Tri-Basin NRD Hazard Mitigation Plan

2018

Tri Basin Natural Resources District

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Hazard Mitigation Planning Team

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**Served as an advisory or consultant role*

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ACS – American Community Survey
BCA – Benefit Cost Analysis
CFR – Code of Federal Regulations
CIKR – Critical Infrastructure and Key Resources
CRS – Community Rating System
DFIRM – Digital Flood Insurance Rate Map
DHS – Department of Homeland Security
DMA 2000 – Disaster Mitigation Act of 2000
EAP – Emergency Action Plan
ELAP – Emergency Assistance for Livestock, Honeybees, and Farm-Raised Fish Program
EPA – Environmental Protection Agency
EPZ – Emergency Planning Zone
ESL – English as Second Language
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
GIS – Geographic Information Systems
HMA – Hazard Mitigation Assistance
HMGP – Hazard Mitigation Grant Program
HMP – Hazard Mitigation Plan
HPRCC – High Plains Regional Climate Center
HSAS – Homeland Security Advisory System
IP – Office of Infrastructure Protection
JEO – JEO Consulting Group, Inc.
LEOP – Local Emergency Operations Plan
LFD – Livestock Forage Disaster Assistance Program
LGA – Liquid Gallon
LIP – Livestock Indemnity Program
MHSW – Mobile Home Single Wide
MPH – miles per hour
NCEI – National Centers for Environmental Information
NDA – Nebraska Department of Agriculture
NDEQ – Nebraska Department of Environmental Quality
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
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
P.L. – Public Law
PSHA – Probabilistic Seismic Hazard Analysis
RMA – Risk Management Agency
SBA – Small Business Administration
SFHA – Special Flood Hazard Area
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
TAP – Tree Assistance Program
TBNRD – Tri-Basin Natural Resources District
TORRO – Tornado and Storm Research Organization
USDA – United States Department of Agriculture
USGS – United States Geological Survey
WUI – Wildland Urban Interface

INTRODUCTION

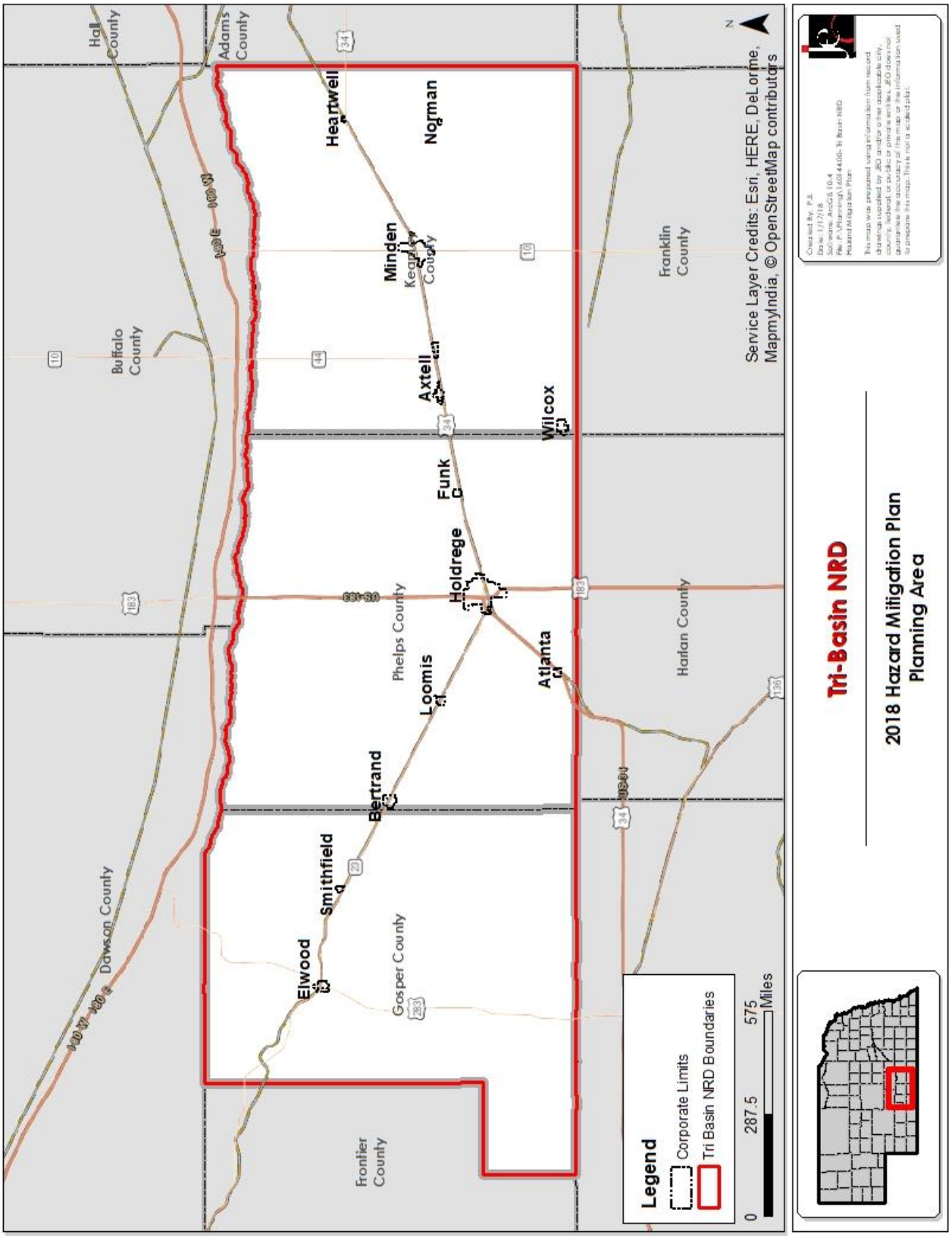
This plan is an update to the Tri-Basin Natural Resources District (TBNRD) Multi-Hazard Mitigation Plan (HMP) approved in 2013. The plan update was developed in compliance with the requirements of the Disaster Mitigation Act of 2000 (DMA 2000).

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

Participating Jurisdictions	
Tri-Basin Natural Resources District	
Gosper County	**Phelps County**
Village of Elwood	Village of Atlanta
Village of Smithfield	Village of Bertrand
Kearney County	Village of Funk
Village of Axtell	City of Holdrege
Village of Heartwell	Village of Loomis
City of Minden	
Village of Wilcox	
Special Districts	
Axtell Community Schools	Bertrand Public Schools
Elwood Public Schools	Holdrege Public Schools
Minden Public Schools	Wilcox-Hildreth Community Schools

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 of this hazard mitigation plan 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 2013 would be carried forward and utilized for the 2018 plan. The goals for this plan update are as follows:

Goal 1: Protect the Health and Safety of the Public

Goal 2: Protect and Maintain Operation of Critical Facilities and Critical Infrastructure After a Hazard

Goal 3: Protect Existing Properties and Natural Resources

Goal 4: Promote Efficient Use of Public Funds

SUMMARY OF CHANGES

Several changes were made to the 2013 Hazard Mitigation Plan and planning process, including: the inclusion of human-caused hazards based on the hazards addressed in the 2014 State of Nebraska Hazard Mitigation Plan; 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 the 2013 Hazard Mitigation Plan. Many of these projects are related to hazard monitoring, redundant power supplies, and warning systems. A few examples include updating or 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 TBNRD 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	9/3	100%	Unavailable
Agricultural Plant Disease	31/16	100%	Unavailable
Chemical Fixed Sites	47/27	100%	175 Gallons
Chemical Transportation	3/37	8%	40 Gallons
Dam Failure	0	~1%	Inundation of floodplain downstream from dam
Drought	475 months/1,465 months	32%	D1-D2
Extreme Heat	Avg. 47 days/year	100%	>90˚
Flooding	25/21	100%	Some inundation of structures* (<1% of structures) and roads near streams. Some evacuations of people may be necessary (<1% of population)
Grass/Wildfires	175/14	100%	<100 acres
Hail	353/21	100%	H2-H5
High Winds	57/21	100%	7 BWF
Severe Thunderstorms	194/21	100%	≥1" rainfall 48 avg mph winds
Severe Winter Storms	205/21	100%	.25 - .5" ice 10-20˚below zero (wind chills) 4-8" snow 25-40 mph winds
Terrorism	0	~1%	Undefined
Tornadoes	30/21	100%	EF0

**Quantification of vulnerable structures provided in Section Four: Risk Assessment and Section Seven: Participant Sections*

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

Table 3: Hazard Loss History

HAZARD TYPE		Count	Property	Crop
Agricultural Disease	**Animal Disease**[2]	9	N/A	N/A
	Plant Disease[3]	31	N/A	$410,190
Chemical Spills (Transportation)[7]		3	$70,300	N/A
Chemical Spills (Fixed Site)[5]		47	$1,000	N/A
Dam Failure[6]		0	$0	N/A
Drought[1]		475 events per 1,465 months	$0	$44,671,748
Extreme Heat[1]		Avg 47 days/year	$0	$6,888,394
Flooding[1]	**Flash Flood**	16	$5,665,000	$228,235
	Flood	9	$93,000	
Grass/Wildfires[4] *1 fatality*		175	N/A	N/A
Hail Average: 1.17in Range: 0.75 – 4.5in		353	$30,829,000	$75,056,923
High Winds[1] Average: 47 EG Range: 35 – 63 EG *6 injuries*		57	$3,226,240	$6,003,632
Severe Thunderstorms[1]	**Thunderstorm Wind** Average: 58 EG Range: 48-75 EG	176	$7,922,000	N/A
	Heavy Rain	17	$20,000	$3,907,696
	Lightning	1	$500,000	N/A
Severe Winter Storms[1]	**Blizzard**	18	$750,000	$2,854,140
	Extreme Cold/Wind Chill	4	$0	
	Heavy Snow	8	$0	
	Ice Storm	18	$21,765,000	
	Winter Storm *1 injury*	108	$600,000	
	Winter Weather	49	$15,000	
Tornadoes[1] Average: EF0 Range: EF0-EF2 *4 injuries*		30	$2,330,000	$32,779
		1,129	**73,786,540**	**140,053,737**

N/A: Data not available
1 indicates data is from NCEI (January 1996 to April 2017)
2 indicates data is from NDA (2014-2017)
3 indicates data is from USDA RMA (2000-2016)
4 indicates data is from NFS (2000 to 2014)
5 indicates data is from U.S. Coast Guard NRC (1990-2016)
6 indicates data is from Stanford NPDP (1911-2016)
7 indicates data is from PHMSA (1980-2017)
in. = inches; EG = Estimated Gust

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 severe winter storms 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 $44 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 353 hail events in 20 years. These events have caused over $30 million in property damages, and $75 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 194 severe thunderstorm events in 20 years. These events caused over $8 million in property damages. 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.

Vulnerable populations related to severe thunderstorms include: residents of mobile homes (six 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. Many participating jurisdictions have reported updates or improvements to outdoor warning systems. Emergency management within the planning area has outfitted most areas with reverse 911 systems which has helped community members be aware of impending inclement weather.

SEVERE WINTER STORMS

Severe winter storms are an annual occurrence for the planning area. Winter storms can bring extreme cold temperatures, freezing rain and ice, and heavy or drifting snow. Blizzards are particularly dangerous and can have significant impacts throughout the planning area. Severe winter storms typically occur between November and March. The NCEI reported 205 severe winter storm events that caused over $23 million in property damages in 20 years. Impacts resulting from severe winter storms include, but are not limited to: hypothermia and frost bite; closure of transportation routes; downed power lines and power outages; collapsed roofs from heavy snow loads; and closure of critical facilities.

The most vulnerable citizens within the planning area were children, the elderly, individuals and families below the poverty line, and those new to the area.

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.

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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.

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."

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.

TBNRD 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 TBNRD 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[1]. Section 322 of the DMA 2000 requires that state and local governments develop, adopt, and routinely update a hazard mitigation plan to remain eligible for pre- and post-disaster

[1] 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.

mitigation funding.[2] These funds include the Hazard Mitigation Grant Program (HMGP)[3], Pre-Disaster Mitigation Program (PDM)[4], and the Flood Mitigation Assistance Program (FMA)[5]. The Federal Emergency Management Agency (FEMA) administers these programs under the Department of Homeland Security (DHS).[6]

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 (P.L. 106-390)[7] and by FEMA's Final Rule (FR)[8] 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.[9]

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

[2]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.

[3] Federal Emergency Management Agency. "Hazard Mitigation Grant Program." Last modified July 8, 2017. https://www.fema.gov/hazard-mitigation-grant-program.

[4] Federal Emergency Management Agency. "Pre-Disaster Mitigation Grant Program." Last modified July 11, 2017. https://www.fema.gov/pre-disaster-mitigation-grant-program.

[5] Federal Emergency Management Agency. "Flood Mitigation Assistance Grant Program." Last modified July 11, 2017. https://www.fema.gov/flood-mitigation-assistance-grant-program.

[6] Federal Emergency Management Agency. "Hazard Mitigation Assistance." Last modified March 29, 2017. https://www.fema.gov/hazard-mitigation-assistance.

[7] 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.

[8] 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.

PLAN FINANCING AND PREPARATION

Regarding plan financing and preparation, in general, the TBNRD 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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INTRODUCTION

The process utilized to develop a hazard mitigation plan is often as important as the final planning document. For this planning process, the TBNRD 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.

> ***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.*

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 TBNRD utilized the multi-jurisdiction planning process recommended by FEMA (Local Mitigation Plan Review Guide[10], Local Mitigation Planning Handbook[11], and Mitigation Ideas: A Resource for Reducing Risk to Natural Hazards[12]) to develop this plan.

[10] 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.

[11] 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.

[12] 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.

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 TBNRD secured funding for their multi-jurisdictional hazard mitigation plan (HMP) in January 2017. JEO Consulting Group, INC. (JEO) was contracted in March 2017 to guide and facilitate the planning process and assemble the multi-jurisdictional hazard mitigation plan. For the planning area, John Thorburn (General Manager with TBNRD) 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 TBNRD HMP update was coordination of efforts with local, state, and federal agencies and organizations. NeDNR and NEMA became involved in the planning process. TBNRD 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
John Thorburn	General Manager	Tri-Basin NRD
Jeff England	Emergency Manager	Kearney County
Justin Norris	Emergency Manager	Phelps County
Roger Powell	Emergency Manager	Gosper County
*Jeff Henson	Project Manager	JEO Consulting Group, Inc.
*Phil Luebbert	Project Coordinator	JEO Consulting Group, Inc.

**Served as a consultant or advisory role*

The first Planning Team meeting was held May 23rd, 2017 with the TBNRD 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
May 23rd, 2017	
Tri-Basin NRD 1723 Burlington St Holdrege, NE 9:00 AM	-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 19 stakeholders that were identified and sent letters to participate. These included one airport, five assisted living facilities, three hospitals or health care providers, and eight fire and rescue departments. The following groups were also invited to participate in the planning process.

Table 6: Notified Stakeholder Groups

Organizations		
Brewster Field Airport	Bethany Home, Inc	Elwood Care Center
Bertrand Nursing Home	Chrisoma West Assisted Living	Holdrege Memorial Home
Elwood Volunteer Fire Department	Loomis Volunteer Fire & Rescue	Bertrand Fire and Rescue Unit
Holdrege Fire Department	Funk Rural Fire Department	Minden Volunteer Fire Department
Axtell Volunteer Fire and Rescue	Wilcox Volunteer Fire Department	Kearney County Health Services
Phelps Memorial Health Center	Christian Homes Health Care Center	Nebraska Public Power District
Holdrege Housing Authority		

Representatives from several fire departments 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/city/village clerks, county emergency managers, and NRDs, at their respective jurisdictions and disseminated appropriately. There was no participation from jurisdictions outside of the planning area.

Table 7: Notified Neighboring Jurisdictions

Notified Nebraska Jurisdictions	
Frontier County*	Dawson County
Buffalo County	Adams County
Franklin County	Harlan County
Furnas County*	Central Platte Natural Resources District
Little Blue Natural Resources District	Lower Republican Natural Resources District
Middle Republican Natural Resources District	

**Frontier County, Furnas County, and Gosper County are managed by the same Emergency Manager.*

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 (http://jeo.com/hazards/tri-basin-hmp/)
Project Announcement	Project announcement posted on TBNRD project website (http://jeo.com/hazards/tri-basin-hmp/)
Round 1 Meeting Letters or Postcards (30-day notification)	Sent to participants and neighboring jurisdictions to discuss the agenda/dates/times/ locations of the first round of public meetings
Round 2 Meeting Letters or Postcards (30-day notification)	Sent to participants to discuss the agenda/dates/times/locations of the second round of public meetings
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 TBNRD 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

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

Table 9: 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**
Legion Hall, Elwood NE: 2:00PM	Wednesday, June 28th, 2017
Minden Fire Hall, Minden NE: 7:00PM	Thursday, July 6th, 2017
Tri-Basin NRD, Holdrege NE: 7:00PM	Wednesday, July 12th, 2017

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 2013 TBNRD HMP, 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 A* and *B).* In addition to the primary data collection objectives for the workshop, representatives also identified critical facilities, and reviewed preliminary participant sections from each participant.

Table 10: Round 1 Meeting Attendees

Name	Title	Jurisdiction
Elwood		
Roger Powell	Emergency Manager	Gosper County/Region 17
Dennis Ocken	Sheriff	Gosper County
John Thorburn	General Manager	Tri-Basin NRD
Pam Bogle	Zoning Administration	Gosper County
Kate Reiners	Elwood Care Center Administrator	Gosper County
Daren Hatch	Superintendent	Elwood Schools
Brooke Welsh	Planner	JEO Consulting Group, Inc.
Phil Luebbert	Planner	JEO Consulting Group, Inc.
Holdrege		
T.J. Wilcox	Board Chairman	Village of Bertrand
John Thorburn	General Manager	Tri-Basin NRD
Dennis DaMoude	Chief of Police	City of Holdrege
Kalen Arehart	Board Member	Village of Loomis
Arden Watson	Board Member	Village of Atlanta
Jeff Smith	Maintenance Supervisor	City of Holdrege
Noelle Ortgiesen	Village Clerk	Village of Atlanta
Jayne Ortgiesen	Chairman	Village of Atlanta
Garrett Fetters	Sheriff's Deputy	Phelps County
Blair Johnson	Utility Superintendent	Village of Wilcox
Justin Norris	Director	Phelps Emergency Management
Bob Rager	City Administrator	City of Holdrege
Larry K. Mattson	Funk Fire Chief	Village of Funk
Capri Chapman	Holdrege Housing Authority	City of Holdrege
Matthew Gregg	Utilities Superintendent	Village of Bertrand
Terry Narblade	Fire Department	Village of Funk
Sandy Tilson	Director Holdrege Memorial Homes	City of Holdrege
Robin Freeburg	Business Manager Holdrege Homes	City of Holdrege

Name	Title	Jurisdiction
Melroy Klassen	Bertrand School Maintenance	Bertrand Public Schools
Melissa Wheelock	Superintendent	Minden Public Schools
Janie Ludithe	Chairman Village Board	Village of Atlanta
Phil Luebbert	Planner	JEO Consulting Group, Inc.
Brooke Welsh	Planner	JEO Consulting Group, Inc.
Minden		
Shawn Lupkes	Minden Fire Dept. Rescue Assistant Chief	Minden Fire and Rescue
Jeff England	EMA Director	Kearney County
Chris Klahn	Street Superintendent	City of Minden
James Huff	Police Chief	City of Minden
Scott White	Sheriff	Kearney County
Connie Linder	Safety Director	Kearney County Health Services
Matt Cederburg	City Administrator	City of Minden
Daniel Schoone	Minden Fire Dept. Rescue Chief	Minden Fire and Rescue
Joe Anderson	Planning and Zoning Commission	Kearney County
Ryan Gibbins	Chief Deputy Sheriff's Office	Kearney County
Craig Lupkes	Fire Captain	Minden Fire and Rescue
Bill Gilbreath	Principal	Axtell Community Schools
Chris Hopkins	Mayor	Village of Heartwell
Phil Luebbert	Planner	JEO Consulting Group, Inc.
Brooke Welsh	Planner	JEO Consulting Group, Inc.

Table 11: Round 1 One-on-One Meeting Attendees

Name	Title	Jurisdiction
Village of Elwood		
Laurie Janken	Clerk/Treasurer	Village of Elwood
Kirk Corder	Utility Superintendent	Village of Elwood
Charles Tilson	Vice Chairman of Board	Village of Elwood
Phil Luebbert	Planner	JEO Consulting Group, Inc.
Brooke Welsh	Planner	JEO Consulting Group, Inc.
Holdrege Public Schools		
Phil Luebbert	Planner	JEO Consulting Group, Inc.
Todd Hilyard	Superintendent	Holdrege Public Schools

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 2013 HMP 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 12 shows the date and location of meetings held for the Mitigation Strategies phase of this project. Meeting attendees are identified in Table 13.

Table 12: 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**
Legion Hall, Elwood NE: 2:00PM	Tuesday, October 17th, 2017
Minden Fire Hall, Minden NE: 7:00PM	Tuesday, October 24th, 2017
Tri-Basin NRD, Holdrege NE: 7:00PM	Wednesday, October 18th, 2017

Table 13: Round 2 Meeting Attendees

Name	Title	Jurisdiction
Elwood		
Bryan Nelson	Board Chairman	Village of Elwood
Laurie Jauken	Clerk/Treasurer	Village of Elwood
Pam Bogle	Zoning Administrator	Gosper County
Annette Bessey	Board Member	Village of Smithfield
Ann Hagan	Chairman of Village Board	Village of Smithfield
Daren Hatch	Superintendent	Elwood Public Schools
Roger Powell	Emergency Manager	Region 17
Justin Collins	Safety Coordinator	Elwood Care Center
Melroy Klassen	Custodian	Bertrand Community Schools
Phil Luebbert	Planner	JEO Consulting Group, Inc.
Holdrege		
John Thorburn	Manager	Tri-Basin NRD
Jayne Ortgiesen	Chairman	Village of Atlanta
Arden Watson	Board Member	Village of Atlanta
Noelle Ortgiesen	Village Clerk	Village of Atlanta
Larry Mattson	Fire Chief	Village of Funk
Kalen Arehart	Board Member	Village of Loomis
Jason Nelson	Clerk	Village of Loomis
Todd Hilyard	Superintendent	Holdrege Public Schools
Dane Jensen	Clerk	City of Holdrege
Cherlyn Hunt	Executive Director	Holdrege Christian Homes
Kevin Stehl	Fire Chief	Bertrand Fire Department
Dennis DaMoude	Chief of Police	City of Holdrege
Matthew Gregg	Street/Water Commissioner	Village of Bertrand
Phil Luebbert	Planner	JEO Consulting Group, Inc.
Brooke Welsh	Planner	JEO Consulting Group, Inc.
Minden		
Connie Lindor	Safety Director	Kearney County Health Services
James Huff	Chief of Police	City of Minden
Jeff England	Emergency Manager	Kearney County
Matt Cederburg	City Administrator	City of Minden
Tom Brown	Fire Chief	Minden Fire Department
Blair Johnson	Utility Superintendent	Village of Wilcox
Chris Hopkins	Mayor	Village of Heartwell
Bill Gilbreath	Principal	Axtell Community Schools

Name	Title	Jurisdiction
Jason Stoddard	Utility Superintendent	Village of Axtell
Melissa Wheelock	Superintendent	Minden Public Schools
Phil Luebbert	Planner	JEO Consulting Group, Inc.
Brooke Welsh	Planner	JEO Consulting Group, Inc.

