Jurisdiction:	Title of Plan:	Date of Plan:
Howard County	Howard County Hazard Mitigation Plan	4/30/2012

Local Point of Contact: Karla Organist	**Address:** 325 Washington Street, Suite A Decorah, IA 52101
Title: Program Manager	
Agency: Upper Explorerland Regional Planning Commission (UERPC)	
Phone Number: (563) 382-6171, ext 211	**E-Mail:** korganist@uerpc.org

State Reviewer:	Title:	Date:

FEMA Reviewer: Kathy Mallard Michelle Wolfe	**Title:** Plan Reviewer Plan Reviewer	**Date:** 8 May 2012
Date Received in FEMA Region VII	30 April 2012	
Plan Not Approved		
Plan Approvable Pending Adoption		
Plan Approved	8 May 2012	

Jurisdiction:	Funding Source: HMGP 1763	NFIP Status*		
		Y (CID)	N	N/A
1. Howard Co Unincorporated	Adoption Resolution: 8/15/2011		✓	
2. Chester	Adoption Resolution: 9/19/2011		✓	
3. Cresco	Adoption Resolution: 8/15/2011	✓		
4. Elma	Adoption Resolution: 8/5/2011	✓		
5. Lime Springs	Adoption Resolution: 9/6/2011	✓		
6. Protivin	Adoption Resolution: 9/13/2011. NFIP Suspended		✓	
7. Howard-Winneshiek CSD	Adoption Resolution: 8/11/2011		✓	
8. Riceville CSD	Adoption Resolution: 8/19/2011		✓	
9. NICC	Adoption Resolution: 8/11/2011		✓	

*** Notes:** **Y = Participating** **N = Not Participating** **N/A = Not Mapped**

SECTION 1: REGULATION CHECKLIST

INSTRUCTIONS: The Regulation Checklist must be completed by FEMA. The purpose of the Checklist is to identify the location of relevant or applicable content in the Plan by Element/sub-element and to determine if each requirement has been 'Met' or 'Not Met.' The 'Required Revisions' summary at the bottom of each Element must be completed by FEMA to provide a clear explanation of the revisions that are required for plan approval. Required revisions must be explained for each plan sub-element that is 'Not Met.' Sub-elements should be referenced in each summary by using the appropriate numbers (A1, B3, etc.), where applicable. Requirements for each Element and sub-element are described in detail in the *Plan Review Guide* in Section 4, Regulation Checklist.

1. REGULATION CHECKLIST Regulation (44 CFR 201.6 Local Mitigation Plans)	Location in Plan (section and/or page number)	Met	Not Met
ELEMENT A. PLANNING PROCESS			
A1. Does the Plan document the planning process, including how it was prepared and who was involved in the process for each jurisdiction? (Requirement §201.6(c)(1))	Executive Summary Chapt. 1, Sec. 1.4, App., Sec. 6.2	✓	
A2. Does the Plan document an opportunity for neighboring communities, local and regional agencies involved in hazard mitigation activities, agencies that have the authority to regulate development as well as other interests to be involved in the planning process? (Requirement §201.6(b)(2))	Executive Summary Chapt. 1, Sec. 1.4, App., Sec. 6.2	✓	
A3. Does the Plan document how the public was involved in the planning process during the drafting stage? (Requirement §201.6(b)(1))	Executive Summary Chapt. 1, Sec. 1.4, App., Sec. 6.2	✓	
A4. Does the Plan describe the review and incorporation of existing plans, studies, reports, and technical information? (Requirement §201.6(b)(3))	App., Sec. 6.1	✓	
A5. Is there discussion of how the community(ies) will continue public participation in the plan maintenance process? (Requirement §201.6(c)(4)(iii))	Chapt. 5, Sec. 5.3	✓	
A6. Is there a description of the method and schedule for keeping the plan current (monitoring, evaluating and updating the mitigation plan within a 5-year cycle)? (Requirement §201.6(c)(4)(i))	Chapt. 5, Sec. 5.1	✓	

ELEMENT A: REQUIRED REVISIONS

N/A

The following guidance is provided:

Under federal regulations, public school districts are considered jurisdictions. See 44. §201.2 Definitions. Local government

1. REGULATION CHECKLIST Regulation (44 CFR 201.6 Local Mitigation Plans)	Location in Plan (section and/or page number)	Met	Not Met
ELEMENT B. HAZARD IDENTIFICATION AND RISK ASSESSMENT			
B1. Does the Plan include a description of the type, location, and extent of all natural hazards that can affect each jurisdiction(s)? (Requirement §201.6(c)(2)(i))	Chapt. 3, Sec 3.2	✓	
B2. Does the Plan include information on previous occurrences of hazard events and on the probability of future hazard events for each jurisdiction? (Requirement §201.6(c)(2)(i))	Chapt. 3, Sec 3.2	✓	
B3. Is there a description of each identified hazard's impact on the community as well as an overall summary of the community's vulnerability for each jurisdiction? (Requirement §201.6(c)(2)(ii))	Chapt. 3, Sec 3.2, 3.3	✓	
B4. Does the Plan address NFIP insured structures within the jurisdiction that have been repetitively damaged by floods? (Requirement §201.6(c)(2)(ii))	Chapt. 3, Sec 3.2, 3.3	✓	
ELEMENT B: REQUIRED REVISIONS N/A			
ELEMENT C. MITIGATION STRATEGY			
C1. Does the plan document each jurisdiction's existing authorities, policies, programs and resources and its ability to expand on and improve these existing policies and programs? (Requirement §201.6(c)(3))	Chapt. 2, Sec 2.2	✓	
C2. Does the Plan address each jurisdiction's participation in the NFIP and continued compliance with NFIP requirements, as appropriate? (Requirement §201.6(c)(3)(ii))	Chapt. 2, Sec 2.2	✓	
C3. Does the Plan include goals to reduce/avoid long-term vulnerabilities to the identified hazards? (Requirement §201.6(c)(3)(i))	Chapt. 4, Sec. 4.1	✓	
C4. Does the Plan identify and analyze a comprehensive range of specific mitigation actions and projects for each jurisdiction being considered to reduce the effects of hazards, with emphasis on new and existing buildings and infrastructure? (Requirement §201.6(c)(3)(ii))	Chapt. 4, Sec. 4.2	✓	
C5. Does the Plan contain an action plan that describes how the actions identified will be prioritized (including cost benefit review), implemented, and administered by each jurisdiction? (Requirement §201.6(c)(3)(iv)); (Requirement §201.6(c)(3)(iii))	Chapt. 4, Sec. 4.3	✓	
C6. Does the Plan describe a process by which local governments will integrate the requirements of the mitigation plan into other planning mechanisms, such as comprehensive or capital improvement plans, when appropriate? (Requirement §201.6(c)(4)(ii))	Chapt. 5, Sec. 5.2	✓	
ELEMENT C: REQUIRED REVISIONS N/A			

1. REGULATION CHECKLIST Regulation (44 CFR 201.6 Local Mitigation Plans)	Location in Plan (section and/or page number)	Met	Not Met
ELEMENT D. PLAN REVIEW, EVALUATION, AND IMPLEMENTATION (applicable to plan updates only)			
D1. Was the plan revised to reflect changes in development? (Requirement §201.6(d)(3))	Chapt. 2	✓	
D2. Was the plan revised to reflect progress in local mitigation efforts? (Requirement §201.6(d)(3))	Chapt. 4	✓	
D3. Was the plan revised to reflect changes in priorities? (Requirement §201.6(d)(3))	Chapt. 4	✓	
ELEMENT D: REQUIRED REVISIONS N/A			
ELEMENT E. PLAN ADOPTION			
E1. Does the Plan include documentation that the plan has been formally adopted by the governing body of the jurisdiction requesting approval? (Requirement §201.6(c)(5))	xviii – xxvi, App. Sec. 6.4	✓	
E2. For multi-jurisdictional plans, has each jurisdiction requesting approval of the plan documented formal plan adoption? (Requirement §201.6(c)(5))	xviii – xxvi, App. Sec. 6.4	✓	
ELEMENT E: REQUIRED REVISIONS N/A *The following guidance is provided:* After a multi-jurisdictional Mitigation Plan has been adopted, and approved by FEMA, additional jurisdictions, such as school districts, may wish to become part of the mitigation plan in order to be eligible for grant funding. Additional jurisdictions may be added to an existing, FEMA-approved, mitigation plan, only if conditions are met. See Local Multi-Hazard Mitigation Planning Guidance (July 2008), pages 21-23.			

SECTION 2: PLAN ASSESSMENT

A. Plan Strengths and Opportunities for Improvement

This section provides a discussion of the strengths of the plan document and identifies areas where these could be improved beyond minimum requirements.

Element A: Planning Process

Plan Strengths

- The plan reflects an open and inclusive public involvement process: the planning process provided multiple opportunities for public participation and feedback. Use of the UERPC's website for public review and comment is commendable.
- Outreach appropriate to constituents (county-wide print and community service ads on the radio) supported strong community involvement.

Opportunities for Improvement

- For future updates, online survey sites and social media could be useful in collecting information, getting feedback and developing even broader public engagement.

Element B: Hazard Identification and Risk Assessment

Plan Strengths

- The plan provides substantive background information including population and demographic analyses, housing characteristics, local capacities and critical facilities.
- The plan identifies 17 hazards that significantly affect the Planning Area, provides the county's disaster declaration history, and uses the CPRI to establish a ranking of hazards.
- Maps and tables are particularly well done; they neatly summarize and clarify a variety of information critical to the plan. Schools are mapped in relation to special flood hazard areas, making it easy to assess any flooding issues for the school jurisdictions; at the next update it might be helpful to map other critical facilities in relation to known flood areas.

Opportunities for Improvement

- Community profile sections on "Other Mitigation Issues," "Activities Already in Place" and "Activities Sought for Future Action" could be expanded with text describing how these activities have mitigated, or would mitigate, specific areas of concern or risk within each community. It would be useful to have more detailed activities/information than "improved/enhanced infrastructure sought." In this case, what kind of infrastructure, where is it located, why is it deficient and what improvements or enhancements are desired? While the plan provides a rational for the relationships between the risk assessment and mitigation strategies, it would be more robust if there were more explicit connections made among different sections of the plan.
- The plan acknowledges an expectation "that better data and analytic tools will be available" in the future; it would certainly be helpful to identify where data gaps exist and what kinds of tools might be beneficial going forward. These deficiencies should be addressed in mitigation actions.

B. Resources for Implementing Your Approved Plan

A variety of mitigation resources are available to communities. The Iowa Homeland Security & Emergency Management website: http://www.iowahomelandsecurity.org/disasters/hazard_mitigation.html provides planning and project related information as well as details on how major FEMA mitigation programs are implemented in the State.

HSEMD's training website provides information on upcoming training opportunities within the State: http://homelandsecurity.iowa.gov/training/.

Review of the FEMA HMA guidance (FY11 is the most current) is also encouraged as guidance provides information about application and eligibility requirements. This guidance is available from http://www.iowahomelandsecurity.org/grants/HMA.html or through FEMA's grant applicant resources page at http://www.fema.gov/government/grant/hma/grant_resources.shtm.

The FEMA Hazard mitigation planning site http://www.fema.gov/plan/mitplanning/index.shtm contains the official guidance to meet the requirements of the Stafford Act, as well as other resources and procedures for the development of hazard mitigation plans.

Various funding programs are available from several state and federal agencies to assist local jurisdictions in accomplishing their mitigation activities and goals. A detailed listing of programs, information on each program, and contact information is also available from the 2010 State Hazard Mitigation Plan.

Howard County, Iowa Multi-Jurisdiction (MJ-2) Multi-Hazard Mitigation Plan

City of Lime Springs ● City of Protivin

July, 2010

Developed by the Cities of Lime Springs and Protivin
with professional planning assistance from
Upper Explorerland Regional Planning Commission (UERPC)

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ACKNOWLEDGEMENTS

Participating Jurisdictions' Hazard Mitigation Planning Committee (HMPC), 2010

Team Member Name	Role/responsibility/contribution in community for planning knowledge
Darrell Knecht, Team Lead	Howard County Emergency Management Coordinator (EMA); Howard County Resident
Barb Robinson	Lime Springs Mayor; Retired from Telecom; Lime Springs Resident
Mike Lensing	Protivin Mayor; Lynch Livestock Manager; Protivin Resident
Tony Roberts	Lime Springs Fire Chief; Carpenter; Lime Springs Resident
Greg Mahr	Lime Springs Fire Department Member; Farmer; Lime Springs Resident
Jerry Johnson	Spring Ahead Preschool Learning Center President; Lime Spring Resident
Mike Johnson	Lime Springs Fire Department Member; Owner, Johnson Farmers; Lime Springs Resident
Robert Hughes	Lime Springs/Chester Elementary Principal; Lime Springs Resident
Jim Panos	Protivin City Council Member; Protivin Resident
Ken Panos	Protivin City Council Member; Protivin Resident
Dale Ryan	Protivin City Council Member; Employee, Ryan Machinery
Milan Mohn	Protivin City Council Member; Protivin Resident
Adam Polashek	Protivin City Council Member; Employee, Polashek's Locker
Brad Moudry	Protivin Fire Chief; Protivin Resident

Special thanks and consideration to the Cities of, and the schools within, Lime Springs and Protivin for their successful completion of this planning process, while allowing Upper Explorerland Regional Planning Commission to assist their Hazard Mitigation Planning Committee (HMPC) as well as the Hazard Mitigation Meeting Participants (HMMP).

- Upper Explorerland Regional Planning Commission (UERPC)

Note: Neighboring communities, agencies, businesses, academia, nonprofits, other interested parties, and/or the general public were invited and encourage to participate during this planning process, including during the selection and appointment of the HMPC.

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CROSS REFERENCE FOR THE LOCAL MULTI-HAZARD MITIGATION PLAN REVIEW

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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. The two participating jurisdictions included in this plan are:

- City of Lime Springs, Iowa
- City of Protivin, Iowa

These two jurisdictions will hereinafter be collectively referred to as Participating Jurisdictions or the planning area.

The Participating Jurisdictions developed this multi-hazard mitigation plan to reduce future losses in the planning area from identified hazards. 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) Flood Mitigation Assistance, Pre-Disaster Mitigation, and Hazard Mitigation Grant Programs.

The remaining Cities in Howard County: Chester, Cresco, Elma and the Unincorporated Area of Howard County are funded under different grants for their multi-hazard mitigation planning process. They will be integrated into a collective plan at a later date. It is a common goal to ultimately join all Howard County communities into one county-wide Multi-Hazard Mitigation Plan. The City of Riceville, Iowa, is also within Howard County boundaries, but their planning is being accomplished by North Iowa Council of Governments (NICOG), Mason City, Iowa.

The Participating Jurisdictions' planning process followed a methodology prescribed by FEMA, which began with the identification and formal appointment of the Hazard Mitigation Planning Committee (HMPC) comprised of key stakeholders in the Participating Jurisdictions.

A multi-jurisdictional meeting was held, with each participating jurisdiction invited and encouraged to attend. At this meeting, referred to as the Multi-Jurisdictional Hazard Mitigation (MJHM) Meeting, the HMPC members were selected. Purpose and intent of the MJHM meeting was to discuss and decide the hazards in which the Participating Jurisdictions are vulnerable to. In addition to the MJHM Meeting, each Participating Jurisdiction held a jurisdiction-specific hazard mitigation meeting to discuss and decide their desired mitigation actions, referred to the Jurisdiction's Hazard Mitigation (HM) Meeting.

Those who attended any of the meetings to provide input, while not necessarily designated as HMPC members, are referred to Hazard Mitigation Meeting Participants (HMMP). The list of HMPC members can be found on Page iii, prior to the Table of Contents. The HMMP of each meeting are found on the sign-in sheets in Appendix B.

At the MJHM Meeting, the HMPC and HMMP conducted a risk assessment that identified and profiled hazards that pose a risk to the Participating Jurisdictions, assessed the Participating Jurisdictions' vulnerability to these hazards, and examined the capabilities in place to mitigate them. The Participating Jurisdictions are vulnerable to several hazards that are identified, profiled, and analyzed in this plan. Windstorms, tornadoes, and severe winter

storms are among the hazards that were determined to have a significant impact on the planning area.

Based upon the risk assessment, the HMPC and HMMP identified goals for reducing risk from hazards. The goals of this multi-hazard mitigation plan are to:

Goal 1: Minimize vulnerability of the people and their property in the Participating Jurisdictions 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 the Participating Jurisdictions
Goal 4: Strengthen communication among agencies and between agencies and the public

To meet the identified goals, the plan recommends the mitigation actions summarized in the table on the following pages. An implementation plan for each action was developed, which identifies priority level, background information, ideas for implementation, responsible agency, timeline, cost estimate and potential funding sources. These additional details are provided in Section 4.3.

The Howard County, Iowa Multi-Jurisdiction (MJ-2) Multi-Hazard Mitigation Plan has been formally adopted by the Howard County Board of Supervisors and the governing bodies of each participating jurisdiction. The plan will be updated within a five-year timeframe.

Mitigation actions for hazards were reviewed, discussed, and scored; the community's priority ranking is noted as the "Action ID".

Action ID	Action	Action Category(ies)	STAPLEE Average	STAPLEE Priority	Goals	Hazard(s) Addressed
Lime Springs – 1	Construct FEMA-compliant tornado safe room(s)	Structural	2.9	H	1	Tornado, Severe Winter Storm, Hailstorms, Extreme Heat, Thunderstorm and Lightning, Windstorm
Lime Springs – 2	Purchase and install warning siren(s)	Emergency Services	2.9	H	1, 2, 4	Tornado, Thunderstorm and Lightning, Windstorm, Hailstorm, Fire
Lime Springs – 3	Purchase and install generator(s)	Emergency Services	2.4	H	1, 2	All Hazards
Lime Springs – 4	Upgrade water supply, water and wastewater treatment infrastructure	Property Protection, Emergency Services, Structural Projects	2.4	H	1, 2	All Hazards

Lime Springs – 5	Purchase and install power supply transfer switch(es)	Emergency Services	2.6	H	1, 2, 4	All Hazards
Lime Springs – 6	Contain creek waters inside designated boundaries	Prevention, Property Protection, Natural Resource Protection, Emergency Services, Structural Projects	1.5	M	1, 2	Flash Flood
Lime Springs – 7	Continue NFIP Participation	Prevention, Property Protection, Natural Resource Protection, Emergency Services	2.1	H	1, 2	Flash Flood
Protivin – 1	Purchase and install power supply transfer switch(es)	Emergency Services	2.7	H	1, 2, 4	All Hazards
Protivin – 2	Purchase and install generator(s)	Emergency Services	2.5	H	1, 2	All Hazards
Protivin – 3	Improve land use management to minimize water damages from flash flooding events	Prevention, Property Protection, Natural Resource Protection, Emergency Services, Structural Projects	2.3	H	1, 2	Flash Flood
Protivin – 4	Construct a new fire station building	Emergency Services, Structural	2	M	1, 2, 3, 4	All Hazards
Protivin – 5	Purchase and install warning siren(s)	Emergency Services	2.2	H	1, 2, 4	Tornado, Thunderstorm and Lightning, Windstorm, Hailstorm, Fire
Protivin – 6	Construct a FEMA-compliant tornado safe room	Structural	1.9	M	1	Tornadoes, Severe Winter Storms, Hailstorms, Extreme Heat, Thunderstorms and Lightning, Windstorms
Protivin – 7	Continue the process to join the National Flood Insurance Program (NFIP)	Prevention	1.6	M	1	Flash Flood
County – 1	Promote the Howard County, Iowa Multi-Jurisdiction (MJ-2) Multi-Hazard Mitigation Plan to the public	Prevention, Property Protection, Structural, Natural Resource Protection, Emergency Services, Public Education and Awareness	2	M	1, 2, 3, 4	All Hazards
County – 2	Ensure the Howard County, Iowa Multi-Jurisdiction (MJ-2) Multi-Hazard Mitigation Plan is reviewed and kept current	Prevention, Property Protection, Structural, Natural Resource Protection, Emergency Services, Public Education and Awareness	2.4	H	1, 2, 3, 4	All Hazards

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.

City of Lime Springs Plan Adoption Resolution

RESOLUTION # 04062010

RESOLUTION ADOPTING
"HOWARD COUNTY MULTI-JURISDICTION MITIGATION PLAN (MJ-2)"

WHEREAS, the City Council of Lime Springs, Iowa recognizes the threat that natural and human-caused 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 Multi-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 City Council of Lime Springs, Iowa fully participated in the FEMA prescribed mitigation planning process to prepare this Multi-Hazard Mitigation Plan; and

WHEREAS, the Iowa Homeland Security and Emergency Management Division and the Federal Emergency Management Agent Region VII officials will review "Howard County Multi-Jurisdiction Mitigation Plan (MJ-2)", and approve it contingent upon this official adoption of the participating governing body; and

WHEREAS, the City Council of Lime Springs, Iowa desires to comply with the requirements of the Disaster Mitigation Act and to augment its emergency planning efforts by formally adopting "Howard County Multi-Jurisdiction Mitigation Plan (MJ-2)"; and

WHEREAS, adoption by the governing body for the City Council of Lime Springs, Iowa demonstrates the jurisdiction's commitment to fulfilling the mitigation goals and objectives outlined in this Multi-Hazard Mitigation Plan; and

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

NOW, THEREFORE, it is hereby resolved that the City Council of Lime Springs, Iowa adopts the "Howard County Multi-Jurisdiction Mitigation Plan (MJ-2)" as an official plan; and

NOW, THEREFORE, it is further hereby resolved that the City Council of Lime Springs, Iowa will submit this Adoption Resolution to the Iowa Homeland Security and Emergency Management Division and Federal Emergency Management Agency Region VII officials to enable the plan's final approval.

Approved and Adopted this 6th day of April, 2010 at the meeting of the City Council.

Barbara Robinson 4/6/2010
Barbara Robinson, Mayor; Date
City of Lime Springs, Iowa

ATTEST:

Mary Schatz 4/6/2010
Mary Schatz, City Clerk; Date
City of Lime Springs, Iowa

City of Protivin Plan Adoption Resolution

RESOLUTION # 04-13-10-1

RESOLUTION ADOPTING
"HOWARD COUNTY MULTI-JURISDICTION MITIGATION PLAN (MJ-2)"

WHEREAS, the City Council of Protivin, Iowa recognizes the threat that natural and human-caused 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 Multi-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 City Council of Protivin, Iowa fully participated in the FEMA prescribed mitigation planning process to prepare this Multi-Hazard Mitigation Plan; and

WHEREAS, the Iowa Homeland Security and Emergency Management Division and the Federal Emergency Management Agent Region VII officials will review "Howard County Multi-Jurisdiction Mitigation Plan (MJ-2)", and approve it contingent upon this official adoption of the participating governing body; and

WHEREAS, the City Council of Protivin, Iowa desires to comply with the requirements of the Disaster Mitigation Act and to augment its emergency planning efforts by formally adopting "Howard County Multi-Jurisdiction Mitigation Plan (MJ-2)"; and

WHEREAS, adoption by the governing body for the City Council of Protivin, Iowa demonstrates the jurisdiction's commitment to fulfilling the mitigation goals and objectives outlined in this Multi-Hazard Mitigation Plan; and

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

NOW, THEREFORE, it is hereby resolved that the City Council of Protivin, Iowa adopts the "Howard County Multi-Jurisdiction Mitigation Plan (MJ-2)" as an official plan; and

NOW, THEREFORE, it is further hereby resolved that the City Council of Protivin, Iowa will submit this Adoption Resolution to the Iowa Homeland Security and Emergency Management Division and Federal Emergency Management Agency Region VII officials to enable the plan's final approval.

Approved and Adopted this 13th day of April, 2010 at the meeting of the City Council.

Michael Lensing 4-13-10
Michael Lensing, Mayor; Date
City of Protivin, Iowa

ATTEST:

Zita Bruess, City Clerk
Zita Bruess, City Clerk; Date 4-13-10
City of Protivin, Iowa

Howard County Board of Supervisors Plan Adoption Resolution

RESOLUTION # 733

RESOLUTION ADOPTING
Howard County, Iowa Multi-Jurisdiction (MJ-2) Multi-Hazard Mitigation Plan

WHEREAS, the Board of Supervisors, Howard County, Iowa recognizes the threat that natural and human-caused hazards pose to people and property within our community; and 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, emphasizing the need for pre-disaster mitigation of potential hazards and the Disaster Mitigation Act made available hazard mitigation grants to state and local governments; and

WHEREAS, an adopted Multi-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 Board of Supervisors, Howard County, Iowa fully participated in the FEMA prescribed mitigation planning process to prepare this Multi-Hazard Mitigation Plan; and

WHEREAS, the Iowa Homeland Security and Emergency Management Division and the Federal Emergency Management Agency Region VII officials will review Howard County, Iowa Multi-Jurisdiction (MJ-2) Multi Hazard Mitigation Plan, and approve it contingent upon this official adoption of the participating governing body; and

WHEREAS, the Board of Supervisors, Howard County, Iowa desires to comply with the requirements of the Disaster Mitigation Act and to augment its emergency planning efforts by formally adopting Howard County, Iowa Multi-Jurisdiction (MJ-2) Multi-Hazard Mitigation Plan; and

WHEREAS, adoption by the governing body for the Board of Supervisors, Howard County, Iowa demonstrates the jurisdiction's commitment to fulfilling the mitigation goals and objectives outlined in this Multi-Hazard Mitigation Plan; and

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

NOW, THEREFORE, it is hereby resolved that the Board of Supervisors, Howard County, Iowa adopts the Howard County, Iowa Multi-Jurisdiction (MJ-2) Multi-Hazard Mitigation Plan as an official plan; and

NOW, THEREFORE, it is further hereby resolved that the Board of Supervisors, Howard County, Iowa will submit this Adoption Resolution to the Iowa Homeland Security and Emergency Management Division and Federal Emergency Management Agency Region VII officials to enable the plan's final approval.

Approved and Adopted this 19th day of April, 2010 at the meeting of the Board of Supervisors.

4-19-10
A. Mick Gamez, Board of Supervisors Chair; Date
Howard County, Iowa

ATTEST:

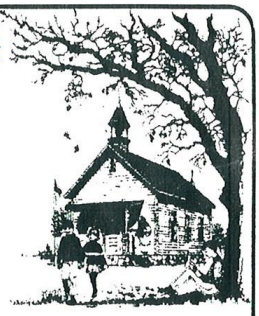
Julie Chapman 4-19-10
Julie Chapman, Auditor; Date
Howard County, Iowa

Howard-Winneshiek Community School District

Howard-Winneshiek Community School District

1000 Schroder Drive • Cresco, Iowa 52136 • 563-547-2762

Attendance Centers: Cresco, Elma, Lime Springs, Ridgeway



April 23, 2010

To all interested parties regarding the Howard County Multi-Jurisdiction (MJ-2) Hazard Mitigation Plan,

We, the Howard-Winneshiek Community School District, are in support of and do adopt-the Howard County Multi-Jurisdiction (MJ-2) Hazard Mitigation Plan as developed and/or updated by the Jurisdictions of:

- City of Lime Springs, Iowa - adopted on April 6, 2010,
- City of Protivin, Iowa - adopted on April 13, 2010,
- Howard County, Iowa - adopted on April 19, 2010, and

with the professional assistance of Upper Explorerland Regional Planning Commission. This plan addresses city, rural and county-wide pre-disaster mitigation actions for hazards identified by the Hazard Mitigation Planning Committee and participants of the planning process, as guided by FEMA and Iowa Homeland Security Emergency Management Division. During the planning process, the general public, governmental bodies, schools, and other resources were invited and encouraged to participate.

As a member of the Hazard Mitigation Planning Committee (HMPC), Robert Hughes, along with myself participated in the planning process, which included the recognition of disaster mitigation goals, review and identification of hazards which impact the planning area, and selection and prioritization of mitigation actions. All hazards in the plan impact the school district in the same manner as the participating jurisdiction, and the school district agrees with the list of goals and mitigation action items already in the plan.

The school district includes the City of Lime Springs. The pending project of a FEMA-compliant tornado safe room has a proposed location within the participating jurisdiction of City of Lime Springs.

With best available data of the 1975 Flood Hazard Boundary Map, the Howard-Winneshiek Community School District has the following property and/or structures located in City of Lime Springs within the Special Flood Hazard Area (SFHA):

- None

Any proposed project site locations are not within designated SFHA's and/or Zone A's.

Respectfully,

Brian Ney

Brian Ney, Superintendent
Howard-Winneshiek Community School District

"Our Opportunity is Service, Our Challenge is Performance"

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1 INTRODUCTION AND PLANNING PROCESS

1.1 Purpose

The Participating Jurisdictions prepared this local hazard mitigation plan to guide hazard mitigation planning, to better protect the people and property of the Participating Jurisdictions from the effects of hazards, and serves as a tool to help decision makers direct mitigation activities and resources. This plan was also developed to make the Participating Jurisdictions eligible for certain federal disaster assistance, specifically, the Federal Emergency Management Agency's (FEMA) Hazard Mitigation Grant Program (HMGP), Pre-Disaster Mitigation program (PDM), and Flood Mitigation Assistance (FMA) programs.

1.2 Background and Scope

Each year in the United States, natural 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 natural disasters are predictable, and much of the damage caused by these events can be minimized or even eliminated.

Hazard mitigation is defined by FEMA as "any sustained action taken to reduce or eliminate long-term risk to human life and property from a hazard event." The results of a three-year, congressionally mandated independent study to assess future savings from mitigation activities provides evidence that mitigation activities are highly cost-effective. On average, each dollar spent on mitigation saves society an average of $4 in avoided future losses in addition to saving lives and preventing injuries (National Institute of Building Science Multi-Hazard Mitigation Council, 2005).

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. This plan documents the Participating Jurisdictions' hazard mitigation planning process and identifies relevant hazards, vulnerabilities, and strategies, the Participating Jurisdictions will use to decrease vulnerability and increase resiliency and sustainability. It will affect activities and decisions for local land use policy in the future as proactive hazard mitigation planning will help reduce the cost of disaster response.

The Howard County, Iowa Multi-Jurisdiction (MJ-2) Multi-Hazard Mitigation Plan is a multi-jurisdictional plan that geographically covers the city limits of the cities of Lime Springs and Protivin (hereinafter referred to as the planning area). 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. (Hereinafter, these requirements and regulations will be referred to collectively as the Disaster Mitigation Act.) While the act emphasized the need for hazard mitigation plans and more coordinated hazard 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 and recovery to communities and their residents by protecting critical community facilities, reducing liability exposure, and minimizing overall community impacts and disruptions. The Participating Jurisdictions have been affected by hazards in the past and therefore committed to reducing future impacts from hazard events and becoming eligible for mitigation-related federal funding.

1.3 Plan Organization

Howard County, Iowa Multi-Jurisdiction (MJ-2) Multi-Hazard Mitigation Plan is organized as follows:

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

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.

The planning process has included the collection of community data, hazard analysis, and mitigation strategies. Upper Explorerland Regional Planning Commission's (UERPC) role was to:

- Assist in establishing the Hazard Mitigation Planning Committee (HMPC) as defined by the Disaster Mitigation Act of 2000 (DMA), and
- Meet the DMA requirements as established by federal regulations and following FEMA's planning guidance, and
- Facilitate and document entire planning process, and
- Identify the data requirements that HMPC participants could provide and conduct the research and documentation necessary to augment data research, and
- Assist in facilitating the public input process, and
- Produce the draft and final plan documents, and
- Coordinate the Iowa Department of Homeland Security and Emergency Management Division, FEMA Iowa, and FEMA Region VII plan reviews

1.4.1 Multi-Jurisdictional Participating

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.

The Disaster Mitigation Act requires that each jurisdiction participate in the planning process and officially adopt the multi-jurisdictional hazard mitigation plan. The communities and resources, including school districts, of Lime Springs and Protivin were invited to be active participants during the Howard County, Iowa Multi-Jurisdiction (MJ-2) Multi-Hazard Mitigation Plan planning process. Each jurisdiction chose to participate in the planning process and development of the plan was required to meet plan participation requirements, which included the following:

- Designate a representative to serve on the HMPC
- Participate in at least one of the meetings, either the multi-jurisdictional HMPC meeting or one of the single jurisdictional HM meetings or assist with data collection per request of UERPC outside of the meetings
- Provide information to support the plan development
- Identify mitigation actions for the plan
- Review and comment on plan drafts
- Inform the public, local officials, and other interested parties about the planning process and provide opportunity for them to comment on the plan
- Formally adopt the hazard mitigation plan

With the communities of Lime Springs and Protivin, Iowa, the Howard-Winneshiek Community School District was a Participating Jurisdiction through this planning process. As documented in their Letter of Adoption, Page xv:

> [Howard-Winneshiek Community School District] participated in the planning process which included the recognition of disaster mitigation goals, review and identification of hazards which impact the planning area, and selection and prioritization of mitigation actions. All hazards in the plan impact the school district in the same manner as the participating jurisdiction and the school district agrees with the list of goals and mitigation action items already in the plan.
>
> The school district includes the City of Lime Springs. The pending project of FEMA-compliant tornado safe room has a proposed location within the participating jurisdiction of City of Lime Springs.
>
> With best available data of the 1975 Flood Hazard Boundary Map the Howard-Winneshiek Community School District has the following property and/or structures located in City of Lime Springs within the Special Flood Hazard Area (SFHA): None.

All of the jurisdictions listed as official participants in this plan met all of these participation requirements. Sign-in sheets are included in Appendix B: Planning Process Documentation to show the attendance of representatives at each meeting.

1.4.2 The 10-Step Planning Process

UERPC and the HMPC and HMMP worked together to establish the framework and process for this planning effort using FEMA's *Local Multi-Hazard Hazard mitigation planning Guidance* (2008) and the *State and Local Hazard mitigation planning How-To Guides* (2001). The plan is structured around a four-phase process:

1) Organize resources
2) Assess Risks
3) Develop the hazard mitigation plan
4) Implement the plan and monitor progress

The following is a modified detailed 10-step planning process used for FEMA's Community Rating System (CRS) and Flood Mitigation Assistance programs. Thus, the modified 10-step process used for this plan meets the funding eligibility requirements of the Hazard Mitigation Grant Program (HMGP), Pre-Disaster Mitigation (PDM) program, Community Rating System (CRS), and Flood Mitigation Assistance (FMA) programs.

Table 1.1 reflects alignment of the modified 10-step process with FEMA's four-phase process.

