

Upper Big Blue NRD  
Multi-Jurisdictional  
**Hazard Mitigation Plan**  
**2019**



Plan developed for  
Upper Big Blue NRD by  
JEO Consulting Group

# **Hazard Mitigation Planning Team**

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## **LIST OF ACRONYMS**

ACS – American Community Survey  
BCA – Benefit Cost Analysis  
CFR – Code of Federal Regulations  
CIKR – Critical Infrastructure and Key Resources  
CRS – Community Rating System  
DMA 2000 – Disaster Mitigation Act of 2000  
EAP – Emergency Action Plan  
EPA – Environmental Protection Agency  
FBI – Federal Bureau of Investigations  
FEMA – Federal Emergency Management Agency  
FIRM – Flood Insurance Rate Map  
FMA – Flood Mitigation Assistance Program  
FR – FEMA’s Final Rule  
HMA – Hazard Mitigation Assistance  
HMGP – Hazard Mitigation Grant Program  
HMP – Hazard Mitigation Plan  
HPRCC – High Plains Regional Climate Center  
IP – Office of Infrastructure Protection  
JEO – JEO Consulting Group, Inc.  
LEOP – Local Emergency Operations Plan  
LGA – Liquid Gallon  
MPH – miles per hour  
NCDC – National Climate Data Center  
NCEI – National Centers for Environmental Information  
NDA – Nebraska Department of Agriculture  
NDEE – Nebraska Department of Environment and Energy  
NDMC – National Drought Mitigation Center  
NeDNR – Nebraska Department of Natural Resources  
NEMA – Nebraska Emergency Management Agency  
NFIP – National Flood Insurance Program  
NFS – Nebraska Forest Service  
NIPP – National Infrastructure Protection Plan  
NOAA – National Oceanic and Atmospheric Administration  
NPDP – National Performance of Dams Program  
NRC – National Response Center  
NRD – Natural Resources District  
NSFHA – No Special Flood Hazard Area  
NTAS – National Terrorism Advisory System  
NWS – National Weather Service  
PDM – Pre-Disaster Mitigation Program  
PDSI – Palmer Drought Severity Index  
PHMSA – U.S. Pipeline and Hazardous Material Safety Administration  
RMA – Risk Management Agency  
SBA – Small Business Administration  
SPIA – Sperry-Piltz Ice Accumulation Index  
SSA – Sector-Specific Agency  
START – National Consortium for the Study of Terrorism and Responses to Terrorism  
SURE – Supplemental Revenue Assistance Payments  
UBBNRD – Upper Big Blue Natural Resources District

TORRO – Tornado and Storm Research Organization  
USDA – United States Department of Agriculture  
USGS – United States Geological Survey

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## Executive Summary

### Introduction

This plan is an update and consolidation of three separate Multi-Hazard Mitigation Plans (HMP); Hamilton County HMP approved in 2015, Seward County HMP approved in 2014, and York County HMP approved in 2014. The plan update was developed in compliance with the requirements of the Disaster Mitigation Act of 2000 (DMA 2000).

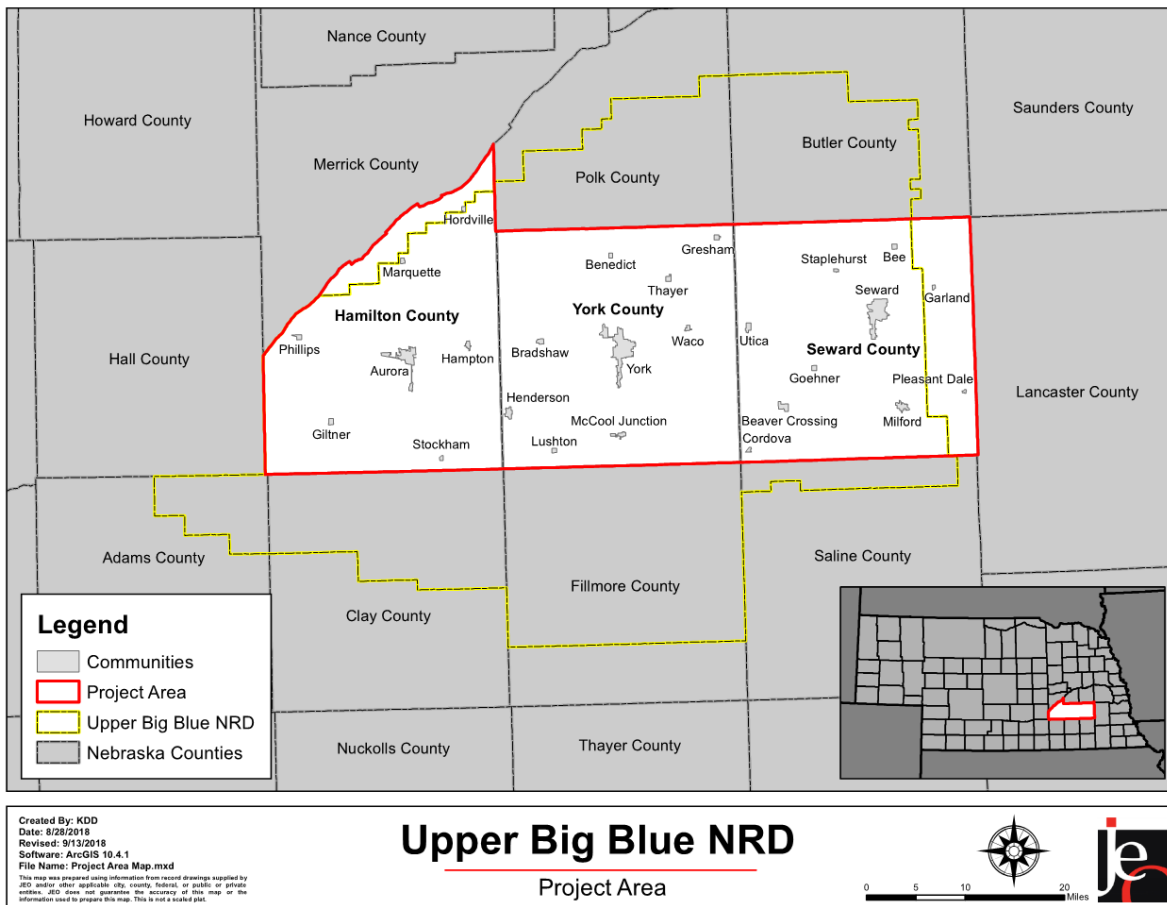
Hazard mitigation planning is a process in which hazards are identified and profiled; people and facilities at-risk are identified and assessed for threats and potential vulnerabilities; and strategies and mitigation measures are identified. Hazard mitigation planning increases the ability of communities to effectively function in the face of natural and human-caused disasters. The goal of the process is to reduce risk and vulnerability, in order to lessen impacts to life, the economy, and infrastructure. Plan participants are listed in the following table.

**Table 1: Participating Jurisdictions**

<b>Participating Jurisdictions</b>	
<b>Upper Big Blue Natural Resources District</b>	
<b>Hamilton County</b>	City of Seward
City of Aurora	Village of Staplehurst
Village of Giltner	Village of Utica
Village of Hampton	<b>York County</b>
Village of Hordville	Village of Benedict
Village of Marquette	Village of Bradshaw
Village of Phillips	Village of Gresham
Village of Stockham	City of Henderson
<b>Seward County</b>	Village of McCool Junction
Village of Beaver Crossing	Village of Thayer
Village of Bee	Village of Waco
Village of Cordova	City of York
Village of Garland	<b>Special Districts</b>
Village of Goehner	Central City School District
City of Milford	Seward Public Schools
Village of Pleasant Dale	Tamora Fire Department



Figure 1: Map of Planning Area



## Goals and Objectives

The potential for disaster losses and the probability of occurrence of natural and human-caused hazards present a significant concern for the communities participating in this plan update. The driving motivation behind the update and consolidation of these hazard mitigation plans is to reduce vulnerability and the likelihood of impacts to the health, safety, and welfare of all citizens in the planning area. To this end, the Planning Team reviewed and approved goals which helped guide the process of identifying both broad-based and community-specific mitigation strategies and projects that will, if implemented, reduce their vulnerability and help build stronger, more resilient communities.

These goals were reviewed, and the Planning Team agreed that they are still relevant and applicable for this plan update. Jurisdictions that participated in this plan update agreed that the goals identified in the Hamilton County HMP would be carried forward and utilized for the 2019 plan. The goals for this plan update are as follows:

### Goal 1: Protect the Health and Safety of Residents

Objective 1.1: Reduce or prevent damage to property and loss of life or serious injury (overall intent of the plan)

**Goal 2: Reduce Future Losses from Hazard Events**

Objective 2.1: Provide protection for existing structures, future development, critical facilities, and infrastructure, services, utilities and trees to the extent possible.

Objective 2.2: Develop hazard specific plans, conduct studies or assessments, and retrofit buildings and facilities to mitigate for hazards and minimize their impact.

Objective 2.3: Minimize and control the impact of hazard events through enacting or updating ordinances, permits, laws, or regulations.

Objective 2.4: Reduce or eliminate economic impacts from hazards.

**Goal 3: Increase Public Awareness and Education Regarding Vulnerabilities to Hazards**

Objective 3.1: Develop and provide information to residents and businesses about the types of hazards they are exposed to, what the effects may be, where they occur, and what they can do to better prepare for them.

**Goal 4: Improve Emergency Management Capabilities**

Objective 4.1: Develop or update Emergency Response Plans, procedures and abilities; increase the capability to respond.

Objective 4.2: Develop or update evacuation plans and procedures.

Objective 4.3: Improve warning systems and ability to communicate to residents and businesses during and following a disaster or emergency.

**Goal 5: Pursue Multi-Objective Opportunities (whenever possible)**

Objective 5.1: When possible, use existing resources, agencies, and programs to implement the projects.

Objective 5.2: When possible, implement projects which achieve multiple goals.

**Goal 6: Enhance Overall Resilience and Promote Sustainability**

Objective 6.1: Incorporate hazard mitigation and adaption into updating other local planning endeavors (e.g., comprehensive plans, zoning ordinance, subdivision regulation, etc.)

**Summary of Changes**

Several changes were made to the 2014/2015 Hazard Mitigation Plans and planning process. The largest change is that this plan update combines the three counties' hazard mitigation plans. Other changes include: greater efforts to reach out to and include stakeholder groups; an expanded risk assessment for the entire area; and the inclusion of additional mitigation strategies. This update also works to unify the various planning mechanisms in place throughout the participating communities (i.e. comprehensive plans, local emergency operation plans, zoning ordinances, building codes, etc.) to ensure that the goals and objectives identified in those planning mechanisms are consistent with the strategies and projects included in this plan.

### Plan Implementation

Various communities across the planning area have implemented hazard mitigation projects following their 2014 or 2015 Hazard Mitigation Plan. Many of these projects are related to hazard monitoring, redundant power supplies, and warning systems. A few examples include floodplain mapping, new wells, improving warning and alert systems at the community level and installing back-up power generators.

In order to build upon these prior successes and to continue implementing mitigation projects, despite limited resources, communities will need to continue relying upon multi-agency coordination as a means of leveraging resources. Communities across the Upper Big Blue Natural Resources District (UBBNRD) have been able to work with a range of entities to complete projects; potential partners for future project implementation include but are not limited to: Nebraska Department of Natural Resources (NeDNR); Nebraska Emergency Management Agency (NEMA); and United States Department of Agriculture (USDA).

## Hazard Profiles

The hazard mitigation plan includes a description of the hazards considered, including a risk and vulnerability assessment. Data considered during the risk assessment process includes: historic occurrences and recurrence intervals; historic losses (physical and monetary); impacts to the built environment (including privately-owned structures as well as critical facilities); and the local risk assessment. The following tables provide an overview of the risk assessment for each hazard and the losses associated with each hazard.

**Table 2: Hazard Occurrences**

Regional Risk Assessment			
Hazard	Previous Occurrence Events/Years	Approximate Annual Probability	Likely Extent
Agricultural Animal Disease	29/4	100%	Unavailable
Agricultural Plant Disease	27/18	100%	Unavailable
Chemical Spills – Fixed Sites	40/18	100%	233 Gallons
Chemical Spills – Transportation	48/48	100%	2,080 Gallons
Dam Failure	0/106	<1%	Inundation of floodplain downstream from dam
Drought	412/1,485 months	28%	D1-D2
Earthquakes	0/120	<1%	<5.0
Extreme Heat	Avg. 5 days/year	100%	>99°
Flooding	55/22	100%	Some inundation of structures and roads near streams. Some evacuations of people may be necessary
Grass/Wildfires	701/18	100%	10 acres
Hail	435/22	100%	H2-H5
High Winds	59/22	100%	49 avg kts
Levee Failure	0/66	1%	Some inundation of structures in the protected levee area.
Severe Thunderstorms	253/22	100%	57 avg kts winds
Severe Winter Storms	218/22	100%	20-40° below zero (wind chills) 0-6" snow 25-35 miles per hour (mph) winds
Terrorism/Civil Disorder	0/49	<1%	Undefined
Tornadoes	52/22	100%	EF0

The following table provides loss estimates for hazards with sufficient data. Description of major events are included in *Section Seven: Participant Sections*.

## Executive Summary

**Table 3: Hazard Loss History**

Hazard Type		Count	Property	Crop <sup>3</sup>
Agricultural Disease	Animal Disease <sup>2</sup>	29	180 Animals	N/A
	Plant Disease <sup>3</sup>	27	N/A	\$741,503
Chemical Spills – Transportation <sup>7</sup>		48	\$1,888,548	N/A
Chemical Spills – Fixed Site <sup>5</sup> <i>6 injuries</i>		40	\$0	N/A
Dam Failure <sup>6</sup>		0	\$0	N/A
Drought <sup>11</sup>		412/1,485 months	\$0	\$51,929,000
Extreme Heat <sup>10</sup>		Avg. 5 days year	\$0	\$9,925,664
Earthquake <sup>8</sup>		0	\$0	N/A
Flooding <sup>1</sup>	Flash Flood	31	\$5,130,000	\$461,087
	Flood	24	\$1,222,000	
Grass/Wildfires <sup>4</sup> <i>5 injuries, 1 fatality</i>		701	\$150,000	\$28,075 <sup>4</sup>
Hail <sup>1</sup> Average: 1.22 in Range: 0.75 – 7.0 in		435	\$8,764,000	\$30,991,310
High Winds <sup>1</sup> Average: 49 kts Range: 35 – 69 kts <i>5 injuries</i>		59	\$1,283,000	\$4,269,741
Levee Failure <sup>9</sup>		0	N/A	N/A
Severe Thunderstorms <sup>1</sup>	Thunderstorm Wind Average: 57 kts Range: 35-69 kts <i>6 injuries</i>	194	\$5,534,500	N/A
	Heavy Rain	51	\$305,000	\$7,442,720
	Lightning <i>1 injury</i>	8	\$437,000	N/A
Severe Winter Storms <sup>1</sup>	Blizzard	21	\$35,000	\$490,925
	Extreme Cold/Wind Chill	8	\$0	
	Heavy Snow	10	\$2,000,000	
	Ice Storm	20	\$5,165,000	
	Winter Storm <i>1 fatality</i>	120	\$660,000	
	Winter Weather	39	\$340,000	
Terrorism/Civil Disorder <sup>12</sup>		0	\$0	N/A
Tornadoes <sup>1</sup> Average: EF1 Range: EF0-EF4		52	\$15,271,000	\$427,788
		<b>2,073</b>	<b>\$48,185,048</b>	<b>\$106,700,646</b>

N/A: Data not available

<sup>1</sup> NCEI (January 1996-December 2017)

2 NDA (2014-2017)  
3 USDA RMA (2000-2017)  
4 NFS (2000 to December 2017)  
5 U.S. Coast Guard NRC (1990- January 2018)  
6 Stanford NPDP (1911-2016)  
7 PHMSA (1971- January 2018)  
8 USGS (1872-2018)  
9 United States Army Corps of Engineers (2010)  
10 High Plains Regional Climate Center (HPRCC) (1901-2018)  
11 National Climate Data Center (NCDC) (1895 – Sept 2018)  
12 START (1970 – October 2018)  
*in.* = inches; *kts* = Knots

Events like agricultural disease, extreme heat, grass and wildfires, hail, severe thunderstorms, and severe winter storms will occur annually. Other hazards like drought, dam failure, earthquakes, and terrorism will occur less often. The scope of events and how they will manifest themselves locally is not known regarding hazard occurrences. Historically, drought, hail, severe thunderstorms, and tornadoes have resulted in the most significant damages within the planning area. These hazards are summarized below.

### **Drought**

Drought is a regular and reoccurring phenomenon in the planning area and the state of Nebraska. Historical data shows that droughts have occurred with regularity across the planning area and recent research indicates that trend will continue and potentially intensify. The most common impacts of drought affect the agricultural sector. Over \$51 million in total crop loss was reported for the planning area since 2000.

Prolonged drought events can have a profound effect on the planning area and the individual communities. Expected impacts from prolonged drought events include but are not limited to: economic loss in the agricultural sector; loss of employment in the agricultural sector; limited water supplies (drinking and fire suppression); and decrease in recreational opportunities.

### **Hail**

Hail events occur on an annual basis in conjunction with severe thunderstorms. Hail is one of the more frequently occurring hazards and has impacted both the agricultural sector and the built environment. The National Centers for Environmental Information (NCEI) has recorded 435 hail events in 22 years. These events have caused over \$8 million in property damages, and \$30 million in crop losses. Common impacts resulting from hail include, but are not limited to: damage to roofs, windows, and siding; damage to mechanical systems located outdoors including HVAC systems; damage to vehicles; and destruction of crops.

### **Severe Thunderstorms**

Thunderstorms differ from many other hazards in that they are generally large in magnitude, have a long duration, and travel across large areas and through multiple jurisdictions within a single region. Additionally, thunderstorms often occur in a series, with one area potentially impacted multiple times in one day. Severe thunderstorms are most likely to occur between the months of May and August with the highest number of events occurring in June. The NCEI recorded 253 severe thunderstorm events in 22 years. These events caused over \$7 million in property damages and \$8 million in crop losses. Typical impacts resulting from severe thunderstorms include but are not limited to: loss of power; obstruction of transportation routes; grass/wildfires starting from lightning strikes; localized flooding; and damages discussed in the hazard profiles for hail and high winds.

## Executive Summary

Vulnerable populations related to severe thunderstorms include: residents of mobile homes (three percent of housing units); citizens with decreased mobility; and those caught outside during storm events. Most residents within the planning area are familiar with severe thunderstorms and know how to appropriately prepare and respond to events.

### Tornadoes

Tornadoes are an annual occurrence for the planning area. Tornadoes are known for high winds and a spinning vortex of air. Tornadoes typically occur between May and July. The NCEI reported 52 tornado events that caused over \$15 million in property damages in 22 years. Impacts resulting from tornadoes include but are not limited to: closure of transportation routes; downed power lines and power outages; collapsed roofs; and closure of critical facilities.

The most vulnerable citizens within the planning area are the elderly, people without basements or shelters, residents of mobile homes, citizens with decreased mobility, and those caught outside during storm events. Most residents within the planning area are familiar with tornadoes and know how to appropriately prepare and respond to events.

## Mitigation Strategies

There are a wide variety of strategies that can be used to reduce the impacts of hazards for the built environment and planning area residents. *Section Five: Mitigation Strategy* shows the mitigation actions chosen by the participating jurisdictions to prevent future losses.

## Section One: Introduction

### Hazard Mitigation Planning

Hazard events are inevitable, it is just a matter of when they occur and what steps jurisdictions have taken to mitigate the potential impacts. Mitigation reduces risk and is a socially and economically responsible action to prevent long term risks from natural and human-caused hazard events.

Natural hazards, such as severe winter storms, tornadoes and high winds, severe thunderstorms, flooding, extreme heat, drought, agriculture diseases (plant and animal), earthquakes, and wildfires are part of the world around us. Their occurrence is natural and inevitable, and there is little that can be done to control their force and intensity. Human-caused hazards are a product of the society and can occur with significant impacts to communities. Human-caused hazards include levee failure, dam failure, chemical and radiological fixed site hazards, major transportation incidents, terrorism, civil disorder, and urban fire. These hazard events can occur as a part of normal operation or as a result of human error. All jurisdictions participating in this planning process are vulnerable to a wide range of natural and human-caused hazards that threaten the safety of residents and have the potential to damage or destroy both public and private property, cause environmental degradation, or disrupt the local economy and overall quality of life.



FEMA definition of  
Hazard Mitigation

*“Any sustained action taken to reduce or eliminate the long-term risk to human life and property from [natural] hazards.”*

UBBNRD prepared this multi-jurisdictional hazard mitigation plan in an effort to reduce impacts from natural and human-caused hazards and to better protect the people and property of the region from the effects of hazards. This plan demonstrates the communities' commitment to reducing risks from hazards and serves as a tool to help decision makers establish mitigation activities and resources. Further, this plan was developed to make UBBNRD and participating jurisdictions eligible for federal pre-disaster funding programs and to accomplish the following objectives:

- Minimize the disruption to each jurisdiction following a disaster.
- Establish actions to reduce or eliminate future damages in order to efficiently recover from disasters.
- Investigate, review, and implement activities or actions to ensure disaster related hazards are addressed by the most efficient and appropriate solution.
- Educate citizens about potential hazards.
- Facilitate development and implementation of hazard mitigation management activities to ensure a sustainable community.

### Disaster Mitigation Act of 2000

The U.S. Congress passed the Disaster Mitigation Act 2000 to amend the Robert T. Stafford Disaster Relief and Emergency Assistance Act<sup>1</sup>. Section 322 of the DMA 2000 requires that state and local governments develop, adopt, and routinely update a hazard mitigation plan to remain

<sup>1</sup> Federal Emergency Management Agency, Public Law 106-390. 2000. "Disaster Mitigation Act of 2000." Last modified September 26, 2013. <https://www.fema.gov/media-library/assets/documents/4596>.



eligible for pre- and post-disaster mitigation funding.<sup>2</sup> These funds include the Hazard Mitigation Grant Program (HMGP)<sup>3</sup>, Pre-Disaster Mitigation Program (PDM)<sup>4</sup>, and the Flood Mitigation Assistance Program (FMA)<sup>5</sup>. The Federal Emergency Management Agency (FEMA) administers these programs under the Department of Homeland Security.<sup>6</sup>

This plan was developed in accordance with current state and federal rules and regulations governing local hazard mitigation plans. The plan shall be monitored and updated on a routine basis to maintain compliance with the legislation – Section 322, Mitigation Planning, of the Robert T. Stafford Disaster Relief and Emergency Assistance Act, as enacted by Section 104 of the DMA 2000 (Public Law 106-390)<sup>7</sup> and by FEMA’s Final Rule (FR)<sup>8</sup> published in the Federal Register on November 30, 2007, at 44 Code of Federal Regulations (CFR) Part 201.

## Hazard Mitigation Assistance

On June 1, 2009, FEMA initiated the Hazard Mitigation Assistance (HMA) program integration, which aligned certain policies and timelines of the various mitigation programs. These HMA programs present a critical opportunity to minimize the risk to individuals and property from hazards while simultaneously reducing the reliance on federal disaster funds.<sup>9</sup>

Each HMA program was authorized by separate legislative actions, and as such, each program differs slightly in scope and intent.

*Mitigation is the cornerstone of emergency management. Mitigation focuses on breaking the cycle of disaster damage, reconstruction, and repeated damage. Mitigation lessens the impact disasters have on people's lives and property through damage prevention, appropriate development standards, and affordable flood insurance. Through measures such as avoiding building in damage-prone areas, stringent building codes, and floodplain management regulations, the impact on lives and communities is lessened.*

*- FEMA Mitigation Directorate*

- **HMGP:** To qualify for post-disaster mitigation funds, local jurisdictions must have adopted a mitigation plan that is approved by FEMA. HMGP provides funds to states, territories, Indian tribal governments, local governments, and eligible private non-profits following a presidential disaster declaration. The DMA 2000 authorizes up to seven percent of HMGP funds available to a state after a disaster to be used for the development of state, tribal, and local mitigation plans.
- **FMA:** To qualify to receive grant funds to implement projects such as acquisition or elevation of flood-prone homes, local jurisdictions must prepare a mitigation plan. Furthermore, local jurisdictions must be participating communities in the National Flood Insurance Program (NFIP). The goal of FMA is to reduce or eliminate claims under the NFIP.
- **PDM:** To qualify for pre-disaster mitigation funds, local jurisdictions must adopt a mitigation plan that is approved by FEMA. PDM assists states, territories, Indian tribal

<sup>2</sup>Federal Emergency Management Agency. June 2007. "Robert T. Stafford Disaster Relief and Emergency Assistance Act, as amended, and Related Authorities." Federal Emergency Management Agency 592: 22. Sec. 322. Mitigation Planning (42 U.S.C. 5165). [https://www.fema.gov/pdf/about/stafford\\_act.pdf](https://www.fema.gov/pdf/about/stafford_act.pdf).

<sup>3</sup> Federal Emergency Management Agency. "Hazard Mitigation Grant Program." Last modified September 19, 2018. <https://www.fema.gov/hazard-mitigation-grant-program>.

<sup>4</sup> Federal Emergency Management Agency. "Pre-Disaster Mitigation Grant Program." Last modified December 3, 2018. <https://www.fema.gov/pre-disaster-mitigation-grant-program>.

<sup>5</sup> Federal Emergency Management Agency. "Flood Mitigation Assistance Grant Program." Last modified December 3, 2018. <https://www.fema.gov/flood-mitigation-assistance-grant-program>.

<sup>6</sup> Federal Emergency Management Agency. "Hazard Mitigation Assistance." Last modified December 18, 2018. <https://www.fema.gov/hazard-mitigation-assistance>.

<sup>7</sup> Federal Emergency Management Agency: Federal Register. 2002. "Section 104 of Disaster Mitigation Act 2000: 44 CFR Parts 201 and 206: Hazard Mitigation Planning and Hazard Mitigation Grant Programs; Interim Final Rule." <https://www.fema.gov/pdf/help/fr02-4321.pdf>.

<sup>8</sup> Federal Emergency Management Agency: Federal Register. 2002 "44 CFR Parts 201 and 206: Hazard Mitigation Planning and Hazard Mitigation Grant Programs; Interim Final Rule." <https://www.fema.gov/pdf/help/fr02-4321.pdf>.

governments, and local governments in implementing a sustained pre-disaster hazard mitigation program.

## **Plan Financing and Preparation**

Regarding plan financing and preparation, in general, the UBBNRD is the “sub-applicant” that is the eligible entity that submits a sub-application for FEMA assistance to the “Applicant.” The “Applicant,” in this case is the State of Nebraska. If HMA funding is awarded, the sub-applicant becomes the “sub-grantee” and is responsible for managing the sub-grant and complying with program requirements and other applicable federal, state, territorial, tribal, and local laws and regulation.

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## Section Two: Planning Process

### Introduction

The process utilized to develop a hazard mitigation plan is often as important as the final planning document. For this planning process, the UBBNRD adapted the four-step hazard mitigation planning process outlined by FEMA to fit the needs of the participating jurisdictions. The following pages will outline how the Regional Planning Team was established; the function of the Regional Planning Team; critical project meetings and community representatives; outreach efforts to the general public; key stakeholders and neighboring jurisdictions; general information relative to the risk assessment process; general information relative to local/regional capabilities; plan review and adoption; and ongoing plan maintenance.

### Multi-Jurisdictional Approach

According to FEMA, “A multi-jurisdictional hazard mitigation plan is a plan jointly prepared by more than one jurisdiction.” The term ‘jurisdiction’ means ‘local government.’ Title 44 Part 201, Mitigation Planning in the CFR, defines a ‘local government’ as “any county, municipality, city, town, township, public authority, school district, special district, intrastate district, council of governments, regional or interstate government entity, or agency or instrumentality of a local government; any Indian tribe or authorized tribal organization, any rural community, unincorporated town or village, or other public entity.” For the purposes of this plan, a ‘taxing authority’ was utilized as the qualifier for jurisdictional participation. FEMA recommends the multi-jurisdictional approach under the DMA 2000 for the following reasons:

- It provides a comprehensive approach to the mitigation of hazards that affect multiple jurisdictions;
- It allows economies of scale by leveraging individual capabilities and sharing cost and resources;
- It avoids duplication of efforts; and
- It imposes an external discipline on the process.

Both FEMA and NEMA recommend this multi-jurisdictional approach through the cooperation of counties, regional emergency management, and natural resource districts. The UBBNRD utilized the multi-jurisdiction planning process recommended by FEMA (Local Mitigation Plan Review Guide<sup>10</sup>, Local Mitigation Planning Handbook<sup>11</sup>, and Mitigation Ideas: A Resource for Reducing Risk to Natural Hazards<sup>12</sup>) to develop this plan.

**Requirement §201.6(b):** *Planning process. 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;*

*(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; and*

*(3) Review and incorporation, if appropriate, of existing plans, studies, reports, and technical information.*

**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.*

<sup>10</sup> Federal Emergency Management Agency. 2011. “Local Mitigation Plan Review Guide.” [https://www.fema.gov/media-library-data/20130726-1809-25045-7498/plan\\_review\\_guide\\_final\\_9\\_30\\_11.pdf](https://www.fema.gov/media-library-data/20130726-1809-25045-7498/plan_review_guide_final_9_30_11.pdf).

<sup>11</sup> Federal Emergency Management Agency. 2013. “Local Mitigation Planning Handbook.” [https://www.fema.gov/media-library-data/20130726-1910-25045-9160/fema\\_local\\_mitigation\\_handbook.pdf](https://www.fema.gov/media-library-data/20130726-1910-25045-9160/fema_local_mitigation_handbook.pdf).

<sup>12</sup> Federal Emergency Management Agency. 2013. “Mitigation Ideas: A Resource for Reducing Risk to Natural Hazards.” [https://www.fema.gov/media-library-data/20130726-1904-25045-0186/fema\\_mitigation\\_ideas\\_final508.pdf](https://www.fema.gov/media-library-data/20130726-1904-25045-0186/fema_mitigation_ideas_final508.pdf).

## Hazard Mitigation Planning Process

The hazard mitigation planning process as outlined by FEMA has four general steps, which include: organization of resources; assessment of risks; development of mitigation strategies; and implementation and annual monitoring of the plan's progress. The mitigation planning process is rarely a linear process. It is characteristic of the process that ideas developed during the initial assessment of risks may need revision later in the process, or that additional information may be identified while developing the mitigation plan or during the implementation of the plan that results in new goals or additional risk assessments.

- Organization of Resources
  - Focus on the resources needed for a successful mitigation planning process. Essential steps include:
    - Organizing interested community members
    - Identifying technical expertise needed
- Assessment of Risks
  - Identify the characteristics and potential consequences of the hazard. Identify how much of the jurisdiction can be affected by specific hazards and the potential impacts on local assets.
- Mitigation Plan Development
  - Determine priorities and identify possible solutions to avoid or minimize the undesired effects. The result is a hazard mitigation plan and strategy for implementation.
- Plan Implementation and Progress Monitoring
  - Bring the plan to life by implementing specific mitigation projects and changing day-to-day operations. It is critical that the plan remains relevant to succeed. Thus, it is important to conduct periodic evaluations and revisions, as needed.

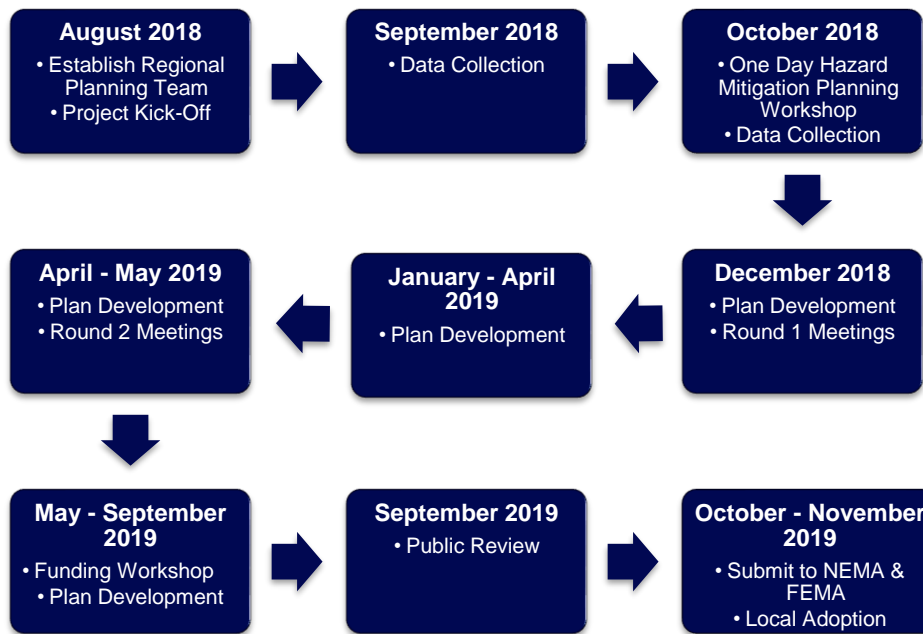
## Organization of Resources

### Plan Update Process

The UBBNRD secured funding for their multi-jurisdictional hazard mitigation plan (HMP) and then hired JEO Consulting Group, INC. (JEO) in July 2018 to guide and facilitate the planning process and assemble the multi-jurisdictional hazard mitigation plan. For the planning area, Rod DeBuhr (Assistant Manager with UBBNRD) led the development of the plan and served as the primary point-of-contact throughout the project.

The first activity in the development process for the UBBNRD HMP update and consolidation was coordination of efforts with local, state, and federal agencies and organizations. NeDNR and NEMA became involved in the planning process. UBBNRD and JEO worked together to identify elected officials and key stakeholders to lead the planning effort. A clear timeline of this plan update process is provided in Figure 2: Project Timeline.

Figure 2: Project Timeline



### Planning Team

At the beginning of the planning process the Planning Team, comprised of local participants and the consultant, was established to guide the planning process, review the existing plan, and serve as a liaison to plan participants throughout the planning area. A list of Planning Team members can be found in Table 4. Additional technical support was provided to the Planning Team by staff from NEMA and the NeDNR.

Table 4: Hazard Mitigation Planning Team

Name	Title	Jurisdiction
Rod DeBuhr	Assistant Manager	Upper Big Blue NRD
Jack Wergin	Projects Department Manager	Upper Big Blue NRD
Kirt Smith	Emergency Manager	Hamilton County
Gary Petersen	Emergency Manager	Seward/York Counties
*Jeff Henson	Project Manager	JEO Consulting Group, Inc.
*Phil Luebbert	Project Coordinator	JEO Consulting Group, Inc.
*Karl Dietrich	Junior Planner	JEO Consulting Group, Inc.
*Mary Baker	Resiliency Strategist	JEO Consulting Group, Inc.

\*Served as a consultant or advisory role

The first Planning Team meeting was held August 23<sup>rd</sup>, 2018 with the UBBNRD and JEO staff. The meeting provided an overview and discussion of the work to be completed over the next several months, including: whether to host a hazard mitigation workshop for plan participants; when and where to host public meetings; plan goals and objectives; discussion of what types of information would be needed to be collected for the HMP; and public outreach methods.

Table 5 shows the data and location of meetings held for Planning Team.

**Table 5: Meeting Locations and Times**

Location and Time	Agenda Items
<b>August 23<sup>rd</sup>, 2018</b>	
Upper Big Blue Natural Resources District (NRD) 319 East 25 <sup>th</sup> Street York, NE 12:30 PM	-Consultant responsibilities -Planning Team responsibilities -Dates/Locations for meetings -Plan Goals/Objectives -Workshop Details

**Public Involvement and Outreach**

At the beginning of the planning process, the Planning Team worked to identify stakeholder groups that could serve as “hubs of communication” throughout the planning process. A wide range of stakeholder groups were contacted and encouraged to participate. There were 44 stakeholders that were identified and sent letters to participate. These included three health departments/health clinics, sixteen assisted living facilities, three major employers, and nineteen fire and rescue departments. The following groups were invited to participate in the planning process.

**Table 6: Notified Stakeholder Groups**

Organizations		
Aurora Fire Department	Beaver Crossing Fire Department	Bee Fire Department
Benedict Fire Department	Brookdale Seward Heartland Park	Central District Health Department
Concordia University	Crestview Care Center	East Park Villa
Four Corners Health Department	Garland Fire Department	Giltner Fire Department
Goehner Fire Department	Greene Place	Gresham Fire Department
Hampton Fire Department	Henderson Care Center	Henderson Family Care
Henderson Fire Department	Hordville Fire Department	Hughes Brothers Inc.
Mahoney House	Marquette Fire Department	McCool Junction Fire Department
Memorial Community Care	Memorial Health Care Systems	Milford Fire Department
Nebraska Correctional Center for Women	Phillips Fire Department	Pleasant Dale Fire Department
Ridgewood Rehabilitation & Care Center	Rosewood Court	Seward Fire Department
Staplehurst Fire Department	Sunrise Country Manor	Tamora Fire Department
Tenneco Automotive	Utica Community Care Center	Utica Fire Department
Waco Fire Department	Westfield Quality Care of Aurora	Willow Brook Assisted Living
York Fire Department	York General Hearthstone	

Representatives from several fire departments and health centers attended meetings and provided input for their community section. See Section Seven: Participant Sections for the members of these organizations that joined their local planning team.

**Neighboring Jurisdictions**

Neighboring jurisdictions were notified and invited to participate in the planning process. The following table indicates which neighboring communities were notified of the planning process.



Letters were sent to county emergency managers and NRDs, at their respective jurisdictions and disseminated appropriately. Representatives from the Little Blue NRD and Region 44 Emergency Management attended project meetings. There was no other participation from jurisdictions outside of the planning area.

**Table 7: Notified Neighboring Jurisdictions**

Notified Nebraska Jurisdictions	
Adams County	Butler County
Central Platte NRD	Clay County
Fillmore County	Hall County
Lancaster County	Little Big Blue NRD
Lower Big Blue NRD	Lower Platte South NRD
Merrick County	Polk County
Saline County	Saunders County

**Participant Involvement**

Participants play a key role in reviewing goals and objectives, identifying hazards, providing a record of historical disaster occurrences and localized impacts, identification and prioritization of potential mitigation projects and strategies, and the development of annual review procedures.

To be a participant in the development of this plan update, jurisdictions were required to have at a minimum one representative present at the Round 1 and Round 2 meeting or attend a follow-up meeting with a member of the Planning Team. Some jurisdictions sent multiple representatives to meetings. For jurisdictions who had only one representative, they were encouraged to bring meeting materials back to their governing bodies, to include a diverse input on the meeting documents. Sign-in sheets from all public meetings can be found in *Appendix A*.

Jurisdictions that were unable to attend the scheduled public meetings were able to request a meeting with members of the Planning Team to satisfy the meeting attendance requirement. This effort enabled jurisdictions, which could not attend a scheduled public meeting, to participate in the planning process. Outreach to eligible jurisdictions included notification prior to all public meetings, phone calls, and email reminders of upcoming meetings, and invitations to complete surveys and worksheets required for the planning process. Table 8 provides a summary of outreach activities utilized in this process.

**Table 8: Outreach Activity Summary**

Action	Intent
Project Website	Informed the public and local/planning team members of past, current, and future activities ( <a href="https://jeo.com/upper-big-blue-hazard-mitigation-plan">https://jeo.com/upper-big-blue-hazard-mitigation-plan</a> )
Project Announcement	Project announcement posted on UBBNRD project website ( <a href="http://jeo.com/hazards/Upper Big Blue-hmp/">http://jeo.com/hazards/Upper Big Blue-hmp/</a> )
Hazard Mitigation Plan Workshop Letters (30-day notification)	Sent to potential participants to discuss the agenda/date/time/location of the plan workshop
Round 1 Meeting Letters (30-day notification)	Sent to potential participants and neighboring jurisdictions to discuss the agenda/dates/times/ locations of the first round of public meetings
Round 2 Meeting Letters (30-day notification)	Sent to participants to discuss the agenda/dates/times/locations of the second round of public meetings
Funding Workshop Letters (30-day notification)	Sent to participants to discuss the agenda/date/time/location of the funding workshop



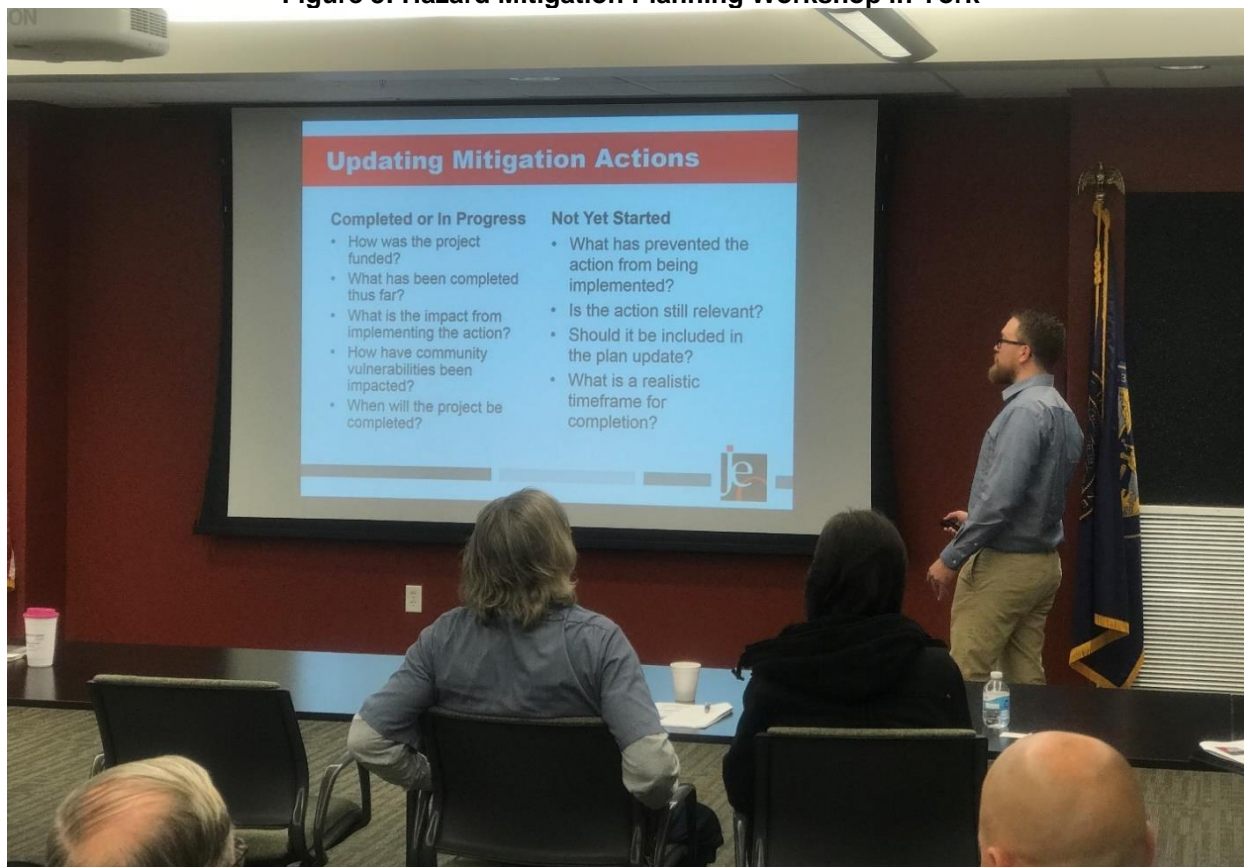
Action	Intent
Press Release	Sent to local newspapers to announce the plan and describe the purpose of the plan
Notification Phone Calls	Called potential participants to remind them about upcoming meetings
Follow-up Emails and Phone Calls	Correspondence was provided to remind and assist participating jurisdictions with the collection and submission of required local data
Project Flyer	Flyers were posted about the UBBNRD HMP and how to get involved. Flyers were posted at multiple locations throughout all counties
Word-of-Mouth	Staff discussed the plan with jurisdictions throughout the planning process

## Assessment of Risk

### HMP Workshop

A Hazard Mitigation Planning Workshop was held prior to the start of Round 1 meetings on October 16, 2018 at the Upper Big Blue NRD office. All jurisdictions within the planning area were invited to attend. The workshop enabled plan participants to better understand the hazard mitigation planning process. A tornado scenario table-top exercise kicked off the workshop. Participants were asked to assess jurisdictional vulnerabilities, identify vital economic sectors, review critical facilities and infrastructure, and consider alternatives to protect jurisdictional assets. The exercise was followed by an introduction to hazard mitigation, the risk assessment process, identifying mitigation actions, and the importance of public outreach. Table 9 provides a list of attendees, their titles, and the jurisdictions they represent.

