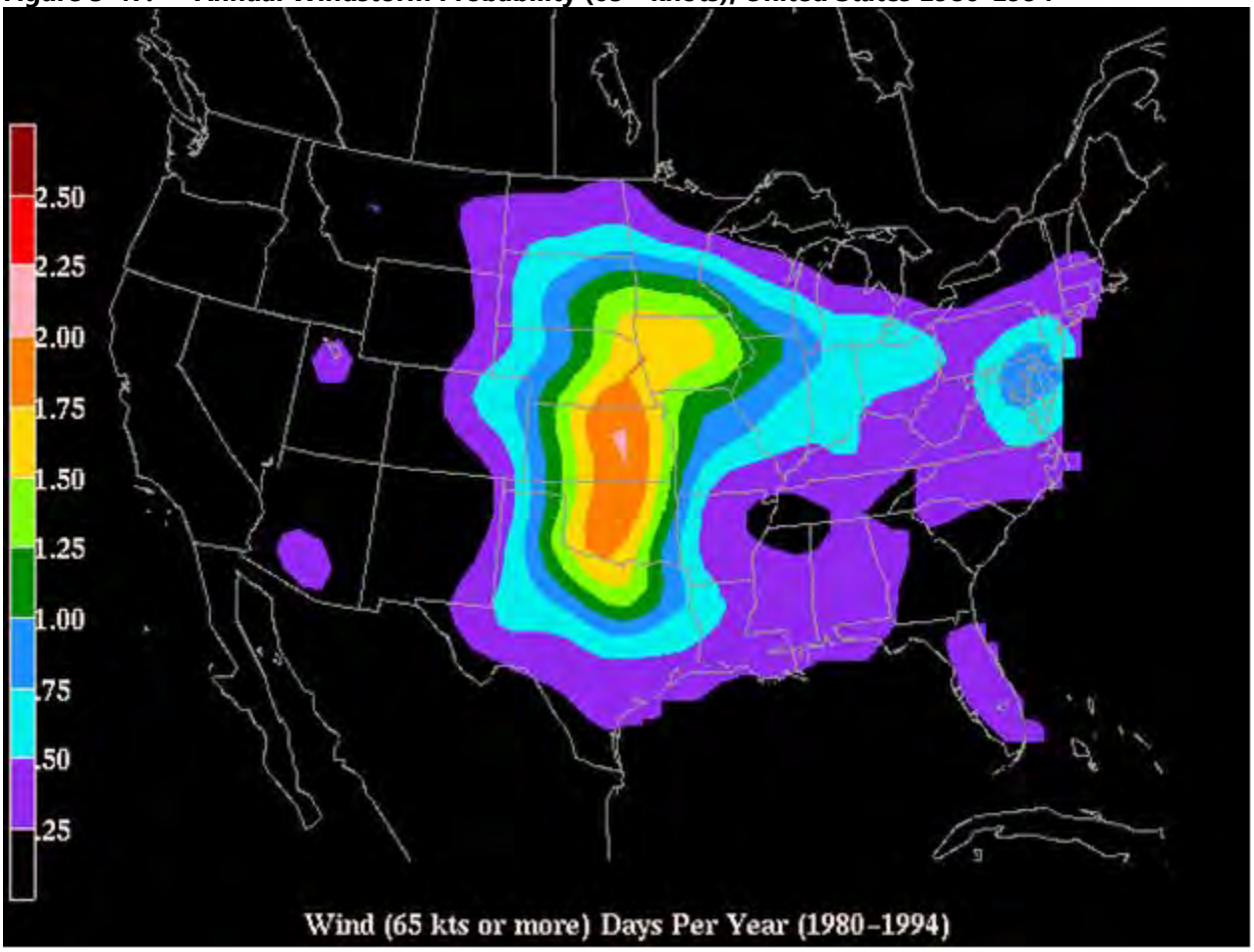
According to NCDC, there were 40 separate high wind events from 1996 to June 2017

(21.5-year period) in Kossuth County. Based on this data there is over a 100-percent annual probability of high wind events in any given year. Therefore, the probability rating is "Highly Likely".

Probability Score: 4 - Highly Likely

Figure 3-47 below shows the probability of a windstorm event (65 knots or greater) in the U.S. The Kossuth County planning area is colored yellow, showing that 65+ knot winds are probable to occur 1.50 to 1.75 times a year.

Figure 3-47: Annual Windstorm Probability (65+ knots), United States 1980-1994



Source: NSSL, http://www.nssl.noaa.gov/users/brooks/public_html/bigwind.gif;
Note: Blue square indicates approximate location of Kossuth County

Vulnerability

Overview

Kossuth County is located just outside in a region of the U.S. with high frequency of dangerous and destructive tornadoes and is referred to as "Tornado Alley". **Figure 3-48** is based on areas where dangerous tornadoes are most likely to take place.

Figure 3-48: Tornado Alley in the U.S.

Source: http://www.tornadochaser.net/tornalley.html

Light frame structures, such as mobile homes, outbuildings and sheds are considered especially vulnerable to damage from tornadoes. Those most at risk from tornadoes include people living in mobile homes, campgrounds, and other dwellings without secure foundations or basements. People in automobiles are also very vulnerable to twisters. **Table 3-73** shows the number of mobile homes in each jurisdiction, according to the U.S. Census Bureau's 2015 American Community Survey 5-year estimates.

Table 3-73: Mobile Homes in Kossuth County by Jurisdiction

Jurisdiction	Number of Mobile Homes
Kossuth County	34
Algona	0
Bancroft	0
Burt	2
Fenton	0
Lakota	0
Ledyard	2
Lone Rock	0
Lu Verne	6
Swea City	5
Titonka	0
Wesley	0
West Bend	14
Whittemore	0

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

The elderly (65 and older), young (less than 18 years old), 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.

According to the *2013 Iowa Hazard Mitigation Plan*, of the 8 hazards for which data was available to estimate annualized losses, tornadoes ranked 3rd with $36 million in annualized losses based on data spanning a 63-year period.

Due to the potential for damaging tornadoes in the planning area, the magnitude was determined to be a 4, catastrophic.

Magnitude Score: 4 - Catastrophic

Potential Losses to Existing Development

In Kossuth County, the NCDC estimate for past property damages resulting from tornadoes from 1950 – June 2017 (67.5 years) was $$929,111. This translates to an annualized loss of over $936,045. For windstorms, NCDC loss estimates were $1,640,740 from 1996 to June 2017 (21.5 years). This translates to an annualized loss of over $76,313.

Loss of Use

Overhead power lines and infrastructure are also vulnerable to damages from windstorms. Potential losses would include cost of repair or replacement of damaged facilities and lost economic opportunities for businesses. Public safety hazards include risk of electrocution from downed power lines. Specific amounts of estimated losses are not available due to the complexity and multiple variables associated with this hazard. Refer to the electric power loss of use estimates provided in **Table 3-58** in the Winter Storm hazard section.

Crop Losses

Crop insurance payments for wind damage are discussed in Section 3.6.15, Thunderstorms with Lightning and Hail.

Future Development

Public buildings such as schools, government offices, as well as other buildings with a high occupancy and mobile home parks should consider inclusion of a tornado saferoom to shelter occupants in the event of a tornado.

Windstorm is primarily a public safety and economic concern, and the planning area is located in a region with very high frequency of occurrence. Windstorm can cause damage to structures and power lines which in turn create hazardous conditions for people. Debris flying from high wind events can shatter windows in structures and vehicles and can harm people that are not adequately sheltered.

Although windstorms occur frequently in the planning area and damages to property occur, much of the damage is generally covered by private insurance. This results in less impact to individuals and the community since recovery is facilitated by insurance.

Climate Change Impacts

According to the *2010 Climate Change Impacts on Iowa* report, growing evidence points to stronger summer storm systems in the Midwest. Studies have not been done to conclusively say that severe storms, including tornadoes, are increasing. However, with summer temperatures becoming warmer and humidity levels increasing, an increase in the likelihood of tornadic activity is plausible.

Tornado/Windstorm Hazard Summary by Jurisdiction

The magnitude was rated as a level 4 for all the participating jurisdictions, as they are all vulnerable to tornado and windstorm damage. The factors of probability, warning time, and duration are also equal across the planning area. This hazard does not substantially vary by jurisdiction.

Jurisdiction	Probability	Magnitude	Warning Time	Duration	Score	Level
Kossuth County, Iowa	4	4	3	1	3.55	High
City of Algona	4	4	3	1	3.55	High
City of Bancroft	4	4	3	1	3.55	High
City of Burt	4	4	3	1	3.55	High
City of Fenton	4	4	3	1	3.55	High
City of Lakota	4	4	3	1	3.55	High
City of Ledyard	4	4	3	1	3.55	High
City of Lone Rock	4	4	3	1	3.55	High
City of Lu Verne	4	4	3	1	3.55	High
City of Swea City	4	4	3	1	3.55	High
City of Titonka	4	4	3	1	3.55	High
City of Wesley	4	4	3	1	3.55	High
City of Whittemore	4	4	3	1	3.55	High
Algona School District	4	4	3	1	3.55	High
Lu Verne School District	4	4	3	1	3.55	High
North Kossuth School District	4	4	3	1	3.55	High

3.6.17 Transportation Incident

Hazard Score Calculation					
Probability	**Magnitude/Severity**	**Warning Time**	**Duration**	**Weighted Score**	**Level**
4	4	4	1	3.70	High

Profile

Hazard Description

This hazard encompasses the following: air transportation, highway transportation, and rail transportation. The transportation incidents can involve any mode of transportation that directly threatens life, and which results in property damage and/or death(s)/injury(s) and/or adversely impact a community's capabilities to provide emergency services. Incidents involving buses and other high occupancy vehicles could trigger a response that exceeds the normal day-to-day capabilities of response agencies.

An air transportation incident may involve a military, commercial or private aircraft. Air transportation is playing a more prominent role in transportation as a whole. Airplanes and helicopters are used to transport passengers for business and recreation as well as thousands of tons of cargo. A variety of circumstances can result in an air transportation incident; mechanical failure, pilot error, enemy attack, terrorism, weather conditions and on-board fire can all lead to an air transportation incident.

Highway transportation incidents are very complex. Contributing factors can include a roadway's design and/or pavement conditions (e.g. rain, snow and ice), a vehicle's mechanical condition (e.g. tires, brakes, lights), a driver's behavior (e.g. speeding, inattentiveness and seat belt usage), the driver's condition (e.g. alcohol use, age-related conditions, physical impairment) and driver inattention by using a wireless device. In fact, the driver's behavior and condition factors are the primary cause in an estimated 67 percent of highway crashes and a contributing factor in an estimated 95 percent of all crashes.

A railway transportation incident is a train accident that directly threatens life and/or property, or adversely impacts a community's capabilities to provide emergency services. Railway incidents may include derailments, collisions and highway/rail crossing accidents. Train incidents can result from a variety of causes; human error, mechanical failure, faulty signals, and/or problems with the track. Results of an incident can range from minor "track hops" to catastrophic hazardous material incidents and even human/animal casualties. With so many miles of track in Iowa, vehicles must cross the railroad tracks at numerous at-grade crossings.

Warning Time Score: 4 - Minimal or no warning

Duration Score: 1 - Less than 6 hours

Geographic Location/Extent

Highways/Roads

There are no major US highways that run through Kossuth County. The closest highway is Interstate 35, which lies two counties to the east. U.S. Highway 169 runs north-south through Bancroft, Burt, and Algona in the middle of the county, while Iowa Highway 18 runs east-west through the county. Other major roads include Iowa Highway 9 which runs through Swea City and Lakota, Highway 15 which runs through Fenton in the western area of the County, and Highway 17 which runs along the south-eastern boarder.

Numerous paved county roads connect all the incorporated cities and unincorporated towns throughout the county.

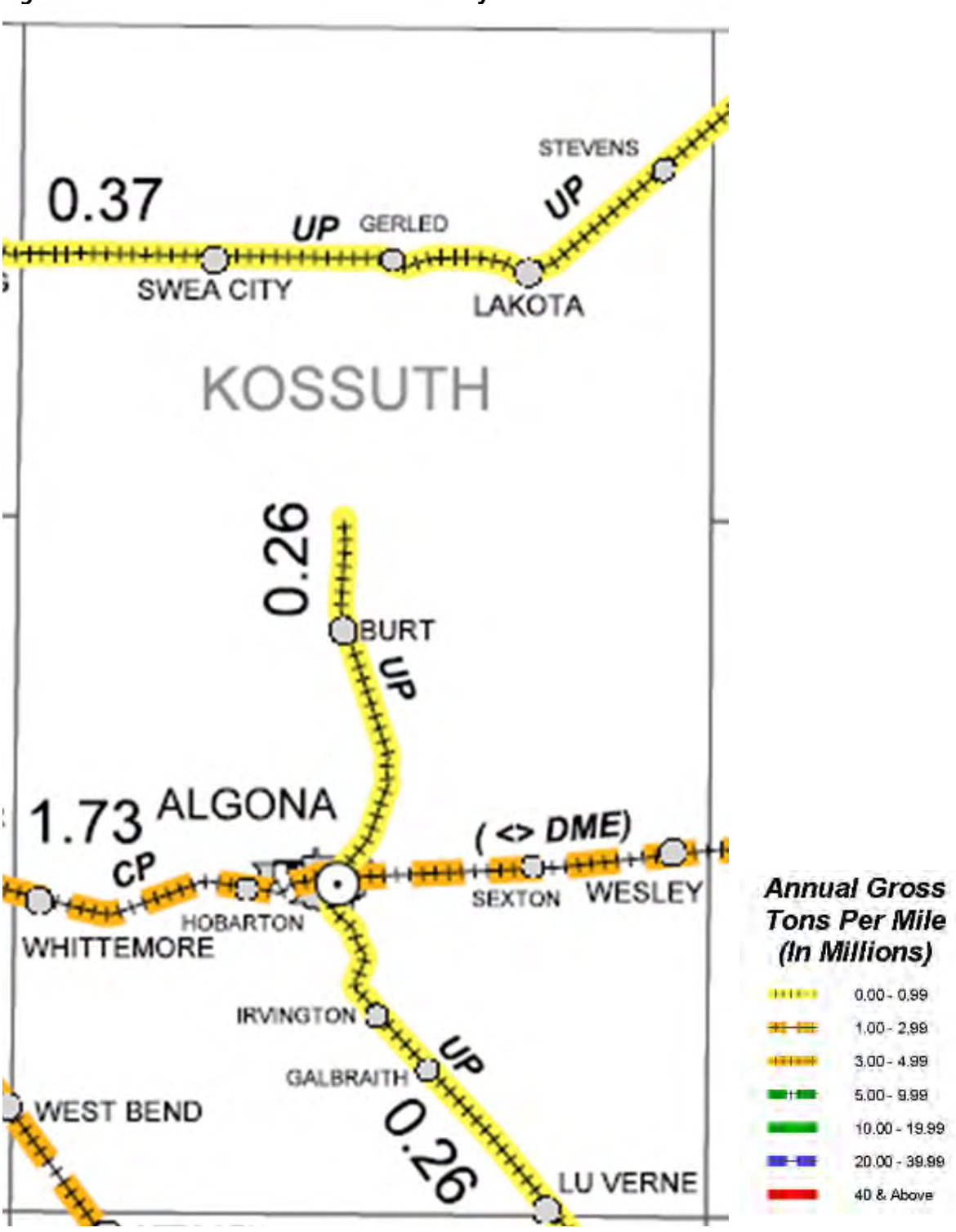
Figure 3-24 in the Infrastructure Failure Incident section shows the major highways in Kossuth County.

According to the Iowa Department of Transportation, the total daily traffic in Kossuth County is 87,660 vehicles, and the total daily truck traffic is 10,042. (Source: http://iowadot.maps.arcgis.com/apps/MapSeries/index.html?appid=db6cb43313354a4f85505089ab317e7a)

Rail Transport

Union Pacific Railroad (UP) operates in Kossuth County with a line running east-west in the northern portion of the County through Swea City and Lakota. Additionally, a line runs through Burt in the north, through Algona, and south through Lu Verne. Dakota, Minnesota and Eastern R.R. Co. (DME) also operates in the County, with a line that runs east-west through Whittemore, Algona, and Wesley. **Figure 3-49** shows the railroads that operate in Kossuth County.

Figure 3-49: Railroad lines in Kossuth County



Source: Iowa Department of Transportation, http://www.iowadot.gov/iowarail/railroads/maps/maphome.htm

Air Transport

The Des Moines International Airport in Polk County or Fort Dodge Regional Airport are the primary commercial airports that services Kossuth County. Algona Municipal Airport is a publicly owned airport located 2 miles west of the city of Algona. The airport contains two runways with an average of 19 flights per day.

The Iowa Aviation System Plan identifies the Algona Municipal Airport as a General Service airport. General Service airports have runways 4,000 feet or greater in length with facilities and services customized to support most general aviation activity, including small to mid-size business jets.

Figure 3-50: Algona Municipal Airport

Source: Iowa Department of Transportation, http://www.iowadot.gov/aviation/airports/municipal.aspx

Previous Occurrences

Rail Transportation Incidents

Table 3-74 provides details of 28 train-vehicle accidents in Kossuth County since 1975 from the Des Moines Register News Data Central.

Table 3-74: Train-Vehicle Accidents in Kossuth County since 1975

Railroad	Year	City	Highway	Total Killed	Total Injured
CNW	1975	Algona	State Street	0	0
MILW	1976		McGreger Road	0	0
MILW	1977	Algona	Hull St	0	3
CNW	1977	Lone Rock	Main Street	0	0
RI	1977	West Bend	County Highway -063	0	1
MILW	1978	Algona	1st Xing West of Dep	0	0
RI	1978	West Bend	County B 63	0	1
RI	1878		Kees Crossing	0	0
MILW	1979	Algona	County Road	0	0
CNW	1980	Algona	Diagonhal St	0	0
MILW	1981	Wesley	Highway 17	0	1
MILW	1983	Hobarton	County Road P-30	0	1
CNW	1986	Burt	Highway B-19 Walnut St	0	0
CNW	1989		County Road P 30	0	0
SOO	1990	Algona	Hall Street	0	0
SOO	1991	Algona	100th Avenue	0	0
CNW	1992	Irvington	140th Avenue	0	3
SOO	1993	Algona	Roan Street	0	1
SOO	1993	Algona	Main Street	0	1
SOO	1994	Whittemore	County Road P-20	2	1
SOO	1994	Wesley	Secon Street	0	0
SOO	1994	Hobarton	80th Avenue	0	1
IMRL	2000	Algona	Main	0	0
UP	2002	Lu Verne	City Rd C12	0	1
UP	2002	Lu Verne	Maple Street	0	0
ICE	2003	Algona	Roan Street	0	1
UP	2004		120th Street	1	0
UP	2006	West Bend	30th Avenue	1	0

Air Transportation Incidents:

Table 3-75 provides details of 20 air transportation incidents in (or near) Kossuth County from 1967 to 2016 (50 years) from the National Transportation Safety Board (NTSB).

Table 3-75: Kossuth County Aircraft Incidents/Accidents (1967-2016)

Event Date	Location	Injury Severity	Aircraft Damage	Make	Broad Phase of Flight
09/29/2013	Algona, IA	Non-Fatal	Substantial	Piper	Approach
07/23/2010	Whittemore, IA	Non-Fatal	Substantial	Air Tractor	Takeoff
08/17/2009	Whittemore, IA	Non-Fatal	Substantial	Air Tractor	Takeoff
12/20/2005	Algona, IA	Non-Fatal	Substantial	Cessna	Takeoff
07/02/2004	Algona, IA	Non-Fatal	Substantial	Beech	Cruise
08/08/1999	Titonka, IA	Fatal (1)	Destroyed	Bellanca	Maneuvering
08/03/1987	Swea City, IA	Non-Fatal	Substantial	Piper	Maneuvering
01/23/1986	Bancroft, IA	Non-Fatal	Substantial	Cessna	Landing
11/07/1984	Algona, IA	Non-Fatal	Substantial	Piper	Takeoff
08/17/1984	Algona, IA	Fatal (1)	Destroyed	Cessna	Maneuvering
08/13/1983	Whittemore, IA	Non-Fatal	Destroyed	Piper	Maneuvering
12/19/1982	Bancroft, IA	Fatal (3)	Destroyed	Piper	Cruise
09/27/1979	Kossuth, IA	Non-Fatal	Not Reported	Cessna	Not Reported
07/01/1979	Algona, IA	Non-Fatal	Not Reported	GR Lakes	Not Reported
06/08/1976	Algona, IA	Non-Fatal	Not Reported	Piper	Not Reported
05/11/1973	Algona, IA	Non-Fatal	Not Reported	Cessna	Not Reported
10/02/1971	Algona, IA	Non-Fatal	Not Reported	Beech	Not Reported
08/22/1971	Whittemore, IA	Fatal (0)	Not Reported	Beech	Not Reported
09/25/1967	Swea City, IA	Non-Fatal	Not Reported	Piper	Not Reported
06/16/1967	Algona, IA	Non-Fatal	Not Reported	Callair	Not Reported

Source: http://www.ntsb.gov/_layouts/ntsb.aviation/index.aspx.

Highway Transportation Incidents:

The Iowa Department of Transportation's Office of Traffic and Safety maintains traffic crash statistics and location maps by county and cities in Iowa. **Table 3-76** shows the reportable crash history for urban crashes in Kossuth County, Iowa from 2007-2016. **Table 3-77** that follows shows the reportable crash history for rural crashes in Kossuth County for the same time period.

Table 3-76: Kossuth County Urban Crashes 2007- 2016

	Crash Counts/Classification						Injury/Fatality Counts/Classification					
Year	Crashes	Fatal	Major	Minor	Poss/Unk	Property Damage Only	Injuries	Fatalities	Major	Minor	Possible	Unknown
2007	94	0	30	7	23	61	42	0	3	8	29	2
2008	106	0	2	9	19	76	32	0	2	9	20	1
2009	94	0	4	8	17	65	46	0	5	15	24	2
2010	109	0	1	11	23	74	45	0	1	11	33	0
2011	87	0	1	6	19	61	29	0	1	6	22	0
2012	66	0	4	6	17	39	43	0	6	12	24	1
2013	96	0	0	7	19	70	39	0	0	11	28	0
2014	81	2	2	5	12	60	56	3	3	9	40	1
2015	97	0	2	20	11	64	39	0	2	22	13	2
2016	100	0	2	9	10	79	28	0	2	12	14	0
Total	**930**	**2**	**48**	**88**	**170**	**649**	**399**	**3**	**25**	**115**		**256**

Source: Iowa Department of Transportation's Office of Traffic and Safety

Table 3-77: Kossuth County Rural Crashes 2007-2016

	Crash Counts/Classification						Injury/Fatality Counts/Classification					
Year	Crashes	Fatal	Major	Minor	Poss/Unk	Property Damage Only	Injuries	Fatalities	Major	Minor	Possible	Unknown
2007	86	0	4	18	19	45	69	0	4	28	36	1
2008	85	3	7	11	29	35	73	3	10	19	40	1
2009	80	2	7	13	18	40	63	2	9	21	31	0
2010	61	0	6	10	13	32	43	0	6	11	26	0
2011	71	2	5	9	16	39	55	2	6	16	31	0
2012	69	1	4	18	17	29	54	1	5	26	22	0
2013	69	3	8	11	14	33	59	3	9	14	33	0
2014	87	0	5	30	20	32	94	0	6	46	41	1
2015	60	2	6	18	14	20	54	2	9	25	18	0
2016	82	1	9	16	12	44	57	2	14	27	13	1
Total	**750**	**14**	**61**	**154**	**172**	**349**	**621**	**15**	**78**	**233**		**295**

Source: Iowa Department of Transportation's Office of Traffic and Safety

Probability of Future Occurrence

A major transportation incident can occur at any time, even though traffic engineering, inspection of traffic facilities and land use management of areas adjacent to roads and highways has increased, incidents continue to occur. The combination of cars and trucks, farm equipment, wildlife, unpredictable weather conditions, potential mechanical problems and human error always leaves the potential for a transportation accident.

Based on the available information, the probability of air transportation or highway incident that directly threatens life and which results in property damage and/or death(s)/injury(s) and/or adversely impact a community's capabilities to provide emergency services is "Highly Likely" with greater than 33 percent likelihood to occur in any given year.

Probability Score: 4 - Highly Likely

Vulnerability

Overview

Transportation incidents can almost always be expected to occur in specific areas, on or near airports, roadways or other transportation infrastructure. The exception is air transportation incidents, which can occur anywhere. However, it is difficult to predict the magnitude of any specific event because these types of events are accidental and the circumstances surrounding these events will impact the extent of damage or injuries that occur. The number of urban and rural highway/roadway transportation accidents from 2007 to 2016 was a total of 1,680 crashes during this 10-year time period (average over 160 per year). 18 fatalities occurred during this time period (averaging nearly 2 per year).

Due to the potential for fatalities to occur, this hazard received a magnitude rating of "Catastrophic".

Magnitude Score: 4 - Catastrophic

Potential Losses to Existing Development

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 2016 dollars using an annual inflation rate of 2.85 percent. The costs are listed below in **Table 3-78**.