Table 1.1 Hazard Mitigation Planning Process Used to Develop the Participating Jurisdictions' Multi-Hazard Hazard mitigation plan

DMA Process	Modified CRS Process
1) Organize Resources	
201.6(c)(1)	1) Organize the Planning Effort
201.6(b)(1)	2) Involve the Public
201.6(b)(2) and (3)	3) Coordinate with Other Departments and Agencies
2) Assess Risks	
201.6(c)(2)(i), (iii)	4) Identify the Hazards
201.6(c)(2)(i), (iii)	5) Profile the Hazards
3) Develop the Hazard mitigation plan	
201.6(c)(3)(i)	6) Set Goals
201.6(c)(3)(ii)	7) Review Possible Activities
201.6(c)(3)(iii)	8) Draft an Action Plan
4) Implement the Plan and Monitor Progress	
201.6(c)(4)	9) Adopt the Plan
201.6(c)(5)	10) Implement, Evaluate, and Revise the Plan

Phase 1 – Organize Resources

Step 1: Organize the Planning Effort

While all neighboring communities, agencies, businesses, academia, nonprofits, other interested parties, and/or the general public were invited and encouraged to attend during the planning process, a Hazard Mitigation Planning Committee (HMPC) was created following the MJHM meeting. The HMPC includes representatives from the Participating Jurisdictions responsible for making decisions in the plan and agreeing upon the final contents. A complete list of all representatives of the agencies and organizations that participated on the HMPC as well as HMMP is provided in Appendix B. The HMPC and HMMP contributed to this planning process by:

- Providing facilities for meetings
- Attending and participating in meetings
- Collecting data
- Managing administrative details
- Making decisions on plan process and content
- Submitting mitigation action implementations worksheets
- Reviewing drafts
- Coordinating and assisting with public involvement and plan adoptions

The HMPC and HMMP communicated with UERPC planners during the planning process with a combination of face-to-face meetings, telephone conversations, and email correspondence. The sign-in sheets, agendas, and meeting minutes for each of the meetings are included in Appendix B.

At the MJHM Meeting, UERPC presented information regarding the scope of work and purpose of the plan, participation requirements of HMPC members, and the proposed project work schedule. Also, plans for public involvement (Step 2) and coordination with other agencies and departments (Step 3) were discussed. The hazard identification information was introduced; the HMPC and HMMP discussed past events and impacts and future probability for each of the hazards suggested by FEMA and the Iowa Homeland Security and Emergency Management Division for consideration in a local hazard mitigation plan. The HMPC, HMMP, and UERPC refined the list of hazards to make it relevant to the Participating Jurisdictions. Data needs were identified throughout the planning process in meetings and email and telephone communications.

Step 2: Plan for Public Involvement

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.

The date, time, and location for all meetings, along with open period dates and date for Participating Jurisdictions to formally adopt the plan by resolution were posted as public notices in all county-wide publications: The Lime Springs Herald and the Cresco Times-Plain Dealer. Members of the public were invited and encouraged to attend. Copies of these notices are provided in Appendix B.

At each hazard mitigation planning meeting UERPC explained to the attendees it was essential to have public involvement and input in the hazard mitigation planning process. Meeting agendas, minutes and draft plan were available online, with hard copies made available upon request. During the drafting stages, the hazard mitigation plan rough draft was available for review and comment for over 30 days, from March 1, 2010 – March 31, 2010. Updated versions of the draft were posted regularly at UERPC's website: http://www.uerpc.org/haz_mit.php.

The public was able to express comments to UERPC through phone, email, or attending the hazard mitigation planning meetings; they could also notify the HMPC Team Lead.

Step 3: Coordinate with Other Departments and Agencies

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 various organizations whose goals and interests interface with hazard mitigation in the Participating Jurisdictions. Coordination with these organizations and other community planning efforts is vital to the success of this plan. UERPC invited local and

regional agencies to the meetings to learn about the hazard mitigation planning initiative. The extensive range of invitees for participation and planning meeting attendance is found in Appendix B.

In addition, UERPC developed a list of neighboring communities and local and regional agencies involved in hazard mitigation activities, as well as other potentially interested parties, to invite by email to attend the hazard mitigation meetings and/or review and comment on the draft version Howard County, Iowa Multi-Jurisdiction (MJ-2) Multi-Hazard Mitigation Plan via email, telephone, or attendance at hazard mitigation planning meetings. Documentation is provided in Appendix B. Public notices in county-wide publications (discussed in Step 2) were utilized to ensure notification, inclusion, and opportunity for involvement to all concerned business, private non-profit organizations, and the general public.

As part of coordination with other agencies, the HMPC and UERPC collected and reviewed existing technical data, reports, and plans. These included the State of Iowa Hazard Mitigation Plan, various literature on local communities as well as other data from state and federal agencies. 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 are documented throughout the plan and in Appendix A, References.

Phase 2 - Assess Risk

Step 4: Identify the Hazards

UERPC assisted the HMPC and HMMP in a process to identify the hazards that have impacted or could impact the Participating Jurisdictions. At the MJHM Meeting, the HMPC and HMMP were supplied with a history of disaster declarations. The HMPC and HMMP also reviewed a list of hazards suggested by FEMA for consideration, and additional hazards included in the State of Iowa Hazard Mitigation Plan. The HMPC and HMMP worked through this list of all potential hazard events, types of damage, and where additional information might be found. There were hazards the HMPC and HMMP chose to exclude from further review. Justification is provided for each hazard removed from further review in Section 3.1

Step 5: Profile the Hazards

At the MJHM Meeting, the HMPC and HMMP refined the list of hazards to make the analysis relevant to the Participating Jurisdictions, discussed past events and impacts and came to consensus on the probability level for each hazard. During this meeting, the HMPC and HMMP also reviewed the magnitude, duration, warning time, and spatial extent elements for each of the hazards that were utilized in preparation of the preliminary hazard profiles and made recommendations for modifications to more accurately reflect the impacts of the hazards in the planning area. Prior to the meeting, a profile of each of these hazards had been developed. Internet resources and existing reports and plans were used to compile the information about past hazard events. After this meeting, the preliminary research and supplementary information and results of discussion by the HMPC and HMMP were compiled to develop complete hazard profiles detailing the

location, previous occurrences, probability of future occurrences, and magnitude of each hazard. More information on the methodology and resources used to identify and profile the hazards can be found in Sections 3.1 and 3.2.

Phase 3 – Develop the Hazard mitigation plan

Step 6: Set Goals

UERPC facilitated discussion with the HMPC and HMMP during the MJHM Meeting to identify goals for the Howard County, Iowa Multi-Jurisdiction (MJ-2) Multi-Hazard Mitigation Plan, sample goals were provided. Key issues for the hazards profiled were discussed to focus the HMPC and HMMP on the issues brought out by the risk assessment. Then the HMPC and HMMP discussed the definition and purpose of goal statements. As a group, the HMPC and HMMP achieved a consensus on the final goals for the Howard County, Iowa Multi-Jurisdiction (MJ-2) Multi-Hazard Mitigation Plan, which are described in Section 4.1.

Step 7: Review Possible Activities

Possible activities to mitigate against hazards were discussed at the single-jurisdiction HM meetings; special focus was on this issue at the final meeting for each jurisdiction. As each action was discussed, the HMPC and HMMP determined whether or not each action would be included in the plan.

At the final HM meetings for each participating jurisdiction, the meeting attendants determined which actions were to be included in the plan specific to the mitigation needs of that individual jurisdiction. UERPC facilitated the discussion that lead to successful completion of an action identification worksheet for each desired action.

The purpose of the action identification worksheet is to document background information, ideas for implementation, responsible agencies, partners, potential funding sources, cost estimates, benefits, and completion timeframe for each identified action. The HMPC and HMMP considered the various cost-benefit criteria, known as the STAPLEE (explained in Section 4.3), as they conducted the prioritization. It was explained to the HMPC and HMMP that cost-effective mitigation actions are those actions that, over time, have a higher value of avoided damages than the cost to implement the measure.

During final HM meetings for each participating jurisdiction, the HMPC and HMMP also participated in a prioritization exercise to help guide the implementation of actions. This exercise is described in Section 4.2. In addition, the HMPC and HMMP completed a STAPLEE worksheet for each action they chose to submit to the plan.

Step 8: Draft the Plan

UERPC made the most updated versions of the plan available at UERPC's website, http://www.uerpc.org/haz_mit.php, for review and comment by the public and other agencies and interested stakeholders. This online review period was from March 1, 2010 – March 31, 2010. Methods for inviting interested parties and the public to review and comment on the plan were discussed in Steps 2 and 3. Comments were integrated into a final draft for submittal to the Iowa Department of Homeland Security and Emergency Management Division, FEMA Iowa, and FEMA Region VII.

Phase 4 – Implement the Plan and Monitor Progress

Step 9: Adopt the Plan

To secure buy-in and officially implement the plan, the Participating Jurisdictions adopted the plan as follows:

- City of Lime Springs, April 6, 2010
- City of Protivin, April 13, 2010
- Howard-Winneshiek Community School District, April 23, 2010

Though not a Participating Jurisdiction, the Howard County Board of Supervisors also adopted the plan, reflecting the county's support of this multi-jurisdictional plan

- Howard County Board of Supervisors, April 19, 2010

Scanned copies of signed adoptions are included in the Prerequisites Section at the beginning of this plan and in Appendix D.

Step 10: Implement, Evaluate, and Revise the Plan

During the MJHM planning meeting, the meeting participants, with the HMPC Team Lead (Howard County Emergency Management Coordinator), agreed upon an overall strategy for plan implementation and for monitoring and maintaining the plan over time. This strategy is detailed in Section 5, Plan Maintenance Process.

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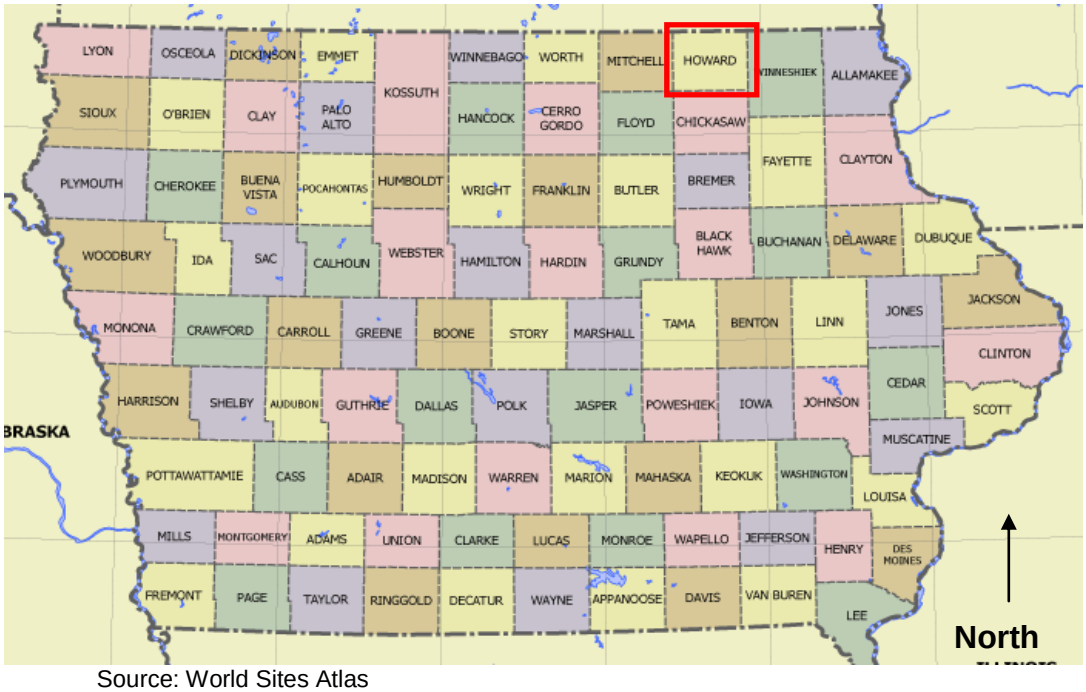
2 PLANNING AREA PROFILE AND CAPABILITIES

Section 2 provides a general profile of the Participating Jurisdictions' area followed by description of each of the jurisdictions participating in this plan and their existing mitigation capabilities.

2.1 Participating Jurisdictions' Planning Area Profile

Figure 2.1 provides a map to show where Howard County is located within the State of Iowa.

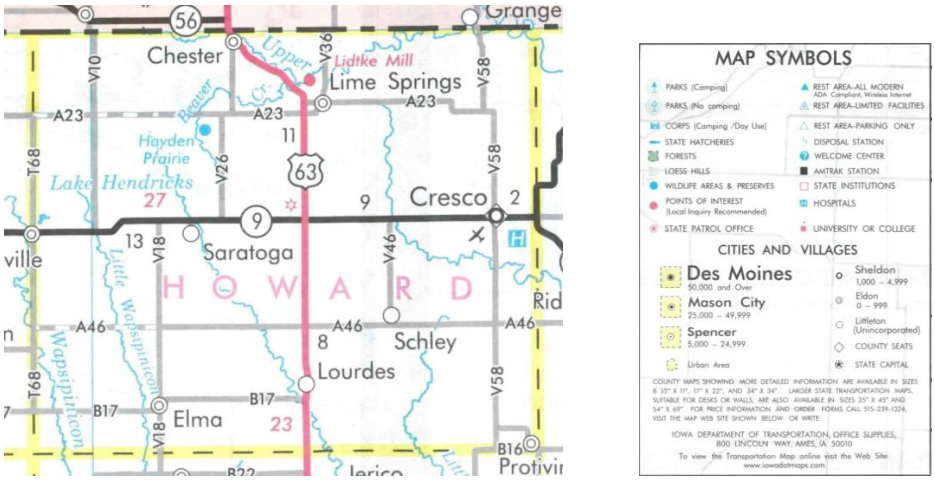
Figure 2.1 State of Iowa with County Boundaries



Source: World Sites Atlas
Note: The red rectangle indicates the approximate location of Howard County, Iowa

Figure 2.2 provides a road map of Howard County.

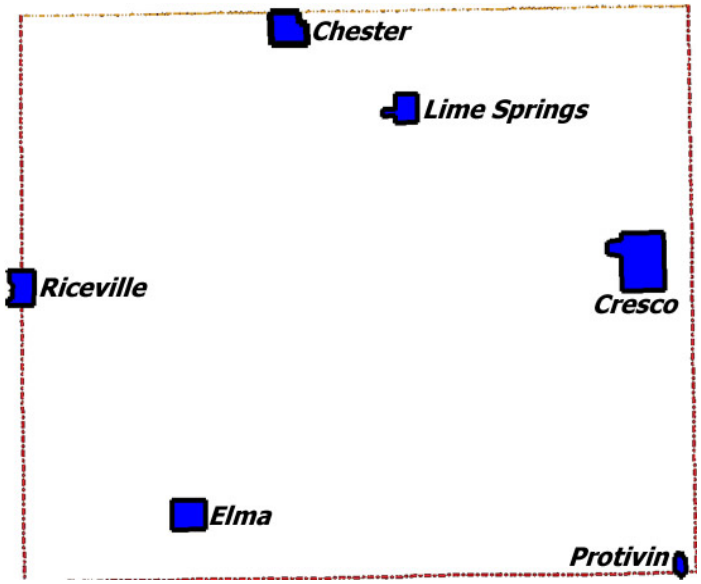
Figure 2.2 Howard County Road Map



Source: Iowa Department of Transportation
Note: Land area of Howard County is 474 square miles

Figure 2.3 provides a map to show where the city limits of Lime Springs and Protivin are located in Howard County with reference to each other.

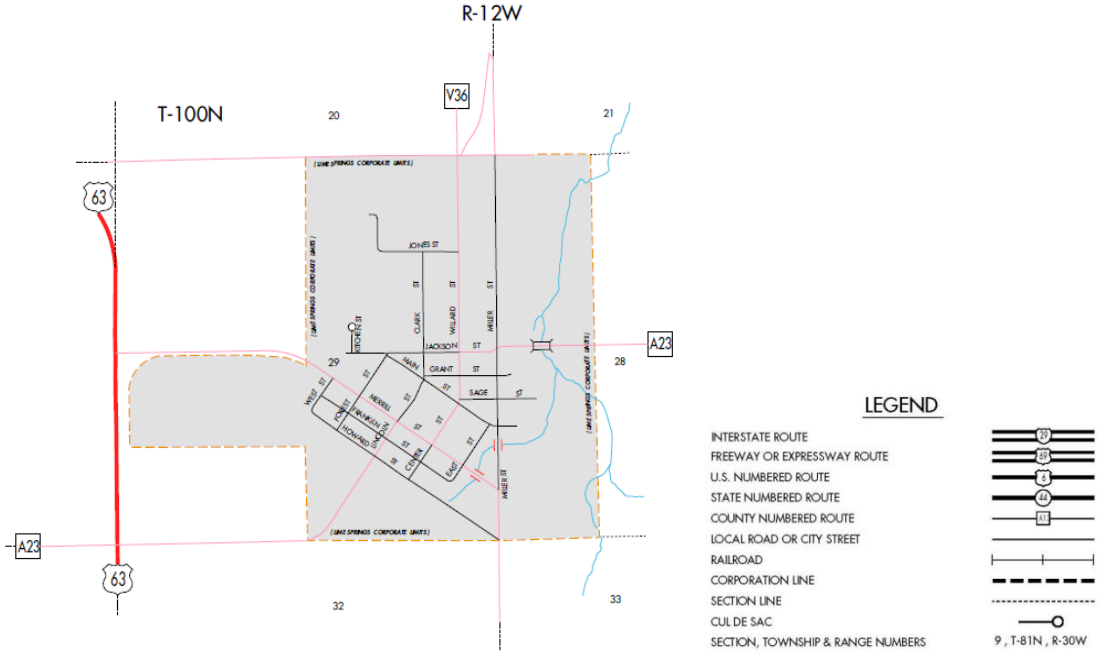
Figure 2.3 Howard County City Limits



Source: Iowa Department of Transportation

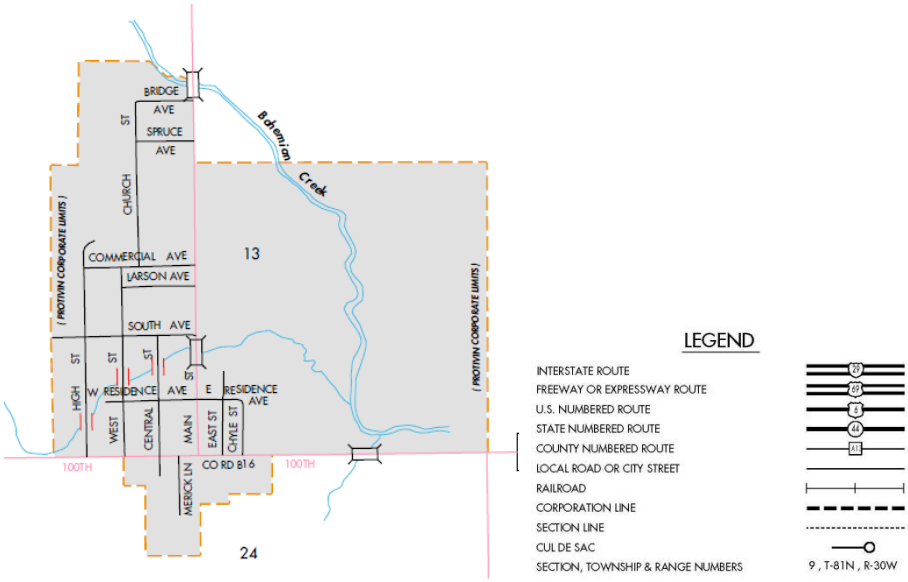
Figures 2.4 and 2.5 provide maps to show the city limits of the participating cities: Lime Springs and Protivin, Iowa.

Figure 2.4 City of Lime Springs Planning Area



Source: Iowa Department of Transportation
Note: The land area of city limits is 1.02 square miles (Source: www.city-data.com)

Figure 2.5 City of Protivin Planning Area



Source: Iowa Department of Transportation
Note: The land area of city limits is 0.48 square miles (Source: www.city-data.com)

2.1.1 Geography and Topography

Howard County is located in the northeastern part of the State of Iowa. The northern boundary of the county borders the State of Minnesota and the eastern boundary is approximately 50 miles from the State of Wisconsin border. Beginning with the north and going clockwise, Howard County is bounded by Mower County, MN, Fillmore County, MN, Winneshiek County, IA, Chickasaw County, IA, Floyd County, IA, and Mitchell County, IA.

With a county land area of relatively flat terrain, the topography range is relatively consistent. The lowest elevation in Howard County is approximately 1,090 feet and the highest elevation is approximately 1,350 feet.

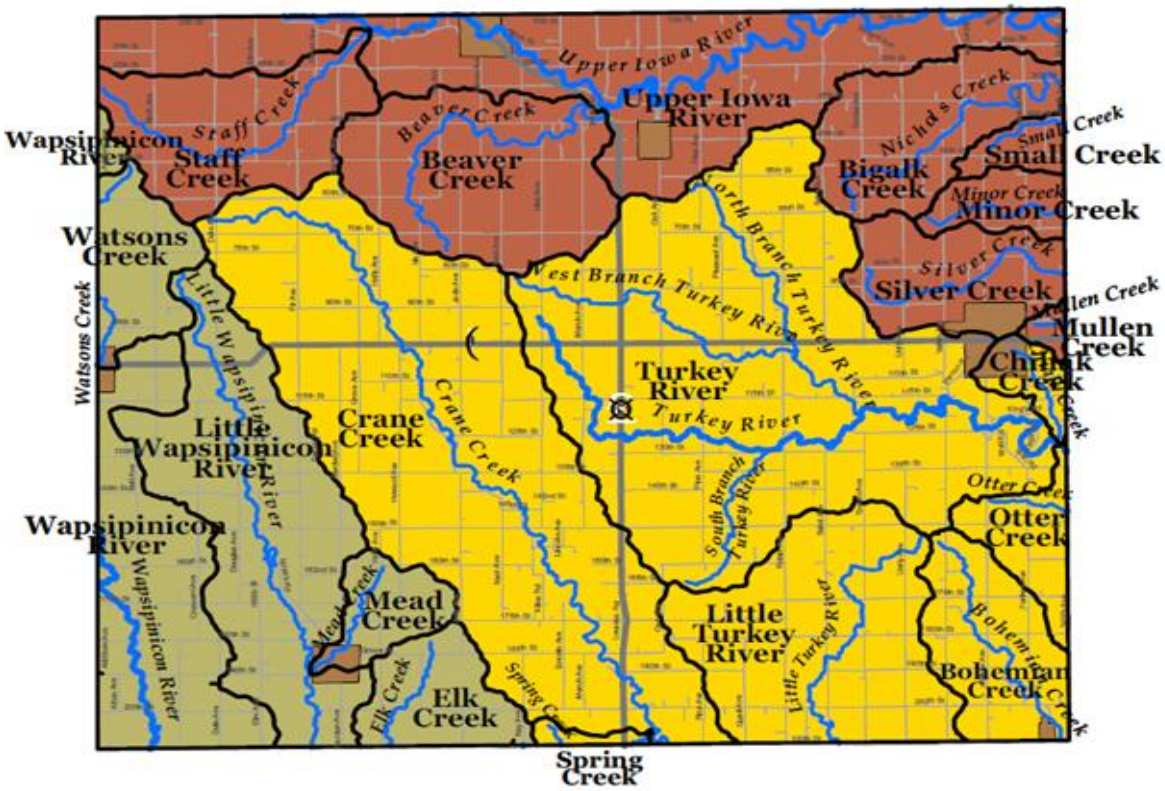
Jurisdiction	Mean Elevation (feet above sea level)
Lime Springs	1,250
Protivin	1,166

Originally, the land surrounding and including Howard County was covered with prairie grass and light forestation. Modern agricultural practices have changed this setting to predominately row crop and pasture settings in the rural areas.

The Wapsipinicon River, Little Wapsipinicon River, Upper Iowa River, Turkey River, and Little Turkey River pass through Howard County. Three watersheds are located in Howard County, to include the Upper Iowa River Watershed in the northern portion, the Turkey River Watershed in the southwestern portion, and the Wapsipinicon Watershed in the southwest corner of the county.

Figure 2.6 below reflects existing watersheds and their approximate locations in Howard County.

Figure 2.6 Watersheds located in Howard County



Source: Howard County Soil and Water Conservation District

2.1.2 Climate

"The area experiences a temperate climate with both warm and cold season extremes. Winter months can bring occasional heavy snows, intermittent freezing precipitation or ice, and prolonged periods of cloudiness. While true blizzards are rare, winter storms impact the area on average about 4-5 times per season. Occasional arctic outbreaks bring extreme cold and dangerous wind chills.

Thunderstorms occur on average 30 to 50 times a year, mainly in the spring and summer months. The strongest storms can produce associated severe weather like tornadoes, large hail, or damaging wind.

Both river flooding and flash flooding can occur. Heat and high humidity is occasionally observed in June, July, or August. The autumn season usually has the quietest weather. High wind events can also occur occasionally, usually in the spring or fall." (http://www.crh.noaa.gov/images/arx/nathaz/HOWhazards.pdf)

Table 2.1 reflects the Annual Climate Averages in Howard County.

Table 2.1 Howard County Annual Climate Averages

Climate	Howard County	United States
Annual Rainfall (inches)	28.5	36.6
Annual Snowfall (inches)	31.1	25.2
Precipitation Days (annual total)	77	101
Sunny Days (annual total)	188	205
Average July High Temperature (˚F)	81	86.5
Average January High Temperature (˚F)	3.3	20.8

Source: Sperlings, http://www.bestplaces.net/

2.1.3 Population/Demographics

The 2000 U.S. Census shows the population for Howard County at 9,932. Population density based on this data is categorized as 'low' with approximately 20 people per square mile (473 total square miles in the county). From 1990 to 2000, the population for Howard County decreased 3.4 percent. During the same time period, the City of Lime Springs reflected a 13 percent population increase; Protivin reflected a nearly 4 percent increase.

Table 2.2 reflects the Howard County and Participating Jurisdictions' change in population and housing units from 1990 to 2000.

Table 2.2 County and Participating Jurisdictions' Population Change, 1990-2000

Jurisdiction	1990 Population	2000 Population	Percent Change 1990-2000	1990 Housing Units	2000 Housing Units	Percent Change 1990-2000
Lime Springs	438	496	+13.2%	223	243	+8.90%
Protivin	305	317	+3.9%	168	180	+7.10%
Howard County	9,809	9,484	-3.4%	4,155	4,432	+6.60%

Source: United States Census Bureau

Table 2.3 reflects the demographic and social characteristics in 2000 for the County and Participating Jurisdictions.

Table 2.3 County and Participating Jurisdictions' Demographic and Social Characteristics, 2000

Jurisdiction	Under 5 Years (%)	65 Years and Over (%)	Average Household Size	High School Graduates (%)	Bachelor Degree or Higher (%)	Persons Below Poverty (%)
Lime Springs	6.0	25.4	2.3	85.1	11.9	5.9
Protivin	4.1	29.0	2.1	75.2	6.6	13.2
Howard County	5.9	20.1	2.4	79.3	12.6	12.0
United States	6.8	12.4	2.6	80.4	24.4	12.4

Source: United States Census Bureau

2.1.4 Economic/Industry

According to the 2000 U.S. Census, the industries that employed the highest percentage of Howard County's labor force were Manufacturing (26.7%); Educational, Health and Social Services (18.1%); Agriculture, Forestry, Fishing and Hunting, and Mining (13.1%).

While rates specific for the individual Participating Jurisdictions are unavailable, the U.S. Bureau of Labor Statistics reported in September 2009 Howard County had an unemployment rate of 8.6 percent, with the statewide unemployment rate, same timeframe, at 6.7 percent.

Table 2.4 reflects the Participating Jurisdictions' economic characteristics in 2007.

Table 2.4 Participating Jurisdictions Economic Characteristics by Jurisdiction, 2007

Jurisdiction	Median Household Income ($)	Median Home Value ($)	Population 16+ in Labor Force (%)	Top Three Employing Industries
Lime Springs	33,750	48,300	60.3	Manufacturing (21.8%); Educational, Health, and Social Services (13.6%); Retail Trade (10.9%)
Protivin	29,779	45,000	62.1	Manufacturing (39.7%); Construction (9.3%); Educational, Health, and Social Services (8.6%)
Howard County	43,408	59,500	64.5	Manufacturing (26.7%); Educational, Health and Social Services (18.1%); Agriculture, Forestry, Fishing and Hunting, and Mining (13.1%)
United States	41,994	119,600	63.9	Educational, Health, Social Services (19.9%); Manufacturing (14.1%); Retail Trade (11.7%)

Source: United States Census Bureau

2.1.5 Agriculture

Agriculture is a major component of the economy of Howard County, which includes the Participating Jurisdictions. The Participating Jurisdictions are surrounded by and/or consist of agricultural land with 267,000 acres of farmland in Howard County to include over 870 farms averaging 321 acres each. Approximately 13.3 percent of Howard County residents are employed with the agricultural industry. In 2007, the overall market value for agriculture products sold within Howard County was $174,425,000.

Table 2.5 reflects the Howard County Agricultural Production in 2009.

Table 2.5 Howard County Agricultural Production Value, 2009

Commodity	Percent of Total Annual Production Value	Production Value ($)
Grains, oilseeds, dry beans, and dry peas	51.0%	86,419,000
Hogs and pigs	29.4%	49,763,000
Cattle and calves	12.3%	20,895,000
Milk and other dairy products from cows	6.8%	11,544,000
Other	0.5%	735,000
Total	100%	**169,356,000**

Source: USDA, National Agriculture Statistics

Table 2.6 provides harvest and yield information for major crops in Howard County, which includes the Participating Jurisdictions, for 2007.

Table 2.6 Howard County Crop Production, 2007

Commodity	Harvested (acres)	Yield (bushels)
Corn for grain	124,421	20,610,632
Corn for silage	4,639	--
Wheat for grain	67	3,490
Oats for grain	2,004	132,935

Source: USDA, National Agriculture Statistics

While crop and livestock production are the visible parts of the agricultural economy, many related businesses contribute as well by producing, processing and marketing farm and food products. These businesses generate income, employment and economic activity throughout the region, including for the Participating Jurisdictions.

2.2 Jurisdictional Descriptions and Capabilities

The mitigation capabilities for each of the Participating Jurisdictions are profiled in the section that follows. This profile includes an overview of the jurisdictions and their organizational structure; a description of staff, fiscal, and technical resources; and information regarding existing hazard mitigation capabilities such as adopted plan policies and regulations, if any. The descriptions and capabilities assessments are based on available and applicable data, including information provided by the jurisdictions collected during the planning process.

Table 2.7 is a listing of Participating Jurisdictions and their grouping.

Table 2.7 Hazard Mitigation Plan Participating Jurisdictions by Group

Jurisdiction
Cities
Lime Springs, Iowa
Protivin, Iowa

School districts in the planning area are included in this hazard mitigation planning process, but are not considered their own separate jurisdictions for this section's purpose.

Table 2.8 is a listing of school districts having a service area within the Participating Jurisdictions.

Table 2.8 School Districts within Participating Jurisdictions

Public School Districts
Howard-Winneshiek Community School District Turkey Valley Community School District
Private School Systems
Trinity Catholic School

Howard-Winneshiek Community School District school officials directly participated in the planning process by meeting attendance and providing data for school infrastructure details, prior planning details, et al. This was accomplished either by phone, email, and/or in hazard mitigation planning meetings.

2.2.1 City of Lime Springs, Iowa

Overview

Platted in 1857 by O. and W.O. Wood, the history of Lime Springs is marked with various town name changes from "Old Town" after it was settled in 1854 by Joseph Knowlton and Oscar Chesebro. Later, the town was renamed after the spring on the south bank of the Upper Iowa River, below the concrete bridge, that produces fresh water.

Lime Springs is nestled along the Upper Iowa River, surrounded by fields and streams, rolling hills and beautiful countryside. The uniqueness of Lime Springs is marked by the milling industry and the Lidtke Mill, a national historic site. Lidtke Mill was famous for its buckwheat flour and in the 1970's the mill was able to put out 100 barrels of flour a day.

Two devastating fires have ripped through the small community, with the first being the "Big Fire" of 1901 which wiped out both sides of main street. While tragic, this fire led to the rebuilding of Main Street, resulting in the beautiful brick buildings currently seen in downtown Lime Springs. The second big fire was on Easter Sunday, April 21, 1927 which

resulted in eight building burned including the lumber yard and the opera house on Center Street.

Today, Lime Springs has a swimming pool, parks, banking services, a medical clinic, meat locker, and more. Named a Tree City USA in April, 2002, Lime Springs has an annual Sweet Corn Days celebration.

The governing body includes one Mayor, one Mayor Pro-Tem, and a five-member Lime Springs City Council. City employees include:

- City Clerk
- Street Superintendent
- Water/Wastewater Superintendent
- City Treasurer
- Police Chief
- Librarian
- Civil Defense Director
- City Engineering
- City Attorney
- City Health Officer
- Police Officer
- Pool Manager and staff

The entire area of Lime Springs' city limits is located inside the Howard-Winneshiek Community School District.

The Lime Springs Fire and Rescue currently consists of 17 volunteers and is funded by the City of Lime Springs and Lime Springs Fire and Rescue Board. Three First Responders and two cross trained Fire and Rescue volunteers are dispatched for First Responder emergencies. The Howard County Sheriff provides law enforcement to the City of Lime Springs. The Regional Health Services of Howard County provides ambulance services out of Cresco, located approximately 15 miles to the southeast of Lime Springs.

As of 2009, the actual value of all residential land and structures in the City of Lime Springs was over $13.7 million, with commercial property being valued at over $3.5 million and agricultural acres in city limits exceeding 230 acres.

Lime Springs proudly boasts one landmark on the National Register of Historic Places, the Lime Springs Mill Complex, Lidtke Mill.

City of Lime Springs currently utilizes two lift stations and one well. There are 50 fire hydrants within city limits.

Technical and Fiscal Resources

Howard County Emergency Management provides services to the City of Lime Springs. The City has an outdoor warning system that is automatically activated by the County's 911 dispatch center.

Fiscal tools or resources that the City could potentially use to help fund mitigation activities include the following:

- Fees for utility services
- Taxes for specific purposes
- Debt through general obligation bonds
- Debt through private activities
- Community Development Block Grants

Existing Plans and Policies

Lime Springs utilizes a City Code, zoning ordinances, and subdivision ordinances.

The City utilizes the Howard County Emergency Operations Plan. All City Response Personnel follow appropriate protocol and guidance. Howard County contracts with the Northeast Iowa Response Group (NIRG), a specialized HAZMAT Team out of Waterloo, IA. Waterloo is located approximately 90 miles to the southwest of Howard County.

Other Mitigation Activities

- The entire County participates in emergency response exercises on a regular basis
- The City is working with UERPC to receive a grant for design and construction of a FEMA compliant tornado safe room into the Howard-Winneshiek Community School building inside city limits
- Howard County Emergency Management Agency has received funds for new and upgraded communication devices
- Within the last year a crisis management course was offered by Homeland Security in which all schools within the County were invited to attend

2.2.2 City of Protivin, Iowa

Overview

With a rich Czech heritage, Protivin became officially incorporated on September 12, 1894. A proposed railroad was to be built and in 1912 the engineering crew surveyed and planned the route. While actual work had begun with the track beds prepared for the tracks, the tracks were never laid as the railroad company ran out of funds.

The area was first settled during the 1850's with immigration of many people from Bohemia. One of the first businesses in the area was a blacksmith shop one half mile north of present day Protivin. Listed on the National Register of Historic Places, The Bohemian Bank was opened on December 1, 1910 and the Beseda Hall was built in 1912. Besada Hall was purchased by Holy Trinity Parish and then used as an auditorium and gymnasium for Rudolphinum School. This historic building was razed in February 1981 and a new Protivin Community Center was built on that site.

