Hazard Mitigation Planning Team

NAME	TITLE
Leon "Butch" Koehlmoos	Lower Loup NRD General Manager
Larry Schultz	Lower Loup NRD Information/Education Coordinator
Russell Callan	Lower Loup NRD Assistant General Manager
Alma Beland	Region 26 Emergency Manager
Tom Smith	Region 44 Emergency Manager
Michelle Woitalewicz	Howard County Emergency Manager
Tim Hofbauer	Platte County Emergency Manager
Mark Rempe	Custer County Emergency Manager
*Mary Baker	State of Nebraska Hazard Mitigation Officer
*Mitch Paine	NDNR State NFIP Coordinator
*Jeff Henson	JEO Consulting Group, Inc.
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*Brooke Welsh	JEO Consulting Group, Inc.
*Ellana Haakenstad	JEO Consulting Group, Inc.

**Served as an advisory or consultant role*

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ACS – American Community Survey
CDBG – Community Development Block Grant
CDC – Center for Disease Control
CF – Critical Facilities
CFR – Code of Federal Regulations
CIKR – Critical Infrastructure and Key Resources
CLABSI – Central Line-Associated Bloodstream Infections
CRS – Community Rating System
CWD – Chronic Wasting Disease
DEM – Digital Elevation Model
DFIRM – Digital Flood Insurance Rate Map
DHHS – Department of Health and Human Services
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
EOC – Emergency Operation Center
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
HAZUS-MH – Hazards United States Multi-Hazard
HMA – Hazard Mitigation Assistance
HMGP – Hazard Mitigation Grant Program
HMP – Hazard Mitigation Plan
HSAS – Homeland Security Advisory System
HUD – Department of Housing and Urban Development
IBC – International Building Code
JEO – JEO Consulting Group, Inc.
LEOP – Local Emergency Operations Plan
LFD – Livestock Forage Disaster Assistance Program
LGA – Liquid Gallon
LIP – Livestock Indemnity Program
LLNRD – Lower Loup Natural Resource District
MHSW – Mobile Home Single Wide
MPH – miles per hour
MRCC – Midwestern Regional Climate Center
MRS – Medical Response System
NCEI – National Centers for Environmental Information
NDA – Nebraska Department of Agriculture
NDEQ – Nebraska Department of Environmental Quality
NDMC – National Drought Mitigation Center
NDNR – Nebraska Department of Natural Resources
NDOR – Nebraska Department of Roads
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
NTAS – National Terrorism Advisory System
NWS – National Weather Service
PDM – Pre-Disaster Mitigation Program
PDSI – Palmer Drought Severity Index
PHMSA – U.S. Pipeline and Hazardous Material Safety Administration
RMA – Risk Management Agency
SBA – Small Business Administration
SFHA – Special Flood Hazard Area
SEP – Syringe Exchange Program
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
TORRO – Tornado and Storm Research Organization
TRIMRS – Tri-City Medical Response System
UNMC – University of Nebraska Medical Center
USDA – United States Department of Agriculture
USGS – United States Geological Survey
WMA – Wildlife Management Area
WUI – Wildland Urban Interface

INTRODUCTION

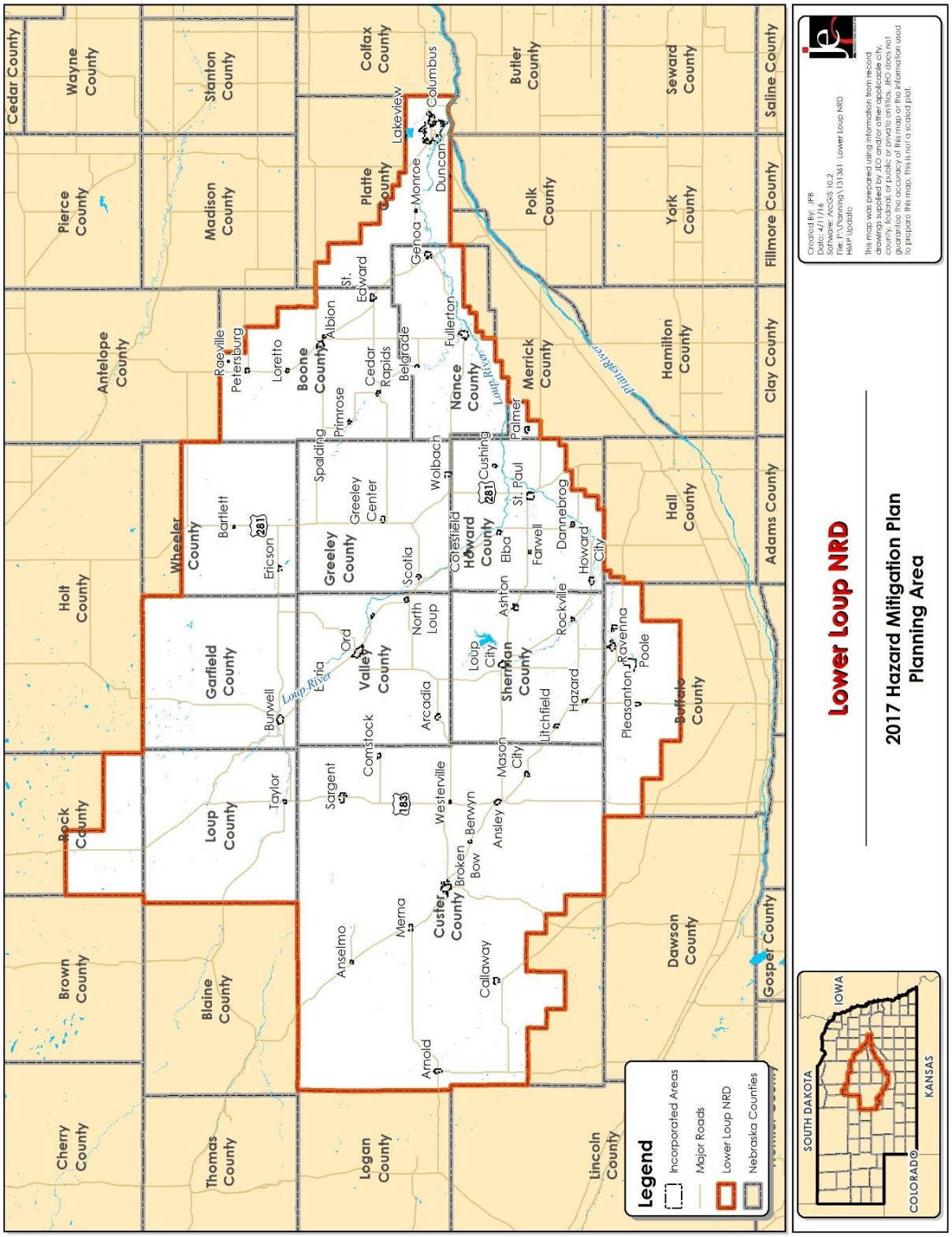
This plan is an update to the Lower Loup Natural Resources District (LLNRD) Multi-Hazard Mitigation Plan (HMP) approved in 2012. The plan update was developed in compliance with the requirements of the Disaster Mitigation Act of 2000 (DMA 2000).

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. The goal of the process is to reduce risk and vulnerability, in order to lessen impacts to life, the economy, and infrastructure. Hazard mitigation planning increases the ability of communities to effectively function in the face of natural and manmade disasters. Plan participants are listed in the following table.

Table 1: Participating Jurisdictions

Participating Jurisdictions	
LLNRD	St. Paul
Boone County	**Loup County**
Albion	Taylor
Cedar Rapids	**Nance County**
Petersburg	Belgrade
St. Edward	Fullerton
Boone Central Schools	Genoa
Custer County	**Platte County**
Anselmo	Columbus
Ansley	Monroe
Arnold	**Sherman County**
Broken Bow	Ashton
Callaway	Litchfield
Comstock	Loup City
Mason City	Rockville
Sargent	**Valley County**
Garfield County	Arcadia
Burwell	Elyria
Greeley County	North Loup
Greeley Village	Ord
Scotia	**Wheeler County**
Spalding	Bartlett
Wolbach	Ericson
Howard County	**Misc. Jurisdictions**
Boelus	East Central District Health Department
Cotesfield	Farwell Irrigation District
Cushing	North Loup River Public Power & Irrigation District
Dannebrog	Region 26 Emergency Management
Elba	Sargent Irrigation District
Farwell	Twin Loups Irrigation District

Figure 1: Map of Planning Area



GOALS AND OBJECTIVES

The potential for disaster losses and the probability of occurrence of natural and manmade 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 2012 would be carried forward and utilized for the 2017 plan. The goals for this plan update are as follows:

Goal 1: Protect Public Health and Safety from Hazard Events

Goal 2: Protect Existing and New Properties from Hazard Events

Goal 3: Increase Public Awareness and Education about Hazard Events

SUMMARY OF CHANGES

Several changes were made to the 2012 Hazard Mitigation Plan and planning process, including: the inclusion of man-made 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 2012 Hazard Mitigation Plan. Many of these projects are related to hazard monitoring, warning systems and/or educating community members. 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 to implement mitigation projects, despite limited resources, communities will need to continue relying upon multi-agency coordination as a means of leveraging resources. Communities across the LLNRD 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 (NDNR), Nebraska Emergency Management Association (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 occurrence and recurrence interval, 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 Occurrence

Regional Risk Assessment			
Hazard	**Previous Occurrence Events/Years**	**Approximate Annual Probability**	**Likely Extent**
Agricultural Animal Disease	11/2	100%	Unavailable
Agricultural Plant Disease	79 /15	100%	Unavailable
Chemical Fixed Sites	53 /27	100%	1,215 Gallons
Chemical Transportation	42/40	100%	694 Gallons
Dam Failure	6/50	12%	Inundation of floodplain downstream from dam
Drought	444 events/1452 months	30.6%	D2
Earthquakes	4/139	2.9%	<4.0
Extreme Heat	40/1	100%	>90˚
Flooding	123/20	100%	Some inundation of structures* (<1% of structures) and roads near streams. Some evacuations of people may be necessary (<1% of population)
Grass/Wildfires	1,784/15	100%	<100 acres
Hail	1,752/20	100%	H3-H6
High Winds	176/20	100%	9 BWF
Levee Failure	0	~1%	Structures located in protected areas*
Public Health Epidemic	34/3	100%	Unavailable
Severe Thunderstorms	546/20	100%	≥1” rainfall 25-40 mph winds
Severe Winter Storms	661/20	100%	.25 - .5” ice 10-20˚below zero (wind chills) 4-8” snow 25-40 mph winds
Terrorism	3/45	7%	Undefined
Tornadoes	134/20	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		Property Loss	Crop Loss[2]
Agricultural Disease	**Animal Disease**	N/A	N/A
	Plant Disease	N/A	$893,921
***Chemical Spills (Transportation)[5]**		$184,463	N/A
Chemical Spills (Fixed Site)[6]		N/A	N/A
Dam Failure		N/A	N/A
Drought[4]		$33,000,000	$209,352,874
Earthquakes		N/A	N/A
Extreme Heat[4]		$0	$44,979,391
Flooding	**Flash Flood[1]**	$6,542,200	$2,163,781
	Flood[1]	$1,733,000	
Grass/Wildfires[3]		$0	$19,568
Hail[1] Average: 1.17” Range: 0.75- 4.5”		$25,103,900	$90,022,627
High Winds[4] Average: 47 kts Range: 35-62 kts		$1,350,400	$16,534,198
Levee Failure		$0	$0
***Severe Thunderstorms[1]**	**Thunderstorm Wind** Average: 56 kts Range: 43-95 kts	$13,592,700	$0
	Heavy Rain	$565,000	N/A
	Lightning	$364,000	N/A
***Severe Winter Storms**	**Blizzard[1]**	$2,959,250	N/A
	Heavy Snow[1]	$0	
	Ice Storm[1]	$6,936,000	
	Winter Storm[1]	$12,043,000	
	Winter Weather[1]	$20,000	
	Extreme Cold/Wind Chill[1]	$0	
Terrorism		$0	$0
Tornado[1] Average: EF0 Range: EF0-EF3		$13,123,000	$29,298
Total		**$117,656,913**	**$363,995,658**

N/A: Data not available
1 Indicates data is from NCEI (January 1996 to December 2015)
2 Indicates data is from USDA (2000 to 2014)
3 Indicates data is from NFS (2000 to 2012)
4 Indicates data is from HPRCC (1927-2016)
5 Indicates data is from PHSMA (1974-2014)
6 Indicates data is from U.S. Coast Guard NRC (1990-2016)
**Refers to occurrences not population affected*

Events like agricultural disease, flooding, extreme heat, grass and wildfires, severe thunderstorms, and severe winter storms will occur annually. Other hazards like drought, dam failure, earthquakes, levee failure, 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, flooding, hail, severe thunderstorms, severe winter storms, and tornadoes have resulted in the most significant damages within the planning area. These hazards are summarized below.

DROUGHT

Drought is a regular and reoccurring phenomenon in the planning area and the state of Nebraska. Historic 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 resulting from drought is focused on the agricultural industry. Over $209 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.

FLOODING

Flash flooding and riverine flooding are common for the planning area due to the regular occurrence of severe thunderstorms in spring and summer, and the proximity of rivers to many communities. Flooding can occur on a local level, only affecting a few streets, but can also extend throughout an entire district, affecting whole drainage basins.

The planning area expects loss inducing floods to occur on an annual basis with 123 flooding events being recorded by the National Centers for Environmental Information (NCEI) over nearly 20 years. These 123 events have resulted in $8,275,200 in property damages, and $2,163,781 in total crop losses.

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. NCEI has recorded 1,752 hail events in 20 years. These events have caused over $25 million in property damages. 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.

Hail events are usually large scale events which can impact multiple communities as well as unincorporated areas of the county. While all segments of the population are vulnerable to the impacts of hail, there are a few groups with higher levels of vulnerability. Community members who reside in mobile homes are at an increased risk of injury and loss resulting from hail storms. Elderly residents may also be more vulnerable to hail events due to decreased mobility and may suffer from prolonged power outages.

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 having the potential to be impacted multiple times in one day. Severe thunderstorms are most likely to occur between the months of May and September with the highest number of events occurring in June. The NCEI recorded 546 severe thunderstorm events in 20 years. These events caused over $14.5 million in property damages. Typical impacts resulting from severe thunderstorms include (but are not limited to): loss of power, obstruction to

transportation routes, grass/wildfires starting from lightning strikes, localized flooding, and damages discussed in the hazard profiles for hail and high winds as these are typical component of severe thunderstorms.

Vulnerable populations related to severe thunderstorms include: residents of mobile homes (nine 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 counties with "CodeRED" reverse 911 systems which has helped community members be aware of any 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 661 severe winter storm events that caused nearly $22 million in property damages in 20 years. Impacts resulting from severe winter storms include (but are not limited to): hypothermia and frost bite, death to those trapped outdoors, closure of transportation routes, downed power lines and prolonged power outages, collapse of roofs from heavy snow loads, death of livestock, and closure of critical facilities.

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

TORNADOES

Tornadoes occur in the planning area on an annual basis. The NCEI reports 134 tornadoes for the planning area since 1996. These tornadic events have caused over $13 million in property damages. Impacts from past tornadoes in the planning area include: damages to homes, vehicles, and agricultural buildings; downing of power lines; and destruction center pivot irrigation systems.

Vulnerable populations within the planning area include residents living in mobile homes (5.5 percent of all housing units), facilities without storm shelters which house large numbers of people (such as nursing homes, hospitals, schools, factories, etc.), homeowners without storm shelters or basements, and residents with decreased mobility.

MITIGATION STRATEGIES

There are a wide variety of strategies that can be used to reduce the impacts of hazards for the residents of the planning area as well as the built environment. *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 happen and what jurisdictions have done to mitigate the potential impacts. Mitigation reduces risk and is a socially and economically responsible action to prevent long term risks from natural and man-made 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 a 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. Man-made hazards are a product of the society and can occur with significant impacts to communities. Man-made 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 man-made 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.

LLNRD prepared this multi-jurisdictional hazard mitigation plan in an effort to reduce impacts from natural and manmade 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. This plan was developed to make LLNRD 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 DMA 2000 to amend the Robert T. Stafford Disaster Relief and Emergency Assistance Act. Section 322 of the DMA 2000 requires that state and local governments develop, adopt, and routinely update a hazard mitigation plan in order to remain eligible for pre- and post-disaster mitigation funding. These funds include the Hazard Mitigation Grant Program (HMGP), Pre-Disaster Mitigation Program (PDM), and the Flood Mitigation Assistance Program (FMA). These programs are administered by the Federal Emergency Management Agency (FEMA) under the Department of Homeland Security (DHS).

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) and by FEMA's Final Rule (FR) 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.

Each HMA program was authorized by separate legislative action, 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.

PLAN FINANCING AND PREPARATION

In regard to plan financing and preparation, in general, the LLNRD 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.

INTRODUCTION

The process utilized to develop a hazard mitigation plan is often as important as the final planning document. For this planning process the LLNRD 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; key 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 LLNRD utilized the multi-jurisdiction planning process recommended by FEMA (Local Mitigation Plan Review Guide October 2011, Local Mitigation Planning Handbook March 2013, and Mitigation Ideas: A Resource for Reducing Risk to Natural Hazards January 2013) to develop this plan.

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 may result in new goals or additional risk assessment.

- 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 impacts they could have 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.

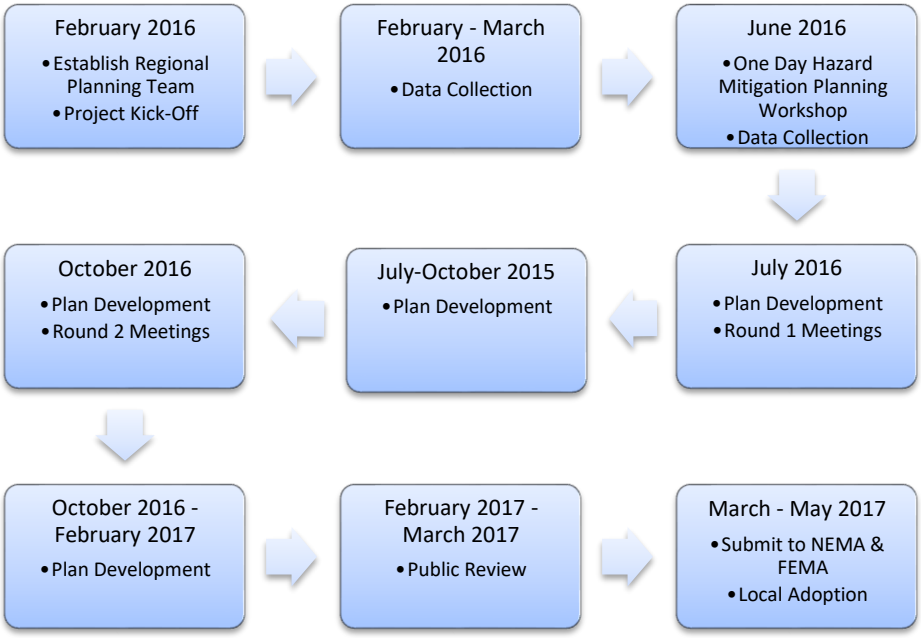
ORGANIZATION OF RESOURCES

PLAN UPDATE PROCESS

The LLNRD began the process of securing funding for their multi-jurisdictional hazard mitigation plan (HMP) in June, 2015. JEO Consulting Group, INC. (JEO) was contracted in July 2015 to guide and facilitate the planning process and assemble the multi-jurisdictional hazard mitigation plan. For the planning area, Larry Schultz (Information/Education Coordinator with LLNRD) 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 LLNRD HMP update was coordination of efforts with local, state, and federal agencies and organizations. NDNR and NEMA became involved in the planning process. LLNRD 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 NDNR.

Table 4: Hazard Mitigation Planning Team

Name	Title	Jurisdiction
Leon "Butch" Koehlmoos	General Manager	Lower Loup NRD
Larry Schultz	Information/Education Coordinator	Lower Loup NRD
Russell Callan	Assistant General Manager	Lower Loup NRD
Alma Beland	Emergency Manager	Region 26 Emergency Management
Tom Smith	Emergency Manager	Region 44 Emergency Management
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*Mary Baker	State Hazard Mitigation Officer	NEMA
*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 April 14, 2016 with the LLNRD 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
April 14, 2016	
Lower Loup NRD 2620 Airport Drive Ord, NE 68862 10:00 AM	-Consultant responsibilities -Planning Team responsibilities -Dates/Locations for meetings -Plan Goals/Objectives -Workshop Details

HMP WORKSHOP

A Hazard Mitigation Planning Workshop was held prior to the start of Round 1 meetings on June 9, 2016. All jurisdictions within the planning area were invited to attend. The workshop enabled plan participants to better understand the hazard mitigation planning process. A tornado scenario table-top exercise kicked off the workshop where attendees were put into small groups for discussion. Participants were asked to assess jurisdictional vulnerabilities identify vital economic sectors, review critical facilities and infrastructure, and consider alternatives to protect jurisdictional assets. The exercise was followed by an introduction to hazard mitigation, the risk assessment process, identifying mitigation actions, and the importance of public outreach.

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 over 100 stakeholders that were identified and sent letters to participate. These included 11 airports, 6 assisted living facilities, 4 economic development districts, 14 hospitals, 9 nursing homes, 103 private schools, and 30 fire and rescue departments. The following groups were also invited to participate in the planning process.

Table 6: Notified Stakeholder Groups

Organizations		
Samaritan Estates	Sargent Fire Department	Jennie M. Melham Memorial Medical Center
Quality Senior Villages	Burwell Rural Fire District	Callaway District Hospital
Greeley Care Home	Greeley Fire Department	Spalding Medical Clinic
Matelyn Retirement Community	Scotia Rural Fire District	Howard County Community Hospital
Valley View Assisted Living	Wolbach Fire and Rescue	Genoa Community Hospital
Grandview Assisted Living	Boelus Fire Department	Columbus Community Hospital
Columbus Urgent Care LLC	Dannebrog Volunteer Fire Department	Loup City Medial Clinic
Northeast Nebraska Economic Development District	Elba Fire and Rescue	Valley County Health System
Custer County Economic Development Corp.	Farwell Volunteer Fire/Rescue	Custer Care Center Inc.
Central Nebraska Economic Development District	Cotesfield Village Fire Department	Callaway Good Life Center
South Central Economic Development District	Saint Paul Volunteer Fire Department	Heritage Living Center
Albion Fire Department	Belgrade Volunteer Fire Department	Christ Lutheran School
Cedar Rapids Fire Department	Genoa Fire Department	Columbus Christian School
Ansley Fire Department	Litchfield Fire and Rescue	St. Mary Elementary School
Arnold Fire Department	Arcadia Volunteer Fire Department	Rose Lane Home
Broken Bow Fire Station	North Loup Fire Department	Loup Power District
Callaway Rural Fire Department	Ord Volunteer Fire Department	Loup Valley Rural PPD
Comstock Rural Fire Protection District	Ericson Volunteer Fire and Rescue	Howard Greeley RPPD
Merna Fire Protection District	Boone County Health Center	Custer PPD
Oconto Fire Department	St. Edward Medical Clinic	Cornhusker PPD

Representatives from several fire departments and Loup Power District 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 as well. 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: Neighboring Jurisdictions Notified

Notified Nebraska Jurisdictions	
Buffalo County	Oconto
Pleasanton	Kearney County
Ravenna	Phelps County
Lincoln County	Gosper County
Butler County	Lower Platte North NRD
David City	Merrick County
Upper Big Blue NRD	Twin Platte NRD
Upper Elkhorn NRD	Central Platte NRD
Upper Loup NRD	

PARTICIPANT INVOLVEMENT

Participants play a key role in reviewing goals and objectives; identification of 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.

In order 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 were able to send 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 B.*

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	To inform the public and local/planning team members of past, current, and future activities (http://jeo.com/llhmp/)
Project Announcement	Project announcement posted on LLNRD project website (http://jeo.com/llhmp/), and the Lower Loup NRD website (https://www.llnrd.org/news)
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	Potential participants were called 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 LLNRD HMP and how to get involved. Flyers were posted at multiple locations throughout all counties.
County Fair Outreach	Flyers and surveys were passed out at the Boone and Nance County fairs
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**
Albion Fire Hall, Albion, NE	7/5/2016 – 10:00 AM
Genoa City Auditorium, Genoa, NE	7/5/2016 – 2:00 PM
Broken Bow City Auditorium, Broken Bow, NE	7/6/2016 – 2:00 PM
Loup Basin Technology Center, Ord, NE	7/7/2016 – 2:00 PM
Howard County Courthouse, St. Paul, NE	7/21/2016 – 7:00 PM

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 2012 LLNRD 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 B* and *C).* 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
Albion		
Bruce Benne	Albion Fire Chief	Albion
Gene Hitchler	Chairman	Spalding
Eric Petsche	Utility Superintendent	Petersburg
Neil Baumgartner	Petersburg Fire Chief	Petersburg
Vet Stuhr	Civil Defense	Petersburg
Cory Worrell	Superintendent	Boone Central Schools
Tom Smith	Emergency Manager	Region 44 Emergency Management
Mark Bauer	Emergency Manager	Greeley County
Hilary Maricle	County Commissioner	Boone County
Sachin Bagade	Public Health Emergency Response Coordinator	East Central District Health Department
Caitlin Olson	Planner	JEO Consulting Group, Inc.
Phil Luebbert	Planner	JEO Consulting Group, Inc.
Genoa		
James Kramer	City Administrator	Fullerton
Gerri Swanson	Clerk	Genoa
Tim Hofbauer	Emergency Manager	Platte County
Tom Smith	Emergency Manager	Region 44 Emergency Management

Name	Title	Jurisdiction
Butch Koehlmoos	General Manager	Lower Loup NRD
Larry Schultz	Information/Education Coordinator	Lower Loup NRD
Phil Luebbert	Planner	JEO Consulting Group, Inc.
Broken Bow		
Craig Kamler	Clerk	Ashton
Gwenda Horky	Clerk	City of Sargent
Reece Jensen	City Administrator/Superintendent	City of Sargent
Alma Beland	Emergency Manager	Region 26 Emergency Management
Bill Moser	Superintendent	Arnold
Sallie Atkins	Agriculture Director to Congressman Adrian Smith	Nebraska's 3rd District
Mark Rempe	Emergency Manager	Custer County
Larry Donner	Sheriff	Garfield County
Robin Christen	Clerk	Anselmo
Mark Christen	Fire Chief	Anselmo
Brent Clark	City Administrator	Broken Bow
Phil Luebbert	Planner	JEO Consulting Group, Inc.
Ord		
Robert Christensen	Village Board Member	Taylor
Bonnie Gilpin	Clerk/Floodplain Manager	Wolbach
Roger Goldfish	Mayor	Ord
Steve Goochie	Sewage Plant Operator	Ord
Randy Faaborg	Chief	Elba Fire Department
Doug Reiter	Emergency Manger/Fire Chief	Wheeler County/Bartlett Fire Department
Gail Payne	Highway Superintendent	Wheeler County
Cherri Klinginsmith	Zoning Administrator	Howard County
Michelle Woitalewicz	Emergency Manager	Howard County
Larry Woitalewicz	Farwell Fire & EMS	Farwell Fire Department
Wayne Reimer	Fire Chief	Boelus Fire Department
Dan Casey	Board Chairman	Greeley County
Jay Meyer	Board Chairperson/Highway Superintendent	Village of Scotia/Howard County
Larry Bruha	Emergency Manager	Sherman County
Alma Beland	Emergency Manager	Region 26 Emergency Manager
Ryan Simpson	Emergency Manager	Valley County
Carrie Hansen	Clerk	Valley-Greeley
Bob Beat	City Administrator	Burwell
Ben Hughes	Police Chief	Burwell
Scott Philbrick	Deputy Emergency Manager	Valley County
Christy Underwood	Village Board Member	Arcadia
Candace Kirwan	Clerk	Comstock
Arlene Johnson	Clerk	Elba
Phil Luebbert	Planner	JEO Consulting Group, Inc.
St. Paul		
Patricia Geiger	Village Board Member	Cushing
Michelle Woitalewicz	Emergency Manager	Emergency Manager
Terry Webb	Fire Chief	Dannebrog Fire Department
Kevin Vogt	Village Board Member	Boelus
Marcus Paczosa	Police Chief	St. Paul

Name	Title	Jurisdiction
Matt Helzer	Utilities Superintendent	St. Paul
Arlene Johnson	Clerk	Elba
Cherri Klinginsmith	Zoning Administrator	Howard County
Michelle Woitalewicz	Emergency Manager	Howard County
Phil Luebbert	Planner	JEO Consulting Group, Inc.

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 2012 HMP to address additional hazards of concern for their jurisdiction. 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 C*).

There was also a brief discussion about the last months of 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 11 shows the date and location of meetings held for the Mitigation Strategies phase of this project.