Figure 3: Hazard Mitigation Planning Workshop in York



**Table 9: Planning Workshop Attendees**

Name	Title	Jurisdiction
Adam Darbro	Utilities Superintendent	City of Aurora
Amanda Wassinger	Staff Development/Infection Control	Ridgewood Rehabilitation & Care Center
Chris Wright	Maintenance Supervisor	Ridgewood Rehabilitation & Care Center
Don Olson	Board Chairperson	Village of Utica
Gary Petersen	Seward/York County Emergency Manager	York/Seward County
Jack Wergin	Projects Department Manager	Upper Big Blue NRD
Jeff Ball	Lead Engineering Tech	Upper Big Blue NRD
Jim Green	Zoning Administrator	Village of McCool Junction
Kirt Smith	Hamilton County Emergency Manager	Hamilton County
Mark Sullivan	Deputy EMA	Seward County
Dr. Matt Dominy	Director of Curriculum and Staff Development	Seward Public Schools
Matthew Rhodes	EHS Manager	Tenneco Automotive
Rich Nelson	Hamilton County Commissioner	Hamilton County
Rod DeBuhr	Assistant Manager	Upper Big Blue NRD
Scott Stuhr	Zoning Administrator	Hamilton County
Todd Bauder	Waco Village Board	Village of Waco
Twila Fuller	Clerk	Village of McCool Junction
Ronald Down	Security Director	Concordia University
Andrew Mills	Emergency Response Coordinator	Central District Health Department
Michael Lloyd	York Fire Chief	City of York
Ed Tjadea	York Police Department	City of York
Jim Dunbar	Fillmore County EMR	Fillmore County
KC Pawling	Highway Superintendent	Hamilton County
Chris Wright	-	Ridgewood Seward
Jeff Jensen	Superintendent	Central City Schools
Larry Paxson	Chair	Centennial School
Mike Yoder	Mayor	City of Henderson
Dave Kumar	-	City of Seward
Tanita Truester	-	Nebraska Department of Corrections
Mitch Dohrt	Maintenance Supervisor	City of York
Karl Dietrich	Intern	JEO Consulting Group
Dan Feuerbach	Planner	JEO Consulting Group
Phil Luebbert	Planner	JEO Consulting Group
Mary Baker	Planner	JEO Consulting Group

### Round 1 Meetings: Hazard Identification

At the Round 1 meetings, jurisdictional representatives (i.e. the local planning team) reviewed the hazards consistent with the 2014 Nebraska State Hazard Mitigation Plan to conduct further risk and vulnerability assessment based on these hazards' previous occurrence and the communities' exposure to the various hazards. (For a complete list of hazards reviewed, see *Section Four: Risk Assessment*.)

Table 10 shows the date and location of meetings held for the Round 1 meeting phase of the project.

**Table 10: Round 1 Meeting Dates and Locations**

Agenda Items	
General overview of the HMP planning process, discuss participation requirements, begin the process of risk assessment and impact reporting, update critical facilities, capabilities assessment, and status update on current mitigation projects	
Location and Time	Date
Seward Civic Center, Seward NE: 6:30PM	Monday, December 10 <sup>th</sup> , 2018
Upper Big Blue NRD, York NE: 6:30PM	Monday, December 17 <sup>th</sup> , 2018
Aurora Fire Department, Aurora NE: 6:30PM	Wednesday, December 19 <sup>th</sup> , 2018

The intent of these meetings was to familiarize the public and jurisdictional representatives with an overview of the work to be completed over the next several months, discuss the responsibilities of being a participant, as well as being a member of the planning team. There were two primary functions of this meeting, to update mitigation actions from the 2014/2015 Hazard Mitigation Plans, and to identify the top concerns from each jurisdiction. This was an opportunity to gather input on the identification of hazards, records of historical occurrences, establishment of goals and objectives, and potential mitigation projects from jurisdictional representatives (refer to *Appendices B*). In addition to the primary data collection objectives, representatives also identified critical facilities, and reviewed preliminary participant sections from each participant.

**Figure 4: Round 1 Meeting in Aurora**



**Table 11: Round 1 Meeting Attendees**

Name	Title	Jurisdiction
<b>Seward</b>		
Kendall Hoggins	-	City of Milford
Patrick Kelley	Mayor	City of Milford
Amanda O'Donnell	Village Board	Village of Gresham
James O'Donnell	Maintenance Supervisor/Assistant Fire Chief	Village of Gresham
Don Olson	Board Chairperson	Village of Utica
Nathan Baack	Board Member	Village of Utica

Name	Title	Jurisdiction
Gary Petersen	Seward/York County Emergency Manager	Seward/York County
Matt Stryson	Plant Engineer	Hughes Brothers Inc.
Kevin Novak	Director of Plant Operations	Tenneco
Jack Wergin	Projects Department Manager	Upper Big Blue NRD
Cody Meredith	Training Officer	Tamora Fire Department
Cheryl Runyan	Administrator	Crestview Care Center
Jon Propst	Fire Chief	Tamora Fire Department
Jamie Knisley	Fire Chief/Town Board	Village of Goehner
Alex Dodson	Town Board	Village of Goehner
Phil Luebbert	Planner	JEO Consulting Group
Karl Dietrich	Junior Planner	JEO Consulting Group
<b>York</b>		
Gary Petersen	Seward/York County Emergency Manger	Seward/York County
Jim Green	Zoning Administrator	Village of McCool Junction
Todd Bauder	Village Chair	Village of Waco
Michael Lloyd	Fire Chief	City of York
Casey Keim	Highway Superintendent	Seward County
Lisa Hurley	Executive Director	York County Development Corporation
Denis Ziemba	Emergency Manager	Region 44
Joseph Colburn	Vice President/Administrator	York General Hearthstone
Jack Wergin	Projects Department Manager	Upper Big Blue NRD
Harvey Keim	Highway Superintendent	York County
Monte Romohr	Fire Chief	Village of Gresham
Jack Sikes	County Commissioner	York County
Kelly Brooke	Village Clerk	Village of Benedict
Jerry Zieg	Village Board Chairman	Village of Beaver Crossing
Phil Luebbert	Planner	JEO Consulting Group
Karl Dietrich	Junior Planner	JEO Consulting Group
<b>Aurora</b>		
Kirt Smith	Emergency Manager	Hamilton County
Kent Will	Town superintendent	Village of Bradshaw
Susan Dallegge	Village Clerk	Village of Hampton
Ruby Skidmore	Board Member	Village of Marquette
Jack Wergin	Projects Department Manager	Upper Big Blue NRD
Jeff Jensen	Central City Schools	Central City Public Schools
John Miller	Director	Upper Big Blue NRD
K.C. Pawling	Highway Superintendent	Hamilton County
Jeff Hansen	Hampton Fire Department	Village of Hampton
DJ Frauendorfer	Marquette Fire Department	Village of Marquette
Rick Nelson	-	Hamilton County
Diane Keller	-	MCHI
Donnie Engelhardt	Assistant Manager	Little Blue NRD
Wayne Heine	Board	Centennial Public School
Levi Erickson	Capitan	Village of Hordville
Scott Star	Administrative Manager	Hamilton County
Laurie Andrews	Manager	MCHI
Elysabeth Kierl	Media and Communications Specialist	Little Blue NRD
Tom Cox	Aurora Fire Chief	City of Aurora



Name	Title	Jurisdiction
Phil Luebbert	Planner	JEO Consulting Group
Karl Dietrich	Junior Planner	JEO Consulting Group

**Table 12: Round 1 One-on-One Meeting Attendees**

Name	Title	Jurisdiction
<b>Village of Hordville</b>		
Scott Simonsen	Clerk	Village of Hordville
Phil Luebbert	Planner	JEO Consulting Group
<b>Village of Garland</b>		
Village Board Members	Village Board	Village of Garland
Phil Luebbert	Planner	JEO Consulting Group
<b>Village of Giltner</b>		
Joan Eastman	Clerk	Village of Giltner
Phil Luebbert	Planner	JEO Consulting Group
Karl Dietrich	Junior Planner	JEO Consulting Group
<b>Seward Public Schools</b>		
Dr. Matt Dominy	Director of Curriculum and Staff Development	Seward Public Schools
Dr. Josh Fields	Superintendent	Seward Public Schools
Phil Luebbert	Planner	JEO Consulting Group
Karl Dietrich	Intern	JEO Consulting Group
<b>City of Aurora</b>		
Adam Darbro	Utilities Superintendent	City of Aurora
Phil Luebbert	Planner	JEO Consulting Group
<b>City of Seward</b>		
Ed Gonzalez	Building/Zoning & Code Enforcement Director	City of Seward
Jake Vasa	City Engineer	City of Seward
Phil Luebbert	Planner	JEO Consulting Group
Karl Dietrich	Junior Planner	JEO Consulting Group
<b>City of York</b>		
Joe Frei	City Administrator	City of York
Phil Luebbert	Planner	JEO Consulting Group
Karl Dietrich	Junior Planner	JEO Consulting Group
<b>Village of Thayer</b>		
Linda Eschenweck	Village Clerk	Village of Thayer
Phil Luebbert	Planner	JEO Consulting Group
Karl Dietrich	Junior Planner	JEO Consulting Group
<b>Village of Bee</b>		
Resa Lavicky	Village Clerk	Village of Bee
Karl Dietrich	Junior Planner	JEO Consulting Group
<b>Village of Pleasant Dale</b>		
Leroy Trese	Village Board	Village of Pleasant Dale
Karl Dietrich	Junior Planner	JEO Consulting Group
<b>Village of Stockham</b>		
Berdon Klierer	Board Chairman	Village of Stockham
Karl Dietrich	Junior Planner	JEO Consulting Group
<b>City of Henderson</b>		
<i>See Appendix A for Henderson meeting attendees</i>		
Karl Dietrich	Junior Planner	JEO Consulting Group
Mary Baker	Resilience Strategist	JEO Consulting Group

Name	Title	Jurisdiction
<b>Village of Staplehurst</b>		
Sharon Reinmiller	Village Clerk	Village of Staplehurst
Karl Dietrich	Junior Planner	JEO Consulting Group
<b>Village of Cordova</b>		
Margie Johnson	Village Clerk	Village of Cordova
Karl Dietrich	Junior Planner	JEO Consulting Group
<b>Village of Phillips</b>		
Jim Crawford	Village Chairperson	Village of Phillips
Cathie Walker	Village Clerk	Village of Phillips
Karl Dietrich	Junior Planner	JEO Consulting Group

## Mitigation Plan Development

### Round 2 Meetings: Mitigation Strategies

The identification and prioritization of mitigation measures is an essential component in developing effective hazard mitigation plans. At the Round 2 meetings, participating jurisdictions identified new mitigation actions in addition to the mitigation actions continued from the 2014/2015 HMPs to address additional hazards of concern. Participating jurisdictions were also asked to review the information collected from the Round 1 meeting related to their community through this planning process. Local planning teams were asked to ensure all information included was up-to-date and accurate. Information/data reviewed include but was not limited to: local hazard prioritization results; identified critical facilities and their location within the community; concentrations of populations identified as 'highly vulnerable'; future development areas; and expected growth trends (refer to *Appendix B*).

There was also a brief discussion about the planning process, when the plan would be available for public review and comment, annual review of the plan, and the grant application process once the plan was approved. Table 13 shows the date and location of meetings held for the Mitigation Strategies phase of this project. Meeting attendees are identified in Table 14.

**Figure 5: Round 2 Meeting in Aurora**



**Table 13: Round 2 Meeting Dates and Locations**

Agenda Items	
Identify new mitigation actions, review of local data, discuss review process, complete plan integration tool.	
Location and Time	Date
Seward Civic Center, Seward NE: 6:30PM	Monday, April 29 <sup>th</sup> , 2019
Aurora Fire Department, Aurora NE: 6:30PM	Tuesday, April 30 <sup>th</sup> , 2019
Upper Big Blue NRD, York NE: 6:30PM	Wednesday, May 1 <sup>st</sup> , 2019

**Table 14: Round 2 Meeting Attendees**

Name	Title	Jurisdiction
<b>Seward</b>		
Nathan Baack	Board Member	Village of Utica
Edward Gonzalez	Building/Zoning & Code Enforcement Director	City of Seward
Leroy Trese	Village Board	Village of Pleasant Dale
Gary TeSelle	Utility Superintendent	City of Milford
Jack Wergin	Projects Department Manager	Upper Big Blue NRD
Cody Meredith	Training Officer	Tamora Fire Department
Gary Petersen	Emergency Manager	Seward/York County
Chris Ulrich	Board Member	Village of Garland
Donald Corner	Water Operator	Village of Bee
Sherri Slack	Trustee	Village of Bee
Alex Dodson	Trustee	Village of Bee
Scott Petersen	Fire Chief	Village of Beaver Crossing
Becky Paulsen	Zoning and Floodplain Administrator	Seward County
Mary Baker	Resilience Strategist	JEO Consulting Group
Karl Dietrich	Junior Planner	JEO Consulting Group
Phil Luebbert	Planner	JEO Consulting Group
<b>Aurora</b>		
Ruby Skidmore	Board Member	Village of Marquette
Susan Dallegge	Clerk	Village of Hampton
Joan Eastman	Clerk	Village of Giltner
Kent Will	Town Superintendent	Village of Bradshaw
Stephanie Metzger	Clerk	Village of Bradshaw
Jim Gordan	Board Chairperson	Village of Bradshaw
Rich Nelson	Hamilton County Commissioner	Hamilton County
Kirt Smith	Emergency Manager	Hamilton County
Jeff Jensen	Superintendent	Central City Public Schools
Berdon Kliever	Village Board Chairperson	Village of Stockham
Tom Cox	Fire Chief	City of Aurora
Denise Ziemba	Region 44 Emergency Manager	Merrick/Nance County
KC Pawling	Highway Superintendent	Hamilton County
Phil Luebbert	Planner	JEO Consulting Group
Karl Dietrich	Junior Planner	JEO Consulting Group
<b>York</b>		
Kelly Brooke	Clerk	Village of Benedict
Todd Bauder	Village Chair	Village of Waco
Jim Green	Zoning Administrator	Village of McCool Junction
Gary Petersen	Emergency Manager	Seward/York County
Jack Wergin	Projects Department Manager	Upper Big Blue NRD

Name	Title	Jurisdiction
Joe Frei	City Administrator	City of York
Donnie Engelhardt	Assistant Manager	Little Blue NRD
Elysabeth Kiel	Media & Communication Specialist	Little Blue NRD
Connie Brown	Clerk	City of Henderson
Sue Foutz	Village Board Member	Village of Thayer
Kurt Bulgrin	County Commissioner	York County
Benjamin Dennis	Zoning Administrator	York County
Kelsey Bergim	Executive Director	City of Henderson Chamber of Commerce
Tyler Newton	Fire Chief	Village of Bradshaw
Phil Luebbert	Planner	JEO Consulting Group
Karl Dietrich	Junior Planner	JEO Consulting Group

Table 15: Round 2 One-on-One Meeting Attendees

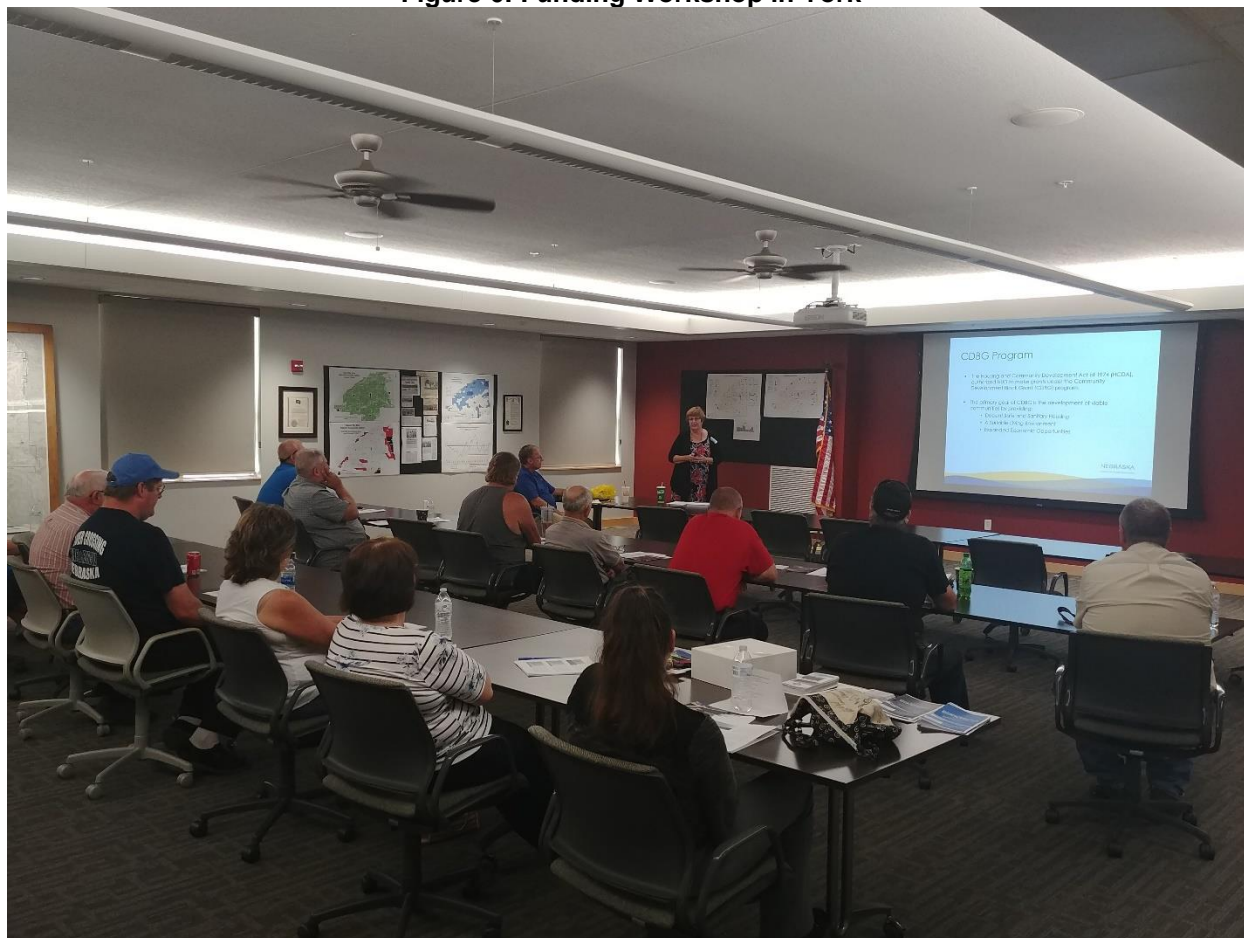
Name	Title	Jurisdiction
<b>Seward Public Schools</b>		
Dr. Matt Dominy	Director of Curriculum and Staff Development	Seward Public Schools
Dr. Josh Fields	Superintendent	Seward Public Schools
Phil Luebbert	Planner	JEO Consulting Group
Karl Dietrich	Junior Planner	JEO Consulting Group
<b>Village of Gresham</b>		
Amanda O'Donnell	Village Board Member	Village of Gresham
Karl Dietrich	Junior Planner	JEO Consulting Group
<b>Village of Hordville</b>		
Scott Simonsen	Village Clerk	Village of Hordville
Karl Dietrich	Junior Planner	JEO Consulting Group
<b>City of Aurora</b>		
Adam Darbro	Utilities Superintendent	City of Aurora
Karl Dietrich	Junior Planner	JEO Consulting Group
<b>Village of Staplehurst</b>		
Sharon Reinmiller	Village Clerk	Village of Staplehurst
Karl Dietrich	Junior Planner	JEO Consulting Group
<b>Village of Cordova</b>		
Margie Johnson	Village Clerk	Village of Cordova
Karl Dietrich	Junior Planner	JEO Consulting Group
<b>Village of Phillips</b>		
Jim Crawford	Village Chairperson	Village of Phillips
Cathie Walker	Village Clerk	Village of Phillips
Karl Dietrich	Junior Planner	JEO Consulting Group

### Funding Workshop

The focus of the Funding Workshop, held on August 7<sup>th</sup>, 2019 at the UBBNRD office in York, was to provide participating jurisdictions with information on potential funding sources that could be accessed in implementing the mitigation actions identified by each jurisdiction. To discuss funding strategies, multiple agencies were asked to provide information to local officials regarding grant, loan, and other funding programs that might be appropriate to assist with the project mitigation action implementation. The following table provides a list of agencies and entities that shared funding information.



**Figure 6: Funding Workshop in York**



**Table 16: Funding Agencies Present at Workshop**

Name	Agency	Funding Programs Reviewed
Janice Stopak	U.S. Department of Agriculture	Water and Waste Disposal Grants, Emergency Community Water Assistance Grants, Preliminary Planning Grants, Special Evaluation Assistance for Rural Communities and Household Grants, Technical Assistance and Training Grants/Solid Waste Management Grants, Household Water Well Systems Grant
Taryn Serwatowski	Nebraska Department of Environment and Energy	NDEE Brownfields, Voluntary Cleanup, Petroleum Title 200, Deconstruction Grants, State Revolving Fund
Kelly Gewecke	Nebraska Department of Economic Development	Community Development Block Grant
Mark Brohman	The Nebraska Environmental Trust	Nebraska Environmental Trust Awards

Table 17 provides a list of attendees, their titles and the jurisdictions they represent.

**Table 17: Funding Workshop Attendees**

Name	Title	Jurisdiction
Susan Dallegge	Village Clerk	Village of Hampton
Todd Bauder	Village Chair	Village of Waco
Jim Green	Zoning Administrator	Village of McCool Junction
Leroy Trese	Board Chairperson	Village of Pleasant Dale
Jerry Zieg	Board Chairperson	Village of Beaver Crossing
Gary TeSelle	Utility Superintendent	City of Milford
Jack Wergin	Projects Department Manager	UBBNRD
Rich Nelson	Hamilton County Commissioner	Hamilton County
Kirt Smith	Hamilton County EM	Hamilton County
Scott Peterson	Fire Chief	Village of Beaver Crossing
Gary Petersen	Seward/York EM	Seward/York County
James Gordon	Village Board Chairman	Village of Beaver Crossing
Joan Eastman	Village Clerk	Village of Giltner
Cheryl Kraft	Village Clerk	Village of Waco
Karl Dietrich	Junior Planner	JEO Consulting Group
Mary Baker	Resiliency Strategist	JEO Consulting Group

### Data Sources and Information

Effective hazard mitigation planning requires the review and inclusion of a wide range of data, documents, plans, and studies. The following table identifies many of the sources utilized during this planning process. Individual examples of plan integration are identified in *Section Seven: Participant Sections*.

**Table 18: General Plans, Documents, and Information**

Documents	Source
Disaster Mitigation Act of 2000 DMA	<a href="http://www.fema.gov/media-library/assets/documents/4596?id=1935">http://www.fema.gov/media-library/assets/documents/4596?id=1935</a>
Final Rule (2007)	<a href="https://www.fema.gov/media-library/assets/documents/23672">https://www.fema.gov/media-library/assets/documents/23672</a>
Local Mitigation Planning Handbook (2013)	<a href="https://www.fema.gov/media-library/assets/documents/31598">https://www.fema.gov/media-library/assets/documents/31598</a>
Hazard Mitigation Assistance Unified Guidance (2013)	<a href="https://www.fema.gov/media-library/assets/documents/103279">https://www.fema.gov/media-library/assets/documents/103279</a>
What is a Benefit: Guidance on Benefit-Cost Analysis on Hazard Mitigation Projects	<a href="http://www.fema.gov/benefit-cost-analysis">http://www.fema.gov/benefit-cost-analysis</a>
The Census of Agriculture (2012)	<a href="https://www.agcensus.usda.gov/Publications/2012/Full_Report/Census_by_State/Nebraska/">https://www.agcensus.usda.gov/Publications/2012/Full_Report/Census_by_State/Nebraska/</a>
National Flood Insurance Program Community Status Book (2018)	<a href="https://www.fema.gov/national-flood-insurance-program-community-status-book">https://www.fema.gov/national-flood-insurance-program-community-status-book</a>
Local Mitigation Plan Review Guide (2011)	<a href="https://www.fema.gov/media-library/assets/documents/23194">https://www.fema.gov/media-library/assets/documents/23194</a>
Plans/Studies	Source
Nebraska Drought Mitigation and Response Plan (2000)	<a href="http://carc.nebraska.gov/docs/NebraskaDrought.pdf">http://carc.nebraska.gov/docs/NebraskaDrought.pdf</a>
Flood Insurance Studies (where applicable)	<a href="http://www.fema.gov/floodplain-management/flood-insurance-study">http://www.fema.gov/floodplain-management/flood-insurance-study</a>
State of Nebraska Hazard Mitigation Plan (2014)	<a href="https://nema.nebraska.gov/sites/nema.nebraska.gov/files/doc/hazmitplan.pdf">https://nema.nebraska.gov/sites/nema.nebraska.gov/files/doc/hazmitplan.pdf</a>
Nebraska Geological Survey Landslide Study (2006)	<a href="http://snr.unl.edu/csd/surveyareas/geology.asp">http://snr.unl.edu/csd/surveyareas/geology.asp</a>

Section Two | Planning Process

Community Comprehensive Plans/Zoning and Subdivision Regulations	From respective communities
<b>Data Sources/Technical Resources</b>	<b>Source</b>
Federal Emergency Management Agency	<a href="http://www.fema.gov">http://www.fema.gov</a>
United States Department of Commerce	<a href="http://www.commerce.gov/">http://www.commerce.gov/</a>
National Oceanic Atmospheric Administration	<a href="http://www.noaa.gov/">http://www.noaa.gov/</a>
National Environmental Satellite, Data, and Information Service	<a href="http://www.nesdis.noaa.gov/">http://www.nesdis.noaa.gov/</a>
National Centers for Environmental Information	<a href="https://www.ncei.noaa.gov/">https://www.ncei.noaa.gov/</a>
Storm Prediction Center Statistics	<a href="http://www.spc.noaa.gov">http://www.spc.noaa.gov</a>
United States Geological Survey	<a href="http://www.usgs.gov/">http://www.usgs.gov/</a>
United States Department of Agriculture	<a href="http://www.usda.gov">http://www.usda.gov</a>
United States Department of Agriculture – Risk Assessment Agency	<a href="http://www.rma.usda.gov">http://www.rma.usda.gov</a>
National Agricultural Statistics Service	<a href="http://www.nass.usda.gov/">http://www.nass.usda.gov/</a>
High Plains Regional Climate Center	<a href="http://www.hprcc.unl.edu">http://www.hprcc.unl.edu</a>
United States Census Bureau	<a href="http://www.census.gov">http://www.census.gov</a>
	<a href="https://factfinder.census.gov/faces/nav/jsf/pages/index.xhtml">https://factfinder.census.gov/faces/nav/jsf/pages/index.xhtml</a>
National Consortium for the Study of Terrorism and Responses to Terrorism (START)	<a href="http://www.start.umd.edu/gtd/">http://www.start.umd.edu/gtd/</a>
National Flood Insurance Program	<a href="https://www.fema.gov/national-flood-insurance-program">https://www.fema.gov/national-flood-insurance-program</a>
	<a href="https://dnr.nebraska.gov/floodplain/flood-insurance">https://dnr.nebraska.gov/floodplain/flood-insurance</a>
National Flood Insurance Program Bureau and Statistical Agent	<a href="https://www.fema.gov/national-flood-insurance-program-bureau-statistical-agent-regional-support-offices">https://www.fema.gov/national-flood-insurance-program-bureau-statistical-agent-regional-support-offices</a>
FEMA Map Service Center	<a href="http://www.msc.fema.gov">http://www.msc.fema.gov</a>
National Drought Mitigation Center – Drought Monitor	<a href="http://drought.unl.edu/dm/monitor.html">http://drought.unl.edu/dm/monitor.html</a>
National Drought Mitigation Center – Drought Impact Reporter	<a href="http://www.droughtreporter.unl.edu">http://www.droughtreporter.unl.edu</a>
National Historic Registry	<a href="http://www.nps.gov/nr">http://www.nps.gov/nr</a>
Nebraska State Historical Society	<a href="http://www.nebraskahistory.org/histpres/index.shtml">http://www.nebraskahistory.org/histpres/index.shtml</a>
United States Small Business Administration	<a href="http://www.sba.gov">http://www.sba.gov</a>
Nebraska Emergency Management Agency	<a href="http://www.nema.ne.gov">http://www.nema.ne.gov</a>
Nebraska Climate Assessment Response Committee	<a href="http://carc.agr.ne.gov">http://carc.agr.ne.gov</a>
	<a href="http://reportcard.education.ne.gov/">http://reportcard.education.ne.gov/</a>

Nebraska Department of Education	<a href="http://educdirsrc.education.ne.gov/">http://educdirsrc.education.ne.gov/</a>
Nebraska Education Profile	<a href="http://nep.education.ne.gov/">http://nep.education.ne.gov/</a>
Nebraska Department of Natural Resources	<a href="http://www.dnr.ne.gov">http://www.dnr.ne.gov</a>
Nebraska Department of Natural Resource – Geographic Information Systems	<a href="http://dnrdata.dnr.ne.gov">http://dnrdata.dnr.ne.gov</a>
Nebraska Department of Natural Resources – Dam Inventory	<a href="http://dnrdata.dnr.ne.gov/Dams/Search.aspx?mode=county">http://dnrdata.dnr.ne.gov/Dams/Search.aspx?mode=county</a>
Nebraska Department of Natural Resources – Soils Data	<a href="http://www.dnr.ne.gov/databank/soilsall.html">http://www.dnr.ne.gov/databank/soilsall.html</a>
Natural Resources Conservation Service	<a href="http://www.ne.nrcs.usda.gov">www.ne.nrcs.usda.gov</a>
Nebraska Forest Service (NFS)	<a href="http://www.nfs.unl.edu/">http://www.nfs.unl.edu/</a>
Nebraska Forest Service – Wildland Fire Protection Program	<a href="http://nfs.unl.edu/fire">http://nfs.unl.edu/fire</a>
Nebraska Association of Resources Districts	<a href="http://www.nrdnet.org">http://www.nrdnet.org</a>
Nebraska Public Power District Service	<a href="http://econdev.nppd.com/">http://econdev.nppd.com/</a>
Nebraska Department of Revenue – Property Assessment Division	<a href="http://www.revenue.ne.gov/PAD">www.revenue.ne.gov/PAD</a>
UNL – College of Agricultural Sciences and Natural Resources – Schools of Natural Resources	<a href="http://casnr.unl.edu">http://casnr.unl.edu</a>
Nebraska Department of Natural Resources - Dam Inventory/Information	<a href="http://prodmaps2.ne.gov/html5DNR/?viewer=daminventory">http://prodmaps2.ne.gov/html5DNR/?viewer=daminventory</a>

## Public Review

Once the draft of the HMP was completed, a public review period was opened to allow for participants and community members at large to review the plan and provide comments and changes. The public review period was open from September 13, 2019 through October 14, 2019. Participating jurisdictions were mailed a letter notifying them of this public review period. The HMP was also made available on the project website (<https://jeo.com/upper-big-blue-hazard-mitigation-plan>) to download the document. Received comments and suggested changes were incorporated into the plan.

## Plan Adoption

Based on FEMA requirements, this multi-jurisdictional hazard mitigation plan must be formally adopted by each participant through approval of a resolution. This approval will create ‘individual ownership’ of the plan by each participant. Formal adoption provides evidence of a participant’s full commitment to implement the plan’s goals, objectives, and action items. Seward County has already formally adopted the hazard mitigation plan. A copy of the Seward County resolution and the resolution draft submitted to participating jurisdictions is located in *Appendix A*. Copies of adoption resolutions may be requested from the State Hazard Mitigation Officer.

**Requirement §201.6(c)(5):** For multi-jurisdictional plans, each jurisdiction requesting approval of the plan must document that it has been formally adopted.

Once adopted, participants are responsible for implementing and updating the plan every five years. Those who participated directly in the planning process would be logical champions for updating the plan. In addition, the plan will need to be reviewed and updated annually or when a hazard event occurs that significantly affects the area or individual participants.

### **Plan Implementation and Progress Monitoring**

Hazard mitigation plans need to be living documents. To ensure this, the plan must be monitored, evaluated, and updated on a five-year or less cycle. This includes incorporating the mitigation plan into county and local comprehensive or capital improvement plans as they stand or are developed. *Section Six* describes the system that jurisdictions participating in the UBBNRD HMP have established to monitor the plan; provides a description of how, when, and by whom the HMP process and mitigation actions will be evaluated; presents the criteria used to evaluate the plan; and explains how the plan will be maintained and updated.

## Section Three: Planning Area Profile

### Introduction

To identify jurisdictional vulnerabilities, it is vitally important to understand the people and built environment of the planning area. The following section is meant to provide a description of the characteristics of the planning area to create an overall profile. Many characteristics are covered in each jurisdiction's participant section, including: demographics; transportation routes; and structural inventory. Redundant information will not be covered in this section. Therefore, this section will highlight at-risk populations and characteristics of the built environment that add to regional vulnerabilities.

### Planning Area Geographic Summary

The UBBNRD is located in east central Nebraska and covers 2,865 square miles in Adams, Butler, Clay, Filmore, Hamilton, Polk, Saline, Seward, and York Counties. However, this plan will only cover Hamilton, Seward, and York Counties. The planning area is largely made up of two topographic regions: plains and valleys. Plains are represented by flat-lying land comprised of sandstone or stream-deposited silt, clay, sand, and gravel. Valleys are comprised of flat-lying land along major streams.

### At-risk Populations

In general, at-risk populations may have difficulty with medical issues, poverty, extremes in age, and communications due to language barriers. Several outliers may be considered when discussing potentially at-risk populations, including:

- Not all people who are considered “at-risk” are at-risk;
- Outward appearance does not necessarily mark a person as at-risk;
- A hazard event will, in many cases, impact at-risk populations in different ways.

The National Response Framework defines at-risk populations as “...populations whose members may have additional needs before, during, and after an incident in functional areas, including but not limited to: maintaining independence, communication, transportation, supervision, and medical care.”<sup>13</sup>

There are many school districts within the planning area. Schools house a high number of at-risk residents within the planning area during the daytime hours of weekdays, as well as during special events on evenings and weekends. The following table identifies the various school districts located within the planning area, and Figure 7 is a map of the school district boundaries. This list is comprehensive and does not represent only the school districts participating in this plan.

**Table 19: School Inventory**

School District	Total Enrollment (2017-2018)
Aurora Public Schools	1,251
Centennial Public Schools	454
Central City Public Schools	731
Crete Public Schools	2,045
Cross County Community Schools	373
Doniphan-Trumbull Public Schools	465

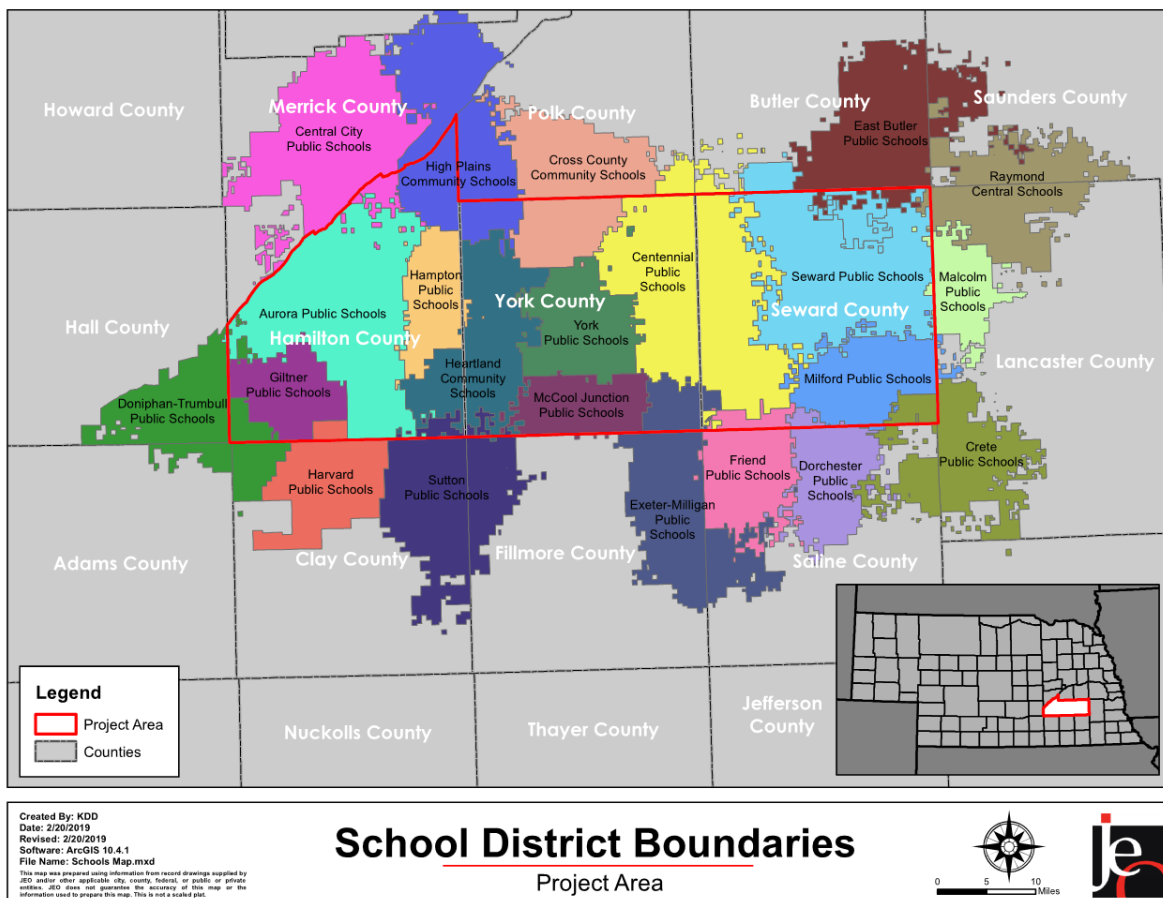
<sup>13</sup> United States Department of Homeland Security. June 2016. “National Response Framework Third Edition.” [https://www.fema.gov/media-library-data/1466014682982-9bcf8245ba4c60c120aa915abe74e15d/National\\_Response\\_Framework3rd.pdf](https://www.fema.gov/media-library-data/1466014682982-9bcf8245ba4c60c120aa915abe74e15d/National_Response_Framework3rd.pdf).



School District	Total Enrollment (2017-2018)
Dorchester Public Schools	201
East Butler Public Schools	306
Exeter-Milligan Public Schools	189
Friend Public Schools	260
Giltner Public Schools	177
Hampton Public Schools	165
Harvard Public Schools	276
Heartland Community Schools	327
High Plains Community Schools	225
Malcolm Public Schools	556
McCool Junction Schools	292
Milford Public Schools	754
Raymond Central Schools	688
Seward Public Schools	1,446
Sutton Public Schools	410
York Public Schools	1,356

Source: Nebraska Department of Education<sup>14</sup>

Figure 7: Regional School Districts



<sup>14</sup> Nebraska Department of Education. 2019. "Nebraska Education Profile." Accessed February 2019. <http://nep.education.ne.gov/>.

Like minors, seniors (age 65 and greater) are often more significantly impacted by temperature extremes. During prolonged heat waves, seniors may lack resources to effectively address the hazards and as a result may incur injury or potentially death. Prolonged power outages (either standalone events or as the result of other contributing factors) can have significant impacts on any citizen relying on medical devices for proper bodily functions. One study conducted by the Center for Injury Research and Policy found that increases in vulnerability related to severe winter storms (with significant snow accumulations) begin at age 55.<sup>15</sup> The study found that on average there are 11,500 injuries and 100 deaths annually related to snow removal. Males over the age of 55 are 4.25 times more likely to experience cardiac symptoms during snow removal.

While the previously identified populations do live throughout the planning area, there is the potential that they will be located in higher concentrations at care facilities. Table 20 identifies the number and capacity of care facilities throughout the planning area.

**Table 20: Inventory of Care Facilities**

Jurisdiction	Hospitals	Hospital Beds	Health Clinics	Adult Care Homes	Adult Care Beds	Assisted Living Homes	Assisted Living Beds
Hamilton County	1	12	0	2	114	1	38
Seward County	1	24	3	4	257	3	114
York County	2	38	1	3	171	3	112

Source: Nebraska Department of Health and Human Services<sup>16,17,18,19</sup>

In addition to residents being classified as at-risk by age, there are other specific groups within the planning area that experience vulnerabilities related to their ability to communicate or their economic status. Table 21 provide statistics per county regarding households with English as a second language and population reported as in poverty within the past 12 months.

**Table 21: At-Risk Population**

County	Percent That Speaks English as Second Language	Families Below Poverty Level
Hamilton County	3.2%	7.9%
Seward County	3.7%	4.7%
York County	4.8%	7.5%

Source: U.S. Census Bureau<sup>20,21</sup>

Residents who speak English as a second language may struggle with a range of issues before, during, and after hazard events. General vulnerabilities revolve around what could be an inability to effectively communicate with others or an inability to comprehend materials aimed at notification and/or education. When presented with a hazardous situation it is important that all community members be able to receive, decipher, and act on relevant information. An inability to understand warnings and notifications may prevent non-native English speakers from reacting in a timely manner. Further, educational materials related to regional hazards are most often

<sup>15</sup> Center for Injury Research and Policy. January 2011. "Snow Shoveling Safety." Accessed February 2019. <http://www.nationwidechildrens.org/cirp-snow-shoveling>.

<sup>16</sup> Department of Health and Human Services. 2019. "Assisted Living Facilities." <http://dhhs.ne.gov/publichealth/Licensure/Documents/ALF%20Roster.pdf>.

<sup>17</sup> Department of Health and Human Services. 2019. "Hospitals." <http://dhhs.ne.gov/publichealth/Licensure/Documents/Hospital%20Roster.pdf>.

<sup>18</sup> Department of Health and Human Services. 2019. "Long Term Care Facilities." <http://dhhs.ne.gov/publichealth/Licensure/Documents/LTCRoster.pdf>.

<sup>19</sup> Department of Health and Human Services. 2019. "Rural Health Clinic." [http://dhhs.ne.gov/publichealth/Licensure/Documents/RHC\\_Roster.pdf](http://dhhs.ne.gov/publichealth/Licensure/Documents/RHC_Roster.pdf).

<sup>20</sup> U.S. Census Bureau. 2018. "Language Spoken at Home: 2016 American Community Survey (ACS) 5-year estimates." <https://factfinder.census.gov/faces/nav/jsf/pages/searchresults.xhtml?refresh=#>.