This predominantly Catholic community originally had to travel to St. Wenceslaus in Spillville or wait for a Mission Priest that would be passing through the area to celebrate Mass in a private home with everyone attending. As was done in their home county, a

church “on top of the hill” was to be built. Frank Chyle Jr. donated the land and on September 28, 1878, the Holy Trinity Church was completed.

Annually, Protivin celebrates “Czech Days”, a weekend celebration to note the deep Czech heritage. Filled with tens of thousands of kolaches and rohliky, the event draws visitors from other counties and states.

The governing body includes one Mayor, one Mayor Pro-Tem, and a five-member Protivin City Council. City employees include:

- City Clerk
- Police Chief
- Recycling Pickup staff member
- Public Works Director/Street Superintendant
- Utilities Verification staff member
- Little League Coaches

The Protivin Community Volunteer Fire Department has approximately 20 trained firefighters. The City employs one part-time law enforcement officer. The Regional Health Services of Howard County provides ambulance services out of Cresco, located approximately 15 miles to the north of Protivin.

City of Protivin participates in the Iowa Rural Water Association (IRWA) and has municipal water for residents. Protivin also owns a cable television station for local usage. The city has one water tower built on/about 1944 and three lift stations.

The entire area of Protivin city limits is located inside either Howard-Winneshiek or Turkey Valley Community School Districts.

The city has recently been updating their city park with enhancements to the basketball court and playground equipment. Being reviewed and analyzed are facilities for the city park restroom as none exist. Street improvements are being evaluated along with energy efficiency being monitored for former city hall building.

Technical and Fiscal Resources

Howard County Emergency Management provides services to the City of Protivin. The City has an outdoor warning system that is manually activated at the City’s Fire Station. Warning siren locations include one at the fire station, one at the old city hall (currently the Public Works Directors storage facility)

Fiscal tools or resources that the City could potentially use to help fund mitigation activities include the following:

- Fees for utility services
- Taxes for specific purposes
- Debt through general obligation bonds
- Debt through private activities
- Community Development Block Grants

Existing Plans and Policies

The City of Protivin utilizes the ordinances Cable Television System Rates and Solid Waste Control, defaulting to the State of Iowa for all other ordinances.

The City utilizes the Howard County Emergency Operations Plan. All City Response Personnel follow appropriate protocol and guidance. Howard County contracts with the Northeast Iowa Response Group (NIRG), a specialized HAZMAT Team out of Waterloo, IA. Waterloo is located approximately 70 miles to the southwest of Howard County.

Other Mitigation Activities

- Community has two backup generators
- The entire County participates in emergency response exercises on a regular basis.

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3 RISK ASSESSMENT

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 to these hazards. The goal of the risk assessment is to estimate the potential loss in the Participating Jurisdictions, including the loss of life, personal injury, property damage, and economic loss, from a hazard event. The risk assessment process allows for the community to better understand their potential risk from natural hazards and provides a framework for developing and prioritizing mitigation actions to reduce risk from future hazard events.

The risk assessment for the Participating Jurisdictions followed the methodology described in FEMA publication 386-2, Understanding Your Risks: Identifying Hazards and Estimating Losses (2002), which includes a four-step process:

- Identify Hazards
- Profile Hazards
- Inventory Assets
- Estimate Losses

This section is divided into four parts:

- **Section 3.1 Hazard Identification** – Identifies the hazards that threaten the planning area and describes why some hazards have been omitted from further consideration.
- **Section 3.2 Hazard Profiles** – Discusses the threat to the planning area and describes previous occurrences of hazard events and the probability of future occurrence.
- **Section 3.3 Vulnerability Assessment** – Assesses the Participating Jurisdictions' vulnerability to hazards, considering critical facilities and other community assets at risk.
- **Section 3.4 Limited Data Resources** – Notes the known existing data limitations and strategies for obtaining information for plan updates.

Multi-Jurisdictional Risk Assessment

For this multi-jurisdictional plan, the risk assessment assesses each jurisdiction's risks where they deviate from the risks facing the entire planning area. The Participating Jurisdictions are located within Howard County; Howard County is not a large county geographically (473 square miles) and is fairly uniform in terms of climate. Accordingly, overall hazards and vulnerability do not vary greatly across the planning area for most hazards. Weather-related hazards, such as drought, extreme heat, hailstorm, lightning, severe winter storm, tornado, and windstorm affect the entire planning area.

In section 3.1, Hazard Identification, Table 3.2 indicates with checkmarks the hazards identified for each participating jurisdiction. In Section 3.2, Hazard Profiles, the Geographic Location section discusses how the hazard varies among jurisdictions across the planning area. Also in Section 3.2, Hazard Profiles, the Previous Occurrences section lists the best available data on where past events have occurred and the associated losses to particular jurisdictions. Section 3.2.2, Vulnerability by Hazard, identifies specific risks by jurisdiction where data is available and hazard areas are identified for hazards of moderate and high planning significance. Table 3.24 at the end of Section 3.2 summarizes the planning significance rating for each hazard by jurisdiction.

The previous chapter, Chapter 2 Planning Area Profile and Capabilities, discussed the existing mitigation capabilities of each jurisdiction, such as plans and policies, personnel, and financial resources, which are currently used to reduce hazard losses.

3.1 Hazard Identification

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

3.1.1 Methodology

The Hazard Mitigation Planning Committee (HMPC) and Hazard Mitigation Meeting Participants (HMMP) reviewed data and discussed the impacts of hazards suggested by Iowa Homeland Security and Emergency Management Division (HSEMD) and FEMA for consideration, listed alphabetically below:

- Avalanche
- Coastal Erosion
- Coastal Storm
- Dam/Levee Failure
- Debris Flow
- Drought
- Earthquake
- Expansive Soils
- Extreme Heat
- Flash Flood
- Grass or Wild Land Fire
- Hailstorm
- Hurricane
- Land Subsidence
- Landslide
- River Flood
- Severe Winter Storm

- Sinkhole
- Thunderstorms and Lightning
- Tornado
- Tsunami
- Volcano
- Windstorm

Due to the frequency of previous occurrences, probability of future occurrences, and the resulting consequences, the HMPC and HMMP decided to review data, discuss and include the following human caused/combination hazards that were included in the State of Iowa Hazard Mitigation Plan:

- Communication Failure

Data on the past impacts and future probability of these hazards in the Participating Jurisdictions' planning area was collected from the following sources:

- Iowa Hazard Mitigation Plan, version September 2007
- Information on past extreme weather and climate events from the National Oceanic and Atmospheric Administration's (NOAA) National Climatic Data Center (NCDC)
- Federal Disaster Declarations from the Federal Emergency Management Agency (FEMA)
- USDA Farm Service Agency (FSA) Disaster Declarations
- Various articles and publications available on the Internet (sources are indicated where data is cited)

The HMPC and HMMP eliminated certain hazards from further profiling due to no known history of occurrence in the planning area and/or their impacts were not considered significant in relation to other hazards.

Table 3.1 lists alphabetically natural hazards suggested for consideration by FEMA, not profiled in the plan, providing the explanation for their omission.

Table 3.1 Natural Hazards Considered, But Not Profiled in the Plan

Hazard	Explanation for Omission
Avalanche	There are no mountains in the planning area
Coastal Erosion	Planning area is not near coastal area
Coastal Storm	Planning area is not near coastal areas
Dam Failure	There are no dams in or High Hazard dams upstream in the Participating Jurisdictions
Debris Flow	There are no mountainous regions in the planning area susceptible to debris flow
Expansive Soils	There are no known expansive soils in the planning area and no known historical occurrences of this hazard
Hurricane	Planning area is not near coastal areas
Landslide	Participating Jurisdictions are not susceptible to landslides due to the flat topography
Land Subsidence	There are no known subsurface void spaces in the Participating Jurisdictions and no known historical occurrences of this hazard
Levee Failure	There are no functional levees in the Participating Jurisdictions
Tsunami	Planning area is not near coastal areas
Volcano	There are no volcanic mountains in the planning area

Source: HMPC and HMMP

The HMPC and HMMP identified 12 hazards that significantly affect the planning area. Staying consistent with the Iowa Hazard Mitigation Plan, these hazards are listed alphabetically and profiled in further detail later in Section 3.1.

- Communication Failure
- Drought
- Earthquake
- Extreme Heat
- Flash Flood
- Grass or Wild Land Fire
- Hailstorm
- River Flood
- Severe Winter Storm
- Sinkhole
- Thunderstorm and Lightning
- Tornado
- Windstorm

The State of Iowa Hazard Mitigation Plan covers all natural and human caused/combination hazards identified for the State of Iowa. Accordingly, the State of Iowa hazard information, details, and risk assessment prevails for hazards not discussed for singular jurisdictions.

Table 3.2 reflects the hazards identified for each Participating Jurisdiction.

Table 3.2 Hazards Identified for Each Participating Jurisdiction

Hazard	City of Lime Springs	City of Protivin
Communication Failure		X
Drought	X	X
Earthquake	X	X
Extreme Heat	X	X
Flash Flood	X	X
Grass or Wild Land Fire	X	X
Hailstorm	X	X
River Flood	X	X
Severe Winter Storm	X	X
Sinkhole	X	X
Thunderstorm and Lightning	X	X
Tornado	X	X
Windstorm	X	X

Source: HMPC and HMMP

A hazard addressed by a Participating Jurisdiction did not mean all Participating Jurisdictions needed to include that particular hazard as a risk.

Table 3.3 offers explanation why a Participating Jurisdiction did not include a profiled hazard in this plan.

Table 3.3 Howard County Designated Hazards Omitted by Individual Jurisdictions

Hazard	Jurisdiction	Reason for Omission
Communication Failure	City of Lime Springs	Risk not identified as significantly different than noted in the State of Iowa's Hazard Mitigation Plan

Source: HMPC and HMMP

3.1.2 Disaster Declaration History

One method used by the HMPC and HMMP to identify hazards was to examine events that triggered federal and/or state 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. Should the disaster be so severe that both the local and state governments' capacities are exceeded; a federal emergency or disaster declaration may be issued, allowing for the provision of federal assistance.

The federal government may issue a disaster declaration through FEMA, the U.S. Department of Agriculture (USDA), and/or the Small Business Administration (SBA). 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 damages and institutions or industrial sectors affected.

A USDA disaster declaration certifies that the affected county has suffered at least a 30 percent loss in one or more crop or livestock areas and provides affected producers with access to low-interest loans and other programs to help mitigate disaster impacts. In accordance with the Consolidated Farm and Rural Development Act, counties neighboring those receiving disaster declarations are named as contiguous disaster counties and are eligible for the same assistance.

Table 3.4 lists FEMA presidentially declared disasters received by multiple counties in Iowa including Howard County, and the Participating Jurisdictions from 1990 to present.

Table 3.4 Presidential Disaster Declaration History in Howard County, 1990-Present

Declaration Number	Declaration Date	Disaster Description	State of Iowa Counties Included
DR-1763-IA	5/27/2008	Severe Storms, Tornadoes, and Flooding	Adair, Adams, Allamakee, Appanoose, Audubon, Benton, Black Hawk, Boone, Bremer, Buchanan, Butler, Carroll, Cass, Cedar, Cerro Gordo, Cherokee, Chickasaw, Clarke, Clayton, Clinton, Crawford, Dallas, Davis, Decatur, Delaware, Des Moines, Dubuque, Fayette, Floyd, Franklin, Fremont, Greene, Grundy, Guthrie, Hamilton, Hancock, Hardin, Harrison, Henry, **Howard**, Humboldt, Iowa, Jackson, Jasper, Johnson, Jones, Keokuk, Kossuth, Lee, Linn, Louisa, Lucas, Lyon, Madison, Mahaska, Marion, Marshall, Mills, Mitchell, Monona, Monroe, Montgomery, Muscatine, Page, Palo Alto, Pocahontas, Polk, Pottawattamie, Poweshiek, Ringgold, Scott, Story, Tama, Taylor, Union, Van Buren, Wapello, Warren, Washington, Wayne, Webster, Winnebago, Winneshiek, Worth, Wright
DR-1688-IA	3/14/2007	Severe Winter Storms	Benton, Black Hawk, Boone, Bremer, Buchanan, Butler, Calhoun, Cedar, Chickasaw, Clinton, Des Moines, Fayette, Floyd, Franklin, Greene, Grundy, Hamilton, Hardin, Henry, **Howard**, Humboldt, Iowa, Jackson, Jasper, Jefferson, Johnson, Jones, Keokuk, Lee, Linn, Louisa, Marion, Marshall, Mitchell, Muscatine, Pocahontas, Poweshiek, Story, Tama, Van Buren, Wapello, Washington, Winnebago, Winneshiek, Worth, Wright
EM-3239-IA	9/10/2005	Hurricane Katrina Evacuation	**All**

DR-1518-IA	5/25/2004	Severe Storms, Tornadoes, and Flooding	Adair, Allamakee, Appanoose, Audubon, Benton, Black Hawk, Boone, Bremer, Buchanan, Butler, Calhoun, Cass, Cerro Gordo, Chickasaw, Clay, Clayton, Dallas, Delaware, Dubuque, Fayette, Franklin, Fremont, Grundy, Guthrie, Hancock, **Howard**, Humboldt, Ida, Jasper, Jones, Kossuth, Linn, Lucas, Marshall, Mitchell, Page, Pocahontas, Polk, Story, Tama, Taylor, Webster, Winnebago, Winneshiek, Worth, Wright
DR-1230-IA	7/1999	Flooding	Black Hawk, Bremer, Buchanan, Butler, Cerro Gordo, Chickasaw, Clayton, Crawford, Fayette, Floyd, Harrison, **Howard**, Jones, Linn, Mills, Mitchell, Montgomery, Pottawattamie, Story, Worth, Woodbury
DR-1230-IA	7/1998	Severe Storms	Adair, Allamakee, Appanoose, Audubon, Benton, Black Hawk, Boone, Buchanan, Buena Vista, Butler, Calhoun, Carroll, Cass, Cedar, Cerro Gordo, Chickasaw, Clarke, Clay, Clayton, Clinton, Crawford, Dallas, Davis, Decatur, Delaware, Des Moines, Dickinson, Emmet, Fayette, Floyd, Franklin, Fremont, Greene, Grundy, Guthrie, Hamilton, Hancock, Hardin, Harrison, Henry, **Howard**, Humboldt, Iowa, Jasper, Jefferson, Johnson, Keokuk, Kossuth, Lee, Linn, Louisa, Lucas, Madison, Mahaska, Marion, Marshall, Mills, Monona, Montgomery, Muscatine, Osceola, Page, Palo Alto, Pocahontas, Polk, Pottawattamie, Poweshiek, Ringgold, Sac, Shelby, Story, Tama, Taylor, Union, Wapello, Washington, Warren, Webster, Winnebago, Winneshiek, Wright
DR-996-IA	6/1993	Flooding	**All**
DR-879-IA	9/1990	Flooding	Black Hawk, Bremer, Buchanan, Cerro Gordo, Chickasaw, Clayton, Clinton, Fayette, Franklin, Fremont, **Howard**, Johnson, Jones, Linn, Pottawattamie, Winneshiek, Worth

Source: Iowa Homeland Security and Emergency Management Division, http://www.iowahomelandsecurity.org/Disasters/DisastersinIowa/tabid/71/Default.aspx

Table 3.5 below lists U.S. Department of Agriculture disaster declarations and their related causes for Howard County, which includes the Participating Jurisdictions, from 2005 to August 2009.

Table 3.5 USDA Disaster Declarations in Howard County, 2005-August, 2009

USDA Disaster Number	Start Date	Causes					
		Hail	Drought	Tornadoes	Severe Storms	Winter Storms	Excessive Moisture
M1688	2/23/2007					X	
M1717	8/18/2007				X		X
M1727	8/17/2007				X		X
S2898	5/15/2009	X			X		X

Source: USDA

3.2 Hazard Profiles

CFR Requirement 201.6(c)(2)(i): [The risk assessment shall include a] description of the… location and extent of all natural hazards than can affect the jurisdiction. The plan shall include information on previous occurrences of hazard events and on the probability of future hazard events.

3.2.1 Methodology

Each hazard identified in Section 3.1 is profiled individually in this section. 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 Participating Jurisdictions.

The sources used to collect information for these profiles include those mentioned in Section 3.1.1 as well as those cited individually in each hazard section. Detailed profiles for each of the identified hazards include information on the following characteristics of the hazard:

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 a ranking to indicate typical warning times and duration of hazard events. Definitions for these rankings are included in Table 3.6.

Geographic Location

This section describes the geographic extent or location of the hazard in the planning area. Where available, maps are utilized to indicate the areas of the planning area that are vulnerable to the subject hazard.

Previous Occurrences

This section includes information on historic incidents and their impacts based upon the sources described in Section 3.1 and the information provided by the HMPC and HMMP.

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. The probability was assigned a rank as defined in Table 3.6.

Magnitude

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.

The magnitude of each profile hazard is classified in the following manner:

- **Catastrophic:** More than 50 percent of property is severely damaged; shutdown of facilities for 30 or more days; multiple deaths
- **Critical:** 25-50 percent of property severely damaged; shutdown of facilities for at least two weeks; and/or injuries and/or illnesses result in permanent disability.
- **Limited:** 10-25 percent of property severely damaged; shutdown of facilities for more than a week; and/or injuries and/or illnesses do not result in permanent disability
- **Negligible:** Less than 10 percent of property severely damaged, shutdown of facilities and services for less than 24 hours; and/or injuries/illnesses treatable with first aid

Hazard Summary

To maintain a consistent reporting format, the Hazard Mitigation Planning Committee (HMPC) and Hazard Mitigation Meeting Participants (HMMP) used a mathematical methodology to prioritize the hazards. This prioritization was based on a Calculated Priority Risk Index (CPRI) that considered four elements of risk: probability, magnitude, warning time, and duration.

Table 3.6 defines the CPRI rankings for elements of hazards risk.

Table 3.6 Calculated Priority Risk Index (CPRI) Element Definitions

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 year 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 year 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" to occur
1 - Unlikely	Event is probable within the next 10 years Event has up to 1 in 10 year 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**	
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
Spatial Extent	
4 - Catastrophic	More than 50% of the jurisdiction to be impacted
3 - Critical	25 – 50% of the jurisdiction to be impacted
2 - Limited	10 – 25% of the jurisdiction to be impacted
1 - Negligible	Less than 10% of the jurisdiction to be impacted

*Based on history, using the definitions given, the likelihood of future events is quantified
** According to severity associated with past events or probable worst case scenario events in the state

Using the ranking described in Table 3.6, the following formula is used to determine each hazard's CPRI, which includes weighting factors:

(Probability x .45) + (Magnitude x .25) + (Warning Time x .15) + (Duration x .10) + (Spatial Extent x .05) = CPRI

Based on their CPRI scores, the Participating Jurisdictions' hazards were separated into three categories of planning significance: High (3.00-4.00), Moderate (2.00-2.99), and Low (1.00-1.99).

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 significance or moderate were given more extensive attention in the remainder of this, while those with a low planning significance were addressed in more general or qualitative ways.

Tables 3.7 and 3.8 summarize the completed Hazard Profiles results.

Table 3.7 City of Lime Springs, Hazard Profile Summary

Hazard Type	Probability	Magnitude	Warning Time	Duration	Spatial Extent	CPRI	Planning Significance
Windstorm	4	2	4	2	4	3.30	High
Tornado	3	4	4	1	4	3.25	High
Thunderstorm and Lightning	4	2	4	2	2	3.20	High
Severe Winter Storm	4	2	2	3	4	3.10	High
Hailstorm	4	1	4	1	4	2.95	Moderate
Flash Flood	3	2	4	2	2	2.75	Moderate
River Flood	3	2	2	3	2	2.55	Moderate
Grass or Wild Land Fire	2	1	4	2	1	2.00	Moderate
Extreme Heat	2	1	1	3	4	1.80	Low
Drought	1	2	1	4	4	1.70	Low
Earthquake	1	1	4	1	4	1.60	Low
Sinkhole	1	1	4	1	1	1.45	Low

Source: HMPC and HMMP

Table 3.8 City of Protivin, Hazard Profile Summary

Hazard Type	Probability	Magnitude	Warning Time	Duration	Spatial Extent	CPRI	Planning Significance
Windstorm	4	2	4	2	4	3.30	High
Tornado	3	4	4	1	4	3.25	High
Thunderstorm and Lightning	4	2	4	2	2	3.20	High
Severe Winter Storm	4	2	2	3	4	3.10	High
River Flood	4	2	2	3	2	3.00	High
Communication Failure	3	2	4	3	4	2.95	Moderate
Hailstorm	4	1	4	1	4	2.95	Moderate
Flash Flood	3	2	4	2	2	2.75	Moderate
Grass or Wild Land Fire	2	1	4	2	1	2.00	Moderate
Extreme Heat	2	1	1	3	4	1.80	Low
Drought	1	2	1	4	4	1.70	Low
Earthquake	1	1	4	1	4	1.60	Low
Sinkhole	1	1	4	1	1	1.45	Low

Source: HMPC and HMMP

Section 3.2 subsections include detailed profiles to utilize the risk assessment methodology for each of the identified hazards.

3.2.2 Communication Failure

Description

Communication failure is the widespread breakdown or disruption of normal communication capabilities. This could include major telephone outages, loss of local government radio facilities, long-term interruption of electronic broadcast services, public works, and emergency warning systems are just a few of the vital services which rely on communication systems to effectively protect citizens. Business and industry rely heavily on various communication media as well. Mechanical failure, traffic accidents, power failure, line severance, and weather can affect communication systems and disrupt service. Disruptions and failures can range from localized and temporary to widespread and long-term. If switching stations are affected, the outage could be more widespread.

Also of concern are solar storms. The next 11-year cycle of solar storms will most likely peak in late 2011 or mid-2012. These storms can potentially affect communication systems.

Warning Time: Less Than 6 Hours

Duration: Less Than 1 Week

Geographic Location
The City of Protivin is subject to communication failure.

Previous Occurrences
Disruptions to communication services result annually as a secondary impact to flood, tornado, thunderstorm and lightning, windstorm, and severe winter storm.

To a certain extent, communication failure is an issue on a daily basis. Because of the current placement of communication towers, the reception for cellular phones is not always reliable forms of communication.

Probability of Future Occurrences
Unless additional communication towers are installed in closer proximity to the City of Protivin, communication failure will continue to be a daily challenge. An event of widespread communication failure is less frequent.

Likely: Event is probable within the next three years

Magnitude

If 911 systems were to fail due to phone communication disruption, secondary impacts could occur by the inability of citizens to alert responders of their needs. Inter-agency and intra-agency communications would be limited. Data transmission could also be affected.

Limited: 10-25 percent of property severely damaged; shutdown of facilities for more than a week; and/or injuries and/or illnesses do not result in permanent disability

Hazard Summary

Jurisdiction	Calculated Priority Risk Index (CPRI)	Planning Significance
City of Lime Springs	N/A	N/A
City of Protivin	2.95	Moderate

Note: "N/A" denotes "Not Applicable;" the jurisdiction chose to not profile this hazard

3.2.3 Drought

Description
Drought is generally defined as a period of prolonged lack of precipitation for weeks at a time producing severe dry conditions. There are three types of drought conditions that are relevant to Iowa: Meteorological drought, which refers to precipitation deficiency; hydrological drought, which refers to declining surface water and ground water supplies; and agricultural drought, which refers to soil moisture deficiencies. A prolonged drought can have serious economic impact on a community. Increased demand for water and electricity may result in shortage of resources. Moreover, food shortages may occur if agricultural production is damaged or destroyed by a loss of crops or livestock. Based on information from the National Weather Service for 2006, drought was the nation's second

most costly natural hazard, causing $2.6 billion in property and crop damages (flooding caused $3.9 billion in damages).

Periods of drought are normal occurrences in all parts of Iowa. Drought in Iowa is caused by severely inadequate amounts of precipitation that adversely affect farming, surface and ground water supplies, and uses of surface waters for navigation and recreation. Drought can cause significant economic and environmental impacts and also create favorable conditions for wildfires and wind erosion. While droughts are generally associated with extreme heat, droughts can and do occur during cooler months.

Warning Time: 24+ hours

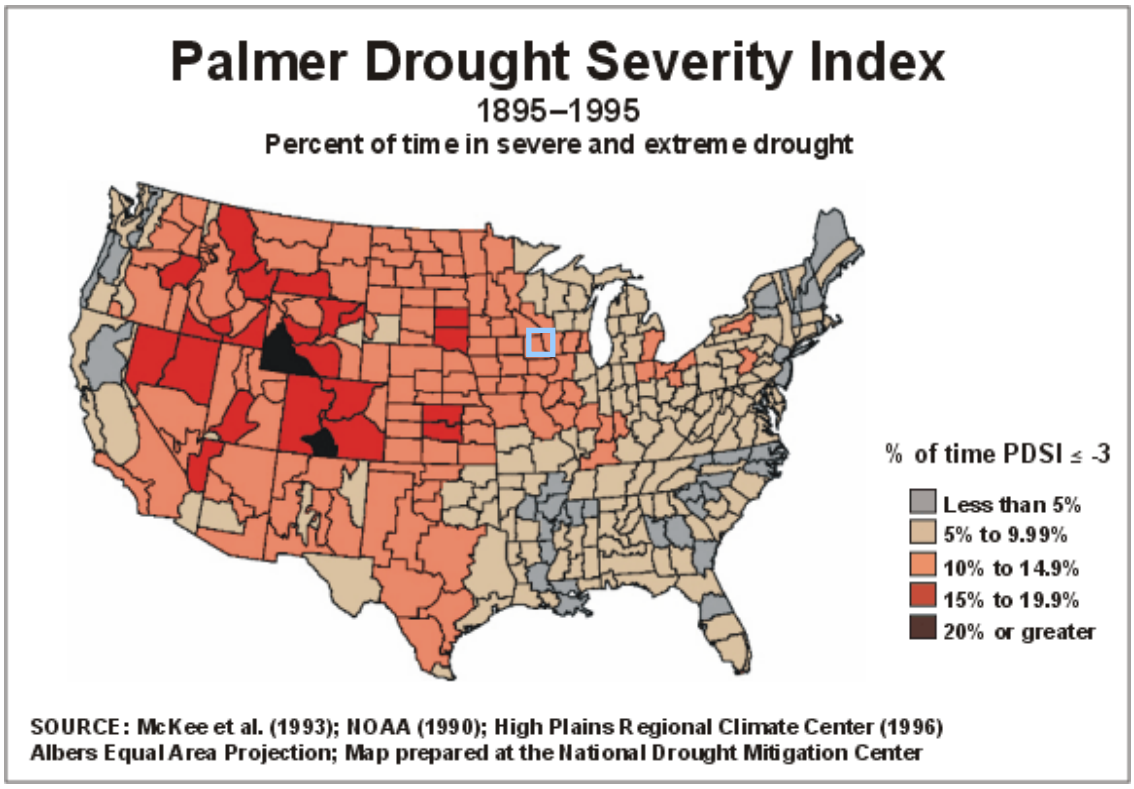
Duration: More Than 1 Week

Geographic Location

As a regional phenomenon, drought can affect the Participating Jurisdictions.

Figure 3.1 below shows that the Participating Jurisdictions are situated in an area that experienced drought 10-14.9 percent of the time over the 100 year period from 1895-1995.

Figure 3.1 United States Percent of Time in Drought, 1895-1995



Note: The light blue square indicates the region of northeastern Iowa that includes the Participating Jurisdictions

Drought can lead to shortages in municipal water supplies due to deficiency of the raw water supply and greatly increased customer water demand. In other cases the raw water

supply may remain adequate, but problems can be encountered due to limited treatment or distribution capacity.

Previous Occurrences

According to the National Climatic Data Center (NCDC), Iowa has had seven periods of drought from 1980-2006. The most common trend was the consistency of drought periods during the month of August. While some may have been more severe than others, agricultural areas were impacted much more than metropolitan areas where impacted.

The NCDC indicates only two of these events directly impacted Howard County, which includes the Participating Jurisdictions, and provides the following details:

- **July 1, 2005-January 31, 2006.** The drought that began back in June 2005 continued through January 2006. Severe to extreme drought continued across the northern half of Illinois, eastern third of Iowa, and northeast Missouri. The severe dryness of the drought continued to place it equal to or exceeding the drought of 1988. In Iowa, crop loses rapidly decreased the further west one went from the Mississippi River Valley and were near or just slightly below normal upon reaching an Independence to Oskaloosa Iowa line. Soybean crop losses generally were estimated at a 10-15% reduction in yield across Illinois, eastern Iowa, and northeast Missouri. There were pockets across eastern Iowa and northeast Missouri where an estimated 20-30% reduction in yield for soybeans was expected. By September, the drought was affecting mainly hydrologic aspects and to a lesser extent agricultural. A report of the hydrologic issues affected by the drought is supplied by the service hydrologist. In January, 2006, the six-month precipitation total is 12.30 inches or 3.69 inches below normal and 77% of normal. The 12-month precipitation total is 23.95 inches or 12.28 inches below normal and 66% of normal.
- **August 1, 1995-August 31, 1995.** August precipitation was confined to widely scattered thunderstorm activity. The dry weather conditions combined with well above normal temperatures translated to the warmest month recorded in Iowa since July 1988 and the 4th warmest August of record. For the summer as a whole, June through August of 1995 ranked as the 14th warmest in the 123 years of record. The dry conditions resulted in deterioration of Iowa's corn and soybean crops. Reports indicate losses in the corn of between five and 25 bushels per acre with the greatest over the south. Soybean losses were not that great and were generally 5% or less. In dollars this translates to about $420 million in corn and $116 million in soybeans.

Table 3.9 provides additional details regarding the affected crops and amounts annually from 2005 to 2008.

Table 3.9 Claims Paid in Howard County for Crop Loss as a Result of Drought, 2005-2008

Year	Crop	Hazard	Claims Paid ($)
2006	Corn	Drought	77,243
2006	Soybeans	Drought	49,234
2007	Corn	Drought	145,333
2007	Soybeans	Drought	131,396
2008	Corn	Drought	893,715
2008	Soybeans	Drought	1,002,808
Total			**2,299,729**

Source: USDA Risk Management Agency

Probability of Future Occurrences

According to the Palmer Drought Severity Index 1895-1995, the Participating Jurisdictions experienced severe and extreme drought 10-14.9 percent of the time during that 100-year period, which equates to an occasional probability of occurrence.

Unlikely: Event is probable within the next 10 years

Magnitude

Drought impacts are wide-reaching and may be economic, environmental, and/or societal. The most significant impacts associated with drought in Iowa are those related to agriculture. Agricultural industry provides an economic base for Howard County, which includes the Participating Jurisdictions. A prolonged drought could have severe economic impacts.

Drought conditions can also cause soil to compact and not absorb water well, potentially making an area more susceptible to flooding. An ongoing drought may also leave an area more prone to wildfires. Water supply can also be of concern during periods of prolonged drought. Drought impacts increase with the length of a drought.

Limited: 10-25 percent of property severely damaged; shutdown of facilities for more than a week; and/or injuries and/or illnesses do not result in permanent disability

Hazard Summary

Jurisdiction	Calculated Priority Risk Index (CPRI)	Planning Significance
City of Lime Springs	1.70	Low
City of Protivin	1.70	Low

3.2.4 Earthquake

Description

An earthquake is sudden motion of trembling of the ground caused by shifting tectonic plates. Earthquakes are potentially catastrophic, capable of causing multiple fatalities and major structural and infrastructure damage including disruption of utilities, communications, and transportation systems. Secondary affects can include landslides, seiches, liquefaction, fires, and dam failure. Earthquakes occur very abruptly with little or no warning. However, seismic monitoring in certain cases can detect increases in the geologic and seismic activity that precedes an earthquake event. Duration typically ranges from a few seconds to a minute or two, but aftershocks can occur during the hours and weeks after the quake, usually with diminishing frequency and intensity.

Warning Time: Less Than 6 Hours

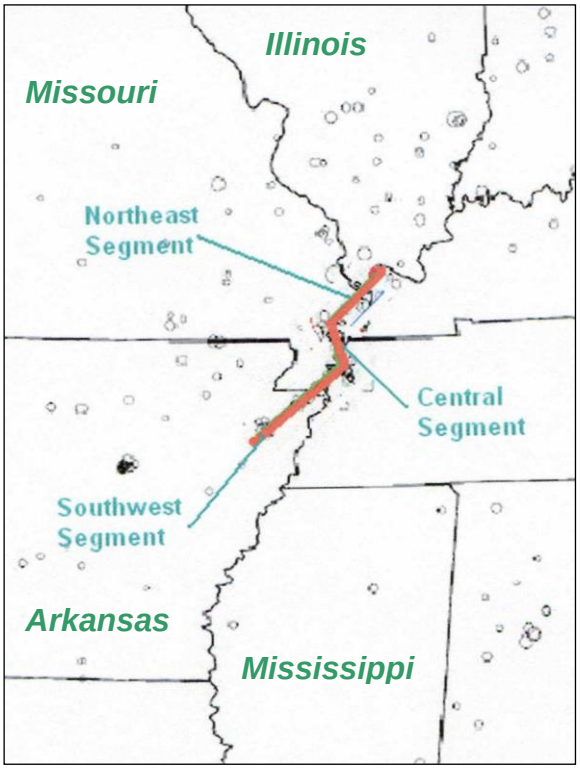
Duration: Less Than 6 Hours

Geographic Location

Overall, the Participating Jurisdictions are in an area of relatively low seismic activity. The closest fault zone is the New Madrid Seismic Zone follows the Mississippi River valley from southeastern Missouri to northwestern Mississippi, roughly about 550 miles south of the Participating Jurisdictions.

Figure 3.2 below shows the location of the New Madrid Fault Line.

Figure 3.2 Location of the New Madrid Fault Line



Source: Suburban Emergency Management Project
Note: The thin black lines indicate state boundaries
Note: The thick orange line indicates the approximate location of the New Madrid Fault Line

Previous Occurrences

Only 13 earthquakes with epicenters in Iowa are known in historic times. The first known occurrence was in 1876 near Sidney in southwest Iowa; the most recent occurrence was in 2004 near Shenandoah in southwest Iowa. The largest Iowa earthquake (Mercalli magnitude VI) occurred near Davenport in southeast Iowa in 1934. Only the most recent of these events was instrumentally recorded.