Table 3-78: Costs of a Traffic Crash

Severity	Cost per injury (in 2016 dollars $)
Fatal	$4,412,996
Evident Injury	$61,101
Possible Injury	$32,250
Property Damage Only	$3,395

Source: U.S. Department of Transportation Federal Highway Administration Technical Advisory T 7570.2, 1994. Adjusted to 2016 dollars.

Using the traffic crash costs per type of severity from **Table 3-78** and combining major and minor injuries as "evident injury" and possible and unknown as "possible injury" the total costs of traffic crashes is figured in **Table 3-79** for Kossuth County based on previous events.

Table 3-79: Costs of Traffic Crashes in Kossuth County, 2007-20016

Urban/Rural	Fatalities	Evident Injury	Possible Injury	Property Damage	Total
Urban	3	140	256	649	
Rural	15	311	295	349	
Total	18	451	551	998	
Estimated Cost	$79,433,928	$27,556,551	$17,769,750	$ 3,388,210	$128,148,439

Sources: U.S. Department of Transportation Federal Highway Administration Technical Advisory T 7570.2, 1994. Adjusted to 2016 dollars and Iowa Department of Transportation's Office of Traffic and Safety, http://www.iowadot.gov/crashanalysis/index.htm?

Based on the 10 years of data, the annual average cost of transportation accidents in Kossuth County is $12,814,844. Estimated losses as a result of rail and air transportation are not available for this analysis.

Future Development

Population in Kossuth County is declining, and volume of traffic on the county roads, highways and interstates decreases as well. With less traffic, transportation accidents may likely become less frequent.

Climate Change Impact

If projections regarding milder winters come to fruition, climate change impacts may reduce the number of transportation incidents associated with some severe weather. However, if ice occurs, rather than snow, this could result in higher incidents of weather-related accidents.

Transportation Hazard Summary by Jurisdiction

All jurisdictions within the planning area are at risk to some kind of transportation incident.

Jurisdiction	Probability	Magnitude	Warning Time	Duration	Score	Level
Kossuth County, Iowa	4	4	4	1	3.70	High
City of Algona	4	4	4	1	3.70	High
City of Bancroft	4	4	4	1	3.70	High
City of Burt	4	4	4	1	3.70	High
City of Fenton	4	4	4	1	3.70	High
City of Lakota	4	4	4	1	3.70	High
City of Ledyard	4	4	4	1	3.70	High
City of Lone Rock	4	4	4	1	3.70	High
City of Lu Verne	4	4	4	1	3.70	High
City of Swea City	4	4	4	1	3.70	High
City of Titonka	4	4	4	1	3.70	High
City of Wesley	4	4	4	1	3.70	High
City of West Bend	4	4	4	1	3.70	High
City of Whittemore	4	4	4	1	3.70	High
Algona School District	4	4	4	1	3.70	High
Lu Verne School District	4	4	4	1	3.70	High
North Kossuth School District	4	4	4	1	3.70	High

3.7 Hazard Analysis Summary

This table below provides a tabular summary of the hazard ranking for each jurisdiction in the planning area.

Table 3-80: Hazard Ranking Summary by Jurisdiction

Jurisdiction	Animal/Crop/Plant Disease	Dam Failure	Drought	Earthquake	Extreme Heat	Flash Flood	Grass or Wildland Fire	Hazardous Materials Incident	Human Disease	Infrastructure Failure	Radiological Incident	River Flooding	Severe Winter Storm	Terrorism	Thunderstorm/Lightning/Hail	Tornado/Windstorm	Transportation Incident
Kossuth County	M	L	H	L	M	M	M	M	M	H	L	M	H	M	M	H	H
Algona	M	L	H	L	M	M	M	H	M	H	L	M	H	M	M	H	H
Bancroft	M	N/A	H	L	M	M	L	H	M	H	L	N/A	H	M	M	H	H
Burt	M	N/A	H	L	M	M	L	H	M	H	L	L	H	M	M	H	H
Fenton	M	N/A	H	L	M	L	L	L	M	H	L	L	H	M	M	H	H
Lakota	M	N/A	H	L	M	M	L	M	M	H	L	M	H	M	M	H	H
Ledyard	M	N/A	H	L	M	L	L	M	M	H	L	N/A	H	M	M	H	H
Lone Rock	M	N/A	H	L	M	L	L	L	M	H	L	N/A	H	M	M	H	H
LuVerne	M	N/A	H	L	M	M	L	M	M	H	L	L	H	M	M	H	H
Swea City	M	N/A	H	L	M	M	L	M	M	H	L	L	H	M	M	H	H
Titonka	M	N/A	H	L	M	L	L	M	M	H	L	M	H	M	M	H	H
Wesley	M	N/A	H	L	M	M	L	M	M	H	L	L	H	M	M	H	H
Whittemore	M	N/A	H	L	M	L	L	H	M	H	L	M	H	M	M	H	H
Algona CSD	L	N/A	H	L	M	L	L	L	M	H	L	L	H	M	M	H	H
LuVerne CSD	L	N/A	H	L	M	L	L	L	M	H	L	L	H	M	M	H	H
North Kossuth CSD	L	N/A	H	L	M	L	L	L	M	H	L	L	H	M	M	H	H

4 MITIGATION STRATEGY

44 CFR Requirement §201.6(c)(3): The plan shall include a mitigation strategy that provides the jurisdiction's blueprint for reducing the potential losses identified in the risk assessment, based on existing authorities, policies, programs and resources, and its ability to expand on and improve these existing tools.

This section presents the mitigation strategy updated by the Hazard Mitigation Planning Committee (HMPC) based on the updated risk assessment. The mitigation strategy was developed through a collaborative group process and consists of updated general goal statements to guide the jurisdictions in efforts to lessen disaster impacts, as well as specific mitigation actions that can be put in place to directly reduce vulnerability to hazards and losses. The following definitions are based upon those found in the March 2013 *Local Mitigation Planning Handbook*:

- **Goals** are general guidelines that explain what the community wants to achieve with the plan. They are usually broad policy-type statements that are long-term, and they represent visions for reducing or avoiding losses from the identified hazards.
- **Mitigation Actions** are specific actions that help achieve goals.

4.1 Goals

44 CFR Requirement §201.6(c)(3)(i): [The hazard mitigation strategy shall include a] description of mitigation goals to reduce or avoid long-term vulnerabilities to the identified hazards.

This planning effort is an update to an existing hazard mitigation plan. Therefore, the goals from the *2013 Kossuth County Hazard Mitigation Plan* were reviewed to determine if they are still valid. The HMPC participated in a facilitated discussion during their second meeting to review and update the plan goals. To ensure that the goals are comprehensive and support State goals, the *2013 State Hazard Mitigation Plan* goals were reviewed as well. The HMPC also reviewed common categories of mitigation goals from other plans.

The planning committee determined that all four goals from the previous plan remain valid. No changes were made to the plan goals. The validated plan goals for the Kossuth County Hazard Mitigation Plan are below:

- Goal 1: Minimize the vulnerability of the people and their property in Kossuth County to the impacts of hazards.
- Goal 2: Protect critical facilities, infrastructure and other community assets from the impacts of hazards.
- Goal 3: Improve education and awareness regarding hazards and risk in Kossuth County.
- Goal 4: Strengthen communication regarding hazard mitigation among agencies and between agencies and the public.

4.1.1 Identification and Analysis of Mitigation Actions

44 CFR Requirement §201.6(c)(3)(ii): The mitigation strategy shall include a section that identifies and analyzes a comprehensive range of specific mitigation actions and projects being considered to reduce the effects of each hazard, with particular emphasis on new and existing buildings and infrastructure.

During the second meeting of the HMPC, sample results of the risk assessment update were provided to the HMPC members. To lay the framework for the impacts to be addressed by the updated mitigation strategy, the full draft of the Risk Assessment Chapter was also provided for review by the HMPC members. Also at Meeting #2, each jurisdiction was provided with a handout listing the actions they included in the previous hazard mitigation plan. The mitigation strategy of the previous plan consisted of 124 individual jurisdictional actions.

Jurisdictional representatives were instructed to work with others in their jurisdiction to update the status of each of the previous actions. The status updates were provided between Meeting #2 and Meeting #3. Of the 124 previous actions, 25 have been completed, 84 are continuing (58 Continue In-Progress and 26 Continue Not Started), and 15 were deleted (see **Table 4-1**). The list of the completed and deleted actions is provided in Appendix C with comments providing additional details, as available.

Table 4-1: Status of Previous Actions

Jurisdiction	Completed	Delete	Continue In-Progress	Continue Not Started	Grand Total
Kossuth County	1	3	7	1	12
Algona	1	0	2	4	7
Bancroft	0	1	9	0	10
Burt	0	2	4	6	12
Fenton	3	4	4	1	12
Lakota	2	2	4	3	11
Ledyard	6	0	1	0	7
Lone Rock	3	0	2	1	6
Lu Verne	1	0	6	2	9
Swea City	6	2	3	0	11
Titonka	1	1	5	4	11
Wesley	0	0	8	0	8
Whittemore	0	0	3	4	7
Algona CSD	1	0	0	0	1
Grand Total	**25**	**15**	**58**	**26**	**124**

For a comprehensive range of mitigation actions to consider, the jurisdictions were provided relevant information and sources to be used in development of new mitigation actions including:

- Validated Plan Goals
- Previous Actions from 2013 Plan
- Key Issues from Risk Assessment
- FEMA's Mitigation Ideas booklet
- State Priorities for Hazard Mitigation Assistance Grants

- Public Opinion from Surveys

To facilitate discussion and ideas on new actions that jurisdictions may want to submit to the plan update, the planning committee reviewed the plan goals that were updated at Meeting #2. Key issues/problem statements for sample hazards in the risk assessment were also discussed, as well as the actions from the 2013 plan that were identified relative to each hazard. The discussion was geared toward identifying any gaps that may exist between the problems identified and actions already developed to address the problems to develop new actions. To provide consideration of a comprehensive range of alternatives, FEMA's Mitigation Ideas Booklet was also reviewed for additional ideas/alternatives for new actions. After the committee meeting, jurisdictions reviewed the materials to determine final mitigation actions to submit to the plan update.

The jurisdictions were encouraged to be comprehensive and include all appropriate actions to work toward becoming more disaster resistant. They were encouraged to maintain a realistic approach and were reminded that the hazard mitigation plan is a "living document". As capabilities, vulnerabilities, or the nature of hazards that threaten each jurisdiction change, the mitigation actions can and should be updated to reflect those changes, including addition or deletion of actions, as appropriate.

As part of the meeting discussion, jurisdictions were instructed to consider the potential cost of each project in relation to the anticipated future cost savings. This type of discussion allowed the committee as a whole to understand the broad priorities and enable discussion of the types of projects most beneficial to all jurisdictions within Kossuth County.

4.2 Implementation of Mitigation Actions

44 CFR Requirement §201.6(c)(3)(ii): The mitigation strategy shall include an action strategy describing how the actions identified in paragraph (c)(2)(ii) will be prioritized, implemented, and administered by the local jurisdiction. Prioritization shall include a special emphasis on the extent to which benefits are maximized according to a cost benefits review of the proposed projects and their associated costs.

Jurisdictional representatives worked with others in their community to finalize the actions to be submitted to the updated mitigation strategy. Throughout the discussion of the types of projects that the committee would include in the mitigation plan, emphasis was placed on the importance of a benefit-cost analysis in determining project priority. The Disaster Mitigation Act regulations state that benefit-cost review is the primary method by which mitigation projects should be prioritized. Recognizing the federal regulatory requirement to prioritize by benefit-cost, and the need for any publicly funded project to be cost-effective, the HMPC decided to pursue implementation according to when and where damage occurs, available funding, political will, jurisdictional priority, and priorities identified in the Iowa State Hazard Mitigation Plan. Due to many variables that must be examined during project development, the benefit/cost review at the planning stage primarily consisted of a qualitative analysis. For each action, the jurisdictions included a narrative describing the types of benefits that could be realized with implementation of the action. Where possible, the cost was estimated as closely as possible with further refinement to occur as project development occurs. Cost-effectiveness will be considered in additional detail if/when seeking FEMA Hazard Mitigation Assistance grant funding or other grant funding for eligible projects identified in this plan. At that time, additional information will be researched to provide for a quantitative benefit-cost analysis.

To provide a mechanism for jurisdictions to prioritize actions, a modified STAPLEE worksheet was completed by the jurisdictions for each new and continued action submitted for the updated mitigation strategy. The modified STAPLEE worksheet includes elements to consider protection of life and reduction

of damages. Although a similar STAPLEE method was a component of the prioritization method utilized for the 2013 plan, the scoring elements were slightly different. For the plan update, the modified STAPLEE worksheet was chosen to re-evaluate all continuing and new actions, as this was deemed a more simplified approach and ensured a consistent methodology for all continuing and new actions.

The STAPLEE prioritization method in general is a tool used to assess the costs, benefits, and overall feasibility of mitigation actions. STAPLEE stands for the following:

- **Social**: Will the action be acceptable to the community? Could it have an unfair effect on a particular segment of the population?
- **Technical**: Is the action technically feasible? Are there secondary impacts? Does it offer a long-term solution?
- **Administrative**: Are there adequate staffing, funding, and maintenance capabilities to implement the project?
- **Political**: Will there be adequate political and public support for the project?
- **Legal**: Does your jurisdiction have the legal authority to implement the action?
- **Economic**: Is the action cost-beneficial? Is there funding available? Will the action contribute to the local economy?
- **Environmental**: Will there be negative environmental consequences from the action? Does it comply with environmental regulations? Is it consistent with community environmental goals?

Additional questions were added to the modified STAPLEE worksheet to include elements to consider mitigation effectiveness related to protection of life and reduction of damages as well as reduction in the need for response actions, and the potential for benefits to exceed the cost.

Figure 4-1 is a sample of the Action Plan worksheet. The Prioritization Section is at the bottom of the worksheet. There is a total possible prioritization score of 19. Those actions that scored 13 or higher were given a priority rating of "High". Those actions that scored 7-12 were given a priority rating of "Medium". And those actions that scored less than 7 were given a rating of "Low".

Figure 4-1: Action Plan Worksheet

Kossuth County Multi-Jurisdictional Hazard Mitigation Plan
Mitigation Action Plan Worksheet

Jurisdiction:	**2017 Action Status** ☐ Continue Not Started ☐ Continue In-Progress ☐ New	**Action ID:** Refer to handout for continuing actions For new actions number with next sequential number after last action #.
Hazards Addressed: ☐ Animal/Plant/Crop Disease ☐ Dam /Levee Failure ☐ Drought ☐ Earthquake ☐ Extreme Heat ☐ Flash Flood	Check all that apply ☐ Grass/Wildland Fire ☐ Hazardous Materials Incident ☐ Human Disease ☐ Infrastructure Failure ☐ Radiological Incident ☐ River Flooding	☐ Severe Winter Storm ☐ Sinkholes ☐ Terrorism ☐ Thunderstorm/Lightning/Hail ☐ Tornado/Windstorm ☐ Transportation Incident
Action Title/ Description:		
Applicable Goal Statement: Check one	☐ Goal 1: ☐ Goal 2: ☐ Goal 3: ☐ Goal 4:	
Issue/Background: Why is this action needed? What is the problem?		
Obstacles to Implementing?		
Responsible Office: Which department in Jurisdiction would implement/track?		
Partners: Who would help?		
Potential Funding Source: (Grants-specific if known, local funds, combination, etc.) Check all that may apply	☐ FEMA Hazard Mitigation Assistance Grant (HMGP, PDM, or FMA) ☐ Local funds, ☐ In-Kind (donated), ☐ Private Non-Profit, ☐ Other (specify)	
Cost Estimate:	☐ Little or no cost ☐ Less than $10,000 ☐ $10,000 to $50,000 ☐ $50,000 to $100,000 ☐ $100,000 to $500,000 ☐ $500,000 to $1,000,000 ☐ Over $1,000,000	
Benefits: (Describe Losses Avoided)		
Timeline: How many years to complete?	☐ 1 yr ☐ 2-3 yrs ☐ 3-5 yrs ☐ More than 5 yrs. ☐ Other	Completed by: (name/title/phone #)
Prioritization: Rate the questions from 0-3 0-unlikely, 1-maybe, 2-probably, or 3-definitely	If implemented, will the action result in lives saved? ☐ 0, ☐ 1, ☐ 2, ☐ 3 If implemented, will the action result in reduced property damages? ☐ 0, ☐ 1, ☐ 2, ☐ 3 If implemented, will the action reduce the need for response actions? ☐ 0, ☐ 1, ☐ 2, ☐ 3 If implemented, will the benefits exceed the cost? ☐ 0, ☐ 1, ☐ 2, ☐ 3	
STAPLEE Rating: Give the action a rating for each element as follows: Positive (+) Neutral (0) Negative (-)	Socially Acceptable Technically Feasible Administrative Capability Politically Desirable Legal Authority Exists Economically Beneficial Environmentally Beneficial	☐ +, ☐ 0, ☐ - ☐ +, ☐ 0, ☐ - ☐ +, ☐ 0, ☐ - ☐ +, ☐ 0, ☐ - ☐ +, ☐ 0, ☐ - ☐ +, ☐ 0, ☐ - ☐ +, ☐ 0, ☐ -

The mitigation action summary table presenting the summary of continuing and new mitigation actions for each jurisdiction is provided in **Table 4-2**. In addition to the 84 actions that were continued from the previous plan, 13 new actions were identified, for a combined total of 97 actions in this updated mitigation strategy.

The Action ID for each action has been carried over from the 2013 plan for continuing actions. As a result of completed and deleted actions, the Action ID does not follow a sequential order. New actions were assigned the next sequential Action ID for each jurisdiction. Following the action summary table, additional details are provided for each continuing and new action in **Table 4-3**. The detailed table serves as the action plan describing how each action will be implemented and administered by the local jurisdiction. The final table, **Table 4-4**, provides the results from the action prioritization.

Table 4-2: Mitigation Action Summary—Continuing and New Actions

Action ID	Action Title	2017 Action Status	2017 Action Status Comment	Hazards Addressed	Applicable Goal	Score	Priority
Kossuth County-2	Public education and awareness of all hazards	Continue In-Progress	Keep. I would not mind if city did more fire specific awareness	All hazards	3,4	15	H
Kossuth County-3	Continuity of Operations Plan (COOP)	Continue In-Progress		Infrastructure Failure	2,4	16	H
Kossuth County-4	Construct, retrofit, or maintain water supply, drainage, sewage, retention and detention systems to provide for the proper functioning of those systems.	Continue In-Progress	This is an ongoing process	Flash Flood, River Flooding, Infrastructure Failure	1,2	16	H
Kossuth County-5	Construction or retrofit existing structures into public safe rooms at government facilities, recreational facilities, recreational areas, manufactured home parks, schools, day care centers, and other critical facilities	Continue Not Started		Tornado/Windstorm	1,2	13	H
Kossuth County-6	Acquire flood prone properties for conversion into green space; or elevate structures to or above base flood elevation; construction of levees, dams, and culverts to ensure adequate capacity and protection levels for property and critical facilities.	Continue In-Progress	Ongoing	Flash Flood, River Flooding	1,2	13	H
Kossuth County-7	Purchase/install backup power generators	Continue In-Progress		Flash Flood, Hailstorm, Infrastructure Failure, River Flooding, Severe Winter Storm, Terrorism, Thunderstorms and Lightning, Tornado, Windstorm	1, 2	15	H

Action ID	Action Title	2017 Action Status	2017 Action Status Comment	Hazards Addressed	Applicable Goal	Score	Priority
Kossuth County-9	Install and maintain security measures at all critical facilities and training of emergency response personnel	Continue In-Progress		All hazards	1,2,3,4	8	M
Kossuth County-11	Develop and promote comprehensive, cost-effective, common sense recommendations for adoption and enforcement of land use, ordinances and regulations, zoning, and building codes that decrease risk in areas susceptible to hazards	Continue In-Progress		All hazards	1,2,3,4	11	M
Kossuth County-13*	Continue to participate in NFIP	New		River Flooding	1, 2, 3, 4	16	H
Algona-1	Develop/update/publicize emergency management plans, including preparedness, response recover, operations, long term recovery, and mitigation plans and maintain data inventory	Continue In-Progress	Multi-jurisdictional hazard mitigation plan update is currently in progress	All hazards	1,2,3,4	15	H
Algona-3	Continuity of Operations Plan (COOP)	Continue In-Progress		Terrorism	2,4	11	M
Algona-5	Construction or retrofit existing structures into public safe rooms at government facilities, recreational facilities, recreational areas, manufactured home parks, schools, day care centers, and other critical facilities	Continue Not Started	City Hall and old ambulance/ police department/power plant/fire station has been demolished and construction of new city hall is underway. Discussion was held to incorporate a public storm shelter into the new structure and it was decided not to pursue that option	Tornado, Windstorm	1,2	8	M

Action ID	Action Title	2017 Action Status	2017 Action Status Comment	Hazards Addressed	Applicable Goal	Score	Priority
Algona-7	Purchase/install backup power generators	Continue Not Started	Purchase of a generator to power lift stations in the event of a power loss is still in the Capital Improvement Plan as well as lift station upgrades to make one generator compatible with all stations	Earthquake, Extreme Heat, Infrastructure Failure, Severe Winter Storm, Terrorism, Thunderstorm/Lightning/Hail, Tornado/Windstorm, Transportation Incident	1,2	11	M
Algona-8	Heating/Cooling Centers/Shelters	Continue Not Started		Extreme Heat, Severe Winter Storm, Terrorism, Thunderstorm/Lightning/Hail, Tornado/Windstorm	1, 3	10	M
Algona-12	Natural resource measures to prevent the damage to critical facility functions	Continue Not Started	The city is currently adopting floodplain management regulations that meet the standards of Paragraph 60.3(d) to remain eligible to participate in the NFIP	Drought, Flash Flood, Grass/Wildland Fire, Infrastructure Failure, River Flooding, Severe Winter Storm, Thunderstorm/Lightning/Hail, Tornado/Windstorm	1, 2, 3	8	M
Algona-13*	Continue to participate in NFIP	New		River Flooding	1, 2, 3, 4	16	H
Bancroft-1	Develop/update/publicize emergency management plans, including preparedness, response recover, operations, long term recovery, and mitigation plans and maintain data inventory	Continue In-Progress		All hazards	1,2,3,4	16	H
Bancroft-2	Public education and awareness of all hazards	Continue In-Progress		All hazards	3,4	19	H
Bancroft-3	Continuity of Operations Plan (COOP)	Continue In-Progress		Radiological, Terrorism, Tornado	2,4	12	M

Action ID	Action Title	2017 Action Status	2017 Action Status Comment	Hazards Addressed	Applicable Goal	Score	Priority
Bancroft-5	Construction or retrofit existing structures into public safe rooms at government facilities, recreational facilities, recreational areas, manufactured home parks, schools, day care centers, and other critical facilities	Continue In-Progress		Tornado, Windstorm	1,2	14	H
Bancroft-6	Acquire flood prone properties for conversion into green space; or elevate structures to or above base flood elevation; construction of levees, dams, and culverts to ensure adequate capacity and protection levels for property and critical facilities.	Continue In-Progress		Flash Flood, River Flooding	1,2	15	H
Bancroft-7	Purchase/install backup power generators	Continue In-Progress		Flash Flood, Hailstorm, Infrastructure Failure, River Flooding, Severe Winter Storm, Terrorism, Thunderstorms and Lightning, Tornado, Windstorm	1,2	17	H
Bancroft-8	Heating/Cooling Centers/Shelters	Continue In-Progress		Extreme Heat, Severe Winter Storm	2	4	L
Bancroft-9	Install and maintain security measures at all critical facilities and training of emergency response personnel	Continue In-Progress		All hazards	1,2,4	8	M
Bancroft-11	Develop and promote comprehensive, cost-effective, common sense recommendations for adoption and enforcement of land use, ordinances and regulations, zoning, and building codes that decrease risk in areas susceptible to hazards	Continue In-Progress		All hazards	1,2,3,4	9	M
Bancroft-12*	Continue to participate in NFIP	New		River Flooding	1, 2, 3, 4	16	H

Action ID	Action Title	2017 Action Status	2017 Action Status Comment	Hazards Addressed	Applicable Goal	Score	Priority
Burt-1	Develop/update/publicize emergency management plans, including preparedness, response recover, operations, long term recovery, and mitigation plans and maintain data inventory	Continue Not Started		All hazards	1,2,3,4	17	H
Burt-2	Public education and awareness of all hazards	Continue In-Progress		All hazards	3,4	15	H
Burt-3	Continuity of Operations Plan (COOP)	Continue In-Progress		All hazards	2,4	15	H
Burt-4	Construct, retrofit, or maintain water supply, drainage, sewage, retention and detention systems to provide for the proper functioning of those systems.	Continue Not Started		Flash Flood, Radiological Incident, River Flooding	1,2	13	H
Burt-5	Construction or retrofit existing structures into public safe rooms at government facilities, recreational facilities, recreational areas, manufactured home parks, schools, day care centers, and other critical facilities	Continue Not Started		Hazardous Materials Incident, Terrorism, Thunderstorm/Lightning/Hail, Tornado/Windstorm, Transportation Incident	1,2	9	M
Burt-7	Purchase/install backup power generators	Continue Not Started		Extreme Heat, Flash Flood, River Flooding, Severe Winter Storm, Terrorism, Thunderstorms/Lightning/Hail, Tornado/Windstorm	1,2	17	H
Burt-8	Heating/Cooling Centers/Shelters	Continue Not Started		Extreme Heat, Severe Winter Storm	2	13	H
Burt-9	Install and maintain security measures at all critical facilities and training of emergency response personnel	Continue Not Started		All hazards	1,2,4	8	M