<sup>21</sup> U.S. Census Bureau. 2018. "Selected Economic Characteristics: 2016 ACS 5-year estimate." <https://factfinder.census.gov/faces/nav/jsf/pages/searchresults.xhtml?refresh=#>.



developed in the dominant language for the area, for the planning area that would be English. Residents who struggle with English in the written form may not have sufficient information related to local concerns to effectively mitigate potential impacts. Residents with limited English proficiency would be at an increased vulnerability to all hazards within the planning area.

Residents below the poverty line may lack resources to prepare for, respond to, or recover from hazard events. Residents with limited economic resources will struggle to prioritize the implementation of mitigation measures over more immediate needs. Further, residents with limited economic resources are more likely to live in older, more vulnerable structures. These structures could be: mobile homes; located in the floodplain; located near know hazard sites (i.e. chemical storage areas); or older poorly maintained structures. Residents below the poverty line will be more vulnerable to all hazards within the planning area.

### Built Environment and Structural Inventory

The US Census provides information related to housing units and potential areas of vulnerability. The selected characteristics examined in Table 22 include: lacking complete plumbing facilities; lacking complete kitchen facilities; no telephone service available; housing units that are mobile homes; and housing units with no vehicles.

**Table 22: Selected Housing Characteristics**

	Hamilton County	Seward County	York County	Total
<b>Occupied housing units</b>	<b>3,705 (91.8%)</b>	<b>6,348 (90.8%)</b>	<b>5,670 (90.4%)</b>	<b>15,723</b>
Lacking complete plumbing facilities	0.9%	0.7%	0.1%	<b>0.5%</b>
Lacking complete kitchen facilities	1.3%	2.0%	1.3%	<b>1.6%</b>
No telephone service available	1.3%	1.2%	2.5%	<b>1.7%</b>
Housing unit with no vehicles available	2.7%	4.2%	4.9%	<b>4.1%</b>
Mobile Homes	4.8%	3.2%	3.5%	<b>4.0%</b>

*Indicated percentages are determined based on total housing units  
Source: U.S. Census Bureau, 2018<sup>22</sup>*

Approximately 1.7 percent of housing units lack access to landline telephone service. This does not necessarily indicate that there is not a phone in the housing unit, as cellular telephones are increasingly a primary form of telephone service. However, this lack of access to landline telephone service does represent a population at increased risk to disaster impacts. Reverse 911 systems are designed to contact households via landline services and as a result, some homes in hazard prone areas may not receive notification of potential impacts in time to take protective actions. Emergency managers should continue to promote the registration of cell phone numbers with Reverse 911 systems.

Four percent of housing units in the planning area are mobile homes. Mobile homes have a higher risk of sustaining damages during high wind events, tornadoes, severe thunderstorms, and severe winter storms. Mobile homes that are either not anchored or are anchored incorrectly can be

<sup>22</sup> U.S. Census Bureau. 2018. "Selected Housing Characteristics: 2016 ACS 5-year estimate." <https://factfinder.census.gov/faces/nav/jsf/pages/searchresults.xhtml?refresh=t#>.

overturned by 60 mph winds. A thunderstorm is classified as severe when wind speeds exceed 58 mph, placing improperly anchored mobile homes at risk.

Furthermore, approximately four percent of all housing units do not have a vehicle available. Households without vehicles may have difficulty evacuating during a hazardous event and a reduced ability to access resources in time of need.

**State and Federally Owned Properties**

The following table provides an inventory of state and federally-owned properties within the planning area by county.

**Table 23: State and Federally-Owned Facilities**

Facility	Nearest Community
<b>Hamilton County</b>	
California National Historic Trail	Phillips
Nelson Waterfowl Production Area	Stockham
Troester Waterfowl Production Area	Hampton
Pintail Wildlife Management Area	Aurora
Deep Well Wildlife Management Area	Phillips
Springer Waterfowl Production Area	Phillips
Gadwall Wildlife Management Area	Aurora
<b>Seward County</b>	
Blue River State Recreation Area	Milford
North Lake Basin Wildlife Management Area	Utica
Shypoke Wildlife Management Area	Utica
Freeman Lakes Waterfowl Production Area	Utica
Tamora Waterfowl Production Area	Goehner
Straight Water Wildlife Management Area	Goehner
Oak Glen Wildlife Management Area	Garland
Branched Oak Wildlife Management Area	Garland
Bur Oak Wildlife Management Area	Seward
Twin Lakes Wildlife Management Area	Pleasant Dale
<b>York County</b>	
Heron Waterfowl Production Area	Benedict
Renquist Basin Wildlife Management Area	Benedict
Freeman Lakes Waterfowl Production Area	Waco
Waco Basin Waterfowl Production Area	Waco
Spikerush Wildlife Management Area	Waco
Marsh Duck Wildlife Management Area	Waco
Kirkpatrick Basin North Wildlife Management Area	York
Kirkpatrick Basin South Wildlife Management Area	Henderson
Sinnigner Waterfowl Production Area	McCool Junction
County Line Marsh Waterfowl Production Area	McCool Junction
Hidden Marsh Wildlife Management Area	McCool Junction

Source: Nebraska Game & Parks,<sup>23</sup> U.S National Park Service<sup>24</sup>

**Historic Places**

According to the National Register of Historic Places for Nebraska by the National Park Service (NPS), there are 20 historic sites located within the planning area by county.

<sup>23</sup> Nebraska Game and Parks. 2019. "Public Access ATLAS." <https://maps.outdoornebraska.gov/PublicAccessAtlas/>.  
<sup>24</sup> U.S National Park Service. 2019. "Parks". <https://www.nps.gov/state/ne/index.htm>.

**Table 24: Historic Places**

Site Name	Address	Date Listed	In Floodplain?
<b>Hamilton County</b>			
United Brethren Church	1103 K St. Aurora, NE	12/3/2008	No
Temple Craft Building	1127 12 <sup>th</sup> St. Aurora, NE	11/12/2014	No
Hamilton County Courthouse	Courthouse Sq. Aurora, NE	7/29/1985	No
Peterson House	1121 9 <sup>th</sup> St. Aurora, NE	11/29/1991	No
Opera House	N. 3 <sup>rd</sup> and B St. Hampton, NE	9/28/1988	No
St. John's Evangelical Lutheran Church	2170 N. T Rd. Marquette, NE	11/13/1992	No
<b>Seward County</b>			
States Ballroom	Off NE 415 Bee, NE	10/14/1981	No
Germantown Bank Building	Main St. Garland, NE	12/13/1984	No
Troyer Site	Address Restricted Milford, NE	3/8/1995	Unknown
Hughes House	W. Hillcrest St. Seward, NE	9/13/1978	No
Seward County Courthouse Square Historic District	Roughly by Jackson, 7 <sup>th</sup> and South St. Seward, NE	7/15/1982	No
Seward County Courthouse	Seward between 5 <sup>th</sup> and 6 <sup>th</sup> St. Seward, NE	1/10/1990	No
Harry T. Jones House	136 N. Columbia Ave. Seward, NE	11/28/1990	No
John and Philomena Sand Zimmerer House	316 N. 6 <sup>th</sup> St. Seward, NE	2/25/1993	No
Our Redeemer Lutheran Church of Marysville	SW of Staplehurst, NE	6/25/1982	No
<b>York County</b>			
Jeffery W. S. Farmstead	W of Benedict, NE	7/26/1982	No
Bradshaw Town Hall	Off US 34 Bradshaw, NE	5/31/1984	No
Clem's Opera House	Main and Post St. Gresham, NE	9/28/1988	No
York Public Library	306 E. 7 <sup>th</sup> St. York NE	12/4/1990	No
York Subway	14 <sup>th</sup> and 15 <sup>th</sup> St. and BNR tracks over US 81 York, NE	6/29/1992	No

Source: National Park Service<sup>25</sup><sup>25</sup> National Park Service. "National Register Database and Research." Accessed October 2018. <https://www.nps.gov/subjects/nationalregister/database-research.htm>.

## Section Four: Risk Assessment

### Introduction

The ultimate purpose of this hazard mitigation plan is to minimize the loss of life and property across the planning area. The basis for the planning process is the regional and local risk assessment. This section contains a description of potential hazards, regional vulnerabilities and exposures, probability of future occurrences, and potential impacts and losses. By conducting a regional and local risk assessment, participating jurisdictions can develop specific strategies to address areas of concern identified through this process. The following table defines terms that will be used throughout this section of the plan.

**Table 25: Term Definitions**

Term	Definition
Hazard	A potential source of injury, death, or damages
Asset	People, structures, facilities, and systems that have value to the community
Risk	The potential for damages, loss, or other impacts created by the interaction of hazards and assets
Vulnerability	Susceptibility to injury, death, or damages to a specific hazard
Impact	The consequence or effect of a hazard on the community or assets
Historical Occurrence	The number of hazard events reported during a defined period of time
Extent	The strength or magnitude relative to a specific hazard
Probability	Likelihood of a hazard occurring in the future

### Methodology

The risk assessment methodology utilized for this plan follows the risk assessment methodology outlined in the FEMA Local Mitigation Planning Handbook. This process consists of four primary steps: 1) Describe the hazard; 2) Identify vulnerable community assets; 3) Analyze risk; and 4) Summarize vulnerability.

When describing the hazard, this plan will examine the following items: previous occurrences of the hazard within the planning area; locations where the hazard has occurred in the past or is likely to occur in the future; extent of past events and likely extent for future occurrences; and probability of future occurrences. While the identification of vulnerable assets will be conducted across the entire planning area, *Section Seven* will include discussion of community-specific assets at risk for relevant hazards. Analysis for regional risk will examine

**Requirement §201.6(c)(2):** Risk assessment. 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.

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

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

**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):** The risk assessment] must also address National Flood Insurance Program (NFIP) insured structures that have been repetitively damaged floods.

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

**Requirement §201.6(c)(2)(iii):** For multi-jurisdictional plans, the risk assessment must assess each jurisdiction's risks where they vary from the risks facing the entire planning area.

historic impacts and losses and what is possible should the hazard occur in the future. Risk analysis will include both qualitative (i.e. description of historic or potential impacts) and quantitative data (i.e. assigning values and measurements for potential loss of assets). Finally, each hazard identified the plan will provide a summary statement encapsulating the information provided during each of the previous steps of the risk assessment process.

For each of the hazards profiled the best and most appropriate data available will be considered. Further discussion relative to each hazard is discussed in the hazard profile portion of this section.

### Average Annual Damages and Frequency

FEMA **Requirement §201.6(c)(2)(ii) (B)** suggests that when the appropriate data is available, hazard mitigation plans should also provide an estimate of potential dollar losses for structures in vulnerable areas. This risk assessment methodology includes an overview of assets at risk and provides historic average annual dollar losses for all hazards for which historic event data is available. Additional loss estimates are provided separately for those hazards for which sufficient data is available. These estimates can be found within the relevant hazard profiles.

Average annual losses from historical occurrences can be calculated for those hazards for which there is a robust historic record and for which monetary damages are recorded. There are three main pieces of data used throughout this formula.

- **Total Damages in Dollars:** This is the total dollar amount of all property damages and crop damages as recorded in federal, state, and local data sources. The limitation to these data sources is that dollar figures usually are estimates and often do not include all damages from every event, but only officially recorded damages from reported events.
- **Total Years of Record:** This is the span of years there is data available for recorded events. Vetted and cleaned up National Centers for Environmental Information (NCEI) data is available for January 1996 to April 2017. Although some data is available back to 1950, this plan update only utilizes the more current and more accurate data available. Wildfire data is available from the Nebraska Forest Service from 2000 to 2014.
- **Number of Hazard Events:** This shows how often an event occurs. The frequency of a hazard event will affect how a community responds. A thunderstorm may not cause much damage each time, but multiple storms can have an incremental effect on housing and utilities. In contrast, a rare tornado can have a widespread effect on a city.

An example of the Event Damage Estimate is found below:

$$\text{Annual Frequency (\#)} = \frac{\text{Total Events Recorded (\#)}}{\text{Total Years of Record (\#)}}$$

$$\text{Annual Damages (\$)} = \frac{\text{Total Damages in Dollars (\$)}}{\text{Total Years Recorded (\#)}}$$

Each hazard will be included, while those which have caused significant damages or occurred in significant numbers are discussed in detail. It should be noted NCEI data is not all inclusive and it provides very limited information on crop losses. To provide a better picture of the crop losses associated with the hazards within the planning area, crop loss information provided by the Risk Management Agency (RMA) of the USDA was also utilized for this update of the plan. The collected data was from 2000 to 2017. Data for all the hazards are not always available, so only those with an available dataset are included in the loss estimation.

## Hazard Identification

The identification of relevant hazards for the planning area began with a review of the 2014 State of Nebraska Hazard Mitigation Plan. The Regional Planning Team and participating jurisdictions reviewed the list of hazards addressed in the state mitigation plan and determined which hazards were appropriate for discussion relative to the planning area. The hazards for which a risk assessment was completed are included in the following table.

**Table 26: Hazards Addressed in the Plan**

Hazards Addressed in the Plan		
Agricultural Disease (Animal and Plant)	Extreme Heat	Severe Thunderstorms
Chemical Spills – Fixed Sites	Flooding	Severe Winter Storms
Chemical Spills – Transportation	Grass/Wildfires	Terrorism
Dam Failure	Hail	Tornadoes
Drought	High Winds	
Earthquakes	Levee Failure	

## Hazard Elimination

Given the location and history of the planning area, the hazards listed below were eliminated from further review. An explanation of why the hazards were eliminated is also provided.

**Avalanche:** No historic occurrence; due to topography of the planning area this type of hazard has a very low probability of future occurrence.

**Civil Disorder:** For the entire state, there have been a small number of civil disorder events reported, most date back to the 1960s. The absence of civil unrest in recent years does not necessarily indicate there will not be events in the future, but there are other planning mechanisms in place to address this concern. This approach is consistent with the 2014 Nebraska State Hazard Mitigation Plan.

**Coastal Erosion:** While it is likely that the planning area will be impacted by a changing climate there is no coast line located in the planning area. This hazard has been eliminated for this reason.

**Expansive Soils:** Consistent with the 2014 Nebraska State HMP, this hazard has been eliminated from further examination. There is not sufficient data available to examine historic impacts or project future probability or losses. Any impact from expansive soils in Nebraska (and the planning area) are likely to be manifested as localized flooding and will be reported as such. This approach is consistent with the 2014 Nebraska State HMP.

**Hurricane:** Given the location of the planning area in the central plains, hurricanes are not expected to occur. This is supported by the historical record.

**Land Subsistence (Sinkholes):** Land subsistence is common in areas of karst topography; there are no recognized areas of true karst topography in planning area or even in Nebraska. This approach is consistent with the 2014 Nebraska State HMP.

**Landslides:** While there is data available related to landslides in the planning area and across the state, the database has not been maintained in recent years. Further, landslides that have occurred (across the state) have not resulted in reported damages. The following table outlines



the number of recorded landslide events that have occurred in the planning area. This is consistent with the 2014 Nebraska State HMP.

**Table 27: Known Landslides in the Planning Area by County**

County	Number of Landslides	Total Estimated Damages
Hamilton County	0	\$0
Seward County	0	\$0
York County	0	\$0

Source: Nebraska Hazard Mitigation Plan, 2014<sup>26</sup>

**Radiological Fixed Site:** Both state and local agencies have developed appropriate and extensive plans and protocols relative to the two nuclear facilities located in the state. The existing plans and protocols are reviewed, updated, and exercised on a regular basis. Due to the extensive planning and regulations related to this threat it will not be further profiled in this plan. This approach is consistent with the 2014 Nebraska State HMP.

**Radiological Transportation:** There have been no incidents reported in the planning area or the state that have required assistance beyond what is considered regular roadside services. Further, the transportation of radiological materials is heavily regulated and monitored. There are other plans across the state that have thoroughly addressed this threat, therefore it will not be further profiled for this plan. This approach is consistent with the 2014 Nebraska State HMP.

**Tsunami:** Given the location of the planning area in the central plains, tsunami are not expected to occur. This is supported by the historical record.

**Urban Fire:** The following table provides the data available from the Nebraska State Fire Marshal relevant for the planning area. The provided data suggests that the planning area has and will continue experience fires in urban areas. Fire departments within the planning area have mutual aid agreements in place to address this threat, typically this hazard is addressed through existing plans and resources. Urban fire will not be fully profiled for this plan. Discussion relative to fire will be focused on wildfire and the potential impacts they could have on the built environment. This approach is consistent with the 2014 Nebraska State HMP.

**Table 28: Urban Fire Incidents**

Fire Department	Number of Urban Fire Incidents						Total
	2007	2008	2009	2010	2011	2012	
<b>Hamilton County</b>							
Aurora Volunteer Fire Department	120	181	134	115	157	164	871
Giltner Rural Fire Department	0	22	14	0	0	0	36
Hampton Volunteer Fire Department	0	1	0	0	0	0	1
Marquette Volunteer Fire and Rescue	4	3	13	2	1	0	23
Phillips Volunteer Fire Department	26	43	35	26	52	56	238
<b>Seward County</b>							
Cordova Volunteer Fire Department	12	7	5	9	6	7	46

<sup>26</sup> Nebraska Emergency Management Agency. 2014. "State of Nebraska Hazard Mitigation Plan."

Fire Department	Number of Urban Fire Incidents						Total
	2007	2008	2009	2010	2011	2012	
Garland Volunteer Fire Department	6	1	0	16	0	0	23
Milford Volunteer Fire Department	15	10	1	0	15	23	64
Tamora Volunteer Fire Department	0	0	9	0	0	0	9
Utica Volunteer Fire Department	2	0	0	1	0	0	3
<b>York County</b>							
Bradshaw Volunteer Fire Department	17	2	0	0	3	0	22
Gresham Volunteer Fire Department	28	33	0	0	26	0	87
Henderson Fire and Rescue	0	2	0	0	0	0	2
Waco Volunteer Fire Department	15	9	15	15	16	11	81
York Volunteer Fire Department	1,003	1,066	1,068	1,084	1,102	1,099	6,422

Source: NFIRS National Reporting System<sup>27</sup>

**Volcano:** Given the location of the planning area, volcanic activity is not expected to occur. This is supported by the historical record.

### Hazard Assessment Summary Tables

The following table provides an overview of the data contained in the hazard profiles. Hazards listed in this table and throughout the section are in alphabetical order. This table is intended to be a quick reference for people using the plan and does not contain source information. Source information and full discussion of individual hazards are included later in this section.

<sup>27</sup> Department of Homeland Security, Federal Emergency Management Agency, U.S. Fire Administration. 2018. "National Fire Incident Reporting System." <https://www.nfirs.fema.gov/>.



Table 29: Regional Risk Assessment

Regional Risk Assessment			
Hazard	Previous Occurrence Events/Years	Approximate Annual Probability	Likely Extent
Agricultural Animal Disease	29/4	100%	Unavailable
Agricultural Plant Disease	27/18	100%	Unavailable
Chemical Fixed Sites	40/18	100%	233 Gallons
Chemical Transportation	48/48	100%	2,080 Gallons
Dam Failure	0/106	<1%	Inundation of floodplain downstream from dam
Drought	412/1,465 months	28%	D1-D2
Earthquakes	0/120	<1%	<5.0
Extreme Heat	Avg. 5 days/year	100%	>99°
Flooding	55/22	100%	Some inundation of structures and roads near streams. Some evacuations of people may be necessary
Grass/Wildfires	701/18	100%	10 acres
Hail	435/22	100%	H2-H5
High Winds	59/22	100%	49 avg kts
Levee Failure	0/66	1%	Some inundation of structures in the protected levee area
Severe Thunderstorms	253/22	100%	57 avg kts winds
Severe Winter Storms	218/22	100%	20-40°below zero (wind chills) 0-6" snow 25-35 mph winds
Terrorism/Civil Disorder	0/49	<1%	Undefined
Tornadoes	52/22	100%	EF0

The following table provides loss estimates for hazards with sufficient data. Detailed description of major events is included in *Section Seven: Participant Sections*.

Table 30: Loss Estimation for the Planning Area

Hazard Type		Count	Property	Crop <sup>3</sup>
Agricultural Disease	Animal Disease <sup>2</sup>	29	180 Animals	N/A
	Plant Disease <sup>3</sup>	27	N/A	\$741,503
Chemical Spills – Transportation <sup>7</sup>		48	\$1,888,548	N/A
Chemical Spills – Fixed Site <sup>5</sup> <i>6 injuries</i>		40	\$0	N/A
Dam Failure <sup>6</sup>		0	\$0	N/A
Drought <sup>11</sup>		412/1,485 months	\$0	\$51,929,000
Extreme Heat <sup>10</sup>		Avg. 5 days year	\$0	\$9,925,664
Earthquake <sup>8</sup>		0	\$0	N/A
Flooding <sup>1</sup>	Flash Flood	31	\$5,130,000	\$461,087
	Flood	24	\$1,222,000	
Grass/Wildfires <sup>4</sup> <i>5 injuries, 1 fatality</i>		701	\$150,000	\$28,075 <sup>4</sup>
Hail <sup>1</sup> Average: 1.22 in Range: 0.75 – 7.0 in		435	\$8,764,000	\$30,991,310
High Winds <sup>1</sup> Average: 49 kts Range: 35 – 69 kts <i>5 injuries</i>		59	\$1,283,000	\$4,269,741
Levee Failure <sup>9</sup>		0	N/A	N/A
Severe Thunderstorms <sup>1</sup>	Thunderstorm Wind Average: 57 kts Range: 35-69 kts <i>6 injuries</i>	194	\$5,534,500	N/A
	Heavy Rain	51	\$305,000	\$7,442,720
	Lightning <i>1 injury</i>	8	\$437,000	N/A
Severe Winter Storms <sup>1</sup>	Blizzard	21	\$35,000	\$490,925
	Extreme Cold/Wind Chill	8	\$0	
	Heavy Snow	10	\$2,000,000	
	Ice Storm	20	\$5,165,000	
	Winter Storm <i>1 fatality</i>	120	\$660,000	
Winter Weather		39	\$340,000	
Terrorism/Civil Disorder <sup>12</sup>		0	\$0	N/A
Tornadoes <sup>1</sup> Average: EF1 Range: EF0-EF4		52	\$15,271,000	\$427,788
		<b>2,073</b>	<b>\$48,185,048</b>	<b>\$106,700,646</b>

N/A: Data not available

1 NCEI (January 1996-December 2017)

2 NDA (2014-2017)

3 USDA RMA (2000-2017)

4 NFS (2000 to December 2017)

5 U.S. Coast Guard NRC (1990- January 2018)

6 Stanford National Performance of Dams Program (NPDP) (1911-2016)

- 7 PHMSA (1971- January 2018)
  - 8 USGS (1872-2018)
  - 9 United States Army Corps of Engineers (2010)
  - 10 HPRCC (1901-2018)
  - 11 NCDC (1895 – Sept 2018)
  - 12 START (1970 – October 2018)
- in. = inches; kts = Knots

## Historical Disaster Declarations

The following tables show past disaster declarations that have been granted within the planning area.

### Farm Service Agency Small Business Administration Disasters

The U.S. Small Business Administration (SBA) was created in 1953 as an independent agency of the federal government to aid, counsel, assist, and protect the interests of small business concerns, to preserve free competitive enterprise, and maintain and strengthen the overall economy of our nation. A program of the SBA includes disaster assistance for those affected by major natural disasters. The following table summarizes the SBA Disasters involving the planning area in the last decade.

**Table 31: SBA Declarations**

Disaster Declaration Number	Declaration Date	Description	Primary Counties	Contiguous Counties
NE-00002	6/23/2005	Severe Storms and Flooding	Hamilton, Seward, York	-
NE-00011	1/7/2007	Severe Winter Storms	Hamilton, Seward, York	-
NE-00020	6/20/2008	Severe Storms, Tornadoes, and Flooding	-	Seward, York
NE-00021	6/20/2008	Severe Storms, Tornadoes, and Flooding	Hamilton, Seward, York	-
NE-00027	7/31/2009	Severe Storms, Tornadoes, and Flooding	Hamilton	-
NE-00033	2/25/2010	Severe Winter Storms and Snowstorm	Hamilton, Seward, York	-
NE-00035	4/21/2010	Severe Storms, Ice Jams, and Flooding	Seward, York	-
NE-00044	8/12/2011	Severe Storms, Tornadoes, Straight-line Winds, and Flooding	Hamilton, York	-
NE-00048	3/25/2013	Drought	-	Hamilton
NE-00049	4/1/2013	Drought	-	Hamilton
NE-00050	4/8/2013	Drought	Hamilton, York	Seward

Disaster Declaration Number	Declaration Date	Description	Primary Counties	Contiguous Counties
NE-00051	4/15/2013	Drought	Seward	Hamilton, York
NE-00053	12/10/2013	Drought	Hamilton, Seward, York	-
NE-00057	5/30/2014	Severe Weather and a Tornado	Seward	York
NE-00060	6/17/2014	Severe Storms, Tornadoes, Straight-line Winds, and Flooding	Seward, York	-
NE-00063	7/28/2014	Tornadoes, Straight-line Winds, and Flooding	Hamilton	-
NE-00064	5/27/2015	Severe Storms, Tornadoes, High Winds, and Flooding	-	Seward, York

\*Source: Small Business Administration, 2001-2017<sup>28</sup>

### Presidential Disaster Declarations

The presidential disaster declarations involving the planning area from 1960 to 2017 are summarized in the following table.

**Table 32: Presidential Disaster Declarations**

Disaster Declaration Number	Declaration Date	Hazards	Declared County/Area*
DR-4420	3/21/2019	Severe Winter Storm, Straight-Line Winds, Flooding	Hamilton, Seward, York
DR-4225	6/25/2015	Severe Storms, Tornadoes, Straight-Line Winds, Flooding	Hamilton, Seward, York
DR-4185	7/28/2014	Severe Storms, Tornadoes, Straight-Line Winds, Flooding	Hamilton
DR-4179	6/17/2014	Severe Storms, Tornadoes, Straight-Line Winds, Flooding	Seward, York
DR-4014	8/12/2011	Severe Storms, Tornadoes, Straight-Line Winds, Flooding	Hamilton, York
DR-1902	4/21/2010	Severe Storms, Ice Jams, Flooding	Seward, York
DR-1878	2/25/2010	Severe Winter Storms, Snowstorm	Hamilton, Seward, York
DR-1853	7/31/2009	Severe Storms, Flooding, Tornadoes	Hamilton
DR-1770	6/20/2008	Severe Storms, Flooding, Tornadoes	Hamilton, Seward, York
DR-1674	1/7/2007	Severe Winter Storms	Hamilton, Seward, York
EM-3245	9/13/2005	Hurricane Katrina Evacuees	Hamilton, Seward, York
DR-1590	6/23/2005	Severe Storms, Flooding	Hamilton, Seward, York

<sup>28</sup> Small Business Administration. 2001-2017. "SBA Disaster Loan Data." Accessed December 2018. <https://www.sba.gov/loans-grants/see-what-sba-offers/sba-loan-programs/disaster-loans/disaster-loan-data>.

Disaster Declaration Number	Declaration Date	Hazards	Declared County/Area*
DR-4420	3/21/2019	Severe Winter Storm, Straight-Line Winds, Flooding	Hamilton, Seward, York
DR-4225	6/25/2015	Severe Storms, Tornadoes, Straight-Line Winds, Flooding	Hamilton, Seward, York
DR-1517	5/25/2004	Severe Storms, Flooding, Tornadoes	Hamilton, Seward, York
DR-1190	11/1/1997	Severe Snow Storms, Rain, Strong Winds	Hamilton, Seward, York
DR-998	7/19/1993	Severe Storms, Flooding	Hamilton, Seward, York
DR-983	4/2/1993	Ice Jams, Flooding	Seward
DR-873	7/4/1990	Severe Storms, Tornadoes, Flooding	Hamilton
DR-625	6/4/1980	Severe Storms, Tornadoes	Hamilton
DR-500	4/8/1976	Ice Storms, High Winds	Hamilton, Seward, York
DR-228	7/18/1967	Severe Storms, Flooding	Hamilton, Seward, York

Source: Federal Emergency Management Agency, 1960-2019<sup>29</sup>

\*Only counties within planning area are included

## Climate Adaptation

Long term climate trends have increased and will continue to increase the planning area's vulnerability to hazards. Since 1895, Nebraska's overall average temperature has increased by about 1°F. This trend will likely contribute to an increase in the frequency and intensity of hazardous events, which will cause significant economic, social, and environmental impacts on Nebraskans.

As seen in Figure 8, the United States is experiencing an increase in the number of billion-dollar natural disasters. Regardless of whether this trend is due to a change in weather patterns or due to increased development, the trend exists.

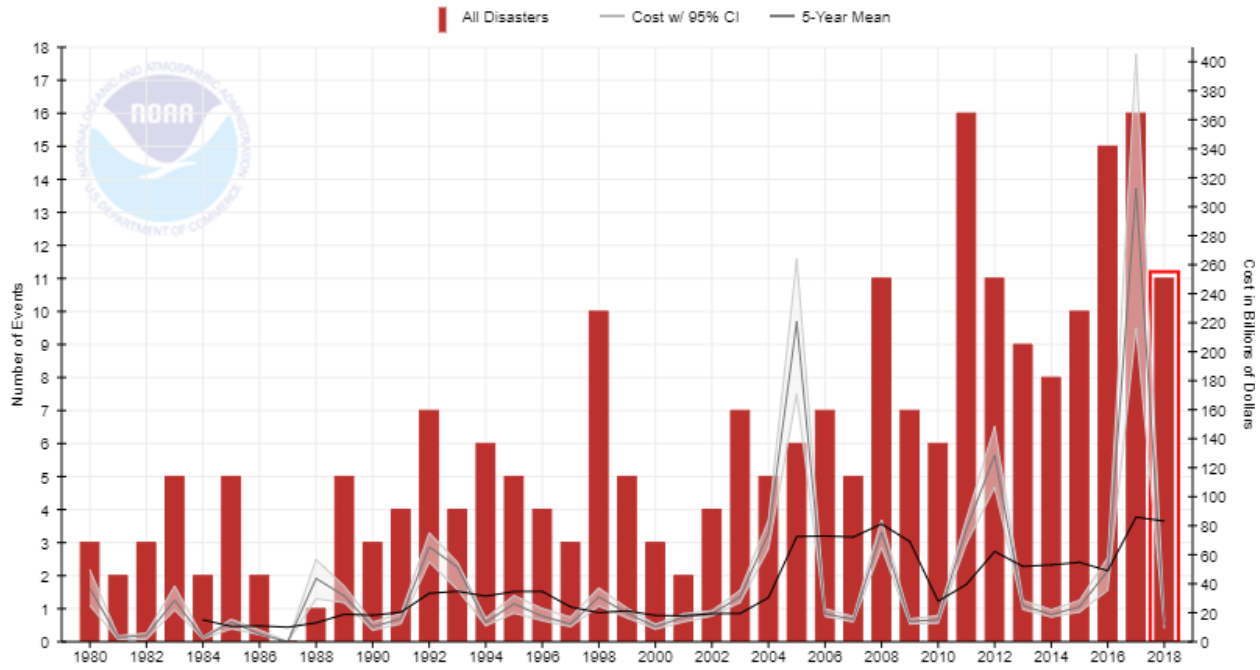
According to a recent University of Nebraska report (*Understanding and Assessing Climate Change: Implications for Nebraska, 2014*),<sup>30</sup> Nebraskans can expect the following from the future climate:

- Increase in extreme heat events
- Decrease in soil moisture by 5-10%
- Increase in drought frequency and severity
- Increase in heavy rainfall events
- Increase in flood magnitude
- Decrease in water flow in the Missouri River from reduced snowpack in the Rocky Mountains
- Additional 30-40 days in the frost-free season

<sup>29</sup> Federal Emergency Management Agency. 2019. "Disaster Declarations." Accessed August 2019. <https://www.fema.gov/disasters>.

<sup>30</sup> Rowe, C.M., Bathke, D.J., Wilhite, D.A., & Oglesby, R.J. 2014. "Understanding and Assessing Climate Change: Implications for Nebraska."

**Figure 8: Billion Dollar Disasters**  
 Billion-Dollar Disaster Event Types by Year (CPI-Adjusted)



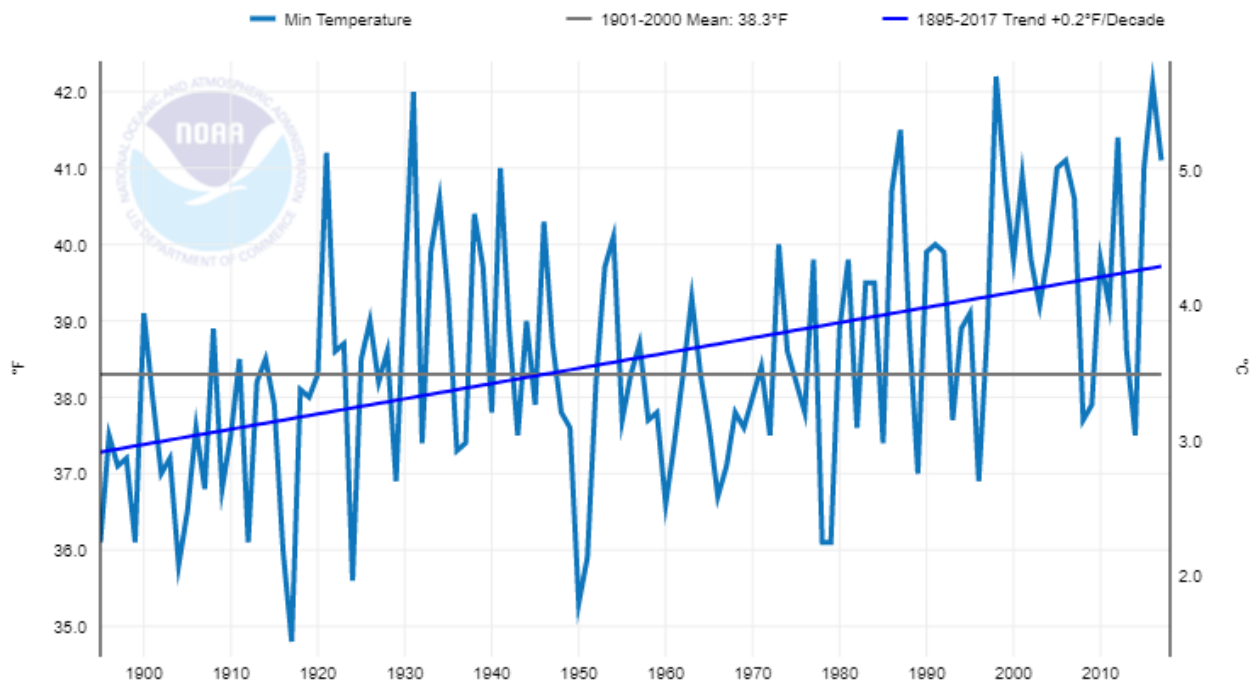
Source: National Oceanic and Atmospheric Administration, 2018<sup>31</sup>

These trends will have a direct impact on water and energy demands. As the number of 100°F days increase, along with warming nights, the stress placed on the energy grid will likely increase and possibly lead to more power outages. Critical facilities and vulnerable populations that are not prepared to handle periods of power outages, particularly during heat waves, will be at risk. Furthermore, the agricultural sector will experience an increase in droughts, changes in the growth cycle as winters warm, and changes in the timing and magnitude of rainfall. These added stressors on agriculture could have devastating economic effects if new agricultural and livestock management practices are not adopted.

Figure 9 shows a trend of increasing minimum temperatures in Climate Division 6, which includes the planning area. High nighttime temperatures can reduce grain yields, increase stress on animals, and lead to an increase in heat-related deaths.

<sup>31</sup> NOAA National Centers for Environmental Information (NCEI). 2018. "U.S. Billion-Dollar Weather and Climate Disasters." <https://www.ncdc.noaa.gov/billions/>

**Figure 9: Climate Division 6, Minimum Temperature 1895 – 2018**  
 Nebraska, Climate Division 6, Minimum Temperature, January-December



Source: National Oceanic and Atmospheric Administration, 2019

The planning area will have to adapt to these changes or experience an increase in economic losses, loss of life, property damages, and crop damages. HMPs have typically been informed by *past* events in order to be more resilient to future events, and this HMP includes strategies for the planning area to address these changes and increase resilience. However, future updates to this plan should consider including adaptation as a core strategy to be better informed by future projections on the frequency, intensity, and distribution of hazards as well.

## Hazard Profiles

Based on research and experiences of the participating jurisdictions, the hazards profiled were determined to either have a historical record of occurrence or the potential for occurrence in the future. As the planning area is generally uniform in climate, topography, building characteristics, and development trends, overall hazards and vulnerability do not vary greatly across the planning area. The following profiles will examine the identified hazards across the region. Local concerns or deviations from the regional risk assessment will be addressed in *Section Seven* of this plan.

## Agricultural Animal and Plant Disease

### Hazard Profile

Agriculture Disease is any biological disease or infection that can reduce the quality or quantity of either livestock or vegetative crops. This section looks at both animal disease and plant disease, as both make up a significant portion of Nebraska's and the planning area's economy.

The economy of the state of Nebraska is heavily vested in both livestock and crop sales. According to the Nebraska Department of Agriculture (NDA) in 2012, the market value of agricultural products sold was estimated at more than \$23 billion; this total is split between crops (estimated \$11.37 billion) and livestock (estimated \$11.69 billion).<sup>32</sup> For the planning area, sold agricultural products were estimated at \$1,077,179,000 with the cost split at \$759,043,000 for crops and \$318,136,000 for livestock.

Table 33 shows the population of livestock within the planning area. This count does not include wild populations that are also at risk from animal diseases.

**Table 33: Livestock Inventory**

County	Market Value of 2012 Livestock Sales	Cattle and Calves	Hogs and Pigs	Poultry Egg Layers	Sheep and Lambs
Hamilton	\$81,036,000	41,093	8,919	692	384
Seward	\$124,458,000	48,059	49,695	1,112	664
York	\$112,642,000	45,226	29,738	(D)	478
<b>Total</b>	<b>\$318,136,000</b>	<b>134,378</b>	<b>88,352</b>	<b>1,804</b>	<b>1,526</b>

Source: U.S. Census of Agriculture, 2012  
(D) Withheld to avoid disclosing data for individual farms

According to the NDA, the primary crops grown throughout the state include alfalfa, corn, sorghum, soybeans, and wheat. The following tables provide the value and acres of land in farms for the planning area.

**Table 34: Land and Value of Farms in the Planning Area**

County	Number of Farms	Land in Farms (acres)	Market Value of 2012 Crop Sales
Hamilton	572	304,395	\$272,201,000
Seward	992	354,857	\$184,071,000
York	541	339,591	\$302,771,000
<b>Total</b>	<b>2,105</b>	<b>998,843</b>	<b>\$759,043,000</b>

Source: U.S. Census of Agriculture, 2012

<sup>32</sup> US Department of Agriculture, National Agricultural Statistics Server. 2012. "2012 Census of Agriculture – County Data."



**Table 35: Crop Values**

County	Corn		Soybeans		Wheat	
	Acres Planted	Value (2012)	Acres Planted	Value (2012)	Acres Planted	Value (2012)
Hamilton	181,373	\$214,555,000	74,979	\$52,980,000	1,388	\$423,000
Seward	145,168	\$120,655,000	114,673	\$59,353,000	1,402	\$590,000
York	208,529	\$235,498,000	92,668	\$64,011,00	288	\$72,000
<b>Total</b>	<b>535,070</b>	<b>\$570,708,000</b>	<b>282,320</b>	<b>\$176,344,000</b>	<b>3,078</b>	<b>\$1,085,000</b>

Source: U.S. Census of Agriculture, 2012

## Location

Given the agricultural presence in the planning area, animal and plant disease have the potential to occur across the planning area. If a major outbreak were to occur, the economy in the entire planning area would be affected, including urban areas.

The main land uses where animal and plant disease will be observed include: agricultural lands; range or pasture lands; and forests. It is possible that animal or plant disease will occur in domestic animals or crops in urban areas.

## Historical Occurrences

### Animal Disease

The NDA provides reports on diseases occurring in the planning area. There were 29 instances of animal diseases reported between January 2014 and June 2017 by the NDA (Table 36). These outbreaks affected 180 animals.

**Table 36: Livestock Diseases Reported in the Planning Area**

Disease	County	Population Impacted
Anaplasmosis	Seward, York*	2, 2
Bluetongue	York	2
Bovine Viral Diarrhea	Hamilton	1
Enzootic Bovine Leukosis	Seward*, York	5, 1
Paratuberculosis	Hamilton*, Seward*, York*	4, 6, 121
Porcine Delta Coronavirus	York	1
Porcine Epidemic Diarrhea	York*	3
Porcine Reproductive & Respiratory Syndrome	Hamilton, York*	1, 5
Rabies	Hamilton*, York	3, 21
Seneca Valley Virus	Hamilton, Seward	1, 1
West Nile Fever	Seward	1

Source: Nebraska Department of Agriculture, January 2014- June 2017<sup>33</sup>

\*multiple separate events occurred during the period

### Plant Disease

A variety of diseases can impact crops and often vary from year to year. The NDA provides information on some of the most common plant diseases, which are listed below.

<sup>33</sup> Nebraska Department of Agriculture. 2017. "Livestock Disease Reporting." <http://www.nda.nebraska.gov/animal/reporting/index.html>.

**Table 37: Common Crop Diseases in Nebraska by Crop Types**

Crop	Diseases	
Corn	<ul style="list-style-type: none"> <li>• Anthracnose</li> <li>• Bacterial Stalk Rot</li> <li>• Common Rust</li> <li>• Fusarium Stalk Rot</li> <li>• Fusarium Root Rot</li> <li>• Gray Leaf Spot</li> <li>• Maize Chlorotic Mottle Virus</li> </ul>	<ul style="list-style-type: none"> <li>• Southern Rust</li> <li>• Stewart's Wilt</li> <li>• Common Smut</li> <li>• Goss's Wilt</li> <li>• Head Smut</li> <li>• Physoderma</li> </ul>
Soybeans	<ul style="list-style-type: none"> <li>• Anthracnose</li> <li>• Bacterial Blight</li> <li>• Bean Pod Mottle</li> <li>• Brown Spot</li> <li>• Brown Stem Rot</li> <li>• Charcoal Rot</li> <li>• Frogeye Leaf Spot</li> <li>• Phytophthora Root and Stem Rot</li> <li>• Pod and Stem Blight</li> </ul>	<ul style="list-style-type: none"> <li>• Purple Seed Stain</li> <li>• Rhizoctonia Root Rot</li> <li>• Sclerotinia Stem Rot</li> <li>• Soybean Mosaic Virus</li> <li>• Soybean Rust</li> <li>• Stem Canker</li> <li>• Sudden Death Syndrome</li> </ul>
Wheat	<ul style="list-style-type: none"> <li>• Barley Yellow Dwarf</li> <li>• Black Chaff</li> <li>• Crown and Root Rot</li> <li>• Fusarium Head Blight</li> </ul>	<ul style="list-style-type: none"> <li>• Leaf Rust</li> <li>• Tan Spot</li> <li>• Wheat Soil-borne Mosaic</li> <li>• Wheat Streak Mosaic</li> </ul>
Sorghum	<ul style="list-style-type: none"> <li>• Ergot</li> <li>• Sooty Stripe</li> <li>• Zonate Leaf Spot</li> </ul>	

**Emerald Ash Borer**

The spread and presence of the EAB has become a rising concern for many Nebraskan communities in recent years. The beetle spreads through transport of infected ash trees, lumber, and firewood. All species of North American ash trees are vulnerable to infestation. Confirmed cases of EAB have been found in three Canadian provinces and 35 US states, primarily in the eastern, southern, and midwestern regions. The two most recent infestation confirmations came from South Dakota and Vermont in early 2018; however, EAB can be found in Iowa, Missouri, Kansas, South Dakota, and Colorado. Nebraska's confirmed cases occurred on private land in Omaha and Greenwood in 2016 and Lancaster County in 2018.<sup>34</sup> The figure below shows the locations of Nebraska's confirmed EAB cases as of 2018. Additional confirmed cases have likely occurred throughout 2019 and many communities across the state are prioritizing the removal of ash trees to help curb potential infestations and tree mortality.