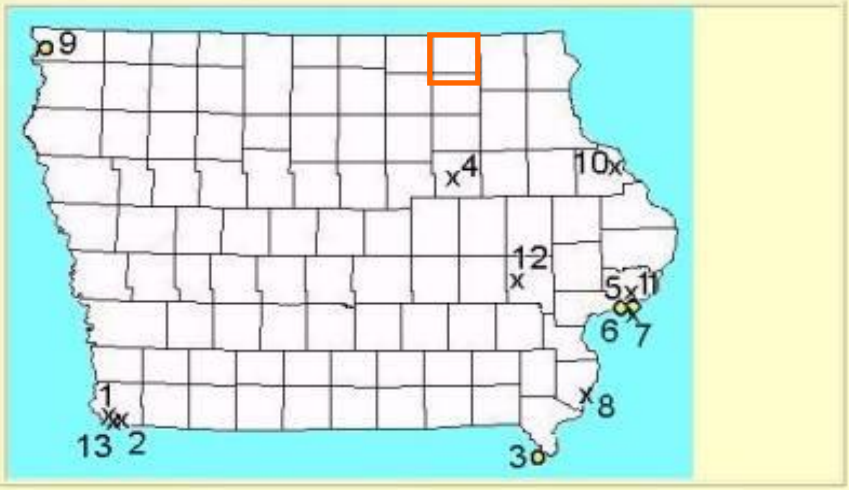
Geologically, the epicenter of an earthquake is the point of the earth's surface directly above the focus of an earthquake.

Figure 3.3 reflects the known history of earthquakes with epicenters in Iowa prior to 2008.

Figure 3.3 Historical Earthquakes in Iowa Prior to 2008

IOWA EARTHQUAKES

HISTORIC EARTHQUAKES WITH EPICENTERS IN IOWA



Number	Date	Nearest Town	Mercalli Intensity
1.	Apr. 28, 1867	Sidney (IA) / Nebraska City (NE)	IV
2.	Dec. 09, 1875	Sidney (IA) / Nebraska City (NE)	III
3.	April 13, 1905 **	Wayland (MO) / Keokuk (IA)	IV-V
4.	Jan. 26, 1925	Waterloo (IA)	II
5.	**Nov. 12, 1934**	**Davenport (IA) / Rock Island (IL)**	**VI**
6.	Jan. 05, 1935 **	Rock Island (IL) / Davenport (IA)	IV
7.	Jan. 05, 1935 **	Rock Island (IL) / Davenport (IA)	III
8.	Feb. 26, 1935	Burlington (IA)	III
9.	Oct. 11, 1938	Inwood (IA)	V
10.	Nov. 08, 1938	Dubuque (IA) *	~II
11.	Nov. 24, 1939	Davenport (IA) / Rock Island (IL)	II-III
12.	Apr. 20, 1948	Oxford (IA)	IV
13.	July 16, 2004	Shenandoah (IA)	III

Red identifies Iowa's largest earthquake
* Dubuque experienced three shocks
** Epicenter probably just outside Iowa

Source: Iowa Department of Natural Resources, http://www.igsb.uiowa.edu/Browse/earthqua/iowa_quakes.htm
Note: The orange rectangle indicates the approximate location of Howard County, which includes the Participating Jurisdictions

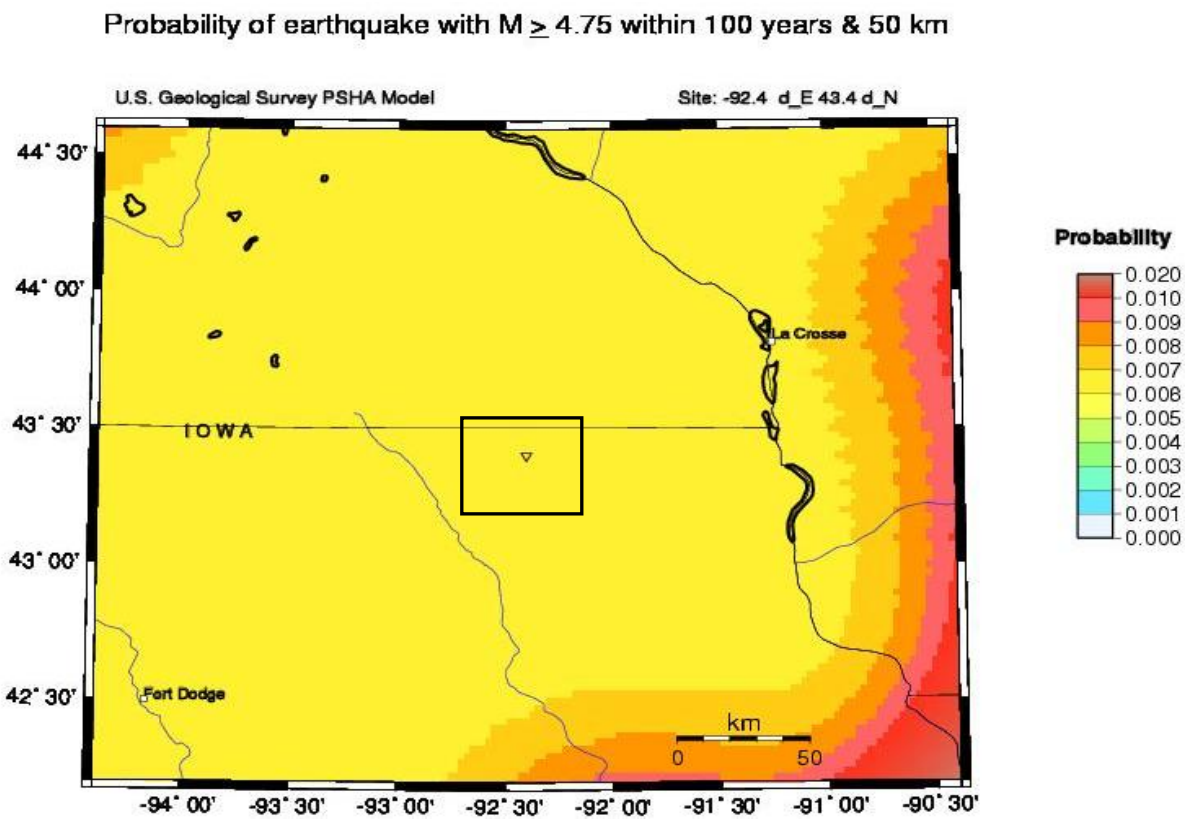
Probability of Future Occurrences

The Participating Jurisdictions' probability of a magnitude 4.75+ earthquake over a 100 year time period is estimated to be 0.5 to 0.6 percent. Similar probabilities equate this to roughly a 10,000 year recurrence interval. Based on these estimates the probability of a significant earthquake in any given year is unlikely.

Unlikely: Event is probable within the next 10 years

Figure 3.4 reflects the Participating Jurisdictions' 100-year probability of a magnitude 4.75+ earthquake.

Figure 3.4 Earthquake Probability: Magnitude ≥4.75 within 50 Kilometers in 100 Years



Source: U.S. Geological Survey, http://eqint.cr.usgs.gov/eqprob/2002/index.php
Note: The black rectangle indicates the approximate location of Howard County

Magnitude

The amount of energy released during an earthquake is most commonly expressed on the moment magnitude scale and is measured directly from energy released from the fault or epicenter as recorded on seismographs. Another measure of earthquake magnitude is intensity. Intensity is an expression of the amount of shaking at any given location on the surface as felt by humans and defined by the Modified Mercalli Intensity Scale. It is typically the greatest cause of losses to structures during earthquakes and is determined by many factors including distance from epicenter and soil types.

Table 3.10 features abbreviated descriptions of the 12 levels of earthquake intensity.

Table 3.10 Modified Mercalli Intensity (MMI) Scale

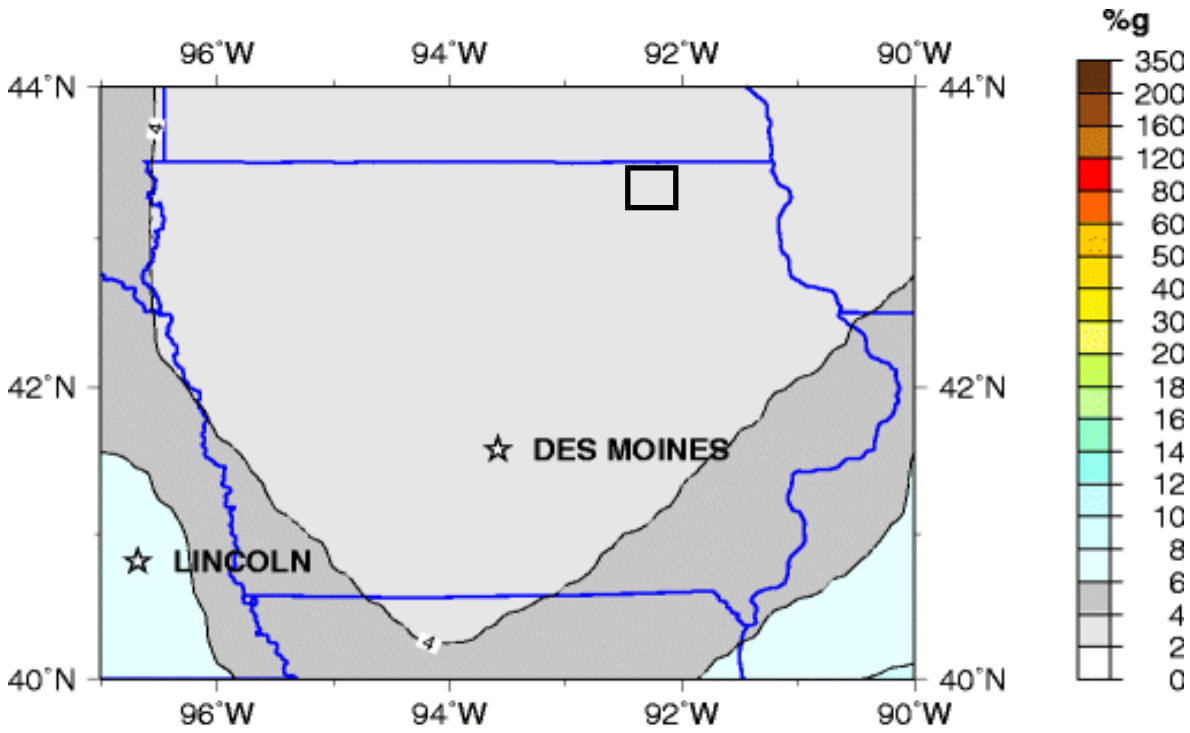
MMI	Felt Intensity
I	Not felt except by very few people under special condition. Detected mostly by instruments.
II	Felt by a few people, especially those on upper floors of building. Suspended objects may swing.
III	Felt noticeably indoors, by a few outdoors. Standing automobiles may rock slightly.
IV	Felt by many people indoors, by a few outdoors. At night, some people are awakened. Dishes, windows, and doors rattle.
V	Felt by nearly everyone. Many people are awakened. Some dishes and windows are broken. Unstable objects are overturned.
VI	Felt by everyone. Many people become frightened and run outdoors. Some heavy furniture is moved. Some plaster falls.
VII	Most people are alarmed and run outside. Damage is negligible in buildings of good construction, considerable damage in buildings of poor construction
VIII	Damage is slight in specially designed structures, considerable in ordinary buildings, great in poorly built structures. Heavy furniture is overturned.
IX	Damage is considerable in specially designed buildings. Buildings shift from their foundations and partly collapse. Underground pipes are broken.
X	Some well built wooden structures and destroyed. Most masonry structures are destroyed. The ground is badly cracked. Considerable landslides occur on steep slopes.
XI	Few, if any masonry structures remain standing. Rails are bent. Broad fissures appear in the ground.
XII	Virtually total destruction. Waves are seen on the ground surface. Objects are thrown in the air.

Source: Multi-Hazard Identification and Risk Assessment, FEMA 1997

Typically, significant earthquake damage occurs when accelerations are greater than 30 percent gravity.

Figure 3.5 indicates that there is a 2.0 percent probability of a peak acceleration of 4.0 gravity in the next 50 years for the Participating Jurisdictions.

Figure 3.5 Iowa Seismic Hazard Map – Peak Acceleration (%g) with 2.0 Percent Probability of Exceedance in 50 Years



Source: U.S. Geological Survey, http://earthquake.usgs.gov/regional/states/iowa/hazards.php
Note: The black square indicates the approximate location of Howard County

Based on recurrence intervals for small earthquakes, scientists estimate a 90% chance of a Richter magnitude 6.0 earthquake in the New Madrid Fault Zone by 2040. A magnitude 6.5 in New Madrid would create magnitude 4 effects in Iowa resulting in little or no damage or fear.

Negligible: Less than 10 percent of property severely damaged, shutdown of facilities and services for less than 24 hours; and/or injuries/illnesses treatable with first aid

Hazard Summary

Jurisdiction	Calculated Priority Risk Index (CPRI)	Planning Significance
City of Lime Springs	1.60	Low
City of Protivin	1.60	Low

3.2.5 Extreme Heat

Description

Extreme temperature events, both hot and cold, can have severe impacts on human health and morality, natural ecosystems, agriculture, and other economic sectors. 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 shown in Figure 3.6 uses both of these factors to produce a guide for the apparent temperature or relative intensity of heat conditions.

Figure 3.6 Heat Index (HI) Chart

Temperature (°F)

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

Likelihood of Heat Disorders with Prolonged Exposure or Strenuous Activity

Caution Extreme Caution Danger Extreme Danger

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

Note: Exposure to direct sun can increase Heat Index values by as much as 15°F. Note on the HI chart the shaded zone above 105°F. This corresponds to a level of HI that may cause increasingly sever heat disorders with continued exposure and/or physical activity.

From 1995 to 2006, there was an annual average of 230 fatalities in the U.S. attributed to summer heat. According to the National Weather Service, among natural hazards, no other natural disaster takes greater toll.

Table 3.11 reflects number of known heat related fatalities per year from 1995 to 2006.

Table 3.11 Extreme Heat Fatalities, U.S. 1995-2006

Year	Heat Related Fatalities	Year	Heat Related Fatalities
1995	1,021	2002	167
1996	36	2003	36
1997	81	2004	6
1998	173	2005	158
1999	502	2006	253
2000	158	**Total**	**2,757**
2001	166	**Annual Avg. (1995-2006)**	**230**

Source: National Weather Service (NWS), http://weather.gov/os/hazstats/images/67-years.pdf

Those at greatest risk for heat-related illness include infants and children up to four years of age, 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 temperatures is a major concern.

Table 3.12 lists typical symptoms and health impacts of exposure to extreme heat.

Table 3.12 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.

Warning Time: 24+ hours

Duration: Less Than 1 Day

Geographic Location

The entire planning area is subject to extreme heat.

Previous Occurrences

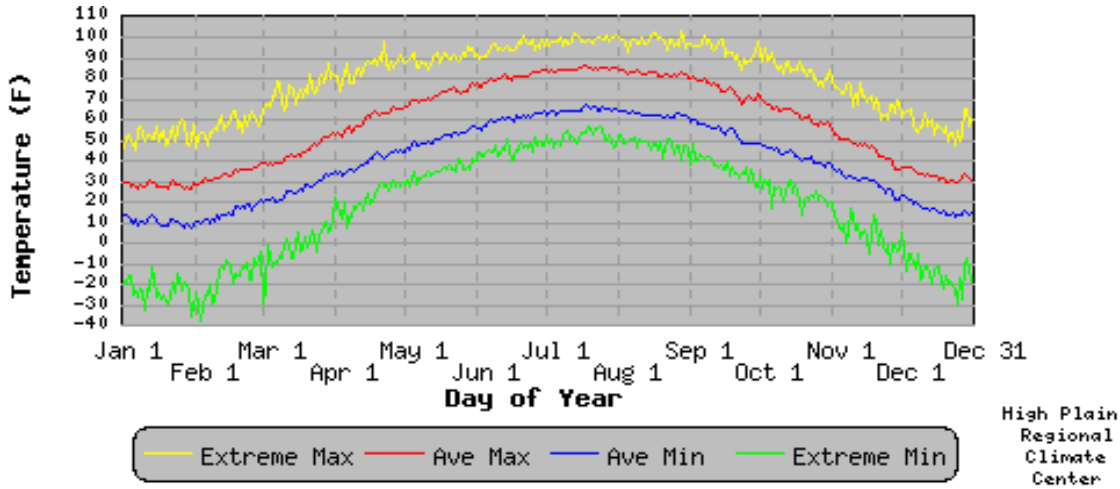
During the period from 1994-2008, the NCDC database lists six incidents of extreme heat that would include the Participating Jurisdictions. Details were provided for the following events:

- **August 1, 2001.** The excessive heat that began in July continued through the first part of August, with afternoon temperatures reaching into the middle to upper 90s. The heat combined with high humidity produced dangerous heat indices of 110 to 120.
- **July 30, 1999.** Yet another period of excessive heat and humidity affected northeast Iowa. Afternoon highs reached the middle 90s to 100, while heat indices of 110 to 120 were common. No deaths directly related to the oppressive heat and humidity were reported.
- **July 5, 1999.** High humidity combined with afternoon temperatures of 95 to 100 produced heat indices of 105 to 115. There were no deaths directly related to the excessive heat and humidity.
- **July 14, 1995.** Intense heat overspread all of Iowa from the 12th to the 14th. Dew point temperatures ranged from the upper 70s to the middle 80s through much of the time. Winds remained light through the period and were generally less than 10 mph. High temperatures during the period were generally in the 98°-108°F range. Nearly every station broke the century mark by the 14th. Overnight low temperatures struggled to reach the middle 70s, with some areas remaining around 80. The highest heat indices were in the east half of Iowa, where the higher dew point temperatures were. The highest reading came from Cedar Rapids on the 13, with a heat index of 131 by late afternoon. Three people died from the heat, one in Des Moines, one in Marshalltown, and a third in Burlington. A significant loss occurred in livestock. Statewide figures indicate the losses approaching the $5-$6 million range. Losses were placed at 4,000 head of cattle, 370 hogs, 1,250,000 chickens, and 250,000 turkeys. Disposal became a serious problem as rendering plants were overwhelmed. In addition to problems caused to humans and livestock, there were numerous heat buckles reported on streets and highways around the state. Early indications were there was little in the way of crop damage. The combination of light winds and extremely high dew point temperatures helped keep the crops from stressing too much. Heavy dew would form overnight that would last well into the early afternoon hours.

During 2005 to 2007, Howard County, which includes the Participating Jurisdictions, did not receive a USDA emergency designation for excessive heat.

Figure 3.7 graphs the record temperatures by month from 1937 to 2008.

Figure 3.7 Daily Temperature Averages and Extremes, Howard County, 1937-2008



- Extreme Max. is the maximum of all daily maximum temperatures recorded for the day of the year
- Ave. Max. is the average of all daily maximum temperatures recorded for the day of the year
- Ave. Min. is the average of all daily minimum temperatures recorded for the day of the year
- Extreme Min. is the minimum of all daily minimum temperatures recorded for the day of the year

Source: High Plains Regional Climate Center, http://www.hprcc.unl.edu/data/historical/index.php?state=ia&action=select_state&submit=Select+State

During the period from 1937 - 2008, the National Weather Service Station in Howard County recorded an annual average of 10.2 days over 90 degrees Fahrenheit and an average of 31.3 days below zero degrees Fahrenheit.

Table 3.13 reflects the daily temperatures extremes from 1937 to 2008 in Howard County.

Table 3.13 Daily Temperature Maximum and Minimum, Howard County, 1937-2008

Month	# Days ≥ 90°F	# Days ≤ 32°F	# Days ≤ 32°F	# Days ≤ 0°F
	Daily High Temperature		Daily Low Temperature	
January	0	23.4	30.7	12.5
February	0	17.6	27.6	8.4
March	0	8.5	26.4	2.1
April	0	0.5	13.4	0
May	0.3	0	1.9	0
June	1.7	0	0	0
July	4.0	0	0	0
August	3.2	0	0	0
September	1.0	0	1.2	0
October	0.0	0.1	9.9	0
November	0.0	6.7	23.8	1.1
December	0.0	199	30.1	7.2
Annual	10.2	76.8	165.0	31.3

Source: High Plains Regional Climate Center Table updated on December 28, 2009

Table 3.14 reflects Howard County crop loss insurance claims as a result of extreme heat from 2005 to 2008.

Table 3.14 Howard County Claims Paid for Crop Loss as Result of Extreme Heat, 2005-2008

Year	Crop	Claims Paid ($)
2008	Soybeans	42,423
Total		**42,423**

Source: USDA Risk Management Agency

Probability of Future Occurrences

Although periods of extreme heat generally occur on an annual basis, events that cause significant health impacts occur less frequently. Based on patterns of previous occurrences, probability of future occurrence is considered likely.

Occasional: Event is probable within the next five years

Magnitude

Due to the potential for fatalities and the possibility for the loss of electric power, periods of extreme heat can severely affect the planning area. In addition, accompanying drought may compound the problem exacerbating agricultural and economic losses.

Negligible: Less than 10 percent of property severely damaged, shutdown of facilities and services for less than 24 hours; and/or injuries/illnesses treatable with first aid

Hazard Summary

Jurisdiction	Calculated Priority Risk Index (CPRI)	Planning Significance
City of Lime Springs	1.80	Low
City of Protivin	1.80	Low

3.2.6 Flash Flood

Description

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

Floods are the most common and widespread of all-natural disasters except fire. In Iowa, as much as 21 inches of rain has fallen in a 24 hour period. The latest significant event to affect Iowa occurred in May of 2004. This event resulted in a Presidential Disaster Declaration due to widespread personal and physical property losses. Since then, many flash flood events have occurred across Iowa though mostly localized events. The National Climatic Data Center lists 1,002 flash flooding/urban or small stream flooding events from 1998-2006. Between 1998 and 2006 there have been three (3) deaths and nine (9) injuries related to flash flooding in Iowa.

The onset of flooding varies depending on the cause and type. Flash flooding typically occurs with little or no warning. The duration of flash flood conditions is generally less than one day, but in exceptional cases can extend for much longer periods.

Warning Time: Less Than 6 Hours

Duration: Less Than 1 Day

Geographic Location

The jurisdictional boundaries of the City of Lime Springs and the City of Protivin do not include rivers and are relatively flat. The threat of flash flooding in these communities is due to the creeks in city limits. The lower elevations and properties adjacent to the creek beds are most at risk to flash flooding.

Previous Occurrences

The NCDC reports 33 flash flooding events in Howard County, which includes the Participating Jurisdictions, between 1993 and May 2009.

Details available from NCDC of the flash flood events that affected the Participating Jurisdictions include:

- **August 19, 2007.** Bohemian Creek was out of its banks and sand bagging was taking place in Protivin as 2 to 5 inches of rain fell in two to three hours causing flash flooding.
- **May 8, 2002.** Thunderstorms produced 4 inches of rain in about an hour, causing flash flooding. Law enforcement officials reported numerous roads washed out, while 1 to 2 feet of water covered roads in Protivin (Howard County).
- **May 31, 2000.** Thunderstorms dropped 3 to 6 inches of rain during the night of May 31 into the early morning hours of June 1. Law enforcement officials reported damage to several roads and bridges in the Lime Springs and Cresco areas.
- **June 18, 1998.** Flash flooding was observed in streams in the Lime Springs area after 2 to 3 inches of rain fell in an hour.
- **August 17, 1994.** Heavy rainfall fell over Howard County. Rainfall between three and four inches fell in .5 to 1.5 hours time. This resulted in flash flooding. Several creeks and streams overflowed their banks and some county roads were overtopped with water. Street flooding was widespread throughout the county.

From 2005 to 2007, Howard County, which includes the Participating Jurisdictions, received three USDA declarations that involved excessive moisture.

Table 3.15 reflects insurance claims paid in Howard County for Crop Loss as a Result of Flood (flash floods or river floods) and Excessive Moisture from 2005 to 2008.

Table 3.15 Claims Paid in Howard County for Crop Loss as a Result of Flood and Excessive Moisture, 2005-2008

Year	Crop	Hazard	Claims Paid ($)
2005	Corn	Excess Moisture/Precip/Rain	9,394
2005	Soybeans	Excess Moisture/Precip/Rain	6,105
2006	Corn	Excess Moisture/Precip/Rain	10,308
2006	Soybeans	Excess Moisture/Precip/Rain	371
2007	Oats	Excess Moisture/Precip/Rain	3,362
2007	Corn	Excess Moisture/Precip/Rain	8,161
2007	Soybeans	Excess Moisture/Precip/Rain	12,244
2008	Wheat	Excess Moisture/Precip/Rain	13,663
2008	Oats	Excess Moisture/Precip/Rain	692
2008	Corn	Excess Moisture/Precip/Rain	1,297,433
2008	Soybeans	Excess Moisture/Precip/Rain	1,004,853
2008	Oats	Flood	3,893
2008	Corn	Flood	503,159
2008	Soybeans	Flood	99,200
Total			**2,972,838**

Source: USDA's Risk Management Agency

Probability of Future Occurrences

Flash flooding occurs on close to an annual basis over the span of Howard County in its low-lying areas and locations close to rivers, creeks and streams. Based on this level of frequency, probability of future flash flooding with significant impacts in the Participating Jurisdictions is considered highly likely.

As land is converted from fields or woodlands to roads and parking lots, it loses its ability to absorb rainfall. Urbanization increases runoff 2 to 6 times over what would occur on natural terrain. As more development occurs in watersheds, the amount of runoff produced also increases.

Likely: Event is probable within the next three years

Magnitude

Factors that directly affect the amount of flood runoff include precipitation, intensity and distribution, the amount of soil moisture, seasonal variation in vegetation, and water-resistance of the surface areas due to urbanization. The term "flash flood" describes localized floods of great volume and short duration.

There have been 3 deaths and 9 injuries in the State of Iowa related to flash flooding between 1998 and 2006; no deaths or injuries are reportedly related to flash flooding in Howard County, which includes the Participating Jurisdictions, since 1993.

Flash floods can quickly inundate areas thought to be out of flood-prone areas. Loss of life; property damage and destruction; damage and disruption of communications, transportation, electric service, and community services; crop and livestock damage and loss and interruption of business are common impacts from flash flooding.

With the primary threat of flash floods occurring adjacent to the creek beds in the in Participating Jurisdictions; fortunately the number of people and structures in that area are limited.

Limited: 10-25 percent of property severely damaged; shutdown of facilities for more than a week; and/or injuries and/or illnesses do not result in permanent disability

Hazard Summary

Jurisdiction	Calculated Priority Risk Index (CPRI)	Planning Significance
City of Lime Springs	2.75	Moderate
City of Protivin	2.75	Moderate

3.2.7 Grass and Wild Land Fire

Description

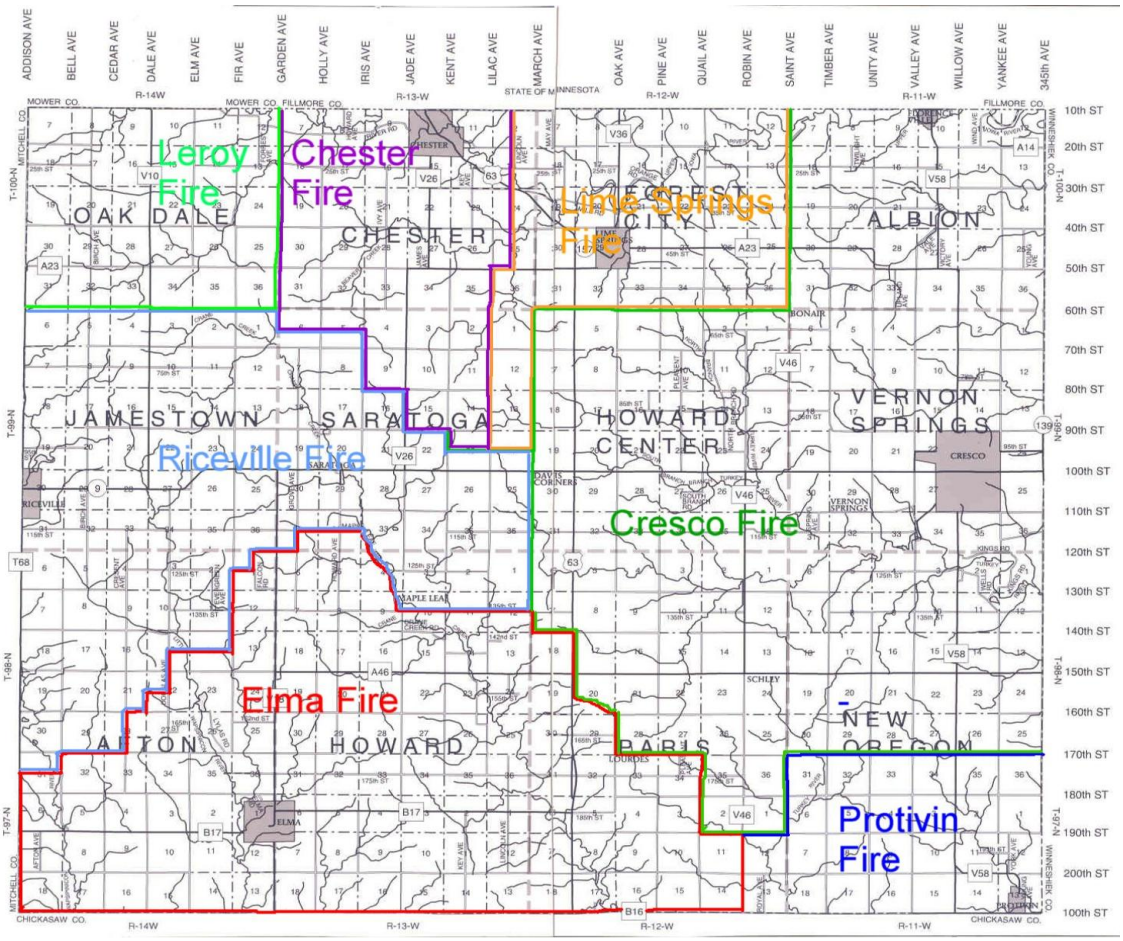
Since protecting people and structures takes priority, a wildfire's cost to natural resources, crops, and pastured livestock can be ecologically and economically devastating. In addition to the health and safety impacts to those directly affected by fires, the state is also concerned about the health effects of smoke emissions to surrounding areas.

Grass and wild land fires in Iowa are frequently associated with lightning and drought conditions, as dry conditions make vegetation more flammable. As new development encroaches into the wild land-urban interface (areas where development occurs within or immediately adjacent to wild lands, near fire-prone trees, brush, and/or other vegetation), more and more structures and people are at risk. On occasion, ranchers and farmers intentionally ignite vegetation to restore soil nutrients or alter the existing vegetation growth. These fires have the potential to erupt into wild land fires.

There are seven fire districts that cover Howard County, which includes the Participating Jurisdictions. A fire station is located within the jurisdictional boundaries of Lime Springs and Protivin. These fire districts reach beyond jurisdictional boundaries into Unincorporated Areas of Howard County.

Figure 3.8 reflects the Fire Districts within Howard County.

Figure 3.8 Howard County Fire District Areas



Source: Howard County GIS

Warning Time: Less Than 6 Hours

Duration: Less Than 1 Day

Geographic Location

The Participating Jurisdictions consist of and/or are surrounded by rural area which is vulnerable to grass and wild land fire given the appropriate conditions.

Previous Occurrence

The State of Iowa's Hazard Mitigation Plan reports Iowa experienced 7,597 grass or wild land fires from 2005 to 2007.

The documentation of previous grass and wild land fires could not be located for the Participating Jurisdictions specifically.

Probability of Future Occurrence
The participating cities: Lime Springs and Protivin have less open grass and wild land area compared to the more rural areas where the fires would have a higher probability.

Occasional: Event is probable within the next five years

Magnitude
Property damage is usually limited to grass, small trees, agricultural fields, etc. Wildfires occur on an annual basis in every county in Iowa; however, most do not result in significant threat to life or property.

Limited: 10-25 percent of property severely damaged; shutdown of facilities for more than a week; and/or injuries and/or illnesses do not result in permanent disability

Hazard Summary

Jurisdiction	Calculated Priority Risk Index (CPRI)	Planning Significance
City of Lime Springs	2.00	Moderate
City of Protivin	2.00	Moderate

3.2.8 Hailstorm

Description
Hailstorms in Iowa cause damage to property, crops, and the environment, and harm livestock. Because of the large agricultural industry in Iowa, crop damage and livestock losses due to hail are of great concern to the state. Even relatively small hail can cause serious damage to crops and trees. Vehicles, roofs of buildings and homes, and landscaping are the other things most commonly damaged by hail. Hail has been known to cause injury and the occasional fatality to humans, often associated with traffic accidents.

Hail is associated with thunderstorms that can also bring powerful winds and tornadoes. A hailstorm forms when updrafts carry raindrops into extremely cold areas of the atmosphere where they condense and freeze. Hail falls when it becomes heavy enough to overcome the strength of the updraft and is pulled by gravity towards the earth. The onset of hailstorms is generally rapid. Duration is less than 6 hours and warning time is generally less than 6 hours.

Table 3.16 describes typical damage impacts due to various sizes of hail.

Table 3.16 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-.06	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 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 > Softball	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 Brooke University
Notes: In addition to hail diameter, factors including number and density of hailstones, hail fall speed and surface wind speeds affect severity.

Warning Time: Less Than 6 Hours

Duration: Less Than 6 Hours

Geographic Location

The entire planning area is at risk to hailstorms.

Previous Occurrences

The NCDC reports 72 hail reports in Howard County, which includes the Participating Jurisdictions, from 1955-2009.

Table 3.17 shows, by the size of hail, the number of known hail events in Howard County from 1955 to 2009.

Table 3.17 Howard County Hail Events, 1955-2009

Hail Size (Inches)	Number of Reports, 1955-2009
0.75	31
0.88	7
1.00	17
1.25	2
1.50	5
1.75	8
2.00	1
2.25	0
2.50	0
2.75	0
3.00	1
4.50	0

Source: National Climatic Data Center Storm Events Database, http://www4.ncdc.noaa.gov/cgi-win/wwcgi.dll?wwEvent~Storms

Notable hailstorm event details affecting Howard County, which includes the Participating Jurisdictions, provided by the NCDC are summarized below:

- **July 24, 2009.** Clusters of severe thunderstorms generated by an approaching cold front affected part of northeast Iowa during the afternoon and early evening of July 24. Reports of hail up to 2 inches in diameter were common from storm spotters, law enforcement officials and the public. Howard County had 36,000 acres impacted, with a total loss of 10,000 acres and an estimated damage cost of $11 million.
- **June 17, 2009.** Severe thunderstorms were triggered along a warm front during the evening of June 17. Storm spotters observed funnel clouds and also reported hail up to the size of baseballs, which caused considerable damage to crops in some locations. Thunderstorm winds also caused damage to windows, siding and roofs.
- **July 16, 2007.** An upper level disturbance interacted with a nearly stationary front to trigger a cluster of severe thunderstorms across northeast Iowa during the evening of July 16. Law enforcement officials, storm spotters and amateur radio operators reported hail up to the size of golf balls.
- **October 4, 2006.** A supercell moved across northeast Iowa during the early morning hours of October 4, producing large hail up to the size of baseballs.
- **May 6, 2002.** Dime to golf ball size hail was reported by law enforcement officials and amateur radio operators.
- **May 31, 2000.** Law enforcement officials estimated winds of 60 mph, while dime size hail was reported by the public.
- **July 20, 1998.** Spotters and law enforcement officials reported hail ranging in size from golf balls to as large as baseballs along with 70 mph winds.

Table 3.18 reflects the Howard County known insured crop losses as a result of hail from 2005 to 2008.