Action ID	Action Title	2017 Action Status	2017 Action Status Comment	Hazards Addressed	Applicable Goal	Score	Priority
Burt-12	Natural resource measures to prevent the damage to critical facility functions	Continue In-Progress		Flash flood	1,2	9	M
Burt-13	Water Conservation Plan	Continue In-Progress		Drought	1,2	12	M
Fenton-1	Develop/update/publicize emergency management plans, including preparedness, response recover, operations, long term recovery, and mitigation plans and maintain data inventory	Continue In-Progress	Working with other agencies	All hazards	1,2,3,4	19	H
Fenton-2	Public education and awareness of all hazards	Continue In-Progress	Working to complete	All hazards	3,4	15	H
Fenton-4	Construct, retrofit, or maintain water supply, drainage, sewage, retention and detention systems to provide for the proper functioning of those systems.	Continue In-Progress	Sewer= Complete Water Supply = In-Progress Under construction	Flash Flood, River Flooding, Infrastructure Failure	1,2	13	H
Fenton-8	Heating/Cooling Centers/Shelters	Continue In-Progress		Extreme Heat, Severe Winter Storm	2	13	H
Fenton-9	Install and maintain security measures at all critical facilities and training of emergency response personnel	Continue Not Started		All hazards	1,2,4	8	M
Fenton-13	Auto Starting Generator for Water Plant	New		Severe Winter Storm, Tornado/Windstorm	1, 2	17	H
Fenton-14	Outdoor Warning System	New		Tornado/Windstorm	1	14	H
Fenton-15*	Continue to participate in NFIP	New		River Flooding	1, 2, 3, 4	16	H

Action ID	Action Title	2017 Action Status	2017 Action Status Comment	Hazards Addressed	Applicable Goal	Score	Priority
Lakota-1	Develop/update/publicize emergency management plans, including preparedness, response recover, operations, long term recovery, and mitigation plans and maintain data inventory	Continue In-Progress		All hazards	1,2,3,4	19	H
Lakota-2	Public education and awareness of all hazards	Continue Not Started		All hazards	3,4	15	H
Lakota-4	Construct, retrofit, or maintain water supply, drainage, sewage, retention and detention systems to provide for the proper functioning of those systems.	Continue In-Progress	Water pumps and generators needed	Flash Flood, River Flooding, Infrastructure Failure, Radiological Incident	1,2	13	H
Lakota-7	Purchase/install backup power generators	Continue Not Started	Need	Flash Flood, Infrastructure Failure, River Flood, Severe Winter Storm, Terrorism, Thunderstorms/Lightning/Hail, Tornado/Windstorm	1,2	17	H
Lakota-8	Heating/Cooling Centers/Shelters	Continue In-Progress	Air conditioning is needed	Extreme Heat, Severe Winter Storm	2	13	H
Lakota-9	Install and maintain security measures at all critical facilities and training of emergency response personnel	Continue In-Progress	We have a volunteer Fire and Ambulance Department	All hazards	1,2,4	8	M
Lakota-12	Natural resource measures to prevent the damage to critical facility functions	Continue Not Started	Water pumps and generators needed	Flash Flood, River Flooding, Terrorism, Thunderstorm/Lightning/Hail, Tornado/Windstorm	1,2	12	M
Lakota-13	Emergency Shelter	New		River Flooding, Severe Winter Storm, Tornado/Windstorm	1	15	H

Action ID	Action Title	2017 Action Status	2017 Action Status Comment	Hazards Addressed	Applicable Goal	Score	Priority
Ledyard-7	Purchase/install backup power generators	Continue In-Progress		Extreme Heat, Flash Flood, Severe Winter Storm, Terrorism, Thunderstorm/Lightning/Hail, Tornado/Windstorm	1,2	17	H
Lone Rock-1	Develop/update/publicize emergency management plans, including preparedness, response recover, operations, long term recovery, and mitigation plans and maintain data inventory	Continue In-Progress		Extreme Heat, Flash Flood, Grass/Wildland Fire, Infrastructure Failure, Severe Winter Storm, Thunderstorm/Lightning/Hail, Tornado/Windstorm, Transportation Incident, Hazardous Materials	1	12	M
Lone Rock-2	Public education and awareness of all hazards	Continue Not Started		Extreme Heat, Flash Flood, Grass/Wildland Fire, Infrastructure Failure, Severe Winter Storm, Thunderstorm/Lightning/Hail, Tornado/Windstorm, Transportation Incident, Hazardous Materials	3	13	H
Lone Rock-9	Install and maintain security measures at all critical facilities and training of emergency response personnel	Continue In-Progress	Training in-progress Mayor, Fire Dept., outside contractor Cameras in place	All hazards	2	6	L
LuVerne-1	Develop/update/publicize emergency management plans, including preparedness, response recover, operations, long term recovery, and mitigation plans and maintain data inventory	Continue In-Progress	Slow due to lack of personnel resources	All hazards	1,2,3,4	19	H
LuVerne-2	Public education and awareness of all hazards	Continue In-Progress		All hazards	3,4	15	H

Action ID	Action Title	2017 Action Status	2017 Action Status Comment	Hazards Addressed	Applicable Goal	Score	Priority
LuVerne-3	Continuity of Operations Plan (COOP)	Continue Not Started		Radiological, Terrorism, Tornado	2,4	15	H
LuVerne-5	Construction or retrofit existing structures into public safe rooms at government facilities, recreational facilities, recreational areas, manufactured home parks, schools, day care centers, and other critical facilities	Continue Not Started		Tornado, Windstorm	1,2	9	M
LuVerne-6	Acquire flood prone properties for conversion into green space; or elevate structures to or above base flood elevation; construction of levees, dams, and culverts to ensure adequate capacity and protection levels for property and critical facilities.	Continue In-Progress		Flash Flood, River Flooding	1,2	10	M
LuVerne-7	Purchase/install backup power generators	Continue In-Progress		Extreme Heat, Flash Flood, Severe Winter Storm, Terrorism, Thunderstorm/Lightning/Hail, Tornado/Windstorm	1,2	17	H
LuVerne-8	Heating/Cooling Centers/Shelters	Continue In-Progress		Extreme Heat, Severe Winter Storm	2	13	H
LuVerne-9	Install and maintain security measures at all critical facilities and training of emergency response personnel	Continue In-Progress		All hazards	1,2,4	8	M
LuVerne-11*	Continue to participate in NFIP	New		River Flooding	1, 2, 3, 4	16	H

Action ID	Action Title	2017 Action Status	2017 Action Status Comment	Hazards Addressed	Applicable Goal	Score	Priority
Swea City-1	Develop/update/publicize emergency management plans, including preparedness, response recover, operations, long term recovery, and mitigation plans and maintain data inventory	Continue In-Progress		All hazards	1,2,3,4	19	H
Swea City-2	Public education and awareness of all hazards	Continue In-Progress		All hazards	3,4	15	H
Swea City-11	Develop and promote comprehensive, cost-effective, common sense recommendations for adoption and enforcement of land use, ordinances and regulations, zoning, and building codes that decrease risk in areas susceptible to hazards	Continue In-Progress		All hazards	1,2,3,4	11	M
Titonka-1	Develop/update/publicize emergency management plans, including preparedness, response recover, operations, long term recovery, and mitigation plans and maintain data inventory	Continue Not Started		All hazards	1,2,3,4	19	H
Titonka-2	Public education and awareness of all hazards	Continue Not Started		All hazards	3,4	15	H
Titonka-3	Continuity of Operations Plan (COOP)	Continue In-Progress		Radiological, Terrorism, Tornado	2,4	15	H
Titonka-4	Construct, retrofit, or maintain water supply, drainage, sewage, retention and detention systems to provide for the proper functioning of those systems.	Continue In-Progress		Flash Flood, River Flooding, Infrastructure Failure, Radiological Incident	1,2	13	H

Action ID	Action Title	2017 Action Status	2017 Action Status Comment	Hazards Addressed	Applicable Goal	Score	Priority
Titonka-5	Construction or retrofit existing structures into public safe rooms at government facilities, recreational facilities, recreational areas, manufactured home parks, schools, day care centers, and other critical facilities	Continue Not Started		Tornado/Windstorm	1,2	9	M
Titonka-6	Acquire flood prone properties for conversion into green space; or elevate structures to or above base flood elevation; construction of levees, dams, and culverts to ensure adequate capacity and protection levels for property and critical facilities.	Continue Not Started		Flash Flood, River Flooding	1,2	10	M
Titonka-7	Purchase/install backup power generators	Continue In-Progress		Flash Flood, Hailstorm, Infrastructure Failure, River Flooding, Severe Winter Storm, Terrorism, Thunderstorms and Lightning, Tornado, Windstorm	1,2	17	H
Titonka-8	Heating/Cooling Centers/Shelters	Continue In-Progress		Extreme Heat, Severe Winter Storm	2	13	H
Titonka-9	Install and maintain security measures at all critical facilities and training of emergency response personnel	Continue In-Progress		All hazards	1,2,4	8	M
Titonka-13*	Continue to participate in NFIP	New		River Flooding	1, 2, 3, 4	16	H

Action ID	Action Title	2017 Action Status	2017 Action Status Comment	Hazards Addressed	Applicable Goal	Score	Priority
Wesley – 1	Develop/update/publicize emergency management plans, including preparedness, response recover, operations, long term recovery, and mitigation plans and maintain data inventory	Continue In-Progress		Drought, Extreme Heat, Flash Flood, Grass/Wildland Fire, Human Disease, Infrastructure Failure, River Flooding, Severe Winter Storm, Terrorism, Thunderstorm/Lightning/Hail, Tornado/Windstorm, Transportation Incident	1,2,3,4	19	H
Wesley – 2	Public education and awareness of all hazards	Continue In-Progress		Earthquake, Extreme Heat, Flash Flood, Infrastructure Failure, River Flooding, Severe Winter Storm, Terrorism, Thunderstorm/Lightning/Hail, Tornado/Windstorm, Transportation Incident	3,4	19	H
Wesley – 4	Construct, retrofit, or maintain water supply, drainage, sewage, retention and detention systems to provide for the proper functioning of those systems.	Continue In-Progress	Completed Retention Basin Project	Flash Flood	1,2	14	H
Wesley – 5	Construction or retrofit existing structures into public safe rooms at government facilities, recreational facilities, recreational areas, manufactured home parks, schools, day care centers, and other critical facilities	Continue In-Progress	Completed Ambulance Shed 7; need signs on street and to educate public on shelter locations	Severe Winter Storm, Tornado/Windstorm	1,2	12	M
Wesley – 7	Purchase/install backup power generators	Continue In-Progress	need to work with local electric to see if we can access; generator hook up for tractor at City Hall and Ambulance Building	Flash Flood, Hailstorm, Infrastructure Failure, River Flooding, Severe Winter Storm, Terrorism, Thunderstorms and Lightning, Tornado, Windstorm	1,2	15	H

Action ID	Action Title	2017 Action Status	2017 Action Status Comment	Hazards Addressed	Applicable Goal	Score	Priority
Wesley – 8	Heating/Cooling Centers/Shelters	Continue In-Progress	need to work with local electric to see if we can access; generator hook up for tractor at City Hall and Ambulance Building	Extreme Heat, Severe Winter Storm	2	15	H
Wesley – 9	Install and maintain security measures at all critical facilities and training of emergency response personnel	Continue In-Progress		All hazards	1,2,4	19	H
Wesley – 11	Develop and promote comprehensive, cost-effective, common sense recommendations for adoption and enforcement of land use, ordinances and regulations, zoning, and building codes that decrease risk in areas susceptible to hazards	Continue In-Progress		All hazards	1,2,3,4	19	H
Wesley – 12	Tornado Siren Upgrade	New		Tornado/Windstorm	1	17	H
Whittemore-1	Develop/update/publicize emergency management plans, including preparedness, response recover, operations, long term recovery, and mitigation plans and maintain data inventory	Continue In-Progress		All hazards	1,2,3,4	19	H
Whittemore-2	Public education and awareness of all hazards	Continue In-Progress		All hazards	3,4	15	H
Whittemore-3	Continuity of Operations Plan (COOP)	Continue In-Progress		Radiological, Terrorism, Tornado	2,4	15	H

Action ID	Action Title	2017 Action Status	2017 Action Status Comment	Hazards Addressed	Applicable Goal	Score	Priority
Whittemore-5	Construction or retrofit existing structures into public safe rooms at government facilities, recreational facilities, recreational areas, manufactured home parks, schools, day care centers, and other critical facilities	Continue Not Started		Tornado, Windstorm	1,2	9	M
Whittemore-7	Purchase/install backup power generators	Continue Not Started		Flash Flood, Hailstorm, Infrastructure Failure, River Flooding, Severe Winter Storm, Terrorism, Thunderstorms and Lightning, Tornado, Windstorm	1,2	17	H
Whittemore-8	Heating/Cooling Centers/Shelters	Continue Not Started		Extreme Heat, Severe Winter Storm	2	13	H
Whittemore-9	Install and maintain security measures at all critical facilities and training of emergency response personnel	Continue Not Started		All hazards	1,2,4	8	M
Algona CSD-7	Purchase/install backup power generators	New		Earthquake, Extreme Heat, Infrastructure Failure, Severe Winter Storm, Terrorism, Thunderstorm/Lightning/Hail, Tornado/Windstorm, Transportation Incident	1,2	11	M
Lu Verne CSD-7	Purchase/install backup power generators	New		Earthquake, Extreme Heat, Infrastructure Failure, Severe Winter Storm, Terrorism, Thunderstorm/Lightning/Hail, Tornado/Windstorm, Transportation Incident	1,2	11	M

Action ID	Action Title	2017 Action Status	2017 Action Status Comment	Hazards Addressed	Applicable Goal	Score	Priority
North Kossuth CSD-7	Purchase/install backup power generators	New		Earthquake, Extreme Heat, Infrastructure Failure, Severe Winter Storm, Terrorism, Thunderstorm/Lightning/Hail, Tornado/Windstorm, Transportation Incident	1,2	11	M

Table 4-3: Mitigation Action Implementation Strategy—Continuing and New Actions

Action ID	Issue/Background	Obstacles	Responsible Office	Partners	Potential Funding Source(s)	Cost Estimate	Benefits	Timeline
Kossuth County-2	This action is ongoing as these events are ongoing issues. Information sharing is key to mitigation of events.	Time	EMA	BOS, IT, S.O, Roads	Local, In-Kind	Less than $10,000	Loss of life and property avoided	Ongoing
Kossuth County-3	Maintains readiness	Funding	IT	All and EMA	FEMA Grant, Local, In-Kind	$10,000 to $50,000	Maintain operations during event	2-3 yrs
Kossuth County-4	This measure will allow the jurisdiction to construct proper water supply, drainage and sewer systems in order to prevent infiltration of silt, soil, and other foreign materials into their supply and sewage systems causing backup into homes and businesses and to maintain proper functioning of water supply to decrease inefficiencies in those systems. Frequent flash flooding and washout occurs and water coming into the cities causes damage. Don't have appropriate depth and width of	Area are in floodplains; funding	Kossuth County Board of Supervisors	Kossuth County Drainage Districts	FEMA Grant, Local funds	Over $1,000,000	Provide outlet for influx of water	Other - ongoing

Action ID	Issue/Background	Obstacles	Responsible Office	Partners	Potential Funding Source(s)	Cost Estimate	Benefits	Timeline
	ditches currently to handle that influx of water.							
Kossuth County-5	This measure will allow the jurisdiction to construct safe rooms that will protect the public during extremely hazardous events, i.e., tornado, thunderstorms and lightning, severe winter storm, etc.; impacted by severe weather on average twice a month.	Cost, locating adequate structures to retrofit - some structures may need to be new construction	Emergency Management	Emergency Management, incorporated cities	FEMA Grant, Local funds, In-Kind, Private Non-Profit	Over $1,000,000	Potentially save lives in the event of severe weather	3-5 years
Kossuth County-6	This measure will allow the jurisdiction the option to acquire flooded properties in order to prevent the continued flooding of structures located in a flood plain or elevate structures as to not have to have the threat of repeated flooding to the subject property. This measure will allow the jurisdiction the ability to prevent damage from flash floods with additional capacity to handle large amounts of water from heavy rains.	Cost, resident willingness to participate	Kossuth County, incorporated cities	Iowa league of cities	FEMA Grant, Local funds	$100,000 to $500,000	Reduction of property damage	2-3 years
Kossuth County-7	County suffers power outages regularly. This mitigation measure assures that a jurisdiction's critical facilities as designated by the Board of Supervisors, City Councils, Emergency Management Coordinator, Sheriff's Department, etc., have adequate	Cost, Compatibility	Emergency Management	Kossuth County Board of Supervisors, Local healthcare coalition, City governments	FEMA Grant, Local funds	$10,000 to $50,000	Provide emergency power backup to lift stations, etc.	1 year

Action ID	Issue/Background	Obstacles	Responsible Office	Partners	Potential Funding Source(s)	Cost Estimate	Benefits	Timeline
	backup power supply to carry on the critical mission of the jurisdictions during a disaster.							
Kossuth County-9	With increased threats to critical infrastructure, we have identified need to monitor and protected that infrastructure. This measure will ensure that security measures at noted critical facilities will be in place to prevent damage and protect those that rely on the function of those critical facilities. This measure will also provide that training of response personnel is up to date and relevant to the disaster at hand.	Cost, Education	Local government, Public Safety	Emergency Management	Local funds, In-Kind, Private Non-Profit	$50,000 to $100,000	Ability to monitor critical infrastructure from threat of natural or manmade incident	3-5 years
Kossuth County-11	We don't have and need building codes, enforcement, etc. This measure will allow jurisdictions the option of putting into place proper ordinances and building codes to prevent or lessen the damage from hazardous events.	Public resistance; staff availability	Local cities	Public Safety	Local funds	$100,000 to $500,000	Reduction in compromised structures	2-3 years
Kossuth County-13	Recently, FEMA and the IDNR completed an update to the Kossuth County FIRM maps. To maintain good standing with the program the City must amend floodplain regulations to reference effective date of the new maps. Effective date of the maps is 3/20/2018.	None	Administration	Public Works	FEMA Grant, Local funds	Little or No Cost	Maintain community standing with the NFIP	1 year

Action ID	Issue/Background	Obstacles	Responsible Office	Partners	Potential Funding Source(s)	Cost Estimate	Benefits	Timeline
Algona-1	This action is needed to minimize vulnerability of people and property; protect critical infrastructure; improve education and awareness of hazards and risks; and strengthen communication among agencies and between agencies and people.	Staff time, impediments to public education, staff turnover	City Administration, City Council, Emergency Management	Public Works, Police, EMS, Fire, AMU, media	Local funds	Less than $10,000	Increase the flexibility and responsiveness of the community in the event of a hazard	More than 5 years
Algona-3	Provide for ongoing service in the event of an event at City Hall, AMU, LEC, Fire Station, Ambulance garage	Staff time, funding	City Administration, City Council, Emergency Management	Police, County Sheriff, EMS, Fire, AMU	Local funds	Less than $10,000	Will provide flexibility and ability to respond in the event of a loss of one or more critical locations	1 year
Algona-5	Protection of people and property	Staff time, funding, political pressures	City Administration, City Council, AMU, Public Works	Fire, EMS, Local Boards	Local funds	$100,000 to $500,000	Potential reduction of casualties in the event of hazard	More than 5 years
Algona-7	Four sanitary sewer lift stations currently do not have backup power sources, leaving the possibility of raw sewage entering basements and overflowing manholes in the event of extended power outages	Budgetary constraints	Public Works	Possible cooperation opportunity with Algona Municipal Utilities	Local funds	$50,000 to $100,000	Reduction of property loss due to basement backups during power loss	2-3 years
Algona-8	In the event of extreme weather conditions there is currently no provision for public shelter	funding, political will	Administration	Kossuth County	Local funds, Private Non-Profit	$50,000 to $100,000	Potential savings of life and health if shelters available during extreme	3-5 years

Action ID	Issue/Background	Obstacles	Responsible Office	Partners	Potential Funding Source(s)	Cost Estimate	Benefits	Timeline
							weather conditions	
Algona-12	Natural resource measures can be used to reduce likelihood and severity of any events that may occur	funding	Administration	Kossuth County, Algona Municipal Utilities, FEMA, IDNR, IDOT	Local funds	$50,000 to $100,000	Potential reduction of flooding, flash flooding, or other events	3-5 years
Algona-13	Recently, FEMA and the IDNR completed an update to the Kossuth County FIRM maps. To maintain good standing with the program the City must amend floodplain regulations to reference effective date of the new maps. Effective date of the maps is 3/20/2018.	None	Administration	Public Works	FEMA Grant, Local funds	Little or No Cost	Maintain community standing with the NFIP	1 year
Bancroft-1	This measure will allow the jurisdiction to produce required and relevant plans that are up to date and are working documents that the community can use.	Testing of plans	EMA, City	Health Care Coalition	Local funds	Less than $10,000	Improve EM cycle	2-3 years
Bancroft-2	This measure gives the jurisdiction the opportunity to produce, inform, etc. using a variety of mass communication methods to inform the public and to keep them aware of the hazards that pose or could potentially pose a threat to the jurisdiction.	Funding, Time	EMA, Local Public Safety	Health Care Coalition	Local funds	Less than $10,000	Increased awareness and preparedness	Other - ongoing
Bancroft-3	This measure gives the jurisdiction the means to provide the jurisdiction a plan that in the	Time	City	EMA, Local Health Care Coalition	Local funds, In-Kind	Less than $10,000	Reduction of time delay to	1 year

Action ID	Issue/Background	Obstacles	Responsible Office	Partners	Potential Funding Source(s)	Cost Estimate	Benefits	Timeline
	case of severe destruction a means to continue operations, who is in charge, where to set up control and command, etc.						resume operations	
Bancroft-5	This measure will allow the jurisdiction to construct safe rooms that will protect the public during extremely hazardous events, i.e., tornado, thunderstorms and lightning, severe winter storm, etc.	Funding	City	EMA	FEMA Grant, Local funds	$100,000 to $500,000	Safe place for residents	More than 5 years
Bancroft-6	This measure will allow the jurisdiction the option to acquire flooded properties in order to prevent the continued flooding of structures located in a flood plain or elevate structures as to not have to have the threat of repeated flooding to the subject property. This measure will allow the jurisdiction the ability to prevent damage from flash floods with additional capacity to handle large amounts of water from heavy rains.	Funding	City	None identified	FEMA Grant, Local funds	$100,000 to $500,000	Reduction in property loss	3-5 years
Bancroft-7	This mitigation measure assures that a jurisdiction's critical facilities as designated by the Board of Supervisors, City Councils, Emergency Management Coordinator, Sheriff's Department, etc., have adequate backup power supply to carry on the critical mission of	Funding	City	EMA	FEMA Grant, Local funds	$10,000 to $50,000		2-3 years

Action ID	Issue/Background	Obstacles	Responsible Office	Partners	Potential Funding Source(s)	Cost Estimate	Benefits	Timeline
	the jurisdictions during a disaster.							
Bancroft-8	This measure will allow the jurisdiction to provide a place for residents to come to get warm or cool depending on the time of year and preferably would have backup power generators due to the use of these structures during an infrastructure failure i.e. energy failure.	Funding	City	EMA	Local funds	Less than $10,000		2-3 years
Bancroft-9	This measure will ensure that security measures at noted critical facilities will be in place to prevent damage and protect those that rely on the function of those critical facilities. This measure will also provide that training of response personnel is up to date and relevant to the disaster at hand.	Funding	City	EMA	Local funds	$10,000 to $50,000		2-3 years
Bancroft-11	This measure will allow jurisdictions the option of putting into place proper ordinances and building codes to prevent or lessen the damage from hazardous events.	Time	City Hall office	County Gov.	Local funds	$10,000 to $50,000	Stream line	2-3 years
Bancroft-12	Recently, FEMA and the IDNR completed an update to the Kossuth County FIRM maps. To maintain good standing with the program the City must amend floodplain regulations to reference effective date of the	None	Administration	Public Works	FEMA Grant, Local funds	Little or No Cost	Maintain community standing with the NFIP	1 year

Action ID	Issue/Background	Obstacles	Responsible Office	Partners	Potential Funding Source(s)	Cost Estimate	Benefits	Timeline
	new maps. Effective date of the maps is 3/20/2018.							
Burt-1	This measure will allow the jurisdiction to produce required and relevant plans that are up to date and are working documents that the community can use.	Need to use EMS's ESF	City & EMA	EMA	Local funds	Less than $10,000		2-3 years
Burt-2	This measure gives the jurisdiction the opportunity to produce, inform, etc. using a variety of mass communication methods to inform the public and to keep them aware of the hazards that pose or could potentially pose a threat to the jurisdiction.	Time	City	EMA, Public Safety, Local Health	Local funds	Less than $10,000	Preparedness	2-3 years
Burt-3	This measure gives the jurisdiction the means to provide the jurisdiction a plan that in the case of severe destruction a means to continue operations, who is in charge, where to set up control and command, etc.	Time, person to do it	City	EMA	Local funds	Less than $10,000	Decreased response time	1 year
Burt-4	This measure will allow the jurisdiction to construct proper water supply, drainage and sewer systems in order to prevent infiltration of silt, soil, and other foreign materials into their supply and sewage systems causing backup into homes and businesses and to maintain proper functioning of water supply to decrease inefficiencies in those systems.	Funding	City	EMA	FEMA Grant, Local funds	$50,000 to $100,000		3-5 years