While adult beetles cause little damage, larvae damage trees by feeding on the inner bark of mature and growing trees, causing tunnels. Effects of EAB infestation include: extensive damage to trees by birds, canopy dieback, bark splitting, and water sprout growth at the tree base, and eventual tree mortality. EAB has impacted millions of trees across North America, killing young trees one to two years after infestation and mature trees three to four years after infestation.<sup>35</sup>

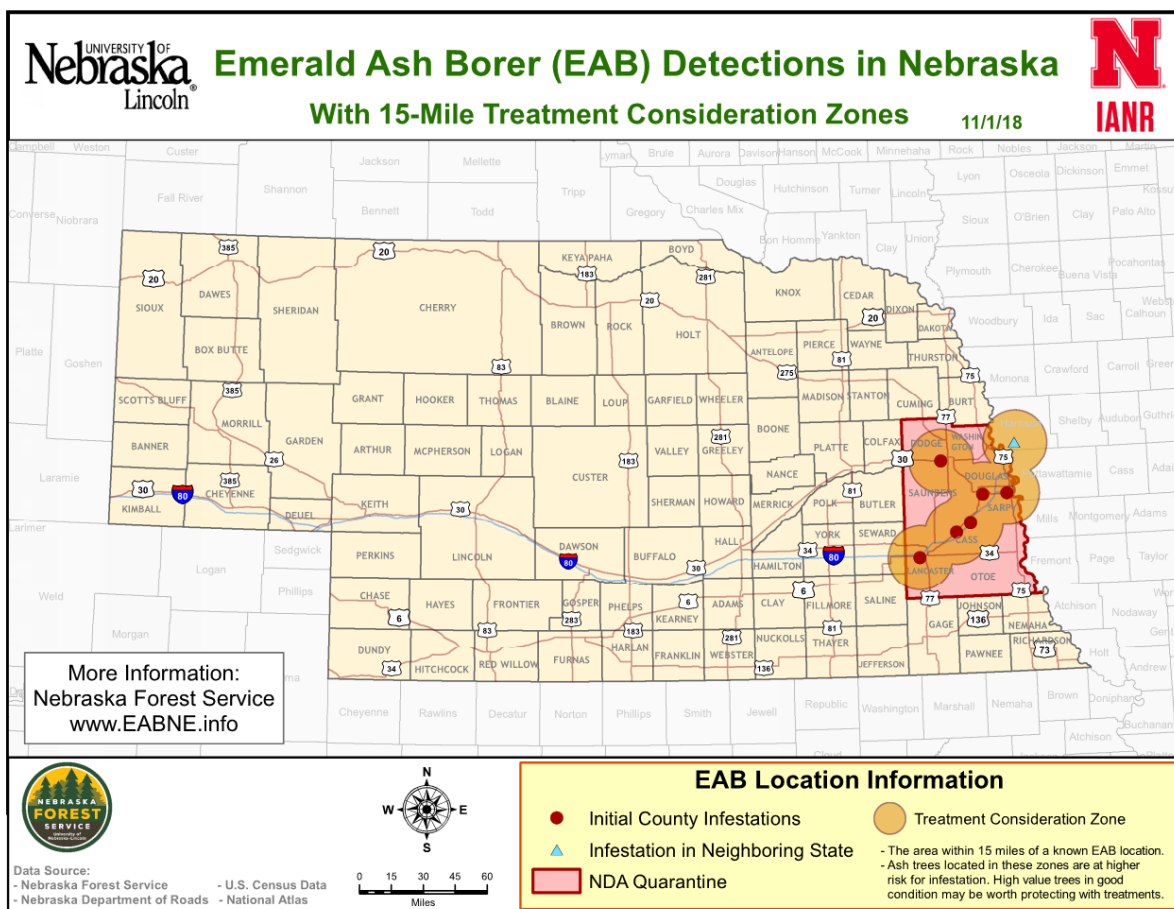
<sup>34</sup> Emerald Ash Borer Information Network. April 2018. "Emerald Ash Borer." <http://www.emeraldashborer.info/>.

<sup>35</sup> Arbor Day Foundation. 2015. "Emerald Ash Borer." <https://www.arborday.org/trees/health/pests/emerald-ash-borer.cfm>.

Estimated economic impacts to Nebraska's 44 million ash trees exceeds \$961 million.<sup>36</sup> Dead or dying trees affected by EAB are also more likely to cause damage during high winds, severe thunderstorms, or severe winter storms from weakened or hazardous limbs and can contribute a significant fuel load to grass/wildfire events.

Because of the Nebraska infestations, a quarantine has been established in Cass, Dodge, Douglas, Otoe, Sarpy, Saunders, Washington, and Lancaster Counties that restricts the movement of Ash trees and lumber to further mitigate the spread of EAB. The Nebraska Department of Agriculture regulates and monitors the sale and distribution of firewood in the state to restrict the flow of firewood from outside the state.

Figure 10: EAB Detections in Nebraska



Source: NDA, 2019<sup>37</sup>

### Average Annual Losses

Using data from the USDA Risk Management Agency (RMA) (2000-2017), annual crop losses from plant disease can be estimated. However, the RMA does not track losses for livestock, so it is not possible to estimate losses due to animal disease.

<sup>36</sup> "Nebraska Emerald Ash Borer Response Plan." May 2015. <https://nfs.unl.edu/NebraskaEABResponsePlan.pdf>.

<sup>37</sup> Nebraska Department of Agriculture. 2019. "Emerald Ash Borer." <https://nda.nebraska.gov/plant/entomology/eab/index.html>.

**Table 38: Agricultural Plant Disease Losses**

Hazard Type	Number of Events	Total Crop Loss	Average Annual Crop Loss
Plant Disease	27	\$734,338	\$40,797

Source: USDA RMA, 2000-2017

### Extent

There is no standard for measuring the magnitude of agricultural disease. Historical events have impacted a relatively small numbers of livestock and/or crops.

### Probability

Given the historic record of occurrence (29 outbreaks of animal disease reported in four years, and 27 plant disease outbreaks reported in 18 years), for the purposes of this plan, the annual probability of occurrence is 100 percent.

### Regional Vulnerabilities

The following table provides information related to regional vulnerabilities; for jurisdictional-specific vulnerabilities, refer to *Section Seven: Participant Sections*.

**Table 39: Regional Agricultural Vulnerabilities**

Sector	Vulnerability
People	-Those in direct contact with infected livestock -Potential food shortage during prolonged events -Residents in poverty if food prices increase
Economic	-Regional economy is reliant on the agricultural industry -Large scale or prolonged events may impact tax revenues and local capabilities -Land value may largely drive population changes within the planning area
Built Environment	None
Infrastructure	-Transportation routes can be closed during quarantine
Critical Facilities	None

## Chemical Spills – Fixed Sites

### Hazard Profile

The following description for hazardous materials is provided by the Federal Emergency Management Agency (FEMA):

Chemicals are found everywhere. They purify drinking water, increase crop production and simplify household chores. But chemicals also can be hazardous to humans or the environment if used or released improperly. Hazards can occur during production, storage, transportation, use or disposal. You and your community are at risk if a chemical is used unsafely or released in harmful amounts into the environment where you live, work or play.<sup>38</sup>

Hazardous materials in various forms can cause fatalities, serious injury, long-lasting health effects, and damage to buildings, homes, and other property. Many products containing hazardous chemicals are used and stored in homes routinely. Chemicals posing a health hazard include carcinogens, toxic agents, reproductive toxins, irritants, and many other substances that can harm human organs or vital biological processes.

Chemical manufacturers are one source of hazardous materials, but there are many others, including service stations, hospitals, and hazardous materials waste sites.

Varying quantities of hazardous materials are manufactured, used, or stored in an estimated 4.5 million facilities in the United States—from major industrial plants to local dry-cleaning establishments or gardening supply stores.

Hazardous materials come in the form of explosives, flammable and combustible substances, poisons, and radioactive materials. Hazardous materials incidents are technological (meaning non-natural hazards created or influenced by humans) events that involve large-scale releases of chemical, biological or radiological materials. Hazardous materials incidents generally involve releases at fixed-site facilities that manufacture, store, process or otherwise handle hazardous materials or along transportation routes such as major highways, railways, navigable waterways and pipelines.

The Environmental Protection Agency (EPA) requires the submission of the types and locations of hazardous chemicals being stored at any facility within the state over the previous calendar year. This is completed by submitting a Tier II form to the EPA as a requirement of the Emergency Planning and Community Right-to-Know Act of 1986.<sup>39</sup>

Fixed-sites are those that involve chemical manufacturing sites and stationary storage facilities. Table 40 demonstrates the nine classes of hazardous material according to the 2016 Emergency Response Guidebook.

<sup>38</sup> Federal Emergency Management Agency. 2017. "Hazardous Materials Incidents." <https://www.ready.gov/hazardous-materials-incident>.

<sup>39</sup> Emergency Planning and Community Right-to-Know Act of 1986, Pub. L. No. 116 § 10904. (1986).

**Table 40: Hazardous Material Classes**

Class	Type of Material	Divisions
1	Explosives	Division 1.1 – Explosives with a mass explosion hazard Division 1.2 – Explosives with a projection hazard but not a mass explosion hazard Division 1.3 – Explosives which have a fire hazard and either a minor blast hazard or a minor projection hazard or both, but not a mass explosion hazard Division 1.4 – Explosives which present no significant blast hazard Division 1.5 – Very insensitive explosives with a mass explosion hazard Division 1.6 – Extremely insensitive articles which do not have a mass explosion hazard
2	Gases	Division 2.1 – Flammable gases Division 2.2 – Non-flammable, non-toxic gases Division 2.3 – Toxic gases
3	Flammable liquids (and Combustible liquids)	
4	Flammable solids; Spontaneously combustible materials	Division 4.1 – Flammable solids, self-reactive substances and solid desensitized explosives Division 4.2 – Substances liable to spontaneous combustion Division 4.3 – Substances which in contact with water emit flammable gases
5	Oxidizing substances and Organic peroxides	Division 5.1 – Oxidizing substances Division 5.2 – Organic peroxides
6	Toxic substances and infectious substances	Division 6.1 – Toxic substances Division 6.2 – Infectious substances
7	Radioactive materials	
8	Corrosive materials	
9	Miscellaneous hazardous materials/products, substances, or organisms	

Source: Emergency Response Guidebook, 2016<sup>40</sup>

### Location

There are 108 facility locations across the planning area that submitted Tier II reports to the Nebraska Department of Environment and Energy (NDEE) in 2017. A listing of chemical storage sites can be found in *Section Seven: Participant Sections* for each jurisdiction.

### Extent

The extent of chemical spills at fixed sites varies and depends on the type of chemical that is released with most events localized to the facility. Forty releases have occurred in the planning area, and the total amount spilled ranged from 0 gallons to 1,500 gallons of pollutant. Of the 40 chemical spills, one spill led to three individuals becoming injured. Another spill led to two individuals becoming injured. Based on historic records, it is likely that any spill involving hazardous materials will not affect an area larger than a quarter mile from the spill location.

<sup>40</sup> U.S. Department of Transportation Pipeline and Hazardous materials Safety Administration. 2016. "2016 Emergency Response Guidebook." <https://www.phmsa.dot.gov/hazmat/outreach-training/erg>.

## Historical Occurrences

### Chemical Spills – Fixed Sites

According to the U.S. Coast Guard’s National Response Center database (NRC), there have been 40 fixed site chemical spills from 1990 – 2018 in the planning area. There were no property damages reported for these chemical spills. The following table displays the larger spills and spills that resulted in injuries that have occurred throughout the planning area.

**Table 41: Fixed Site Chemical Spills**

Year of Event	Location of Release	Quantity Spilled	Material Involved	Number of Injuries	Property Damage
2012	York	250 Pounds	Anhydrous Ammonia	2	\$0
2010	York	Unknown Amount	Unknown Material	3	\$0
2009	Aurora	800 Pounds	Anhydrous Ammonia	0	\$0
2007	Phillips	Unknown Amount	Natural Gas	1	\$0
2001	Aurora	274 Pounds	Anhydrous Ammonia	0	\$0
1994	York	300 Pounds	Anhydrous Ammonia	0	\$0
1993	Seward	1,000 Gallons	Pentachlorophenol	0	\$0
1991	Seward	1,500 Gallons	Pentachlorophenol	0	\$0

Source: National Response Center, 1990-2018

### Average Annual Damages

Using data from Table 42, average annual damages from chemical fixed site spills can be estimated.

**Table 42: Chemical Fixed Site Average Annual Losses**

Hazard Type	Number of Events	Events Per Year	Injuries	Total Damages	Average Annual Chemical Spill Loss
Chemical Spills	40	1.4	6	\$0	\$0

Source: National Response Center, 1990-2018

### Probability

Chemical releases at fixed site storage areas are likely in the future. Given the historic record of occurrence (40 chemical fixed site spills reported in 29 years), the annual probability of occurrence for chemical fixed site spills is 100 percent.

### Regional Vulnerabilities

The following table provides information related to regional vulnerabilities; for jurisdictional-specific vulnerabilities, refer to *Section Seven: Participant Sections*.

**Table 43: Regional Chemical and Radiological Fixed Site Vulnerabilities**

Sector	Vulnerability
People	<ul style="list-style-type: none"> <li>-Those in close proximity could have minor to moderate health impacts</li> <li>-Possible evacuation</li> <li>-Hospitals, nursing homes, and the elderly at greater risk due to low mobility</li> </ul>
Economic	<ul style="list-style-type: none"> <li>-A chemical plant shutdown in smaller communities would have significant impacts to the local economy</li> <li>-A long-term evacuation of the emergency planning zone would have a negative effect on the economy in the area</li> </ul>
Built Environment	<ul style="list-style-type: none"> <li>-Risk of fire or explosion</li> </ul>
Infrastructure	<ul style="list-style-type: none"> <li>-Transportation routes can be closed during evacuations</li> </ul>
Critical Facilities	<ul style="list-style-type: none"> <li>-Critical facilities are at risk of evacuation</li> </ul>



## Chemical Spills – Transportation

### Hazard Profile

The transportation of hazardous materials is defined by the U.S. Pipeline and Hazardous Materials Safety Administration (PHMSA) as "...a substance that has been determined to be capable of posing an unreasonable risk to health, safety, and property when transported in commerce..."<sup>41</sup> According to PHMSA, hazardous materials traffic in the U.S. now exceeds 1,000,000 shipments per day.<sup>42</sup>

Nationally, the U.S. has had 108 fatalities associated with the transport of hazardous materials between 2007 through 2016.<sup>43</sup> While such fatalities are a low probability risk, even one event can harm many people. For example, a train derailment in Crete, Nebraska in 1969 allowed anhydrous ammonia to leak from a rupture tanker. The resulting poisonous fog killed nine people and injured 53.

### Location

Chemical releases can occur during transportation, primarily on major transportation routes as identified in Figure 11. A large number of spills also occur during the loading and unloading of chemicals. Participating communities specifically reported transportation along railroads and highways as having the potential to impact communities. Railroads providing service through the planning area have developed plans to respond to chemical release along rail routes.

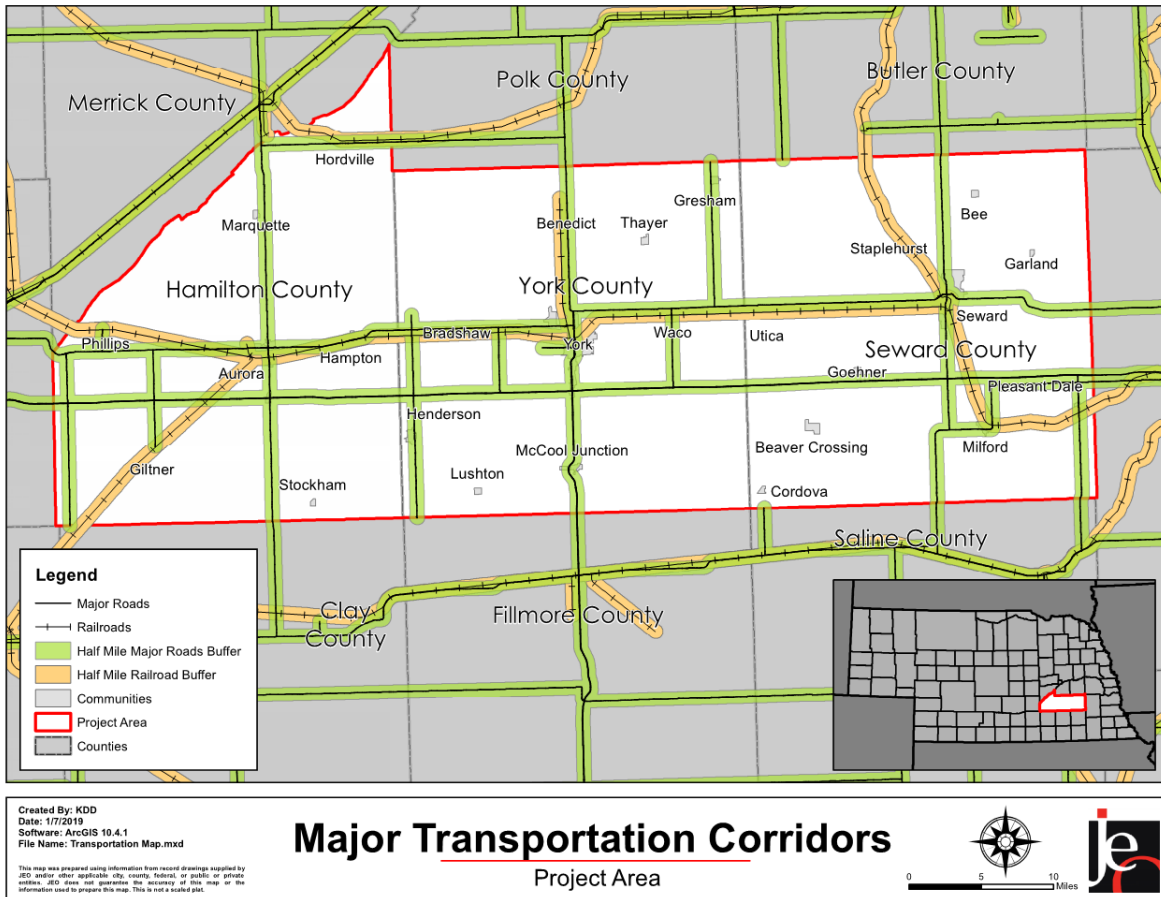
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<sup>41</sup> Pipeline and Hazardous Materials Safety Administration. 2017. "Hazmat Safety Community FAQ." <https://phmsa.dot.gov/regulations>.

<sup>42</sup> U.S. Department of Transportation. 2015. "2012 Economic Census: Transportation." <https://www.census.gov/econ/cfs/2012/ec12tcf-us-hm.pdf>.

<sup>43</sup> Pipeline and Hazardous Materials Safety Administration. 2016. "10 Year Incident Summary Reports." <https://www.phmsa.dot.gov/hazmat/library/data-stats/incidents>.

Figure 11: Major Transportation Routes with Half Mile Buffer



**Extent**

The probable extent of chemical spills during transportation is difficult to anticipate and depends on the type and quantity of chemical released. Releases that have occurred during transportation in the planning area ranged from 1 to 109,000 liquid gallons (LGA). None of the chemical spills resulted in deaths or injuries.

**Historical Occurrences**

PHMSA reports that 48 chemical spills occurred during transportation in the planning area between 1971 and 2018. During these events, there were no injuries, no fatalities, and \$1,888,548 in damages.

The following table provides a list of the larger historical chemical spills during transportation in the planning area.

**Table 44: Historical Chemical Spills 1971-Jan. 2018**

Date of Event	Location of Release	Failure Description	Material Involved	Method of Transportation	Amount	Total Damage	Evacuation (Yes/No)
6/14/2017	Aurora	Broken Pressure Relief Valve	Anhydrous Ammonia	Highway	239 GCF	\$0	No
10/26/2008	York	Loose Closure Component	Hydrochloric Acid	Highway	150 LGA	\$25,000	No
1/9/1999	Milford	Derailment	Fuel Oil	Rail	109,000 LGA	\$1,827,000	No
7/15/1977	Aurora	Derailment	Ammonium Nitrate Fertilizer	Rail	27,000 SLB	\$0	No

Source: PHMSA, 1971– Jan. 2018<sup>44</sup>

### Average Annual Damages

The average damage per event estimate was determined based upon PHMSA's Incidents Reports since 1971 and the number of historical occurrences. This does not include losses from displacement, functional downtime, economic loss, injury, or loss of life. This hazard causes an average of \$39,345 per year in property damages.

**Table 45: Chemical Transportation Losses**

Hazard Type	Number of Events	Events Per Year	Total Property Loss	Average Annual Property Loss
Chemical Transportation Spills	48	1	\$1,888,548	\$39,345

Source: PHMSA 1971 – Jan. 2018

### Probability

The historical record indicates that chemical releases during transport have a 100 percent chance of occurring annually in the planning area, with 48 events over a 48-year period.

### Regional Vulnerabilities

The following table provides information related to regional vulnerabilities; for jurisdictional-specific vulnerabilities, refer to *Section Seven: Participant Sections*.

<sup>44</sup> Pipeline and Hazardous Materials Safety Administration. 2018. "Office of Hazardous Materials Safety: Incident Reports Database Search." Accessed January 17, 2018. <https://www.phmsa.dot.gov/hazmat/library/data-stats/incidents>.

**Table 46: Regional Chemical Transportation Vulnerabilities**

Sector	Vulnerability
People	<ul style="list-style-type: none"> <li>-Those in close proximity to transportation corridors</li> <li>-Possible evacuation</li> <li>-Hospitals, nursing homes, and the elderly at greater risk due to low mobility</li> </ul>
Economic	<ul style="list-style-type: none"> <li>-Evacuations and closed transportation routes could impact businesses near spill</li> </ul>
Built Environment	<ul style="list-style-type: none"> <li>-Risk of fire or explosion</li> </ul>
Infrastructure	<ul style="list-style-type: none"> <li>-Transportation routes can be closed</li> </ul>
Critical Facilities	<ul style="list-style-type: none"> <li>-Critical facilities near major transportation corridors are at risk</li> </ul>

## Dam Failure

### Hazard Profile

According to the Nebraska Administrative Code, dams are “any artificial barrier, including appurtenant works, with the ability to impound water, wastewater, or liquid-borne materials and which is:

- twenty-five feet or more in height from the natural bed of the stream or watercourse measured at the downstream toe of the barrier, or from the lowest elevation of the outside limit of the barrier if it is not across a stream channel or watercourse, to the maximum storage elevation or
- has an impounding capacity at maximum storage elevation of fifty acre-feet or more, except that any barrier described in this subsection which is not in excess of six feet in height or which has an impounding capacity at maximum storage elevation of not greater than fifteen acre-feet shall be exempt, unless such barrier, due to its location or other physical characteristics, is classified as a high hazard potential dam.

Dams do not include:

- an obstruction in a canal used to raise or lower water;
- a fill or structure for highway or railroad use, but if such structure serves, either primarily or secondarily, additional purposes commonly associated with dams it shall be subject to review by the department;
- canals, including the diversion structure, and levees; or
- water storage or evaporation ponds regulated by the United States Nuclear Regulatory Commission.”<sup>45</sup>

The NeDNR uses a classification system for dams throughout the state, including those areas participating in this plan. The classification system includes three classes, which are defined in the table below.

**Table 47: Dam Size Classification**

Size	Effective Height (feet) x Effective Storage (acre-feet)	Effective Height
Small	≤ 3,000 acre-feet	and ≤ 35 feet
Intermediate	> 3,000 acre-feet to < 30,000 acre-feet	or > 35 feet
Large	≥ 30,000 acre-feet	Regardless of Height

Source: NeDNR, 2013<sup>46</sup>

The effective height of a dam is defined as the difference in elevation in feet between the natural bed of the stream or watercourse measured at the downstream toe (or from the lowest elevation of the outside limit of the barrier if it is not across stream) to the auxiliary spillway crest. The effective storage is defined as the total storage volume in acre-feet in the reservoir below the elevation of the crest of the auxiliary spillway. If the dam does not have an auxiliary spillway, the effective height and effective storage should be measured at the top of dam elevation.

<sup>45</sup> Nebraska Department of Natural Resources. “Department of Natural Resources Rules for Safety of Dam and Reservoirs.” Nebraska Administrative Code, Title 458, Chapter 1, Part 001.09.

<sup>46</sup> Nebraska Department of Natural Resources. 2013. “Classification of Dams: Dam Safety Section.” <https://dnr.nebraska.gov/sites/dnr.nebraska.gov/files/doc/dam-safety/resources/Classification-Dams.pdf>.

Dam failure, as a hazard, is described as a structural failure of a water impounding structure. Structural failure can occur during extreme conditions, which include, but are not limited to:

- Reservoir inflows in excess of design flows
- Flood pools higher than previously attained
- Unexpected drop in pool level
- Pool near maximum level and rising
- Excessive rainfall or snowmelt
- Large discharge through spillway
- Erosion, landslide, seepage, settlement, and cracks in the dam or area
- Earthquakes
- Vandalism
- Terrorism

The NeDNR regulates dam safety and has classified dams by the potential hazard each poses to human life and economic loss. The following are classifications and descriptions for each hazard class:

- **Minimal Hazard Potential** - failure of the dam expected to result in no economic loss beyond the cost of the structure itself and losses principally limited to the owner's property.
- **Low Hazard Potential** - failure of the dam expected to result in no probable loss of human life and in low economic loss. Failure may damage storage buildings, agricultural land, and county roads.
- **Significant Hazard Potential** - failure of the dam expected to result in no probable loss of human life but could result in major economic loss, environmental damage, or disruption of lifeline facilities. Failure may result in shallow flooding of homes and commercial buildings or damage to main highways, minor railroads, or important public utilities.
- **High Hazard Potential** - failure of the dam expected to result in loss of human life is probable. Failure may cause serious damage to homes, industrial or commercial buildings, four-lane highways, or major railroads. Failure may cause shallow flooding of hospitals, nursing homes, or schools.

In total, there are 90 dams located within the planning area, with classifications ranging from minimal hazard to high hazard. Four dams are rated minimal, eighty-one dams are rated low, three are rated significant, and two are rated a high hazard dam. Figure 12 maps the location of these dams in the planning area.

**Table 48: Dams in the Planning Area**

County	Minimal Hazard	Low Hazard	Significant Hazard	High Hazard
Hamilton County	1	20	0	0
Seward County	3	47	2	2
York County	0	14	1	0
<b>Total</b>	<b>4</b>	<b>81</b>	<b>3</b>	<b>2</b>

Source: NeDNR, 2019<sup>47</sup>

<sup>47</sup> Nebraska Department of Natural Resources. 2019. "Nebraska Dam Inventory." <https://dnr.nebraska.gov/dam-safety/nebraska-dam-inventory>.



Dams classified with high hazard potential require the creation of an Emergency Action Plan (EAP). The EAP defines responsibilities and provides procedures designed to identify unusual and unlikely conditions which may endanger the structural integrity of the dam within sufficient time to take mitigating actions and to notify the appropriate emergency management officials of possible, impending, or actual failure of the dam. The EAP may also be used to provide notification when flood releases will create major flooding. An emergency situation can occur at any time; however, emergencies are more likely to happen when extreme conditions are present.

Figure 12: Dam Locations

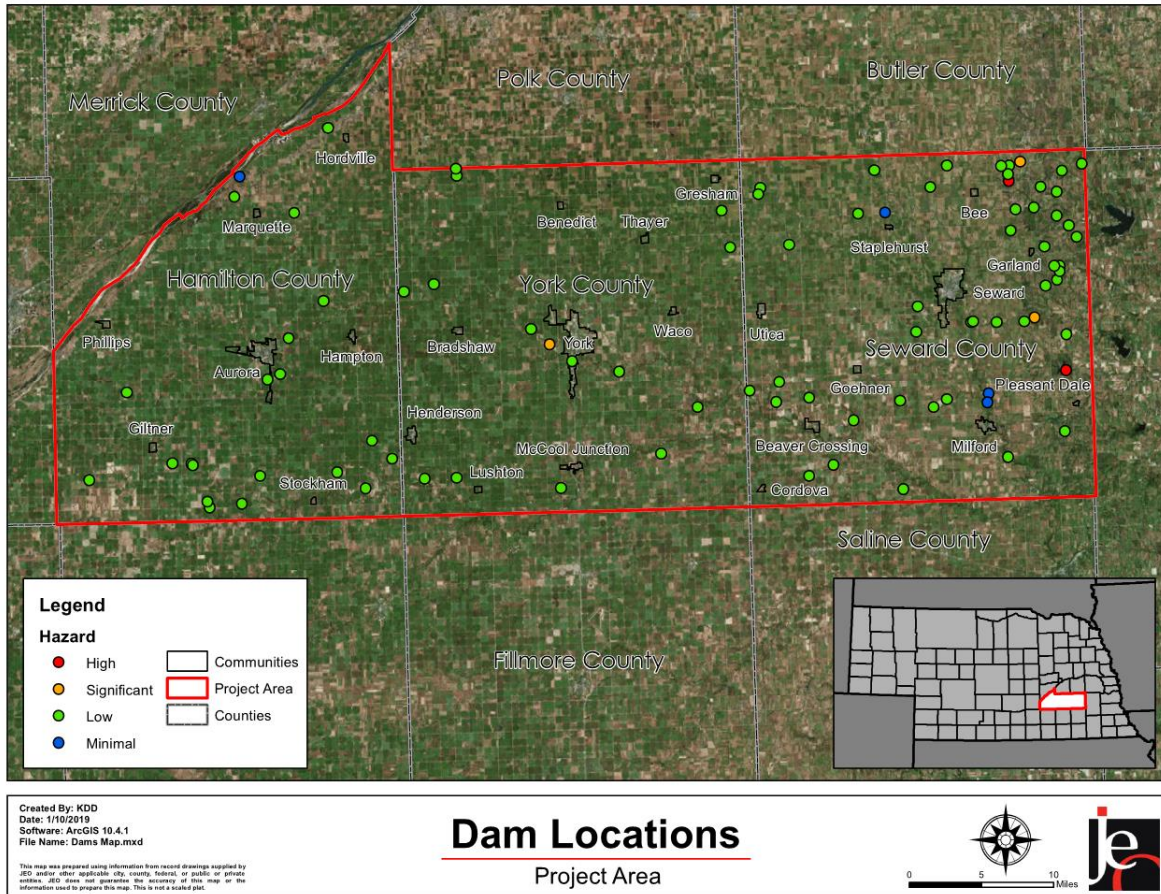


Table 49 lists the two dams classified as high hazard potential in the planning area. The Salt Creek 13 – Twin Lakes dam is included in the 2014 Nebraska State HMP’s list of “Top 30 Ranked High Hazard Dams Based on Population at Risk.”

**Table 49: High Hazard Dams**

NID	Dam Name	Owner	Stream Name	Maximum Storage (acre-feet)	Emergency Action Plan
NE00068	Oak-Middle 82-B	Lower Platte South NRD	Tr-Middle Oak Creek	371.4	Yes
NE01060	Salt Creek 13 – Twin Lakes	United States Army Corps of Engineers	South Branch Middle Creek	11,750	Yes

Source: NeDNR, 2019

### **Upstream Dams Outside the Planning Area**

According to the Counties' Local Emergency Operations Plan (LEOPs)<sup>48,49,50</sup>, there are four upstream dams (upstream of the planning area) which could affect the planning area. Those dams are the Kingsley Dam, Twin Lakes Dam, Oak-Middle Dam, and Hudkins Road Structure Dam. The Kingsley dam would affect the Platte River in Hamilton County and would impact an area slightly greater than the 100-year floodplain. The Twins Lake, Oak-Middle, and Hudkins Road dams would affect less than one percent of the population of Seward County.

### **Location**

Communities or areas downstream of a dam, especially high hazard dams, are at greatest risk of dam failure. Dam owners and the NeDNR have opted, at this time, to not include dam breach maps or inundation maps in hazard mitigation plans due to the sensitive nature of this information. Requests can be made of the dam owner or the Dam Safety Division of NeDNR to view an inundation map specific to a dam.

### **Extent**

While a breach of a high hazard dam would certainly impact those in inundation areas, the total number of people and property exposed to this threat would vary based on the dam location. Since inundation maps are not made publicly available for security reasons, the extent of a high hazard dam breach is not known.

### **Historical Occurrences**

According to the Stanford University National Performance of Dams Program, there have been no dam failure events within the planning area.<sup>51</sup>

### **Average Annual Damages**

Due to lack of data and the sensitive nature of this hazard, potential losses are not calculated for this hazard. Community members in the planning area that wish to quantify the threat of dam failure should contact their County Emergency Management, UBBNRD, or the NeDNR.

### **Probability**

According to the 2014 Nebraska State Hazard Mitigation Plan, the probability of a high hazard dam failing is "very low" due to the high design standards for this class of dam. There is a higher possibility of a significant or low hazard dam failing as those dams are not designed to the same standard. For the purpose of this plan, the probability of dam failure will be stated at less than one percent annually as no dams have failed in the planning area over the past 100 years.

<sup>48</sup> Hamilton County Emergency Management Agency. 2017. "Hamilton County, Nebraska Local Emergency Operations Plan."

<sup>49</sup> Seward County Emergency Management Agency. 2017. "Seward County, Nebraska Local Emergency Operations Plan."

<sup>50</sup> York County Emergency Management Agency. 2017. "York County, Nebraska Local Emergency Operations Plan."

<sup>51</sup> Stanford University. 1911-2016. "National Performance of Dams Program Dam Incident Database." Accessed August 2018. [http://npdp.stanford.edu/dam\\_incidents](http://npdp.stanford.edu/dam_incidents).



### Regional Vulnerabilities

The following table provides information related to regional vulnerabilities; for jurisdictional-specific vulnerabilities, refer to *Section Seven: Participant Sections*.

**Table 50: Regional Dam Failure Vulnerabilities**

Sector	Vulnerability
People	<ul style="list-style-type: none"> <li>-Those living downstream of high hazard dams</li> <li>-Evacuation likely with high hazard dams</li> <li>-Hospitals, nursing homes, and the elderly at greater risk due to low mobility</li> </ul>
Economic	<ul style="list-style-type: none"> <li>-Businesses located in the inundation areas would be impacted and closed for an extended period of time</li> <li>-Employees working in the inundation area may be out of work for an extended period of time</li> </ul>
Built Environment	<ul style="list-style-type: none"> <li>-Damage to homes and buildings</li> </ul>
Infrastructure	<ul style="list-style-type: none"> <li>-Transportation routes could be closed for extended period of time</li> </ul>
Critical Facilities	<ul style="list-style-type: none"> <li>-Critical facilities in inundation areas are vulnerable to damages</li> </ul>

## Drought

### Hazard Profile

Drought is generally defined as a natural hazard that results from a substantial period of below normal precipitation. Although many erroneously consider it a rare and random event, drought is actually a normal, recurrent feature of climate. It occurs in virtually all climatic zones, but its characteristics vary significantly from one region to another. A drought often coexists with periods of extreme heat, which together can cause significant social stress, economic losses, and environmental degradation.

Drought is a slow-onset, creeping phenomenon that can affect a wide range of people and industries. While many drought impacts are non-structural, there is the potential that during extreme or prolonged drought events structural impacts can occur. Drought normally affects more people than other natural hazards, and its impacts are spread over a larger geographical area. As a result, the detection and early warning signs of drought conditions and assessment of impacts are more difficult to identify than that of quick-onset natural hazards (e.g., flood) that results in more visible impacts. According to the National Drought Mitigation Center (NDMC), droughts are classified into four major types:

*Drought is a normal, recurrent feature of climate, although many erroneously consider it a rare and random event. It occurs in virtually all climatic zones, but its characteristics vary significantly from one region to another.*

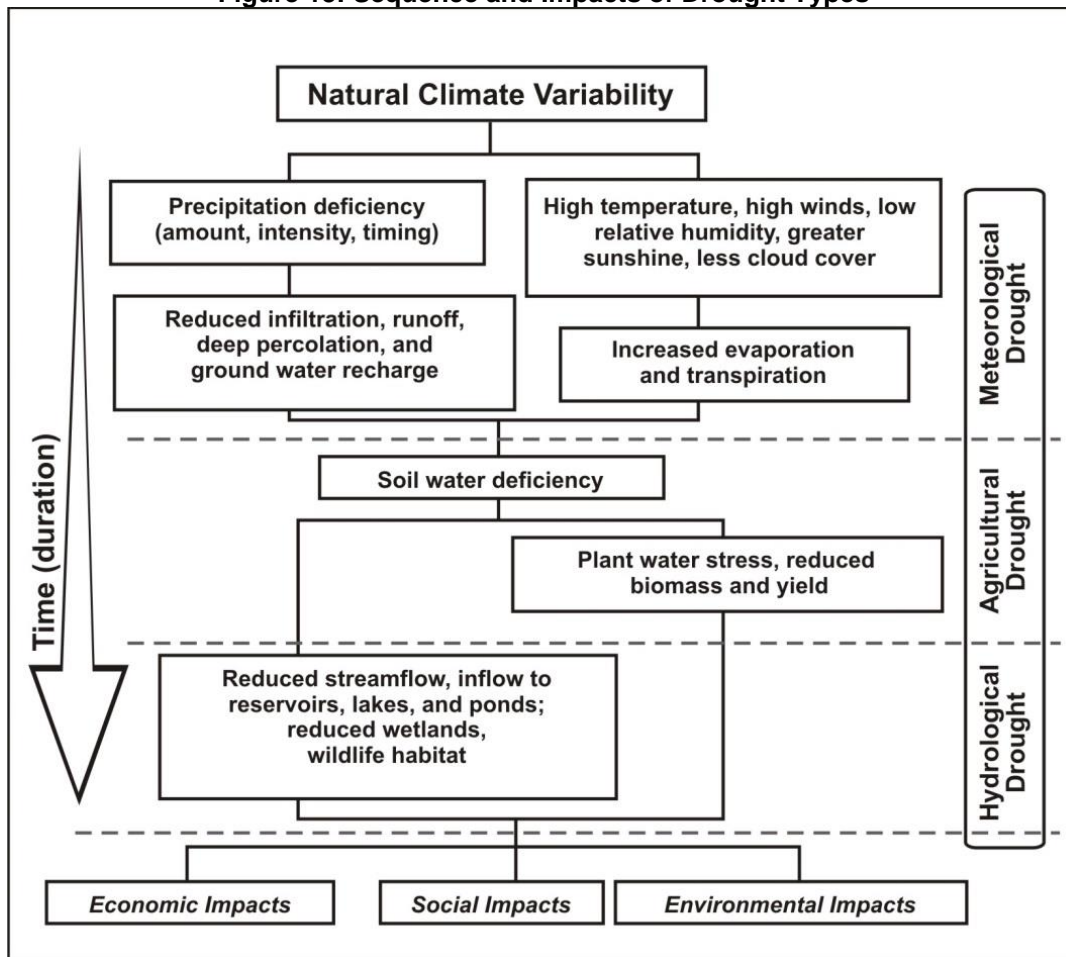
~National Drought Mitigation Center

- **Meteorological Drought** – is defined based on the degree of dryness and the duration of the dry period. Meteorological drought is often the first type of drought to be identified and should be defined regionally as precipitation rates and frequencies (norms) vary.
- **Agricultural Drought** – occurs when there is deficient moisture that hinders planting germination, leading to low plant population per hectare and a reduction of final yield. Agricultural drought is closely linked with meteorological and hydrological drought; as agricultural water supplies are contingent upon the two sectors.
- **Hydrologic Drought** – occurs when water available in aquifers, lakes, and reservoirs falls below the statistical average. This situation can arise even when the area of interest receives average precipitation. This is due to the reserves diminishing from increased water usage, usually from agricultural use or high levels of evapotranspiration, resulting from prolonged high temperatures. Hydrological drought often is identified later than meteorological and agricultural drought. Impacts from hydrological drought may manifest themselves in decreased hydropower production and loss of water-based recreation.
- **Socioeconomic Drought** – occurs when the demand for an economic good exceeds supply due to a weather-related shortfall in water supply. The supply of many economic goods includes, but are not limited to, water, forage, food grains, fish, and hydroelectric power.<sup>52</sup>

The following figure indicates different types of droughts, their temporal sequence, and the various types of effects they can have on a community.

<sup>52</sup> National Drought Mitigation Center. 2017. "Drought Basics." <http://drought.unl.edu/DroughtBasics.aspx>.

Figure 13: Sequence and Impacts of Drought Types



Source: National Drought Mitigation Center, University of Nebraska-Lincoln, 2017<sup>53</sup>

### Historical Occurrences

The Palmer Drought Severity Index (PDSI) is utilized by climatologists to standardize global long-term drought analysis. The data for the planning area was collected for Climate Division 6, which includes the planning area. This particular station’s period of record started in 1895. Figure 14 shows the data from this time period. The negative Y axis represents a drought, for which ‘-2’ indicates a moderate drought, ‘-3’ a severe drought, and ‘-4’ an extreme drought. Table 51 shows the details of the Palmer classifications.

<sup>53</sup> National Drought Mitigation Center. 2017. “Types of Drought.” <http://drought.unl.edu/DroughtBasics/TypesofDrought.aspx>.