Table 11: 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**
Judicial Center, Broken Bow, NE	9/8/2016 – 6:30 PM
Albion Fire Hall, Albion, NE	10/4/2016 – 10:00 AM
Genoa City Auditorium, Genoa, NE	10/4/2016 – 2:00 PM
Loup Basin Technology Center, Ord, NE	10/5/2016 – 2:00 PM
Howard County Courthouse, St. Paul, NE	10/27/2016 – 7:00 PM

Meeting attendees are identified in Table 13.

Table 12: Round 2 Meeting Attendees

Name	Title	Jurisdiction
Broken Bow		
Scott Stupka	Chairperson	Anselmo
Mark Rempe	Emergency Manager	Custer County
Eric Nelson	Fire Chief	Arnold
Bill Moser	Superintendent	Arnold
Perry Erikson	Fire Chief	Comstock
Gwenda Horky	Clerk	Sargent
Brent Clark	City Administrator	Broken Bow
Ken Oatman	Fire Chief	Broken Bow
Jonathan Hawkins	Fire Chief	Mason City
Phil Luebbert	Planner	JEO Consulting Group, Inc.

Name	Title	Jurisdiction
Albion		
Mary Ziemba	Zoning Administrator/Floodplain Manager	Boone County
Gary Thompson	Fire Chief	St. Edward
Gene Hitchler	Chairman	Spalding
Mark Bauer	Emergency Manager	Greeley County
Neil Baumgartner	Chief	Petersburg
Dan Casey	Chairperson	Greeley Center
Tom Smith	Emergency Manager	Region 44 Emergency Manager
Andrew Devine	Administrator/Clerk/Treasurer	Albion
Phil Luebbert	Planner	JEO Consulting Group, Inc.
Genoa		
Bill Zoucha	Utilities Supervisor	Monroe
Mike Middendorf	Assistant City Engineer	Columbus
Mary Baldridge	Zoning/Floodplain Administrator	Nance County
Sachin Bagade	Public Health Emergency Response Coordinator	East Central District Health Department
Virgil Gellermann	Board Member	Lower Loup NRD
Tom Smith	Emergency Manager	Region 44 Emergency Manager
Phil Luebbert	Planner	JEO Consulting Group, Inc.
Ord		
Craig Kamler	Clerk	Ashton
Al Klemke	Village Board Member	Litchfield
Alma Beland	Emergency Manager	Region 26 Emergency Management
Alec Baillie	Mayor	Loup City
Matt Lukasiewicz	General Manager	Farwell/Sargent Irrigation District
John Hogmire	Firefighter	Burwell/Garfield County
Robert Christensen	Village Board Member	Taylor
Sheri Goodrich	Planning & Zoning/Floodplain Administrator	Garfield County/Valley County/Arcadia/Elyria/North Loup
Bonnie Gilpin	Clerk/Floodplain Manager	Wolbach
Roger Goldfish	Mayor	Ord
Scott Philbrick	Deputy Emergency Manager	Valley County
Larry Bruha	Emergency Manager	Valley County
Ben Hughes	Chief	Burwell
Sara Switzer	Board Chairperson	Ansley
Doug Weede	Board of Commissioners	Greeley County
Phil Luebbert	Planner	JEO Consulting Group, Inc.
St. Paul		
Patricia Geiger	Village Board Member	Cushing
Michelle Woitalewicz	Emergency Manager	Emergency Manager
Terry Webb	Fire Chief	Dannebrog Fire Department
Kevin Vogt	Village Board Member	Boelus
Matt Helzer	Utilities Superintendent	St. Paul
Arlene Johnson	Clerk	Elba
Michelle Woitalewicz	Emergency Manager	Howard County
Phil Luebbert	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 13: 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)	http://www.fema.gov
Local Mitigation Planning Handbook (2013)	http://www.fema.gov/media-library-data/20130726-1910-25045-9160/fema_local_mitigation_handbook.pdf
Hazard Mitigation Assistance Unified Guidance (2013)	http://www.fema.gov/hazard-mitigation-assistance
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)	http://www.agcensus.usda.gov/
National Flood Insurance Program Community Status Book (2014)	http://www.fema.gov/cis/NE.html
Local Mitigation Plan Review Guide (2011)	http://www.fema.gov
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)	http://www.nema.ne.gov/pdf/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
National Consortium for the Study of Terrorism and Responses to Terrorism (START) (2013)	http://www.start.umd.edu/gtd/
National Flood Insurance Program	http://www.fema.gov http://dnrdata.dnr.ne.gov

Documents	Source
National Flood Insurance Program Bureau and Statistical Agent	http://www.fema.gov/national-flood-insurance-program
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
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 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/program-wildlandfireprotection.asp
Nebraska Association of Resources Districts	http://www.nrdnet.org
Nebraska Public Power District Service	http://sites.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
High Hazard Dam Inundation Area/Information	http://dnr.ne.gov/website

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, if any at that time. The public review period was open from February 15, 2017 through March 17, 2017. 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/llhmp/) to download the document, and a notification was posted to the LLNRD website http://www.llnrd.org/). Comments and changes that were received were incorporated into the plan.

PLAN ADOPTION

Based on FEMA requirements, this multi-jurisdictional hazard mitigation plan must be formally adopted by each participant through approval of a resolution. This approval will create 'individual ownership' of the plan by each participant. Formal adoption provides evidence of a participant's full commitment to implement the plan's goals and objectives and action items.

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

Once adopted, participants are responsible for implementing and updating the plan every five years. Those who participated directly in the planning process would be a logical champion 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. Copies of resolutions approved by each participant are located in *Appendix A.*

PLAN IMPLEMENTATION AND PROGRESS MONITORING

Hazard mitigation plans need to be a living document. 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 LLNRD 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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SECTION THREE: PLANNING AREA PROFILE

INTRODUCTION

In order to identify 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 that will 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 populations at risk and characteristics of the built environment that add to regional vulnerabilities.

PLANNING AREA GEOGRAPHIC SUMMARY

The LLNRD is located is central Nebraska and covers 5,070,720 acres in all or parts of the following counties: Boone, Buffalo, Butler, Custer, Garfield, Greeley, Hall, Howard, Loup, Merrick, Nance, Platte, Rock, Sheridan, Valley, and Wheeler. The district encompasses 514 miles of rivers, including the drainage systems of the lower reaches of the North, Middle, and South Loup River systems. The planning area is largely made up of two topographic regions: dissected plains and sand hills. Dissected plains are represented by hilly land with moderate to steep slopes and sharp ridge crests. Sand hills are hilly lands comprised of low to high dunes of sand stabilized by a grass cover.

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."

There are a number of 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 that are participating in this plan.

Table 14: School Inventory

School District	Total Enrollment (2015-2016)
Boone Central Schools	587
St. Edwards Public Schools	166
Anselmo-Merna Public Schools	271
Ansley Public Schools	158
Arnold Public Schools	149
Broken Bow Public Schools	821
Sargent Public Schools	183
Burwell Public Schools	358
Elba Public Schools	110
St. Paul Public Schools	709
Loup County Public Schools	66
Fullerton Public Schools	317
Twin River Public Schools	486
Columbus Public Schools	3838
Humphrey Public Schools	267
Lakeview Community Schools	840
Litchfield Public Schools	101
Loup City Public Schools	345
Arcadia Public Schools	126
Ord Public Schools	632
Wheeler Central Schools	93
Riverside Public Schools	234
Callaway Public Schools	226
Central Valley Public Schools	309
Centura Public Schools	481

Source: Nebraska Department of Education

Like minors, seniors (age 65 and greater) are often times 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. The 2011 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. The Table 15 identifies the location and capacity of care facilities throughout the planning area.

Figure 3: Regional School Districts

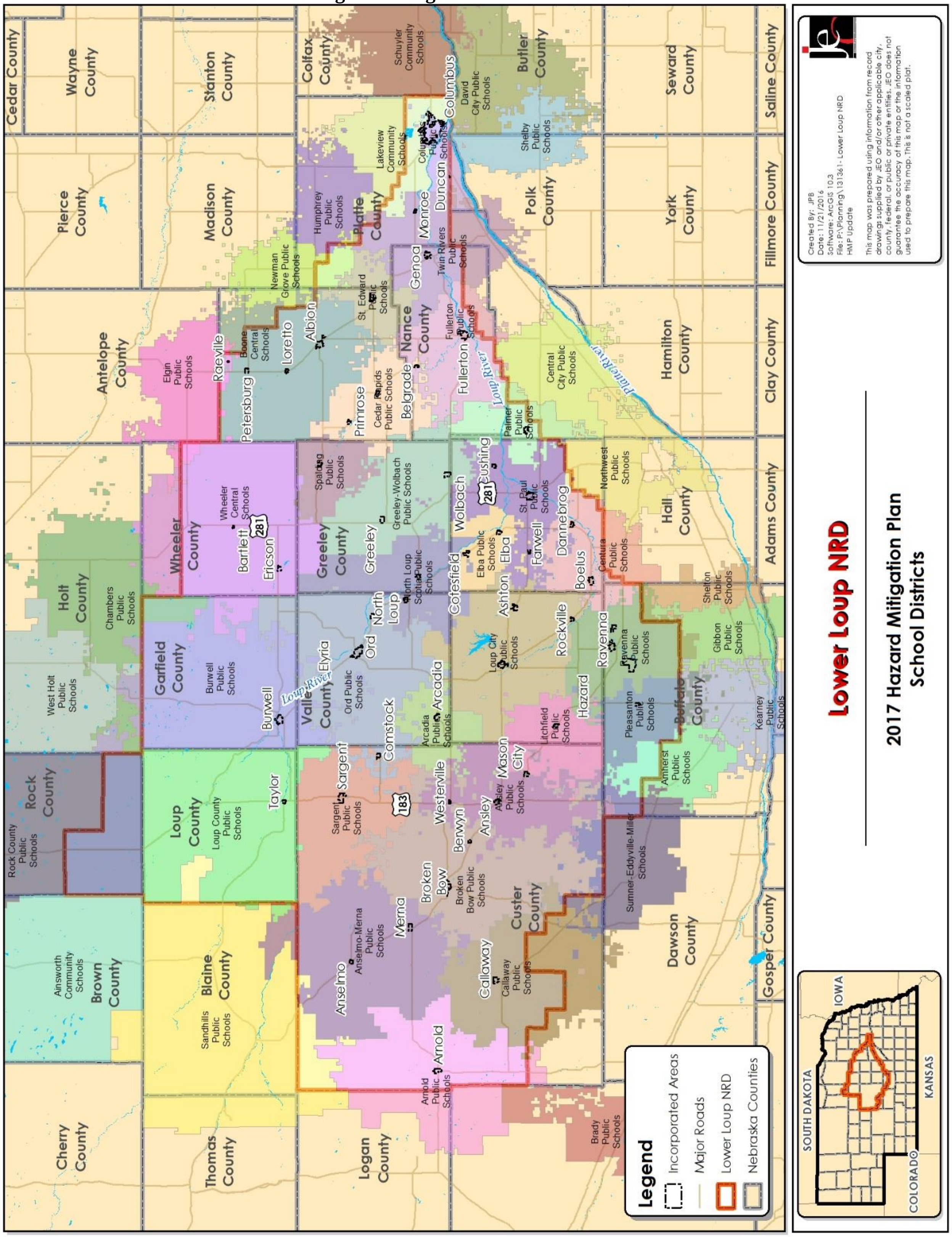


Table 15: Inventory of Care Facilities

Jurisdiction	Number of Hospitals	Number of Hospital Beds	Number of Health Clinics	Adult Care Home	Adult Care Beds	Assisted Living Homes	Assisted Living Beds
Boone County	1	25	3	2	115	1	28
Custer County	2	35	1	3	174	4	80
Garfield County	0	0	2	1	61	1	18
Greeley County	0	0	2	1	26	1	12
Howard County	1	16	0	1	70	1	35
Loup County	0	0	0	0	0	0	0
Nance County	1	20	3	2	114	4	88
Platte County	1	47	1	4	277	5	256
Sherman County	0	0	1	1	64	1	12
Valley County	1	16	0	1	60	1	50
Wheeler County	0	0	0	0	0	0	0

Source: Nebraska Department of Health and Human Services

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 16 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 16: At Risk Population

County	Percent That Speaks English as Second Language	Families Below Poverty Level
Boone	2.8%	6.8%
Custer	3.2%	7.9%
Garfield	0.9%	3.7%
Greeley	0.9%	7.3%
Howard	2.1%	6.4%
Loup	0.4%	10.3%
Nance	2.2%	8.6%
Platte	14.7%	6.5%
Sherman	3.2%	10.5%
Valley	2.5%	8.2%
Wheeler	0.2%	3.8%

Source: Language Spoken at Home: 2010 – 2014 ACS 5-year estimate, Selected Economic Characteristics: 2010 – 2014 ACS 5-year estimate

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 not 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.

BUILT ENVIRONMENT AND STRUCTURAL INVENTORY

The US Census provides information related to housing units and potential areas of vulnerability. This information is taken from the 2010 – 2014 ACS 5-year estimate data regarding selected housing characteristics. The selected characteristics examined in Table 17 include: lack of complete plumbing facilities, lacking complete kitchen facilities, no telephone service available, housing units that are mobile homes, and housing units with no vehicles.

Table 17: Selected Housing Characteristics

County	Occupied housing units	Lacking complete plumbing facilities	Lacking complete kitchen facilities	No landline telephone service available	Mobile Homes	Housing Unit with No vehicles available
Boone	84.5%	0.1%	0.1%	1.4%	3.0%	3.5%
Custer	85.2%	0.6%	1.4%	1.9%	3.1%	5.6%
Garfield	75.8%	0.0%	0.3%	0.7%	6.1%	3.0%
Greeley	77.0%	1.1%	2.6%	1.5%	3.9%	3.2%
Howard	85.5%	0.0%	1.3%	3.8%	8.4%	3.0%
Loup	58.4%	0.0%	0.0%	1.9%	15.2%	1.2%
Nance	84.9%	0.2%	0.9%	1.9%	2.7%	5.4%
Platte	93.8%	0.1%	1.1%	2.7%	5.1%	4.9%
Sherman	71.1%	0.0%	0.0%	2.1%	13.7%	3.8%
Valley	83.4%	0.0%	0.0%	1.3%	4.1%	4.8%
Wheeler	69.1%	0.3%	0.0%	1.8%	18.5%	4.1%
Total	**86.4%**	**0.2%**	**0.8%**	**1.8%**	**5.5%**	**3.9%**

Indicated percentage is determined based on total housing units
Source: Selected Housing Characteristics: 2010 – 2014 ACS 5-year estimate

Approximately 1.8 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 work to promote the registration of cell phone numbers with Reverse 911 systems.

Over five percent of housing units in the planning area are mobile homes. In Sherman, Loup, and Wheeler counties over thirteen 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.

Loup and Wheeler counties has an extremely high percentage of unoccupied housing units. Unoccupied homes may not be maintained as well as occupied housing, thus adding to their vulnerability.

Furthermore, approximately 3.9 percent of all housing units do not have a vehicle available. Households without vehicles may have difficulty evacuating during a hazardous event and a reduced ability to access resources in time of need.

STATE AND FEDERALLY OWNED PROPERTIES

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

Table 18: State and Federally Owned Facilities

Facility	Nearest Community
Boone County	
None	N/A
Custer County	
Victoria Springs State Recreation Area (SRA)	Anselmo, NE
Pressey State Wildlife Management Area (WMA)	Oconto, NE
Nebraska Department of Roads Facility	Broken Bow, NE
Garfield County	
Calamus Reservoir State Recreation Area & WMA	Burwell, NE
Various State-Owned Agricultural Areas (Likely Department of Education)	County-wide
Greeley County	
Various State-Owned Agricultural Areas (Likely Department of Education)	County-wide
Davis Creek Wildlife Management Area (WMA)	Scotia, NE
Howard County	
Nebraska Department of Roads Facility	St. Paul, NE
Loup County	
(Not available at this time)	N/A
Nance County	
Prairie Wolf State Wildlife Management Area	Genoa, NE
Platte County	
George Syas State Wildlife Management Area	Genoa, NE
Various State-Owned Agricultural Areas (Likely Department of Education)	County-wide
Nebraska Department of Roads Facility	Columbus, NE
Sherman County	
None	N/A
Valley County	
Fort Hartsuff State Historical Park	Elyria, NE
Nebraska Department of Roads Facility	Ord, NE
Wheeler County	
(Not available at this time)	N/A

Source: County Assessors

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 are able to 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 19: 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 (March 2013). 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. The identification of vulnerable assets will be 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 potential loss of assets).

***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.*

Finally, for 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. The following table outlines the data sources utilized to examine each individual hazard. Further discussion relative to each hazard is discussed in the hazard profile portion of this section.

Table 20: Risk Assessment Data Sources

Type of Data	Data Source
Property Damage*	NCEI Storm Events Database
Crop Damage	USDA RMA
Sperry-Piltz Ice Accumulation Index (SPIA)	National Weather Service (NWS)
Temperature, Precipitation, Snowfall	Weather Stations
TORRO Hailstone Scale	The Tornado and Storm Research Organization (TORRO)
Monthly Tornado Averages	National Oceanic and Atmospheric Administration (NOAA)
Tornado Time of Occurrence	NOAA
Tornado Activity in the United States	NOAA
Wind Zones in the United States	FEMA
Beaufort Wind Force Rankings	NWS
Historical Drought Impacts	National Drought Mitigation Center, University of Nebraska-Lincoln
Palmer Drought Severity Index	NOAA, High Plains Regional Climate Center
USDA Secretarial Disaster Designations	USDA
Heat Index	NOAA
Number of Wildfires by Cause in Nebraska 2000-2012	Nebraska Forest Service
Acres Burned by Cause in Nebraska 2000-2012	Nebraska Forest Service
Wildfire Risk Potential Map	USDA Forest Service
NFIP Status	Nebraska Department of Natural Resources, National Flood Insurance Program
NFIP Policies - March 2016	Nebraska Department of Natural Resources, National Flood Insurance Program
NFIP Claims Statistics	National Flood Insurance Program Loss Statistics
Recorded Animal Diseases	Nebraska Department of Agriculture
High Hazard Dams in the Planning Area	Nebraska Department of Natural Resources
Fault Lines in Nebraska	Nebraska Department of Natural Resources
Richter Scale	FEMA
Modified Mercalli Intensity Scale	FEMA
Nebraska Seismic Hazard Map	United States Geological Survey
Chemical Spills from 1980 to 2015	Pipeline and Hazardous Materials Safety Administration
Global Terrorism Database (1970-2014)	National Consortium for the Study of Terrorism and Responses to Terrorism
Database of Dam Failures	Stanford University's National Performance of Dams Program

**NCEI data was used for property damage, unless otherwise noted.*

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 that are 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 rather 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 NCEI data is available for January 1996 to December 2015. Although some data is available back to 1950, this plan update utilizes only the more current and more accurate data available. Wildfire data is available from the Nebraska Forest Service from 2000 to 2012.
- **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 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. In order 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 2014. 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 for this planning process 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	Public Health Epidemic
Chemical Fixed Sites	Flooding	Severe Thunderstorms
Chemical Transportation	Grass/Wildfires	Severe Winter Storms
Dam Failure	Hail	Terrorism
Drought	High Winds	Tornadoes
Earthquakes	Levee Failure	

HAZARD ELIMINATION

Given the location and history of the planning area the following hazards were eliminated from further review. An explanation of how and why the hazards were eliminated is 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 reported events 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 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 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 HMP.

Landslides: While there is data available related to landslides which have occurred in the planning area and across the state, the database has not been maintained in recent years. Further landslides that have occurred (in the planning area and across the state) have resulted in no reported damages. The following table outlined the number of recorded landslide events, which have occurred in the planning area. This is consistent with the 2014 Nebraska HMP.

Table 22: Known Landslides in the Planning Area by County

County	Number of Landslides	Total Estimated Damages
Custer County	8	$0
Sherman County	2	$0
Valley County	1	$0

Source: Nebraska Hazard Mitigation Plan, 2014

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 exercise 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 Hazard Mitigation Plan.

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 profiled further for this plan. This approach is consistent with the 2014 Nebraska 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 Hazard Mitigation Plan.

Table 23: Urban Fire Incidents

Fire Department	Number of Urban Fire Incidents						
	2007	2008	2009	2010	2011	2012	Total
Boone County							
Albion Vol Fire Dept	11	14	8	14	18	22	87
Cedar Rapids Vol Fire Dept	-	-	0	-	0	0	0
Petersburg Vol Fire Dept	10	10	17	15	16	17	85
Primrose Rural Fire Dept	-	-	0	-	0	0	0
St. Edward Vol Fire Dept	-	-	12	2	0	0	14
Custer County							
Anselmo Vol Fire Dept	5	1	0	-	0	0	6
Ansley Vol Fire Dept	0	8	1	3	9	20	41
Arnold Vol Fire Dept	6	9	7	4	21	43	90
Berwyn Vol Fire Dept	-	-	0	-	0	0	0
Broken Bow Vol Fire Dept	21	19	17	30	30	46	163
Callaway Vol Fire Dept	-	-	0	-	9	1	10
Comstock Vol Fire Dept	-	-	0	-	0	0	0
Mason City Vol Fire Dept	6	-	0	1	4	0	11
Merna Vol Fire Dept	9	16		6	18	2	51
Oconto Vol Fire Dept	-	-	0	0	0	0	0
Sargent Vol Fire Dept	-	-	0	0	0	0	0

Garfield County							
Burwell Vol Fire Dept	11	7	7	13	5	24	67
Greeley County							
Greeley Vol Fire Dept	7	7	4	10	3	7	38
Scotia Vol Fire Dept	-	1	8	2	1	1	13
Spalding Vol Fire Dept	2	10	9	9	8	9	47
Wolbach Suburban Fire Dept	6	3	0	-	0	0	9
Howard County							
Boelus Vol Fire Dept	-	2	3	1	0	0	6
Dannebrog Vol Fire	-	-	0	-	0	0	0
Elba Fire & Rescue	0	-	0	-	0	0	0
Farwell Vol Fire Dept	1	-	4	-	0	0	5
St Libory Vol Fire Dept	18	23	17	19	0	0	77
St Paul Vol Fire Dept	15	13	17	14	17	23	99
Nance County							
Belgrade Vol Fire Dept	1	-	0	1	0	0	2
Fullerton Vol Fire Dept	13	12	11	-	0	0	36
Genoa Vol Fire Dept	14	15	18	12	17	32	108
Platte County							
Columbus Fire Dept	81	86	66	67	0	100	400
Creston Vol Fire Dept	-	-	0	-	0	0	0
Duncan Vol Fire Dept	14	8	12	10	14	20	78
Humphrey Rural Fire	-	-	0	-	0	0	0
Lindsay Vol Fire Dept	-	2	5	4	9	8	28
Monroe Vol Fire Dept	-	-	0	-	0	0	0
Platte Center Vol Fire Dept	-	9	4	8	0	0	21
Sherman County							
Ashton Vol Fire Dept	4	1	3	6	0	8	22
Hazard Vol Fire Dept	-	-	0	-	0	0	0
Litchfield Vol Fire Dept	1	-	0	-	0	11	12
Loup City Vol Fire Dept	1	0	6	8	8	1	24
Rockville Vol Fire Dept	1	1	4	4	0	0	10
Valley County							
Arcadia Vol Fire Dept	-	10	0	6	7	9	32
North Loup Vol Fire Dept	3	11	6	2	4	1	27
Ord Vol Fire Dept	14	18	13	11	9	26	91
Wheeler County							
Bartlett Vol Fire Dept	-	-	0	-	0	0	0
Ericson Vol Fire Dept	2	-	0	-	0	0	2

Source: NFIRS National Reporting System

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

HAZARD ASSESSMENT SUMMARY TABLES

The following table provides an overview of the data contained in the hazard profiles, hazards listed in this table and throughout the section are in alphabetical. 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 in this section.

Table 24: Regional Risk Assessment

Regional Risk Assessment			
Hazard	**Previous Occurrence Events/Years**	**Approximate Annual Probability**	**Likely Extent**
Agricultural Animal Disease	11/2	100%	Unavailable
Agricultural Plant Disease	79 /15	100%	Unavailable
Chemical Fixed Sites	94 /26	100%	1,215 Gallons
Chemical Transportation	43/40	100%	694 Gallons
Dam Failure	6/50	12%	Inundation of floodplain downstream from dam
Drought	444 events/1452 months	30.6%	D2
Earthquakes	4/139	2.9%	<4.0
Extreme Heat	40/1	100%	>90˚
Flooding	123/20	100%	Some inundation of structures* (<1% of structures) and roads near streams. Some evacuations of people may be necessary (<1% of population)
Grass/Wildfires	1,784/15	100%	<100 acres
Hail	1,752/20	100%	H3-H6
High Winds	176/ 89	100%	9 BWF
Levee Failure	0	~1%	Structures located in protected areas*
Severe Thunderstorms	546/20	100%	≥1” rainfall 25-40 mph winds
Severe Winter Storms	661 /20	100%	.25 - .5” ice 10-20˚below zero (wind chills) 4-8” snow 25-40 mph winds
Terrorism	3/45	7%	Undefined
Tornadoes	134/20	100%	EF0

**Quantification of vulnerable structures provided in 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 25: Loss Estimation for the Planning Area

Hazard Type		Property Loss	Crop Loss[2]
Agricultural Disease	**Animal Disease**	N/A	N/A
	Plant Disease	N/A	$893,921
***Chemical Spills (Transportation)[5]**		$184,463	N/A
Chemical Spills (Fixed Site)[6]		N/A	N/A
Dam Failure		N/A	N/A
Drought[4]		$33,000,000	$209,352,874
Earthquakes		N/A	N/A
Extreme Heat[4]		$0	$44,979,391
Flooding	**Flash Flood[1]**	$6,542,200	$2,163,781
	Flood[1]	$1,733,000	
Grass/Wildfires[3]		$0	$19,568
Hail[1] Average: 1.17” Range: 0.75- 4.5”		$25,103,900	$90,022,627
High Winds[4] Average: 47 kts Range: 35-62 kts		$1,350,400	$16,534,198
Levee Failure		$0	$0
***Severe Thunderstorms[1]**	**Thunderstorm Wind** Average: 56 kts Range: 43-95 kts	$13,592,700	$0
	Heavy Rain	$565,000	N/A
	Lightning	$364,000	N/A
***Severe Winter Storms**	**Blizzard[1]**	$2,959,250	N/A
	Heavy Snow[1]	$0	
	Ice Storm[1]	$6,936,000	
	Winter Storm[1]	$12,043,000	
	Winter Weather[1]	$20,000	
	Extreme Cold/Wind Chill[1]	$0	
Terrorism		$0	$0
Tornado[1] Average: EF0 Range: EF0-EF3		$13,123,000	$29,298
Total		**$117,656,913**	**$363,995,658**

N/A: Data not available
1 Indicates data is from NCEI (January 1996 to December 2015)
2 Indicates data is from USDA RMA (2000 to 2014)
3 Indicates data is from NFS (2000 to 2012)
4 Indicates data is from HPRCC (1927-2016)
5 Indicates data is from PHSMA (1974-2014)
6 Indicates data is from U.S. Coast Guard NRC (1990-2016)

HISTORICAL DISASTER DECLARATIONS

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

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-00059	1/28/2015	Drought	Arthur, Blaine, Custer, Dawson, Deuel, Furnas, Garden, Garfield, Gosper, Grant, Hooker, Logan, Loup, McPherson, Phelps, Sherman, Thomas, Valley	Brown, Buffalo, Cherry, Cheyenne, Franklin, Frontier, Greeley, Harlan, Holt, Howard, Kearney, Keith, Lincoln, Morrill, Perkins, Red Willow, Rock, Sheridan, Wheeler
NE-0061	7/31/2014	Tornadoes, High Winds, Flooding	Stanton	Colfax, Cuming, Madison, Pierce, Platte, Wayne
NE-0060	6/17/2014	Drought	Arthur, Blaine, Custer, Dawson, Deuel, Furnas, Garden, Garfield, Gosper, Grant, Hooker, Locan, Loup, McPherson, Phelps, Sherman, Thomas, Valley	Brown, Buffalo, Cherry, Cheyenne, Franklin, Frontier, Greeley, Harlan, Holt, Howard, Kearney, Keith, Lincoln, Morrill, Perkins, Red Willow, Rock, Sheridan, Wheeler
NE-00053	12/10/2013	Drought	Adams, Antelope, Arthur, Banner, Blaine, Boone, Box Butte, Boyd, Brown, Buffalo, Burt, Butler, Cass, Cedar, Chase, Cherry, Cheyenne, Clay, Colfax, Cuming, Custer, Dakota, Dawes, Dawson, Deuel, Dixon, Dodge, Douglas, Dundy, Fillmore, Franklin, Frontier, Furnas, Gage, Garden, Garfield, Gosper, Grant, Greeley, Hall, Hamilton, Harlan, Hayes, Hitchcock, Holt, Hooker, Howard, Jefferson, Johnson, Kearney, Keith, Keya Paha, Kimball, Knox, Lancaster, Lincoln, Logan, Loup, Madison, McPherson, Merrick, Morrill, Nance, Otoe, Perkins, Phelps, Pierce, Platte, Polk, Red Willow, Rock, Saline, Sarpy, Saunders, Scotts Bluff, Seward, Sheridan, Sherman, Sioux, Stanton, Thayer, Thomas, Thurston, Valley, Washington, Wayne, Webster, Wheeler, York	Nemaha, Nuckolls, Pawnee
NE-00049	4/1/2013	Drought	Antelope, Arthur, Banner, Blaine, Box Butte, Brown, Buffalo, Cedar, Chase, Cherry, Cheyenne, Dawes, Dawson, Deuel, Dixon, Franklin, Garden, Garfield, Gosper, Grant, Hall, Harlan, Holt, Hooker, Kearney, Keith, Keya Paha, Kimball, Knox, Lincoln, Logan, Loup, Madison, McPherson, Morrill, Perkins, Phelps, Pierce, Platte, Rock, Scotts Bluff, Sheridan, Sioux, Stanton, Thomas, Wayne, Wheeler	Adams, Boone, Boyd, Butler, Clay, Colfax, Cuming, Custer, Dakota, Dundy, Frontier, Furnas, Greeley, Hamilton, Hayes, Howard, Merrick, Nance, Polk, Sherman, Thurston, Valley, Webster
NE-00038	09/07/2011 08/12/2011 11/18/2011	Drought	Lincoln, Nemaha, Richardson / Boyd, Burt, Cass, Dakota, Dixon, Douglas, Knox, Sarpy, Washington / Thurston, including the Omaha Tribe of Nebraska and Iowa	Custer, Dawson, Frontier, Hayes, Johnson, Keith, Logan, McPherson, Pawnee, Perkins / Antelope, Cedar, Cuming, Dodge, Holt, Keya Paha, Lancaster, Otoe, Pierce, Rock, Saunders, Thurston, Wayne

Disaster Declaration Number	Declaration Date	Description	Primary Counties	Contiguous Counties
NE-00059	1/28/2015	Drought	Arthur, Blaine, Custer, Dawson, Deuel, Furnas, Garden, Garfield, Gosper, Grant, Hooker, Logan, Loup, McPherson, Phelps, Sherman, Thomas, Valley	Brown, Buffalo, Cherry, Cheyenne, Franklin, Frontier, Greeley, Harlan, Holt, Howard, Kearney, Keith, Lincoln, Morrill, Perkins, Red Willow, Rock, Sheridan, Wheeler
NE-00011	1/7/2007	Severe Winter Storms	Adams, Antelope, Blaine, Boone, Brown, Buffalo, Cedar, Chase, Cheyenne, Clay, Custer, Dawson, Dixon, Dundy, Fillmore, Franklin, Frontier, Furnas, Garden, Garfield, Gosper, Greeley, Hall, Hamilton, Harlan, Hayes, Hitchcock, Holt, Howard, Kearney, Keith, Keya Paha, Kimball, Knox, Lincoln, Logan, Loup, Madison, Merrick, Morrill, Nance, Nuckolls, Perkins, Phelps, Pierce, Platte, Polk, Red Willow, Rock, Seward, Sherman, Stanton, Valley, Wayne, Webster, Wheeler York	

**Denotes date of grant application deadline, rather than disaster declaration date*

PRESIDENTIAL DISASTER DECLARATIONS

The presidential disaster declarations involving the planning area from 2001 to 2015 are summarized in the following table.

