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Acronyms

ACS – American Community Survey
BCA – Benefit Cost Analysis
BRIC – Building Resilient Infrastructure and Communities
CAFO – Concentrated Animal Feeding Operations
CDBG – Community Development Block Grant
CDC – Center for Disease Control
CFR – Code of Federal Regulations
CIKR – Critical Infrastructure and Key Resources
CRS – Community Rating System
cyanoHAB – Cyanobacterial Harmful Algae Blooms
CWPP – Community Wildfire Protection Plan
DHHS – Department of Health and Human Services
DHS – Department of Homeland Security
DMA 2000 – Disaster Mitigation Act of 2000
EAB – Emerald Ash Borer
EAP – Emergency Action Plan
ELAP – Emergency Assistance for Livestock, Honeybees, and Farm-Raised Fish Program
EPA – Environmental Protection Agency
ESL – English as Second Language
FBI – Federal Bureau of Investigations
FEMA – Federal Emergency Management Agency
FIRM – Flood Insurance Rate Map
FIS – Flood Insurance Study
FMA – Flood Mitigation Assistance Program
FR – FEMA’s Final Rule
GIS – Geographic Information Systems
HMA – Hazard Mitigation Assistance
HMGP – Hazard Mitigation Grant Program
HMP – Hazard Mitigation Plan
HPRCC – High Plains Regional Climate Center
HSAS – Homeland Security Advisory System
HUD – Department of Housing and Urban Development
IBC – International Building Code
JEO – JEO Consulting Group, Inc.
LBNRD – Little Blue Natural Resources District
LBBNRD – Lower Big Blue Natural Resources District
LEDRS – Livestock Emergency Disease Response System
LEOP – Local Emergency Operations Plan
LFD – Livestock Forage Disaster Assistance Program
LGA – Liquid Gallon
LIP – Livestock Indemnity Program
LOMA – Letter of Map Amendment
LOMR – Letter of Map Revision
MPH – miles per hour
NCEI – National Centers for Environmental Information
NDA – Nebraska Department of Agriculture
NDEE – Nebraska Department of Environment and Energy
NDMC – National Drought Mitigation Center
NDOT – Nebraska Department of Transportation
NeDNR – Nebraska Department of Natural Resources
NEMA – Nebraska Emergency Management Agency
NFIP – National Flood Insurance Program
NFS – Nebraska Forest Service

NIPP – National Infrastructure Protection Plan
NOAA – National Oceanic and Atmospheric Administration
NPI – Nonpharmaceutical interventions
NPS – National Park Service
NRC – National Response Center
NTAS – National Terrorism Advisory System
NWS – National Weather Service
PAL – Provisionally Accredited Levee
PDSI – Palmer Drought Severity Index
PHMSA – U.S. Pipeline and Hazardous Material Safety Administration
P.L. – Public Law
RMA – Risk Management Agency
SBA – Small Business Administration
SERT – State Emergency Response Team
SFHA – Special Flood Hazard Area
SPIA – Sperry-Piltz Ice Accumulation Index
SSA – Sector-Specific Agency
START – National Consortium for the Study of Terrorism and Responses to Terrorism
SURE – Supplemental Revenue Assistance Payments
TAP – Tree Assistance Program
TORRO – Tornado and Storm Research Organization
UNL – University of Nebraska-Lincoln
USACE – United States Army Corps of Engineering
USDA – United States Department of Agriculture
USGS – United States Geological Survey
WUI – Wildland Urban Interface

EXECUTIVE SUMMARY

Introduction

This plan is an update to the Little Blue Natural Resources District and Lower Big Blue Natural Resources District Hazard Mitigation Plan (HMP), last approved in 2016. The plan update was developed in compliance with the requirements of the Disaster Mitigation Act of 2000 (DMA 2000).

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

Plan participants are listed in the following table and illustrated in the following planning area map. New participating jurisdictions in this plan update included the Village of Milligan, Village of Strang, Village of Cowles, City of Beatrice, Adams Central Public Schools, Beatrice Public Schools, South Central USD Public Schools, Barneston Fire District, and Wymore Fire District.

The communities of Roseland, Harvard, Steele City, Byron, Carleton, Nora, Oak, Gilead, and Bladen did not participate in this HMP. Additionally, several school districts who participated in the 2016 HMP did not participate in the 2021 update; however, this was largely due to the coronavirus pandemic in 2019.

Table 1: Participating Jurisdictions in LBNRD and LBBNRD HMP

Participating Jurisdictions		
Little Blue Natural Resources District		
Lower Big Blue Natural Resources District		
Adams County	Gage County	Saline County
Village of Ayr	Village of Adams	City of Crete
City of Hastings	Village of Barneston	Village of DeWitt
Village of Holstein	City of Beatrice	Village of Dorchester
Village of Juniata	City of Blue Springs	City of Friend
Village of Kenesaw	Village of Clatonia	Village of Swanton
Village of Prosser	Village of Cortland	Village of Tobias
Clay County	Village of Filley	Village of Western
City of Clay Center	Village of Liberty	City of Wilber
Village of Deweese	Village of Odell	Thayer County
City of Edgar	Village of Pickrell	Village of Alexandria
City of Fairfield	Village of Virginia	Village of Belvidere
Village of Glenvil	City of Wymore	Village of Bruning
Village of Ong	Jefferson County	Village of Chester
Village of Saronville	Village of Daykin	Village of Davenport
City of Sutton	Village of Diller	City of Deshler
Village of Trumbull	Village of Endicott	City of Hebron
Fillmore County	City of Fairbury	Village of Hubbell
Village of Exeter	Village of Harbine	Webster County
Village of Fairmont	Village of Jansen	City of Blue Hill

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 Regional Planning Team reviewed, updated, and approved goals and objectives 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 and objectives were reviewed by the Regional Planning Team at the Kick-off meeting and revised to reflect experiences from the past HMP process and newly identified priorities. The goals and objectives for this plan update are as follows:

GOAL 1: PROTECT THE HEALTH AND SAFETY OF THE PUBLIC

- Objective 1.1: Continue compliance with NFIP for participating communities; encourage joining NFIP if not currently participating
- Objective 1.2: Construct safe rooms in schools, public buildings, and in select locations at popular outdoor venues
- Objective 1.3: Update or obtain additional outdoor warning sirens as needed in the project area
- Objective 1.4: Develop additional emergency notification methods to alert the public of potential hazards
- Objective 1.5: Provide educational opportunities for the public to promote preparedness in the project area

GOAL 2: PROTECT CRITICAL FACILITIES, CRITICAL INFRASTRUCTURE, AND MAINTAIN THEIR OPERATION AFTER A HAZARD

- Objective 2.1: Protect power lines throughout the NRDs by burying them or reinforcing them
- Objective 2.2: Obtain backup power systems and emergency equipment required to keep critical facilities, critical infrastructure, and emergency operations running after a hazard event
- Objective 2.3: Develop studies to determine infrastructure systems that require updating

GOAL 3: PROTECT EXISTING PROPERTIES AND NATURAL RESOURCES

- Objective 3.1: Implement or strengthen regulations and building codes promoting development and construction that protects existing and future development or properties
- Objective 3.2: Protect existing infrastructure or critical facilities from flooding
- Objective 3.3: Perform studies to determine locations of concern and determine projects to mitigate against the hazards
- Objective 3.4: Protect public structures and recreational facilities against hazard events and damages from trees
- Objective 3.5: Improve drainage through creeks where necessary
- Objective 3.6: Develop and implement planning mechanisms which address hazard mitigation actions and maintenance procedures for structures throughout the planning area to protect against hazard events

GOAL 4: PROMOTE MULTI-AGENCY COORDINATION AND RESOURCES

- Objective 4.1: Maximize funding opportunities through grant money and other outside sources
- Objective 4.2: Prioritize projects based on greatest risk
- Objective 4.3: Encourage individual property owners to develop independent measures to protect their property and not rely on public funding
- Objective 4.4: Promote the efficient use of all public, private, and allocated funds

Summary of Changes

The hazard mitigation planning process undergoes several changes during each plan update to best accommodate the planning area and specific conditions. Changes from the 2016 Hazard Mitigation Plan and planning process in this update included: combined risk assessment for hazards with similar mitigation strategies (High Winds and Tornadoes, Drought and Extreme Heat, and Severe Thunderstorms with Hail); elimination of hazards of low risk to local planning teams; modified public meeting planning process to respond to the COVID-19 pandemic; and the inclusion of Plan Maintenance sections to individual community profiles.

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. Other changes made to the plan to address review comments from the 2016 plan are described in the table below.

Table 2: 2021 LBNRD and LBBNRD HMP Changes

Comment/Revision from 2016 Review Tool	Location of Revision	Summary of Change
Improve map labeling, legibility, and legends	Throughout plan	New maps have been developed and included where appropriate
Include discussion of extreme cold along with wind chill	Severe Winter Storms	Discussion of extreme cold as a component of severe winter storms
Include more specific information for climate change for individual hazards	Hazard risk profiles	Regional vulnerabilities table includes impacts from climate change on hazard type
Include specific actions for communities to support the NFIP	Section five, community profiles	Regional vulnerabilities table includes impacts from climate change on hazard type
Remove mitigation action redundancies or clarify mitigation action status	Section five, community profiles	Selected mitigation actions were reviewed and renamed/combined to remove redundancies between jurisdictions.

It should be noted as well that due to the COVID-19 outbreak, numerous changes were made in the midst of the planning process to plan meeting dates and requirements. To best protect residents and staff members in the planning area, Round 1 public meetings were held as a mixture of in-person and virtual formats and Round 2 meetings were held virtually. Additional one-on-one

meetings were held via phone as needed. Additional changes and summary of the planning process are described in Section Two.

Plan Implementation

Various communities across the planning area have implemented hazard mitigation projects following the 2016 Hazard Mitigation Plan. A few examples of completed projects include updating or adopting more stringent ordinance or building codes, removing hazardous trees, alert siren updates or replacements, expanding local emergency response capabilities, and flood protection or drainage improvements throughout the planning area.

In order to build upon these prior successes and to continue implementing mitigation projects, despite limited resources, communities will need to continue relying upon multi-agency coordination as a means of leveraging resources. Communities across the nine-county planning area 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: University of Nebraska-Lincoln (UNL), Nebraska Forest Service (NFS), Nebraska Department of Energy and Environment (NDEE), Nebraska Department of Transportation (NDOT), Nebraska Department of Natural Resources (NeDNR); Nebraska Emergency Management Agency (NEMA), United States Department of Agriculture (USDA), and Federal Emergency Management Agency (FEMA).

Hazard Profiles

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

Table 3: Regional Risk Assessment

Hazard	Previous Occurrences	Approximate Annual Probability*	Likely Extent
Agricultural Animal Disease	125	7/7 = 100%	Mean ~214 animal per event; Median ~1 animal per event
Agricultural Plant Disease	258	19/21 = 90%	Unavailable
Dam Failure	18	13/129 = 10%	Varies by structure
Drought	493/1,504 months	>32.8%	Mild Drought
Earthquakes	2	2/121 = 2%	~2.0 – 4.0 magnitude
Extreme Heat	Avg. 6 days per year	125/128 = 98%	>100°F
Flooding	234	24/25 = 98% 100% [^]	Minor to moderate flooding with some inundation of structures and roads near streams.

Hazard	Previous Occurrences	Approximate Annual Probability*	Likely Extent
			Evacuations of people may be necessary.
Grass/Wildfire	2,059	20/20 = 100%	Avg. fire <21 acres; Some homes and structures threatened or at risk
Hazardous Materials - Fixed Sites	368	30/30 = 100%	Avg spill ~475 gal. Localize to the facilities and adjacent surroundings.
Hazardous Materials - Transportation	72	25/31 = 81%	<50 gallons, Limited (<0.5 mile) from release site
High Winds	183	21/25 = 84%	9 BWF (47-54mph)
Levee Failure	0	0/120 = <1%	~30% of Fairbury Total of 649 people and 585 structures in leveed areas
Public Health Emergency	3 outbreak events	>1%	Varies by event; >1 fatality
Severe Thunderstorms (includes hail)	2,755	25/25 = 100%	>1" rainfall Avg 1.16 hail; 35-58 mph
Severe Winter Storms	766	25/25 = 100%	0.25-0.5" ice 20°-40° below zero (wind chill) 4-8" snow 35-45 mph winds
Terrorism	2	1/48 = <1%	Isolated to a single building; damages <\$1M; varies by event
Tornadoes	148	24/25 = 96%	EF0-EF4 Mode: EF0

*Annual Probability = Total Years with an Event Occurrence / Total Years on Record

^Indicates flood events likely occurred in year with missing data, however, were not reported during this planning process.

The following table provides loss estimates for hazards with sufficient data. Detailed descriptions of major events are included in *Section Seven: Community Profiles* as appropriate per jurisdiction.

Table 4: Hazard Loss Estimates for the Planning Area

HAZARD		COUNT	PROPERTY	CROP
AGRICULTURAL DISEASE	Animal Disease	125	26,789 animals	N/A
	Plant Disease	258	N/A	\$3,156,617
DAM FAILURE		18	\$0	N/A
DROUGHT & EXTREME HEAT	Drought	493/1,504 months	\$70,000,000	\$246,935,998
	Extreme Heat	Avg. 6 days per year	\$400,000	\$22,026,050
EARTHQUAKES		2	\$0	\$0
FLOODING	Flash Flood	112	\$21,010,000	\$2,408,030

HAZARD		COUNT	PROPERTY	CROP
1 FATALITY	Flood	122	\$117,270,900	
GRASS/WILDFIRE 15 INJURIES, 3 FATALITIES		2,059	41,288 acres and \$613,319	\$1,361,497
HAZARDOUS MATERIALS 1 INJURY	Fixed Sites	368	\$0	N/A
	Transportation	72	\$1,206,459	N/A
HIGH WINDS & TORNADOES 35 INJURIES, 1 FATALITY	High Winds	183	\$2,284,580	\$10,526,687
	Tornadoes	148	\$124,804,000	\$388,802
LEEVE FAILURE		0	N/A	N/A
PUBLIC HEALTH EMERGENCY		3 outbreak events	>9,825 infections; >91 fatalities	N/A
SEVERE THUNDERSTORMS 2 FATALITIES, 9 INJURIES	Hail	1,712	\$83,647,000	\$134,205,021
	Heavy Rain	196	\$1,097,000	
	Lightning	25	\$20,335,000	
	Thunderstorm Wind	822	\$53,817,200	
SEVERE WINTER STORMS 1 INJURY	Blizzards	79	\$105,000	\$12,156,696
	Extreme Cold	25	\$0	
	Heavy Snow	41	\$5,500,000	
	Ice Storms	51	\$12,464,000	
	Winter Storms	379	\$16,382,000	
	Winter Weather	191	\$95,000	
TERRORISM		2	\$0	N/A
TOTAL		6,990	\$531,031,458	\$433,165,398

N/A – Data not available

Many of the natural hazards can be expected to occur annually within the planning area. Events like agricultural disease, flooding, extreme heat, grass and wildfires, severe thunderstorms, and severe winter storms will occur annually. Other hazards like drought will occur less often. What is not known regarding hazard occurrences is the scope of events and how they will manifest themselves locally.

Historically, severe thunderstorms and flooding have resulted in the most significant structural damage within the planning area. These top hazards of concern for the planning area are summarized below.

Flooding

Flooding is one of the most costly hazards in the planning area. Flash flooding and riverine flooding are common for the planning area due to the regular occurrence of severe thunderstorms in spring and summer, the proximity of many communities next to rivers and tributaries, and aged or undersized stormwater drainage infrastructure. Flooding can occur on a local level, only affecting a few streets, but can also extend throughout an entire district, affecting whole drainage basins particularly along major waterways such as the Little Blue River, Big Blue River, and Republican River.

During the 2016 plan update, the planning area experienced one of its largest flooding events in history. Severe storms and flooding events resulted in presidential disaster declarations for Gage, Jefferson, Saline, and Thayer Counties. These events occurred intermittently between May 6, 2015 and June 17, 2015. Communities impacted by these events, including Hebron, Deshler, Roseland DeWitt and Fairbury, saw hundreds of residents evacuate to avoid danger. One elderly woman drowned in Fairbury. The planning area expects loss inducing floods to occur on an annual basis with 234 flooding events being recorded by the NCEI over nearly 25 years. These events have resulted in an approximated \$138,280,900 in losses and damages.

High Winds and Tornadoes

High winds and tornadoes occur in the planning area annually. The National Centers for Environmental Information (NCEI) reports 148 tornadoes for the nine-county area since 1996. Tornado events ranged between an F/EF0 and EF4 with many events reporting damages. These events have resulted in more than \$127M in losses and structural damage. While the most frequently occurring tornadic event (for the planning area) is an EF 0 there is a history of major tornadic events. In 1996 a F2 tornado passed through Gage County injuring 15 and causing an estimated \$12M in losses and structural damages. In 2003, a tornado moved through Thayer County and directly impacted the community of Deshler, this event killed one, injured seven and damaged hundreds of homes in the community. Finally, in 2004 Saline and Gage County experienced the F4 tornado which destroyed a community in nearby Lancaster County. This tornado injured eight and resulted in an estimated \$40M in damages.

Vulnerable populations within the planning area include residents living in mobile homes, aged housing stock, facilities without storm shelters which house large numbers of people (such as nursing homes, schools, factories, etc.), homeowners without storm shelters or basements, and residents with decreased mobility. The majority of communities in the planning area have outdoor warning sirens; however, many noted sirens and emergency alert systems should be updated or improved.

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. Hail, lightning, heavy rain, and strong winds can all occur during storm events and cause damage. 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 March and September with the highest number of events occurring in June. 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. The discussion related to severe thunderstorms in the planning area include a few key and regularly occurring local concerns. Severe thunderstorms within the planning area commonly include excessive rainfall, high winds, and hail. Hail and high winds are two of the most costly hazards for this region.

Vulnerable populations related to severe thunderstorms include: residents of mobile homes (two 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.

Severe Winter Storms

Severe winter storms are an annual occurrence for the planning area and the entire state of Nebraska. 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 but early and late season storms have occurred in the past and can have dramatic impacts in the planning area. 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 dilapidated structures; death of livestock; and closure of critical facilities. Severe winter weather has resulted in significant losses within the planning area, but due to the frequency of exposure most Nebraskans and Nebraskan communities are prepared to address the most frequently occurring events. Many communities did express concerns about major winter storms and their capabilities to respond, specifically power outages and local snow removal resources.

Mitigation Strategies

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

Table 5: Key Mitigation Strategies

Hazard	Mitigation Strategies
Agricultural Plant and Animal Disease	<ul style="list-style-type: none"> -Public education and awareness -Outbreak emergency exercises
Chemical Fixed Site and Transportation Spills	<ul style="list-style-type: none"> -Public education and awareness -Chemical spill emergency exercises -Shelter in place or HAZMAT training
Dam Failure	<ul style="list-style-type: none"> -Develop evacuation plans -Emergency exercise
Drought and Extreme Heat	<ul style="list-style-type: none"> -Identify additional water sources -Expand water storage capacity -Establish drought best practices and response plan -Upgrade rural water infrastructure -Develop vulnerable population databases within the community
Flooding	<ul style="list-style-type: none"> -Limit or restrict development in flood-prone areas via ordinances or development restrictions -Property acquisition or flood-proofing of structures in the floodplain -Improve or upgrade drainage structures and stormwater management systems -Bank stabilization or channel improvements
Grass/Wildfire	<ul style="list-style-type: none"> -Additional personnel, training and equipment for local fire departments -Upgrade/expand fire facilities -Hazardous fuels reduction

Hazard	Mitigation Strategies
	-Public education and awareness
High Winds and Tornadoes	<ul style="list-style-type: none"> -Remove hazardous trees -Design and construct storm shelters and safe rooms -Upgrade and maintain emergency warning sirens and early notification systems -Bury power lines or harden critical infrastructure
Levee Failure	<ul style="list-style-type: none"> -Maintain and upgrade levee systems -Conduct role-play tabletop levee failure exercises
Public Health Emergency	<ul style="list-style-type: none"> -Purchase or upgrade health facility equipment and facilities -Develop and implement Pandemic Response Plans
Severe Thunderstorms	<ul style="list-style-type: none"> -Purchase and install backup power generators for redundant power -Install static detectors, surge protectors, and/or lightning rods -Remove hazardous trees -Design and construct storm shelters and safe rooms -Upgrade and maintain emergency warning sirens and early notification systems -Bury power lines or harden critical infrastructure
Severe Winter Storms	<ul style="list-style-type: none"> -Incorporate use of snow fences to protect vulnerable transportation routes -Purchase and install backup power generators for redundant power -Remove hazardous trees -Review and improve snow/ice removal protocols -Upgrade and maintain emergency warning sirens and early notification systems -Bury power lines or harden critical infrastructure
Terrorism	-Improve local security systems for critical facilities

SECTION ONE

INTRODUCTION

Hazard Mitigation Planning

Severe weather and hazardous events are becoming a more common occurrence in our daily lives. Pursuing mitigation strategies reduces risk and is a socially and economically responsible action to prevent long term risks from natural and human-caused hazard events.

Natural hazards, such as severe winter storms, tornadoes and high winds, severe thunderstorms, flooding, extreme heat, drought, agricultural diseases (plant and animal), earthquakes, and wildfires are part of the world around us. Human-caused hazards are a product of society and can occur with significant impacts to communities.

Human-caused hazards include levee or dam failure, hazardous chemical spills (either fixed sites or transportation), and terrorism or civil disorder events. These hazard events can occur as a part of normal operations or as a result of human error. All jurisdictions participating in this planning process are vulnerable to a wide range of natural and human-caused hazards that threaten the safety of residents and have the potential to damage or destroy both public and private property, cause environmental degradation, or disrupt the local economy and overall quality of life.

The Little Blue Natural Resources District (LBNRD) and Lower Big Blue Natural Resources District (LBBNRD) have prepared this multi-jurisdictional multi-hazard mitigation plan in an effort to identify potential impacts from natural and human-caused hazards and to better protect the people and property of the region from the effects of these hazards. This plan demonstrates a regional commitment to reducing risks from hazards and serves as a tool to help decision makers establish mitigation activities and resources. Further, this plan was developed to make LBNRD, LBBNRD, and the participating jurisdictions herein eligible for federal funding programs under the Hazard Mitigation Assistance (HMA) program. This plan was also developed 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 deficiently 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; and,
- Facilitate development and implementation of hazard mitigation management activities to ensure a sustainable and more resilient community.



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.”

Disaster Mitigation Act of 2000

The U.S. Congress passed the Disaster Mitigation Act of 2000 to amend the Robert T. Stafford Disaster Relief and Emergency Assistance Act.¹ Section 322 of the DMA 2000 requires that state and local governments develop, adopt, and routinely update a hazard mitigation plan to remain eligible for pre- and post-disaster mitigation funding.² These funds include the Hazard Mitigation Grant Program (HMGP)³, Flood Mitigation Assistance (FMA)⁴, and the newly released Building Resilient Infrastructure and Communities (BRIC)⁵. BRIC replaced the Pre-Disaster Mitigation (PDM) Program in 2020. The Federal Emergency Management Agency (FEMA) administers these programs under the Department of Homeland Security (DHS).⁶ The Nebraska Emergency Management Agency (NEMA) administers these grants at the state level.

FEMA MITIGATION DIRECTORATE

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.

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, minimally every five years, to maintain compliance with the legislature per Section 322, Mitigation Planning, of the Robert T. Stafford Disaster Relief and Emergency Assistance Act, as enacted by Section 104 of the DMA 2000 (P.L. 106-390)⁷ and by FEMA's Final Rule (FR)⁸ published in the Federal Register on November 30, 2007, at 44 Code of Federal Regulations (CFR) Part 201.

Hazard Mitigation Assistance

On June 1, 2009, FEMA initiated the 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 actions and, as such, each program differs slightly in scope and intent. All three grant programs require jurisdictions to have participated in and adopted a FEMA-approved mitigation plan and are selected for funding through a competitive application process.

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

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

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

⁴ Federal Emergency Management Agency. "Flood Mitigation Assistance Grant Program." Last modified July 11, 2017. <https://www.fema.gov/flood-mitigationassistance-grant-program>.

⁵ Federal Emergency Management Agency. "Building Resilient Infrastructure and Communities." Last modified September 8, 2020. <https://www.fema.gov/grants/mitigation/building-resilient-infrastructure-communities>.

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

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

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

- **HMGP:** This program provides funds to states, territories, Indian tribal governments, local governments, and other eligible participants 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:** This program provides grant funds to implement projects such as acquisition or elevation of flood-prone homes. Jurisdictions must be participating communities in the National Flood Insurance Program (NFIP) to qualify.
- **BRIC:** This program replaces the Pre-Disaster Mitigation Program and provides funds on an annual allocation basis to local jurisdictions for implementing programs and projects to improve resiliency and local capacity before disaster events.

Plan Financing and Preparation

The 2021 Little Blue NRD and Lower Big Blue NRD Multi-Jurisdictional Hazard Mitigation Plan Update was financed through a HMGP grant and a combination of in-kind labor match and NRD cash match. Regarding plan financing and preparation, the NRDs tradeoff between each other for each plan update cycle to determine which NRD will be the “sub-applicant”. For the 2021 plan, the LBNRD is the “sub-applicant” that is the eligible entity which submits applications 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 regulations.

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SECTION TWO

PLANNING PROCESS

Introduction

The process utilized to develop a hazard mitigation plan is as important as the final planning document itself. The Little Blue NRD and Lower Big Blue NRD utilized and adapted the four-step hazard mitigation planning process as outlined by FEMA to fit the needs of the regional planning area, specific jurisdictions, and changing circumstances during the planning process period. The following section describes the planning process including: the development and establishment of both the Regional and Local Planning Teams; the function of each type of planning team; project meeting times, dates, agendas, and attendees; outreach efforts to the general public, neighboring jurisdictions, and available stakeholders; general information relative to the risk assessment process; general information relative to local/regional capabilities; plan review and adoption; and a brief discussion of 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 state 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.*

Multi-Jurisdictional Approach

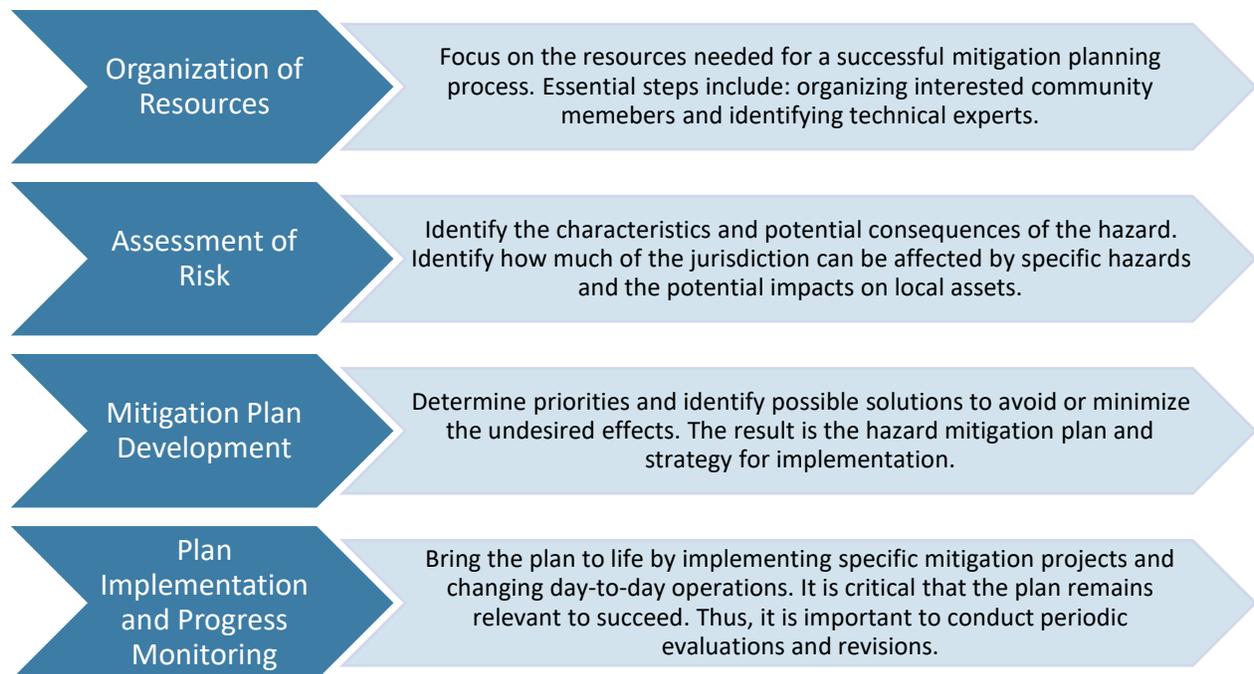
According to FEMA, “A multi-jurisdictional hazard mitigation plan is a plan jointly prepared by more than one jurisdiction.” For the purpose of this planning process, the term ‘jurisdiction’ refers to any eligible (i.e. taxing authority) participating entity. Title 44 Part 201, Mitigation Planning in the CFR, defines a ‘local government’ [jurisdiction] 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 a 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 resources districts. The Little Blue NRD and Lower Big Blue NRD utilized the multi-jurisdictional planning process recommended by FEMA resources (*Local Mitigation Plan Review Guide*⁹, *Local Mitigation Planning Handbook*¹⁰, and *Mitigation Ideas: A Resource for Reducing Risk to Natural Hazards*¹¹) to develop this plan.

Hazard Mitigation Planning Process

The hazard mitigation planning process as outlined by FEMA has four general steps which are detailed in the figure below. The mitigation planning process is rarely a linear process. It's common that ideas developed during the initial assessment of risks may need revision later in the process, or that additional information may be identified while developing the mitigation plan or during the implementation of the plan that results in new goals or additional risk assessments. The four-step approach is described in the figure below.



Organization of Resources

Plan Update Schedule

JEO Consulting Group (JEO), was contracted in September 2018 to assist, guide, and facilitate the HMP planning process and assembly. The Little Blue NRD secured HMGP grant funding for their multi-jurisdictional hazard mitigation plan (HMP) in June 2020. For the planning area sponsor, Scott Sobotka (Assistant General Manager) served as the primary contact from the Lower Big Blue NRD. Both Kyle Hauschild (General Manager) and Tyler Goeschel (Assistant General Manager) served as the primary points of contact for the Little Blue NRD during the first

⁹ Federal Emergency Management Agency. 2011. "Local Mitigation Plan Review Guide." https://www.fema.gov/media-library-data/20130726-1809-25045-7498/plan_review_guide_final_9_30_11.pdf

¹⁰ Federal Emergency Management Agency. 2013. "Local Mitigation Planning Handbook." https://www.fema.gov/media-library-data/20130726-1910-25045-9160/fema_local_mitigation_handbook.pdf.

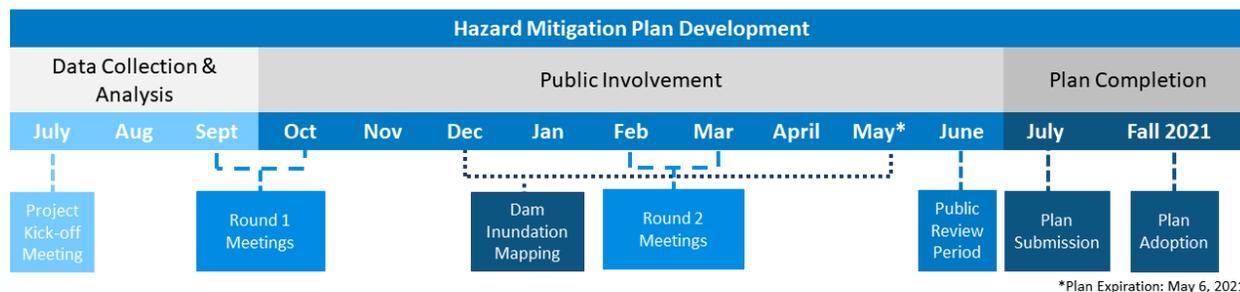
¹¹ Federal Emergency Management Agency. 2013. "Mitigation Ideas: A Resource for Reducing Risk to Natural Hazards." https://www.fema.gov/media-librarydata/20130726-1904-25045-0186/fema_mitigation_ideas_final508.pdf.

SECTION TWO: PLANNING PROCESS

half of the planning process. In early 2021, Scott Nelson was hired as the new General Manager of the Little Blue NRD and became a primary point of contact as well.

A clear timeline of this plan update process is provided in Figure 2.

Figure 2: Project Timeline



Regional Planning Team Establishment

At the beginning of the planning process the two NRD sponsors and JEO staff identified key contacts to serve as the Regional Hazard Mitigation Planning Team. This Regional Planning Team comprised of county representatives for the nine-county area, state agencies, and the consultant, was established to guide the planning process; review the 2016 HMP and discuss planning process changes or plan requirements; and serve as the liaison between the project sponsor and consultant to local participating jurisdictions. Those invited to be a part of the Regional Planning Team included contacts from: Little Blue NRD, Lower Big Blue NRD, county emergency management and county planning officials/floodplain administrators, Nebraska Department of Natural Resources, Nebraska Emergency Management Agency, and JEO. The following table provides a list of Regional Planning Team Members who attended the Kick-off Meeting and/or participated in this plan update process.

Table 6: Regional Planning Team Members

Name	Title	Jurisdiction
Tyler Goeschel	Assistant General Manager	Little Blue NRD
Kyle Hauschild	General Manager	Little Blue NRD
Scott Sobotka	Assistant General Manager	Lower Big Blue NRD
Dawna Whitcomb	Administration Assistant	Adams County
Ron Pughes	Emergency Manager	Adams County
James Dunker*	Emergency Manager/FP Admin	Fillmore County
John McKee	Emergency Manager/FP Admin	Jefferson and Saline County
Lisa Wiegand	Emergency Manager	Gage County
Tim Lewis	Emergency Manager	Clay County
Nicholas Elledge	Emergency Manager/FP Admin	Nuckolls County
Colt Farringer	Emergency Manager/FP Admin	Thayer County
Ron Sunday	Emergency Manager	Webster County
Adele Phillips	Flood Mitigation Planner	NeDNR
Lexy Hindt	Deputy State Hazard Mitigation Officer	NEMA
Brooke Seachord	Project Planner	JEO Consulting Group
Becky Appleford	Project Manager	JEO Consulting Group

*Retired during plan update and was replaced by Jean Engle.

A project Kick-off Meeting was held on July 14, 2020 to discuss an overview of the planning process between JEO staff and the Regional Planning Team. Discussion at this meeting included participation requirements for eligible jurisdictions, HMP update project description, updates and changes to the HMP, review and revision of Goals and Objectives, identify hazards for risk assessment, identifying all potential plan participants or key stakeholders, and general schedule for the planning process. This meeting also assisted in clarifying roles and responsibilities of Regional Planning Team and Local Planning Teams, strategies for public engagement throughout the process, and a brief discussion of applicable COVID-19 safety measures and contingency plans for the HMP update. The following table shows the date, location, and attendees from the Kick-off Meeting.

Table 7: Kick-off Meeting Information

Meeting Date and Location		Agenda Items
SHICKLEY COMMUNITY CENTER 102 N MARKET ST SHICKLEY NE 68436 JULY 14, 2020 10:00AM		-Consultant, regional, and local planning team responsibilities -Overview of plan update process and changes from 2016 HMP -Public engagement and participants -Goals and Objectives/Hazard Identification
NAME	TITLE	JURISDICTION
Colt Farringer	Emergency Manager/FP Admin	Thayer County
James Dunker	Emergency Manager	Fillmore County
John Mckee	Emergency Manager/FP Admin	Jefferson and Saline Counties
Kyle Hauschild	General Manager	Little Blue NRD
Lisa Wiegand	Emergency Manager	Gage County
Ron Pughes	Emergency Manager	Adams County
Scott Sobotka	Assistant General Manager	Lower Big Blue NRD
Tyler Goeschel	Assistant General Manager	Little Blue NRD
Dawna Whitcomb	Administrative Assistant	Adams County
Becky Appleford	Project Manager	JEO Consulting Group
Brooke Seachord	Project Planner	JEO Consulting Group

Project Announcement - Neighboring Jurisdictions

Neighboring jurisdictions were notified of the Little Blue NRD and Lower Big Blue NRD HMP update and invited to participate in the planning process. The following table lists the neighboring communities or entities notified of the planning process. The Little Blue NRD mailed a copy of the Project Announcement letter to each listed jurisdiction. Representatives from Hall County, Lower Platte South NRD, and Upper Big Blue NRD provided feedback on the plan and were invited to HMP update meetings. No other comments or revisions were received or incorporated.

Table 8: Notified Neighboring Jurisdictions

Neighboring Jurisdictions		
Lower Republican NRD	Otoe County NE	Franklin County NE
Tri-Basin NRD	Lancaster County NE	Marshall County KS
Central Platte NRD	Seward County NE	Washington County KS
Upper Big Blue NRD	York County NE	Republic County KS
Lower Platte South NRD	Hamilton County NE	Jewell County KS

Neighboring Jurisdictions		
Nemaha NRD	Hall County NE	Smith County KS
Pawnee County NE	Buffalo County NE	
Johnson County NE	Kearney County NE	

Project Announcement - Stakeholders

Potential stakeholders were identified by the consultant, plan sponsors, and Regional Planning Team members. These stakeholders were notified of the HMP update and invited to participate in the planning process. The following table lists entities notified of the planning process. The Little Blue NRD mailed a copy of the Project Announcement letter to each listed stakeholder. Comments and information provided by stakeholders was incorporated into applicable community profiles. No stakeholders participated in the planning process or provided input.

Table 9: Notified Stakeholders

Notified Stakeholders		
Azria Health Blue Hill	Good Samaritan Society - Hastings Village	Omaha Public Power District
Beatrice Community Hospital	Good Samaritan Society - Superior	Parkview Haven/Meadowlark Heights
Beatrice Dialysis	Harvard Rest Haven	Perennial Public Power District
Beatrice Health and Rehabilitation	Harvard State Airfield	Premier Estates of Kenesaw
Beatrice Municipal Airport	Hastings Dialysis Center	Providence Place of Hastings
Blue Valley Lutheran Homes	Hastings Laser & Eye Surgery Center	Red Cloud Municipal Airport
Brodstone Memorial Hospital	Hastings Municipal Airport	South Central Public Power District
Champion Homes of Hastings	Hastings Surgical Center	Spring Creek Home
Cherry Corner Estates	Hebron Municipal Airport	Superior Municipal Airport
College View Assisted Living and Memory Support	Heritage Care Center	Sutton Community Home
Community Health Center	Heritage Crossings	Tabitha in Crete
Crete Area Medical Center	Heritage of Red Cloud	Thayer County Health Services
Crete Municipal Airport	Homestead House	The Hastings Homestead
Edgewood Hastings Senior Living	Hope-Wymore	The Kensington – Adams County
Fairbury Municipal Airport	Jefferson Community Health & Life	The Kensington – Gage County
Fairmont State Airfield	Jefferson Community Health Center	United States Army Corps of Engineering (USACE)
Fairview Manor	Kingswood Court	Webster County Community Hospital
Fillmore County Hospital	Mary Lanning Healthcare	Whispering Winds Cottage
Friend Community Healthcare System	Nebraska Forest Service	Wilber Care Center
Gold Crest Retirement Center	Nebraska PEO Home	
Good Samaritan Society - Beatrice	Norris Public Power District	

Participant Involvement

Participants play a key role in reviewing information, identifying hazards of top concern, providing descriptions of localized impacts from hazard events, identification and prioritization of potential mitigation projects and strategies, and the development of plan maintenance procedures.

To be a participant in the development of this HMP update, jurisdictions were required to:

- Attend Round 1 and Round 2 meetings or a one-on-one meeting with JEO staff,
- Provide relevant information throughout the plan update process, and
- Pass an *Adoption Resolution* for the approved HMP.

Jurisdictions had to have at least one representative present at meetings. Some jurisdictions sent multiple representatives to meetings. For jurisdictions who only had one representative at meetings, they were encouraged to take materials back to their governing bodies and include a diverse input on the meeting documents. Sign-in and attendance sheets from all public meetings can be found in *Appendix A*.

Outreach to eligible jurisdictions included notification prior to all public meetings, letters, phone calls, emails, and calendar meeting invitations. Due to the development of COVID-19 during the planning period, an emphasis was made on virtual and electronic outreach. The following table provides a summary of outreach activities utilized in this process.

Table 10: Outreach Activity Summary

Activity	Intent
Project Website	Informed the public and local planning team members of past, current and future activities related to the HMP process (https://jeo.com/blues-hmp)
Project Announcement	A Project Announcement letter was sent to all neighboring jurisdictions, stakeholder list, and eligible participants to inform them of the planning process.
Meeting Invitations (Round 1 and Round 2)	Letters, electronic calendar invitations, emails and phone calls were used to notify participants of meeting agenda/data/time/locations for Round 1 and Round 2 meetings. Round 1 meetings were a hybrid of in-person and virtual meetings. Round 2 meetings were held virtually.
Follow up Emails and Phone Calls	Correspondence to all participating jurisdictions to remind and assist them with the collection and submission of required local data
Project Flyer	A fact sheet flyer was developed and shared with all planning team members to post locally. Information included why and how to be involved in the process.
Local Outreach	Project sponsors and members of Regional Planning Team provided follow up to jurisdictions on an as needed basis.
Social Media	The local sponsors, county Emergency Management Agencies, and local communities were encouraged to share updates on HMP process via local social media channels.

Assessment of Risk

Round 1 Meetings: Hazard Identification and Risk Assessment

Round 1 Meetings are an opportunity to familiarize participating jurisdictions with the HMP update process, review information from the previous HMP, and begin the hazard identification at the local level. At these meetings, the local jurisdictional representatives serve as the Local Planning Teams to review the hazards to be profiled in this HMP update (as established by the Regional Planning Team at the Kick-off Meeting) and provide information about local impacts, historical occurrences, and overall community exposure to the various hazards. For a complete list of hazards reviewed in the 2021 Little Blue NRD and Lower Big Blue NRD HMP, see *Section Four Risk Assessment*.

The following table shows the dates and times for Round 1 Meetings. Note that due to the development and prevalence of COVID-19, Round 1 Meetings were held as a mixture of both socially distanced in-person meetings and virtual meetings.

Table 11: Round 1 Meetings

Agenda Items	
General overview of the HMP planning process; discussion of participation requirements; begin risk assessment and impact reporting discussion; review and identification of critical facilities; update capability assessment; and review and update past mitigation actions	
IN-PERSON MEETINGS	DATE AND TIME
Nuckolls	Tuesday, September 22 from 2:00-4:00PM @ Nelson Community Center (580 Main St, Nelson)
Jefferson	Wednesday, September 30 from 6:00-8:00PM @ 4-H Extension (56885 PWF Rd, Fairbury)
Adams	Thursday, October 8 from 10:00AM-12:00PM @ Hastings Library (314 N Denver Ave, Hastings)
Fillmore	Wednesday, October 14 from 6:00-8:00PM @ Geneva Public Library (1043 G St, Geneva)
Gage	Tuesday, October 20 from 6:00-8:00PM @ Extension Building (1115 W Scott St, Beatrice)
VIRTUAL MEETINGS	DATE AND TIME
	Thursday, September 24 from 2:00-4:00PM
	Tuesday, September 29 from 10:00AM-12:00PM
	Tuesday, October 6 from 2:00-4:00PM
	Wednesday, October 21 from 2:00-4:00PM
	Thursday, November 12 from 3:00PM-5:00PM

The intent of these meetings was to familiarize the jurisdictional representatives with an overview of the work to be completed over the next year as the plan progressed, discuss the responsibilities of being a participant, and to collect preliminary information to update the HMP. Data collected at these meetings included: updates to mitigation actions from the 2016 Little Blue NRD and Lower Big Blue NRD HMP; hazard prioritization for each jurisdiction; review/update the list of critical facilities; and to begin reviewing community profiles for demographics and capabilities. These meetings also served as an opportunity to gather input on the identification of hazards, such as records of historical occurrences and the community's capability to mitigate and respond to those events.

The following table shows the attendees for each jurisdiction who attended Round 1 meetings. Follow up one-on-one meetings were held for communities who did not have representatives present at public meetings through in-person meetings or conference calls with JEO Staff.

Table 12: Round 1 In-Person Meeting Attendees

Name	Title	Jurisdiction
<i>Nuckolls County Meeting – Tuesday, September 22</i>		
Becky Appleford	Project Manager	JEO Consulting Group
Brooke Seachord	Project Coordinator	JEO Consulting Group
Sara Griffis	Board Member	Village of Lawrence
Kyle Hauschild	General Manager	LBNRD
Tyler Goeschel	Assistant Manager	LBNRD
Chad Winslow	Maintenance Supervisor	Guide Rock
Sam Clark	Clerk	Hardy and Superior
Adam Brittenham	Utilities Manager	Superior
Donovan Kruse	Fire Chief	Davenport
Sandra Schendt	Clerk	Nelson
Nick Elledge	Emergency Manager/FP Admin	Nuckolls County
Julie Otero	Superintendent	SCN Unified School District
Marty Kobr	Superintendent	Superior Public Schools
<i>Jefferson County Meeting – Wednesday, September 30</i>		
Becky Appleford	Project Manager	JEO Consulting Group
Brooke Seachord	Project Coordinator	JEO Consulting Group
Renice Bales	Clerk	Reynolds
Robert Brocking	Chairman	Daykin
Matt Schultz	Deputy Sheriff	Jefferson County
Doug Brandt	Fire Chief	Daykin FD
Mary Renn	City Administrator	Fairbury
Tana Hofstetter	Clerk	Plymouth
Scott Sobotka	Assistant Manager	LBBNRD
Chris Zabokrtsky	Chairperson	Endicott
Jeremy VanWesten	Chairperson	Alexandria
Nathan Francis	Board Member	Fairbury
Laura Bella	Board Member	Fairbury
Raymond Wit	Utilities Superintendent	Chester
Joe Carbonneau	Chairman	Chester
Terry Blas	Assistant Supervisor – Highway Dept	Jefferson County
Jim Mentems	City Maintenance	Plymouth
Elaine Blobaum	Clerk	Harbine
Jerry Ginn	Board Member	Reynolds
John McKee	Zoning/FP Administrator, Emergency Manager	Jefferson/Saline Counties
Jeff Sweetse	Utility Superintendent	Fairbury
Kyle Hauschild	General Manager	LBNRD
<i>Adams County Meeting – Thursday, October 8</i>		
Becky Appleford	Project Manager	JEO Consulting Group
Brooke Seachord	Project Coordinator	JEO Consulting Group
John Uden	EM Coordinator	Juniata

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Name	Title	Jurisdiction
Jack Wergin	Projects Department Manager	Upper Big Blue NRD
Mike Stromer	County Supervisor	Adams County
Jim Morgan	Public Health Risk Coordinator	South Heartland District Health Dept
Jeff Edmondson	Utilities Superintendent	Kenesaw
Kyle Hauschild	General Manager	LBNRD
Shawn Scott	Superintendent	Adams Central Public Schools
Michael Matthews	EM Director	Prosser
Ron Pughes	Emergency Manager	Adams County
Judy Mignery	Planning and Zoning Director	Adams County
Marty Stang	Environmental Director	Hastings
Michelle Matthew	Clerk	Prosser
Tyler Goeschel	Assistant Manager	LBNRD
<i>Fillmore County Meeting – Wednesday, October 14</i>		
Becky Appleford	Project Manager	JEO Consulting Group
Brooke Seachord	Project Coordinator	JEO Consulting Group
Becky Erdkamp	Clerk	Exeter
Steve Briske	Facilities Manager	Exeter-Milligan Schools
Jean Engle	Emergency Manager/FP Admin	Fillmore County
Sue Keenan	Clerk	Grafton
Larry Cerny	Supervisor	Geneva
Merle Nod	County Supervisor	Fillmore County
Don Schaldecker	Board Member	Grafton
Larry Wollenbarg	Fire Chief	Geneva Fire Dept.
Brandie Conway	Supervisor	Geneva/Fillmore County
Frank Myers	Chairman	Western
Gary Bulin	Chairman	Ohiowa
James Dunker	Emergency Manager/FP Admin	Fillmore County
Kyle Hauschild	General Manager	LBNRD
Jeff Neiman	County Supervisor	Fillmore County
Tyler Salmon	Board Member	Fairmont
<i>Gage County Meeting – Tuesday, October 20</i>		
Becky Appleford	Project Manager	JEO Consulting Group
Brooke Seachord	Project Coordinator	JEO Consulting Group
Lisa Wiegand	Emergency Manager	Gage County
Galen Engle	Highway Superintendent	Gage County
Denis VanLangham	Chairman	Gage County
Tom Bass	Board Member	Saline County
Taylor McHenry	Fire Chief	Barneston Rural Fire, Barneston
Roger Theye	Chairman	Liberty
Ileen Theye	Clerk	Liberty
Mark Billesbach	Chairman	Odell
Janet Riensche	Clerk	Blue Springs/Wymore
Kelly Harms	Clerk	Virginia
Linda Searcy	Treasurer	Virginia
Jason Alexander	Superintendent	Beatrice Public Schools

Name	Title	Jurisdiction
Scott Sobotka	Assistant Manager	LBBNRD
Kyle Hauschild	General Manager	LBNRD

Table 13: Round 1 Virtual Meeting Attendees

Name	Title	Jurisdiction
<i>Thursday, September 24 at 2:00PM</i>		
Brooke Seachord	Project Coordinator	JEO Consulting Group
Steve Oakman	City Superintendent	City of Deshler
Bonnie Welch	Assistant Clerk	Village of Hubbell
Anthony Kohel	Planner	JEO Consulting Group
Julie Buescher	City Clerk	City of Deshler
<i>Tuesday, September 29 at 10:00AM</i>		
Brooke Seachord	Project Coordinator	JEO Consulting Group
Becky Appleford	Project Manager	JEO Consulting Group
Kate Manes	Assistant Clerk	Village of Davenport
Arlene Vorce	Village Clerk/Treasurer	Village of Davenport
Randy Schlueter	Superintendent	Tri-County Schools
Scott Sobotka	Assistant General Manager	Lower Big Blue NRD
Rebecca Kleen	Village Clerk	Village of Ruskin
<i>Tuesday, October 6 at 2:00PM</i>		
Brooke Seachord	Project Coordinator	JEO Consulting Group
Becky Appleford	Project Manager	JEO Consulting Group
Kyle Hauschild	General Manager	LBNRD
Tyler Goeschel	Assistant Manager	LBNRD
Tara Ogren	Civil Engineer/Floodplain Administrator	City of Hastings
Shawn Scott	Superintendent	Adams Central Public Schools
Tricia Allen	City Clerk	City of Blue Hill
Susan Kohmetscher	City Clerk	City of Blue Hill
Todd Himmelberg	Assistant Fire Chief	Lawrence Fire Department
Luke Muir	Safety Committee	Lawrence Fire Department
<i>Wednesday, October 21 at 2:00PM</i>		
Brooke Seachord	Project Coordinator	JEO Consulting Group
Becky Appleford	Project Manager	JEO Consulting Group
Dawn Miller	County Highway Superintendent	Adams County
Sheryl Heil	Village Clerk	Village of Ayr
Lana Svoboda	Village Clerk	Village of Deweese
Pam Johnson	Village Clerk/Treasurer	Village of Glenvil
Tim Lewis	Emergency Manager	Clay County
Jennifer Jung	Village Clerk	Village of Shickley
John Zelenka	Utilities Superintendent	Village of Milligan
Vicky Thompson	Village Clerk	Village of Milligan
Chris Schiebur	Board Chairman	Village of Adams
Kendra Jantzen	Clerk/Treasurer	Village of Adams
Lisa Wiegand	Emergency Manager	Gage County

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Name	Title	Jurisdiction
Richard Douglas	Board Member	Village of Cortland
Judd Stewart	Assistant Fire Chief	Fairbury Rural Fire District
Robert Wellsandt	Maintenance/Utilities Superintendent	Village of Diller
Allen Brozovsky	City Council Member	Village of Wilber
Billy Buagh	Utility Supervisor	City of Friend
David Krause	Superintendent	Friend Public School District
Roger Chrans	Mayor	City of Wilber
Casie Olson	City Clerk	City of Red Cloud
Michael Clark	City Superintendent of Utilities	City of Red Cloud
Rick Pendleton	Maintenance Superintendent	Village of Bladen
Ron Sunday	Emergency Manager	Webster County
<i>Tuesday, November 10 at 6:00PM</i>		
Brooke Seachord	Project Coordinator	JEO Consulting Group
Kayla Vondracek	Planning Intern	JEO Consulting Group
Nanette Shakelford	Mayor	City of Clay Center
Scott Pauley	Board Member/Attorney	City of Fairfield
Jeff Hofaker	City Administrator	City of Sutton
Robert Boettcher	Board Member	Village of Ong
Dorothy Thiel	Village Clerk/Treasurer	Village of Trumbull
Joshua Warren	Principal	Shickley Schools
Josh Cumpston	Superintendent	Silver Lakes Public School
Heather Schultz	Village Clerk	Village of Iowa
Jennifer Griffith	Village Clerk	Village of Shickley
LoNeal Beck	Board Member	Village of Strang
Lynn Gibson	Village Clerk	Village of Strang
Lorrie Stierwalt	Executive Assistant	Beatrice Public Schools
Lisa Wiegand	Emergency Manager	Gage County
Bob Morgan	Campus Director	SCC - Beatrice
Scott nelson	Board Member	Village of Filley
Ross Trauernicht	Board Member	Village of Pickrell
Shawna Schwartz	Rescue Chief	Wymore Fire District
John McKee	Zoning/FP Administrator, Emergency Manager	Jefferson/Saline Counties
Kesha Eldridge	Board Chair	Village of Jansen
Brad Bailey	Building Inspector	City of Crete
Roger Miller	Board Member	Village of Dorchester
Jana Tietjen	City Clerk	City of Hebron
Colt Farrigner	Emergency Manager	Thayer County
Sarah Krehnke	Village Clerk Water Operator	Village of Bruning Village of Belvidere
Kevin Dickson	Board Member	Village of Carleton

Table 14: Round 1 One-on-One Meeting Attendees

Name	Title	Jurisdiction
<i>City of Beatrice – Thursday, November 12</i>		
Brooke Seachord	Project Coordinator	JEO Consulting Group
Becky Appleford	Project Manager	JEO Consulting Group
Kayla Vondracek	Planning Intern	JEO Consulting Group
Bob Morgan	Campus Director	SCC - Beatrice
Brian Daake	Fire Chief	Beatrice Fire District
Kyle Hauschild	General Manager	Little Blue Natural Resources District
Tobias Tempelmeyer	City Administrator	City of Beatrice
Tyler Goeschel	Assistant General Manager	Little Blue Natural Resources District
Lisa Wiegand	Emergency Manager	Gage County

Mitigation Plan Development

Round 2 Meetings: Mitigation Strategy, Maintenance, and Integration

The identification and prioritization of mitigation measures is an essential component in developing effective hazard mitigation plans. Round 2 meetings are designed to allow participating jurisdictions an opportunity to identify and describe new mitigation strategies to address prioritized hazards or identified gaps in planning, response, or resiliency from Round 1 meetings. Participating jurisdictions were also asked to review the information collected from Round 1 meetings related to their community through this planning process. The 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; future development areas; continued, removed, or completed mitigation actions; and overall growth trends.