**Table 51: Palmer Drought Severity Index Classification**

Numerical Value	Description	Numerical Value	Description
4.0 or more	Extremely wet	-0.5 to -0.99	Incipient dry spell
3.0 to 3.99	Very wet	-1.0 to -1.99	Mild drought
2.0 to 2.99	Moderately wet	-2.0 to -2.99	Moderate drought
1.0 to 1.99	Slightly wet	-3.0 to -3.99	Severe drought
0.5 to 0.99	Incipient wet spell	-4.0 or less	Extreme drought
0.49 to -0.49	Near normal	--	--

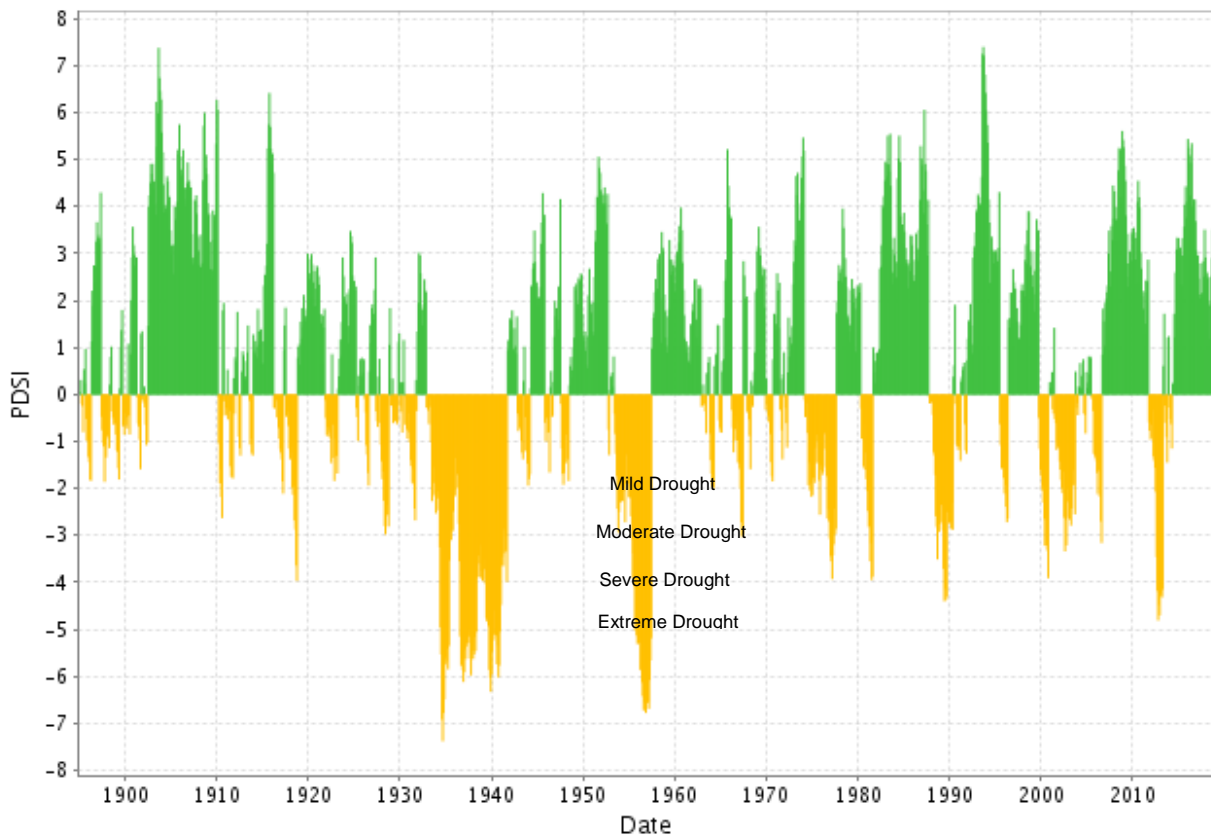
Source: Climate Prediction Center<sup>54</sup>

**Table 52: Historic Droughts**

Drought Magnitude	Months in Drought	Percent Chance
-1 Magnitude (Mild)	171/1,485	11.5%
-2 Magnitude (Moderate)	103/1,485	6.9%
-3 Magnitude (Severe)	48/1,485	3.2%
-4 Magnitude or Greater (Extreme)	90/1,485	6.1%

Source: NCEI, Jan 1895-Sept 2018<sup>55</sup>

**Figure 14: Palmer Drought Severity Index  
NE East Central – PDSI  
189501 – 201812**



Source: NCEI, Jan. 1895-Dec. 2018

<sup>54</sup> National Weather Service. 2017. "Climate Prediction Center." <http://www.cpc.noaa.gov/>.

<sup>55</sup> National Centers for Environmental Information. 1895-2018. Accessed January 2019. <https://www7.ncdc.noaa.gov/CDO/CDODivisionalSelect.jsp>.

### Location

The entire planning area is susceptible to impacts resulting from drought.

### Extent

Using the data from

Table 52 it is reasonable to expect extreme drought to occur in 6.1 percent of months for the planning area (90 extreme drought months in 1,485 months). Severe drought occurred in 48 months of the 1,485 months of record (3.2 percent of months). Moderate drought occurred in 103 months of the 1,485 months of record (6.9 percent of months), and mild drought occurred in 171 of the 1,485 months of record (11.5 percent of months). Non-drought conditions (incipient dry spell, near normal, or incipient wet spell conditions) occurred in 358 months, or 24.1 percent of months. These statistics show that the drought conditions of the planning area are highly variable.

### Average Annual Losses

The annual property estimate was determined based upon NCEI Storm Events Database since 1996. The annual crop loss was determined based upon the RMA Cause of Loss Historical Database since 2000. This does not include losses from displacement, functional downtime, economic loss, injury, or loss of life.

**Table 53: Loss Estimate for Drought**

Hazard Type	Total Property Loss <sup>1</sup>	Average Annual Property Loss <sup>1</sup>	Total Crop Loss <sup>2</sup>	Average Annual Crop Loss <sup>2</sup>
Drought	\$0	\$0	\$51,929,000	\$288,494

*1 Indicates the data is from NCEI (January 1996 to December 2017); 2 Indicates data is from USDA RMA (2000 to 2017)*

The extreme drought in 2012 significantly affected the agricultural sector of the state. Although the full impacts are yet to be studied, the USDA reported a total of \$139,957,809 in drought relief to Nebraska from 2008 to 2011 for all five disaster programs: Supplemental Revenue Assistance Payments; Livestock Forage Disaster Assistance Program; Emergency Assistance for Livestock, Honeybees, and Emergency Assistance for Livestock, Honey Bees, and Farm-Raised Fish Program; Livestock Indemnity Program; and Tree Assistance Program. According to the PDSI, 2012’s average severity index was ranked at a -2.79, with extremes in September and November of -4.81 and -4.70 respectively.

### Probability

The following table summarizes the magnitude of drought and monthly probability of occurrence.

**Table 54: Period of Record in Drought**

PDSI Value	Magnitude	Drought Occurrences by Month	Monthly Probability
4 or more to -0.99	No Drought	1,073/1,485	72.3%
-1.0 to -1.99	Mild Drought	171/1,485	11.5%
-2.0 to -2.99	Moderate Drought	103/1,485	6.9%
-3.0 to -3.99	Severe Drought	48/1,485	3.2%
-4.0 or less	Extreme Drought	90/1,485	6.1%

*Source: NCEI, Jan 1895-Sept 2018*

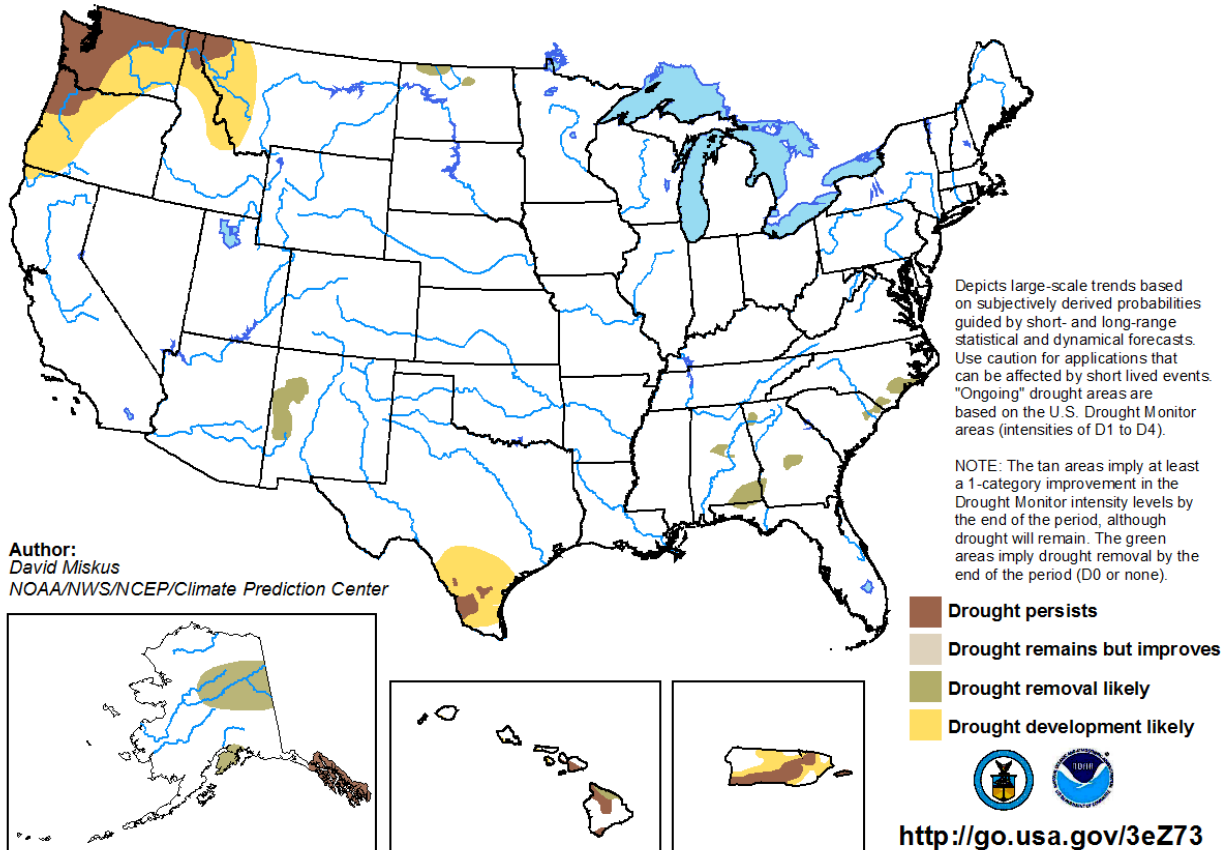
Given the historic record of occurrence (412 months of drought occurrence out of 1,465 months), the annual probability of occurrence for drought is 28 percent.

The U.S. Seasonal Drought Outlook (Figure 15) provides a short-term drought forecast that can be utilized by local officials and residents to examine the likelihood of drought developing or continuing depending on the current situation. The following figure provides the drought outlook for July 18, 2019 through October 31, 2019. According to the U.S. Seasonal Drought Outlook, drought is likely to persist in the north-west and south-central United States, but the planning area should experience seasonal norms relative to precipitation and temperatures.

Figure 15: U.S. Seasonal Drought Outlook

**U.S. Seasonal Drought Outlook**  
**Drought Tendency During the Valid Period**

Valid for July 18 - October 31, 2019  
 Released July 18



Source: NCEI, July 2019

**Regional Vulnerabilities**

The Drought Impact Reporter is a database of drought impacts throughout the United States with data going back to 2000. The Drought Impact Reporter has recorded a total of 18 drought-related impacts throughout the region. This is not a comprehensive list of droughts which may have impacted the planning area. These impacts are summarized in the following table.

**Table 55: Drought Impacts in Planning Area**

Category	Date	Affected Counties	Title
Society & Public Health	2013	Hamilton	Drought alleviated some of the flooding that would have otherwise occurred along the Platte River in southern Nebraska.
Plants & Wildlife, Water Supply & Quality	2013	Hamilton	Low water, warm water temperatures killing fish in Platte River in south central Nebraska.
Agriculture, Relief, Response & Restrictions	2013	Hamilton, Seward, York	Drought-related USDA disaster declarations in 2013.
Plants & Wildlife, Water Supply & Quality	2012	Hamilton	Thousands of fish dead in dry Lower Platte River in Nebraska.
Agriculture, Relief, Response & Restrictions, Water Supply & Quality	2012	Hamilton, Seward	Low flow in several Nebraska rivers brought surface irrigation closures.
Fire, Relief, Response & Recreation	2012	Hamilton, Seward, York	Nebraskans urged to leave the fireworks to the professionals.
Agriculture, Plants & Wildlife	2012	Hamilton	Drought led ranchers in western Nebraska to cull cow herds by 25 to 60 percent.
Relief, Response & Restrictions	2007	Hamilton, Seward, York	Due to lower groundwater levels, the Upper Big Blue Natural Resources District will require groundwater users to report their yearly water use and certify their irrigated land in 2007.
Relief, Response & Restrictions	2006	Hamilton, Seward, York	Another 34 counties in Nebraska were recognized as disaster areas, due to drought.
Water Supply & Quality	2006	Hamilton, Seward, York	Drought has forced some well shutoffs on the Little Blue and Big Blue rivers.
Water Supply & Quality	2005	Hamilton	From west of Grand Island, northeast to Columbus, the Platte River has all but dried up.
Water Supply & Quality	2005	Seward, York	York and Seward have instituted watering restrictions because of low well levels and drought.
Relief, Response & Restrictions	2004	Hamilton, Seward, York	The U.S. Department of Agriculture designated 24 Nebraska counties as primary natural disaster areas on Dec. 28, 2004, due to drought.
Relief, Response & Restrictions	2003	Hamilton	The manager of a local Hampton wholesale company that is going out of business attributes the closure to the effects of continued drought on the local economy.
Relief, Response & Restrictions	2003	Hamilton, Seward, York	Gov. Mike Johanns has requested U.S. Agriculture Secretary Ann Veneman to designate 28 Nebraska counties as agriculture disaster areas due to drought.
Plants & Wildlife	2003	Hamilton	A University of Nebraska Extension Associate has stated that many of the trees in central Nebraska are dying from iron chlorosis, which is an iron deficiency in trees caused by high levels of alkaline in soil.



Category	Date	Affected Counties	Title
Relief, Response & Restrictions	2003	Hamilton, Seward, York	All counties in Nebraska, except Thurston County, were declared federal disaster areas due to the drought.
Relief, Response & Restrictions	2002	Hamilton, York	The U.S. Department of Agriculture has designated the following eighteen Nebraska counties as primary disaster areas for drought.

Source: NDMC, 2000-2018<sup>56</sup>

The following table provides information related to regional vulnerabilities. For jurisdictional-specific vulnerabilities, refer to *Section Seven: Participant Sections*.

**Table 56: Regional Drought Vulnerabilities**

Sector	Vulnerability
People	-Insufficient water supply -Loss of jobs in agricultural sector -Residents in poverty if food prices increase
Economic	-Closure of water intensive businesses (carwashes, pools, etc.) -Loss of tourism dollars -Decrease of land prices → jeopardizes educational funds
Built Environment	-Cracking of foundations (residential and commercial structures) -Damages to landscapes
Infrastructure	-Damages to waterlines below ground -Damages to roadways (prolonged extreme events) -Stressing of electrical systems (brownouts during peak usage)
Critical Facilities	None
Other	-Increase in wildfires and wildfire intensity

<sup>56</sup> National Drought Mitigation Center. 2018. "U.S. Drought Impact Reporter." <http://droughtreporter.unl.edu/map/>.



## Earthquakes

### Hazard Profile

An earthquake is the result of a sudden release of energy in the Earth’s tectonic plates that creates seismic waves. The seismic activity of an area refers to the frequency, type, and size of earthquakes experienced over a period of time. Although rather uncommon, earthquakes do occur in Nebraska and are usually small, generally not felt, and cause little to no damage. Earthquakes are measured by magnitude and intensity. Magnitude is measured by the Richter Scale, a base-10 logarithmic scale, which uses seismographs around the world to measure the amount of energy released by an earthquake. Intensity is measured by the Modified Mercalli Intensity Scale, which determines the intensity of an earthquake by comparing actual damage against damage patterns of earthquakes with known intensities. The following figure shows the fault lines in Nebraska and the following tables summarize the Richter Scale and Modified Mercalli Scale.

**Table 57: Richter Scale**

Richter Magnitudes	Earthquake Effects
Less than 3.5	Generally, not felt, but recorded.
3.5 – 5.4	Often felt, but rarely causes damage.
Under 6.0	At most, slight damage to well-designed buildings. Can cause major damage to poorly constructed buildings over small regions.
6.1 – 6.9	Can be destructive in areas up to about 100 kilometers across where people live.
7.0 – 7.9	Major earthquake. Can cause serious damage over larger areas.
8 or greater	Great earthquake. Can cause serious damage in areas several hundred kilometers across.

Source: FEMA, 2016<sup>57</sup>

**Table 58: Modified Mercalli Intensity Scale**

Scale	Intensity	Description of Effects	Corresponding Richter Scale Magnitude
I	Instrumental	Detected only on seismographs	
II	Feeble	Some people feel it	< 4.2
III	Slight	Felt by people resting, like a truck rumbling by	
IV	Moderate	Felt by people walking	
V	Slightly Strong	Sleepers awake; church bells ring	< 4.8
VI	Strong	Trees sway; suspended objects swing; objects fall off shelves	< 5.4
VII	Very Strong	Mild Alarm; walls crack; plaster falls	< 6.1
VIII	Destructive	Moving cars uncontrollable; masonry fractures; poorly constructed buildings damaged	
IX	Ruinous	Some houses collapse; ground cracks; pipes break open	< 6.9
X	Disastrous	Ground cracks profusely; many buildings destroyed; liquefaction and landslides widespread	< 7.3
XI	Very Disastrous	Most buildings and bridges collapse; roads, railways, pipes and cables destroyed; general triggering of other hazards	< 8.1

<sup>57</sup> Federal Emergency Management Agency. 2016. "Earthquake." <https://www.fema.gov/earthquake>.

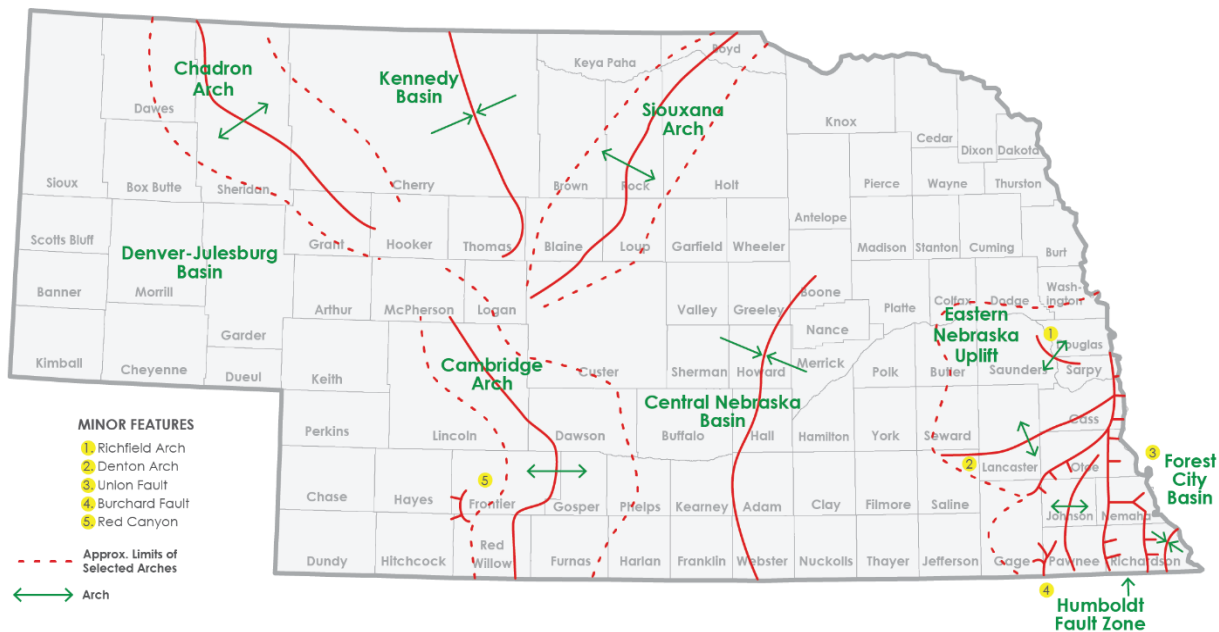
Scale	Intensity	Description of Effects	Corresponding Richter Scale Magnitude
XII	Catastrophic	Total destruction; trees fall; ground rises and falls in waves	> 8.1

Source: FEMA, 2016

**Location**

The most likely locations in the planning area to experience an earthquake are near a fault line (Figure 16). The Eastern Nebraska Uplift would affect the planning area.

**Figure 16: Fault Lines in Nebraska**



Source: Nebraska Department of Natural Resources

**Extent**

If an earthquake were to occur in the planning area, it would likely measure 5.0 or less on the Richter Scale.

**Historical Occurrences**

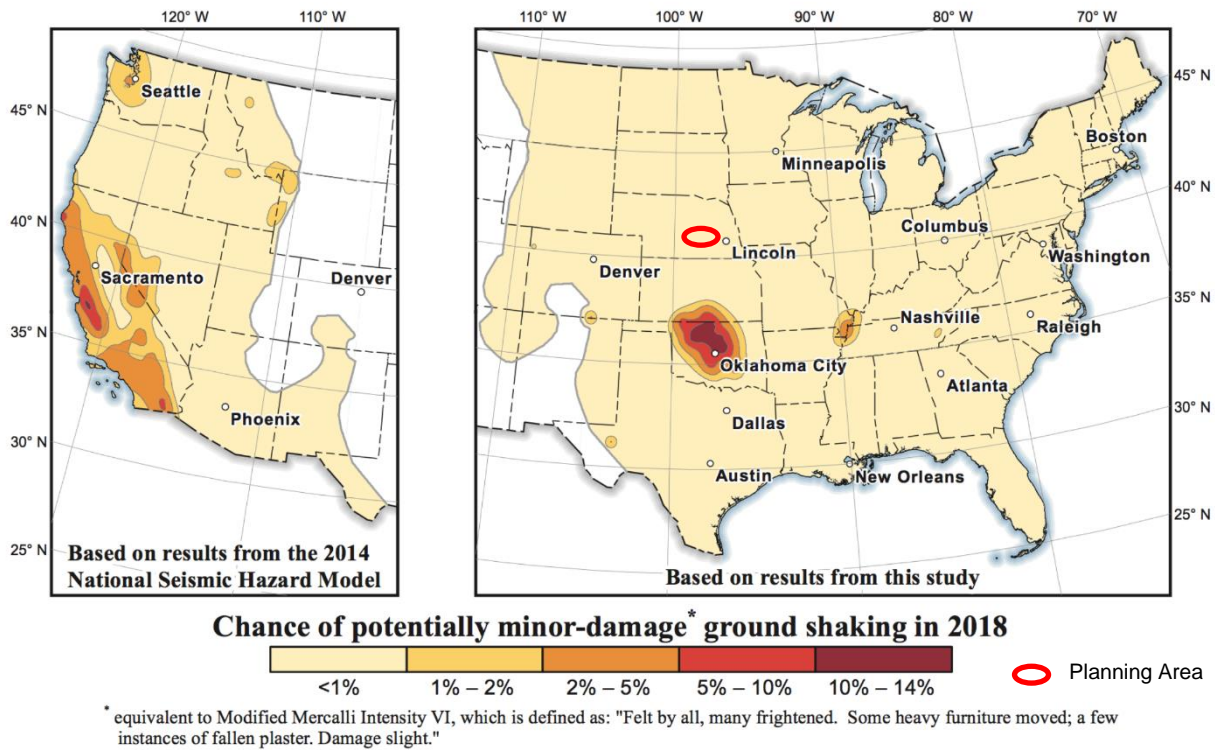
According to the United States Geological Survey (USGS), there have been no earthquakes in the planning area since 1900.<sup>58</sup>

**Average Annual Losses**

Due to the lack of sufficient earthquake data, limited resources, extremely low earthquake risk for the area, and no recorded damages with the reports of historical occurrences, it is not feasible to utilize the 'event damage estimate formula' to estimate potential losses for the planning area. Figure 17 shows the probability of damage from earthquakes, according to the USGS. The figure shows that the planning area has a less than one percent chance of damages from earthquakes.

<sup>58</sup> United States Geological Survey. 2019. "Information by Region – Nebraska." <https://earthquake.usgs.gov/earthquakes/byregion/nebraska.php>.

**Figure 17: 2018 Probability of Damage from Earthquakes**



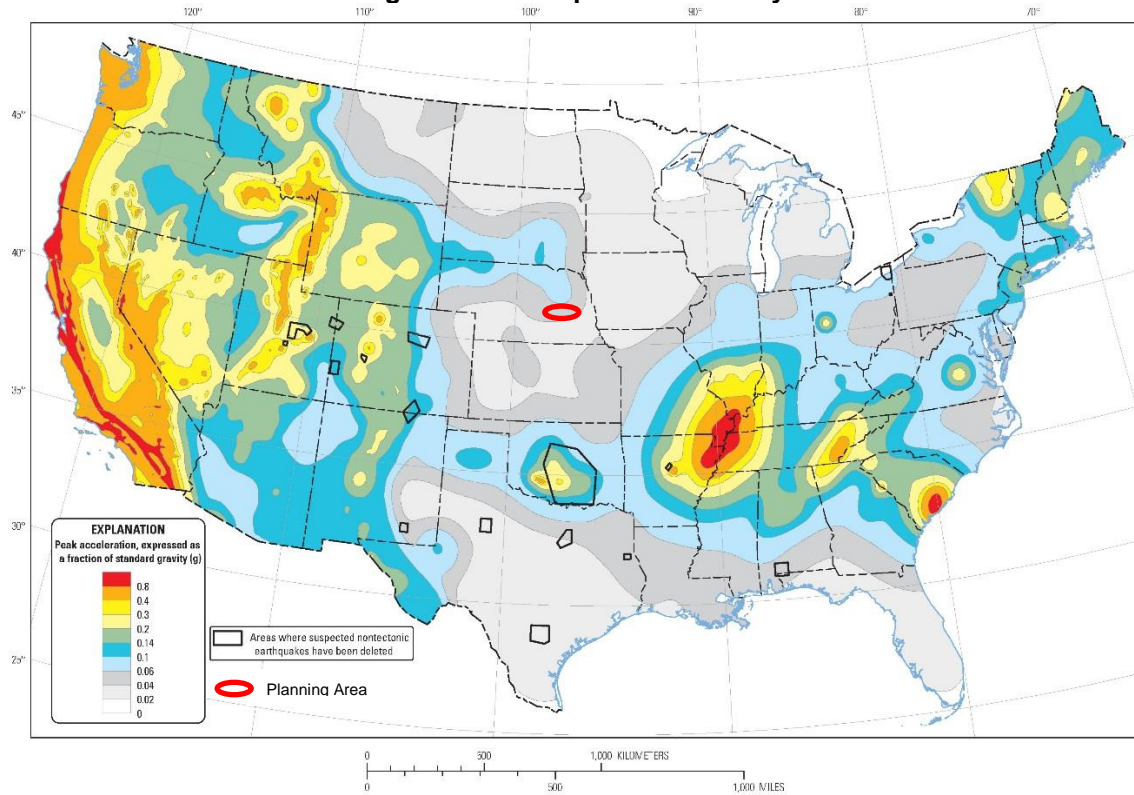
Source: USGS, 2018<sup>59</sup>

### Probability

The following figure summarizes the probability of a 5.0 or greater earthquake occurring in the planning area within 50 years, which is less than one percent. However, with no earthquakes occurring in the planning area in 120 years, for the purposes of this plan, there is less than one percent chance of an earthquake occurring each year.

<sup>59</sup> United States Geological Survey. 2018. "Short-term Induced Seismicity Models: 2017 One-Year Model." <https://earthquake.usgs.gov/hazards/induced/index.php#2018>.

**Figure 18: Earthquake Probability**



Source: USGS 2009 Probabilistic Seismic Hazard Analysis Model  
 Map shows the two-percent probability of exceedance in 50 years of peak ground acceleration

**Regional Vulnerabilities**

The following table provides information related to regional vulnerabilities; for jurisdictional-specific vulnerabilities, refer to *Section Seven: Participant Sections*.

**Table 59: Regional Earthquake Vulnerabilities**

Sector	Vulnerability
People	-Falling objects
Economic	-Short-term interruption of business
Built Environment	-Cracking of foundations (residential and commercial structures) -Damage to structures
Infrastructure	-Damages to subterranean infrastructure (e.g. waterlines, gas lines, etc.) -Damages to roadways
Critical Facilities	-Same as all other structures

## Extreme Heat

### Hazard Profile

Extreme heat is often associated with periods of drought but can also be characterized by long periods of high temperatures in combination with high humidity. During these conditions, the human body has difficulty cooling through the normal method of the evaporation of perspiration. Health risks arise when a person is overexposed to heat. Extreme heat can also cause people to overuse air conditioners, which can lead to power failures. Power outages for prolonged periods increase the risk of heat stroke and subsequent fatalities due to loss of cooling and proper ventilation. The planning area is largely rural, which presents an added vulnerability to extreme heat events; those suffering from an extreme heat event may be farther away from medical resources as compared to those living in an urban setting.

Along with humans, animals also can be affected by high temperatures and humidity. For instance, cattle and other farm animals respond to heat by reducing feed intake, increasing their respiration rate, and increasing their body temperature. These responses assist the animal in cooling itself, but this is usually not sufficient. When animals overheat, they will begin to shut down body processes not vital to survival, such as milk production, reproduction, or muscle building.

Other secondary concerns connected to extreme heat hazards include water shortages brought on by drought-like conditions and high demand. Government authorities report that civil disturbances and riots are more likely to occur during heat waves. In cities, pollution becomes a problem because the heat traps pollutants in densely populated urban areas. Adding pollution to the stresses associated with the heat magnifies the health threat to the urban population.

For the planning area, the months with the highest temperatures are June, July, and August. The National Weather Service (NWS) is responsible for issuing excessive heat outlooks, excessive heat watches, and excessive heat warnings.

- **Excessive heat outlooks** are issued when the potential exists for an excessive heat event in the next three to seven days. Excessive heat outlooks can be utilized by public utility staffs, emergency managers, and public health officials to plan for extreme heat events.
- **Excessive heat watches** are issued when conditions are favorable for an excessive heat event in the next 24 to 72 hours.
- **Excessive heat warnings** are issued when an excessive heat event is expected in the next 36 hours. Excessive heat warnings are issued when an extreme heat event is occurring, is imminent, or has a very high probability of occurring.

### Location

This hazard may occur throughout the planning area.

### Extent

A key factor to consider regarding extreme heat situations is the humidity level relative to the temperature. As is indicated in the following figure from the National oceanic and Atmospheric Administration (NOAA), as the Relative Humidity increases, the temperature needed to cause a dangerous situation decreases. For example, for 100 percent Relative Humidity, dangerous levels of heat begin at 86°F where as a Relative Humidity of 50 percent, require 94°F. The combination of Relative Humidity and Temperature result in a Heat Index as demonstrated below:



100% Relative Humidity + 86°F = 112°F Heat Index

**Figure 19: NOAA Heat Index Temperature (°F)**



Likelihood of Heat Disorders with Prolonged Exposure or Strenuous Activity



Source: NOAA, 2017<sup>60</sup>

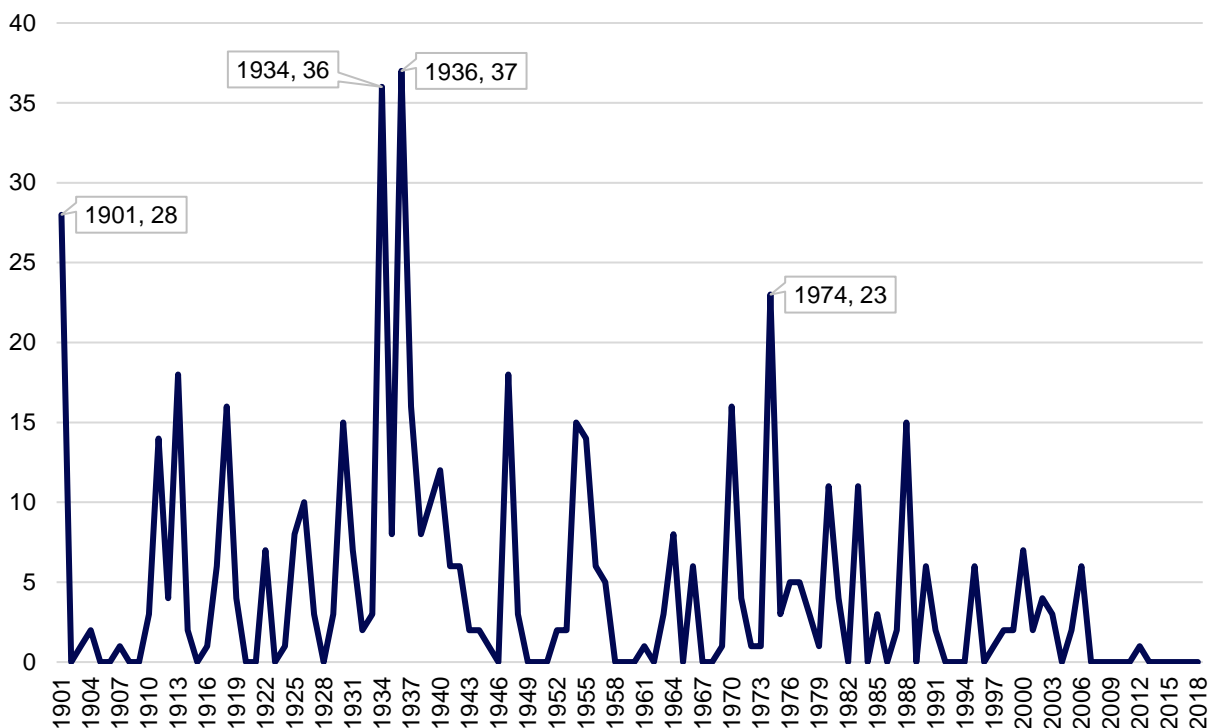
The figure above is designed for shady and light wind conditions. Exposure to full sunshine or strong winds can increase hazardous conditions and raise heat index values by up to 15°F. For the purposes of this plan, extreme heat is being defined as temperatures of 100°F or greater.

**Historical Occurrences**

According to the High Plains Regional Climate Center (HPRCC), on average, the planning area experiences five days at or above 100°F. The planning area experienced 37 days at or above 100°F in 1936, which was the most 100°F days on record. More recently, in 2000 and 2006 there were seven days and six days respectively above 100°F. Conversely, the past six years (2013-2018) did not have any days at or above 100°F.

<sup>60</sup> National Oceanic and Atmospheric Administration, National Weather Service. 2017. "Heat Index." [http://www.nws.noaa.gov/om/heat/heat\\_index.shtml](http://www.nws.noaa.gov/om/heat/heat_index.shtml).

Figure 20: Number of Days at or Above 100°F



Source: HPRCC, 1901-2018

### Average Annual Losses

The direct and indirect effects of extreme heat are difficult to quantify. Potential losses such as power outages could affect businesses, homes, and critical facilities. High demand and intense use of air conditioning can overload the electrical systems and cause damages to infrastructure.

The NCEI database did not report any property damage due to extreme heat events.

Table 60: Extreme Heat Loss Estimation

Hazard Type	Number of Average Days Above 90°F <sup>1</sup>	Property Damages <sup>2</sup>	Average Annual Property Damage <sup>2</sup>	Total Crop Loss <sup>3</sup>	Annual Crop Loss <sup>3</sup>
Extreme Heat	5	\$0	\$0	\$9,925,664	\$551,526

Source: 1 indicates the data is from HPRCC; 2 NCEI (1901-2018); 3 USDA RMA (2000-2017)

### Estimated Loss of Electricity

According to the FEMA Benefit Cost Analysis (BCA) Reference Guide, if an extreme heat event occurred within the planning area, the following table assumes the event could potentially cause a loss of electricity for 10 percent of the population at a cost of \$126 per person per day.<sup>61</sup> In rural areas, the percent of the population affected, and duration may increase during extreme events. The assumed damages do not take into account physical damages to utility equipment and infrastructure.

<sup>61</sup> Federal Emergency Management Agency. June 2009. "BCA Reference Guide."

**Table 61: Loss of Electricity - Assumed Damage by Jurisdiction**

Jurisdiction	2017 Population	Population Affected (Assumed)	Electric Loss of Use Assumed Damage Per Day
Hamilton County	9,118	912	\$114,912
Seward County	17,113	1,711	\$215,586
York County	13,842	1,384	\$174,384

### Probability

Extreme heat is a regular part of the climate for the planning area. Based on historical data of an average of five extreme heat days a year, there is a 100 percent probability that temperatures greater than or equal to 100°F will occur annually.

### Regional Vulnerabilities

The following table provides information related to regional vulnerabilities; for jurisdictional-specific vulnerabilities, refer to *Section Seven: Participant Sections*.

**Table 62: Regional Extreme Heat Vulnerabilities**

Sector	Vulnerability
People	-Heat exhaustion -Heat Stroke -Vulnerable populations include: -People working outdoors -People without air conditioning -Young children outdoors or without air conditioning -Elderly outdoors or without air conditioning
Economic	-Short-term interruption of business -Loss of power -Agricultural losses
Built Environment	None
Infrastructure	-Overload of electrical systems -Damages to roadways
Critical Facilities	-Loss of power



## **Flooding**

### **Hazard Profile**

Flooding can occur on a local level, sometimes affecting only a few streets, but can also extend throughout an entire district, affecting whole drainage basins and impacting property in multiple states. Heavy accumulations of ice or snow can also cause flooding during the melting stage. These events are complicated by the freeze/thaw cycles characterized by moisture thawing during the day and freezing at night. There are four main types of flooding in the planning area: riverine flooding, flash flooding, sheet flooding, and ice jam flooding.

### **Riverine Flooding**

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

### **Flash Flooding**

Flash floods, faster in nature than the other types of floods, result from convective precipitation usually due to intense thunderstorms or sudden releases from an upstream impoundment created behind a dam, landslide, or levee. Flash floods are distinguished from regular floods by a timescale of fewer than six hours. Flash floods cause the most flood-related deaths as a result of this shorter timescale. Flooding from excessive rainfall in Nebraska usually occurs between late spring and early fall.

### **Sheet Flooding**

In some cases, flooding may not be directly attributable to a river, stream, or lake overflowing its banks. Rather, it may simply be the combination of excessive rainfall or snowmelt, saturated ground, and inadequate drainage. With no place to go, the water will find the lowest elevations – areas that are often not in a floodplain. This type of flooding, often referred to as sheet flooding, is becoming increasingly prevalent as development exceeds the capacity of drainage infrastructure, therefore limiting its capacity to convey the water flow. Flooding also occurs due to combined storm and sanitary sewers being overwhelmed by the tremendous flow of water that often accompanies storm events. Typically, the result is water backing into basements, which damages mechanical systems and can create serious public health and safety concerns.

### **Ice Jam Flooding**

Ice jams typically occur when ice breaks up in moving waterways during thawing conditions, and then stacks on itself where channels narrow, or human-made obstructions constrict the channel. This creates an ice dam, often causing flooding within minutes of the dam formation.

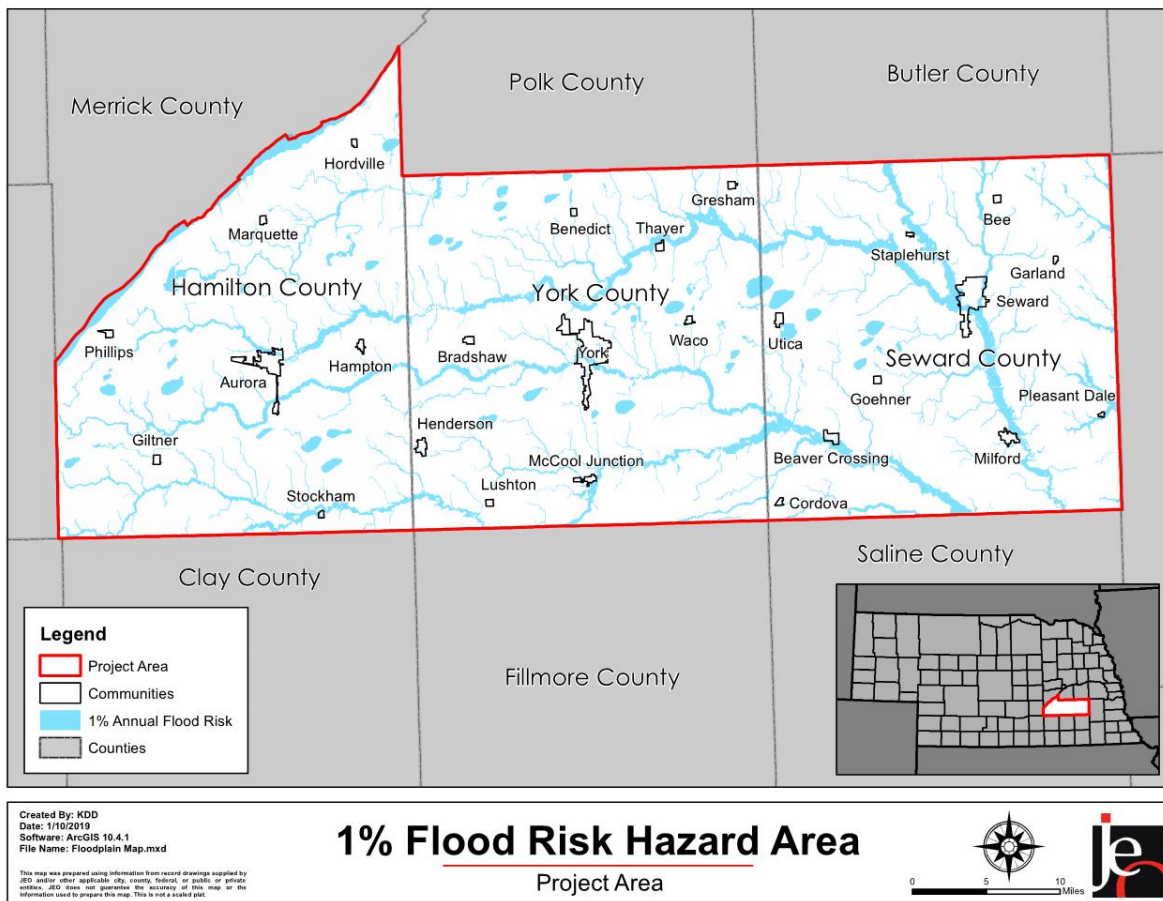
Ice formation in streams occurs during periods of cold weather when finely divided colloidal particles called “frazil ice” form. These particles combine to form what is commonly known as “sheet ice.” This type of ice covers the entire river. The thickness of this ice sheet depends upon the degree and duration of cold weather in the area. This ice sheet can freeze to the bottom of the channel in places. During spring thaw, rivers frequently become clogged with this winter accumulation of ice. Because of relatively low stream banks and channels blocked with ice, rivers overtop existing banks and flow overland. Along the Platte River in central Nebraska, ice jams have also occurred during freeze up at the beginning of winter.

**Location**

Table 63 shows current statuses of Flood Insurance Rate Map (FIRM) panels. Some of the jurisdictions throughout the planning area also have FIRMs at the municipal level.

Figure 21 shows the Preliminary FIRM data for the planning area. Seward, York, and Hamilton Counties are currently going through a floodplain mapping update. The projected effective date for Hamilton and York Counties is August 1<sup>st</sup>, 2019. The projected effective date for Seward County is late 2019 to early 2020. For jurisdictional-specific maps as well as an inventory of structures in the floodplain, please refer to *Section Seven: Participant Sections*.

**Figure 21: 1% Annual Flood Risk Area**



\*Note: Floodplain is based off preliminary FIRM maps. Final effective FIRM maps are currently being produced.

**Table 63: FEMA FIRM Panel Status**

Jurisdiction	Panel Number	Effective Date
Hamilton County	310441IND0	12/02/1992
	310441 0025 A	
	310441 0050 A	
	310441 0075 A	
	310441 0100 A	
	310441 0125 A	
	310441 0150 A	
	310441 0175 A	

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Jurisdiction	Panel Number	Effective Date
City of Aurora	310105 0001 B	02/08/1983
	310105 005 C	08/16/1988
Village of Stockham	310106	12/06/1974
Seward County	310474IND0	03/16/1992
	3104749999B	09/01/1990
	310474 0001 B	
	310474 0002 B	
	310474 0003 B	
	310474 0004 B	
	310474 0005 C	03/16/1992
310474 0006 B	09/01/1990	
City of Milford	310209IND0	11/05/1997
	310209 0001 C	
	310209 0002 C	
City of Seward	310210IND0	09/30/1993
	31021 0005 C	
	31021 00010 C	
Village of Beaver Crossing	310208 0005 B	03/16/1992
York County	310486IND0	09/01/1986
	3104869999A	
	310486 0001 B	
	310486 0002 B	
	310486 0003 B	
	310486 0004 B	
	310486 0005 B	
	310486 0006 B	
	310486IND01177	11/01/1977
	310486 0001 A	
	310486 0002 A	
	310486 0003 A	
	310486 0004 A	
	310486 0005 A	
310486 0006 A		
City of Henderson	310378 A	09/04/1986
City of York	3102737IND0	09/29/1978
	310237FND0	
	310237 0005 B	
	310237 0010 B	
	310237 0005	
	310237 0010	
Village of Benedict	310250	04/18/1975
	3102509999A	12/01/2001
	310250 A	
Village of McCool Junction	310236 005 A	09/04/1987

Source: FEMA, 2018<sup>62</sup>

The three counties in the planning area are all currently undergoing a floodplain mapping update. Effective FIRM maps are anticipated to be effective late 2019 or early 2020. The FIRM panels listed above are the effective FIRM panels as of 2018. Floodplain maps used throughout this plan are based on preliminary FIRM maps provided by FEMA. Future updates of the HMP will include

<sup>62</sup> Federal Emergency Management Agency. 2018. "FEMA Flood Map Service Center." <http://msc.fema.gov/portal/advanceSearch>.

the newly effective FIRM maps. The most recent floodplain maps and panels can be found on the FEMA Flood Map Service Center.