Table 3.18 Claims Paid in Howard County for Crop Loss as a Result of Hail, 2005-2008

Year	Crop	Hazard	Claims Paid ($)
2006	Corn	Hail	4,880
2006	Soybeans	Hail	76,692
2007	Corn	Hail	278,880
2007	Soybeans	Hail	122,542
2008	Corn	Hail	30,437
2008	Soybeans	Hail	95,563
Total			**608,994**

Source: USDA's Risk Management Agency

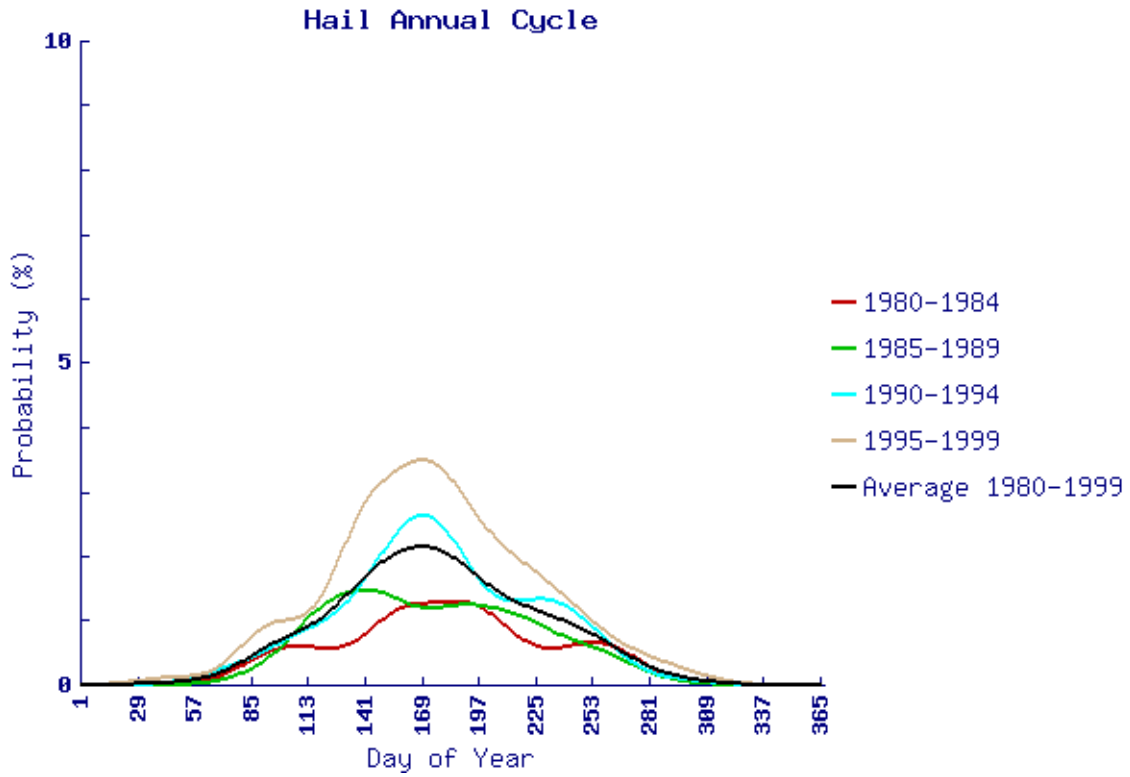
Probability of Future Occurrences

Based on NCDC data, there were 72 hail events in Howard County, which includes the Participating Jurisdictions from 1955 –2009, an average of 1.3 each year. Hail events producing hail 1.75 inches and larger occurred 16 times over the same 54 year period. Based on the frequency of previous occurrences of storms producing hail 1.75 inches and larger, the probability of such an event in any given year is roughly 20 percent. Although there were only two events during this period of hail two inches or larger, the probability of a hail event of this magnitude is two percent in any given year.

Probability for hail events is highest in the late spring and overall probability is highest in the most recent reporting period.

Figure 3.9 reflects the daily probability for the Participating Jurisdictions of a hailstorm, 2" diameter or larger, from 1980 to 1999.

Figure 3.9 Howard County's Daily Hailstorm Probability, 2" Diameter or Larger, 1980-1999

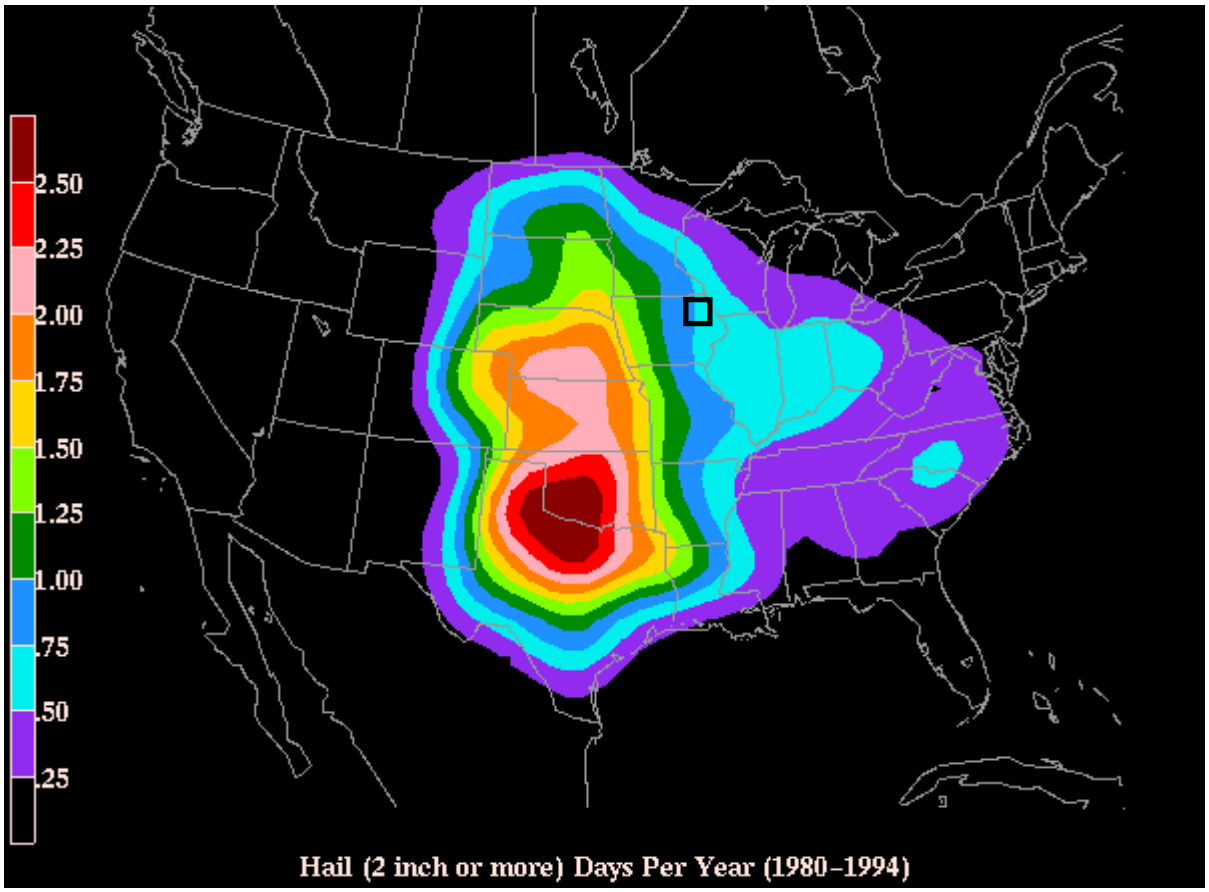


Source: National Severe Storms Laboratory, http://www.nssl.noaa.gov/hazard/hazardmap.html

For example, a y-axis value of 2.0 would indicate a two percent chance of receiving the chosen type of severe weather on the date indicated by the x-axis value.

Figure 3.10 reflects the United States' probability of hailstorm occurrence, 2" diameter or larger, based on number of days per year within a 12.5 mile radius of a given point on the map, from 1980 to 1994.

Figure 3.10 Annual Hailstorm Probability (2" diameter or larger), United States, 1980-1994



Source: NSSL, http://www.nssl/noaa.gov/users/brooks/public_html/bighail.gif
Note: Black square indicates approximate location of Howard County

Howard County, which includes the Participating Jurisdictions, is located where the probability appears to increase from 0.50–0.75 days per year with hail two inches in diameter or more.

Highly Likely: Event is probable within the calendar year

Magnitude

In addition to concerns for public safety, assets that are vulnerable to hail damage include crops and built structures. Of these, crop damage from hailstorms is the most common and the most costly. Large hail can devastate crops that are at vulnerable stages in the plant/harvest cycle, and it is possible for a great percentage of crop yields to be lost as a result of even a single hail event.

Structure damage due to hail is usually covered under private insurance. The NCDC reports that over $800,000 in property and crop damage occurred in Howard County from

1994-2009. Information on specific structural damage costs in the planning area as a result of hail damage was not available. There was a hailstorm on July 27, 2009 that caused an estimated 100 million dollars in crop damage in Howard County.

Negligible: Less than 10 percent of property severely damaged, shutdown of facilities and services for less than 24 hours; and/or injuries/illnesses treatable with first aid

Hazard Summary

Jurisdiction	Calculated Priority Risk Index (CPRI)	Planning Significance
City of Lime Springs	2.95	Moderate
City of Protivin	2.95	Moderate

3.2.9 River Flood

Description

River flooding is defined as when a watercourse exceeds its "bank-full" capacity and is the most common type of flood event. River flooding generally occurs as a result of prolonged rainfall, or rainfall that is combined with solids already saturated from previous rain events. The area adjacent to a river channel is its floodplain. In its common usage, "floodplain" most often refers to that area that is inundated by the 100-year flood, the flood that has a 1 percent chance in any given year of being equaled or exceeded. The 1 percent annual flood is the national standard to which communities regulate their floodplains through the National Flood Insurance Program (NFIP). The planning area is mapped for flood, therefore eligible to participate in the National Flood Insurance Program. Currently, the City of Lime Springs is NFIP compliant; City of Protivin is currently suspended.

Floods are the most common and widespread of all-natural disasters except fire. Floodwaters can be extremely dangerous. The force of six inches of swiftly moving water can knock people off their feet and two feet of water can float a car. Floods can be slow-, or fast-rising. River flooding is a natural and expected phenomenon that occurs annually, usually restricted to specific streams, rivers or watershed areas.

Warning Time: 12-24 Hours

Duration: Less Than 1 Week

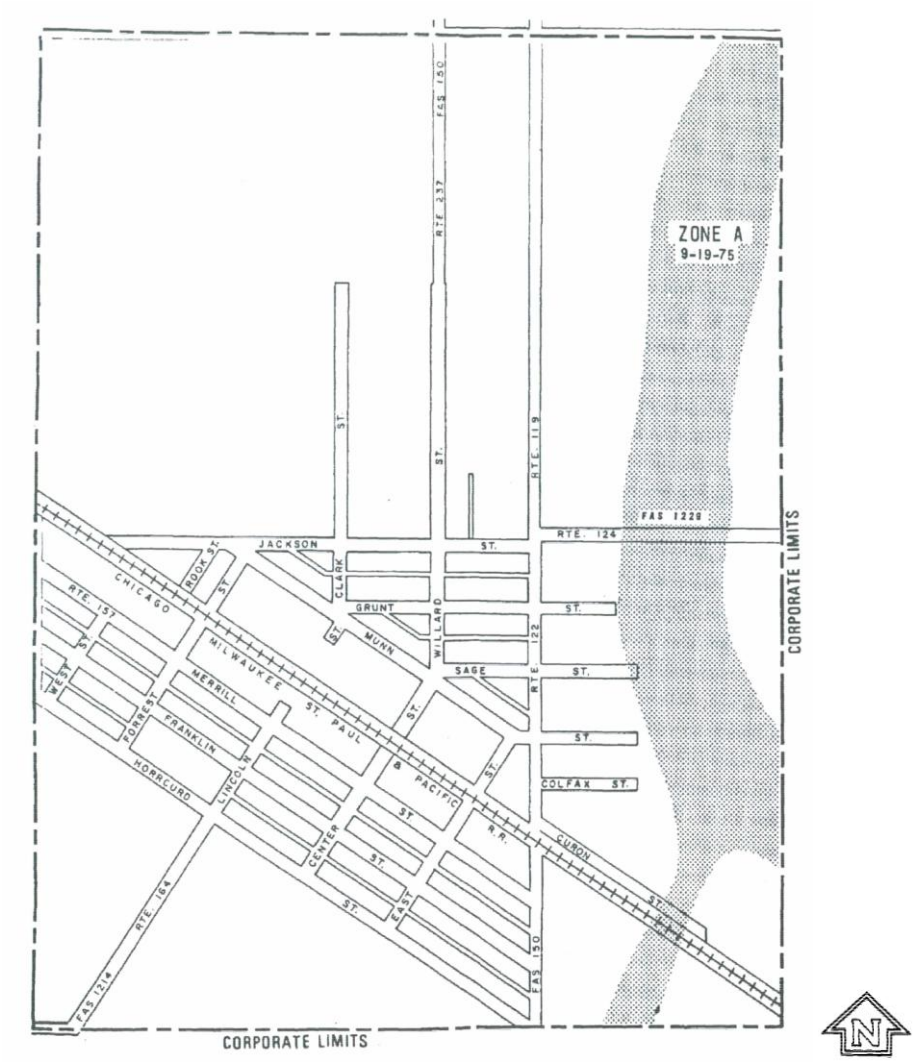
Geographic Location

Two creeks flow through City of Lime Springs, with Miller Creek to the East end of town and the second creek running through town, beginning from the North end. In City of Protivin, the Bohemian Creek and the dry run bed both experience increased volume with heavy rains. The low-lying areas along these water sources are vulnerable to damage from river flooding. Many structures, homes, main roadways, and agricultural areas are threatened by river flooding.

Figures 3.11 - 3.12 reflect current available flood map data for the planning area, with Special Flood Hazard Area's being shaded and marked 'Zone A'. City of Lime Spring's Flood Hazard Boundary Map (FHBM) is dated September 19, 1975. City of Protivin's Flood Insurance Rate Map (FIRM) is dated August 19, 1986.

Figure 3.11 reflects the FHBM for the City of Lime Springs, with 'Zone A' being shaded.

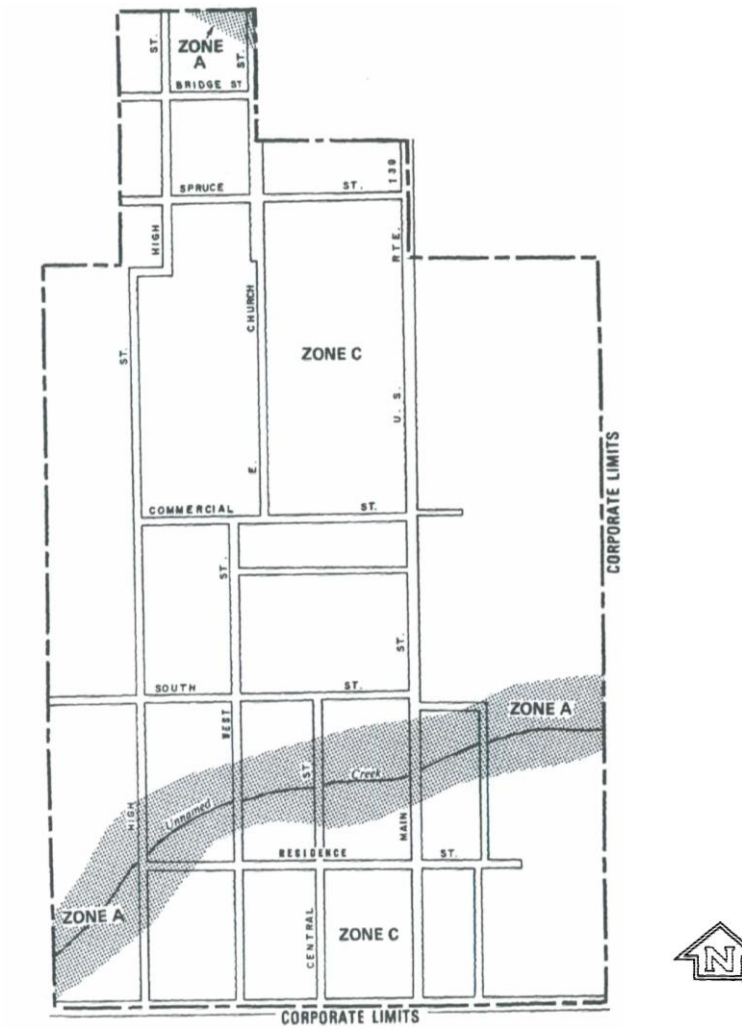
Figure 3.11 City of Lime Springs, Flood Hazard Boundary Map, 1975



Source: Department of Housing and Rural Development

Figure 3.12 reflects the FIRM for the City of Protivin, with 'Zone A' being shaded, which notes the area subject to a 1 percent or greater chance of flooding in any given year. As no detailed hydraulic analyses have been performed on these areas, no base flood elevations are shown.

Figure 3.12 City of Protivin, Flood Insurance Rate Map, 1986



Source: Federal Emergency Management Agency (FEMA)

Limited: 10-25 percent of property severely damaged; shutdown of facilities for more than a week; and/or injuries and/or illnesses do not result in permanent disability

Previous Occurrences

In Howard County, which includes the planning area, there have been five federal disaster declarations involved with flooding since 1990.

The NCDC reports 33 flooding events in Howard County, which includes the planning area between 1993 and December 2009. Selected details available from the NCDC of river flood events that affected Howard County are:

- **June 8, 2008.** Flash flooding led to aerial flooding across much of the county. Numerous roads and bridges remained closed, mainly in the northern part of the county. Parts of Protivin were evacuated due to flood waters and ponding. Crops were also hit hard with too much standing water.

From 2005 to 2008, Howard County, including the planning area, received three USDA disaster declarations that involved excessive moisture. According to the USDA Risk Management Agency, insured crop losses in Howard County as a result of flood conditions and excessive moisture from 2005 to 2008 totaled $2,972,838.

Probability of Future Occurrences

It was estimated by the HMPC Chair that a major flooding event requiring federal assistance will occur within the next three (3) years for City of Lime Springs; within the calendar year for City of Protivin. However, damaging river floods of varying extent do occur on an annual basis.

Likely: Event is probable within the next three years (City of Lime Springs)
Highly Likely: Event is probable within the calendar year (City of Protivin)

Magnitude

River flooding impacts include property damage and destruction; damage and disruption of communications, transportation, energy service, community services, water treatment and wastewaters treatment facilities, crop and livestock damage. Facilities and infrastructure can be scoured around and degrading its structural integrity. Past flood events in Howard County have caused significant damage to property and agriculture, endangered lives and critical facilities.

In City of Protivin flood waters often rise up to cover Main Street, flooding some businesses and residential homes to include but not limited to the fire station, city hall and post office. Annually, the Protivin City Park is submerged due to flood waters.

Limited: 10-25 percent of property severely damaged; shutdown of facilities for more than a week; and/or injuries and/or illnesses do not result in permanent disability

Hazard Summary

Jurisdiction	Calculated Priority Risk Index (CPRI)	Planning Significance
City of Lime Springs	2.55	Moderate
City of Protivin	3.00	High

3.2.10 Severe Winter Storm

Description

Winter storms in Iowa typically involve snow, extreme cold, and/or freezing rain (ice storms). These conditions pose a serious threat to public safety, disrupt commerce and transportation, and can damage utilities and communications infrastructure. Winter storms can also disrupt emergency and medical services, hamper the flow of supplies, and isolate homes and farms.

Heavy snow can collapse roofs and down trees onto power lines. Extreme cold conditions can stress or kill unprotected livestock and freeze water sources. Direct and indirect economic impacts of winter storms include cost of snow removal, damage repair, increased heating bills, business and crop losses, power failures and frozen or burst water lines.

For humans, extreme cold can cause hypothermia (an extreme lowering of the body's temperature) and permanent loss of limbs due to frostbite. Infants and the elderly are particularly at risk, but anyone can be affected. According to the National Center for Health Statistics, approximately 600 adults die from hypothermia each year, with the isolated elderly being most at risk. Also at risk are those without shelter or live in a home that is poorly insulated or without heat. Other potential health and safety threats include toxic fumes from emergency heaters, household fires caused by fireplaces or emergency heaters, and driving in treacherous conditions.

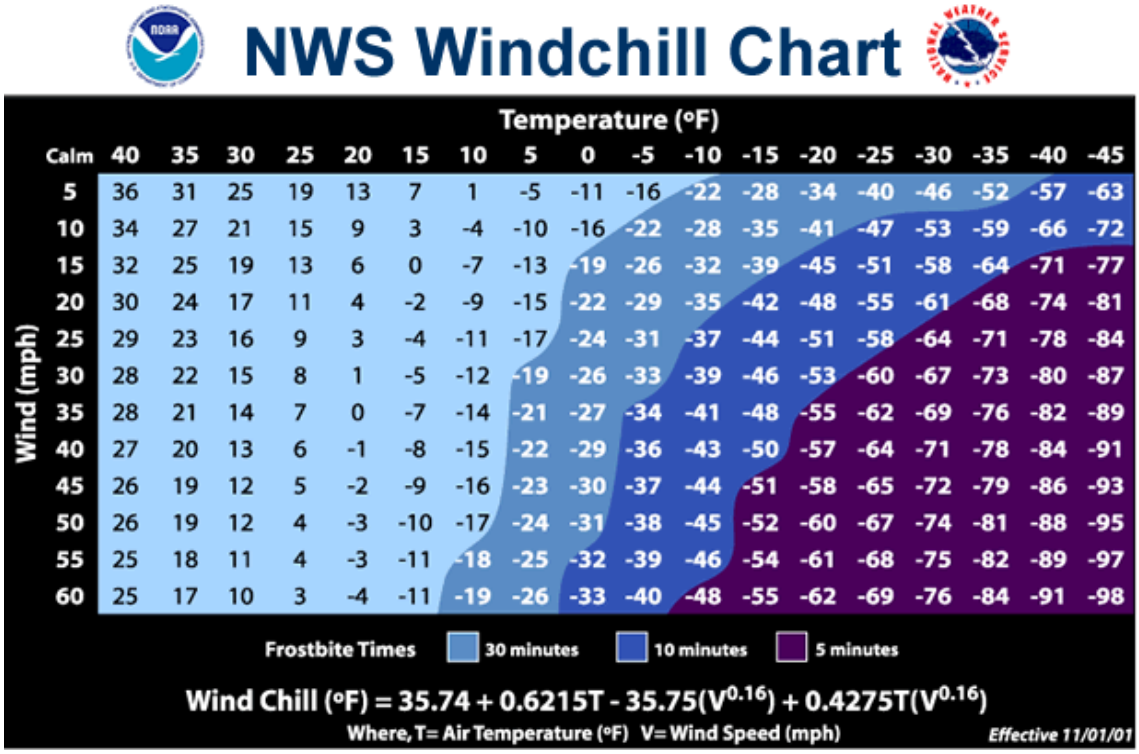
The National Weather Service describes different types of winter storm conditions as follows:

- **Blizzard** – Winds of 35 mph or more with snow and blowing snow reducing visibility to less than 1/4 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 whose temperature is below freezing. This causes the rain to freeze on 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.

Wind can greatly amplify the impact of cold ambient air temperatures and accordingly, the severity of winter storms.

Figure 3.13 reflects the relationship of wind speed to apparent temperature and typical time periods for the onset of frostbite.

Figure 3.13 Wind Chill Chart



NWS Windchill Chart

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

Frostbite Times: 30 minutes, 10 minutes, 5 minutes

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

Where, T= Air Temperature (°F) V= Wind Speed (mph)

Effective 11/01/01

Source: NOAA, National Weather Service, http://www.weather.gov/om/windchill/

Duration of the most severe impacts of winter storms is generally less than one week, though dangerous cold, snow, and ice conditions can remain present for longer periods in certain cases. Weather forecasts commonly predict the most severe winter storms at least 24 hours in advance, leaving adequate time to warn the public.

Warning Time: 12-24 Hours

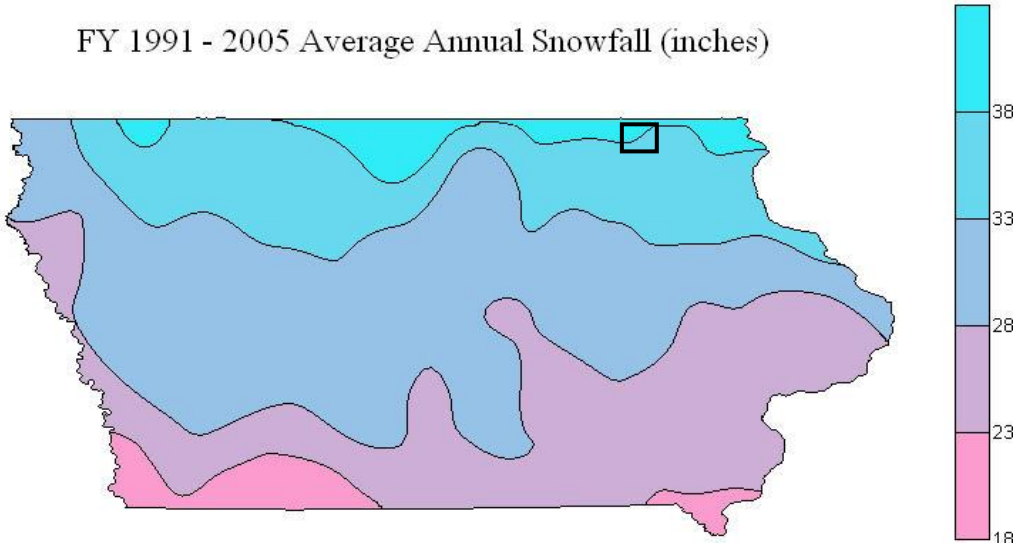
Duration: Less Than 1 Week

Geographic Location

The entire State of Iowa is vulnerable to heavy snow and freezing rain. The far northern portion of Iowa, near the Minnesota border, receives the greatest average annual snowfall in Iowa with upwards of 38 inches per year. The northwest portion of Howard County, which includes the Participating Jurisdictions, is among the region that receives the greatest average annual snowfall, while the southeast portion receives an average annual snowfall of 33 to 38 inches per year.

Figure 3.14 reflects the State of Iowa average annual snowfall from 1991 to 2005.

Figure 3.14 Iowa Average Annual Snowfall, 1991-2005

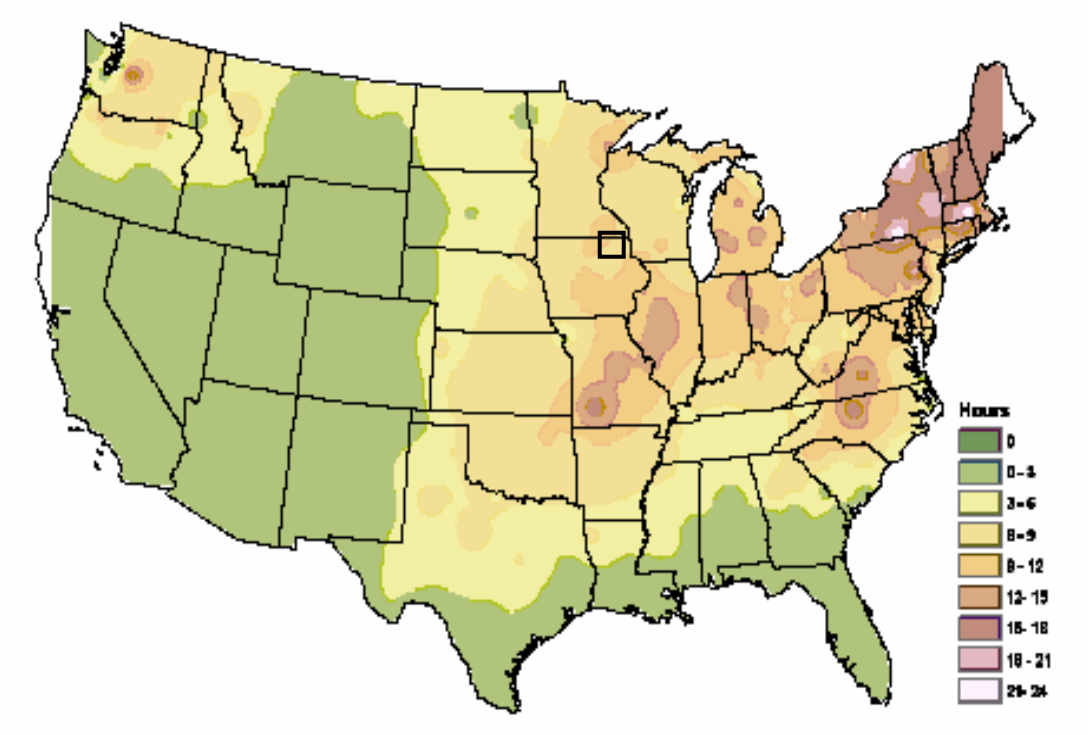


Source: Iowa Department of Transportation, http://www.iowadot.gov
Note: The black square indicates the approximate location of Howard County

The segment of northeastern Iowa that includes the Participating Jurisdictions receives 8-9 hours of freezing rain on average per year. Surrounding areas not far from the Participating Jurisdictions receive the most (9-12) hours of freezing rain on an annual average in Iowa.

Figure 3.15 reflects United States zones for annual average hours of freezing rain.

Figure 3.15 Average Number of Hours per Year with Freezing Rain in the United States



Source: American Meteorological Society. "Freezing Rain Events in the United States.", http://ams.confex.com/ams/pdfpapers/71872.pdf
Note: The black square indicates approximate location of Howard County

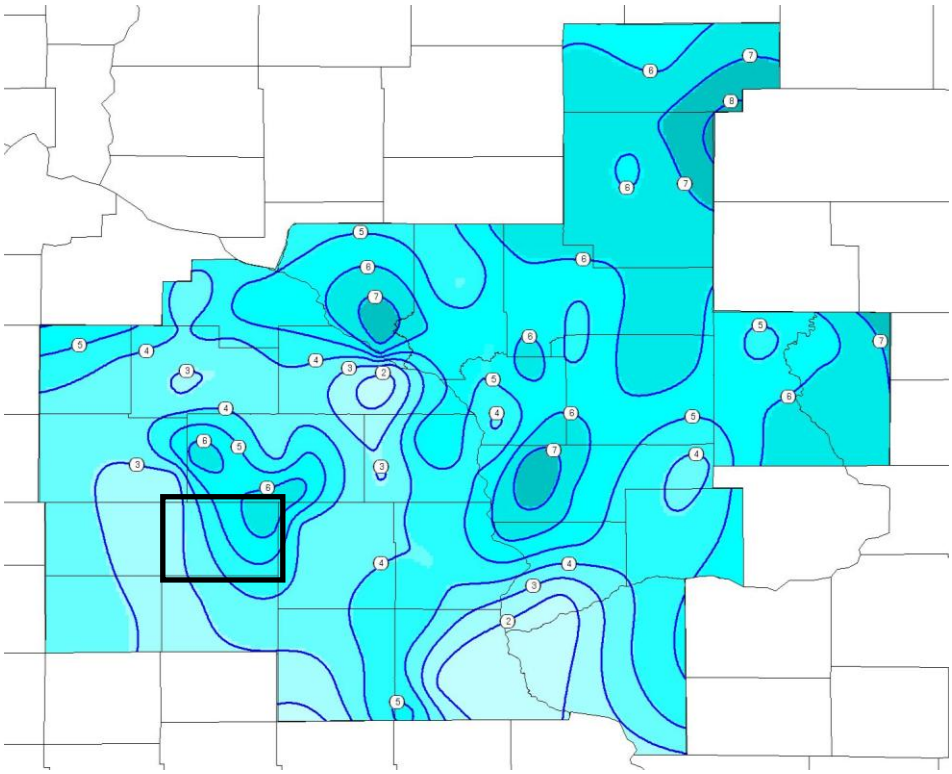
Previous Occurrence

Summaries of selected winter storm events available from the NCDC are listed below:

- **December 1, 2007.** A winter storm moved from the southern plains into the Ohio Valley, producing widespread precipitation across the Midwest. In northeast Iowa, the storm was the first of the winter season, producing a mix of heavy snow and sleet much of Saturday December 1. Precipitation changed to mainly drizzle or freezing drizzle during the evening, before ending in the early morning of Sunday December 2. Unusually high accumulations of sleet were measured by weather observers. There was some freezing rain during the event, although ice accumulations were a tenth of an inch or less.

Figure 3.16 reflects snow accumulation for the planning area after a severe winter storm on December 1, 2007.

Figure 3.16 Snow Accumulation Map: LaCrosse, WI NWS Forecast Area, December 1, 2007



Source: National Weather Service (NWS), Winter Storm Summaries, http://www.crh.noaa.gov/arx/?n=dec0107
Note: The black rectangle indicates the approximate location of Howard County

- **January 4, 2005.** Only days after having been hit by an ice storm, a winter storm produced heavy snow across northeast Iowa. Specific snowfall reports from weather observers include 8.0 inches at both Cresco and Lime Springs (Howard County).
- **January 26, 2004.** A winter storm produced heavy snow across parts of northeast Iowa. Specific reports included 6 to 7 inches near Lime Springs (Howard County).
- **April 7, 2003.** An early spring snowstorm hit northeast Iowa, with accumulation of 9 inches in Lime Springs (Howard County). The heavy snow was accompanied by strong east winds gusting to 30 mph, which caused whiteout conditions at times.
- **January 19, 2000.** Heavy snowfall accompanied the first major winter storm of the season to affect northeast Iowa. Law enforcement officials and volunteer weather observers reported 6.5 inches at Lime Springs (Howard County). As the snow was winding down, north winds picked up to 20 to 30 mph, causing considerable blowing and drifting.

There has been one USDA declared disaster issued because of a winter storm in Howard County, including the Participating Jurisdictions; the declared disaster was in effect from February 23 – March 2, 2007.

Table 3.19 reflects Howard County's crop losses as a result of winter conditions from 2005 to 2008.

Table 3.19 Claims Paid in Howard County for Crop Loss as a Result of Winter Conditions, 2005-2008

Year	Crop	Hazard	Claims Paid ($)
2005	Beans	Cold Wet Weather	498
2005	Corn	Frost	916
2006	Corn	Cold Wet Weather	2,229
2007	Soybeans	Cold Wet Weather	8,285
Total			**11,928**

Source: USDA's Risk Management Agency

Probability of Future Occurrence

During the 16-year period from 1993-2009, there were 50 recorded winter storm events affecting Howard County, which includes the Participating Jurisdictions. The recurrence interval for winter storms is highly likely.

Highly Likely: Event is probable within the calendar year

Magnitude

Response personnel are exposed to cold temperatures and traffic accidents when responding to the victims' needs. Operations can be limited or halted when critical services are not available. Workers may not be able to make it to their place of work, thus, limiting the continuity of operations.