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 14: General Plans, Documents, and Information

Documents	Source
Disaster Mitigation Act of 2000 DMA	http://www.fema.gov/media-library/assets/documents/4596?id=1935
Final Rule (2007)	https://www.fema.gov/media-library/assets/documents/23672
Local Mitigation Planning Handbook (2013)	https://www.fema.gov/media-library/assets/documents/31598
Hazard Mitigation Assistance Unified Guidance (2013)	https://www.fema.gov/media-library/assets/documents/103279
What is a Benefit: Guidance on Benefit-Cost Analysis on Hazard Mitigation Projects	http://www.fema.gov/benefit-cost-analysis
The Census of Agriculture (2012)	https://www.agcensus.usda.gov/Publications/2012/Full_Report/Census_by_State/Nebraska/
National Flood Insurance Program Community Status Book (2016)	https://www.fema.gov/national-flood-insurance-program-community-status-book
Local Mitigation Plan Review Guide (2011)	https://www.fema.gov/media-library/assets/documents/23194
Plans/Studies	**Source**
Nebraska Drought Mitigation and Response Plan (2000)	http://carc.nebraska.gov/docs/NebraskaDrought.pdf
Flood Insurance Studies (where applicable)	http://www.fema.gov/floodplain-management/flood-insurance-study
State of Nebraska Hazard Mitigation Plan (2014)	https://nema.nebraska.gov/sites/nema.nebraska.gov/files/doc/hazmitplan.pdf
Nebraska Geological Survey Landslide Study (2006)	http://snr.unl.edu/csd/surveyareas/geology.asp
Community Comprehensive Plans/Zoning and Subdivision Regulations	From respective communities
Data Sources/Technical Resources	**Source**
Federal Emergency Management Agency	http://www.fema.gov
United States Department of Commerce	http://www.commerce.gov/
National Oceanic Atmospheric Administration	http://www.noaa.gov/
National Environmental Satellite, Data, and Information Service	http://www.nesdis.noaa.gov/
National Centers for Environmental Information	https://www.ncei.noaa.gov/
Storm Prediction Center Statistics	http://www.spc.noaa.gov
United States Geological Survey	http://www.usgs.gov/
United States Department of Agriculture	http://www.usda.gov

United States Department of Agriculture – Risk Assessment Agency	http://www.rma.usda.gov
National Agricultural Statistics Service	http://www.nass.usda.gov/
High Plains Regional Climate Center	http://www.hprcc.unl.edu
United States Census Bureau	http://www.census.gov
	https://factfinder.census.gov/faces/nav/jsf/pages/index.xhtml
National Consortium for the Study of Terrorism and Responses to Terrorism (START)	http://www.start.umd.edu/gtd/
National Flood Insurance Program	https://www.fema.gov/national-flood-insurance-program
	https://dnr.nebraska.gov/floodplain/flood-insurance
National Flood Insurance Program Bureau and Statistical Agent	https://www.fema.gov/national-flood-insurance-program-bureau-statistical-agent-regional-support-offices
FEMA Map Service Center	http://www.msc.fema.gov
National Drought Mitigation Center – Drought Monitor	http://drought.unl.edu/dm/monitor.html
National Drought Mitigation Center – Drought Impact Reporter	http://www.droughtreporter.unl.edu
National Historic Registry	http://www.nps.gov/nr
Nebraska State Historical Society	http://www.nebraskahistory.org/histpres/index.shtml
United States Small Business Administration	http://www.sba.gov
Nebraska Emergency Management Agency	http://www.nema.ne.gov
Nebraska Climate Assessment Response Committee	http://carc.agr.ne.gov
Nebraska Department of Education	http://reportcard.education.ne.gov/
	http://educdirsrc.education.ne.gov/
Nebraska Education Profile	http://nep.education.ne.gov/
Nebraska Department of Natural Resources	http://www.dnr.ne.gov
Nebraska Department of Natural Resource – GIS	http://dnrdata.dnr.ne.gov
Nebraska Department of Natural Resources – Dam Inventory	http://dnrdata.dnr.ne.gov/Dams/Search.aspx?mode=county
Nebraska Department of Natural Resources – Soils Data	http://www.dnr.ne.gov/databank/soilsall.html
Natural Resources Conservation Service	www.ne.nrcs.usda.gov
Nebraska Forest Service (NFS)	http://www.nfs.unl.edu/
Nebraska Forest Service – Wildland Fire Protection Program	http://nfs.unl.edu/fire
Nebraska Association of Resources Districts	http://www.nrdnet.org
Nebraska Public Power District Service	http://econdev.nppd.com/
Nebraska Department of Revenue – Property Assessment Division	www.revenue.ne.gov/PAD
UNL – College of Agricultural Sciences and Natural Resources – Schools of Natural Resources	http://casnr.unl.edu
Nebraska Department of Natural Resources - Dam Inventory/Information	http://prodmaps2.ne.gov/html5DNR/?viewer=daminventory

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 January 15, 2018 through February 16, 2018. Participating jurisdictions were emailed and mailed a letter notifying them of this public review period. The HMP was also made available on the project website (http://jeo.com/hazards/tri-basin-hmp/) to download the document, and a notification was posted to the TBNRD website. Received comments and suggested changes were incorporated into the plan.

PLAN ADOPTION

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

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. A copy of 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.

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 TBNRD 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.

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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 TBNRD is located is south central Nebraska and covers 1,519 square miles in Gosper, Phelps, and Kearney counties. The district encompasses roughly 50 miles of the Platte River system along the northern border of the NRD. The planning area is largely made up of two topographic regions: dissected plains and plains. Dissected plains are represented by hilly land with moderate to steep slopes and sharp ridge crests. Plains are represented by flat-lying land comprised of sandstone or stream-deposited silt, clay, sand, and gravel.

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."[13]

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 3 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 15: School Inventory

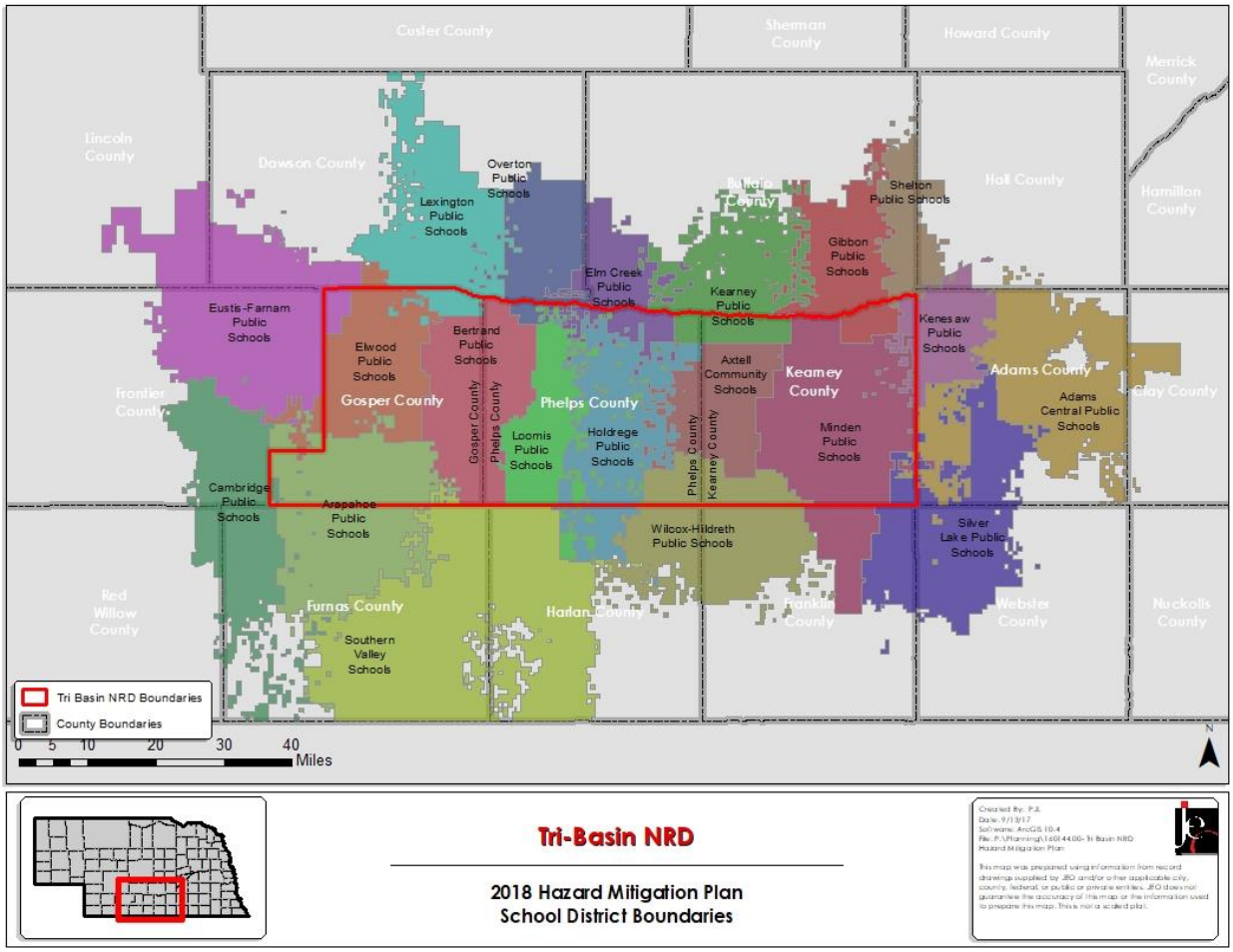
School District	Total Enrollment (2015-2016)
Axtell Community Schools	264
Bertrand Public Schools	300
Elwood Public Schools	222
Holdrege Public Schools	1,153
Loomis Public Schools	213
Minden Public Schools	802
Wilcox-Hildreth Community Schools	199

Source: Nebraska Department of Education[14]

[13] 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.

[14] Nebraska Department of Education. 2017. "Nebraska Education Profile." Accessed May 2017. http://nep.education.ne.gov/.

Figure 3: Regional School Districts



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.[15] 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 16 identifies the number and capacity of care facilities throughout the planning area.

[15] Center for Injury Research and Policy. January 2011. "Snow Shoveling Safety." Accessed July 2017. http://www.nationwidechildrens.org/cirp-snow-shoveling.

Table 16: Inventory of Care Facilities

Jurisdiction	Hospitals	Hospital Beds	Health Clinics	Adult Care Homes	Adult Care Beds	Assisted Living Homes	Assisted Living Beds
Gosper County	0	0	1	1	47	1	10
Kearney County	1	10	1	2	98	2	95
Phelps County	1	25	1	3	206	3	92

Source: Nebraska Department of Health and Human Services[16,17,18,19]

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 17 provide statistics per county regarding households with English as a second language (ESL) and population reported as in poverty within the past 12 months.

Table 17: At-Risk Population

County	Percent That Speaks English as Second Language	Families Below Poverty Level
Gosper County	1.4%	3.2%
Kearney County	4.6%	3.2%
Phelps County	4.2%	3.8%

Source: U.S. Census Bureau[20,21]

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 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.

[16] Department of Health and Human Services. 2017. "Assisted Living Facilities." http://dhhs.ne.gov/publichealth/Documents/ALF%20Roster.pdf.
[17] Department of Health and Human Services. 2017. "Hospitals." http://dhhs.ne.gov/publichealth/Documents/Hospital%20Roster.pdf.
[18] Department of Health and Human Services. 2017. "Long Term Care Facilities." http://dhhs.ne.gov/publichealth/Documents/LTCRoster.pdf.
[19] Department of Health and Human Services. 2017. "Rural Health Clinic." http://dhhs.ne.gov/publichealth/Documents/RHC_Roster.pdf.
[20] U.S. Census Bureau. 2017. "Language Spoken at Home: 2015 American Community Survey (ACS) 5-year estimates." https://factfinder.census.gov/faces/nav/jsf/pages/searchresults.xhtml?refresh=t#.
[21] U.S. Census Bureau. 2017. "Selected Economic Characteristics: 2015 ACS 5-year estimate." https://factfinder.census.gov/faces/nav/jsf/pages/searchresults.xhtml?refresh=t#.

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 18 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 18: Selected Housing Characteristics

	Gosper County	Kearney County	Phelps County	Total
Occupied housing units	**789 (63.1%)**	**2,767 (94.7%)**	**3,728 (88.8%)**	**7,284**
Lacking complete plumbing facilities	0.2%	0.2%	0.3%	**0.3%**
Lacking complete kitchen facilities	0.2%	1.5%	1.3%	**1.2%**
No telephone service available	0.8%	2.9%	2.4%	**2.4%**
Housing unit with no vehicles available	1.3%	3.4%	5.0%	**3.9%**
Mobile Homes	11.6%	5.9%	4.5%	**6.0%**

Indicated percentages are determined based on total housing units
Source: U.S. Census Bureau, 2017[22]

Approximately 2.4 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.

Six percent of housing units in the planning area are mobile homes. In Gosper County, over eleven percent of the housing stock 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 overturned by 60 mph winds. A thunderstorm is classified as severe when wind speeds exceed 58 mph, placing improperly anchored mobile homes at risk.

Gosper County has a high percentage of unoccupied housing units. Unoccupied homes may not be maintained as well as occupied housing, thus adding to their vulnerability.

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.

[22] U.S. Census Bureau. 2017. "Selected Housing Characteristics: 2015 ACS 5-year estimate." https://factfinder.census.gov/faces/nav/jsf/pages/searchresults.xhtml?refresh=t#.

STATE AND FEDERALLY OWNED PROPERTIES

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

Table 19: State and Federally-Owned Facilities

Facility	Nearest Community
Gosper County	
Johnson Lake State Recreation Area	Elwood
Phillips Lake State Recreation Area	Elwood
Gosper National Wildlife Management Area	Bertrand
Various State-Owned Agricultural Areas (Likely Department of Education)	County-wide
Phelps County	
Sacramento-Wilcox State Wildlife Management Area	Wilcox
Nebraska Department of Roads Office	Holdrege
Atlanta National Wildlife Management Area	Atlanta
Jones Federal Waterfowl Production Area	Atlanta
Richardson Lagoon State Wildlife Management Area	Holdrege
Lynder Federal Waterfowl Production Area	Loomis
Cottonwood Federal Waterfowl Production Area	Bertrand
Various State-Owned Agricultural Areas (Likely Department of Education)	County-wide
Kearney County	
Prairie Dog Federal Waterfowl Production Area	Wilcox
Clark Federal Waterfowl Production Area	Wilcox
Youngson Lagoon Wildlife Management Area	Norman
Jensen Lagoon National Wildlife Management Area	Norman
Northeast Sacramento State Wildlife Management Area	Minden
Fort Kearney State Historical Park	Kearney
Fort Kearney State Recreation Area	Kearney
Various State-Owned Agricultural Areas (Likely Department of Education)	County-wide

Source: County Assessors

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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 20: 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 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

***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.*

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:

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

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

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 2016. 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 21: Hazards Addressed in the Plan

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

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 22: Known Landslides in the Planning Area by County

County	Number of Landslides	Total Estimated Damages
Gosper County	0	$0
Kearney County	0	$0
Phelps County	0	$0

Source: Nebraska Hazard Mitigation Plan, 2014[23]

Levee Failure: There are no levees located in the planning area. Therefore, levee failures are not expected to occur in the planning area which is supported by the historical record.

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 23: Urban Fire Incidents

Fire Department	Number of Urban Fire Incidents						
	2007	2008	2009	2010	2011	2012	Total
Gosper County							
Elwood Fire Department	1	0	6	4	6	3	20
Kearney County							
Axtell Vol Fire Department	17	10	13	10	21	11	82
Minden Vol Fire Department	21	12	17	18	19	26	113
Wilcox Vol Fire Department	0	0	0	2	0	0	2
Phelps County							
Funk Rural Fire Department	6	0	0	3	3	0	12
Holdrege Vol Fire Department	18	21	23	17	21	20	120

Source: NFIRS National Reporting System[24]

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

[23] Nebraska Emergency Management Agency. 2014. "State of Nebraska Hazard Mitigation Plan."
[24] Department of Homeland Security, Federal Emergency Management Agency, U.S. Fire Administration. 2017. "National Fire Incident Reporting System." https://www.nfirs.fema.gov/.

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.

Table 24: Regional Risk Assessment

Regional Risk Assessment			
Hazard	**Previous Occurrence Events/Years**	**Approximate Annual Probability**	**Likely Extent**
Agricultural Animal Disease	9/3	100%	Unavailable
Agricultural Plant Disease	31/16	100%	Unavailable
Chemical Fixed Sites	47/27	100%	175 Gallons
Chemical Transportation	3/37	8%	40 Gallons
Dam Failure	0	~1%	Inundation of floodplain downstream from dam
Drought	475 events/1,465 months	32%	D1-D2
Extreme Heat	Avg 47 days/year	100%	>90˚
Flooding	25/21	100%	Some inundation of structures* (<1% of structures) and roads near streams. Some evacuations of people may be necessary (<1% of population)
Grass/Wildfires	175/14	100%	<100 acres
Hail	353/21	100%	H2-H5
High Winds	57/21	100%	7 BWF
Severe Thunderstorms	194/21	100%	≥1" rainfall 48 avg mph winds
Severe Winter Storms	205/21	100%	.25 - .5" ice 10-20˚below zero (wind chills) 4-8" snow 25-40 mph winds
Terrorism	0	~1%	Undefined
Tornadoes	30/21	100%	EF0

**Quantification of vulnerable structures provided in Section Seven: Participant Sections*

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

Table 25: Loss Estimation for the Planning Area

HAZARD TYPE		Count	Property	Crop
Agricultural Disease	**Animal Disease**[2]	9	N/A	N/A
	Plant Disease[3]	31	N/A	$410,190
Chemical Spills (Transportation)[7]		3	$70,300	N/A
Chemical Spills (Fixed Site)[5]		47	$1,000	N/A
Dam Failure[6]		0	$0	N/A
Drought[1]		475 events per1,465 months	$0	$44,671,748
Extreme Heat[1]		Avg 47 days/year	$0	$6,888,394
Flooding[1]	**Flash Flood**	16	$5,665,000	$228,235
	Flood	9	$93,000	
Grass/Wildfires[4] *1 fatality*		175	N/A	N/A
Hail Average: 1.17in Range: 0.75 – 4.5in		353	$30,829,000	$75,056,923
High Winds[1] Average: 47 EG Range: 35 – 63 EG *6 injuries*		57	$3,226,240	$6,003,632
Severe Thunderstorms[1]	**Thunderstorm Wind** Average: 58 EG Range: 48-75 EG	176	$7,922,000	N/A
	Heavy Rain	17	$20,000	$3,907,696
	Lightning	1	$500,000	N/A
Severe Winter Storms[1]	**Blizzard**	18	$750,000	$2,854,140
	Extreme Cold/Wind Chill	4	$0	
	Heavy Snow	8	$0	
	Ice Storm	18	$21,765,000	
	Winter Storm *1 injury*	108	$600,000	
	Winter Weather	49	$15,000	
Tornadoes Average: EF0 Range: EF0-EF2 *4 injuries*		30	$2,330,000	$32,779
		1,129	**$73,786,540**	**$140,053,737**

N/A: Data not available
1 indicates data is from NCEI (January 1996 to April 2017)
2 indicates data is from NDA (2014-2017)
3 indicates data is from USDA RMA (2000-2016)
4 indicates data is from NFS (2000 to 2014)
5 indicates data is from U.S. Coast Guard NRC (1990-2016)
6 indicates data is from Stanford NPDP (1911-2016)
7 indicates data is from PHMSA (1980-2017)
in. = inches; EG = Estimated Gust

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 26: SBA Declarations

Disaster Declaration Number	Declaration Date	Description	Primary Counties	Contiguous Counties
NE-00062	7/24/2014	Severe Storms, Tornadoes, Straight-line Winds, and Flooding.	Kearney, Phelps	-
NE-00059	1/28/2015	Drought	Gosper, Phelps	Brown, Buffalo, Cherry, Cheyenne, Franklin, Frontier, Greeley, Harlan, Holt, Howard, Kearney, Keith, Lincoln, Morrill, Perkins, Red Willow, Rock, Sheridan, Wheeler
NE-00056	12/9/2014		Gosper	-
NE-000053	12/10/2013	Drought	Gosper, Kearney, Phelps	-
NE-00050	4/8/2013	Drought		Kearney
NE-00049	4/1/2013	Drought	Gosper, Kearney, Phelps	-
NE-00047	3/12/2013	Drought	Gosper, Phelps	-
NE-00044	8/12-25/2011	Severe Storms, Tornadoes, Straight-line Winds, Flooding	Phelps	-
NE-00038	7/15/2010, 8/29/2010, 9/1/2010	Severe Storms, Flooding, Tornadoes	Phelps	-
NE-00033	2/25/2010, 3/26/2010	Severe Winter Storms and Snowstorm	Gosper	-
NE-00021	6/20/2008, 6/24/2008, 7/29/2008	Severe Winter Storms and Snowstorm	Gosper	-
NE-00020	6/20/2008, 6/24,2008, 7/29/2008	Severe Storms, Tornadoes, Flooding	Kearney	Gosper, Phelps
NE-00014	7/24/2007	Severe Storms, Flooding	Kearney	-
NE-00011	1/7/2007	Severe Winter Storms	Phelps	-
NE-00005	1/26/2006	Severe Winter Storms	Phelps	-
NE-00002	6/23/2005	Severe Storms, Flooding	Kearney	-

**Source: Small Business Administration, 2005-2016*[25]

[25] Small Business Administration. 2005-2016. "SBA Disaster Loan Data." Accessed July 2017. https://www.sba.gov/loans-grants/see-what-sba-offers/sba-loan-programs/disaster-loans/disaster-loan-data.

PRESIDENTIAL DISASTER DECLARATIONS

The presidential disaster declarations involving the planning area from 2001 to 2017 are summarized in the following table.