Round 2 meetings are also used as an opportunity to discuss Plan Integration components. Each participating jurisdiction was asked to either describe or provide a copy of other planning mechanisms which support the goals and intent of the HMP for inclusion. These included Local Emergency Operations Plans, Comprehensive Plans, 1- & 6-Year Plans, Zoning Ordinances, Floodplain Ordinances, Building Codes, or other plans used by the jurisdiction. Newly added to Round 2 meetings also included a discussion of Plan Maintenance by the Local Planning Team and the importance of updating local profiles as priorities change, mitigation actions are completed, or after a disaster event.

A brief status update on project schedule, public review period, final local adoption, and the approval and grant opportunities available once the plan is approved by NEMA and FEMA was also provided to all participants. Due to ongoing concerns for COVID-19, all Round 2 meetings were held virtually. The following table shows the attendees for each jurisdiction who attended a virtual Round 2 meeting. Follow up one-on-one meetings were held for communities who did not have representatives present at public meetings through conference calls with JEO Staff.

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Table 15: Round 2 Meetings

Agenda Items	
Review of the HMP planning process; review of Round 1 collected and integrated information; identify and prioritize new mitigation actions; discussion of plan maintenance requirements; review and integration of other community planning mechanisms.	
VIRTUAL MEETING	DATE AND TIME
	Tuesday, February 23 at 6:30PM
	Thursday, February 25 at 2:00PM
	Tuesday, March 2 at 6:30PM
	Friday, March 5 at 12:00PM
	Tuesday, March 23 at 1:00PM

Table 16: Round 2 Meeting Attendees

Name	Title	Jurisdiction
Tuesday, February 23 at 6:30PM		
Jean Engle	Emergency Manager/FP Admin	Fillmore County
Suzanne Keenan	Village Clerk	Grafton
Don Schaldecker	Board Chairman	Grafton
Janet Riensche	City Clerk	City of Wymore; City of Blue Springs
David Norton	Village Clerk	Filley
Galen Engel	Highway Super/Floodplain Administrator	Gage County
Becky Borgan	Highway Department	Gage County
Lisa Wiegand	Emergency Manager	Gage County
Chris Zabokrtsky	Village Chairperson	Endicott
Jim Morgan	Public Health Risk Coordinator	South Heartland District Health Department
Roger Chrans	Mayor	City of Wilber
Moria Holly	Village Clerk	DeWitt
Gary Dick	Board Member	Tobias
Randy Badman	Board Member	DeWitt
Arlene	Village Clerk	Davenport
Jeremy VanWesten	Board Chairperson	Village of Alexandria
Joe Carbonneau	Chairman	Chester
Ray Wit	Utility Superintendent	Chester
Dianne Waldmeier	Village Clerk	Belvidere
Thursday, February 25 at 2:00PM		
Marty Kobza	Superintendent	Superior Public Schools
Paul Sheffield	Superintendent	Exeter-Milligan Schools
Dawn Miller	Highway Superintendent	Adams County
Dawna Whitcomb	Administration Assistant	Adams County
Judy Mignery	Highway Department	Adams County
Marty Stang	Environmental Director	City of Hastings
Ron Pughes	Emergency Manger	Adams County
Tara Ogren	Civil Engineer	City of Hastings
Eric Nejezchleb	Board Member	Village of Deweese
Jeff Hofaker	City Administrator	City of Sutton

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Name	Title	Jurisdiction
Tim Lewis	Emergency Manager	Clay County
Becky Erdkamp	Village Clerk	Village of Exeter
Jen Griffith	Village Clerk	Shickley
John Zelenka	Utilities Superintendent	Village of Milligan
Vicky Thompson	Village Clerk	Village of Milligan
Kyle Svec	City Administrator	City of Geneva
Brian Daake	Fire Chief	City of Beatrice
Lisa Wlegand	Emergency Manager	Gage County
Jennifer Jung	Village Clerk	Village of Diller
Laura Bedlan	Zoning Administrator	City of Fairbury
Andrew Brittenham	Utility Superintendent	City of Superior
Nick Elledge	Emergency Manager/FP Admin	Nuckolls County
Sam Clark	Village Clerk	Village of Hardy
Billy Baugh	Public Works	City of Friend
July Buescher	City Clerk	City of Deshler
Sarah Krehnke	Village Clerk	Bruning
Sarah Krehnke	Water Operator	Belvidere
Casie Olson	Clerk	City of Red Cloud
Mike Clark	Engineer	City of Red Cloud
Brad Bailey	Building Inspector	City of Crete
Tuesday, March 2 at 6:30PM		
Michelle Matthews	Clerk	Prosser
Randy Kort	Vice Chairman	Ayr
Cindy Kiefer	Clerk	Kenesaw
Dorothy Thiele	Village Clerk/Treasurer	Trumbull
Robert Boettcher	Board Member	Ong
Nanette Shackelford	Mayor	Clay Center
LoNeal Beck	Clerk	Strang
Taylor McHenry	Fire Chief	Barneston & Barneston FD
Ross Trauernicht	Board Member	Pickrell
Dennis VanLangham	Chairman	Claytonia
Kesha Eldridge	Board Chair	Jansen
Tamara Katz	City Administrator	Steele City
Sara Griffis	Board Member	Lawrence
Colt Farrington	Emergency Manager	Thayer County
Friday, March 5 at 12:00PM		
Stephen Grizzle	Superintendent	Fairbury Schools
Scott Sobotka	General Manager	LBBNRD
Scott Nelson	General Manager	LBNRD
Jeff Edmondson	Maintenance Supervisor	Kenesaw
Matt Whitten	Board Member	Glenvil
Pam Johnson	Village Clerk	Glenvil
Kendra Jantzen	Village Clerk	Adams
Tobias Tempelmeyer	City Administrator	City of Beatrice
Galen Engle	Highway Superintendent	Gage County
Kelly Harms	Village Clerk	Virginia
Donna Rut	Village Clerk	Daykin
Mary Renn	City Administrator	Fairbury

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Name	Title	Jurisdiction
Tana Hofstetter	Village Clerk	Village of Plymouth
Sandra Schendt	City Clerk	City of Nelson
Rebecca Kleen	Village Clerk	Ruskin
Donna Rut	Village Clerk	Swanton
Donna Rut	Village Clerk	Western
Roger Chrans	Mayor	Wilber
Jodi Rostvet	Administration Assistant	Adams Central
Kolin Haecker	Superintendent	Bruning-Davenport Schools
Julie Otero	Superintendent	South Central Unified
Randy Schlueter	Superintendent	Tri-County
Mark Meints	Campus Safety and Security	SCC Wymore Fire District
Josh Cumpston	Superintendent	Fillmore Schools
Bonnie Welch	Village Clerk	Hubbell
Edith Laue	Village Clerk	Hubbell
Tricia Allen	City Clerk	Blue Hill
Ron Sunday	Emergency Manager	Webster County
Tuesday, March 23 at 1:00PM		
John Uden	EM Coordinator	Juniata
Mary Baker	Resiliency Strategist	JEO Consulting Group
Miranda Ward	City Clerk	Fairfield
Lorrie Stierwalt	Administrative Assistant	Beatrice Public Schools
Rich Douglass	Board Member	Cortland
Mark Billesbach	Chairman	Odell
Renice Bales	Clerk	Reynolds
John McKee	Zoning/FP Administrator, Emergency Manager	Jefferson and Saline Counties
Scott Sobotka	Assistant Manager	LBBNRD
Scott Nelson	General Manager	LBNRD
Tyler Goeschel	Assistant Manager	LBNRD
Andrea Pracheil	Board Chair	Dorchester
Jana Tietjen	City Clerk	Hebron
Terri Rose	Village Clerk	Cowles
Chad Winslow	Water/Sewer Operator	Guide Rock

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 documents are identified in their respective *Section Seven: Community Profiles*. Additionally, sources and references are included throughout the document.

Table 17: Data, Plans, and Information used in HMP Development

Documents	
Benefit-Cost Analysis https://www.fema.gov/grants/guidance-tools/benefit-cost-analysis	Mitigation Ideas: A Resource for Reducing Risk to Natural Hazards (2013)

	https://www.fema.gov/media-library-data/20130726-1904-25045-0186/fema_mitigation_ideas_final508.pdf
Disaster Mitigation Act of 2000 https://www.congress.gov/bill/106th-congress/house-bill/707#:~:text=Requires%20the%20President%2C%20in%20determining,future%20natural%20disasters%3B%20(3)	Mitigation Planning and the Community Rating System Key Topics Bulletin https://www.fema.gov/media-library-data/1560365486495-6e5bdaa89de4bf2363596e615f4c7575/MitigationPlanningandtheCommunityRatingSystemKeyTopicsBulletin.pdf
Hazard Mitigation Assistance Guidance and Addendum (2015) https://www.fema.gov/media-library-data/1424983165449-38f5dfc69c0bd4ea8a161e8bb7b79553/HMA_Addendum_022715_508.pdf	National Flood Insurance Program Community Rating System https://www.fema.gov/media-library-data/1535126505943-439b296e7778b037d05f698f65c7891b/2018NFIP_CRS_Brochure_June_2018_508OK.pdf
Hazard Mitigation Assistance Unified Guidance (2013) https://www.fema.gov/media-library-data/15463cb34a2267a900bde4774c3f42e4/FINAL_Guidance_081213_508.pdf	National Flood Insurance Program Community Status Book (2020) https://www.fema.gov/flood-insurance/work-with-nfip/community-status-book
Local Mitigation Plan Review Guide (2011) https://www.fema.gov/sites/default/files/2020-06/fema-local-mitigation-plan-review-guide_09_30_2011.pdf	National Response Framework (2019) https://www.fema.gov/emergency-managers/national-preparedness/frameworks/response
Local Mitigation Planning Handbook (2013) https://www.fema.gov/sites/default/files/2020-06/fema-local-mitigation-planning-handbook_03-2013.pdf	Robert T. Stafford Disaster Relief and Emergency Assistance Act (2019) https://www.fema.gov/sites/default/files/2020-03/stafford-act_2019.pdf
PLANS AND STUDIES	
Flood Hazard Mitigation Plan State of Nebraska (2013) https://nema.nebraska.gov/sites/nema.nebraska.gov/files/doc/flood-hazmit-plan.pdf	Little Blue NRD and Lower Big Blue NRD Hazard Mitigation Plan (2016) https://jeo.com/blues-hmp
Flood Insurance Studies https://www.fema.gov/flood-maps/change-your-flood-zone/status/flood-insurance-study	Public Power in Nebraska (2018) https://nebraskalegislature.gov/pdf/reports/research/public_power_2018.pdf
Fourth National Climate Assessment https://nca2018.globalchange.gov/	State of Nebraska Hazard Mitigation Plan (2014) https://nema.nebraska.gov/sites/nema.nebraska.gov/files/doc/hazmitplan.pdf
National Climate Assessment (2014) https://nca2014.globalchange.gov/	State of Nebraska Hazard Mitigation Plan (2019) https://nema.nebraska.gov/sites/nema.nebraska.gov/files/doc/hazmitplan2019.pdf
Nebraska State Drought Plan (2000) https://carc.nebraska.gov/docs/NebraskaDrought.pdf	State of Nebraska Hazard Mitigation Plan (2021) https://nema.nebraska.gov/sites/nema.nebraska.gov/files/doc/hazmitplan2021.pdf
TECHNICAL AND DATA RESOURCES	
Arbor Day Foundation – Tree City Designation (2019) https://www.arborday.org/programs/treecityusa/directory.cfm	Nebraska Department of Natural Resources – Dam Inventory https://gis.ne.gov/portal/apps/webappviewer/index.html?id=2aab04a13817421992dc5398ad462e22
CDC Social Vulnerability Index https://www.atsdr.cdc.gov/placeandhealth/svi/index.html	Nebraska Department of Transportation http://dot.nebraska.gov/
CDC Underlying Cause of Death https://wonder.cdc.gov/ucd-icd10.html	Nebraska Emergency Management Agency http://www.nema.ne.gov
Census Bureau – My Tribal Area https://www.census.gov/tribal/	Nebraska Flooding: March 2019 (Storymap) https://storymaps.arcgis.com/stories/9ce70c78f5a44813a326d20035cab95a
Federal Emergency Management Agency https://www.fema.gov/	Nebraska Forest Service (NFS) http://www.nfs.unl.edu/

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FEMA Disaster Declarations https://www.fema.gov/openfema-data-page/disaster-declarations-summaries-v1	Nebraska Forest Service – Wildland Fire Protection Program http://nfs.unl.edu/fire
FEMA Flood Map Service Center https://msc.fema.gov/portal/advanceSearch	Nebraska Local Health Departments http://dhhs.ne.gov/Pages/Local-Health-Departments.aspx
FEMA Hazard Mitigation Plan Status https://fema.maps.arcgis.com/apps/webappviewer/index.html?id=ec2fb023df744cf480da89539338c386	Nebraska Power Review Board https://nprb.qworks.com/
High Plains Regional Climate Center http://climod.unl.edu/	Nebraska Rural Electric Association https://www.nrea.org/nrea-member-systems
Midwestern Regional Climate Center https://mrcc.illinois.edu/qismaps/cntyorn.htm#	Nebraska State Historical Society http://www.nebraskahistory.org/histpres/index.shtml
National Agricultural Statistics Service http://www.nass.usda.gov/	NOAA – Billion Dollar Weather and Climate Disasters https://www.ncdc.noaa.gov/billions/overview
National Centers for Environmental Information https://www.ncei.noaa.gov/	NWS – Seasonal Drought Outlook https://www.cpc.ncep.noaa.gov/products/expert_assessment/do_summary.php
National Consortium for the Study of Terrorism and Responses to Terrorism (START) http://www.start.umd.edu/gtd/	PHMSA Incident Statistics https://www.phmsa.dot.gov/hazmat-program-management-data-and-statistics/data-operations/incident-statistics
National Drought Mitigation Center – Drought Impact Reporter http://droughtreporter.unl.edu/map/	Small Business Administration – Disaster Loan Assistance https://disasterloan.sba.gov/ela/Declarations/Index
National Drought Mitigation Center – Drought Monitor http://droughtmonitor.unl.edu/	Stanford University - National Performance of Dams Program https://npdp.stanford.edu/
National Environmental Satellite, Data, and Information Service http://www.nesdis.noaa.gov/	Storm Prediction Center Statistics http://www.spc.noaa.gov
National Fire Protection Association https://www.nfpa.org/	The Census of Agriculture (2012) https://www.nass.usda.gov/Publications/AqCensus/2012/
National Flood Insurance Program https://www.fema.gov/national-flood-insuranceprogram	The Census of Agriculture (2017) https://www.nass.usda.gov/Publications/AqCensus/2017/index.php
National Flood Insurance Program https://dnr.nebraska.gov/floodplain/floodinsurance	Union of Concerned Scientists – Killer Heat Interactive Tool https://www.ucsusa.org/resources/killer-heat-interactive-tool?location=lancaster-county--ne
National Historic Registry https://www.nps.gov/subjects/nationalregister/index.htm	United States Army Corps of Engineers – National Levee Database https://levees.sec.usace.army.mil/#/
National Interagency Fire Center https://www.nifc.gov/fireInfo/fireInfo_statistics.html	United States Census Bureau https://data.census.gov/cedsci/
National Oceanic Atmospheric Administration (NOAA) http://www.noaa.gov/	United States Department of Agriculture http://www.usda.gov
National Weather Service http://www.weather.gov/	United States Department of Agriculture – Risk Management Agency http://www.rma.usda.gov
National Weather Service StormReady and TsunamiReady https://www.weather.gov/stormready/communities	United States Department of Agriculture – Web Soil Survey https://websoilsurvey.nrcs.usda.gov/app/WebSoil_Survey.aspx

Natural Resources Conservation Service www.ne.nrcs.usda.gov	United States Department of Transportation – Pipeline and Hazardous Materials Safety Administration https://www.phmsa.dot.gov/
NE DHHS Rosters of Facilities and Services http://dhhs.ne.gov/licensure/Pages/Rosters-of-Facilities-and-Services.aspx	United States Geological Survey http://www.usgs.gov/
Nebraska Association of Resources Districts http://www.nrdnet.org	United States National Response Center http://www.nrc.uscg.mil/
Nebraska Climate Assessment Response Committee http://carc.agr.ne.gov	UNL – College of Agricultural Sciences and Natural Resources – Schools of Natural Resources http://casnr.unl.edu
Nebraska Department of Agriculture – Livestock Disease https://nda.nebraska.gov/animal/reporting/index.html	UNL – County Extension Offices https://extension.unl.edu/statewide/hal/officeslist/
Nebraska Department of Education http://nep.education.ne.gov/	UNL IANR – Nebraska Landslides http://snr.unl.edu/data/geologysoils/landslides/landslidedatabase.aspx
Nebraska Department of Education http://educdirsrc.education.ne.gov/	USACE National Inventory of Dams https://nid.sec.usace.army.mil/ords/f?p=105:1
Nebraska Department of Environment and Energy http://www.deg.state.ne.us/	USDA – Disaster Assistance Programs https://www.fsa.usda.gov/programs-and-services/disaster-assistance-program/index
Nebraska Department of Health and Human Services http://dhhs.ne.gov/Pages/default.aspx	USGS – Landslide Inventory https://usgs.maps.arcgis.com/apps/webappviewer/index.html?id=ae120962f459434b8c904b456c82669d
Nebraska Department of Natural Resources http://www.dnr.ne.gov	Wildfire Risk to Communities https://wildfirerisk.org/
Nebraska Department of Natural Resource – Geographic Information Systems (GIS) https://dnr.nebraska.gov/data	

Plan Implementation and Progress Monitoring

Public Review Period

Once the draft 2021 HMP was completed, a public review period was opened to allow for participants and community members at large to review the plan and provide comments and changes. The public review period was open from June 1, 2021 to June 30, 2021. All participating jurisdictions and relevant stakeholders were notified via letter of the public review period. This draft HMP was also made publicly available on the JEO project website to download. Received comments and suggested changes were incorporated into the plan. Examples of such revisions are listed in the table below.

Table 18: Public Review Revisions

Plan Section	Name, Title, and/or Agency	Comment/Revision
Section 4: Grass/Wildfire	Sandy Benson, NFS	Reviewed wildfire section, provided data clarification
Section 7: Beatrice Profile	Tobias Tempelmeyer, City of Beatrice	General grammatical revisions
Section 7: Nelson Profile	Sandra Schendt, City of Nelson	General grammatical revisions

Plan Section	Name, Title, and/or Agency	Comment/Revision
Section 4: Dam Failure	Tim Gokie, NeDNR Dam Safety Division	Reviewed dam section, provided additional local concern information
Section 7: Lawrence Profile	Sara Griffis, Village of Lawrence	Clarified local planning team members
Section 7: Trumbull Profile	Dorothy Thiel, Village of Lawrence	Clarified local planning team members
Section 7: Superior Profile	Andrew Brittenham, City of Superior	Updated jurisdictional boundary
Section 7: Glenvil Profile	Matt Whitten, Village of Glenvil	Generator status revision, capabilities revision
Section 4: Flooding	Adele Phillips, NeDNR	Reviewed flooding section, provided additional input on RiskMap products
Section 7: Reynolds Profile	Renice Bales, Village of Reynolds	Local planning team member updates, include additional capabilities and jurisdictional concerns

Plan Adoption

Based on FEMA requirements, this multi-jurisdictional hazard mitigation plan must be formally adopted by each participant's governing body through the approval of an *Adoption Resolution*. The approval creates 'individual ownership' of the plan by each participating entity. Formal adoption provides evidence of a participant's full commitment to implement the plan's goals, objectives, and action items. A copy of the resolution draft submitted to participating jurisdiction is located in Appendix A. Copies of adoption resolutions may be requested from the State Hazard Mitigation Officer.

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

HMPs need to be living documents. Once adopted, participants are responsible for implementing and updating the plan as described in their *Community Profiles*. Those who participated directly in the planning process would be logical champions for updating the plan. In addition, the plan will need to be reviewed and updated as projects are completed and particularly after major events occur. Participating jurisdictions outlined individual maintenance goals in respective profiles and were notified such amendments and updates can be shared via the plan sponsor or JEO for inclusion in the HMP. Additionally, HMPs should be integrated into other planning mechanism as they are reviewed and updated. This includes county and local comprehensive or capital improvement plans as applicable.

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SECTION THREE

PLANNING AREA PROFILE

Introduction

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

Planning Area Geographic Summary

The planning area includes both the Little Blue NRD and Lower Big Blue NRD boundaries and is comprised of nine-adjacent counties in southcentral Nebraska. These counties include Adams, Clay, Fillmore, Gage, Jefferson, Nuckolls, Saline, Thayer, and Webster. Since all nine counties are full participants in this plan, the planning area will be defined by the full nine-county area (5,578 square miles).

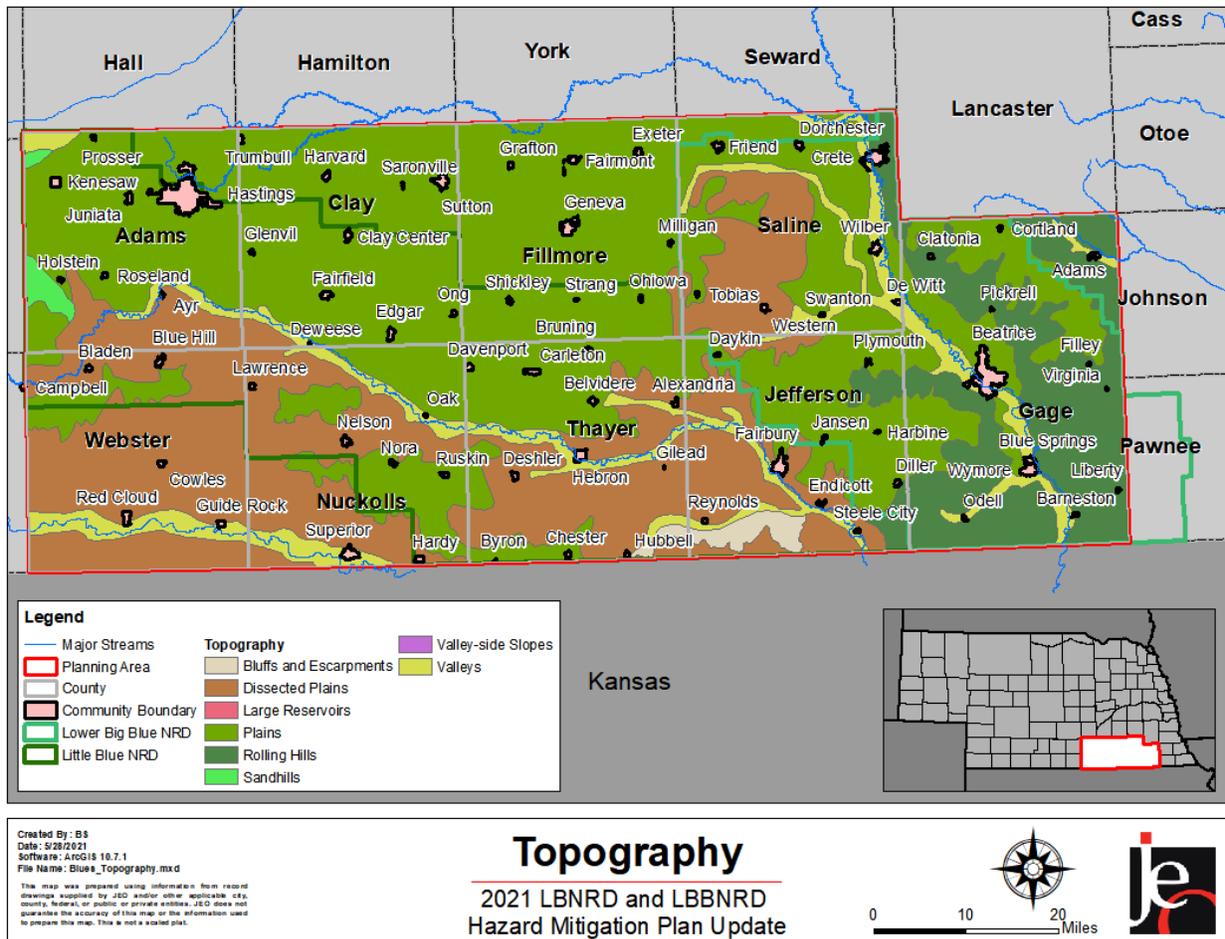
The planning area lies within the eastern portion of Nebraska's 'loess' plain, a region of soil deposited by the wind during a period between 25,000 and 13,000 years ago, forming a plain that slopes gently downward to the southeast. The rivers and their tributaries have incised channels into the loess surface in places, but in much of the planning area the original plain remains. These loess-plain regions are characterized by extensive upland flats with shallow depressions.

The planning area is composed of three primary topographical regions: Plains, Dissected Plains, Rolling Hills, and a small portion of Bluffs and Escarpments (in southern Jefferson and Thayer Counties). Plains are flat-lying land that lies above the valley with materials of sandstone or stream-deposited silt, clay, sand and gravel overlain by wind-deposited silt. Dissected Plains are hilly land with moderate to steep slopes, sharp ridge crests and remnants of the old, nearly level plain. Rolling Hills are hilly land with moderate to steep slopes and rounded ridge crests. And Bluffs and Escarpments are rugged land with very steep and irregular slopes. Bedrock materials, such as sandstone, shale and limestone are often exposed in these areas.¹²

The planning area rests within the watersheds of the Little Blue, Big Blue, and Republican Rivers and is home to numerous rivers, tributaries, creeks, or other bodies of water. Much of the planning area is comprised of small to moderate sized communities, agricultural land, and rivers or water bodies.

¹² Center for Applied Rural Innovation. August 2001. "Topographic Regions Map of Nebraska." <https://digitalcommons.unl.edu/cgi/viewcontent.cgi?article=1062&context=caripubs>.

Figure 3: Planning Area Topography



Demographics

Demographic and asset information can be used to determine differing levels of vulnerability via population and housing, structural inventories and valuations, critical facilities, and vulnerable areas analysis. In general, the planning area is a mixture of rural and incorporated areas. While the two NRDs and U.S. Census Bureau do not collect specific demographic information for the planning area, the Little Blue NRD serves approximately 64,000 people and the Lower Big Blue NRD serves an estimated population of 38,000.

This population includes a range of demographic cohorts and persons at risk to natural and man-made disasters. The following table depicts the estimated population per county in 2000, 2010, and 2018 population. At the time of this plan development, the U.S. 2020 census data was not available and is thus not included.

Table 19: Estimated Population for the Planning Area

County	2000 Population	2010 Population	2018 Population (estimated)
Adams	31,151	31,364	31,583
Clay	7,039	6,542	6,232
Fillmore	6,634	5,890	5,574
Gage	22,993	22,311	21,595
Jefferson	8,333	7,547	7,188
Nuckolls	5,057	4,500	4,275
Saline	13,843	14,200	14,288
Thayer	6,055	5,228	5,098
Webster	4,061	3,812	3,571
TOTAL	105,166	101,394	99,404

Source: U.S. Census Bureau¹³

Table 20: Percentage of Population for the Planning Area by Cohort (2018)

Age	Planning Area	State of Nebraska
<5	6.1%	6.9%
5 – 19	20.0%	20.7%
20 – 64	54.5%	57.6%
>64	19.4%	14.8%
Median	43.1	36.3

Source: U.S. Census Bureau

The population for the planning area has declined since the 2010 census (105,166 persons to 99,404 persons). The region accounts for approximately 5% of the total population for the state in 2018. Eight of the nine counties are experiencing population decline. As these areas experience population decline, they become more vulnerable to the impacts from natural and manmade hazards. Adams County and Saline County are the only two counties which are experiencing growth.

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.”¹⁴

Dependent children under 19 years old are one of the most vulnerable populations to disasters.¹⁵ The majority of people in this age group do not have access to independent financial resources,

¹³ U.S. Census Bureau. 2000/2010/2018 Estimated Total Population. <https://data.census.gov/cedsci/>.

¹⁴ United States Department of Homeland Security. June 2016. “National Response Framework Forth Edition.” https://www.fema.gov/media-librarydata/1572366339630-0e9278a0ede9ee129025182b4d0f818e/National_Response_Framework_4th_20191028.pdf.

¹⁵ Flanagan, Gregory, Hallisey, Heitgerd, & Lewis. 2011. “A Social Vulnerability Index for Disaster Management.” *Journal of Homeland Security and Emergency Management*, 8(11): Article 3.

SECTION THREE: PLANNING AREA PROFILE

transportation, or cellular telephones. They also lack practical knowledge necessary to respond appropriately during a disaster. As a result, this demographic group experiences increased vulnerability to the following list of hazards: tornadoes (especially daytime events), severe thunderstorms, severe winter storms, extreme heat, water shortage created by drought, and chemical releases. Lack of awareness can at times be a concern for people in this age range as well as an inability to recognize and respond to environmental stimuli, which could lead to increased vulnerability to flooding (especially flash flooding), severe thunderstorms, tornadoes, and severe winter storms.

Despite this vulnerability, children are generally overlooked in disaster planning because the presence of a care-taker is assumed. With over a quarter of the planning area's total population younger than 19, children are a key vulnerable group to address in the planning process. A significant portion of this subset are additionally children under the age of five, further exacerbating their vulnerability.

Schools house a high number of children 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 public school districts located within the nine-county planning area, and Figure 4 is a map of the school district boundaries. This list is comprehensive and does not represent only the school districts participating in this plan.

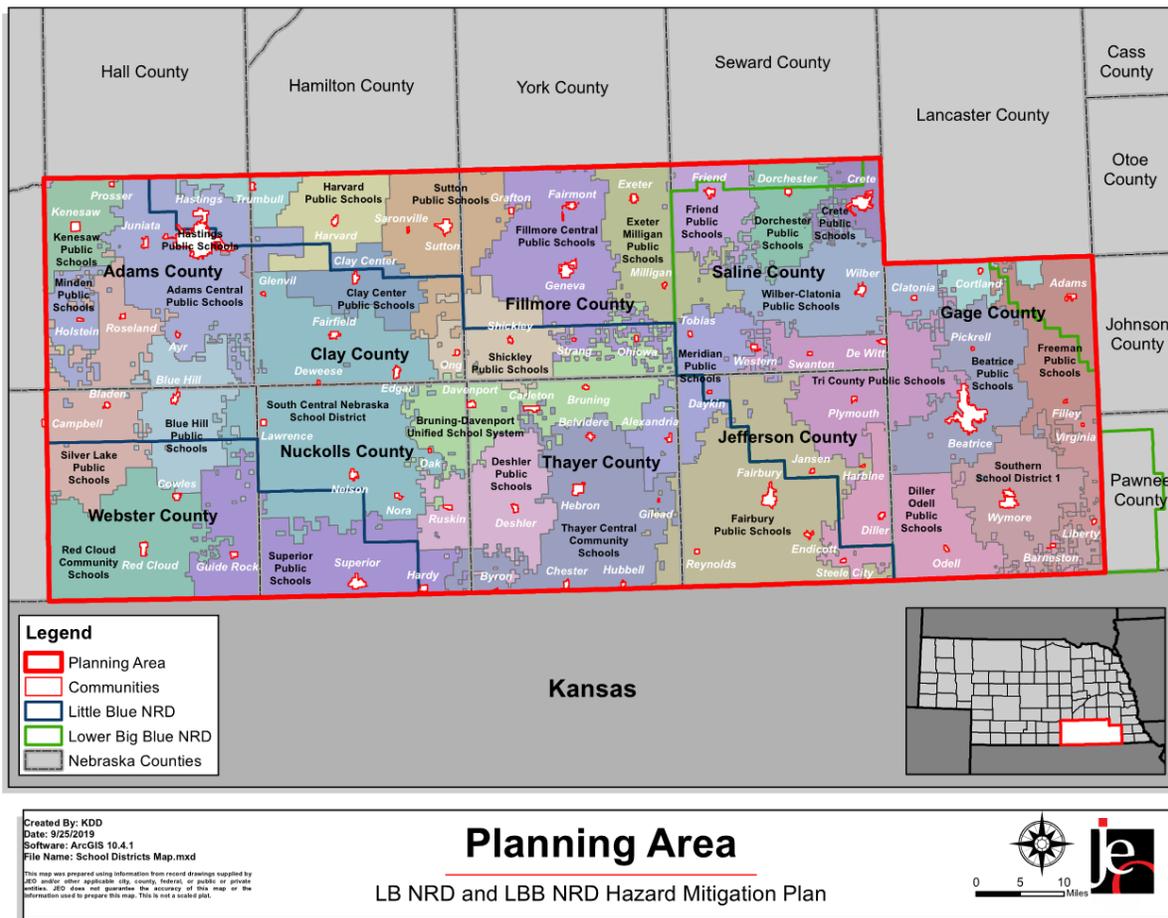
Table 21: School Inventory

School District	Total Enrollment (2018-2019)
Adams Central Public Schools	1,005
Beatrice Public Schools	2,151
Blue Hill Public Schools	339
Bruning-Davenport Public Schools	190
Deshler Public Schools	252
Exeter-Milligan Public Schools	187
Fairbury Public Schools	899
Fillmore Central Public Schools	587
Friend Public Schools	251
Harvard Public Schools	293
Hastings Public Schools	3,610
Kenesaw Public Schools	276
Meridian Public Schools	243
Red Cloud Public Schools	251
Shickley Public Schools	163
South Central United School District	686
Superior Public Schools	430
Sutton Public Schools	410
Thayer Central Public Schools	475
Tri-County Public Schools	410

Source: Nebraska Department of Education¹⁶

¹⁶ Nebraska Department of Education. 2020. "Nebraska Education Profile: District and School Data." Accessed August 2020. <http://nep.education.ne.gov/>

Figure 4: Regional School Districts



Like minors, seniors (age 65 and greater) are often more significantly impacted by temperature extremes. During prolonged heat waves, seniors may lack resources to effectively address hazard conditions 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 55.¹⁷ The study found that on average there are 11,500 injuries and 100 deaths annually related to snow removal. Males over the age of 55 are 4.25 times more likely to experience cardiac symptoms during snow removal. On the other hand, women can have a more difficult time during post-disaster recovery than men, often due to sector-specific employment, lower wages, and family care responsibilities.

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 following table identifies the number and capacity of care facilities throughout the planning area.

¹⁷ Center for Injury Research and Policy. January 2011. "Snow Shoveling Safety." Accessed July 2017. <http://www.nationwidechildrens.org/cirp-snow-shoveling>.

Table 22: Care Facility Inventory

County	Hospitals	Hospital Beds	Health Clinics	Adult Care Homes	Adult Care Beds	Assisted Living Homes	Assisted Living Beds
Adams	1	170	4	2	251	7	339
Clay	0	0	0	2	68	2	40
Fillmore	1	30	0	2	108	2	50
Gage	1	25	1	3	219	7	280
Jefferson	1	17	0	2	140	1	65
Nuckolls	1	25	0	1	69	2	68
Saline	2	45	0	2	106	2	186
Thayer	1	17	0	2	113	2	75
Webster	1	13	0	2	105	2	59
Total	9	342	5	18	1,179	27	1,162

Source: Nebraska Department of Health and Human Services^{18, 19, 20, 21}

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. The following table provide statistics per county regarding households with English as a second language (ESL) and population reported as in poverty within the past 12 months. Saline County has a large ESL population at 23% with the majority speaking Spanish as their primary language.

Table 23: Percentage of ESL and Poverty At-risk Populations

County	Percent that speak English as a Second Language	Families Below Poverty Level
Adams	8.5%	13.0%
Clay	8.0%	11.4%
Fillmore	3.4%	10.0%
Gage	2.8%	9.8%
Jefferson	2.8%	12.0%
Nuckolls	4.1%	12.2%
Saline	23.2%	13.5%
Thayer	2.2%	8.4%
Webster	1.9%	11.0%

Source: U.S. Census Bureau^{22, 23}

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.

¹⁸ Department of Health and Human Services. February 2021. "Hospitals." <http://dhhs.ne.gov/publichealth/Documents/Hospital%20Roster.pdf>.

¹⁹ Department of Health and Human Services. February 2021. "Health Clinics." http://dhhs.ne.gov/licensure/Documents/HC_ASC_ESRD%20Lic%20Roster.pdf.

²⁰ Department of Health and Human Services. February 2021. "Assisted Living Facilities." <http://dhhs.ne.gov/publichealth/Documents/ALF%20Roster.pdf>.

²¹ Department of Health and Human Services. February 2021. "Long Term Care Facilities." <http://dhhs.ne.gov/publichealth/Documents/LTCRoster.pdf>.

²² U.S. Census Bureau. 2019. "Language Spoken at Home: 2017 American Community Survey (ACS) 5-year estimates." <https://factfinder.census.gov/faces/nav/jsf/pages/searchresults.xhtml?refresh=t#>.

²³ U.S. Census Bureau. 2019. "Selected Economic Characteristics: 2017 ACS 5-year estimate." <https://factfinder.census.gov/faces/nav/jsf/pages/searchresults.xhtml?refresh=t#>.

Residents who speak English as a second language may struggle with a range of issues before, during, and after hazard events. General vulnerabilities revolve around what could be an inability to effectively communicate with others or an inability to comprehend materials aimed at notification and/or education. When presented with a hazardous situation it is important that all community members be able to receive, decipher, and act on relevant information. An inability to understand warnings and notifications may prevent non-native English speakers from reacting in a timely manner. Further, educational materials related to regional hazards are most often developed in the dominant language for the area, for the planning area that would be English. Residents who struggle with English in the written form may not have sufficient information related to local concerns to effectively mitigate potential impacts. Residents with limited English proficiency would be at an increased vulnerability to all hazards within the planning area.

Similar to residents below the poverty line, racial minorities tend to have access to fewer financial and systemic resources that would enable them to implement hazard mitigation projects and to respond and recover from hazard events, including residence in standard housing and possession of financial stability. The planning area is primarily White alone, with little change in diversity since 2010. Small changes in racial inequity will likely not significantly affect the region's overall vulnerability to hazards.

Table 24: Racial Composition in the Planning Area

Race	2010		2018		% Change
	Number	% of total	Number	% of total	
White alone	94,484	93%	93,850	94%	+1%
Black	563	1%	614	1%	-
American Indian & Alaskan Native	406	0%	476	0%	-
Asian	825	1%	1,089	1%	-
Native Hawaiian & Other Pacific Islander	45	0%	59	0%	-
Other Races	3,726	4%	1,592	2%	-2%
Two Or More Races	1,345	1%	1,724	2%	+1%
Total Population	101,394	-	99,404	-	-

Source: U.S. Census Bureau^{24, 25}

Built Environment and Structural Inventory

Data related to the built environment is an important component of a hazard mitigation plan. It is essential that during the planning process communities and participating jurisdictions display an understanding of their built environment and work to identify needs that may exist within their planning area. The US Census provides information related to housing units and potential areas of vulnerability. The selected characteristics examined below include: lacking complete plumbing facilities; lacking complete kitchen facilities; no telephone service available; housing units that are mobile homes; and housing units with no vehicles.

24 U.S. Census Bureau. 2019. "Race: 2018 ACS 5-year estimates." <https://factfinder.census.gov/faces/nav/jsf/pages/searchresults.xhtml?refresh=t#>.
 25 U.S. Census Bureau. 2019. "Race: 2010 ACS 5-year estimate." <https://factfinder.census.gov/faces/nav/jsf/pages/searchresults.xhtml?refresh=t#>.

Table 25: Selected Housing Characteristics

	Adams	Clay	Fillmore	Gage	Jefferson	Total
Occupied housing units	12,710 (91.6%)	2,574 (85.1%)	2,510 (85.5%)	9,160 (87.8%)	32,883 (84.1%)	70,626
Lacking complete plumbing facilities	0.1%	1.0%	0.0%	0.5%	0.3%	139 (0.2%)
Lacking complete kitchen facilities	1.2%	0.5%	0.4%	0.9%	1.1%	373 (0.53%)
No telephone service available	3.4%	1.9%	0.9%	3.0%	1.7%	1,021 (1.45%)
Housing unit with no vehicles available	4.5%	4.4%	0.0%	6.4%	4.0%	1,750 (2.43%)
Mobile homes	3.9%	3.3%	1.1%	1.7%	2.4%	1,419 (2.01%)

*Total refers to sum of all nine counties in the planning area

	Nuckolls	Saline	Thayer	Webster	Total
Occupied housing units	1,914 (77.9%)	5,073 (87.1%)	2,283 (82.7%)	1,519 (79.4%)	70,626
Lacking complete plumbing facilities	0.0%	0.0%	1.5%	0.4%	139 (0.2%)
Lacking complete kitchen facilities	0.0%	0.6%	0.9%	2.3%	373 (0.53%)
No telephone service available	1.7%	1.1%	3.3%	2.6%	1,021 (1.45%)
Housing unit with no vehicles available	0.0%	2.9%	0.0%	2.2%	1,750 (2.43%)
Mobile homes	2.4%	5.4%	1.8%	2.5%	1,419 (2.01%)

Source: U.S. Census Bureau²⁶

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

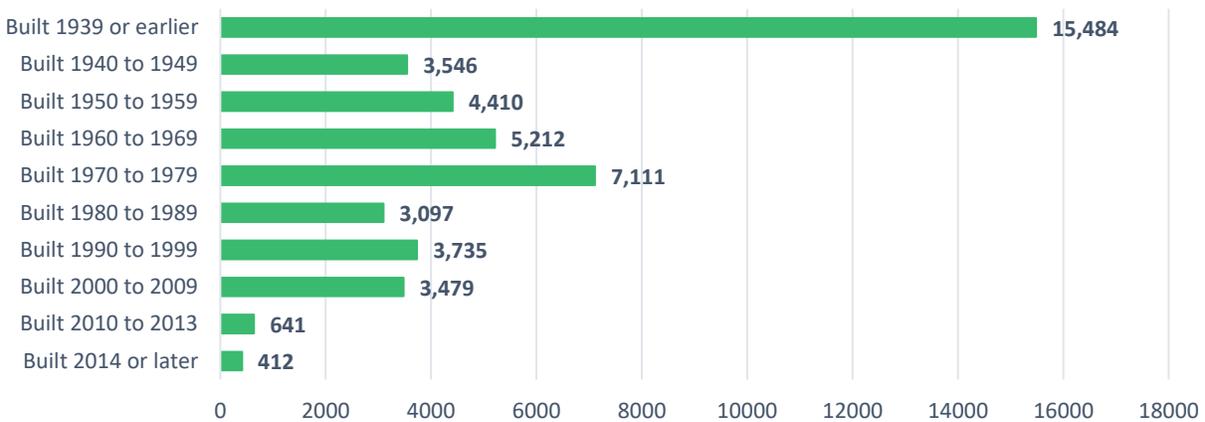
Approximately three and a half percent of housing units in the planning area are mobile homes. Saline, Adams, and Clay counties have the largest shares of mobile homes. Mobile homes have a higher risk of sustaining damages during high wind events, tornadoes, severe thunderstorms, and severe winter storms. 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.

26 U.S. Census Bureau. 2019. "Selected Housing Characteristics: 2017 ACS 5-year estimates." <https://factfinder.census.gov/faces/nav/jsf/pages/searchresults.xhtml?refresh=#>

Nuckolls County has the highest percentage of unoccupied housing units. Unoccupied homes may not be maintained as well as occupied housing, thus adding to their vulnerability. However, very few households in the planning area report no available vehicles. Households without vehicles may have difficulty evacuating during a hazardous event and a reduced ability to access resources in time of need.

The vast majority of homes in the planning area were built prior to 1939 (Figure 5). Housing age can serve as an indicator of risk, as structures built prior to state building codes being developed may be more vulnerable. According to the Department of Housing and Urban Development (HUD), older homes are at greater risk of poor repair and dilapidation resulting in blighted or substandard properties. Residents living in these homes maybe at higher risk to the impacts of high winds, tornadoes, severe winter storms, and thunderstorms. Across the state, the first building codes were adopted in 1987, but prior to this time, codes and building standards were established (or not) by each county and community. The State of Nebraska later adopted the International Building Code (IBC) 2000 codes (adopted in 2003), the IBC 2009 codes (adopted in 2010), and the IBC 2018 codes as of 2020.

Figure 5: Housing Age in Planning Area



Source: U.S. Census Bureau

Social Vulnerability Index

All communities have some vulnerability to natural and man-made hazard events. Various social conditions such as poverty rates, vehicle access, language, or housing stock contribute to a community's overall social vulnerability. The Center for Disease Control (CDC) has developed a Social Vulnerability Index to help public health officials and emergency responders identify communities at greater risk before, during, and after major hazardous events. The index evaluates 15 social factors and breaks down vulnerability into four domains: socioeconomic status; household composition and disability; minority status and language; housing and transportation. Several of these factors have been discussed in more depth earlier in this section. The following table lists the overall Social Vulnerability Index score for counties in the planning area.

Table 26: Social Vulnerability Index Score by County

County	Overall Score	Vulnerability Level
Adams	0.3592	Low to Moderate
Clay	0.1646	Low

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County	Overall Score	Vulnerability Level
Fillmore	0.0618	Low
Gage	0.1105	Low
Jefferson	0.2185	Low
Nuckolls	0.1736	Low
Saline	0.5978	Moderate to High
Thayer	0.058	Low
Webster	0.1092	Low

Source: CDC Social Vulnerability Index, 2018²⁷

State and Federally Owned Properties

The following table provides an inventory of state and federally-owned properties within the planning area by county. Note that this list does not include federally or state-owned highway systems or specific buildings within each community.

Table 27: State and Federally Owned Facilities

Facility	Nearest Community
Adams County	
Kenesaw Waterfowl Production Areas	Kenesaw
Weseman Waterfowl Production Areas	Holstein/Roseland
Ayr Lake Wildlife Management Area	Hastings
Clay County	
Hultine Waterfowl Production Areas	Saronville
Harvard Marsh Waterfowl Production Areas	
Ducks Unlimited Revolving Property (Conservation Partner Lands)	Sutton
Lange Waterfowl Production Areas	Sutton
Theesen Waterfowl Production Areas	Glenvil
Ducks Unlimited Verona Complex – Swanson S (#6)	Clay Center
Ducks Unlimited Verona Complex – Swanson N (#7)	Clay Center
Verona Waterfowl Production Areas	Clay Center
Ducks Unlimited Verona Complex – Dietz (#4)	Clay Center
Ducks Unlimited Verona Complex – Kramer (#5)	Clay Center
Ducks Unlimited Verona Complex – Wolf N (#1)	Clay Center
Ducks Unlimited Verona Complex – Wolf S (#2)	Clay Center
Ducks Unlimited Verona Complex – Heinze (#3)	Clay Center
White Front Wildlife Management Area	Clay Center
Glenvil Basin Waterfowl Production Areas	Glenvil
Kissinger Basin Wildlife Management Area	Fairfield
Bulrush Wildlife Management Area	Deweese
Bluewing Wildlife Management Area	Edgar
Remmenga Waterfowl Production Areas	Clay Center
Massie Waterfowl Production Areas	Clay Center
Harms Waterfowl Production Areas	Clay Center
Ducks Unlimited Revolving Property – Godtel (Conservation Partner Lands)	Clay Center
Moger Waterfowl Production Areas	Clay Center
Meadowlark Waterfowl Production Areas	Clay Center

²⁷ Center for Disease Control Social Vulnerability Index. 2018. "CDC's Social Vulnerability Index (SVI): SVI Interactive Map" <https://svi.cdc.gov/map.html>

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Facility	Nearest Community
Schuck Waterfowl Production Areas	Clay Center
Smith Waterfowl Production Areas	Fairfield
Ducks Unlimited Revolving Property – Morgan II (Conservation Partner Lands)	Edgar
Greenhead Wildlife Management Area	Edgar
Eckhardt Waterfowl Production Areas	Ong
Hansen Waterfowl Production Areas	Ong
Green Wing Wildlife Management Area	Ong
Fillmore County	
County Line Marsh Waterfowl Production Areas	McCool Junction
Real Waterfowl Production Area	Fairmont
Ducks Unlimited Revolving Property – Real (Conservation Partner Lands)	Fairmont
Wilkins Waterfowl Production Areas	Grafton
Brauning Waterfowl Production Areas	Grafton
Morphy Waterfowl Production Areas	Grafton
Rauscher Waterfowl Production Areas	Grafton
Griess Waterfowl Production Areas	Grafton
Rolland Waterfowl Production Areas	Sutton
Bluebill Wildlife Management Area	Grafton
Sandpiper Wildlife Management Area	Geneva
Marsh Hawk Wildlife Management Area	Grafton
Ducks Unlimited Revolving Property – Heinrich (Conservation Partner Lands)	Shickley
Krause Waterfowl Production Areas	Shickley
Redhead Wildlife Management Area	Shickley
Mallard Haven Waterfowl Production Areas	Shickley
Miller's Pond Waterfowl Production Areas	Shickley
Ducks Unlimited Revolving Property – Paul Ag (Conservation Partner Lands)	Shickley
Sora Wildlife Management Area	Shickley
Ducks Unlimited Revolving Property – Ohioa (Conservation Partner Lands)	Ohioa
Gage County	
Rockford Lake State Recreation Area	Virginia
Arrowhead Wildlife Management Area	Diller
Donald Whitney Memorial Wildlife Management Area	Odell
Diamond Lake Wildlife Management Area	Odell
Rock Glen Wildlife Management Area	Endicott
Rock Creek Station State Historical Park	Endicott
Rock Creek Station State Recreation Area	Endicott
Flathead Wildlife Management Area	Fairbury
Rose Creek Wildlife Management Area	Renolds/Fairbury
Alexandria Wildlife Management Area	Alexandria
Nuckolls County	
Smartweed Marsh Wildlife Management Area	Deweese
Smartweed Marsh West Wildlife Management Area	Deweese
Saline County	

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Facility	Nearest Community
Divoky Acres Wildlife Management Area	Central Saline County
Swan Creek Wildlife Management Area	Central Saline County
Thayer County	
Prairie Marsh Wildlife Management Area	Carleton
Father Hupp Wildlife Management Area	Carleton
Dry Sandy Wildlife Management Area	Bruning
Meridian Wildlife Management Area	Alexandria
Little Blue East Wildlife Management Area	Hebron
Little Blue Wildlife Management Area	Hebron
Webster County	
Elm Creek Wildlife Management Area	Cowles
Guide Rock Diversion Dam Wildlife Management Area	Guide Rock
Guide Rock Diversion Dam Operations	Guide Rock
Indian Creek Wildlife Management Area	Red Cloud
Narrows Wildlife Management Area	Inavale

Source: Nebraska Game and Parks²⁸

Historical Sites

According to the National Register of Historic Places for Nebraska by the National Park Service (NPS), there are 148 historic sites located in the planning area. Structures identified as cultural or historic resources represent assets that are unique to the planning area and are, in many situations, irreplaceable and have local significance.