**Extent**

The NWS has three categories to define the severity of a flood once a river reaches flood stage as indicated in Table 64.

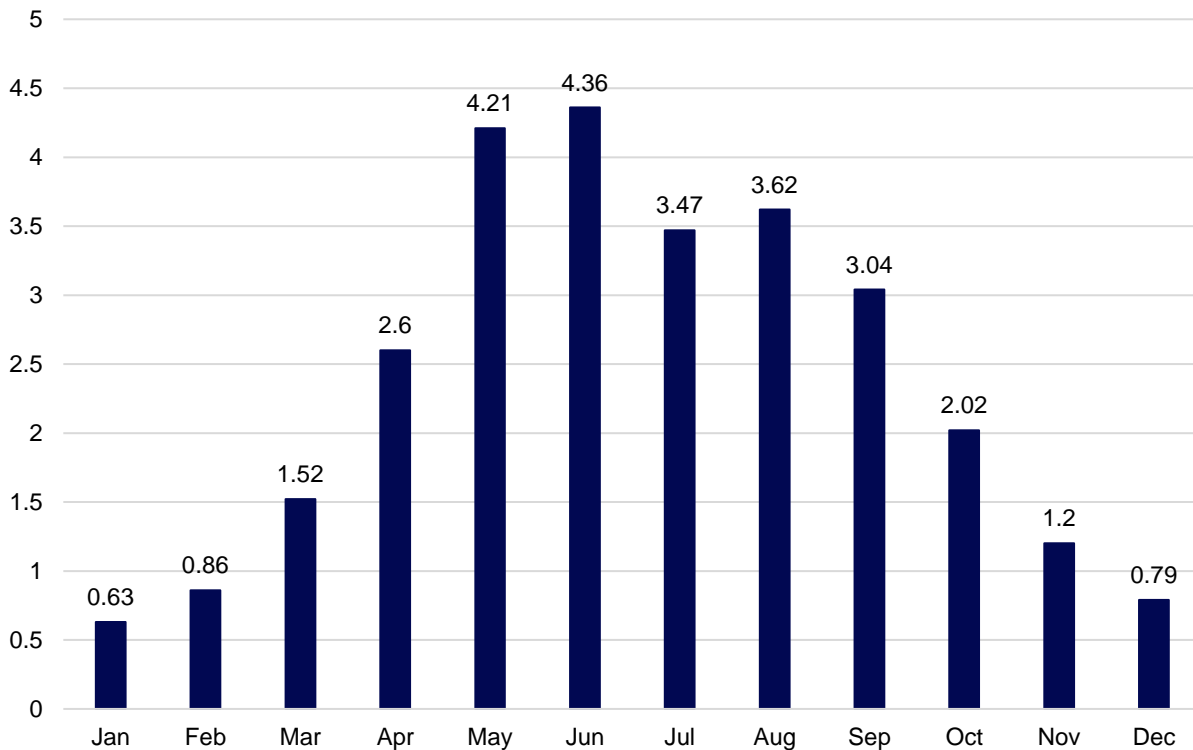
**Table 64: Flooding Stages**

Flood Stage	Description of flood impacts
Minor Flooding	Minimal or no property damage, but possibly some public threat or inconvenience
Moderate Flooding	Some inundation of structures and roads near streams. Some evacuations of people and/or transfer of property to higher elevations are necessary
Major Flooding	Extensive inundation of structures and roads. Significant evacuations of people and/or transfer of property to higher elevations

Source: NOAA, 2017<sup>63</sup>

Figure 22 shows the normal average monthly precipitation for the planning area, which is helpful in determining whether any given month is above, below, or near normal in precipitation. As indicated in Figure 23, the most common months for flooding within the planning area are May and June. While it is possible that major flood events will occur, the likely extent of flood events within the planning area is classified as moderate.

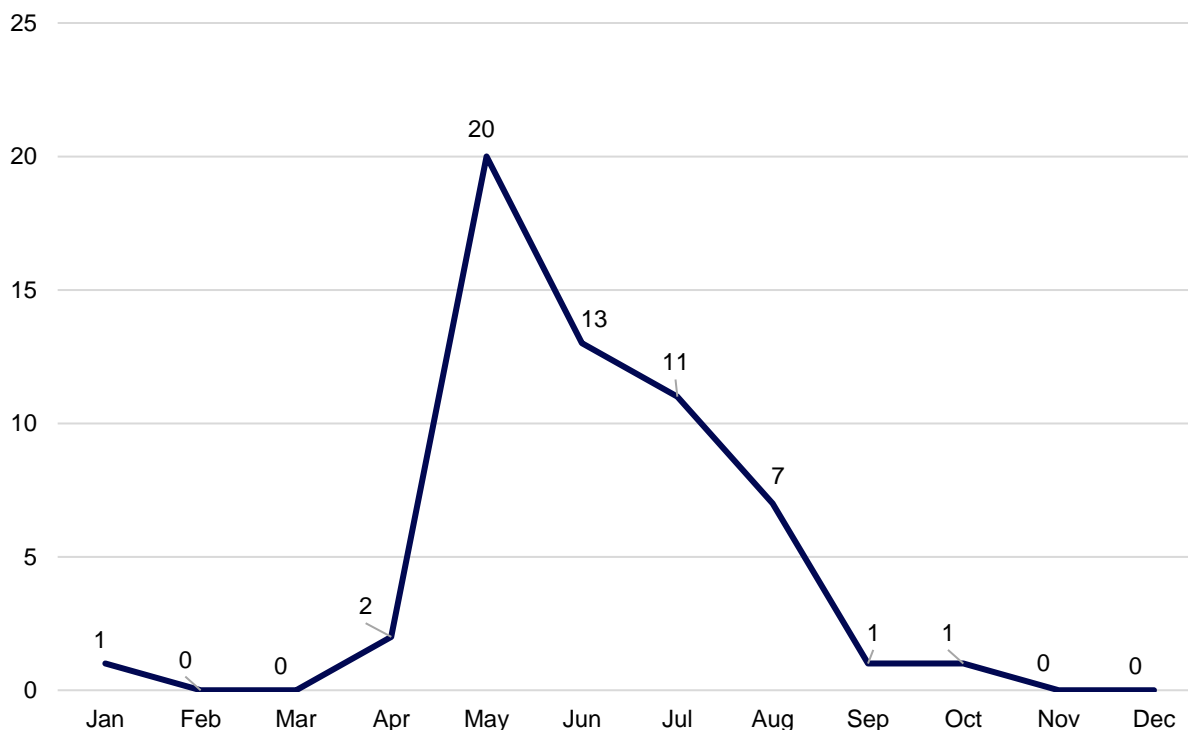
**Figure 22: UBBNRD Average Monthly Precipitation**



Source: NOAA, 2018

<sup>63</sup> National Weather Service. 2017. "Flood Safety." <http://www.floodsafety.noaa.gov/index.shtml>.

**Figure 23: Monthly Events for Floods/Flash Flood in the UBBNRD (1996-2017)**



Source: NCEI, 1996-2017

**National Flood Insurance Program (NFIP)**

The NFIP was established in 1968 to reduce flood losses and disaster relief costs by guiding future development away from flood hazard areas where feasible; by requiring flood resistant design and construction practices; and by transferring the costs of flood losses to the residents of floodplains through flood insurance premiums.

In return for availability of federally-backed flood insurance, jurisdictions participating in the NFIP must agree to adopt and enforce floodplain management standards to regulate development in special flood hazard areas as defined by FEMA’s flood maps. One of the strengths of the program has been keeping people away from flooding rather than keeping the flooding away from people – through historically expensive flood control projects.

The following tables summarize NFIP participation and active policies within the planning area.

**Table 65: NFIP Participants**

Jurisdiction	Eligible-Regular Program	Date Current Map	Sanction	Suspension	Rescinded	Participation in NFIP
<b>Hamilton County</b>	06/21/93	12/02/92	-	-	-	Yes
Aurora	08/16/88	08/16/88	-	-	-	Yes
<b>Seward County</b>	09/01/90	03/16/92 (M)	-	-	-	Yes
Beaver Crossing	08/19/87	03/16/92 (M)	-	-	-	Yes
Milford	10/16/84	11/05/97	-	-	-	Yes
Seward	09/30/80	09/30/93	-	-	-	Yes
<b>York County</b>	09/01/86	09/01/86 (L)	-	-	-	Yes
Benedict	12/01/01	12/01/01 (L)	-	-	-	Yes
Henderson	09/04/86	09/04/86 (M)	-	-	-	Yes
McCool Junction	09/04/87	09/04/87 (M)	-	-	-	Yes
Waco	08/31/11	(NSFHA)	-	-	-	Yes
York	09/29/78	09/29/78	-	-	-	Yes

\*NSFHA = No Special Flood Hazard Area – All Zone C; (M) = No Elevation Determined – All Zone A, C and X; (L)Original FIRM by Letter – All Zone A, C and X

Source: Nebraska Department of Natural Resources, National Flood Insurance Program, 2018

**Table 66: NFIP Policies in Force and Total Payments**

Jurisdiction	Policies In-force	Total Coverage	Total Premium	Closed Losses*	Total Payments
<b>Hamilton County</b>	16	\$2,654,300	\$14,131	2	\$9,792.52
Aurora	5	\$365,200	\$3,856	10	\$76,402.14
<b>Seward County</b>	12	\$1,451,000	\$11,750	2	\$12,950.68
Beaver Crossing	1	\$96,400	\$895	0	\$0
Milford	2	\$276,500	\$1,953	0	\$0
Seward	11	\$2,089,400	\$6,662	15	\$104,803.18
<b>York County</b>	16	\$2,661,100	\$16,954	0	\$0
Benedict	1	\$81,700	\$2,056	0	\$0
McCool Junction	8	\$1,548,900	\$6,800	1	\$27,149.43
York	36	\$3,008,100	\$34,466	1	\$3,434.48
<b>Planning Area Total</b>	108	\$14,232,600	\$99,523	31	\$234,532.43

Source: NFIP Community Status Book, 2018<sup>64</sup>

Only communities with policies in force are included in this table

\*Closed Losses are those flood insurance claims that resulted in payment

<sup>64</sup> Federal Emergency Management Agency: National Flood Insurance Program. August 2018. "Policy & Claim Statistics for Flood Insurance." Accessed August 2018. <https://www.fema.gov/policy-claim-statistics-flood-insurance>.

This plan highly recommends and strongly encourages each plan participant to remain in good standing and continue involvement with the NFIP. Compliance with the NFIP should remain a top priority for each participant, regardless of whether or not a flooding hazard map has been delineated for the jurisdiction. Jurisdictions are encouraged to initiate activities above the minimum participation requirements, which are described in the NFIP Community Rating System (CRS) Coordinator’s Manual (FIA-15/2017).<sup>65</sup>

### NFIP Repetitive Loss Structures

Multiple requests were made to NeDNR and FEMA to determine if any existing buildings, infrastructure, or critical facilities are classified as NFIP Repetitive Loss Structures. Due to privacy concerns, the Planning Team was unable to obtain updated repetitive loss data for the planning area. The following information is taken from the previous HMPs.

Hamilton County had one NFIP Repetitive Loss Structure (as of December 2014). The property is a single-family home located in Aurora. Seward County had one NFIP Repetitive Loss Structure (as of January 2013). The repetitive loss structure is a non-residential structure. York County did not have any NFIP Repetitive Loss Structures listed in the previous HMP.

### Historical Occurrences

According to the NCEI, flash flooding resulted in \$5,130,000 in property damage, while riverine flooding caused \$1,222,000 in property damage. USDA RMA data does not distinguish the difference between riverine flooding damages and flash flooding damages. The total crop loss according to the RMA is \$461,087.

In March 2019 a large flooding event occurred in the northern and eastern parts of the state. The planning area experienced localized flooding as well as damages to several county roads. Exact damage numbers are not known at this time. For specific community impacts please refer to *Section Seven: Participant Sections*.

### Average Annual Damages

The average damage per event estimate and the number of historical occurrences was determined based upon NCEI Storm Events Database since 1996. This does not include losses from displacement, functional downtime, economic loss, injury, or loss of life. Flooding causes an average of \$288,727 in property damages and \$25,616 in crop losses per year for the planning area.

**Table 67: Flood Loss Estimate**

Hazard Type	Number of Events <sup>1</sup>	Number of Events Per Year	Total Property Loss <sup>1</sup>	Average Annual Property Loss <sup>1</sup>	Total Crop Loss <sup>2</sup>	Average Annual Crop Loss <sup>2</sup>
Flood Events	55	2.5	\$6,352,000	\$288,727	\$461,087	\$25,616

<sup>1</sup> Indicates data from NCEI (January 1996 to December 2017); <sup>2</sup> Indicates data from RMA (2000 to 2017)

### Probability

The NCEI reports 55 flooding/flash flooding events from January 1996 to December 2017. Based on the historic record and reported incidents by participating communities, there is a 100 percent probability that flooding will occur annually in the planning area.

<sup>65</sup> Federal Emergency Management Agency. May 2017. “National Flood Insurance Program Community Rating System: Coordinator’s Manual FIA-15/2017.” Accessed January 2019. <https://www.fema.gov/media-library/assets/documents/8768>.



**Regional Vulnerabilities**

A 2008 national study examining social vulnerability as it relates to flood events found that low-income and minority populations are disproportionately vulnerable to flood events. These groups may lack needed resources to mitigate potential flood events as well as resources that are necessary for evacuation and response. In addition, low-income residents are more likely to live in areas vulnerable to the threat of flooding but lack the resources necessary to purchase flood insurance. The study found that flash floods are more often responsible for injuries and fatalities than prolonged flood events.

Other groups that may be more vulnerable to floods, specifically flash floods, include the elderly, those outdoors during rain events, and those in low-lying areas. Elderly residents may suffer from a decrease or complete lack of mobility and as a result, be caught in flood-prone areas. Residents in campgrounds or public parks may be more vulnerable to flooding events. Many of these areas exist in natural floodplains and can experience rapid rise in water levels resulting in injury or death.

On a state level, the Nebraska’s State National Flood Insurance Coordinator’s office has done some work, studying who lives in special flood hazard areas. According to the NeDNR, floodplain areas have a few unique characteristics which differ from non-floodplain areas:

- Higher vacancy rates within floodplain
- Far higher percentage of renters within floodplain
- Higher percentage of non-family households in floodplain
- More diverse population in floodplain
- Much higher percentage of Hispanic/Latino populations in the floodplain

The following table is a summary of regional vulnerabilities. For jurisdictional-specific vulnerabilities, refer to *Section Seven: Participant Sections*.

**Table 68: Regional Flooding Vulnerabilities**

Sector	Vulnerability
People	-Low income and minority populations may lack the resources needed for evacuation, response, or to mitigate the potential for flooding -The elderly has decreased mobility -Residents in low-lying areas, especially campgrounds, are vulnerable during flash flood events -Residents living in the floodplain may need to evacuate for extended periods
Economic	-Business closures or damages may have significant impacts -Agricultural losses from flooded fields -Closed roads and railways would impact commercial transportation of goods
Built Environment	-Buildings damages
Infrastructure	-Damages to roadways and railways
Critical Facilities	-Wastewater facilities are at risk, particularly those in the floodplain -Those in the floodplain, are at risk to damage (critical facilities are noted within individual participant sections)

## Grass/Wildfire

### Hazard Profile

Wildfires, also known as brushfires, forest fires, or wildland fires, are any uncontrolled fire that occurs in the countryside or wildland. Wildland areas may include but are not limited to: grasslands; forests; woodlands; agricultural fields; and other vegetated areas. Wildfires differ from other fires by their extensive size, the speed at which they can spread from the original source, their ability to change direction unexpectedly, and to jump gaps (such as roads, rivers, and fire breaks). While some wildfires burn in remote forested regions, others can cause extensive destruction of homes and other property located in the wildland-urban interface, the zone of transition between developed areas and undeveloped wilderness.

Wildfires are a growing hazard in most regions of the United States, posing a threat to life and property, particularly where native ecosystems meet urban developed areas. Although fire is a natural and often beneficial process, fire suppression can lead to more severe fires due to the buildup of vegetation, which creates more fuel and increases the intensity and devastation of future fires.

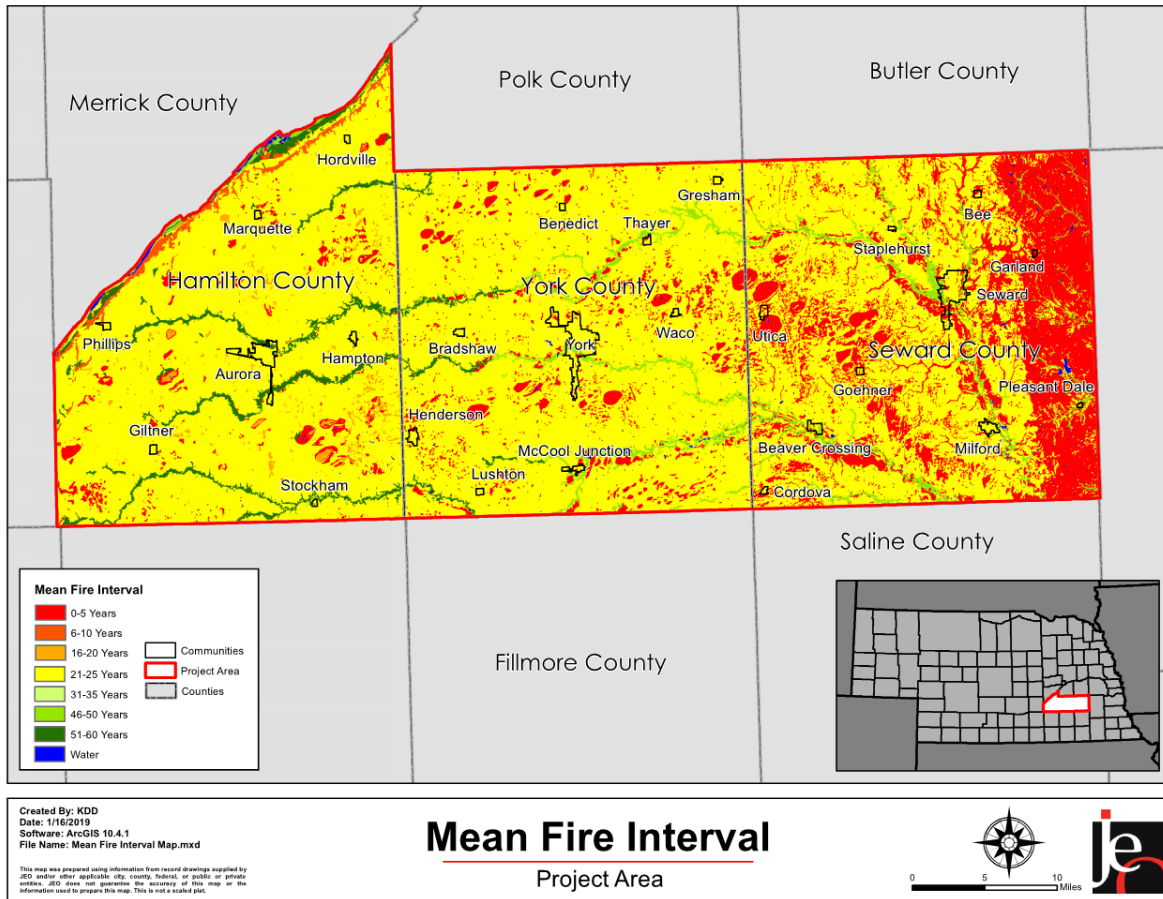
*Lightning starts approximately 10,000 forest fires each year, yet **ninety percent** of forest fires are started by humans.*

*-National Park Service*

Wildfires are characterized in terms of their physical properties including topography, weather, and fuels. Wildfire behavior is often complex and variably dependent on factors such as fuel type, moisture content in the fuel, humidity, wind speed, topography, geographic location, ambient temperature, the effect of weather on the fire, and the cause of ignition. Fuel is the only physical property humans can control and is the target of most mitigation efforts. The NWS monitors the risk factors including high temperature, high wind speed, fuel moisture (greenness of vegetation), low humidity, and cloud cover in the state on a daily basis.

Figure 24 shows the USGS' Mean Fire Return Interval. This model considers a variety of factors, including landscape, fire dynamics, fire spread, fire effects, and spatial context. These values show how often fires occur in each area under natural conditions.

Figure 24: Mean Fire Return Interval



Source: USGS LANDFIRE Database<sup>66</sup>

**Location**

As the number of reported wildfires by the county indicates, the greatest threat of wildfire that could impact people and homes is in York County.

Table 69: Reported Wildfires by County

County	Reported Wildfires	Acres Burned
Hamilton County	247	1,509
Seward County	170	3,548
York County	284	1,670
<b>Total</b>	<b>701</b>	<b>6,727</b>

Source: Nebraska Forest Service, 2000-2017<sup>67</sup>

**Extent**

Figure 25 illustrates the number of wildfires by cause in the planning area from 2000 to 2017, which burned 6,727 acres in total. There were 701 reported wildfires in the planning area between 2000 and 2017. Fourteen of the fires burned 100 acres or more, with the largest wildfire burning 1,000 acres in Seward County in February of 2014.

<sup>66</sup> United States Geological Survey. 2019. "Landfire Data Distribution Site." <https://landfire.cr.usgs.gov/viewer/viewer.html>.

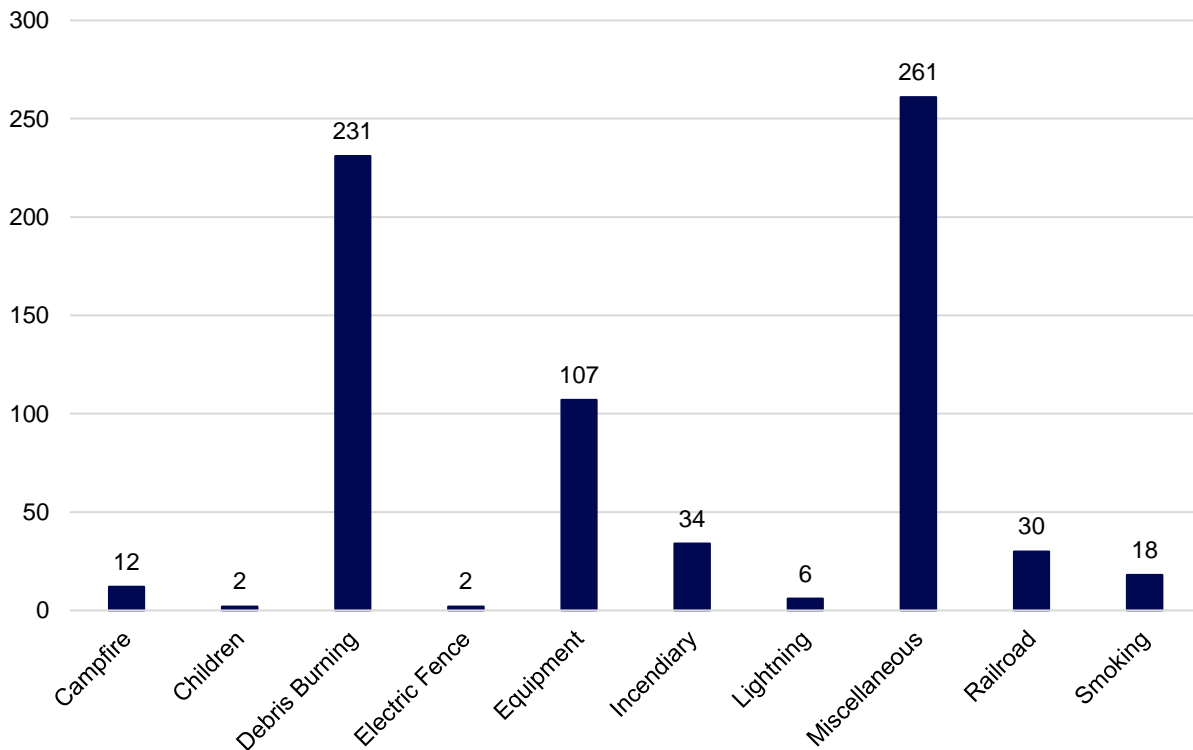
<sup>67</sup> Nebraska Forest Service. 2000-2017. "Fire Incident Type Summary." Data Files 2000-2017.

### Historical Occurrences

For the planning area, 22 different fire departments reported a total of 701 wildfires, according to the National Forest Service (NFS), from 2000 to 2017. Most fires occurred in 2012 (Figure 26). The reported events burned 6,727 acres. The reported fire events caused \$0 in crop damages according to the RMA.

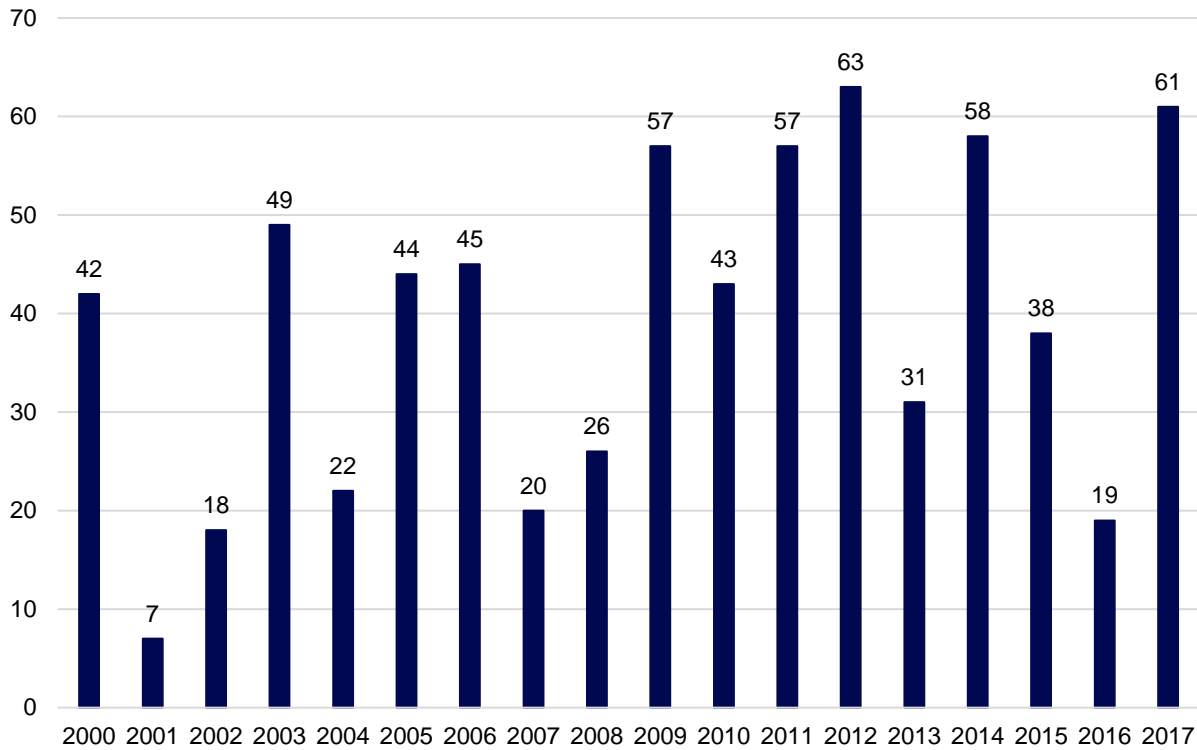
Wildfires are most likely to be started by Miscellaneous (37%). Debris burning (33%) and equipment (15%) are the second and third leading causes of fires in the planning area. Most wildfires that occur in the planning area will likely be kept to under 100 acres.

**Figure 25: Wildfires by Cause for the Planning Area 2000-2017**



Source: Nebraska Forest Service, 2000-2017

**Figure 26: Number of Wildfires by Year for the Planning Area**



Source: Nebraska Forest Service, 2000-2017

**Average Annual Damages**

The number of events and average acres per fire was determined based upon the Nebraska Forest Service Wildfires Database from 2000 to 2017 and number of historical occurrences. The average loss per event estimate was determined based upon NCEI Storm Events Database since 1996. This does not include losses from displacement, functional downtime, economic loss, injury, or loss of life. During the 18-year period, wildfires burned 6,727 acres and caused \$28,075 in crop damage in the planning area.

**Table 70: Wildfire Loss Estimation**

Hazard Type	Number of Events <sup>1</sup>	Events Per Year	Average Acres Per Fire <sup>1</sup>	Total Property Damage <sup>2</sup>	Average Annual Property Loss <sup>2</sup>	Total Crop Loss <sup>3</sup>	Average Annual Crop Loss <sup>3</sup>
Grass/Wildfires	701	38.9	9.6	\$150,000	\$6,818	\$28,075	\$1,560

<sup>1</sup> Indicates data is from Nebraska Forest Service (2000 to 2017); <sup>2</sup> Indicates data is from NCEI (1996 to 2017) <sup>3</sup> Indicates data is from RMA (2000 to 2017)

**Table 71: Wildfire Threats**

Hazard Type	Injuries	Homes Threatened	Other Structures Threatened
Grass/Wildfires	5	59	41

Source: Nebraska Forest Service, 2000-2017

**Probability**

Probability of grass/wildfire occurrence is based on the historic record provided by the Nebraska Forest Service and reported potential by participating jurisdictions. Based on the historic record, there is a 100 percent annual probability of wildfires occurring in the planning area each year.

**Regional Vulnerabilities**

The following table provides information related to regional vulnerabilities; for jurisdictional-specific vulnerabilities, refer to *Section Seven: Participant Sections*.

**Table 72: Regional Wildfire Vulnerabilities**

Sector	Vulnerability
People	<ul style="list-style-type: none"> <li>-Risk of injury or death</li> <li>-Displacement of people and loss of homes</li> <li>-Lack of transportation poses risk to low income individuals, families, and elderly</li> </ul>
Economic	<ul style="list-style-type: none"> <li>-Loss of businesses</li> </ul>
Built Environment	<ul style="list-style-type: none"> <li>-Property damages</li> </ul>
Infrastructure	<ul style="list-style-type: none"> <li>-Transportation routes may be closed</li> <li>-Damage to power lines</li> </ul>
Critical Facilities	<ul style="list-style-type: none"> <li>-Risk of damages</li> </ul>
Other	<ul style="list-style-type: none"> <li>-Increase chance of landslides and erosion</li> <li>-May lead to poor water quality</li> </ul>

## Hail

### Hazard Profile

According to the NWS, hail is defined as a showery precipitation in the form of irregular pellets or balls of ice more than five millimeters in diameter, falling from a cumulonimbus cloud. Early in the developmental stages of a hailstorm, ice crystals form within a low pressure front due to the rapid rising of warm air into the upper atmosphere and the subsequent cooling of the air mass. Frozen droplets gradually accumulate on the ice crystals until, having developed sufficient weight; they fall as precipitation, in the form of balls or irregularly shaped masses of ice. The size of hailstones is a direct function of the size and severity of the storm. High velocity updraft winds are required to keep hail in suspension in thunderclouds. The strength of the updraft is a function of the intensity of heating at the Earth's surface. Higher temperature gradients relative to elevation above the surface result in increased suspension time and hailstone size.

### Location

The entire planning area is at risk to hail due to the regional nature of this type of event.

### Extent

The Tornado and Storm Research Organization (TORRO) scale is used to classify hailstones and provides some detail related to the potential impacts from hail. Table 73 outlines the TORRO Hail Scale.

**Table 73: TORRO Hail Scale**

TORRO Classification / Intensity	Typical Hail Diameter	Typical Damage Impacts
H0: Hard Hail	5 mm; (Pea size); 0.2 in	No damage
H1: Potentially Damaging	5 -15 mm (Marble); 0.2 – 0.6 in	Slight general damage to plants and crops
H2: Significant	10 -20 mm (Grape); 0.4 – 0.8 in.	Significant damage to fruit, crops, and vegetation
H3: Severe	20 -30 mm (Walnut); 0.8 – 1.2 in	Severe damage to fruit and crops, damage to glass and plastic structures
H4: Severe	30 -40 mm (Squash Ball); 1.2 – 1.6 in	Widespread damage to glass, vehicle bodywork damaged
H5: Destructive	40 – 50 mm (Golf ball); 1.6 – 2.0 in.	Wholesale destruction of glass, damage to tiled roofs; significant risk or injury
H6: Destructive	50 – 60 mm (chicken egg); 2.0 – 2.4 in	Grounded aircrafts damaged, brick walls pitted; significant risk of injury
H7: Destructive	60 – 75 mm (Tennis ball); 2.4 – 3.0 in	Severe roof damage; risk of serious injuries
H8: Destructive	75 – 90 mm (Large orange); 3.0 – 3.5 in.	Severe damage to structures, vehicles, airplanes; risk of serious injuries
H9: Super Hail	90 – 100 mm (Grapefruit); 3.5 – 4.0 in	Extensive structural damage; risk of severe or even fatal injuries to persons outdoors
H10: Super Hail	>100 mm (Melon); > 4.0 in	Extensive structural damage; risk or severe or even fatal injuries to persons outdoors

Source: TORRO, 2019<sup>68</sup>

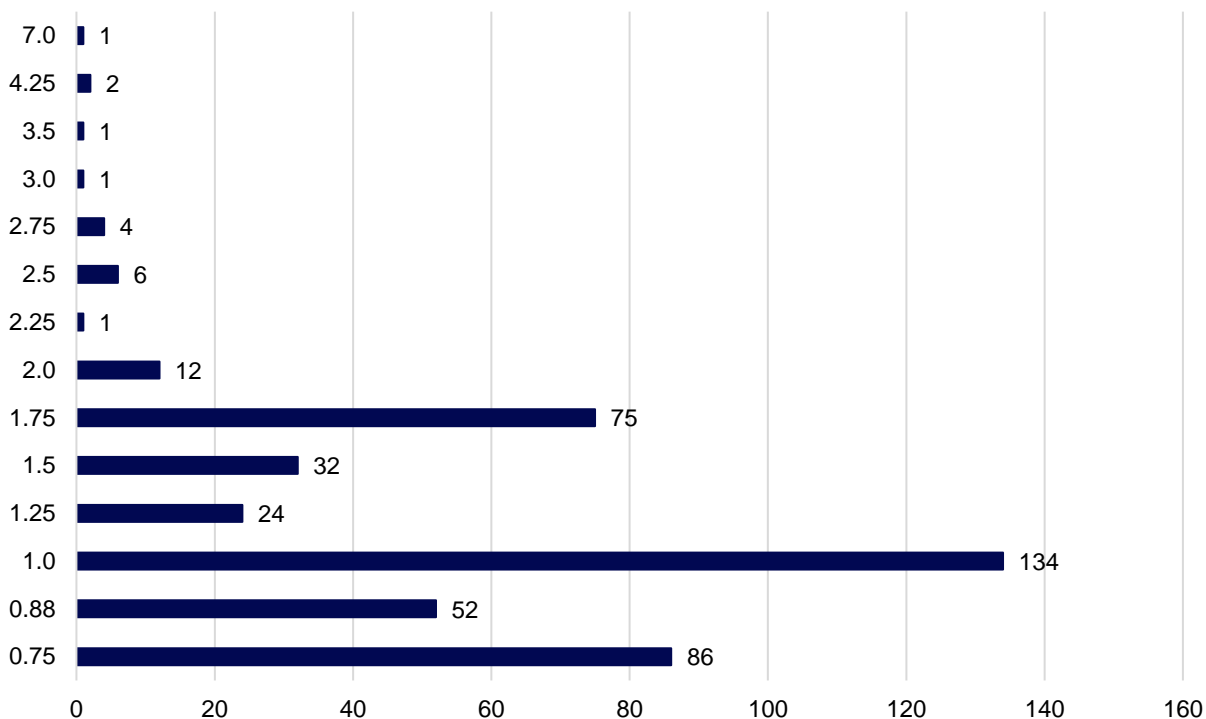
Of the 435 hail events reported for the planning area, the average hailstone size was 1.22 inches. Events of this magnitude correlate to an H4 classification. It is reasonable to expect H4 classified

<sup>68</sup> Tornado and Storm Research Organization. 2019. "Hail Scale." <http://www.torro.org.uk/hscale.php>.



events to occur several times in a year throughout the planning area. In addition, it is reasonable, based on the number of occurrences, to expect larger hailstones to occur in the planning area annually. The planning area has endured three H10 hail events (>4.0 inches) during the period of record. Figure 27 shows hail events based on the size of the hail.

**Figure 27: Hail Events by Magnitude**



Source: NCEI, 1996-2017

### Historical Occurrences

The NCEI reports events as they occur in each community. A single hail event can affect multiple communities and counties at a time; the NCEI reports these large scale, multi-county events as separate events. The result is a single hail event covering a large portion of the planning area could be reported by the NCEI as several events. The NCEI reports a total of 435 hail events in the planning area between January 1996 and December 2017. These events were responsible for \$8,764,000 in property damages and \$30,991,310 in crop damages. These events resulted in no injuries or fatalities.

Hail events from NCEI reported by each community are listed in the participant sections in *Section Seven: Participant Sections*.

### Average Annual Damages

The average damage per event estimate was based on the NCEI Storm Events Database since 1996 and number of historical occurrences as described above. This does not include losses from displacement, functional downtime, economic loss, injury, or loss of life.

**Table 74: Hail Loss Estimate**

Hazard Type	Number of Events <sup>1</sup>	Events Per Year	Total Property Loss <sup>1</sup>	Average Annual Property Loss <sup>1</sup>	Total Crop Loss <sup>2</sup>	Average Annual Crop Loss <sup>2</sup>
Hail Events	435	19.8	\$8,764,000	\$398,364	\$30,991,310	\$1,721,739

<sup>1</sup> Indicates the data is from NCEI (January 1996 to December 2017); <sup>2</sup> Indicates data is from USDA RMA (2000 to 2017)

### Probability

Based on historic records and reported events, severe thunderstorms with hail are likely to occur several times annually within the planning area. The NCEI reported 435 hail events between 1996 and 2017, or approximately 19.8 hail occurrences per year. Based on these records hail, the annual probability of occurrence for hail is 100 percent.

### Regional Vulnerabilities

The following table provides information related to regional vulnerabilities; for jurisdictional-specific vulnerabilities, refer to *Section Seven: Participant Sections*.

**Table 75: Regional Hail Vulnerabilities**

Sector	Vulnerability
People	-Injuries can occur from: not seeking shelter, standing near windows, and shattered windshields in vehicles
Economic	-Damages to buildings and property can cause significant losses to business owners
Built Environment	-Roofs, siding, windows, gutters, HVAC systems, etc. can incur damage
Infrastructure	-Power lines and utilities can be damaged
Critical Facilities	-Property damages and power outages
Other	-High winds, lightning, heavy rain, and possibly tornadoes can occur with this hazard

## High Winds

### Hazard Profile

High winds typically accompany severe thunderstorms, severe winter storms, and other large low-pressure systems, which can cause significant crop damage, downed power lines, loss of electricity, traffic flow obstructions, and significant property damage including to trees and center-pivot irrigation systems.

The National Weather Service (NWS) defines high winds as sustained wind speeds of 40 mph or greater lasting for 1 hour or longer, or winds of 58 mph or greater for any duration.<sup>69</sup> The NWS issues High Wind Advisories when there are sustained winds of 25 to 39 miles per hour and/or gusts to 57 mph. Figure 28 shows the wind zones in the United States. The wind zones are based on the maximum wind speeds that can occur from a tornado or hurricane event. The planning area is located in Zone III/IV which has maximum winds of 250 mph equivalent to an EF5 tornado.

Figure 28: Wind Zones in the U.S.



### Location

High winds commonly occur throughout the planning area.

<sup>69</sup> National Weather Service. 2009. "Glossary." <http://w1.weather.gov/glossary/index.php?letter=h>.

## Extent

The Beaufort Wind Scale can be used to classify wind strength. Table 76 outlines the scale, provides wind speed ranking, range of wind speeds per ranking, and a brief description of conditions for each ranking.

**Table 76: Beaufort Wind Ranking**

Beaufort Wind Force Ranking	Range of Wind Speeds	Conditions
0	<1 mph	Smoke rises vertically
1	1 – 3 mph	Direction shown by smoke but not wind vanes
2	4 – 7 mph	Wind felt on face; leaves rustle; wind vanes move
3	8 – 12 mph	Leaves and small twigs in constant motion
4	13 – 18 mph	Raises dust and loose paper; small branches move
5	19 – 24 mph	Small trees in leaf begin to move
6	25 – 31 mph	Large branches in motion; umbrellas used with difficulty
7	32 – 38 mph	Whole trees in motion; inconvenience felt when walking against the wind
8	39 – 46 mph	Breaks twigs off tree; generally impedes progress
9	47 – 54 mph	Slight structural damage; chimneypots and slates removed
10	55 – 63 mph	Trees uprooted; considerable structural damages; improperly or mobiles homes with no anchors turned over
11	64 – 72 mph	Widespread damages; very rarely experienced
12 – 17	72 - >200 mph	Hurricane; devastation

Source: Storm Prediction Center, 2019<sup>70</sup>

Using the NCEI reported events, the most common high wind event is a level 10. The reported high wind events had an average of 56 mph winds. It is likely that this level of event will occur annually.

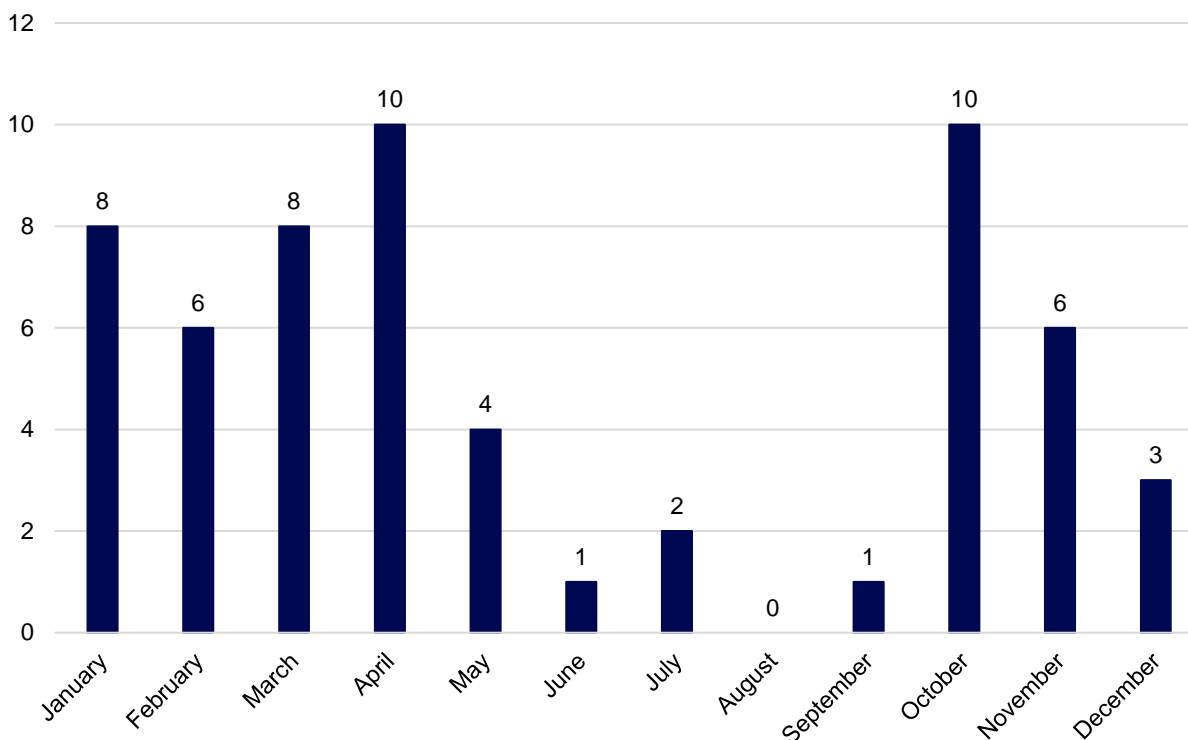
## Historical Occurrences

Due to the regional scale of high winds, the NCEI reports events as they occur in each county. While a single event can affect two or more counties at a time, the NCEI reports them as separate events.