Table 27: Presidential Disaster Declarations

Disaster Declaration Number	Declaration Date	Hazards	Declared County/Area*
DR-4321	4/29/2017-5/3/2017	Nebraska Severe Winter Storm and Straight-line Winds	Gosper
DR-4183	6/14/2014-6/21/2014	Nebraska Severe Storms, Tornadoes, Straight-line Winds, and Flooding	Phelps, Kearney
DR-4014	6/19/2011-6/21/2011	Nebraska Severe Storms, Tornadoes, Straight-line Winds, and Flooding	Phelps
DR-1924	6/1/2010-8/29/2010	Nebraska Severe Storms, Flooding, and Tornadoes	Phelps
DR-1878	12/22/2009-1/8/2010	Nebraska Severe Winter Storms and Snowstorm	Gosper
DR-1770	5/22/2008-6/24/2008	Nebraska Severe Storms, Tornadoes, and Flooding	Gosper, Phelps
DR-1714	5/28/2007-6/2/2007	Nebraska Severe Storms and Flooding	Kearney
DR-1674	12/19/2006-1/1/2007	Nebraska Severe Winter Storms	Gosper, Kearney, Phelps
DR-1627	11/27/2005-11/28/2005	Nebraska Severe Winter Storm	Gosper, Kearney, Phelps
DR-1590	5/11/2005-5/12/2005	Nebraska Severe Storms and Flooding	Kearney
DR-1517	5/20/2004-6/1/2004	Nebraska Severe Storms, Tornadoes, and Flooding	Kearney
DR-1190	10/24/1997-10/26/1997	Nebraska Severe Snow Storms	Gosper, Kearney, Phelps
DR-1027	5/10/1994-5/13/1994	Nebraska Snow Storm, Ice Storm	Gosper, Phelps
DR-998	6/23/1993-8/5/1993	Nebraska Flooding, Severe Storms	Gosper, Kearney, Phelps
DR-500	5/8/1976	Nebraska Ice Storms, High Winds	Kearney
DR-228	7/18/1967	Nebraska Severe Storms, Flooding	Gosper, Kearney, Phelps

Source: Federal Emergency Management Agency, 2001-2017[26]
**Only counties within planning area are included*

[26] Federal Emergency Management Agency. 2017. "Disaster Declarations." Accessed July 2017. https://www.fema.gov/disasters.

CLIMATE ADAPTATION

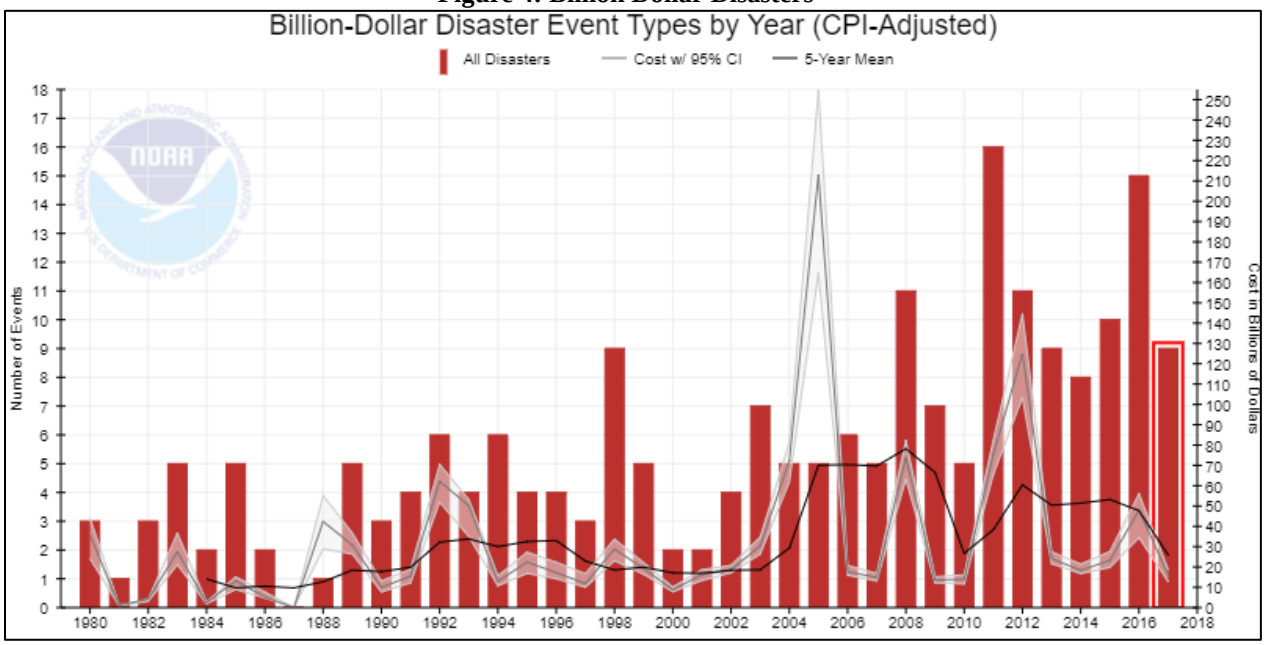
Long term climate trends have increased and will continue to increase the planning area's vulnerability to hazards. Since 1895, Nebraska's overall average temperature has increased by about 1°F. This trend will likely contribute to an increase in the frequency and intensity of hazardous events, which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

As seen in Figure 4, 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),[27] 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

Figure 4: Billion Dollar Disasters



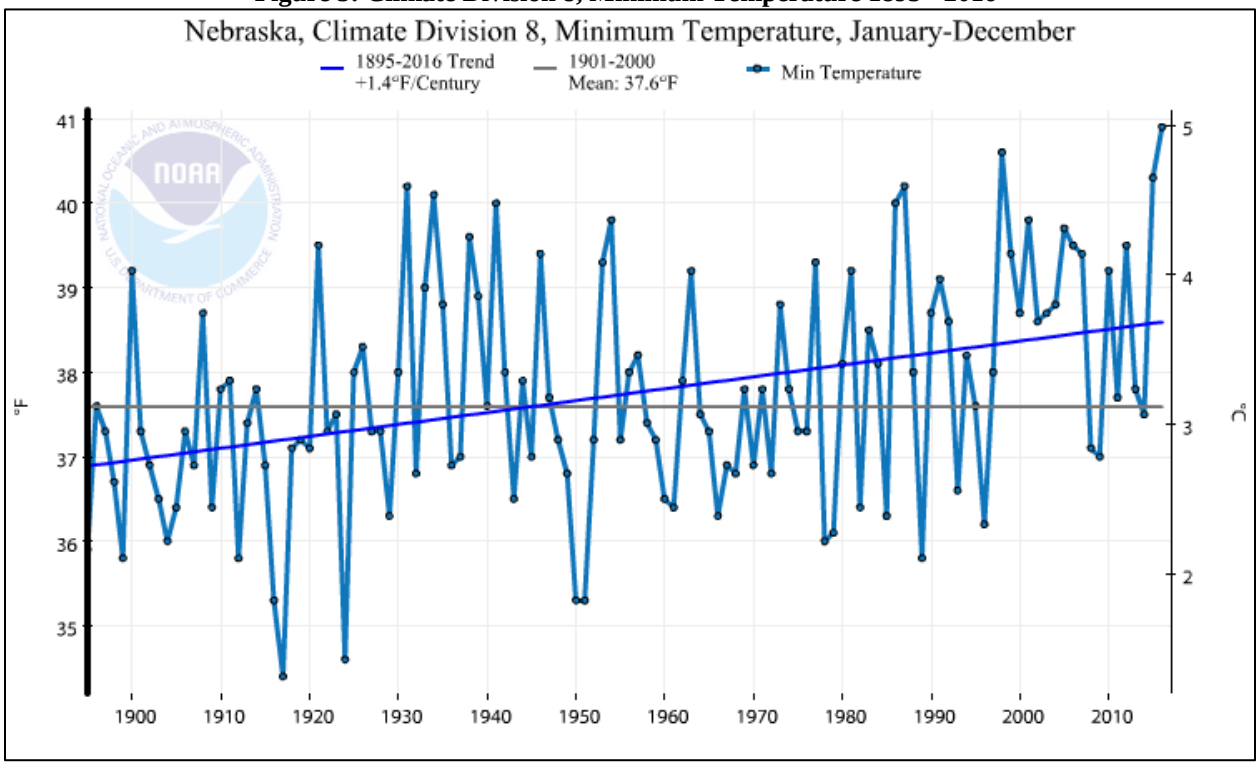
Source: National Oceanic and Atmospheric Administration, 2017[28]

[27] Rowe, C.M., Bathke, D.J., Wilhite, D.A., & Oglesby, R.J. 2014. "Understanding and Assessing Climate Change: Implications for Nebraska."
[28] NOAA National Centers for Environmental Information (NCEI). 2017. "U.S. Billion-Dollar Weather and Climate Disasters." https://www.ncdc.noaa.gov/billions/

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 5 shows a trend of increasing minimum temperatures in Climate Division 8, 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.

Figure 5: Climate Division 8, Minimum Temperature 1895 - 2016



Source: National Oceanic and Atmospheric Administration, 2017

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).[29] For the planning area, sold agricultural products were estimated at $1,285,290,000 with the cost split at $605,994,000 for crops and $629,296,000 for livestock.

Table 28 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 28: Livestock Inventory

County	Market Value of 2012 Livestock Sales	Cattle and Calves	Hogs and Pigs	Poultry Egg Layers	Sheep and Lambs
Gosper	$28,988,000	27,089	(D)	401	154
Kearney	$175,583,000	81,374	3,625	213	424
Phelps	$474,725,000	167,120	(D)	380	1,006
Total	**$679,296,000**	**275,583**	**3,625**	**994**	**1,584**

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 29: Land and Value of Farms in the Planning Area

County	Number of Farms	Land in Farms (acres)	Market Value of 2012 Crop Sales
Gosper	260	289,872	$110,082,000
Kearney	344	293,608	$231,842,000
Phelps	405	331,390	$264,070,000
Total	**1,009**	**914,870**	$605,994,000

Source: U.S. Census of Agriculture, 2012

[29] US Department of Agriculture, National Agricultural Statistics Server. 2012. "2012 Census of Agriculture – County Data."

Table 30: Crop Values

County	Corn		Soybeans		Wheat	
	Acres Planted	Value (2012)	Acres Planted	Value (2012)	Acres Planted	Value (2012)
Gosper	95,314	$78,237,000	45,629	$26,587,000	8,591	$2,868,000
Kearney	148,615	$165,391,000	75,195	$55,704,000	6,533	$1,906,000
Phelps	166,343	$192,299,000	83,018	$65,080,000	2,368	$1,024,000
Total	410,272	$435,927,000	203,842	$147,371,000	17,492	$5,798,000

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 nine instances of animal diseases reported between January 2014 and June 2017 by the NDA (Table 31). These outbreaks affected eleven animals.

Table 31: Livestock Diseases Reported in the Planning Area

Disease	County	Population Impacted
Anaplasmosis	Phelps	1
Paratuberculosis	Kearney*; Phelps	3;1
Bovine Viral Diarrhea	Gosper; Kearney	1;1
Porcine Reproductive and Respiratory Syndrome	Gosper	1
Leptospirosis	Kearney; Phelps	1;2

Source: Nebraska Department of Agriculture, January 201 4- June 2017[30]
** two 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.

[30] Nebraska Department of Agriculture. 2017. "Livestock Disease Reporting." http://www.nda.nebraska.gov/animal/reporting/index.html.

Table 32: Common Crop Diseases in Nebraska by Crop Types

Crop	Diseases	
Corn	• Anthracnose • Bacterial Stalk Rot • Common Rust • Fusarium Stalk Rot • Fusarium Root Rot • Gray Leaf Spot • Maize Chlorotic Mottle Virus	• Southern Rust • Stewart's Wilt • Common Smut • Goss's Wilt • Head Smut • Physoderma
Soybeans	• Anthracnose • Bacterial Blight • Bean Pod Mottle • Brown Spot • Brown Stem Rot • Charcoal Rot • Frogeye Leaf Spot • Phytophthora Root and Stem Rot • Pod and Stem Blight	• Purple Seed Stain • Rhizoctonia Root Rot • Sclerotinia Stem Rot • Soybean Mosaic Virus • Soybean Rust • Stem Canker • Sudden Death Syndrome
Wheat	• Barley Yellow Dwarf • Black Chaff • Crown and Root Rot • Fusarium Head Blight	• Leaf Rust • Tan Spot • Wheat Soil-borne Mosaic • Wheat Streak Mosaic
Sorghum	• Ergot • Sooty Stripe • Zonate Leaf Spot	

AVERAGE ANNUAL LOSSES

Using data from the USDA RMA (2000-2016), 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.

Table 33: Agricultural Plant Disease Losses

Hazard Type	Number of Events	Total Crop Loss	Average Annual Crop Loss
Plant Disease	31	$410,190	$25,637

Source: USDA RMA, 2000-2016

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 (nine outbreaks of animal disease reported in three years, and 31 plant disease outbreaks reported in 16 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 34: 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 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.[31]

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.[32]

Fixed-sites are those that involve chemical manufacturing sites and stationary storage facilities. Table 35 demonstrates the nine classes of hazardous material according to the 2016 Emergency Response Guidebook.

[31] Federal Emergency Management Agency. 2017. "Hazardous Materials Incidents." https://www.ready.gov/hazardous-materials-incidents.
[32] Emergency Planning and Community Right-to-Know Act of 1986, Pub. L. No. 116 § 10904. (1986).

Table 35: 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 infections 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[33]

LOCATION

There are 22 locations across the planning area that house hazardous materials, according to the Tier II reports submitted to the Nebraska Department of Environmental Quality (NDEQ) in 2016. 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-seven releases have occurred in the planning area, and the total amount spilled ranged from 0 gallons to 5,000 gallons of pollutant. Of the 47 chemical spills, one spill led to the evacuation of 70 individuals. Another spill led to two individuals becoming injured in 2013. 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.

[33] 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 Fixed Sites

According to the U.S. Coast Guard's National Response Center database (NRC), there have been 47 fixed site chemical spills from 1990 – 2017 in the planning area. There were $1,000 in property damages reported for these chemical spills. The following table displays a combination of the larger spills that have occurred throughout the planning area and those that have caused damages.

Table 36: Fixed Site Chemical Spills

Year of Event	Location of Release	Quantity Spilled	Material Involved	Number of Injuries	Property Damage
1990	Heartwell	500 Gallons	Fertilizer	0	$0
1990	Atlanta	4000 Gallons	Fertilizer	0	$0
1993	Bertrand	50 Gallons	Methyl Parathion	0	$0
1994	Bertrand	350 Gallons	Anhydrous Ammonia	1	$0
1994	Minden	5000 Gallons	Anhydrous Ammonia	0	$0
1996	Funk	20 Gallons	Oil	0	$1,000
1998	Norman	1700 lbs.	Anhydrous Ammonia	0	$0
2010	Heartwell	200 Gallons	Liquefied Nitrogen	0	$0
2013	Funk	Unknown	Natural Gas	2	$0

Source: National Response Center, 1990-2017

AVERAGE ANNUAL DAMAGES

Using data from Table 36, average annual damages from chemical fixed site spills can be estimated.

Table 37: Chemical Fixed Site Average Annual Losses

Hazard Type	Number of Events	Events Per Year	Injuries	Total Damages	Average Annual Chemical Spill Loss
Chemical Spills	47	1.7	3	$1,000	$37

Source: National Response Center, 1990-2017

PROBABILITY

Chemical releases at fixed site storage areas are likely in the future. Given the historic record of occurrence (47 chemical fixed site spills reported in 27 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 38: Regional Chemical and Radiological Fixed Site Vulnerabilities

Sector	Vulnerability
People	-Those in close proximity could have minor to moderate health impacts -Possible evacuation -Hospitals, nursing homes, and the elderly at greater risk due to low mobility
Economic	-A chemical plant shutdown in smaller communities would have significant impacts to the local economy -A long-term evacuation of the emergency planning zone (EPZ) would have a negative effect on the economy in the area
Built Environment	-Risk of fire or explosion
Infrastructure	-Transportation routes can be closed during evacuations
Critical Facilities	-Critical facilities are at risk of evacuation

CHEMICAL 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…"[34] According to PHMSA, hazardous materials traffic in the U.S. now exceeds 1,000,000 shipments per day.[35]

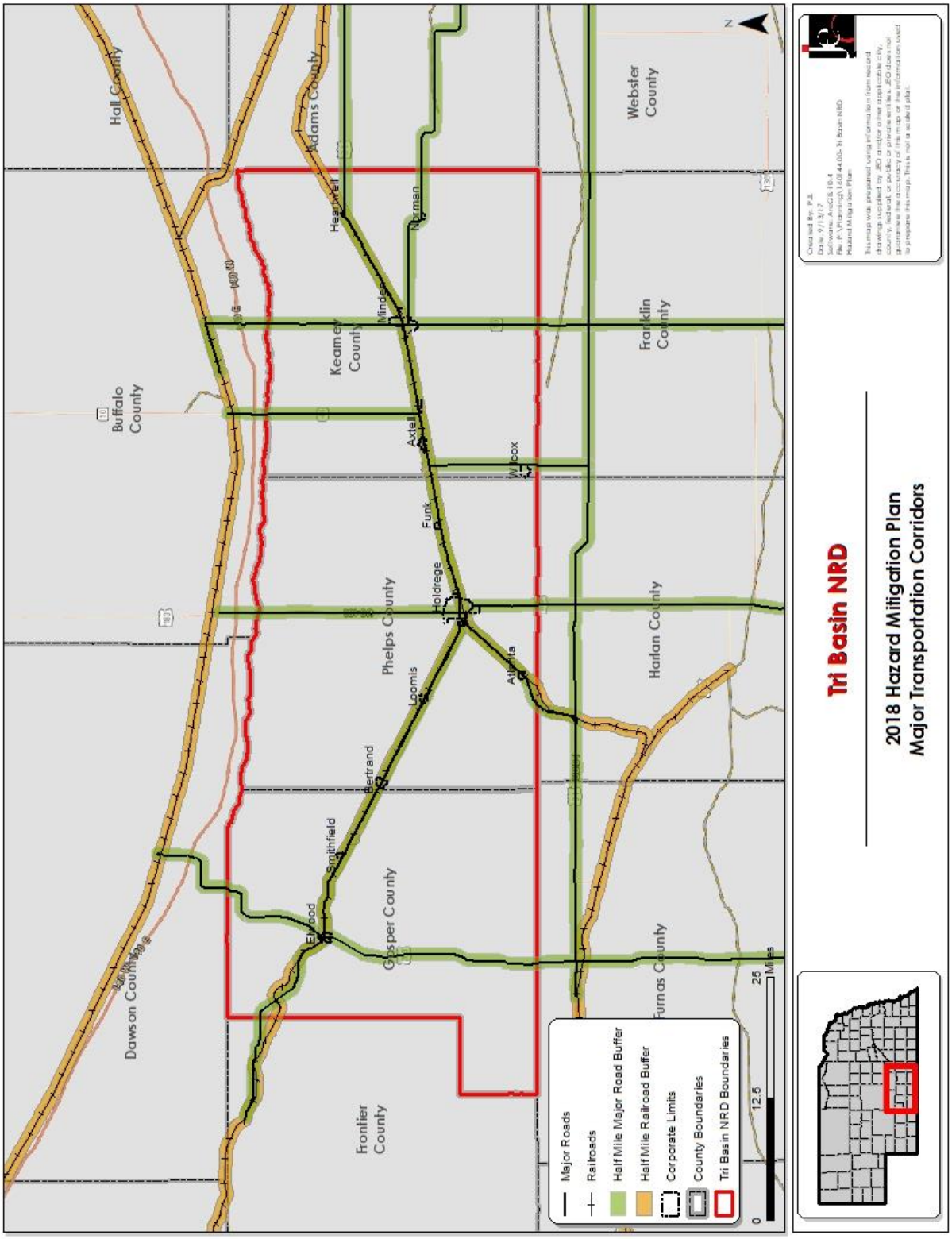
Nationally, the U.S. has had 108 fatalities associated with the transport of hazardous materials between 2007 through 2016.[36] While such fatalities are a low probability risk, even one event can harm many people. For example, a train derailment in Crete, Nebraska in 1969 allowed anhydrous ammonia to 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 6. A large number of spills also occur during the loading and unloading of chemicals. Participating communities specifically reported transportation along railroads 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.

[34] Pipeline and Hazardous Materials Safety Administration. 2017. "Hazmat Safety Community FAQ." https://phmsa.dot.gov/regulations.
[35] U.S. Department of Transportation. 2015. "2012 Economic Census: Transportation." https://www.census.gov/econ/cfs/2012/ec12tcf-us-hm.pdf.
[36] Pipeline and Hazardous Materials Safety Administration. 2016. "10 Year Incident Summary Reports." https://www.phmsa.dot.gov/hazmat/library/data-stats/incidents.

Figure 6: 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 zero to 100 liquid gallons (LGA). None of the chemical spills resulted in deaths or injuries.

HISTORICAL OCCURRENCES

PHMSA reports that three chemical spills occurred during transportation in the planning area between 1980 and 2017. During these events, there were no injuries, no fatalities, and $70,300 in damages.

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

Table 39: Historical Chemical Spills 1980-2017

Date of Event	Location of Release	Failure Description	Material Involved	Method of Transportation	Amount in Gallons	Total Damage	Evacuation (Yes/No)
5/23/2015	Holdrege	Human Error	Flammable Liquids	Highway	100 LGA	$70,300	No
6/5/1985	Minden	Loose Closure Component or Device; Rollover Accident	Resin Solution – Flammable	Highway	10 LGA	$0	No
8/30/1983	Loomis	Unknown	Anhydrous Ammonia	Highway	0	$0	No

Source: PHMSA, April 1980– June 2017[37]

AVERAGE ANNUAL DAMAGES

The average damage per event estimate was determined based upon PHMSA's Incidents Reports since 1980 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 $1,635 per year in property damages.

Table 40: Chemical Transportation Losses

Hazard Type	Number of Events	Events Per Year	Total Property Loss	Average Annual Property Loss
Chemical Transportation Spills	3	0.1	$70,300	$1,635

Source: PHMSA April 1980 – June 2017

PROBABILITY

The historical record indicates that chemical releases during transport have an eight percent chance of occurring annually in the planning area, with three events over a 37-year period.

[37] Pipeline and Hazardous Materials Safety Administration. 2017. "Office of Hazardous Materials Safety: Incident Reports Database Search." Accessed August 1, 2017. https://www.phmsa.dot.gov/hazmat/library/data-stats/incidents.

REGIONAL VULNERABILITIES

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

Table 41: Regional Chemical Transportation Vulnerabilities

Sector	Vulnerability
People	-Those in close proximity to transportation corridors -Possible evacuation -Hospitals, nursing homes, and the elderly at greater risk due to low mobility
Economic	-Evacuations and closed transportation routes could impact businesses near spill
Built Environment	-Risk of fire or explosion
Infrastructure	-Transportation routes can be closed
Critical Facilities	-Critical facilities near major transportation corridors are at risk

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."[38]

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 42: 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[39]

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.

[38] 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.

[39] 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 97 dams located within the planning area, with classifications ranging from minimal hazard to high hazard. Seventy dams are rated low, one is rated significant, and 1 is rated a high hazard dam. Figure 7 maps the location of these dams in the planning area.