Table 28: Historical Sites

Site Name	Date Listed	Nearest Community	County	In Floodplain?
Antioch School	9/28/1988	Pauline	Adams	N
Auditorium, The	9/28/1988	Geneva	Fillmore	N
Auld Public Library	12/10/1993	Red Cloud	Webster	N
Barneston Site	1/21/1974	Barneston	Gage	N
Beatrice Chautauqua Pavilion and Gatehouse	4/9/1979	Beatrice	Gage	Y
Beatrice City Library	7/12/1976	Beatrice	Gage	N
Beatrice Municipal Auditorium	11/16/2005	Beatrice	Gage	N
Belle Prairie Township Hall & Strang Town Hall--Jail	11/29/1991	Strang	Fillmore	N
Bentley, Matthew R., House	8/11/1982	Red Cloud	Webster	N
Bickle, Jesse C., House	11/23/1977	Crete	Saline	N
Big Blue River Bridge	6/29/1992	Grafton	Fillmore	N
Big Indian Creek Bridge	6/29/1992	Wymore	Gage	N
Bloody Run Bridge	6/29/1992	Virginia	Gage	N
Blue Springs Site	8/14/1973	Blue Springs	Gage	N
Brach, William, House	2/1/1979	Hastings	Adams	N
Bridge	6/29/1992	Wymore	Gage	N
Burk, J. M., House	2/23/2001	Geneva	Fillmore	N
Burlington Depot	3/5/1981	Red Cloud	Webster	Y
Burlington Northern Depot	5/2/1975	Beatrice	Gage	Y
Burlington Station	3/29/1978	Hastings	Adams	N

²⁸ Nebraska Game and Parks. 2020. "Public Access ATLAS." [Web Map]. Accessed September 2020. <http://outdoornebraska.gov/publicaccessatlas/>

SECTION THREE: PLANNING AREA PROFILE

Site Name	Date Listed	Nearest Community	County	In Floodplain?
Cather House	4/16/1969	Red Cloud	Webster	N
Cather, George, Farmstead	8/11/1982	Bladen	Webster	N
Cather, William, Homestead Site	8/11/1982	Red Cloud	Webster	N
Central Hastings Historic District	8/21/2003	Hastings	Adams	N
Cesko-narodni sin--Milligan Auditorium	2/29/1996	Milligan	Fillmore	N
Chalk Cliff and Republican River	8/11/1982	Red Cloud	Webster	N
Chautauqua Pavilion	10/19/1978	Hastings	Adams	N
Christ Church Episcopal	11/29/1999	Beatrice	Gage	N
City Pharmacy	2/11/1982	Red Cloud	Webster	N
Clark, Isaac Newton, House	12/15/1983	Sutton	Clay	N
Clarke Hotel	12/7/1987	Hastings	Adams	N
Clay County Courthouse	1/10/1990	Clay Center	Clay	N
College Hill Historic District	2/10/1983	Crete	Saline	N
Colman House	6/25/1982	Diller	Jefferson	N
Crossroads Grave Site	8/11/1982	Red Cloud	Webster	N
Deering Bridge	6/29/1992	Sutton	Clay	N
Dempster--Sloan House	3/15/2005	Geneva	Fillmore	N
DeWitt Flour Mills and King Iron Bridge	12/27/1978	DeWitt	Gage	N
Dill, Richard E., House	1/29/1973	Alexandria	Thayer	N
Diller, Anna C., Opera House	7/6/1988	Diller	Jefferson	N
District No. 1 School of Jefferson County	12/8/1997	Steele City	Jefferson	N
District No. 10 School	12/15/1978	Powell	Jefferson	N
Doane College Historic Buildings	8/16/1977	Crete	Saline	N
Dole, Marion and Ruth Ann, House	12/10/2010	Beatrice	Gage	Y
Ducker, William, House	2/11/1982	Red Cloud	Webster	N
Eberhardt, Philip and Addie Ellis, Farmstead	3/14/1991	Exeter	Fillmore	N
Elm St. Historic District	8/11/1982	Red Cloud	Webster	N
Fairbury Commercial Historic District	6/20/1997	Fairbury	Jefferson	N
Fairbury Jr/Sr High School and Gymnasium-Auditorium	3/25/1999	Fairbury	Jefferson	N
Fairbury Public-Carnegie Library	9/12/1985	Fairbury	Jefferson	N
Fairbury Rock Island Depot and Freight House	6/21/1996	Fairbury	Jefferson	N
Fairfield Carnegie Library	11/29/2001	Fairfield	Clay	N
Fairmont Army Airfield	3/11/2003	Fairmont	Fillmore	N
Fairmont Creamery Company Building	12/15/1983	Fairmont	Fillmore	N
Farmer's and Merchant's Bank Building	3/5/1981	Red Cloud	Webster	N
Farmers State Bank	6/11/1992	Adams	Gage	N
Farrell Block	5/1/1979	Hastings	Adams	N
Filley, Elijah, Stone Barn	4/11/1977	Filley	Gage	N
Fillmore County Courthouse	12/12/1978	Geneva	Fillmore	N
First Baptist Church	8/12/1982	Red Cloud	Webster	N
First Commercial Bank	11/15/2007	Odell	Gage	N
Frank Pisar Farmstead	8/6/1986	Dorchester	Saline	N
Gage County Courthouse	1/10/1990	Beatrice	Gage	N
Garber Grove	8/11/1982	Red Cloud	Webster	N
Glenville School	12/31/1998	Glenville	Clay	N
Grace Protestant Episcopal Church	2/11/1982	Red Cloud	Webster	N
Hastings Municipal Airport Hangar--Building No. 1	7/22/2005	Hastings	Adams	N

SECTION THREE: PLANNING AREA PROFILE

Site Name	Date Listed	Nearest Community	County	In Floodplain?
Heartwell Park Historic District	3/9/2000	Hastings	Adams	N
Homestead National Monument of America	10/15/1966	Beatrice	Gage	N
Hotel Wilber	9/20/1978	Wilber	Saline	N
Hoyt Street Bridge	6/29/1992	Beatrice	Gage	N
Inland School	3/28/2002	Inland	Clay	N
Institution for Feeble Minded Youth Farm	12/8/1997	Beatrice	Gage	N
IOOF Hall and Opera House	7/6/1988	Bladen	Webster	N
IOOF Temple Building	6/15/1987	Fairbury	Jefferson	N
Jackson--Einspahr Sod House	11/8/2006	Holstein	Adams	N
Jackson's Reserve	8/11/1982	Red Cloud	Webster	N
Jefferson County Courthouse	11/27/1972	Fairbury	Jefferson	N
Johnston-Muff House	9/19/1977	Crete	Saline	N
Kendall, Wallace Warren and Lillian Genevieve Bradshaw, House	12/10/1993	Superior	Nuckolls	N
Kiddle, Richard R., House	9/12/1985	Friend	Saline	N
Kilpatrick, Samuel D., House	12/20/1984	Beatrice	Gage	N
Lake Bridenthal House	2/24/1983	Wymore	Gage	N
Lawrence Opera House	9/28/1988	Lawrence	Nuckolls	N
Lincoln Telephone & Telegraph Exchange Building in Fairmount	3/2/2006	Fairmont	Fillmore	N
Main Street Historic District	2/11/1982	Red Cloud	Webster	N
Mann-Zwonecek House	12/29/1978	Wilber	Saline	N
Maple Grove Sales Pavilion and Farrowing Barn	7/16/2009	Tobias	Fillmore	N
McCormick Hall	5/12/1975	Hastings	Adams	N
McCue--Trausch Farmstead	3/9/2000	Hastings	Adams	N
McKeeby, Dr. Gilbert, House	8/11/1982	Red Cloud	Webster	N
Miner Brothers Store	8/11/1982	Red Cloud	Webster	N
Miner House	8/11/1982	Red Cloud	Webster	N
Mission Creek Bridge	6/29/1992	Barneston	Gage	N
Moon Block	8/11/1982	Red Cloud	Webster	N
Nebraska Loan and Trust Company Building	5/1/1979	Hastings	Adams	N
Nelson Cemetery Walk	12/5/2002	Nelson	Nuckolls	N
North Eleventh Street Historic District	3/10/2010	Beatrice	Gage	N
North Seventh Street Historic District	3/10/2010	Beatrice	Gage	N
Nowlan-Dietrich House	4/17/1979	Hastings	Adams	N
Nuckolls County Courthouse	1/10/1990	Nelson	Nuckolls	N
Ohioa Public School	7/22/2005	Ohioa	Fillmore	N
Opera House	8/11/1982	Red Cloud	Webster	N
Paddock Hotel	11/30/1987	Beatrice	Gage	N
Paddock, Algernon S., House	3/14/1973	Beatrice	Gage	N
Pavelka Farmstead	4/13/1979	Bladen	Webster	N
People's State Bank	12/13/1984	Diller	Jefferson	N
Perkins-Wiener House	8/11/1982	Red Cloud	Webster	N
Pike-Pawnee Village Site	10/15/1966	Guide Rock	Webster	N
Purdy, Rachel Kilpatrick, House	11/8/2006	Beatrice	Gage	N
Rad Saline Center cis. 389 Z. C. B. J.	1/4/1996	Western	Saline	N
Rademacher, Frank J., House	3/11/1980	Crete	Saline	N
Railroad Addition Historic District	8/11/1982	Red Cloud	Webster	N

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Site Name	Date Listed	Nearest Community	County	In Floodplain?
Red Cloud Bridge	6/29/1992	Red Cloud	Webster	N
Saint Martin's Catholic Church	9/26/1985	DeWeese	Clay	N
Saline County Bank	4/5/1990	Western	Saline	N
Saline County Courthouse	7/5/1990	Wilber	Saline	N
Schmuck, J., Block	7/2/2008	Beatrice	Gage	N
Seward Street Historic District	2/11/1982	Red Cloud	Webster	N
Smith, George W., House	5/8/1986	Geneva	Fillmore	N
Smith, Woral C., Lime Kiln and Limestone House	12/3/1974	Fairbury	Jefferson	N
Sokol Pavilion	7/23/1998	Wilber	Saline	N
Sokol, Telocvicna Jednota "T.J.", Hall	11/26/2003	Crete	Saline	N
St. Juliana Falconieri Catholic Church	3/5/1981	Red Cloud	Webster	N
St. Mark's Episcopal Pro-Catherdral	11/30/1987	Hastings	Adams	N
St. Stephenie Scandinavian Evangelical Lutheran Church	8/11/1982	Red Cloud	Webster	N
Starke Round Barn	3/16/1972	Red Cloud	Webster	N
Steele City Historic District	3/16/1972	Steele City	Jefferson	N
Stein Brothers Building	5/1/1979	Hastings	Adams	N
Stewart Bridge	6/29/1992	Oak	Nuckolls	N
Stockholm Swedish Lutheran Church and Cemetery	6/30/1995	Shickley	Fillmore	N
Strang School District No. 36	6/25/1992	Strang	Fillmore	N
Superior City Hall and Auditorium	3/12/2012	Superior	Nuckolls	N
Superior Downtown Historic District	1/21/1994	Superior	Nuckolls	N
Telocvicna Jednota Sokol	1/18/1985	Wilber	Saline	N
Thirty-Two Mile Station Site	2/20/1975	Hastings	Adams	N
Trinity Memorial Episcopal Church	9/14/1979	Crete	Saline	N
US Post Office--Geneva	5/11/1992	Geneva	Fillmore	N
US Post Office--Hebron	5/11/1992	Hebron	Thayer	N
US Post Office--Red Cloud	5/11/1992	Red Cloud	Webster	N
Victory Building	3/31/1987	Hastings	Adams	N
Warner-Cather House	8/11/1982	Red Cloud	Webster	N
Warner's Filling Station and House	7/12/2006	Geneva	Fillmore	N
Warren's Opera House	9/28/1988	Friend	Saline	N
Webster County Courthouse	3/5/1981	Red Cloud	Webster	N
Willa Cather Memorial Prairie	8/12/1982	Red Cloud	Webster	N
Witt, Michael, Fachwerkbau	1/14/1980	Western	Saline	N
Z.C.B.J. Rad Tabor No. 74	8/23/1985	Dorchester	Saline	N

Source: National Parks Service²⁹

²⁹ National Park Service. January 2020. "National Register of Historic Places NPGallery Database." <https://npgallery.nps.gov/nrhp>.

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SECTION FOUR

RISK ASSESSMENT

Introduction

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

Table 29: Term Definitions

Term	Definition
Hazard	A potential source of injury, death, or damage
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 consequences 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

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.

Methodology

The risk assessment methodology utilized for this plan follows the risk assessment methodology outlined in the FEMA Local Mitigation Planning Handbook. This process consists of four primary steps:

1. Describe the hazard
2. Identify vulnerable community assets
3. Analyze risk
4. Summarize vulnerability

When describing the hazard, this plan will examine the following items: previous occurrences of the hazard within the planning area; locations where the hazard has occurred in the past or is likely to occur in the future; extent of past events and likely extent for future occurrences; and probability of future occurrences. While the identification of vulnerable assets will be conducted across the entire planning area, *Section Seven* will discuss 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). Finally, each hazard identified the plan will provide a summary statement encapsulating the information provided during each of the previous steps of the risk assessment process.

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

Average Annual Damages and Frequency

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

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

- **Total Damages in Dollars:** This is the total dollar amount of all property damages and crop damages as recorded in federal, state, and local data sources. The limitation to these data sources is that dollar figures usually are estimates and often do not include all damages from every event, but only officially recorded damages from reported events.
- **Total Years on Record:** This is the span of years there is data available for recorded events. During this planning process, vetted and cleaned up National Centers for Environmental Information (NCEI) was primarily used from between January 1996 and April 2020. Although some data is available back to 1950, this plan update only utilizes the more current and accurate data available. Other periods of record for data are supplied where appropriate.

- **Number of Hazard Events:** This shows how often an event occurs. The frequency of a hazard event will affect how a community responds. A thunderstorm may not cause much damage each time, but multiple storms can have an incremental effect on housing and utilities. In contrast, a rare tornado can have a widespread effect on a city.

An example of the event damage estimate is found below:

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

Annual probability can be calculated based on the total years of record and the total number of years in which an event occurred. An example of the annual probability estimate is found below:

$$\text{Annual Probability (\%)} = \frac{\text{Total Years with an Event Recorded (\#)}}{\text{Total Years of Record (\#)}}$$

Each hazard will be included, while those which have caused significant damages or occurred in significant numbers are discussed in detail. It should be noted NCEI data is not all inclusive and the database provides very limited information on crop losses. To provide a better picture of the crop losses associated with the hazards within the planning area, crop loss information provided by the Risk Management Agency (RMA) of the USDA was also utilized for this update of the plan for counties with available data. The collected data were from 2000 to August 2020. Data for all the hazards are not always available, so only those with an available dataset are included in the loss estimation.

Hazard Identification

At the time of hazard identification for this planning effort, the Regional Planning Team reviewed relevant hazards from the previous 2016 HMP and the 2019 State of Nebraska Hazard Mitigation Plan. The Regional Planning Team reviewed, discussed, and determined the list of hazards to be profiled in this HMP update at the Kick-off meeting. The hazards for which a risk assessment was completed are listed in the table below.

Table 30: Hazards Addressed in the Plan

Hazards Addressed in the 2021 LBNRD and LBBNRD HMP		
Agricultural Plant and Animal Disease	Grass/Wildfire	Severe Winter Storms
Dam Failure	Hazardous Materials	Terrorism
Drought and Extreme Heat	Levee Failure	Tornadoes and High Winds
Earthquakes	Public Health Emergency	
Flooding	Severe Thunderstorms	

Hazard Changes and/or Elimination

Due to the development of new events, impacts to the planning area, and overall response capabilities associated per hazard, several changes were made to the hazards profiled for the 2021 HMP. These hazards are listed below with a brief explanation or description of the change.

Additions

- Public Health Emergency - Due to the Covid-19 pandemic, the Hazard Mitigation Planning Team determined that Public Health Emergency should be addressed in this HMP. Although local health departments have plans in place and will lead many of the mitigation efforts, many communities were not prepared for the impacts and response for this hazard. Therefore, public health emergencies will be further analyzed in this planning effort.

Eliminated

- Transportation Incidents

Changes

Additionally, several hazards from the 2016 Little Blue NRD and Lower Big Blue HMP have been modified and combined to provide a more robust and interconnected discussion. The following hazards from the previous HMP have combined hazard profiles:

- Drought and Extreme Heat
- Severe Thunderstorms and Hail
- Tornadoes and High Winds

Hazard Assessment Summary Tables

The following table provides an overview of the data contained in the hazard profiles. Hazards listed in this table and throughout the section are in alphabetical order. This table is intended to be a quick reference for people using the plan and does not contain source information. Source information and full discussion of individual hazards are included later in this section. Annual probability is based off the number of years that had at least one event.

Table 31: Regional Risk Assessment

Hazard	Previous Occurrences	Approximate Annual Probability*	Likely Extent
Agricultural Animal Disease	125	7/7 = 100%	Mean ~214 animal per event; Median ~1 animal per event
Agricultural Plant Disease	258	19/21 = 90%	Unavailable
Dam Failure	18	13/129 = 10%	Varies by structure
Drought	493/1,504 months	>32.8%	Mild Drought
Earthquakes	2	2/121 = 2%	~2.0 – 4.0 magnitude
Extreme Heat	Avg. 6 days per year	125/128 = 98%	>100°F
Flooding	234	24/25 = 98%-100%^	Minor to moderate flooding with some inundation of structures and roads near streams. Evacuations of people may be necessary.
Grass/Wildfire	2,059	20/20 = 100%	Avg. fire <21 acres; Some homes and structures threatened or at risk

Hazard	Previous Occurrences	Approximate Annual Probability*	Likely Extent
Hazardous Materials - Fixed Sites	368	30/30 = 100%	Avg spill ~475 gal. Localize to the facilities and adjacent surroundings.
Hazardous Materials - Transportation	72	25/31 = 81%	<50 gallons, Limited (<0.5 mile) from release site
High Winds	183	21/25 = 84%	9 BWF (47-54mph)
Levee Failure	0	0/120 = <1%	~30% of Fairbury Total of 649 people and 585 structures in leveed areas
Public Health Emergency	3 outbreak events	>1%	Varies by event; >1 fatality
Severe Thunderstorms (includes hail)	2,755	25/25 = 100%	>1" rainfall Avg 1.16 hail; 35-58 mph
Severe Winter Storms	766	25/25 = 100%	0.25-0.5" ice 20°-40° below zero (wind chill) 4-8" snow 35-45 mph winds
Terrorism	2	1/48 = <1%	Isolated to a single building; damages <\$1M; varies by event
Tornadoes	148	24/25 = 96%	EF0-EF4 Mode: EF0

*Annual Probability = Total Years with an Event Occurrence / Total Years on Record

^Indicates flood events likely occurred in year with missing data, however, were not reported during this planning process.

Table 32: Hazard Loss Estimates for the Planning Area

HAZARD		COUNT	PROPERTY	CROP
AGRICULTURAL DISEASE	Animal Disease	125	26,789 animals	N/A
	Plant Disease	258	N/A	\$3,156,617
DAM FAILURE		18	\$0	N/A
DROUGHT & EXTREME HEAT	Drought	493/1,504 months	\$70,000,000	\$246,935,998
	Extreme Heat	Avg. 6 days per year	\$400,000	\$22,026,050
EARTHQUAKES		2	\$0	\$0
FLOODING 1 FATALITY	Flash Flood	112	\$21,010,000	\$2,408,030
	Flood	122	\$117,270,900	
GRASS/WILDFIRE 15 INJURIES, 3 FATALITIES		2,059	41,288 acres and \$613,319	\$1,361,497
HAZARDOUS MATERIALS 1 INJURY	Fixed Sites	368	\$0	N/A
	Transportation	72	\$1,206,459	N/A
	High Winds	183	\$2,284,580	\$10,526,687

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HAZARD		COUNT	PROPERTY	CROP
HIGH WINDS & TORNADOES 35 INJURIES, 1 FATALITY	Tornadoes	148	\$124,804,000	\$388,802
	LEEVE FAILURE	0	N/A	N/A
PUBLIC HEALTH EMERGENCY		3 outbreak events	>9,825 infections; >91 fatalities	N/A
SEVERE THUNDERSTORMS 2 FATALITIES, 9 INJURIES	Hail	1,712	\$83,647,000	\$134,205,021
	Heavy Rain	196	\$1,097,000	
	Lightning	25	\$20,335,000	
	Thunderstorm Wind	822	\$53,817,200	
SEVERE WINTER STORMS 1 INJURY	Blizzards	79	\$105,000	\$12,156,696
	Extreme Cold	25	\$0	
	Heavy Snow	41	\$5,500,000	
	Ice Storms	51	\$12,464,000	
	Winter Storms	379	\$16,382,000	
	Winter Weather	191	\$95,000	
TERRORISM		2	\$0	N/A
TOTAL		6,990	\$531,031,458	\$433,165,398

N/A – indicates data not available

Historical Disaster Declarations

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

Farm Service Agency Small Business Administration Disasters

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

Table 33: SBA Declarations

Disaster Declaration Number	Declaration Year	Description	Primary Counties	Contiguous Counties
NE-00002	2005	Severe Storms and Flooding.	Adams, Fillmore	
NE-00011	2007	Severe Winter Storms.	Adams, Clay, Fillmore, Nuckolls, Webster	
NE-00013	2007	Severe Storms, Flooding, and Tornadoes	Gage, Jefferson, Saline	
NE-00018	2008	Severe Winter Storm	Gage, Jefferson	

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Disaster Declaration Number	Declaration Year	Description	Primary Counties	Contiguous Counties
NE-00019	2008	Severe Storms, Tornadoes, and Flooding	Gage, Johnson	
NE-00020	2008	Severe Storms, Tornadoes, and Flooding	Gage, Jefferson	Adams, Clay, Fillmore, Saline, Webster
NE-00021	2008	Severe Storms, Tornadoes, and Flooding	Adams, Fillmore, Gage, Jefferson, Saline, Thayer, Webster	
NE-00032	2009	Severe Winter Storm	Gage, Jefferson	
NE-00033	2010	Severe Winter Storms and Snowstorm	Adams, Clay, Gage, Jefferson, Saline, Thayer	
NE-00035	2010	Severe Storms, Ice Jams, and Flooding.	Gage, Jefferson, Nuckolls, Saline	
NE-00038	2013	Severe Storms, Flooding, and Tornadoes	Nuckolls, Webster	
NE-00042	2011	Flooding		Gage
NE-00049	2013	Drought		Adams, Clay, Webster
NE-00050	2013	Drought	Adams, Clay, Webster	Fillmore, Nuckolls, Saline
NE-00051	2013	Drought	Fillmore, Saline	Clay, Gage, Jefferson, Nuckolls, Thayer
NE-00052	2013	Drought	Gage, Jefferson, Nuckolls, Thayer	Adams, Clay, Fillmore, Saline, Webster
NE-00053	2013	Drought	Adams, Clay, Fillmore, Gage, Jefferson, Saline, Thayer, Webster	
NE-00054	2014	Drought	Nuckolls	Adams, Clay, Fillmore, Thayer, Webster
NE-00055	2013	Severe Storms, Winter Storms, Tornadoes, and Flooding	Adams	
NE-00060	2014	Severe Storms, Tornadoes, Straight-line Winds, and Flooding	Clay, Fillmore, Saline	
NE-00064	2015	Severe Storms, Tornadoes, High Winds and Flooding	Saline, Thayer	Fillmore, Gage, Jefferson, Nuckolls
NE-00065	2015	Severe Storms, Tornadoes, Straight-line Winds, and Flooding.	Gage, Jefferson, Nuckolls, Saline, Thayer	

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Source: Small Business Administration, 2001-2018³⁰

³⁰ Small Business Administration. 2001-2018. "SBA Disaster Loan Data." Accessed December 2019. <https://www.sba.gov/loans-grants/see-what-sba-offers/sba-loan-programs/disaster-loans/disaster-loan-data>.

Presidential Disaster Declarations

The presidential disaster declarations involving the planning area from 1953 to April 2020 are summarized in the following table. Declarations prior to 1962 are not designated by county and are not included.

Table 34: Presidential Disaster Declarations

Disaster Declaration Number	Declaration Date	Title	Affected Counties
228	7/18/1967	Severe Storms & Flooding	Adams, Clay, Fillmore, Gage, Jefferson, Saline, Thayer
406	10/20/1973	Severe Storms & Flooding	Clay, Gage, Jefferson, Nuckolls, Saline, Thayer, Webster
500	4/8/1976	Ice Storms & High Winds	Adams, Clay, Fillmore, Gage, Jefferson, Nuckolls, Saline, Thayer, Webster
552	3/24/1978	Storms, Ice Jams, Snowmelt & Flooding	Jefferson, Nuckolls, Thayer
716	7/3/1984	Tornadoes & Flooding	Fillmore, Gage, Jefferson, Saline, Thayer
873	7/4/1990	Severe Storms, Tornadoes & Flooding	Clay, Gage, Thayer
954	8/19/1992	Severe Storms & Flooding	Jefferson, Nuckolls, Thayer
983	4/2/1993	Ice Jams & Flooding	Adams
998	7/19/1993	Severe Storms and Flooding	Adams, Clay, Fillmore, Gage, Jefferson, Nuckolls, Saline, Thayer, Webster
1123	6/25/1996	Severe Storms and Tornadoes	Gage
1190	11/1/1997	Severe Snow Storms, Rain, And Strong Winds	Adams, Clay, Fillmore, Nuckolls, Saline, Thayer, Webster
1373	5/16/2001	Severe Winter Storms, Flooding And Tornadoes	Gage, Nuckolls, Saline
1480	7/21/2003	Severe Storms And Tornadoes	Jefferson, Thayer
1517	5/25/2004	Severe Storms And Tornadoes	Adams, Clay, Fillmore, Gage, Jefferson, Nuckolls, Saline, Thayer, Webster
1590	6/23/2005	Severe Storms And Flooding	Adams, Fillmore
1674	1/7/2007	Severe Winter Storms	Adams, Clay, Fillmore, Nuckolls, Webster
1706	6/6/2007	Severe Storms, Flooding, And Tornadoes	Gage, Jefferson, Saline
1739	1/11/2008	Severe Winter Storm	Gage, Jefferson, Thayer
1765	5/30/2008	Severe Storms, Tornadoes, And Flooding	Gage
1770	6/20/2008	Severe Storms, Tornadoes, And Flooding	Adams, Fillmore, Gage, Jefferson, Saline, Thayer, Webster
1864	12/16/2009	Severe Winter Storm	Gage, Jefferson, Thayer
1878	2/25/2010	Severe Winter Storms And Snowstorm	Adams, Clay, Fillmore, Gage, Jefferson, Nuckolls, Saline, Thayer

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Disaster Declaration Number	Declaration Date	Title	Affected Counties
1902	4/21/2010	Severe Storms, Ice Jams, and Flooding	Gage, Jefferson, Nuckolls, Saline
1924	7/15/2010	Severe Storms and Flooding	Adams, Jefferson, Nuckolls, Webster
3245	9/13/2005	Hurricane Katrina Evacuees	Adams, Clay, Fillmore, Gage, Jefferson, Nuckolls, Saline, Thayer, Webster
4156	11/26/2013	Severe Storms, Winter Storms, Tornadoes and Flooding	Adams
4179	6/17/2014	Severe Storms, Tornadoes, Straight-Line Winds, and Flooding	Clay, Fillmore, Saline
4225	6/25/2015	Severe Storms, Tornadoes, Straight-Line Winds, and Flooding	Adams, Clay, Fillmore, Gage, Jefferson, Nuckolls, Saline, Thayer
4325	8/1/2017	Severe Storms, Tornadoes, and Straight-Line Winds	Fillmore, Gage, Jefferson
4375	6/29/2018	Severe Winter Storm and Straight-Line Winds	Clay, Fillmore, Nuckolls, Webster
4420	3/21/2019	Severe Winter Storm, Straight-Line Winds, and Flooding	Adams, Clay, Fillmore, Gage, Jefferson, Nuckolls, Saline, Thayer, Webster
3483	3/13/2020	Covid-19	Adams, Clay, Fillmore, Gage, Jefferson, Nuckolls, Saline, Thayer, Webster
4521	4/4/2020	Covid-19 Pandemic	Adams, Clay, Fillmore, Gage, Jefferson, Nuckolls, Saline, Thayer, Webster

Source: FEMA, 1953-2020³¹

Climate Adaptation

Long-term climate trends have shifted throughout the 21st century and have created significant changes in precipitation and temperature which have altered the severity and subsequent impacts from severe weather events. The Regional and Local Planning Teams identified changes in the regional climate as a top concern impacting communities, Indian tribes, residents, local economies, and infrastructure throughout the planning area. Discussions on temperature, precipitation, and climate impacts are included below.

Figure 6: Great Plains Region



The planning area is located in the Northern Great Plains region of the United States, which stretches from Montana and North Dakota southward to Wyoming and Nebraska. A large elevation change across the region contributes to high geographical, ecological, and climatological variability, including a strong gradient of decreasing precipitation moving from east

³¹ Federal Emergency Management Agency. 2020. "Disaster Declarations." Accessed March 2021. <https://www.fema.gov/openfema-data-page/disaster-declarations-summaries-v2>.

to west across the region. Significant weather extremes impact this area, including winter storms, extreme heat and cold, severe thunderstorms, drought, and flood producing rainfall.

The Fourth National Climate Assessment has provided an overview of potential impacts within the planning area.

- **Water:** Water is the lifeblood of the Northern Great Plains, and effective water management is critical to the region's people, crops and livestock, ecosystems, and energy industry. Even small changes in annual precipitation can have large effects downstream; when coupled with the variability from extreme events, these changes make managing these resources a challenge. Future changes in precipitation patterns, warmer temperatures, and the potential for more extreme rainfall events are very likely to exacerbate these challenges.
- **Agriculture:** Agriculture is an integral component of the economy, the history, and the culture of the Northern Great Plains. Recently, agriculture has benefited from longer growing seasons and other recent climatic changes. Some additional production and conservation benefits are expected in the next two to three decades as land managers employ innovative adaptation strategies, but rising temperatures and changes in extreme weather events are very likely to have negative impacts on parts of the region. Adaptation to extremes and to longer-term, persistent climate changes will likely require transformative changes in agricultural management, including regional shifts of agricultural practices and enterprises.
- **Recreation and Tourism:** Ecosystems across the Northern Great Plains provide recreational opportunities and other valuable goods and services that are at risk in a changing climate. Rising temperatures have already resulted in shorter snow seasons, lower summer streamflow's and higher stream temperatures. These changes have important consequences for local economies that depend on winter or river-based recreational activities. Climate-induced land-use changes in agriculture can have cascading effects on closely entwined natural ecosystems, such as wetlands, and the diverse species and recreational amenities they support.
- **Energy:** Fossil fuel and renewable energy production and distribution infrastructure is expanding within the Northern Great Plains. Climate change and extreme weather events put this infrastructure at risk, as well as the supply of energy it contributes to support individuals, communities, and the U.S. economy as a whole. The energy sector is also a significant source of greenhouse gases and volatile organic compounds that contribute to climate change and ground-level ozone pollution.

Nebraska's Changing Climate

The United States as a whole is experiencing significant changes in temperature, precipitation, and severe weather events resulting from climate change. According to a University of Nebraska report (*Understanding and Assessing Climate Change: Implications for Nebraska, 2014*), the following changes can be expected for Nebraska's future climate:

- Increase in extreme heat events (days over 100°F)
- Decrease in soil moisture by 5-10%
- Increase in drought frequency and severity
- Increase in heavy rainfall events

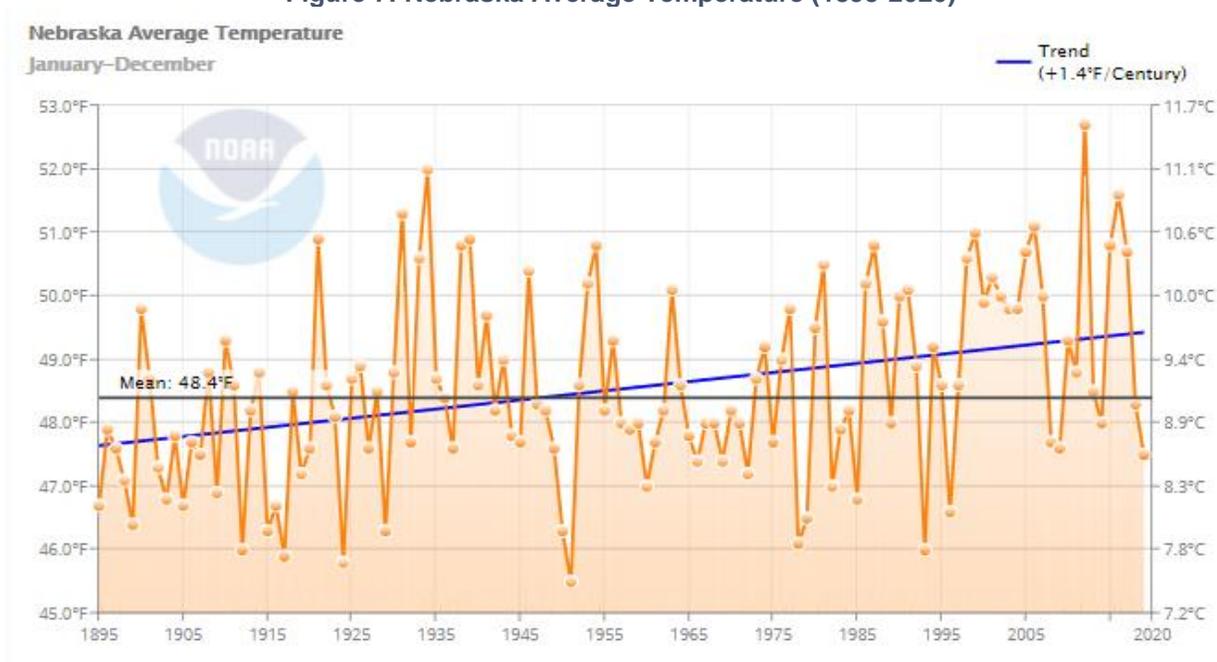
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- Increase in flood magnitude
- Decrease in water flow in the Missouri River and Platte River from reduced snowpack in the Rocky Mountains
- Additional 30-40 days in the frost-free season

Changes in Temperature

Since 1895 Nebraska's overall average temperature has increased by almost 1.5°F (Figure 7). The Great Plains region has additionally seen the greatest increase in overall temperature in the past two decades. While overall temperature shifts have not been consistent, the trend for increasing temperatures is apparent. Climate modeling suggests warmer temperature conditions will continue in the coming decades and rise steadily into mid-century. This trend will likely contribute to an increase in the frequency and intensity of hazardous events, which will cause significant economic, social, and environmental impacts on Nebraskans.

Figure 7: Nebraska Average Temperature (1895-2020)



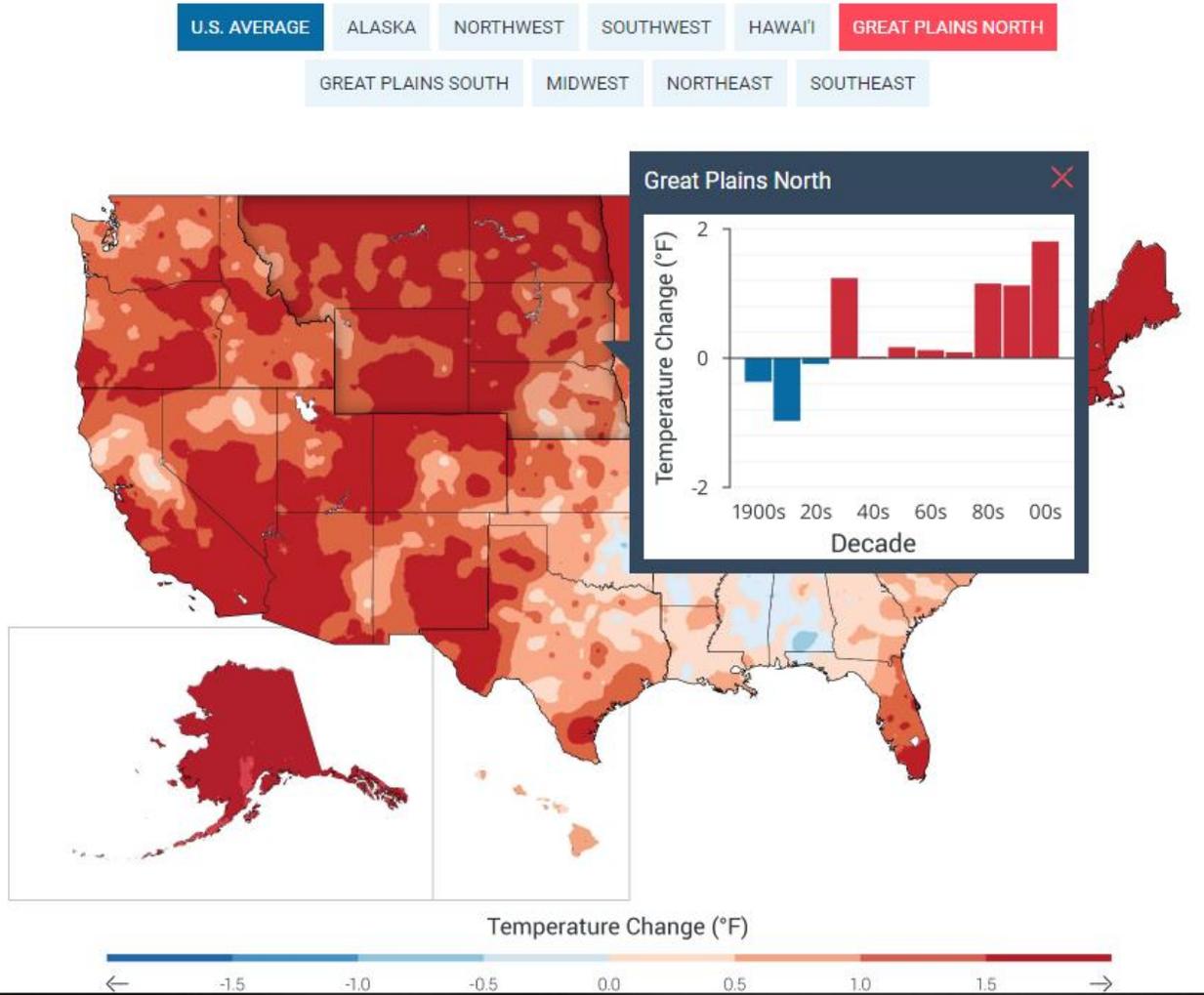
Source: NOAA, 2020³²

Additionally, the length of the frost-free season (i.e. growing season) has been increasing nationally since the 1980s. While a longer growing season may provide some benefit for heavily agricultural areas, concurrent changes in temperature, water availability, and pest pressures may cause additional impacts. For instance, longer growing seasons coinciding with periods of drought and extreme heat can indicate lower production from increased plant mortality and increased risk

³² NOAA. 2020. "Climate at a Glance: Statewide Time Series.". Accessed September 2020. https://www.ncdc.noaa.gov/cag/statewide/time-series/25/tavg/12/12/1895-2020?base_prd=true&begbaseyear=1901&endbaseyear=2000&trend=true&trend_base=100&begtrendyear=1895&endtrendyear=2020

to wildfire ignition probability and fuel load potentials. On average, the Great Plains has seen an increase of ten days to the annual growing season.³³

Figure 8: Observed U.S. Temperature Change



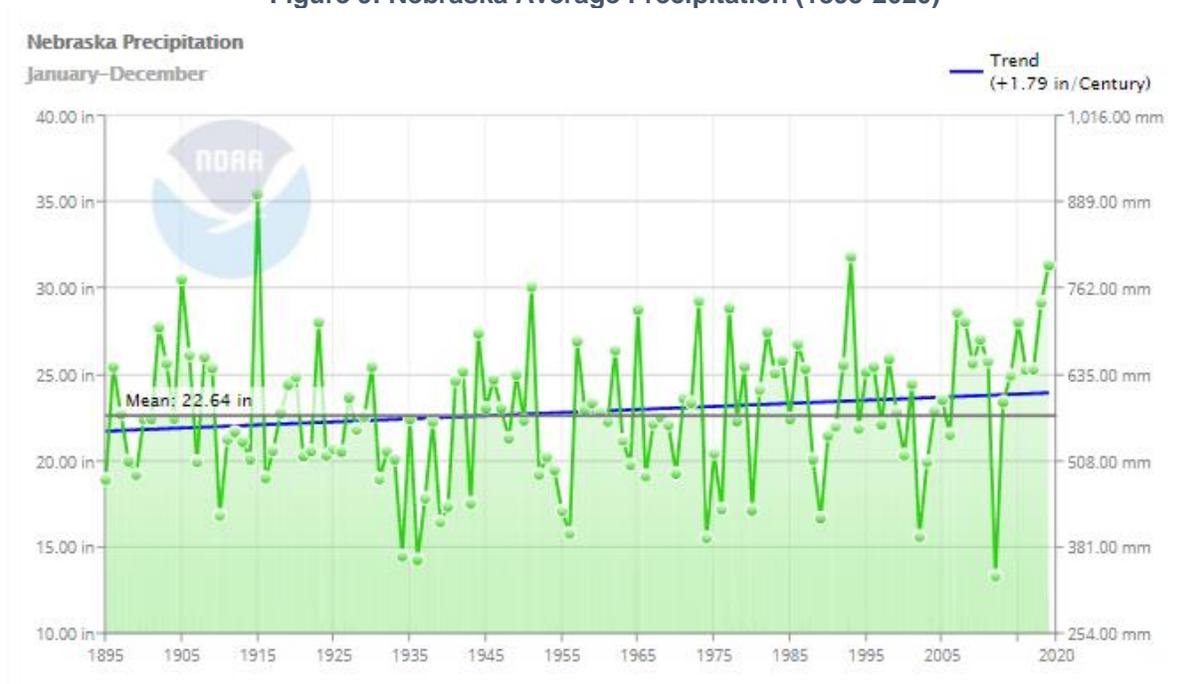
Source: National Climate Assessment, 2014³⁴

³³ U.S. Global Change Research Program. "2014 National Climate Assessment: Frost-free Season." Accessed 2020. <https://nca2014.globalchange.gov/report/our-changing-climate/frost-free-season#tab2-images>
³⁴ U.S. Global Change Research Program. "2014 National Climate Assessment." Accessed 2020. <https://nca2014.globalchange.gov/>

Changes in Precipitation

Changing extremes in precipitation are anticipated in the coming decades, with more significant rain and snowfall events and more intense drought periods. Seasonal variations will be heightened, with more frequent and more significant rainfall expected in the spring and winter and hotter, drier periods in the summer. Since 1895, yearly annual precipitation for Nebraska has increased slightly. This trend is expected to continue as the impacts of climate change continue to be felt. Climate modeling may show only moderate precipitation and streamflow changes; however, most of the Northern Great Plains region is already at risk to large annual and seasonable variability as seen by flooding and drought events occurring in concurrent years. There will likely be more days with a heavy precipitation event (rainfall of greater than one inch per day) across the region and subsequent impacts to riverine flooding events or overwhelmed local stormwater management systems. Groundwater and reservoir water sources are increasingly important to communities and residents in the planning area to meet water needs during periods of shortage. Precipitation varies significantly across the state (Figure 10) and moves in a longitudinal gradient. The east receives twice as much precipitation (35 inches annually) as the Nebraska Panhandle (15 inches) on average.³⁵

Figure 9: Nebraska Average Precipitation (1895-2020)

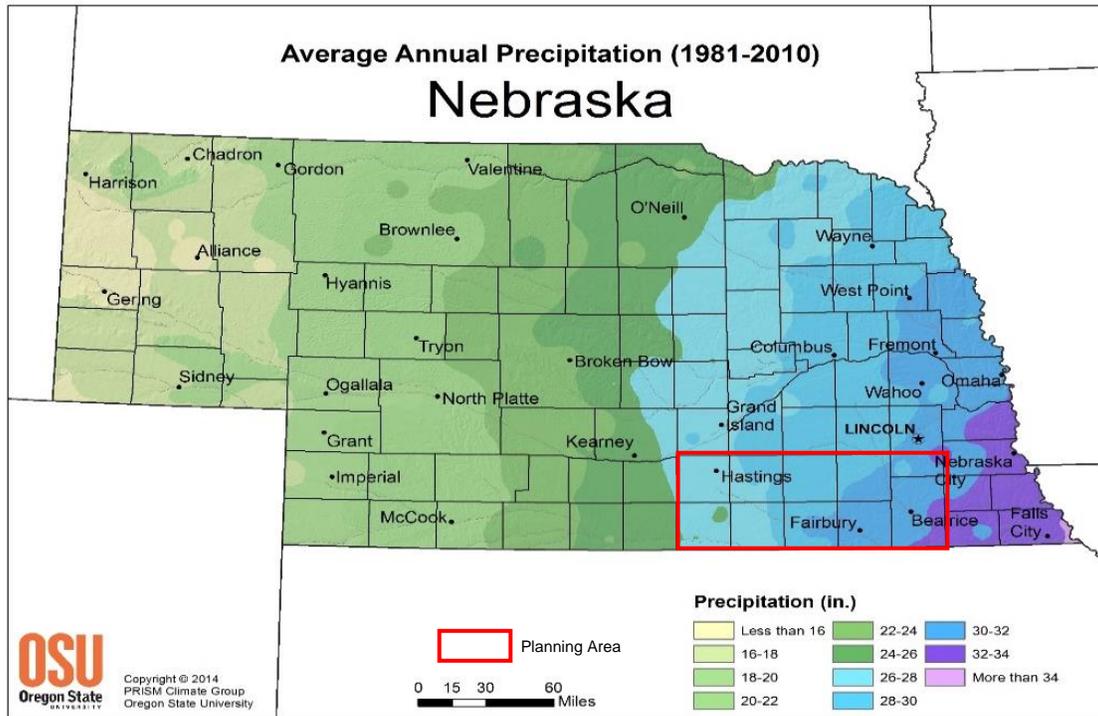


Source: NOAA, 2020³⁶

³⁵ North Central Climate Collaborative. January 2020. "NC3 Nebraska Climate Summary." Accessed April 2021. https://northcentralclimate.org/files/2020/01/nc3-Nebraska-Climate-Summary-FINAL_2.12.pdf?x24082

³⁶ NOAA. 2020. "Climate at a Glance: Statewide Time Series." Accessed September 2020. https://www.ncdc.noaa.gov/cag/statewide/time-series/25/pcp/12/12/1895-2020?base_prd=true&begbaseyear=1901&endbaseyear=2000&trend=true&trend_base=100&begtrendyear=1895&endtrendyear=2020

Figure 10: Average Annual Precipitation for Nebraska (1981-2010)



Source: Oregon State University PRISM Climate Group, 2014

Impacts from Climate Change

Observed changes in the intensity and frequency of extreme events are a significant concern now and in the future because of the social, environmental, and economic costs associated with their impacts. Challenges that are expected to affect communities, environments, and residents as a result of climate change include:

- Developing and maintaining sustainable agricultural systems
- Resolving increasing competition among land, water, and energy resources
- Conserving vibrant and diverse ecological systems
- Enhancing the resilience of the region's people to the impacts of climatic extremes

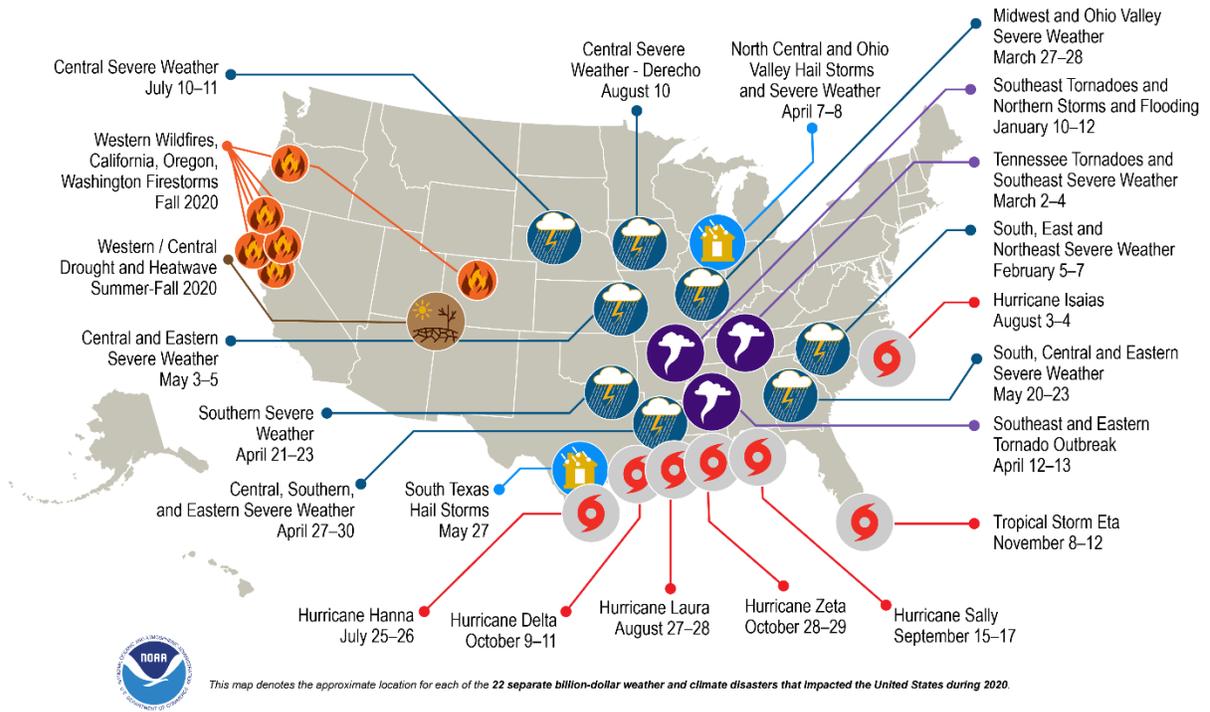
Certain groups of people may face greater difficulty when dealing with the impacts of a changing climate. Older adults, immigrant communities, and those living in poverty are particularly susceptible. Additionally, specific industries and professions tied to weather and climate, like outdoor tourism, commerce, and agriculture, are especially vulnerable.³⁷

As seen in the figure below, the United States is experiencing an increase in the number of billion-dollar natural disasters.