Fire during winter storms presents a great danger because water supplies may freeze and firefighting equipment may not function effectively, or personnel and equipment may be unable to get to the fire. If power is out, interiors of homes become very cold and lead to pipes freezing and possibly bursting. Rivers and lakes freeze and subsequent ice jams can create flooding problems when temperatures begin to rise. Ice coating at least one-fourth inch in thickness is heavy enough to damage trees, overhead wires, and similar objects and to produce widespread power outages.

Limited: 10-25 percent of property severely damaged; shutdown of facilities for more than a week; and/or injuries and/or illnesses do not result in permanent disability

Hazard Summary

Jurisdiction	Calculated Priority Risk Index (CPRI)	Planning Significance
City of Lime Springs	3.10	Moderate
City of Protivin	3.10	Moderate

3.2.11 Sinkhole

Description

Sinkholes are common where the rock below the land surface is limestone, carbonate, salt beds, or rocks that can naturally be dissolved by ground water circulating through them. As the rock dissolves, spaces and caverns develop underground. Sinkholes are dramatic because the land usually stays intact for awhile until the underground spaces get too big. If there is not enough support for the land above the spaces then a sudden collapse of the land surface can occur.

Sinkholes range from broad, regional lowering of the land surface to localized collapse. The primary causes of most sinkholes are human activities: Underground mining of coal, groundwater or petroleum withdraw, and drainage of organic soils. In addition, this is due to the erosion of limestone of the subsurface.

Sinkholes can aggravate flooding potential, collapses such as the sudden formation of sinkholes or the collapse of an abandoned mine may destroy buildings, roads, and utilities.

Karst is a landscape formed from the dissolution of soluble rocks including limestone, dolomite and gypsum. Sinkholes are a common indication of karst; caves and underground drainage systems are other indicators. With limestone commonly found in northeast Iowa, sinkholes have the potential to occur.

Warning Time: Less Than 6 Hours

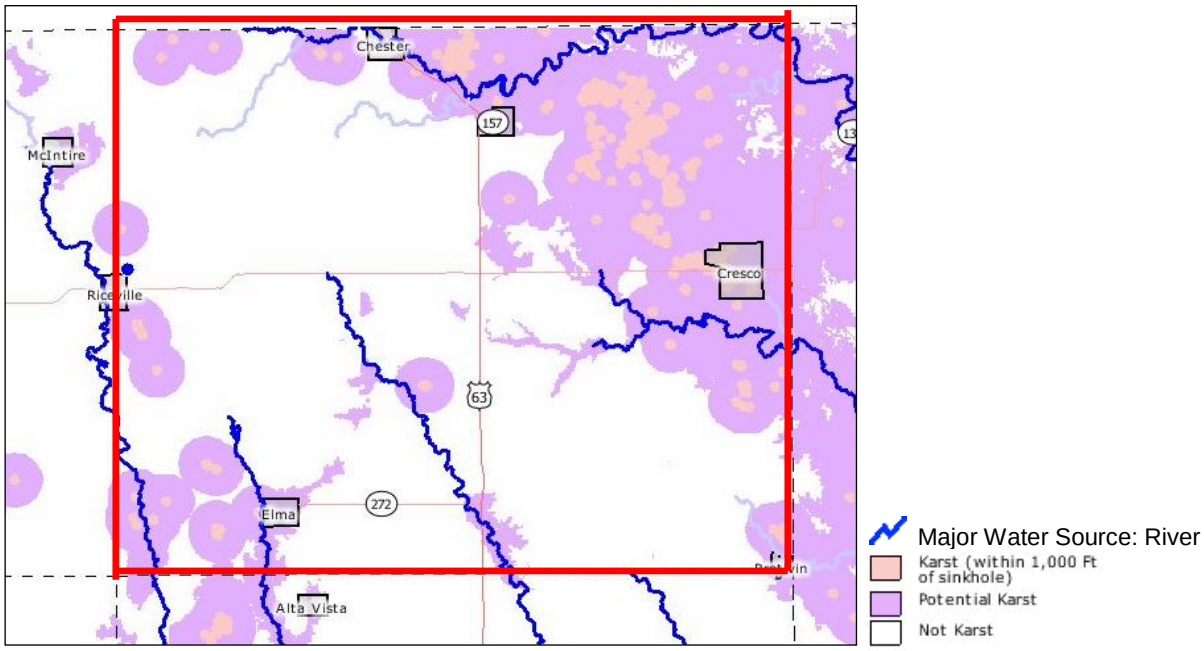
Duration: Less Than 6 Hours

Geographic Location

Sinkhole records or estimates for the area specific to the planning area are not available at this time.

Figure 3.17 reflects areas of karst (within 1,000 ft of known sinkhole) and potential karst in Howard County, which includes the Participating Jurisdictions.

Figure 3.17 Karst Terrain (Sinkhole Location and Potential), Howard County



Source: Iowa DNR, http://www.iowadnr.gov/afo/maps_instruct.html
Note: The red rectangle indicates the approximate boundaries of Howard County

The Cities of Lime Springs and Protivin do not appear to have any known sink holes within the areas of city limits, rather they have the potential for sinkholes given their terrain.

Previous Occurrence

The HMPC and HMMP noted there have been occurrences of sinkholes in the Unincorporated Areas of Howard County. Official records of sinkholes in Howard County were not available.

Probability of Future Occurrence

The HMPC and HMMP determined the probability of future occurrence is 'occasional' in any given year.

Unlikely: Event is probable within the next 10 years

Magnitude

Damage consists primarily of direct structural damage and property loss and depreciation of land values, but also includes business and personal losses that accrue during periods of repair. Damage to property, facilities, and infrastructure would only occur if the event undermined foundations.

Negligible: Less than 10 percent of property severely damaged, shutdown of facilities and services for less than 24 hours; and/or injuries/illnesses treatable with first aid

Hazard Summary

Jurisdiction	Calculated Priority Risk Index (CPRI)	Planning Significance
City of Lime Springs	1.45	Low
City of Protivin	1.45	Low

3.2.12 Thunderstorms and Lightning

Description

Atmospheric imbalance and turbulence may result in thunder, heavy rains (which may cause flooding), strong winds, microbursts, high straight-line winds (often mistaken for tornadoes), tornadoes, surface hail, or lightning. Most thunderstorms produce only thunder, lightning, and rain; thunderstorms can occur singly, in clusters, or in lines. The National Weather Service considers a thunderstorm severe if it produces hail at least one inch in diameter, wind 58 mph or higher, or tornadoes.

Lightning is an electrical discharge between positive and negative regions of a thunderstorm. It is sudden, extremely destructive and potentially deadly. The National Weather Service reports that lightning caused 48 fatalities and 246 injuries nationwide in 2006 and causes 73 fatalities and 300 injuries in an average year.

The National Lightning Safety Institute reports that lightning causes more than 26,000 fires in the United States each year. The institute estimates that the total cost for direct and indirect impacts of lightning including property damage, increased operating costs, production delays, and lost revenue to be in excess of $6 billion per year.

Due to its nature as a powerful electrical phenomenon, lightning causes extensive damage to electronic systems that it contacts. A particular concern in Iowa is the protection of facilities and communications systems that are critical for maintaining emergency response systems, protecting public health, and maintaining the state's economy.

Average duration of each lightning stroke is 30 microseconds and duration of thunderstorm events is usually less than six hours. Thunderstorm forecasting and warning time for lightning occurrence is generally less than six hours.

Warning Time: Less Than 6 Hours

Duration: Less Than 1 Day

Geographic Location

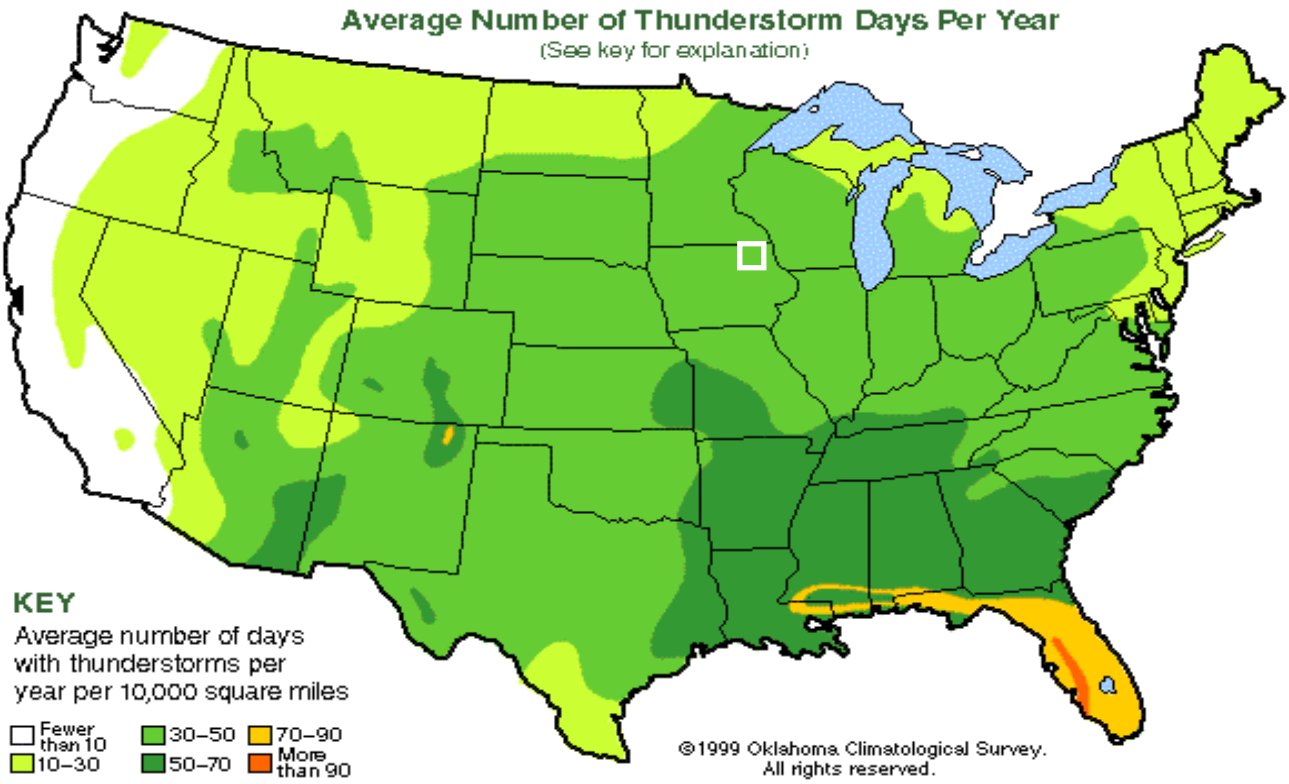
Lightning affects broad regions. The Participating Jurisdictions are similar to the surrounding area and the entire state of Iowa with the frequency of thunderstorms and lightning flashes.

The region that includes the Participating Jurisdictions averages:

- 30-50 days with thunderstorms per year per 10,000 square miles and
- Two to four lightning strikes per square kilometer per year

Figure 3.18 reflects United States annual distribution and frequency of thunderstorm events.

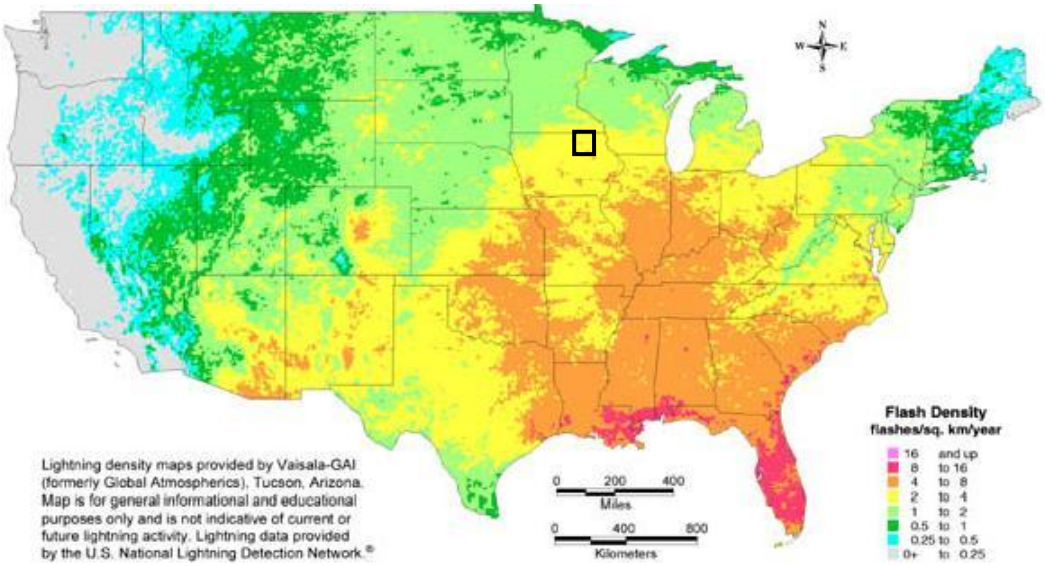
Figure 3.18 Annual Distribution and Frequency of Thunderstorms



Source: Oklahoma Climatology Survey
Note: The white square indicates the approximate location of Howard County

Figure 3.19 reflects the United States annual frequency of lightning from 1996-2000.

Figure 3.19 Annual Frequency of Lightning, 1996-2000



Source: National Weather Service, http://www.lightningsafety.noaa.gov/lightning_map.htm
Note: The black square indicates the approximate location of Howard County

Previous Occurrences

Thunderstorms are common in Iowa; at least 6,698 severe thunderstorm, high wind, or lightning events have impacted Iowa from 1980-2006. Because thunderstorms may occur singularly, in clusters, or in lines, it is possible that several thunderstorms may affect the area in the course of a few hours. It is likely that more than the 6,698 individual severe storm systems occurred in the state. One system may spawn multiple events. There have been three presidential declarations in Howard County since 1990 related to severe storms.

The NCDC database has record of one damaging lightning event in Howard County, which includes the Participating Jurisdictions, from 1993 to August 2009.

Table 3.20 reflects Howard County recorded lightning strikes from 1993 to April, 2009.

Table 3.20 Recorded Lightning Strikes in Howard County, 1993-2009

Date	Time	Estimated Damages ($)
July 7, 2003	2:30 AM	8,000
Total:		**8,000**

Source: NCDC

The NCDC had the following details available:

- **July 7, 2003.** Lightning hit a barn during the early morning hours, burning the structure to the ground. There were no livestock or farm machinery in the barn.

Probability of Future Occurrences

With Iowa's location in the interior of the U.S., the ingredients of a severe storm are usually available (moisture, warm and unstable air, and a lifting mechanism). There is a very high likelihood that a few of these summer storms will become severe and cause damage.

According to National Weather Service data, the Participating Jurisdictions receive two to four lightning strikes per square kilometer per year. The HMPC and HMMP classify the probability of future occurrence of damage due to thunderstorms and lightning as 'highly likely' in any given year.

Highly Likely: Event is probable within the calendar year

Magnitude

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

Although the frequency of lightning events is high, the magnitude is limited. Generally damages are limited to single buildings and in most cases, personal hazard insurance covers any losses.

Limited: 10-25 percent of property severely damaged; shutdown of facilities for more than a week; and/or injuries and/or illnesses do not result in permanent disability

Hazard Summary

Jurisdiction	Calculated Priority Risk Index (CPRI)	Planning Significance
City of Lime Springs	3.20	High
City of Protivin	3.20	High

3.2.13 Tornado

Description

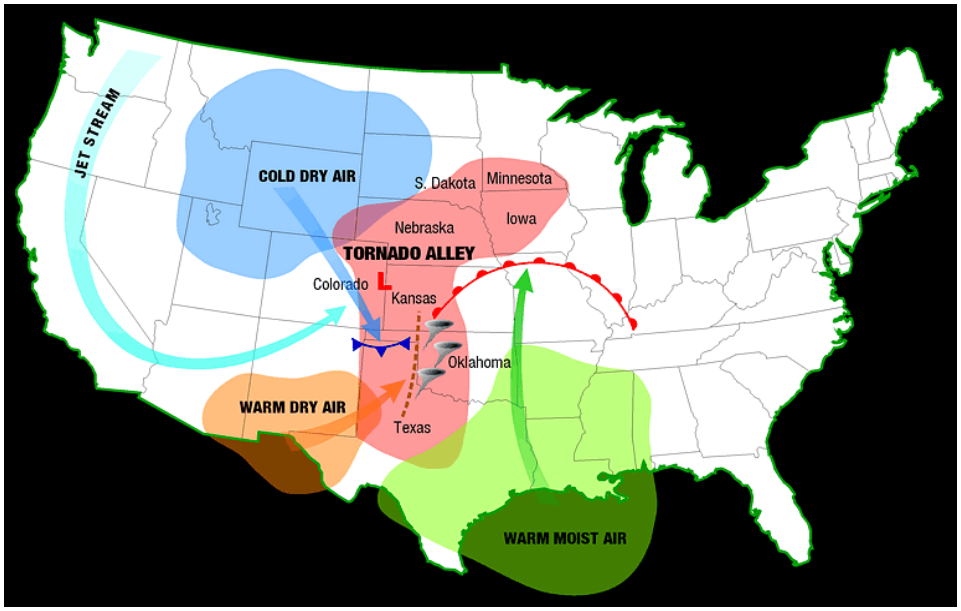
The National Weather Service defines a tornado as a "violently rotating column of air extending from a thunderstorm to the ground." Tornadoes are the most violent of all atmospheric storms and are capable of tremendous destruction. Wind speeds can exceed 250 mph, and damage paths can be more than one mile wide and 50 miles long. In an average year, more than 900 tornadoes are reported in the United States, resulting in approximately 80 deaths and more than 1,500 injuries. High winds not associated with tornadoes are profiled separately in this document in Section 3.2.14.

Although tornadoes have been documented on every continent, they most frequently occur in the United States east of the Rocky Mountains. According to National Severe Storms

Laboratory, Northeast Iowa is located just on the edge of an area that is generally known as “Tornado Alley”. Climatological conditions are such that warm and cold air masses meet in the center of the country to create conditions of great instability and fast moving air at high pressure that can ultimately result in formation of tornado funnels.

Figure 3.20 shows the geographic location and the climatological conditions that create “Tornado Alley”.

Figure 3.20 Climate Conditions Which Produce “Tornado Alley”



Source: National Severe Storms Laboratory, http://www.nssl.noaa.gov/primer/tornado/tor_climatology.html

In Iowa, most tornadoes occur during the months of April, May, and June. However, tornadoes can strike in any of the 12 months. Similarly, while most tornadoes occur between 4:00 and 9:00 p.m., a tornado can strike at any time.

Prior to February 1, 2007, tornado intensity was measured by the Fujita (F) scale. This scale was revised and is now referred to as the Enhanced Fujita Scale (EF). Both scales are sets of wind estimates (not measurements) based on damage. The new scale uses more damage indicators and associated degrees of damage, allowing for more detailed and accurate analysis. The tornado intensity scale update was the result of advanced research by meteorologists and wind engineers. For further information on the EF-scale, see http://www.spc.noaa.gov/efscale/.

Table 3.21 compares the tornado intensity F-scale EF-scale.

Table 3.21 F-Scale and EF-Scale for Tornado Damage

Fujita (F) Scale (Previous)		Enhanced Fujita (EF) Scale (Current)	
F Number	3 Second Gust (mph)	EF Number	3 Second Gust (mph)
0	45-78	0	65-85
1	79-117	1	86-109
2	118-161	2	110-137
3	162-209	3	138-167
4	210-261	4	168-199
5	262-317	5	200-234

Source: http://www.spc.noaa.gov/faq/tornado/ef-scale.html

Warning Time: Less Than 6 Hours

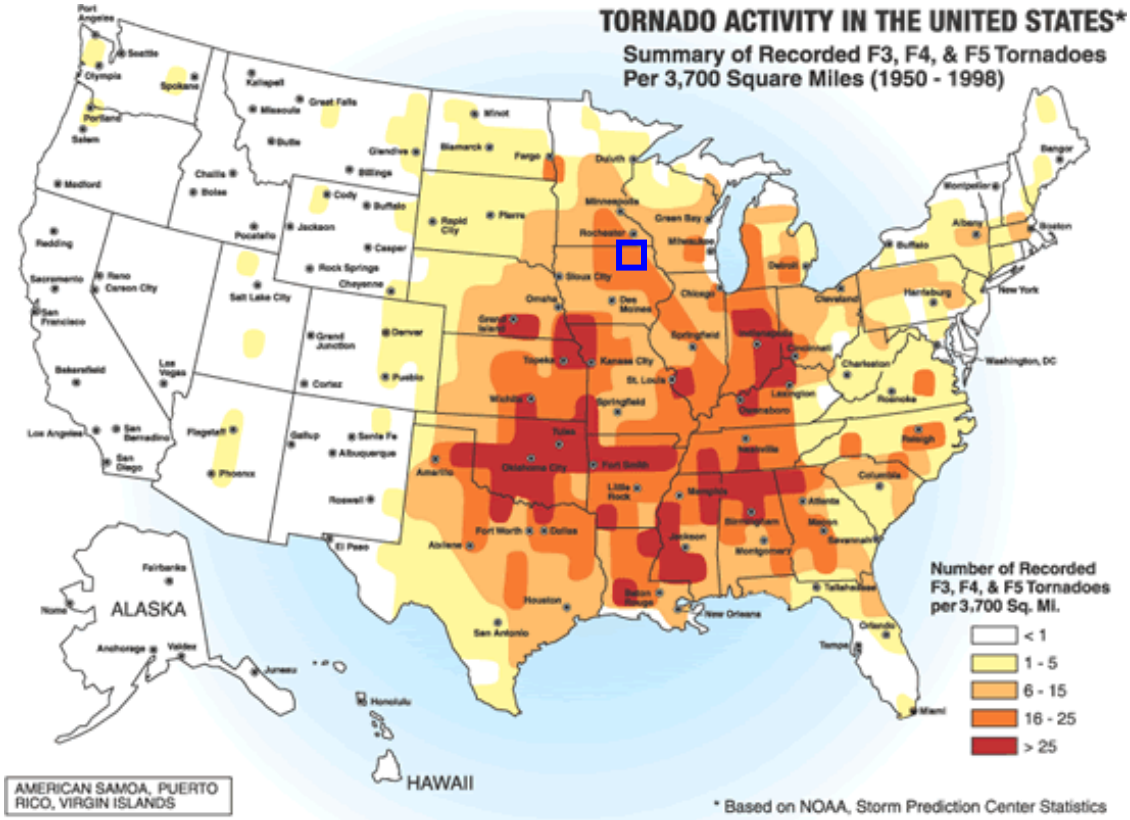
Duration: Less Than 6 Hours

Geographic Location

While tornadoes can occur in all areas of the State of Iowa, historically, some areas of the state have been more susceptible to this type of damaging storm. The following figure illustrates the number of F3 and larger tornadoes recorded in the United States per 3,700 square miles between 1950 and 1998. It appears the shaded dark orange area, indicating 16-25 tornadoes of this magnitude during this 48-year period falls within Howard County boundaries.

Figure 3.21 reflects the recorded F3 and larger tornadoes in the United States from 1950 to 1998.

Figure 3.21 Tornado Activity in the United States, 1950-1998



Source: NOAA Storm Prediction Center, http://www.fema.gov/plan/prevent/saferoom/tsfs02_torn_activity.shtm
Note: The blue square indicates the approximate location of Howard County

Previous Occurrence

According to the NCDC database, there were 27 tornadoes in Howard County, which includes the Participating Jurisdictions from 1957 to August, 2009. There were 23 injuries and zero deaths reported. Of these 27 tornadoes, four were rated F4 and one was rated F5.

Table 3.22 reflects details of recorded Howard County tornadoes from 1953 to 2009.

Table 3.22 Recorded Tornadoes in Howard County, 1953-2009

Date	Time	Magnitude	Injuries	Estimated Damages ($)
May 10, 1953	5:30 PM	F4	2	0
June 25, 1959	10:00 PM	F1	0	3,000
September 2, 1961	10:30 PM	F2	0	25,000
May 5, 1965	8:34 PM	F4	5	25,000
May 5, 1965	9:16 PM	F4	0	25,000
August 25, 1965	5:45 PM	F1	0	25,000
September 9, 1965	1:45 PM	F2	0	25,000
March 30, 1967	10:40 PM	F2	0	25,000
May 15, 1968	4:00 PM	F5	12	3,000
May 15, 1968	5:15 PM	F2	0	25,000
July 12, 1971	5:15 PM	F4	4	2,500,000
April 17, 1975	7:50 PM	F1	0	3,000
May 29, 1980	8:00 PM	F0	0	0
August 2, 1980	4:45 AM	F1	0	25,000
May 17, 1982	7:30 PM	F1	0	3,000
August 9, 1990	7:30 PM	F1	0	3,000
July 19, 1994	7:29 PM	F2	0	55,000
July 19, 1994	8:06 PM	F1	0	501,000
August 19, 1996	6:00 PM	F0	0	2,000
July 20, 1997	8:20 PM	F0	0	35,000
June 27, 1998	7:08 PM	F0	0	2,000
June 11, 2004	4:40 PM	F0	0	120,000
June 11, 2004	4:56 PM	F3	0	220,000
June 16, 2004	1:48 PM	F0	0	0
June 16, 2004	12:55 PM	F0	0	0
July 5, 2004	4:40 PM	F0	0	15,000
August 19, 2009	14:50 PM	F0	0	2,000

Source: National Climatic Data Center (NCDC), http://www4.ncdc.noaa.gov/cgi-win/wwcgi.dll?wwevent~storms

The NCDC had only one event where details were available:

- **July 5, 2004.** A couple of tornadoes touched down briefly, one of which hit a barn that housed turkeys near Protivin.

Probability of Future Occurrence

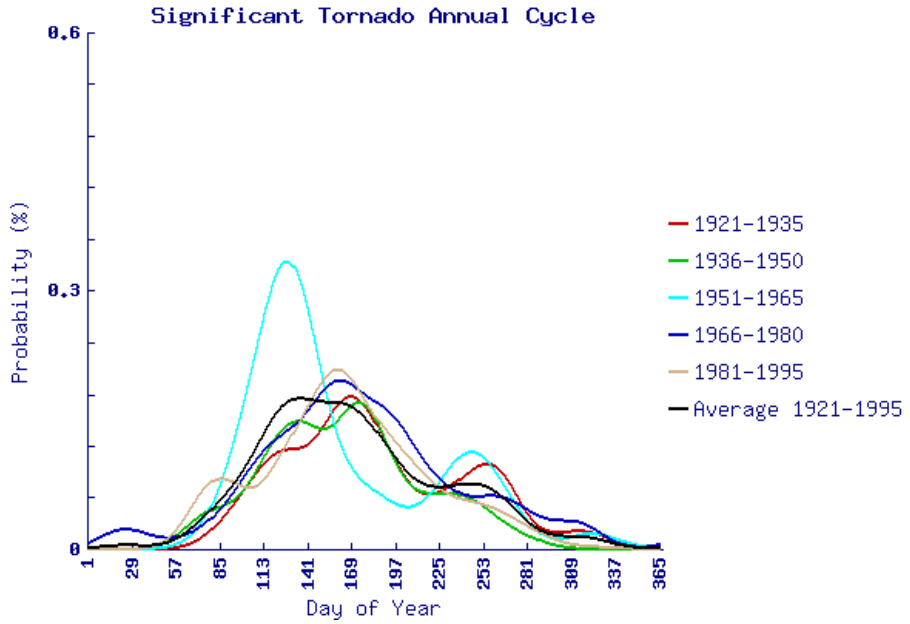
The National Severe Storms Laboratory calculated probability of violent tornadoes based on time of year for the period 1921-1995.

Figure 3.22 shows the probability of an F2 or larger tornado occurring on any given day at a location within a 25 mile radius Howard County, which includes the Participating Jurisdictions. For example, a y-axis vale of 2.0 would indicate a two percent chance of receiving the chosen type of severe weather on the date indicated by the x-axis. For both significant (F2 or larger) and violent (F4 or larger) tornadoes the 1951-1965 period was the peak in probability based on the data from previous occurrences, with the most recent reporting period (1981-1995) showing a probability right on track with the overall average. Significant tornadoes show a common peak in probability in late spring while violent tornadoes have an overall less probability, they do not have a distinct time of probability for them to occur from early spring through mid autumn.

Figures 3.23 and 3.24 are based on the same methodology as described for Figure 3.22.

Figure 3.22 reflects the daily probability for a significant tornado, rated F2 or larger, within a 25 mile radius of Howard County, including the Participating Jurisdictions during 1921 to 1995.

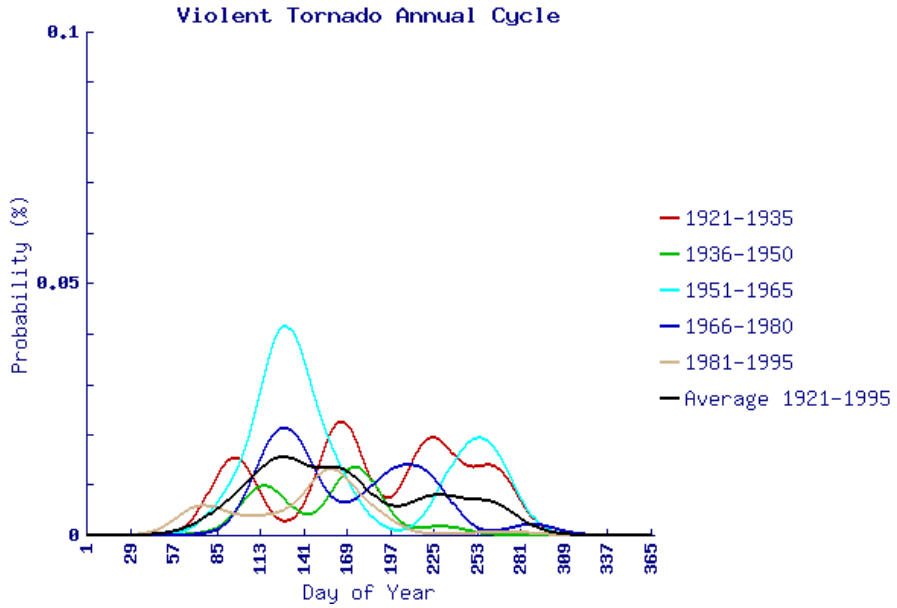
Figure 3.22 Daily Significant Tornado Probability, F2 or Larger, Howard County, 1921-1995



Source: National Severe Storms Laboratory, http://www.nssl.noaa.gov/hazard/hazardmap.html
Note: This probability tool has not been adjusted for the new EF-Scale, the comparable wind speeds are found in Table 3.21.

Figure 3.23 reflects the daily probability for a violent tornado, rated F4 or larger, within a 25 mile radius of Howard County, including the Participating Jurisdictions, during 1921 to 1995.

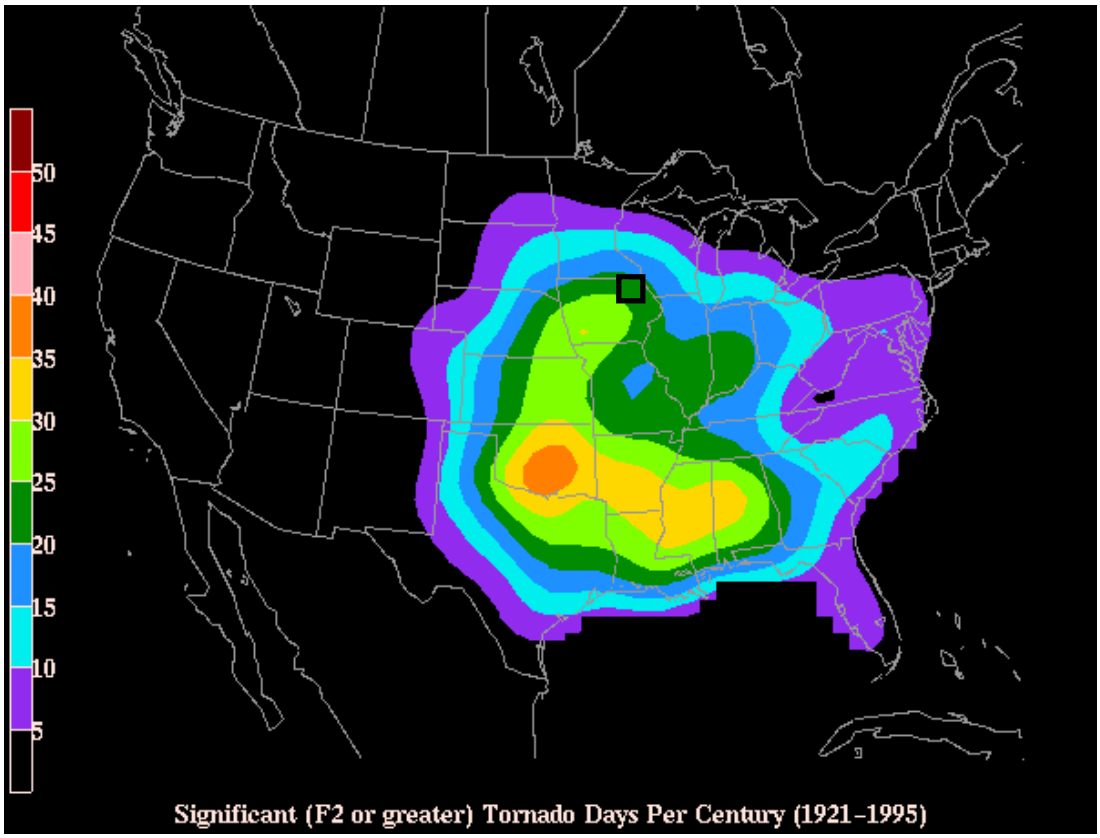
Figure 3.23 Daily Violent Tornado Probability, F4 or Larger, Howard County, 1921-1995



Source: National Severe Storms Laboratory, http://www.nssl.noaa.gov/hazard/hazardmap.html

Figure 3.24 reflects the United States' frequency of a tornado rated F2 or larger, based on number of days per year within a 12.5 mile radius of a given point on the map, from 1921 to 1995.

Figure 3.24 Frequency of F2 or Larger Tornadoes, 1921-1995



Source: NSSL, http://www.nssl.noaa.gov/users/brooks/public_html/sigt2195.gif
Note: The black square indicates the approximate location of Howard County

Likely: Event is probable within the next three years

Magnitude

Impacts can range from broken tree branches, shingle damage to roofs, and some broken windows; all the way to complete destruction and disintegration of well-constructed structures, infrastructure, and trees. Generally the destructive path of a tornado is only a couple hundred feet in width, but stronger tornadoes can leave a path of devastation up to a mile wide.

Injury or death related to tornadoes most often occur when buildings collapse, people are hit by flying objects, or are caught trying to escape the tornado in a vehicle.