Table 43: Dams in the Planning Area

County	Minimal Hazard	Low Hazard	Significant Hazard	High Hazard
Gosper County	21	50	1	1
Kearney County	1	7	0	0
Phelps County	3	13	0	0
Total	25	70	1	1

Source: NeDNR, 2017[40]

[40] Nebraska Department of Natural Resources. 2017. "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 7: Dam Locations

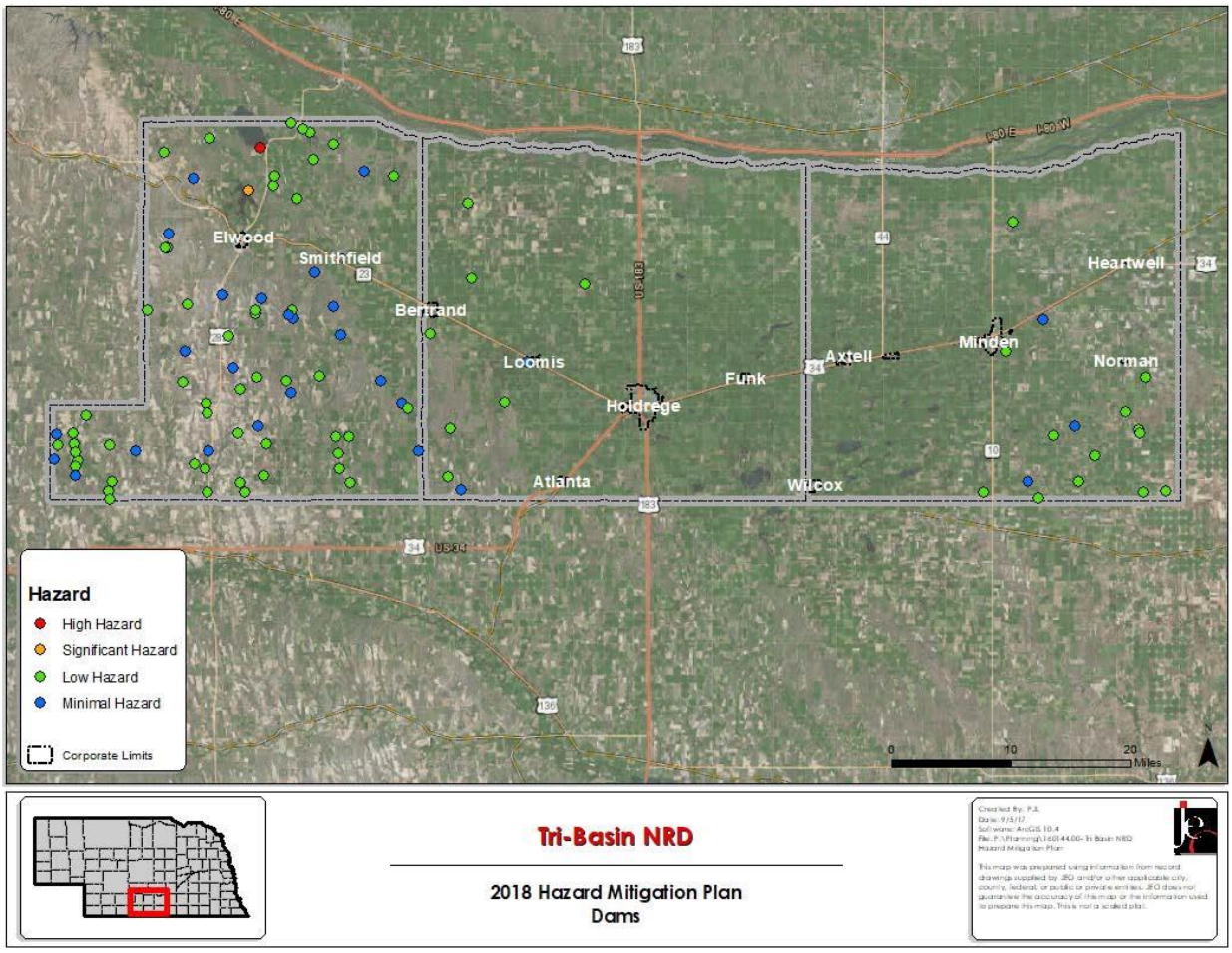


Table 44 lists the only dam classified as high hazard potential in the planning area. None of the dams in the planning area are included in the 2014 Nebraska State HMP's list of "Top 30 Ranked High Hazard Dams Based on Population at Risk."

Table 44: High Hazard Dams

NID	Dam Name	Owner	Location	Stream Name	Maximum Storage (acre-feet)	Emergency Action Plan
NE01025	Johnson Dam Canal Mile 64.5	Central Nebraska Public Power & Irrigation District	Johnson Lake	Tri-County Canal Off Platte R	71,445	Yes

Source: NeDNR, 2017

Upstream Dams Outside the Planning Area

According to the Counties' Local Emergency Operations Plan (LEOPs)[41,42,43], there are no upstream dams (upstream of the planning area) which could affect the planning area.

LOCATION

Communities or areas downstream of a dam, especially high hazard dams, are at greatest risk of dam failure. To view the mapped location of dams by county please refer to *Section Seven: Participant Sections.*

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 following is provided as a description of areas affected in the inundation area from Gosper County's Local Emergency Operations Plan (LEOP) where available for specific high hazard dams. Note that there is only one high hazard dam located within the planning area.

Gosper County

Johnson Lake Dam – Inundation area: this would affect the entire Plum Creek Watershed as well as the Platte River in Gosper County. In Gosper County, the area affected would be slightly greater than the 100-year flood plain with the greatest effect on rural farmland which would approach the 100 percent inundation. Refer to the Johnson Lake Warning and Information Plan for detailed maps.

HISTORICAL OCCURRENCES

According to the Stanford University National Performance of Dams Program, there have been no dam failure events within the planning area.[44]

[41] Gosper County Emergency Management Agency. January 2012. "Gosper County, Nebraska Local Emergency Operations Plan."
[42] Kearney County Emergency Management Agency. January 2013. "Kearney County, Nebraska Local Emergency Operations Plan."
[43] Region 15 Emergency Management Agency. September 2012. "Phelps County, Nebraska Local Emergency Operations Plan."
[44] Stanford University. 1911-2016. "National Performance of Dams Program Dam Incident Database." Accessed August 2017. http://npdp.stanford.edu/dam_incidents.

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, TBNRD, 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.

REGIONAL VULNERABILITIES

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

Table 45: Regional Dam Failure Vulnerabilities

Sector	Vulnerability
People	-Those living downstream of high hazard dams -Evacuation likely with high hazard dams -Hospitals, nursing homes, and the elderly at greater risk due to low mobility
Economic	-Businesses located in the inundation areas would be impacted and closed for an extended period of time -Employees working in the inundation area may be out of work for an extended period of time
Built Environment	-Damage to homes and buildings
Infrastructure	-Transportation routes could be closed for extended period of time
Critical Facilities	-Critical facilities in inundation areas are vulnerable to damages

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 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 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*

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:

- **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.

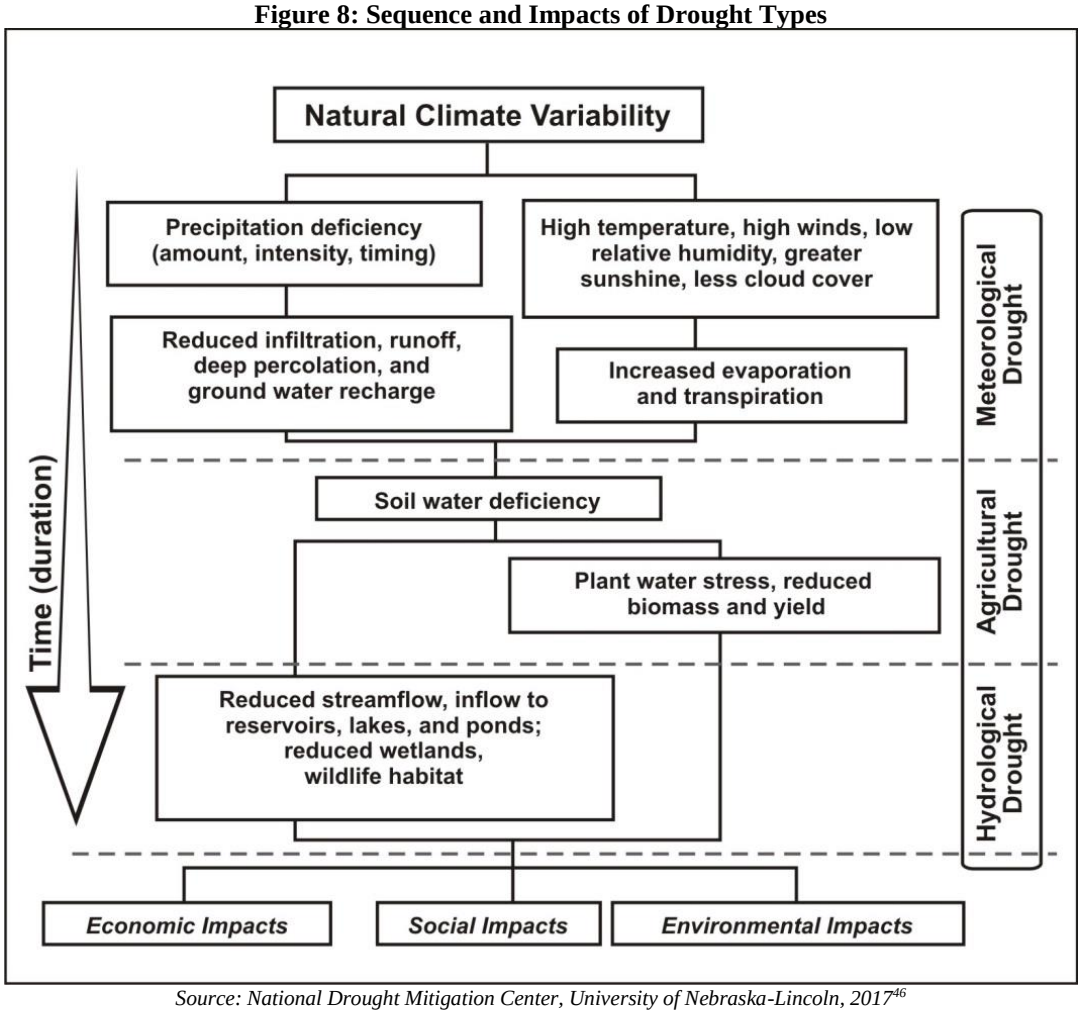
- **Hydrologic Drought** – occurs when water available in aquifers, lakes, and reservoirs falls below the statistical average. This situation can arise even when the area of interest receives average precipitation. This is due to the reserves diminishing from increased water usage, usually from agricultural 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.[45]

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

[45] National Drought Mitigation Center. 2017. "Drought Basics." http://drought.unl.edu/DroughtBasics.aspx.

Figure 8: Sequence and Impacts of Drought Types



Source: National Drought Mitigation Center, University of Nebraska-Lincoln, 2017[46]

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 8, which includes the planning area. This particular station's period of record started in 1895. Figure 9 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 46 shows the details of the Palmer classifications.

Table 46: 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[47]

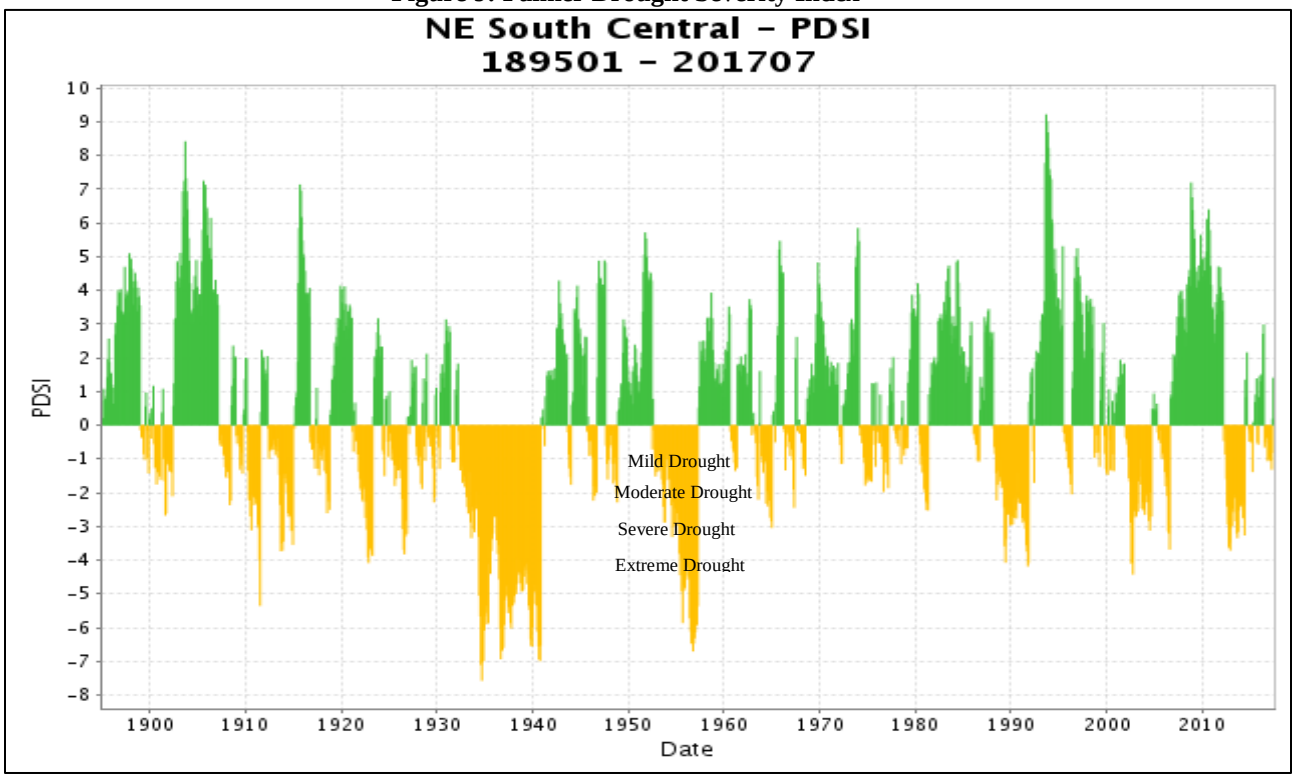
[46] National Drought Mitigation Center. 2017. "Types of Drought." http://drought.unl.edu/DroughtBasics/TypesofDrought.aspx.
[47] National Weather Service. 2017. "Climate Prediction Center." http://www.cpc.noaa.gov/.

Table 47: Historic Droughts

Drought Magnitude	Months in Drought	Percent Chance
-1 Magnitude (Mild)	187/1,465	12.8%
-2 Magnitude (Moderate)	136/1,465	9.3%
-3 Magnitude (Severe)	55/1,465	3.8%
-4 Magnitude or Greater (Extreme)	97/1,465	6.6%

Source: NCEI, Jan 1895-Jan 2017[48]

Figure 9: Palmer Drought Severity Index



Source: NCEI, Jan. 1895-July 2017

LOCATION

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

EXTENT

Using the data from Table 47 it is reasonable to expect extreme drought to occur in 6.6 percent of years of months for the planning area (97 extreme drought months in 1,465 months). Severe drought occurred in 55 months of the 1,465 months of record (3.8 percent of months). Moderate drought occurred in 136 months of the 1,465 months of record (9.3 percent of months), and mild drought occurred in 187 of the 1,465 months of record (12.8 percent of months). Non-drought conditions (incipient dry spell, near normal, or incipient wet spell conditions) occurred in 349 months, or 23.8% percent of months. These statistics show that the drought conditions of the planning area are highly variable.

[48] National Centers for Environmental Information. 1895-2017. Accessed August 2, 2017. https://www7.ncdc.noaa.gov/CDO/CDODivisionalSelect.jsp.

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 48: Loss Estimate for Drought

Hazard Type	Total Property Loss[1]	Average Annual Property Loss[1]	Total Crop Loss[2]	Average Annual Crop Loss[2]
Drought	$0	$0	$44,671,748	$2,127,226

1 Indicates the data is from NCEI (January 1996 to April 2017); 2 Indicates data is from USDA RMA (2000 to 2016)

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 (SURE); Livestock Forage Disaster Assistance Program (LFD); Emergency Assistance for Livestock, Honeybees, and Emergency Assistance for Livestock, Honey Bees, and Farm-Raised Fish Program (ELAP); Livestock Indemnity Program (LIP); and Tree Assistance Program (TAP). According to the PDSI, 2012's average severity index was ranked at a -4.47, with extremes in August and September of -7.35 and -7.57 respectively.

PROBABILITY

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

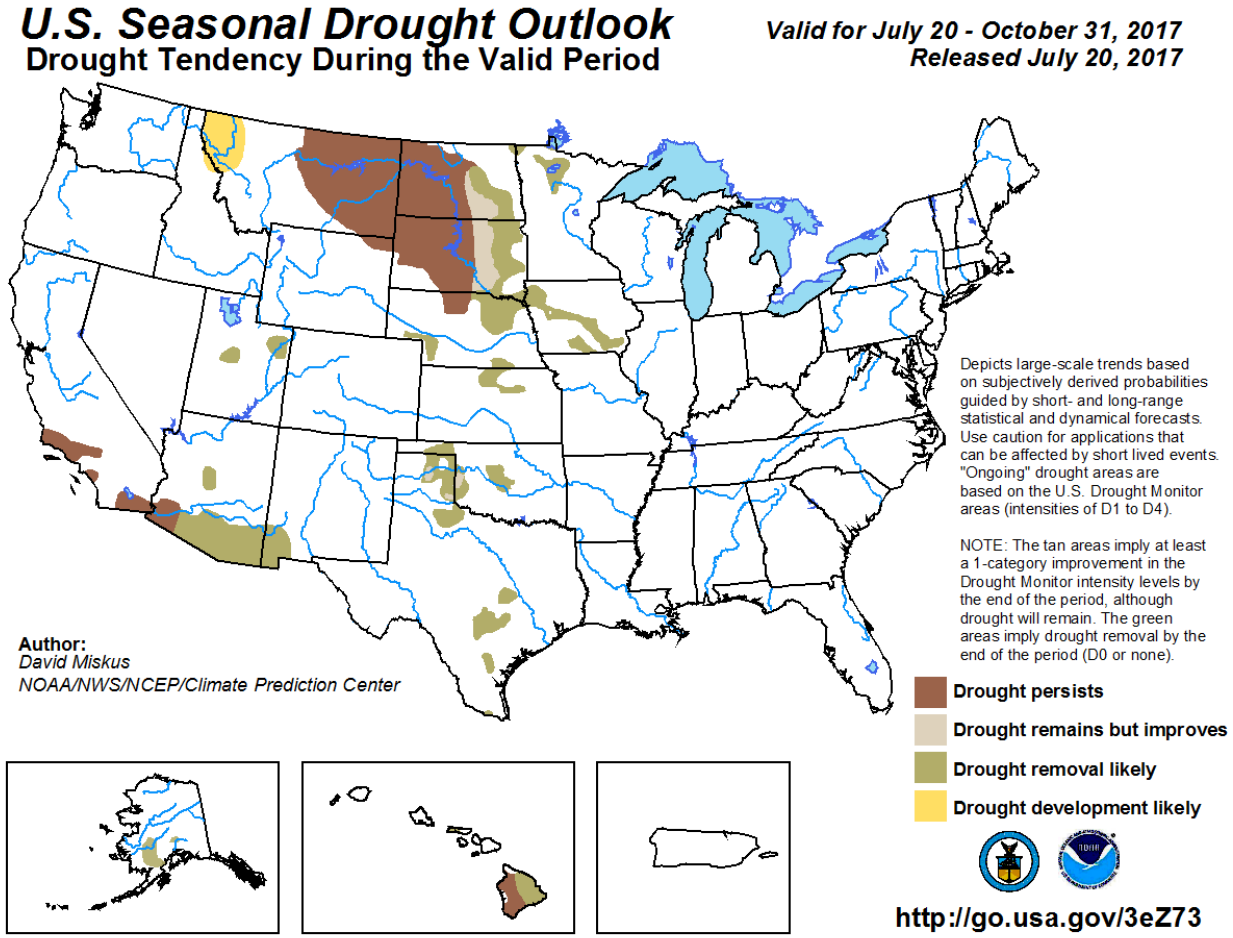
Table 49: Period of Record in Drought

PDSI Value	Magnitude	Drought Occurrences by Month	Monthly Probability
4 or more to -0.99	No Drought	990/1,465	67.5%
-1.0 to -1.99	Mild Drought	187/1,465	12.8%
-2.0 to -2.99	Moderate Drought	136/1,465	9.3%
-3.0 to -3.99	Severe Drought	55/1,465	3.8%
-4.0 or less	Extreme Drought	97/1,465	6.6%

Source: NCEI, Jan 1895-Jan 2017

The U.S. Seasonal Drought Outlook (Figure 10) 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 20, 2017 through October 31, 2017. According to the U.S. Seasonal Drought Outlook, drought is likely to persist in the north-central United States, but the planning area should experience seasonal norms relative to precipitation and temperatures.

Figure 10: U.S. Seasonal Drought Outlook



Source: NCEI, July 2017

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 17 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 50: Drought Impacts in Planning Area

Category	Date	Affected Counties	Title
Agriculture	2003	Gosper	Agriculture impact from Media submitted on 10/24/2007
Fire; Relief, Response & Restrictions; Tourism & Recreation	2013	Gosper	Campers in western Nebraska were urged to be particularly careful with campfires over the Labor Day weekend
Relief, Response & Restrictions; Water Supply & Quality	2013	Gosper, Kearney, Phelps	Central Nebraska Public Power and Irrigation District reducing releases from Lake McConaughy

Category	Date	Affected Counties	Title
Society & Public Health	2013	Kearney, Phelps	Drought alleviated some of the flooding that would have otherwise occurred along the Platte River in southern Nebraska
Agriculture; Plants & Wildlife	2012	Gosper, Kearney, Phelps	Drought led ranchers in western Nebraska to cull cow herds by 25 to 60 percent
Agriculture; Relief, Response & Restrictions	2013	Gosper, Kearney, Phelps	Drought-related USDA disaster declarations in 2013
Agriculture; Relief, Response & Restrictions	2014	Gosper, Kearney, Phelps	Drought-related USDA disaster Declarations in 2014
Energy; Water Supply & Quality	2013	Gosper, Kearney, Phelps	Electric power generation levels below peak production for Central Nebraska Public Power District
Agriculture; Water Supply & Quality	2012	Gosper, Kearney, Phelps	Irrigators in the Republican River basin portion of the Tri-Basin Natural Resources District in southern Nebraska used double the groundwater in 2012 than was used in 2011
Agriculture; Relief, Response & Restrictions; Water Supply & Quality	2012	Kearney, Phelps	Low flow in several Nebraska rivers brought surface irrigation closures
Plants & Wildlife; Water Supply & Quality	2013	Kearney County, NE	Low water, warm water temperatures killing fish in Platte River in south central Nebraska
Plants & Wildlife	2012	Gosper	Many trees in western Nebraska died from drought, high temperatures and strong winds in 2012
Agriculture; Relief, Response & Restrictions; Water Supply & Quality	2013	Gosper, Kearney, Phelps	Reduced water allotment for irrigators in the Central Nebraska Public Power and Irrigation District
Agriculture; Relief, Response & Restrictions; Water Quality	2013	Gosper, Phelps	The Nebraska Department of Natural Resources ordered that 12,000 acre-feet of water held in four federal Bureau of Reclamation reservoirs be released to honor the Republican River Compact
Plants & Wildlife; Water Supply & Quality	2012	Kearney	Thousands of fish dead in dry Lower Platte River in Nebraska
Agriculture; Relief, Response & Restrictions	2012	Gosper, Phelps	USDA Announces Streamlined Disaster Designation Process
Water Supply & Quality	2008	Gosper	Water Supply & Quality impact from Media submitted on 8/11/2008

Source: NDMC, 2000-2017[49]

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

[49] National Drought Mitigation Center. 2017. "U.S. Drought Impact Reporter." http://droughtreporter.unl.edu/map/.