³⁷ U.S. Environmental Protection Agency. "Climate Impacts on Society." Accessed April 2021. https://19january2017snapshot.epa.gov/climate-impacts/climate-impacts-society_.html

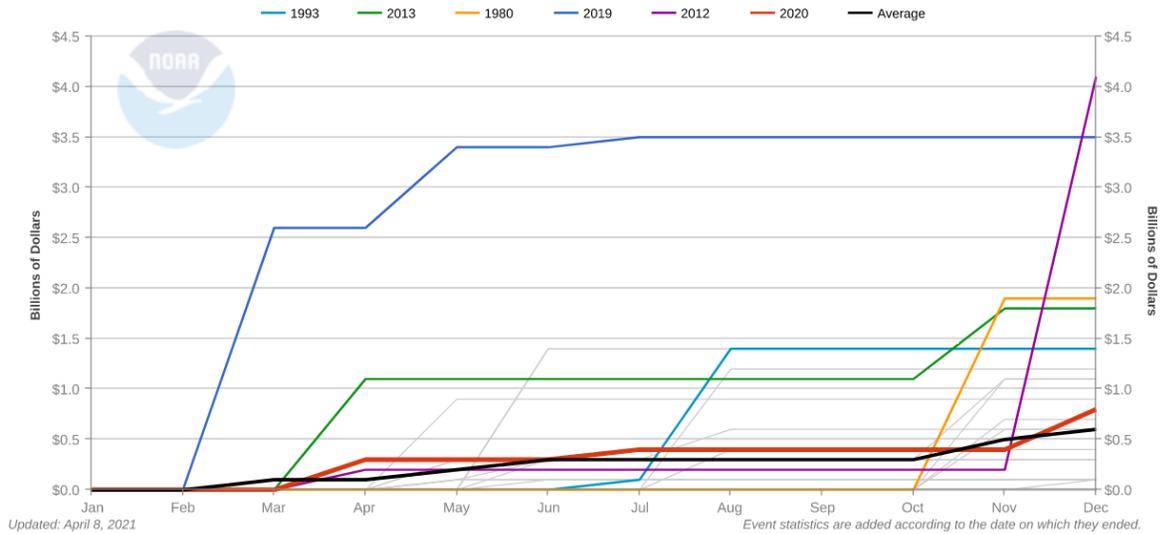
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Figure 11: Billion Dollar Weather and Climate Disasters (2020)
U.S. 2020 Billion-Dollar Weather and Climate Disasters



Source: NOAA, 2021³⁸

Figure 12: Billion Dollar Disaster Costs in Nebraska
Year-to-Date Nebraska Billion-Dollar Disaster Event Cost (CPI-Adjusted)



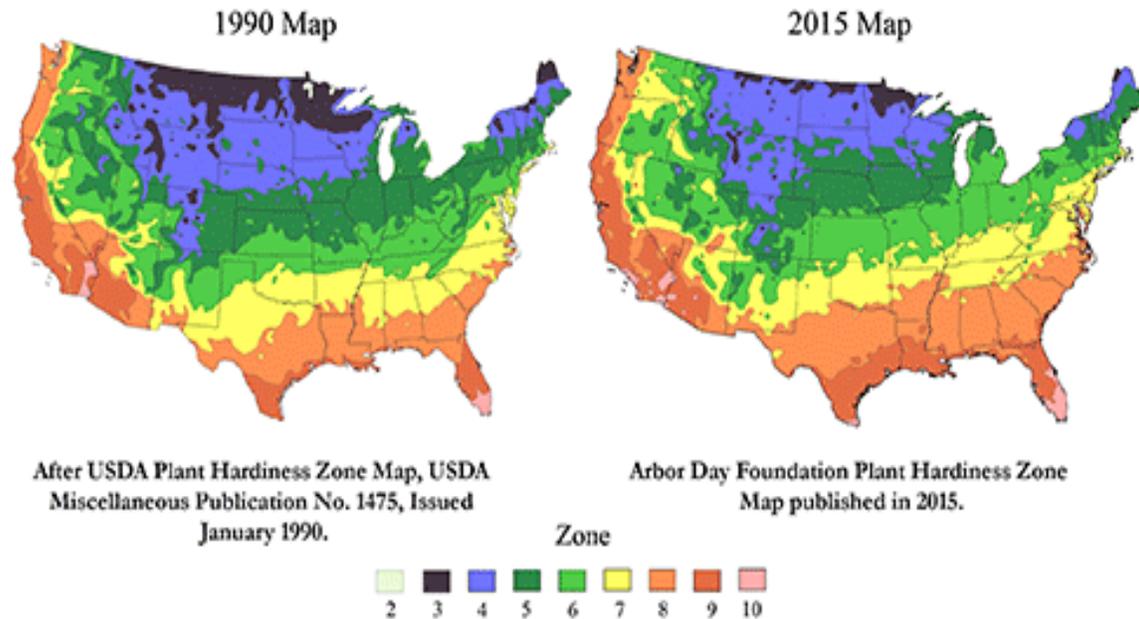
Source: NOAA, 2021

³⁸ NOAA. 2020. "Billion-Dollar Weather and Climate Disasters: Overview. Accessed April 2021. <https://www.ncdc.noaa.gov/billions/overview>

Agriculture

The agricultural sector will experience an increase in droughts, an increase in grass and wildfire events, changes in the growth cycle as winters warm, an influx of new and damaging agricultural diseases or pests, and changes in the timing and magnitude of rainfall. As described in the Plant Hardiness Zone map (Figure 13) available for the United States, these changes have shifted the annual growing season and expected agricultural production conditions. Nebraska is vulnerable to changes in growing season duration and growing season conditions as a heavily agriculturally dependent state. These added stressors on agriculture could have devastating economic effects if new agricultural and livestock management practices are not adopted.

Figure 13: Plant Hardiness Zone Change



Source: Arbor Day Foundation, 2018³⁹

Air Quality

Rising temperatures will also impact air quality. Harmful air pollutants and allergens increase as temperatures increase. More extended periods of warmth contribute to longer pollen seasons that allow plant spores to travel farther and increase exposure to allergens. More prolonged exposure to allergens can increase the risk and severity of asthma attacks and worsen existing allergies in individuals.⁴⁰ An increase in air pollutants can occur from the growing number of grass and wildfires. The public can be exposed to harmful particulate matter from smoke and ash that can cause various health issues. Depending on the length of exposure, age, and individual susceptibility, effects from wildfire smoke can range from eye and respiratory irritation to severe disorders like bronchitis, asthma, and aggravation of pre-existing respiratory and cardiovascular diseases.⁴¹

³⁹ Arbor Day Foundation. 2018. "Hardiness Zones." https://www.arborday.org/media/map_change.cfm.

⁴⁰ Asthma and Allergy Foundation of America. 2010. "Extreme Allergies and Climate Change." Accessed 2021. <https://www.aafa.org/extreme-allergies-and-climate-change/>

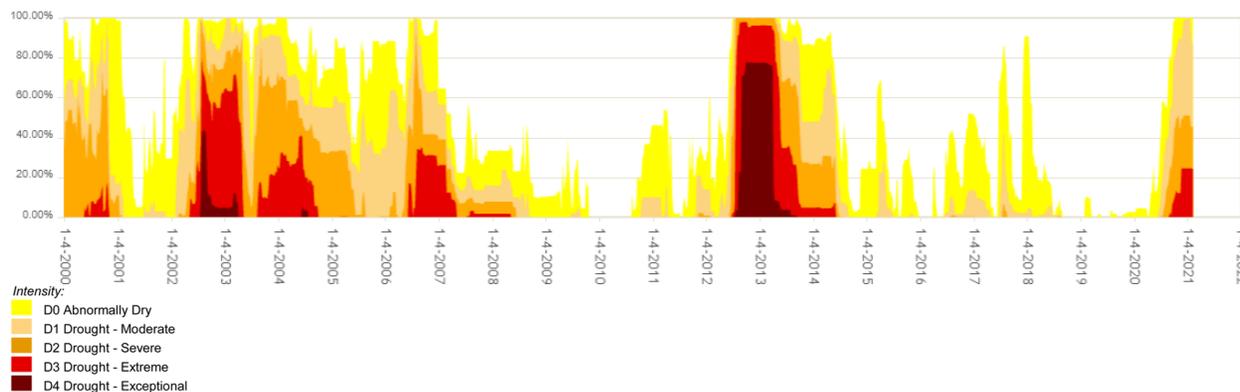
⁴¹ AirNow. 2019. "Wildfire Smoke: A Guide for Healthcare Professionals." Accessed 2021. https://www.airnow.gov/sites/default/files/2020-10/wildfire-smoke-guide-revised-2019-chapters-1-3_0.pdf

Drought and Extreme Heat

An increase in average temperatures will contribute to the rise in the frequency and intensity of hazardous events like extreme heat and drought, which will cause significant economic, social, and environmental impacts on Nebraskans. Although drought is a natural part of the climate system, increasing temperatures will increase evaporation rates, decrease soil moisture, and lead to more intense droughts in the future, having negative impacts on dryland farming. Extreme heat events have adverse effects on both human and livestock health. Heatwaves may also impact plant health, with negative effects on crops during essential growth stages. Increasing temperatures and drought may reduce the potential for aquifers to recharge, which has long-term implications for the viability of agriculture in Nebraska.

Changes in precipitation are tied to changes in drought patterns. The following figure shows the percent of Nebraska's area that experienced significant increases in moderate (D1) to exceptional drought (D4) from 2000 to January 2021. Record dryness occurred in Nebraska between June through August of 2012. Nebraska in 2012 had the driest year on record. The area will remain vulnerable to periodic drought as most projected increases in precipitation are anticipated to occur during the winter months, while increasing temperatures lead to increased soil drying.

Figure 14: Drought Severity 2000-January 2021
Nebraska Percent Area



Source: NOAA, 2018

Energy

Shifting climate trends will have a direct impact on water and energy demands. As the number of 100°F days increases, along with warming nights, the stress placed on the energy grid will likely increase and possibly lead to more power outages. Severe weather events also stress energy production, infrastructure transmission, and transportation. Roads, pipelines, and rail lines are all at risk of damages from flooding, extreme heat, erosion, or added stress from increased residential demands.⁴² Critical facilities and vulnerable populations that are not prepared to handle periods of power outages, particularly during heat waves, will be at risk.

⁴² USGCRP, 2018: Impacts, Risks, and Adaptation in the United States: Fourth National Climate Assessment, Volume II: Report-in-Brief [Reidmiller, D.R., C.W. Avery, D.R. Easterling, K.E. Kunkel, K.L.M. Lewis, T.K. Maycock, and B.C. Stewart (eds.)]. U.S. Global Change Research Program, Washington, DC, USA, 186 pp.

Precipitation

With a changing climate, winter and spring precipitation is projected to increase across Nebraska. Average annual precipitation varies across the state, with the panhandle receiving 15 inches and the southeast receiving up to 35 inches. According to climate projections, winter and spring will likely become 20 percent wetter, with summers becoming 10 percent drier.

Winter precipitation is projected to increase in intensity and may benefit Nebraska's agricultural economy by improving soil moisture but could potentially delay crop planting in the summer. Increased spring precipitation may lead to heightened runoff and flooding, reducing water quality and eroding soils.⁴³

Water Quality

Increasing temperatures, shifting precipitation patterns, and extreme weather events impact water quality throughout the state. As average temperatures increase, water temperatures also rise and put water bodies at risk for eutrophication and excess algal growth that reduce water quality. Extreme weather events and shifting precipitation can lead to fluctuating river flows, erosion, sediment accumulation, and morphological changes to water bodies and surrounding landscapes. In agricultural landscapes, major storm events can cause sediment and nutrients such as phosphorous and nitrogen to runoff into nearby water sources. Runoff can contribute to the buildup of nutrients in the water, increasing plant and algae growth that can deplete oxygen and kill aquatic life. Nutrient enrichment can lead to toxic cyanobacterial harmful algae blooms (cyanoHABs), which can be harmful to animal and human health. CyanoHABs can cause economic damage such as decreasing property values, reducing recreational revenue, and increasing the costs for treating drinking water.⁴⁴

With the increasing intensity and frequency of extreme precipitation events, impacts to water systems ultimately threaten human health. Events can lead to flooding and stormwater runoff that can carry pollutants across landscapes and threaten human health by contaminating water wells, groundwater, and other bodies of water. Common pollutants include pesticides, bacteria, nutrients, sediment, animal waste, oil, and hazardous waste. Flooding impacts property, infrastructure, economies, and the ecology of water bodies.

Grass/Wildfire

Rising temperatures can increase the frequency and intensity of wildfires across the state. Warmer temperatures cause snow to melt sooner and create drier soils and forests, which act as kindling to ignite and spread fires. Additionally, warmer nighttime temperatures contribute to the continued spread of wildfires over multiple days.⁴⁵

Severe Storms

Nebraska experiences frequent snowstorms and ice storms during winter, which can produce heavy snowfall and high wind gusts that lead to whiteout conditions. In the warmer months, convective storms are common and include flash flood-producing rainstorms and severe thunderstorms capable of producing hail, damaging winds, and tornadoes. As temperatures

⁴³ NOAA NCEI. 2017. "Nebraska State Climate Summary." Accessed 2021. <https://statesummaries.ncics.org/chapter/ne/>

⁴⁴ USGS. "Nutrients and Eutrophication". Accessed February 2021. https://www.usgs.gov/mission-areas/water-resources/science/nutrients-and-eutrophication?qt-science_center_objects=0#qt-science_center_objects

⁴⁵ NASA Global Climate Change. September 2019. "Satellite Data Record Shows Climate Change's Impact on Fires." Accessed 2021. <https://climate.nasa.gov/news/2912/satellite-data-record-shows-climate-changes-impact-on-fires/>

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continue to rise, more water vapor evaporates into the atmosphere, creating increased humidity, which can develop intense storms.

Future Adaptation and Mitigation

The planning area will have to adapt to a changing climate and its impacts or experience an increase in economic losses, property damages, agricultural damages, and loss of life. Past events have typically informed HMPs to be more resilient to future events. This HMP includes strategies for the planning area to address these changes and increase resilience. However, future updates of this HMP should consider including adaptation as a core strategy to be better informed by “future” projections on the frequency, intensity, and distribution of hazards. Jurisdictions in the planning area should consider past and future climate changes and impacts when incorporating mitigation actions into local planning processes.

Hazard Profiles

Based on research and experiences of the participating jurisdictions, the hazards profiled were determined to either have a historical record of occurrence or the potential for occurrence in the future. Local hazard concerns and events that deviate from the region’s norm are discussed in greater detail in *Section Seven: Community Profiles*.

The following table identifies the top hazards of concern for participating jurisdictions.

Table 35: Top Hazards of Concern by Jurisdiction

Jurisdiction	Agricultural Disease	Dam Failure	Drought and Extreme Heat	Earthquakes	Flooding	Grass/Wildfire	Hazardous Materials	Levee Failure	Public Health Emergency	Severe Thunderstorms	Severe Winter Storms	Terrorism	Tornadoes and High Winds
Little Blue NRD	X	X	X		X			X		X	X		X
Lower Big Blue NRD		X	X		X					X			
Adams County			X		X					X	X		X
Village of Ayr					X					X			X
City of Hastings		X								X	X		X
Village of Holstein										X	X		X
Village of Juniata			X		X					X	X		X
Village of Kenesaw					X			X			X		X
Village of Prosser										X	X		X
Clay County					X	X	X			X	X		X
City of Clay Center	X									X			X
Village of Deweese										X	X		X
City of Edgar							X			X			X
City of Fairfield					X		X			X			X
Village of Glenvil	X					X	X						X
Village of Ong						X	X			X	X		X
Village of Saronville			X							X	X		X
City of Sutton					X			X		X			X
Village of Trumbull							X			X	X		X
Fillmore County			X		X	X	X		X		X		X
Village of Exeter					X					X	X		X
Village of Fairmont										X	X		X
City of Geneva					X					X			X
Village of Grafton							X			X	X		X
Village of Milligan			X							X	X		X

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Jurisdiction	Agricultural Disease	Dam Failure	Drought and Extreme Heat	Earthquakes	Flooding	Grass/Wildfire	Hazardous Materials	Levee Failure	Public Health Emergency	Severe Thunderstorms	Severe Winter Storms	Terrorism	Tornadoes and High Winds
Village of Ohiowa					X								X
Village of Shickley			X		X						X		X
Village of Strang										X	X		X
Gage County			X		X				X	X	X		X
Village of Adams		X			X		X				X		X
Village of Barneston					X		X			X	X		X
City of Beatrice					X					X	X		X
City of Blue Springs										X	X		X
Village of Clatonia							X			X	X		X
Village of Cortland										X			X
Village of Filley							X			X	X		X
Village of Liberty			X							X	X		X
Village of Odell			X				X			X	X		X
Village of Pickrell											X		X
Village of Virginia										X			X
City of Wymore			X							X	X		X
Jefferson County					X		X			X	X		X
Village of Daykin							X			X	X		X
Village of Diller							X			X	X		X
Village of Endicott										X			
City of Fairbury					X		X			X	X		X
Village of Harbine										X	X		X
Village of Jansen							X			X			X
Village of Plymouth							X				X		X
Village of Reynolds					X		X			X			X
Village of Steele City					X					X			X
Nuckolls County					X					X	X		X
Village of Hardy							X			X	X		X

Jurisdiction	Agricultural Disease	Dam Failure	Drought and Extreme Heat	Earthquakes	Flooding	Grass/Wildfire	Hazardous Materials	Levee Failure	Public Health Emergency	Severe Thunderstorms	Severe Winter Storms	Terrorism	Tornadoes and High Winds
Village of Lawrence							X			X	X		X
City of Nelson					X					X	X		X
Village of Ruskin						X	X				X		X
City of Superior		X	X		X	X	X				X		X
Saline County					X		X			X	X		X
City of Crete					X		X				X		X
Village of Dewitt					X					X	X		X
Village of Dorchester			X				X			X	X		X
City of Friend					X					X	X		X
Village of Swanton					X		X						X
Village of Tobias					X		X			X	X		X
Village of Western						X	X			X	X		X
City of Wilber							X		X	X	X	X	X
Thayer County	X		X		X	X				X	X		X
Village of Alexandria					X		X				X		X
Village of Belvidere					X					X	X		X
Village of Bruning					X		X			X	X		X
Village of Chester						X				X	X		X
Village of Davenport						X	X				X		X
City of Deshler					X		X				X		X
City of Hebron		X			X		X						X
Village of Hubbell					X					X			X
Webster County					X					X			X
City of Blue Hill						X				X			X
Village of Cowles										X			
Village of Guide Rock					X						X		X
City of Red Cloud					X						X		X
Adams Central Public Schools													X

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Jurisdiction	Agricultural Disease	Dam Failure	Drought and Extreme Heat	Earthquakes	Flooding	Grass/Wildfire	Hazardous Materials	Levee Failure	Public Health Emergency	Severe Thunderstorms	Severe Winter Storms	Terrorism	Tornadoes and High Winds
Beatrice Public Schools					X	X	X			X	X		X
Exeter Milligan Public Schools							X			X	X		X
Fillmore Central Public Schools										X	X		X
Meridian Public Schools										X	X		X
South Central Nebraska Unified School District						X	X		X	X	X	X	X
Superior Public Schools							X			X	X	X	X
Tri-County Public Schools							X			X	X	X	X
Southeast Community College – Beatrice										X	X		X
South Heartland District Health Department	X		X				X		X		X		X
Adams Fire District							X						
Barneston Fire District						X				X	X		X

As identified by the local planning teams of participating jurisdictions, top hazards of concern in the planning area from greatest concern to least concern are:

1. Tornadoes and High Winds
2. Severe Thunderstorms
3. Severe Winter Storms
4. Hazardous Materials
5. Flooding
6. Drought and Extreme Heat
7. Grass/Wildfire
8. Dam Failure
9. Agricultural Disease
10. Public Health Emergency
11. Terrorism
12. Levee Failure
13. Earthquakes

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Agricultural Plant and Animal Disease

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

The economy of the State of Nebraska is heavily vested in both livestock and crop sales. According to the Nebraska Department of Agriculture (NDA) in 2017, the market value for Nebraska of agricultural products sold was estimated at \$22 billion; this total is split between crops (estimated \$9.3 billion) and livestock (estimated \$12.7 billion). For the planning area, the market value of sold agricultural products exceeded \$2.4 billion (\$1.1 billion animal sales and \$1.2 billion crop sales).⁴⁶

The following table 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 36: Livestock Inventory

County	Market Value of 2017 Livestock Sales	Cattle and Calves	Hogs and Pigs	Poultry Egg Layers	Sheep and Lambs
Adams	\$219,119,000	66,267	10,947	365	1,297
Clay	\$198,519,000	62,013	(D)	(D)	3,770
Fillmore	\$60,450,000	24,671	24,464	372	578
Gage	\$99,627,000	32,517	470,968	1,443,351	351
Jefferson	\$105,396,000	34,658	(D)	(D)	624
Nuckolls	\$30,931,000	44,222	13,320	501	1,672
Saline	\$62,195,000	28,785	56,470	391	803
Thayer	\$98,957,000	45,056	(D)	398	888
Webster	\$270,386,000	85,546	(D)	654	3,360
Total	\$1,145,580,000	423,735	576,169	1,446,032	13,343

Source: U.S. Census of Agriculture, 2017; (D) – data not available

According to the NDA, the primary crops grown throughout the state include alfalfa, corn, sorghum, soybeans, wheat, sugar beets, dry beans, sunflowers, and chickpeas. The planning area is a mixture of pasture/grassland, crop land, and incorporated areas. The following tables provide the value and acres of land in farms in the planning area and the crops that make up the bulk of Nebraska's crop production.

⁴⁶ US Department of Agriculture, National Agricultural Statistics Server. 2020. "2017 Census of Agriculture – Nebraska." https://www.nass.usda.gov/Publications/AgCensus/2017/Full_Report/Volume_1_Chapter_2_County_Level/Nebraska/

Table 37: Land and Value of Farms in the Planning Area

County	Number of Farms	Land in Farms (acres)	Market Value of 2017 Crop Sales
Adams	545	340,016	\$173,393,000
Clay	441	319,009	\$157,532,000
Fillmore	439	329,466	\$180,495,000
Gage	1,188	538,982	\$180,546,000
Jefferson	590	358,869	\$114,177,000
Nuckolls	431	357,443	\$116,590,000
Saline	717	360,323	\$144,714,000
Thayer	414	325,649	\$128,769,000
Webster	406	328,967	\$77,466,000
Total	5,171	3,258,724	\$1,273,682,000

Source: U.S. Census of Agriculture, 2017

Table 38: Crop Values

County	Corn		Soybeans		Wheat	
	Acres Harvested	Value	Acres Harvested	Value	Acres Harvested	Value
Adams	9,455,031	\$113,534,000	5,664,225	\$53,508,000	1,060,786	\$898,000
Clay	155,125	\$106,347,000	86,633	\$50,131,000	1,197	\$195,000
Fillmore	177,074	\$116,865,000	113,624	\$61,777,000	1,872	\$278,000
Gage	193,150	\$93,059,000	197,155	\$84,214,000	5,559	\$1,075,000
Jefferson	129,239	\$62,402,000	118,018	\$48,830,000	5,483	\$1,256,000
Nuckolls	129,666	\$69,803,000	81,764	\$40,509,000	16,286	\$2,711,000
Saline	153,803	\$86,597,000	123,216	\$55,859,000	3,536	\$623,000
Thayer	128,948	\$77,748,000	95,533	\$46,642,000	6,688	\$1,452,000
Webster	80,618	\$43,217,000	59,658	\$28,019,000	17,030	\$2,684,000
Total	10,602,654	\$769,572,000	6,539,826	\$469,489,000	1,118,437	\$11,172,000

Source: U.S. Census of Agriculture, 2017

Location

Given the strong agricultural presence in the planning area, animal and plant diseases have the potential to occur in any of the nine-county planning area. If a major outbreak were to occur, the economy across the local planning area would likely be affected. Thayer County has the smallest amount of land used for agriculture and Webster County has the fewest number of agricultural farms; however, many residents work in industries closely tied to surrounding agriculture producers which could be impacted by disease outbreaks. The Planning Team did identify the US Meat Animal Research Center in Clay County near Clay Center as a specific area of concern, however, smaller outbreaks may occur in any of the rural agricultural areas of the planning area.

The primary land uses where animal and/or plant diseases will be observed include: agricultural lands; range or pasture lands; forests; and/or concentrated animal feeding operations (CAFOs). It is possible that animal or plant disease will occur in domestic animals or crops in urban areas but their impacts will be limited in scope and severity.

Historical Occurrences

Animal Disease

The NDA provides reports on diseases occurring in the planning area. There were 125 instances of animal diseases reported between January 2014 and June 2020 by the NDA. These outbreaks affected a total of 26,798 animals and impacted all nine counties.

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Table 39: Livestock Diseases Reported in the Planning Area

Disease	Year	County	Population Impacted
Anaplasmosis	2016	Adams; Clay; Gage; Saline	1;1;1;1
	2017	Clay; Jefferson	150;1
	2018	Gage	1
	2019	Fillmore; Gage	3;3
	2020	Clay; Gage	1;2
Bovine Genital Campylobacteriosis	2019	Saline	2
Bovine Viral Diarrhea	2014	Jefferson	8
	2015	Thayer	1
	2016	Gage	1
	2018	Gage; Jefferson	1;1
	2020	Jefferson	1
Brucellosis	2015	Clay	1
Caprine Arthritis/Encephalitis	2018	Clay	18
Epizootic Hemorrhagic Disease (Blue Tongue)	2014	Adams; Fillmore	1;1
	2019	Clay; Fillmore	1;1
Enzootic Bovine Leukosis	2014	Jefferson	32
	2015	Gage; Jefferson; Thayer	1;1;1
	2016	Gage; Jefferson	1;2
	2018	Gage; Jefferson; Nuckolls	2;74;1
	2019	Gage; Jefferson	1;43
	2020	Gage; Jefferson; Saline; Thayer	4;26;1;1
Leptospirosis	2014	Clay	1
	2016	Gage; Nuckolls; Webster	1;1;2
	2020	Jefferson	1
Paratuberculosis	2014	Adams; Fillmore; Gage; Jefferson; Nuckolls; Thayer	3;1;13;2;1;1
	2015	Adams; Clay; Gage	1;1;1;
	2016	Adams; Clay; Fillmore; Nuckolls; Thayer; Webster	4;1;2;1;2;2
	2017	Adams; Clay; Gage; Jefferson; Thayer; Webster	3;5;2;2;6;3
	2018	Clay; Gage; Jefferson; Nuckolls; Webster	3;12;6;1;2
	2019	Adams; Clay; Jefferson; Saline; Thayer; Webster	7;10;3;40;1;2
	2020	Adams; Clay; Gage; Jefferson; Thayer	1;3;2;1;1
Porcine Circovirus	2014	Fillmore; Jefferson; Saline	1;1;1
	2015	Saline	1
	2017	Adams	1
	2018	Saline	2
Porcine Circovirus (Type 2)	2017	Saline	1
	2018	Saline	2
Porcine Delta Coronavirus	2014	Clay; Jefferson; Webster	1;2;2
Porcine Epidemic Diarrhea	2014	Gage	2
	2015	Clay; Jefferson	1;1
	2018	Jefferson	25,001
Porcine Reproductive and Respiratory Syndrome	2014	Clay; Fillmore; Gage; Saline	1;1;15;11
	2015	Saline	1
	2016	Clay; Fillmore; Jefferson; Saline	1;1;2;8

Disease	Year	County	Population Impacted
	2017	Fillmore; Jefferson; Saline	2;17;200
	2018	Gage; Jefferson; Saline	400;9;40
	2019	Clay; Jefferson	3;3
	2020	Clay	1
Q Fever	2015	Webster	1
Seneca Valley Virus	2017	Adams; Clay; Gage; Jefferson; Saline; Thayer	1;3;1;1;1;1
Trichomoniasis	2014	Clay	1
	2015	Clay; Nuckolls	1;1
	2020	Clay	1

Source: U.S. Census of Agriculture, 2014-2020⁴⁷

Plant Disease

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

Table 40: Common Crop Diseases by Crop Type

Crop Type	Crop Disease	
Corn	Anthracnose	Southern Rust
	Bacterial Stalk Rot	Stewart's Wilt
	Common Rust	Common Smut
	Fusarium Stalk Rot	Gross's Wilt
	Fusarium Root Rot	Head Smut
	Gray Leaf Spot	Physoderma
	Maize Chlorotic Mottle Virus	
Soybeans	Anthracnose	Pot and Stem Blight
	Bacterial Blight	Purple Seed Stain
	Bean Pod Mottle	Rhizoctonia Root Rot
	Brown Spot	Sclerotinia Stem Rot
	Brown Stem Rot	Soybean Mosaic Virus
	Charcoal Rot	Soybean Rust
	Frogeye Leaf Spot	Stem Canker
	Phytophthora Root and Stem Rot	Sudden Death Syndrome
Wheat	Barley Yellow Dwarf	Leaf Rust
	Black Chaff	Tan Spot
	Crown and Root Rot	Wheat soy-borne Mosaic
	Fusarium Head Plight	Wheat Streak Mosaic
Sorghum	Ergot	Zonate Leaf Spot
	Sooty Stripe	
Trees	Burr Oak Blight	Dutch Elm Disease
	Powdery Mildew	Leaf Spot and Blight
	Canker (various types)	Root Rot
	Pine Wilt Disease	Crown Gall

In addition to the viral and bacterial diseases that could impact crops, pests can also result in crop loss or detract from crop quality. Pests present in the planning area include:

- Emerald Ash Borer (EAB)

⁴⁷ Nebraska Department of Agriculture. August 2020. "Livestock Disease Reporting." <http://www.nda.nebraska.gov/animal/reporting/index.html>.

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- Japanese Beetles
- Grasshoppers
- Western Bean Cutworm
- European Corn Borer
- Corn Rootworm
- Corn Nematodes, Bean Weevil
- Mexican Bean Beetle
- Soybean Aphids
- Rootworm Beetles

Emerald Ash Borer

The spread and presence of the Emerald Ash Borer (EAB) has become a rising concern for many Nebraskan communities in recent years. The beetle spreads through transport of infected ash trees, lumber, and firewood. All species of North American ash trees are vulnerable to infestation. Confirmed cases of EAB have been in three Canadian provinces and 35 U.S. states, primarily in the eastern, southern and midwestern regions. Nebraska's confirmed cases occurred on private land in Omaha and Greenwood in 2016 and Lancaster County in 2018.⁴⁸ Figure 15 shows the locations of Nebraska's confirmed EAB cases as of October 2020. Additional confirmed cases have likely occurred since then and many communities across the state and planning area are prioritizing the removal of ash trees to help curb potential infestations and tree mortality.

While adult beetles cause little damage, larvae damage trees by feeding on the inner bark of mature and growing trees, causing tunnels. Effects of EAB infestation include: extensive damage to trees by birds, canopy dieback, bark splitting, and water sprout growth at the tree base, and eventual tree mortality. EAB has impacted millions of trees across North America, killing young trees one to two years after infestation and mature trees three to four years after infestation.⁴⁹ Estimated economic impacts to Nebraska's 44 million ash trees exceeds \$961 million.⁵⁰ Dead or dying trees affected by EAB are also more likely to cause damage during high winds, severe Thunderstorms, or severe winter storms from weakened or hazardous limbs and can contribute a significant fuel load to grass/wildfire events. The Nebraska Forest Service estimates that across the state communities will be forced to commit over \$275 million to protect themselves from infested, publicly-owned ash trees.

Because of the Nebraska infestations, a quarantine order has been established in Cass, Dodge, Douglas, Otoe, Sarpy, Saunders, Lancaster, and Washington Counties that restricts the movement of ash trees and lumber to further mitigate the spread of EAB. In the State of Kansas, no adjacent counties to the planning area (Marshall, Washington, Republic, Jewell, and Smith) have confirmed presence of EAB.

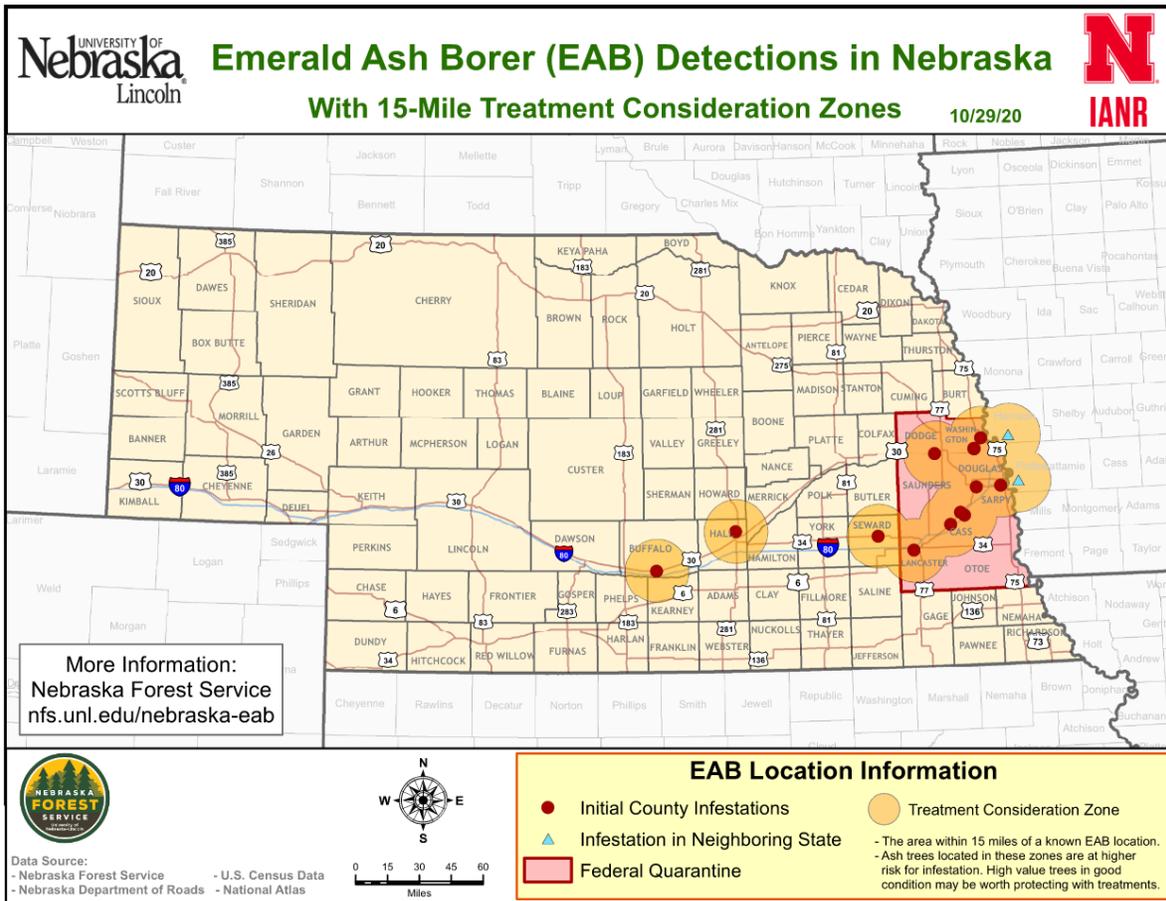
No counties in the planning area have reported confirmed cases of EAB; however, it is a rising concern in the planning area. Saline, Gage, and Adams Counties are at greatest risk of spreading EAB from neighboring counties with confirmed cases. The Nebraska Department of Agriculture and Kansas Forest Service regulate and monitor the sale and distribution of firewood in their respective states to restrict the flow of firewood from outside the state.

⁴⁸ Emerald Ash Borer Information Network. April 2018. "Emerald Ash Borer." <http://www.emeraldashborer.info/>.

⁴⁹ Arbor Day Foundation. 2015. "Emerald Ash Borer." <https://www.arborday.org/trees/health/pests/emerald-ash-borer.cfm>.

⁵⁰ Nebraska Department of Agriculture. 2019. "Emerald Ash Borer." <https://nda.nebraska.gov/plant/entomology/eab/index.html>.

Figure 15: EAB Confirmation in Nebraska



Source: NDA, 2020⁵¹

Japanese Beetles

Japanese beetles are a rising concern in the state and planning area. Japanese beetles are invasive pests found in Adams, Clay, Fillmore, Gage, Jefferson, Saline, and Thayer counties. These beetles cause damage at the larval state (root damage) and adult stage (defoliation). Chemical pesticides provide temporary protection however there are no long range protection measures.

Average Annual Losses

According to the USDA RMA (2000-2019) there have been 258 plant disease events in the planning area. The RMA does not track losses for livestock, but annual crop losses from plant disease can be estimated. The USDA RMA also does not include losses associated with ash tree mortality from EAB. With the lack of reporting and data gathering, it is hard to determine an accurate account of disease and pests that occur in livestock and plants.

⁵¹ Nebraska Department of Agriculture. October 2020. "Emerald Ash Borer." <https://nda.nebraska.gov/plant/entomology/eab/index.html>.

Table 41: Agricultural Disease Losses

Hazard Type	Number of Events	Events per Year	Total Loss	Average Annual Loss
Animal Disease	125	17.8	26,798 animals	3,828 animals/yr
Plant Disease	258	12.3	\$3,156,617	\$286,965

Source: RMA, 2000-2020; NDA, 2014-2020

Extent

There is no standard for measuring the magnitude of agricultural disease. Historically, the extent of agricultural and plant diseases has been highly localized. Given the high degree of agricultural development in the planning area, potential does exist for a widespread outbreak which could affect a large area if left unattended. Farm operations located adjacent or near one another are at risk to diseases. Fungal diseases are commonly spread via the wind while bacterial and pest-borne diseases can survive in debris from previous crop cycles. The USDA maintains the US Meat Animal Research Center in Clay County near Clay Center. This facility is a complex of laboratories and pastures that sprawls over 55 square miles. The planning team identified this facility as one possible source of risk for agricultural animal disease outbreaks. If an outbreak were to occur, the extent of the outbreak should be confined with the Research Center's property.

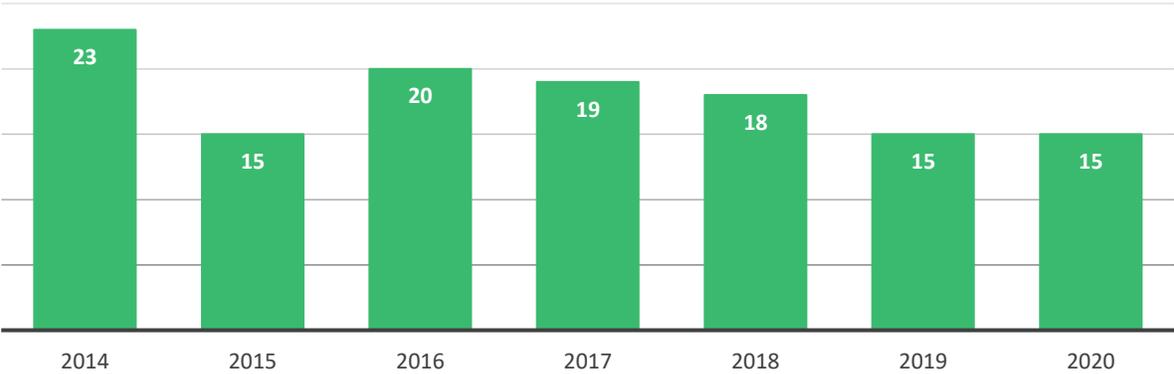
Historical events have impacted a relatively small number of livestock and/or crops in comparison to the planning area. For animal disease events, one large event impacted over 25,000 animals; however, the median impact is one animal per event. The planning area is heavily dependent on the agricultural economy. A loss in production or crop yield will lead to farm revenue, processing plant, or other agricultural facility losses, as well as local tax revenues. Rural communities are at greater economic risks. Any severe plant or animal disease outbreak which may impact this sector would negatively impact the entire planning area.

Nebraska farmers also lose a significant amount of crops each year as a result of wildlife foraging and climate change. This can be particularly problematic in areas where natural habitat has been diminished or in years where weather patterns such as early or late frost, deep snow, or drought have drastically shifted.

Probability

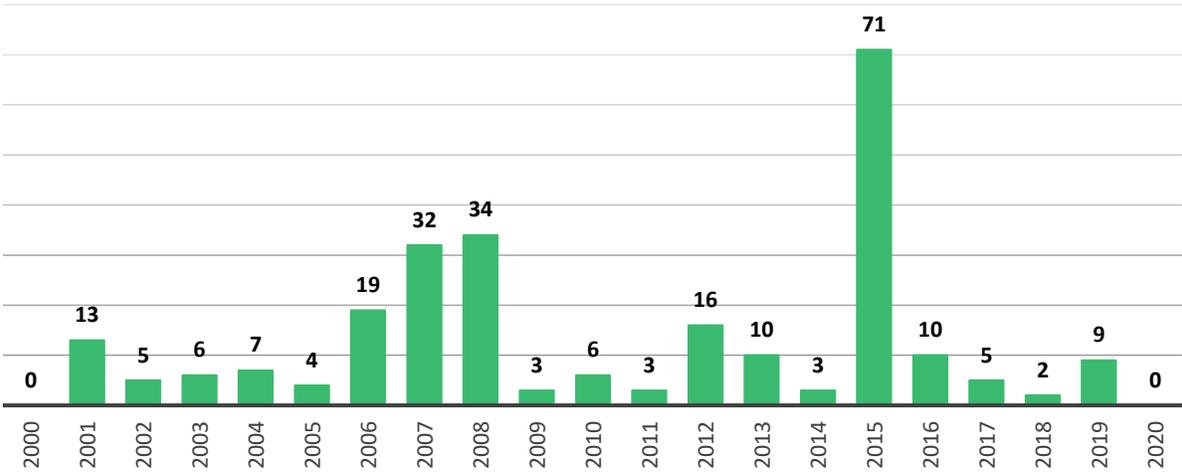
Given the historic record of occurrence for agricultural animal disease events (at least one animal disease outbreak reported in all seven years), for the purposes of this plan, the annual probability of agricultural animal disease occurrence is 100 percent. Given the historic record of occurrence for agricultural plant disease events (19 out of 21 years with a reported event), for the purposes of this plan, the annual probability of agricultural plant disease occurrence is 90%.

Figure 16: Animal Disease Events by Year



Source: NDA, 2014-2020

Figure 17: Plant Disease Events by Year



Source: RMA, 2000-2020

Community Top Hazard Status

The following table lists jurisdictions which identified Agricultural Plant and Animal Disease as a top hazard of concern:

Jurisdictions	
Little Blue NRD	Village of Glenvil
Thayer County	South Heartland District Health Department
City of Clay Center	

Regional Vulnerabilities

Given the planning area’s heavy involvement in the agriculture industry, this hazard is of particular note. The following table provides information related to regional vulnerabilities; for jurisdictional-specific vulnerabilities, refer to *Section Seven: Community Profiles*.

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Table 42: Regional Agricultural Disease Vulnerabilities

Sector	Vulnerability
People	<ul style="list-style-type: none"> -Those in direct contact with infected livestock -Potential food shortage during prolonged events -Residents in poverty if food prices increase
Economic	<ul style="list-style-type: none"> -Economic power tied to the agricultural industry -Large scale or prolonged events may impact tax revenues and local capabilities -Land values may largely drive population changes within the planning area
Built Environment	None
Infrastructure	-Transportation routes can be closed during quarantine
Critical Facilities	-None
Climate	-Changes in seasonal normals can promote spread of invasive species and agricultural disease

Dam Failure

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

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

Dams do not include:

- an obstruction in a canal used to raise or lower water;
- a fill or structure for highway or railroad use, but if such structure serves, either primarily or secondarily, additional purposes commonly associated with dams it shall be subject to review by the department;
- canals, including the diversion structure, and levees; or
- water storage or evaporation ponds regulated by the United States Nuclear Regulatory Commission.”⁵²

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

Table 43: Dam Size Classification

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

Source: NeDNR, 2013⁵³

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.

⁵² Nebraska Department of Natural Resources. “Department of Natural Resources Rules for Safety of Dam and Reservoirs.” Nebraska Administrative Code, Title 458, Chapter 1, Part 001.09.

⁵³ Nebraska Department of Natural Resources. 2013. “Classification of Dams: Dam Safety Section.” <https://dnr.nebraska.gov/sites/dnr.nebraska.gov/files/doc/damsafety/resources/Classification-Dams.pdf>.

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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

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

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

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. The EAP includes information regarding the efficiency of emergency response entities so that proper action can be taken to prevent the loss of life and property. Local emergency response entities generally included in an EAP include but are not limited to 911 Dispatch, County Sheriffs, Local Fire Departments, Emergency Management Agency Director, County Highway Department, and the National Weather Service (NWS). According to NeDNR, there are 14 high hazard dams located within the planning area.

Location

Communities or areas downstream of a dam, especially high hazard dams, are at greatest risk of property or infrastructure damage and loss of life due to dam failure. In total there are 577 dams located within the nine-county planning area.

At this time dam owners and the NeDNR have opted at this time to not include dam breach maps or inundation maps in hazard mitigation plans due to the sensitive nature of this information. Requests can be made of the dam owner or the Dam Safety Division of NeDNR to view an inundation to view an inundation map specific to a dam. Figure 18 maps the physical locations of dams in the planning area.

Table 44: Dams in the Planning Area

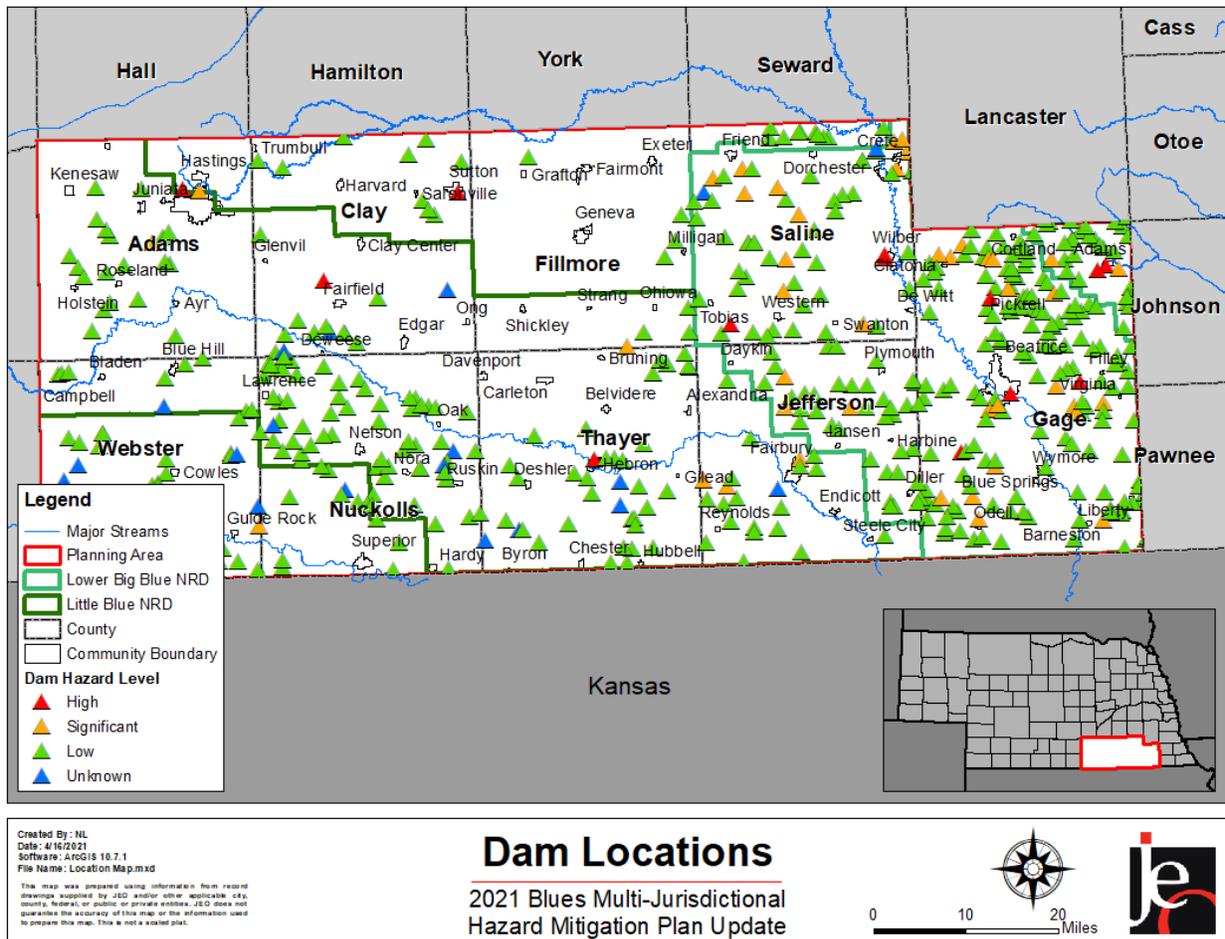
County	Minimal Hazard	Low Hazard	Significant Hazard	High Hazard	Total
Adams	1	19	4	2	26
Clay	4	20	0	2	26
Fillmore	0	8	1	0	9
Gage	3	179	19	6	207
Jefferson	1	57	7	0	65
Nuckolls	7	71	1	0	79
Saline	2	53	13	3	71
Thayer	5	34	0	1	40
Webster	9	39	6	0	54
Total	32	480	51	14	577

Source: NeDNR, 2021⁵⁴

⁵⁴ Nebraska Department of Natural Resources. 2021. "Nebraska Dam Inventory." <https://dnr.nebraska.gov/dam-safety/nebraska-dam-inventory>.

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Figure 18: Dam Locations in the Planning Area



The following table lists dams classified as “High Hazard” in the planning area.

Table 45: High Hazard Dams in the Planning Area

NID	Dam Name	Owner	Stream Name	Downstream Town
Adams County				
NE01726	Hastings Northwest Dam	UBBNRD	TR-W FK Big Blue River	Hastings
NE01551	Thirty-Two Mile Creek H	LBNRD	Thirty-Two Mile Creek	Deweese
Clay County				
NE02407	Dam 2-7-5W	City of Sutton	Tr-School Creek	Sutton
NE00703	Big Sandy Creek 20-6-7	LBNRD	Big Sandy Creek	2 Farmsteads
Gage County				
NE00914	Upper Big Nemaha 25-C (Rehab)	Nemaha NRD	Jakes Creek	Railroad
NE00993	Upper Big Nemaha 7-A	Nemaha NRD	TR-Mid BR Big Nemaha River	Adams
NE01000	Mud Creek 2-A	LBBNRD	Mud Creek	Farmstead/Us Hwy 136 (2-Lane)
NE01210	Big Indian Creek 14-B	LBBNRD	Sicity Creek	Farmstead

NID	Dam Name	Owner	Stream Name	Downstream Town
NE04779	Flowing Springs Dam	Flowing Springs Development LLC	TR-Big Blue River	Beatrice
NE00489	Little Indian Creek 15-A	LBBNRD	Possum Creek	US Hwy 77 (4-Lane Divided)
Saline County				
NE07975	Wilber Watershed Dam	Lower Big Blue Natural Resources District	TR-Big Blue River	Wilber
NE01519	Wilber Dam 1	City of Wilber	TR-Big Blue River	Wilber
NE02248	Swan Creek 20	Lower Big Blue Natural Resources District	S FK Swan Creek	Farmstead
Thayer County				
NE01576	Hebron Dam	Thayer County	TR-Little Blue River	Hebron

Source: NeDNR, 2020⁵⁵

Dams of Concern Outside the Planning Area

There are two identified dams upstream of the planning area which, in the case of failure event, would impact communities in the planning area. The Upper Big Nemaha 11-A dam in Firth Nebraska would potentially impact upper Gage County and Harlan County Dam would affect Webster County if a failure were to occur. Additionally, there are four high hazard dams in neighboring counties in Kansas to the south, two are in Jewell County and two are in Marshall County. Failure of these dams would not impact locations in the planning area.

Historical Occurrences

According to NeDNR as of December 2020, 18 dam failure events have occurred within the planning area. The following table describes dam failure events.

Table 46: High Hazard Dams in the Planning Area

NID	County	Dam Name	Hazard Class	Year of Failure	Description of Failure
NE00275	Adams	Dominy Dam 1	Low	1998E	Piping Along Conduit – Failure likely caused by corroded CMP spillway conduit. No damages reported.
NE01017	Gage	Barneston Power Plant Dam	Low	1993	Gate Washed Out – No damages reported.
NE01461	Gage	Blue Springs Power Plant Dam	Low	2004	Overtopped During Flooding – No damages reported.
NE00490	Gage	Snyder Dam 490	Low	2006E	Unknown Breach – No damages reported.
NE04758	Gage	Kapke Dam	Low	2015	Piping Along Conduit – Damages unknown, failure occurred during widespread flooding.
NE00206	Jefferson	Davis Dam 206	Low	1995E	Unknown Breach – No damages reported.

⁵⁵ Nebraska Department of Natural Resources. 2020. "Nebraska Dam Inventory." <https://dnr.nebraska.gov/dam-safety/nebraska-dam-inventory>.

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NID	County	Dam Name	Hazard Class	Year of Failure	Description of Failure
NE05530	Jefferson	Schmidt Ag Irrig Dam	Low	2019	Internal Erosion Along Conduit – No damages reported. Likely due to dispersive clay.
NE06106	Jefferson	Dowdy Dam 6106	Low	2019	Conduit Corrosion – No damages reported. Local road that ran along the crest of the dam was closed for several months.
NE01612	Nuckolls	Jones Dam 1612	Low	1988E	Unknown Breach – No damages reported.
NE00218	Nuckolls	Saul Dam	Low	1994E	Unknown Breach – Breached between 1994 and 1997. No damages reported.
NE01613	Nuckolls	Adams Dam	Low	2015E	Unknown Breach – No damages reported.
NE01499	Saline	Dudley Dam	Low	1978E	Spillway Erosion – No damages reported.
NE04436	Saline	Stehlik Dam	Low	2016	Unknown Breach – No damages reported.
NE01383	Thayer	Elting Dam	Low	2007E	Internal Erosion Along Conduit – No damages reported.
NE00453	Thayer	Fintel Dam	Low	2009E	Overtopped – Erosion over principal spillway. No damages reported.
NE06722	Thayer	Hintz Dam	Low	2015	Overtopped – minor flooding of country roads, rebuilt in 2016.
NE08657	Thayer	Dageforde Dam	Low	2019E	Conduit Corrosion – No damages reported.
NE01291	Webster	Schmidt Dam 1291	Low	2007E	Auxiliary Spillway Erosion – No damages reported.