Action ID	Issue/Background	Obstacles	Responsible Office	Partners	Potential Funding Source(s)	Cost Estimate	Benefits	Timeline
Burt-5	This measure will allow the jurisdiction to construct safe rooms that will protect the public during extremely hazardous events, i.e., tornado, thunderstorms and lightning, severe winter storm, etc.	Funding	City	EMA	FEMA Grant, Local funds	$500,000 to $1,000,000	Reduced loss of life	More than 5 years
Burt-7	This mitigation measure assures that a jurisdiction's critical facilities as designated by the Board of Supervisors, City Councils, Emergency Management Coordinator, Sheriff's Department, etc., have adequate backup power supply to carry on the critical mission of the jurisdictions during a disaster.	Funding	City	EMA	FEMA Grant, Local funds	$10,000 to $50,000		2-3 years
Burt-8	This measure will allow the jurisdiction to provide a place for residents to come to get warm or cool depending on the time of year and preferably would have backup power generators due to the use of these structures during an infrastructure failure i.e. energy failure.	Funding	City	EMA	Local funds	$10,000 to $50,000		2-3 years
Burt-9	This measure will ensure that security measures at noted critical facilities will be in place to prevent damage and protect those that rely on the function of those critical facilities. This measure will also provide that	Funding	City	Public Safety	Local funds	$50,000 to $100,000		3-5 years

Action ID	Issue/Background	Obstacles	Responsible Office	Partners	Potential Funding Source(s)	Cost Estimate	Benefits	Timeline
	training of response personnel is up to date and relevant to the disaster at hand.							
Burt-12	The City experiences flash flooding and has an overwhelmed storm system	Funding	City	EMA, County Engineer	FEMA Grant, Local funds	$100,000 to $500,000	Reduce flooding in the city	3-5 years
Burt-13	The City of Burt has minimal water storage. In the even of a drought or large fire, water supply is gone.	Funding	City	DNR	Local funds, Other	$10,000 to $50,000		2-3 years
Fenton-1	This measure will allow the jurisdiction to produce required and relevant plans that are up to date and are working documents that the community can use.	Need to use EMA's ESFs	EMA, City	None identified	Local funds	Little or No Cost	Preparedness	1 year
Fenton-2	This measure gives the jurisdiction the opportunity to produce, inform, etc. using a variety of mass communication methods to inform the public and to keep them aware of the hazards that pose or could potentially pose a threat to the jurisdiction.	Time	Local Boards and Councils, Emergency Management Coordinator	EMA, Public Safety, Local Health	Local funds	Less than $10,000	Preparedness	2-3 years
Fenton-4	This measure will allow the jurisdiction to construct proper water supply, drainage and sewer systems in order to prevent infiltration of silt, soil, and other foreign materials into their supply and sewage systems causing backup into homes and businesses and to maintain proper functioning of water	Funding	City	EMA	FEMA Grant, Local funds	$50,000 to $100,000		3-5 years

Action ID	Issue/Background	Obstacles	Responsible Office	Partners	Potential Funding Source(s)	Cost Estimate	Benefits	Timeline
	supply to decrease inefficiencies in those systems.							
Fenton-8	This measure will allow the jurisdiction to provide a place for residents to come to get warm or cool depending on the time of year and preferably would have backup power generators due to the use of these structures during an infrastructure failure i.e. energy failure.	Funding	City	EMA	Local funds	$10,000 to $50,000	Safe place for residents	2-3 years
Fenton-9	This measure will ensure that security measures at noted critical facilities will be in place to prevent damage and protect those that rely on the function of those critical facilities. This measure will also provide that training of response personnel is up to date and relevant to the disaster at hand.	Funding	City	Public Safety	Local funds	$50,000 to $100,000		3-5 years
Fenton-13	DNR wants auto starting gen	Funding	Water Department		FEMA Grant	$10,000 to $50,000	Would keep water pressure at all times	1 yr
Fenton-14	To upgrade warning system to reach all parts of town	Funding	Street Department		FEMA Grant	$10,000 to $50,000	Would warn people if tornado was in area	1 yr
Fenton-15	Recently, FEMA and the IDNR completed an update to the Kossuth County FIRM maps. To maintain good standing with the program the City must amend floodplain regulations to	None	Administration	Public Works	FEMA Grant, Local funds	Little or No Cost	Maintain community standing with the NFIP	1 year

Action ID	Issue/Background	Obstacles	Responsible Office	Partners	Potential Funding Source(s)	Cost Estimate	Benefits	Timeline
	reference effective date of the new maps. Effective date of the maps is 3/20/2018.							
Lakota-1	This measure will allow the jurisdiction to produce required and relevant plans that are up to date and are working documents that the community can use.	Need to use EMA's ESFs	EMA & City	None identified	Local funds	Little or No Cost	Preparedness	1 year
Lakota-2	This measure gives the jurisdiction the opportunity to produce, inform, etc. using a variety of mass communication methods to inform the public and to keep them aware of the hazards that pose or could potentially pose a threat to the jurisdiction.	Time	Local Boards and Councils, Emergency Management Coordinator	EMA, Public Safety, Local Health	Local funds	Less than $10,000	Preparedness	2-3 years
Lakota-4	This measure will allow the jurisdiction to construct proper water supply, drainage and sewer systems in order to prevent infiltration of silt, soil, and other foreign materials into their supply and sewage systems causing backup into homes and businesses and to maintain proper functioning of water supply to decrease inefficiencies in those systems.	Funding	City	EMA	FEMA Grant, Local funds	$50,000 to $100,000		3-5 years
Lakota-7	This mitigation measure assures that a jurisdiction's critical facilities as designated by the Board of Supervisors, City Councils, Emergency Management Coordinator,	Funding	City	EMA	FEMA Grant, Local funds	$10,000 to $50,000		2-3 years

Action ID	Issue/Background	Obstacles	Responsible Office	Partners	Potential Funding Source(s)	Cost Estimate	Benefits	Timeline
	Sheriff's Department, etc., have adequate backup power supply to carry on the critical mission of the jurisdictions during a disaster.							
Lakota-8	This measure will allow the jurisdiction to provide a place for residents to come to get warm or cool depending on the time of year and preferably would have backup power generators due to the use of these structures during an infrastructure failure i.e. energy failure.	Funding	City	EMA	Local funds	$10,000 to $50,000		2-3 years
Lakota-9	This measure will ensure that security measures at noted critical facilities will be in place to prevent damage and protect those that rely on the function of those critical facilities. This measure will also provide that training of response personnel is up to date and relevant to the disaster at hand.	Funding	City	Public Safety	Local funds	$50,000 to $100,000		3-5 years
Lakota-12	This measure will prevent many hazardous events like flooding, grass or wild- land fire, etc. This measure will ensure safety and property protection of Kossuth County residents and property owners.	Funding	City	EMA	FEMA Grant, Local funds	$100,000 to $500,000	Reduce loss	More than 5 years
Lakota-13	No emergency shelter in Lakota - need to plan for construction and funding of emergency	Funding and Agreement	City Council	EMS, Eagle Center,	FEMA Grant, Local Funds,	$50,000 to $100,000	Human lives saved + property	3-5 years

Action ID	Issue/Background	Obstacles	Responsible Office	Partners	Potential Funding Source(s)	Cost Estimate	Benefits	Timeline
	shelter in case of long-term power outage and/or flood			Funding Sources	Private Non-Profit		protected, avoided loss of life, shelter, and loss of self sustainability	
Ledyard-7	This mitigation measure assures that a jurisdiction's critical facilities as designated by the Board of Supervisors, City Councils, Emergency Management Coordinator, Sheriff's Department, etc., have adequate backup power supply to carry on the critical mission of the jurisdictions during a disaster.	Funding	City	EMA	FEMA Grant, Local funds	$10,000 to $50,000		2-3 years
Lone Rock-1	Think through actions required for city/emergency personnel to help educate, inform, and train residents	None	Mayor, City Clerk, City Council	Kossuth County	Local	Little or no cost	Save critical time, confusion, injury, illness	1 yr
Lone Rock-2	Residents need to know hazards potential & any available safeguards	Resident Cooperation	Mayor, City Clerk, City Council	Sheriff's Dept, Fire Dept, Emergency Responders	Local, In-Kind	Little or no cost	Avoid confusion, panic, improve cooperation and communication	2-3 years
Lone Rock-9	Provide security of infrastructure, water supply system		Mayor, City	Sheriff's Dept. Kossuth County	Local	$50,000 to $100,000		3-5 years
LuVerne-1	This measure will allow the jurisdiction to produce required and relevant plans that are up to date and are working documents that the community can use.	Need to use EMA's ESFs	EMA & City	None identified	Local funds	Little or No Cost	Preparedness	1 year

Action ID	Issue/Background	Obstacles	Responsible Office	Partners	Potential Funding Source(s)	Cost Estimate	Benefits	Timeline
LuVerne-2	This measure gives the jurisdiction the opportunity to produce, inform, etc. using a variety of mass communication methods to inform the public and to keep them aware of the hazards that pose or could potentially pose a threat to the jurisdiction.	Time	City	EMA, Public Safety, Local Health	Local funds	Less than $10,000	Preparedness	2-3 years
LuVerne-3	This measure gives the jurisdiction the means to provide the jurisdiction a plan that in the case of severe destruction a means to continue operations, who is in charge, where to set up control and command, etc.	Time, person to do it	City	EMA	Local funds	Less than $10,000	Decreased response time	1 year
LuVerne-5	This measure will allow the jurisdiction to construct safe rooms that will protect the public during extremely hazardous events, i.e., tornado, thunderstorms and lightning, severe winter storm, etc.	Funding	City	EMA	FEMA Grant, Local funds	$100,000 to $500,000	Reduced loss of life	More than 5 years
LuVerne-6	This measure will allow the jurisdiction the option to acquire flooded properties in order to prevent the continued flooding of structures located in a flood plain or elevate structures as to not have to have the threat of repeated flooding to the subject property. This measure will allow the jurisdiction the ability to prevent damage from flash floods with additional capacity	Funding	City	EMA	FEMA Grant, Local funds	$10,000 to $50,000	Reduction in property loss	2-3 years

Action ID	Issue/Background	Obstacles	Responsible Office	Partners	Potential Funding Source(s)	Cost Estimate	Benefits	Timeline
	to handle large amounts of water from heavy rains.							
LuVerne-7	This mitigation measure assures that a jurisdiction's critical facilities as designated by the Board of Supervisors, City Councils, Emergency Management Coordinator, Sheriff's Department, etc., have adequate backup power supply to carry on the critical mission of the jurisdictions during a disaster.	Funding	City	EMA	FEMA Grant, Local funds	$10,000 to $50,000		2-3 years
LuVerne-8	This measure will allow the jurisdiction to provide a place for residents to come to get warm or cool depending on the time of year and preferably would have backup power generators due to the use of these structures during an infrastructure failure i.e. energy failure.	Funding	City	EMA	Local funds	$10,000 to $50,000		2-3 years
LuVerne-9	This measure will ensure that security measures at noted critical facilities will be in place to prevent damage and protect those that rely on the function of those critical facilities. This measure will also provide that training of response personnel is up to date and relevant to the disaster at hand.	Funding	City	Public Safety	Local funds	$50,000 to $100,000		3-5 years
LuVerne-11	Recently, FEMA and the IDNR completed an update to the	None	Administration	Public Works	FEMA Grant, Local funds	Little or No Cost	Maintain community	1 year

Action ID	Issue/Background	Obstacles	Responsible Office	Partners	Potential Funding Source(s)	Cost Estimate	Benefits	Timeline
	Kossuth County FIRM maps. To maintain good standing with the program the City must amend floodplain regulations to reference effective date of the new maps. Effective date of the maps is 3/20/2018.						standing with the NFIP	
Swea City-1	This measure will allow the jurisdiction to produce required and relevant plans that are up to date and are working documents that the community can use.	Need to use EMA's ESFs	EMA & City	None identified	Local funds	Little or No Cost	Preparedness	1 year
Swea City-2	This measure gives the jurisdiction the opportunity to produce, inform, etc. using a variety of mass communication methods to inform the public and to keep them aware of the hazards that pose or could potentially pose a threat to the jurisdiction.	Time	Local Boards and Councils, Emergency Management Coordinator	EMA, Public Safety, Local Health	Local funds	Less than $10,000	Preparedness	2-3 years
Swea City-11	This measure will allow jurisdictions the option of putting into place proper ordinances and building codes to prevent or lessen the damage from hazardous events.	Public resistance; staff availability	Local cities	Public Safety	Local funds	$100,000 to $500,000	Reduction in compromised structures	2-3 years
Titonka-1	This measure will allow the jurisdiction to produce required and relevant plans that are up to date and are working documents that the community can use.	Need to use EMA's ESFs	EMA & City	None identified	Local funds	Little or No Cost	Preparedness	1 year
Titonka-2	This measure gives the jurisdiction the opportunity to produce, inform, etc. using a	Time	Local Boards and Councils, Emergency	EMA, Public Safety, Local Health	Local funds	Less than $10,000	Preparedness	2-3 years

Action ID	Issue/Background	Obstacles	Responsible Office	Partners	Potential Funding Source(s)	Cost Estimate	Benefits	Timeline
	variety of mass communication methods to inform the public and to keep them aware of the hazards that pose or could potentially pose a threat to the jurisdiction.		Management Coordinator					
Titonka-3	This measure gives the jurisdiction the means to provide the jurisdiction a plan that in the case of severe destruction a means to continue operations, who is in charge, where to set up control and command, etc.	Time, person to do it	City	EMA	Local funds	Less than $10,000	Decreased response time	1 year
Titonka-4	This measure will allow the jurisdiction to construct proper water supply, drainage and sewer systems in order to prevent infiltration of silt, soil, and other foreign materials into their supply and sewage systems causing backup into homes and businesses and to maintain proper functioning of water supply to decrease inefficiencies in those systems.	Funding	City	EMA	FEMA Grant, Local funds	$50,000 to $100,000		3-5 years
Titonka-5	This measure will allow the jurisdiction to construct safe rooms that will protect the public during extremely hazardous events, i.e., tornado, thunderstorms and lightning, severe winter storm, etc.	Funding	City	EMA	FEMA Grant, Local funds	$500,000 to $1,000,000	Reduced loss of life	More than 5 years
Titonka-6	This measure will allow the jurisdiction the option to acquire flooded properties in order to	Cost, resident willingness	City	EMA	FEMA Grant, Local funds	$100,000 to $500,000	Reduction in property loss	2-3 years

Action ID	Issue/Background	Obstacles	Responsible Office	Partners	Potential Funding Source(s)	Cost Estimate	Benefits	Timeline
	prevent the continued flooding of structures located in a flood plain or elevate structures as to not have to have the threat of repeated flooding to the subject property. This measure will allow the jurisdiction the ability to prevent damage from flash floods with additional capacity to handle large amounts of water from heavy rains.	to participate						
Titonka-7	This mitigation measure assures that a jurisdiction's critical facilities as designated by the Board of Supervisors, City Councils, Emergency Management Coordinator, Sheriff's Department, etc., have adequate backup power supply to carry on the critical mission of the jurisdictions during a disaster.	Funding	City	EMA	FEMA Grant, Local funds	$10,000 to $50,000		2-3 years
Titonka-8	This measure will allow the jurisdiction to provide a place for residents to come to get warm or cool depending on the time of year and preferably would have backup power generators due to the use of these structures during an infrastructure failure i.e. energy failure.	Funding	City	EMA	Local funds	$10,000 to $50,000		2-3 years
Titonka-9	This measure will ensure that security measures at noted critical facilities will be in place	Funding	City	Public Safety	Local funds	$50,000 to $100,000		3-5 years

Action ID	Issue/Background	Obstacles	Responsible Office	Partners	Potential Funding Source(s)	Cost Estimate	Benefits	Timeline
	to prevent damage and protect those that rely on the function of those critical facilities. This measure will also provide that training of response personnel is up to date and relevant to the disaster at hand.							
Titonka-13	Recently, FEMA and the IDNR completed an update to the Kossuth County FIRM maps. To maintain good standing with the program the City must amend floodplain regulations to reference effective date of the new maps. Effective date of the maps is 3/20/2018.	None	Administration	Public Works	FEMA Grant, Local funds	Little or No Cost	Maintain community standing with the NFIP	1 year
Wesley-1	This measure will allow the jurisdiction to produce required and relevant plans that are up to date and are working documents that the community can use.		City and all EMS	EMS, 911 EMS		Less than $10,000		Ongoing
Wesley-2	This measure gives the jurisdiction the opportunity to produce, inform, etc. using a variety of mass communication methods to inform the public and to keep them aware of the hazards that pose or could potentially pose a threat to the jurisdiction.	N/A	City	City		Less than $10,000		1 yr
Wesley-4	Sewer backup into resident basements during times of heavy rains	Identifying the issue	City Council		FEMA Grant	$100,000 to $500,000	No losses to citizens (property)	3-5 yrs
Wesley-5	Do not have a designated safe area for residents to go; do not	need to check out	City Council	Fire and EMS Depts	FEMA Grant, Local,	Less than $10,000	Safe place for residents	1 yr

Action ID	Issue/Background	Obstacles	Responsible Office	Partners	Potential Funding Source(s)	Cost Estimate	Benefits	Timeline
	have signs or communications to residents	areas, need to ensure generators work, need to have accessible						
Wesley-7	Need to ensure we have backup power for our emergency shelter	we have generator but not sure it works	City Maint.	local electricians	FEMA Grant, Local	Less than $10,000		2-3 yrs
Wesley-8	Need to ensure we have backup power for our emergency shelter	we have generator but not sure it works	City Maint.	local electricians	FEMA Grant, Local	Less than $10,000		2-3 yrs
Wesley-9	This measure will ensure that security measures at noted critical facilities will be in place to prevent damage and protect those that rely on the function of those critical facilities. This measure will also provide that training of response personnel is up to date and relevant to the disaster at hand.		Local Fire Chief + EMS Director	Fire Dept. and Wesley EMS	Local	$10,000 to $50,000		Ongoing
Wesley-11	This measure will allow jurisdictions the option of putting into place proper ordinances and building codes to prevent or lessen the damage from hazardous events.		Ongoing with City Ordinances	Wesley City Council		Less than $10,000		Ongoing
Wesley-12	Siren only faces one direction and is not heard in the north part of town	Cost	City Council	City and Local 911 board	FEMA Grant, Local	$10,000 to $50,000	Early warning for citizens	2-3 yrs
Whittemore-1	This measure will allow the jurisdiction to produce required	Need to use EMA's ESFs	EMA & City	None identified	Local funds	Little or No Cost	Preparedness	1 year

Action ID	Issue/Background	Obstacles	Responsible Office	Partners	Potential Funding Source(s)	Cost Estimate	Benefits	Timeline
	and relevant plans that are up to date and are working documents that the community can use.							
Whittemore-2	This measure gives the jurisdiction the opportunity to produce, inform, etc. using a variety of mass communication methods to inform the public and to keep them aware of the hazards that pose or could potentially pose a threat to the jurisdiction.	Time	Local Boards and Councils, Emergency Management Coordinator	EMA, Public Safety, Local Health	Local funds	Less than $10,000	Preparedness	2-3 years
Whittemore-3	This measure gives the jurisdiction the means to provide the jurisdiction a plan that in the case of severe destruction a means to continue operations, who is in charge, where to set up control and command, etc.	Time, person to do it	City	EMA	Local funds	Less than $10,000	Decreased response time	1 year
Whittemore-5	This measure will allow the jurisdiction to construct safe rooms that will protect the public during extremely hazardous events, i.e., tornado, thunderstorms and lightning, severe winter storm, etc.	Funding	City	EMA	FEMA Grant, Local funds	$500,000 to $1,000,000	Reduced loss of life	More than 5 years
Whittemore-7	This mitigation measure assures that a jurisdiction's critical facilities as designated by the Board of Supervisors, City Councils, Emergency Management Coordinator, Sheriff's Department, etc., have adequate backup power supply to carry on the critical mission of	Funding	City	EMA	FEMA Grant, Local funds	$10,000 to $50,000		2-3 years

Action ID	Issue/Background	Obstacles	Responsible Office	Partners	Potential Funding Source(s)	Cost Estimate	Benefits	Timeline
	the jurisdictions during a disaster.							
Whittemore-8	This measure will allow the jurisdiction to provide a place for residents to come to get warm or cool depending on the time of year and preferably would have backup power generators due to the use of these structures during an infrastructure failure i.e. energy failure.		Local Boards and Councils		Local	$5,000.00		
Whittemore-9	This measure will ensure that security measures at noted critical facilities will be in place to prevent damage and protect those that rely on the function of those critical facilities. This measure will also provide that training of response personnel is up to date and relevant to the disaster at hand.	Funding	City	Public Safety	Local funds	$50,000 to $100,000		3-5 years
Algona CSD-7	The schools are used as evacuation centers and possible Emergency Operations Centers. Installing backup generators in the schools will ensure they can continue to operate as critical facilities during emergencies.	Budgetary constraints	School Administration	County, Cities	Local funds	$50,000 to $100,000	Continued operations during emergencies	2-3 years
Lu Verne CSD-7	The schools are used as evacuation centers and possible Emergency Operations Centers. Installing backup generators in the schools will ensure they can	Budgetary constraints	School Administration	County, Cities	Local funds	$50,000 to $100,000	Continued operations during emergencies	2-3 years

Action ID	Issue/Background	Obstacles	Responsible Office	Partners	Potential Funding Source(s)	Cost Estimate	Benefits	Timeline
	continue to operate as critical facilities during emergencies.							
North Kossuth CSD-7	The schools are used as evacuation centers and possible Emergency Operations Centers. Installing backup generators in the schools will ensure they can continue to operate as critical facilities during emergencies.	Budgetary constraints	School Administration	County, Cities	Local funds	$50,000 to $100,000	Continued operations during emergencies	2-3 years

Table 4-4: Action Prioritization

Action ID	Mitigation Action Title / Description	Lives Saved?	Reduced Property Damages?	Reduce need for response actions?	Will benefits exceed cost?	Social	Technical	Administrative	Political	Legal	Economic	Environment	Score	Priority
		0-unlikely, 1-maybe, 2-probably, or 3-definitely				Positive (1) Neutral (0) Negative (-1)								
Kossuth County-2	Public education and awareness of all hazards	3	1	1	3	1	1	1	1	1	1	1	15	H
Kossuth County-3	Continuity of Operations Plan (COOP)	3	3	3	3	1	0	0	1	1	1	0	16	H
Kossuth County-4	Construct, retrofit, or maintain water supply, drainage, sewage, retention and detention systems to provide for the proper functioning of those systems.	2	3	1	3	1	1	1	1	1	1	1	16	H
Kossuth County-5	Construction or retrofit existing structures into public safe rooms at government facilities, recreational facilities, recreational areas, manufactured home parks, schools, day care centers, and other critical facilities	3	0	2	3	1	1	1	0	1	1	0	13	H

Action ID	Mitigation Action Title / Description	Lives Saved?	Reduced Property Damages?	Reduce need for response actions?	Will benefits exceed cost?	Social	Technical	Administrative	Political	Legal	Economic	Environment	Score	Priority
		0-unlikely, 1-maybe, 2-probably, or 3-definitely				Positive (1) Neutral (0) Negative (-1)								
Kossuth County-6	Acquire flood prone properties for conversion into green space; or elevate structures to or above base flood elevation; construction of levees, dams, and culverts to ensure adequate capacity and protection levels for property and critical facilities.	1	3	3	3	0	1	1	0	1	0	0	13	H
Kossuth County-7	Purchase/install backup power generators	1	2	3	3	1	1	1	0	1	1	1	15	H
Kossuth County-9	Install and maintain security measures at all critical facilities and training of emergency response personnel	1	1	1	1	1	1	1	0	1	0	0	8	M
Kossuth County-11	Develop and promote comprehensive, cost-effective, common sense recommendations for adoption and enforcement of land use, ordinances and regulations, zoning, and building codes that decrease risk in areas susceptible to hazards	1	2	2	2	0	1	1	0	1	0	1	11	M
Kossuth County-13	Continue to participate in NFIP	0	3	3	3	1	1	1	1	1	1	1	16	H
Algona-1	Develop/update/publicize emergency management plans, including preparedness, response recover, operations, long term recovery, and mitigation plans and maintain data inventory	2	2	1	3	1	1	1	1	1	1	1	15	H
Algona-3	Continuity of Operations Plan (COOP)	1	1	0	2	1	1	1	1	1	1	1	11	M
Algona-5	Construction or retrofit existing structures into public safe rooms at government facilities, recreational facilities, recreational areas, manufactured home parks, schools, day care centers, and other critical facilities	2	2	1	2	0	1	0	0	0	0	0	8	M