Table 27: Presidential Disaster Declarations

Disaster Declaration Number	Declaration Date	Hazards	Declared County/Area*
DR-4185	2014	Severe Thunderstorms, Tornadoes, High Winds, Flooding	Valley
DR-4156	2013	Severe Thunderstorms, Severe Winter Storms, Tornadoes, Flooding	Greeley, Howard, Sherman
DR-1924	2010	Severe Thunderstorms, Flooding, Tornadoes	Boone, Custer, Garfield, Greeley, Howard, Loup, Nance, Platte, Sherman, Valley, Wheeler
DR-1902	2010	Severe Thunderstorms, Ice Jams, Flooding	Greeley, Howard, Loup, Nance, Platte, Valley, Wheeler
DR-1878	2010	Severe Winter Storms	Garfield, Nance
DR-1853	2009	Floods, Tornadoes, Severe Thunderstorms	Custer
DR-1770	2008	Floods, Tornadoes, Severe Thunderstorms	Boone, Custer, Garfield, Greeley, Howard, Loup, Nance, Platte, Valley, Wheeler
DR-1714	2007	Floods, Severe Thunderstorms	Custer County, Greeley County, Howard County, Loup County, Valley County, Wheeler County
DR-1706	2007	Severe Winter Storms	Custer County, Garfield County, Loup County, Wheeler County
DR-1674	2007	Severe Winter Storms	Boone County, Custer County, Garfield County, Greeley County, Howard County, Loup County, Nance County, Platte County, Sherman County, Valley County, Wheeler County

Disaster Declaration Number	Declaration Date	Hazards	Declared County/Area*
DR-1627	2006	Severe Winter Storms	Custer County, Garfield County, Greeley County, Loup County, Nance County, Sherman County, Valley County, Wheeler County
DR-1590	2005	Floods, Severe Thunderstorms	Howard County
DR-1517	2004	Floods, Tornadoes, Severe Thunderstorms	Greeley County, Howard County, Nance County, Sherman County
DR-1480	2003	Tornadoes, Severe Thunderstorms	Greeley County, Howard County, Platte County, Valley County
DR-1373	2001	Floods, Tornadoes, Severe Thunderstorms	Custer County

Source: Federal Emergency Management Agency, 2001-2015
**Only counties within planning area are included*

CLIMATE ADAPTATION

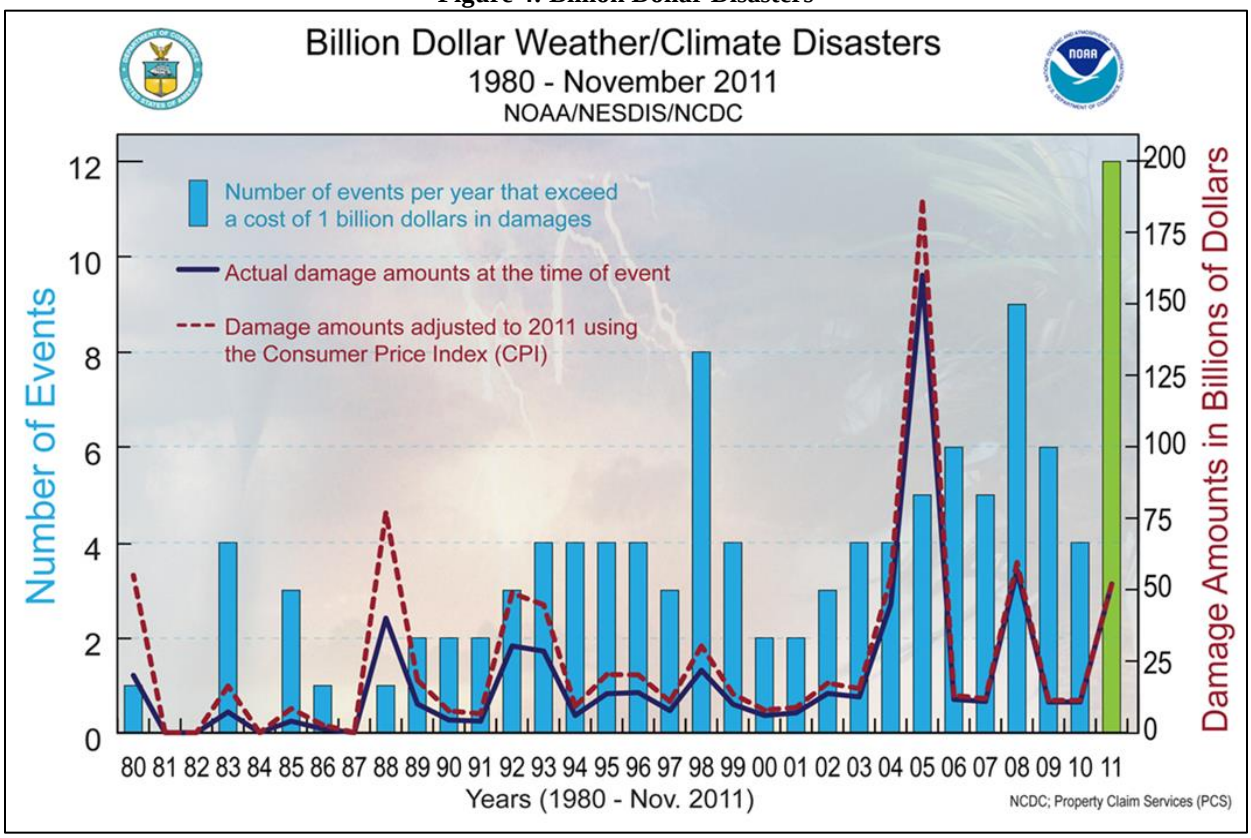
Long term climate trends have and will continue to increase the risk to hazards within the planning area. Since 1895, Nebraska's overall average temperature has increased by about 1°F. This trend will lead to an increase in the frequency and intensity of hazardous events, which will cause a number of 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), Nebraskan's 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: NOAA

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 possibly leading 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.

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 resiliency. 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 the 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 state of Nebraska has one of the country's largest economies that is 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). For the planning area, sold agricultural products were estimated at $3,206,458,000 with the cost split at $1,232,688,000 for crops and $1,973,770,000 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	Poultry Broilers	Sheep and Lambs
Boone	$259,094,000	96,568	178,155	377	405	928
Custer	$552,348,000	290,990	130,565	2,327	80	1,741
Garfield	$42,181,000	44,054	N/A	423	N/A	57
Greeley	$102,121,000	59,636	N/A	N/A	N/A	1,058
Howard	$134,241,000	80,275	4,704	1,574	1,404	2,733
Loup	$24,302,000	29,362	1,808	218	-	204
Nance	$73,947,000	28,078	65,884	349	800	74
Platte	$415,153,000	127,115	308,866	1,148	5,150	1,443
Sherman	$36,143,000	45,226	N/A	249	N/A	545
Valley	$109,677,000	76,326	1,617	337	-	N/A
Wheeler	$224,563,000	113,174	N/A	229	N/A	N/A
Total	**$1,973,770,000**	**990,804**	**691,599**	**7,231**	**7,839**	**8,783**

Source: 2012 U.S. Census of Agriculture

Feedlot near Broken Bow

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
Boone	646	434,370	$194,302,000
Custer	1,352	1,503,594	$292,956,000
Garfield	226	345,908	$22,590,000
Greeley	389	338,271	$85,428,000
Howard	682	312,234	$112,048,000
Loup	138	282,989	$7,769,000
Nance	355	208,146	$71,932,000
Platte	942	426,329	$236,952,000
Sherman	414	281,176	$78,019,000
Valley	402	349,404	$95,415,000
Wheeler	198	357,134	$35,277,000
Total	**5,744**	**4,839,555**	**$1,232,688,000**

Source: 2012 U.S. Census of Agriculture

Table 30: Crop Values

County	Corn		Soybeans		Wheat	
	Acres Planted	Value (2012)	Acres Planted	Value (2012)	Acres Planted	Value (2012)
Boone	170,663	$139,099	101,655	$51,209	324	D
Custer	234,919	$227,129	65,815	$40,185	8,949	$2,894
Garfield	16,377	$15,036	3,185	N/A	N/A	N/A
Greeley	75,469	$64,579	33,176	$17,223	114	N/A
Howard	95,501	$83,108	34,925	$20,579	52,279	$453
Loup	4,327	$3,537	2,268	$1,199	147	N/A
Nance	65,201	$47,142	45,874	$21,071	2,893	N/A
Platte	187,112	$162,842	115,216	$61,221	1,746	$661
Sherman	62,955	$60,388	22,169	$13,024	720	$242
Valley	71,599	$64,585	33,789	N/A	1,152	$383
Wheeler	25,815	$24,075	9,101	N/A	84	$31
Total	1,009,938	$891,520	467,173	$225,711	68,408	4,664

Source: 2012 U.S. Census of Agriculture
N/A- Data not available

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 to occur in domestic animals or crops in urban areas.

HISTORICAL OCCURRENCES

Animal Disease

NDA provides reports on diseases occurring in the planning area. There were eleven instances of animal diseases reported between January 2015 and October 2016 by the NDA (Table 31). These outbreaks affected 5,914 animals.

Table 31: Livestock Diseases Reported in the Planning Area

Disease	County	Population Impacted
Porcine Reproductive and Respiratory Syndrome	Boone, Platte	2,650; 1
Anaplasmosis	Custer, Valley	2; 1
Enzootic Bovine Leukosis	Custer	200
Paratuberculosis	Custer, Garfield, Nance, Wheeler	1,400; 365; 700; 200
Bovine Viral Diarrhea	Sherman, Valley	125; 270

Source: Nebraska Department of Agriculture

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, being:

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 (2000-2014), annual crop losses from plant disease, insects, and wildlife 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	79	$893,921	$59,594

Source: USDA RMA, 2000-2014

EXTENT

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

PROBABILITY

Given the historic record of occurrence (11 outbreaks of animal disease reported in two years, and 79 plant disease outbreaks reported in 15 years), 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, are used in agriculture and industrial production, fuel our vehicles and machines, 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. The community is at risk if a chemical is used unsafely or released in harmful amounts.

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 at 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 material 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 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.

Fixed-sites are those that involve chemical manufacturing sites and stationary storage facilities. Table 35demonstrates the nine classes of hazardous material according to the 2012 Emergency Response Guidebook.

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 Division 1.3 – Explosives predominantly a fire hazard Division 1.4 – Explosives with no significant blast hazard Division 1.5 – Very insensitive explosives with a mass explosion hazard Division 1.6 – Extremely insensitive articles
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 Division 4.2 – Spontaneously combustible materials Division 4.3 – Water-reactive substances/Dangerous when wet materials
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, 2012

LOCATION

There are dozens of 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 a majority of events localized to the facility. 53 releases have occurred in the planning area, and the total amount spilled ranged from 2 gallons to 24,000 gallons. Of the 53 chemical spills, two spills led to evacuations. These evacuations were minor; involving 35 people total. 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.

HISTORICAL OCCURRENCES

Chemical Fixed Sites

According to the U.S. Coast Guard's National Response Center database (NRC), there have been 53 fixed site chemical spills from 1990 – 2016 in the planning area. There were no property damages reported for these chemical spills. The following table displays the larger spills that have occurred throughout the planning area.

Table 36: Fixed Site Chemical Spills

Date of Event	Location of Release	Quantity Spilled	Material Involved	Number of Injuries	Property Damage
7/17/2010	Broken Bow	2490 Gallons	Caustic Soda and Water	0	$0
9/4/1998	Merna	1900 Pounds	Anhydrous Ammonia	1	$0
10/2/2002	St. Paul	2500 Pounds	Anhydrous Ammonia	0	$0
4/18/1993	Dannebrog	21000 Gallons	Liquid Fertilizer	0	$0
4/21/2014	Columbus	500 Gallons	Other Oil (Used Oil Mixed with Rain Water)	0	$0
7/12/2008	Columbus	500 Gallons	Ethanol	0	$0
11/7/1995	Columbus	3462 Gallons	Ethanol (90%), Gasoline (10%)	0	$0
4/16/1993	Columbus	6000 Gallons	Sulfur Dioxide	2	$0
6/30/2007	Ord	1200 Gallons	Gasoline	0	$0
9/3/2000	Ord	24000 Gallons	Fertilizer	0	$0

Source: National Response Center, 1990-2016

AVERAGE ANNUAL DAMAGES

Using data from Table 37, 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	53	2.0	3	$0	$0

Source: National Response Center, 1990-2016

PROBABILITY

Chemical releases at fixed site storage areas are likely in the future. Given the historic record of occurrence (53 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 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 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…".

According to PHMSA, hazardous materials traffic in the U.S. now exceeds 800,000 shipments per day, transporting 3.1 billion tons of hazardous materials annually.

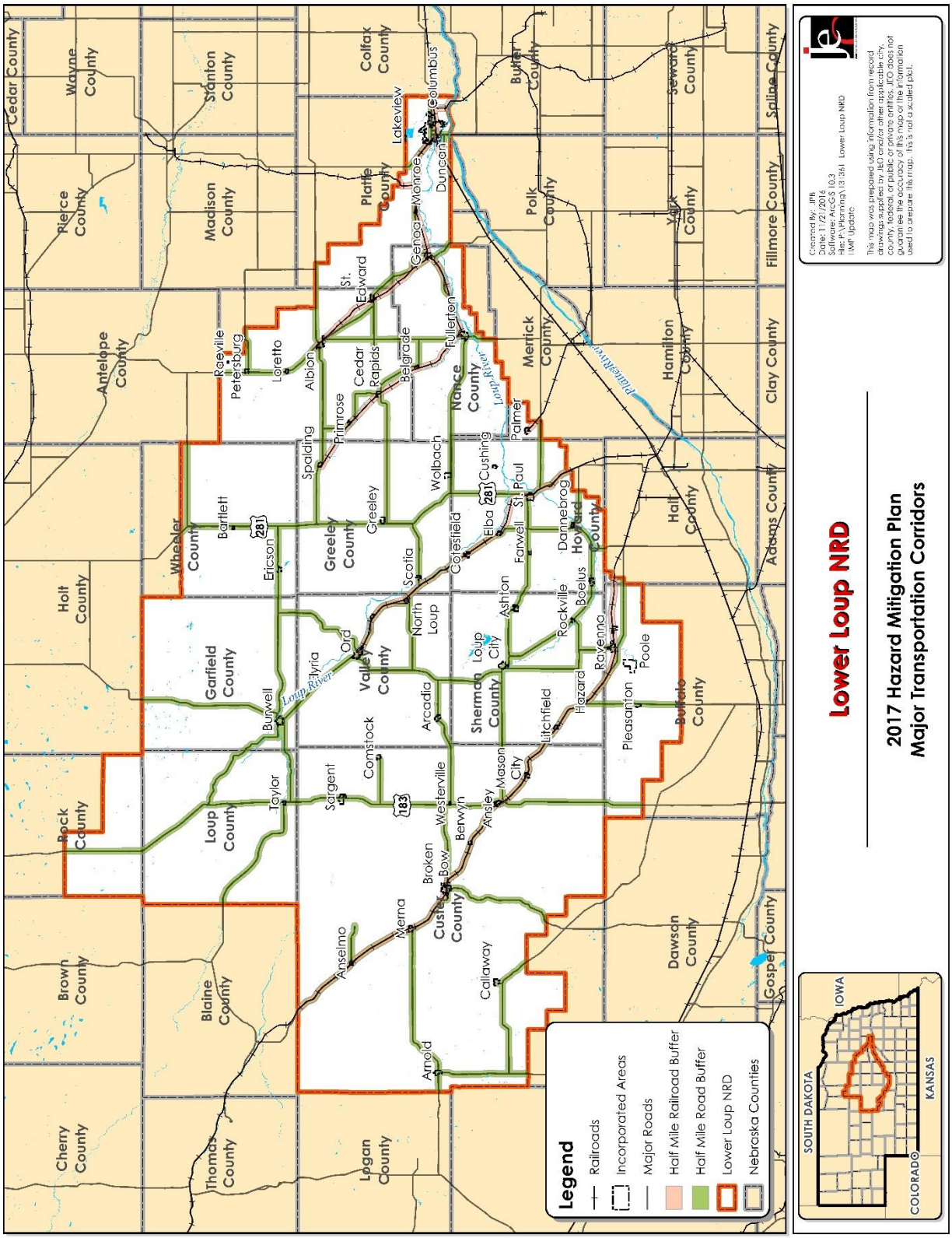
Nationally, the U.S. averages 28 deaths per year due to accidents resulting from the transportation of hazardous materials. While such fatalities are a low probability risk, even one event can harm many people. For example, a train derailment in Crete, Nebraska in 1969 allowed anhydrous ammonia to leak 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 5. 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.

Rail line carrying ethanol near Ord

Figure 5: 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 that is released. Releases that have occurred during transportation in the planning area ranged from less than 1 Liquid Gallon (LGA) to 28,963 LGAs. None of the chemical spills resulted in deaths or injuries.

HISTORICAL OCCURRENCES

PHMSA reports that 42 chemical spills occurred during transportation in the planning area between April 15, 1974 and March 12, 2014. During these events, there were no injuries, no fatalities, and $184,463 in damages. In 1993, a derailment in Berwyn resulted in evacuations as tens of thousands of gallons of denatured alcohol spilled.

The following table provides a list of the largest spills and incidents which reported damages or losses.

Table 39: Historical Chemical Spills 1980-2014

Date of Event	Location of Release	Failure Description	Material Involved	Method of Transportation	Amount in Gallons	Total Damage	Evacuation (Yes/No)
1/20/2014	Columbus	Inadequate Bracing	Organic Peroxide Type F Liquid	Highway	100	$28,000	No
2/13/2007	Columbus	Loose Closure Component	Phosphoric Acid Solution	Rail	5	$6,112	No
6/27/1995	Columbus	Loose Closure Component	Molten Sulfur	Rail	300	$1,100	No
10/7/1994	Columbus	Storage Tank Overflow	Hydrochloric Acid Solution	Highway	10	$10	No
4/28/1993	Berwyn	Derailment	Denatured Alcohol	Rail	28,963	$149,041	Yes

Source: PHMSA, 1974-2014

AVERAGE ANNUAL DAMAGES

The average damage per event estimate was determined based upon PHMSA's Incidents Reports since 1974 and 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 $4,290 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	42	1.1	$184,463	$4,290

Source: PHMSA April 1974 – March 2014

PROBABILITY

The historical record indicates that chemical releases during transport have a 100 percent chance of occurring annually in the planning area with 42 events over a 40-year period.

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 at risk

DAM FAILURE

HAZARD PROFILE

According to the Nebraska Administrative Code, Title 458, Chapter 1, Part 001.09, dams are "any artificial barrier, including appurtenant works, with the ability to impound water, wastewater, or liquid-borne materials and which is:

- 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. Dam does 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."

The NDNR uses a classification system for dams throughout the State including those areas participating this plan. The classification system includes three classes, which are defined as:

Table 42: Dam Size Classification

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

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.

Dam failure, as a hazard, is described as a structural failure of 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

NDNR 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 135 dams located within the planning area with classifications ranging from low hazard to high hazard. 119 dams are rated low, 6 are significant, and 5 are rated a high hazard dam. Figure 6 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
Boone County	1	18	0	1
Custer County	0	22	1	0
Garfield County	0	1	0	1
Greeley County	0	9	0	1
Howard County	1	22	3	0
Loup County	0	2	0	0
Nance County	1	12	0	0
Platte County	1	14	0	0
Sherman County	0	5	0	1
Valley County	0	6	2	1
Wheeler County	1	8	0	0
Total	5	119	6	5

Source: NDNR

Dams that are 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 6: High Hazard Dam Locations

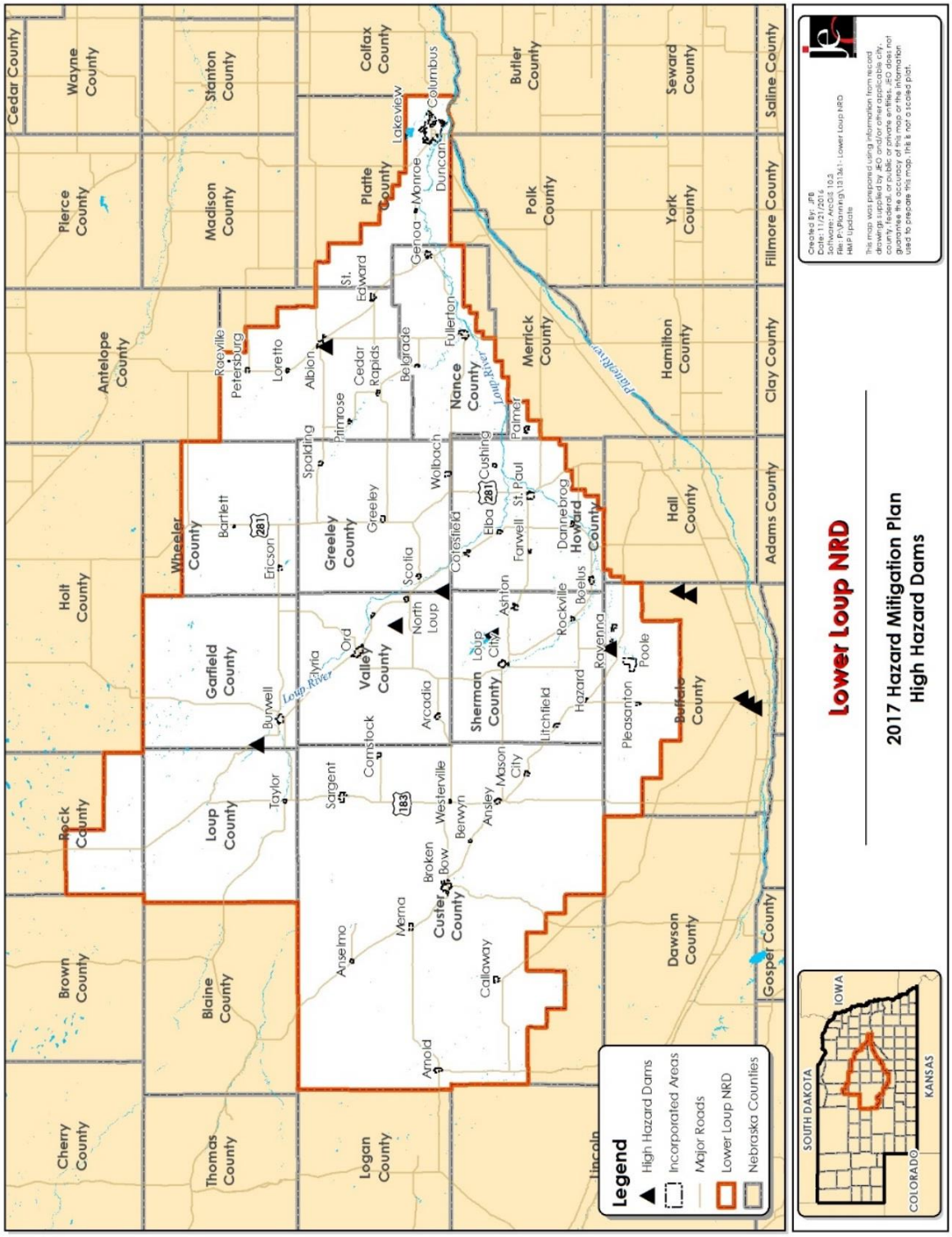


Table 44 lists those dams classified as "High Hazard Potential." None of the dams in the planning area are included in the 2014 Nebraska HMP's list of "Top 30 Ranked High Hazard Dams Based on Population at Risk".

Table 44: High Hazard Dams

NID	Dam Name	Owner	Location	Stream Name	Maximum Storage (acre-feet)	Emergency Action Plan
NE02342	Davis Creek Dam	US Bureau of Reclamation	Davis Creek Reservoir (south of North Loup)	Jacks Canyon	46,179	Yes
NE02287	Virginia Smith Dam	US Bureau of Reclamation	Northwest of Burwell	Calamus Reservoir	169,530	Yes
NE00153	Kohtz City of Albion Dam	City of Albion	Southwest of Albion	TR-Beaver Creek	102	Yes
NE01077	Sherman Dam	Farwell Irrigation District	Sherman Reservoir	Oak Creek	125,477	Yes
NE00264	Bredthauer Dam	Private Owner	Bredthauer Reservoir	N BR Mira Creek	665	No*

Source: NDNR
**Bredthauer Dam breached and has not been rebuilt*

Upstream Dams Outside the Planning Area
According to the Counties' Local Emergency Operations Plan (LEOPs), 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 NDNR 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 NDNR 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 each County's Local Emergency Operations Plan (LEOP) where available for specific high hazard dams. Note that not all of the high hazard dams in each county are given extended descriptions in the LEOP.

Boone County
Kohtz-Albion Dam – Failure would impact a swath northeast of the dam. This would impact approximately 15% of Albion. There is the potential for up to 18 homes and Fuller Park in southwest Albion to experience substantial flooding if the dam were to fail. Most of the streets within the City of Albion including Highways 14/39 and 91 could experience dangerous levels of flooding. In addition, the Boone County Health Center,

Boone Central Schools, St. Michael's School, Albion City Hall, Albion City Police Department, up to 110 homes, and several downtown businesses may experience shallow flooding.

Custer County
According to the Custer County LEOP, there are no High Hazard Dams located within the county and zero percent of the population would be affected by the failure of dams within Custer County.

Garfield County
Virginia Smith Dam—The Garfield County LEOP does not specify the percentage of the population that would be affected by the failure of the Virginia Smith Dam. However, the LEOP does say that the affected area would be within the 100-year floodplain.