There were 59 high wind events that occurred between January 1996 and December 2017. As seen in Figure 29, most high wind events occur in April and October. One event led to the injury of five individuals. The events identified by the NCEI are listed in *Section Seven: Participant Sections* for each county.

<sup>70</sup> Storm Prediction Center: National Oceanic and Atmospheric Administration. 1805. "Beaufort Wind Scale." Accessed January 2019. <http://www.spc.noaa.gov/faq/tornado/beaufort.html>.

Figure 29: High Wind Events by Month



Source: NCEI, 1996-2017

### Average Annual Damages

The average damage per event estimate was determined based upon NCEI Storm Events Database since 1996 and number of historical occurrences. This does not include losses from displacement, functional downtime, economic loss, injury, or loss of life. It is estimated that high wind events can cause an average of \$158,318 per year in property damage, and an average of \$237,208 per year in crop damage for the planning area.

Table 77: High Wind Loss Estimate

Hazard Type	Number of Events <sup>1</sup>	Events Per Year	Total Property Loss <sup>1</sup>	Average Annual Property Loss <sup>1</sup>	Total Crop Loss <sup>2</sup>	Average Annual Crop Loss <sup>2</sup>
High Winds	59	2.7	\$1,283,000	\$58,318	\$4,269,741	\$237,208

<sup>1</sup> Indicates the data is from NCEI (January 1996 to December 2017); <sup>2</sup> Indicates data is from USDA RMA (2000 to 2017)

### Probability

Based on historical records and reported events, it is likely that high winds will occur within the planning area annually. For the 22 years examined, there were 59 reported high wind events reported. The probability for a high wind event occurring annually is 100 percent.

### Regional Vulnerabilities

The following table provides information related to regional vulnerabilities; for jurisdictional-specific vulnerabilities, refer to *Section Seven: Participant Sections*.

**Table 78: Regional High Wind Vulnerabilities**

Sector	Vulnerability
People	<ul style="list-style-type: none"> <li>-Vulnerable populations include those living in mobile homes, especially if they are not anchored properly</li> <li>-People outdoors during events</li> </ul>
Economic	<ul style="list-style-type: none"> <li>-Agricultural losses</li> <li>-Damages to businesses and prolonged power outages can cause significant impacts to the local economy</li> </ul>
Built Environment	<ul style="list-style-type: none"> <li>-All building stock are at risk to damages from high winds</li> </ul>
Infrastructure	<ul style="list-style-type: none"> <li>-Downed power lines and power outages</li> <li>-Downed trees blocking road access</li> </ul>
Critical Facilities	<ul style="list-style-type: none"> <li>-All critical facilities are at risk to damages from high winds</li> </ul>

## Levee Failure

### Hazard Profile

According to FEMA:

“The United States has thousands of miles of levee systems. These manmade structures are most commonly earthen embankments designed and constructed in accordance with sound engineering practices to contain, control, or divert the flow of water to provide some level of protection from flooding. Some levee systems date back as far as 150 years. Some levee systems were built for agricultural purposes. Those levee systems designed to protect urban areas have typically been built to higher standards. Levee systems are designed to provide a specific level of flood protection. No levee system provides full protection from all flooding events to the people and structures located behind it. Thus, some level of flood risk exists in these levee-impacted areas.”

Levee failure can occur several ways. A breach of a levee is when part of the levee breaks away, leaving a large opening for floodwaters to flow through. A levee breach can be gradual by surface or subsurface erosion, or it can be sudden. A sudden breach of a levee often occurs when there are soil pores in the levee that allow water to flow through causing an upward pressure greater than the downward pressure from the weight of the soil of the levee. This under seepage can then resurface on the backside of the levee and can quickly erode a hole to cause a breach. Sometimes the levee actually sinks into a liquefied subsurface below.

Another way a levee failure can occur is when the water overtops the crest of the levee. This happens when the flood waters simply exceed the lowest crest elevation of the levee. An overtopping can lead to significant erosion of the backside of the levee and can result to a breach and thus a levee failure.

The USACE, who is responsible for federal levee oversight and inspection of levees, has three ratings for levee inspections.

**Table 79: USACE Levee Rating Categories**

Ratings	Description
Acceptable	All inspection items are rated as Acceptable
Minimally Acceptable	One or more inspection items are rated as Minimally Acceptable or one or more items are rated as Unacceptable and an engineering determination concludes that the Unacceptable inspection items would not prevent the segment/system from performing as intended during the next flood event.
Unacceptable	One or more items are rated as Unacceptable and would prevent the segment/system from performing as intended, or a serious deficiency noted in past inspections has not been corrected within the established timeframe, not to exceed two years.

Source: USACE



## Location

There is one federal levee with two segments located within the planning area as reported in USACE's National Levee Database. It is located in the City of Seward. See Table 80 and Figure 30 for information on the levee protected area.

Beyond the USACE's National Levee Database, there is no known comprehensive list of levees that exists in the planning area especially for private agricultural levees. Thus, it is not possible at this time to document the location of non-federal levees, the areas they protect, nor the potential impact of these levees.

**Table 80: UBBNRD Levees**

Name <sup>1</sup>	Sponsor <sup>1</sup>	City <sup>1</sup>	County <sup>1</sup>	River <sup>1</sup>	Length (miles) <sup>1</sup>	Type of Protection <sup>1</sup>	Protected Area (sq miles) <sup>1</sup>	Approximate Level of Protection <sup>2</sup>
Seward, NE FPP North	City of Seward	Seward	Seward County	Big Blue River	1.61	Urban	0.18	100-Year Level*
Seward, NE FPP South	City of Seward	Seward	Seward County	Big Blue River	0.64	Urban	0.087	Unknown, <100-year level

1: National Levee Database

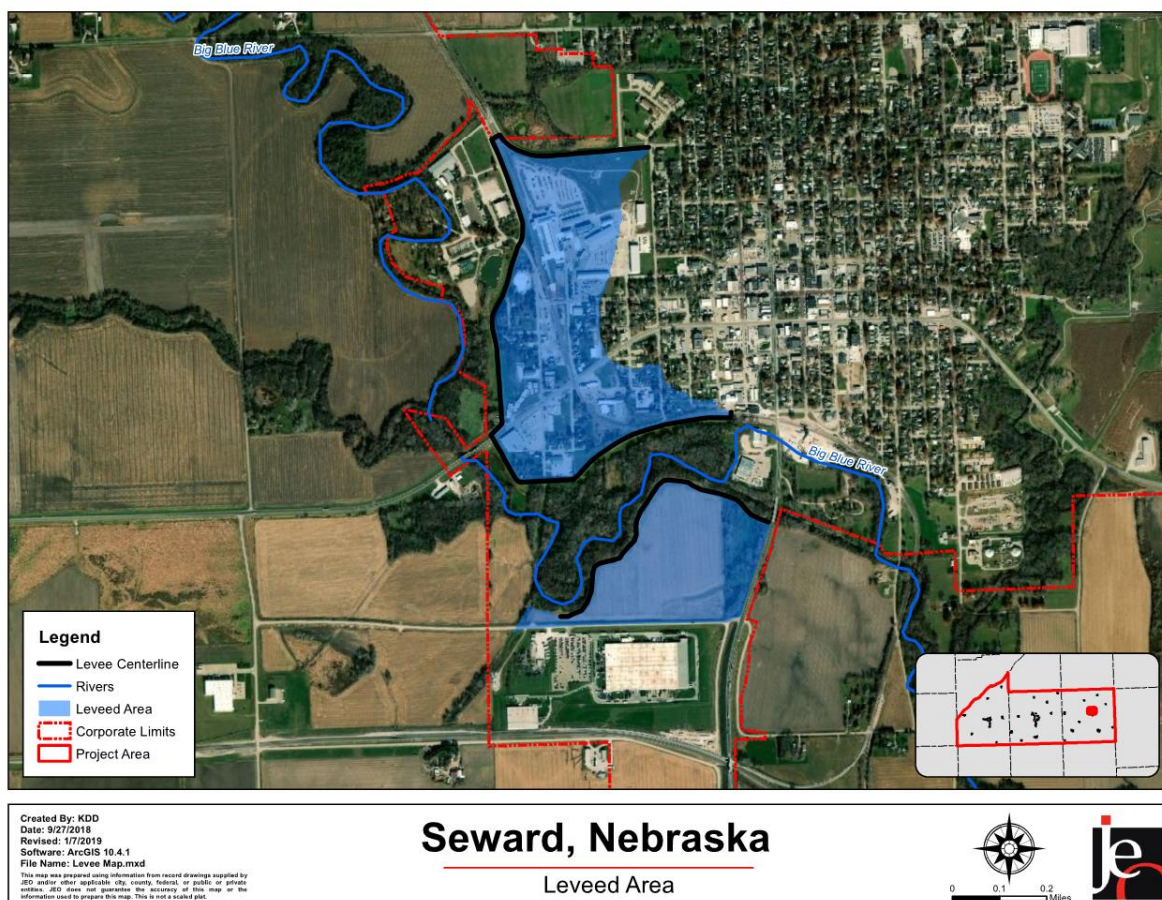
2: FEMA

\*The levee system is currently shown as providing a 100-year (1% annual chance) level of flood risk reduction on the Federal Emergency Management Agency (FEMA) Flood Insurance Rate Map (FIRM), effective date September 30, 1993. Currently the levee is being reevaluated.

## Extent

The figure below shows the levees and estimated levee area. Data used in the figure comes from the National Levee Database. The Seward FPP North levee is rated as Minimally Acceptable. The Seward FPP South levee does not have a rating.

Figure 30: Leveed Area in the Planning Area



### Historical Occurrences

There is no history of levee failure in the planning area. As there is no formal database of historical levee failures, the following sources were consulted: members of the Planning Team, local newspapers, U.S. Army Corps of Engineers, and the USACE. A 2010 inspection report of the Seward FPP North levee by the Army Corps of Engineers states that “there are no available documents that indicate any major flood events or problems with levee performance since the levee was constructed”.

### Average Annual Losses

To determine average annual losses from levee failure, the USACE was utilized. The following tables show the approximate number of people at risk, number of structures at risk, and the total property value. A total of 69 structures are within the leveed areas, which are valued at \$21,830,000 with a total of 334 people at risk.

Table 81: 2015 Potential Losses in Levee Breach Area

Levee	People at Risk	Structures at Risk	Property Value
Seward, NE FPP North	329	67	\$20,900,000
Seward, NE FPP South	5	2	\$930,000
<b>Total</b>	<b>334</b>	<b>69</b>	<b>\$21,830,000</b>

Source: USACE

### Probability

The Seward FPP North levee has never been breached. It is unknown if the Seward FPP South levee has ever been breached. While it is possible for levee failure to occur in the future, this is considered a low probability of occurring in the future. For the purposes of this plan, the probability of levee failure will be stated as one percent annually.

### Regional Vulnerabilities

The following table provides information related to regional vulnerabilities; for jurisdictional specific vulnerabilities, refer to *Section Seven: Participant Sections*.

**Table 82: Regional Levee Failure Vulnerabilities**

Sector	Vulnerability
People	-Those living in federal levee protected areas -Residents with low mobility or with no access to a vehicle are more vulnerable during a levee failure -Low income and minority populations may lack the resources needed for evacuation, response, or to mitigate the potential for flooding
Economic	-Business and industry protected by levees are at risk
Built Environment	-All buildings within levee protected areas are at risk to damages
Infrastructure	-Major transportation corridors and bridges at risk to levee failure
Critical Facilities	-Those in the levee protected areas, are at risk to damage (critical facilities are noted within individual participant sections)

## Severe Thunderstorms

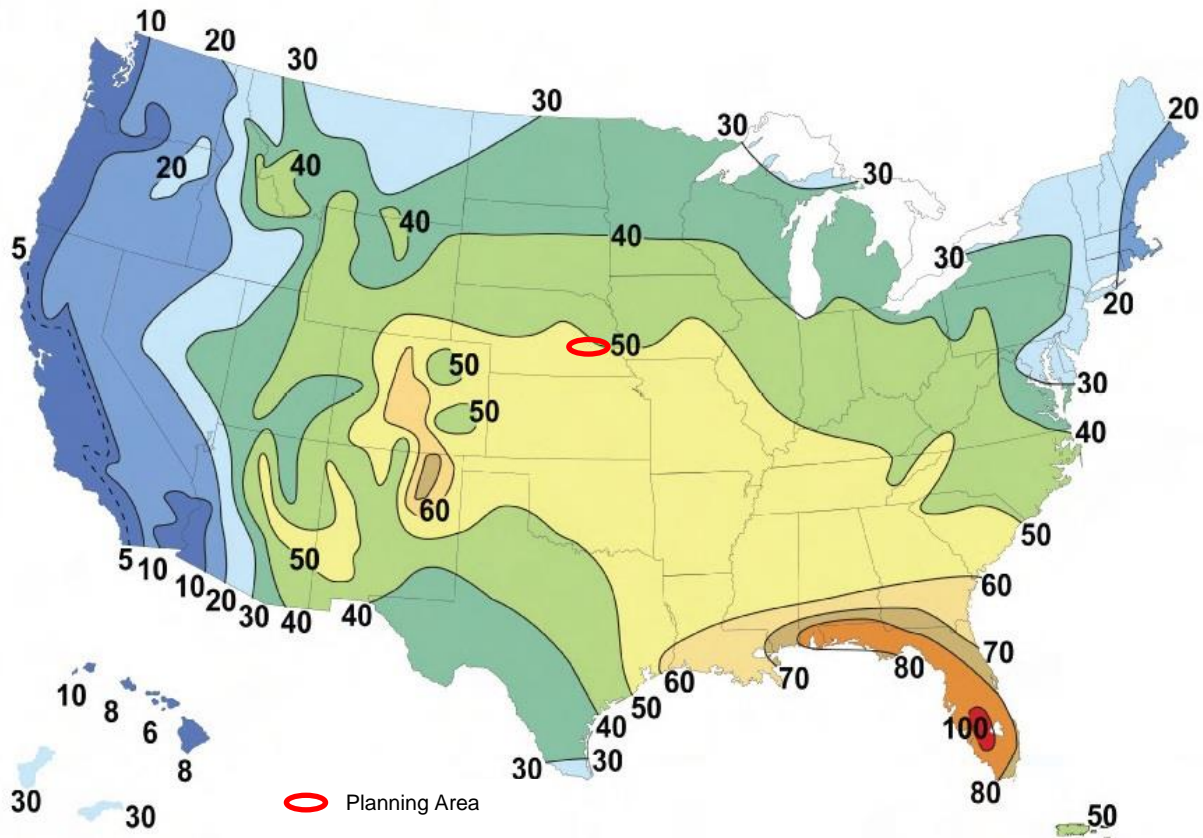
### Hazard Profile

Severe thunderstorms are common and unpredictable seasonal events throughout Nebraska. A thunderstorm is defined as a storm that contains lightning and thunder, which is caused by unstable atmospheric conditions. When the cold upper air sinks and the warm, moist air rises, storm clouds or “thunderheads” develop, resulting in thunderstorms. This can occur singularly, in clusters, or in lines.

Thunderstorms can develop in fewer than 30 minutes and can grow to an elevation of eight miles into the atmosphere. Lightning, by definition, is present in all thunderstorms and can cause harm to humans and animals, fires to buildings and agricultural lands, and electrical outages in municipal electrical systems. Lightning can strike up to 10 miles from the portion of the storm depositing precipitation. There are three primary types of lightning: intra-cloud, inter-cloud, and cloud to ground. While intra and inter-cloud lightning are more common, communities are potentially impacted when lightning comes in contact with the ground. Lightning generally occurs when warm air mixes with colder air masses resulting in atmospheric disturbances necessary for polarizing the atmosphere.

Economically, thunderstorms are generally beneficial in that they provide moisture necessary to support Nebraska’s largest industry, agriculture. The majority of thunderstorms do not cause damage, but when they escalate to severe storms, the potential for damages increases. Damages can include: crop losses from wind and hail; property losses due to building and automobile damages from hail; high wind; flash flooding; and death or injury to humans and animals from lightning, drowning, or getting struck by falling or flying debris. Figure 31 displays the average number of days with thunderstorms across the country each year. The planning area experiences an average of 50 to 60 thunderstorms over the course of one year.

Figure 31: Average Number of Thunderstorms



Source: NWS, 2019<sup>71</sup>

**Location**

The entire planning area is at risk of severe thunderstorms.

**Extent**

The geographic extent of a severe thunderstorm event may be large enough to impact the entire planning area (such as in the case of a squall line, derecho, or long-lived supercell) or just a few square miles, in the case of a single cell that marginally meets severe criteria.

The NWS defines a thunderstorm as severe if it contains hail that is one inch in diameter or capable of winds gusts of 58 mph or higher.

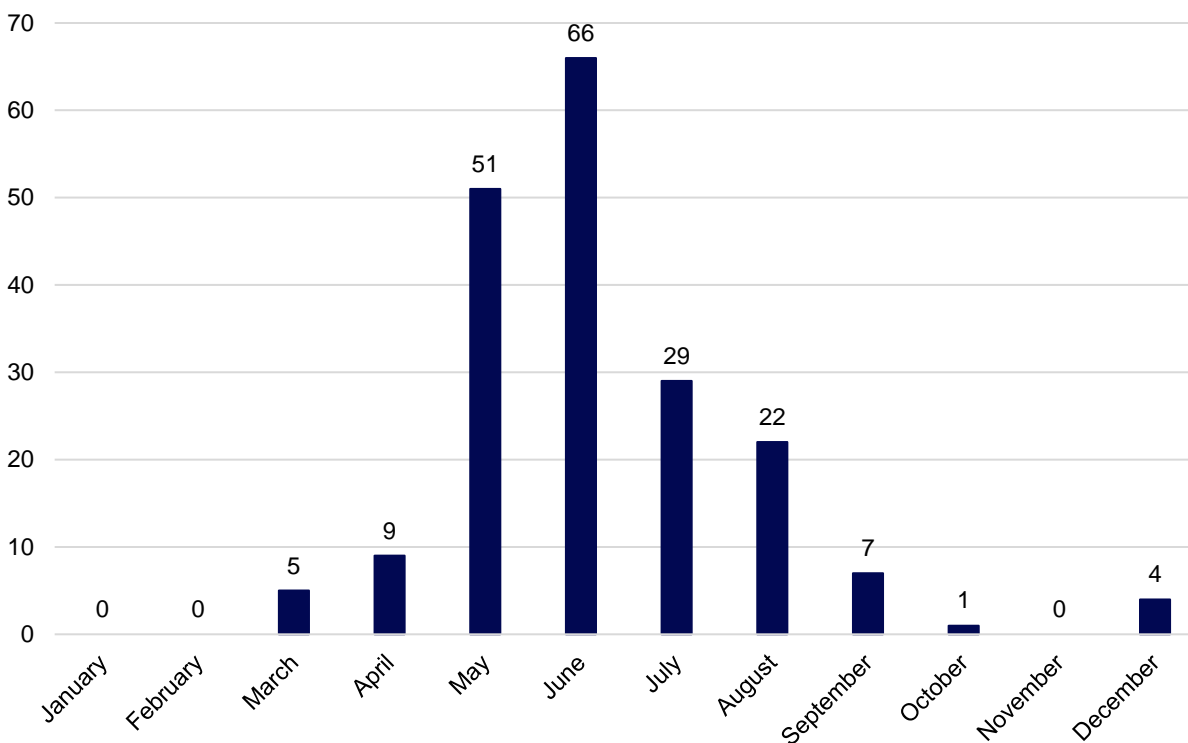
**Historical Occurrences**

Severe thunderstorms in the planning area usually occur in the afternoon and evening during the spring and summer months (Figure 32).

<sup>71</sup> National Weather Service. 2019. "Introduction to Thunderstorms." [http://www.srh.noaa.gov/jetstream/tstorms/tstorms\\_intro](http://www.srh.noaa.gov/jetstream/tstorms/tstorms_intro).



**Figure 32: Thunderstorm Wind Events by Month**



Source: NCEI, 1996-2017

The NCEI reports events as they occur in each community. A single severe thunderstorm event can affect multiple communities and counties at a time; the NCEI reports these large scale, multi-county events as separate events. The result is a single thunderstorm event covering the entire region could be reported by the NCEI as several events. The NCEI reports a total of 194 thunderstorm wind, 51 heavy rain, and 8 lightning events in the planning area from January 1996 to December 2017. Severe thunderstorm events were responsible for \$6,276,500 in property damages. The USDA RMA data does not specify severe thunderstorms as a cause of loss, however heavy rains which may be associated with severe thunderstorms caused \$7,442,720 in crop damages. There were seven injuries and no deaths reported in association with these storms.

**Average Annual Damages**

The average damage per event estimate was determined based upon recorded damages from NCEI Storm Events Database since 1996 and number of historical occurrences. This does not include losses from displacement, functional downtime, economic loss, injury, or loss of life. Severe thunderstorms and lightning cause an average of \$285,295 per year in property damages.

**Table 83: Severe Thunderstorms Loss Estimate**

Hazard Type	Number of Events <sup>1</sup>	Events Per Year	Total Property Loss <sup>1</sup>	Average Annual Property Loss	Total Crop Loss <sup>2</sup>	Average Annual Crop Loss
Thunderstorm Wind	194	8.8	\$5,534,500	\$251,568	N/A	N/A
Heavy Rain	51	2.3	\$305,000	\$13,864	\$7,442,720	\$413,484
Lightning	8	0.4	\$437,000	\$19,864	N/A	N/A
<b>Total</b>	<b>253</b>	<b>11.5</b>	<b>\$6,276,500</b>	<b>\$285,295</b>	<b>\$7,442,720</b>	<b>\$413,484</b>

<sup>1</sup> Indicates the data is from NCEI (January 1996 to December 2017); <sup>2</sup> Indicates data is from USDA RMA (2000 to 2017)

### Probability

Based on historical records and reported events, severe thunderstorms are likely to occur on an annual basis. The NCEI reported 253 severe thunderstorm events between 1996 and 2017; resulting in 100 percent chance annually for thunderstorms.

### Regional Vulnerabilities

The following table provides information related to regional vulnerabilities; for jurisdictional-specific vulnerabilities, refer to *Section Seven: Participant Sections*.

**Table 84: Regional Thunderstorm Vulnerabilities**

Sector	Vulnerability
People	-Elderly citizens are vulnerable as they are less mobile than other members of the community -Mobile home residents are risk of injury and damage to their property if the mobile home is not anchored properly
Economic	-Closed businesses from damage or closed roads are likely to lose revenue and loss of income to workers
Built Environment	-Buildings are at risk to hail damage -Downed trees and tree limbs
Infrastructure	-High winds and lightning can cause power outages and down power lines -Roads may wash out from heavy rains and become blocked from downed tree limbs
Critical Facilities	-Power outages are possible -Critical facilities may sustain damage from hail, lightning, and wind



## Severe Winter Storms

### Hazard Profile

Severe winter storms are an annual occurrence in Nebraska. Winter storms can bring extreme cold, freezing rain, heavy or drifting snow, and blizzards. Blizzards are particularly dangerous due to drifting snow and the potential for rapidly occurring whiteout conditions which greatly inhibit vehicular traffic. Generally, winter storms occur between the months of November and March but may occur as early as October and as late as April. Heavy snow is usually the most defining element of a winter storm. Large snow events can cripple an entire jurisdiction by hindering transportation, knocking down tree limbs and utility lines, and structurally damaging buildings.

### Extreme Cold

Along with snow and ice storm events, extreme cold is dangerous to the well-being of people and animals. What constitutes extreme cold varies from region to region but is generally accepted as temperatures that are significantly lower than the average low temperature. For the planning area, the coldest months of the year are January, February, and December. The average low temperature for these months are all below freezing (average low for the three months is 25.9°F). The average high temperatures for the months of January, February, and December are near 36.9°F.<sup>72</sup>

### Freezing Rain

Along with snow events, winter storms also have the potential to deposit significant amounts of ice. Ice buildup on tree limbs and power lines can cause them to collapse. This is most likely to occur when rain falls that freezes upon contact, especially in the presence of wind. Freezing rain is the name given to rain that falls when surface temperatures are below freezing. Unlike a mixture of rain and snow, ice pellets or hail, freezing rain is made entirely of liquid droplets. Freezing rain can also lead to many problems on the roads, as it makes them slick, causing automobile accidents, and making vehicle travel difficult.

### Blizzards

Blizzards are particularly dangerous due to drifting snow and the potential for rapidly occurring whiteout conditions, which greatly inhibits vehicular traffic. Heavy snow is usually the most defining element of a winter storm. Large snow events can cripple an entire jurisdiction for several days by hindering transportation, knocking down tree limbs and utility lines, and structurally damaging buildings.

### Location

The entire planning area is at risk of severe winter storms.

### Extent

The Sperry-Piltz Ice Accumulation Index (SPIA) was developed by the NWS to predict the accumulation of ice and resulting damages. The SPIA assesses total precipitation, wind, and temperatures to predict the intensity of ice storms. Figure 33 shows the SPIA index.

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<sup>72</sup> National Centers for Environmental Information. 2018. "Data Tools: 1981-2010 Normals." <http://www.ncdc.noaa.gov/cdo-web/datatools/normals>.

Figure 33: SPIA Index

**The Sperry-Piltz Ice Accumulation Index, or “SPIA Index” – Copyright, February, 2009**

ICE DAMAGE INDEX	* AVERAGE NWS ICE AMOUNT (in inches) <small>*Revised-October, 2011</small>	WIND (mph)	DAMAGE AND IMPACT DESCRIPTIONS
<b>0</b>	< 0.25	< 15	Minimal risk of damage to exposed utility systems; no alerts or advisories needed for crews, few outages.
<b>1</b>	0.10 – 0.25	15 - 25	Some isolated or localized utility interruptions are possible, typically lasting only a few hours. Roads and bridges may become slick and hazardous.
	0.25 – 0.50	> 15	
<b>2</b>	0.10 – 0.25	25 - 35	Scattered utility interruptions expected, typically lasting 12 to 24 hours. Roads and travel conditions may be extremely hazardous due to ice accumulation.
	0.25 – 0.50	15 - 25	
	0.50 – 0.75	< 15	
<b>3</b>	0.10 – 0.25	>= 35	Numerous utility interruptions with some damage to main feeder lines and equipment expected. Tree limb damage is excessive. Outages lasting 1 – 5 days.
	0.25 – 0.50	25 - 35	
	0.50 – 0.75	15 - 25	
	0.75 – 1.00	< 15	
<b>4</b>	0.25 – 0.50	>= 35	Prolonged & widespread utility interruptions with extensive damage to main distribution feeder lines & some high voltage transmission lines/structures. Outages lasting 5 – 10 days.
	0.50 – 0.75	25 - 35	
	0.75 – 1.00	15 - 25	
	1.00 – 1.50	< 15	
<b>5</b>	0.50 – 0.75	>= 35	Catastrophic damage to entire exposed utility systems, including both distribution and transmission networks. Outages could last several weeks in some areas. Shelters needed.
	0.75 – 1.00	>= 25	
	1.00 – 1.50	>= 15	
	> 1.50	Any	

(Categories of damage are based upon combinations of precipitation totals, temperatures and wind speeds/directions.)

Source: SPIA-Index, 2019<sup>73</sup>

According to the NCEI, 20 ice storms were reported between January 1996 and December 2017. These storms did not result in injuries or deaths but reported \$5,165,000 in damages. Ice accumulation was not reported.

The Wind Chill Index was developed by the NWS to determine the decrease in air temperature felt by the body on exposed skin due to wind. The wind chill is always lower than the air temperature and can quicken the effects of hypothermia or frost bite as it gets lower. Figure 34 shows the Wind Chill Index used by the NWS.

<sup>73</sup> SPIA-Index. 2009. “Sperry-Piltz Ice Accumulation Index.” Accessed January 2019. <http://www.spia-index.com/index.php>.

**Figure 34: Wind Chill Index Chart**  
**Temperature (°F)**

	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	-82	-89	-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

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

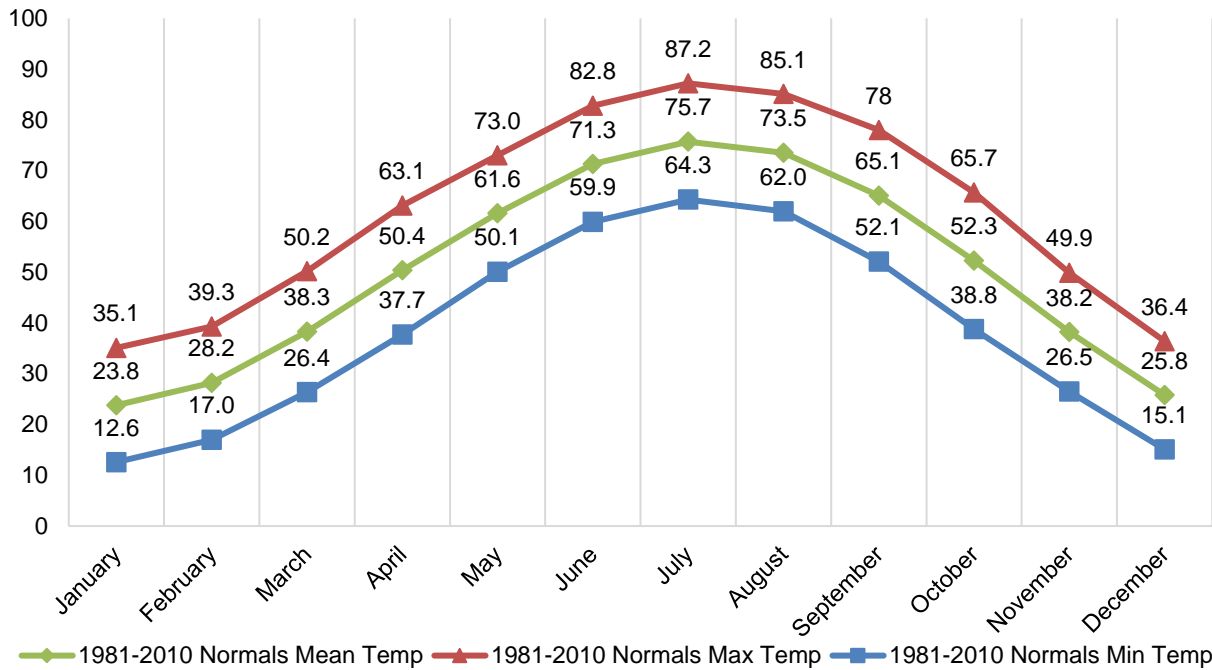
T = Air Temperature (°F) V = Wind Speed (mph)



Source: NWS, 2019<sup>74</sup>

<sup>74</sup> National Weather Service. 2001. "Wind Chill Chart." Accessed January 2019. [http://www.nws.noaa.gov/om/cold/wind\\_chill.shtml](http://www.nws.noaa.gov/om/cold/wind_chill.shtml).

**Figure 35: Monthly Normal Temperature (1981-2010)**

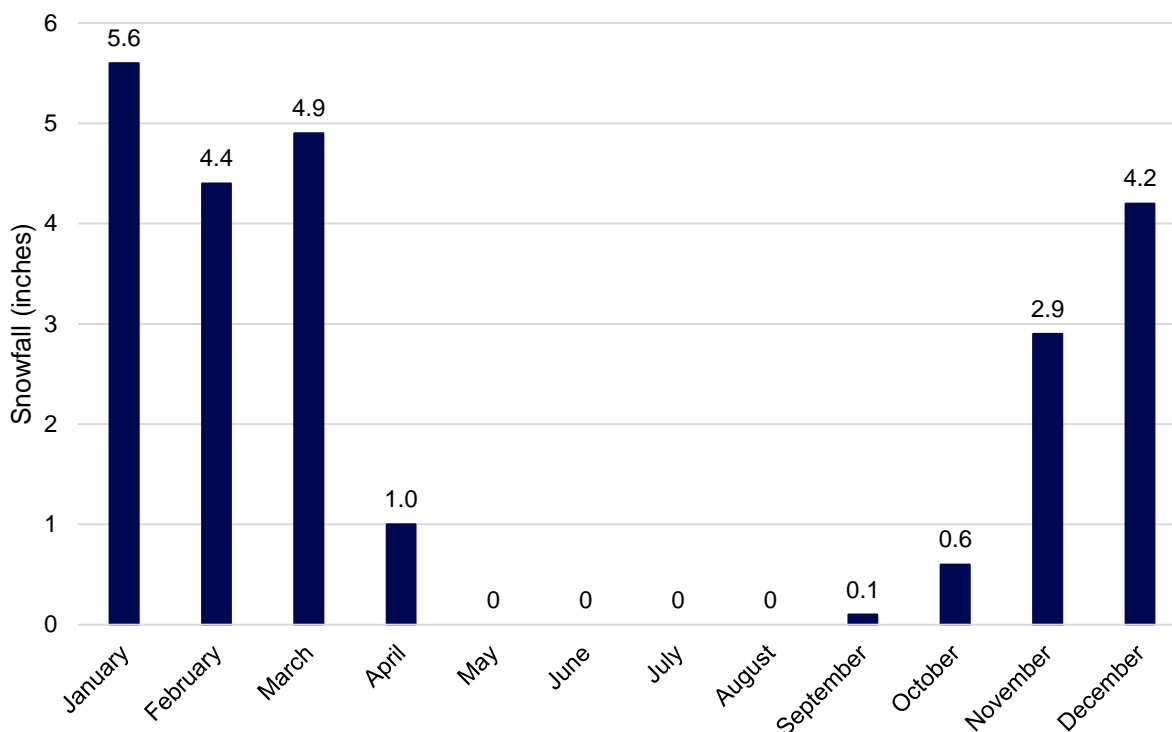


Source: National Centers for Environmental Information, 2018

The coldest months of the year are December, January, and February and normal lows for these months average around 25.9°F as shown in Figure 35.

Average monthly snowfall for the planning area is shown in Figure 36, which shows the snowiest months are between December and March. A common snow event (likely to occur annually) will result in accumulation totals between zero and five inches. Often these snow events are accompanied by high winds. It is reasonable to expect wind speeds of 25 to 35 mph with gusts reaching 50 mph or higher. Strong winds and low temperatures can combine to produce extreme wind chills of 20°F to 40°F below zero.

**Figure 36: Monthly Normal (1981-2010) Snowfall in Inches**



Source: High Plains Regional Climate Center, 2019

### Historical Occurrences

Due to the regional scale of severe winter storms, the NCEI reports events as they occur in each county. According to the NCEI, there were a combined 253 severe winter storm events for the planning area from January 1996 to December 2017. These recorded events caused a total of \$8,200,000 in property damages, no injuries, but one fatality.

The NCEI recorded a total of 21 blizzard events, causing \$35,000 in property damages and no directly related injuries; ten heavy snow events, causing \$2,00,000 in property damages; 20 ice storm events, causing \$5,165,000 in property damages; 120 winter storm events with \$660,000 in property damages and one fatality; 39 winter weather events, causing \$340,000 in property damages; and eight extreme cold/wind chill events causing no damages.

### Average Annual Damages

The average damage per event estimate was determined based upon NCEI Storm Events Database since 1996 and includes aggregated calculations for each of the six types of winter weather as provided in the database. This does not include losses from displacement, functional downtime, economic loss, injury, or loss of life. Severe winter storms have caused an average of \$372,727 per year in property damage for the planning area.

**Table 85: Severe Winter Storm Loss Estimate**

Hazard Type	Number of Events <sup>1</sup>	Average Number of Events Per Year <sup>1</sup>	Total Property Loss <sup>1</sup>	Average Annual Property Loss <sup>1</sup>	Total Crop Loss <sup>2</sup>	Average Annual Crop Loss <sup>2</sup>
Blizzard	21	0.9	\$35,000	\$1,591	\$490,925	\$27,274
Heavy Snow	10	0.5	\$2,000,000	\$90,909		
Ice Storm	20	0.9	\$5,165,000	\$234,773		
Winter Storm	120	5.5	\$660,000	\$30,000		
Winter Weather	39	1.8	\$340,000	\$15,455		
Extreme Cold/Wind Chill	8	0.4	\$0	\$0		
<b>Severe Winter Storms</b>	<b>253</b>	<b>11.5</b>	<b>\$8,200,000</b>	<b>\$372,727</b>	<b>\$490,925</b>	<b>\$27,274</b>

<sup>1</sup>Indicates the data is from NCEI (January 1996 to December 2017); <sup>2</sup>Indicates data is from USDA RMA (2000 to 2017)

**Probability**

Based on historic records and reported events, severe winter storms are likely to occur several times annually within the planning area. The NCEI reported 218 hail events between 1996 and 2017, or approximately 9.91 severe winter storm occurrences per year. Given the historic record of occurrence, the annual probability of occurrence for severe winter storms is 100 percent.

**Regional Vulnerabilities**

The following table provides information related to regional vulnerabilities; for jurisdictional-specific vulnerabilities, refer to *Section Seven: Participant Sections*.

**Table 86: Regional Severe Winter Storm Vulnerabilities**

Sector	Vulnerability
People	-Elderly citizens at higher risk of injury or death, especially during extreme cold and heavy snow accumulations -Citizens without adequate heat and shelter at higher risk of injury or death
Economic	-Closed roads and power outages can cripple a region for days, leading to significant revenue loss and loss of income for workers
Built Environment	-Heavy snow loads can cause roofs to collapse -Significant tree damage possible, downing power lines and blocking roads
Infrastructure	-Heavy snow and ice accumulation can lead to downed power lines and prolonged power outages -Transportation may be difficult or impossible during blizzards, heavy snow, and ice events
Critical Facilities	-Emergency response and recovery operations, communications, water treatment plants, and others are at risk to power outages, impassable roads, and other damages

## Terrorism

### Hazard Profile

The Federal Bureau of Investigation (FBI) describes terrorism as either domestic or international, depending on the origin, base, and objectives of the terrorist organization. For the purpose of this report, the following definitions from the FBI will be used:

- Domestic terrorism is the unlawful use, or threatened use, of force or violence by a group or individual based and operating entirely within the United States or Puerto Rico without foreign direction committed against persons or property to intimidate or coerce a government, the civilian population, or any segment thereof in furtherance of political or social objectives.
- International terrorism involves violent acts or acts dangerous to human life that are a violation of the criminal laws of the United States or any state, or that would be a criminal violation if committed within the jurisdiction of the United States or any state. These acts appear to be intended to intimidate or coerce a civilian population, influence the policy of a government by intimidation or coercion, or affect the conduct of a government by assassination or kidnapping. International terrorist acts occur outside the United States or transcend national boundaries in terms of the means by which they are accomplished, the persons they appear intended to coerce or intimidate, or the locale in which their perpetrators operate or seek asylum.

There are different types of terrorism depending on the target of attack, which are

- Political terrorism
- Bio-terrorism
- Cyber-terrorism
- Eco-terrorism
- Nuclear-terrorism
- Narco-terrorism
- Agro-terrorism

Terrorist activities are also classified based on motivation behind the event (such as ideology: i.e. religious fundamentalism, national separatist movements, and social revolutionary movements). Terrorism can also be random with no ties to ideological reasoning.

The FBI also provides clear definitions of a terrorist incident and prevention:

- A terrorist *incident* is a violent act or an act dangerous to human life, in violation of the criminal laws of the United States, or of any state, to intimidate or coerce a government, the civilian population, or any segment thereof, in furtherance of political or social objectives.
- Terrorism *prevention* is a documented instance in which a violent act by a known or suspected terrorist group or individual with the means and a proven propensity for violence is successfully interdicted through investigative activity.

Primarily, threat assessment, mitigation, and response to terrorism are federal and state directives and work in conjunction with local law enforcement. The Office of Infrastructure Protection (IP) within the Federal Department of Homeland Security is a component of the National Programs and Protection Directorate.



The IP leads the coordinated national program to reduce and mitigate risk within 18 national critical infrastructure and key resources (CIKR) sectors from acts of terrorism and natural disasters. The IP also works to strengthen sectors' ability to respond and quickly recover from attacks or other emergencies. This is done through the National Infrastructure Protection Plan (NIPP).

Under the NIPP, a Sector-Specific Agency (SSA) is a federal agency assigned to lead a collaborative process for infrastructure protection for each of the 18 sectors. The NIPP's comprehensive framework allows the IP to provide the cross-sector coordination and collaboration needed to set national priorities, goals, and requirements for effective allocation of resources. More importantly, the NIPP framework integrates a broad range of public and private CIKR protection activities.

SSAs provide guidance about the NIPP framework to state, tribal, territorial, and local homeland security agencies and personnel. They coordinate NIPP implementation within the sector, which involves developing and sustaining partnerships and information-sharing processes, as well as assisting with contingency planning and incident management.

The IP has SSA responsibility for six of the 18 CIKR sectors. Those six are:

- Chemical
- Commercial Facilities
- Critical Manufacturing
- Dams
- Emergency Services
- Nuclear Reactors, Materials and Waste

SSA responsibility for the other 12 CIKR sectors is held by other Department of Homeland Security components and other federal agencies. Those 12 are:

- Agriculture and Food – Department of Agriculture; Food and Drug Administration
- Banking and Finance – Department of the Treasury
- Communications – Department of Homeland Security
- Defense Industrial Base – Department of Defense
- Energy – Department of Energy
- Government Facilities – Department of Homeland Security
- Information Technology – Department of Homeland Security
- National Monuments and Icons – Department of the Interior
- Postal and Shipping – Transportation Security Administration
- Healthcare and Public Health – Department of Health and Human Services
- Transportation Systems – Transportation Security Administration; U.S. Coast Guard
- Water – Environmental Protection Agency

The NIPP requires that each SSA prepare a Sector-Specific Plan, review it annually, and update it as appropriate.

The Department of Homeland Security and its affiliated agencies are responsible for disseminating any information regarding terrorist activities in the country. The system in place is the National Terrorism Advisory System (NTAS). In 2011, NTAS replaced the Homeland Security

Advisory System which was the color-coded system put in place after the September 11<sup>th</sup> attacks by Presidential Directive 5 and 8 in March of 2002.

NTAS is based on a system of analyzing threat levels and providing either an imminent threat alert or an elevated threat alert.

An **Imminent Threat Alert** warns of a credible, specific and impending terrorist threat against the United States.

An **Elevated Threat Alert** warns of a credible terrorist threat against the United States.