Action ID	Mitigation Action Title / Description	Lives Saved?	Reduced Property Damages?	Reduce need for response actions?	Will benefits exceed cost?	Social	Technical	Administrative	Political	Legal	Economic	Environment	Score	Priority
		0-unlikely, 1-maybe, 2-probably, or 3-definitely				Positive (1) Neutral (0) Negative (-1)								
Algona-7	Purchase/install backup power generators	0	1	0	3	1	1	1	1	1	1	1	11	M
Algona-8	Heating/Cooling Centers/Shelters	1	0	2	2	1	1	1	0	1	1	0	10	M
Algona-12	Natural resource measures to prevent the damage to critical facility functions	1	2	2	2	0	1	-1	0	0	0	1	8	M
Algona-13	Continue to participate in NFIP	0	3	3	3	1	1	1	1	1	1	1	16	H
Bancroft-1	Develop/update/publicize emergency management plans, including preparedness, response recover, operations, long term recovery, and mitigation plans and maintain data inventory	2	2	2	3	1	1	1	1	1	1	1	16	H
Bancroft-2	Public education and awareness of all hazards	3	3	3	3	1	1	1	1	1	1	1	19	H
Bancroft-3	Continuity of Operations Plan (COOP)	0	0	2	3	1	1	1	1	1	1	1	12	M
Bancroft-5	Construction or retrofit existing structures into public safe rooms at government facilities, recreational facilities, recreational areas, manufactured home parks, schools, day care centers, and other critical facilities	3	0	2	2	1	1	1	1	1	1	1	14	H
Bancroft-6	Acquire flood prone properties for conversion into green space; or elevate structures to or above base flood elevation; construction of levees, dams, and culverts to ensure adequate capacity and protection levels for property and critical facilities.	1	3	3	2	0	1	1	1	1	1	1	15	H
Bancroft-7	Purchase/install backup power generators	2	2	3	3	1	1	1	1	1	1	1	17	H
Bancroft-8	Heating/Cooling Centers/Shelters	1	0	1	2	1	0	0	0	0	0	-1	4	L

Action ID	Mitigation Action Title / Description	Lives Saved?	Reduced Property Damages?	Reduce need for response actions?	Will benefits exceed cost?	Social	Technical	Administrative	Political	Legal	Economic	Environment	Score	Priority
		0-unlikely, 1-maybe, 2-probably, or 3-definitely				Positive (1) Neutral (0) Negative (-1)								
Bancroft-9	Install and maintain security measures at all critical facilities and training of emergency response personnel	1	1	2	2	1	1	1	0	1	-1	-1	8	M
Bancroft-11	Develop and promote comprehensive, cost-effective, common sense recommendations for adoption and enforcement of land use, ordinances and regulations, zoning, and building codes that decrease risk in areas susceptible to hazards	1	1	1	1	1	1	1	0	1	1	0	9	M
Bancroft-12	Continue to participate in NFIP	0	3	3	3	1	1	1	1	1	1	1	16	H
Burt-1	Develop/update/publicize emergency management plans, including preparedness, response recover, operations, long term recovery, and mitigation plans and maintain data inventory	2	2	3	3	1	1	1	1	1	1	1	17	H
Burt-2	Public education and awareness of all hazards	2	2	2	2	1	1	1	1	1	1	1	15	H
Burt-3	Continuity of Operations Plan (COOP)	1	1	3	3	1	1	1	1	1	1	1	15	H
Burt-4	Construct, retrofit, or maintain water supply, drainage, sewage, retention and detention systems to provide for the proper functioning of those systems.	1	2	2	1	1	1	1	1	1	1	1	13	H
Burt-5	Construction or retrofit existing structures into public safe rooms at government facilities, recreational facilities, recreational areas, manufactured home parks, schools, day care centers, and other critical facilities	3	0	3	2	1	0	0	0	1	0	-1	9	M
Burt-7	Purchase/install backup power generators	2	2	3	3	1	1	1	1	1	1	1	17	H
Burt-8	Heating/Cooling Centers/Shelters	1	1	2	2	1	1	1	1	1	1	1	13	H

Action ID	Mitigation Action Title / Description	Lives Saved?	Reduced Property Damages?	Reduce need for response actions?	Will benefits exceed cost?	Social	Technical	Administrative	Political	Legal	Economic	Environment	Score	Priority
		0-unlikely, 1-maybe, 2-probably, or 3-definitely				Positive (1) Neutral (0) Negative (-1)								
Burt-9	Install and maintain security measures at all critical facilities and training of emergency response personnel	1	1	2	2	1	0	0	0	1	0	0	8	M
Burt-12	Natural resource measures to prevent the damage to critical facility functions	1	2	1	1	0	1	1	0	1	0	1	9	M
Burt-13	Water Conservation Plan	0	0	2	3	1	1	1	1	1	1	1	12	M
Fenton-1	Develop/update/publicize emergency management plans, including preparedness, response recover, operations, long term recovery, and mitigation plans and maintain data inventory	3	3	3	3	1	1	1	1	1	1	1	19	H
Fenton-2	Public education and awareness of all hazards	2	2	2	2	1	1	1	1	1	1	1	15	H
Fenton-4	Construct, retrofit, or maintain water supply, drainage, sewage, retention and detention systems to provide for the proper functioning of those systems.	1	2	2	1	1	1	1	1	1	1	1	13	H
Fenton-8	Heating/Cooling Centers/Shelters	1	1	2	2	1	1	1	1	1	1	1	13	H
Fenton-9	Install and maintain security measures at all critical facilities and training of emergency response personnel	1	1	2	2	1	0	0	0	1	0	0	8	M
Fenton-13	Auto Starting Generator for Water Plant	2	2	3	3	1	1	1	1	1	1	1	17	H
Fenton-14	Outdoor Warning System	3	1	3	2	1	1	1	1	1	0	0	14	H
Fenton-15	Continue to participate in NFIP	0	3	3	3	1	1	1	1	1	1	1	16	H
Lakota-1	Develop/update/publicize emergency management plans, including preparedness, response recover, operations, long term recovery, and mitigation plans and maintain data inventory	3	3	3	3	1	1	1	1	1	1	1	19	H
Lakota-2	Public education and awareness of all hazards	2	2	2	2	1	1	1	1	1	1	1	15	H

Action ID	Mitigation Action Title / Description	Lives Saved?	Reduced Property Damages?	Reduce need for response actions?	Will benefits exceed cost?	Social	Technical	Administrative	Political	Legal	Economic	Environment	Score	Priority
		0-unlikely, 1-maybe, 2-probably, or 3-definitely				Positive (1) Neutral (0) Negative (-1)								
Lakota-4	Construct, retrofit, or maintain water supply, drainage, sewage, retention and detention systems to provide for the proper functioning of those systems.	1	2	2	1	1	1	1	1	1	1	1	13	H
Lakota-7	Purchase/install backup power generators	2	2	3	3	1	1	1	1	1	1	1	17	H
Lakota-8	Heating/Cooling Centers/Shelters	1	1	2	2	1	1	1	1	1	1	1	13	H
Lakota-9	Install and maintain security measures at all critical facilities and training of emergency response personnel	1	1	2	2	1	0	0	0	1	0	0	8	M
Lakota-12	Natural resource measures to prevent the damage to critical facility functions	2	2	2	2	1	0	0	1	1	0	1	12	M
Lakota-13	Emergency Shelter	3	0	2	3	1	1	1	1	1	1	1	15	H
Ledyard-7	Purchase/install backup power generators	2	2	3	3	1	1	1	1	1	1	1	17	H
Lone Rock-1	Develop/update/publicize emergency management plans, including preparedness, response recover, operations, long term recovery, and mitigation plans and maintain data inventory	1	1	1	2	1	1	1	1	1	1	1	12	M
Lone Rock-2	Public education and awareness of all hazards	1	2	1	2	1	1	1	1	1	1	1	13	H
Lone Rock-9	Install and maintain security measures at all critical facilities and training of emergency response personnel	0	1	1	2	1	0	0	0	1	0	0	6	L
LuVerne-1	Develop/update/publicize emergency management plans, including preparedness, response recover, operations, long term recovery, and mitigation plans and maintain data inventory	3	3	3	3	1	1	1	1	1	1	1	19	H
LuVerne-2	Public education and awareness of all hazards	2	2	2	2	1	1	1	1	1	1	1	15	H
LuVerne-3	Continuity of Operations Plan (COOP)	1	1	3	3	1	1	1	1	1	1	1	15	H

Action ID	Mitigation Action Title / Description	Lives Saved?	Reduced Property Damages?	Reduce need for response actions?	Will benefits exceed cost?	Social	Technical	Administrative	Political	Legal	Economic	Environment	Score	Priority
		0-unlikely, 1-maybe, 2-probably, or 3-definitely				Positive (1) Neutral (0) Negative (-1)								
LuVerne-5	Construction or retrofit existing structures into public safe rooms at government facilities, recreational facilities, recreational areas, manufactured home parks, schools, day care centers, and other critical facilities	3	0	3	2	1	0	0	0	1	0	-1	9	M
LuVerne-6	Acquire flood prone properties for conversion into green space; or elevate structures to or above base flood elevation; construction of levees, dams, and culverts to ensure adequate capacity and protection levels for property and critical facilities.	2	2	2	1	1	1	0	0	1	0	0	10	M
LuVerne-7	Purchase/install backup power generators	2	2	3	3	1	1	1	1	1	1	1	17	H
LuVerne-8	Heating/Cooling Centers/Shelters	1	1	2	2	1	1	1	1	1	1	1	13	H
LuVerne-9	Install and maintain security measures at all critical facilities and training of emergency response personnel	1	1	2	2	1	0	0	0	1	0	0	8	M
LuVerne-11	Continue to participate in NFIP	0	3	3	3	1	1	1	1	1	1	1	16	H
Swea City-1	Develop/update/publicize emergency management plans, including preparedness, response recover, operations, long term recovery, and mitigation plans and maintain data inventory	3	3	3	3	1	1	1	1	1	1	1	19	H
Swea City-2	Public education and awareness of all hazards	2	2	2	2	1	1	1	1	1	1	1	15	H
Swea City-11	Develop and promote comprehensive, cost-effective, common sense recommendations for adoption and enforcement of land use, ordinances and regulations, zoning, and building codes that decrease risk in areas susceptible to hazards	1	2	2	2	0	1	1	0	1	0	1	11	M

Action ID	Mitigation Action Title / Description	Lives Saved?	Reduced Property Damages?	Reduce need for response actions?	Will benefits exceed cost?	Social	Technical	Administrative	Political	Legal	Economic	Environment	Score	Priority
		0-unlikely, 1-maybe, 2-probably, or 3-definitely				Positive (1) Neutral (0) Negative (-1)								
Titonka-1	Develop/update/publicize emergency management plans, including preparedness, response recover, operations, long term recovery, and mitigation plans and maintain data inventory	3	3	3	3	1	1	1	1	1	1	1	19	H
Titonka-2	Public education and awareness of all hazards	2	2	2	2	1	1	1	1	1	1	1	15	H
Titonka-3	Continuity of Operations Plan (COOP)	1	1	3	3	1	1	1	1	1	1	1	15	H
Titonka-4	Construct, retrofit, or maintain water supply, drainage, sewage, retention and detention systems to provide for the proper functioning of those systems.	1	2	2	1	1	1	1	1	1	1	1	13	H
Titonka-5	Construction or retrofit existing structures into public safe rooms at government facilities, recreational facilities, recreational areas, manufactured home parks, schools, day care centers, and other critical facilities	3	0	3	2	1	0	0	0	1	0	-1	9	M
Titonka-6	Acquire flood prone properties for conversion into green space; or elevate structures to or above base flood elevation; construction of levees, dams, and culverts to ensure adequate capacity and protection levels for property and critical facilities.	2	2	2	1	1	1	0	0	1	0	0	10	M
Titonka-7	Purchase/install backup power generators	2	2	3	3	1	1	1	1	1	1	1	17	H
Titonka-8	Heating/Cooling Centers/Shelters	1	1	2	2	1	1	1	1	1	1	1	13	H
Titonka-9	Install and maintain security measures at all critical facilities and training of emergency response personnel	1	1	2	2	1	0	0	0	1	0	0	8	M
Titonka-13	Continue to participate in NFIP	0	3	3	3	1	1	1	1	1	1	1	16	H

Action ID	Mitigation Action Title / Description	Lives Saved?	Reduced Property Damages?	Reduce need for response actions?	Will benefits exceed cost?	Social	Technical	Administrative	Political	Legal	Economic	Environment	Score	Priority
		0-unlikely, 1-maybe, 2-probably, or 3-definitely				Positive (1) Neutral (0) Negative (-1)								
Wesley-1	Develop/update/publicize emergency management plans, including preparedness, response recover, operations, long term recovery, and mitigation plans and maintain data inventory	3	3	3	3	1	1	1	1	1	1	1	19	H
Wesley-2	Public education and awareness of all hazards	3	3	3	3	1	1	1	1	1	1	1	19	H
Wesley-4	Construct, retrofit, or maintain water supply, drainage, sewage, retention and detention systems to provide for the proper functioning of those systems.	0	3	2	3	1	0	1	1	1	1	1	14	H
Wesley-5	Construction or retrofit existing structures into public safe rooms at government facilities, recreational facilities, recreational areas, manufactured home parks, schools, day care centers, and other critical facilities	3	0	1	3	1	1	1	1	0	1	0	12	M
Wesley-7	Purchase/install backup power generators	3	0	3	3	1	1	1	1	0	1	1	15	H
Wesley-8	Heating/Cooling Centers/Shelters	3	0	3	3	1	1	1	1	0	1	1	15	H
Wesley-9	Install and maintain security measures at all critical facilities and training of emergency response personnel	3	3	3	3	1	1	1	1	1	1	1	19	H
Wesley-11	Develop and promote comprehensive, cost-effective, common sense recommendations for adoption and enforcement of land use, ordinances and regulations, zoning, and building codes that decrease risk in areas susceptible to hazards	3	3	3	3	1	1	1	1	1	1	1	19	H
Wesley-12	Tornado Siren Upgrade	3	1	3	3	1	1	1	1	1	1	1	17	H

Action ID	Mitigation Action Title / Description	Lives Saved?	Reduced Property Damages?	Reduce need for response actions?	Will benefits exceed cost?	Social	Technical	Administrative	Political	Legal	Economic	Environment	Score	Priority
		0-unlikely, 1-maybe, 2-probably, or 3-definitely				Positive (1) Neutral (0) Negative (-1)								
Whittemore-1	Develop/update/publicize emergency management plans, including preparedness, response recover, operations, long term recovery, and mitigation plans and maintain data inventory	3	3	3	3	1	1	1	1	1	1	1	19	H
Whittemore-2	Public education and awareness of all hazards	2	2	2	2	1	1	1	1	1	1	1	15	H
Whittemore-3	Continuity of Operations Plan (COOP)	1	1	3	3	1	1	1	1	1	1	1	15	H
Whittemore-5	Construction or retrofit existing structures into public safe rooms at government facilities, recreational facilities, recreational areas, manufactured home parks, schools, day care centers, and other critical facilities	3	0	3	2	1	0	0	0	1	0	-1	9	M
Whittemore-7	Purchase/install backup power generators	2	2	3	3	1	1	1	1	1	1	1	17	H
Whittemore-8	Heating/Cooling Centers/Shelters	1	1	2	2	1	1	1	1	1	1	1	13	H
Whittemore-9	Install and maintain security measures at all critical facilities and training of emergency response personnel	1	1	2	2	1	0	0	0	1	0	0	8	M
Algona CSD-7	Purchase/install backup power generators	1	0	1	3	1	1	1	1	1	1	0	11	M
Lu Verne CSD-7	Purchase/install backup power generators	1	0	1	3	1	1	1	1	1	1	0	11	M
North Kossuth CSD-7	Purchase/install backup power generators	1	0	1	3	1	1	1	1	1	1	0	11	M

5 Plan Maintenance Process

This chapter provides an overview of the overall strategy for plan maintenance and outlines the method and schedule for monitoring, updating and evaluating the plan. The chapter also discusses incorporating the plan into existing planning mechanisms and how to address continued public involvement.

5.1 Monitoring, Evaluating, and Updating the Plan

44 CFR Requirement 201.6(c)(4): The plan maintenance process shall include a section describing the method and schedule of monitoring, evaluating, and updating the mitigation plan within a five-year cycle.

5.1.1 Hazard Mitigation Planning Committee (HMPC)

With adoption of this plan, the HMPC will continue to be tasked with plan monitoring, evaluation and maintenance. The participating jurisdictions and agencies, led by the Kossuth 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 Kossuth County Board of Supervisors and governing bodies of participating jurisdictions; and
- Inform and solicit input from the public.

The HMPC is an advisory body and can only make recommendations to county, city, 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.

5.1.2 Plan Maintenance Schedule

The HMPC agrees to meet annually to monitor progress, discuss recent hazard events and changes in development that impact vulnerability, and update the mitigation strategy. The Kossuth County Emergency Management Coordinator will be responsible for initiating the plan reviews.

In coordination with the other participating jurisdictions, a written update of the plan will be submitted to the Iowa Homeland Security and Emergency Management Department and FEMA Region VII for review and adoption within the five-year cycle per Requirement §201.6(c)(4)(i) of the Disaster Mitigation Act of 2000, unless disaster or other circumstances (e.g., changing regulations) require a change to this schedule.

5.1.3 Plan Maintenance Process

Evaluation of progress can be achieved by monitoring changes in vulnerabilities identified in the plan. Changes in vulnerability can be identified by noting:

- Decreased vulnerability as a result of implementing recommended actions,
- Increased vulnerability as a result of failed or ineffective mitigation actions, and/or
- Increased vulnerability as a result of new development (and/or annexation).

The annual reviews and updates to this plan will:

- Consider changes in vulnerability due to action implementation,
- Document success stories where mitigation efforts have proven effective,
- Document areas where mitigation actions were not effective,
- Document any new hazards that may arise or were previously overlooked,
- Incorporate new data or studies on hazards and risks,
- Incorporate new capabilities or changes in capabilities,
- Incorporate growth and development-related changes to inventories, and
- Incorporate new action recommendations or changes in action prioritization.

In order 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.
- As part of the annual review process, the Kossuth County Emergency Management Coordinator will provide the updated Mitigation Strategy with the current status of each mitigation action to the County Board of Supervisors and County Department Heads as well as all Mayors, City Clerks, and

School District Superintendents requesting that the mitigation strategy be incorporated, where appropriate in other planning mechanisms.

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 Kossuth County HMPC deems appropriate and necessary, and as approved by the Kossuth County Board of Supervisors and the governing boards of the other participating jurisdictions.

5.2 Incorporation into Existing Planning Mechanisms

44 CFR Requirement §201.6(c)(4)(ii): [The plan shall include a] process by which local governments incorporate the requirements of the mitigation plan into other planning mechanisms such as comprehensive or capital improvement plans, when appropriate.

Many of the small jurisdictions in Kossuth County do not have standing formal planning mechanisms such as a Comprehensive Plan or Capital Improvements Plan through which formal integration of mitigation actions can be documented. As a result, activities that occur in these small communities are developed through annual budget planning, regular City Council Meetings and other community forums rather than a formal planning process. Planning mechanisms that do exist to some degree within the participating jurisdictions include:

- Comprehensive Plans;
- Various ordinances of participating jurisdictions, including floodplain management ordinances in NFIP-participating communities;
- Kossuth County Emergency Operations Plan; and
- Capital Improvement Plans

For a detailed summary of planning mechanisms and other mitigation-related capabilities, see Chapter 2.

5.2.1 Incorporation of Updated Hazard Mitigation Plan into Existing Planning Mechanisms

Where possible, plan participants will use existing plans and/or programs to implement hazard mitigation actions. After the annual review of the Hazard Mitigation Plan, the Kossuth County Emergency Management Coordinator will provide the updated Mitigation Strategy with the current status of each mitigation action to the County Board of Supervisors and County Department Heads as well as all Mayors, City Clerks, and School District Superintendents requesting that the mitigation strategy be incorporated, where appropriate in other planning mechanisms.

Table 5-1 Provides additional details on each jurisdiction regarding how the *2013 Hazard Mitigation Plan* was integrated into existing planning mechanisms as well as the strategy going forward to integrate this plan update into existing planning mechanisms.

Table 5-1: Integration of Previous Plan and Strategies to Integrate Plan Update

Jurisdiction	Incorporation of 2013 Plan into Existing Planning Mechanisms	Integration Process for Plan Update
Unincorporated County	Plan was used when updating ESF and other plans	Plan will be used in planning of ordinances, and will be integrated into Comprehensive Plan, CIP, county infrastructure plan, and school infrastructure and emergency plans
City of Algona	Did not occur	Mitigation actions will be reviewed during budget preparation and incorporated into CIP and infrastructure improvement plans
City of Bancroft	Did not occur	Plan will be incorporated into future capital improvement through Capital Improvement Plan
City of Burt	Plan was incorporated into emergency support functions	Plan will be reviewed yearly and incorporated into Capital Improvement Plan
City of Fenton	Did not occur	Plan will be incorporated into Capital Improvement Plan; will be reviewed when planning for capital improvements to water plant
City of Lakota	Did not occur	Will look at plan to incorporate possible new ideas of keeping people safe; will incorporate into city infrastructure plan
City of Ledyard	Not reported	Not reported
City of Lone Rock	Some of the projects were completed outside the plan for emergency response, disaster recovery, etc.	It will be intertwined with any other improvement to infrastructure, etc. Plan will be maintained and incorporated into Comprehensive Plan.
City of Lu Verne	Did not occur	Plan will be incorporated into Comprehensive Plan, CIP, ESF, and infrastructure plan.
City of Swea City	Unsure if incorporated occurred	Plan will be incorporated into Comprehensive Plan, CIP, and infrastructure plan, and plan findings will help organize future action
City of Titonka	Did not occur	The City does not have any formal planning mechanisms to integrate the plan with
City of Wesley	Plan was used to inform grant funded project for storm sewer system berm through town to mitigate flooding	Will use plan to move forward on second half of sewer back up issues; Plan will be integrated with city infrastructure plan
City of Whittemore	Plan used to inform purchase of property in flood prone areas	Plan will be incorporated into Comprehensive Plan, CIP, ESF, and infrastructure plan.
Algona School District	Did not occur	Plan will be incorporated into school infrastructure plan and used to inform creation of safe rooms if new gym space or classroom space is built
Lu Verne School District	Not reported	Not reported
North Kossuth School District	Not reported	Not reported

5.3 Continued Public Involvement

44 CFR Requirement §201.6(c)(4)(iii): [The plan maintenance process shall include a] discussion on how the community will continue public participation in the plan maintenance process.

The public will be involved in the plan maintenance process by publication of a press release after each annual review indicating the committee has met and providing a summary of mitigation action status updates and highlights of specific completed mitigation actions, as applicable. The public will be invited to provide comments on HMPC meeting outcomes and/or attend HMPC meetings.

The update process provides an opportunity to publicize success stories from the plan's implementation and seek additional public comment. 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 notices will be posted through available website postings, community message boards, and social media outlets.