Greeley County
There are ten dams in Greeley County. One of these dams has been identified as a high hazard dam. If a dam were to fail, the likely impacts would include loss of property and loss of roads that affect emergency response. If the upstream dam Virginia Smith Dam were to fail, it could affect approximately two percent of the county's population. The high hazard dam in Greeley County at Davis Creek Reservoir would affect populations in downstream counties.

Howard County
There are 26 dams in Howard County. None of these dams have been identified as a high hazard dam. If a dam were to fail in the county, the likely impacts would be flooding of agricultural lands, loss of rural housing, loss of agricultural land, and loss of livestock.

According to the Howard County LEOP, the following upstream dams could affect Howard County: Sherman Dam, Davis Creek Dam, and Virginia Smith Dam.

Loup County
There are two dams in Loup County. Neither of these dams have been identified as a high hazard dam. According to the Loup County LEOP, there are three dams that could affect approximately two percent of the population of Loup County if they were to fail. These dams are the Taylor Diversion Dam, Kent Diversion Dam, and Gracie Creek Dam.

Nance County
There are 13 dams in Nance County. None of these dams have been identified as a high hazard dam. If a dam were to fail, the likely impacts would be crop damage. However, there are three upstream dams that could affect Nance County. These dams are Sherman Dam, Virginia Smith Dam, and Davis Creek Dam. It is estimated that ten percent of the population of Nance County could be affected by the failure of one or another of these dams.

Platte County
There are 15 dams in Platte County. None of these dams have been identified as a high hazard dam. The Platte County LEOP identifies these facilities in the inundation area: Columbus Waste Water System, Highway 81/30 Bridge south of Columbus, Union Pacific Railroad bridge and tracks just southwest of Columbus.

Sherman County
Sherman Dam – According to the Sherman County LEOP, if Sherman Dam were to fail, approximately three percent of the population of the Sherman County would be affected. It would affect the Middle Loup River as far as St. Paul. In Sherman County, the affected area would be slightly greater than the 100-year flood plain with the greatest effect on Ashton, which would approach 100 percent inundation.

Valley County
In 2010, the Bredthauer Dam failed causing the village of North Loup to flood. The Bredthauer Dam has not been rebuilt as of this plan writing. According to the Valley County LEOP, an upstream dam that could affect the county is the Virginia Smith Dam. If this dam were to fail, approximately 3.7% of the population of the county would be affected.

Wheeler County
According to the Wheeler County LEOP, the Lake Ericson Dam would affect "a small portion of Wheeler County if failure occurs at the dam".

HISTORICAL OCCURRENCES
In June of 2010, heavy rain caused the failure of six dams across the planning area: Bredthauer Dam in Valley County, Ericson Dam in Wheeler County, Gracie Creek Road Dam in Loup County, Morgan Dam in Loup County, Ord-North Loup Diversion Dam in Valley County, and Taylor-Ord Diversion Dam in Loup County. According to the NDNR, the dam failures did not cause any significant property damages, nor did they cause any loss of life. Alternatively, NCEI estimated flooding damages in North Loup to be a million dollars after this event.

Lake Ericson Dam Failure, June 2010

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, LLNRD, or the NDNR.

PROBABILITY
According to the 2014 Nebraska 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 twelve percent annually as six dams have failed in the planning area over the past 50 years. The plan recognizes that while there have been occurrences in the past, that is not necessarily indicative of future occurrences.

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 actually a normal, recurrent feature of climate. It occurs in virtually all climatic zones, but its characteristics vary significantly from one region to another. A drought often coexists with periods of extreme heat, which together can cause significant social stress, economic losses, and environmental degradation.

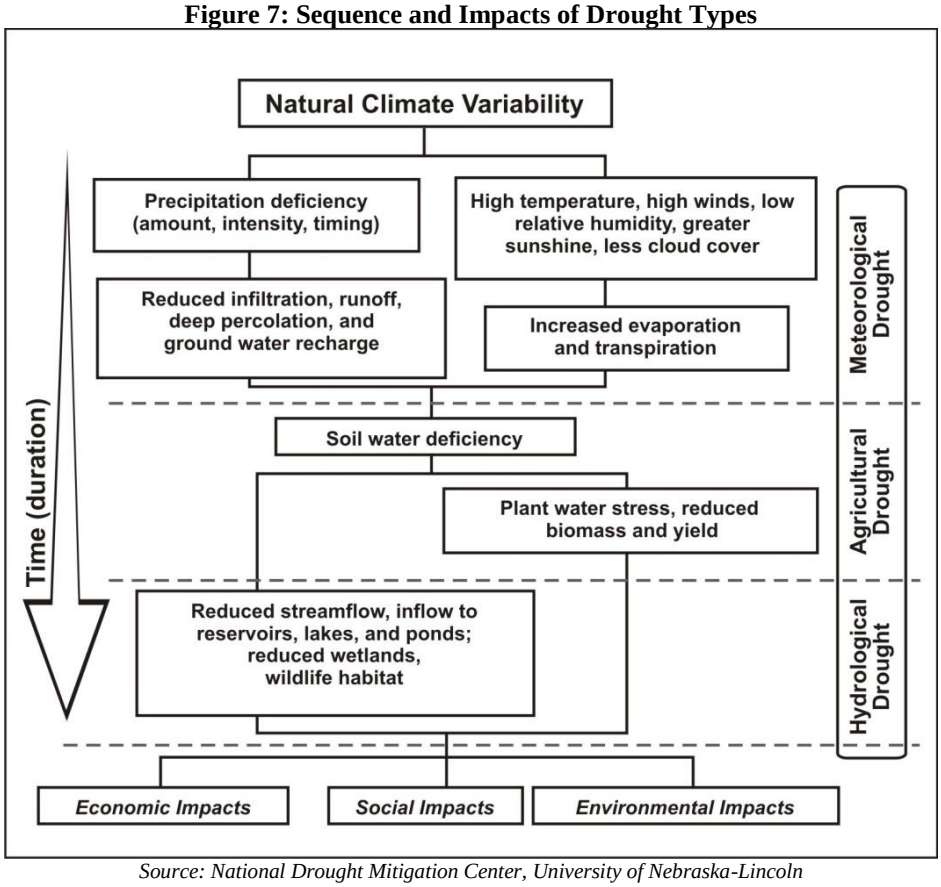
*According to the National Drought Mitigation Center, "**drought** is a normal, recurrent feature of climate, although many erroneously consider it a rare and random event. It occurs in virtually all climatic zones, but its characteristics vary significantly from one region to another."*

Drought is a slow-onset, creeping phenomenon that can effect 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 include, but are not limited to, water, forage, food grains, fish, and hydroelectric power.

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

Figure 7: Sequence and Impacts of Drought Types



Source: National Drought Mitigation Center, University of Nebraska-Lincoln

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 Region 5, which is within the planning area. This particular station's period of record started in 1895. Figure 8 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	--	--

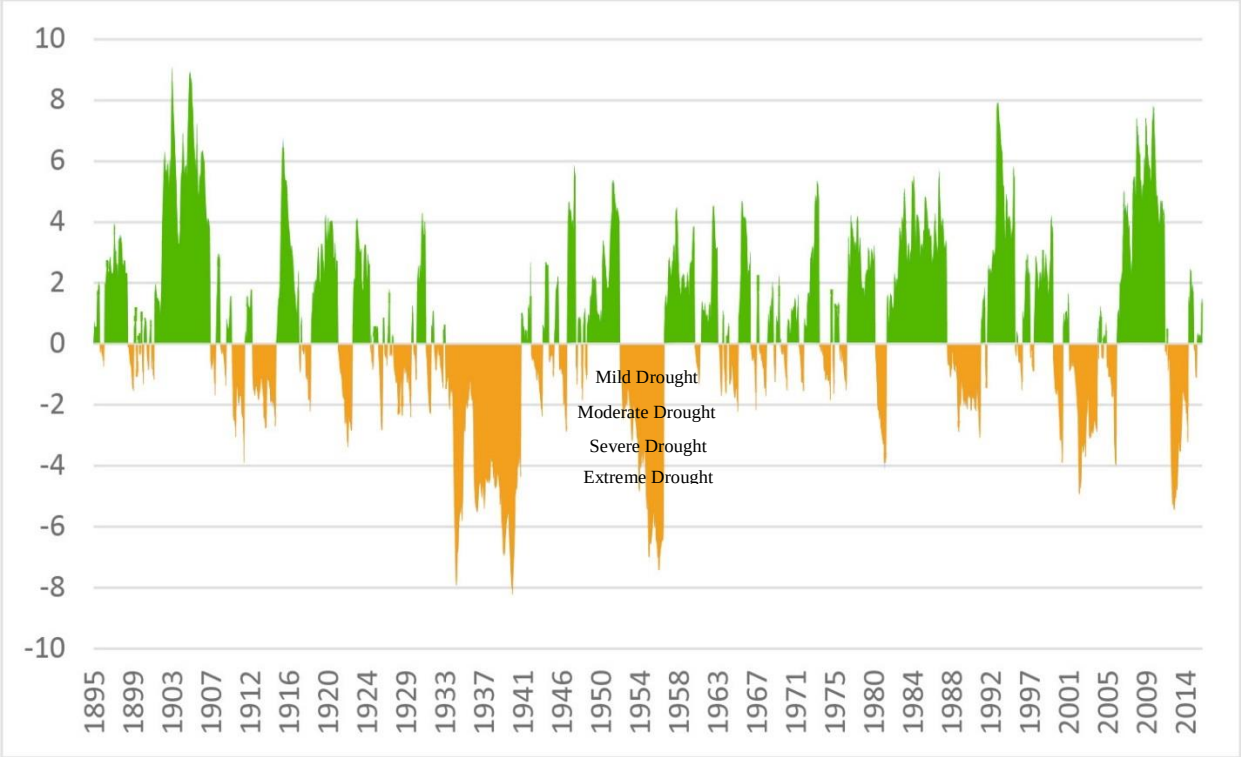
Source: Climate Prediction Center

Table 47: Historic Droughts

Drought Magnitude	Months in Drought	Percent Chance
-1 Magnitude	185/1452	12.7%
-2 Magnitude	100/1452	6.9%
-3 Magnitude	50/1452	3.4%
-4 Magnitude	109/1452	7.5%

Source: NCEI

Figure 8: Palmer Drought Severity Index



Source: NCEI, Climate Region 5

LOCATION

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

EXTENT

Using the date from Figure 8, it is reasonable to expect extreme drought to occur in 7.5 percent of years of months for the planning area (109 extreme drought months in 1,452 months). Severe drought occurred in 50 months of the 1,452 months of record (3.4 percent of months). Moderate drought occurred in 100 months of the 1,452 years of record (6.9 percent of months), and mild drought occurred in 185 of the 1,452 months of record (12.7 percent of months). Non-drought conditions (incipient dry spell, near normal, or wet spell conditions) occurred in 1,008 months, or 69.4 percent of months. These statistics show that the drought conditions of the planning area are highly variable.

AVERAGE ANNUAL LOSSES

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

Table 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	$33,000,000	$1,736,842	$209,352,874	$13,956,858

1 Indicates the data is from NCEI (January 1996 to December 2015); 2 Indicates data is from USDA RMA (2000 to 2014)

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

Magnitude	Drought Occurrences by Month	Monthly Probability
No Drought	1008/1452	69.4%
Mild Drought	185/1452	12.7%
Moderate Drought	100/1452	6.9%
Severe Drought	50/1452	3.4%
Extreme Drought	109/1452	7.5%

Source: NCEI, 1895-2016

The U.S. Seasonal Drought Outlook (Figure 9) 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 October 20, 2016 through January 31, 2017. According to the U.S. Seasonal Drought Outlook, drought is likely to persist in the western and southwestern United States, but the planning area should experience seasonal norms relative to precipitation and temperatures.

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 0 drought related impacts throughout the region. This may be a result of a deficiency in reporting of events, as drought impacts have certainly been felt throughout the region.

The Table 50 provides information related to regional vulnerabilities. For jurisdictional specific vulnerabilities, refer to *Section Seven: Participant Sections*.

Figure 9: U.S. Seasonal Drought Outlook

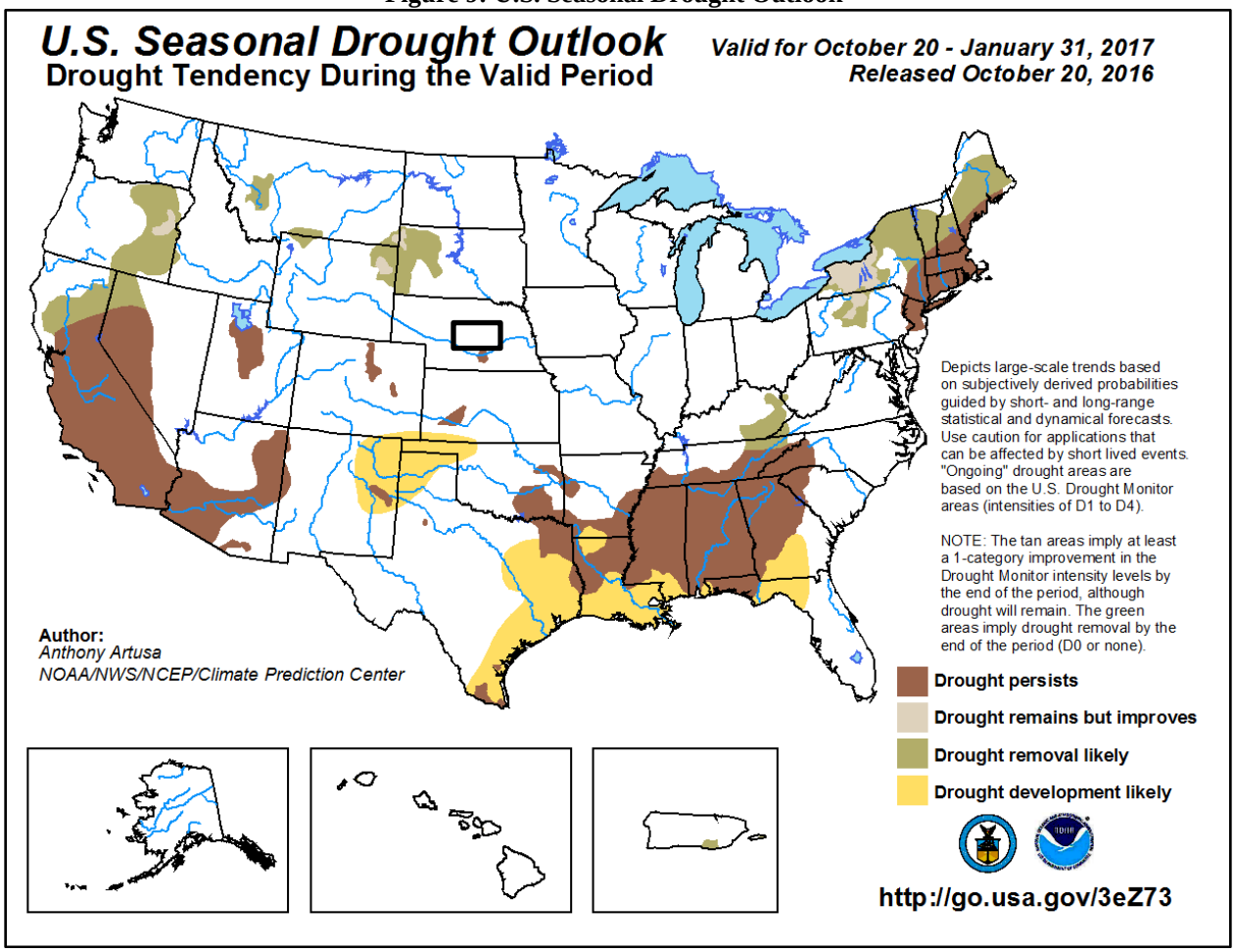


Table 50:Regional Drought Vulnerabilities

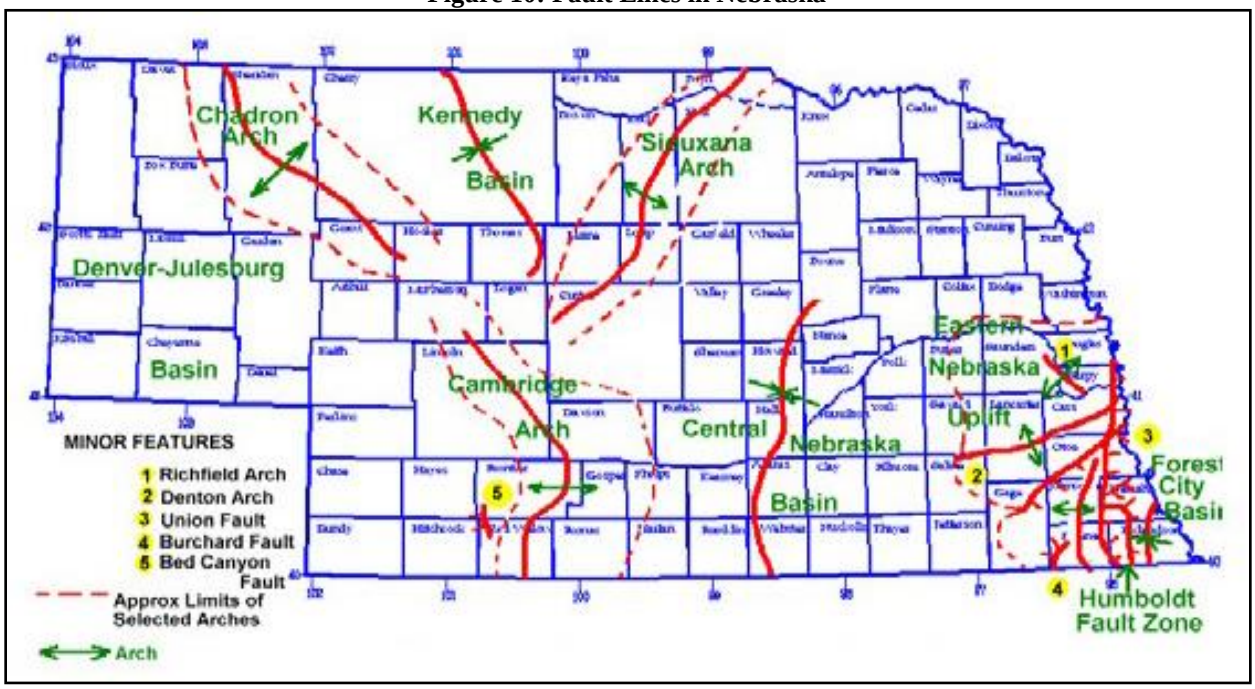
Sector	Vulnerability
People	-Insufficient water supply -Loss of jobs in agricultural sector -Residents in poverty if food prices increase
Economic	-Closure of water intensive businesses (carwashes, pools, etc.) -Loss of tourism dollars -Decrease of land prices→ jeopardizes educational funds
Built Environment	-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.

Figure 10: Fault Lines in Nebraska



Source: Nebraska Department of Natural Resources

Table 51: 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: Federal Emergency Management Agency

Table 52: 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: Federal Emergency Management Agency

LOCATION

The most likely locations in the planning area to experience an earthquake are those located near a fault line (Figure 11). The Siouxana Arch and Central Nebraska Basin lie within the planning area.

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 four earthquakes in the planning area since 1877: 3.5 near Broken Bow in 2016; 3.0 near Ord in 1990; 2.8 in St. Paul in 1979; and 5.1 near Columbus in 1877. The 1877 quake matches the largest earthquake in Nebraska history. The 30 second shock split the courthouse walls in nine places and damaged the schoolhouse walls.

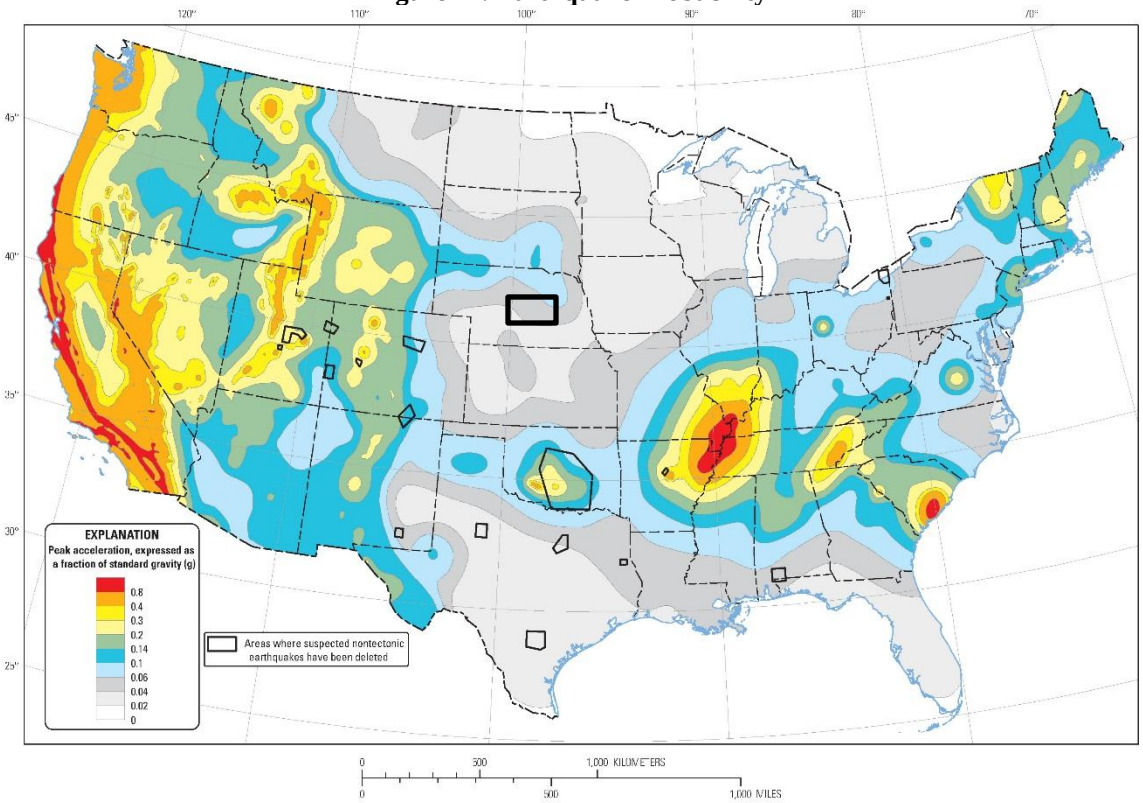
AVERAGE ANNUAL LOSSES

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.

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 1 percent. However, with four earthquakes occurring in the planning area in 139 years, for the purposes of this plan, there is a 2.9% chance of an earthquake occurring each year.

Figure 11: 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 53: 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 difficulties 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 highly 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. The hotter the animal is, the more it will begin to shut down body processes not vital to its survival, such as milk production, reproduction, or muscle building.

Other secondary concerns that are 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 also 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 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. Finally, 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.

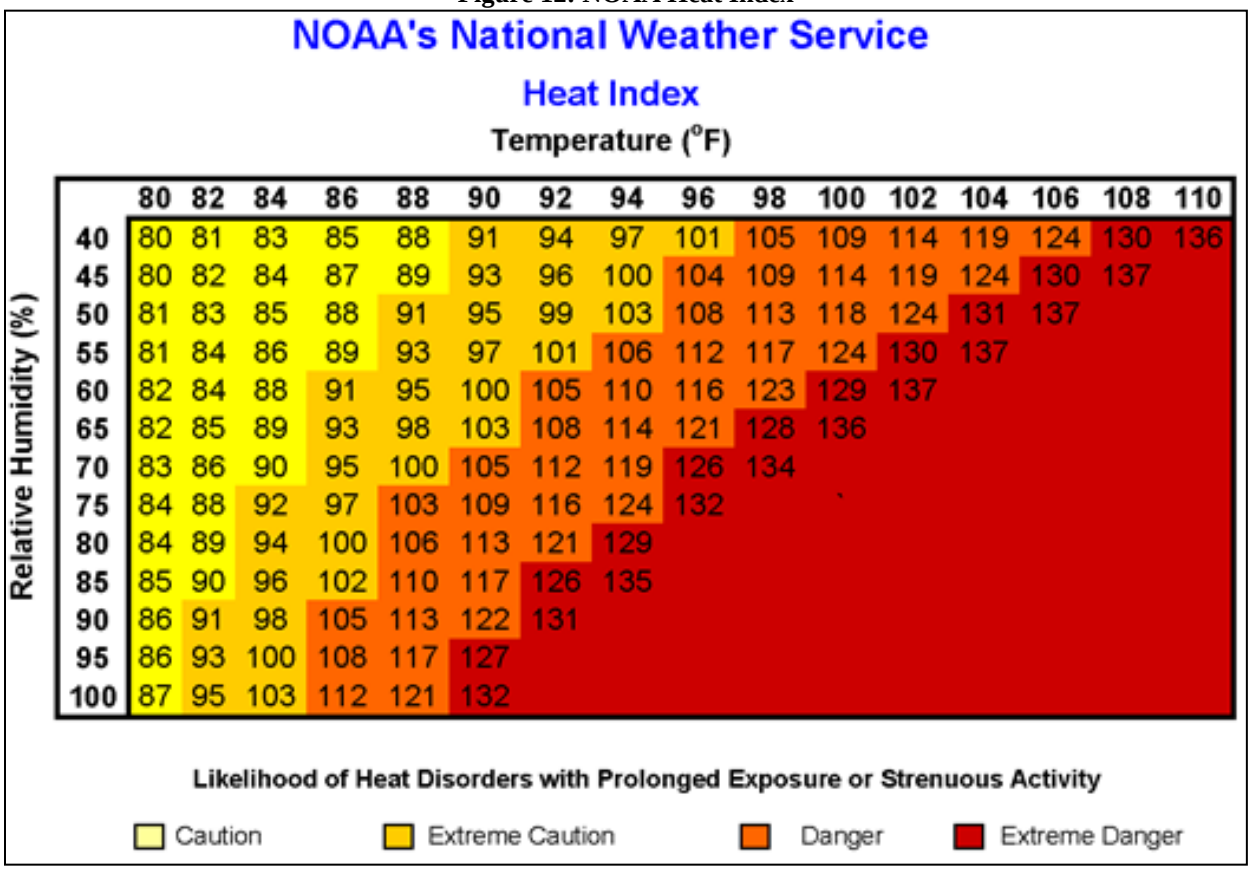
LOCATION

This hazard may occur anywhere in the planning area.

EXTENT

A key factor to consider in regards to extreme heat situations is the humidity level relative to the temperature. As is indicated in the following figure, 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: 100 percent Relative Humidity + 86°F = 112° Heat Index.

Figure 12: NOAA Heat Index



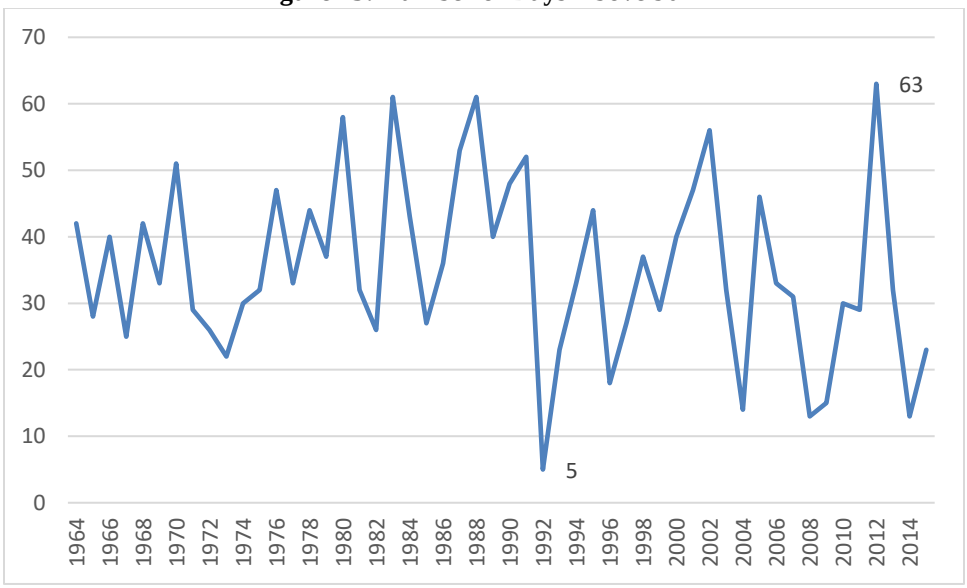
Source: NOAA

For the purpose of this plan extreme heat is being defined as temperatures of 90°F or greater.

HISTORICAL OCCURRENCES

According to the HPRCC, on average, the planning area experiences 40 days above 90°F. The planning area experienced 63 days above 90°F in 2012, which was the most 90°F on record. Conversely, 1992 was the "coolest" year on record, with only five days above 90°F.

Figure 13: Number of Days Above 90˚F



Source 1: NOAA, HPRCC

AVERAGE ANNUAL LOSSES

The direct and indirect effects of extreme heat are difficult to quantify. There is no way to place a value on the loss of human life. 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 damages due to extreme heat events.