Table 51: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

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 52: 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[50]

Table 53: 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
XII	Catastrophic	Total destruction; trees fall; ground rises and falls in waves	> 8.1

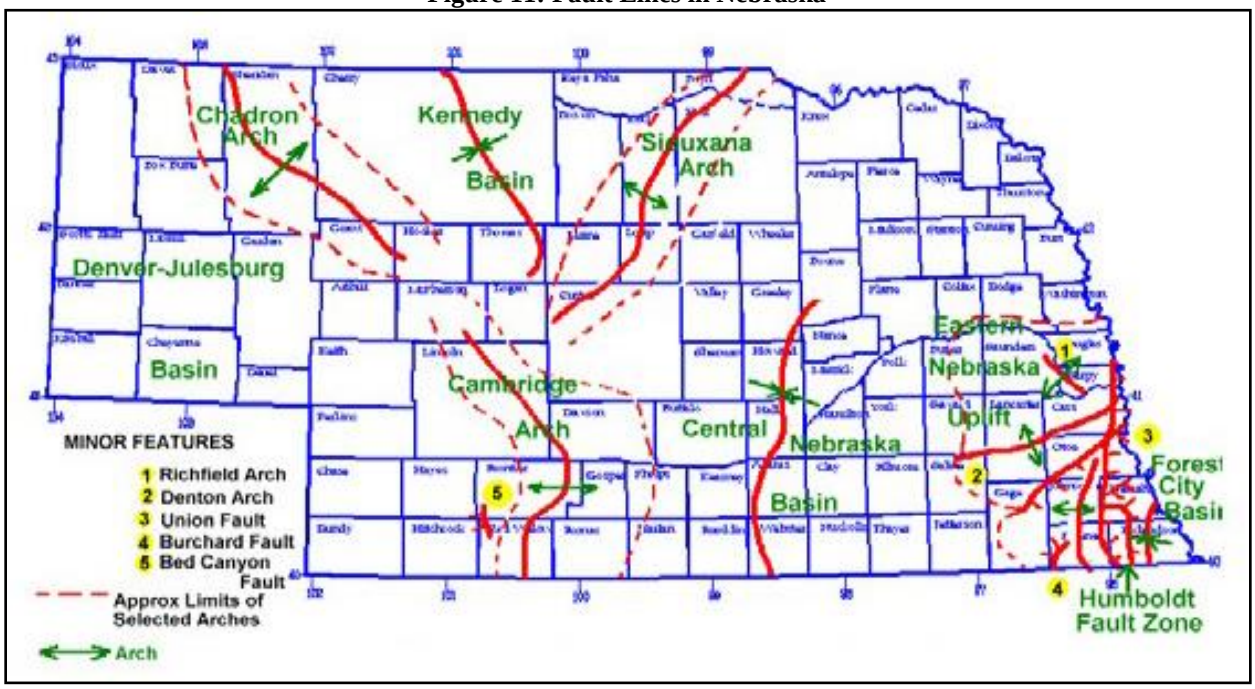
Source: FEMA, 2016

[50] Federal Emergency Management Agency. 2016. "Earthquake." https://www.fema.gov/earthquake.

LOCATION

The most likely locations in the planning area to experience an earthquake are near a fault line (Figure 11). The Bed Canyon Fault line would affect the planning area.

Figure 11: 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

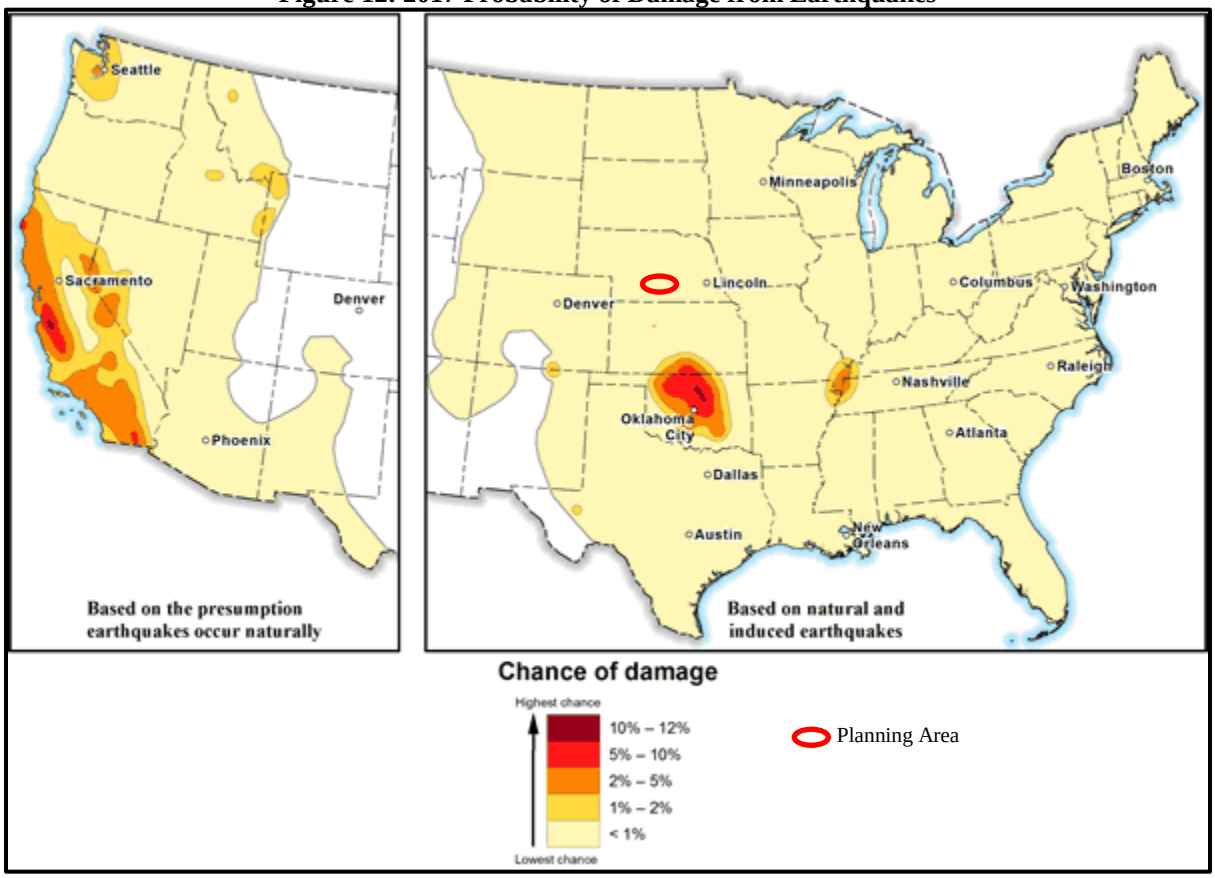
According to the United States Geological Survey (USGS), there have been no earthquakes in the planning area since 1900.[51]

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 12 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.

[51] United States Geological Survey. 2017. "Information by Region – Nebraska." https://earthquake.usgs.gov/earthquakes/byregion/nebraska.php.

Figure 12: 2017 Probability of Damage from Earthquakes



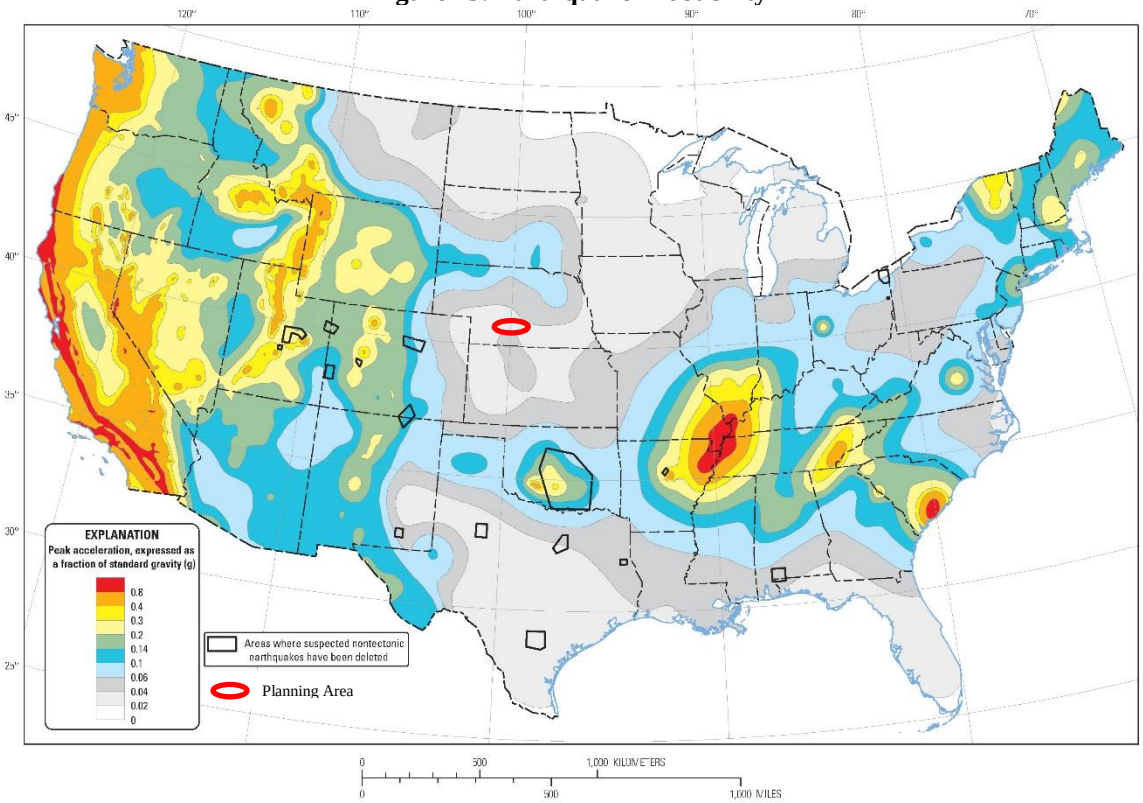
Source: USGS, 2017[52]

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 139 years, for the purposes of this plan, there is less than one percent chance of an earthquake occurring each year.

[52] United States Geological Survey. 2017. "Short-term Induced Seismicity Models: 2017 One-Year Model." https://earthquake.usgs.gov/hazards/induced/index.php#2017.

Figure 13: Earthquake Probability



Source: USGS 2009 PSHA 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 54: 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 3 to 7 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

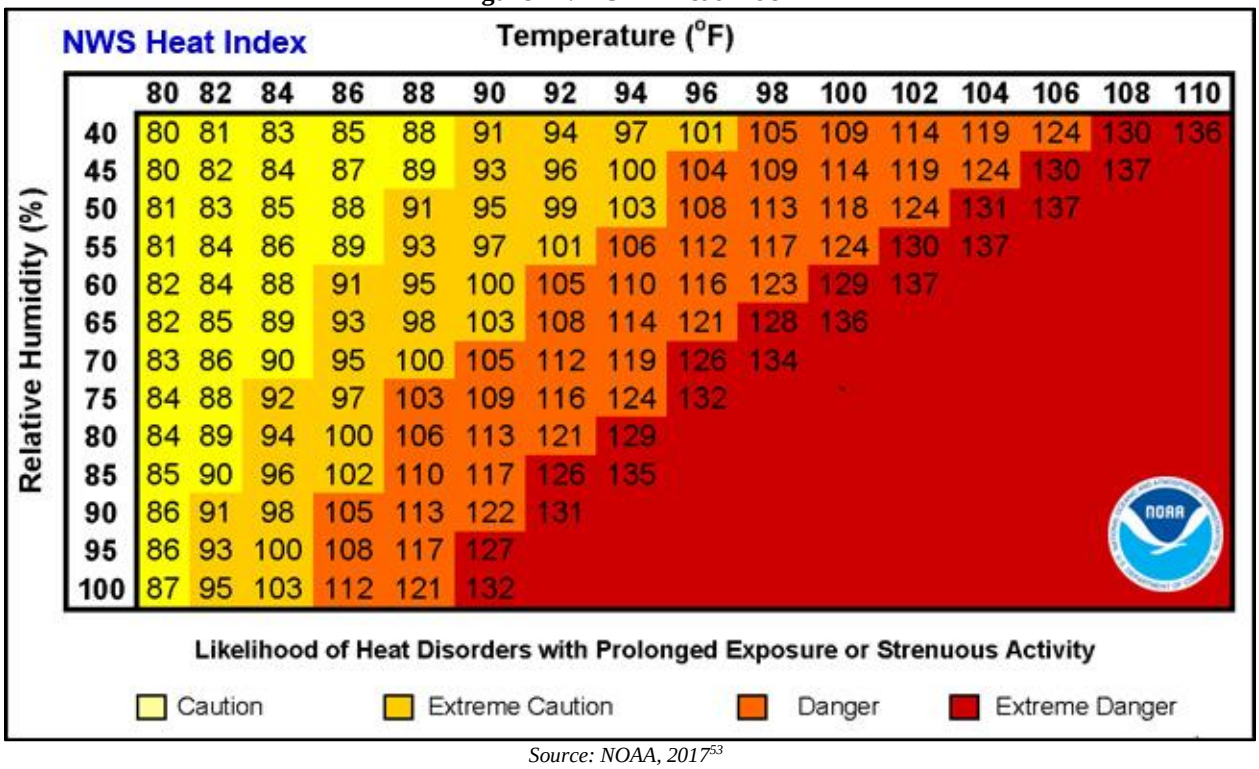
This hazard may occur throughout the planning area.

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:

$$100\%\ Relative\ Humidity + 86°\text{F} = 112°\text{F}\ Heat\ Index$$

Figure 14: NOAA Heat Index



Source: NOAA, 2017[53]

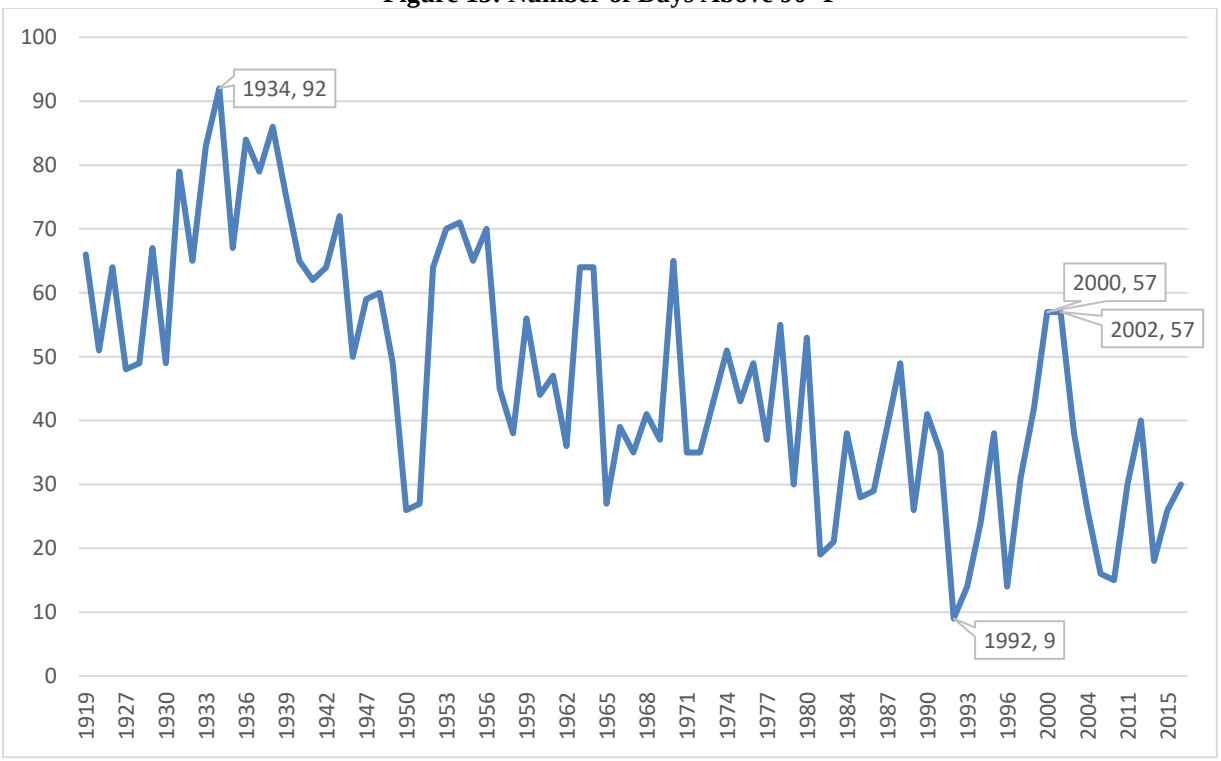
The figure above is designed for shady and light wind conditions. Exposure to full sunshine or strong winds can increase hazardous conditions and raise heat index values by up to 15°F. For the purposes of this plan, extreme heat is being defined as temperatures of 90°F or greater.

HISTORICAL OCCURRENCES

According to the High Plains Regional Climate Center (HPRCC), on average, the planning area experiences 47 days above 90°F. The planning area experienced 92 days above 90°F in 1934, which was the most 90°F days on record. More recently, in 2000 and 2002 there were 57 days above 90°F. Conversely, 1992 was the "coolest" year on record, with only nine days above 90°F.

[53] National Oceanic and Atmospheric Administration, National Weather Service. 2017. "Heat Index." http://www.nws.noaa.gov/om/heat/heat_index.shtml.

Figure 15: Number of Days Above 90˚F



Source: HPRCC, 1919-2016

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 55: Extreme Heat Loss Estimation

Hazard Type	Number of Average Days Above 90°F[1]	Property Damages[2]	Average Annual Property Damage[2]	Total Crop Loss[3]	Annual Crop Loss[3]
Extreme Heat	47	$0	$0	$6,888,393	$430,524

Source: 1 indicates the data is from HPRCC; 2 NCEI (1970-2017); 3 USDA RMA (2000-2016)

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.[54] 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.

[54] Federal Emergency Management Agency. June 2009. "BCA Reference Guide."

Table 56: Loss of Electricity - Assumed Damage by Jurisdiction

Jurisdiction	2015 Population	Population Affected (Assumed)	Electric Loss of Use Assumed Damage Per Day
Gosper County	1,976	198	$24,948
Kearney County	6,549	655	$82,530
Phelps County	9,216	922	$116,172

PROBABILITY

Extreme heat is a regular part of the climate for the planning area; there is a 100 percent probability that temperatures greater than 90°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 57: 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 the drainage infrastructure, therefore limiting its ability to properly carry and disburse 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 occur when ice breaks up in moving waterways, 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.

LOCATION

Table 58 shows current statuses of Flood Insurance Rate Map (FIRM) panels. Most jurisdictions throughout the planning area also have FIRMs at the municipal level.

Figure 16 shows the Digital Flood Insurance Rate Maps (DFIRM) for the planning area. For jurisdictional-specific maps as well as an inventory of structures in the floodplain, please refer to *Section Seven: Participant Sections.*

Figure 16: 1% Annual Chance Flood Risk Area

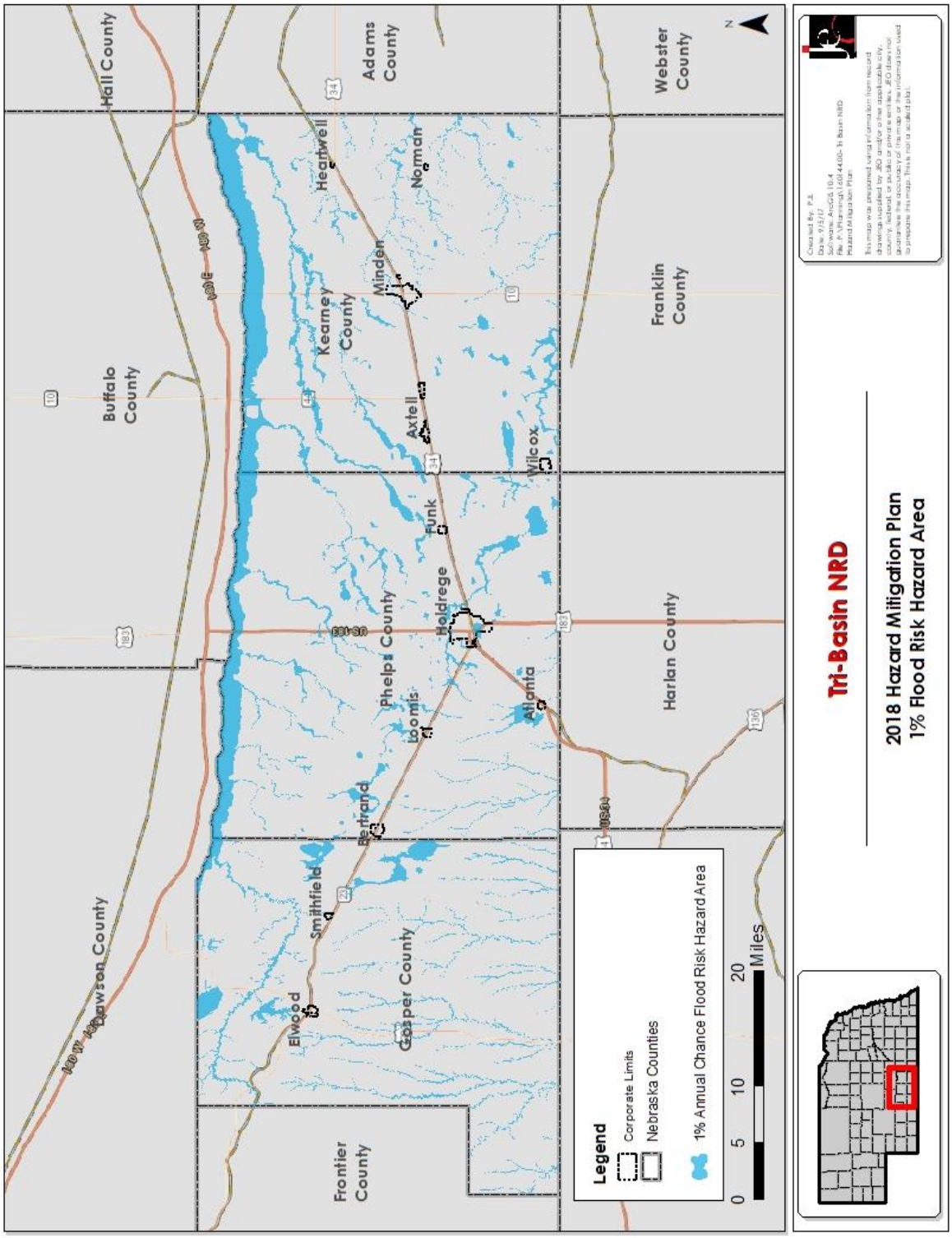


Table 58: FEMA FIRM Panel Status

Jurisdiction	Panel Number	Effective Date
Gosper County	31073CIND0A	08/04/2005
Elwood	31073CIND0A, 31073C0125A	08/04/2005
Smithfield	31073C0150A	08/04/2005
Kearney County	31099CIND0B	02/18/2005
Axtell	31099CIND0B, 31099C0260A, 31099CO300A	2/18/2005, 1/16/2004
Heartwell	31099CIND0B, 31099CO225A	2/18/2005, 1/16/2004
Minden	31099CIND0B, 31099CO190A, 31099CO205A, 31099CO325A	02/18/2005, 1/16/2004
Norman	31099CIND0B, 31099CO350A	2/18/2005, 1/16/2004
Wilcox	31099CIND0B, 31099CO275A, 31099CO380A, 31099CO385A	2/18/2005, 1/16/2004
Phelps County	31137CIND0A	01/16/2008
Atlanta	31137CIND0A, 31137CO325C, 31137CO430C	1/16/2008
Bertrand	31137CIND0A, 31137CO145C, 31137CO175C	1/16/2008
Funk	-	-
Holdrege	31137CIND0A, 31137CO310C, 31137CO320C, 31137CO330C, 31137CO340C	1/16/2008
Loomis	31137CIND0A, 31137CO285C, 31137CO325C	1/16/2008

Source: FEMA, 2017[55]

EXTENT

The NWS has three categories to define the severity of a flood once a river reaches flood stage as indicated in Table 59.