APPENDIX A: REFERENCES

- Coalition to Support Iowa's Farmers
- Des Moines Register News Data Central
- Environmental Protection Agency, heat-related deaths
- Environmental Protection Agency, Surf Your Watershed
- Federal Emergency Management Agency, BCA Reference Guide, 2009
- Federal Emergency Management Agency, Community Status Book
- Federal Emergency Management Agency, National Flood Hazard Layer
- Federal Emergency Management Agency, Presidential Disaster Declarations
- Federal Emergency Management Agency, Taking Shelter from the Storm, 3rd Edition
- Federal Emergency Management Agency, Kossuth County Flood Insurance Study (2016-Preliminary)
- Flood Insurance Administration, Policy and Loss Statistics
- Hazards US MH 2.2 (HAZUS)
- Hazards US MH 4.0 (HAZUS)
- Hazards Vulnerability Research Institute, Social Vulnerability Index
- High Plains Regional Climate Center
- Iowa Communications Network
- Iowa Department of Agriculture and Land Stewardship, Division of Soil Conservation
- Iowa Department of Agriculture and Land Stewardship, Pesticide Bureau - Sensitive Crop Registry
- Iowa Department of Agriculture, Agricultural Statistics bulletin
- Iowa Department of Education, Bureau of Planning, Research and Evaluation
- Iowa Department of Natural Resources, Animal Feeding Operations
- Iowa Department of Natural Resources, Dam Safety Program
- Iowa Department of Natural Resources, NPDES
- Iowa Department of Natural Resources, NRGIS Library
- Iowa Department of Public Health Center for Acute Disease Epidemiology
- Iowa Department of Transportation’s Office of Traffic and Safety
- Iowa Homeland Security and Emergency Management Department
- Iowa State Hazard Mitigation Plan, 2013
- Iowa State University, College of Agriculture and Life Sciences
- Iowa State University, Department of Agronomy, Environmental Mesonet
- Iowa State University, Extension Office, Distribution of Ash Trees in Iowa
- Karl, T.R., J.M. Melillo, and T.C. Peterson (eds). 2009. Global Climate ChangeImpacts in the United States. U.S. Global
- Kossuth County Conservation Board

- Kossuth County, Iowa Multi-Jurisdictional Hazard Mitigation Plan, 2013
- Midwestern Regional Climate Center
- National Drought Mitigation Center, U.S. Drought Monitor & Drought Impact Reporter
- National Inventory of Dams
- National Oceanic and Atmospheric Administration, Storm Prediction Center
- National Oceanic and Atmospheric Administration, National Climatic Data Center
- National Park Service, National Register of Historic Places
- National Severe Storms Laboratory
- National Transportation Safety Board
- National Weather Service
- New York Times.com, Water Supply Systems
- Pipeline and Hazardous Materials Safety Administration
- Stanford University, National Performance of Dams Program
- Tornado and Storm Research Organization (TORRO), Department of Geography, Oxford Brooks University
- TornadoChaser.net
- TornadoHistoryProject.com
- U.S. Army Corps of Engineers, Cold Regions Research and Engineering Laboratory
- U.S. Army Corps of Engineers, National Inventory of Dams
- U.S. Army Corps of Engineers, National Levee Database
- U.S. Census Bureau, American Community Survey, 5-Year Estimates, 2016
- U.S. Census Bureau, Building Permit Data
- U.S. Census Bureau, Decenniel Census, 2000, 2010
- U.S. Census Bureau, Population Estimates, 2016
- U.S. Department of Agriculture Cropland Data Layer (CropScape)
- U.S. Department of Agriculture National Agricultural Statistics Service, 2012 Census of Agriculture
- U.S. Department of Agriculture, Emerald Ash Borer County Detection Map
- U.S. Department of Agriculture, Risk Management Agency Crop Insurance Statistics
- U.S. Department of Agriculture, Secretarial Disaster Declarations
- U.S. Department of Transportation
- U.S. Fish and Wildlife Service, Threatened and Endangered Species
- U.S. Geological Survey
- University of Nebraska, National Drought Mitigation Center
- University of Wisconsin-Madison, Department of Forest Ecology and Management, SILVIS Lab

APPENDIX B: PLANNING PROCESS

The following materials are provided to document the planning process:

B.1 KOSSUTH COUNTY HAZARD MITIGATION PLANNING COMMITTEE (HMPC) MEMBERS

Jurisdictional and Stakeholder Representatives that Attended Meetings

Name		Title	Department	Jurisdiction/Organization
Rick	Adams	Buildings and Grounds	Algona CSD	Algona CSD
Philip	Albers		North Kossuth School	North Kossuth School
Michael	Bierstedt			Fenton
Brian	Blodgett		Buffalo Center FD	North Iowa Community School
Aaron	Boyken	Mayor		Titonka
Sharon	Corwin	Mayor	City of Ledyard	Ledyard
Ron	Covert	Director	Algona Public Works	Algona
John	Crookshank	Fire Chief	Swea City Fire Department	Swea City
Doug	Crouch		Kossuth County Secondary Roads	Kossuth County
Kelly	Fitzgerald			Burt
Marty	Fonley	Superintendent	Algona CSD	Algona CSD
Sue	Golwitzer	Mayor-Pro Tem	City Council	Wesley
Eric	Goodman	Fire Chief	Whittemore Fire Department	Whittemore
Karen	Hamilton			Titonka
Ryan	Harms			Fenton
Jordan	Jahnke			Burt
Royce	Jameson			Lakota
Jim	Kelly			
Richard	Knoll		Fenton Public Works	Fenton
Steve	Kollasch	Sheriff	Kossuth County Sheriff's Office	Kossuth County
Edward	Krause	Councilperson	Fenton City Council	Fenton
Don	McGregor	BOS	kossuth County	Kossuth County
Nick	McGuire		Burt Fire Department	Burt
Doug	Miller		Engineer	Kossuth County
Alan	Miller	Mayor	Burt	Burt
Merrill	Mueller	Transportation Director	Algona CSD	Algona CSD
Chrysti	Neuman			Bancroft
Dave	Newbrough			Lone Rock
Kendall	Pals	Chief of Police	Algona Police Department	Algona
David	Penton	Coordinator	Kossuth County Emergency Management	Kossuth County
Cory	Rasch	FD	Bancroft FD	Bancroft

Name		Title	Department	Jurisdiction/Organization
Luke	Schneider	GIS Coordinator	Kossuth County	Kossuth County
Rhonda	Sexton		Kossuth Regional Health Center	
Debra	Steven	Councilperson	Lakota City Council	Lakota
Chris	Stevens			North Kossuth Community School
Jerry	Thompson	Mayor	City of Lone Rock	Lone Rock
Angie	Thompson	City Clerk	City of Lone Rock	Lone Rock
Stacy	Thompson	Director	Kossuth County HR/Safety	Algona
Roger	Tjarks			Titonka
David	Trunkhill	Fire Chief	Titonka Fire Department	Titonka
Bill	Weisbrod	Council Member	City Council	Lone Rock
Alicia	Wolterman			Swea City
Pat	Wymore		Kossuth County Supervisors	Kossuth County

Stakeholder Representatives Invited to Provide Comments

Name		Title	Agency	Type
Tony	Loeser	Water Resources Engineer	Iowa State University, Iowa Flood Center	Academia
Andy	Buffington	Emergency Management Coordinator	Winnebago County EM	Adjacent County
Andy	Buffington	Emergency Management Coordinator	Hancock County EM	Adjacent County
Melody	Larson	Emergency Management Coordinator	Humboldt County EM	Adjacent County
Mark	Hunefeld	Emergency Management Coordinator	Palo Alto County EM	Adjacent County
Travis	Sheridan	Emergency Management Coordinator	Emmet County EM	Adjacent County
Erin	Morrill	Emergency Management Director	Martin County, Minnesota EM	Adjacent County
Lisa	Frommie	Emergency Management Director	Faribault County, Minnesota EM	Adjacent County
Brian	Blodgett		North Iowa Community School District	School District
Brian	Blodgett	Fire Chief	Buffalo Center Fire Department	Fire Department
Dar	Elbert	Assistant Administrator	Kossuth Regional Health Center	Hospital
Tom	Taylor		EPA/Water Resources Protection Branch	Federal Agency
Joe	Chandler		FEMA Region VII	Federal Agency
Jeff	Johnson		NWS	Federal Agency
Jeff	Zogg		NWS	Federal Agency
Andrew	Leichty		USCOE Rock Island District	Federal Agency
Steve	Russell		USCOE Rock Island District	Federal Agency
Jerry	Skalak		USCOE Rock Island District	Federal Agency
Rob	Middlemis-Brown		USGS	Federal Agency
Terry	Jensen		Dept of Ag & Land Stewardship	State Agency
Scott	Ralston	Floodplain Mapping Coordinator	DNR	State Agency
Casey	Welty	Dam Safety Engineer	DNR, Dam Safety Program	State Agency
Gail	Kantak	Wildland Fire Supervisor	DNR-Forestry	State Agency
Aimee	Bartlett	State Hazard Mitigation Officer	Iowa Homeland Security and Emergency Management	State Agency
Terry	Brown	GIS Coordinator	Iowa Homeland Security and Emergency Management	State Agency
Jim	Marwedel	Mitigation Planner	Iowa Homeland Security and Emergency Management	State Agency
Jennifer	Jones	Project Officer	Iowa Homeland Security and Emergency Management	State Agency
Jessica	Turba	Planner	Iowa Homeland Security and Emergency Management	State Agency

B.2 KICK-OFF MEETING INVITE

Subject: Kossuth County Hazard Mitigation Plan Kickoff Meeting - PLEASE NOTE NEW DATE
Location: Skype Meeting

Start: Wed 8/23/2017 6:00 PM
End: Wed 8/23/2017 8:00 PM

Recurrence: (none)

Meeting Status: Meeting organizer

Organizer: Karsjen, Kyle
Required Attendees: Bestgen, Laurie; Brislawn, Jeff P; Pluss, Madeleine; Curt Wiseman; kpals@kcso.net; 'David Penton'; Steve Kollasch; Ron Covert; Doug Miller; Derek J. Olson; Monica Diggins; Brian Blodgett; Chuck Bell; Dave McPeak; David Trunkhill; Eric Goodman; Jerry Thompson; John Cowin; Matt Duve; Mike Doocy; Nick McGuire; Randy Draper; Ray Ludwig; Richard Knoll; Brian Spry, Burt FR; David Reding; Deb Steven, Lakota; Doris Blocker; Gary Merrill, Algona EMS; Hilary Beenken; Kelly Deitering; Phil Albers, Swea City Ambulance; Sue Golwitzer; Brian Goodman; Corey Rasch (corey@heartlandmutual.com); Don Besch; Don McGregor; John Crookshank; Lynn Kueck; Lynn Kueck (lynn.kueck@ci.algona.ia.us); Monica Preuschel; Nick McGuire; Richard Knoll; Troy Armstrong; Aaron Boyken; Alan Miller; 'cowin@iowatelcom.net'; Dan Elbert; Dennis Holmes; Doug Price; Supervisors; Tom Johnson (johnstw73@gmail.com); Marwedel, Jim; aimee.bartlett@iowa.gov; te.brown@iowa.gov; dcrouch@co.kossuth.ia.us
Optional Attendees: Gary Merrill; Eric Goodman; Brian Blodgett; Luke Snyder; Melissa Arndorfer; Stacy Thompson; Lisa Sewell; Steve Anderson; Charissa R. Mueller; Dona Nielsen; Nick Roethler

Kossuth County Hazard Mitigation Planning Committee,

You should have received an email from David Penton, Kossuth County Emergency Management Coordinator inviting you to participate in the hazard mitigation planning process; this email included the original kickoff meeting date of August 2nd. Due to low confirmed meeting attendance, we are going to push the meeting back a couple of weeks in order to better accommodate your schedules. **The kickoff meeting for the Kossuth County Hazard Mitigation Planning Committee will now be held August 23rd from 7-9 PM CST.**

The meeting will be held over Skype; Kossuth County Emergency Management will also host a centralized location where group members can get together and participate in the call. Information on this site will be added to this invite once information is available.

Below is the information for connecting to the webinar to kick off the hazard mitigation planning process for Kossuth County. **It is important to ensure that your jurisdiction is represented on this call as meeting participation is required for jurisdictions to be included in the plan.** If you are unable to attend this webinar, please forward this invite to an alternate.

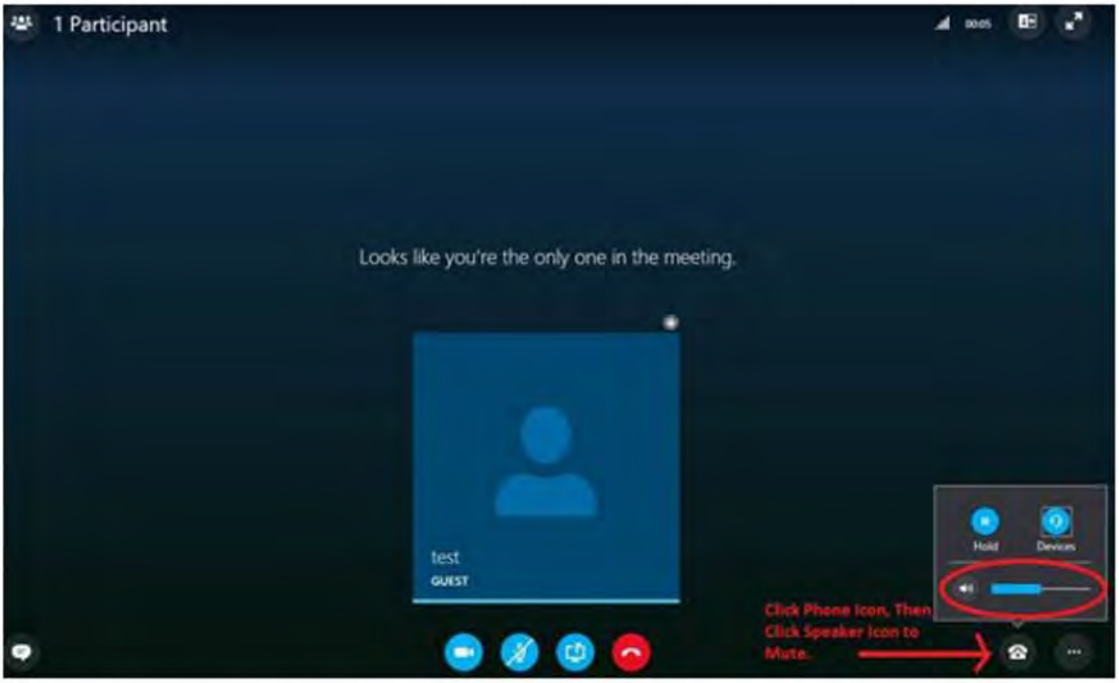
How to Access the Webinar from Your Computer

At meeting time, please click on the 'Join Skype Meeting' to link to the presentation **(located at the end of this email)**. In addition, call in to the meeting using the toll-free number listed below. Please mute your

phones.

Please log in early to ensure that you can join the webinar. If you have trouble joining, please click the *Try Skype Web App*; you will have to download the app plug in. Once you join the meeting, please type your name, the jurisdiction you represent and your title or role in the Guest Name Box.

You will need to mute your computer in two ways, one by actually muting your computer speakers and the other by muting your speaker in the Skype Conference. I have added a picture to show where mute is in the conference.



I will update this invitation with the meeting materials before the meeting, including a copy of the presentation if you aren't able to access Skype. If you have any questions, please let me or David Penton know. Thanks, and I look forward to kicking off this process with you on the 23rd.

Kyle

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B.3 KICK-OFF MEETING AGENDA

B.4 KICKOFF MEETING MINUTES

To	**Kossuth County Hazard Mitigation Planning Committee**
Through	**David Penton, Emergency Management Coordinator**
From	**Kyle Karsjen, Amec Foster Wheeler**
Date	**9/7/2017**
Subject	**Minutes from Kossuth County Hazard Mitigation Planning Kickoff Meeting held on 8/23/2017**

This document is a record of attendance and a summary of the issues discussed during the above meeting. The presentation began with an introduction to the purpose of hazard mitigation planning, grant programs linked to an approved plan, and the benefits of a multi-jurisdictional approach. The hazard mitigation planning process was reviewed to include requirements for participation and public involvement and the use of data collection guides. The planning committee participated in a discussion of the hazards that have the potential to impact Kossuth County. The hazard ranking method adopted by Iowa Homeland Security and Emergency Management for the 2013 State Hazard Mitigation Plan was introduced and the sources for compiling a GIS layer of critical facilities were discussed. The meeting concluded with a discussion of the next steps in the planning process.

The meeting was held over Skype Webinar/Conference Call from 7:00 pm to 8:00 pm CST.

Note: Copies of all meeting materials are available through the project's box.com account located at https://amec.app.box.com/v/Kossuth-CO-IA

Attendees

Name	Jurisdiction	Organization	Title
Aaron Boykin	Titonka	City	Mayor
Elaine Davis	Bancroft	Bancroft EMS	
Brian Blodgett	North Iowa Community School	North Iowa Community School	
Dar Elbert		Kossuth Regional Health Center	Assistant Administrator/CNO
Doug Miller	Kossuth County		
Eric Goodman	Whittemore	Whittemore Fire Department	Fire Chief
David Trunkhill	Titonka	Titonka Fire Department	Fire Chief
Edward Krause	Fenton	City Council	Councilperson
Rachael K	Fenton	Public Works	
Sue Golwitzer	Wesley	City	Mayor Pro-Tem
Jerry Thompson	Lone Rock	City	Mayor
Angie Thompson	Lone Rock	City	City Clerk
Debra Steven	Lakota	City Council	Councilperson
Philip Albers	North Kossuth School Swea City	North Kossuth School	
John Crookshank	Swea City	Swea City Fire Department	Fire Chief
Nick McGuire	Burt	Burt Fire Department	
Kendall Pals	Algona	Police Department	Chief of Police
Doug Crouch	Algona	Kossuth County Secondary Roads	
Ron Covert	Algona	Public Works	Director
Stacy Thompson	Kossuth County	HR/Safety	Director
David Penton	Kossuth County	Emergency Management	Coordinator
Steve Kollasch	Kossuth County	Sheriff's Office	Sheriff
Kyle Karsjen	N/A	Amec Foster Wheeler	Planner

Page 1

Introductions

The meeting began with a welcome and thank you to all attendees for calling in. Kyle asked all attendees to either sign in to the sign in sheet at the emergency management office, or to send an email to kyle.karsjen@amecfw.com acknowledging attendance.

Kyle introduced himself; Amec Foster Wheeler is the consulting firm selected through a state-managed project to develop or update local hazard mitigation plans for 11 counties in Iowa, including the update for Kossuth County. The first meeting was done via webinar; meetings 2 and 3 will be held on-site in Kossuth County.

Hazard Mitigation Planning Purpose

Mr. Karsjen presented information on the purpose of Hazard Mitigation Planning and the Disaster Mitigation Act of 2000. The attendees were reminded this is an update of the Kossuth County Hazard Mitigation Plan, previously approved in 2013. A summary of the 14 Presidential Disaster Declarations including Kossuth County since 1965 was presented.

Grant Programs Linked to Approved Plan

Mr. Karsjen briefly discussed the FEMA Hazard Mitigation Assistance grants that require participation in an approved Hazard Mitigation Plan for jurisdictions to be eligible to apply. These include: Hazard Mitigation Grant Program, Pre-Disaster Mitigation Program, and Flood Mitigation Assistance Program. All programs are available for jurisdictions covered under an approved Hazard Mitigation Plan.

Multi-Jurisdictional Approach

An overview of the 9 Planning Tasks that will be followed during the planning process was given and Mr. Karsjen addressed the benefits for jurisdictions participating in this mitigation plan update including improved coordination and communication among local jurisdictions. Impacts of hazards do not stop at jurisdictional boundaries. This multi-jurisdictional approach allows for a more comprehensive risk assessment and resulting mitigation strategy for the entire planning area. The following jurisdictions have been invited to participate as "official participants" in the Kossuth County Multi-Jurisdictional Hazard Mitigation Plan Update:

- Unincorporated Kossuth County
- Algona
- Bancroft
- Burt
- Fenton
- Lakota
- Ledyard
- Lone Rock
- Lu Verne
- Swea City
- Titonka
- Wesley
- Whittemore
- Algona Community School District
- Lu Verne Public School District
- North Kossuth Community School District

Mr. Karsjen also described the role of the HMPC. Each jurisdiction participating in development of the plan must meet the following minimum requirements:

- Designate a representative to serve on the Kossuth County HMPC, which will meet **three** times during the planning process;
- Provide data for and assist in the development of the updated risk assessment that describes how various hazards impact your jurisdiction;
- Provide data to describe current capabilities;

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- Develop/update mitigation actions (at least one) specific to your jurisdiction;
- Provide comments on plan drafts as requested;
- Inform the public, local officials, and other interested parties about the planning process and provide opportunities for them to comment on the plan; and
- Formally adopt the mitigation plan.

Jurisdictions that choose not to participate in development of a FEMA-approved mitigation plan **will not** be eligible applicants for FEMA Hazard Mitigation Assistance Grants.

Planning for Public Involvement

The local hazard mitigation plan requirements state that the public needs to have the opportunity to comment on the plan. The public will be given two opportunities to comment on the plan, once during the drafting stage and another when the plan is complete in the final draft stage.

A survey has been created to both provide information about the plan update under development as well as gain input from the public on the hazards they are most concerned about and mitigation strategies that they think will be most effective. This was shared with the attendees.

The survey will be placed in hard copy at identified locations throughout the county. Planning Committee Jurisdictional representatives will ensure copies of the survey are available as well as periodically gather completed surveys and send to David Penton. The survey will also be available on SurveyMonkey.com at https://amec.app.box.com/v/Kossuth-CO-IA. David Penton will coordinate a press release to announce availability of the survey; a copy is attached so that jurisdictions can use it to publicize the survey. The survey will remain open until October 30th.

Data Collection Process

Amec Foster Wheeler provided electronic files of the Data Collection Guides prior to the meeting via email. (these documents are also available through the box.com link at https://amec.app.box.com/v/Kossuth-CO-IA). For your convenience, a copy is also attached to this email. The guides are specific for local units of government and schools. So, please be sure to complete the appropriate guide.

The Data Collection Guide is designed to collect information on existing capabilities within each jurisdiction to implement mitigation initiatives as well as collect information on previous hazard events. For the hazards that were included in the 2013 plan, information is especially needed for the events that have occurred from 2013 to the present. For hazards not included in the 2013 plan, all known previous events are needed.

Deadline for submittal of the Data Collection Guides to Amec Foster Wheeler is September 15, 2017

Discussion/Prioritization of Hazards

Mr. Karsjen presented initial research information on the 20 hazards included in the 2013 State Hazard Mitigation Plan that have the potential to impact Kossuth County; Kyle also identified which hazards were profiled in the previous county plan. Details of the information provided are in the PowerPoint presentation which can be obtained at https://amec.app.box.com/v/Kossuth-CO-IA.

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Mr. Karsjen discussed information about the hazard profiles in the plan and introduced the HMPC to the elements of probability, magnitude, warning time, and duration to rank the hazards. The table below provides additional information on the elements and rating levels.

Element/Level	Characteristics
Probability	
4 – Highly Likely	Event is probable within the calendar year. Event has up to 1 in 1 year chance of occurring (1/1=100%) History of events is greater than 33% likely per year. Event is "Highly Likely" to occur
3 – Likely	Event is probable within the next three years. Event has up to 1 in 3 years chance of occurring (1/3=33%) History of events is greater than 20% but less than or equal to 33% likely per year. Event is "Likely" to occur
2 – Occasional	Event is probable within the next five years. Event has up to 1 in 5 years chance of occurring (1/5=20%) History of events is greater than 10% but less than or equal to 20% likely per year. Event could "Possibly" occur
1 – Unlikely	Event is possible within the next 10 years. Event has up to 1 in 10 years chance of occurring (1/10=10%) History of events is less than or equal to 10% likely per year. Event is "Unlikely" but is possible of occurring
Magnitude / Severity	
4 - Catastrophic	Multiple deaths Complete shutdown of facilities for 30 or more days More than 50 percent of property is severely damaged
3 – Critical	Injuries and/or illnesses result in permanent disability Complete shutdown of critical facilities for at least two weeks 25–50 percent of property is severely damaged
2 – Limited	Injuries and/or illnesses do not result in permanent disability Complete shutdown of critical facilities for more than one week 10–25 percent of property is severely damaged
1 – Negligible	Injuries and/or illnesses are treatable with first aid Minor quality of life lost Shutdown of critical facilities and services for 24 hours or less Less than 10 percent of property is severely damaged
Warning Time	
4	Less Than 6 Hours
3	6-12 Hours
2	12-24 Hours
1	24+ Hours
Duration	
4	More Than 1 Week
3	Less Than 1 Week
2	Less Than 1 Day
1	Less Than 6 Hours

These elements are used in the 2013 Iowa State Hazard Mitigation Plan to determine a final Hazard Assessment Score for each hazard. The score provides a hazard ranking mechanism as well as a planning significance rating, to focus planning efforts on those hazards with the highest scores. Using the ranking described in the table above, the formula used to determine each hazard's score, which includes weighting factors defined by the State of Iowa's Hazard Mitigation Plan is:

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

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The scores for each element may be revised throughout the course of the risk assessment update based on additional information. Additionally, individual hazard ranking scores will be developed for each participating jurisdiction to demonstrate how hazards vary among jurisdictions. The revised planning area hazard ranking results and results for each participating jurisdiction will be available for comment in the draft risk assessment.

If the decision to exclude any of the 20 hazards form further review in the plan due to lack of risk/non-occurrence in the county, the HMPC will be notified and the plan update will provide justification for exclusion. Candidates for exclusion are hazards that weren't included in the previous plan, as well as any hazards that do not have any previous occurrences or known risk areas.

Critical Facilities

Mr. Karsjen explained that the Risk Assessment will include information on critical facilities for each jurisdiction. An inventory of the critical facilities will be developed from GIS layers available from Kossuth County, the Iowa Department of Natural Resources as well as a national Homeland Security database of critical facilities.

Next Steps

Attendees were asked to complete their jurisdiction's Data Collection Guide by September 15th, 2017. Please return these to David Penton, or to Kyle Karsjen at kyle.karsjen@amecfw.com.

Two more on-site meetings will be conducted as part of this process. The next meeting will center around the preliminary results of the hazard identification and risk assessment, as well as reviewing and updating goal statements for the plan. Status updates of previous mitigation actions will also be discussed. **The 2nd meeting will be held on October 11, 2017 from 7-9 PM CST.** The meeting location is still to be determined; a full invite will be sent once meeting details have been established.

The third meeting of the planning process will involve a continued discussion of the mitigation strategies, including development of new actions and action plans for continuing and new actions. This meeting is targeted for some time in November. Additional details on this meeting will be provided at a later date.