Table 54: Extreme Heat Loss Estimation

Hazard Type	Number of Average Days Per Year at 90°F[1]	Property Damages[2]	Average Annual Property Damage[2]	Total Crop Loss[3]	Annual Crop Loss[3]
Extreme Heat	40	$0	$0	$44,979,391	$2,998,626

Source: 1 indicates the data is from MRCC; 2 NCEI; 3 USDA RMA (2000-2014)

Estimated Loss of Electricity

According to the FEMA publication "What is a Benefit: Guidance on Benefit-Cost Analysis of Hazard Mitigation Project (June 2009)", 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. 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.

Table 55: Loss of Electricity - Assumed Damage by Jurisdiction

Jurisdiction	2014 Population	Population Affected (Assumed)	Electric Loss of Use Assumed Damage Per Day
Boone County	5,404	540	$68,040
Custer County	10,820	1,082	$136,332
Garfield County	1,954	195	$24,570
Greeley County	2,500	250	$31,500
Howard County	6,315	632	$79,632
Loup County	559	56	$7,056
Nance County	3,667	367	$46,242
Platte County	32,485	3,249	$409,374
Sherman County	3,120	312	$39,312
Valley County	4,269	427	$53,802
Wheeler County	848	85	$10,710

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 56: 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 has been a major problem for many of the communities in the LLNRD. Many of the communities were settled and developed largely because of their proximity to water resources. 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 1 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, result from convective precipitation usually due to intense thunderstorms or sudden release from an upstream impoundment created behind a dam, landslide, or levee. Flash floods are distinguished from a regular flood by a timescale less than six hours and 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 man-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 57 shows current statuses of FIRM panels. Most jurisdictions throughout the planning area also have FIRMS at the municipal level. However, effective Digital Flood Insurance Rate Maps (DFIRM) were not available for all jurisdictions within the planning area. Therefore, the best available digital data for depicting the flood hazard for these counties is a modeled floodplain using Hazards United States Multi-Hazard (HAZUS-MH). In the absence of DFIRM data, HAZUS-MH was used to generate a 1 percent annual flood event for major rivers and creeks (those with a 10-square mile minimum drainage area). Hazus does not provide a perfect reflection of the situation on the ground. There may be rivers or streams which cause flooding damages, but have drainages areas smaller than 10 square miles: these streams will not be included for analysis. A USGS 30-meter resolution digital elevation model (DEM) was used as the terrain base in the model; features smaller than 30 square meters may not be included in analysis. The Special Flood Hazard Areas shown in this plan are not regulatory, and are only approximations of vulnerability.

Figure 14 shows the DFIRMs and modeled floodplain 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 14: 1% Annual Chance Flood Risk Area

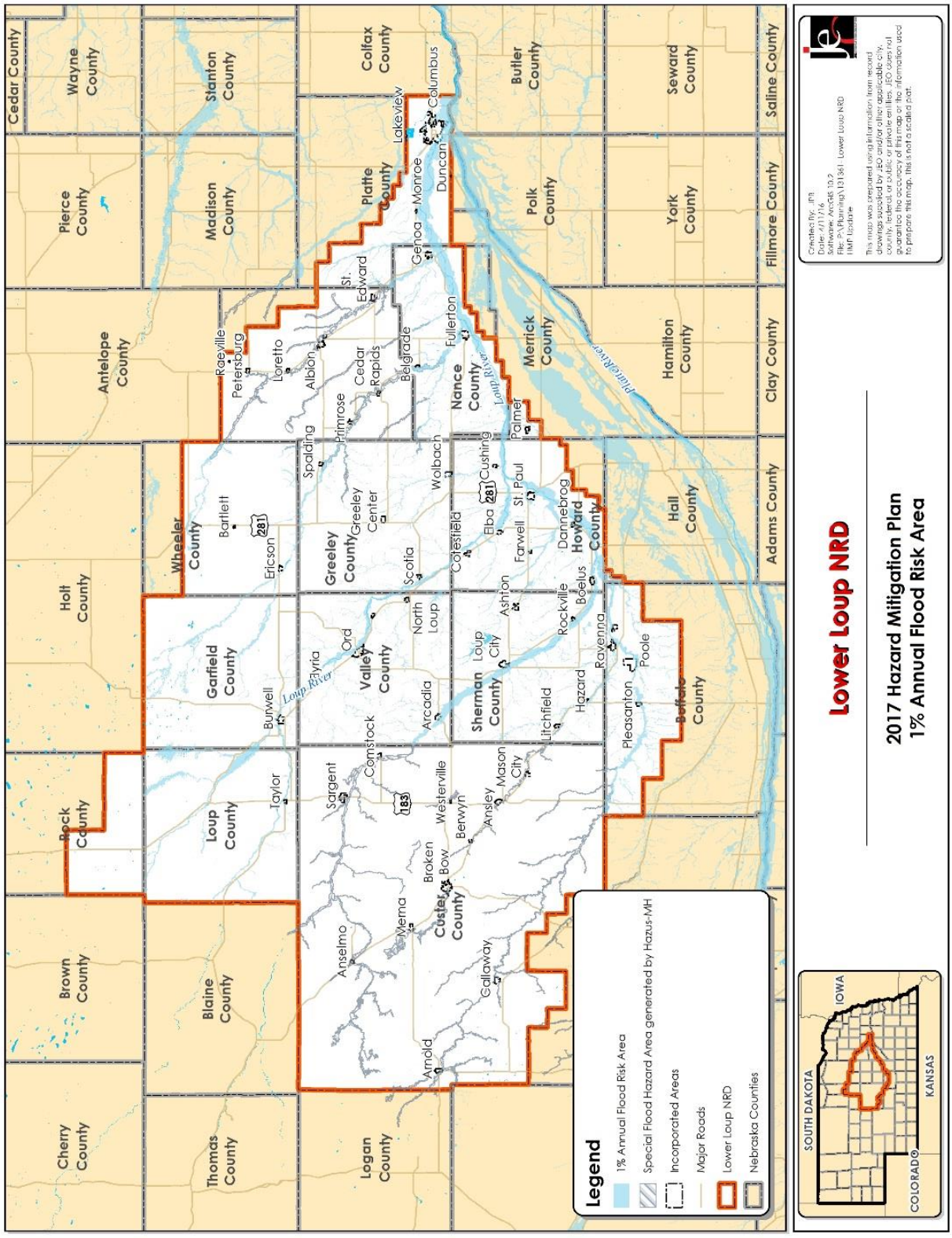


Table 57: FEMA FIRM Panel Status

Jurisdiction	Panel Number	Effective Date
Boone County	31011CIND0	12/06/99
Albion	31011C0309C, 31011C0325C, 31011C0328C, 31011C0350C	12/06/99
Cedar Rapids	31011C0409C, 31011C0417C, 31011C0425C	12/06/99
Petersburg	31011C0177C	12/06/99
St. Edwards	31011C0478C	12/06/99
Custer County	310428IND0A	3/1/02
Anselmo	-	-
Ansley	3103400001A	8/19/87
Arnold	310342	8/15/75
Broken Bow	3100510001B, 3100510001	9/29/78
Callaway	-	-
Sargent	-	-
Garfield County	31071CIND0A	4/16/08
Burwell	31071C0225B, 31071C0250B	4/16/08
Greeley County	31077CIND0A	5/16/08
Greeley	31077C0195B, 31077C0200B	5/16/08
Scotia	31077CO280B, 31077CO300B	5/16/08
Spalding	31077C0100B, 31077C0105B, 31077C0115B	5/16/08
Wolbach	31077CIND0A	5/16/08
Howard County	31093CIND0B	7/7/14
Boelus	31093C0303C, 31093C0304C	10/19/04
Cotesfield	31093C011C	10/19/04
Cushing	31093C0190C	10/19/04
Dannebrog	31093C0331D	7/7/04
Elba	31093C0410C	10/19/04
Farwell	31093C0210C, 31093C0230C	10/19/04
St. Paul	31093C0255D, 31093C0275D	7/7/04
Loup County	31115CIND0A	5/16/08
Taylor	31115C0325B, 31115C0350B	5/16/08
Nance County	31125CIND0A	8/4/05
Belgrade	31125C0152C, 31125C0154C	8/4/05
Fullerton	31125C0188C, 31125C0189C, 31125C0325C, 31125C0326C, 31125C0327C	8/4/05
Genoa	31125C0228C	8/4/05
Platte County	31141CIND0A	4/19/10
Columbus	31141C0310E, 31141C0320E, 31141C0330E, 31141C0335E, 31141C0340E, 31141C0345E	4/19/10
Monroe	31141C0300E	4/19/10
Sherman County	31163CIND0A	5/16/08
Ashton	31163C0220C	5/16/08
Hazard	31163C0405C	5/16/08
Litchfield	31163CIND0A	5/16/08
Loup City	31163C0190C	5/16/08
Rockville	31163C0455C	5/16/08
Valley County	31175CIND0A	8/19/08
Arcadia	31175C0220C, 31175C0225C, 31175C0240C, 31175C0250C	8/19/08

Elyria	31175C0045C, 31175C0050C, 31175C0075C	8/19/08
North Loup	31175C0195C, 31175C0285C	8/19/08
Ord	31175C0075C, 31175C0155C, 31175C0160C	8/19/08
Wheeler County	31183CIND0A	1/2/08
Bartlett	31183C0200A, 31183C0325A	1/2/08
Ericson	31183C0300A	1/2/08

Source: National Flood Insurance Program

EXTENT

The NWS has three categories to define the severity of a flood once a river reaches flood stage as indicated in Table 58.

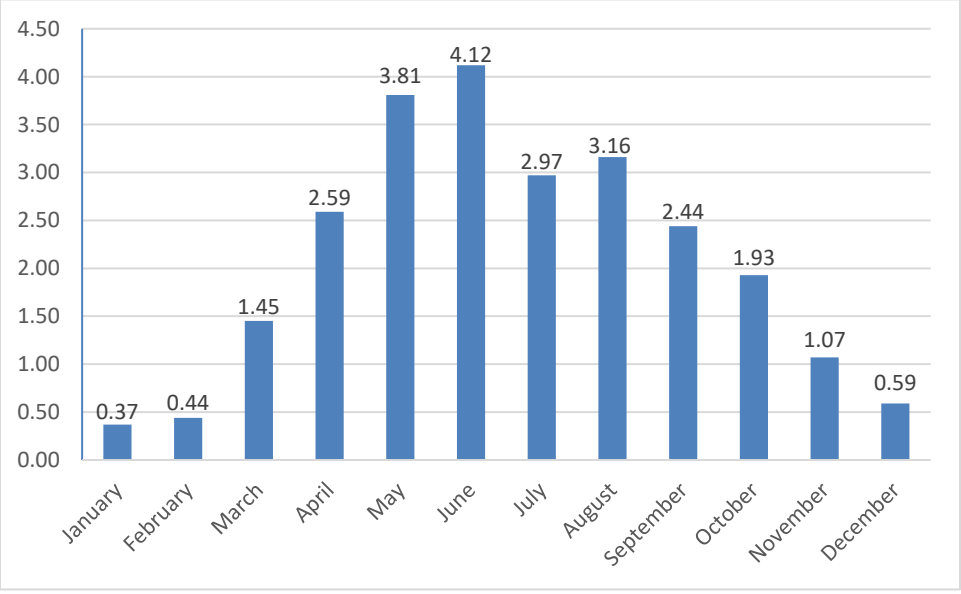
Table 58: Flooding Stages

Flood Stage	Description of flood impacts
Minor Flooding	Minimal or no property damage, but possible 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

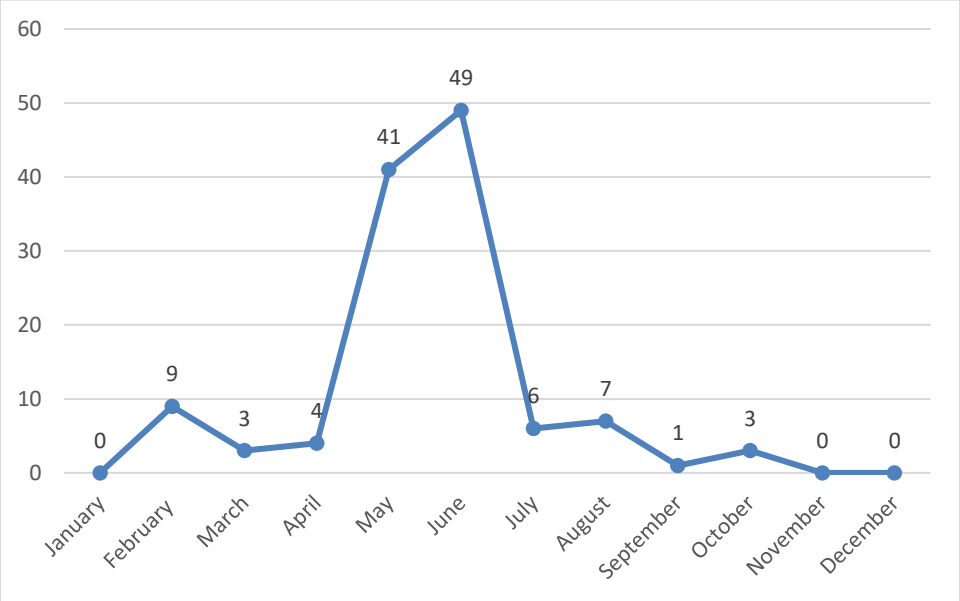
Figure 15 shows the normal average monthly precipitation for the planning area, which is helpful in determining whether any given month is above, below, or near normal in precipitation. As indicated in Figure 16, the most common months for flooding within the planning area are May and June. While it is possible that major flood events will occur, the likely extent of flood events within the planning area is classified as moderate.

Figure 15: LLNRD Average Monthly Precipitation



Source: HPRCC

Figure 16: Monthly Trend for Floods/Flash Flood in the LLNRD (1996-2015)



Source: NCEI

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 that participate 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 59: NFIP Participants

Jurisdiction	Eligible-Regular Program	Date Current Map	Sanction	Suspension	Rescinded	Participation in NFIP
Boone County	9/18/87	12/6/99	-	-	-	Yes
Albion	4/2/86	12/6/99	-	-	-	Yes
Cedar Rapids	12/18/01	12/6/99	-	-	-	Yes
Petersburg	9/24/84	12/6/99	-	-	-	Yes
Primrose	-	-	-	-	-	No
St. Edward	2/01/90	12/6/99	-	-	-	Yes
Custer County	3/1/02	3/1/02	-	-	-	Yes
Anselmo	9/4/86	11/22/74	-	-	-	Yes
Ansley	8/19/87	8/19/87	-	-	-	Yes

Jurisdiction	Eligible-Regular Program	Date Current Map	Sanction	Suspension	Rescinded	Participation in NFIP
Arnold	-	8/15/75	8/15/76	-	-	No
Berwyn	-	-	-	-	-	No
Broken Bow	9/29/78	9/29/78	-	-	-	Yes
Callaway	-	-	-	-	-	No
Comstock	-	-	-	-	-	No
Mason City	-	-	-	-	-	No
Merna	-	-	-	-	-	No
Sargent	9/24/84	9/24/84	-	-	-	Yes
Garfield County	6/12/08	4/16/08	-	-	-	Yes
Burwell	6/2/03	4/16/08	-	-	-	Yes
Greeley County	7/16/08	5/16/08	-	-	-	Yes
Greeley	6/2/03	5/16/08	-	-	-	Yes
Scotia	11/28/08	5/16/08	-	-	-	Yes
Spalding	6/3/10	5/16/08	-	-	-	Yes
Wolbach	2/1/87	5/16/08	-	-	-	Yes
Howard County	9/30/97	7/7/14	-	-	-	Yes
Boelus	9/27/85	10/19/04	-	-	-	Yes
Cotesfield	-	10/19/04	10/19/05	-	-	No
Cushing	-	10/19/04	10/19/05	-	-	No
Dannebrog	1/3/90	7/7/14	-	-	-	Yes
Elba	10/19/04	10/19/04	-	-	-	Yes
Farwell	-	10/19/04	10/19/05	-	-	No
St. Paul	1/21/05	7/7/14		-	-	Yes
Loup County	-	5/16/08	5/16/09	-	-	No
Taylor	7/11/75	5/16/08	-	-	-	Yes
Nance County	8/4/05	8/4/05	-	-	-	Yes
Belgrade	-	8/4/05	5/2/76	-	-	No
Fullerton	2/1/87	8/4/05	-	-	-	No
Genoa	8/19/87	8/4/05	-	-	-	Yes
Platte County	9/1/90	4/19/10	-	-	-	Yes
Columbus	6/29/73	4/19/10	-	-	-	Yes
Monroe	7/14/10	4/19/10	-	-	-	Yes
Sherman County	9/12/08	5/16/08	-	-	-	Yes
Ashton	5/16/08	5/16/08	-	-	-	Yes
Hazard	-	5/16/08	5/16/09	-	-	No

Jurisdiction	Eligible-Regular Program	Date Current Map	Sanction	Suspension	Rescinded	Participation in NFIP
Litchfield	2/1/87	5/16/08	-	-	-	No
Loup City	5/1/87	5/16/08	-	-	-	Yes
Rockville	7/2/09	5/16/08	-	-	-	Yes
Valley County	9/19/08	8/19/08	-	-	-	Yes
Arcadia	9/10/84	8/19/08	-	-	-	Yes
Elyria	8/28/08	8/19/08	-	-	-	Yes
North Loup	8/1/87	8/19/08	-	-	-	Yes
Ord	12/7/84	8/19/08	-	-	-	Yes
Wheeler County	6/12/08	1/2/08	-	-	-	Yes
Bartlett	-	-	-	-	-	No
Ericson	-	-	-	-	-	No

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

Table 60: NFIP Policies in Place and Total Payments

Jurisdiction	Policies In-force	Total Coverage	Total Premium	Closed Losses*	Total Payments
Rural Boone County	5	$475,000	$2,393	0	$0
Albion	1	$60,800	$754	1	$812.29
Cedar Rapids	4	$156,000	$2,123	0	$0
Petersburg	0	N/A	N/A	N/A	N/A
Primrose	0	N/A	N/A	N/A	N/A
St. Edward	8	$686,600	$7,616	5	$30,696.79
Rural Custer County	10	$1,404,900	$7,899	1	$66,677.36
Anselmo	0	N/A	N/A	N/A	N/A
Ansley	32	$1,179,100	$16,460	0	$0
Arnold	0	N/A	N/A	N/A	N/A
Berwyn	0	N/A	N/A	N/A	N/A
Broken Bow	27	$1,877,400	$18,946	0	$0
Callaway	0	N/A	N/A	N/A	N/A
Comstock	0	N/A	N/A	N/A	N/A
Mason City	0	N/A	N/A	N/A	N/A
Merna	0	N/A	N/A	N/A	N/A
Sargent	1	$175,000	$322	1	$3,205.88
Rural Garfield County	0	N/A	N/A	N/A	N/A
Burwell	4	$296,400	$1,670	0	$0
Rural Greeley County	0	N/A	N/A	N/A	N/A
Greeley	0	N/A	N/A	N/A	N/A
Scotia	0	N/A	N/A	N/A	N/A

Jurisdiction	Policies In-force	Total Coverage	Total Premium	Closed Losses*	Total Payments
Spalding	0	N/A	N/A	N/A	N/A
Wolbach	0	N/A	N/A	N/A	N/A
Rural Howard County	35	$4,658,800	$31,467	0	$1,245.75
Boelus	0	N/A	N/A	1	N/A
Cotesfield	0	N/A	N/A	N/A	N/A
Cushing	0	N/A	N/A	N/A	N/A
Dannebrog	19	$1,397,500	$16,384	1	$770.00
Elba	0	N/A	N/A	N/A	N/A
Farwell	0	N/A	N/A	N/A	N/A
St. Paul	2	$299,500	$1,938	0	$0
Rural Loup County	0	N/A	N/A	N/A	N/A
Taylor	0	N/A	N/A	N/A	N/A
Rural Nance County	7	$622,800	$5,314	0	$0
Belgrade	0	N/A	N/A	N/A	N/A
Fullerton	0	N/A	N/A	N/A	N/A
Genoa	0	N/A	N/A	N/A	N/A
Rural Platte County	56	$11,461,900	$67,937	6	$95,671.53
Columbus	91	$27,784,400	$41,706	24	$109,741.73
Monroe	0	N/A	N/A	N/A	N/A
Rural Sherman County	1	$60,000	$819	0	$0
Ashton	0	N/A	N/A	N/A	N/A
Hazard	0	N/A	N/A	N/A	N/A
Litchfield	0	N/A	N/A	1	$7,045.99
Loup City	5	$461,000	$4,836	0	$0
Rockville	0	N/A	N/A	N/A	N/A
Rural Valley County	1	$121,000	$1,270	0	$0
Arcadia	0	N/A	N/A	N/A	N/A
Elyria	0	N/A	N/A	N/A	N/A
North Loup	1	$14,900	$365	4	$23,555.64
Ord	6	$471,000	$4,311	2	$6,192.51
Rural Wheeler County	2	$222,500	$867	1	$7,763.06
Bartlett	0	N/A	N/A	N/A	N/A
Ericson	0	N/A	N/A	N/A	N/A
Planning Area Total	**318**	**$53,886,500**	**$235,397**	**48**	**$353,378.50**

Source: NFIP Community Status Book, November 2016; NFIP Claim Statistics
*N/A: Not Applicable; *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. Jurisdictions are encouraged to initiate activities above the minimum participation requirements, which are described in the CRS Coordinator's Manual (FIA-15/2013).

NFIP REPETITIVE LOSS STRUCTURES

NDNR was contacted to determine if any existing buildings, infrastructure, or critical facilities are classified as an NFIP Repetitive Loss Structure. There is a total of two repetitive loss properties in the planning area. The following table indicates the number, type, and location of these properties in the planning area (as of August 2016).

Table 61: Repetitive Loss Structures

Jurisdiction	Number of Properties	Type of Property
Columbus	1	Single Family
St. Edward	1	Single Family

Source: NDNR, August 2016

HISTORICAL OCCURRENCES

According to the NCEI, flash flooding resulted in $7,442,200 in property damage, while riverine flooding caused $1,733,000 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 $2,163,781.

Flooding in Valley County, June 2010

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 $413,760 in property damages and $154,555 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	123	6.5	$8,275,200	$413,760	$2,163,781	$154,555

1 Indicates data from NCEI (January 1996 to December 2015) 2 Indicates data from RMA (2000 to 2014)

PROBABILITY

The NCEI reports 123 flooding/flash flooding events from January 1996 to December 2015. Based on the historic record and reported incidents by participating communities, there is a 100 percent probability of flooding will occur annually in the planning area.

REGIONAL VULNERABILITY

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 did find 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.

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

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

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

Table 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

Sector	Vulnerability
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 out from the original source, their ability to change direction unexpectedly, and to jump gaps, such as roads, rivers, and fire breaks. While some wildfires burn in remote forested regions, others can cause extensive destruction of homes and other property located in the wildland-urban interface, the zone of transition between developed areas and undeveloped wilderness.

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

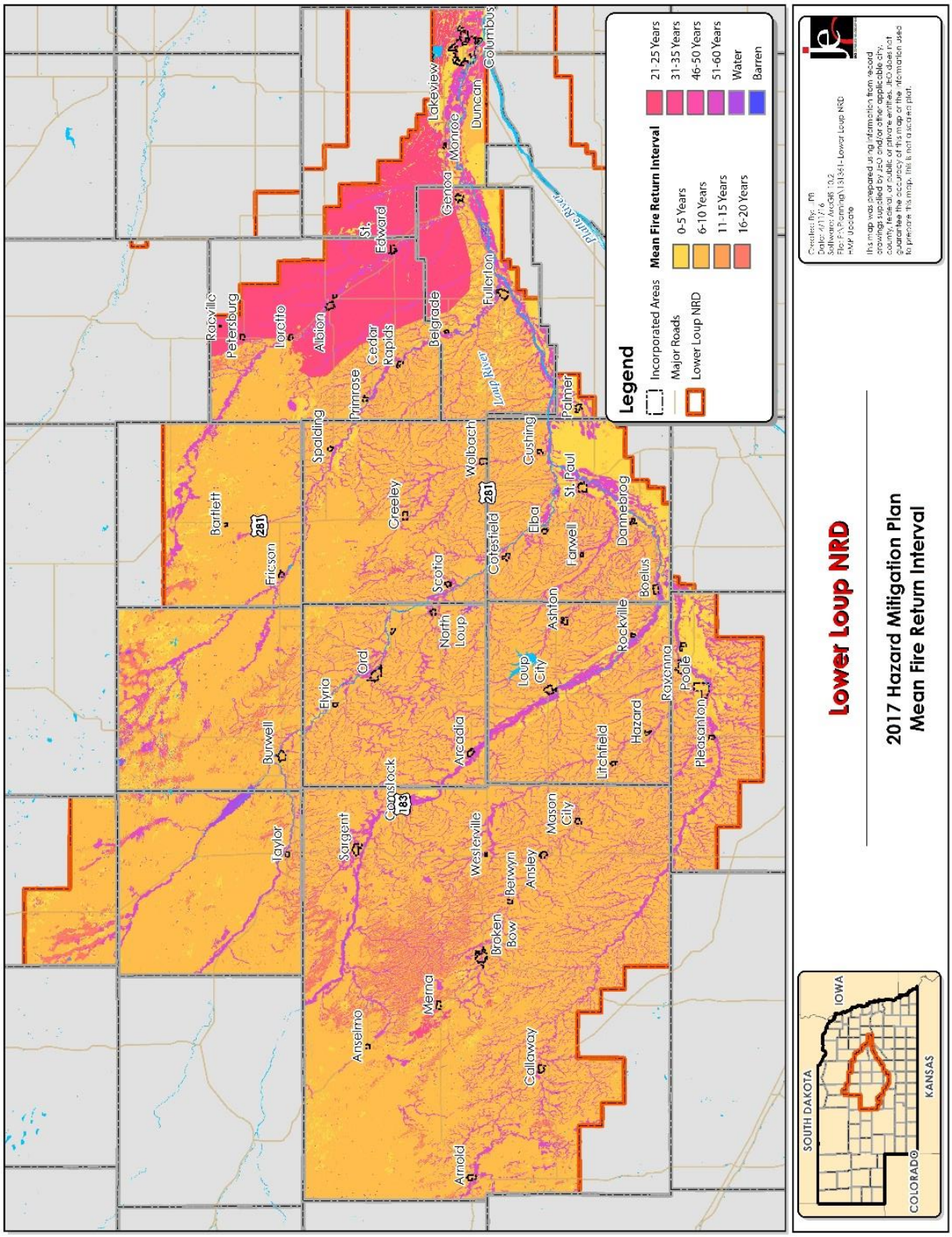
Lightning starts approximately 10,000 ***forest fires*** *each year, yet ninety percent of forest fires are started by humans.*

-National Park Service

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

Figure 17 shows the USGS' Mean Fire Return Interval. This model takes into account a variety of factors, including landscape, fire dynamics, fire spread, fire effects and spatial context. These values show how often fires occur in a given area, under natural conditions. While much of the planning area has adopted a culture of absolute fire suppression, due to agricultural concerns, it is important to recognize that in a natural environment, some areas experience higher levels of vulnerability to grass and wildfires. According to the map below, the planning area has a wide range of fire regimes.

Figure 17: Mean Fire Return Interval



Source: USGS LANDFIRE Database

LOCATION

As the number of reported wildfires by the county indicates, the greatest threat of wildfire that could impact people and homes is in portions of Custer and Platte Counties.

Table 64: Reported Wildfires by County

County	Reported Wildfires	Acres Burned
Boone	84	640.4
Custer	632	30,942.9
Garfield	67	4,266.9
Greeley	163	17,310
Howard	78	1,721.4
Loup	57	1,732.7
Nance	109	1,661.6
Platte	375	3,063.98
Sherman	83	2,692.4
Valley	97	766.9
Wheeler	39	2,401.9
Total	**1,784**	**67,201**

Source: Nebraska Forest Service, 2000-2014

EXTENT

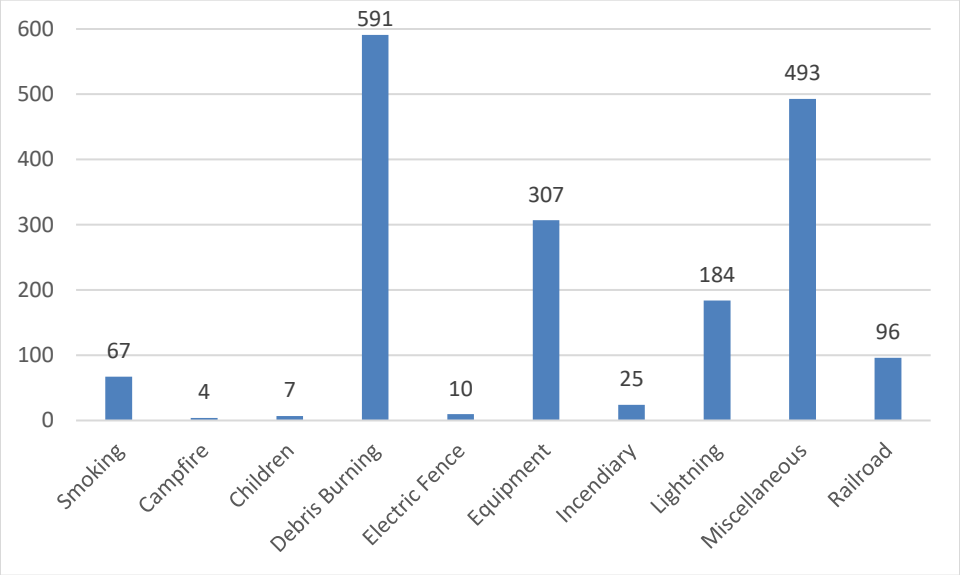
Figure 18 illustrates the number of wildfires by cause in the planning area from 2000 to 2014, which burned 67,201 acres in total. There were 1,784 reported wildfires in the planning area between 2000 and 2014. One hundred and two of the fires burned 100 acres or more, with the largest wildfire burning 10,000 acres in Greeley County in April 2000.