Source: NeDNR private correspondence, 2020; E indicates year of failure is estimated

Additionally, the planning team highlighted a historical occurrence on May 10, 1982 in which a road dam failed and caused road damages in Adams and Webster County. No specific damages, injuries, fatalities, or evacuations were reported from these dam failure events. All dams are inspected on a regular basis and after area flash flood events. If problems are found during an inspection, the proper course of action is taken to ensure the structural integrity of the dam is preserved. In the event that dam failure is imminent, the EAP for the dam governs the course of action.

Average Annual Losses

Due to a 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, the LBNRD, the LBBNRD, or the NeDNR.

Extent

The extent of dam failure is indicated by its hazard classification and location. Note that hazard classification does not indicate the likelihood of a dam failure event to occur, but rather the extent of potential damages that may occur in case of a failure. Thus, the high hazard dam in the planning area would have the greatest impact if it were to fail. The NeDNR determines high hazard dam status based on numerous requirements including proximity to the nearest community. The following table outlines these distance requirements.

Table 47: High Hazard Potential Based on Proximity

Incorporated Class	Population	Location within or within given distance of jurisdictional limits of City of Village
Metropolitan Class	>300,000	3 miles
Primary Class	>100,000 up to 300,000	3 miles
First Class	>5,000 up to 100,000	2 miles
Second Class	>800 up to 5,000	1 mile
Village	100 up to 800	1 mile

Source: NeDNR Classification of Dams 2013

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 the 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 county LEOPs.

Adams County

- *Northwest Watershed Dam Adams County – owned by Adams County, City of Hastings, and Upper Blue Natural Resource District.*
- *Lake Hastings Dam – owned by City of Hastings.*

Clay County

- *Flood Control Dam Site #2-7-5w, School Creek Watershed – owned by City of Sutton. Approximately 2 to 3 percent of the population of Clay County could be affected by the failure of this dam.*

Fillmore County

- *None identified in LEOP.*

Gage County

- *Site 7-A Dam-Adams: Upper Nemaha Watershed – owned by Nemaha NRD. Inundation Area: this would affect Jakes Creek and the Middle Branch of the Big Nemaha as far as Tecumseh, Johnson County. In Gage County, the area affected would be slightly greater than the 100-year floodplain with the greatest affect on 15% of the population and the business area of Adams. Refer to the Nemaha NRD Warning and Information Plan for detailed maps. Approximately 4% of the population of Gage County could be affected by the failure of one or another of these dams.*

Jefferson County

- *None identified in LEOP.*

Nuckolls County

- *None identified in LEOP.*

Saline County

- *Wilber Detention Dam No 1 – owned by Lower Big Blue Natural Resources District.* Located at the west edge of Wilber, south of Highway 41 with a total drainage of .44 square miles. It is a rolled earth fill structure with a crest length of 542 feet, a crest width of 28 feet, and 22 feet in height above the streambed. It will store 13 acre-feet at normal pool, 85 acre-feet at spillway crest, and 127 acre-feet at maximum pool. Inundation Area: In Wilber, the area affected would be slightly greater than the 100-year floodplain with the greatest effect on an area approximately two blocks wide and 11 blocks long in the City of Wilber with 100 percent inundation.
- *Wilber Detention Dam No 2 – owned by Lower Big Blue Natural Resources District.* Located at the northwest edge of Wilber just west and north of the water tower with a total drainage of 474 acres. It is a rolled earth fill structure with a crest length of 1,020 feet and 28 feet in height above the streambed. It will store 38.1 acre-feet at normal pool, 141 acre-feet at spillway crest, and 400.5 acre-feet at maximum pool. Inundation Area: in Wilber, the area affected would be slightly greater than the 100-year floodplain with the greatest effect on an area approximately two blocks wide and 11 blocks long in the City of Wilber with 100 percent inundation.
- *Swan Creek Watershed Dam No 20 – owned by Lower Big Blue Natural Resources District.* Located 2 miles east and 2 miles south of Tobias. It is located on a tributary on the South Fork of Swan Creek. The drainage area of the dam is 4,926 acres. The basin has a total length of 5 miles and an average width of 2 miles. The topography of the area is nearly level to moderate steep and drainage patterns are well defined. Slopes along the main channel average about 37 feet per mile. The crest length is 1,760 feet; crest width is 18 feet, and 55 feet high above the streambed. It will store 340.5 acre-feet at normal pool, 1,838 acre-feet at spillway crest, and 4,277.5 acre-feet at maximum pool. Inundation Area: In Saline County the area affected would be slightly greater than the 100-year floodplain with the greatest effect upon an area approximately 0.2 mile in width and 2 miles downstream which would approach 100 percent inundation. Approximately 5% of the population of Saline County could be affected by the failure of one or another of these dams.

Thayer County

- *None identified in LEOP.*

Webster County

- *Harlan County Dam – owned by USACE.* Inundation Area: this would affect the Republican River in Webster County. The area affected would be slightly greater than the 100-year floodplain with the greatest effect on Inavale which would approach 100 percent inundation as well as Red Cloud and Guide Rock which would approach 50% inundation. Refer to the Harlan County Dam Warning and Information Plan for detailed maps.

Approximately 1% of the population of Webster County could be affected by the failure of one or another of these dams.

Probability

According to the 2021 Nebraska State Hazard Mitigation Plan and NeDNR, 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. However, dams in the state have an average age of over 44 years and many have already exceeded their original 50-year design life. There have been 13 years with a reported dam failure out of 129 years, so the probability of dam failure will be stated as ten percent annually. The NeDNR has stated that there is typically at least one dam failure in the State of Nebraska each year. According to Tim Gokie, Dam Safety Section, NeDNR: *“Large storm systems that result in regional flooding, like the widespread flood events of 2010 and 2019, often result in several dam failures. The majority of the dams that fail are small, low hazard potential dams located in rural areas where the resulting damage is mostly limited to the dam itself and the dam owners’ property. Low and minimal hazard potential dams are typically designed to safely pass either a 50-year or 100-year design flood event, so larger events will overtop the dam, which can result in dam failure. Dams that are classified as significant and high hazard potential are required to meet higher standards and failure of these dams is rare.”*

Community Top Hazard Status

The following table lists jurisdictions which identified Dam Failure as a top hazard of concern:

Jurisdictions	
Little Blue NRD	City of Hebron
Lower Big Blue NRD	City of Superior
City of Hastings	Village of Adams

Regional Vulnerabilities

According to the *Classification of Dams (2013)* developed and updated by NeDNR, *“the potential for future development must be taken into consideration when determining the hazard potential class for a dam. Any dam located in close proximity to a city or village as detailed in Table 68 must be designed to meet the requirements for a high hazard potential structure. The design requirements can be adjusted if development in the downstream breach inundation area is sufficiently curtailed due to zoning restrictions, easements, deed restrictions, or other methods of restriction acceptable to the Department.”*⁵⁶ Regional vulnerabilities to dam failure vary based on surrounding development and other flood control measures. A minor dam failure also has the potential to cause loss of life and property damage. When dams fail suddenly their contents are released at a high rate of speed, this has the potential to cause injuries, loss of life, or property damage. As communities and the region develop, considerations should be made to a variety of local vulnerabilities.

The Lower Big Blue NRD is currently in the process of developing inundation maps for high hazard dams which can be used in future land-use decisions.

⁵⁶ Nebraska Department of Natural Resources. March 2013. “Classification of Dams.” <https://dnr.nebraska.gov/sites/dnr.nebraska.gov/files/doc/dam-safety/resources/Classification-Dams.pdf>.

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The following table provides information related to regional vulnerabilities; for jurisdictional-specific vulnerabilities, refer to *Section Seven: Community Profiles*. Specifically, communities at greater risk include Adams, Hebron, Sutton, and Wilber.

Table 48: Regional Dam Failure Vulnerabilities

SECTOR	VULNERABILITY
PEOPLE	<ul style="list-style-type: none"> -Those living downstream of high hazard dams -Evacuations likely with high hazard dams; areas without established evacuation maps at greater risk -Hospitals, nursing homes, and the elderly at greater risk due to low mobility
ECONOMIC	<ul style="list-style-type: none"> -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	<ul style="list-style-type: none"> -Damage to homes and buildings
INFRASTRUCTURE	<ul style="list-style-type: none"> -Transportation routes could be closed for extended periods of time
CRITICAL FACILITIES	<ul style="list-style-type: none"> -Critical facilities in inundation areas are vulnerable to damages
CLIMATE	<ul style="list-style-type: none"> -Increased annual precipitation contributes to sustained stress on systems -Changes in water availability and supply can constrain energy production and reservoir stores

Drought and Extreme Heat

Drought is generally defined as a natural hazard that results from a substantial period of below normal precipitation. Although many erroneously consider it a rare and random event, drought is a normal, recurrent feature of climate. It occurs in virtually all climatic zones, but its characteristics vary significantly from one region to another. A drought often coexists with periods of extreme heat, which together can cause significant social stress, economic losses, and environmental degradation. Extreme heat can also be characterized by long periods of high temperatures in combination with high humidity. During these conditions, the human body has difficulty cooling through the normal method of the evaporation of perspiration. Health risks arise when a person is overexposed to heat or prolonged drought conditions. 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 a mixture of rural and moderately sized metropolitan areas, which presents an added vulnerability to extreme heat and drought events as:

- In rural areas those suffering from an extreme heat event may be farther away from medical resources;
- Drought conditions can significantly and negatively impact the agricultural economic base and numerous affiliate industries; and,
- Cities trap heat to a greater extent, exacerbating extreme heat events for residents.

Drought is a slow-onset, creeping phenomenon that can affect a wide range of people, livestock, and industries. While many impacts of these hazards are non-structural, there is the potential that during extreme heat 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 or long-term extreme heat 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.
- **Hydrological 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 of 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.

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- **Socioeconomic Drought** – occurs when the demand for an economic good exceeds supply due to a weather-related shortfall in water supply. The supply of many economic goods includes, but are not limited to: water, forage, food grains, fish, and hydroelectric power.⁵⁷

The NWS is responsible for issuing excessive heat outlooks, excessive heat watches, and excessive heat warnings.

- **Excessive heat outlooks** are issued when the potential exists for an excessive heat event in the next 3 to 7 days. Excessive heat outlooks can be utilized by public utility staffs, emergency managers, and public health officials to plan for extreme heat events.
- **Excessive heat watches** are issued when conditions are favorable for an excessive heat event in the next 24 to 72 hours.
- **Excessive heat warnings** are issued when an excessive heat event is expected in the next 36 hours. Excessive heat warnings are issued when an extreme heat event is occurring, is imminent, or has a very high probability of occurring.

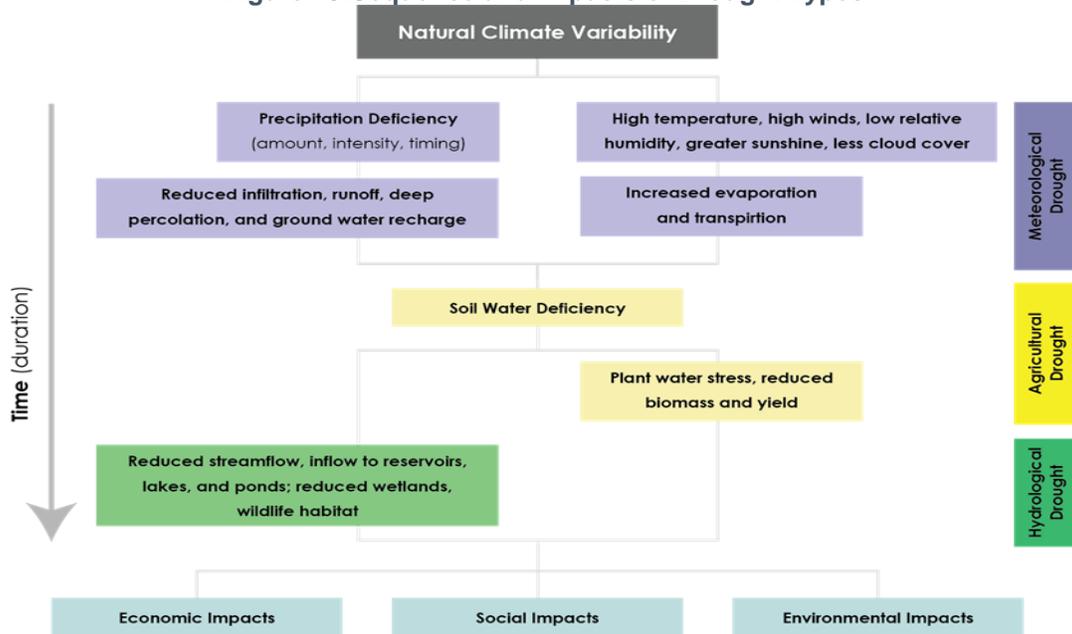
Along with humans, animals also can be affected by high temperatures, drought conditions, and humidity levels. For instance, cattle and other farm animals respond to heat by reducing feed intake, increasing their respiration rate, and increasing their body temperature. These responses assist the animal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

Additionally, government authorities report that civil disturbances and riots are more likely to occur during heat waves or when water supplies are threatened. In cities, pollution becomes a problem with high heat as 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.

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

⁵⁷ National Drought Mitigation Center. 2017. "Drought Basics." <http://drought.unl.edu/DroughtBasics.aspx>.

Figure 19: Sequence and Impacts of Drought Types



Source: National Drought Mitigation Center, University of Nebraska-Lincoln, 2017⁵⁸

Location

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

Historical Occurrences

The Palmer Drought Severity Index (PDSI) is utilized by climatologists to standardize global long-term drought analysis. The PDSI was developed in 1965 to measure dryness based on recent precipitation and temperatures. The data for the planning area was collected from NOAA’s Climate Division 8 – South Central Nebraska which includes Adams and Webster Counties and from Climate Division 9 – Southeast Nebraska which includes Clay, Fillmore, Saline, Nuckolls, Thayer, Jefferson, and Gage Counties between the years of 1895 and 2020.⁵⁹ The table below shows details of the Palmer classifications. The figures below show the data from this time period from NCEI. The negative Y axis represents a drought, for which ‘-2’ indicates a moderate drought, ‘-3’ a severe drought, and ‘-4’ an extreme drought. Major drought events occurred in the 1930s (Dust Bowl era), the 1980s and the most recent 2012 drought. The planning area has a cyclical wet and dry period.

Table 49: Palmer Drought Magnitude

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	Near Normal	-4.0 or less	Extreme Drought
0.49 to -0.49	Near Normal	--	--

Source: NCEI

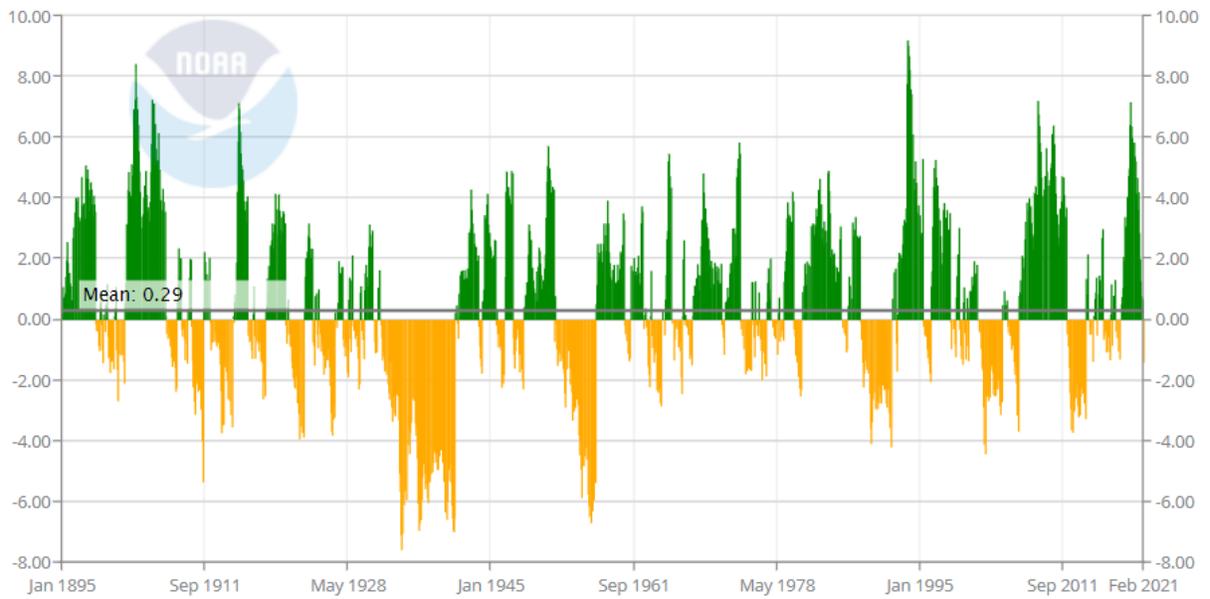
⁵⁸ National Drought Mitigation Center. 2017. “Types of Drought.” <http://drought.unl.edu/DroughtBasics/TypesofDrought.aspx>.

⁵⁹ NCEI. 2020. “Climate at a Glance: Divisional PDSI Data”. https://www.ncdc.noaa.gov/cag/divisional/time-series/2505/pdsi/all/7/1895-2021?base_prd=true&begbaseyear=1901&endbaseyear=2000

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Figure 20: Palmer Drought Severity Index – South Central

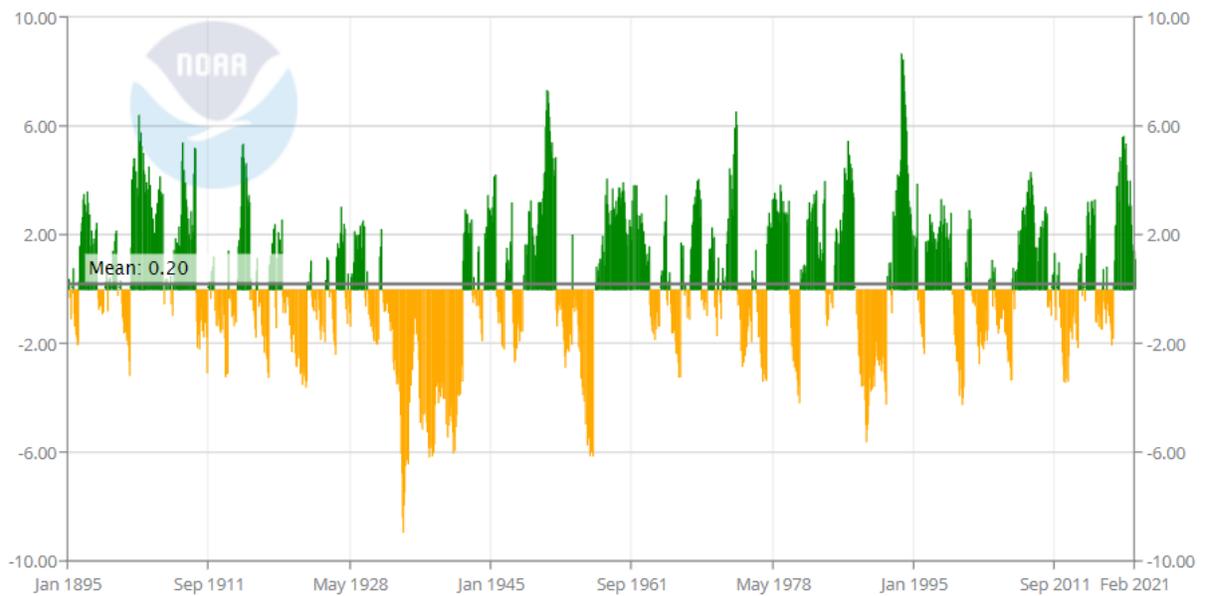
Nebraska, Climate Division 8 Palmer Drought Severity Index (PDSI)



Source: NOAA

Figure 21: Palmer Drought Severity Index – Southeast

Nebraska, Climate Division 9 Palmer Drought Severity Index (PDSI)



Source: NOAA

The following table indicates it is reasonable to expect drought to occur throughout the planning area. The planning area has experienced several ‘extreme’ drought and moderate, severe, and extreme droughts are likely in the future.

Table 50: Historic Drought Events and Probability

Drought Magnitude	Months in Drought	Percentage
-1 Magnitude (Mild)	209/1,504	13.9%
-2 Magnitude (Moderate)	108/1,504	7.2%
-3 Magnitude (Severe)	95/1,504	6.3%
-4 Magnitude or Greater (Extreme)	81/1,504	5.4%
Total Months in Drought	493/1,504	32.8%

Source: NOAA, Jan 1895-July 2020⁶⁰

Using the data from the PDSI, the planning area has exceptional droughts approximately 15 times since 1895. Some of the exceptional drought events have lasted for multiple years (1930’s, 1950’s). Other exceptional droughts occurred in the 1980’s and most recently in 2000. Severe droughts occurred in most decades dating back to the 1900’s with the exception of the 1950’s and 1990’s. Over half of all years dating back to 1895 experienced precipitation levels below what is considered the norm for the planning area.

The most recent drought of note for the planning area was in 2014 (moderate drought), per the National Climatic Data Center. Impacts from recent droughts that were reported by local planning teams include shortages of water available for irrigation, water restrictions for households, shortages of potable water from wells, decreases in water quality, and excessive wear on water pumping equipment.

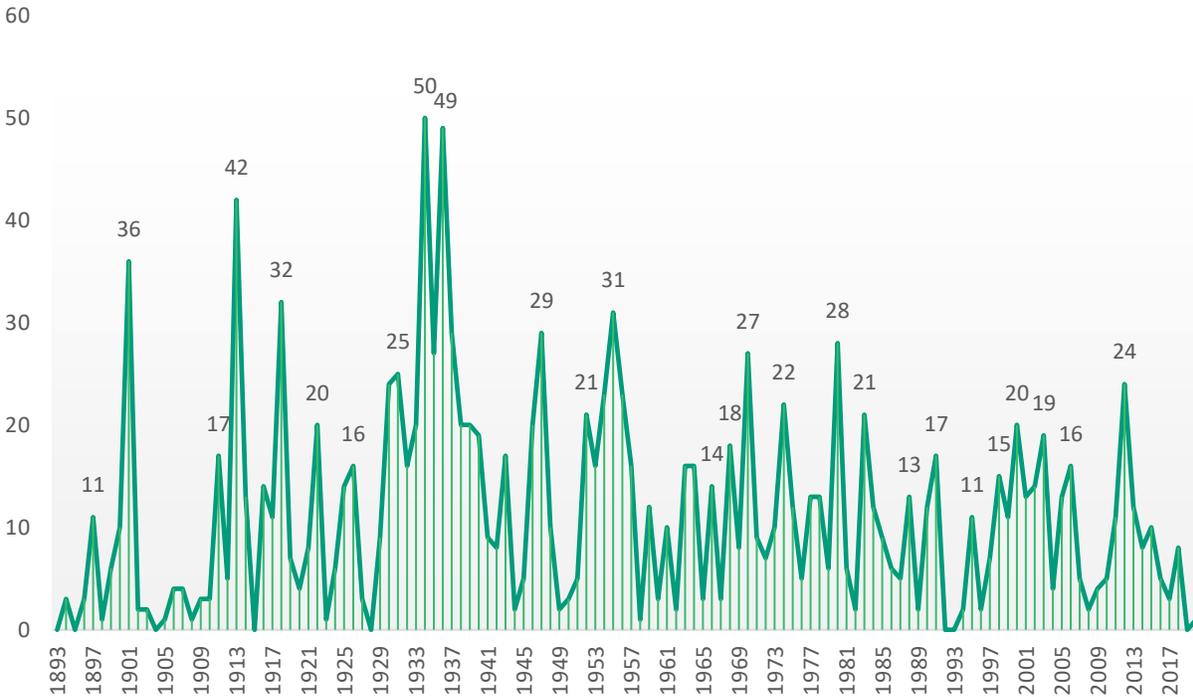
The 2012 drought event is the most recent significant event on record for the planning area; however, the overall event did not warrant a presidential disaster declaration within Nebraska. The whole state of Nebraska was in severe drought conditions from the middle of July in 2012 to the end of May in 2013 and over 70% of the state was in exceptional drought conditions for over eight months. Numerous cities implemented mandatory water restrictions, and some encouraged voluntarily water conservation during the period of drought. As many as 81 municipal water systems in the state experienced drought-related water supply issues in 2021 according to the Nebraska Department of Health and Human Services. Local planning teams reported a few impacts from the 2012 drought which were primarily lower water well levels and some communities encouraged water restrictions.

According to the High Plains Regional Climate Center (HPRCC), on average, the planning area experiences six days above 100°F per year. The planning area experienced the most days on record above 100°F in 1934 with 50 days and 1936 with 49 days. Conversely, 2020 was the most recent ‘coolest’ year on record with only one reported day above 100°F. However, this is likely attributed to a lack of reportable data.

⁶⁰ NCEI. 2020. “Climate at a Glance: Divisional PDSI Data”. https://www.ncdc.noaa.gov/cag/divisional/time-series/2505/pdsi/all/7/1895-2021?base_prd=true&begbaseyear=1901&endbaseyear=2000

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Figure 22: Number of Days above 100°F



Source: HPRCC, 2020

On average, the planning area receives approximately 29 inches of precipitation annually.⁶¹ The following figure shows average precipitation per month in the planning area. Prolonged deviations from the norm showcase drought conditions and influence growing conditions for farmers or resource management needs for local agricultural producers.

Figure 23: Average Monthly Precipitation



Source: NCEI, 2020

⁶¹ NOAA National Centers for Environmental Information. January 2020. "Data Tools: 1981-2010 Normals." [datafile]. <https://www.ncdc.noaa.gov/cdoweb/datatools/normals>.

For the purposes this plan, only reports of ‘Excessive Heat’ are analyzed from the NCEI Storm Events Database. However, several ‘Heat’ events have caused significant impacts to the planning area. Event information for significant Excessive Heat and Heat events are described below:

- **Heat – Clay and Fillmore County 6/22/2009** – *A strong upper level ridge anchored across the central U.S. allowed for hot air to build into the region, and along with surface dewpoints in the upper 60s and lower 70s, made for muggy conditions. Heat indices across the area reached into the 100 to 110 degree range on the 23rd, which lead to the deaths of approximately 4,000 head of cattle. The afternoon high temperatures reached into the mid to upper 90s, which was a change from the previous few weeks, where highs had generally been in the 70s and 80s. The cooler than normal high temperatures had prevented the cattle from properly shedding their winter coats, which aided in their overheating.*
- **Excessive Heat - Fillmore County 7/15/2011** – *July 2011 will be remembered for the heat across South Central Nebraska, with nearly the entire area averaging 3-4 degrees above 30-year normals when factoring in both the daily highs and lows. The overall hottest 10-11 day stretch of the month centered from the 14th through the 24th, as an expansive upper level high pressure ridge became dominant over the Central Plains. During this time frame, daily high temperatures were well into the 90s to near 100, with locations such as Hastings reaching at least 96 degrees six times. Factoring in high humidity, with dewpoints well into the 70s most days, afternoon heat index values across the 24-county area climbed to around 105 degrees on several afternoons, and topped out closer to 110 or higher in eastern counties such as York, Fillmore, Thayer and Nuckolls. Although the heat put a strain on area crops, including corn entering the pollination stage, significant agricultural impacts were minimized as most of South Central Nebraska received near-to-above-normal precipitation for the month*
- **Excessive Heat – Jefferson 6/22/2009** - *A period of hot and very humid conditions was observed over eastern Nebraska and southwest Iowa on June 22nd and 23rd. High temperatures on the 22nd were in the lower to mid 90s and in the mid to upper 90s on the 23rd. Overnight lows on the 23rd were in the mid to upper 70s. Dew point temperatures on the 23rd were in the mid 70s to lower 80s. The combination of the heat and humidity brought heat index values up into the 108 to 118 degree range during the afternoon of the 23rd. Since these extremely uncomfortable temperatures occurred with light winds, generally less than 10 mph, conditions became deadly for livestock, especially during the afternoon of the 23rd. It was estimated that at least 2,000 head of cattle died because of the heat in eastern Nebraska and western Iowa, most of them on the 23rd. Conditions improved a bit during the late afternoon and early evening of the 23rd when isolated thunderstorms and associated outflow brought a little cooler temperatures and increased winds.*

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. The direct and indirect effects of extreme heat and drought are difficult to quantify. Potential losses such as power outages could affect businesses, homes, and critical facilities. High demand and intense use of air conditioning or water pumps can

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overload the electrical systems and cause damage to infrastructure. The NCEI database reported \$70,400,000 in property damages and over \$268,000,000 in crop damages from drought and extreme heat. However, it is important to note that additional heat damages were reported which were the result of loss of livestock during extreme heat events.

Table 51: Drought and Extreme Heat Losses

Hazard Type	Avg. # Days over 100°F ¹	Total Property Loss ²	Average Annual Property Loss	Total Crop Loss ³	Average Annual Crop Loss
Drought	-	\$70,000,000	\$2,800,000	\$246,935,998	\$11,758,857
Extreme Heat	6 days	\$400,000	\$16,000	\$22,026,050	\$1,048,860

Source: 1 HPRCC (1893-2020), 2 NCEI (Jan 1996-April 2020), 3 USDA RMA (2000-Aug 2020)

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).

The extreme drought in 2012 significantly affected the agricultural sector across the State of Nebraska and for the planning area. 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. The Farm Credit Services reported total indemnity payments to Nebraska totaled \$1.49 billion from crop loss. Cattle ranching is a large driver of the local planning area's economy. The 2012 drought forced ranchers to cull herds by as much as 60% to cope with reduced forage production with an estimated loss of \$200 per head by taking cattle to market earlier than normal. Neighborhood plots and small organic farms up to large-scale corn and soybean productions and ranches all faced agricultural declines. Hay production was down 28%, corn was down 16%, and soybean production dropped by 21%.⁶²

Estimated Loss of Electricity

According to the FEMA Benefit Cost Analysis (BCA) Reference Guide, if an extreme heat event occurred within the planning area, the following table assumes the event could potentially cause a loss of electricity for 10 percent of the population at a cost of \$126 per person per day.⁶³ 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 52: Loss of Electricity – Assumed Damage by Jurisdiction

County	2018 (est.) Population	Population Affected (assumed 10%)	Electric Loss of Use Assumed Damage per Day
Adams	31,583	3,158	\$397,908
Clay	6,232	623	\$78,498
Fillmore	5,574	557	\$70,182
Gage	21,595	2,159	\$272,034
Jefferson	7,188	718	\$90,468

⁶² National Integrated Drought Information System, National Drought Mitigation Center, and University of Nebraska-Lincoln. 2015. "From Too Much to Too Little: how the central U.S. drought of 2012 evolved out of one of the most devastating floods on record in 2011." https://www.drought.gov/drought/sites/drought.gov.drought/files/media/reports/regional_outlooks/CentralRegion2012DroughtAssessment_1-5-15.pdf.

⁶³ Federal Emergency Management Agency. June 2009. "BCA Reference Guide."

County	2018 (est.) Population	Population Affected (assumed 10%)	Electric Loss of Use Assumed Damage per Day
Nuckolls	4,275	427	\$53,802
Saline	14,288	1,428	\$179,928
Thayer	5,098	509	\$64,134
Webster	3,571	357	\$44,982
Total	99,404	9,936	\$1,251,936

Extent

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

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

Figure 24: NOAA Heat Index Temperature (°F)



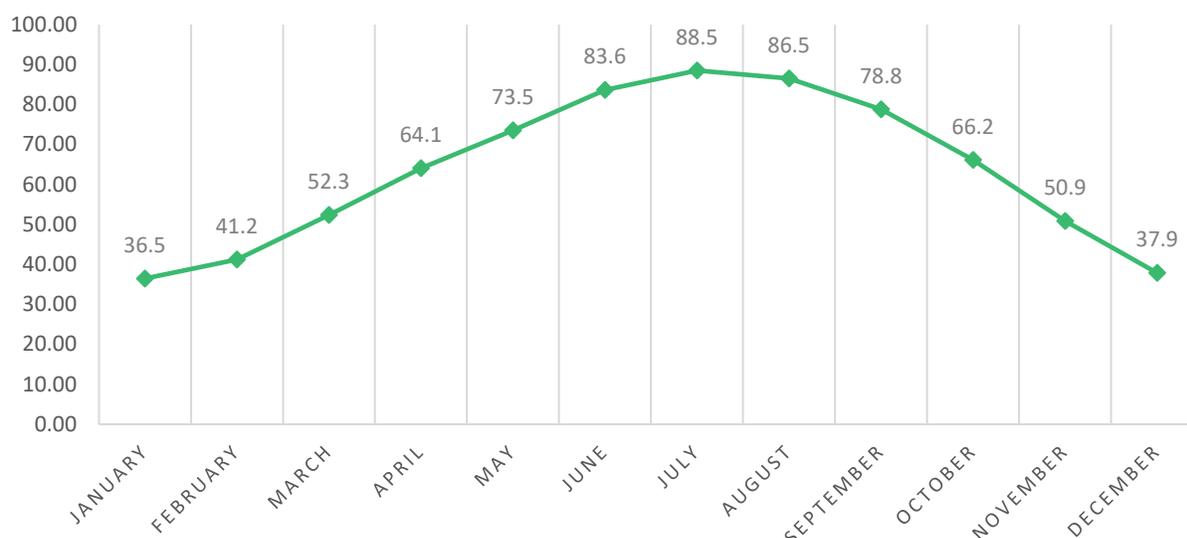
Likelihood of Heat Disorders with Prolonged Exposure or Strenuous Activity



The figure above is designed for shady and light wind conditions. Exposures to full sunshine or strong hot winds can increase hazardous conditions and raise heat index values by up to 15°F. For the purposes of this plan, extreme heat is being defined as temperatures of 100°F or greater. For the planning area the months with the highest average temperatures are June, July, and August.

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Figure 25: Monthly Climate Normals Max Temperature (1981-2010)



Source: NCEI, 2019

Overall in the planning area the most common type of drought has been mild drought (209 out of 1,504 total months) and the planning area is likely to feel mild drought most commonly in the future. The planning area also commonly experiences days which exceed 100°F annually.

Probability

Extreme heat is a regular part of the climate; with 125 years out of 128 having at least one day over 100°F. On average the planning area experiences six days over 100°F. The probability that extreme heat will occur in any given year in the planning area is 98 percent. Drought conditions are also likely to occur regularly in the planning area. The following table summarizes the magnitude of drought and monthly probability of occurrence.

Table 53: Record of Drought in the Planning Area

Drought Magnitude	Magnitude	Months in Drought	Percentage
4 or more to -0.99	No Drought	1,011/1,504	67.2%
-1 to -1.99	Mild Drought	209/1,504	13.9%
-2 to -2.99	Moderate Drought	108/1,504	7.2%
-3 to -3.99	Severe Drought	95/1,504	6.3%
-4.0 or less	Extreme Drought	81/1,504	5.4%
Total Months Likely in Drought		493/1,504 months	32.8%

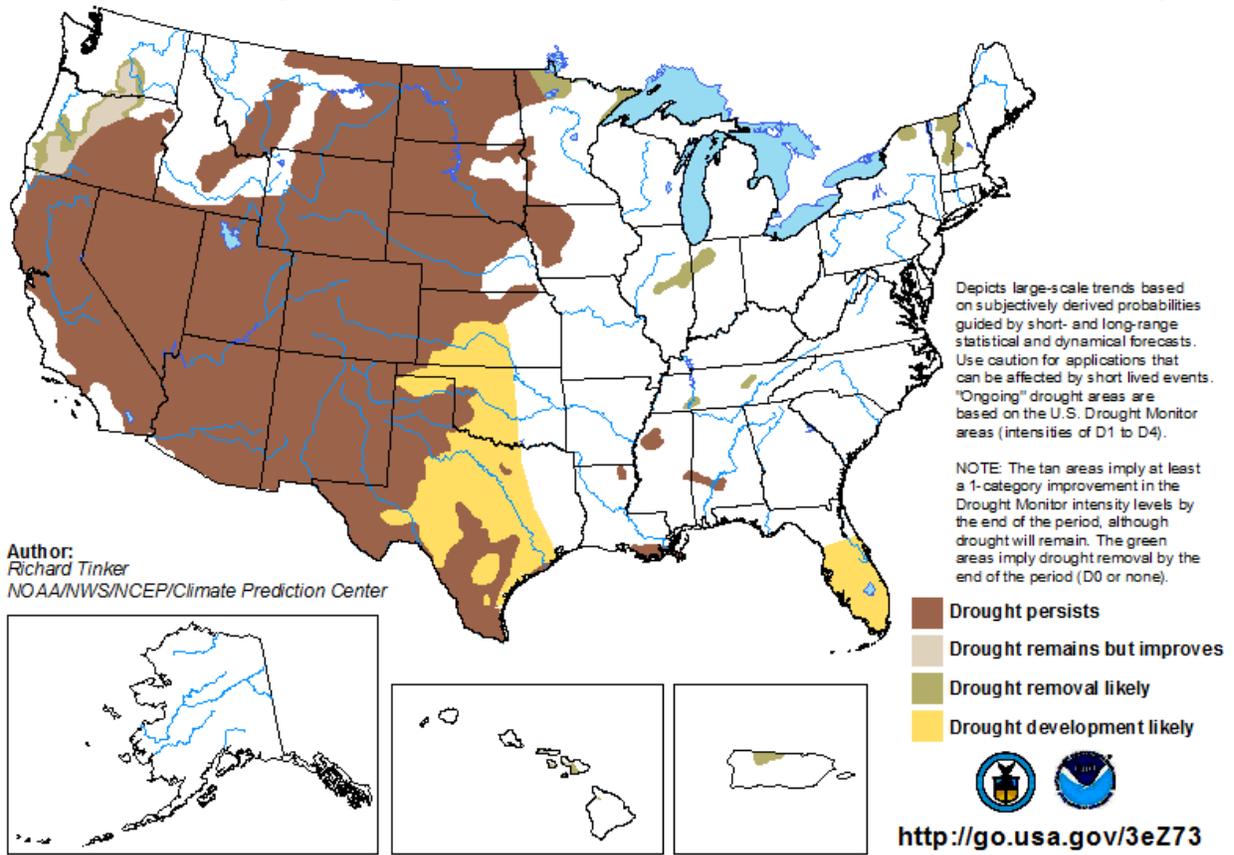
Source: NCEI, Jan 1895-July 2020

The U.S. Seasonal Drought Outlook (Figure 26) 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 drought outlook is updated consistently throughout the year and should be reviewed on an ongoing basis. The following figure provides the drought outlook from March 2021 as an example.

Figure 26: U.S. Seasonal Drought Outlook

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

Valid for February 18 - May 31, 2021
Released February 18



Source: NCEI, March 2021

The Union for Concerned Scientists released a report in July 2019 titled *Killer Heat in the United States: Climate Choices and the Future of Dangerously Hot Days*⁶⁴ which included predictions for extreme heat events in the future dependent on future climate actions. These figures show the average number of days per year above a selected heat index, or “feels like” temperature, for three different time periods: historical, midcentury, and late century. The table below summarizes those findings for the planning area. It is worth noting period of records and available data used in the following report is different than information provided by the more local HPRCC and may not be fully reflected.

⁶⁴ Union of Concerned Scientists. 2019. “Killer Heat in the United States: Climate Choices and the Future of Dangerously Hot Days.” <https://www.ucsusa.org/sites/default/files/attach/2019/07/killer-heat-analysis-full-report.pdf>.

Table 54: Extreme Heat Predictions for Days over 100F

County	Historical Average 1971-2000 (days per year)	Midcentury Prediction 2036-2065 (days per Year)	Late Century 2070-2099 (days per year)
Adams	3	30	58
Clay	4	30	58
Fillmore	5	36	63
Gage	7	41	68
Jefferson	8	41	68
Nuckolls	6	36	64
Saline	7	39	66
Thayer	6	39	66
Webster	5	36	63

Source: Union of Concerned Scientists, 1971-2000⁶⁵

Community Top Hazard Status

The following table lists jurisdictions which identified Drought and Extreme Heat as a top hazard of concern:

Jurisdictions	
Little Blue NRD	City of Wymore
Lower Big Blue NRD	Village of Dorchester
South Heartland District Health Department	Village of Juniata
Adams County	Village of Liberty
Fillmore County	Village of Milligan
Gage County	Village of Odell
Thayer County	Village of Saronville
City of Superior	Village of Shickley

Regional Vulnerabilities

As identified in Nebraska's Drought Mitigation and Response Plan, drought is a common feature of the Nebraska landscape and often causes significant economic, environmental, and social impacts. Although agriculture is the major sector affected, impacts on rural and municipal water supplies, fish and wildlife, tourism, recreation, water quality, soil erosion, the incidence of wildland fires, electricity demand, and other sectors are also significant. Also, the indirect impacts of drought on personal and business incomes, tax revenues, unemployment, and other areas are also important. In general, drought produces a complex web of impacts that ripple through many sectors of the economy. This is largely due to the dependence of so many sectors on water for producing goods and providing services.

All segments of the population are vulnerable to the effects of extreme heat, some specific groups have higher levels of vulnerability to extreme heat include the elderly (55 years and older), residents of nursing homes or care facilities, children, those isolated from social interactions, and low-income groups. Elderly residents and people living in nursing homes and care facilities have less tolerance for temperature extremes and can quickly feel the effects of extreme temperatures. Low-income elderly in urban areas and young children under the age of 5 are especially at risk and susceptible to the effects of extreme temperatures. Young children have a smaller body mass

⁶⁵ Union of Concerned Scientists. 2019. "Extreme Heat and Climate Change: Interactive Tool". <https://www.ucsusa.org/resources/killer-heat-interactive-tool>.

to surface ratio making them more vulnerable to heat-related morbidity and mortality. Children also become dehydrated more quickly than adults making for greater concern. Low-income people and families may lack resources that mitigate the impacts of extreme heat such as air conditioning. The agricultural economy, especially livestock, is highly vulnerable and at great risk during periods of extreme heat. Heat stress in feedlot cattle can cause reduced performance, and in the most severe cases, death of the animals, resulting in millions of dollars in losses to the cattle industry.

The Drought Impact Reporter is a database of drought impacts throughout the United States with data going back to 2000. The more impacts that are reported to the National Drought Mitigation Center the more severe the drought.

Some specific examples of reported drought impacts include:

- Western Governors Association talking about coping with drought's effect on agriculture (November 2014);
- Vegetable supplies short in US through Thanksgiving (November 2014);
- Large food companies buying up smaller ones in an effort to remain competitive as drought, other factors challenge profitability (June 2014);
- Great Plains winter wheat in poor shape (June 2014);
- High milk prices (April 2014);
- Turkey hunters were urged by the Nebraska Game and Parks Commission to be careful to avoid starting wildfires (April 2014); and
- Beef prices highest in US history (January 2014).

The Drought Impact Reporter has recorded a total of 40 drought-related impacts throughout the region. This is not a comprehensive list of droughts which may have impacted the planning area, but only those with reported impacts. These impacts are summarized in the following table.

Table 55: Drought Impacts in Planning Area

Category	Date	Affected Counties	Title
Water Supply & Quality	7/21/2005	Saline County, NE	Water Supply & Quality impact from Media submitted on 7/21/2005
Water Supply & Quality	7/27/2005	Adams County, NE	Water Supply & Quality impact from Media submitted on 7/27/2005
Relief, Response & Restrictions	9/30/2005	Adams County, NE, Clay County, NE, Fillmore County, NE, Gage County, NE, Jefferson County, NE, Nuckolls County, NE, Saline County, NE, Thayer County, NE, Webster County, NE	Relief, Response & Restrictions impact from Media submitted on 9/30/2005
Society & Public Health	10/14/2005	Webster County, NE	Society & Public Health impact from Media submitted on 10/14/2005

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Category	Date	Affected Counties	Title
Relief, Response & Restrictions	10/28/2005	Clay County, NE, Fillmore County, NE, Gage County, NE	Relief, Response & Restrictions impact from Government submitted on 10/28/2005
Relief, Response & Restrictions	10/28/2005	Thayer County, NE	Relief, Response & Restrictions impact from Government submitted on 10/28/2005
Relief, Response & Restrictions	11/1/2005	Adams County, NE, Nuckolls County, NE, Webster County, NE	Relief, Response & Restrictions impact from Media submitted on 11/1/2005
Relief, Response & Restrictions	11/3/2005	Clay County, NE, Fillmore County, NE, Gage County, NE, Jefferson County, NE, Saline County, NE, Thayer County, NE	Relief, Response & Restrictions impact from Media submitted on 11/3/2005
Relief, Response & Restrictions	11/17/2005	Webster County, NE	Relief, Response & Restrictions impact from Media submitted on 11/17/2005
Relief, Response & Restrictions	12/15/2005	Nuckolls County, NE, Webster County, NE	Relief, Response & Restrictions impact from Government submitted on 12/15/2005
Relief, Response & Restrictions	2/22/2006	Nuckolls County, NE, Webster County, NE	Relief, Response & Restrictions impact from Government submitted on 2/22/2006
Relief, Response & Restrictions	3/1/2006	Adams County, NE, Clay County, NE, Fillmore County, NE, Gage County, NE, Jefferson County, NE, Nuckolls County, NE, Saline County, NE, Thayer County, NE, Webster County, NE	Relief, Response & Restrictions impact from Media submitted on 3/1/2006
Relief, Response & Restrictions	7/17/2006	Adams County, NE, Clay County, NE, Nuckolls County, NE, Webster County, NE	Relief, Response & Restrictions impact from Media submitted on 7/17/2006
Water Supply & Quality	7/27/2006	Adams County, NE, Clay County, NE, Fillmore County, NE, Gage County, NE, Jefferson County, NE, Nuckolls County, NE, Saline County, NE, Thayer	Water Supply & Quality impact from Media submitted on 7/27/2006

Category	Date	Affected Counties	Title
		County, NE, Webster County, NE	
Relief, Response & Restrictions	9/28/2006	Adams County, NE, Clay County, NE, Fillmore County, NE, Gage County, NE, Jefferson County, NE, Nuckolls County, NE, Saline County, NE, Thayer County, NE	Relief, Response & Restrictions impact from Media submitted on 9/28/2006
Relief, Response & Restrictions	10/12/2006	Adams County, NE, Clay County, NE, Fillmore County, NE, Saline County, NE	Relief, Response & Restrictions impact from Media submitted on 10/12/2006
Agriculture	6/22/2009	Nuckolls County, NE	Agriculture impact from Government submitted on 6/22/2009
Agriculture	6/23/2009	Webster County, NE	Agriculture impact from Government submitted on 6/23/2009
Agriculture	7/6/2009	Nuckolls County, NE	Agriculture impact from Government submitted on 7/6/2009
Agriculture	7/6/2009	Webster County, NE	Agriculture impact from Government submitted on 7/6/2009
Agriculture	7/13/2009	Webster County, NE	Agriculture impact from Government submitted on 7/13/2009
Agriculture	9/3/2009	Webster County, NE	Agriculture impact from Government submitted on 9/3/2009
Agriculture	9/28/2009	Webster County, NE	Agriculture impact from Government submitted on 9/28/2009
Agriculture	6/4/2012	Nuckolls County, NE, Webster County, NE	Alfalfa yields down in Nuckolls and Webster counties, Nebraska
Agriculture, Relief, Response & Restrictions, Water Supply & Quality	7/20/2012	Adams County, NE, Clay County, NE, Gage County, NE, Jefferson County, NE, Nuckolls County, NE, Saline County, NE, Thayer County, NE, Webster County, NE	Low flow in several Nebraska rivers brought surface irrigation closures
Society & Public Health, Tourism & Recreation	8/22/2012	Gage County, NE, Cortland, NE,	Hot, dry conditions damage hiker/biker trails in Butler,

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Category	Date	Affected Counties	Title
			Cass, Gage, and Lancaster counties in Nebraska
Agriculture, Plants & Wildlife	12/17/2012	Adams County, NE, Clay County, NE, Nuckolls County, NE, Webster County, NE	Drought led ranchers in western Nebraska to cull cow herds by 25 to 60 percent
Agriculture, Relief, Response & Restrictions, Water Supply & Quality	4/9/2013	Nuckolls County, NE, Webster County, NE	The Nebraska Department of Natural Resources ordered that 12,000 acre-feet of water held in four federal Bureau of Reclamation reservoirs be released to honor the Republican River Compact
Agriculture, Relief, Response & Restrictions	5/17/2013	Adams County, NE, Clay County, NE, Fillmore County, NE, Gage County, NE, Jefferson County, NE, Nuckolls County, NE, Saline County, NE, Thayer County, NE, Webster County, NE	Drought-related USDA disaster declarations in 2013
Agriculture, Plants & Wildlife	8/2/2013	Saline County, NE	Lack of rain causes hay to stop growing in Saline County, Nebraska
Agriculture, Relief, Response & Restrictions, Water Supply & Quality	12/5/2013	Gage County, NE, Jefferson County, NE,	The Lower Big Blue Natural Resources District in southeastern Nebraska announced a moratorium on new wells for 180 days
Agriculture, Relief, Response & Restrictions	2/7/2014	Gage County, NE, Jefferson County, NE, Thayer County, NE, Webster County, NE	Drought-Related USDA Disaster Declarations in 2014
Fire, Relief, Response & Restrictions	2/22/2018	Adams County, NE, Clay County, NE, Fillmore County, NE, Gage County, NE, Jefferson County, NE, Nuckolls County, NE, Saline County, NE, Thayer County, NE, Webster County, NE	Nebraskans urged to leave the fireworks to the professionals
Agriculture, Business & Industry	11/28/2018	Saline County, NE, Crete, NE	Dearth of mature Christmas trees on Nebraska tree farms
Relief, Response & Restrictions,	12/12/2018	Jefferson County, NE, Thayer County, NE	Water restrictions for Nebraska communities

Category	Date	Affected Counties	Title
Water Supply & Quality			
Fire, Society & Public Health	3/27/2019	Fillmore County, NE, Gage County, NE, Jefferson County, NE, Saline County, NE, Thayer County, NE	Drought prevented agricultural burning in Kansas, Oklahoma in 2018
Agriculture	4/22/2019	Clay County, NE, Fillmore County, NE, Gage County, NE, Jefferson County, NE, Nuckolls County, NE, Saline County, NE, Thayer County, NE	Corn chopped for silage in eastern Nebraska
Agriculture, Water Supply & Quality	4/23/2019	Adams County, NE, Clay County, NE, Fillmore County, NE, Gage County, NE, Jefferson County, NE, Nuckolls County, NE, Saline County, NE, Thayer County, NE, Webster County, NE	Nebraska ranchers hauling water to livestock
Plants & Wildlife, Tourism & Recreation, Water Supply & Quality	1/27/2020	Adams County, NE, Clay County, NE, Fillmore County, NE, Nuckolls County, NE, Saline County, NE, Thayer County, NE, Webster County, NE	Nebraska's Rainwater Basin being refilled with groundwater
Plants & Wildlife, Relief, Response & Restrictions, Water Supply & Quality	1/29/2020	Adams County, NE, Clay County, NE, Fillmore County, NE, Nuckolls County, NE, Saline County, NE, Thayer County, NE, Webster County, NE	Water pumped into Nebraska's Rainwater Basin

Source: NDMC, 2000-2020

Additionally, future development and growth in the planning area would likely increase the intensity of drought impacts including increased demand on water systems and supply, increased demand on electric providers, urban heat island effects, and increased dependence on agricultural industry.

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The following table provides information related to regional vulnerabilities for drought and extreme heat. For jurisdictional-specific vulnerabilities, refer to *Section Seven: Community Profiles*.