Table 59: Flooding Stages

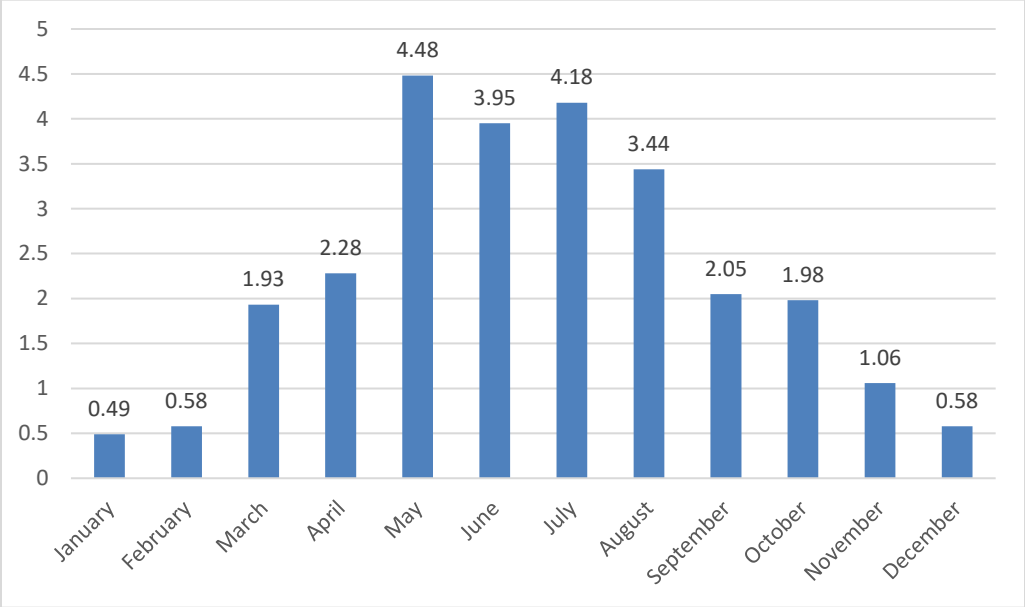
Flood Stage	Description of flood impacts
Minor Flooding	Minimal or no property damage, but possibly some public threat or inconvenience
Moderate Flooding	Some inundation of structures and roads near streams. Some evacuations of people and/or transfer of property to higher elevations are necessary
Major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

Source: NOAA, 2017[56]

Figure 17 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 18, 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.

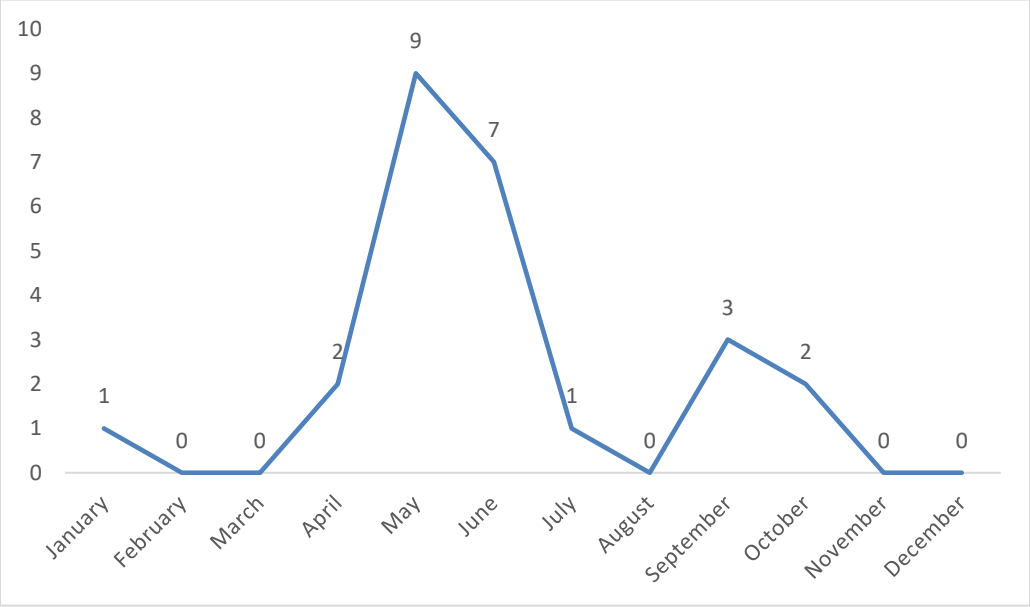
[55] Federal Emergency Management Agency. 2017. "FEMA Flood Map Service Center." http://msc.fema.gov/portal/advanceSearch.
[56] National Weather Service. 2017. "Flood Safety." http://www.floodsafety.noaa.gov/index.shtml.

Figure 17: TBNRD Average Monthly Precipitation



Source: HPRCC, 2017

Figure 18: Monthly Events for Floods/Flash Flood in the TBNRD (1996-2016)



Source: NCEI, 1996-2016

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 (SFHA) 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 60: NFIP Participants

Jurisdiction	Eligible-Regular Program	Date Current Map	Sanction	Suspension	Rescinded	Participation in NFIP
Gosper County	08/04/05	08/04/05	-	-	-	Yes
Elwood	03/31/06	(NSFHA)	-	-	-	Yes
Smithfield	02/26/08	08/04/05	-	-	-	Yes
Kearney County	01/16/04	02/18/05	-	-	-	Yes
Axtell	02/24/94	01/16/04	-	-	-	Yes
Heartwell	-	01/16/04	01/16/05	-	-	No
Minden	09/24/84	01/16/04	-	-	-	Yes
Norman	-	01/16/14	01/16/15	-	-	No
Wilcox	09/24/84	01/16/04	-	-	-	Yes
Phelps County	02/01/90	01/16/08(M)	-	-	-	Yes
Atlanta	01/16/08	01/16/08(M)	-	-	-	Yes
Bertrand	06/24/08	01/16/08(M)	-	-	-	Yes
Funk	01/16/08	(NSFHA)	-	-	-	Yes
Loomis	-	01/16/08	01/16/09	-	-	No
Holdrege	04/02/86	01/16/08(M)	-	-	-	Yes

**NSFHA = No Special Flood Hazard Area – All Zone C; (M) = No Elevation Determined – All Zone A, C and X*
Source: Nebraska Department of Natural Resources, National Flood Insurance Program, 2017

Table 61: NFIP Policies in Force and Total Payments

Jurisdiction	Policies In-force	Total Coverage	Total Premium	Closed Losses*	Total Payments
Gosper County	5	$692,300	$8,017	0	$0
Kearney County	32	$4,256,100	$40,731	1	$6,349
Phelps County	7	$891,500	$10,729	4	$41,864
Holdrege	6	$785,000	$3,795	2	$32,892
Planning Area Total	50	$6,624,900	$63,272	7	$81,105

Source: NFIP Community Status Book, 2017[57]
Only communities with policies in force are included in this table
**Closed Losses are those flood insurance claims that resulted in payment*

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 area map has been delineated for the jurisdiction.

[57] Federal Emergency Management Agency: National Flood Insurance Program. April 2017. "Policy & Claim Statistics for Flood Insurance." Accessed August 2017. https://www.fema.gov/policy-claim-statistics-flood-insurance.

Jurisdictions are encouraged to initiate activities above the minimum participation requirements, which are described in the Community Rating System (CRS) Coordinator's Manual (FIA-15/2017).[58]

NFIP Repetitive Loss Structures

NeDNR was contacted to determine if any existing buildings, infrastructure, or critical facilities are classified as NFIP Repetitive Loss Structures. There are no repetitive loss properties located in the planning area.

Historical Occurrences

According to the NCEI, flash flooding resulted in $5,665,000 in property damage, while riverine flooding caused $93,000 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 $228,235.

Average Annual Damages

The average damage per event estimate was determined based upon NCEI Storm Events Database since 1996 and the number of historical occurrences. This does not include losses from displacement, functional downtime, economic loss, injury, or loss of life. Flooding causes an average of $274,190 in property damages and $14,265 in crop losses per year for the planning area.

Table 62: Flood Loss Estimate

Hazard Type	Number of Events[1]	Number of Events Per Year	Total Property Loss[1]	Average Annual Property Loss [1]	Total Crop Loss[2]	Average Annual Crop Loss [2]
Flood Events	25	1.2	$5,758,000	$274,190	$228,235	$14,265

1 Indicates data from NCEI (January 1996 to April 2017); 2 Indicates data from RMA (2000 to 2016)

Probability

The NCEI reports 25 flooding/flash flooding events from January 1996 to April 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.

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 interesting 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:

[58] Federal Emergency Management Agency. May 2017. "National Flood Insurance Program Community Rating System: Coordinator's Manual FIA-15/2017." Accessed August 2017. https://www.fema.gov/media-library/assets/documents/8768.

- 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 63: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 -Critical facilities, especially 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 (WUI), 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.

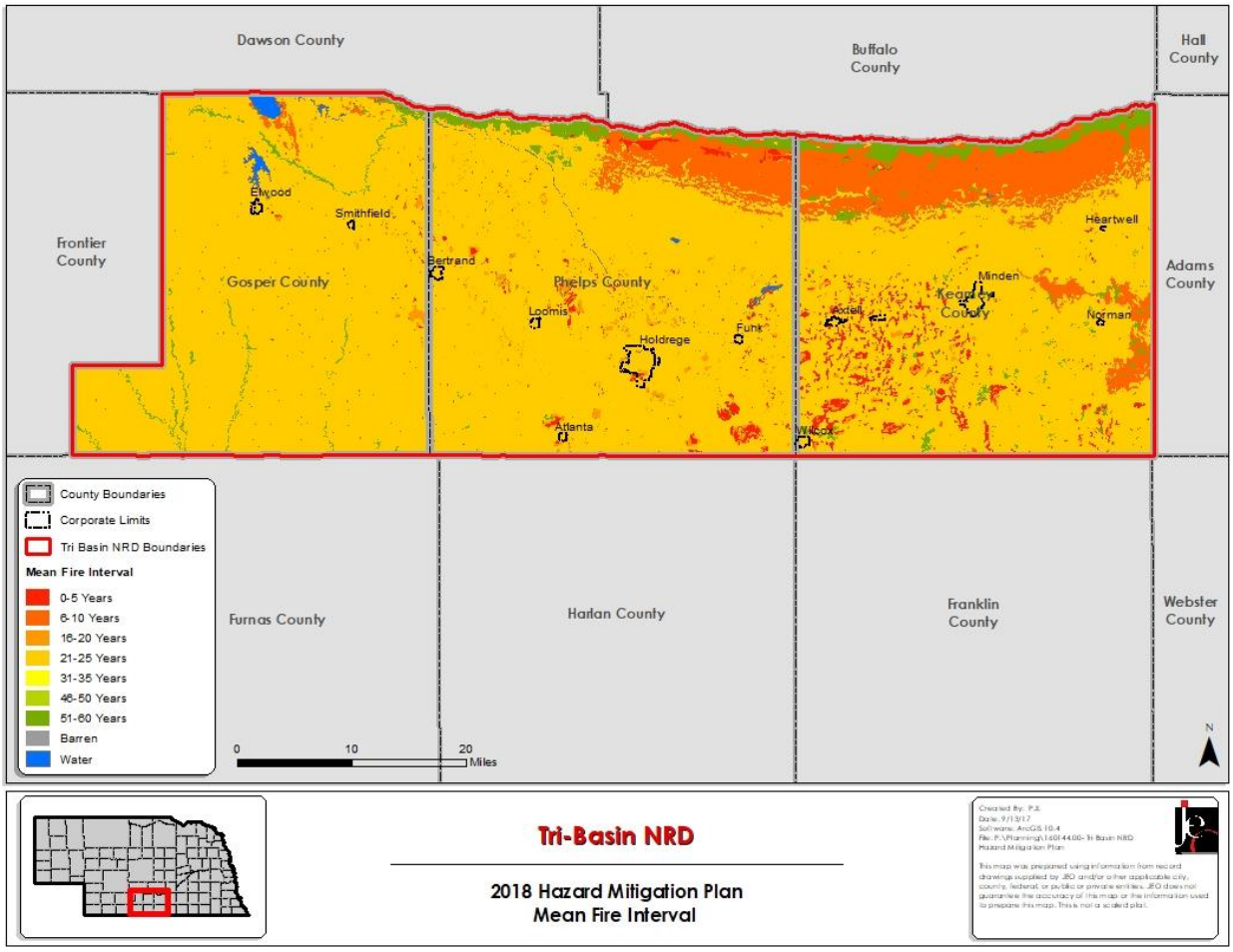
*Lightning starts approximately 10,000 forest fires each year, yet **ninety percent** of forest fires are started by humans.*

-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 19 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 19: Mean Fire Return Interval



Source: USGS LANDFIRE Database[59]

LOCATION

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

Table 64: Reported Wildfires by County

County	Reported Wildfires	Acres Burned
Gosper County	35	971
Kearney County	82	3,652
Phelps County	58	654
Total	**175**	**5,277**

Source: Nebraska Forest Service, 2000-2014[60]

EXTENT

Figure 20 illustrates the number of wildfires by cause in the planning area from 2000 to 2014, which burned 5,277 acres in total. There were 175 reported wildfires in the planning area between 2000 and 2014. Four of the fires burned 100 acres or more, with the largest wildfire burning 3,000 acres in Kearney County in February of 2000.

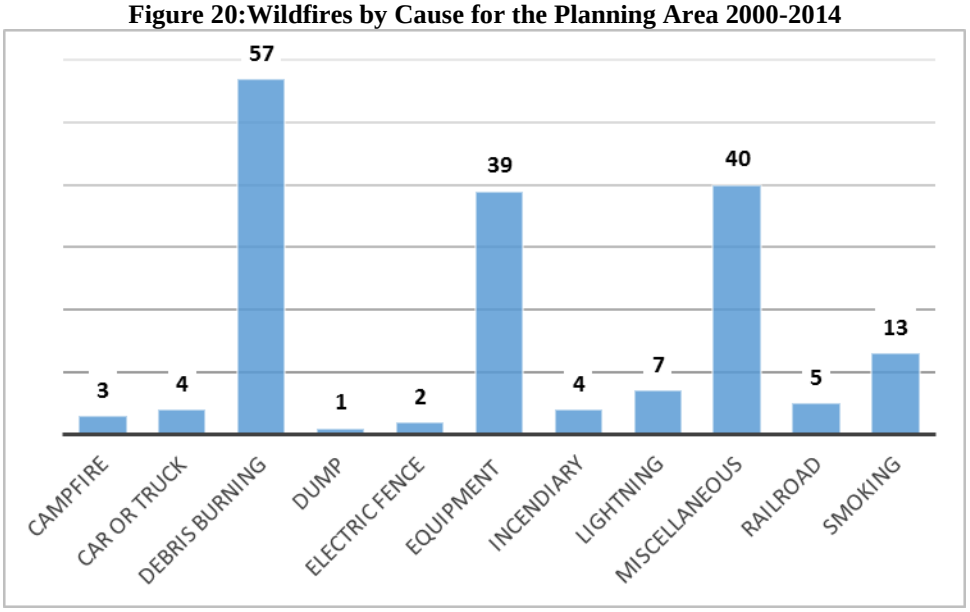
[59] United States Geological Survey. 2017. "Landfire Data Distribution Site." https://landfire.cr.usgs.gov/viewer/viewer.html.
[60] Nebraska Forest Service. 2000-2014. "Fire Incident Type Summary." Data Files 2000-2014.

HISTORICAL OCCURRENCES

For the planning area, eight different fire departments reported a total of 175 wildfires, according to the National Forest Service (NFS), from 2000 to 2014. Most fires occurred in 2002 (Figure 21). The reported events burned 5,277 acres. The reported fire events caused $0 in crop damages according to the RMA.

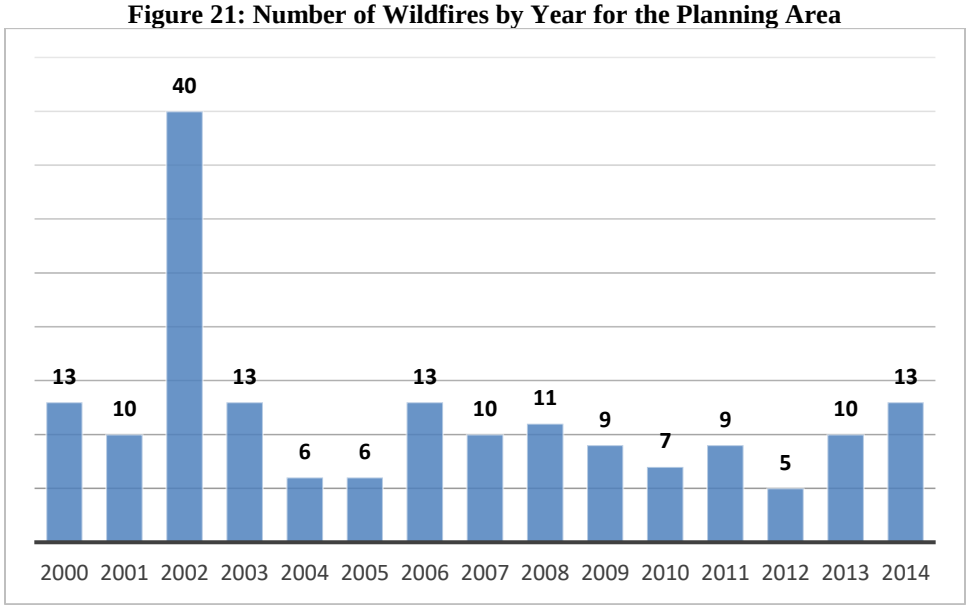
Wildfires are most likely to be started by debris burning (33%). Miscellaneous causes (23%) and equipment (22%) are the second and third leading causes of fires in the planning area. Most wildfires that occur in the planning area will likely be kept to under 100 acres.

Figure 20:Wildfires by Cause for the Planning Area 2000-2014



Source: Nebraska Forest Service, 2000-2014

Figure 21: Number of Wildfires by Year for the Planning Area



Source: Nebraska Forest Service, 2000-2014

AVERAGE ANNUAL DAMAGES

The average damage per event estimate was determined based upon the Nebraska Forest Service Wildfires Database from 2000 to 2014 and number of historical occurrences. This does not include losses from displacement, functional downtime, economic loss, injury, or loss of life. During the 15-year period, wildfires burned 5,277 acres and caused no crop damage in the planning area.

Table 65: Wildfire Loss Estimation

Hazard Type	Number of Events[1]	Events Per Year	Average Acres Per Fire	Total Property Loss[1]	Total Crop Loss[2]	Average Annual Crop Loss[2]
Grass/Wildfires	175	11.7	30.2	5,277 acres	$0	$0

1 Indicates data is from Nebraska Forest Service (2000-2014); 2 Indicates data is from RMA (2000 to 2016)

Table 66: Wildfire Threats

Hazard Type	Injuries	Homes Threatened	Other Structures Threatened
Grass/Wildfires	0	7	0

Source: Nebraska Forest Service, 2000-2014

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 67: Regional Wildfire Vulnerabilities

Sector	Vulnerability
People	-Risk of injury or death -Displacement of people and loss of homes -Lack of transportation poses risk to low income individuals, families, and elderly
Economic	-Loss of businesses
Built Environment	-Property damages
Infrastructure	-Transportation routes may be closed -Damage to power lines
Critical Facilities	-Risk of damages
Other	-Increase chance of landslides and erosion -May lead to poor water quality

HAIL

HAZARD PROFILE

Hail is commonly associated with severe thunderstorms, and this association makes hail just as unpredictable as severe thunderstorms. Additionally, hail events in thunderstorms often occur in series, with one area having the potential to be hit multiple times in one day.

Severe thunderstorms in the planning area usually occur in the evening during the spring and summer months. These, often large, storms can include heavy rain, hail, lightning, and high winds. Severe thunderstorms can also produce tornadoes with little or no advanced warning. Furthermore, hail can destroy property and crops with sheer force, as some hail stones can fall at speeds up to 100 mph.

While the moisture from thunderstorms associated with hail events can be beneficial, when thunderstorms do produce hail, there is potential for crop losses, property losses due to building and automobile damages, and personal injury from people not seeking shelter during these events or standing near windows. The potential for damages increases as the size of the hail increases.

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 68 outlines the TORRO Hail Scale.