HISTORICAL OCCURRENCES

For the planning area, there were 1,784 reported wildfires by 47 different fire departments according to the NFS from 2000 to 2014. The reported events burned 67,201 acres. The reported fire events caused $19,568 in crop damages according to the RMA.

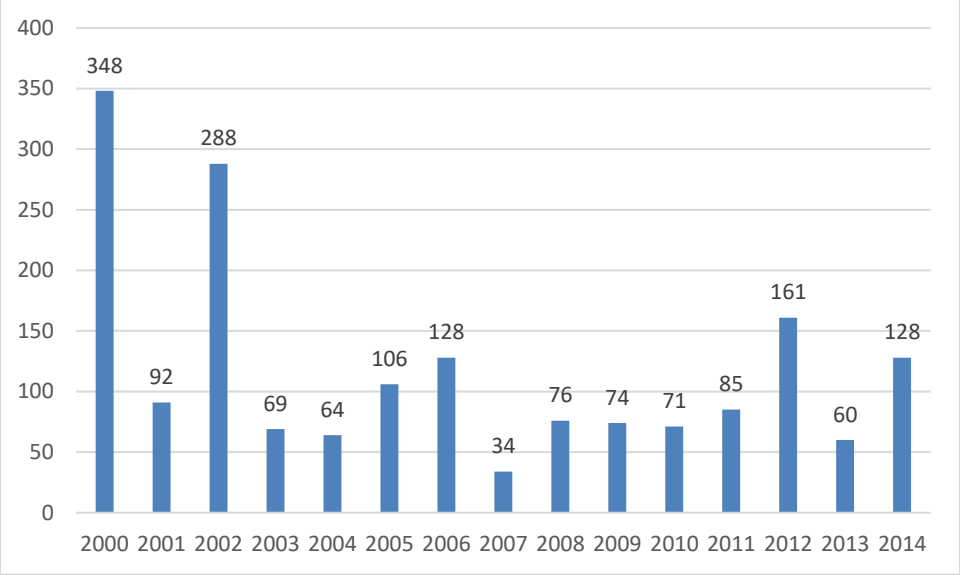
Wildfires are most likely to be started by debris burning (33%). Miscellaneous causes (28%) and equipment (17%) are the second and third leading causes of fires in the planning area. Most wildfires that occur in the planning area will likely be kept to under 100 acres.

Figure 18:Wildfires by Cause for the Planning Area 2000-2014



Source: Nebraska Forest Service

Figure 19: Number of Wildfires by Year for the Planning Area



Source: Nebraska Forest Service

AVERAGE ANNUAL DAMAGES

The average damage per event estimate was determined based upon U.S. 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 67,201 acres and caused $19,568 in 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	1,784	118.9	37.7 acres	67,201 acres	$19,568	$1,305

1 Indicates data is from NFS (2000-2014); 2 Indicates data is from RMA (2000 to 2014)

Table 66: Wildfire Threats

Hazard Type	Injuries	Homes Threatened	Other Structures Threatened
Grass/Wildfires	21	9	3

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 or about 119 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 usually associated with severe thunderstorms, and this association makes hail just as unpredictable as a severe thunderstorm. 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, high winds, and can produce tornadoes with little or no advanced warning. Furthermore, hail can destroy property and crops with their shear force as some hail stones can fall at 100 mph.

The moisture from the thunderstorms that are 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 TORRO scale is used to classify hailstones and provides some detail related to the potential impacts from hail. Table 68 outlines the TORRO Hailstone Scale.

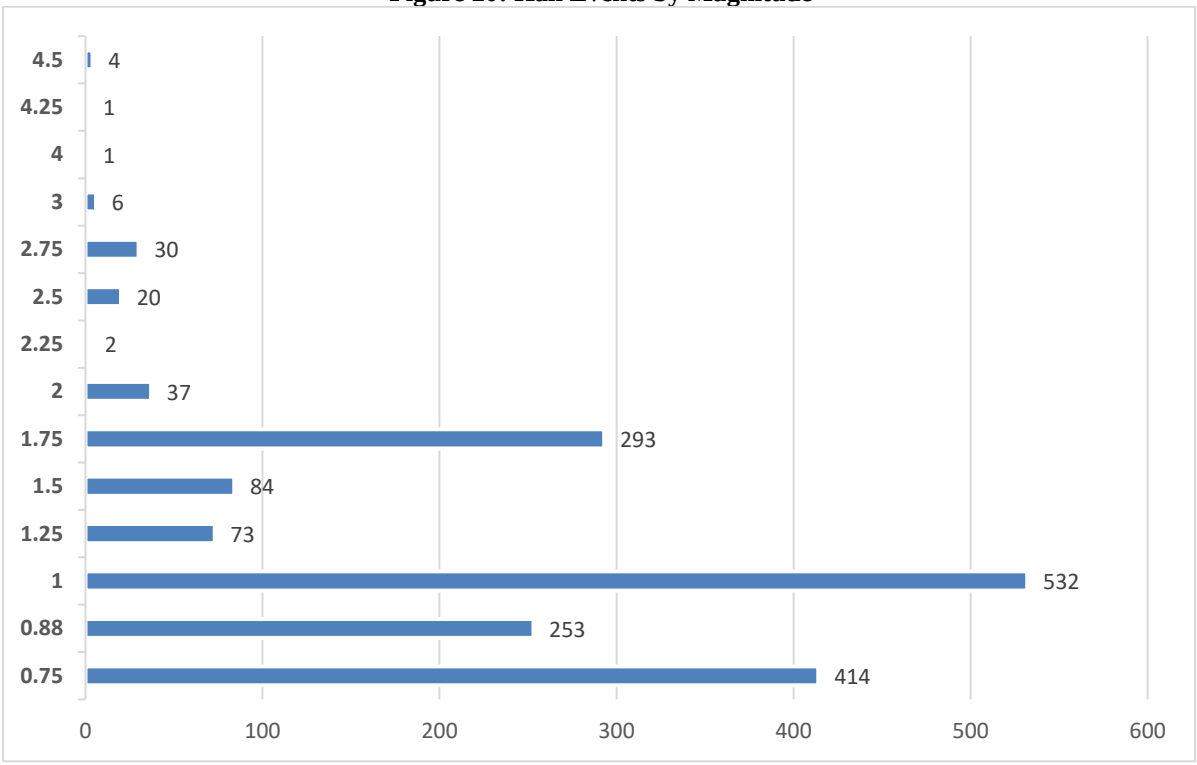
Table 68: TORRO Hail Scale

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

Of the 1,752 hail events reported for the planning area, the average hailstone size is 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 six H10 hail events (>4.0 inches) during the period of record. Figure 20 shows hail events based on the size of the hail.

Figure 20: Hail Events by Magnitude



Source: NCEI, 1996--2016

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 that could be reported by the NCEI as several events. The NCEI reports a total of 1,752 hail events in the planning area between 1996 and 2015. These events were responsible for $25,103,900 in property damages and $90,022,627 in crop damages. These events resulted in two injuries and no 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	1,752	87.6	$25,103,900	$1,255,195	$90,022,627	$6,001,508

1 Indicates the data is from NCEI (January 1996 to December 2015); 2 Indicates data is from USDA RMA (2000 to 2014)

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 1,752 hail events between 1996 and 2015, or approximately 88 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

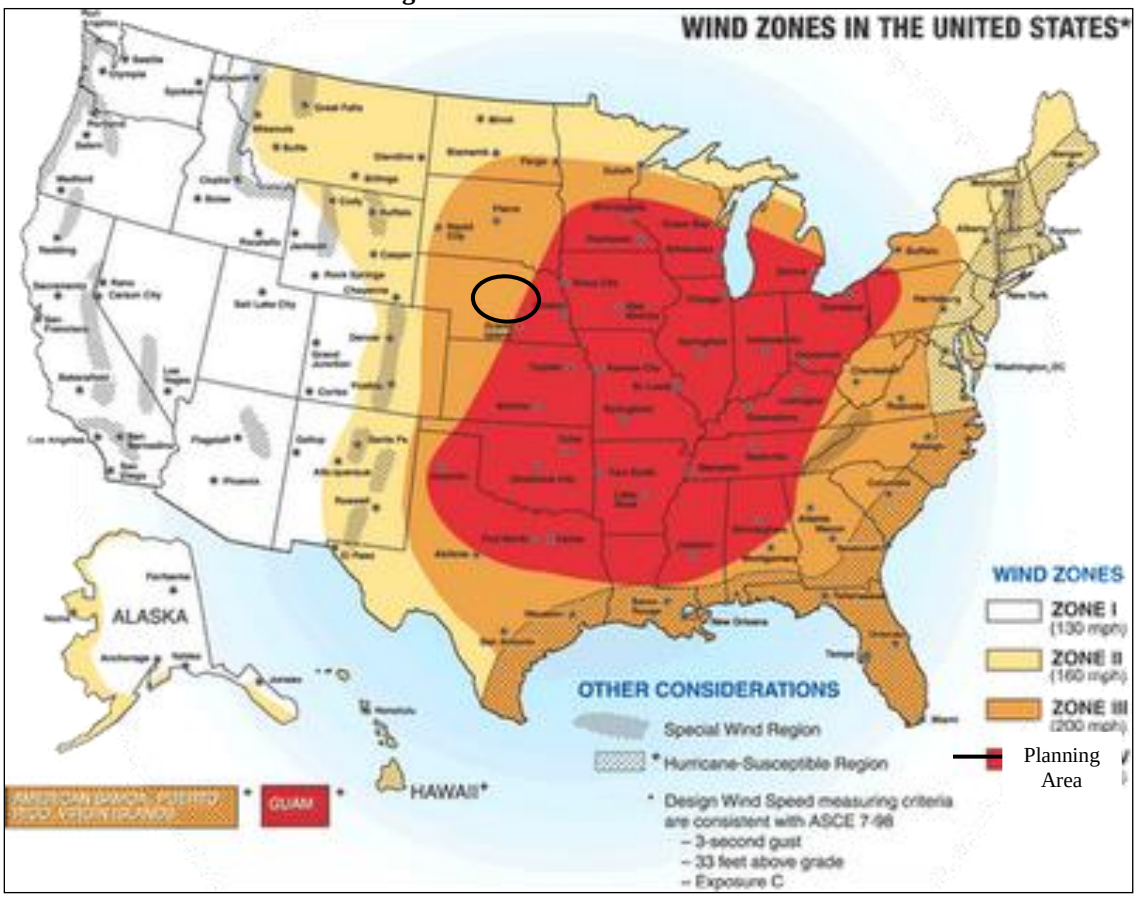
HIGH WINDS

HAZARD PROFILE

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

The 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. 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 21 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 21:Wind Zones in the U.S.



Source: FEMA

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, providing wind speed ranking, range of wind speeds per ranking, and a brief description of conditions for each ranking.

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

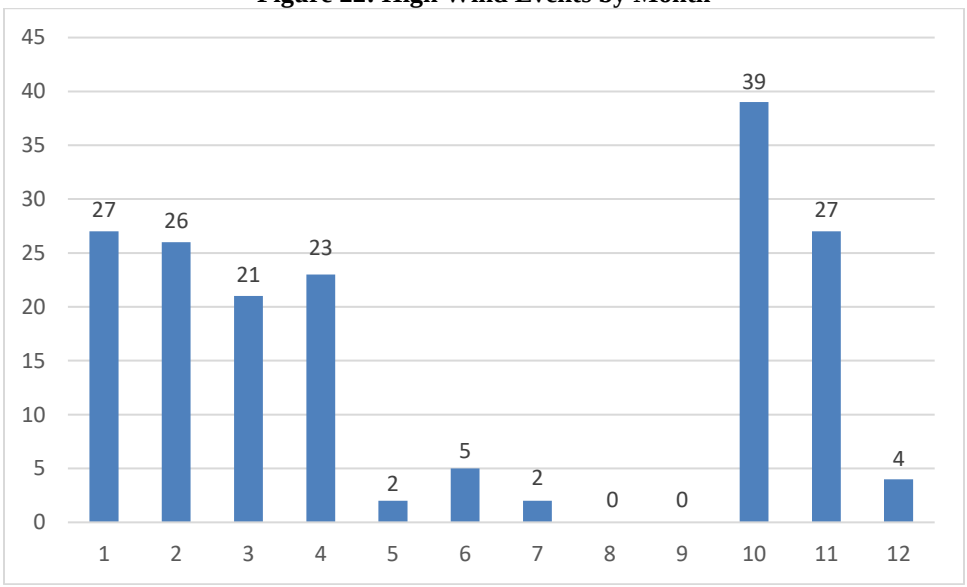
Using the NCEI reported events, the most common high wind event is a level 9. The reported high wind events had an average of 50 mph winds. It is likely that this level of event will occur several times annually.

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 176 high wind events that occurred between January 1996 and December 2015. As seen in Figure 22, most high wind events occur in the fall, winter, and spring months. The events identified by the NCEI are listed in *Section Seven: Participant Sections* for each county.

Figure 22: High Wind Events by Month



Source: NCEI

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 $67,520 per year in property damage, and an average of $1,102,279 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	176	8.8	$1,350,400	$67,520	$16,534,198	$1,102,279

1 Indicates the data is from NCEI (January 1996 to December 2015); 2 Indicates data is from USDA RMA (2000 to 2014)

PROBABILITY

Based on historical records and reported events, it is likely that high winds will occur within the planning area several times annually. For the 20 years examined, there were 176 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

LEVEE FAILURE

HAZARD PROFILE

According to FEMA:

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

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

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

LOCATION

There are four levees located within the planning area as reported by the USACE. See Figure 23 and Table 74 for levee protected areas in the planning area.

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

Table 74: Levees in LLNRD

Name	Sponsor	City	County	River	Length (miles)	Type of Protection	Protected Area (acres)	Inspection Rating
Broken Bow – Mud Creek LB	City of Broken Bow	Broken Bow	Custer	Mud Creek	0.17	100 Year	35.02	Unacceptable
Broken Bow – Mud Creek RB	City of Broken Bow	Broken Bow	Custer	Mud Creek	0.83	100 Year	156.78	Minimally Acceptable
Columbus – Lost Creek RB	City of Columbus	Columbus	Platte	Lost Creek	1.35	100 Year	474.70	Minimally Acceptable
Columbus – Loup River LB	City of Columbus	Columbus	Platte	Loup River	5.17	100 Year	1,718.64	Minimally Acceptable

Source: USACE Levee Database

Figure 23: Broken Bow Leveed Areas

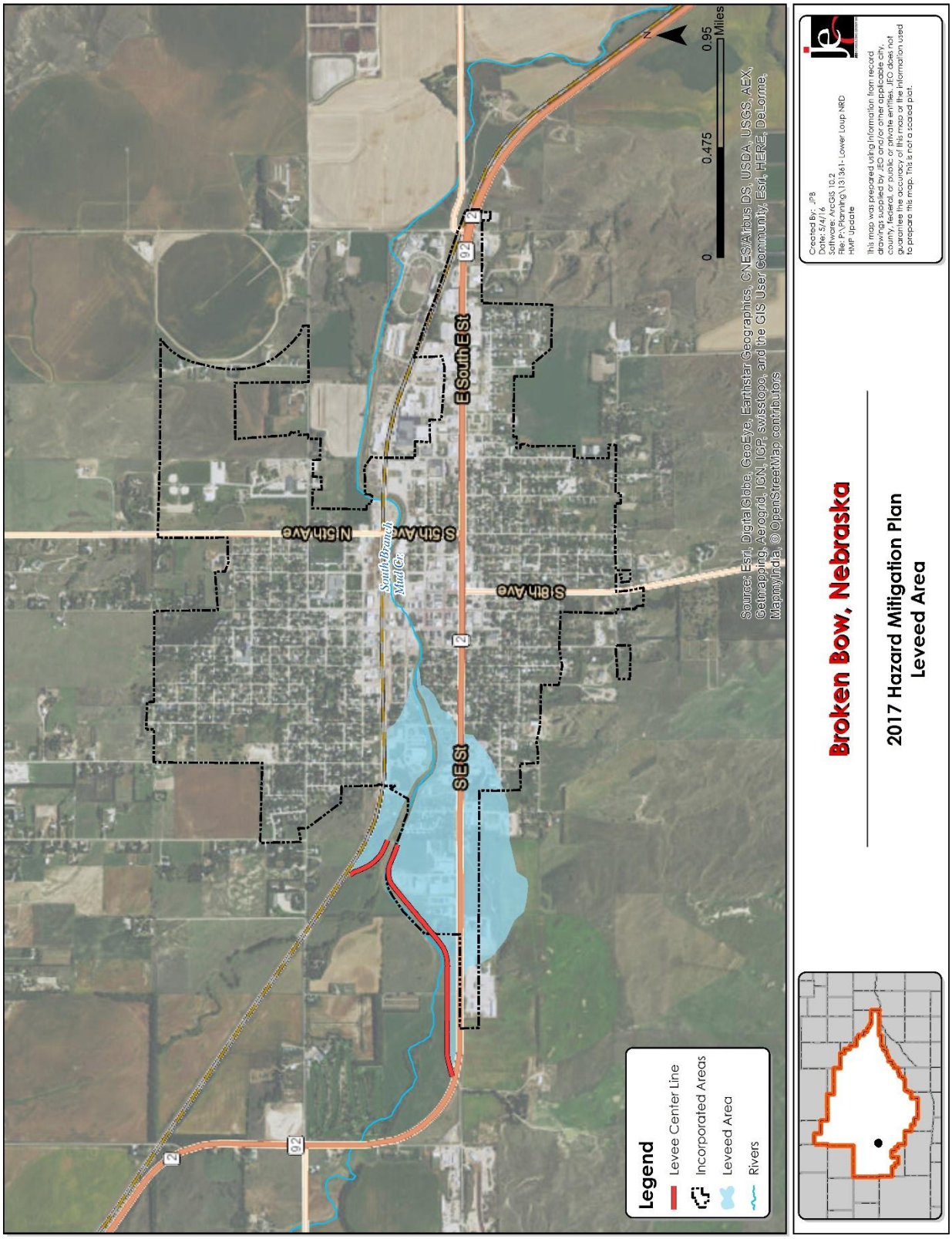
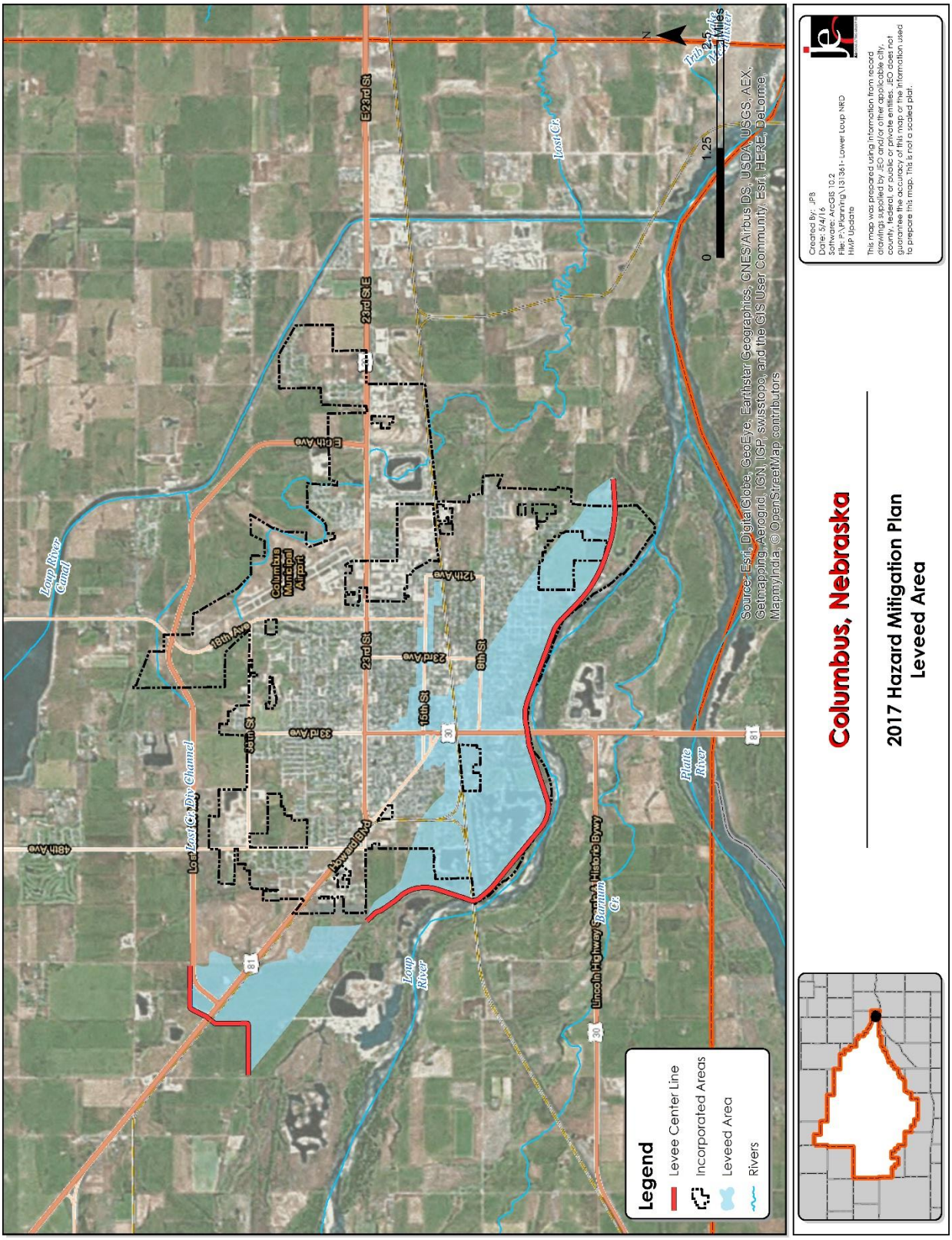


Figure 24: Columbus Leveed Areas



EXTENT

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

Table 75: USACE Levee Rating Categories

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

Source: USACE

HISTORICAL OCCURRENCES

There is no known database of historical occurrences for levee failure. Instead, the planning team and the USACE was consulted for any previous occurrences of levee failure. Neither the planning team, nor the USACE could recall a time in which a levee had failed in the planning area.

POTENTIAL LOSSES

To determine potential losses for levee failure, a parcel inventory from the levee breach areas was utilized. Based on the nature of the assessor's parcel data, it is not possible to do a true structural inventory with structure-specific impacts. Instead, inundated parcels were used as a proxy for structural data. The following table show the number of parcels included in the leveed areas for Broken Bow and Columbus. A total of 1,503 parcels are within the leveed area, which are valued at $183,843,127.

Table 76: Potential Losses in Levee Breach Area

Location	Number of Parcels in Leveed Area	Value of Improvements within Leveed Area
Broken Bow	102	$20,847,582
Columbus	1,854	$162,995,545

Source: Custer County Assessor, Platte County Assessor

PROBABILITY

According to the local planning team, these levees have never been breached. While it is possible that levee failure may occur in the future, this is considered a low probability of occurring in the future. For the purposes of levee failure will be stated as one percent annually.

REGIONAL VULNERABILITIES

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

Table 77: Regional Levee Failure Vulnerabilities

Sector	Vulnerability
People	-Those living in federal levee protected areas -Residents with low mobility or with no access to a vehicle are more vulnerable during a levee failure - Students at high school, and elementary school who may need additional assistance while evacuating
Economic	- Parts of Broken Bow and Columbus are in the levee protected areas, these businesses are at risk -Business and industry protected by levees are at risk
Built Environment	-All buildings within levee protected areas are at risk to damages
Infrastructure	-Major transportation corridors and bridges at risk to levee failure
Critical Facilities	Many Critical Facilities such as the following are within the levee inundation area in Columbus: - Mobile Home Park - Alltel Tower - Water Tower - National Guard Armory - Wastewater Facility - Water Wells - Sewage Treatment Plant

PUBLIC HEALTH EPIDEMIC

HAZARD PROFILE

According to the Centers for Disease Control and Prevention (CDC), an epidemic refers to an increase, often sudden, in the number of cases of a disease above what is normally expected in a given population and area. The number of cases that qualifies disease rates as epidemic depends on the prevalence of that specific disease: common diseases are epidemics when their incidence rates surpass normal seasonal levels (called the epidemic threshold), while rare or previously unknown disease occurrences may qualify as epidemics after only one case of infection. Both chronic and infectious diseases can become epidemic in a population, but for the purposes of this plan, infectious diseases are of more concern because of their generally acute effects resulting in higher mortality and morbidity rates. Nebraska's Department of Health and Human Services (DHHS) requires that healthcare providers report cases of infectious disease, including cases of food poisoning and bioterror agents, so that DHHS can monitor disease rates for epidemic events. The current national opioid epidemic will also be considered because of its widespread and acute nature.

In their Community Health Assessments, the two local public health departments in the LLNRD, East Central District Health Department and Loup Basin Public Health Department, have identified hepatitis A, hepatitis B, pneumonia, influenza, West Nile Virus, tuberculosis, sexually transmitted diseases/infections, and shingles as the most likely infectious diseases to occur in the area.

LOCATION

Epidemic threshold levels are dependent on disease, location, and season. Normal infectious disease patterns are changing due to increasing human mobility globally and climate change. Rural areas of Nebraska are particularly at risk from tick-transmitted diseases, tularemia, West Nile Virus, influenza, and pesticide poisoning. Urban areas of Nebraska are particularly at risk from influenza, norovirus, and other communicable diseases.

EXTENT

Those most affected by communicable diseases are typically the very young, the very old, and those with immunodeficiency disorders. Refer to *Section Seven: Participant Sections* for jurisdiction-specific age vulnerabilities, (information about immunodeficient-persons is not publicly available). The extent to which these populations are affected by communicable diseases depends greatly on the attack rate and duration of the disease, and the extent to which herd immunity has been established by the community through effective vaccination programs. Nebraska state law requires school-aged children to be vaccinated for tetanus, diphtheria, pertussis, measles, mumps, rubella, varicella, and hepatitis B, with the option to wave the requirements for religious objections. Nebraska state law also requires that postsecondary educational institutions recommend meningococcal vaccination. Diphtheria, tetanus, pertussis, poliovirus, haemophilus influenza type b, measles, hepatitis B and varicella vaccination rates in are recommended for children 19-35 months. Influenza vaccinations are recommended yearly for those over 6 months old.

HISTORICAL OCCURRENCES

Previous accounts of public health disease events in Nebraska were gathered from the Health Alert Network, maintained by the Nebraska DHHS. This database is the local network funded nationally by the CDC, and serves to alert local public health departments and healthcare providers about health alerts, updated treatment and prevention guidelines, and other information. It contains health alert messages issued by DHHS beginning in 2004. For the purpose of this risk assessment, alerts pertaining to the epidemic spread of infectious diseases and opioid use fatalities have been collected from the Health Alert Network only through 2013, due to the multitude of health alerts issued each year. According to the historical occurrences of diseases over the last three years, the most likely types of epidemics will be influenza A, emerging infectious diseases such as Ebola and Zika, antibiotic resistant infections, healthcare-related bloodstream infections, opioid overdoses, hunting and agricultural animal pathogens, tick and mosquito

transmitted infections, and communicable diseases such as pertussis and mumps that are longer vaccinated for due to personal beliefs.