Catastrophic: More than 50 percent of property is severely damaged; shutdown of facilities for 30 or more days; multiple deaths

Hazard Summary

Jurisdiction	Calculated Priority Risk Index (CPRI)	Planning Significance
City of Lime Springs	3.25	High
City of Protivin	3.25	High

3.2.14 Windstorm

Description

Windstorms are extreme straight-line winds associated with severe winter storms, severe thunderstorms, downbursts, and very strong pressure gradients. Straight-line winds are generally any thunderstorm wind that is not associated with rotation (i.e., not a tornado). These winds, which can exceed 100 mph, represent the most common type of severe weather and are the most common cause of thunderstorm damage. Since windstorms do not have a narrow track like a tornado, associated damage can be extensive and affect broad regions including 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. One type of straight-line wind is the downburst, which can cause damage equivalent to a strong tornado and can be extremely dangerous to aviation.

Windstorms in Iowa typically happen between late April and early September, but, given the right conditions, they can develop as early as March. They are usually produced by super cell thunderstorms or a line of thunderstorms that typically develop on hot and humid days.

Warning Time: Less Than 6 Hours

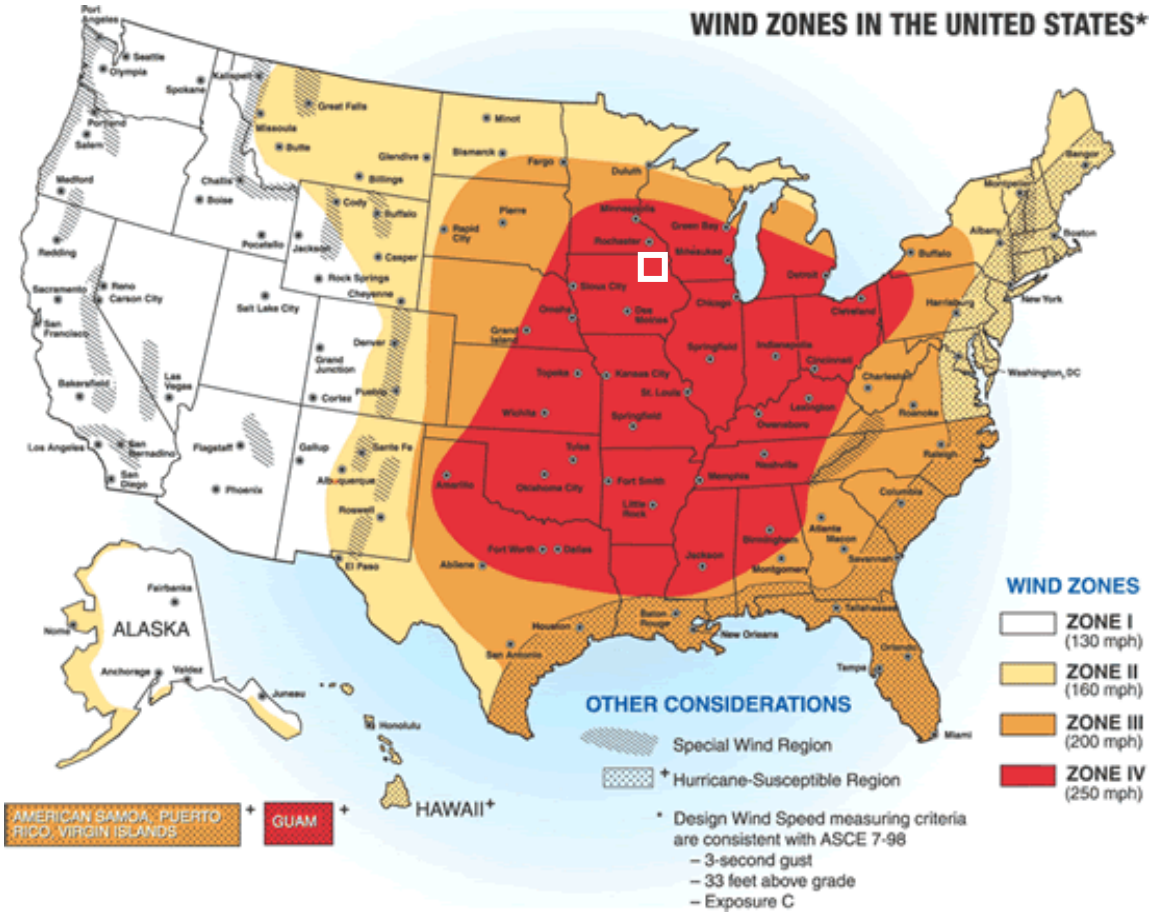
Duration: Less Than 1 Day

Geographic Location

The Participating Jurisdictions are susceptible to high wind events. Howard County is located in Wind Zone IV, which is susceptible to winds up to 250 mph. Iowa is located in Wind Zone IV, the highest inland category.

Figure 3.25 reflects the United States Wind Zones based on maximum wind speeds.

Figure 3.25 Frequency Wind Zones in the United States



Source: FEMA; http://www.fema.gov/plan/prevent/saferoom/tsfs02_wind_zones.shtm
Note: The white square indicates the approximate location of Howard County

Previous Occurrence

According to the NCDC database, there are 89 separate reports of wind events in Howard County, including the Participating Jurisdictions, during 1950 to 2009. During this time period there were no reported deaths and six known injuries as a result of windstorm events. Total property and crop damage for events from 1994-2009 is estimated at $1.8 million.

Table 3.23 below lists windstorm events in Howard County from 1994 to July, 2009.

Table 3.23 Windstorm Events, Howard County, 1994- July, 2009

Date	Magnitude	Estimated Damages ($)
March 9, 1993	0 kts.	500,000
April 19, 1993	0 kts.	50,000
August 9, 1993	50 kts	6,000
April 14, 1994	0 kts.	500,000
April 26, 1994	0 kts.	5,000,000
July 1, 1994	50 kts	6,000
July 19, 1994	85 kts.	505,000
August 17, 1994	61kts.	55,000
November 18, 1994	0 kts.	200,000
February 10, 1995	0 kts.	150,000
April 3, 2019	0 kts.	125,000
April 9, 1995	50 kts	3,000
April 18, 1995	0 kts.	500,000
December 8, 1995	N/A	0
January 17, 1996	55 kts.	250,000
January 18, 1996	N/A	0
February 1, 1996	N/A	0
February 10, 1996	56 kts.	350,000
March 24, 1996	54 kts.	300,000
April 25, 1996	59 kts.	750,000
May 18, 1996	80 kts.	50,000
June 21, 1996	68 kts.	100,000
August 7, 1996	52 kts.	2,000
October 30, 1996	52 kts.	100,000
January 16, 1997	N/A	0
April 5, 1997	50 kts.	10,000
April 6, 1997	56 kts.	50,000
June 22, 1997	53 kts.	12,000
May 30, 1998	56 kts.	75,000
June 18, 1998	53 kts.	10,000
June 20, 1998	61 kts.	165,000
June 23, 1998	0 kts.	0
June 27, 1998	0 kts.	5,000
November 10, 1998	78 kts.	1,500,000
June 6, 1999	58 kts.	105,000
July 9, 2000	55 kts.	65,000
August 26, 2000	52 kts.	3,000
April 7, 2001	61 kts.	16,000
April 11, 2001	52 kts.	1,000
October 25, 2020	52 kts.	1,000
May 8, 2002	82 kts.	5,000
July 27, 2002	55 kts.	8,000
July 4, 2003	57 kts.	4,000
July 7, 2003	52 kts.	4,000
December 12, 2004	54 kts.	0
July 19, 2006	61 kts.	5,000
May 14, 2007	56 kts.	2,000
June 7, 2007	52 kts.	1,000
September 21, 2007	55 kts.	85,000
January 29, 2008	N/A	0
February 10, 2008	N/A	0
May 29, 2008	53 kts.	185,000
July 11, 2008	56 kts.	30,000
October 26, 2008	50 kts.	3,000
December 14, 2008	N/A	0
December 21, 2008	N/A	0
January 14, 2009	N/A	0
July 24, 2009	55 kts.	50,000
Total:		**11,902,000**

Source: National Climatic Data Center (NCDC), http://www4.ncdc.noaa.gov/cgiwin/wwcgi.dll?wwevent~storms
Note: Zero (0) value indicates missing data
Note: kts. value divided by 0.869 provides mph value

Summaries of selected known windstorm events are listed below (source: NCDC):

- **July 11, 2008.** A cold front over central Minnesota moved across northeast Iowa during the late evening hours of July 11. A line of thunderstorms developed along the front which produced strong winds in extreme southeast Howard County. A business building was destroyed by a storm in the Protivin area. A gustnado likely

caused the damage, but local officials suspected a tornado may have struck in a 100-foot area and destroyed the building.

- **May 8, 2002.** Straight-line winds of 80 to 100 mph destroyed a pole barn about 1 mile southwest of Protivin (Howard County), blowing debris from the barn about 3/4 of a mile into an open field. A nearby farmer's mill sustained minor damage as well.
- **November 10, 1998.** One of the most powerful low pressure systems in 25 years caused hurricane force winds with gusts up to 90 mph. Widespread damage occurred to vehicles, signs, buildings and trees, while thousands were left without power for hours.
- **June 27, 1998.** A line of thunderstorms swept across northeast Iowa producing widespread wind damage and flash flooding. The strongest winds were near the Iowa-Minnesota border with hundreds of trees down. Combined with other storms from earlier in the month, 7 northeast Iowa counties were declared Federal Disaster areas, including Allamakee, Clayton, Chickasaw, Fayette, Floyd, Howard, and Winneshiek.
- **April 26, 1994.** Winds increased rapidly after sunrise and continued through the day. Winds were sustained in the 30 to 45 mph range throughout the day over a large part of Iowa. Frequent gusts in excess of 50 mph were reported, with occasional gusts to 60 mph or more. With fields mostly bare ground and dry, blowing dust was a problem. Visibility was reduced in many areas by blowing dust. A few locations had visibility restrictions to near zero at times. The visibility restrictions caused a few accidents with a few reports of cars being rear ended. The greatest damage occurred over the northeast and east-central counties. Three injuries were reported. Throughout Iowa, property damage was estimated at $5,000,000.

Table 3.24 reflects Howard County's insurance claims paid due to excessive wind from 2005 to 2008.

Table 3.24 Claims Paid in Howard County for Crop Loss as a Result of Wind, 2005-2008

Year	Crop	Hazard	Claims Paid ($)
2005	Corn	Wind/Excess Wind	15,142
2006	Corn	Wind/Excess Wind	25,984
2007	Corn	Wind/Excess Wind	28,613
Total			**69,739**

Source: USDA's Risk Management Agency

Probability of Future Occurrence

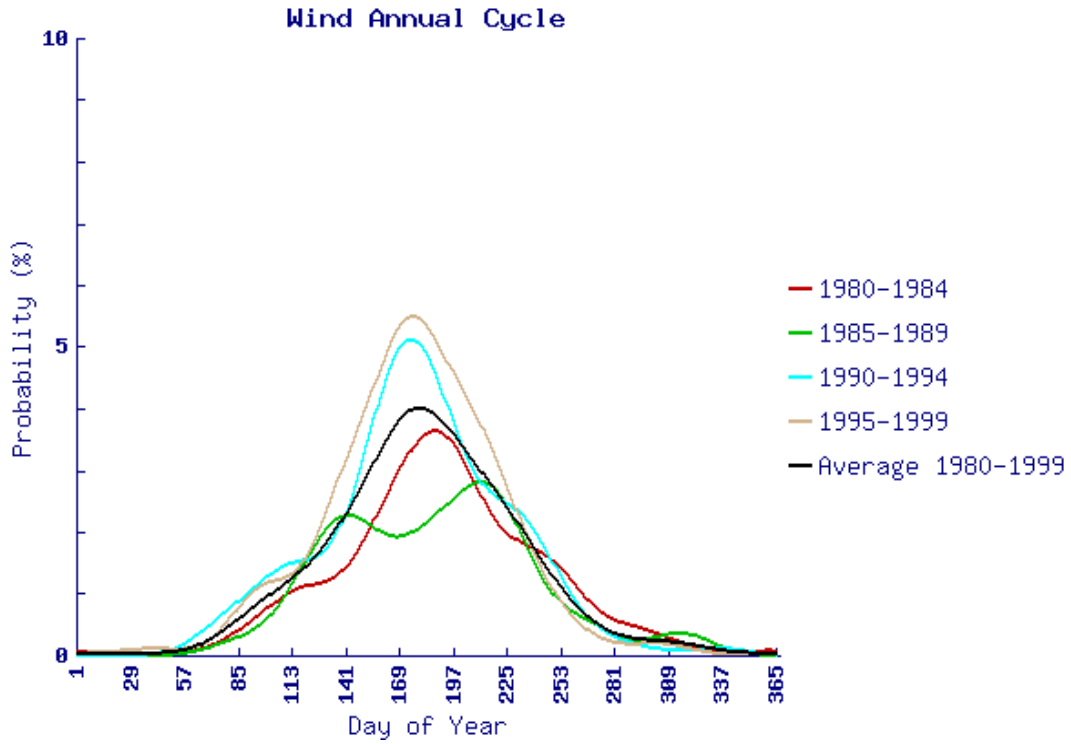
According to the NCDC, there were 89 reports of impact due to high wind events in Howard County, including the Participating Jurisdictions, during 1950 to 2009. For some events, more than one impact report was issued. There was an average of 1.5 wind impact reports per year for this period. Based on the frequency of previous occurrences, probability of future occurrence is considered highly likely.

Highly Likely: Event is probable within the calendar year

The National Severe Storms Laboratory calculated probability of windstorms based on time of year for the period 1980 to 1999. The most recent reporting period had the highest probability based on data from previous occurrences, while overall probability was the highest during the late spring and early summer across all reporting periods.

Figure 3.26 charts the probability of a windstorm 50 knots of greater occurring on any given day at a location within a 25 mile radius of the center of Howard County. Whereby, a y-axis value of 2.0 would indicate a two percent chance of receiving the chosen type of severe weather on the date indicated by the x- axis value.

Figure 3.26 Daily Windstorm Probability, 50 Knots or Higher, Howard County 1980-1999

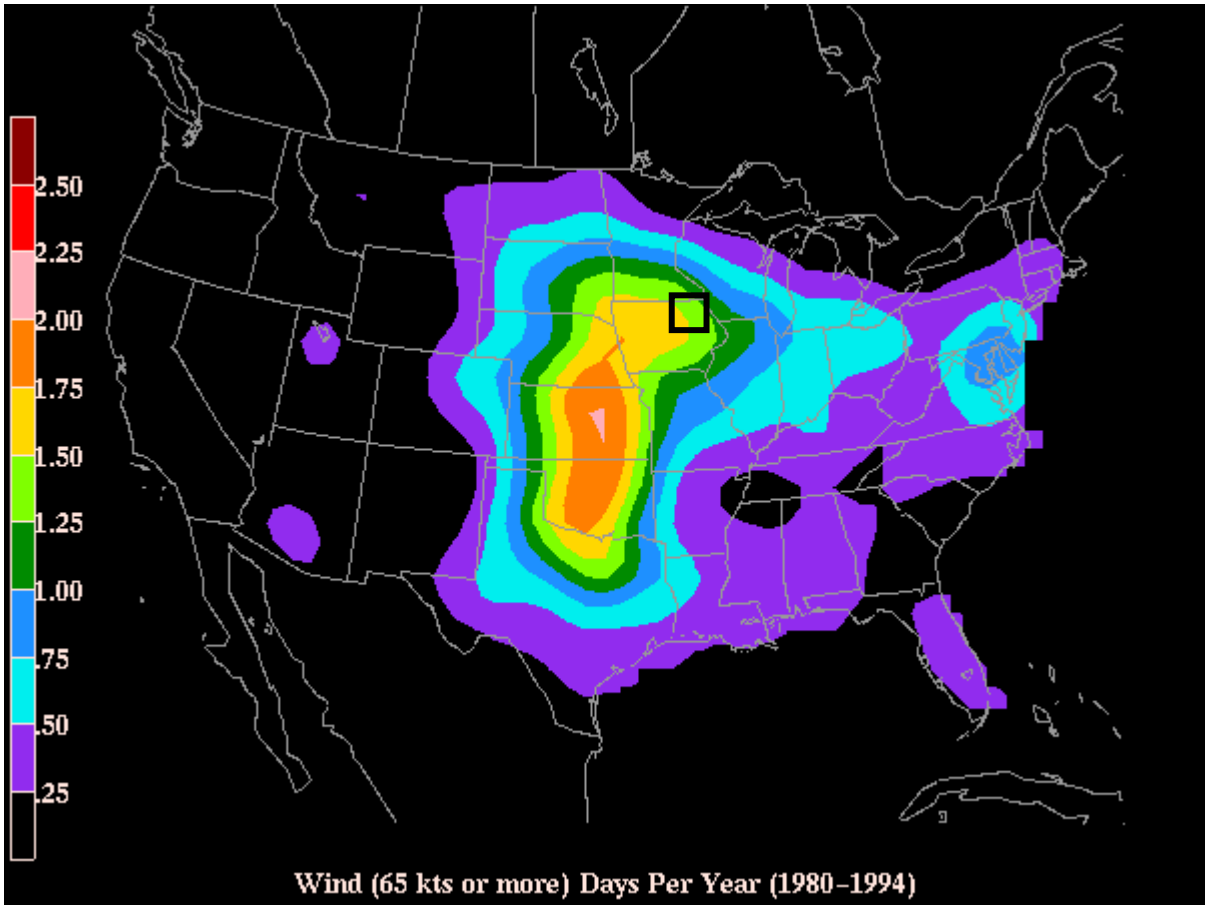


Source: National Severe Storms Laboratory, http://www.nssl.noaa.gov/hazard/hazardmap.html

Accordingly, the probability of a windstorm is at its peak late spring through mid-summer, historically ranging from 2 – 6 percent during that timeframe.

Figure 3.27 reflects the probability of a windstorm (65 knots or greater) occurring on any given day at a location within a 25 mile radius of Howard County during 1980 to 1994.

Figure 3.27 Annual Windstorm Probability (65+ knots), United States 1980-1994



Source: NSSL, http://www.nssl.noaa.gov/users/brooks/public_html/bigwind.gif
Note: The black square indicates the approximate location of Howard County

Magnitude

Limited: 10-25 percent of property severely damaged; shutdown of facilities for more than a week; and/or injuries and/or illnesses do not result in permanent disability.

Hazard Summary

Jurisdiction	Calculated Priority Risk Index (CPRI)	Planning Significance
City of Lime Springs	3.30	High
City of Protivin	3.30	High

3.2.15 Hazard Profiles Summary

Description

The hazard profile assessment was utilized by the HMPC and HMMP to prioritize those hazards of greatest significance to the planning area, enabling the Participating Jurisdictions to focus resources where they are most needed. Those hazards that occur infrequently, or have little or no impact on the planning area were determined to be of low significance. Those hazards determined to be of moderate and high significance were categorized as priority hazards, and further evaluated in Section 3.3.

Table 3.25 summarizes the Participating Jurisdictions' planning significance results, arranged alphabetically by hazard.

Table 3.25 Participating Jurisdiction's Planning Significance of Identified Hazards

Hazard	City of Lime Springs	City of Protivin
Communication Failure	--	M
Drought	L	L
Earthquake	L	L
Extreme Heat	L	L
Flash Flood	M	M
Grass or Wild Land Fire	M	M
Hailstorm	M	M
River Flood	M	H
Severe Winter Storm	H	H
Sinkhole	L	L
Thunderstorm and Lightning	H	H
Tornado	H	H
Windstorm	H	H

Source: HMPC and HMMP
Note: H = High, M = Moderate, L= Low
"--" denotes the Jurisdiction did not identify that hazard as a risk

3.3 Vulnerability Assessment

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 shall describe vulnerability in terms of the types and numbers of existing buildings, infrastructure, and critical facilities located in the identified hazard area.

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 floods.

3.3.1 Methodology

The vulnerability assessment further defines the Participating Jurisdictions' risk to high and moderate significance hazards addressed in Section 3.2.

The vulnerability assessment was conducted based on the best available data and the significance of the hazard. Data to support the vulnerability assessment was collected from the following sources:

- County GIS data (base layers and assessor's data)
- Written descriptions of assets and risks provided by the Participating Jurisdictions
- Existing plans and reports
- Personal interviews with HMPC members, HMMP and other stakeholders

The Vulnerability Assessment is presented in three parts:

- **Section 3.3.2 Community Assets** – Describes the assets at risk in the Participating Jurisdictions
- **Section 3.3.3 Vulnerability by Hazard** – Describes the vulnerability to each hazard identified in Section 3.1 and profiled in Section 3.2. This vulnerability analysis includes a vulnerability overview for each hazard. For hazards of high and moderate significance, where available, the vulnerability analysis includes evaluation of vulnerable buildings, infrastructure, and critical facilities in hazard-prone areas.
- **Section 3.3.4 Summary of Key Issues** – Summarizes the key issues and conclusions identified in the risk assessment process.

3.3.2 Community Assets

This section describes overall hazard vulnerability and buildings, infrastructure, and critical facilities located in identified hazard areas.

The value of utilities infrastructure in City of Lime Springs is $200,832; $90,043 in City of Protivin according to the Howard County Auditor's 2009 data.

Table 3.26 provides the building count and value of privately held structures in the Participating Jurisdictions.

Table 3.26 Building Exposure in Participating Jurisdictions, 2009

Structure Type	Structure Count	Value of Structures ($)
City of Lime Springs		
Residential	224	11,751,490
Commercial	117	3,119,270
Industrial	15	687,790
Agricultural	Unknown	11,830
City of Protivin		
Residential	151	6,897,900
Commercial	76	2,378,570
Industrial	0	0
Agricultural	0	0

Source: Howard County Assessor

The counts of structures for agricultural (in Lime Springs) and utility types were unknown due to data limitations. Also unknown due to data limitations are the count and value for religious/non-profit, government, and education structures.

A critical facility may be defined as one that provides essential public safety or mitigation functions during response or recovery operations.

Table 3.27 below gives examples of critical facilities, high potential loss facilities and transportation and lifelines as they are defined for the purposes of this analysis.

Table 3.27 Critical Facilities, Definitions and Examples

Essential Facilities	High Potential Loss Facilities	Transportation and Lifelines
Hospitals and other medical facilities	Power plants, transmission lines and distribution stations	Highways, bridges and tunnels
Police Stations	Dams and levees	Railroads and facilities
Fire Stations	Military installations	Airports
Emergency Operations Centers	Hazardous material sites	Water treatment facilities
	Schools	Natural gas pipelines and facilities
	Shelters	Petroleum pipelines and facilities
	Day care centers	Communications facilities
	Elder Care Facilities/Long Term Care Facilities	
	Main government buildings	

Table 3.28 is an inventory of critical facilities and infrastructure (based on available data) in the Participating Jurisdictions.

Table 3.28 Inventory of Critical Facilities and Infrastructure by Jurisdiction, 2010

Facility	Lime Springs	Protivin
Hospitals and other medical facilities	1	0
Fire Stations	1	1
Schools	1	1
Day Care Centers	1	0
Main Government Buildings	1	1
Railroads and Facilities	1	1
Water Treatment Facilities	1	1

Source: Participating Jurisdictions and Howard County Emergency Management Coordinator (EMA)

With improved data resources not available at this time, further details regarding critical facilities and infrastructure could be included. The technical capability to map critical facilities is also not available at this time, but is sought for future plan updates.

3.3.3 Vulnerability by Hazard

This vulnerability assessment was limited to the hazards that received high or moderate planning significance scores based on HMPC and HMMP input. Planning significance scores are based on the results of the CPRI Index.

After hazard profiling, the HMPC and HMMP eliminated the hazards with low and no planning significance when considering vulnerability and hazard summary. Detailed vulnerability assessment is not provided for hazards with low and no planning significance scores. Hazard vulnerabilities are presented in alphabetical order by hazard.

Communication Failure Vulnerability
Planning Significance: Moderate. With weak cellular communication strength, Protivin residents are at increased risk for slowed response time and inaccurate data being transmitted. In some isolated instances involving damage and complications from hazards, it is possible no communication is available.

Flash Flood Vulnerability
Planning Significance: Moderate. Major flash flooding has the potential to impact the entire county in some way, be it closed roads or bridges, resulting in limited access to business or residential areas, or the cost incurred to the communities. The city limits of the Participating Jurisdictions are relatively flat, but small creek beds are located within the city limits and the water tends to overflow with heavy rains. The overflow can flood low-lying structures and block roadways. The Protivin Fire Department has had water up to 12 inches deep in their fire station twice in since 2000.

National Flood Insurance Program (NFIP) and Repetitive Flood Loss Properties

- Regarding the planning area and National Flood Insurance Program (NFIP), the City of Lime Springs is currently participating and compliant with NFIP; the City of Protivin status with NFIP is “suspended". There are no repetitive flood loss properties within the planning area.

Grass or Wild Land Fire Vulnerability
Planning Significance: Moderate. With agricultural burning practices, the whole community is at risk. High winds and limited resources could escalate a small fire into major damage. All structures and infrastructures are at risk for damage in the impacted area.

Hailstorm Vulnerability
Planning Significance: Moderate. In general, assets in the planning area that are vulnerable to hail damage include vehicles, crops and built structures. If hail size is large in diameter and crops are at a vulnerable stage in the plant/harvest cycle, it is possible for a great percentage of crop yields to be lost as result of even a single hail event.

Structural damage, such as roof damage, damages to siding and windows occurs frequently with hail damage and is usually covered under private insurance. Specific structural damages in the planning area as a result of hail damage are not available.

Personal injury can also occur as a result of very large hail if individuals are outdoors during a hail event.

The State of Iowa Hazard Mitigation Plan estimates Howard County, which includes the Participating Jurisdictions, has an annual loss of $48,118 due to hailstorm events.

River Flood Vulnerability
Planning Significance: High (City of Protivin); Moderate (City of Lime Springs). Major riverine flooding has the potential to impact the entire planning area in some way, be it closed roads or bridges, resulting in limited access to business or residential areas. All

structures, infrastructures and agricultural land in low-lying areas along water sources are particularly at risk for damages.

Severe Winter Storm Vulnerability
Planning Significance: High. During periods of icing and/or heavy snow fall, transportation can be treacherous. The most significant damage during winter storm events occur when freezing rain and drizzle accumulate on utility poles and power lines causing widespread power outages. Since the power outages associated with winter storms occur during cold weather, the population is at risk to cold temperature exposures. As with extreme heat events, the elderly and poverty populations are considered to be more vulnerable.

Table 3.29 reflects the percentage of persons over age 65 and the percentage of persons below the federal poverty level in the Participating Jurisdictions compared to the state and national averages.

Table 3.29 Selected Demographic and Economic Characteristics, 2000

Jurisdiction	2000 Population	65 Years and Over (%)	Persons Below Poverty (%)
Lime Springs	496	25.4	5.9
Protivin	317	29.0	13.2
Howard County	9,484	20.1	12.0
United States	281,421,906	12.4	12.4

Source: U.S. Census Bureau

The State of Iowa Hazard Mitigation Plan estimates Howard County, including the Participating Jurisdictions, has an annual estimation loss of $34,743 due to severe winter storms.

Thunderstorm and Lightning Vulnerability
Planning Significance: High. The NCDC reports no injuries or fatalities resulting from lightning strikes from 1993-2009, but nonetheless a significant public safety hazard. National Weather Service data indicates that the Participating Jurisdictions are in a region that receives two to four lightning strikes per square kilometer per year. Most of these lightning strikes do not result in damages, but electronic equipment located inside buildings is vulnerable. Communications equipment and warning transmitters and receivers could be knocked out by lightning strikes.

Secondary hazards resulting from a thunderstorm, such as hail, high straight-line winds, and microbursts also bring risk for property damage and life safety.

Tornado Vulnerability
Planning Significance: High. The planning area is located in a region of the U.S. with high frequency of dangerous and destructive tornadoes. On at least four occasions tornadoes have resulted in injuries to persons in Howard County, including the Participating Jurisdictions, and there have been five occurrences with tornado related damages of $250,000 or more.

Warning time for tornados is relatively short. Children, the elderly, and disabled persons are particularly vulnerable to such hazards with rapid onset. There is an identified need for storm shelters that can withstand the force of a major tornado and to protect the safety of residents in the communities of Howard County. All infrastructure and structures are at risk for damage since currently, none are built to resist tornado wind speeds.

The State of Iowa Hazard Mitigation Plan estimates Howard County, including the Participating Jurisdictions, has an annual estimation loss of $76,548 due to tornados.

Windstorm Vulnerability

Planning Significance: High. Damaging windstorms are a common occurrence in the planning area. Damages frequently occur to structures and power lines. Debris flying from high wind events can shatter windows in structures and vehicles and can harm people that are not adequately sheltered.

The State of Iowa Hazard Mitigation Plan estimates Howard County, including the Participating Jurisdictions, has an annual estimation loss of $88,850 due to windstorms.

This section has the potential to be greatly expanded with estimating developing trends and monetary, economic, and social potential losses for the hazards using HAZUS-MH software. At this time, HAZUS is not an available resource, but will continue to be sought after and will be incorporated into plan updates as the HAZUS data becomes available.

3.3.4 Summary of Key Issues

Tables 3.30-3.31 reflect the results of the Hazard Ranking for each of the Participating Jurisdictions in order of High to Low Planning Significance based on the methodology described in Section 3.1.

Table 3.30 City of Lime Springs' Hazard Ranking – High to Low Planning Significance, 2010

Hazard Type	Probability	Magnitude	Warning Time	Duration	Spatial Extent	CPRI	Planning Significance
Windstorm	4	2	4	2	4	3.30	High
Tornado	3	4	4	1	4	3.25	High
Thunderstorm and Lightning	4	2	4	2	2	3.20	High
Severe Winter Storm	4	2	2	3	4	3.10	High
Hailstorm	4	1	4	1	4	2.95	Moderate
Flash Flood	3	2	4	2	2	2.75	Moderate
River Flood	3	2	2	3	2	2.55	Moderate
Grass or Wild Land Fire	2	1	4	2	1	2.00	Moderate
Extreme Heat	2	1	1	3	4	1.80	Low
Drought	1	2	1	4	4	1.70	Low
Earthquake	1	1	4	1	4	1.60	Low
Sinkhole	1	1	4	1	1	1.45	Low

Source: HMPC and HMMP

Table 3.31 City of Protivin's Hazard Ranking – High to Low Planning Significance, 2010

Hazard Type	Probability	Magnitude	Warning Time	Duration	Spatial Extent	CPRI	Planning Significance
Windstorm	4	2	4	2	4	3.30	High
Tornado	3	4	4	1	4	3.25	High
Thunderstorm and Lightning	4	2	4	2	2	3.20	High
Severe Winter Storm	4	2	2	3	4	3.10	High
River Flood	4	2	2	3	2	3.00	High
Communication Failure	3	2	4	3	4	2.95	Moderate
Hailstorm	4	1	4	1	4	2.95	Moderate
Flash Flood	3	2	4	2	2	2.75	Moderate
Grass or Wild Land Fire	2	1	4	2	1	2.00	Moderate
Extreme Heat	2	1	1	3	4	1.80	Low
Drought	1	2	1	4	4	1.70	Low
Earthquake	1	1	4	1	4	1.60	Low
Sinkhole	1	1	4	1	1	1.45	Low

Source: HMPC and HMMP

The following section summarizes key issues brought out by the risk assessment from the hazards of moderate and high planning significance, arranged alphabetically by hazard.

Communication Failure

- Weak cell phone service daily in the City of Protivin
- Lack of communication could cause Fire Departments, EMS/First Responder, and Law Enforcement response time delays
- Existing communications towers and facilities are vulnerable to lightning strikes

Flash Flood

- Low-lying areas and the basements of structures are vulnerable with heavy rains
- When flood waters saturate the ground, ground water can become contaminated
- Private wells can become contaminated
- Flash floods can have severe impacts to low-lying areas adjacent to the water source, particularly the fire station in the City of Protivin

Grass or Wild Land Fire

- Agricultural practices which include controlled burning take place in rural areas
- Increased concern with city limits embedded in rural areas susceptible to grass or wild land fire; all structures and infrastructures are at risk
- Fire Departments in the planning area regularly participate in training

Hailstorm

- 72 hail events in 54 years in Howard County, which includes the Participating Jurisdictions
- Crops, structures, and vehicles are damaged by large hail events
- $608,994 in crop insurance claims in Howard County as a result of hail damage from 2005-2008
- The associated thunderstorms can generate damaging winds

River Flood

- Five federal disaster declarations involved with flooding since 1990
- Low-lying areas and the basements of structures are vulnerable with heavy rains

Severe Winter Storm

- Snow load on roofs can cause structure damage
- Ice accumulation damages power lines and power infrastructure
- Roads become hazardous for motorists
- Schools and businesses close as a result of power outages and treacherous road conditions
- Freeze conditions can cause losses to crop yield. Nearly $1,000 in crop insurance claims as a result of freeze conditions in Howard County, which includes the Participating Jurisdictions, from 2005-2008

Thunderstorm and Lightning

- Associated winds and hail can cause damage to power infrastructure, structures, and vehicles
- Direct lightning strikes can cause major damage to the power infrastructure or structures, start a fire or cause death
- Four presidential disasters have been declared in Howard County as part of severe storms
- Agriculture production and financial return can be severely impacted

Tornado

- No schools or public buildings in the planning area are known to have FEMA-compliant tornado safe rooms
- The Participating Jurisdictions have the need for an improved outdoor warning siren
- Damage endured from a tornado could range from minimal to complete devastation
- Agricultural production and financial return can be severely impacted

Windstorm

- Frequent wind events can cause damage to power lines
- Unsecured mobile homes, campers, barns, and sheds and their occupants are specifically vulnerable
- Trees and tree limb debris damage power lines, power infrastructure, structures, and automobiles
- Storefront windows are vulnerable to damage from high-winds
- Roofs are frequently damaged

3.4 Limited Data Resources

Section 3 has the potential to be greatly expanded with enhanced historical data, hazard event documentation, and supplementary resource inclusion. Estimates were attempted with aerials but without success. The addition and expansion of technological tools such as GIS would enhance and provide a visual for existing details. GIS resources are currently limited in the planning area.

Developing trends, monetary, economic, and social potential losses for the hazards can be estimated using HAZUS-MH software data not currently available for the planning area. Local, state and federal resources will continue to be contacted to document and make available the optimal planning data not currently available.

As available, the challenges mentioned above will continue to be addressed with continual enhancements sought for future plan updates.

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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 developed by the Hazard Mitigation Planning Committee (HMPC) and Hazard Mitigation Meeting Participants (HMMP) based on the risk assessment. This mitigation strategy was developed through a collaborative group process and consists of general goal statement to guide the Participating Jurisdictions in efforts to lessen disaster impacts as well as specific mitigation actions that can be put in place to directly reduce vulnerability to hazards and losses. The following definitions are based upon those found in FEMA publications 386-3, *Developing a Hazard Mitigation Plan* (2002):

- **Goals** – General guidelines that explain what you want to achieve. Goals are defined before considering how to accomplish them so that they are not dependent on the means of achievement. They are usually long-term, broad, policy-type statements
- **Objectives** – Strategies or implementation steps to attain the identified goals
- **Mitigation Actions** – Specific actions that help achieve goals and objectives

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.