Table 68: TORRO Hail Scale

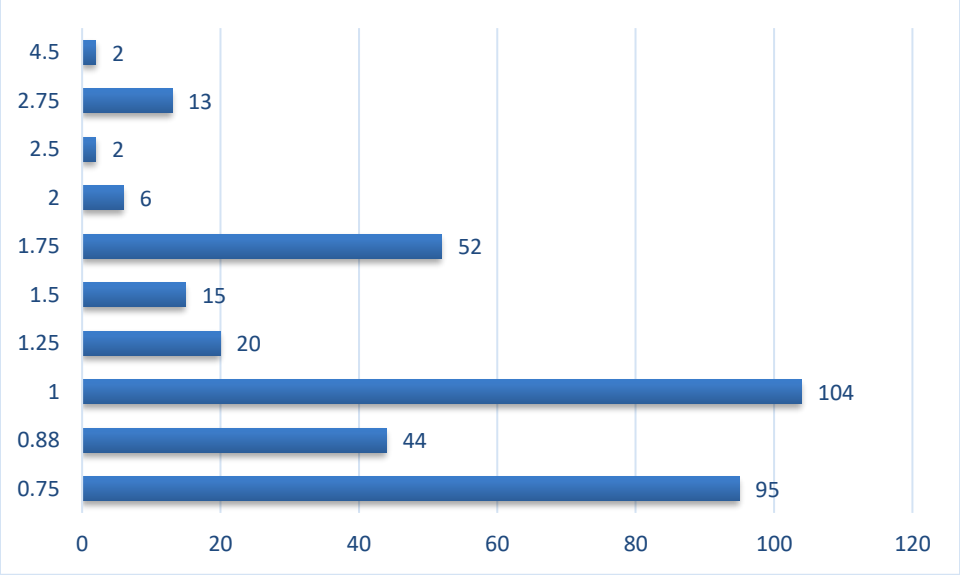
TORRO Classification / Intensity	Typical Hail Diameter	Typical Damage Impacts
H0: Hard Hail	5 mm; (Pea size); 0.2 in	No damage
H1: Potentially Damaging	5 -15 mm (Marble); 0.2 – 0.6 in	Slight general damage to plants and crops
H2: Significant	10 -20 mm (Grape); 0.4 – 0.8 in.	Significant damage to fruit, 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, 2017[61]

[61] Tornado and Storm Research Organization. 2017. "Hail Scale." http://www.torro.org.uk/hscale.php.

Of the 353 hail events reported for the planning area, the average hailstone size was 1.17 inches. Events of this magnitude correlate to an H3 classification. It is reasonable to expect H3 classified events to occur several times in a year throughout the planning area. In addition, it is reasonable, based on the number of occurrence, to expect larger hailstones to occur in the planning area annually. The planning area has endured two H10 hail events (>4.0 inches) during the period of record. Figure 22 shows hail events based on the size of the hail.

Figure 22: 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 353 hail events in the planning area between January 1996 and April 2017. These events were responsible for $30,829,000 in property damages and $75,056,923 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 69: Hail Loss Estimate

Hazard Type	Number of Events[1]	Events Per Year	Total Property Loss[1]	Average Annual Property Loss[1]	Total Crop Loss[2]	Average Annual Crop Loss[2]
Hail Events	353	16.8	$30,829,000	$1,468,048	$75,056,923	$4,691,058

1 Indicates the data is from NCEI (January 1996 to April 2017); 2 Indicates data is from USDA RMA (2000 to 2016)

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 353 hail events between 1996 and 2015, or approximately 17 hail occurrences per year.

REGIONAL VULNERABILITIES

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

Table 70: 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

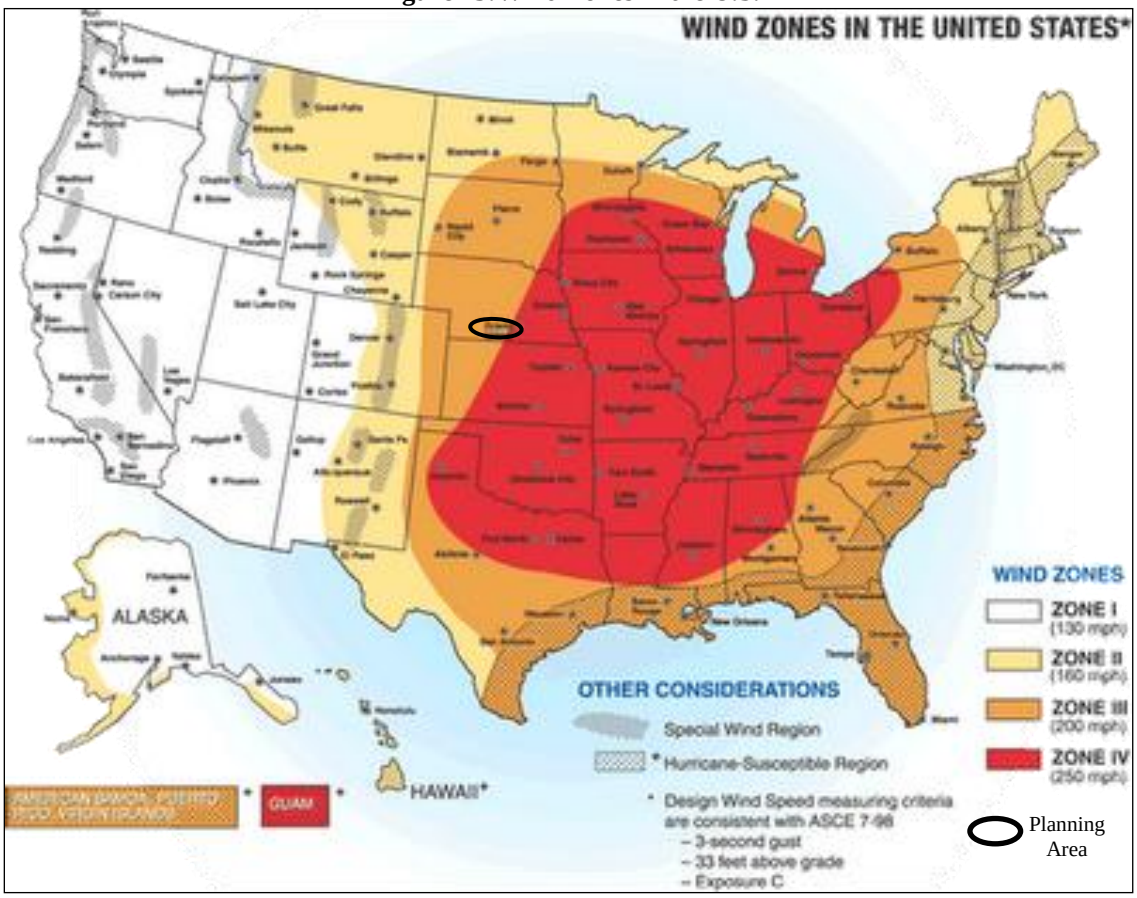
HIGH WINDS

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.[62] 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 23 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 23:Wind Zones in the U.S.



Source: FEMA, 2016

LOCATION

High winds commonly occur throughout the planning area.

EXTENT

The Beaufort Wind Scale can be used to classify wind strength. Table 71 outlines the scale, provides wind speed ranking, range of wind speeds per ranking, and a brief description of conditions for each ranking.

[62] National Weather Service. 2017. "Glossary." http://w1.weather.gov/glossary/index.php?letter=h.

Table 71: 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, 2017[63]

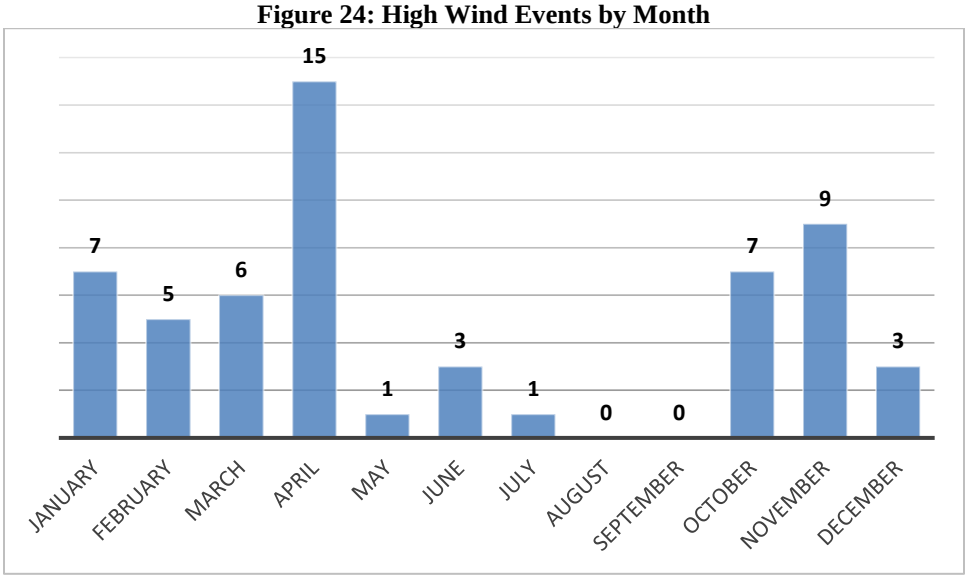
Using the NCEI reported events, the most common high wind event is a level 8. The reported high wind events had an average of 46 mph winds. It is likely that this level of event will occur annually.

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 57 high wind events that occurred between January 1996 and April 2017. As seen in Figure 24, most high wind events occur in the spring and winter months. Two events led to the injury of six individuals. The events identified by the NCEI are listed in *Section Seven: Participant Sections* for each county.

Figure 24: High Wind Events by Month



Source: NCEI, 1996-2017

[63] Storm Prediction Center: National Oceanic and Atmospheric Administration. 1805. "Beaufort Wind Scale." Accessed August 2017. http://www.spc.noaa.gov/faq/tornado/beaufort.html.

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 $153,630 per year in property damage, and an average of $375,227 per year in crop damage for the planning area.

Table 72: High Wind Loss Estimate

Hazard Type	Number of Events[1]	Events Per Year	Total Property Loss[1]	Average Annual Property Loss[1]	Total Crop Loss[2]	Average Annual Crop Loss[2]
High Winds	57	2.7	$3,226,240	$153,630	$6,003,632	$375,227

1 Indicates the data is from NCEI (January 1996 to April 2017); 2 Indicates data is from USDA RMA (2000 to 2016)

PROBABILITY

Based on historical records and reported events, it is likely that high winds will occur within the planning area annually. For the 21 years examined, there were 57 reported high wind events reported.

REGIONAL VULNERABILITIES

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

Table 73: Regional High Wind Vulnerabilities

Sector	Vulnerability
People	-Vulnerable populations include those living in mobile homes, especially if they are not anchored properly -People outdoors during events
Economic	-Agricultural losses -Damages to businesses and prolonged power outages can cause significant impacts to the local economy
Built Environment	-All building stock are at risk to damages from high winds
Infrastructure	-Downed power lines and power outages -Downed trees blocking road access
Critical Facilities	-All critical facilities are at risk to damages from high winds

SEVERE THUNDERSTORMS

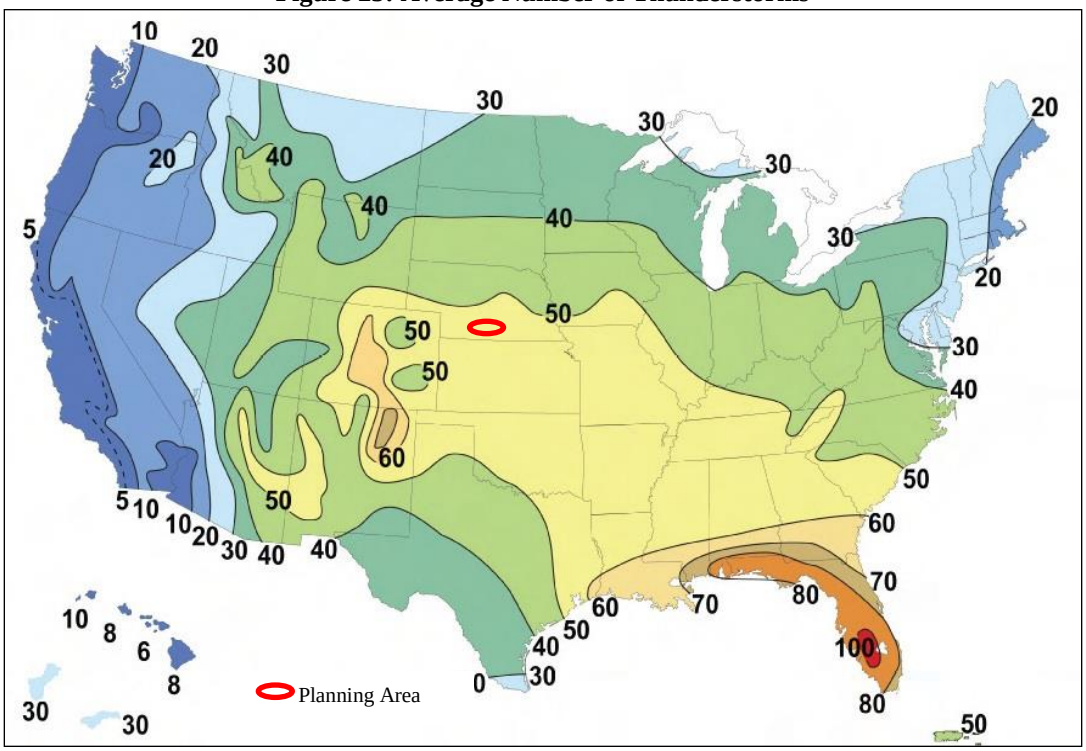
HAZARD PROFILE

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 25 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 25: Average Number of Thunderstorms



Source: NWS, 2017[64]

[64] National Weather Service. 2017. "Introduction to Thunderstorms." http://www.srh.noaa.gov/jetstream/tstorms/tstorms_intro.html.

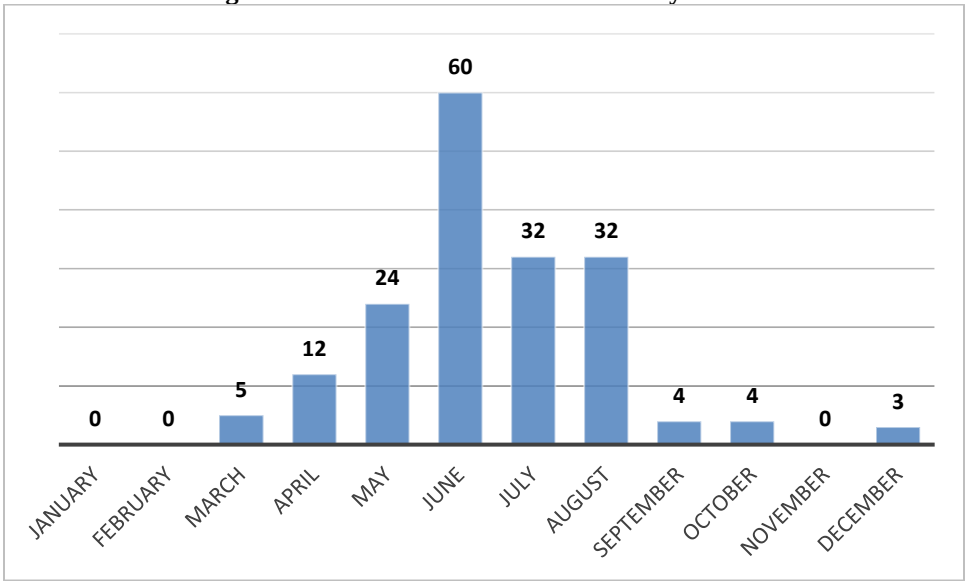
LOCATION
The entire planning area is at risk of severe thunderstorms.

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 26).

Figure 26: 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 176 thunderstorm wind, 17 heavy rain, and one lightning event in the planning area from January 1996 to April 2017. Severe thunderstorm events were responsible for $8,442,000 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 $3,907,696 in crop damages. There were no injuries or 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 $402,001 per year in property damages.

Table 74: Severe Thunderstorms Loss Estimate

Hazard Type	Number of Events[1]	Events Per Year	Total Property Loss[1]	Average Annual Property Loss	Total Crop Loss[2]	Average Annual Crop Loss
Thunderstorm Wind	176	8.4	$7,922,000	$377,238	N/A	N/A
Heavy Rain	17	0.8	$20,000	$953	$3,907,696	$244,231
Lightning	1	0.05	$500,000	$23,810	N/A	N/A
Total	**194**	**9.25**	**$8,442,000**	**$402,001**	**$3,907,696**	**$244,231**

1 Indicates the data is from NCEI (January 1996 to April 2017); 2 Indicates data is from USDA RMA (2000 to 2016)

PROBABILITY

Based on historical records and reported events, severe thunderstorms are likely to occur on an annual basis. The NCEI reported 194 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 75: 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 15.6°F). The average high temperatures for the months of January, February, and December are near 38.6°F.[65]

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 27 shows the SPIA index.

[65] High Plains Regional Climate Center. 2017. "Monthly Climate Normals 1981-2010." http://climod.unl.edu/.

Figure 27: SPIA Index

The Sperry-Piltz Ice Accumulation Index, or "SPIA Index" – Copyright, February, 2009

ICE DAMAGE INDEX	* AVERAGE NWS ICE AMOUNT (in inches) *Revised-October, 2011	WIND (mph)	DAMAGE AND IMPACT DESCRIPTIONS
0	< 0.25	< 15	Minimal risk of damage to exposed utility systems; no alerts or advisories needed for crews, few outages.
1	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	
2	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	
3	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	
4	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	
5	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.)

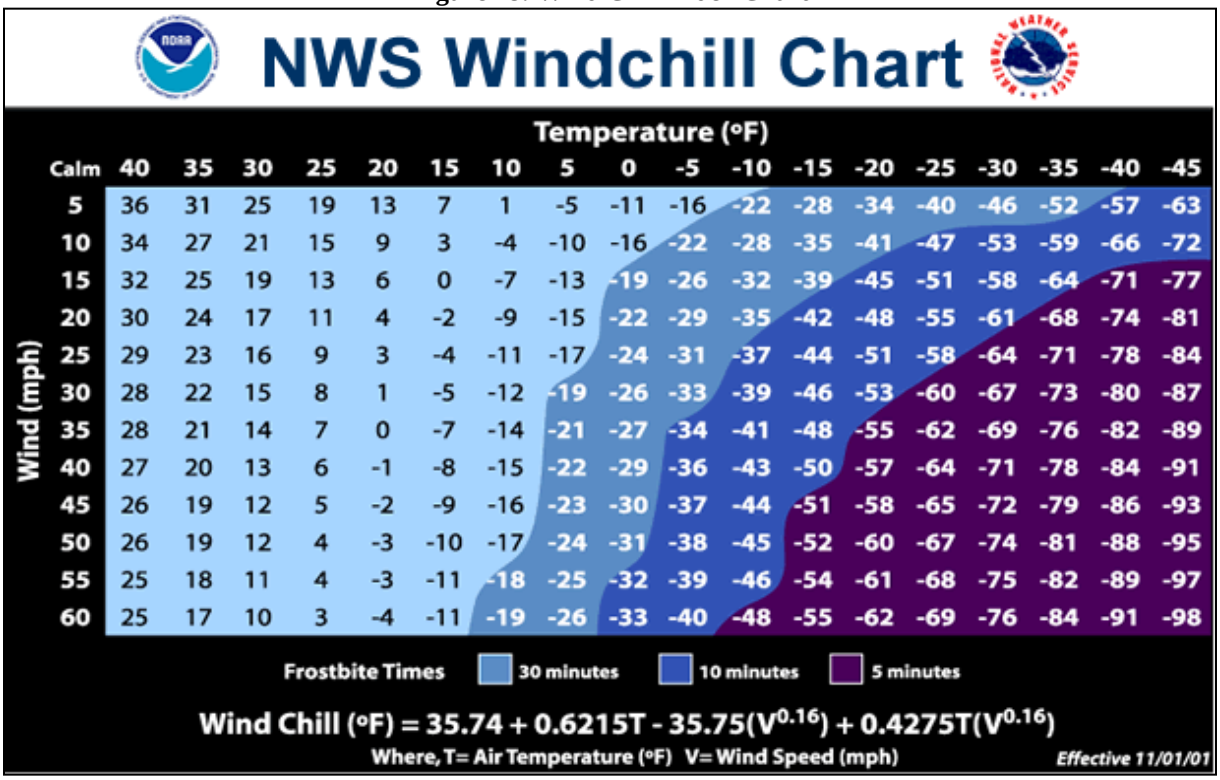
Source: SPIA-Index, 2017[66]

According to the NCEI, 18 ice storms were reported between January 1996 and April 2017. These storms did not result in injuries or deaths, but reported $21,765,000 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 28 shows the Wind Chill Index used by the NWS.

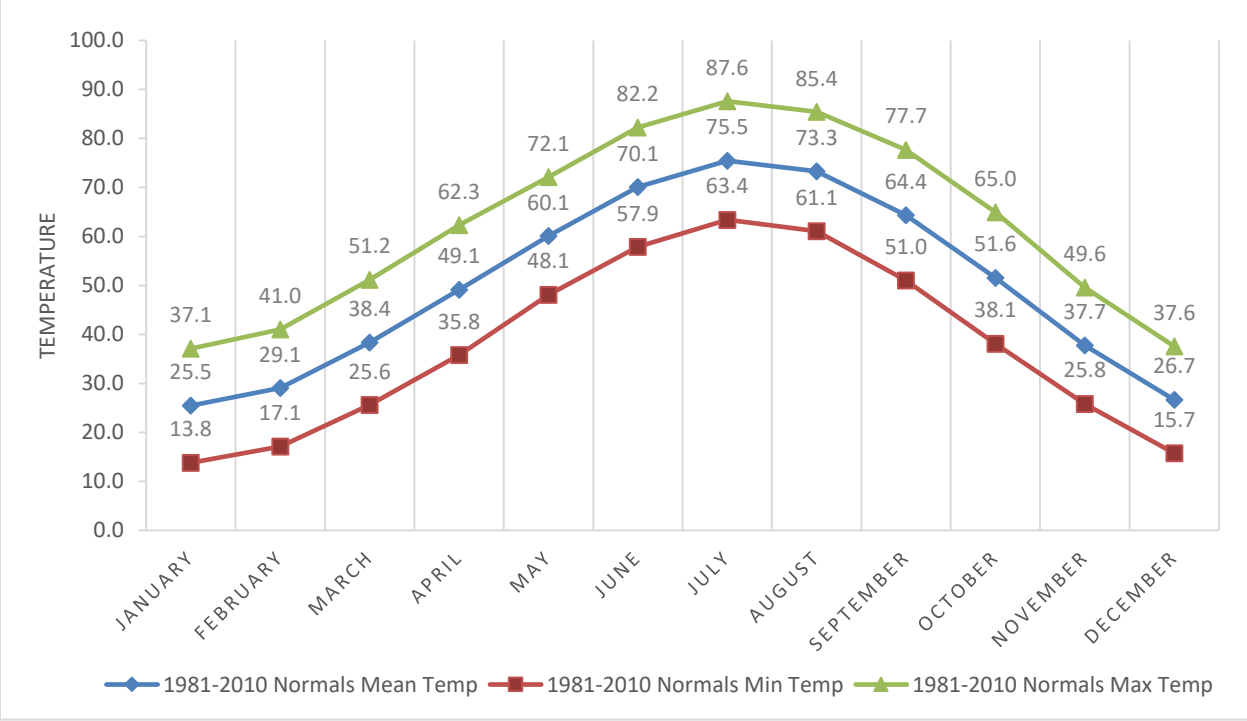
[66] SPIA-Index. 2009. "Sperry-Piltz Ice Accumulation Index." Accessed June 2017. http://www.spia-index.com/index.php.