Table 56: Regional Drought and Extreme Heat Vulnerabilities

SECTOR	VULNERABILITY
PEOPLE	<ul style="list-style-type: none"> -Insufficient water supply -Loss of jobs in agriculture sector -Residents in poverty if food prices increase -Health impacts: heat exhaustion; heat stroke; those working outdoors; people without air conditioning; young children/elderly outside or without air conditioning
ECONOMIC	<ul style="list-style-type: none"> -Closure of water intensive businesses (carwashes, pool, etc.) -short-term interruption of business -Loss of tourism dollars -Losses in crop production -Decrease in cattle prices -Decrease of land prices → jeopardizes educational funds
BUILT ENVIRONMENT	<ul style="list-style-type: none"> -Cracking of foundations (residential and commercial structures) -Damages to landscapes -Damage to air conditioning/HVAC systems if overworked
INFRASTRUCTURE	<ul style="list-style-type: none"> -Damages to waterlines below ground -Damages to roadways (prolonged extreme events) -Stressing of electrical systems (brownouts during peak usage)
CRITICAL FACILITIES	<ul style="list-style-type: none"> -Loss of power and impact on infrastructure
CLIMATE	<ul style="list-style-type: none"> -Increased risk of wildfire events, damaging buildings and agricultural land -Increases in extreme heat conditions are likely, adding stress on livestock, crops, people, and infrastructure

Earthquakes

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

Table 57: Richter Scale

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

Source: FEMA, 2016⁶⁶

Table 58: Modified Mercalli Intensity Scale

Scale	Intensity	Description of Effects	Corresponding Richter Scale Magnitude
<i>I</i>	Instrumental	Detected only on seismographs	
<i>II</i>	Feeble	Some people feel it	< 4.2
<i>III</i>	Slight	Felt by people resting, like a truck rumbling by	
<i>IV</i>	Moderate	Felt by people walking	
<i>V</i>	Slightly Strong	Sleepers awake; church bells ring	< 4.8
<i>VI</i>	Strong	Trees sway; suspended objects swing, objects fall off shelves	< 5.4
<i>VII</i>	Very Strong	Mild alarm; walls crack; plaster falls	< 6.1
<i>VII</i>	Destructive	Moving cars uncontrollable; masonry fractures, poorly constructed buildings damaged	
<i>IX</i>	Ruinous	Some houses collapse; ground cracks; pipes break open	< 6.9

⁶⁶ Federal Emergency Management Agency. 2020. "Earthquake Risk." <https://www.fema.gov/emergency-managers/risk-management/earthquake>

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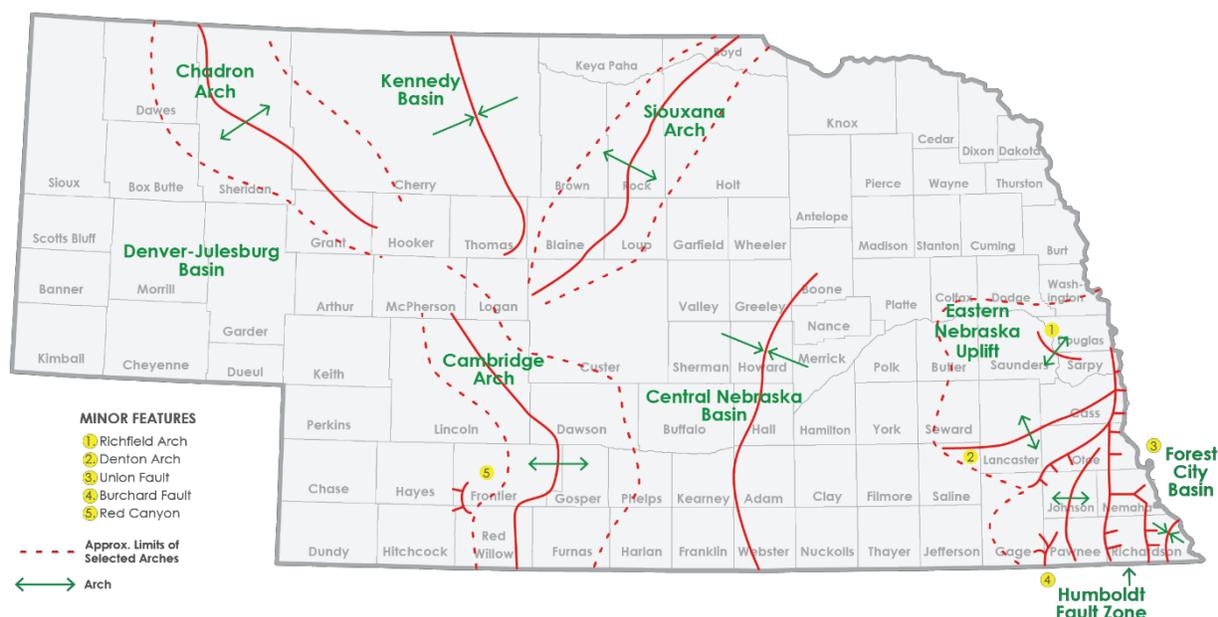
Scale	Intensity	Description of Effects	Corresponding Richter Scale Magnitude
X	Disastrous	Ground cracks profusely; many buildings destroyed; liquefaction and landslides widespread	< 7.3
XI	Very Disastrous	Most Buildings and bridges collapse; roads, railways, pipes, and cables destroyed; general triggering of other hazards	< 8.1
XII	Catastrophic	Total destruction; trees fall; ground rises and falls in waves	> 8.1

Source: FEMA, 2020

Location

The most likely locations in the planning area to experience an earthquake are near a fault line (Figure 27). Adams, Webster, Saline, and Gage Counties are most likely to experience an earthquake as they are nearest established fault lines in the state. The Central Nebraska Basin would impact Adams and Webster Counties while portions of the Eastern Nebraska Uplift and Humboldt Fault Zones could impact Saline and Gage Counties if an earthquake were to occur in Nebraska. The Humboldt Fault Zone does extend south into Kansas near the planning area.

Figure 27: Fault Lines in Nebraska



Historical Occurrences

The NCEI reported two earthquakes in the planning area during the 121 year time frame between 1900 and 2020.⁶⁷ The first event occurred on June 30, 1979 in the southwest corner of Jefferson County. This event did not produce any recorded damages. The event measured 3.3 of the Richter scale. The second event occurred on January 6, 2014 in the southeast corner of Gage

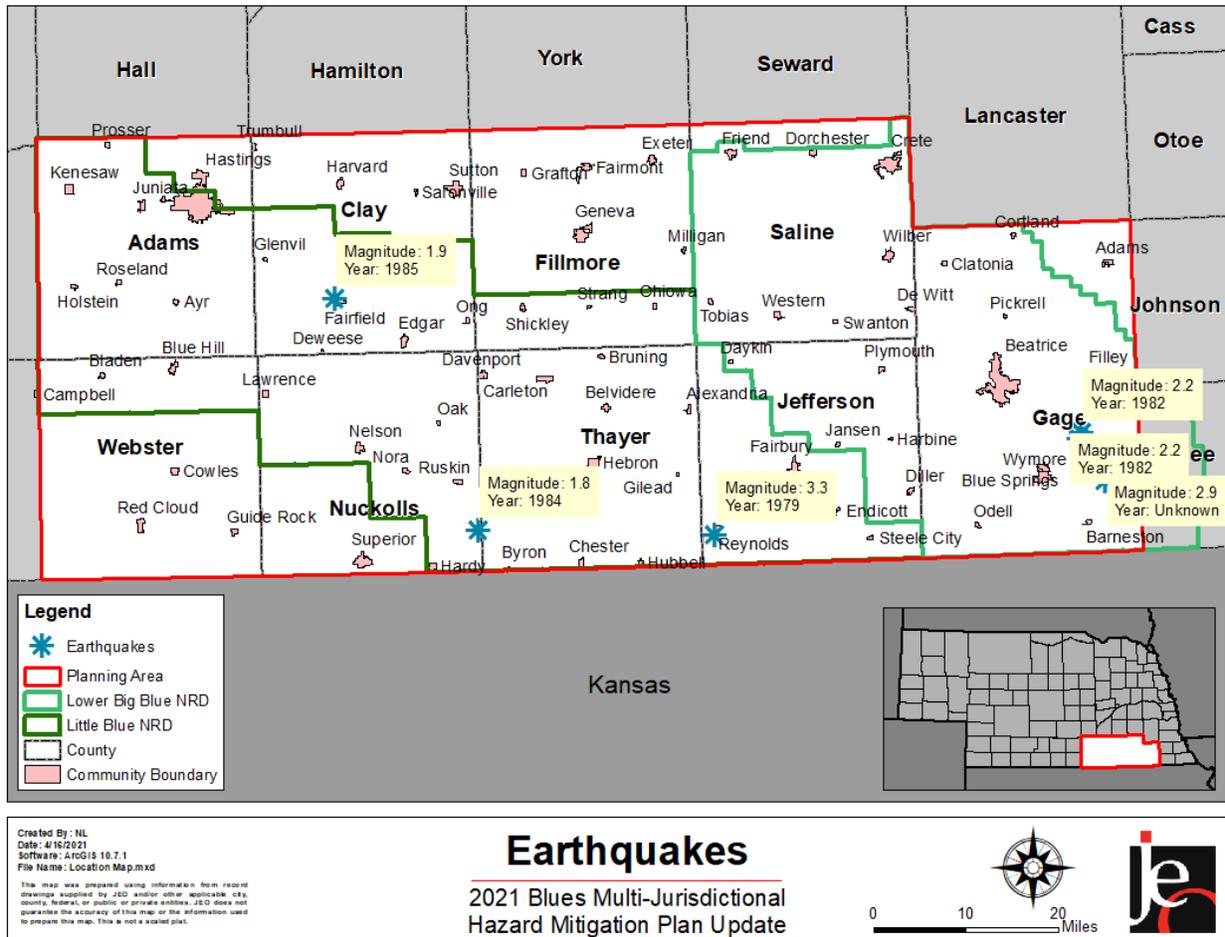
⁶⁷ United States Geological Survey. 2020. "Information by Region – Nebraska." <https://earthquake.usgs.gov/earthquakes/byregion/nebraska.php>.

County, approximately 6.2 miles east of Wymore. This event did not produce any recorded damages. The event measured 2.9 of the Richter scale.

The USDA RMA also reported indemnity crops losses since 2000 attributed to earthquakes. These totaled \$6,326 in damages. Since no other information is available for these events, the planning team used the United States Geological Survey (USGS) to indicate historical earthquake events, given its higher degree of accuracy and more available information.

The following figure displays historical occurrences of earthquakes in and around the planning area and state of Nebraska. The information displayed is from the NEIC Earthquake Search database provided by the USGS Earthquake Hazards Program.

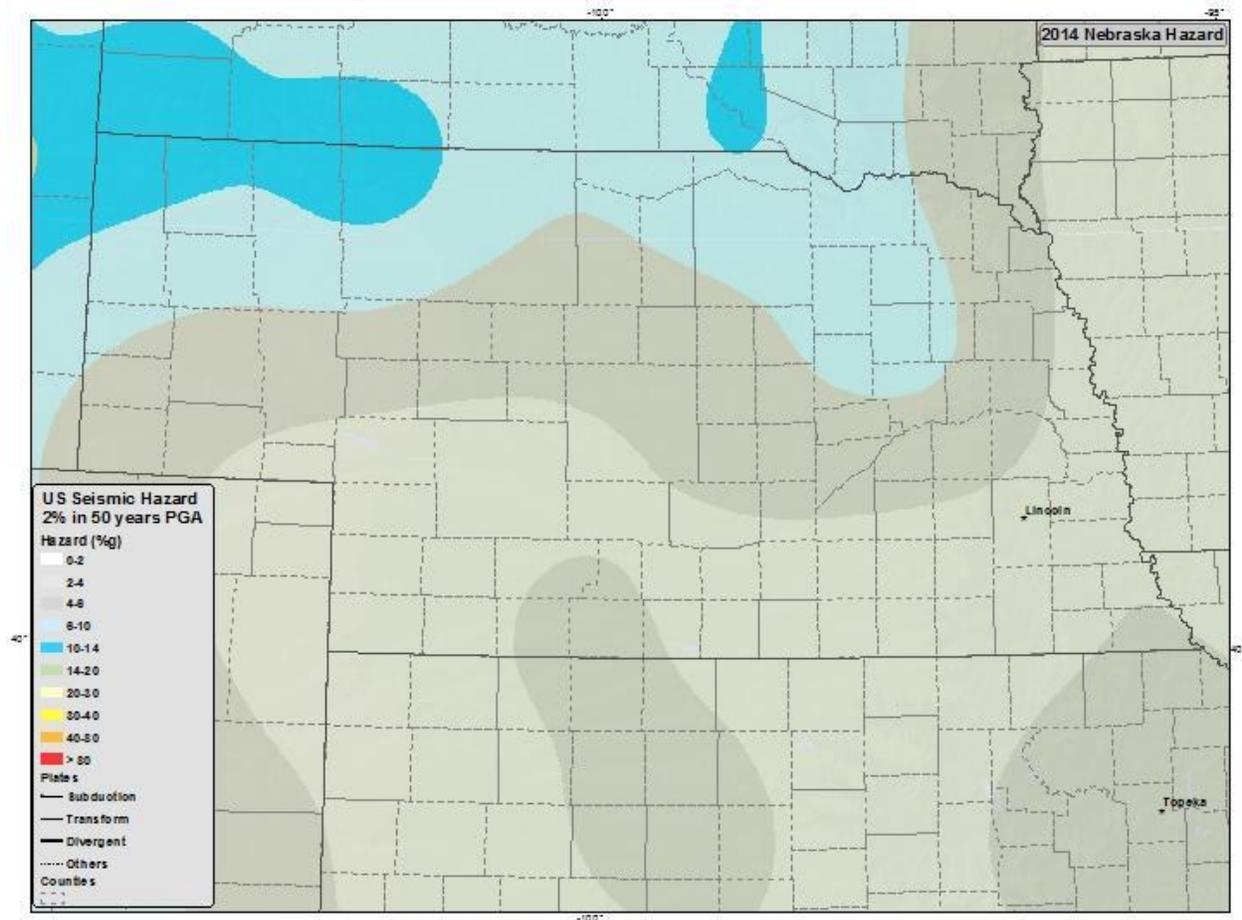
Figure 28: Earthquake Events in the Planning Area



Average Annual Losses

Neither the 1979 nor 2014 earthquakes caused damage in the planning area. Due to the lack of sufficient earthquake data, limited resources, low earthquake risk for the area, and no recorded damages, it is not feasible to utilize the ‘event damage estimate formula’ to estimate potential losses for the planning area. Figure 29 shows the State of Nebraska’s seismic hazard risk across the state. According to the USGS, the planning area has a less than 0.2 percent change of damages from earthquakes.

Figure 29: 2014 Seismic Hazard Map - Nebraska



Source: USGS, 2020⁶⁸

Extent

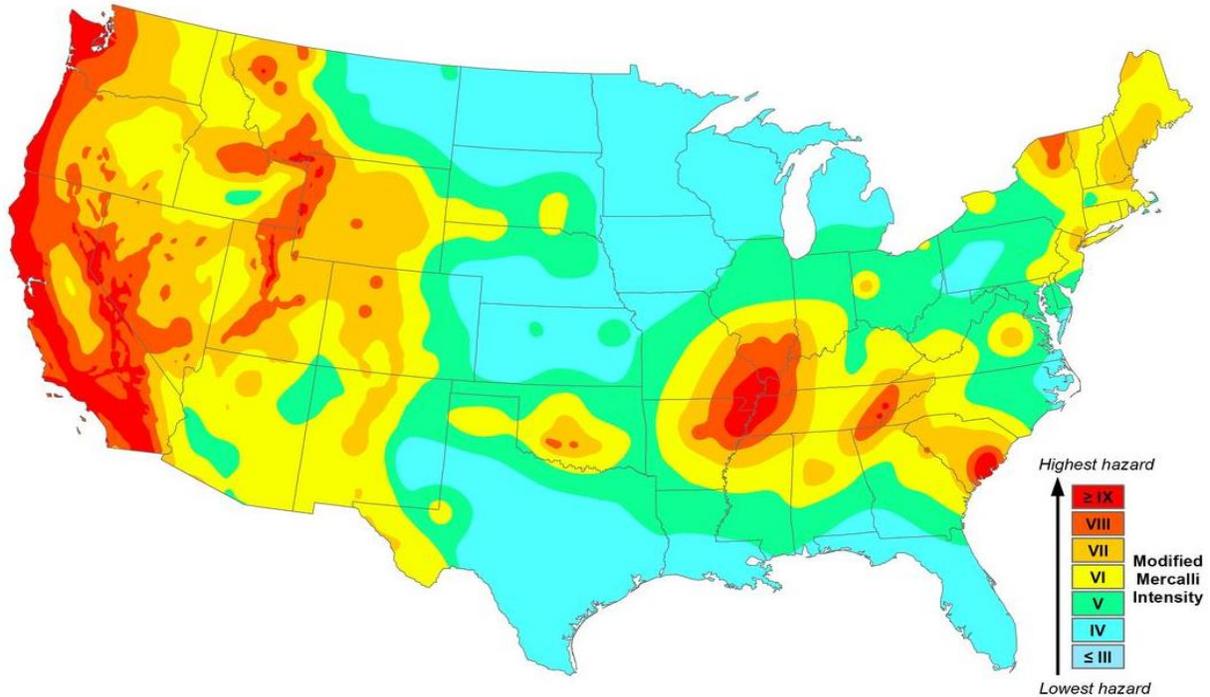
The extent of damages from earthquakes is often limited to areas near fault lines. In the planning area, the Central Nebraska Basin, which runs through Adams and Webster Counties, and the Eastern Nebraska Uplift, which may impact Saline and Gage Counties, both pose risk. The Humboldt Fault Zone, which runs through Jefferson, Gage, and Saline, is also seismically active. Based on historical record, the magnitude for earthquakes in the planning area ranges from approximately 2 to 4 on the Richter Scale.

Probability

The following figure summarizes the probability of an intense earthquake occurring in the planning area. Based on the two years with a recorded occurrence of an earthquake over a 121-year period, the probability of an earthquake in the nine-county region in any given year is approximately two percent.

⁶⁸ USGS. 2014. "2014 Seismic Hazard Map – Nebraska." Accessed September 2020. <https://www.usgs.gov/media/images/2014-seismic-hazard-map-nebraska>.

Figure 30: Earthquake Probability



USGS map showing the intensity of potential earthquake ground shaking that has a 2% chance of occurring in 50 years

Source: USGS, 2016

Community Top Hazard Status

No participating jurisdictions identified Earthquakes as a top hazard of concern.

Regional Vulnerabilities

Particularly vulnerable populations for earthquake include, but are not limited to:

- *Low income individuals*
 - Often, low income individuals and families live in lower cost homes (older homes, mobile homes) that are less able to withstand disaster.
- *Older homes and mobile homes*
 - These may not have been constructed using the most advanced building codes or have received updates and retrofits that would have increased their stability and ability to withstand seismic events. Damages resulting from the 1994 Northridge earthquake in California were disproportionately focused on low and moderate income rental housing units that were older and thus more vulnerable to seismic damages.
- *Elderly citizens*
 - Senior citizens living on a fixed income may lack the disposable income necessary to upgrade their homes to withstand seismic events. In addition, senior citizens may lack the mobility required to implement low cost mitigation measures. A 2006

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Census Bureau report found that 20-percent of the US Population age 65 and older report some level of disability.

Future development and growth would likely increase the intensity of earthquake impacts across the planning area. Future development and growth would have impacts including increased development near dams and levees; increased density in urban areas, and new structures built without reinforcements.

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

Table 59: Regional Earthquake Vulnerabilities

SECTOR	VULNERABILITY
PEOPLE	-Risk of injury or death from falling objects and structures
ECONOMIC	-Short term to long term interruption of business
BUILT ENVIRONMENT	-Damage to buildings, homes, or other structures from foundation cracking, falling objects, shattered windows, etc.
INFRASTRUCTURE	-Damage to subterranean infrastructure (i.e. waterlines, gas lines) -Damage to roadways
CRITICAL FACILITIES	-Same as other structures
CLIMATE	-None

Flooding

Flooding due to rainfall can occur on a local level, sometimes affecting only a few streets, but can also extend throughout an entire region, 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, typically more slowly developing with a moderate to long warning time, 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 are called floodplains. A floodplain or flood risk area is defined as the lowland and relatively flat area adjoining a river or stream. The terms “base flood” and “100-year flood” refer to the area in the floodplain that is subject to a one percent or greater chance of flooding in any given year. Floodplains are part of a larger entity called a basin or watershed, which is defined as all the land draining to a river and its tributaries.

Flash Flooding, including Levee or Dam Failure

Flash floods, typically rapidly developing with little to no warning time, result from convective precipitation usually due to intense thunderstorms or sudden releases due to failure of an upstream impoundment created behind a dam, landslide, or levee. Flash floods are distinguished from regular floods by a timescale of fewer than six hours. Flash floods cause the most flood-related deaths as a result of this shorter timescale. Flooding from excessive rainfall in Nebraska usually occurs between late spring and early fall.

Urban 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 capacity. 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 urban flooding, is becoming increasingly prevalent as development exceeds the capacity of drainage infrastructure, therefore limiting its ability to properly convey stormwater. Flooding also occurs due to combined storm and sanitary sewers being overwhelmed by the high flows that often accompany storm events. Typical impacts range from dangerously flooded roads to water backing into homes or basements, which damages mechanical systems and can create serious public health and safety concerns.

Ice Jam Flooding

Ice jams occur when ice breaks up in moving waterways, and then stacks on itself where channels narrow or human-made obstructions constrict the channel. This creates an ice dam, often causing flooding within minutes of the dam formation. Ice formation in streams occurs during periods of cold weather when finely divided colloidal particles called “frazil ice” form. These particles combine to form what is commonly known as “sheet ice.” This type of ice covers the entire river. The thickness of this ice sheet depends upon the degree and duration of cold weather in the area. This ice sheet can freeze to the bottom of the channel in places. During spring thaw, rivers frequently become clogged with this winter accumulation of ice. Because of relatively low stream

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banks and channels blocked with ice, rivers overtop existing banks and flow overland. This type of flooding tends to more frequently occur on wide, shallow rivers such as the Platte, although other rivers can be impacted.

Location

The major rivers in the planning area include the Republican River, the Little Blue River and its tributaries, and the Big Blue River and its tributaries. These rivers as well as smaller streams and creeks are potential locations for flooding to occur.

Table 60 shows the current status of Flood Insurance Rate Map (FIRM) panels within the study areas. Figure 34 shows flood risk hazard areas for the floodway, one percent annual chance, and 0.2 percent annual chance flood events for counties in the planning area. For jurisdictional-specific maps as well as an inventory of structures in the floodplain, please see *Section Seven: Community Profiles*. For additional details on localized flood risk such as flood zone types, please refer to the official FIRM available from FEMA’s Flood Map Service Center.

Table 60: FEMA FIRM Panel Status

Jurisdiction	Panel Numbers	Effective Date
Adams County	31001CIND0A; 31001C0025C; 31001C0040C; 31001C0050C; 31001C0070C; 31001C0075C; 31001C0100C; 31001C0110C; 31001C0125C; 31001C0135C; 31001C0139C; 31001C0150C; 31001C0157C; 31001C0160C; 31001C0175C; 31001C0176C; 31001C0180C; 31001C0200C; 31001C0210C; 31001C0225C; 31001C0250C; 31001C0255C; 31001C0265C; 31001C0275C; 31001C0300C; 31001C0325C; 31001C0350C; 31001C0375C; 31001C0400C	7/5/18
Village of Ayr	31001CIND0A; 31001C0255C; 31001C0265C; 31001C0275C	7/5/18
City of Hastings	31001CIND0A; 31001C0070C; 31001C0075C; 31001C0100C; 31001C0157C; 31001C0160C; 31001C0175C; 31001C0176C; 31001C0180C; 31001C0200C	7/5/18
Village of Holstein	31001CIND0A; 31001C0210C; 31001C0250C	7/5/18
Village of Juniata	31001CIND0A; 31001C0135C; 31001C0139C; 31001C0175C	7/5/18
Village of Kenesaw	31001CIND0A; 31001C0025C; 31001C0110C; 31001C0125C	7/5/18
Village of Prosser	31001CIND0A; 31001C0040C; 31001C0050C	7/5/18
Village of Roseland	31001CIND0A; 31001C0250C	7/5/18
Clay County	31035CIND0A; 31035C0025C; 31035C0050C; 31035C0075C; 31035C0100C; 31035C0125C; 31035C0150C; 31035C0175C; 31035C0200C; 31035C0225C; 31035C0250C; 31035C0275C; 31035C0300C; 31035C0325C; 31035C0350C; 31035C0375C; 31035C0400C; 31035C0425C; 31035C0450C; 31035C0475C; 31035C0500C	7/5/18
City of Clay Center	31035CIND0A; 31035C0200C	7/5/18
Village of Deweese	31035CIND0A; 31035C0425C	7/5/18

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Jurisdiction	Panel Numbers	Effective Date
City of Edgar	31035CIND0A; 31035C0350C; 31035C0475C	7/5/18
City of Fairfield	31035CIND0A; 31035C0300C; 31035C0325C	7/5/18
Village of Glenvil	31035CIND0A; 31035C0150C; 31035C0175C; 31035C0275C; 31035C0300C	7/5/18
City of Harvard	31035CIND0A; 31035C0075C; 31035C0200C	7/5/18
Village of Ong	31035CIND0A; 31035C0375C	7/5/18
Village of Saronville	31035CIND0A; 31035C0225C	7/5/18
City of Sutton	31035CIND0A; 31035C0100C; 31035C0125C; 31035C0225C; 31035C0250C	7/5/18
Village of Trumbull	31001CIND0A; 31035CIND0A; 31081CIND0A; 31001C0100C; 31035C0025C; 31035C0050C; 31081C0375D	7/5/18 & 8/1/2019
Fillmore County	31059CIND0A; 31059C0025B; 31059C0050B; 31059C0075B; 31059C0100B; 31059C0125B; 31059C0150B; 31059C0175B; 31059C0190B; 31059C0200B; 31059C0225B; 31059C0250B; 31059C0275B; 31059C0286B; 31059C0290B; 31059C0300B; 31059C0315B; 31059C0325B; 31059C0332B; 31059C0350B; 31059C0375B; 31059C0400B; 31059C0425B; 31059C0450B; 31059C0475B; 31059C0500B	9/16/04
Village of Exeter	31059CIND0A; 31059C0100B; 31059C0225B	9/16/04
Village of Fairmont	31059CIND0A; 31059C0075B; 31059C0200B	9/16/04
City of Geneva	31059CIND0A; 31059C0175B; 31059C0190B	9/16/04
Village of Grafton	31059CIND0A; 31059C0050B; 31059C0175B	9/16/04
Village of Milligan	31059CIND0A; 31059C0225B; 31059C0250B; 31059C0332B; 31059C0350B; 31059C0375B	9/16/04
Village of Ohiowa	31059CIND0A; 31059C0350B	9/16/04
Village of Shickley	31059CIND0A; 31059C0286B	9/16/04
Village of Strang	31059CIND0A; 31059C0315B	9/16/04
Gage County	31067CIND0B; 31067C0020C; 31067C0050C; 31067C0064C; 31067C0075C; 31067C0100C; 31067C0115C; 31067C0150C; 31067C0151C; 31067C0153C; 31067C0175C; 31067C0188C; 31067C0200C; 31067C0209C; 31067C0225C; 31067C0250C; 31067C0275C; 31067C0292C; 31067C0293C; 31067C0294C; 31067C0300C; 31067C0311C; 31067C0313C; 31067C0314C; 31067C0325C; 31067C0341C; 31067C0342C; 31067C0350C; 31067C0375C; 31067C0400C; 31067C0407C; 31067C0425C; 31067C0426C; 31067C0443C; 31067C0444C; 31067C0450C; 31067C0460C; 31067C0475C; 31067C0480C; 31067C0500C; 31067C0525C; 31067C0541C; 31067C0550C; 31067C0556C; 31067C0557C; 31067C0575C; 31067C0587D; 31067C0600C; 31067C0603C; 31067C0625C	6/18/2010 & 5/2/2016
Village of Adams	31067CIND0B; 31067C0209C	5/2/2016 & 6/18/2010
Village of Barneston	31067CIND0B; 31067C0587D	5/2/16

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Jurisdiction	Panel Numbers	Effective Date
City of Beatrice	31067CIND0B; 31067C0292C; 31067C0293C 31067C0294C; 31067C0300C; 31067C0311C; 31067C0313C; 31067C0314C; 31067C0325C; 31067C0407C; 31067C0425C; 31067C0426C; 31067C0450C	5/2/16 & 6/18/10
City of Blue Springs	31067CIND0B; 31067C0443C; 31067C0444C; 31067C0450C	5/2/16 & 6/18/10
Village of Clatonia	31067CIND0B; 31067C0151C; 31067C0153C	5/2/16 & 6/18/10
Village of Cortland	31067CIND0B; 31067C0064C; 31067C0075C; 31067C0200C	5/2/16 & 6/18/10
Village of Filley	31067CIND0B; 31067C0341C; 31067C0342C	5/2/16 & 6/18/10
Village of Liberty	31067CIND0B; 31067C0603C	5/2/16 & 6/18/10
Village of Odell	31067CIND0B; 31067C0541C	5/2/16 & 6/18/10
Village of Pickrell	31067CIND0B; 31067C0188C	5/2/16 & 6/18/10
Village of Virginia	31067CIND0B; 31067C0460C; 31067C0480C	5/2/16 & 6/18/10
City of Wymore	31067CIND0B; 31067C0443C; 31067C0444C; 31067C0450C; 31067C0556C; 31067C0557C; 31067C0575C; 31067C0600C	5/2/16 & 6/18/10
Jefferson County	31095CIND0A; 31095C0010D; 31095C0025D; 31095C0050D; 31095C0075D; 31095C0090D; 31095C0100D; 31095C0125D; 31095C0140D; 31095C0145D; 31095C0150D; 31095C0155D; 31095C0165D; 31095C0175D; 31095C0180D; 31095C0200D; 31095C0215D; 31095C0225D; 31095C0250D; 31095C0255D; 31095C0260D; 31095C0265D; 31095C0270D; 31095C0280D; 31095C0285D; 31095C0300D	8/17/2015
Village of Daykin	31095CIND0A; 31095C0010D; 31095C0025D	8/17/15
Village of Diller	31095CIND0A; 31067C0525C; 31095C0200D; 31095C0280D; 31095C0285D	8/17/2015 & 6/18/10
Village of Endicott	31095CIND0A; 31095C0255D; 31095C0265D	8/17/15
City of Fairbury	31095CIND0A; 31095C0140D; 31095C0145D; 31095C0250D	8/17/2015
Village of Harbine	31095CIND0A; 31095C0180D; 31095C0200D	8/17/15
Village of Jansen	31095CIND0A; 31095C0155D; 31095C0165D; 31095C0175D	8/17/15
Village of Plymouth	31095CIND0A; 31095C0075D; 31095C0090D; 31095C0100D	8/17/15
Village of Reynolds	31095CIND0A; 31095C0215D; 31095C0225D	8/17/15
Village of Steele City	31095CIND0A; 31095C0270D; 31095C0300D	8/17/15
Nuckolls County	31129CIND0A; 31129C0025C; 31129C0050C; 31129C0075C; 31129C0100C; 31129C0125C; 31129C0150C; 31129C0175C; 31129C0180C; 31129C0185C; 31129C0200C; 31129C0210C; 31129C0225C; 31129C0250C; 31129C0275C; 31129C0300C; 31129C0315C; 31129C0320C; 31129C0325C; 31129C0345C; 31129C0350C; 31129C0375C	12/16/04
Village of Hardy	31129CIND0A; 31129C0345C	12/16/04

Jurisdiction	Panel Numbers	Effective Date
Village of Lawrence	31129CIND0A; 31129C0025C	12/16/04
City of Nelson	31129CIND0A; 31129C0180C; 31129C0185C; 31129C0200C	12/16/04
Village of Nora	N/A	N/A
Village of Oak	31129CIND0A; 31129C0210C	
Village of Ruskin	31129CIND0A; 31129C0225C; 31129C0250C	12/16/04
City of Superior	31129CIND0A; 31129C0315C; 31129C0320C	12/16/04
Saline County	31151CIND0A; 31151C0020D; 31151C0025D; 31151C0050D; 31151C0065D; 31151C0075D; 31151C0088D; 31151C0089D; 31151C0093D; 31151C0100D; 31151C0125D; 31151C0150D; 31151C0175D; 31151C0176D; 31151C0177D; 31151C0180D; 31151C0185D; 31151C0190D; 31151C0195D; 31151C0215D; 31151C0225D; 31151C0240D; 31151C0250D; 31151C0265D; 31151C0275D; 31151C0276D; 31151C0277D; 31151C0280D; 31151C0281D; 31151C0283D; 31151C0290D; 31151C0291D; 31151C0293D; 31151C0325D; 31151C0350D; 31151C0375D; 31151C0400D	11/4/10
City of Crete	31151CIND0A; 31151C0088D; 31151C0089D; 31151C0093D; 31151C0176D; 31151C0177D; 31151C0185D	11/4/10
Village of Dewitt	31151CIND0A; 31151C0290D; 31151C0291D; 31151C0292D; 31151C0293D; 31151C0294D	11/4/10
Village of Dorchester	31151CIND0A; 31151C0065D	11/4/10
City of Friend	31151CIND0A; 31151C0020D	11/4/10
Village of Swanton	31151CIND0A; 31151C0265D	11/4/10
Village of Tobias	31151CIND0A; 31151C0215D	11/4/10
Village of Western	31151CIND0A; 31151C0240D	11/4/10
City of Wilber	31151CIND0A; 31151C0190D; 31151C0276D; 31151C0277D; 31151C0280D; 31151C0281D	11/4/10
Thayer County	31169CIND0A; 31169C0025C; 31169C0045C; 31169C0050C; 31169C0070C; 31169C0075C; 31169C0100C; 31169C0125C; 31169C0138C; 31169C0139C; 31169C0150C; 31169C0155C; 31169C0160C; 31169C0161C; 31169C0162C; 31169C0163C; 31169C0164C; 31169C0170C; 31169C0182C; 31169C0200C; 31169C0225C; 31169C0250C; 31169C0269C; 31169C0275C; 31169C0288C; 31169C0300C	9/30/04
Village of Alexandria	31169CIND0A; 31169C0100C; 31169C0182C; 31169C0200C	9/30/04
Village of Belvidere	31169CIND0A; 31169C0070C; 31169C0075C; 31169C0155C; 31169C0160C	9/30/04
Village of Bruning	31169CIND0A; 31169C0075C	9/30/04
Village of Byron	31169CIND0A; 31169C0225C; 31169C0250C	9/30/04
Village of Carleton	31169CIND0A; 31169C0045C; 31169C0050C	9/30/04
Village of Chester	31169CIND0A; 31169C0250C; 31169C0275C	9/30/04

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Jurisdiction	Panel Numbers	Effective Date
Village of Davenport	31169CIND0A; 31169C0025C	9/30/04
City of Deshler	31169CIND0A; 31169C0138C; 31169C0139C; 31169C0150C; 31169C0250C	9/30/04
Village of Gilead	31169CIND0A; 31169C0200C	9/30/04
City of Hebron	31169CIND0A; 31169C0155C; 31169C0161C; 31169C0162C; 31169C0163C; 31169C0164C; 31169C0170C	9/30/04
Village of Hubbell	31169CIND0A; 31169C0269C; 31169C0288C	9/30/04
Webster County	31181CIND0A; 31181C0025C; 31181C0030C; 31181C0050C; 31181C0055C; 31181C0075C; 31181C0100C; 31181C0125C; 31181C0150C; 31181C0165C; 31181C0175C; 31181C0200C; 31181C0210C; 31181C0225C; 31181C0235C; 31181C0250C; 31181C0275C; 31181C0280C; 31181C0300C	5/16/08
Village of Bladen	31181CIND0A; 31181C0030C	5/16/08
City of Blue Hill	31181CIND0A; 31181C0055C; 31181C0075C	5/16/08
Village of Cowles	31181CIND0A; 31181C0165C	5/16/08
Village of Guide Rock	31181CIND0A; 31181C0280C; 31181C0300C	5/16/08
City of Red Cloud	31181CIND0A; 31181C0235C; 31181C0250C; 31181C0275C	5/16/08

Source: FEMA⁶⁹

Risk Map Products

Risk Mapping, Assessment, and Planning (Risk MAP) is a FEMA program that provides communities with flood information and additional flood risk data (e.g. flood depth grids, percent chance grids, etc.) that can be used to enhance their mitigation plans and take action to better protect their citizens. As of June 2021, portions of the planning area are currently undergoing flood risk mapping activities (Figure 31).

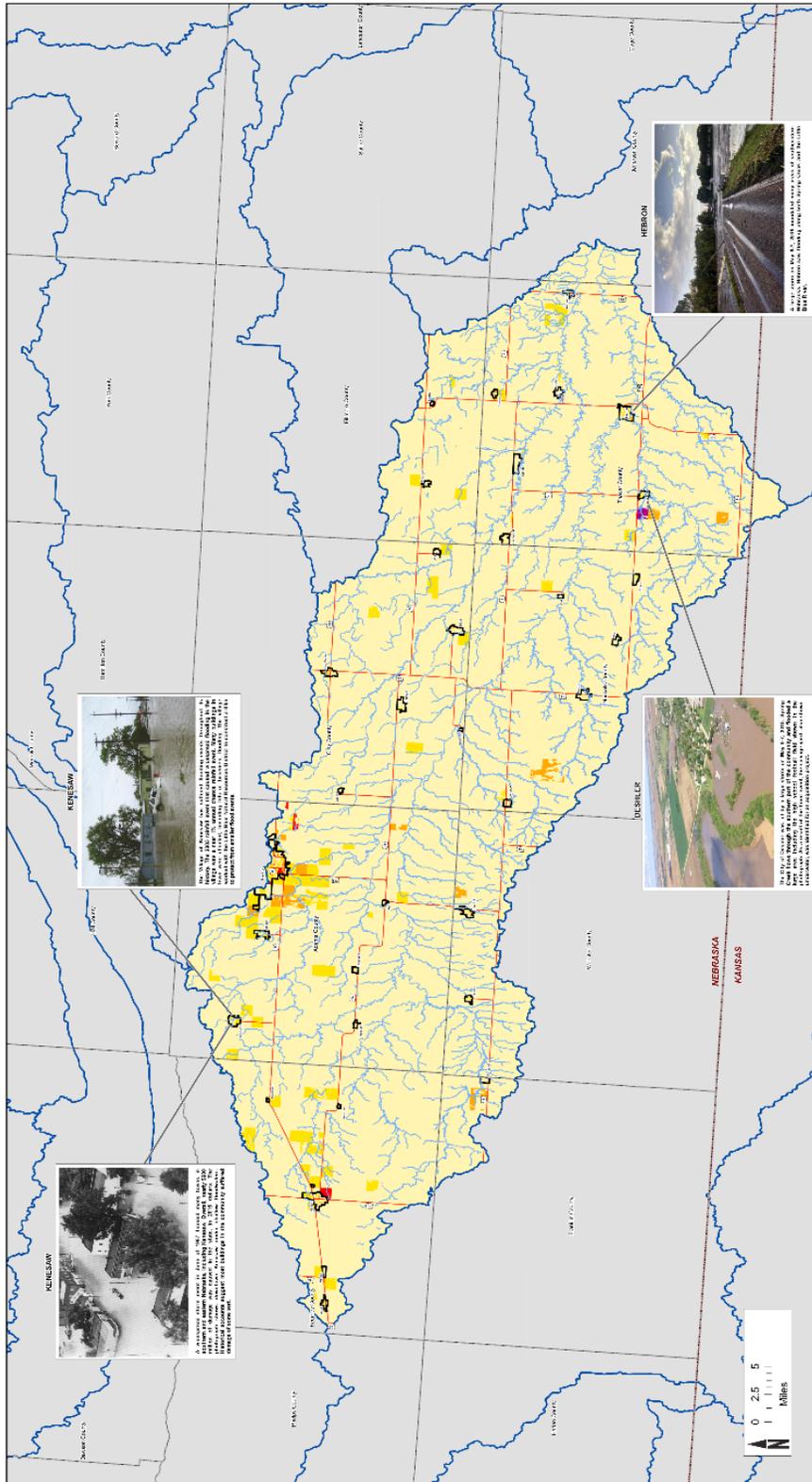
Mapping projects are planned for portions of Gage, Jefferson, and Saline Counties that lay within the Middle Big Blue watershed, as well as the portions of Saline and Fillmore counties that lay within the Turkey Creek watershed. The northeast portion of Gage County lays within the Big Nemaha watershed; base level engineering and discovery phases of the mapping project have been completed. Portions of Nuckolls and Thayer Counties lay within the Upper Little Blue watershed. Flood Risk Products have been completed for this watershed, and Flood Insurance Studies now in development.

As data becomes available, NeDNR hosts the Risk Map products on an interactive web map, which can be viewed here: <https://dnr.nebraska.gov/floodplain/interactive-maps>. This data can also be obtained from the FEMA Flood Map Service Center.

⁶⁹ Federal Emergency Management Agency. Accessed February 2021. "FEMA Flood Map Service Center." <http://msc.fema.gov/portal/advanceSearch> .

Figure 32: Upper Little Blue Watershed Flood Risk Map

Flood Risk Map: Upper Little Blue Watershed



MAP SYMBOLS

Base Data	Flood Data	Flood Risk	Areas of Mitigation Interest
<ul style="list-style-type: none"> County Limits Major Roads Interstates Waterway Boundary State Boundary 	<ul style="list-style-type: none"> Rivers and Streams Recreational Areas New SFLRA Coastal Surge Fill/Retreat Area 	<ul style="list-style-type: none"> Very Low Low Medium High Very High 	<ul style="list-style-type: none"> Areas of Interest for FEMA's Risk Assessment: Major Losses Significant Land Use Changes within the next 5 years and Areas at Risk from Hurricanes or Coastal Erosion Non-Residential Losses Threats Coastal Structures Street Floor Obstructions Heat Cams Hot Spots Efficient Mills Other Flood Risk Areas Areas of Mitigation Success Other

Risk Mapping, Assessment, and Planning (Risk MAP)

FRM FLOOD RISK MAP

UPPER LITTLE BLUE WATERSHED

FEMA

MAP DATE: 10/27/2016
RELEASE DATE: 3/15/2016

For more information of data used by the FRM, please contact the FRM team at frmap@fema.gov or call 1-800-453-3346.

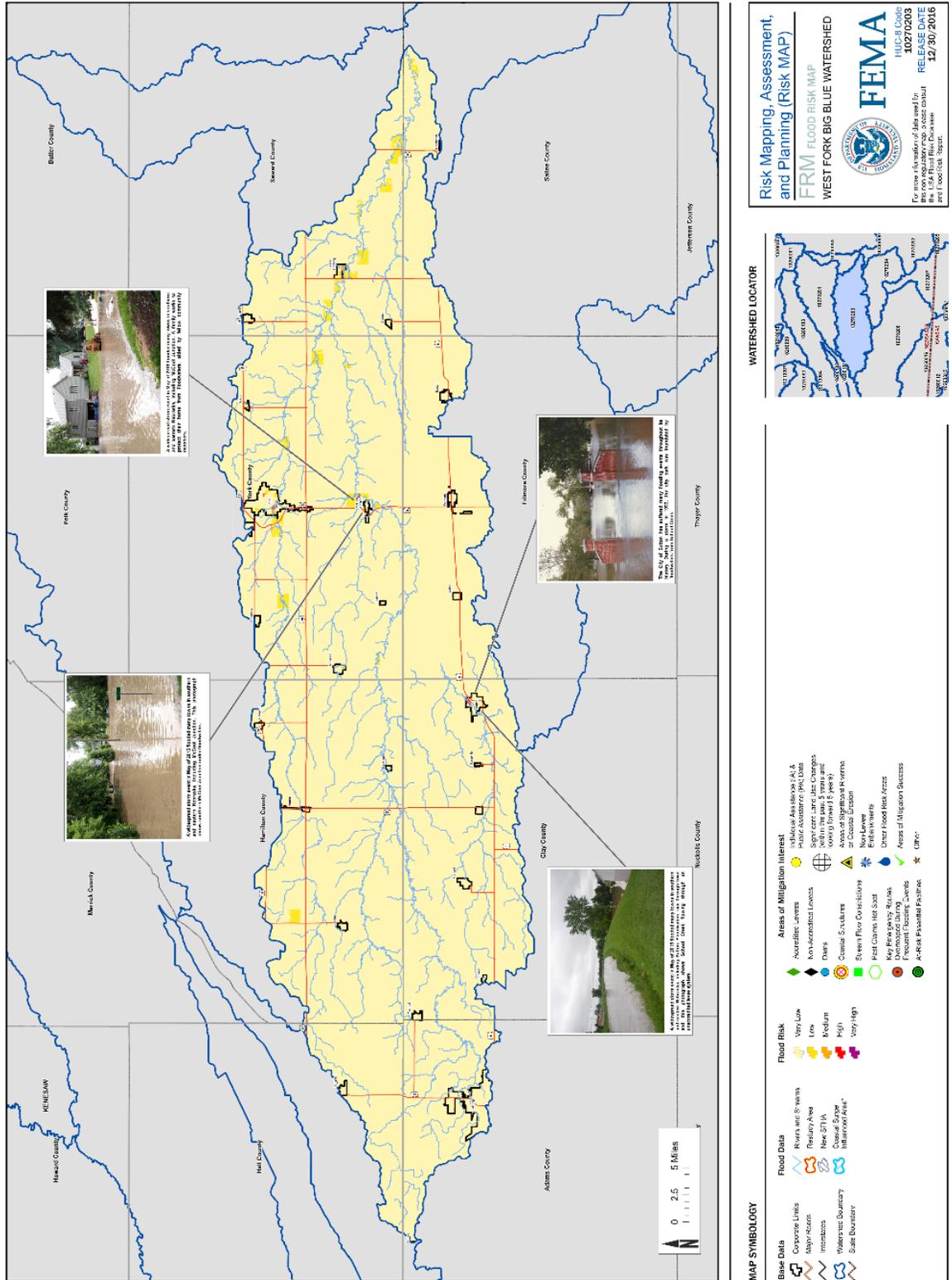
WATERSHED LOCATOR

Source: FEMA Flood Map Service Center⁷⁰

⁷⁰ FEMA. 2021. "Flood Map Service Center." https://map1.msc.fema.gov/data/FRP/FRM_10270206_20160318.pdf?LOC=881937312b05065fccb72d0409f2a57f.

Figure 33: West Fork Big Blue Watershed Flood Risk Map

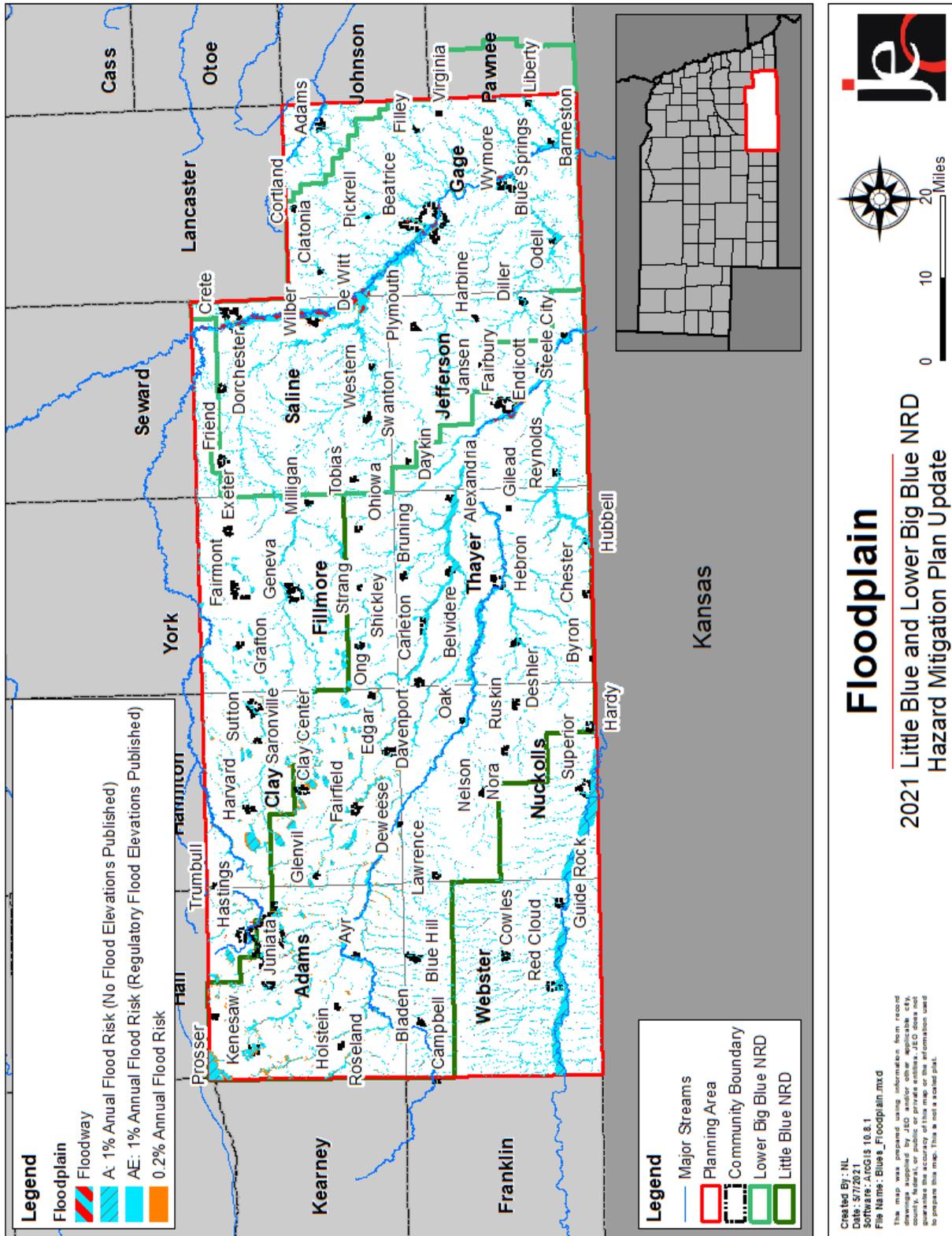
Flood Risk Map: West Fork Big Blue Watershed



Source: FEMA Flood Map Service Center⁷¹

⁷¹ FEMA. 2021. "Flood Map Service Center." https://map1.msc.fema.gov/data/FRP/FRM_10270203_20161230.pdf?LOC=4c79b50ac3f3a3a01c88cc36c488a399

Figure 34: Flood Risk Hazard Areas



Other regulatory products reviewed and utilized in this planning process include Letter of Map Amendments (LOMAs), Letter of Map Revisions (LOMR), and Flood Insurance Studies (FIS) as available and applicable for each of the nine counties in the planning area. Specific LOMAs as identified in the planning process are described in their appropriate community profiles in *Section Seven*.

Historical Occurrences

The NCEI reports events as they occur in each community. A single flooding 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 flood event covering a large portion of the planning area could be reported by the NCEI as several events. According to the NCEI, 112 flash flooding events resulted in \$21,010,000 in property damage, while 122 riverine flooding events caused \$117,270,900 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 \$2,408,030.

During the 2015 HMP planning process, the planning area experienced one of the largest flooding events in its history. Severe storms and flooding events resulted in presidential disaster declarations for Gage, Jefferson, Saline, and Thayer Counties. These events occurred intermittently between May 6, 2015 and June 17, 2015. Communities impacted by these events, including Hebron, Deshler, Roseland DeWitt and Fairbury, saw hundreds of residents evacuate to avoid danger. One elderly woman drowned in Fairbury. The town of Crete saw 8.10 inches of rain fall in 24 hours. Salt Creek and the Little Blue River were reported to be at flood stage at several points in the area. The following are pictures documenting some of the flood damages from this event.