Goals were used to provide direction for reducing hazard-related losses in the Participating Jurisdictions. The HMPC and HMMP identified and approved four main goals:

Goal 1: Minimize vulnerability of the people andA their property in the Participating Jurisdictions 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 the Participating Jurisdictions
Goal 4: Strengthen communication among agencies and between agencies and the public

4.2 Identification and Analysis of Mitigation Actions

44 CFR Requirement §201.6(c)(3)(ii): The mitigation strategy shall include a section that identifies and analyzes a comprehensive range of specific mitigation actions and projects being considered to reduce the effects of each hazard, with particular emphasis on new and existing buildings and infrastructure.

During each of the participating jurisdiction's last hazard mitigation meeting, a brainstorming process came to a conclusion regarding which mitigation actions to include in this plan for their community. To assist with ideas, UERPC provided the HMPC and HMMP a handout with the following categories of mitigation actions and definitions for each type:

- **Prevention:** Administrative or regulatory actions or processes that influence the way land and buildings are developed and built
- **Property protection:** Actions that involve the modification of existing buildings or structures to protect them from a hazard or remove them for the hazard area
- **Structural:** Actions that involve the construction of structures to reduce the impact of hazards
- **Natural resource protection:** Actions that, in addiction to minimizing hazard losses, also preserve or restore the functions of natural systems
- **Emergency services:** Actions that protect people and property during and immediately after a disaster or hazard event
- **Public education and awareness:** Actions to inform and educate citizens, elected officials, and property owners about the hazards and potential ways to mitigate them

The HMPC and HMMP were asked to review the hazards their community identified as risks as well as the mitigation action goals and categories with regards to the identified hazards. Anyone from the HMPC or HMMP could verbally submit a mitigation action to be considered in the plan, and then each mitigation action was brainstormed and discussed, placing particular emphasis on new and existing buildings and infrastructure. After discussing a comprehensive range of alternatives the HMPC and HMMP achieved a consensus on those actions to include in the plan. For each action the HMPC and HMMP decided to include in this plan, a mitigation action implementation worksheet and STAPLEE score was accomplished and included. The STAPLEE scores are found in Table 4.2 and the implementation worksheets are located at the end of Section 4.3. The mitigation actions are found in order of each jurisdiction's prioritization.

4.3 Implementation of Mitigation Actions

44 CFR Requirement §201.6(c)(3)(iii): The mitigation strategy shall include an action strategy describing how the actions identified in paragraph (c)(3)(ii) will be prioritized, implemented, and administered by the local jurisdiction. Prioritization shall include a special emphasis on the extent to which benefits are maximized according to a cost benefits review of the proposed projects and their associated costs.

After the HMPC and HMMP determined the actions to include in the mitigation strategy for the each of the jurisdictions, each meeting attendee participated in an exercise to prioritize the mitigation actions that are considered by the individual to be most important to implement.

To assist with the prioritization of the mitigation actions, the HMPC and HMMP discussed the STAPLEE criteria recommended by FEMA. STAPLEE is a tool used to assess the costs and 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?

The STAPLEE criteria were discussed prior to the prioritization exercise. The exercise was a voting process, each member of the HMPC and HMMP was provided a worksheet to issue a score of 0-3 for each mitigation action based on the STAPLEE criteria.

Table 4.1 reflects the explanations for scoring STAPLEE criteria.

Table 4.1 STAPLEE Criteria Scoring Explanation

Score	Explanation
0	I do not feel this is a mitigation action that needs to be considered
1	This is an action I do feel would benefit the mitigation of hazards, but I considered it a **LOW** priority based on the STAPLEE criteria
2	This is an action I do feel would benefit the mitigation of hazards, but I consider it a **MODERATE** priority based on the STAPLEE criteria
3	This is an action I do feel would benefit the mitigation of hazards and I consider it a **HIGH** priority based on the STAPLEE criteria

At the conclusion of each of the participating jurisdictions' final hazard mitigation meeting, the STAPLEE worksheets were collected, scored, and averaged, assigning: high, moderate, and low priority levels. A STAPLEE score had been determined for each individual action. The process of identification and analysis of mitigation options allowed and challenged the HMPC and HMMP to prioritize mitigation actions. The HMPC and HMMP present at the jurisdictions' final meeting voted on the prioritization of the mitigation actions. Following the mitigation action discussion, and after completion of STAPLEE scoring, each meeting participant noted their order of priority for mitigation action ranking.

Emphasis was placed on the importance of a cost-benefit analysis. As the Disaster Mitigation Act (DMA) regulations state that benefit-cost review is the regulatory requirement to prioritize by benefit-cost, and the need for any publically funded project to be cost-effective, the HMPC and HMMP decided to pursue implementation according to when and where damage occurs, available funding, political will, and jurisdictional priority. Cost-effectiveness will be considered in additional detail when seeking FEMA mitigation grant funding for eligible projects identified in this plan.

As seen in the Executive Summary, Table 4.2 reflects mitigation actions the Participating Jurisdictions selected to include in the plan, ranked by HMPC and HMMP prioritization (note as the Action ID).

Table 4.2 Mitigation Actions Developed for the Participating Jurisdictions, 2010

Action ID	Action	Action Category(ies)	STAPLEE Average	STAPLEE Priority	Goals	Hazard(s) Addressed
Lime Springs – 1	Construct FEMA-compliant tornado safe room(s)	Structural	2.9	H	1	Tornado, Severe Winter Storm, Hailstorms, Extreme Heat, Thunderstorm and Lightning, Windstorm
Lime Springs – 2	Purchase and install warning siren(s)	Emergency Services	2.9	H	1, 2, 4	Tornado, Thunderstorm and Lightning, Windstorm, Hailstorm, Fire
Lime Springs – 3	Purchase and install generator(s)	Emergency Services	2.4	H	1, 2	All Hazards
Lime Springs – 4	Upgrade water supply, water and wastewater treatment infrastructure	Property Protection, Emergency Services, Structural Projects	2.4	H	1, 2	All Hazards
Lime Springs – 5	Purchase and install power supply transfer switch(es)	Emergency Services	2.6	H	1, 2, 4	All Hazards

Lime Springs – 6	Contain creek waters inside designated boundaries	Prevention, Property Protection, Natural Resource Protection, Emergency Services, Structural Projects	1.5	M	1, 2	Flash Flood
Lime Springs – 7	Continue NFIP Participation	Prevention, Property Protection, Natural Resource Protection, Emergency Services	2.1	H	1, 2	Flash Flood
Protivin – 1	Purchase and install power supply transfer switch(es)	Emergency Services	2.7	H	1, 2, 4	All Hazards
Protivin – 2	Purchase and install generator(s)	Emergency Services	2.5	H	1, 2	All Hazards
Protivin – 3	Improve land use management to minimize water damages from flash flooding events	Prevention, Property Protection, Natural Resource Protection, Emergency Services, Structural Projects	2.3	H	1, 2	Flash Flood
Protivin – 4	Construct a new fire station building	Emergency Services, Structural	2	M	1, 2, 3, 4	All Hazards
Protivin – 5	Purchase and install warning siren(s)	Emergency Services	2.2	H	1, 2, 4	Tornado, Thunderstorm and Lightning, Windstorm, Hailstorm, Fire
Protivin – 6	Construct a FEMA-compliant tornado safe room	Structural	1.9	M	1	Tornadoes, Severe Winter Storms, Hailstorms, Extreme Heat, Thunderstorms and Lightning, Windstorms
Protivin – 7	Continue the process to join the National Flood Insurance Program (NFIP)	Prevention	1.6	M	1	Flash Flood
County – 1	Promote the Howard County, Iowa Multi-Jurisdiction (MJ-2) Multi-Hazard Mitigation Plan to the public	Prevention, Property Protection, Structural, Natural Resource Protection, Emergency Services, Public Education and Awareness	2	M	1, 2, 3, 4	All Hazards
County – 2	Ensure the Howard County, Iowa Multi-Jurisdiction (MJ-2) Multi-Hazard Mitigation Plan is reviewed and kept current	Prevention, Property Protection, Structural, Natural Resource Protection, Emergency Services, Public Education and Awareness	2.4	H	1, 2, 3, 4	All Hazards

Table 4.3 reflects the City of Lime Spring's mitigation action implementation worksheets, listed by the HMPC and HMMP's order of priority ranking.

Table 4.3 Mitigation Action Worksheets, City of Lime Springs, 2010

Lime Springs – 1	Construct a FEMA-compliant tornado safe room
Objective(s):	Protect residents and rural residents from severe weather elements
Hazard(s):	Tornadoes, Severe Winter Storms, Hailstorms, Extreme Heat, Thunderstorms and Lightning, and Windstorms
Goal(s):	1
Category(ies):	Structural
Issue/Background:	The city of Lime Springs is in need of a shelter to house citizens during severe weather. This space could be used to store supplies in the event of a natural disaster. An initial engineer's analysis has been accomplished. There is an interest to incorporate this shelter with Spring Ahead Preschool, a community child care facility.
Plan for Implementation:	Construct a facility that can be used for a city-wide storm shelter, cooling center, and warming center
Lead Agency:	City of Lime Springs
Potential Partner(s):	Spring Ahead Preschool, LLC., Howard County Emergency Management Commission, Iowa Homeland Security and Emergency Management, FEMA, Howard-Winneshiek School District, USDA Rural Development
Potential Funding Source(s):	HMGP, CDBG, PDM, USDA Rural Development, I-Jobs, community fundraising
Total Cost:	Estimated $800,000+
Benefit(s) (Losses Avoided):	Life Safety, shelter, continuity of city government
Completion Timeframe:	1 year after funds are secured

Lime Springs – 2	Purchase and install warning siren(s)
Objective(s):	To provide warning to residents, particularly those outdoors, of approaching hazards with an approved warning siren
Hazard(s):	Tornado, Thunderstorm and Lightning, Windstorm, Hailstorm, Fire
Goal(s):	1, 2, 4
Category(ies):	Emergency Services
Issue/Background:	City of Lime Springs has one warning siren currently in use, but the sound does not carry across the town, especially when the trees are full with leaves. The current siren was installed in 1931, affixed approximately 20 feet high above ground level. Located on city property behind the City Library, attached to two wooden power poles, the siren can only be manually activated. The library building also acts as a sound barrier. Ideally, the Howard County Sheriff's Office would be able to remotely activate the siren.
Plan for Implementation:	Install outdoor warning siren in central location to provide citizens advanced warning of approaching hazards
Lead Agency:	City of Lime Springs
Potential Partner(s):	Lime Springs Fire and Rescue, Howard County Emergency Management Commission, Howard County Sherriff's Office

Potential Funding Source(s):	HMGP, CDBG, PDM, Lime Springs General Funds
Total Cost:	Unknown
Benefit(s) (Losses Avoided):	Life Safety
Completion Timeframe:	Approximately 1 year after funds are secured

Lime Springs – 3	Purchase and install generator(s)
Objective(s):	Maintain functions of facilities and services during power loss events
Hazard(s):	All
Goal(s):	1, 2
Category(ies):	Emergency Services
Issue/Background:	Severe weather occurrences have caused the community to occasionally experience extended periods of electrical outage. These outages not only cause business operations to cease, but more importantly, put school children, faculty, staff, business owners, and residents at risk. In addition, critical electronic infrastructure including life-safety and security monitoring systems fail. The City currently utilizes a small, 25 year old generator, which is stored at the old City Garage. Said generator is not dual function, instead solely PTO-driven. The current generator is the backup power source for the city sewer plant and water tower. With only one generator, community not able to have back-up power at current community shelter, the Community Center/
Plan for Implementation:	Purchase and install adequate generator(s) appropriate to the City's expanding needs
Lead Agency:	City of Lime Springs
Potential Partner(s):	Lime Springs Fire and Rescue, City of Lime Springs Water and Wastewater Department, Howard County Emergency Management Commission, power company, other POC's with generator knowledge
Potential Funding Source(s):	HMGP, CDBG, PDM, USDA Rural Development, Fire Grants, Lime Springs General Funds
Total Cost:	$30,000+
Benefit(s) (Losses Avoided):	Emergency shelter operations could be maintained for hours or even days. Critical communications could continues to take place with city and county emergency officials; Life Safety, Continued Electrical Power, Continued Water Supply, Basic Health
Completion Timeframe:	Estimated 3 months after funds are secured

Lime Springs – 4	Upgrade water supply, water and wastewater treatment infrastructure
Objective(s):	To improve water and wastewater infrastructure
Hazard(s):	All
Goal(s):	1, 2
Category(ies):	Property Protection, Emergency Services, Structural Projects
Issue/Background:	Current water mains diameter range between 4-8 inches, not meeting current water flow demand, some water mains having even collapsed. There are approximately 50 fire hydrants in city limits, of which 10 are inoperable and/or provide inadequate water supply; 40 are operable at a level to meet community needs. While repair work has been attempted, some have weak water pressure, some are too small to hook up with fire protection equipment, and some do not even turn on. In previous instances of a structural fire, water has been pumped from the city swimming pool,

	nearby river, and some ponds. If both wells are on, only approximately 1,000 gallons/minute can be pumped to the water tower, as one pump only pumps 750 gallons/minute.
Plan for Implementation:	City to discuss water resources options for improvement and mitigation of current issue, to include but not limited to, smoke-out equipment to test the current connection. Locate potential city-owned property for site of a replacement or additional water tower. Community to consult with an engineer for water main replacement costs/consideration.
Lead Agency:	City of Lime Springs Water and Wastewater Department
Potential Partner(s):	Iowa DNR, Howard County Engineer, Howard County Secondary Roads Department, Iowa Rural Water Association (IRWA), Howard County Board of Supervisors, Howard County Assessor
Potential Funding Source(s):	CDBG, HMGP, PDM, USDA Rural Development, I-Jobs, Lime Springs General Funds
Total Cost:	Unknown
Benefit(s) (Losses Avoided):	Improved water flow/safety to residents and business district. Compliance with laws regarding water infrastructure. Maintain continued tax base.
Completion Timeframe:	Ongoing

Lime Springs – 5	Purchase and install power supply transfer switch(es)
Objective(s):	Obtain necessary tools to utilize back-up power supply
Hazard(s):	All
Goal(s):	1, 2, 4
Category(ies):	Emergency Services
Issue/Background:	Transfer switches allow switching from a primary power source to a secondary or tertiary power source. Maximizing safety and complying with power company requirements including taking a power user “off the grid” when utilizing a secondary power source. None currently exist in Lime Springs
Plan for Implementation:	Install transfer switch(es) at facilities used for city-wide shelter locations and to support the functions of critical services, particularly emergency services and water supply
Lead Agency:	City of Lime Springs
Potential Partner(s):	Lime Springs Fire and Rescue, Howard County Emergency Management Commission
Potential Funding Source(s):	HMGP, CDBG, PDM, Homeland Security Grant Program (HSGP), Federal Surplus, local funds
Total Cost:	Unknown
Benefit(s) (Losses Avoided):	Life Safety
Completion Timeframe:	Approximately 3 months after funds are secured

Lime Springs – 6	Contain creek waters inside designated boundaries
Objective(s):	Minimize flood damages and loss of life
Hazard(s):	Flash Flooding
Goal(s):	1, 2
Category(ies):	Prevention, Property Protection, Natural Resource Protection, Emergency Services, Structural Projects

Issue/Background:	There are two creeks in city limits primarily tile fed (essentially watersheds) that, when the creek rises out of its banks, causes multiple home basement flooding and road blockage. This causes a negative impact to businesses, which impacts the city's tax base. There is a city ball park nearby where children are often present, posing a life safety risk. The city has previously dredged the creek bed to widen and smooth out the banks while also removing trees and debris. The old railroad tracks have created a berm of sorts, collecting trees, debris, et al., possibly affecting creek flow.
Plan for Implementation:	Design and develop structure and/or method to contain the creek waters during flash flooding conditions
Lead Agency:	City of Lime Springs
Potential Partner(s):	Howard County Soil and Water Conservation District, NRCS, Iowa DNR, Howard County Emergency Management Commission
Potential Funding Source(s):	NRCS, FSA, PDM, FMA, HMGP, CDBG, USDA Rural Development
Total Cost:	Unknown
Benefit(s) (Losses Avoided):	Life Safety, Property Protection, Infrastructure Preservation
Completion Timeframe:	Approximately 2 years after funds are secured

Lime Springs – 7	Continue NFIP Participation
Objective(s):	To remain eligible for residents to purchase flood insurance and flood buyout eligibility funding
Hazard(s):	Flash Flooding
Goal(s):	1, 2
Category(ies):	Prevention, Property Protection, Natural Resource Protection, Emergency Services
Issue/Background:	There is area on the east side of Lime Springs that lie within the designated flood zone. The City currently participates in the NFIP and will continue to do so; the City will continue to regulate development in the floodplain according to the floodplain management ordinance.
Plan for Implementation:	Continue to participate in the NFIP and enforce the current floodplain management ordinance. Maximize flood mapping with county agencies, including Geographic Information Systems (GIS).
Lead Agency:	City of Lime Springs
Potential Partner(s):	Howard County Emergency Management Coordinator, Iowa DNR, FEMA, Iowa Homeland Security & Emergency Management Division, Howard County Soil and Water Conservation District, NRCS
Potential Funding Source(s):	Lime Springs General Funds
Total Cost:	Unknown
Benefit(s) (Losses Avoided):	Prevention of loss of life and property within the designated flood zones. Flood insurance and reimbursement for losses due to flooding becomes available to residents.
Completion Timeframe:	Ongoing

Table 4.4 reflects the City of Protivin's mitigation action implementation worksheets, listed by the HMPC and HMMP's order of priority ranking.

Table 4.4 Mitigation Action Worksheets, City of Protivin, 2010

Protivin – 1	Purchase and install power supply transfer switch(es)
Objective(s):	Obtain necessary tools to utilize back-up power supply
Hazard(s):	All
Goal(s):	1, 2, 4
Category(ies):	Emergency Services
Issue/Background:	Transfer switches allow switching from a primary power source to a secondary or tertiary power source. Transfer switches maximize safety and comply with power company requirements including taking a power user "off the grid" when utilizing a secondary power source. The City utilizes three (3) transfer switches, currently located at the Fire Station, water tower, and at main pump of wastewater station
Plan for Implementation:	Install transfer switch(es) at facilities used for city-wide shelter locations and other locations where generators are anticipated to be used to support the functions of critical services, particularly emergency services and water supply
Lead Agency:	City of Protivin
Potential Partner(s):	Protivin Fire Department, Protivin Water and Wastewater Department, Howard County Emergency Management Commission
Potential Funding Source(s):	HMGP, CDBG, PDM, Homeland Security Grant Program (HSGP), Federal Surplus, local funds
Total Cost:	Unknown
Benefit(s) (Losses Avoided):	Life Safety
Completion Timeframe:	Approximately 3 months after funds are secured

Protivin – 2	Purchase and install generator(s) for City of Protivin
Objective(s):	Maintain functions of facilities and services during power loss events
Hazard(s):	All
Goal(s):	1, 2
Category(ies):	Emergency Services
Issue/Background:	Severe weather occurrences have caused the community of occasionally experience extended periods of electrical outage. These outages not only cause business operations to cease, but more importantly, put school children, faculty, staff, business owners, and residents at risk. In addition, critical electronic infrastructure including life-safety and security monitoring systems fail. The City currently utilizes two older, manual generators for water tower and fire station needs.
Plan for Implementation:	Purchase and install adequate generator(s) appropriate to the City's growing needs
Lead Agency:	City of Protivin
Potential Partner(s):	Protivin Fire Department, City of Protivin Water and Wastewater Department, Howard County Emergency Management Commission, Alliant Energy
Potential Funding Source(s):	HMGP, CDBG, PDM, USDA Rural Development, Fire Grants, City of Protivin General Funds
Total Cost:	$30,000+

Benefit(s) (Losses Avoided):	Emergency shelter operations could be maintained for hours or even days. Critical communications could continue to take place with city and county emergency officials; Life Safety, Basic Health, continued electrical power, continued water supply
Completion Timeframe:	Estimated 3 months after funds are secured

Protivin – 3	Improve land use management to minimize water damages from flash flooding events
Objective(s):	Control water volume and flow through city limits
Hazard(s):	Flash Flood
Goal(s):	1, 2
Category(ies):	Prevention, Property Protection, Natural Resource Protection, Emergency Services, Structural Projects
Issue/Background:	Bohemian Creek and one dry run bed both experience flash flooding with heavy rains. The flash floods often rise up to cover main street, flooding some business and residential homes to include but not limited to the fire station, city hall and post office. Water has come within inches of the City Hall door. Annually the Protivin City Park is submerged and sub sequentially sanitized. Ideally the water flow to be opened up, slowed down, and/or diverted from city limits. Community researched and evaluated flood control measures to include land acquisition, with private land owner willing to sell.
Plan for Implementation:	Design and develop strategies to minimize flood damage
Lead Agency:	City of Protivin
Potential Partner(s):	Howard County Soil and Water Conservation District, NRCS, Iowa DNR, Howard County Emergency Management Commission
Potential Funding Source(s):	NRCS, FSA, HMGP, CDBG, PDM, FMA, USDA Rural Development
Total Cost:	Unknown
Benefit(s) (Losses Avoided):	Life Safety, Property Protection, Infrastructure Preservation
Completion Timeframe:	Approximately 6-12 months after funds are secured

Protivin – 4	Construct a new Fire Station Building
Objective(s):	To obtain a building to serve the current fire protection needs
Hazard(s):	All
Goal(s):	1, 2, 3, 4
Category(ies):	Emergency Services, Structural
Issue/Background:	The current fire station was built in the mid 1960's and has been outgrown and damaged by flood waters. New fire protection vehicles would not fit inside the building which limits their fire protection abilities. The current location of the fire station is vulnerable to inside the flood plain and flood waters have been almost a foot deep in the building twice since 2000. A new fire station would ideally accommodate increased fire safety training opportunities for school children and residents, with potential for incorporating the new structure with a community tornado safe room.
Plan for Implementation:	The City will continue to contact contractors to start plan and design cost estimates while researching and evaluating funding opportunities
Lead Agency:	Protivin Fire Department
Potential Partner(s):	Protivin Community Fire District Trustees, City of Protivin

Potential Funding Source(s):	Local Option Tax, City of Protivin General Funds, HMGP, PDM, USDA Rural Development, Fire Grants
Total Cost:	Unknown
Benefit(s) (Losses Avoided):	Improved Fire Department and EMS functions, adequate room to expand, new location would minimize risk of fire station being negatively affected by flash flooding
Completion Timeframe:	Estimated 1 year after funds are secured

Protivin – 5	Purchase and install warning siren(s)
Objective(s):	To provide warning to residents, particularly those outdoors, of approaching hazards with an improved warning siren
Hazard(s):	Tornado, Thunderstorm and Lightning, Windstorm, Hailstorm, Fire
Goal(s):	1, 2, 4
Category(ies):	Emergency Services
Issue/Background:	City of Protivin currently utilizes two (2) sirens, one installed between 1930 and 1950 and the second unit installed in the 1960's. Both sirens are only manually activated while neither are rotating models. Ideally, the new siren(s) would rotate and the Howard County Sheriff's Office would be able to remotely activate the siren(s) for maximum community protection
Plan for Implementation:	Install outdoor warning siren(s) in key location(s) to provide citizens advanced warning of approaching hazards
Lead Agency:	City of Protivin
Potential Partner(s):	Protivin Fire Department, Howard County Emergency Management Commission, Howard County Sheriff's Office
Potential Funding Source(s):	HMGP, CDBG, PDM, Protivin General Funds
Total Cost:	Unknown
Benefit(s) (Losses Avoided):	Life Safety
Completion Timeframe:	Approximately 1 year after funds are secured

Protivin – 6	Construct a FEMA-compliant tornado safe room
Objective(s):	Protect residents and visitors from severe weather elements
Hazard(s):	Tornadoes, Severe Winter Storms, Hailstorms, Extreme Heat, Thunderstorms and Lightning, and Windstorms
Goal(s):	1
Category(ies):	Structural
Issue/Background:	The City of Protivin is in need of a shelter to house citizens during severe weather. This space could be used to store supplies in the event of a natural disaster. The city currently does not have a designated shelter for this need. The Protivin Community Center, owned by Trinity Catholic Church, is current warming/cooling center site if needed as it has a kitchen and bathrooms, but no showers, generators or transfer switches. The Trinity Catholic Church basement was deemed the current safest tornado shelter in town, though it does not meet FEMA tornado safe room guidelines
Plan for Implementation:	Construct a facility that can be used for a city-wide storm shelter, cooling center, and warming center
Lead Agency:	City of Protivin

Potential Partner(s):	Howard County Emergency Management Commission, Iowa Homeland Security and Emergency Management, FEMA, Turkey Valley School District, Trinity Catholic School, USDA Rural Development
Potential Funding Source(s):	HMGP, PDM, USDA Rural Development, I-JOBS, community fundraising
Total Cost:	Estimated $80,000+
Benefit(s) (Losses Avoided):	Life Safety
Completion Timeframe:	Estimated 1 year after funds are secured.

Protivin – 7	Continue the process to re-join the National Flood Insurance Program (NFIP)
Objective(s):	Afford residents maximum protection for flooding events while providing opportunity for residents to purchase flood insurance
Hazard(s):	Flash Flooding
Goal(s):	1, 2
Category(ies):	Prevention
Issue/Background:	For NFIP, the City of Protivin is currently “suspended”.
Plan for Implementation:	City of Protivin is reviewing and evaluating NFIP guidance and requirements for compliancy
Lead Agency:	City of Protivin
Potential Partner(s):	FEMA, Iowa Homeland Security and Emergency Management, Iowa DNR
Potential Funding Source(s):	City of Protivin General Funds
Total Cost:	Unknown
Benefit(s) (Losses Avoided):	Residents' eligibility to purchase flood insurance; community maximization of flood recovery funding
Completion Timeframe:	6-12 months

Table 4.5 reflects the mitigation action implementation worksheets pertaining to all Participating Jurisdictions, listed by the HMPC and HMMP's order of priority ranking.

Table 4.5 Mitigation Action Worksheets, All Participating Jurisdictions "County", 2010

Howard County – 1	Promote the Howard County, Iowa Multi-Jurisdiction (MJ-2) Multi-Hazard Mitigation Plan to the public
Objective:	To continue community-wide commitment of mitigating against hazards
Hazard(s):	All
Goal(s):	1, 2, 3, 4
Category(ies):	Prevention, Property Protection, Structural, Natural Resource Protection, Emergency Services, Public Education and Awareness
Issue/Background:	The public will had an opportunity to review during the drafting stages. In addition, during the plan maintenance process, the planning committee will continue to keep the public informed by posting and distributing Public Notice awareness of progress of implementation
Plan for Implementation:	Maintain the Howard County, Iowa Multi-Jurisdiction (MJ-2) Multi-Hazard Mitigation Plan in a public location, and as available, with each planning committee member and on the planners' website. Note annually mitigation strategies implemented and accomplished
Lead Agency:	Governing Bodies of Participating Jurisdictions
Potential Partner(s):	Howard County Emergency Management Coordinator, FEMA, HSEMD
Potential Funding Source(s):	No direct costs associated with this action
Total Cost:	None
Benefit(s)(Losses Avoided):	Keep the public informed of hazards and planning in the County as well as implementation of mitigation actions
Completion Timeframe:	Ongoing

Howard County – 2	Ensure the Howard County, Iowa Multi-Jurisdiction (MJ-2) Multi-Hazard Mitigation Plan is reviewed and kept current
Objective:	Maintain the currency of the plan. Appropriate adjustments and additions must be made to match the communities' needs as they evolve
Hazard(s):	All
Goal(s):	1, 2, 3, 4
Category(ies):	Prevention, Property Protection, Structural, Natural Resource Protection, Emergency Services, Public Education and Awareness
Issue/Background:	Like any plan, the Howard County, Iowa Multi-Jurisdiction (MJ-2) Multi-Hazard Mitigation Plan will need to be reviewed and kept up to date
Plan for Implementation:	The Hazard Mitigation Planning Committee (HMPC) has arranged to meet once a year, reviewing accomplishments and making plan updates accordingly. In addition, an updated plan will be submitted to HSEMD and FEMA every five years for review and approval
Lead Agency:	Governing Bodies of Participating Jurisdictions
Potential Partner(s):	Howard County EMA, FEMA, HSEMD
Potential Funding Source:	No direct costs associated with this action
Total Cost:	None
Benefit(s) (Losses Avoided):	Continue the mitigation process to prevent life and property loss within the planning area
Completion Timeframe:	Annual Meetings/submission of revised plan within 5 years

4.4 Mitigation Actions in Support of the National Flood Insurance Program

44 CFR Requirement §201.6(c)(3)(ii): [The mitigation strategy] must also address the jurisdiction's participation in the National Flood Insurance Program (NFIP), and continued compliance with NFIP requirements, as appropriate.

The City of Lime Springs is committed to continued participation and compliance with the National Flood Insurance Program (NFIP). The City of Protivin is in the process of reviewing and evaluating requirements for NFIP compliancy.

Table 4.6 summarizes the specific actions that were identified in support of the National Flood Insurance Program.

Table 4.6 Specific Actions in Support of the NFIP

Action ID	Action
Lime Springs -7	Continue NFIP Participation
Protivin - 7	Continue the process to re-join NFIP

Specifics on implementation of each of the above actions can be found in Section 4.3 in the tables following each jurisdiction's complete list of identified actions.

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5 PLAN MAINTENANCE PROCESS

This section provides an overview of the overall strategy for plan maintenance and outlines the method and schedule for monitoring, updating, and evaluating the plan. It 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)(i): The plan maintenance process shall include a section describing the method and schedule of monitoring, evaluating, and updating the hazard mitigation plan within a five year cycle.

With adoption of this plan, the HMPC and governing body with legal authority for each Participating Jurisdiction will be tasked with monitoring, evaluating, and maintaining the plan.

5.1.1 Hazard Mitigation Planning Committee

A multi-jurisdictional Hazard Mitigation Planning Committee (HMPC) has been appointed by the Participating Jurisdictions. The HMPC has agreed to meet as a committee once annually to monitor and evaluate the plan. The HMPC Team Lead will coordinate the meeting time and place and notify other members. The core duty of the HMPC in relation to this plan is to see it 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 for the public to see.

More specifically, the HMPC, lead by the HMPC Team Lead, agree to:

- Meet annually to monitor and evaluate the implementation of the plan;
- Act as a forum for hazard mitigation issues;
- Disseminate hazard mitigation ideas and activities to all participants;
- Pursue the implementation of high priority, low- or no-cost recommended actions;
- Maintain vigilant monitoring of multi-objective, cost-share, and other funding opportunities to help the community implement the plan's recommended actions or which no current funding exists;
- Monitor and assist in implementation and update of this plan;
- Keep the concept of mitigation in the forefront of community decision making by identifying plan recommendations when other community goals, plans, and activities overlap, influence, or directly affect increased community vulnerability to disasters;

- Report on plan progress and recommended changes to the governing body with legal authority of the Participating Jurisdictions, Howard County Emergency Management Coordinator (EMA) and Upper Explorerland Regional Planning Commission (UERPC); and
- Inform and solicit the public for input.

5.1.2 Plan Maintenance Schedule

The HMPC agrees to meet annually to monitor progress and update the mitigation strategy. The HMPC Team Lead is responsible for initiating these plan reviews. A five-year written update of the plan will be submitted to the Iowa Homeland Security and Emergency Management Division (HSEMD), FEMA Iowa and FEMA Region VII per Requirement §201.6(c)(4)(i) of the Disaster Mitigation Act (DMA) of 2000 and adopted by the governing body with legal authority of the Participating Jurisdictions within a five-year period from the final approval of this plan unless a 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).

Updates to this plan will:

- Consider changes in vulnerability due to action implementation,
- Document success stories where mitigation efforts have proven effective,
- Document areas where mitigation actions were not effective,
- Document any new hazards that may arise or were previously overlooked,
- Incorporate new data or studies on hazards and risks,
- Incorporate new capabilities or changes in capabilities,
- Incorporate growth and development-related changes to inventories, and
- Incorporate new action recommendations or changes in action prioritization.

In order to best evaluate any changes in vulnerability as a result of plan implementation, the Participating Jurisdictions will undergo the following process:

- A representative from the responsible office identified in each mitigation action will be responsible for tracking and reporting to the jurisdictional lead annually on action status. The representative will also provide input on whether the action, as implemented, meets the defined objectives and is likely to be successful in reducing vulnerabilities.
- If the action does not meet identified objectives, the jurisdictional lead will determine what additional measures may be implemented, and an assigned individual will be

responsible for defining action scope, implementing the action, monitoring success of the action, and making any required modifications to the plan.

Changes will be made to the plan to accommodate actions that have failed or are not considered feasible after a review of their adherence to established criteria, time frames, community priorities, and/or funding resources. Actions that were not ranked high but were identified as potential mitigation activities will be reviewed during the monitoring and update of this plan to determine feasibility for future implementation. Updating of the plan will be enacted through written changes and submissions as the HMPC, particularly the HMPC Team Lead, deems appropriate and necessary, and as approved by the governing body with legal authority of the 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 hazard mitigation plan into other planning mechanisms such as comprehensive or capital improvement plans, when appropriate.

Where possible, the Participating Jurisdictions will use existing plans and/or programs to implement hazard mitigation actions. Based on the capability assessments of the Participating Jurisdictions, the communities will continue to plan and implement programs to reduce loss of life and property from hazards. This plan builds upon the momentum developed through previous related planning efforts and mitigation programs, and recommends implementing actions, where possible, through the following means:

- Howard County Basic Operations Plan
- General or master plans of participating jurisdictions
- Comprehensive plans
- Ordinances of participating jurisdictions
- Capital improvement plans and budgets
- Howard County Multi-Jurisdiction Multi-Hazard Mitigation Plan developed in future
- Other community plans either in existence or developed in the future
- Other county/regional plans either in existence or developed in the future

The governing body with legal authority of the participating jurisdictions adopting this plan will encourage other relevant planning mechanisms under their authority to consult this plan to ensure minimization of risk to natural hazards as well as maximum coordination of activities.

This multi-hazard mitigation plan will be included in the next update of the Howard County Basic Operations Plan, Part B. The local data collected will be included in the State of Iowa Hazard Mitigation Plan where appropriate. In the future, UERPC will attempt to coordinate the annual review and update of all jurisdictions in Howard County to promote integration into one county-wide multi-hazard mitigation plan.

HMPC members involved in updating these existing planning mechanisms will be responsible for integrating the findings and actions of the hazard mitigation plan, as appropriate. The HMPC is also responsible for monitoring this integration and incorporating the appropriate information into the five-year update of the multi-hazard mitigation plan.

5.3 Continued Public Involvement

44 CFR Requirement §201.6(c)(4)(iii): [The plan maintenance process shall include a] discussion on how the community will continue public participation in the plan maintenance process.

The update process provides an opportunity to publicize success stories from the plan's implementation and seek additional public comment. Information will be posted in a county-wide publication following the annual review of the hazard mitigation plan. Public meeting(s) to receive public comment on plan maintenance and updating will be held during the update period. 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.

In conclusion, public notices will continue to be posted and public participation will continue to be sought and encouraged through available local media outlets as this planning document is reviewed and revised.