Figure 28: Wind Chill Index Chart



Source: NWS, 2017[67]

Figure 29: Monthly Normal Temperature (1981-2010)



Source: High Plains Regional Climate Center, 2017

[67] National Weather Service. 2001. "Wind Chill Chart." Accessed June 2017. http://www.nws.noaa.gov/om/cold/wind_chill.shtml.

The coldest months of the year are December, January, and February and normal lows for these months average around 16°F as shown in Figure 29.

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 205 severe winter storm events for the planning area from January 1996 to April 2017. These recorded events caused a total of $23,130,000 in property damages, one injury, but no fatalities.

The NCEI recorded a total of 18 blizzard events, causing $750,000 in property damages and no directly related injuries; eight heavy snow events, causing no property damages; 18 ice storm events, causing $21,765,000 in property damages; 108 winter storm events with $600,000 in property damages and one injury; 49 winter weather events, causing $15,000 in property damages; and four extreme cold/wind chill events causing no damages.

Additional information from these events from NCEI and reported by each community are listed in each participant section in *Section Seven: Participant Sections*.

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 $1,101,428 per year in property damage for the planning area.

Table 76: Severe Winter Storm Loss Estimate

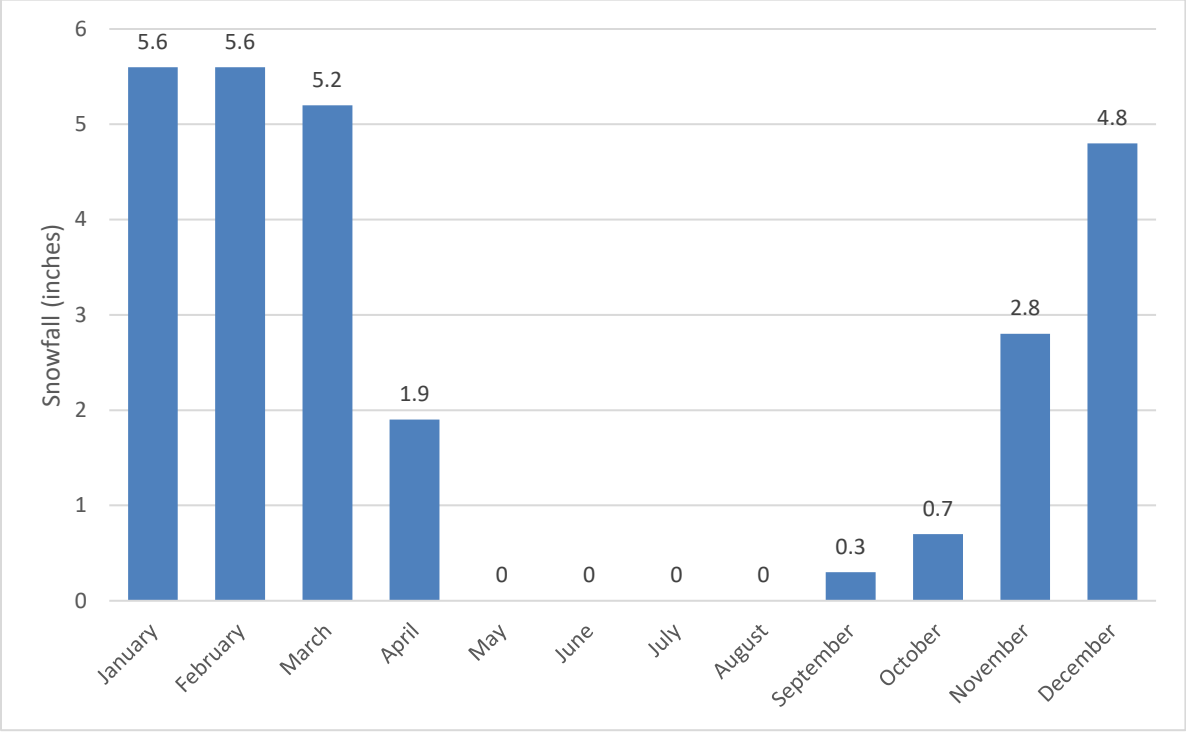
Hazard Type	Number of Events[1]	Average Number of Events Per Year[1]	Total Property Loss[1]	Average Annual Property Loss [1]	Total Crop Loss[2]	Average Annual Crop Loss [2]
Blizzard	18	0.9	$750,000	$35,714	$2,854,140	$178,384
Heavy Snow	8	0.4	$0	$0		
Ice Storm	18	0.9	$21,765,000	$1,036,439		
Winter Storm	108	5.1	$600,000	$28,571		
Winter Weather	49	2.3	$15,000	$714		
Extreme Cold/Wind Chill	4	0.2	$0	$0		
Severe Winter Storms	**205**	**9.8**	**$23,130,000**	**$1,101,428**	**$2,854,140**	**$178,384**

[1]Indicates the data is from NCEI (January 1996 to April 2017); 2Indicates data is from USDA RMA (2000 to 2016)

PROBABILITY

Average monthly snowfall for the planning area is shown in Figure 30, which shows the snowiest months are between December and March. A common snow event (likely to occur annually) will result in accumulation totals between one 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 30: Monthly Normal (1981-2010) Snowfall in Inches



Source: High Plains Regional Climate Center, 2017

REGIONAL VULNERABILITIES

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

Table 77: 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

According to the Federal Bureau of Investigation (FBI), there is no single, universally accepted definition of terrorism. Terrorism is defined in the Code of Federal Regulations as "the unlawful use of force and violence against persons or property to intimidate or coerce a government, the civilian population, or any segment thereof in furtherance of political or social objectives" (28 C.F.R. Section 0.85).

The FBI further 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.

Note: The FBI investigates terrorism-related matters without regard to race, religion, national origin, or gender. Reference to individual members of any political, ethnic, or religious group in this report is not meant to imply that all members of that group are terrorists. Terrorists represent a small criminal minority in any larger social context.

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 within the Federal Department of Homeland Security is a component of the National Programs and Protection Directorate.

The Office of Infrastructure Protection (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 (HSAS) which was the color-coded system put in place after the September 11th 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 - 2016.[68]

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, 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 45 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 78: 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

[68] National Consortium for the Study of Terrorism and Responses to Terrorism (START). 2016. Global Terrorism Database [Data file]. Retrieved from https://www.start.umd.edu/gtd.

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:

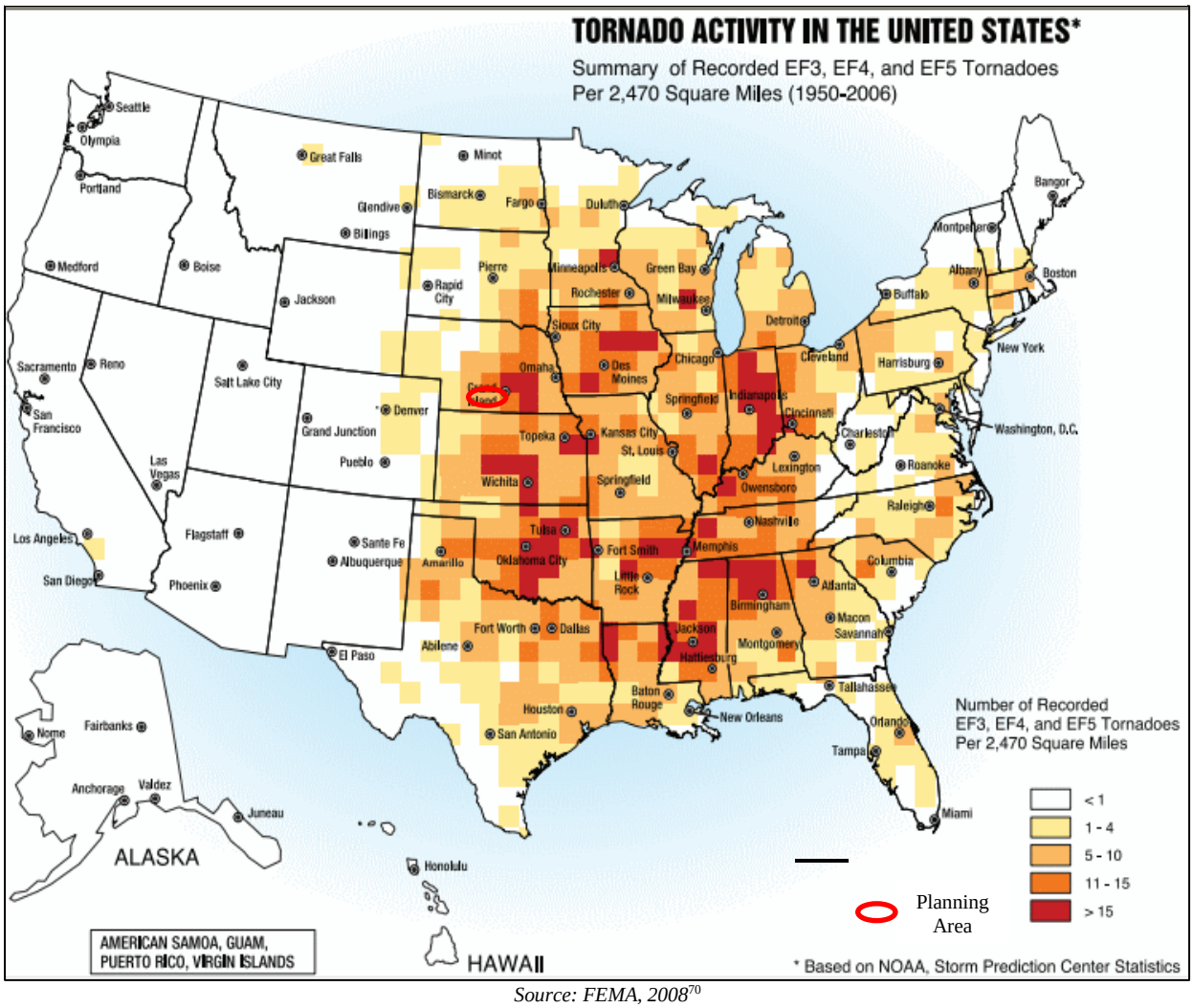
- There must be a microscale rotating area of wind, ranging in size from a few feet to a few miles wide;
- The rotating wind, or vortex, must be attached to a convective cloud base and must be in contact with the ground; and,
- The spinning vortex of air must have caused enough damage to be classified 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.[69] 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.

[69] National Centers for Environmental Information. 2013. "U.S. Tornado Climatology." https://www.ncdc.noaa.gov/climate-information/extreme-events/us-tornado-climatology.

Figure 31: Tornado Activity in the United States



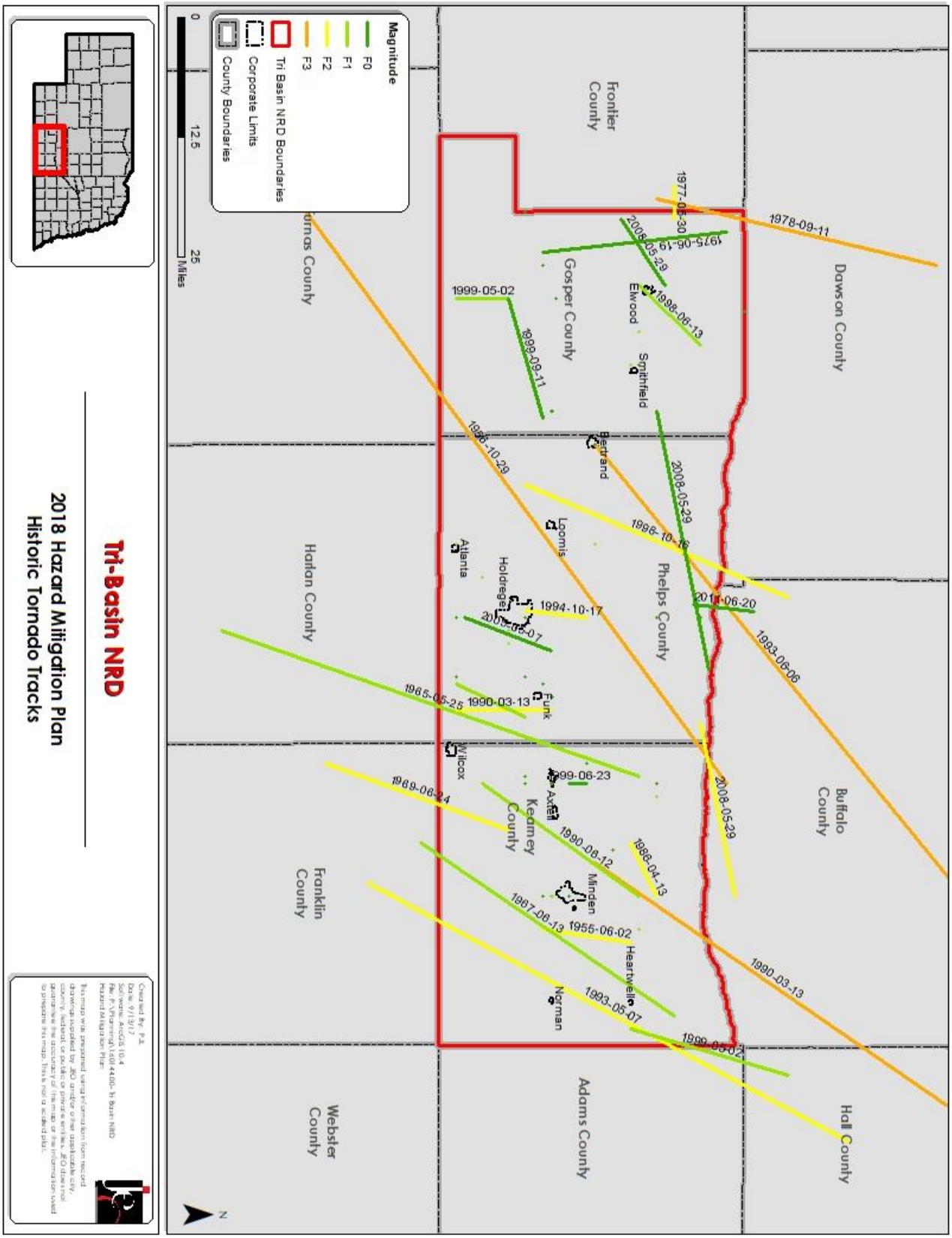
Source: FEMA, 2008[70]

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 2016. Note that this map shows tornado tracks for EF-0 and EF-1.

[70] Federal Emergency Management Agency. August 2008. "Taking Shelter From the Storm: Building a Safe Room for Your Home or Small Business, 3rd edition."

Figure 32: 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 79 and Table 80 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.[71]

Table 79: 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

[71] 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 80: Enhanced Fujita Scale Damage Indicator

Number	Damage Indicator
1	Small barns, farm outbuildings
2	One- or two-family residences
3	Single-wide mobile home (MHSW)
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.
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

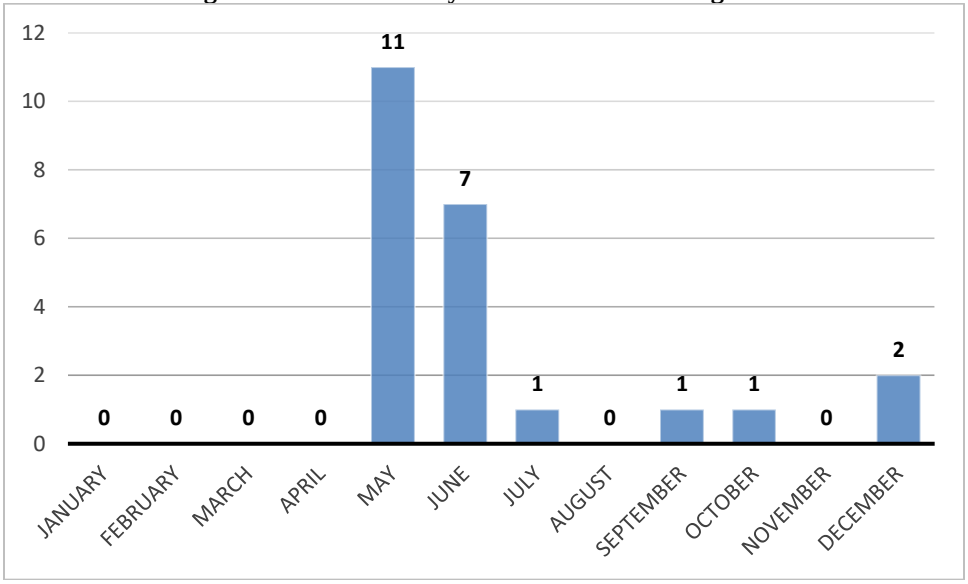
Based on the historic record, it is most likely that tornadoes that occur within the planning area will be of EF0 strength. Of the 30 reported events, four were F/EF1 and two were F/EF2.

HISTORICAL OCCURRENCES

NCEI cites 30 tornadic events ranging from a magnitude of EF0 to EF2 between 1996 and 2017. These events were responsible for $2,330,000 in property damages. No deaths were reported; however, four injuries were cited during one event. The most damaging tornadoes occurred in Phelps County (2011) and Gosper County (1998), each causing $500,000 in damages. The Gosper County tornado led to the injury of four individuals.

The jurisdiction-specific events from NCEI and reported by each community are listed in each participant section in *Section Seven: Participant Sections*. 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 33: 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 $110,952 per year in property damage. The RMA recorded $32,779 in crop damages due to tornadic events.

Table 81: Tornado Loss Estimate

Hazard Type	Number of Events[1]	Average Number of Events Per Year	Total Property Loss[1]	Average Annual Property Loss [1]	Total Crop Loss[2]	Average Annual Crop Loss [2]
Tornadoes	30	1.4	$2,330,000	$110,952	$32,779	$2,048

[1]Indicates the data is from NCEI (January 1996 to April 2017); [2]Indicates data is from USDA RMA (2000 to 2016)

PROBABILITY

Given the 30 events over the course of 21 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 82: 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

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 2013 HMP 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 is 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 2013 HMP. Participating jurisdictions also decided to utilize the same goals.

***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.*

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 the Public

Goal 2: Protect and Maintain Operation of Critical Facilities and Critical Infrastructure After a Hazard

Goal 3: Protect Existing Properties and Natural Resources

Goal 4: Promote Efficient Use of Public Funds

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 Tri-Basin 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 2013 HMP 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 83 is a compilation of the mitigation alternatives identified by jurisdiction and organized by the goal to be met.

Table 83: Mitigation Alternatives Selected by Each Jurisdiction

Mitigation Alternatives	Goal	Tri-Basin NRD	Gosper County	Village of Elwood	Village of Smithfield	Kearney County	Village of Axtell	Village of Heartwell	City of Minden	Village of Wilcox	Phelps County	Village of Atlanta	Village of Bertrand	Village of Funk	City of Holdrege	Village of Loomis	Axtell Schools	Bertrand Schools	Elwood Schools	Holdrege Schools	Minden Schools	Wilcox-Hildreth Schools
		NRD	Gosper County			Kearney County					Phelps County						Schools					
Backup Generators	2	X	X	X			X		X					X	X		X	X	X	X	X	X
Bury Power and Service Lines	2					X			X													
Civil Service Improvements	2,4			X																		
Develop Dam Failure Emergency Action and Evacuation Plans	3	X																				
Electrical System Looped Distribution/Redundancies	2								X						X							
Emergency Exercise: Dam Failure	3	X																				
Emergency Exercise: Hazardous Spill	3			X													X					
Facility Security	1,2																		X			
First Aid Training	1																					X
Forestry Management	3	X																				
Groundwater Recharge	3	X																				
Hazardous Tree Removal	3													X								
Implement Water System Improvements	1,4								X													
Improve and Revise Snow/Ice Removal Program	2						X															

Mitigation Alternatives	Goal	Tri-Basin NRD	Gosper County	Village of Elwood	Village of Smithfield	Kearney County	Village of Axtell	Village of Heartwell	City of Minden	Village of Wilcox	Phelps County	Village of Atlanta	Village of Bertrand	Village of Funk	City of Holdrege	Village of Loomis	Axtell Schools	Bertrand Schools	Elwood Schools	Holdrege Schools	Minden Schools	Wilcox-Hildreth Schools
		NRD	**Gosper County**			**Kearney County**					**Phelps County**						**Schools**					
Infrastructure Hardening	3	X																				
Install Vehicular Barriers	1,2			X																		
Map Municipal Infrastructure	2,4															X						
New Warning Sirens	1		X			X				X				X	X							
Public Awareness/Education	1	X		X		X																
Remove Flow Constrictions	3									X												
Rescue/Snow Removal	2			X																		
Reverse 911 System	1,4					X																
School Continuity Plan	1																X					
Snow Removal Resources	2																					X
Source Water Contingency Plan	1,3,4									X												
Storm Shelter Identification	1															X						
Storm Shelters/Safe Rooms	1				X						X	X	X					X		X	X	X
Stormwater System and Drainage Improvements	1,2,3, 4	X	X	X					X					X	X							
Streambank Stabilization	3	X																				
Tornado Safety	1	X																				

Mitigation Alternatives	Goal	Tri-Basin NRD	Gosper County	Village of Elwood	Village of Smithfield	Kearney County	Village of Axtell	Village of Heartwell	City of Minden	Village of Wilcox	Phelps County	Village of Atlanta	Village of Bertrand	Village of Funk	City of Holdrege	Village of Loomis	Axtell Schools	Bertrand Schools	Elwood Schools	Holdrege Schools	Minden Schools	Wilcox-Hildreth Schools
		NRD	**Gosper County**			**Kearney County**					**Phelps County**						**Schools**					
Transportation Drainage Improvements	1,2,3, 4			X																		
Tree Care Ordinance	3															X						
Tree Maintenance Program	3						X		X	X												
Weather Radios	1,4		X			X											X					
Windbreaks/Living Snow Fence	3	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*.

MONITORING, EVALUATING, AND UPDATING THE PLAN

Participants of the TBNRD 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.

***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.*

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.

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 TBNRD 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*[72] guidance, as well as FEMA's *2015 Plan Integration*[73] 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.

[72] 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.

[73] 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.

SECTION SEVEN: PARTICIPANT SECTIONS

PURPOSE OF PARTICIPANT SECTIONS

Participant sections contain information specific to jurisdictions participating in the TBNRD 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)
- Demographics
- Transportation
- Future Development Trends
- Parcel Improvements and Valuations
- Critical Infrastructure and Key Resources
- Historical Hazard Events (County Level)
- Hazard Prioritization
- Governance
- Capability Assessment
- Plan Integration
- Mitigation Actions

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.*