Table 78: Health Alerts in Nebraska

Advisory Date	Disease	Infectious Agent	Source of Agent	Geographic Area Affected
10/13/2016	Bacterial Infection	Mycobacterium chimaera	Heater-Coolers used in Cardiac Surgery	United States
6/29/2016	Bacterial Pneumonia	Burkholderia cepacia	Ventilators in Intensive Care Units	United States
5/19/2016	Mumps	Paramyxovirus	Communicable	Fremont, NE
3/28/2016	Rocky Mountain Spotted Fever, Ehrlichiosis, Tularemia, Lyme Disease, Southern Tick-Associated Rash Illness, Heartland Virus Disease	Rickettsia rickettsii, Ehrlichia chaffeensis, Francisella tularensis, Borrelia burgdorferi, Amblyomma americanum	Ticks	Nebraska
2/26/2016	Influenza	Influenza A H1N1	Communicable	Burt, Cuming, Stanton, and Madison Counties, NE
2/9/2016	Guillian-Barre Syndrome	Zika Virus	Mosquitoes, Pigs	Douglas and Sarpy Counties, NE
2/8/2016	Opioid Overdose	N/A	Fentanyl-related Overdose Fatalities	Nebraska
1/27/2016	Hepatitis C Virus Infection	Hepatitis C Virus	Hemodialysis equipment	United States
9/22/2015	Opioid Overdose	N/A	Fentanyl-related Overdose Fatalities	Nebraska
9/17/2015	Tularemia	Francisella tularensis	Infected animals, contaminated food, water, and soil, insect bites	Nebraska
5/13/2015	Rocky Mountain Spotted Fever, Ehrlichiosis, Tularemia, Lyme Disease, Southern Tick-Associated Rash Illness, Heartland Virus Disease	Rickettsia rickettsii, Ehrlichia chaffeensis, Francisella tularensis, Borrelia burgdorferi, Amblyomma americanum	Ticks	Nebraska
12/28/2012	Norovirus Infection	Norovirus	Communicable	Nebraska
4/5/2013	Influenza	Influenza A H7N9	Communicable	Global
6/3/2013	Pertussis	Bordetella pertussis	Communicable	Nebraska
7/3/2013	Cylosporiasis	Cylospora cayetanensis	Imported food stuffs	Nebraska
7/5/2013	Influenza	Influenza A H3N2	Communicable	United States
12/13/2013	Chikungunya	Chukungunya Virus	Mosquitoes	Western Hemisphere
12/26/2013	Influenza	Influenza A H5N1, Influenza A H1N1	Communicable	Nebraska
5/3/2014	MERS (Middle East Respiratory Syndrome)	MERS-Coronavirus	Communicable	United States
5/20/2014	Rocky Mountain Spotted Fever, Ehrlichiosis, Tularemia, Lyme Disease, Southern Tick-Associated Rash Illness, Heartland Virus Disease	Rickettsia rickettsii, Ehrlichia chaffeensis, Francisella tularensis, Borrelia burgdorferi, Amblyomma americanum	Ticks	Nebraska
6/2/2014	Polio	Poliovirus	Communicable	Global
6/20/2014	Pesticide poisoning	N/A	Pesticides	Nebraska

Advisory Date	Disease	Infectious Agent	Source of Agent	Geographic Area Affected
6/27/2014	West Nile Virus, Summertime Flu	West Nile Virus, Influenza A H3N2v	Mosquitoes, Pigs	Nebraska
7/18/2014	Measles	Morbillivirus	Communicable	United States
7/28/2014	Ebola	Ebola Virus	Communicable	Global
9/12/2014	Severe Respiratory Illness	Enterovirus D68	Communicable	Missouri and Illinois
9/26/2014	Acute Neurologic Illness	Unknown	Unknown	Denver, Colorado
10/15/2014	Meningococcal disease	Neisseria meningitidis	Communicable	Burt and Washington Counties, NE
11/25/2014	Mucormycosis	Rhizopus oryzae	Infant formula	United States
12/3/2014	Influenza	Influenza A H3N2	Communicable	United States
1/23/2015	Measles	Morbillivirus	Communicable	California
4/24/2015	Human Immunodeficiency Virus Infection, Hepatitis C Virus Infection	Human Immunodeficiency Virus, hepatitis C Virus	Infected drug injection equipment	Indiana
5/15/2015	Avian Influenza	Influenza A H5N2	Birds	Dixon County, NE
6/26/2015	West Nile Virus, Summertime Flu	West Nile Virus, Influenza A H3N2v	Mosquitoes, Pigs	Nebraska

Source: Nebraska DHHS Health Alert Network 2012-2016. http://dhhs.ne.gov/publichealth/HAN/Pages/han_hanindex.aspx

PROBABILITY

Epidemics occur yearly in Nebraska, and are controlled through mitigation measures.

REGIONAL VULNERABILITIES

Health care access is critical for those exposed to acute infectious diseases. In the LLNRD, Custer, Howard, Valley, Boone, Nance, and Platte Counties have hospital and satellite clinic facilities. Garfield, Greeley, and Sherman Counties have access only to satellite healthcare clinics. There are no hospitals or satellite clinics in Wheeler and Loup Counties.

The 2015 annual DHHS report on the statewide Immunization Program indicates that school-aged children across Nebraska have a 95% vaccination rate on the required vaccinations. Vaccination rates in licensed childcare facilities were at 61% in 2015. Flu vaccination rates for Nebraska were at 49.1% for 2015, as reported by the CDC.

An independent study conducted in 2015 by Trust for America's Health gave Nebraska a score of seven out of ten for their efforts to reduce vulnerability to the spread of infectious diseases. This score is based on Nebraska's public health department funding, vaccination efforts, climate change adaptation plan, infectious disease reporting requirements, public health food safety laboratory testing capabilities and laboratory biosafety capabilities, syringe exchange programs, and rate of central line-associated bloodstream infections (CLABSIs). This high score suggests that Nebraska is only slightly vulnerable to epidemic outbreaks.

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

Table 79: Regional Public Health Vulnerability

Sector	Vulnerability
Healthcare Safety	-CLASBI standard infection rates are 0.7, while national rates are 0.5. About one of every 25 patients contracts a healthcare-associated infection in Nebraska, leading to about 75,000 deaths per year
Environment	-Climate change and infectious disease adaptation plans have not been completed for the state
Public Health Policy	-Nebraska does not explicitly authorize syringe exchange program (SEP) to reduce Hepatitis C infections related to the rise in injected opioid use
Vaccination	-Vaccination rates in childcare center are at 61% -Influenza vaccination rates are at 49.1%
Healthcare Access	-Wheeler and Loup Counties do not have healthcare facilities, leading to reduced treatment options for patients

SEVERE THUNDERSTORMS

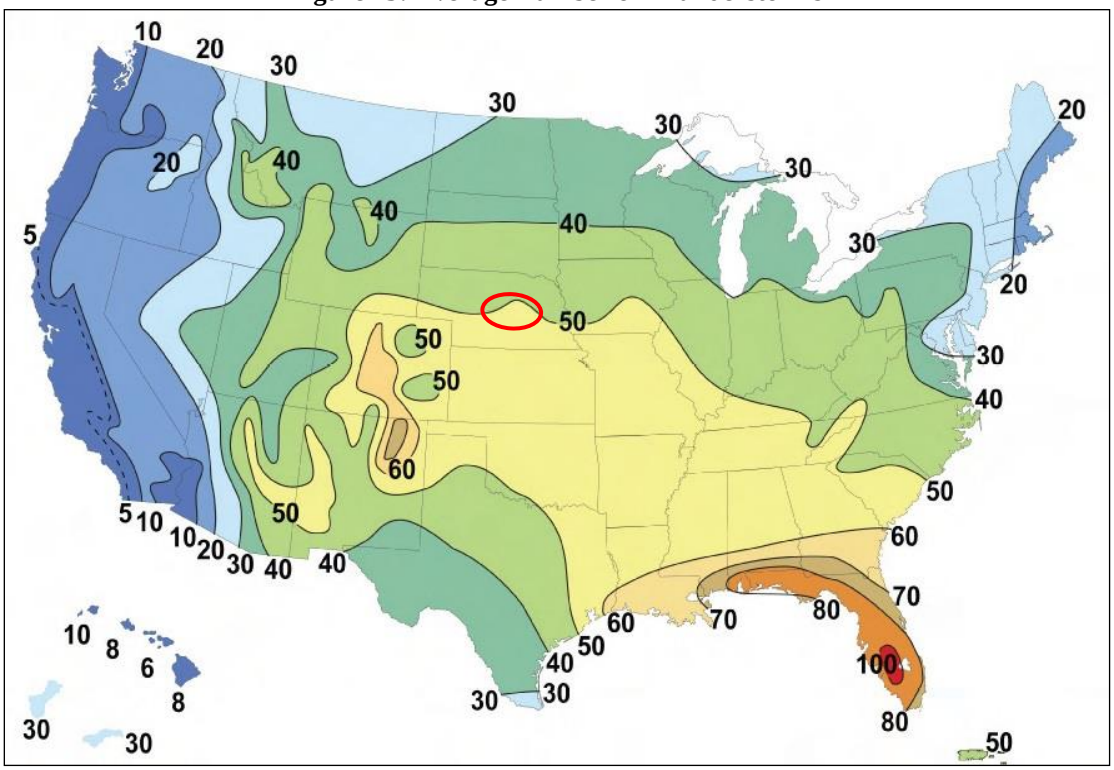
HAZARD PROFILE

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 upper air, which is cold, sinks and the warm, moist air rises, storm clouds or "thunderheads" develop resulting in thunderstorms. This can occur singularly, in clusters, or in lines.

Thunderstorms can develop in less 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 be harmful to humans and animals, cause fires to buildings and agricultural lands, and cause 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, it is when lightning comes in contact with the ground that society is potentially impacted. Lightning generally occurs when warm air is mixed 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 the point of becoming severe, the potential for damages include crop losses from wind and hail, property losses due to building and automobile damages due to hail, wind, or 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

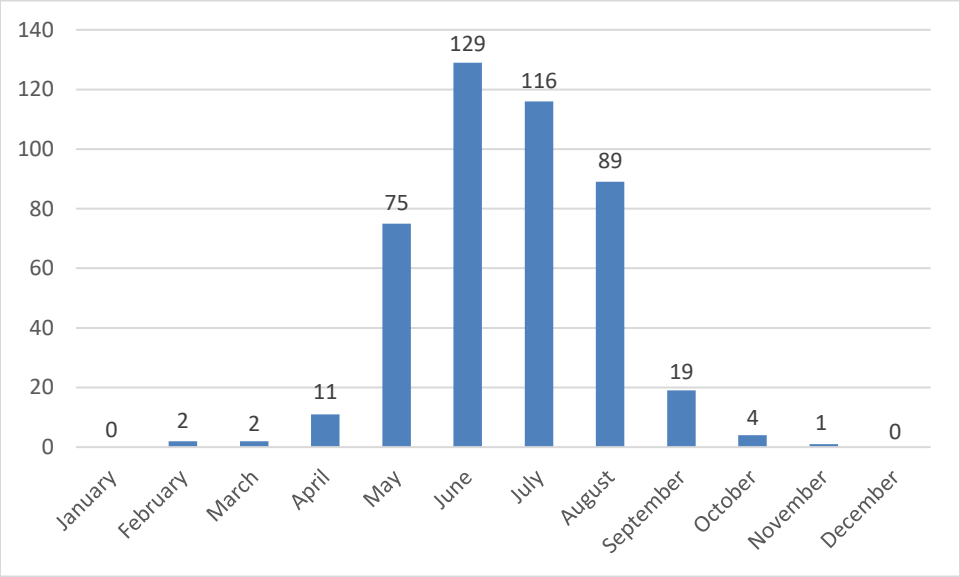
LOCATION
The entire planning area is at risk of severe thunderstorms.

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, 1996-2015

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 497 thunderstorm wind, 36 heavy rain, and 13 lightning events in the planning area from January 1996 to December 2015. Severe thunderstorm events were responsible for $14,521,700 in property damages. The USDA RMA data does not specify severe thunderstorms as a cause of loss. There were two injuries and no deaths reported in association with these storms.

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. Severe thunderstorms and lightning cause an average of $726,085 per year in property damages.

Table 80: 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	497	24.8	$13,592,700	$679,635	$0	$0
Heavy Rain	36	1.8	$565,000	$28,250	$0	$0
Lightning	13	0.7	$364,000	$18,200	$0	$0
Total	**546**	**27.3**	**$14,521,700**	**$726,085**	**$0**	**$0**

1 Indicates the data is from NCEI (January 1996 to December 2015); 2 Indicates data is from USDA RMA (2000 to 2014)

PROBABILITY

Based on historical records and reported events, severe thunderstorms are likely to occur on an annual basis. The NCEI reported 546 severe thunderstorms between 1996 and 2015; this results 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 81: 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 inhibits 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 causing structural damage to buildings.

Extreme Cold

Along with snow and ice storm events, extreme cold can be dangerous to the well-being of people and animals. What constitutes extreme cold varies from region to region, but is generally accepted as being 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 13.4°F). The average high temperatures for the months of January, February, and December are near 36.7°F.

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 ice falls in the form of rain 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 rail 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 causing structural damage to 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 looks at total precipitation, wind, and temperatures to predict the intensity of ice storms. Figure 27 shows the SPIA index.

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	

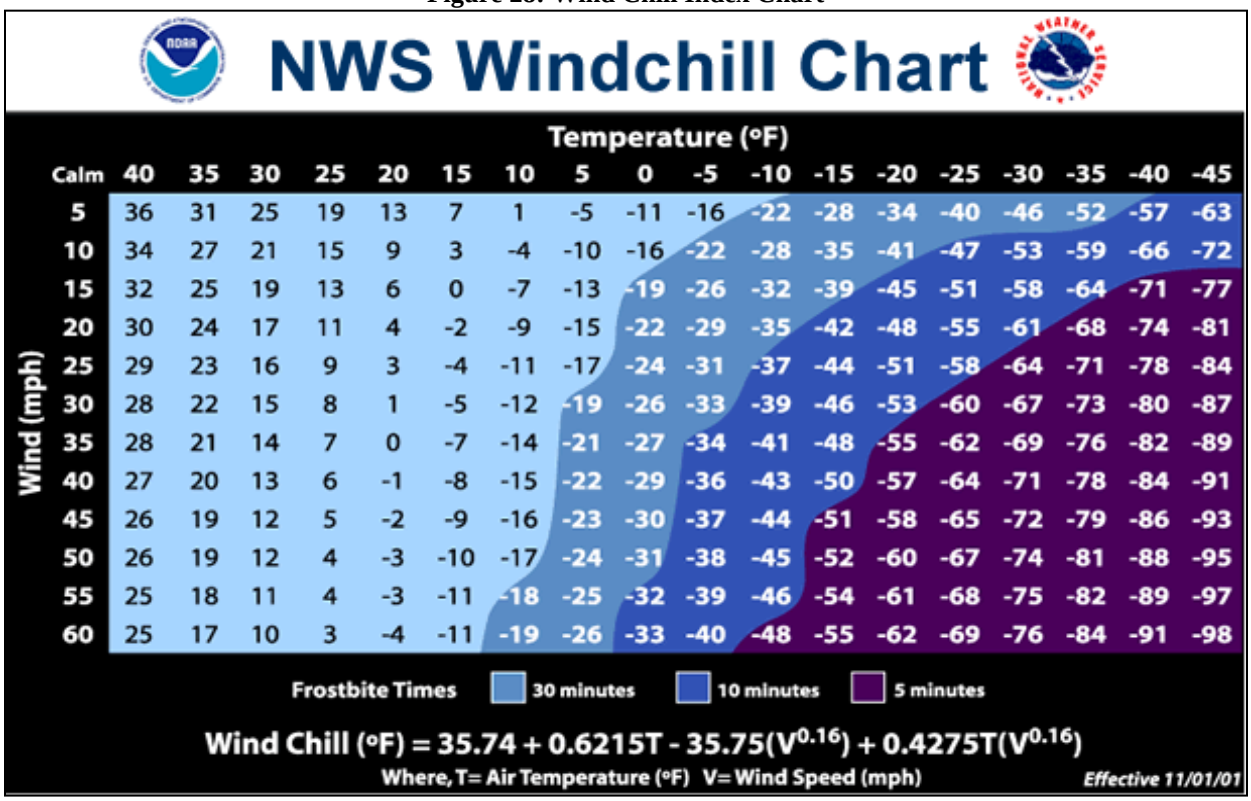
(Categories of damage are based upon combinations of precipitation totals, temperatures and wind speeds/directions.)

Source: http://www.spia-index.com/index.php

According to the NCEI, 36 ice storms were reported between December of 1997 and February of 2011. These storms resulted in one injury but no deaths, as well as a reported $6,936,000 in damages. Accumulation of ice was not reported.

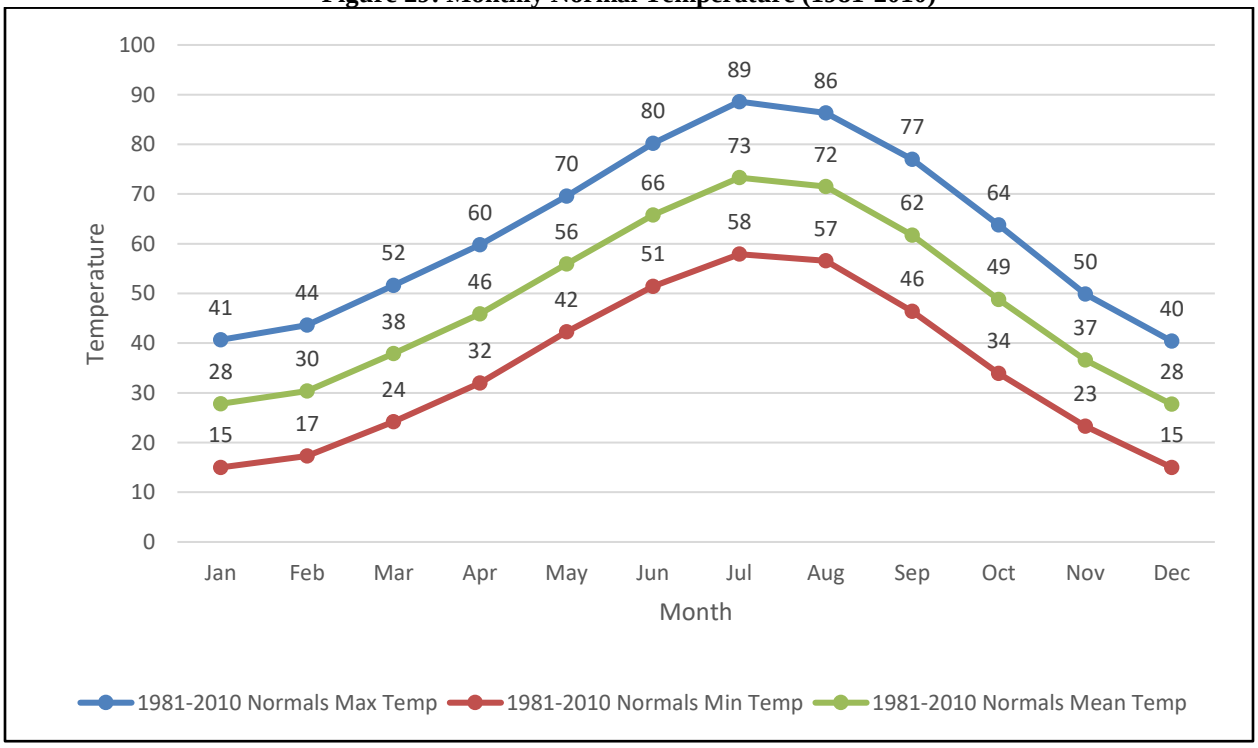
The Wind Chill Index was developed by the NWS to determine the decrease in air temperature felt by the body on exposed skin due to wind. The wind chill is always lower than the air temperature and can quicken the effects of hypothermia or frost bite as it gets lower. Figure 28 shows the wind chill index used by the NWS.

Figure 28: Wind Chill Index Chart



Source: NWS

Figure 29: Monthly Normal Temperature (1981-2010)



Source: Midwestern Regional Climate Center

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 was a combined 661 severe winter storm events for the planning area from January 1996 to December 2015. These recorded events caused a total of $22,098,250 in property damages, twenty-two injuries and four fatalities.

The NCEI recorded a total of 61 blizzard events, causing $2,959,250 in property damages and no directly related injuries; 42 heavy snow events, causing no property damages; 36 ice storm events, causing $6,936,000 in property damages, and one injury; 85 winter weather events with $20,000 in property damages, three deaths and one injury; 305 winter storm events, causing $12,043,000 in property damages and five injuries and 132 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*.

Clearing snow in Greeley County

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 $1,097,912 per year in property damage for the planning area.

Table 82: Severe Winter Storm Loss Estimate

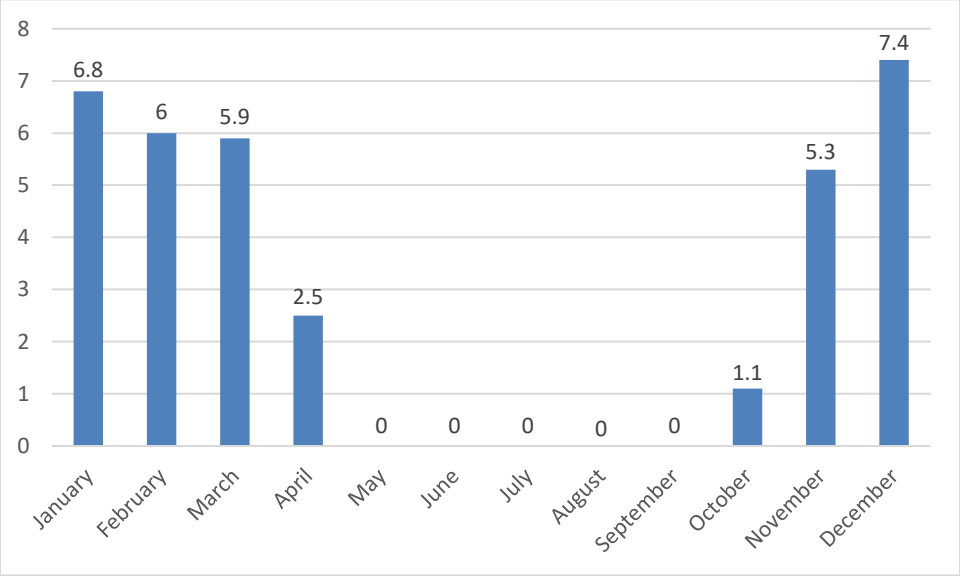
Hazard Type	Number of Events[1]	Average Number of Events Per Year[1]	Total Property Loss[1]	Average Annual Property Loss [1]	Total Crop Loss[2]	Average Annual Crop Loss [2]
Blizzard	61	3.1	$2,959,250	$147,962	-	-
Heavy Snow	42	2.1	$0	0$	-	-
Ice Storm	36	1.8	$6,936,000	$346,800	-	-
Winter Storm	305	15.3	$12,043,000	$602,150	-	-
Winter Weather	85	4.25	$20,000	$1,000	-	-
Extreme Cold/Wind Chill	132	6.6	$0	$0	-	-
Severe Winter Storms	**661**	**33.15**	**$21,958,250**	**$1,097,912**	**$0**	**$0**

[1]Indicates the data is from NCEI (January 1996 to December 2015); [2]Indicates data is from USDA RMA (2000 to 2014)

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 three 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

REGIONAL VULNERABILITIES

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

Table 83: 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 a 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 primarily with local law enforcement. The Office of Infrastructure Protection within the Federal Department of Homeland Security is a component within the National Programs and Protection Directorate.

The Office of Infrastructure Protection 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 and to strengthen sectors' ability to respond and quickly recover from an attack or other emergency. This is done through the National Infrastructure Protection Plan (NIPP).

Under the NIPP, a Sector-Specific Agency (SSA) is the federal agency assigned to lead a collaborative process for infrastructure protection for each of the 18 sectors. The NIPP's comprehensive framework allows the Office of Infrastructure Protection 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.

The 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 Office of Infrastructure Protection 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). 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 replaced HSAS in 2011.

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 whether a threat alert of one kind or the other 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 then 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 that there is 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

Previous terrorist attacks in the planning area have been limited to primarily individual private property. However, terrorist attacks can vary greatly in scale and magnitude.

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 three terrorist incidents since 1970 within the planning area. These incidents are related to one event. Between May 3-7, 2002, a college student placed eighteen pipe bombs in rural mailboxes throughout five Midwestern states, causing seven injuries and widespread panic in the region. The bombs placed in mailboxes in the planning area did not detonate, and no injuries were suffered.

Table 84: Terrorist Incidents in the Planning Area

Date	Location	Perpetrator Group	Fatalities	Injuries	Target	Property Damage
5/4/2002	Scotia	Individual	0	0	US Mail Boxes	None
5/4/2002	Columbus	Individual	0	0	US Mail Boxes	None
5/4/2002	Albion	Individual	0	0	US Mail Boxes	None

Source: START Global Terrorism Database, 1970-2014, http://www.start.umd.edu/gtd/

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. It should also be noted that none of the pipe bombs detonated, therefore there were no reported damages.

Table 85: Terrorism Incidents Loss Estimate

Hazard Type	Number of Events	Average Number of Events Per Year	Total Property Loss	Annual Property Loss	Total Crop Loss	Annual Crop Loss
Terrorism	3	0.07	$0	$0	$0	$0

Source: START Global Terrorism Database, 1970-2014

PROBABILITY

Given three incidences over the course of 45 years, the annual probability for terrorism in the planning area is stated at seven percent during 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 86: Regional Terrorism Vulnerabilities

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

TORNADOES

HAZARD PROFILE

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

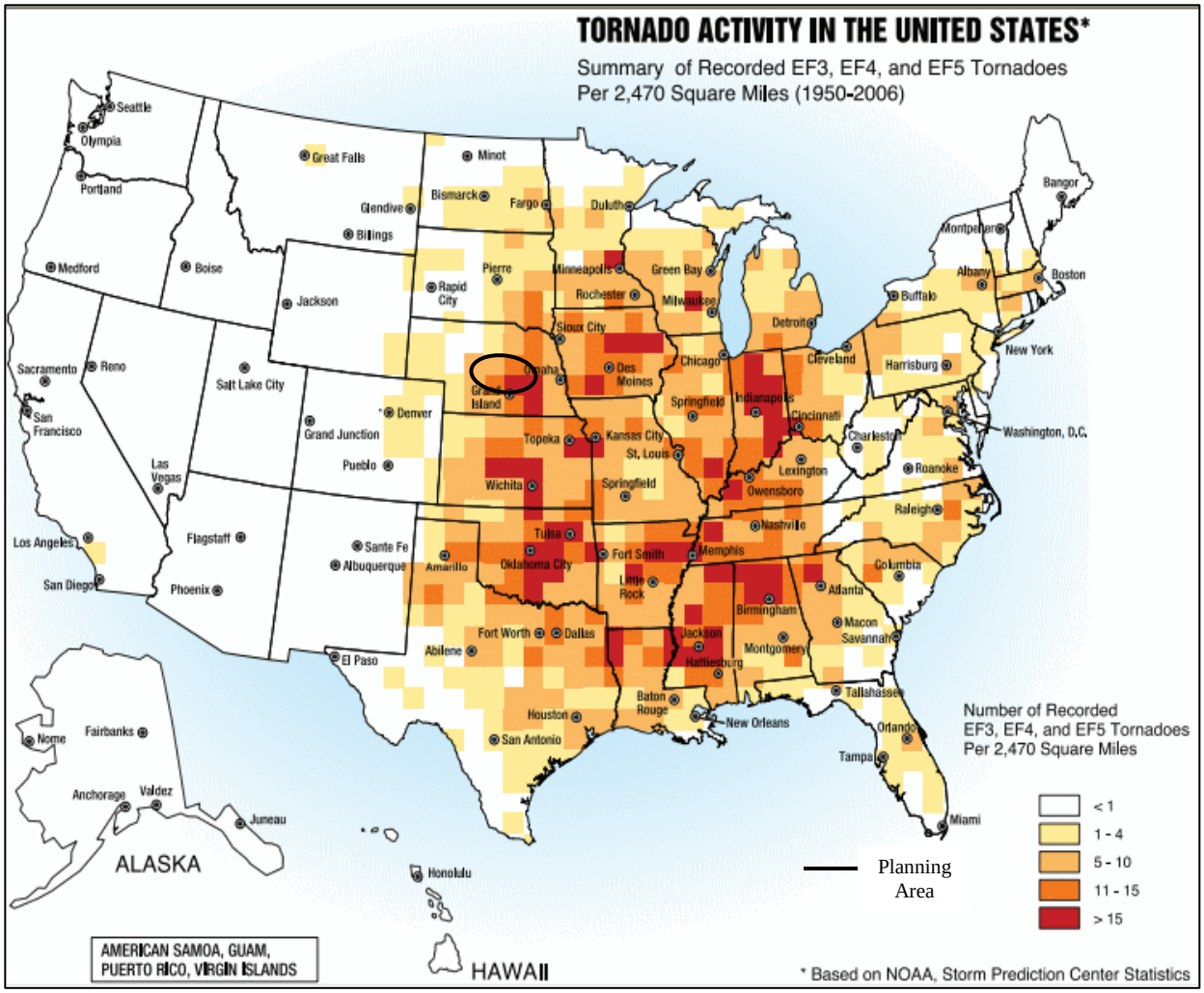
- There must be a microscale rotating area of wind, ranging in size from a few feet to a few miles wide;
- The rotating wind, or vortex, must be attached to a convective cloud base and must be in contact with the ground; and,
- The spinning vortex of air must have caused enough damage to be classified 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 1,000 tornadoes are reported annually in the contiguous United States (NOAA 2012). 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 45 tornadoes between 1953 and 2004 (NOAA 2011). The annual average number of tornadoes for Nebraska from 1991 to 2011 has increased slightly to 57 (NOAA 2013). 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.