Figure 35: 2015 Flooding in Deshler



Figure 36: 2015 Flooding in Hebron (1st and Lincoln Ave)



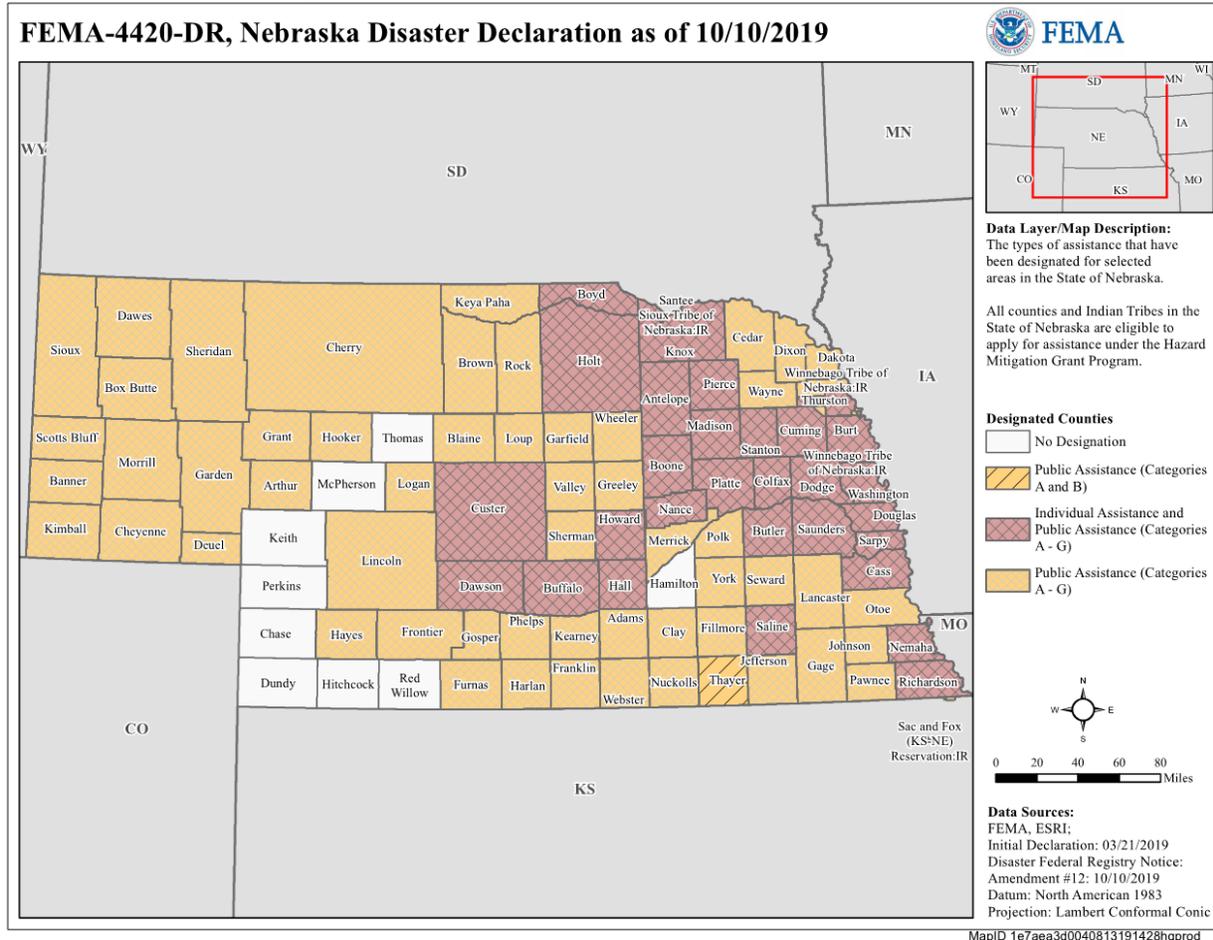
Figure 37: 2015 Flooding in DeWitt



March 2019 Flood Event

The March 2019 flood event was a major flood event in the state which impacted most areas. Fortunately the planning area did not experience direct impacts from the catastrophic flooding on the eastern edge of the state. However, each of the nine counties applied for some form of disaster assistance due to subsequent impacts. In total, 104 cities, 81 counties, and 5 tribal nations in Nebraska received State or Federal Disaster Declarations due to the flood events.

Figure 38: Nebraska Disaster Declaration, March 2019



The NeDNR has collected and reviewed extensive data records from the flood event. An event-wide storymap has been developed and provides an excellent resource to understand the cause, duration, impacts, and recovery efforts from this event. The storymap can be viewed at: <https://storymaps.arcgis.com/stories/9ce70c78f5a44813a326d20035cab95a>.

Impacts from this event included significant damage to homes, commercial buildings, agriculture, bridges, and roads. Agriculturally, hundreds of acres of pastureland and fields were destroyed by several inches to feet of sand and silt left behind by receding flood waters. The flooding event also occurred in the midst of calving season, resulting in the loss of hundreds of calves for ranchers across the state. Roads, bridges, and critical transportation routes across the state were blocked by flood waters or washed out entirely. At least three fatalities occurred during the flood event while the Nebraska National Guard performed dozens of rescues in inundated areas. No fatalities were reported within the nine-county planning area during this event.

In total, the U.S. Army Corps of Engineers reported 41 breaches to federal and non-federal levees across the state of Nebraska. The failure of these structures significantly impacted subsequent flooding in neighboring communities. No levee breaches occurred in the planning area during this event. Community specific impacts reported by affected communities are included in *Section Seven: Community Profiles* as appropriate.

Average Annual Losses

The average damage per event estimate was determined based upon the 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. Flooding caused a total average of \$5,531,236 in property damages and \$2,408,030 in crop losses per year for the planning area.

Table 61: Flooding Losses

Hazard Type	# of Events ¹	Average # events per year	Total Property Loss ¹	Average Annual Property Loss	Total Crop Loss ²	Average Annual Crop Loss
Flash Flood	112	4.5	\$21,010,000	\$840,400	\$2,408,030	\$114,668
Flood	122	4.9	\$117,270,900	\$4,690,836		
Total	234	9.36	\$138,280,900	\$5,531,236	\$2,408,030	\$114,668

Source: 1 NCEI (1996-April 2020), 2 USDA RMA (2000-Aug 2020)

Extent

The NWS has three categories to define the typical severity of a flood once a river reaches flood stage as indicated in Table 62. Actual impacts will vary by community.

Table 62: Flooding Stages

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

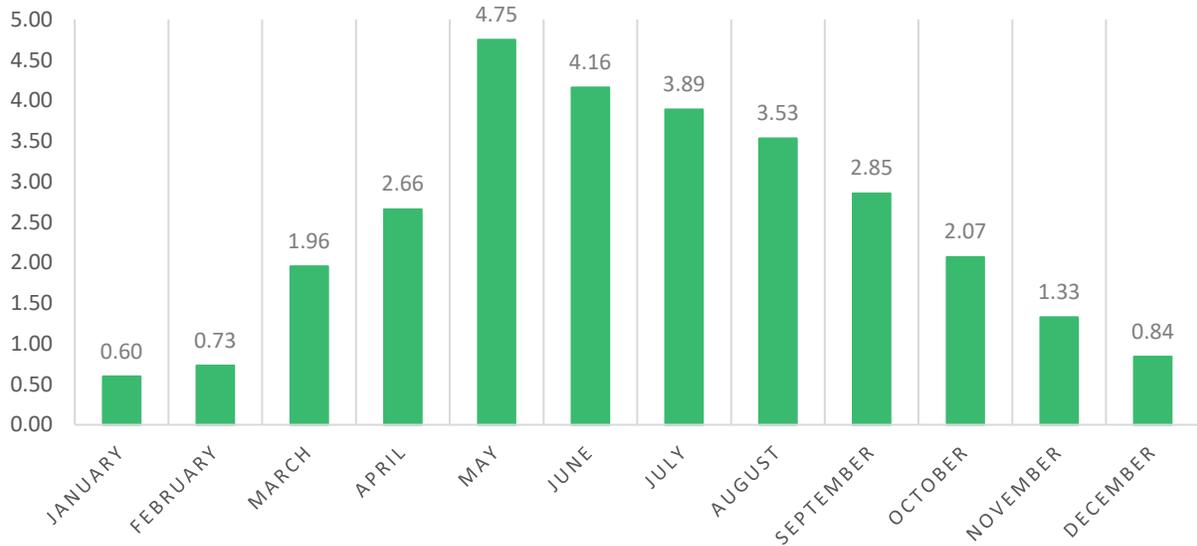
Source: NOAA, 2017⁷²

The following figure 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 39, the most common month for flooding within the planning area is in May. The planning area is likely to experience minor to moderate flooding regularly.

⁷² National Weather Service. 2017. "Flood Safety." <http://www.floodsafety.noaa.gov/index.shtml>.

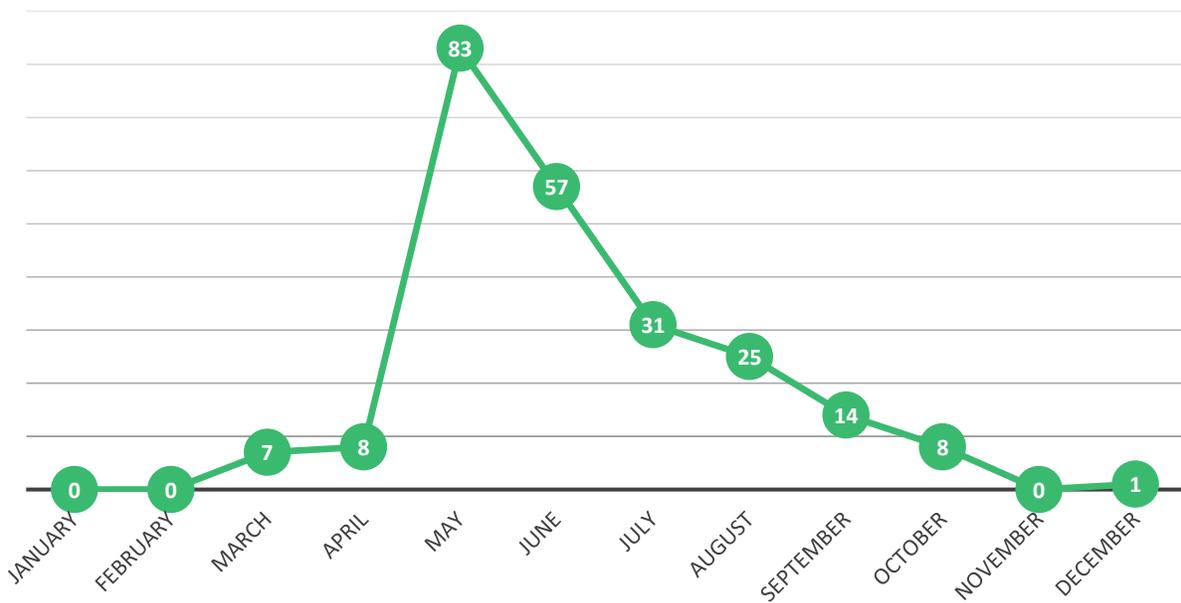
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Figure 39: Average Monthly Precipitation



Source: NCEI

Figure 40: Monthly Events for Flood/Flash Floods in the Planning Area



Source: NCEI, 2020

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 resident of floodplains through flood insurance premiums.

In return for availability of federally-backed flood insurance, jurisdictions participating in the NFIP must agree to adopt and enforce floodplain management standards to regulate development in

special flood hazard areas (SFHA) as defined by FEMA's flood maps. The following tables summarize NFIP participation and active policies within the planning area as of March 2020.

Table 63: NFIP Participants

Jurisdiction	Participate in NFIP?	Eligible-Regular Program	Date Current Map	Sanction	Suspension	Rescinded
Adams County	Yes	6/1/1988	7/5/2018	-	-	-
Village of Ayr	No	-	-	7/5/19	-	-
City of Hastings	Yes	8/17/1981	7/5/2018	-	-	-
Village of Holstein	Yes	4/1/1992	07/05/18(M)	-	-	-
Village of Juniata	Yes	6/18/1990	7/5/2018	-	-	-
Village of Kenesaw	Yes	7/5/2018	07/05/18(M)	-	-	-
Village of Prosser	Yes	7/5/2018	07/05/18(M)	-	-	-
Village of Roseland	No	-	-	7/5/19	-	-
Clay County	Yes	9/1/1986	07/05/18(L)	-	-	-
City of Clay Center	Yes	7/5/2018	07/05/18(M)	-	-	-
Village of Deweese	No	-	-	11/8/75	-	-
City of Edgar	Yes	7/5/2018	07/05/18(M)	-	-	-
City of Fairfield	No	-	-	8/22/76	-	-
Village of Glenvil	No	-	-	-	-	-
City of Harvard	Yes	7/5/2018	(NSFHA)	-	-	-
Village of Ong	No	-	-	-	-	-
Village of Saronville	No	-	-	-	-	-
City of Sutton	Yes	9/1/1986	07/05/18(M)	-	-	-
Village of Trumbull	No	-	-	8/1/20	-	-
Fillmore County	Yes	9/16/2004	9/16/2004	-	-	-
Village of Exeter	Yes	9/16/2004	(NSFHA)	-	-	-
Village of Fairmont	Yes	9/16/2004	9/16/2004	-	-	-
City of Geneva	Yes	9/16/2004	9/16/2004	-	-	-
Village of Grafton	No	-	-	9/16/05	-	-
Village of Milligan	No	-	-	7/9/77	-	-
Village of Ohioa	No	-	-	11/8/75	-	-
Village of Shickley	Yes	7/2/1987	9/16/2004	-	-	-

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Jurisdiction	Participate in NFIP?	Eligible-Regular Program	Date Current Map	Sanction	Suspension	Rescinded
Village of Strang	No	-	-	-	-	-
Gage County	Yes	5/1/1990	5/2/2016	-	-	-
Village of Adams	Yes	6/1/1988	7/5/2018	-	-	-
Village of Barneston	No	-	-	5/17/89	5/17/89(S)	-
City of Beatrice	Yes	9/30/1977	6/18/2010	-	-	-
City of Blue Springs	Yes	6/3/1986	6/18/2010	-	-	-
Village of Clatonia	No	-	-	9/18/85	9/18/85(S)	-
Village of Cortland	Yes	6/18/2010	06/18/10(M)	-	-	-
Village of Filley	No	-	-	-	-	-
Village of Liberty	No	-	-	6/18/11	-	-
Village of Odell	Yes	6/1/1987	06/18/10(M)	-	-	-
Village of Pickrell	No	-	-	6/18/11	-	-
Village of Virginia	No	-	-	-	-	-
City of Wymore	Yes	7/2/1987	6/18/2010	-	-	-
Jefferson County	Yes	6/1/1988	8/17/2015	-	-	-
Village of Daykin	No	-	-	8/17/16	-	-
Village of Diller	Yes	6/18/2010	08/17/15(M)	-	-	-
Village of Endicott	No	-	-	8/17/16	-	-
City of Fairbury	Yes	9/3/1980	8/17/2015	-	-	-
Village of Harbine	No	-	-	8/17/16	-	-
Village of Jansen	No	-	-	8/17/16	-	-
Village of Plymouth	No	-	-	8/17/16	-	-
Village of Reynolds	No	-	-	8/17/16	-	-
Village of Steele City	Yes	6/1/1987	8/17/2015	-	-	-
Nuckolls County	Yes	12/16/2004	12/16/2004	-	-	-
Village of Hardy	No	-	-	11/19/77	-	-
Village of Lawrence	Yes	12/16/2004	(NSFHA)	-	-	-
City of Nelson	Yes	9/4/1987	12/16/04(M)	-	-	-
Village of Nora	No	-	-	-	-	-
Village of Oak	No	-	-	11/15/75	-	-

SECTION FOUR: RISK ASSESSMENT

Jurisdiction	Participate in NFIP?	Eligible-Regular Program	Date Current Map	Sanction	Suspension	Rescinded
Village of Ruskin	No	-	-	-	-	-
City of Superior	Yes	8/19/1987	12/16/04(M)	-	-	-
Saline County	Yes	10/13/1987	11/4/2010	-	-	-
City of Crete	Yes	10/15/1982	11/4/2010	-	-	-
Village of Dewitt	Yes	10/15/1982	11/4/2010	-	-	-
Village of Dorchester	No	-	-	3/26/77	-	-
City of Friend	Yes	11/4/2010	11/04/10(M)	-	-	-
Village of Swanton	Yes	8/19/1985	11/04/10(M)	-	-	-
Village of Tobias	No	-	-	-	-	-
Village of Western	No	-	-	-	-	-
City of Wilber	Yes	11/3/1982	11/4/2010	-	-	-
Thayer County	Yes	9/30/2004	9/30/2004	-	-	-
Village of Alexandria	Yes	9/30/2004	9/30/2004	-	-	-
Village of Belvidere	Yes	9/30/2004	9/30/2004	-	-	-
Village of Bruning	Yes	9/30/2004	9/30/2004	-	-	-
Village of Byron	Yes	9/30/2004	9/30/2004	-	-	-
Village of Carleton	Yes	9/30/2004	9/30/2004	-	-	-
Village of Chester	Yes	9/30/2004	9/30/2004	-	-	-
Village of Davenport	Yes	9/30/2004	9/30/2004	-	-	-
City of Deshler	Yes	2/1/1987	09/30/04(L)	-	-	-
Village of Gilead	No	-	-	9/30/05	-	-
City of Hebron	Yes	7/16/1987	09/30/04(M)	-	-	-
Village of Hubbell	Yes	2/1/1987	09/30/04(L)	-	-	-
Webster County	Yes	5/1/1987	5/16/2008	-	-	-
Village of Bladen	No	-	-	7/11/76	-	-
City of Blue Hill	Yes	5/16/2008	5/16/2008	-	-	-
Village of Cowles	No	-	-	5/16/09	-	-
Village of Guide Rock	Yes	3/1/2001	5/16/2008	-	-	-

SECTION FOUR: RISK ASSESSMENT

Jurisdiction	Participate in NFIP?	Eligible-Regular Program	Date Current Map	Sanction	Suspension	Rescinded
City of Red Cloud	Yes	1/1/1987	5/16/2008	-	-	-

Source: FEMA, NFIP Community Status Book Report⁷³

Note: (M) – No elevation determined – All Zone A, C, and X; (L) – Original FIRM by Letter – All Zone A, C, and X

It should be noted that while the number of policies in force may change monthly and annually as representatives enroll, maintain, or lapse policies, the total number of losses and payments are cumulative over time.

Table 64: NFIP Policies in Force and Total Payments

Jurisdiction	Policies in-force	Total Coverage	Total Premiums	Closed Losses*	Total Payments*
Adams County	19	\$5,299,000	\$10,374	5	\$5,946
Village of Ayr	-	-	-	-	-
City of Hastings	24	\$7,128,900	\$15,437	18	\$293,728
Village of Holstein	-	-	-	-	-
Village of Juniata	10	\$1,559,000	\$6,865	-	-
Village of Kenesaw	15	\$1,477,600	\$12,731	-	-
Village of Prosser	-	-	-	-	-
Village of Roseland	-	-	-	-	-
Clay County	6	\$1,157,400	\$7,225	-	-
City of Clay Center	1	\$350,000	\$467	-	-
Village of Deweese	-	-	-	-	-
City of Edgar	-	-	-	-	-
City of Fairfield	-	-	-	-	-
Village of Glenvil	-	-	-	-	-
City of Harvard	1	\$210,000	\$395	-	-
Village of Ong	-	-	-	-	-
Village of Saronville	-	-	-	-	-
City of Sutton	13	\$3,232,700	\$64,839	1	\$1,561
Village of Trumbull	-	-	-	-	-
Fillmore County	4	\$560,600	\$3,431	-	-
Village of Exeter	-	-	-	-	-
Village of Fairmont	-	-	-	-	-
City of Geneva	2	\$377,000	\$1,525	-	-
Village of Grafton	-	-	-	-	-
Village of Milligan	-	-	-	-	-
Village of Ohioa	-	-	-	-	-
Village of Shickley	2	\$405,000	\$64,839	2	\$25,000
Village of Strang	-	-	-	-	-
Gage County	15	\$2,671,200	\$10,559	7	\$281,257
Village of Adams	2	\$225,000	\$2,628	-	-
Village of Barneston	-	-	-	-	-
City of Beatrice	61	\$17,032,000	\$69,466	153	\$1,339,522
City of Blue Springs	1	\$40,000	\$457	-	-
Village of Clatonia	-	-	-	-	-
Village of Cortland	1	\$350,000	\$467	-	-
Village of Filley	-	-	-	-	-
Village of Liberty	-	-	-	-	-

⁷³ Federal Emergency Management Agency. 2020. "The National Flood Insurance Program Community Status Book." <https://www.fema.gov/cis/NE.html>.

SECTION FOUR: RISK ASSESSMENT

Jurisdiction	Policies in-force	Total Coverage	Total Premiums	Closed Losses*	Total Payments*
Village of Odell	2	\$108,500	\$1,694	-	-
Village of Pickrell	-	-	-	-	-
Village of Virginia	-	-	-	-	-
City of Wymore	-	-	-	5	\$17,419
Jefferson County	2	\$519,400	\$8,489	-	-
Village of Daykin	-	-	-	-	-
Village of Diller	-	-	-	-	-
Village of Endicott	-	-	-	-	-
City of Fairbury	2	\$269,000	\$5,463	2	\$7,969
Village of Harbine	-	-	-	-	-
Village of Jansen	-	-	-	-	-
Village of Plymouth	-	-	-	-	-
Village of Reynolds	-	-	-	-	-
Village of Steele City	-	-	-	8	\$6,217
Nuckolls County	2	\$150,000	\$819	-	-
Village of Hardy	-	-	-	-	-
Village of Lawrence	-	-	-	-	-
City of Nelson	1	\$150,000	\$1,742	-	-
Village of Nora	-	-	-	-	-
Village of Oak	-	-	-	-	-
Village of Ruskin	-	-	-	-	-
City of Superior	3	\$93,700	\$1,228	3	\$7,070
Saline County	15	\$2,829,900	\$13,797	11	\$74,432
City of Crete	92	\$8,008,700	\$116,536	18	\$46,539
Village of Dewitt	55	\$4,365,700	\$62,207	152	\$956,716
Village of Dorchester	-	-	-	-	-
City of Friend	-	-	-	-	-
Village of Swanton	-	-	-	-	-
Village of Tobias	-	-	-	-	-
Village of Western	-	-	-	-	-
City of Wilber	12	\$1,319,000	\$15,690	4	-
Thayer County	6	\$688,500	\$8,411	4	\$128,993
Village of Alexandria	4	\$110,800	\$1,771	-	-
Village of Belvidere	12	\$752,700	\$8,528	1	\$1,124
Village of Bruning	-	-	-	-	-
Village of Byron	2	\$29,700	\$212	-	-
Village of Carleton	1	\$25,000	\$401	-	-
Village of Chester	-	-	-	-	-
Village of Davenport	-	-	-	-	-
City of Deshler	8	\$1,183,200	\$4,836	5	\$5,874
Village of Gilead	-	-	-	-	-
City of Hebron	3	\$320,000	\$5,423	10	\$72,983
Village of Hubbell	7	\$826,300	\$14,243	5	\$116,863
Webster County	2	\$149,500	\$580	-	-
Village of Bladen	-	-	-	-	-
City of Blue Hill	-	-	-	-	-
Village of Cowles	-	-	-	-	-
Village of Guide Rock	-	-	-	1	\$11,599
City of Red Cloud	10	\$3,140,000	\$4,169	2	\$1,727

SECTION FOUR: RISK ASSESSMENT

Source: FEMA, HUDEX Policy Loss Data, November 30 2020⁷⁴

This plan highly recommends and strongly encourages plan participants to enroll, participate, and remain in good standing with the NFIP. Compliance with the NFIP should remain a top priority for each participant with flooding concerns, 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, such as those described in the Community Rating System (CRS) Coordinator's Manual (FIA-15/2017).⁷⁵ The Village of Dewitt has participated in the program in the past but is currently inactive.

NFIP Repetitive Loss Structures

NeDNR and FEMA Region VII were contacted to determine if any existing buildings, infrastructure, or critical facilities are classified as NFIP Repetitive Loss Structures. Note there are two definitions for repetitive loss structures. Severe repetitive loss is a grant definition for HMA purposes that has specific criteria while repetitive loss is a general NFIP definition. There are 17 repetitive loss properties located in the planning area as of February 2020. Only jurisdictions with reported properties are included in the following table.

Table 65: Repetitive Loss and Severe Repetitive Loss Properties

Jurisdiction	NFIP Repetitive Loss	# of Repetitive Loss Properties	Repetitive Loss Type	# of Severe Repetitive Loss Properties	Severe Repetitive Loss Type
City of Beatrice	9	1	Single Family	0	Single Family
City of Crete	1	-	-	-	-
City of Hastings	1	-	-	-	-
City of Hebron	1	-	-	-	-
Thayer County	1	-	-	-	-
Village of Dewitt	4	-	-	-	-

Source: NeDNR, February 2020 (personal correspondence)

NFIP RL: Repetitive Loss Structure refers to a structure covered by a contract for flood insurance under the NFIP that has incurred flood-related damage on two occasions during a 10-year period, each resulting in at least a \$1,000 claim payment.

NFIP SRL: Severe Repetitive Loss Properties are defined as single or multifamily residential properties that are covered under an NFIP flood insurance policy and:

- (1) That have incurred flood-related damage for which four or more separate claims payments have been made, with the amount of each claim (including building and contents payments) exceeding \$5,000, and with the cumulative amount of such claim payments exceeding \$20,000; or

⁷⁴ Federal Emergency Management Agency: National Flood Insurance Program. December 2019. Policy & Claim Statistics for Flood Insurance." Accessed November 2020. <https://www.fema.gov/policy-claim-statistics-flood-insurance>.

⁷⁵ Federal Emergency Management Agency. May 2017. "National Flood Insurance Program Community Rating System: Coordinator's Manual FIA-15/2017." Accessed October 2020. https://www.fema.gov/media-library-data/1493905477815-d794671adeed5beab6a6304d8ba0b207/633300_2017_CRS_Coordinators_Manual_508.pdf.

- (2) For which at least two separate claims payments (building payments only) have been made under such coverage, with cumulative amount of such claims exceeding the market value of the building.
- (3) In both instances, at least two of the claims must be within 10 years of each other, and claims made within 10 days of each other will be counted as one claim.

HMA RL: A repetitive loss property is a structure covered by a contract for flood insurance made available under the NFIP that:

- (1) Has incurred flood-related damage on two occasions, in which the cost of the repair, on the average, equaled or exceeded 25 percent of the market value of the structure at the time of each such food event; and
- (2) At the time of the second incidence of flood-related damage, the contract for flood insurance contains increased cost of compliance coverage.

HMA SRL: A severe repetitive loss property is a structure that:

- (1) Is covered under a contract for flood insurance made available under the NFIP.
- (2) Has incurred flood related damage –
 - (a) For which four or more separate claims payments (includes building and contents) have been made under flood insurance coverage with the amount of each such claim exceeding \$5,000, and with the cumulative amount of such claim payments exceeding \$20,000; or
 - (b) For which at least two separate claims payments (includes only building) have been made under such coverage, with the cumulative amount of such claims exceeding the market value of the insured structure.

Purpose of the HMA definitions: The HMA definitions were allowed by the Biggert-Waters Flood Insurance Reform Act of 2012 to provide an increased federal cost share under the FMA grant when a property meets the HMA definition.

Supplemental Analysis

In order to conduct an analysis of potential impacts utilizing current critical facility and structure data, GIS was used to identify which structures and critical facilities fell within mapped flood risk hazard areas. GIS parcel data were acquired from each County Assessor. This data was analyzed for the location, number, and value of property improvements at the parcel level. Property improvements include any built structures such as roads, buildings, and paved lots. The data did not contain the number of structures on each parcel. The following table illustrates the results. It is necessary to note that a location within the flood zone does not necessarily imply significant flood impacts, but it is illustrative of potential risk depending upon building elevation. Specific jurisdictional parcel improvements in the floodplain can be found in the corresponding community profile in *Section Seven: Community Profiles*.

Table 66: Planning Area Parcel Improvements and Value in the Floodplain

Jurisdiction	# of Total Parcels	# of Total Improvements	Total Improvements Value	# of Improvements in Floodplain	Total Improvements Value in Floodplain
Adams County	17,106	11,849	\$1,522,604,325	2351	\$210,265,755
Village of Ayr	102	54	\$2,212,825	3	\$84,375
City of Hastings	10,500	9,014	\$1,101,530,865	361	\$136,311,000
Village of Holstein	165	125	\$7,010,975	0	-
Village of Juniata	469	306	\$26,506,960	207	\$16,405,610
Village of Kenesaw	508	411	\$34,765,685	628	\$46,601,920
Village of Prosser	95	54	\$2,089,510	0	-
Village of Roseland	196	135	\$11,587,895	0	-
Clay County	8,130	2,652	\$234,382,635	699	\$82,165,635
City of Clay Center	551	318	\$26,460,750	8	\$1,287,100
Village of Deweese	105	36	\$1,350,380	2	\$313,380
City of Edgar	495	206	\$11,861,425	5	\$105,295
City of Fairfield	443	168	\$9,696,540	0	-
Village of Glenvil	189	129	\$8,393,265	0	-
City of Harvard	646	358	\$15,891,605	0	-
Village of Ong	139	50	\$896,660	0	-
Village of Saronville	84	19	\$1,159,130	0	-
City of Sutton	1,009	578	\$61,007,870	299	\$30,933,660
Village of Trumbull	182	77	\$7,528,905	0	-

Jurisdiction	# of Total Parcels	# of Total Improvements	Total Improvements Value	# of Improvements in Floodplain	Total Improvements Value in Floodplain
Fillmore County	7,649	2,913	\$259,949,565	255	\$28,677,310
Village of Exeter	475	326	\$21,886	0	-
Village of Fairmont	441	280	\$27,361	0	-
City of Geneva	1,349	1,068	\$111,742,155	8	\$4,828,960
Village of Grafton	170	86	\$3,612,920	0	-
Village of Milligan	241	166	\$7,732,140	1	\$65,830
Village of Ohioa	172	72	\$1,184,705	0	-
Village of Shickley	299	196	\$14,239,500	12	\$951,420
Village of Strang	78	23	\$717,015	0	-
Gage County	18,626	10,162	\$1,110,892,070	11331	\$1,327,537,730
Village of Adams	368	256	\$30,539,685	269	\$33,787,680
Village of Barneston	138	77	\$3,463,040	78	\$3,490,110
City of Beatrice	7,021	5,391	\$579,905,675	5612	\$630,351,970
City of Blue Springs	408	205	\$6,783,570	216	\$7,082,890
Village of Clatonia	189	145	\$9,040,100	145	\$9,040,100
Village of Cortland	298	233	\$23,980,655	233	\$23,980,655
Village of Filley	124	88	\$4,185,355	88	\$4,185,355
Village of Liberty	179	73	\$1,604,355	74	\$1,907,440
Village of Odell	238	161	\$8,511,555	170	\$9,873,865
Village of Pickrell	124	104	\$10,172,500	105	\$11,550,185
Village of Virginia	102	55	\$4,079,690	55	\$4,079,690
City of Wymore	1,121	825	\$27,686,765	846	\$28,419,640
Jefferson County	9,637	3,979	\$306,058,640	4413	\$351,086,654
Village of Daykin	179	106	\$6,758,888	106	\$6,758,888
Village of Diller	280	153	\$10,043,368	160	\$11,927,353
Village of Endicott	232	88	\$3,729,668	92	\$4,268,589
City of Fairbury	2,756	1,990	\$121,545,108	1999	\$122,301,819
Village of Harbine	58	31	\$1,243,963	31	\$1,243,963

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Jurisdiction	# of Total Parcels	# of Total Improvements	Total Improvements Value	# of Improvements in Floodplain	Total Improvements Value in Floodplain
Village of Jansen	144	83	\$2,748,664	83	\$2,748,664
Village of Plymouth	296	214	\$15,866,226	214	\$15,866,226
Village of Reynolds	116	51	\$1,092,277	52	\$1,096,094
Village of Steele City	167	62	\$1,188,734	65	\$1,222,594
Nuckolls County	6,673	2,148	\$109,711,650	2458	\$128,576,205
Village of Hardy	179	70	\$845,045	71	\$860,525
Village of Lawrence	257	150	\$6,342,115	151	\$6,452,615
City of Nelson	606	258	\$8,545,270	269	\$9,021,790
Village of Nora	67	9	\$340,865	9	\$340,865
Village of Oak	93	29	\$471,145	34	\$541,615
Village of Ruskin	186	69	\$3,467,050	69	\$3,467,050
City of Superior	1,460	927	\$44,390,030	973	\$46,352,640
Saline County	11,176	5,658	\$603,581,315	6393	\$718,132,135
City of Crete	2,571	2,010	\$234,846,480	2156	\$254,535,180
Village of Dewitt	390	281	\$7,962,645	562	\$35,925,290
Village of Dorchester	368	289	\$27,687,245	0	-
City of Friend	759	549	\$53,288,025	551	\$53,434,390
Village of Swanton	133	79	\$3,646,685	85	\$4,736,510
Village of Tobias	202	104	\$1,969,630	104	\$1,969,630
Village of Western	260	186	\$7,125,025	189	\$7,256,875
City of Wilber	968	796	\$75,310,290	858	\$81,031,710
Thayer County	7,071	2,292	\$169,015,679	2574	\$196,794,768
Village of Alexandria	241	79	\$1,616,668	106	\$2,161,267
Village of Belvidere	125	29	\$496,893	44	\$685,227
Village of Bruning	284	139	\$8,936,418	139	\$8,936,418
Village of Byron	111	49	\$1,539,790	49	\$1,539,790
Village of Carleton	160	40	\$2,079,407	40	\$2,079,407
Village of Chester	346	120	\$4,424,201	120	\$4,424,201

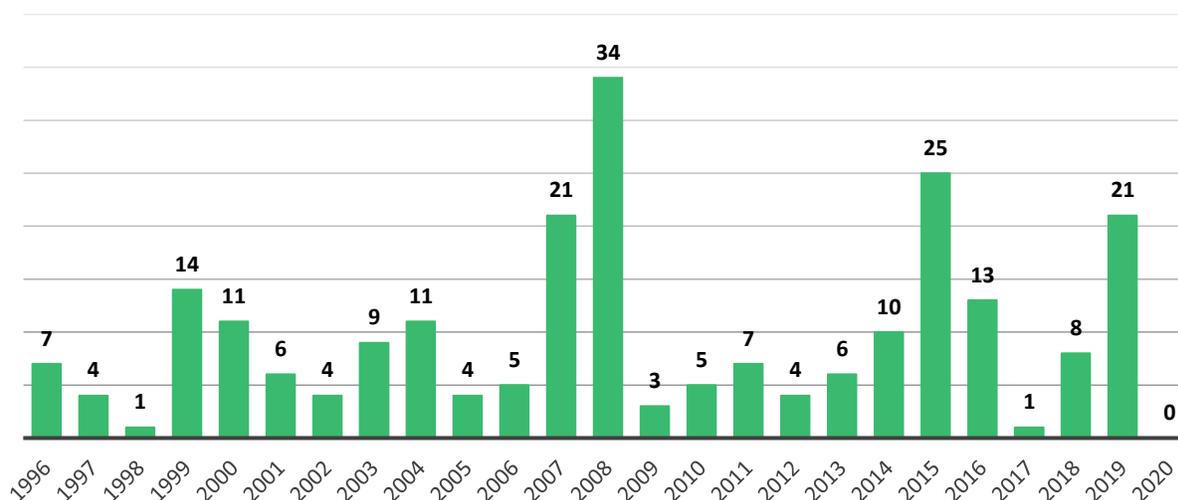
Jurisdiction	# of Total Parcels	# of Total Improvements	Total Improvements Value	# of Improvements in Floodplain	Total Improvements Value in Floodplain
Village of Davenport	344	167	\$5,592,729	167	\$5,592,729
City of Deshler	558	316	\$17,230,669	324	\$17,849,067
Village of Gilead	80	18	\$452,550	18	\$452,550
City of Hebron	1,014	610	\$45,806,797	633	\$47,207,531
Village of Hubbell	155	38	\$798,290	52	\$1,184,687
Webster County	4,859	1,841	117,393,615	2192	144,030,020
Village of Bladen	177	114	\$4,339,220	115	\$4,347,885
City of Blue Hill	467	365	\$32,672,040	369	\$33,173,290
Village of Cowles	48	16	\$464,695	16	\$464,695
Village of Guide Rock	258	145	\$3,124,225	152	\$3,245,515
City of Red Cloud	766	579	\$27,881,815	610	\$29,608,770

Source: County Assessors 2019, JEO GIS analysis

Probability

The NCEI reports 122 flooding and 112 flash flooding events from January 1996 to April 2020. Some years had multiple flooding events. The following figure shows the events broken down by year. Based on the historic record and reported incidents by participating communities, there is a 96 percent probability that flooding will occur annually in the planning area. It is worth noting that while no events were reported for 2020, data utilized in this analysis only included January 2020 to April 2020. Flood events likely occurred during 2020 but were not reported here.

Figure 41: Nebraska Disaster Declaration, March 2019



Source: NCEI, 1996-April 2020

Community Top Hazard Status

The following table lists jurisdictions which identified Flooding as a top hazard of concern:

Jurisdictions	
Little Blue NRD	City of Superior
Lower Big Blue NRD	City of Sutton
Adams County	Village of Adams
Clay County	Village of Alexandria
Fillmore County	Village of Ayr
Gage County	Village of Barneston
Jefferson County	Village of Belvidere
Nuckolls County	Village of Bruning
Saline County	Village of DeWitt
Thayer County	Village of Exeter
Webster County	Village of Guide Rock
Beatrice Public Schools	Village of Hubbell
City of Beatrice	Village of Juniata
City of Crete	Village of Kenesaw
City of Deshler	Village of Ohioa
City of Fairbury	Village of Reynolds
City of Fairfield	Village of Shickley
City of Friend	Village of Steele City

Jurisdictions	
City of Geneva	Village of Swanton
City of Hebron	Village of Tobias
City of Red Cloud	

Regional Vulnerabilities

An updated national study examining social vulnerability as it relates to flood events found that low-income and minority populations are disproportionately vulnerable to flood events.⁷⁶ 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 and renters are more likely to live in areas vulnerable to the threat of flooding, yet lack the resources necessary to purchase flood insurance. And finally 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.

Any future development in floodplains should be discouraged to protect future assets. Land-use regulations should be used to limit development in floodplains and other flood prone areas as well as a protecting natural flood mitigation features. Buyout programs can be used to eliminate properties located in floodplains, especially properties that have experienced repetitive losses. Communities may also consider incorporating “Green Infrastructure” to address flooding concerns, and examples of this would include using permeable surfaces for parking areas, using rainwater retention swales, developing rain gardens, developing green roofs, and establishing greenways. Building codes currently require tie-down straps for propane tanks.

Nebraska’s minimum standards for floodplain management require that all new construction and substantial improvements of residential structures shall have the lowest floor (including basements) elevated to or above one foot above the base flood elevation. Nebraska standards also require that new structures for human habitation are not permitted in the floodway. These requirements will help reduce flood impacts and damages by requiring a one foot “freeboard” to allow for known flood hazards and also result in lower premiums for those participating in the NFIP.

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

- 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

⁷⁶ Tate, E., Rahman, M.A., Emrich, C.T. *et al.* Flood exposure and social vulnerability in the United States. *Nat Hazards* (2021). <https://doi.org/10.1007/s11069-020-04470-2>

SECTION FOUR: RISK ASSESSMENT

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

Table 67: Regional Flooding Vulnerabilities

SECTOR	VULNERABILITY
PEOPLE	<ul style="list-style-type: none"> -Low income and minority populations may lack the resources needed for evacuation, response, or to mitigate the potential for flooding -Elderly or residents with decreased mobility may have trouble evacuating -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	<ul style="list-style-type: none"> -Business closures or damages may have significant impacts -Agricultural losses from flooded fields or cattle loss -Closed roads and railroads would impact commercial transportation of goods
BUILT ENVIRONMENT	<ul style="list-style-type: none"> -Building may be damaged
INFRASTRUCTURE	<ul style="list-style-type: none"> -Damages to roadways and railways
CRITICAL FACILITIES	<ul style="list-style-type: none"> -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 community profiles)
CLIMATE	<ul style="list-style-type: none"> -Changes in seasonal and annual precipitation normals will likely increase frequency and magnitude of flood events

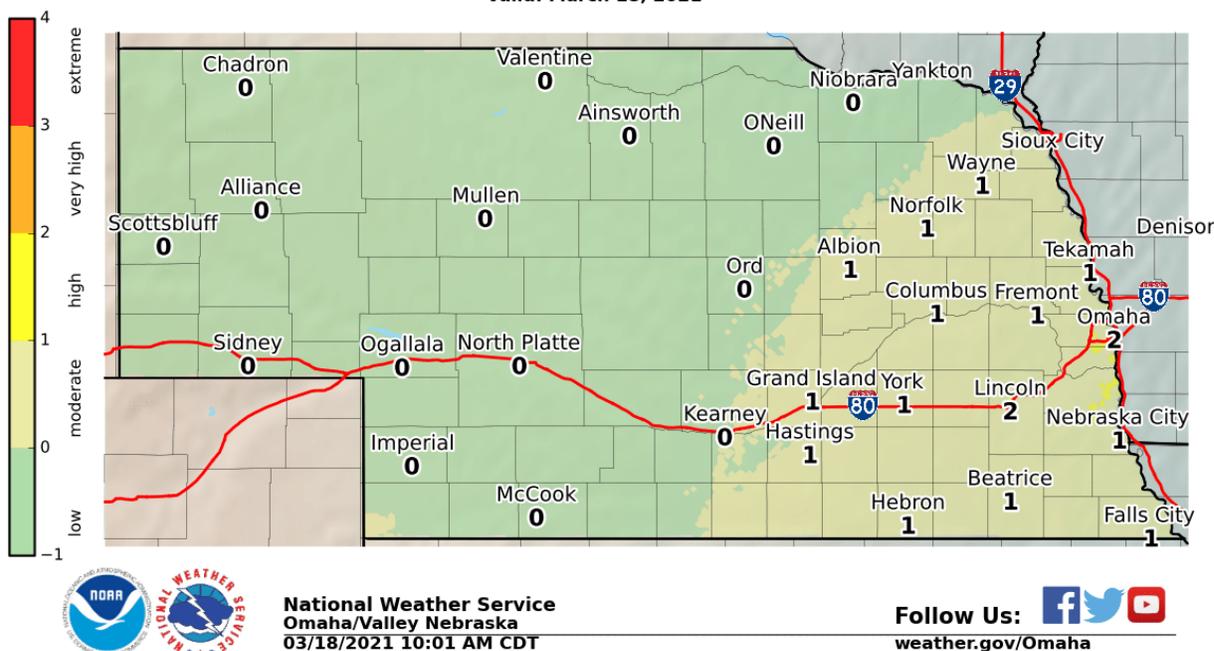
Grass/Wildfires

Wildfires, also known as grass fires, brush fires, 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; pastures; and other vegetated areas. Wildfires range in size from a few acres (the most common) to thousands of acres in some cases. Fire events can rapidly spread from their original source, change direction quickly, and jump gaps (such as roads, rivers, and fire breaks). Wildfire events are particularly dependent on the local conditions including temperature, humidity, wind speed, wind direction, slope, and available fuel load. While some wildfires burn in remote forested regions, others can cause extensive destruction of homes and other property located in the wildland-urban interface (WUI), the zone of transition between developed areas and undeveloped wilderness.

Wildfires are a growing hazard in most regions of the United States, posing a threat to life and property, particularly where natural ecosystems meet urban developed areas or where local economies are heavily dependent on open agricultural land. 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.

Wildfires are characterized in terms of their geographical characteristics including topography, weather, and fuels; or physical properties such as flame length and propagation. 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, and the effect of weather on the fire. Fuel and structure durability are the primary factors people can control and are 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 42). Fire danger predictions are updated regularly and should be reviewed frequently by community leaders and fire department officials.

Figure 42: Rangeland Fire Danger Example
Nebraska Rangeland Fire Danger - *Does not account for snow cover*
 Valid: March 18, 2021

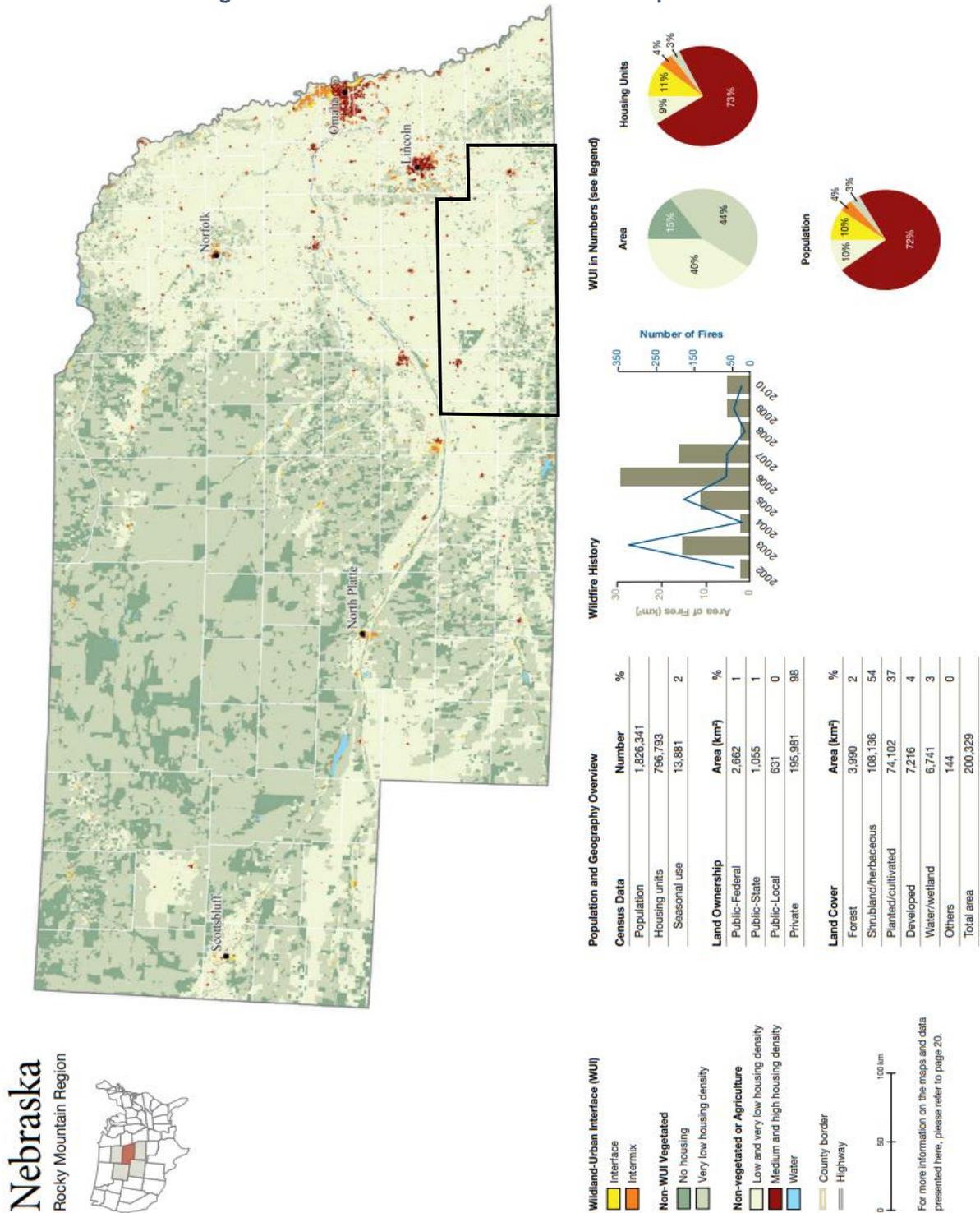


In recent decades, as the population of the United States has decentralized and residents have moved farther away from the center of villages and cities, the WUI has developed significantly, in both terms of population and building stock. The WUI is defined as the zone of transition between developed areas and undeveloped wilderness, where structures and other human development meet wildland. The expansion of the WUI increases the likelihood that wildfires will threaten people and homes, making this area the focus of the majority of wildfire mitigation efforts. The Nebraska Forest Service (NFS) develops Community Wildfire Protection Plans (CWPP) for regions across the state. Gage County is located in the Southeast CWPP region with a completed plan (August 2020) while Adams, Clay, Fillmore, Jefferson, Nuckolls, Saline, Thayer, and Webster Counties are all located in the South Central East region which anticipated to be developed in 2022.⁷⁷

The following figure produced by the USDA Forest Service displays the State of Nebraska’s WUI conditions as of 2010. The approximate location of the planning area is indicated by the black outline. Areas that are indicated by the WUI (Figure 43), either interface (yellow) or intermix (orange) are primarily found in portions of Gage and Adams Counties. The rest of the planning area is located in primarily non-WUI vegetated designated areas, with no or low-density housing with a mix of vegetated, non-vegetated, and agricultural land.

⁷⁷ Nebraska Forest Service. 2020. "Community Wildfire Protection Plans." <https://nfs.unl.edu/publications/community-wildfire-protection-plans>.

Figure 43: 2010 Wildland Urban Interface Map of Nebraska



Source: USDA, 2010⁷⁸

⁷⁸ USDA, USFS, & University of Wisconsin. 2010. "The 2010 Wildland-Urban Interface of the Conterminous United States." https://www.fs.fed.us/nrs/pubs/rmap/rmap_nrs8.pdf.