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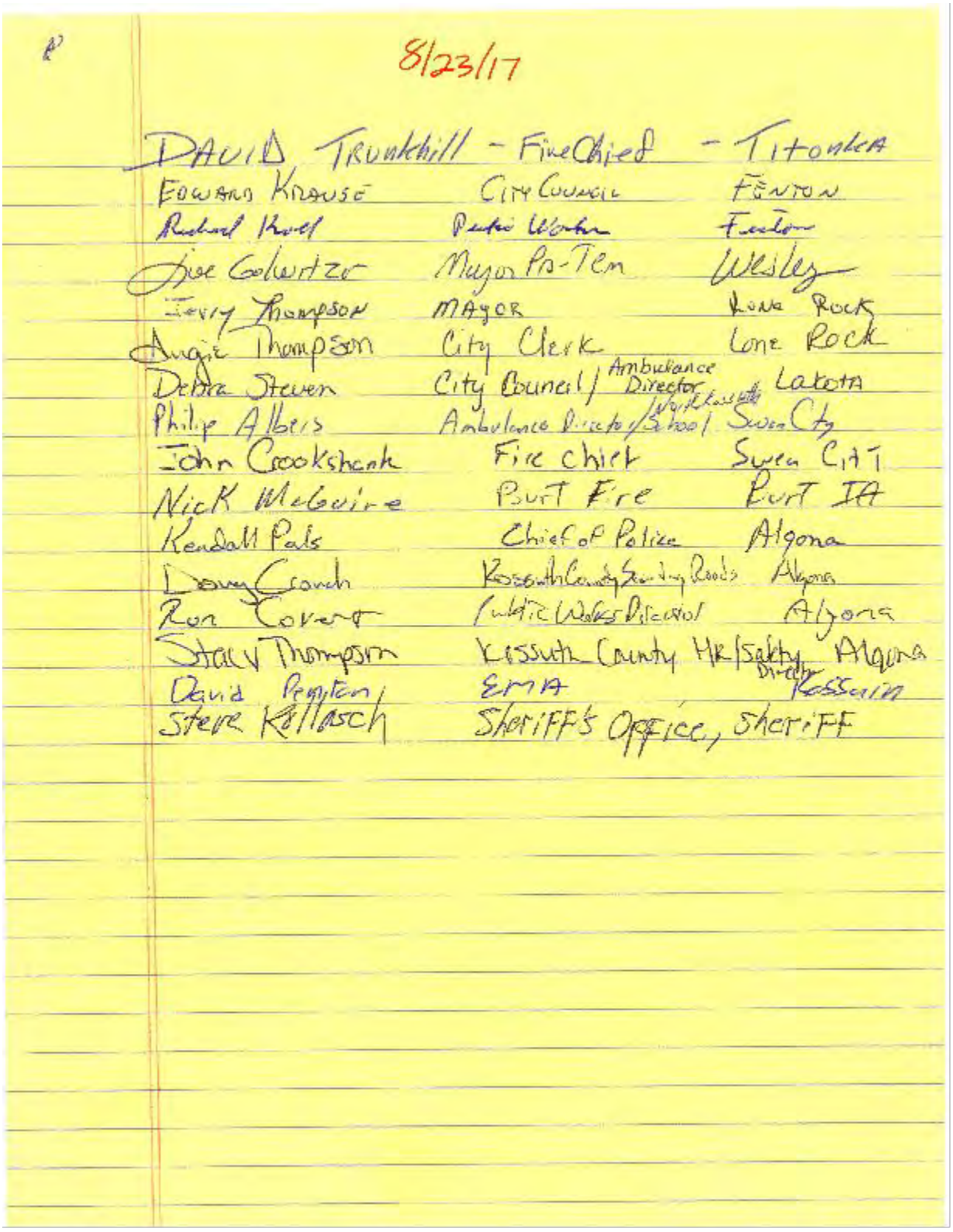
B.5 KICK-OFF MEETING SIGN-IN SHEETS



8/23/17

DAVID TRUNKHILL	- Fire Chief	- Titonka
EDWARD KRAUSE	City Council	FENTON
Richard Knoll	Public Works	Fenton
Joe Colwitzer	Mayor Pro-Tem	Wesley
Terry Thompson	MAYOR	Lone Rock
Angie Thompson	City Clerk	Lone Rock
Debra Steven	City Council / Ambulance Director	Lakota
Philip Albers	Ambulance Director / School Worktrans with	Swea City
John Cookshank	Fire chief	Swea City
Nick McGuire	Burt Fire	Burt IA
Kendall Pals	Chief of Police	Algona
Doug Couch	Kossuth County Secondary Roads	Algona
Ron Covert	Public Works Director	Algona
Stacy Thompson	Kossuth County HR/Safety Director	Algona
David Peyton	EMA	Kossuth
Steve Kollasch	Sheriff's Office, Sheriff	

B.6 MEETING #2 AGENDA

Kossuth County
Multi-Jurisdictional Hazard Mitigation Plan Update
Planning Meeting #2
October 11, 2017
7:00-9:00 pm

Agenda

Welcome/Introductions

Brief Review

Public Survey Update

Participation Requirements/Status

Plan Update Format

Sample Results of Countywide Risk Assessment Update

Update Mitigation Goals

Discuss Mitigation Action Updates

Next Steps

DRAFT RISK ASSESSMENT CHAPTER AVAILABLE FOR REVIEW

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B.7 MEETING #2 MINUTES

To	**Kossuth County Hazard Mitigation Planning Committee**
From	**Kyle Karsjen, Amec Foster Wheeler Mitigation Planner**
Tel / E-mail	**303-820-4661 / kyle.karsjen@amecfw.com**
Date	**10/19/2017**
Subject	**Minutes from Kossuth County Hazard Mitigation Planning Meeting #2 held on 10/12/2017**

This document is a record of attendance and a summary of the issues discussed during the above meeting, including: a brief review of the purpose of a Hazard Mitigation Plan, an update on the public survey for the plan update, discussion of participation requirements and the status of each jurisdiction, presentation of the plan update format, sample results of the risk assessment, a facilitated session to update the plan's mitigation goals, discussion of status updates of previous mitigation actions, and the next steps in this process.

Attendees

Name		Title	Department	Jurisdiction Name
Sue	Golwitzer	Mayor Pro-Tem	City Council	Wesley
David	Penton	Coordinator	Kossuth County EMA	Kossuth County
Jim	Kelley			
Debra	Steven	Councilperson	City Council	Lakota
Ron	Covert			Algona
Bill	Westrod			Lone Rock
Jerry	Thompson	Mayor	City of Lone Rock	Lone Rock
Dave	Newbrough			Lone Rock
Eric	Goodman	Fire Chief	Whittemore FD	Whittemore
Crystal	Neiman			Bancroft
Ryan	Harms			Fenton
Jordan	Jahnke			Burt
Kelly	Fitzgerald			Burt
Karen	Hamilton			Titonka
Brian	Blodgett		Buffalo Center FD	Buffalo Center North Iowa CSD
Alan	Miller	Mayor	City of Burt	Fenton
Michael	Bierstadt			Fenton
Steve	Kollasch	Sheriff	Sheriff's Office	Kossuth County
Alycia	Wolterman			Swea City
Sharon	Corwin	Mayor	City of Ledyard	Ledyard
Royce	Janssen			Lakota
Chris	Stevens			North Kossuth CSD
Doug	Miller	Engineer	Engineer's Office	Kossuth County
Pam	Wymore	Supervisor	Board of Supervisors	Kossuth County
Don	McGregor	Supervisor	Board of Supervisors	Kossuth County
Roger	Tjarks	Supervisor	Board of Supervisors	Kossuth County
Rhonda	Sexton		Regional Health	Kossuth County
Amec Foster Wheeler				
Kyle	Karsjen	Senior Emergency Management Specialist	Hazard Mitigation and Emergency Management	Amec Foster Wheeler

Introductions

Mr. David Penton with Kossuth County Emergency Management began the meeting by welcoming and thanking the attendees. Kyle Karsjen, with Amec Foster Wheeler

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Environment & Infrastructure, Inc., the firm contracted to assist in the development of the Kossuth County multi-jurisdictional hazard mitigation plan update, facilitated the remainder of the presentation.

Note: The PowerPoint presentation utilized during the meeting is available, along with other planning materials at the following Box.com location: https://amec.app.box.com/v/Kossuth-CO-IA.

Purpose/Public Survey/Participation Status

Mr. Karsjen provided a brief summary of the purpose of the Hazard Mitigation Plan and the Disaster Mitigation Act of 2000 that codified the requirement of local governments to adopt a hazard mitigation plan to maintain eligibility for FEMA Hazard Mitigation Assistance Grants. The nine-task planning process was summarized and participants were informed that at the conclusion of the meeting, the planning committee will have completed at least portions of Tasks 1-6. Mr. Karsjen also provided a status update and summary of responses to date for the Public Survey that has been disseminated via survey monkey which can be found at https://www.surveymonkey.com/r/Kossuth-CO-IA. Planning Committee representatives were encouraged to continue to publicize the availability of the surveys and to notify Amec Foster Wheeler of these efforts so that they can be described in the planning process section of the plan. The survey closes on **October 30, 2017**.

A review of the requirements for jurisdictions to officially participate in the Multi-jurisdictional Hazard Mitigation Plan was provided as well as a table summarizing each jurisdiction's participation to date.

Type	Jurisdiction	Kickoff Meeting	Data Collection Guide
County	Unincorporated Kossuth County	x	x
Cities	Algona	x	x
	Bancroft	x	x
	Burt	x	x
	Fenton	x	x
	Lakota	x	x
	Ledyard		x
	Lone Rock	x	x
	LuVerne		
	Swea City	x	x
	Titonka	x	x
	Wesley	x	x
	West Bend	x	x
	Whittemore	x	x
Public School Districts	Algona CSD		
	LuVerne CSD	x	
	North Kossuth CSD		x

2

Hazard	Comments
	causes power loss, and has caused computer issues in Fenton
Wind	• Wind causes tree damages and power pole breakage
Tornado	• Two fatalities in 1979 tornado – house collapsed • Make sure property damage number isn't higher • Crop damage may also be higher

Mitigation Goals

Following the discussion of the risk assessment, Mr. Karsjen facilitated a discussion of the mitigation goals. Common categories of mitigation goals were presented as well as the 2013 State Hazard Mitigation Plan goals.

This planning effort is an update to an existing hazard mitigation plan. As a result, the goals from the *2013 Kossuth County Multi-jurisdictional Hazard Mitigation Plan* were reviewed. The planning committee elected to keep the previous goals:

Goal 1: Minimize the vulnerability of the people and their property in Kossuth County to the impacts of hazards.
Goal 2: Protect critical facilities, infrastructure and other community assets from the impacts of hazards.
Goal 3: Improve education and awareness regarding hazards and risk in Kossuth County.
Goal 4: Strengthen communication regarding hazard mitigation among agencies and between agencies and the public.

Mitigation Actions

The planning committee members were provided a handout of the actions that were included in the previous plan. As part of the planning process, each community is asked to return **ONE** spreadsheet reporting on mitigation actions by **November 3rd, 2017** *(note the change from October 27)*.

Mr. Karsjen informed the committee that Meeting #3 which is scheduled for **November 15th, 2017** will focus primarily on the development of new actions. For the November 3rd deadline, just the updated status and comments are due. After meeting #3, the Action Plan Worksheets must be completed for all continuing and new actions that will make up the updated mitigation strategy for each jurisdiction.

Next Steps

The meeting concluded with a discussion of the remaining steps to complete the planning process:

- 11/3—Risk Assessment Comments and Action Status Due
- 11/15—Final Meeting, Updating/Developing Mitigation Actions
- 12/8—All Mitigation Action Forms Due (Continuing & New)
- Early Jan 2018—Final Draft of Plan Update for Committee Review
- Late Feb 2018—Final Public Comment Period / State Review
- Mid-March 2018—Submit Plan to FEMA

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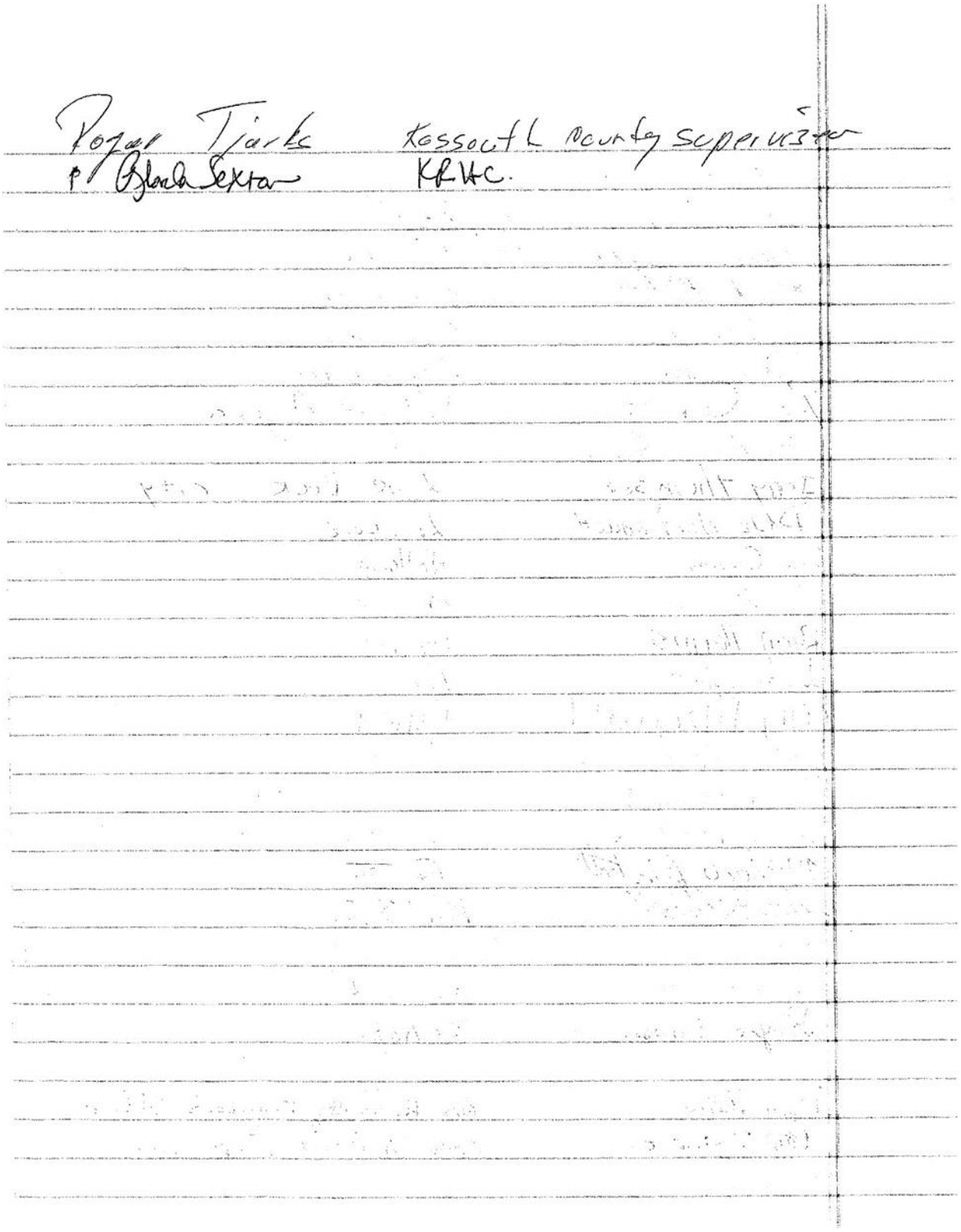
- Jun 2018—Anticipate FEMA's Approval Pending Adoption
- Jul 2018—Jurisdictions Adopt Plan

B.8 Meeting #2 Sign-In Sheets

MJHMP MTG #2 10/11/17

Dave Golwitzer	Wesley
Don McGregor	Moss
Roger Tjaden	Titonka
David Pet	Kossuth EMA
Jim Kelley	Wesley
Debra Steven	City of Lakota
Ron Covert	City of Algona
Bill Westrod	Lone Rock
Jerry Thompson	Lone Rock city
Dave Newbrough	Lone Rock
Eric Goodman	Whittemore
Cryst Meier	Bancroft
Ryan Harms	Fenton
Jordan Jahnke	Burt
Kelly Fitzgerald	BURT
Karen Hamilton	Titonka
Brian Blodgett	Buffalo Center
Alan Miller	Fenton city
Michael Bierstedt	Fenton
Steve Kollasch	K.C.S.O.
Alycia Wolterman	City of Swea City
Sharon Corwin	Ledyard
Royce Janssen	Lakota
Chris Stevens	North Kossuth Community School
Doug Miller	Kossuth County Engineer's Office
Pam Wymore	Kossuth County Supervisor
Don McGregor	Koss County Supervisor


Roger Tjarks
Kossuth County Supervisor
KRTC.

B.9 MEETING #3 AGENDA

Kossuth County
Multi-Jurisdictional Hazard Mitigation Plan Update
Planning Meeting #3

Wednesday, November 15, 2017
7:00 - 9:00 pm

Agenda

- Introductions/Remarks
- Review Purpose/Requirements
- Public Survey Results
- Updating the Mitigation Strategy
  - Review Updated Plan Goals
  - Status of Previous Actions
  - Development of New Actions
  - Prioritization of Mitigation Actions
- Hazard Mitigation Assistance Grants
- Plan Maintenance
- Next Steps

Please access meeting materials and draft documents here:

https://amec.box.com/v/Kossuth-CO-IA

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B.10 MEETING #3 MINUTES

To	**Kossuth County Hazard Mitigation Planning Committee**
From	**Kyle Karsjen, Amec Foster Wheeler Mitigation Planner**
Tel / E-mail	**303-820-4661/kyle.karsjen@amecfw.com**
Date	**11/28/2017**
Subject	**Minutes from Kossuth County Hazard Mitigation Planning Meeting #3 held on 11/15/2017**

This document is a record of attendance and a summary of the issues discussed during the above meeting, including: a brief review of the purpose of a Hazard Mitigation Plan, the public survey results, updating the mitigation strategy, Hazard Mitigation Assistance grants, plan maintenance and the next steps in this process.

Attendees

Name		Title	Department	Jurisdiction Name
Merrill	Mueller	Transportation Director	Algona CSD	Algona CSD
David	Penton	Coordinator	Emergency Management	Kossuth County
Richard	Knoll		Public Works	Fenton
Jordan	Jahnke		Fire Department	Burt
Corey	Rasch		Fire Department	Bancroft
Sue	Golwitzer	Mayor-Pro Tem	City Council	Wesley
Jerry	Thompson	Mayor		Lone Rock
Bill	Weisbrod	Council Member	City Council	Lone Rock
Ron	Covert	Director	Public Works	Algona
Rick	Adams	Buildings and Grounds	Algona CSD	Algona CSD
Marty	Fonley	Superintendent	Algona CSD	Algona
Debra	Steven	Councilperson	City Council	Lakota
Aaron	Boyken	Mayor	Titonka	Titonka
Kyle	Karsjen	Planner	N/A	Amec Foster Wheeler

Kyle Karsjen, with Amec Foster Wheeler, the firm contracted to assist in the development of the Kossuth County multi-jurisdictional hazard mitigation plan update, facilitated the meeting.

Note: The PowerPoint presentation utilized during the meeting is available, along with other planning materials at the following location:
https://amec.app.box.com/v/Kossuth-CO-IA

Review Purpose/Participation Status

Mr. Karsjen provided a brief summary of the purpose of the Hazard Mitigation Plan and the Disaster Mitigation Act of 2000 that codified the requirement of local governments to adopt a hazard mitigation plan to maintain eligibility for FEMA Hazard Mitigation Assistance Grants. The nine-task planning process was summarized and participants were informed that at the conclusion of the meeting, the planning committee will have completed at least portions of Tasks1-6.

A review of the requirements for jurisdictions to officially participate in the Multi-jurisdictional Hazard Mitigation Plan was provided. Kyle presented a summary of participation requirements met to date by each jurisdiction. For communities that have not yet provided a data collection guide or status updates of previous mitigation actions, Kyle will send a separate specific email to each community letting them know which specific information is needed. Communities are

Page 1

asked to return info as soon as possible. The following table shows which communities have met which requirements; please note that action plan worksheets are not due until **December 8**.

Jurisdiction	Meeting 1	Meeting 2	Data Collection Guide	Action Status Updates	Action Plan Worksheets	Integration Questionnaire
Algona	x	x	x	x	x	x
Bancroft	x	x	x		x	x
Burt	x	x	x		x	x
Fenton	x	x	x	x	x	x
Lakota	x	x	x	x	x	x
Ledyard	x	x	x	x		
Lone Rock	x	x	x	x	x	x
Lu Verne			x		x	x
Swea City	x	x	x	x	x	x
Titonka	x	x	x		x	x
Wesley	x	x	x	x	x	x
Whittemore	x	x	x		x	x
Kossuth County	x	x	x	x	x	x
Algona CSD			x	x	x	x
Lu Verne CSD	x		x	N/A		
North Kossuth CSD		x	x	N/A		

Public Survey Results

Mr. Karsjen presented a summary of the public survey results; the survey has now closed, with 125 surveys completed.

According to the survey responses, of the hazards evaluated, the top three in terms of probability of occurrence were Thunderstorm/Lightning/Hail, Tornado/ Windstorm, and Severe Winter Storm. The top three hazards in terms of potential magnitude were Tornado/Windstorm, Severe Winter Storm, and Thunderstorm/Lightning/Hail.

Mitigation Strategy

Mr. Karsjen reviewed the following information related to update of the mitigation strategy:

- Plan Goals
- Previous Actions from Previous Plan
- Key Issues from Risk Assessment (identified hazards)
- FEMA's Mitigation Ideas booklet
- State Priorities for Hazard Mitigation Assistance Grants
- Public Opinion from Surveys

Goals

To facilitate discussion and ideas on new actions that jurisdictions may want to submit to the plan update, Mr. Karsjen reminded the planning of the plan goals that were updated at meeting #2.

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- Goal 1: Minimize the vulnerability of the people and their property in Kossuth County to the impact of hazards.
- Goal 2: Protect critical facilities, infrastructure and other community assets from the impacts of hazards.
- Goal 3: Improve education and awareness regarding hazards and risk in Kossuth County.
- Goal 4: Strengthen communication regarding hazard mitigation among agencies and between agencies and the public.

Previous Actions

Mr. Karsjen discussed status updates for previous actions. If your community has not yet provided status updates for previous actions, please do so as soon as possible; see the table on the previous page to see which communities still need to return paperwork. Previous actions that are considered "continue in-progress" or "continue not started" will be included as mitigation actions in the new plan.

Key Issues

Key issues/problem statements for selected hazards in the risk assessment were discussed. The discussion was geared toward identifying any gaps that may exist between the problems identified and actions already developed to address the problems. The planning committee was encouraged to develop new actions to fill any gaps. Planning committee members will work with others in their jurisdiction to determine any additional new mitigation actions that are necessary for the hazards in the plan.

FEMA Mitigation Ideas Booklet

A link to FEMA's Mitigation Ideas Booklet at http://www.fema.gov/hazard-mitigation-planning-resources was provided to the HMPC; the document can be accessed directly at https://www.fema.gov/media-library-data/20130726-1904-25045-0186/fema_mitigation_ideas_final508.pdf. The PDF document of this Mitigation Ideas Booklet was shown to the planning committee and action ideas were reviewed for several of the hazards. Jurisdictions were encouraged to review this document with others in their jurisdiction to determine final mitigation actions to submit to the plan update.

State Priorities

Mr. Karsjen also discussed the priorities set by the Iowa Homeland Security and Emergency Management Division for use of Hazard Mitigation Assistance Grants, as well as the results of the public survey related to mitigation actions that the public considers important and effective. Per Iowa Homeland Security and Emergency Management, the two biggest current state priorities are property acquisition and structure demolition and relocation, though shovel-ready projects are also a priority.

Public Opinion

The survey results for the question asking the public about the mitigation actions that they felt should be considered resulted in the following percent of public support for each action type presented:

Answer Choices	Responses
Flood-prone Property Acquisition & Structure Demolition/Relocation	25.86%
Flood-prone Structure Elevation	19.83%
Floodproofing of Historical and/or Non-residential Structures	11.21%
Minor Localized Flood Reduction Projects (stormwater management or other localized flood control projects)	47.41%
Structural Retrofitting of Existing Buildings to Add a Tornado Saferoom	70.69%
Retrofitting of Existing Buildings and Facilities to Prevent Wind Damage	43.97%
New Tornado Safe Room Construction	65.52%
Electrical Utilities Infrastructure Retrofit (i.e. strengthening lines/connections to withstand ice/wind damages, burying power lines)	72.41%
Soil Erosion Stabilization	33.62%
Wildfire Mitigation	12.07%

Action Plans

Mr. Karsjen discussed the excel spreadsheet that has been created capturing each jurisdiction's previous actions and the updated status. The spreadsheet has been emailed to the planning committee members and is be uploaded to the box.com account with these minutes.

Jurisdictions must provide a completed Action Plan Worksheet for all continuing and new actions.