Supercell located west of Burwell, June 2014

Figure 31: Tornado Activity in the United States

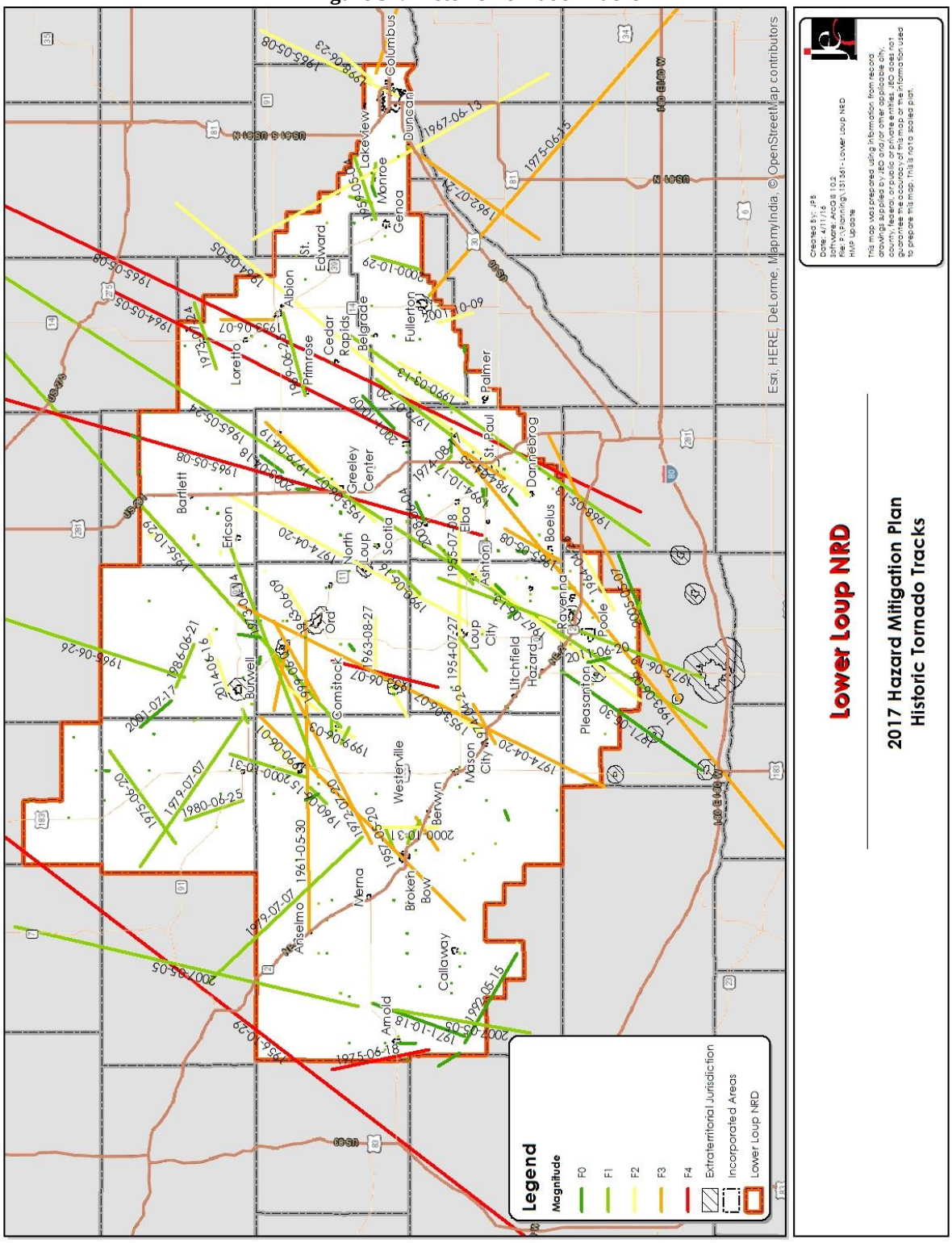


Source: Storm Prediction Center

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 since 1950 along with the population density in each census tract in the NRD. Note that this map does show tornado tracks for EF-0 and EF-1.

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. In order 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. Tables 87 and 88 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.

Table 87: Enhanced Fujita Scale

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

Source: NOAA; FEMA

Table 88: 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

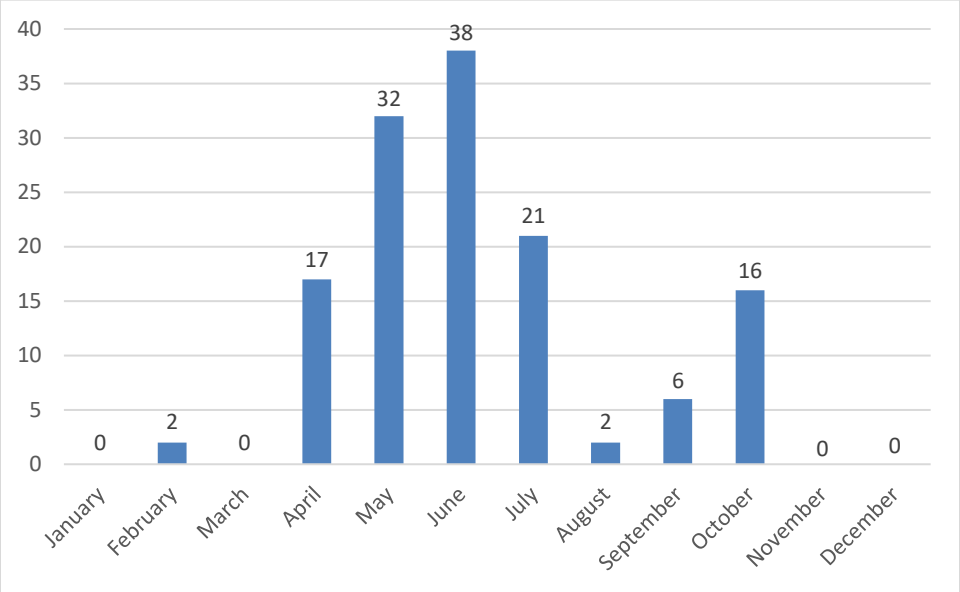
Based on the historic record, it is most likely that tornadoes that do occur within the planning area will be of EF0 or EF1 strength. Of the 134 reported events, 19 were F/EF1, 11 were F/EF2, and one was F3.

HISTORICAL OCCURRENCES

NCEI cites 134 tornadic events ranging from a magnitude of EF0 to EF3 between 1996 and 2015. These events were responsible for $13,123,000 in property damages. No deaths were reported; however, 19 injuries were cited over two events. The most damaging tornado occurred in Platte County in 1998, causing $4 million in damages. This F2 tornado destroyed two farm houses, severely damaged six farm houses, overturned center pivots, and injured 17 people.

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 June 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, 1996-2015

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 $656,150 per year in property damage. The RMA recorded $29,298 in crop damages due to tornadic events.

Table 89: Tornado Loss Estimate

Hazard Type	Number of Events[1]	Average Number of Events Per Year	Total Property Loss[1]	Average Annual Property Loss [1]
Tornadoes	134	6.7	$13,123,000	$656,150

Source: NCEI (January 1996 to December 2015)

PROBABILITY

Given the 134 events over the course of 20 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 90: Regional Tornado Vulnerabilities

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

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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 2012 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 and objectives from the 2012 HMP. Each participating jurisdiction decided to utilize the same goals and objectives.

***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 Public Health and Safety from Hazard Events

Goal 2: Protect Existing and New Properties from Hazard Events

Goal 3: Increase Public Awareness and Education about Hazard Events

MITIGATION ALTERNATIVES (ACTION ITEMS)

After the establishment of the goals and objectives, 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. In addition, 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 at 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 included 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 LLNRD HMP intended to be utilized in the implementation of mitigation alternatives. Each action is described by the following:

- Objective – general summary of the action item
- Actions – brief summary of what the action item(s) will accomplish
- Goal/Objective – which goal and objective the action item falls under
- Hazard(s) Addressed – which hazard the mitigation action aims to address
- Potential funding – a list of any potential funding mechanism used 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 smaller communities. Establishment of a cost-benefit analysis is out of 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, ongoing and 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 2012 HMP and review a list of potential mitigation alternatives which would lead to action items to reduce the effects of hazards. Projects selected varied from community to community depending upon the significance of each hazard present. The information listed in Tables 91 and 92 is a compilation of the mitigation alternatives identified by jurisdiction and organized by the goal and objective to be met.

Table 91: Mitigation Alternatives Selected by Each Jurisdiction

Mitigation Action	Goal	Lower Loup NRD	Region 26	ECDHD	Farwell Irrigation District	North Loup River PP&ID	Sargent Irrigation District	Twin Loups Irrigation District	Boone County	Albion	Cedar Rapids	Petersburg	Boone Central Schools	St. Edwards	Custer County	Anselmo	Ansley	Arnold	Broken Bow	Callaway	Comstock	Mason City	Sargent	Garfield County	Burwell	Greeley County	Greeley Village	Scotia	Spalding	Wolbach
									Boone County						Custer County									Garfield County		Greeley County				
Acquire LiDAR	3	X																												
Backup Municipal Records	2								X																	X				
Biosecurity Plan	1														X															
Building Codes	1, 2																			X										
Canal Maintenance	1,2					X																								
Channel and Bridge Improvements	1,2	X																								X				
Civil Service Improvements	1,2								X										X											
Community Education and Awareness	3			X						X	X	X	X													X			X	
Complete Wildfire Protection Plan	1,2,3																									X				
Comprehensive City Disaster/Emergency Response Plan	1,2,3																													
Continuity Planning	1								X																	X				
Create a Community Wide Master Plan to Prioritize a Flood Related Projects	1,2																									X				
Critical Facility Siting	2									X					X															
Database of Vulnerable Population	1																									X				
Defensible Space	1,2																									X				
Develop a Drought Management Plan	1,3				X		X		X																					

Mitigation Action	Goal	Lower Loup NRD	Region 26	ECDHD	Farwell Irrigation District	North Loup River PP&ID	Sargent Irrigation District	Twin Loups Irrigation District	Boone County	Albion	Cedar Rapids	Petersburg	Boone Central Schools	St. Edwards	Custer County	Anselmo	Ansley	Arnold	Broken Bow	Callaway	Comstock	Mason City	Sargent	Garfield County	Burwell	Greeley County	Greeley Village	Scotia	Spalding	Wolbach
									Boone County						Custer County									Garfield County		Greeley County				
Develop an Agricultural Disease Response Action Plan	1,3														X															
Develop Dam Failure Emergency Action and Evacuation Plans	1,2,3				X		X	X																						
Develop Emergency Snow/Evacuation Routes	1,3								X								X					X	X							
Develop Flood Assistance Strategies	1,2				X		X																							
Develop/Implement Hazard/Emergency Operations/Actions/Response Plan	1,2,3	X							X						X		X													
Develop/Update Floodplain Information	1,2,3										X						X					X								
Drainage Study/Stormwater Master Plan	1,2									X																X				
Education Program for Agricultural Disease	3																							X						
Emergency Exercise: Dam Failure	3				X		X	X																						
Emergency Exercise: Flooding	3																						X			X				
Emergency Exercise: Agricultural Disease Outbreak	3														X									X						
Emergency Exercise: Drought Tournament	3				X			X																						
Emergency Exercise: Hazardous Spill	3								X						X		X													
Emergency Fuel Supply Plan	1											X																		

Mitigation Action	Goal	Lower Loup NRD	Region 26	ECDHD	Farwell Irrigation District	North Loup River PP&ID	Sargent Irrigation District	Twin Loups Irrigation District	Boone County	Albion	Cedar Rapids	Petersburg	Boone Central Schools	St. Edwards	Custer County	Anselmo	Ansley	Arnold	Broken Bow	Callaway	Comstock	Mason City	Sargent	Garfield County	Burwell	Greeley County	Greeley Village	Scotia	Spalding	Wolbach
									Boone County						Custer County									Garfield County		Greeley County				
Emergency Operations Center	1,2								X																					
Evaluate/Improve Berm, Floodwall and/or Levee	1,2	X																												
Expand Water Storage Capacity/Emergency Water Supplies/Dry Hydrants/Water Availability Study	1																								X					X
Facility Flood Proofing	2		X		X		X		X					X					X											
Fire Prevention Program/Planning and Training	3									X													X	X		X				
Firewise Community	3									X													X			X				
FIRM Mapping	1,2,3														X				X											
First Aid Training	3								X									X					X			X				
Grade Control Structures	2				X		X	X																						
Groundwater Recharge	1,2	X			X	X	X																							
Hail Insurance	2								X			X																		
Hazardous Fire Fuels Reduction	1,2									X																				
Impact Resistant Roof Coverings	2								X																	X				
Improve and Revise Snow/Ice Removal Program	1								X			X								X						X				
Improve Construction Standards and Building Survivability	1,2																													X

Mitigation Action	Goal	Lower Loup NRD	Region 26	ECDHD	Farwell Irrigation District	North Loup River PP&ID	Sargent Irrigation District	Twin Loups Irrigation District	Boone County	Albion	Cedar Rapids	Petersburg	Boone Central Schools	St. Edwards	Custer County	Anselmo	Ansley	Arnold	Broken Bow	Callaway	Comstock	Mason City	Sargent	Garfield County	Burwell	Greeley County	Greeley Village	Scotia	Spalding	Wolbach
									Boone County						Custer County									Garfield County		Greeley County				
Improve Drainage	2									X								X					X			X				
Improve Electrical Service	1,2								X					X			X	X				X	X		X	X				
Improve Emergency Communications	1		X		X		X		X			X	X		X			X				X				X		X	X	
Improve Emergency Responder Access During Hazards and Other Emergencies	1								X																					
Improve Flood and Dam Failure Warning System	1,3																													
Improve Stream Bed/Bank Stabilization	1,2	X												X				X	X				X			X				
Improve Warning Systems	1,3		X			X			X	X		X		X	X	X	X	X	X			X			X	X				X
Improve/Provide Adequate Backup and Emergency Generators	1		X		X		X	X	X	X	X	X		X	X	X	X	X	X			X	X		X	X	X	X	X	X
Improve/Provide Facilities for Vulnerable Populations	1																						X								
Increase Soil and Water Conservation	3																													
Infrastructure Assessment Study	2																									X				
Install Vehicular Barriers	1																													
Intergovernmental Support	3																													
Land Use Regulations (Chemical Spills)	1,2								X																					
Mobile Home Anchoring	1,2																													

Mitigation Action	Goal	Lower Loup NRD	Region 26	ECDHD	Farwell Irrigation District	North Loup River PP&ID	Sargent Irrigation District	Twin Loups Irrigation District	Boone County	Albion	Cedar Rapids	Petersburg	Boone Central Schools	St. Edwards	Custer County	Anselmo	Ansley	Arnold	Broken Bow	Callaway	Comstock	Mason City	Sargent	Garfield County	Burwell	Greeley County	Greeley Village	Scotia	Spalding	Wolbach
		Boone County													Custer County									Garfield County		Greeley County				
Monitor Drought Conditions	1,3				X		X	X																						
Monitor Water Supply	1				X		X																							
Mortality Management Plan	1														X															
Parcel Level Evaluation of Flood Prone Properties	2						X											X								X				
Provide Adequate Public Safe Rooms & Post Disaster Storm Shelters	1	X	X	X					X			X		X			X		X		X	X	X	X		X	X	X	X	X
Provide Information to Citizens About Hazard Events and Preparedness	3	X	X					X	X					X	X		X		X	X	X	X		X						
Provide Short Term Residency Shelters	1																		X											
Reduce Damage in Floodplain	2		X						X					X							X	X	X				X			X
Reduce Storm Water Damage	2															X	X			X							X			
Reduce Stream & Drainage Bottlenecks/Flow Restrictions	1,2					X										X											X	X		X
Reduce Tree Damage and Damage from Trees	2	X			X		X		X					X				X			X	X			X					X
Reduce Water Demand/Improve Drought Education	3	X			X		X		X							X				X	X		X					X		
Reduce Wildfire Damage	1,2	X																												

Mitigation Action	Goal	Lower Loup NRD	Region 26	ECDHD	Farwell Irrigation District	North Loup River PP&ID	Sargent Irrigation District	Twin Loups Irrigation District	Boone County	Albion	Cedar Rapids	Petersburg	Boone Central Schools	St. Edwards	Custer County	Anselmo	Ansley	Arnold	Broken Bow	Callaway	Comstock	Mason City	Sargent	Garfield County	Burwell	Greeley County	Greeley Village	Scotia	Spalding	Wolbach
		Boone County													Custer County									Garfield County		Greeley County				
Relocate Municipal Infrastructure	2	X										X							X				X			X				
Resource Tracking	2																							X						
Resurface Roads	1											X																		
School Continuity Plan	1												X																	
Shelter in Place	1					X			X	X																				
Site Security	1	X																												
Snow Fences	1,2								X	X																X				
Static Detectors	2			X					X																	X				
Storm Shelter Identification	1																													
Study/Improve Drinking Water Supply	1																													
Surge Protectors	2								X											X						X				
Transportation Drainage Improvements	2									X																				
Tree Planting	2																		X				X			X				
Update Comprehensive Plan	1,2,3								X									X								X				
Telephone Warning Systems	1,3												X																	
Alert Sirens	1,3				X		X					X							X											
Water System Improvements	1				X		X	X		X																X				
Weather Radios	1,3				X		X						X											X						
Well Improvement	1									X																				

Mitigation Action	Goal	Lower Loup NRD	Region 26	ECDHD	Farwell Irrigation District	North Loup River PP&ID	Sargent Irrigation District	Twin Loups Irrigation District	Boone County	Albion	Cedar Rapids	Petersburg	Boone Central Schools	St. Edwards	Custer County	Anselmo	Ansley	Arnold	Broken Bow	Callaway	Comstock	Mason City	Sargent	Garfield County	Burwell	Greeley County	Greeley Village	Scotia	Spalding	Wolbach
									Boone County						Custer County									Garfield County		Greeley County				
Wildfire Education	3				X		X			X																				
Wildfire Hazard Identification and Mitigation System (WHIMS)	1,2	X																								X				
Wind Breaks Studies	1																									X				

Table 92: Mitigation Alternatives Selected by Each Jurisdiction

Mitigation Action	Goal	Howard County	Boelus	Cotesfield	Cushing	Dannebrog	Elba	Farwell	St. Paul	Loup County	Taylor	Nance County	Belgrade	Fullerton	Genoa	Platte County	Columbus	Monroe	Sherman County	Ashton	Litchfield	Loup City	Rockville	Valley County	Arcadia	Elyria	North Loup	Ord	Wheeler County	Bartlett	Ericson
		Howard County								Loup County		Nance County				Platte County			Sherman County					Valley County					Wheeler County		
Acquire LiDAR	3																														
Backup Municipal Records	2											X																			
Biosecurity Plan	1																														
Building Codes	1, 2																														
Canal Maintenance	1,2																														
Channel and Bridge Improvements	1,2																														
Civil Service Improvements	1,2											X			X																

Mitigation Action	Goal	Howard County	Boelus	Cotesfield	Cushing	Dannebrog	Elba	Farwell	St. Paul	Loup County	Taylor	Nance County	Belgrade	Fullerton	Genoa	Platte County	Columbus	Monroe	Sherman County	Ashton	Litchfield	Loup City	Rockville	Valley County	Arcadia	Elyria	North Loup	Ord	Wheeler County	Bartlett	Ericson
		Howard County								Loup County		Nance County				Platte County			Sherman County					Valley County					Wheeler County		
Community Education and Awareness	3						X					X			X			X	X		X										
Complete/Update Wildfire Protection Plan	1,2,3																														
Comprehensive City Disaster/Emergency Response Plan	1,2,3						X																								
Continuity Planning	1											X																			
Create a Community Wide Master Plan to Prioritize a Flood Related Projects	1,2																														
Critical Facility Siting	2																														
Database of Vulnerable Population	1											X																			
Defensible Space	1,2																														
Develop a Drought Management Plan	1,3																														
Develop an Agricultural Disease Response Action Plan	1,3																														
Develop Dam Failure Emergency Action and Evacuation Plans	1,2,3																														
Develop Emergency Snow/Evacuation Routes	1,3														X							X			X						

Mitigation Action	Goal	Howard County	Boelus	Cotesfield	Cushing	Dannebrog	Elba	Farwell	St. Paul	Loup County	Taylor	Nance County	Belgrade	Fullerton	Genoa	Platte County	Columbus	Monroe	Sherman County	Ashton	Litchfield	Loup City	Rockville	Valley County	Arcadia	Elyria	North Loup	Ord	Wheeler County	Bartlett	Ericson
		Howard County								Loup County		Nance County				Platte County			Sherman County					Valley County					Wheeler County		
Develop Flood Assistance Strategies	1,2																														
Develop/Implement Hazard/Emergency Operations/Actions /Response Plan	1,2 ,3										X						X					X							X	X	
Develop/Update Floodplain Information	1,2 ,3																X	X													
Drainage Study/Stormwater Master Plan	1,2																								X						
Education Program for Agricultural Disease	3																														
Emergency Exercise: Dam Failure	3																														
Emergency Exercise: Flooding	3																														
Emergency Exercise: Agricultural Disease Outbreak	3																														
Emergency Exercise: Drought Tournament	3																														
Emergency Exercise: Hazardous Spill	3						X																								
Emergency Fuel Supply Plan	1		X												X																
Emergency Operations Center	1,2																														
Evaluate/Improve Berm, Floodwall and/or Levee	1,2															X	X														

Mitigation Action	Goal	Howard County	Boelus	Cotesfield	Cushing	Dannebrog	Elba	Farwell	St. Paul	Loup County	Taylor	Nance County	Belgrade	Fullerton	Genoa	Platte County	Columbus	Monroe	Sherman County	Ashton	Litchfield	Loup City	Rockville	Valley County	Arcadia	Elyria	North Loup	Ord	Wheeler County	Bartlett	Ericson
		Howard County								Loup County		Nance County				Platte County			Sherman County					Valley County					Wheeler County		
Expand Water Storage Capacity/Emergency Water Supplies/Dry Hydrants/Water Availability Study	1																														
Facility Floodproofing	2										X					X	X				X										
Fire Prevention Program/Planning and Training	3																														
Firewise Community	3																														
FIRM Mapping	1,2,3																														
First Aid Training	3											X																			
Grade Control Structures	2																														
Groundwater Recharge	1,2																														
Hail Insurance	2		X																												
Hazardous Fire Fuels Reduction	1,2																														
Impact Resistant Roof Coverings	2														X																
Improve and Revise Snow/Ice Removal Program	1																								X						
Improve Construction Standards and Building Survivability	1,2											X			X							X									
Improve Drainage	2																			X											

Mitigation Action	Goal	Howard County	Boelus	Cotesfield	Cushing	Dannebrog	Elba	Farwell	St. Paul	Loup County	Taylor	Nance County	Belgrade	Fullerton	Genoa	Platte County	Columbus	Monroe	Sherman County	Ashton	Litchfield	Loup City	Rockville	Valley County	Arcadia	Elyria	North Loup	Ord	Wheeler County	Bartlett	Ericson
		Howard County								Loup County		Nance County				Platte County			Sherman County					Valley County					Wheeler County		
Improve Electrical Service	1,2														X	X						X				X		X			
Improve Emergency Communications	1	X							X	X	X	X	X		X	X	X		X		X	X						X	X	X	X
Improve Emergency Responder Access During Hazards and Other Emergencies	1																														
Improve Flood and Dam Failure Warning System	1,3					X					X			X						X											
Improve Stream Bed/Bank Stabilization	1,2													X	X	X	X					X			X			X	X		
Improve Warning Systems	1,3	X				X	X		X	X	X	X	X	X	X	X	X		X			X	X	X	X	X	X	X	X	X	X	X
Improve/Provide Adequate Backup and Emergency Generators	1	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X		X	X	X	X	X		X	X	X	X	X	
Improve/Provide Facilities for Vulnerable Populations	1																														
Increase Soil and Water Conservation	3																					X		X							
Infrastructure Assessment Study	2											X																			
Install Vehicular Barriers	1																				X										
Intergovernmental Support	3											X																			
Land Use Regulations (Chemical Spills)	1,2																														

Mitigation Action	Goal	Howard County	Boelus	Cotesfield	Cushing	Dannebrog	Elba	Farwell	St. Paul	Loup County	Taylor	Nance County	Belgrade	Fullerton	Genoa	Platte County	Columbus	Monroe	Sherman County	Ashton	Litchfield	Loup City	Rockville	Valley County	Arcadia	Elyria	North Loup	Ord	Wheeler County	Bartlett	Ericson
		Howard County								Loup County		Nance County				Platte County			Sherman County					Valley County					Wheeler County		
Mobile Home Anchoring	1,2		X																												
Monitor Drought Conditions	1,3		X																												
Monitor Water Supply	1																														
Mortality Management Plan	1																														
Parcel Level Evaluation of Flood Prone Properties	2																														
Provide Adequate Public Safe Rooms & Post Disaster Storm Shelters	1	X		X	X	X	X	X	X	X	X			X	X	X	X		X	X	X	X	X	X		X	X	X	X	X	X
Provide Information to Citizens About Hazard Events and Preparedness	3	X		X					X																			X			
Provide Short Term Residency Shelters	1		X									X																			
Reduce Damage in Floodplain	2			X						X	X					X		X	X				X					X			
Reduce Storm Water Damage	2															X	X														
Reduce Stream & Drainage Bottlenecks/Flow Restrictions	1,2	X		X		X										X			X			X					X		X		
Reduce Tree Damage and Damage from Trees	2		X	X					X				X			X	X				X	X				X	X	X		X	
Reduce Water Demand/Improve Drought Education	3	X						X			X				X	X	X					X		X							
Reduce Wildfire Damage	1,2																					X		X							

Mitigation Action	Goal	Howard County	Boelus	Cotesfield	Cushing	Dannebrog	Elba	Farwell	St. Paul	Loup County	Taylor	Nance County	Belgrade	Fullerton	Genoa	Platte County	Columbus	Monroe	Sherman County	Ashton	Litchfield	Loup City	Rockville	Valley County	Arcadia	Elyria	North Loup	Ord	Wheeler County	Bartlett	Ericson
		Howard County								Loup County		Nance County				Platte County			Sherman County					Valley County					Wheeler County		
Relocate Municipal Infrastructure	2																														
Resource Tracking	2																														
Resurface Roads	1																														
School Continuity Plan	1																														
Shelter in Place	1																				X										
Site Security	1																														
Snow Fences	1,2														X										X						
Static Detectors	2		X																												
Storm Shelter Identification	1						X													X	X										
Study/Improve Drinking Water Supply	1															X	X							X							
Surge Protectors	2						X														X										
Transportation Drainage Improvements	2																														
Tree Planting	2														X										X						
Update Comprehensive Plan	1,2,3											X													X						
Telephone Warning Systems	1,3																														
Warning Sirens	1,3						X					X																			
Water System Improvements	1																														
Weather Radios	1,3											X																			
Well Improvement	1																														

Mitigation Action	Goal	Howard County	Boelus	Cotesfield	Cushing	Dannebrog	Elba	Farwell	St. Paul	Loup County	Taylor	Nance County	Belgrade	Fullerton	Genoa	Platte County	Columbus	Monroe	Sherman County	Ashton	Litchfield	Loup City	Rockville	Valley County	Arcadia	Elyria	North Loup	Ord	Wheeler County	Bartlett	Ericson
		Howard County								Loup County		Nance County				Platte County			Sherman County					Valley County					Wheeler County		
Wildfire Education	3																														
Wildfire Hazard Identification and Mitigation System (WHIMS)	1,2																														
Wind Breaks Studies	1																														

COMPLETED MITIGATION EFFORTS

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

SECTION SIX: PLAN IMPLEMENTATION AND MAINTENANCE

MONITORING, EVALUATING, AND UPDATING THE PLAN

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

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

***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.*

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 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 D* may also be used to assist with plan updates.

In addition, the governing body will be responsible for ensuring that the Hazard Mitigation Plan goals and objectives are incorporated into applicable revisions of each participant's comprehensive plan and any new

planning projects undertaken by the participant. The HMP will also take into account any changes in the 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 or 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 LLNRD 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* Guidance, as well as FEMA's *2014 Plan Integration 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 Hazard Mitigation Plan.

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 these communities that lack existing planning mechanisms, especially smaller villages, the Hazard Mitigation Plan may be used as a guide for future activity and development in the community.

SECTION SEVEN: PARTICIPANT SECTIONS

PURPOSE OF PARTICIPANT SECTIONS

Participant sections contain information specific to jurisdictions which have participated in the LLNRD 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 only to each jurisdiction are included such as: critical facilities as identified by the jurisdiction, flood prone areas (including those delineated by Hazus 3.1), and 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 referred to in *Section Four: Risk Assessment.*