The Department of Homeland Security, in conjunction with other federal agencies, will decide which level of threat alert should be issued, should credible information be available.

Each alert provides a statement summarizing the potential threat and what, if anything, should be done to ensure public safety.

The NTAS Alerts will be based on the nature of the threat: in some cases, alerts will be sent directly to law enforcement or affected areas of the private sector, while in others, alerts will be issued more broadly to the American people through both official and media channels.

An individual threat alert is issued for a specific time period and automatically expires. It may be extended if new information becomes available or the threat evolves. The **sunset provision** contains a specific date when the alert expires, as there will not be a constant NTAS Alert or blanket warning of an overarching threat. If threat information changes for an alert, the Secretary of Homeland Security may announce an updated NTAS Alert. All changes, including the announcement that cancels an NTAS Alert, will be distributed the same way as the original alert.

### Location

Terrorist activities could occur throughout the entire planning area. In rural areas, concerns are primarily related to agro-terrorism and tampering with water supplies. In urban areas, concerns are related to political unrest, activist groups, and others that may be targeting businesses, police, and federal buildings.

### Extent

Terrorist attacks can vary greatly in scale and magnitude, depending on the location of the attack.

### Historical Occurrences

Previous accounts of terrorism in the planning area were gathered from the Global Terrorism Database, maintained by the University of Maryland and the National Consortium for the Study of Terrorism and Responses to Terrorism (START). This database contains information for over 140,000 terrorist attacks. According to this database, there have been no terrorist incidents in the planning area from 1970 – October 2018.<sup>75</sup>

### Average Annual Damages

The average damage per event estimate was determined based upon the START Global Terrorism Database information since 1970. This does not include losses from displacement,

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<sup>75</sup> National Consortium for the Study of Terrorism and Responses to Terrorism (START). October 2018. Global Terrorism Database [Data file]. Retrieved from <https://www.start.umd.edu/gtd>.

functional downtime, or economic loss. As there were no terrorist events within the planning area, there were no average annual damages.

### Probability

Given zero incidences over the course of 49 years, the annual probability for terrorism in the planning area has a less than one percent chance of occurring during any given year. This does not indicate that a terrorist event will never occur within the planning area, only that the likelihood of such an event is incredibly low.

### Regional Vulnerabilities

The following table provides information related to regional vulnerabilities; for jurisdictional-specific vulnerabilities, refer to *Section Seven: Participant Sections*.

**Table 87: Regional Terrorism Vulnerabilities**

Sector	Vulnerability
People	-Police officers and first responders at risk of injury or death
Economic	-Damaged businesses can cause loss of revenue and loss of income for workers -Agricultural attacks could cause significant economic losses for the region
Built Environment	-Targeted buildings may sustain heavy damage
Infrastructure	-Water supply, power plants, utilities
Critical Facilities	-Police stations and government offices are at a higher risk

## Tornadoes

### Hazard Profile

A tornado is typically associated with a supercell thunderstorm. For a rotation to be classified as a tornado, three characteristics must be met:

- There must be a microscale rotating area of wind, ranging in size from a few feet to a few miles wide;
- The rotating wind, or vortex, must be attached to a convective cloud base and must be in contact with the ground; and,
- The spinning vortex of air must have caused enough damage to be classified by the Fujita Scale as a tornado.

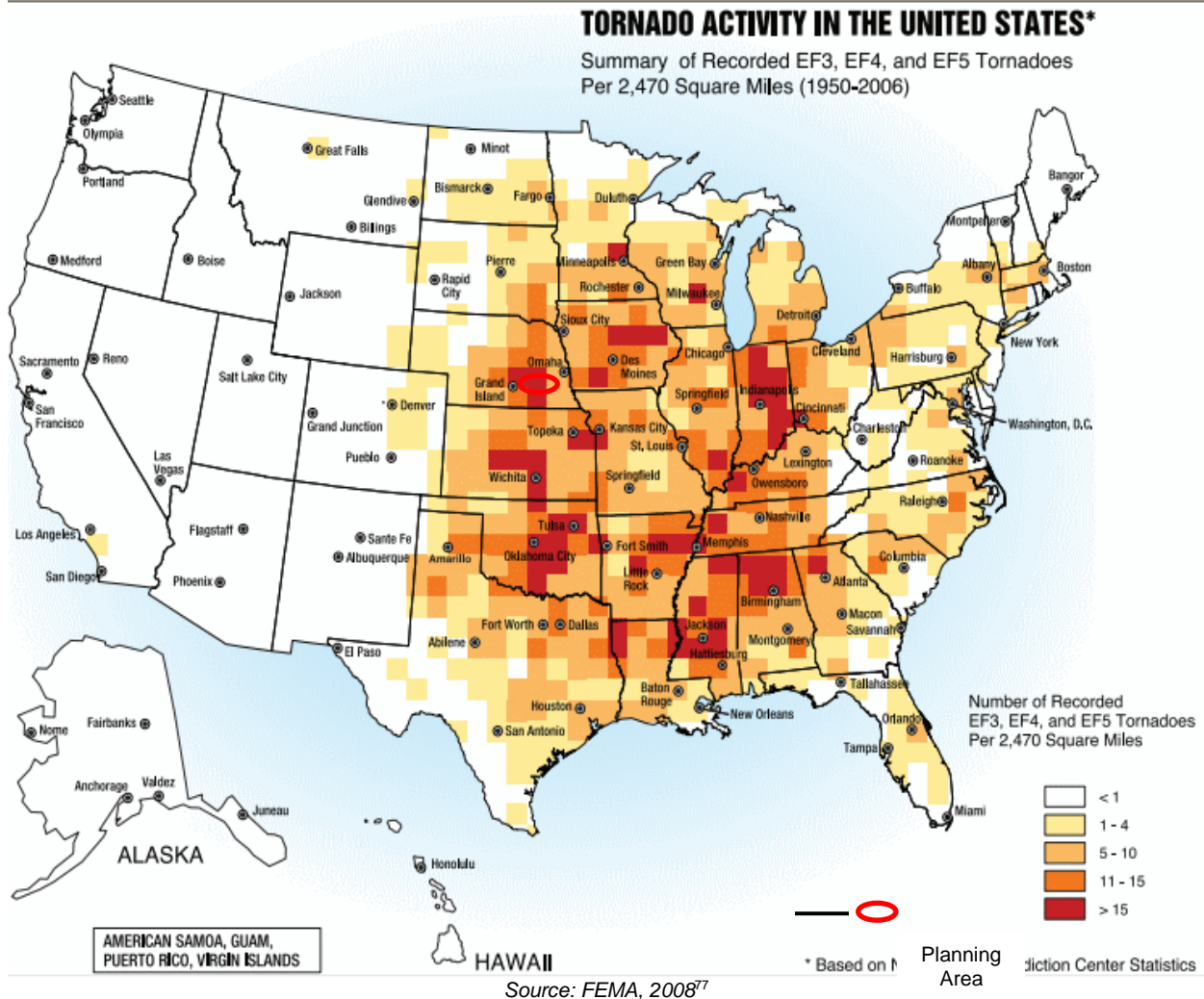
Once tornadoes are formed, they can be extremely violent and destructive. They have been recorded all over the world but are most prevalent in the American Midwest and South, in an area known as “Tornado Alley.” Approximately 1,250 tornadoes are reported annually in the contiguous United States. Tornadoes can travel distances over 100 miles and reach over 11 miles above ground. Tornadoes usually stay on the ground no more than 20 minutes. Nationally, the tornado season typically occurs between April and July. On average, 80 percent of tornadoes occur between noon and midnight. In Nebraska, 77 percent of all tornadoes occur in the months of May, June, and July.

Nebraska is ranked fifth in the nation for tornado frequency with an annual average of 57 tornadoes between 1991 to 2010.<sup>76</sup> The following figure shows the tornado activity in the United States as a summary of recorded EF3, EF4, and EF5 tornadoes per 2,470 square miles from 1950-2006.

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<sup>76</sup> National Centers for Environmental Information. 2013. “U.S. Tornado Climatology.” <https://www.ncdc.noaa.gov/climate-information/extreme-events/us-tornado-climatology>.

Figure 37: Tornado Activity in the United States

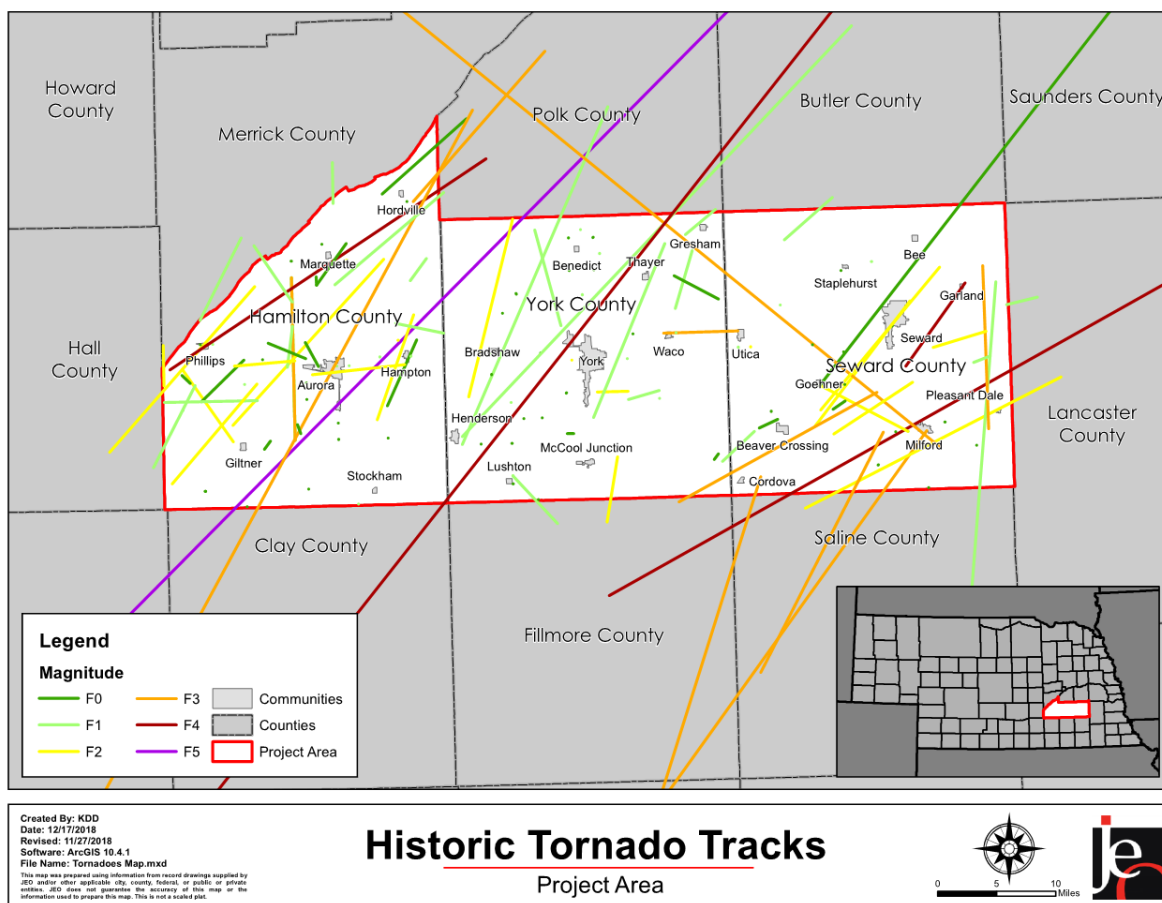


**Location**

Tornadoes can occur anywhere in the planning area. The impacts would likely be greater in more densely populated areas. The following map shows the historical track locations across the region from 1950 to 2017. Note that this map shows tornado tracks for F-0 and F-5.

<sup>77</sup> Federal Emergency Management Agency. August 2008. "Taking Shelter From the Storm: Building a Safe Room for Your Home or Small Business, 3<sup>rd</sup> edition."

Figure 38: Historic Tornado Tracks



### Extent

After a tornado passes through an area, an official rating category is determined, which provides a common benchmark that allows comparisons to be made between different tornadoes. The magnitude of tornadoes is measured by the Enhanced Fujita Scale. The Enhanced Fujita Scale does not measure tornadoes by their size or width, but rather the amount of damage caused to human-built structures and trees. The Enhanced Fujita Scale replaced the Fujita Scale in 2007. The enhanced scale classifies EF0-EF5 damage as determined by engineers and meteorologists across 28 different types of damage indicators, including different types of building and tree damage. To establish a rating, engineers and meteorologists examine the damage, analyze the ground-swirl patterns, review damage imagery, collect media reports, and sometimes utilize photogrammetry and videogrammetry. Based on the most severe damage to any well-built frame house, or any comparable damage as determined by an engineer, an EF-Scale number is assigned to the tornado. Table 88 and Table 89 summarize the Enhanced Fujita Scale and damage indicators. According to a recent report from the National Institute of Science and Technology on the Joplin Tornado, tornadoes rated EF3 or lower account for around 96 percent of all tornado damages.<sup>78</sup>

<sup>78</sup> Kuligowski, E.D., Lombardo, F.T., Phan, L.T., Levitan, M.L., & Jorgensen, D.P. March 2014. "Final Report National Institute of Standards and Technology (NIST) Technical Investigation of the May 22, 2011, Tornado in Joplin, Missouri."

**Table 88: Enhanced Fujita Scale**

Storm Category	3 Second Gust (mph)	Damage Level	Damage Description
EF0	65-85 mph	Gale	Some damages to chimneys; breaks branches off trees; pushes over shallow-rooted trees; damages to sign boards.
EF1	86-110 mph	Weak	The lower limit is the beginning of hurricane wind speed; peels surface off roofs; mobile homes pushed off foundations or overturned; moving autos pushed off the roads; attached garages might be destroyed.
EF2	111-135 mph	Strong	Considerable damage. Roofs torn off frame houses; mobile homes demolished; boxcars pushed over; large trees snapped or uprooted; light object missiles generated.
EF3	136-165 mph	Severe	Roof and some walls torn off well-constructed houses; trains overturned; most trees in forest uprooted.
EF4	166-200 mph	Devastating	Well-constructed houses leveled; structures with weak foundations blown off some distance; cars thrown and large missiles generated.
EF5	200+ mph	Incredible	Strong frame houses lifted off foundations and carried considerable distances to disintegrate; automobile sized missiles fly through the air in excess of 100 meters; trees debarked; steel re-enforced concrete structures badly damaged.
EF No rating	--	Inconceivable	Should a tornado with the maximum wind speed in excess of F5 occur, the extent and types of damage may not be conceived. A number of missiles such as iceboxes, water heaters, storage tanks, automobiles, etc. will create serious secondary damage on structures.

Source: NOAA; FEMA

**Table 89: Enhanced Fujita Scale Damage Indicator**

Number	Damage Indicator
1	Small barns, farm outbuildings
2	One- or two-family residences
3	Single-wide mobile home
4	Double-wide mobile home
5	Apartment, condo, townhouse (3 stories or less)
6	Motel
7	Masonry apartment or motel
8	Small retail bldg. (fast food)
9	Small professional (doctor office, branch bank)
10	Strip mall
11	Large shopping mall
12	Large, isolated ("big box") retail bldg.
13	Automobile showroom
14	Automotive service building
15	School - 1-story elementary (interior or exterior halls)
16	School - Junior or Senior high school
17	Low-rise (1-4 story) bldg.
18	Mid-rise (5-20 story) bldg.



Number	Damage Indicator
19	High-rise (over 20 stories)
20	Institutional bldg. (hospital, govt. or university)
21	Metal building system
22	Service station canopy
23	Warehouse (tilt-up walls or heavy timber)
24	Transmission line tower
25	Free-standing tower
26	Free standing pole (light, flag, luminary)
27	Tree - hardwood
28	Tree - softwood

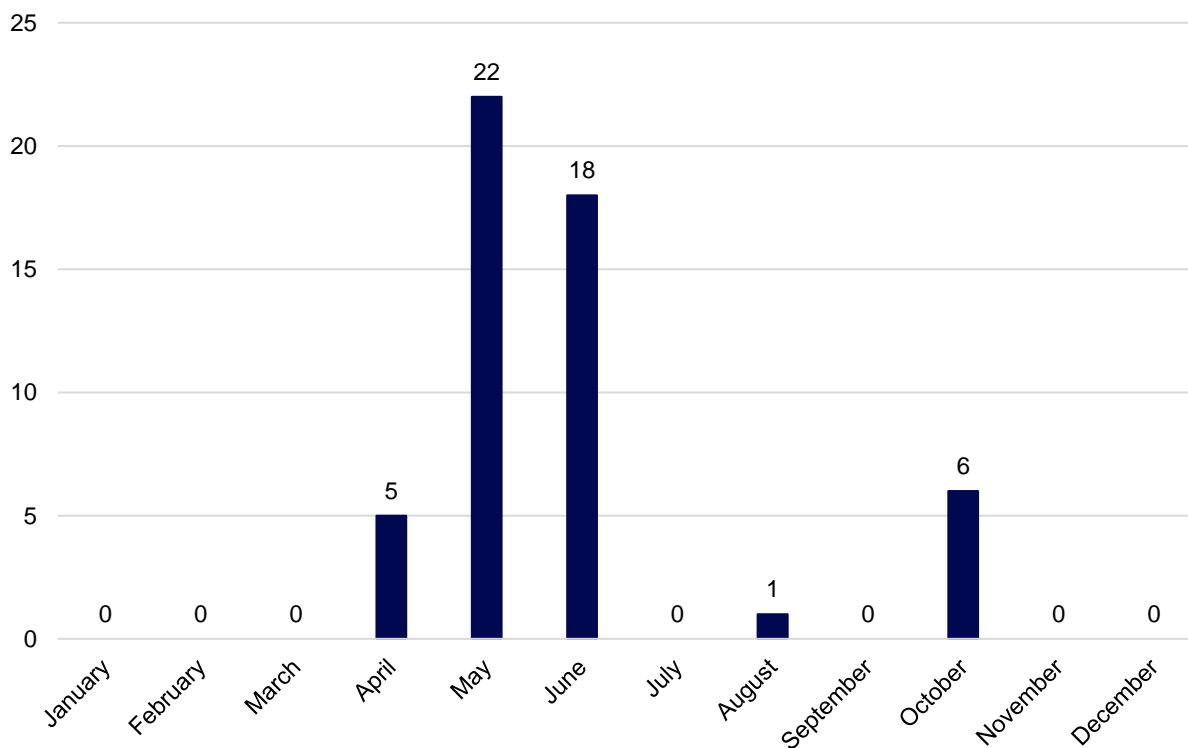
Source: NOAA; FEMA

Based on the historic record, it is most likely that tornadoes that occur within the planning area will be of EF0 strength. Of the 52 reported events, 13 were F/EF1, six were F/EF2, two were F/EF3, and one was F/EF4.

### Historical Occurrences

NCEI cites 52 tornadic events ranging from a magnitude of F/EF0 to F/EF4 between 1996 and 2017. These events were responsible for \$15,271,000 in property damages. No deaths or injuries were reported. The most damaging tornadoes occurred in Hamilton County (2014) and York County (2013), each causing \$500,000 in damages. The following figure shows that the month of May is the busiest month of the year with the highest number of tornadoes in the planning area.

Figure 39: Tornadoes by Month in the Planning Area



Source: NCEI, 1996-2017

### Average Annual Damages

The average damage per event estimate was determined based upon NCEI Storm Events Database since 1996 and number of historical occurrences. This does not include losses from displacement, functional downtime, economic loss, injury, or loss of life. Tornadoes cause an average of \$694,136 per year in property damage. The RMA recorded \$427,788 in crop damages due to tornadic events.

**Table 90: Tornado Loss Estimate**

Hazard Type	Number of Events <sup>1</sup>	Average Number of Events Per Year	Total Property Loss <sup>1</sup>	Average Annual Property Loss <sup>1</sup>	Total Crop Loss <sup>2</sup>	Average Annual Crop Loss <sup>2</sup>
Tornadoes	52	2.4	\$15,271,000	\$694,136	\$427,788	\$23,766

<sup>1</sup>Indicates the data is from NCEI (January 1996 to December 2017); <sup>2</sup>Indicates data is from USDA RMA (2000 to 2017)

### Probability

Given the 52 events over the course of 22 years, there is a 100 percent probability that a tornadic event will occur in the planning area in any given year.

### Regional Vulnerabilities

The following table provides information related to regional vulnerabilities; for jurisdictional-specific vulnerabilities, refer to *Section Seven: Participant Sections*.

**Table 91: Regional Tornado Vulnerabilities**

Sector	Vulnerability
People	-Citizens living in mobile homes are at risk to death or injury -Citizens without access to shelter below ground or in safe room -Elderly with decreased mobility or poor hearing may be higher risk -Lack of multiple ways of receiving weather warnings, especially at night
Economic	-Significant economic losses possible, especially with EF3 tornadoes or greater
Built Environment	-All building stock are at risk of significant damages
Infrastructure	-All above ground infrastructure at risk to damages -Impassable roads due to debris blocking roadways
Critical Facilities	-All critical facilities at risk to significant damages and power outages

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## Section Five: Mitigation Strategy

### Introduction

The primary focus of the mitigation strategy is to establish goals and objectives and identify action items to reduce the effects of hazards on existing infrastructure and property in a cost effective and technically feasible manner. The establishment of goals and objectives took place during the Planning Team meetings.

Meeting participants reviewed the goals from the 2014/2015 HMPs and discussed recommended additions and modifications. The intent of each goal and set of objectives is to develop strategies to account for risks associated with hazards and identify ways to reduce or eliminate those risks. Each goal and set of objectives are followed by 'mitigation alternatives,' or actions.

A preliminary list of goals and objectives was provided to the Planning Team and participants at the Round 1 public meetings. The Planning Team voted to maintain the same list of goals from the 2014/2015 HMPs. Participating jurisdictions also decided to utilize the same goals.

### Summary of Changes

The development of the mitigation strategy for this plan update includes the addition of several mitigation actions, revisions to the mitigation alternative selection process, and the incorporation of mitigation actions for the additional hazards addressed in the update.

### Goals

Below is the final list of goals as determined by the participants and Planning Team. These goals provide direction to guide participants in reducing future hazard related losses.

#### Goal 1: Protect the Health and Safety of Residents

Objective 1.1: Reduce or prevent damage to property and loss of life or serious injury (overall intent of the plan)

#### Goal 2: Reduce Future Losses from Hazard Events

Objective 2.1: Provide protection for existing structures, future development, critical facilities, and infrastructure, services, utilities and trees to the extent possible.

*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.*

*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.*

*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.*

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

*Requirement §201.6(c)(3)(iv): For multi-jurisdictional plans, there must be identifiable action items specific to the jurisdiction requesting FEMA approval or credit of the plan.*

## Section Five | Mitigation Strategy

Objective 2.2: Develop hazard specific plans, conduct studies or assessments, and retrofit buildings and facilities to mitigate for hazards and minimize their impact.

Objective 2.3: Minimize and control the impact of hazard events through enacting or updating ordinances, permits, laws, or regulations.

Objective 2.4: Reduce or eliminate economic impacts from hazards.

### **Goal 3: Increase Public Awareness and Education Regarding Vulnerabilities to Hazards**

Objective 3.1: Develop and provide information to residents and businesses about the types of hazards they are exposed to, what the effects may be, where they occur, and what they can do to better prepare for them.

### **Goal 4: Improve Emergency Management Capabilities**

Objective 4.1: Develop or update Emergency Response Plans, procedures and abilities; increase the capability to respond.

Objective 4.2: Develop or update evacuation plans and procedures.

Objective 4.3: Improve warning systems and ability to communicate to residents and businesses during and following a disaster or emergency.

### **Goal 5: Pursue Multi-Objective Opportunities (whenever possible)**

Objective 5.1: When possible, use existing resources, agencies, and programs to implement the projects.

Objective 5.2: When possible, implement projects which achieve multiple goals.

### **Goal 6: Enhance Overall Resilience and Promote Sustainability**

Objective 6.1: Incorporate hazard mitigation and adaptation into updating other local planning endeavors (e.g., comprehensive plans, zoning ordinance, subdivision regulation, etc.)

## **Mitigation Alternatives (Action Items)**

After establishing the goals, mitigation alternatives were prioritized. The alternatives considered included: the mitigation actions in the previous plan; additional mitigation actions discussed during the planning process; and recommendations from JEO for additional mitigation actions. JEO provided each participant a preliminary list of mitigation alternatives to be used as a starting point. The prioritized list of alternatives helped participants determine which actions will best assist their respective jurisdiction in alleviating damages in the event of a disaster. The listed priority does not indicate which actions will be implemented first but will serve as a guide in determining the order in which each action should be implemented.

These projects are the core of a hazard mitigation plan. The group was instructed that each alternative must be directly related to the goals of the plan. Alternatives must be specific activities that are concise and can be implemented individually.

Mitigation alternatives were evaluated based on referencing the community's risk assessment and capability assessment. Communities were encouraged to choose mitigation actions that were realistic and relevant to the concerns identified.

A final list of alternatives was established including: information on the associated hazard mitigated; description of the action; responsible party; priority; cost estimate; potential funding sources; and timeline. This information was established through input from participants and determination by JEO.

It is important to note that not all of the mitigation actions identified by a community may ultimately be implemented due to limited capabilities, prohibitive costs, low benefit/cost ratio, or other concerns. Participants have not committed to undertaking identified mitigation actions in the plan. The cost estimates, priority ranking, potential funding, and identified agencies are used to give communities an idea of what actions may be the most feasible over the next five years. This information will serve as a guide for the participants to assist in hazard mitigation for the future. Additionally, some jurisdictions may identify additional mitigation actions not identified.

### **Participant Mitigation Alternatives**

The following are specific actions listed by participants of the Upper Big Blue NRD HMP intended to be utilized in the implementation of mitigation alternatives. Each action is described by the following:

- Mitigation Action – general title of the action item
- Description – brief summary of what the action item(s) will accomplish
- Hazard(s) Addressed – which hazard the mitigation action aims to address
- Estimated Cost – a general cost estimate for implementing the mitigation action for the appropriate jurisdiction
- Potential funding – a list of any potential funding mechanisms to fund the action
- Timeline – a general timeline as established by planning participants
- Priority – a general description of the importance and workability in which an action may be implemented (high/medium/low); priority may vary between each community, mostly dependent on funding capabilities and the size of the local tax base
- Lead agency – listing of agencies or departments which may lead or oversee the implementation of the action item
- Status – a description of what has been done, if anything, to implement the action item

Implementation of the actions will vary between individual plan participants based upon the availability of existing information, funding opportunities and limitations, and administrative capabilities of communities. Establishment of a cost-benefit analysis is beyond the scope of this plan and could potentially be completed prior to submittal of a project grant application or as part of a five-year update. Completed, removed, and ongoing or new mitigation alternatives for each participating jurisdiction can be found in *Section Seven: Participant Sections*.

### **Mitigation Alternative Project Matrix**

During public meetings, each participant was asked to review mitigation projects listed in the 2014/2015 HMPs and review a list of potential mitigation alternatives which would lead to action items to reduce the effects of hazards. Selected projects varied from community to community depending upon the significance of each hazard present. The information listed in Table 92 and Table 93 is a compilation of the mitigation alternatives identified by jurisdiction and organized by the goal to be met.

**Table 92: Mitigation Alternatives Selected by Hamilton County and York County**

		City of Aurora	Hamilton County	Village of Giltner	Village of Hampton	Village of Hordville	Village of Marquette	Village of Phillips	Village of Stockham	City of Henderson	City of York	Village of Benedict	Village of Bradshaw	Village of Gresham	Village of McCool Junction	Village of Thayer	Village of Waco	York County
Mitigation Alternatives	Goal	Hamilton County								York County								
Alert Sirens	1,4,5	X			X		X	X	X		X		X				X	X
All-Terrain Vehicles	2										X							
Acquire Identification Resource	1	X												X				
Backup Generators	1,2,5	X	X	X	X	X	X	X	X	X		X	X	X		X	X	X
Backup Municipal Records	2						X							X				
Best Management Practices	2						X											
Bridge Replacement	1,2,5		X															
Civil Service Improvements	1,2,5	X	X	X	X		X				X		X	X				
Community Rating System (CRS)	2	X													X			
Comprehensive City/Village Disaster and Emergency Response Plan	4	X		X	X													
Construct Cooling Stations	1						X											
Continuity Plans	4	X	X		X											X		
Dam Failure Exercises	1,4,5																	
Develop a Drought Management Plan	2																	
Drainage Study / Stormwater Master Plan	2	X			X					X	X		X					
Education about Continuity Plans	3	X	X		X													
Electronic Door Access	1,2,5																	
Emergency Communication	1,4,5	X	X		X		X					X	X	X	X		X	
Emergency Operations	4																	



Emergency Preparedness Plan	4																	
Emergency Signage	1				X													
Enhanced Codes	2,5,6	X			X									X				
Enroll in the National Flood Insurance Program (NFIP)	2			X	X		X											
Establish Formal Drought Response Protocols	2						X											
Event Cancellation	1,4,5						X											
Fire Prevention Program: Planning and Training	2,4,5																	
Fire Wise Defensible Space	4	X	X				X											
First Aid Training	1,3,4,5	X	X		X													
Floodplain Management	2,5,6									X								
Floodplain Mapping / Remapping	2,3,5	X	X															
Flood-Prone Property Acquisition	1,2,5	X								X								
Formal Evacuation Plan	4	X	X		X	X			X									
Grade Control Structures	2																	
Groundwater/Irrigation/Water Conservation Management Plan and Practices	2				X													
Hail Insurance	2,3,5													X				
Hazardous Tree Removal	1,2,5	X								X	X	X		X			X	
Improve Snow / Ice Removal Program	1	X	X	X	X		X			X	X	X		X				
Improvements to Flood Warning System	4																	
Improvements to Dam Failure Warning System	4																	
Install Hail Resistant Roofing	1,2,5													X				
Interior Door Locking Mechanisms	1																	
Intergovernmental Support	2,5,6						X											
Levee/Floodwall Construction and/or Improvements	1,2,5																	
Low Impact Development Practices	6	X												X				

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Milford Flood Hazard Mitigation Study	2																	
Mobile Home Anchoring	1,2,5														X			
Monitor Water Supply	1						X											
New Municipal Well	2	X			X										X			
No Adverse Impact Adoption	6	X													X			
Obtaining Missing Data for Future Updates	2										X							
Parcel Level Evaluation of Floodprone Properties	1,2,5	X																
Physical Security Systems	1,2,5																	
Power, Service, Electrical, and Water Distribution Lines	1,2,4,5	X	X	X	X	X	X			X			X		X			
Preservation of Open Space	6																	
Protection of Vulnerable Populations	1																	
Public Awareness/Education	3	X	X	X	X	X	X	X	X	X	X	X	X	X	X		X	X
Relocation of Chemical Storage	1,2,5											X			X			
Road Paving	2		X															
Rural Water District and Water System Upgrades	2				X													
Shelter In-Place Training/Education	3	X	X		X													
Snow Fences	1,2,5				X							X			X			
Source Water Contingency Plan	2				X		X											
Stabilize/Anchor Fertilizer, Fuel, and Propane Tanks	1,2,5									X	X	X						
Static Detectors	4	X			X													
Storm Shelter / Safe Rooms	1,2,5	X	X		X		X	X	X	X	X		X				X	X
Stormwater System and Drainage Improvements	1,2,5	X			X		X	X	X	X			X	X			X	X
Stream Bank Stabilization / Grade Control Structures / Channel Improvements	1,2,5	X									X							X
Surge Protectors	2						X											
Training for Response to Train Derailment	3,4,5		X	X	X	X												

Transportation Communication System Upgrades	2,4,5																	
Tree and Refuse Disposal Site	1,2,5							X										
Tree City USA - Tree Maintenance Program	1,2,5	X			X		X	X	X	X			X	X	X			
Tree Inventory	2	X																
Update Comprehensive Plan	6						X					X	X		X			
Vehicular Barriers	1,2,5	X	X		X													
Vulnerable Population Database	1	X	X		X													
Water Conservation Awareness Programs	3																	
Warning Systems	1,4,5	X									X		X					
Weather Radar System Program	1,4,5				X													
Weather Radios	1,4,5	X	X		X				X	X		X	X		X			
Wellhead Protection Plan	2						X											
Windbreaks	2				X							X		X				

**Table 93: Mitigation Alternatives Selected by Seward County, UBBNRD, School Districts, and Fire Departments**

Mitigation Alternatives	Goal	UBBNRD	City of Milford	City of Seward	Seward County	Village of Beaver Crossing	Village of Bee	Village of Cordova	Village of Garland	Village of Goehner	Village of Pleasant Dale	Village of Staplehurst	Village of Utica	Central City Public Schools	Seward Public Schools	Tamora Fire Department
		NRD	Seward County											School Districts	Fire Department	
Alert Sirens	1,4,5	X			X		X		X			X		X		X
All-Terrain Vehicles	2			X								X				
Acquire Identification Resource	1															
Backup Generators	1,2,5	X	X				X	X		X	X	X	X	X	X	X

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Backup Municipal Records	2					X									
Best Management Practices	2		X			X									
Bridge Replacement	1,2,5														
Civil Service Improvements	1,2,5					X									X
Community Rating System (CRS)	2		X			X				X	X				
Comprehensive City/Village Disaster and Emergency Response Plan	4			X		X	X								
Construct Cooling Stations	1														
Continuity Plans	4		X			X		X					X		
Dam Failure Exercises	1,4,5	X													
Develop a Drought Management Plan	2	X													
Drainage Study / Stormwater Master Plan	2	X	X									X			
Education about Continuity Plans	3		X												
Electronic Door Access	1,2,5													X	
Emergency Communication	1,4,5					X		X				X	X		
Emergency Operations	4					X									
Emergency Preparedness Plan	4			X											
Emergency Signage	1														
Enhanced Codes	2,5,6		X	X	X			X	X			X			
Enroll in the National Flood Insurance Program (NFIP)	2														
Establish Formal Drought Response Protocols	2														
Event Cancellation	1,4,5														
Fire Prevention Program: Planning and Training	2,4,5					X									
Fire Wise Defensible Space	4														
First Aid Training	1,3,4,5	X		X		X				X	X	X			
Floodplain Management	2,5,6			X											
Floodplain Mapping / Remapping	2,3,5		X							X					
Flood-Prone Property Acquisition	1,2,5			X											

Formal Evacuation Plan	4			X	X	X			X			X			
Grade Control Structures	2	X			X										
Groundwater/Irrigation/Water Conservation Management Plan and Practices	2	X		X											
Hail Insurance	2,3,5														
Hazardous Tree Removal	1,2,5	X													
Improve Snow / Ice Removal Program	1			X		X			X			X			
Improvements to Flood Warning System	4	X													
Improvements to Dam Failure Warning System	4	X													
Install Hail Resistant Roofing	1,2,5			X									X		
Interior Door Locking Mechanisms	1													X	
Intergovernmental Support	2,5,6	X													
Levee/Floodwall Construction and/or Improvements	1,2,5	X		X											
Low Impact Development Practices	6		X												
Milford Flood Hazard Mitigation Study	2		X												
Mobile Home Anchoring	1,2,5														
Monitor Water Supply	1	X													
New Municipal Well	2			X					X	X	X				
No Adverse Impact Adoption	6			X											
Obtaining Missing Data for Future Updates	2														
Parcel Level Evaluation of Floodprone Properties	1,2,5														
Physical Security Systems	1,2,5													X	
Power, Service, Electrical, and Water Distribution Lines	1,2,4,5			X		X			X	X			X		
Preservation of Open Space	6				X										
Protection of Vulnerable Populations	1		X	X		X									
Public Awareness/Education	3	X		X	X	X			X		X		X		

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Relocation of Chemical Storage	1,2,5														
Road Paving	2														
Rural Water District and Water System Upgrades	2			X					X	X					
Shelter In-Place Training/Education	3			X											
Snow Fences	1,2,5			X		X									
Source Water Contingency Plan	2											X			
Stabilize/Anchor Fertilizer, Fuel, and Propane Tanks	1,2,5														
Static Detectors	4														
Storm Shelter / Safe Rooms	1,2,5	X		X	X	X	X		X	X	X	X	X	X	
Stormwater System and Drainage Improvements	1,2,5		X	X	X		X			X		X	X		
Stream Bank Stabilization / Grade Control Structures / Channel Improvements	1,2,5	X			X	X									
Surge Protectors	2														
Training for Response to Train Derailment	3,4,5														
Transportation Communication System Upgrades	2,4,5														X
Tree and Refuse Disposal Site	1,2,5														
Tree City USA - Tree Maintenance Program	1,2,5					X	X								
Tree Inventory	2	X													
Update Comprehensive Plan	6											X			
Vehicular Barriers	1,2,5			X	X										
Vulnerable Population Database	1						X			X					
Water Conservation Awareness Programs	3	X													
Warning Systems	1,4,5														
Weather Radar System Program	1,4,5														

Weather Radios	1,4,5			X					X							
Wellhead Protection Plan	2															
Windbreaks	2											X				

**Completed Mitigation Efforts**

Previously completed mitigation actions identified by the communities can be found in their specific participant section in *Section Seven: Participant Sections*.



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## Section Six: Plan Implementation and Maintenance

### Monitoring, Evaluating, and Updating the Plan

Participants of the UBBNRD HMP will be responsible for monitoring (annually at a minimum), evaluating, and updating the plan. Hazard mitigation projects will be prioritized by each participant's governing body with support and suggestions from the public and business owners. Unless otherwise specified by each participant's governing body, the governing body will be responsible for implementation of the recommended projects. The responsible party for the various implementation actions will report on the status of all projects and include which implementation processes worked well, any difficulties encountered, how coordination efforts are proceeding, and which strategies could be revised.

To assist with monitoring of the plan, as each recommended project is completed, a detailed timeline of how that project was completed will be written and attached to the plan in a format selected by the governing body. Information that will be included will address project timelines, agencies involved, area(s) benefited, total funding (if complete), etc. At the discretion of each governing body, a local task force will be used to review the original draft of the mitigation plan and to recommend changes.

Review and updating of this plan will occur at least every five years. At the discretion of each governing body, updates may be incorporated more frequently, especially in the event of a major hazard. The governing body will start meeting to discuss mitigation updates at least six months prior to the deadline for completing the plan review. The persons overseeing the evaluation process will review the goals and objectives of the previous plan and evaluate them to determine whether they are still pertinent and current. Among other questions, they may want to consider the following:

- Do the goals and objectives address current and expected conditions?
- If any of the recommended projects have been completed, did they have the desired impact on the goal for which they were identified? If not, what was the reason it was not successful (lack of funds/resources, lack of political/popular support, underestimation of the amount of time needed, etc.)?
- Have either the nature, magnitude, and/or type of risks changed?
- Are there implementation problems?
- Are current resources appropriate to implement the plan?
- Were the outcomes as expected?
- Did the plan partners participate as originally planned?
- Are there other agencies which should be included in the revision process?

Worksheets in *Appendix C* may also be used to assist with plan updates.

#### **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 mitigation plan within a five-year cycle.*

#### **Requirement**

**§201.6(c)(4)(ii):** *[The plan shall include a] process by which local governments incorporate the requirements of the mitigation plan into other planning mechanisms such as comprehensive or capital improvement plans, when appropriate.*

#### **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.*

In addition, the governing body will be responsible for ensuring that the HMP's goals are incorporated into applicable revisions of each participant's comprehensive plan and any new planning projects undertaken by the participant. The HMP will also consider any changes in comprehensive plans and incorporate the information accordingly in its next update.

### Continued Public Involvement

To ensure continued plan support and input from the public and business owners, public involvement will remain a top priority for each participant. Notices for public meetings involving discussion of an action on mitigation updates will be published and posted in the following locations a minimum of two weeks in advance:

- Public spaces around the jurisdiction
- City/Village Hall
- Websites
- Local radio stations
- Local newspapers
- Regionally-distributed newspaper

### Unforeseen Opportunities

If new, innovative mitigation strategies arise that could impact the planning area or elements of this plan, which are determined to be of importance, a plan amendment may be proposed and considered separate from the annual review and other proposed plan amendments. The UBBNRD will compile a list of proposed amendments received annually and prepare a report for NEMA, by providing applicable information for each proposal, and recommend action on the proposed amendments.

## Incorporation into Existing Planning Mechanisms

The Planning Team utilized a variety of plan integration tools to help communities determine how their existing planning mechanisms were related to the Hazard Mitigation Plan. Utilizing FEMA's *Integrating the Local Natural Hazard Mitigation Plan into a Community's Comprehensive Plan*<sup>79</sup> guidance, as well as FEMA's *2015 Plan Integration*<sup>80</sup> guide, each community engaged in a plan integration discussion. This discussion was facilitated by a Plan Integration Worksheet, created by the Planning Team. This document offered an easy way for participants to notify the Planning Team of existing planning mechanisms, and if they interface with the HMP.

Each community referenced all relevant existing planning mechanisms and provided information on how these did or did not address hazards and vulnerability. Summaries of plan integration are found in each participant's *Participant Section*. For communities that lack existing planning mechanisms, especially smaller villages, the HMP may be used as a guide for future activity and development in the community.

<sup>79</sup> Federal Emergency Management Agency. November 2013. "FEMA Region X Integrating the Local Natural Hazard Mitigation Plan into a Community's Comprehensive Plan." <https://www.fema.gov/media-library-data/1388432170894-6f744a8afa8929171dc62d96da067b9a/FEMA-X-IntegratingLocalMitigation.pdf>.

<sup>80</sup> Federal Emergency Management Agency. July 2015. "Plan Integration: Linking Local Planning Efforts." [https://www.fema.gov/media-library-data/1440522008134-ddb097cc285bf741986b48fdcef31c6e/R3\\_Plan\\_Integration\\_0812\\_508.pdf](https://www.fema.gov/media-library-data/1440522008134-ddb097cc285bf741986b48fdcef31c6e/R3_Plan_Integration_0812_508.pdf).

## Section Seven: Participant Sections

### Purpose of Participant Sections

Participant sections contain information specific to jurisdictions participating in the UBBNRD planning effort. Participant sections were developed with the intention of highlighting each jurisdiction's unique characteristics that affect its risk to hazards. Participant sections may serve as a short reference of identified vulnerabilities and mitigation actions for a jurisdiction as they implement the mitigation plan. Information from individual communities was collected at public and one-on-one meetings and used to establish the plan. Participant sections may include the following elements:

- Local Planning Team
- Location/Geography
- Climate (County Level)
- Transportation
- Demographics
- Employment and Economics
- Major Employers
- Housing
- Future Development Trends
- Structural Inventory and Valuation
- Critical Infrastructure/Key Resources
- Historical Occurrences
- Hazard Prioritization
- Governance
- Capability Assessment
- Plan Integration
- Mitigation Strategy

In addition, maps specific to each jurisdiction are included such as: jurisdiction identified critical facilities; flood prone areas; and a future land use map (when available).

The hazard prioritization information, as provided by individual participants, in *Section Seven: Participant Sections* varies due in large part to the extent of the geographical area, the jurisdiction's designated representatives (who were responsible for completing meeting worksheets), identification of hazards, and occurrence and risk of each hazard type. For example, a jurisdiction located near a river may list flooding as highly likely in probability and severe in extent of damage, where a jurisdiction located on a hill may list flooding as unlikely in probability and limited in extent of damage. The overall risk assessment for the identified hazard types represents the presence and vulnerability to each hazard type area wide throughout the entire planning area. The discussion of certain hazards selected for each participant section were prioritized by the local planning team based on the identification of hazards of greatest concern, hazard history, and the jurisdiction's capabilities. The hazards not examined in depth can be found in *Section Four: Risk Assessment*.