Communities participating in the National Flood Insurance Program were informed that they must have at least one action addressing continued compliance with the National Flood Insurance Program. NFIP jurisdictions are:

- Unincorporated Kossuth County
- Algona
- Bancroft
- Fenton
- Lu Verne
- Titonka

The due date for completion and return of Action Plan worksheets for all Continuing and New actions is December 8, 2017

In discussing the action plans, the concept of cost-effectiveness of actions was discussed. For planning purposes, benefits will be recorded for each action in qualitative terms. For example, an action to construct a community safe room will provide life-safety benefits. Mr. Karsjen explained that for actions that will be submitted as Hazard Mitigation Assistance grant applications, a quantitative benefit-cost analysis must be completed to demonstrate that the

benefits that will be realized after implementation outweigh the cost of completing the project. FEMA has benefit-cost analysis modules available for this purpose.

Hazard Mitigation Assistance Grants

The Hazard Mitigation Plan is a requirement for jurisdictions to be eligible to apply for FEMA's Hazard Mitigation Assistance Grants. Jurisdictions were informed that Iowa's Homeland Security and Emergency Management Department is the State agency responsible for administration of these grants. Mr. Karsjen also presented a list of agencies and grant programs of other state and federal grants that fund mitigation activities.

Plan Implementation

The communities discussed how the previous plan had been implemented in conjunction with previous planning efforts over the last five years, and how the new plan will be implemented in conjunction with planning efforts through 2023. Attendees at the meeting filled out Integration Questionnaires for their communities; communities that did not attend the meeting will need to return the Integration Questionnaire as part of their required documentation.

Plan Maintenance

Mr. Karsjen discussed the requirements for the plan to provide a formal plan maintenance process to ensure that the mitigation plan remains an active and relevant document. After discussion, the following plan maintenance process is proposed:

- The HMPC will meet annually to review the Hazard Mitigation Plan;
- The Kossuth County Emergency Management Coordinator will organize the meetings;
- After the annual review, the Emergency Management Coordinator will forward the updated Mitigation Strategy with status updates to mayors, city clerks, and school superintendents for consideration in other planning mechanisms/discussions;
- The Kossuth County Emergency Management Coordinator will coordinate the formal plan update/re-submittal to IA HSEMD and FEMA every 5 years;
- The public will be involved in the plan maintenance process by publication of a Press Release indicating the team has met with a summary of mitigation action status updates and highlights of specific completed mitigation actions, as applicable.

Next Steps

The meeting concluded with a discussion of the remaining steps to complete the planning process as follows:

- **ASAP – Data Collection Guides/Action Statuses**
- 12/8/2017—Action Plan Worksheets Due
- January 2018 —Final draft for committee review
- February 2018 - Final public comment period/State review
- March 2018—Submit Plan to FEMA
- June 2018—Anticipate FEMA's Approval Pending Adoption (preliminary approval)
- July 2018—Jurisdictions adopt plan

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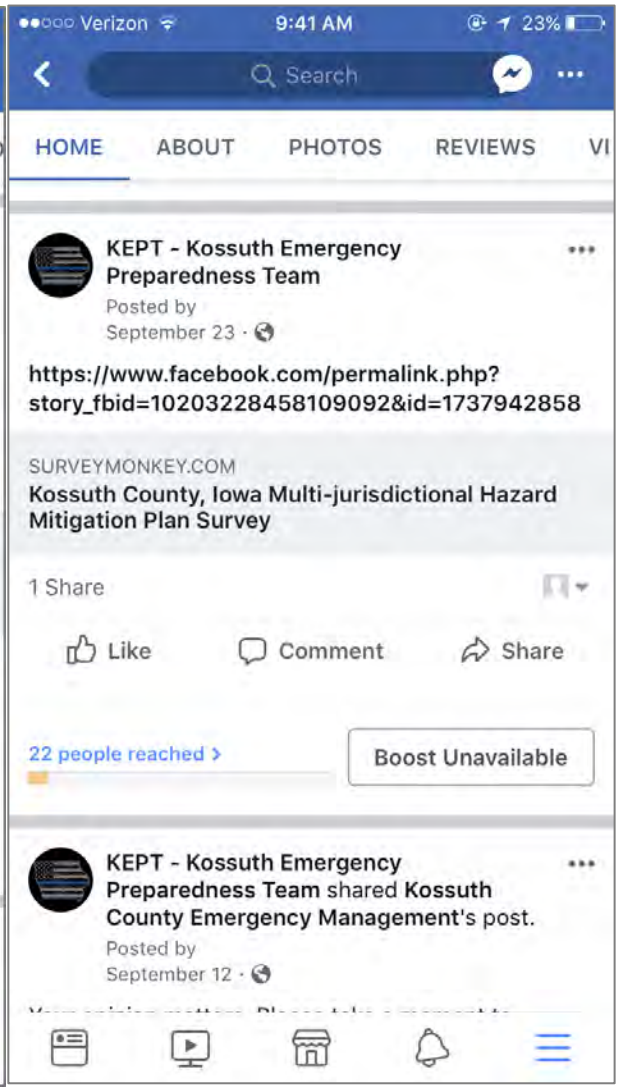
B.11 Meeting #3 Sign-In Sheets

Kossuth County Emergency Management Agency

Name	City	Address	Phone	Email Address
Merrill Mueller	Algona	600 S Hale	515-295-5481	mmueller@algona.k12.ia.us
[illegible]	Kossuth EMA	909 E. Lucas	515-295-5904	kossema@co.kossuth.ia.us
Jordan Jahnke	Burt	701 Walnut St	515-320-4321	burtfiredept@yahoo.com
Richard Kroll	Fenton	210 Ash St	515-200-9205	Public Works
Corey Rasch	Bancroft	512 S Portland	515-361-6114	Corey@heartlandmutual.com
Sue Golwitzer	Wesley	605 1st St N	515-341-0881	golwitzer@ncn.net
Jerry Thompson	Lone Rock	306 Maine St	515 320 2553	jtat@netins.net
Bill Weisbrod	Lone Rock	401 2nd St	515-925-3257	WBWeisbrod4548@gmail.com
Ron Covert	Algona	116 S. Thorington	515-295-2411	rcovert@ci.algona.ia.us
Rick Adams	Algona	620 N Thorington	515 341 4882	radams@algona.k12.ia.us
Marty Foley	Algona	1702 E. Nebraska St.	515-295-3578	mfoley@algona.k12.ia.us
Debra Steven	Lakota	400 Smith St	515 320 5010	overworked44@hotmail.com
Aaron Boyken	Titonka	2102 330th St	515-928-2205	Aaron.Boyken@tsbbank.com

B.12 Public Notice During Drafting Stage



B.13 Plan Summary/Questionnaire for Public Comment during Drafting Stage

Online Survey was available at SurveyMonkey.com and hard copies were available at post office locations throughout the county.

Public Survey: Kossuth County
Multi-jurisdictional Hazard Mitigation Plan

The federal government requires all states and local governments to have hazard mitigation plans approved by FEMA that are consistent with the Disaster Mitigation Act of 2000. This is required to maintain eligibility for certain types of federal Hazard Mitigation Assistance Grants. Mitigation planning is the process of identifying hazards to which jurisdictions are at risk as well as development of actions that will reduce or prevent damages from those hazards.

A planning committee comprised of representatives from Kossuth County, the incorporated cities, public school districts, and other stakeholders including private businesses, private non-profits, and others is currently developing an update to the comprehensive Kossuth County Multi-Jurisdictional Hazard Mitigation Plan with a strategy to reduce the vulnerability of people and property in the planning area to the impacts of hazards and to remain eligible for mitigation funding programs from FEMA.

One of the key components of a hazard mitigation plan is public input during the planning process. The planning committee will be evaluating information on the hazards that impact each jurisdiction within Kossuth County. The committee is seeking your input on the hazards that will be evaluated as well as your opinions on the types of activities that should be considered to reduce future impacts. Your comments will be considered by your community's representatives on the planning committee as the plan is developed. Please take a few moments to answer the following questions. Thank you for your participation.

1. Please select your jurisdiction from the list. You may only select one jurisdiction for each survey completed. If you belong to more than one jurisdiction in this list, please complete multiple surveys.

- ☐ Unincorporated Kossuth County
- ☐ City of Algona
- ☐ City of Bancroft
- ☐ City of Burt
- ☐ City of Fenton
- ☐ City of Lakota
- ☐ City of Ledyard
- ☐ City of Lone Rock
- ☐ City of Lu Verne
- ☐ City of Swea City
- ☐ City of Titonka
- ☐ City of Wesley
- ☐ City of West Bend
- ☐ City of Whittemore
- ☐ Other*_____
- ☐ Algona Public School District
- ☐ LuVerne Public School District
- ☐ North Kossuth Public School District

2. The hazards addressed in the Multi-Jurisdictional Hazard Mitigation Plan Update are listed below. Please indicate your opinion on the likelihood for each hazard to impact YOUR JURISDICTION (identified above).
Please rate EACH hazard 1 through 4 as follows:
1=Unlikely, 2=Occasional, 3=Likely, 4=Highly Likely

- ☐ Animal/Plant/Crop Disease
- ☐ Dam/Levee Failure
- ☐ Drought
- ☐ Earthquake
- ☐ Expansive Soils
- ☐ Extreme Heat
- ☐ Flash Flood
- ☐ Grass or Wildland Fire
- ☐ Hazardous Materials Incident
- ☐ Human Disease
- ☐ Infrastructure Failure
- ☐ Landslide
- ☐ Radiological Incident
- ☐ River Flooding
- ☐ Severe Winter Storm
- ☐ Sinkholes
- ☐ Terrorism
- ☐ Thunderstorm/Lightning/Hail
- ☐ Tornado/Windstorm
- ☐ Transportation Incident

Optional Online Survey: https://www.surveymonkey.com/r/Kossuth-CO-IA

Public Survey: Kossuth County Multi-jurisdictional Hazard Mitigation Plan

3. Please indicate your opinion on the potential magnitude of each hazard's impact on YOUR JURISDICTION (identified above). **Please rate EACH hazard 1 through 4 as follows: 1=Negligible, 2=Limited, 3=Critical, 4=Catastrophic**

- ☐ Animal/Plant/Crop Disease
- ☐ Dam/Levee Failure
- ☐ Drought
- ☐ Earthquake
- ☐ Expansive Soils
- ☐ Extreme Heat
- ☐ Flash Flood
- ☐ Grass or Wildland Fire
- ☐ Hazardous Materials Incident
- ☐ Human Disease
- ☐ Infrastructure Failure
- ☐ Landslide
- ☐ Radiological Incident
- ☐ River Flooding
- ☐ Severe Winter Storm
- ☐ Sinkholes
- ☐ Terrorism
- ☐ Thunderstorm/Lightning/Hail
- ☐ Tornado/Windstorm
- ☐ Transportation Incident

4. FEMA Hazard Mitigation Assistance Grants can fund projects identified in the Hazard Mitigation Plan. These grants are administered by the Iowa Homeland Security & Emergency Management Department. Listed below are some types of projects considered.
Please check all those that could benefit your jurisdiction, in your opinion:

- ☐ Flood-prone Property Acquisition & Structure Demolition /Relocation
- ☐ Flood-Prone Structure Elevation
- ☐ Dry Floodproofing of Historical Residential Structures and/or Non-residential Structures
- ☐ Minor Localized Flood Reduction Projects (storm water management or localized flood control projects)
- ☐ Structural Retrofitting of Existing Buildings to Add a Tornado Safe Room
- ☐ Non-structural Retrofitting of Existing Buildings, and Facilities from Wind Damage.
- ☐ New Tornado Safe Room Construction
- ☐ Electrical Utilities Infrastructure Retrofit
- ☐ Soil Erosion Stabilization
- ☐ Wildfire Mitigation
- ☐ Other (please specify)

_____

5. Please comment on any other issues that the Kossuth County Hazard Mitigation Planning Committee should consider in developing a strategy to reduce future losses caused by hazard events.

Return / Contact Information: David Penton, Coordinator, Kossuth County Emergency Mgmt. kossema@co.kossuth.ia.us, 515-295-5904, 121 W. State Street, Algona, IA 50511

Optional Online Survey: https://www.surveymonkey.com/r/Kossuth-CO-IA

B.14 Announcement for Final Public Comment Period

Kossuth County, Iowa
Multi-jurisdictional Hazard Mitigation Plan

Contact: David Penton
515-295-5904

Kossuth County Planning Team Seeks Public Input

Kossuth County, IA — The public is encouraged to review and comment on the Kossuth County Multi-jurisdictional Hazard Mitigation Plan Update before it is finalized. The plan includes an updated strategy to reduce damage and losses caused by hazard events. The final draft of the plan will be available online and in hard-copy from October 18, 2018 to November 6, 2018. The purpose is to provide information to the public on the Multi-jurisdictional Hazard Mitigation Plan Update as well as gain public input.

Taxpayers pay billions of dollars each year for disaster recovery. Some events are predictable, and often, damages can be reduced or eliminated. The Federal Disaster Mitigation Act of 2000 requires communities to develop an approved local hazard mitigation plan to remain eligible for certain federal funding.

Kossuth County invited representatives from County departments, the incorporated cities, public school districts and other mitigation planning stakeholders to work together to develop this plan update. The planning Team addressed 17 hazards—ranging from drought and severe winter storms to tornadoes and flooding—and considered the impacts of these events on local communities. Based on the results of an updated risk assessment of the hazards, team members updated the strategies for their jurisdictions to reduce damages caused by the various hazards. The team consulted with Wood Environment & Infrastructure, Inc. to assist with the plan update and ensure that the final plan meets federal regulations.

The planning team would like input from the public on the updated strategy to lessen impacts of future disasters on people and property in Kossuth County. The Plan will also be reviewed by the Iowa Homeland Security and Emergency Management Department (IA HSEMD) and then submitted to FEMA for review and approval. Public comments will be considered by the Hazard Mitigation Planning Team and incorporated into the final plan, as appropriate. The final plan must be approved by the governing body of each participating jurisdiction, IA HSEMD, and FEMA before becoming official.

From October 18 to November 6, the final draft plan will be available for your review at the following locations:

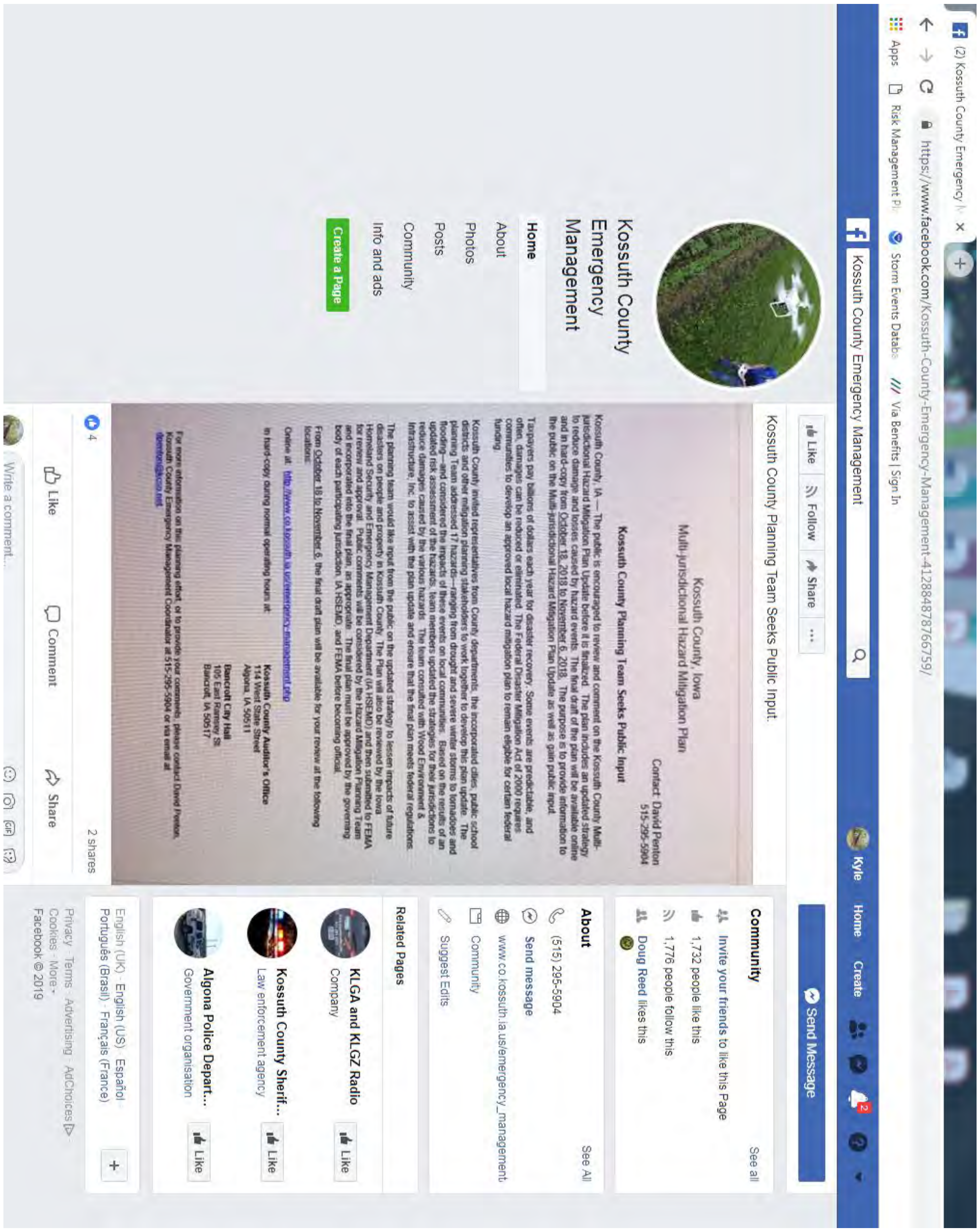
Online at: http:///www.co.kossuth.ia.us/emergency-management.php

In hard-copy during normal operating hours at:

Kossuth County Auditor's Office
114 West State Street
Algona, IA 50511

Bancroft City Hall
105 East Ramsey Street
Bancroft, IA 50517

For more information on this planning effort, or to provide your comments, please contact David Penton, Kossuth County Emergency Management Coordinator at 515-295-5904 or via email at kossuth@co.kossuth.ia.us.



Kossuth County, Iowa
Multi-jurisdictional Hazard Mitigation Plan

Contact: David Penton
515-295-5904

Kossuth County Planning Team Seeks Public Input

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Algona, IA 50511

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105 East Ramsey St.
Bancroft, IA 50517

For more information on this planning effort, or to provide your comments, please contact David Penton, Kossuth County Emergency Management Coordinator at 515-295-5904 or via email at dpenton@kcso.net.

APPENDIX A: COMPLETED/DELETED MITIGATION ACTIONS

The table below provides the disposition of actions from the previous Kossuth County Hazard Mitigation Plan that the jurisdictions did not continue forward in the mitigation strategy of this plan update. This includes actions with the following statuses:

- Completed
- Deleted

Action ID	Action Title	2017 Action Status	2017 Action Status Comment (include for completed, deleted, in-progress actions)
Kossuth County-1	Develop/update/publicize emergency management plans, including preparedness, response recover, operations, long term recovery, and mitigation plans and maintain data inventory	Delete	
Kossuth County-8	Heating/Cooling Centers/Shelters	Delete	
Kossuth County-10	Complete FIRM (Flood Insurance Rate Maps) and encourage NFIP community and individual participation, and survey of flood prone areas, and river channel studies, and update of existing flood maps.	Completed	
Kossuth County-12	Natural resource measures to prevent the damage to critical facility functions	Delete	
Algona-10	Complete FIRM (Flood Insurance Rate Maps) and encourage NFIP community and individual participation, and survey of flood prone areas, and river channel studies, and update of existing flood maps.	Completed	FEMA and IDNR have completed and submitted to the city a final flood hazard determination, the city is currently in good standing with the NFIP but must adopt floodplain management regulations that meet the standards of Paragraph 60.3(d) of the NFIP to remain in good standing
Bancroft-10	Complete FIRM (Flood Insurance Rate Maps) and encourage NFIP community and individual participation, and survey of flood prone areas, and river channel studies, and update of existing flood maps.	Delete	

Action ID	Action Title	2017 Action Status	2017 Action Status Comment (include for completed, deleted, in-progress actions)
Burt-6	Acquire flood prone properties for conversion into green space; or elevate structures to or above base flood elevation; construction of levees, dams, and culverts to ensure adequate capacity and protection levels for property and critical facilities.	Delete	
Burt-10	Complete FIRM (Flood Insurance Rate Maps) and encourage NFIP community and individual participation, and survey of flood prone areas, and river channel studies, and update of existing flood maps.	Delete	
Fenton-3	Continuity of Operations Plan (COOP)	Completed	
Fenton-5	Construction or retrofit existing structures into public safe rooms at government facilities, recreational facilities, recreational areas, manufactured home parks, schools, day care centers, and other critical facilities	Delete	
Fenton-6	Acquire flood prone properties for conversion into green space; or elevate structures to or above base flood elevation; construction of levees, dams, and culverts to ensure adequate capacity and protection levels for property and critical facilities.	Delete	
Fenton-7	Purchase/install backup power generators	Delete	Replaced with Action #14
Fenton-10	Complete FIRM (Flood Insurance Rate Maps) and encourage NFIP community and individual participation, and survey of flood prone areas, and river channel studies, and update of existing flood maps.	Completed	
Fenton-11	Develop and promote comprehensive, cost-effective, common sense recommendations for adoption and enforcement of land use, ordinances and regulations, zoning, and building codes that decrease risk in areas susceptible to hazards	Delete	

Action ID	Action Title	2017 Action Status	2017 Action Status Comment (include for completed, deleted, in-progress actions)
Fenton-12	Natural resource measures to prevent the damage to critical facility functions	Completed	
Lakota-5	Construction or retrofit existing structures into public safe rooms at government facilities, recreational facilities, recreational areas, manufactured home parks, schools, day care centers, and other critical facilities	Completed	We have an emergency shelter
Lakota-6	Acquire flood prone properties for conversion into green space; or elevate structures to or above base flood elevation; construction of levees, dams, and culverts to ensure adequate capacity and protection levels for property and critical facilities.	Delete	
Lakota-10	Complete FIRM (Flood Insurance Rate Maps) and encourage NFIP community and individual participation, and survey of flood prone areas, and river channel studies, and update of existing flood maps.	Completed	Done, sent back/waiting
Lakota-11	Develop and promote comprehensive, cost-effective, common sense recommendations for adoption and enforcement of land use, ordinances and regulations, zoning, and building codes that decrease risk in areas susceptible to hazards	Delete	
Ledyard-1	Develop/update/publicize emergency management plans, including preparedness, response recover, operations, long term recovery, and mitigation plans and maintain data inventory	Completed	
Ledyard-2	Public education and awareness of all hazards	Completed	
Ledyard-5	Construction or retrofit existing structures into public safe rooms at government facilities, recreational facilities, recreational areas, manufactured home parks, schools, day care centers, and other critical facilities	Completed	

Action ID	Action Title	2017 Action Status	2017 Action Status Comment (include for completed, deleted, in-progress actions)
Ledyard-8	Heating/Cooling Centers/Shelters	Completed	
Ledyard-9	Install and maintain security measures at all critical facilities and training of emergency response personnel	Completed	
Ledyard-10	Complete FIRM (Flood Insurance Rate Maps) and encourage NFIP community and individual participation, and survey of flood prone areas, and river channel studies, and update of existing flood maps.	Completed	
Lone Rock-4	Construct, retrofit, or maintain water supply, drainage, sewage, retention and detention systems to provide for the proper functioning of those systems.	Completed	New Water System 2017 New Sewer System 2015
Lone Rock-7	Purchase/install backup power generators	Completed	
Lone Rock-8	Heating/Cooling Centers/Shelters	Completed	
LuVerne-10	Complete FIRM (Flood Insurance Rate Maps) and encourage NFIP community and individual participation, and survey of flood prone areas, and river channel studies, and update of existing flood maps.	Completed	
Swea City-3	Continuity of Operations Plan (COOP)	Delete	
Swea City-4	Construct, retrofit, or maintain water supply, drainage, sewage, retention and detention systems to provide for the proper functioning of those systems.	Completed	
Swea City-5	Construction or retrofit existing structures into public safe rooms at government facilities, recreational facilities, recreational areas, manufactured home parks, schools, day care centers, and other critical facilities	Completed	
Swea City-7	Purchase/install backup power generators	Completed	
Swea City-8	Heating/Cooling Centers/Shelters	Completed	
Swea City-9	Install and maintain security measures at all critical facilities and training of emergency response personnel	Completed	

Action ID	Action Title	2017 Action Status	2017 Action Status Comment (include for completed, deleted, in-progress actions)
Swea City-10	Complete FIRM (Flood Insurance Rate Maps) and encourage NFIP community and individual participation, and survey of flood prone areas, and river channel studies, and update of existing flood maps.	Completed	
Swea City-12	Natural resource measures to prevent the damage to critical facility functions	Delete	
Titonka-10	Complete FIRM (Flood Insurance Rate Maps) and encourage NFIP community and individual participation, and survey of flood prone areas, and river channel studies, and update of existing flood maps.	Completed	
Titonka-12	Natural resource measures to prevent the damage to critical facility functions	Delete	
Algona CSD-5	Construction or retrofit existing structures into public safe rooms at government facilities, recreational facilities, recreational areas, manufactured home parks, schools, day care centers, and other critical facilities	Completed	

APPENDIX D: ADOPTION RESOLUTIONS

<Placeholder for resolutions after FEMA provides approval pending adoption letter>