Figure 44: Lower Big Blue District Wildland Urban Interface Map

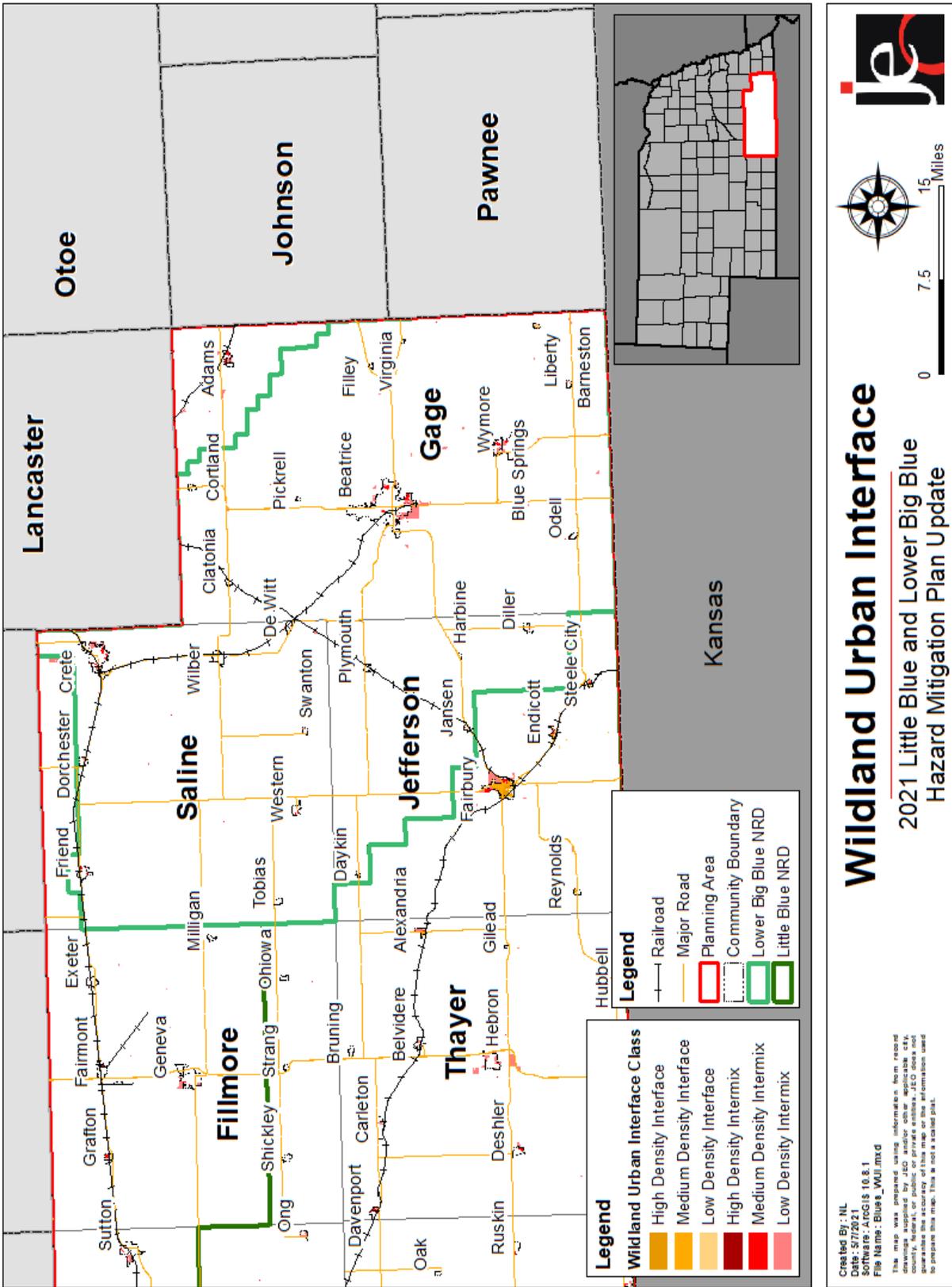
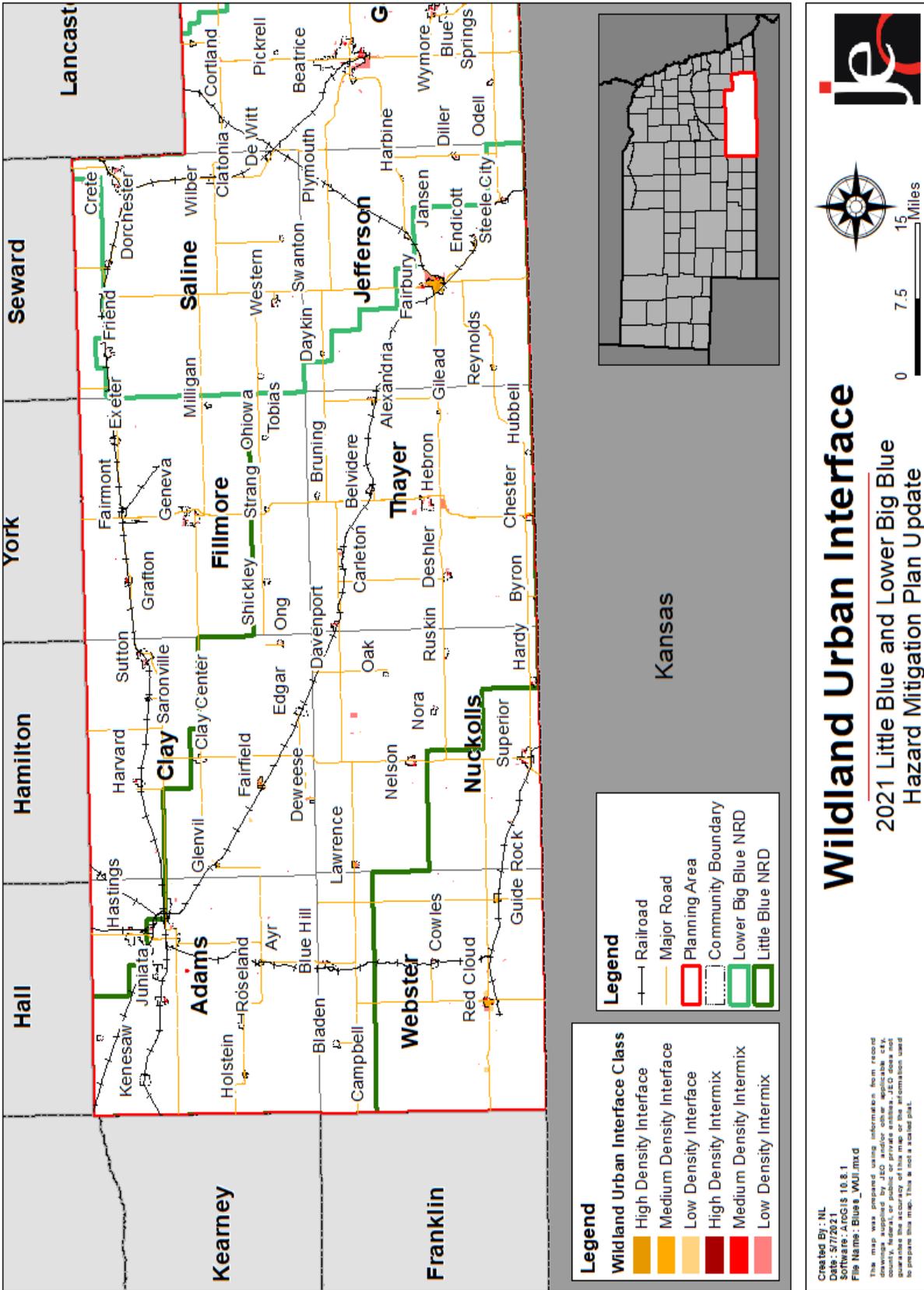


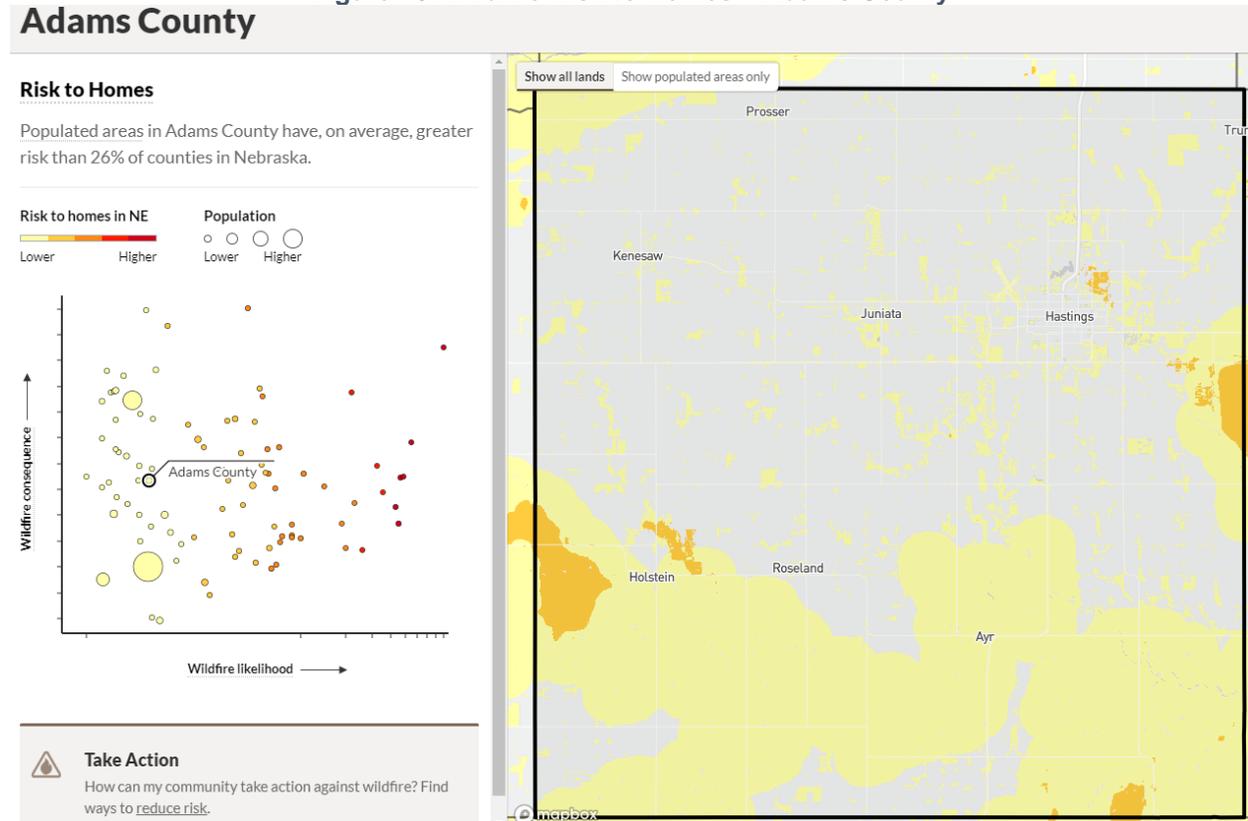
Figure 45: Little Blue District Wildland Urban Interface Map



SECTION FOUR: RISK ASSESSMENT

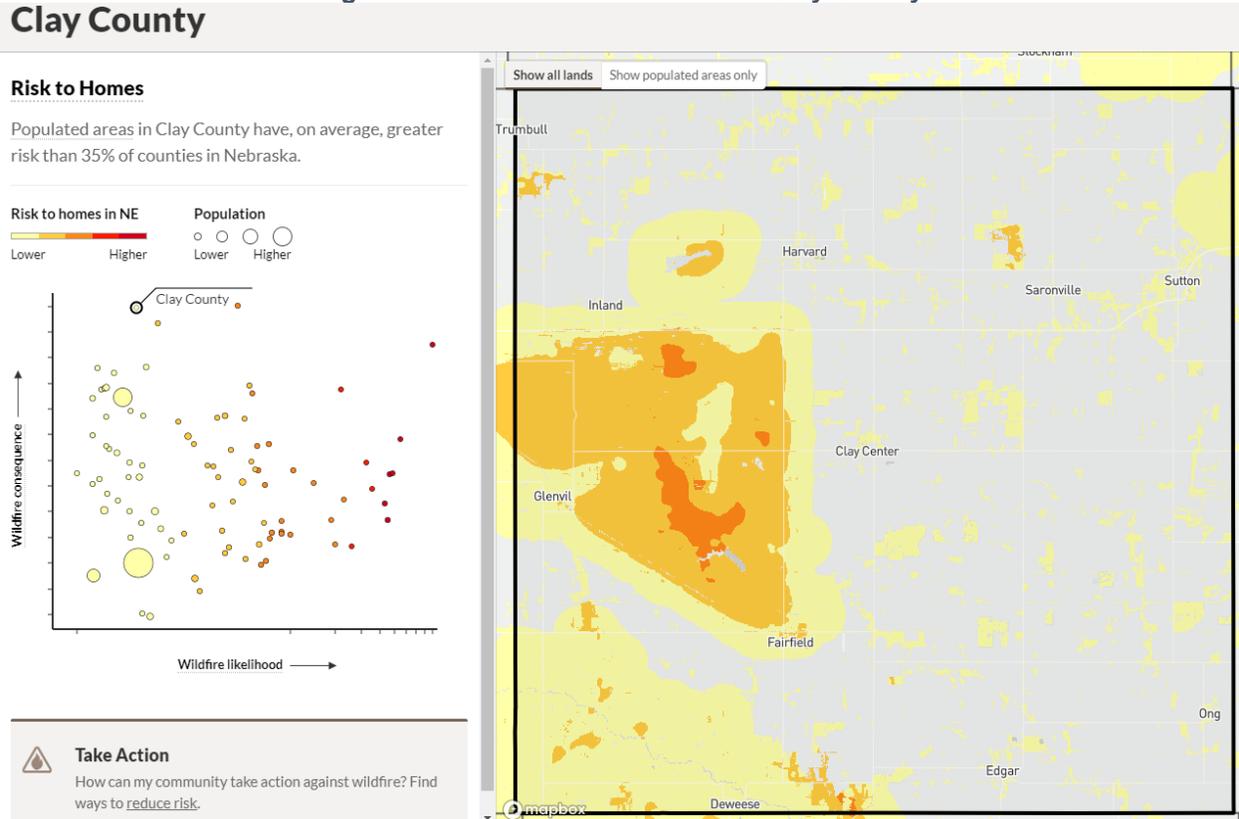
The United States Department of Agriculture Forest Service created the interactive web resource *Wildfire Risk to Communities* to help communities and jurisdictions understand, explore, and reduce wildfire risk. The following figures show wildfire risk to homes per county in the planning area.

Figure 46: Wildfire Risk to Homes – Adams County



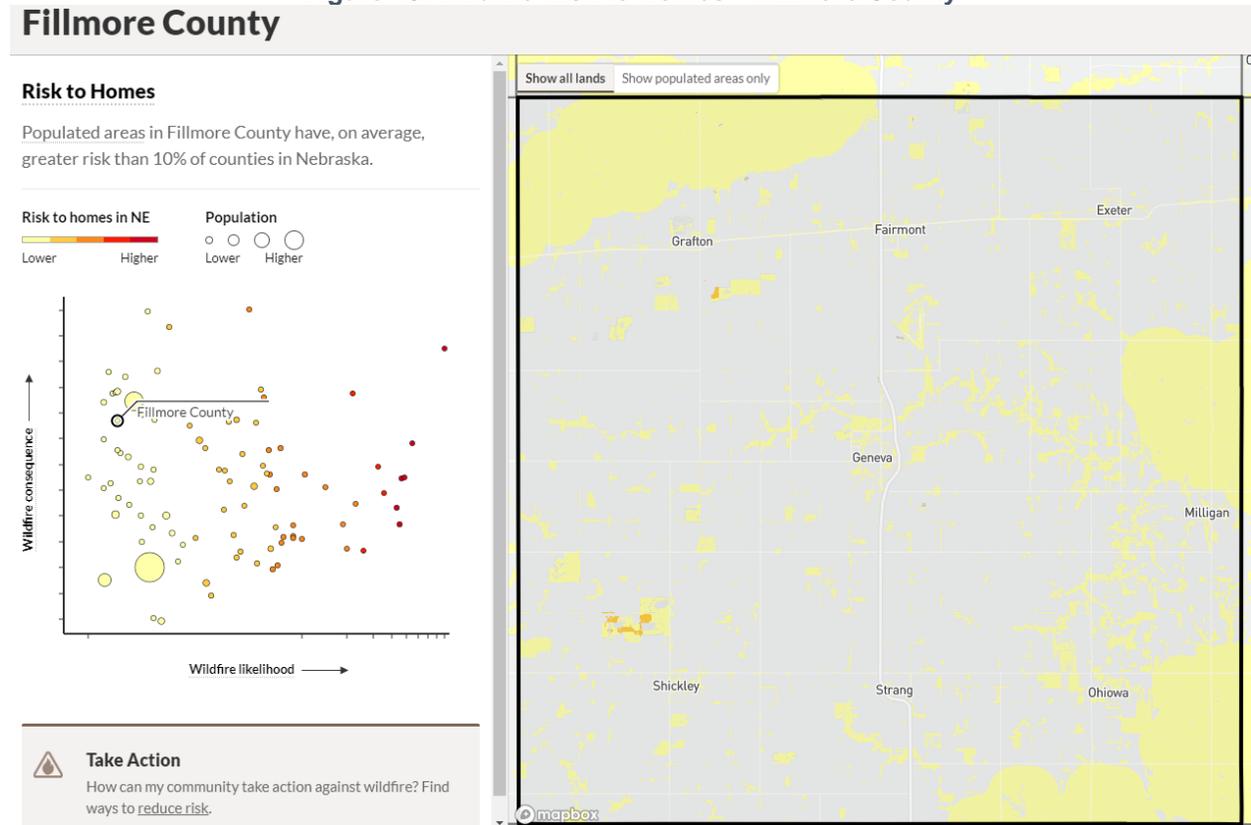
Source: *Wildfire Risk to Communities*

Figure 47: Wildfire Risk to Homes – Clay County



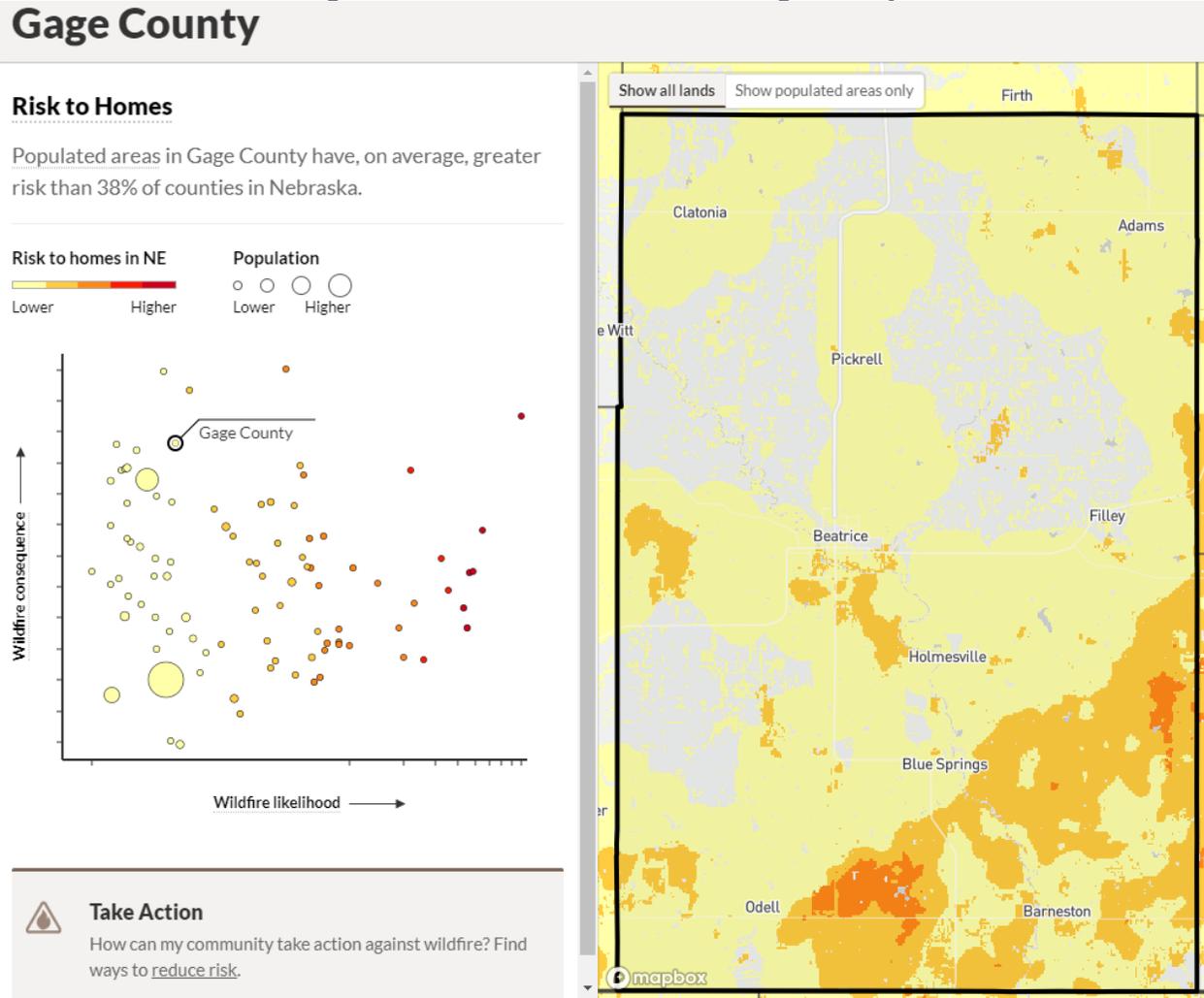
Source: *Wildfire Risk to Communities*

Figure 48: Wildfire Risk to Homes – Fillmore County



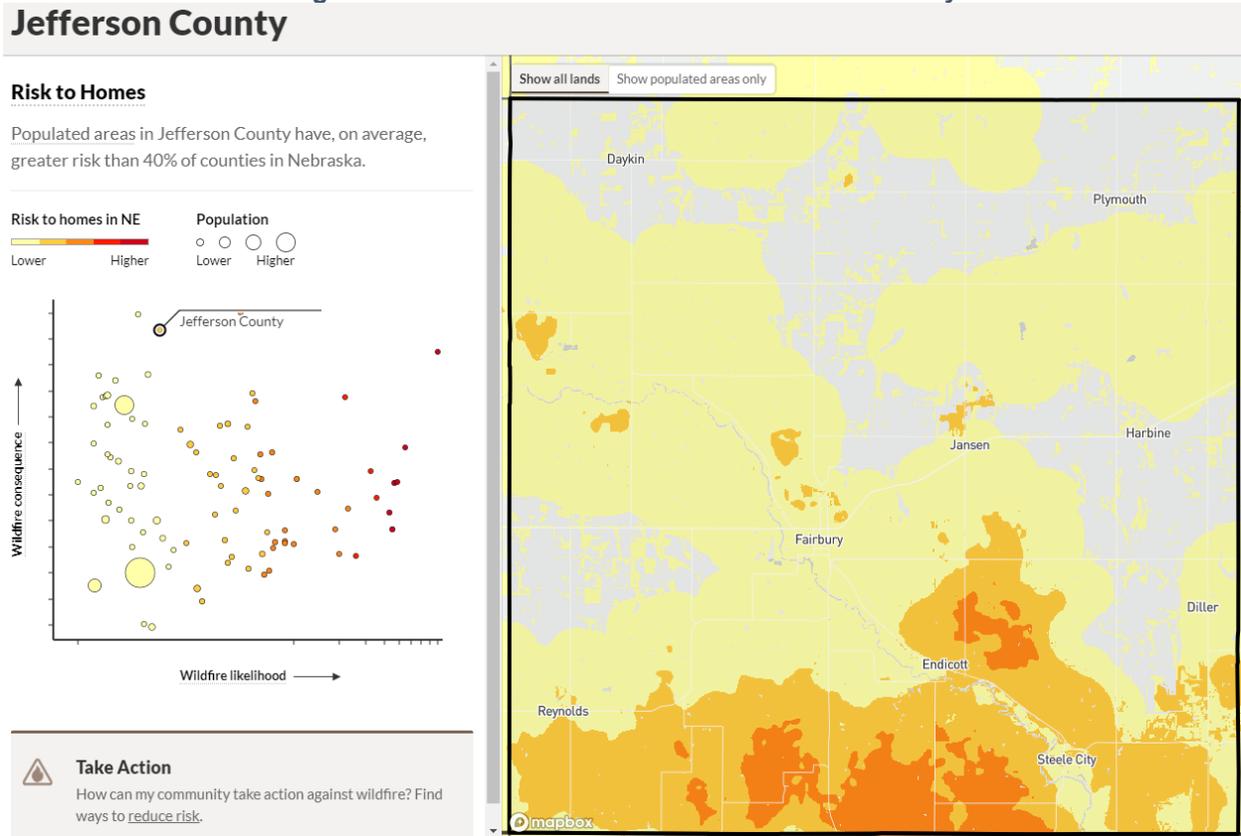
Source: *Wildfire Risk to Communities*

Figure 49: Wildfire Risk to Homes – Gage County



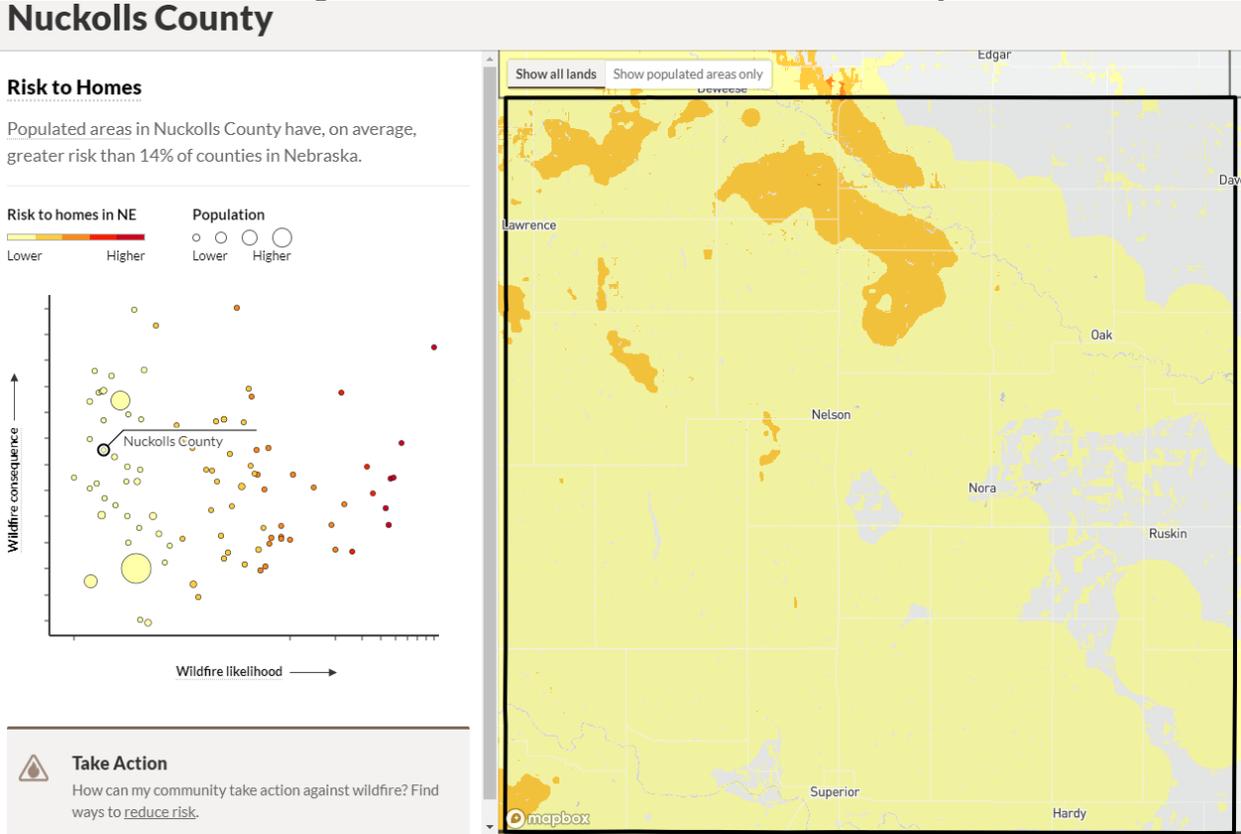
Source: *Wildfire Risk to Communities*

Figure 50: Wildfire Risk to Homes – Jefferson County



Source: *Wildfire Risk to Communities*

Figure 51: Wildfire Risk to Homes – Nuckolls County



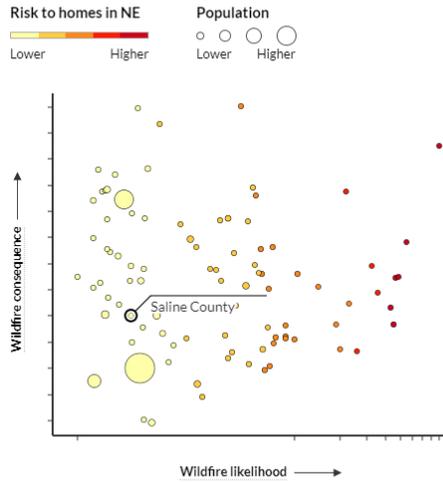
Source: Wildfire Risk to Communities

Figure 52: Wildfire Risk to Homes – Saline County

Saline County

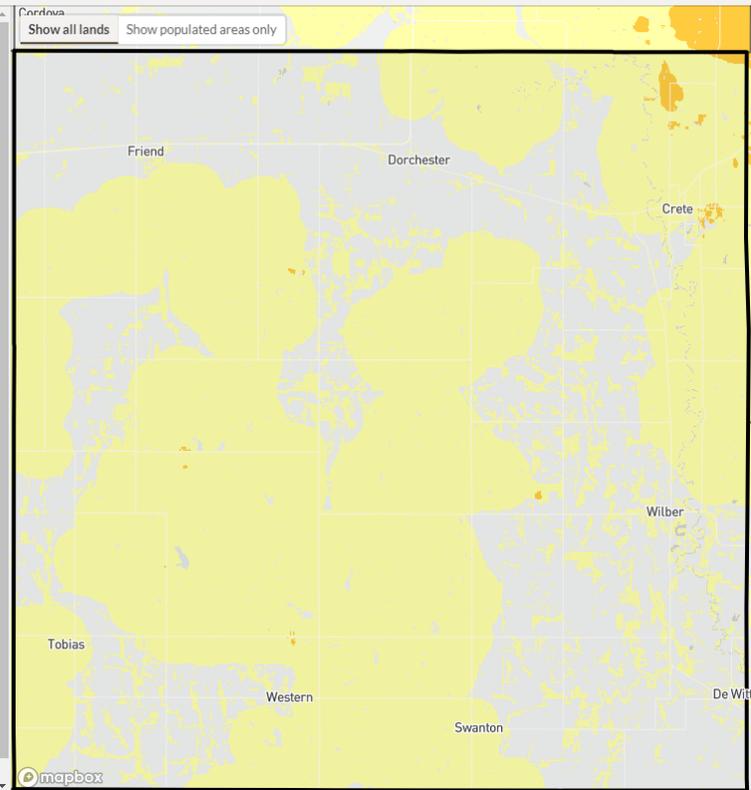
Risk to Homes

Populated areas in Saline County have, on average, greater risk than 27% of counties in Nebraska.



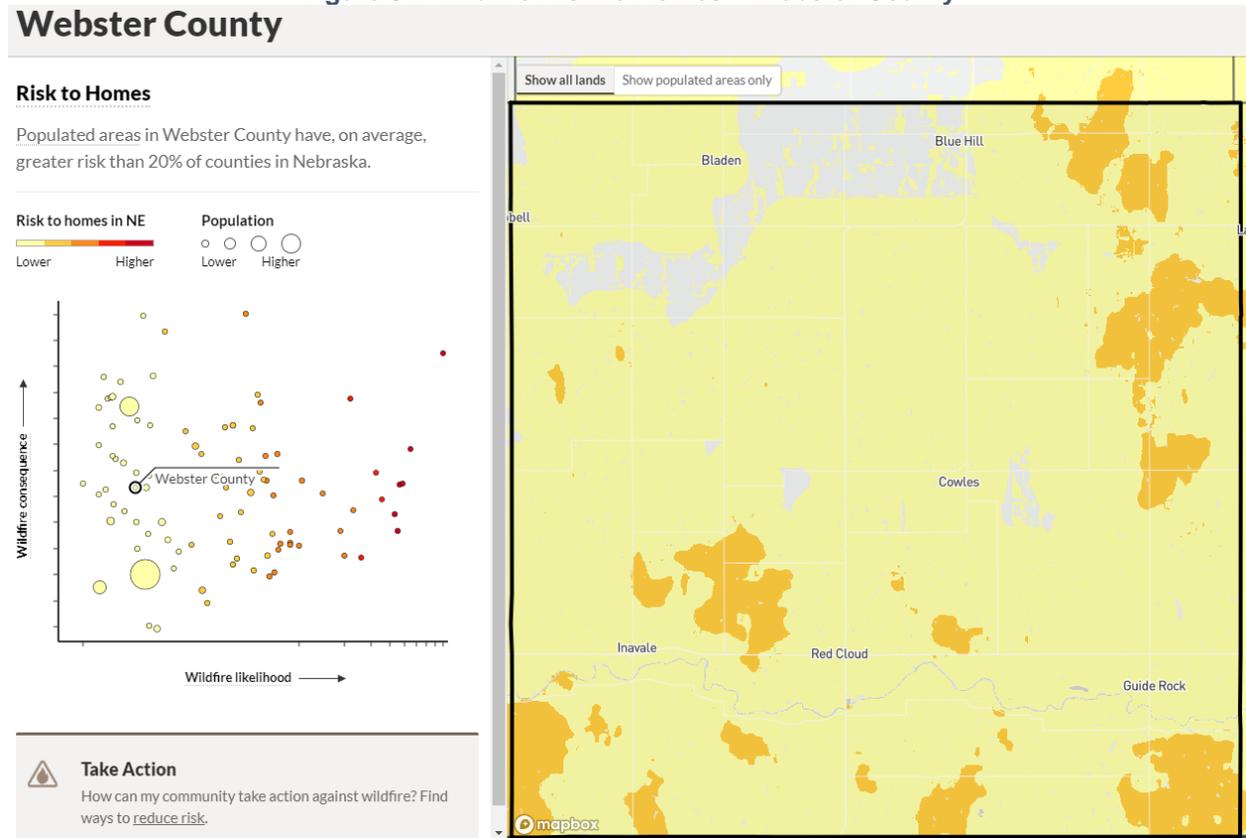
Take Action

How can my community take action against wildfire? Find ways to **reduce risk**.



Source: *Wildfire Risk to Communities*

Figure 54: Wildfire Risk to Homes – Webster County



Source: *Wildfire Risk to Communities*

According to the Southeast Nebraska Community Wildfire Protection Plan, specific concerns are located throughout Gage County. Locations of special concern include population centers adjacent to wildlands where topography is rough and woody fuels are dense in some areas, creating high fire hazard. The areas most at-risk from wildfire are located along the rivers and major creeks. All of Gage County’s population centers, dispersed farms and ranches, and wooded areas along the rivers and streams lie within the boundaries of the WUI as defined in the CWPP. The previously single-jurisdictional 2019 HMP for the City of Beatrice noted a concern for wildfire throughout the city due to the high amount of WUI, particularly the riverfront, Southeast Community College campus, industrial park, the airport, Good Samaritan facility, and homes along the edges of city boundaries. The Beatrice fire chief identified locations throughout the city and edges of town, as well as many rural subdivisions, as at-risk WUI areas with multiple structures, difficult access, rough terrain, and heavy fuels. Specifically listed were the Covered Bridge area, Country Club Lane, Country Meadows, Flowing Springs area, Wildwood, Chester St., and Montgomery St. The Dewitt fire chief identified Turkey Creek and the Big Blue River as having difficult access.

Of the counties in the planning area, Jefferson County has the greatest risk of wildfire. The following tables describes other specific risks and vulnerabilities seen across the planning area.

Table 68: Wildfire Vulnerabilities by County

County	Risk To Homes (compared to NE Counties)	Exposure Type	Wildfire Likelihood (compared to NE Counties)
Adams	Greater risk than 26% of NE Counties	Directly Exposed (13%) Indirectly Exposed (2%) Not Exposed (85%)	Greater risk than 28% of NE Counties
Clay	Greater risk than 35% of NE Counties	Directly Exposed (24%) Indirectly Exposed (11%) Not Exposed (65%)	Greater risk than 26% of NE Counties
Fillmore	Greater risk than 10% of NE Counties	Directly Exposed (20%) Indirectly Exposed (2%) Not Exposed (78%)	Greater risk than 11% of NE Counties
Gage	Greater risk than 38% of NE Counties	Directly Exposed (25%) Indirectly Exposed (52%) Not Exposed (24%)	Greater risk than 34% of NE Counties
Jefferson	Greater risk than 40% of NE Counties	Directly Exposed (27%) Indirectly Exposed (60%) Not Exposed (13%)	Greater risk than 37% of NE Counties
Nuckolls	Greater risk than 14% of NE Counties	Directly Exposed (32%) Indirectly Exposed (62%) Not Exposed (6%)	Greater risk than 13% of NE Counties
Saline	Greater risk than 27% of NE Counties	Directly Exposed (28%) Indirectly Exposed (42%) Not Exposed (30%)	Greater risk than 22% of NE Counties
Thayer	Nearly all other NE counties have greater risk	Directly Exposed (27%) Indirectly Exposed (48%) Not Exposed (25%)	Nearly all other NE counties have greater risk
Webster	Greater risk than 20% of NE Counties	Directly Exposed (27%) Indirectly Exposed (46%) Not Exposed (27%)	Greater risk than 21% of NE Counties

Source: *Wildfire Risk to Communities, 2020*⁷⁹

Table 69: Wildfire Vulnerable Populations by County

County	Families in Poverty	People with Disabilities	People over 65	Difficulty with English	Households with no Vehicle	Mobile Homes
Adams	597 (7.7%)	4,447 (14.2%)	5,438 (17.2%)	579 (2%)	705 (5.5%)	481 (3.8%)
Clay	119 (7%)	938 (15.3%)	1,220 (19.6%)	99 (1.7%)	49 (1.9%)	50 (1.9%)
Fillmore	141 (9%)	845 (15.8%)	1,298 (23.3%)	28 (0.5%)	60 (2.4%)	16 (0.6%)
Gage	291 (5.2%)	3,282 (15.4%)	4,399 (20.4%)	46 (0.2%)	414 (4.5%)	128 (1.4%)
Jefferson	120 (6.3%)	1,197 (16.9%)	1,665 (23.2%)	108 (1.6%)	149 (4.5%)	38 (1.2%)
Nuckolls	66 (5.7%)	713 (17%)	1,145 (26.8%)	39 (1%)	115 (6%)	49 (2.6%)

⁷⁹ United States Department of Agriculture, United States Forest Service. 2020. "Wildfire Risk to Communities." <https://wildfireisk.org/>.

SECTION FOUR: RISK ASSESSMENT

County	Families in Poverty	People with Disabilities	People over 65	Difficulty with English	Households with no Vehicle	Mobile Homes
Saline	358 (10.2%)	1,597 (11.4%)	2,027 (14.2%)	1,010 (7.6%)	80 (1.6%)	291 (5.7%)
Thayer	95 (6.4%)	752 (15.2%)	1,278 (25.1%)	16 (0.3%)	101 (4.4%)	36 (1.6%)
Webster	81 (8.7%)	539 (15.4%)	796 (22.3%)	0 (0%)	77 (5.1%)	30 (2%)

Source: *Wildfire Risk to Communities, 2020*⁸⁰

Location

There were 66 volunteer, rural, or municipal fire districts identified in the planning area. The following table lists these fire districts by county.

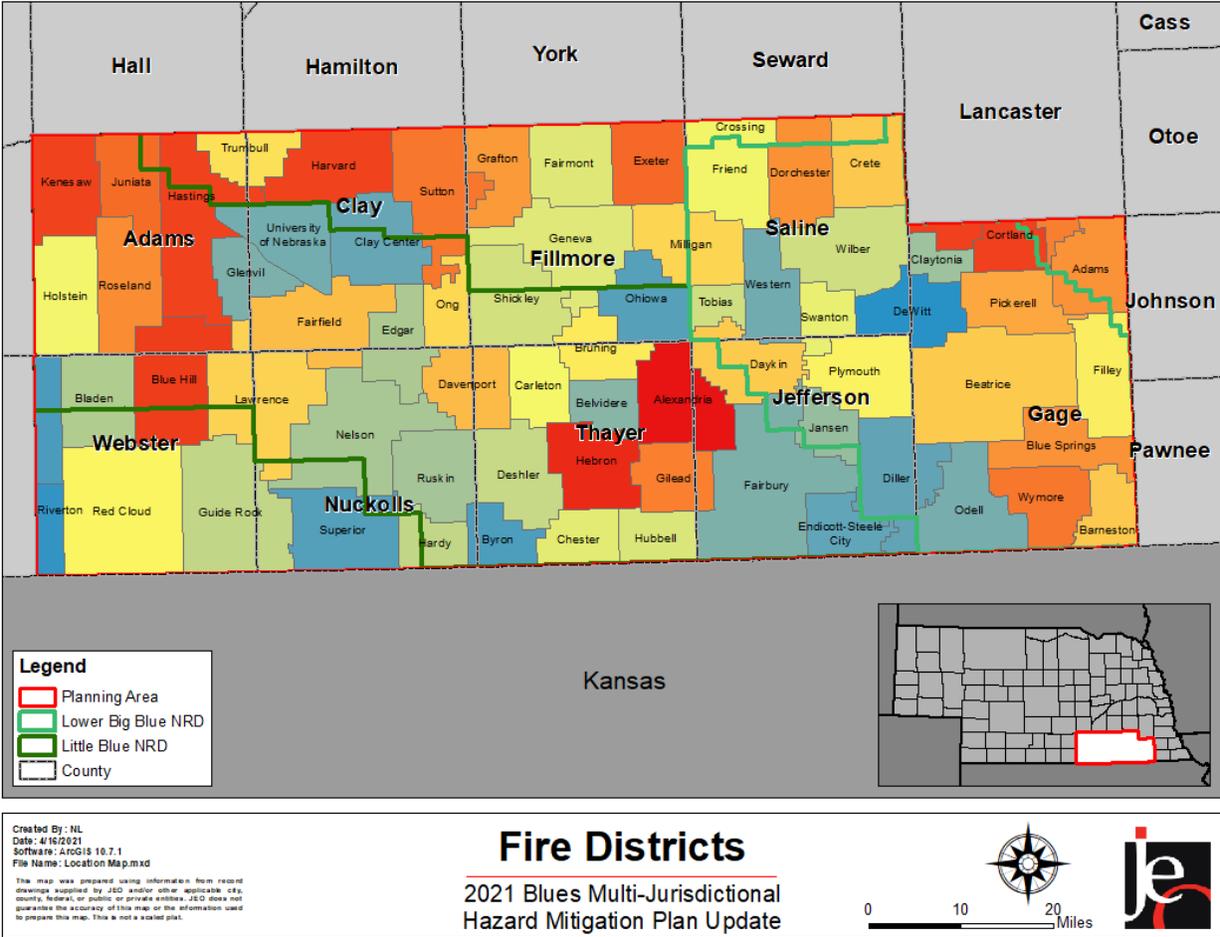
Table 70: Fire Districts in the Planning Area by County

County	Fire Districts	
Adams	Hastings Fire and Rescue	Juniata Rural Fire District
	Hastings Rural Fire District	Kenesaw Volunteer Fire Department
	Holstein Volunteer Fire Department	Roseland Volunteer Fire Department
Clay	Clay Center Volunteer Fire Department	Harvard Volunteer Fire Department
	Edgar Volunteer Fire Department	Sutton Volunteer Fire Department
	Fairfield Vol Fire & Rescue Dept	Trumbull Volunteer Fire Department
	Glenvil Fire & Rescue	
Fillmore	Exeter Volunteer Fire Department	Milligan Volunteer Fire Department
	Fairmont Volunteer Fire Department	Ohioa Rural Fire Department
	Geneva Fire & Rescue	Shickley Volunteer Fire & Rescue
	Grafton Rural Fire Department	
Gage	Adams Rural Fire Department	Cortland Volunteer Fire Department
	Barneston Rural Fire Department	Filley Rural Fire Department
	Beatrice City Fire & Rescue	Odell Volunteer Fire Department
	Beatrice Rural Fire Department	Pickrell Volunteer Fire Department
	Blue Springs Volunteer Fire Department	Wymore Volunteer Fire & Rescue Department
	Clatonia Fire Department	
Jefferson	Daykin Volunteer Fire Department	Jansen Rural Fire District 9
	Diller Rural Fire Department	Plymouth Volunteer Fire Department
	Fairbury Rural Fire Department	Steele City Rural Volunteer Fire Department
	Fairbury Volunteer City Fire Department	
Nuckolls	Hardy Fire Department	Ruskin Fire Department
	Lawrence Volunteer Fire Department	Superior Volunteer Fire Department
	Nelson Volunteer Fire Department	
Saline	Crete Volunteer Fire & Rescue	Swanton Volunteer Fire Department
	Dewitt Volunteer Fire Department	Tobias Volunteer Fire Department
	Dorchester Volunteer Fire Department	Western Rural Fire Department
	Friend Volunteer Fire Department	Wilber Volunteer Fire Department
Thayer	Alexandria Volunteer Rural Fire	Davenport Volunteer Fire Department
	Belvidere Fire Department	Deshler Fire Department
	Bruning Fire Department	Gilead Volunteer Fire Department
	Byron Volunteer Fire Department	Hebron Volunteer Fire Department

⁸⁰ United States Department of Agriculture, United States Forest Service. 2020. "Wildfire Risk to Communities." <https://wildfireisk.org/>.

County	Fire Districts	
	Carleton Volunteer Fire Department	Hubbell Volunteer Fire Department
	Chester Volunteer Fire Department	
Webster	Bladen Volunteer Fire Department	Guide Rock Volunteer Fire Department
	Blue Hill Volunteer Fire Department	Red Cloud Volunteer Fire Department

Figure 55: Fire Districts in the Planning Area



Historical Occurrences

For the planning area, 60 different fire departments reported a total of 2,059 wildfires between January 2000 and July 2020 according to the Nebraska Forest Service. The reported events burned 41,288 acres in total. While the RMA lists no damages from fire in the planning area, the local fire departments reported \$613,319 in crop loss and \$1,361,497 in property damages. Most fires occurred in 2006, 2000, and 2009 (Figure 56). The majority of wildfires were caused by Debris Burning or Miscellaneous causes (Figure 57). Wildfire events have ranged from less than one acre to 7,500 acres, with an average event burning 20 acres. It is important to note that there is no comprehensive fire event database. Fire events, magnitude, and local responses were reported voluntarily by local fire departments and local reporting standards can vary between departments. Actual fire events and their impacts are likely underreported in the available data.

SECTION FOUR: RISK ASSESSMENT

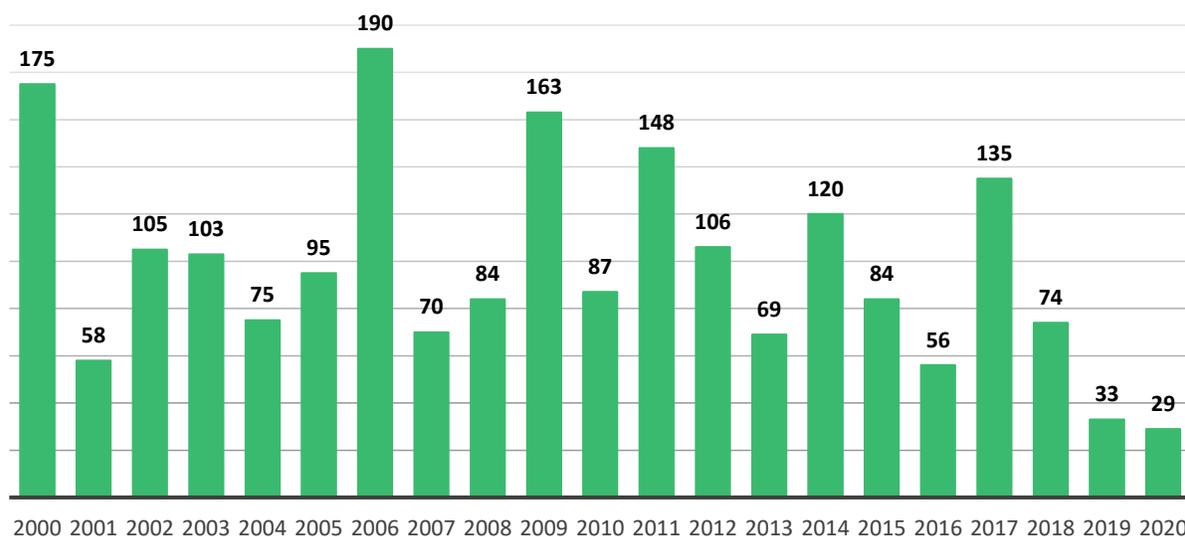
Wildfire count data was provided by the Nebraska Forest Service from January 2000 to July 2020. As the number of reported wildfires by county indicates, wildfire events can occur in any county within the planning area. Gage County has reported the greatest number of fires and number of acres burned.

Table 71: Reported Wildfires by County

County	Reported Wildfires	Acres Burned	Other Impacts
Adams	121	1,033	2 fatalities; 3 structures threatened
Clay	122	1,983	37 structures threatened; 5 structures destroyed
Fillmore	257	6,995	15 structures threatened; 11 structures destroyed
Gage	536	19,737	2 injuries; 17 structures threatened; 1 structure destroyed
Jefferson	235	3,502	18 structures threatened; 4 structures destroyed
Nuckolls	210	1,212	2 injuries; 28 structures threatened; 3 structures destroyed
Saline	243	2,477	3 injuries; 34 structures threatened; 3 structures destroyed
Thayer	237	2,807	6 injuries; 1 fatality; 84 structures threatened; 17 structures destroyed
Webster	98	1,543	2 injuries; 9 structures threatened
Total	2,059	41,288	15 injuries; 3 fatalities; 245 structures threatened; 44 structures destroyed

Source: NFS, 2000-2020⁸¹

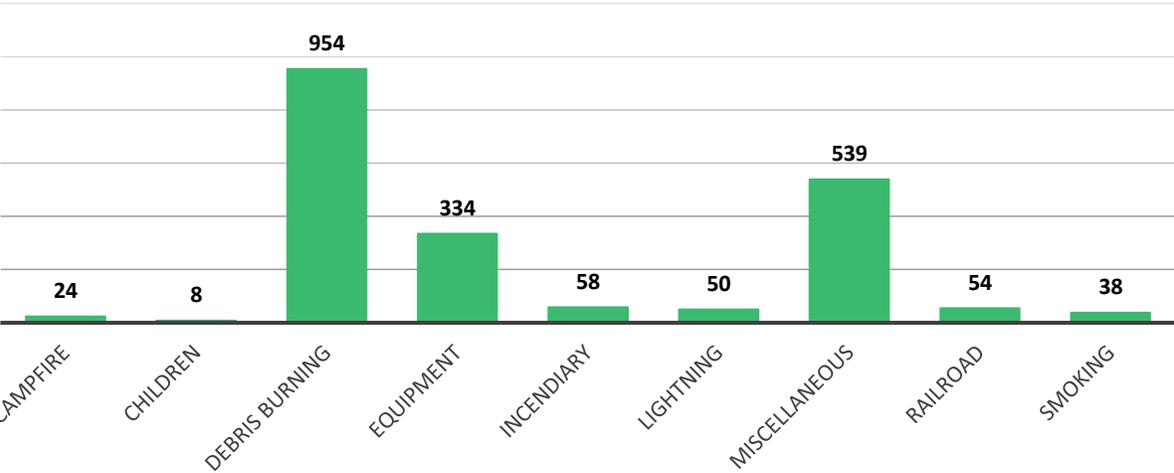
Figure 56: Wildfire Events by Year



Source: NFS, 2000-2020

⁸¹ Nebraska Forest Service. 2020. "Fire Incident Type Summary." Data Files 2000-2018 provided by NFS.

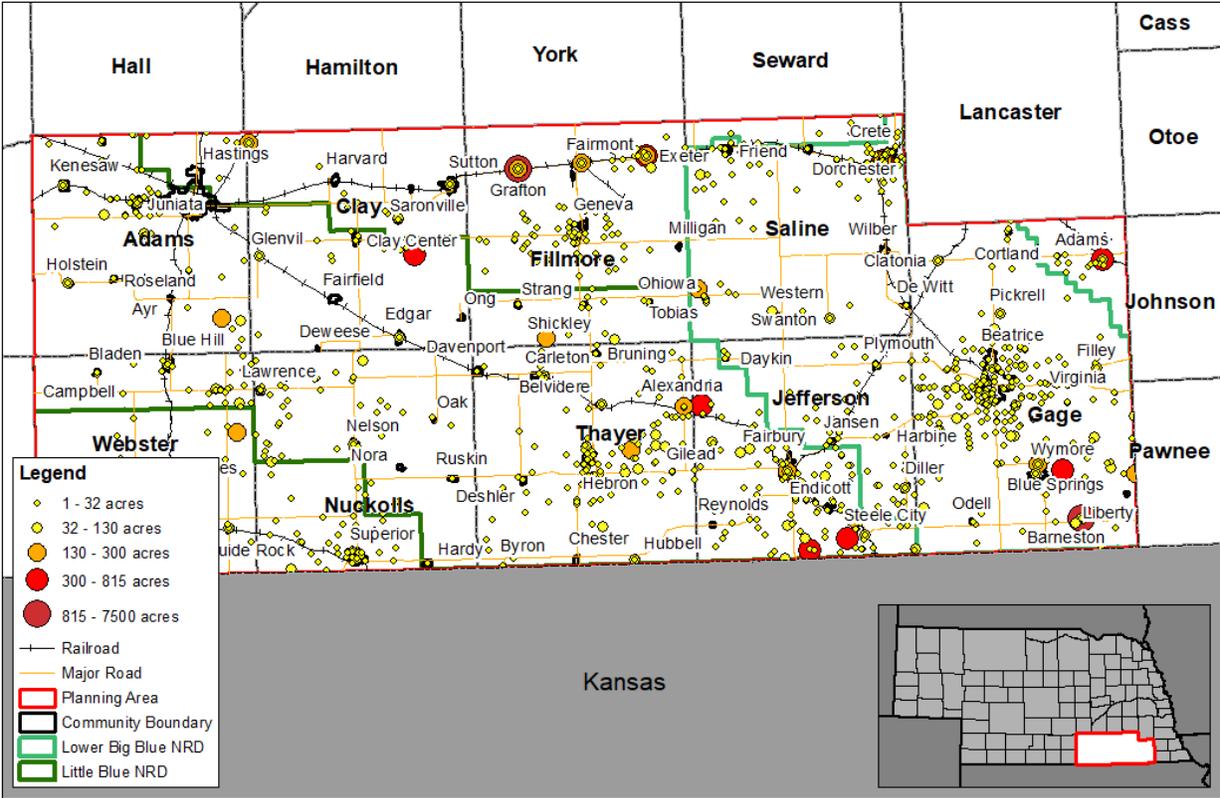
Figure 57: Wildfires by Cause in Planning Area



Source: NFS, 2000-2020

Figure 58 shows the location and general size of wildfires from 1990 to 2020.

Figure 58: Wildfire Occurrences in the Planning Area



Created By: NL
 Date: 4/27/2021
 Software: ArcGIS 10.7.1
 File Name: Blues_WUI.mxd

The map was prepared using information from record drawings supplied by JED and/or other applicable city, county, federal, or public or private entities. JED does not guarantee the accuracy of this map or the information used to prepare this map. This is not a scaled plot.

Wildfires

2021 Blues Multi-Jurisdictional Hazard Mitigation Plan Update

Average Annual Losses

The average damage per event estimate was determined based upon records from the Nebraska Forest Service Wildfire Database from January 2000 to July 2020 and the number of historical occurrences. This does not include losses from displacement, functional downtime, economic loss, injury, or loss of life. During this 21-year period, 2,059 wildfires burned 41,288 acres and caused \$613,319 crop and \$1,361,497 property damages.

Damages caused by wildfires extend past the loss of building stock, recreation areas, timber, forage, wildlife habitat, and scenic views. Secondary effects of wildfires, including erosion, landslides, introduction of invasive species, and changes in water quality, all increase due to the exposure of bare ground and loss of vegetative cover following a wildfire, and can often be more disastrous than the fire itself in long-term recovery efforts.

Table 72: Wildfire Loss Estimation

Hazard Type	Number of Events	Events Per Year	Average Acres per Fire	Total Property Loss	Average Property Loss	Total Crop Loss	Average Annual Crop Loss
Grass/Wildfire	2,059	98	20.1	\$613,319	\$29,206	\$1,361,497	\$64,833

Source: NFS, 2000-2020

Table 73: Wildfire Event Impacts and Threats

Hazard Type	Injuries	Fatalities	Homes Threatened or Destroyed	Other Structures Threatened or Destroyed
Grass/Wildfire	15	3	129	160

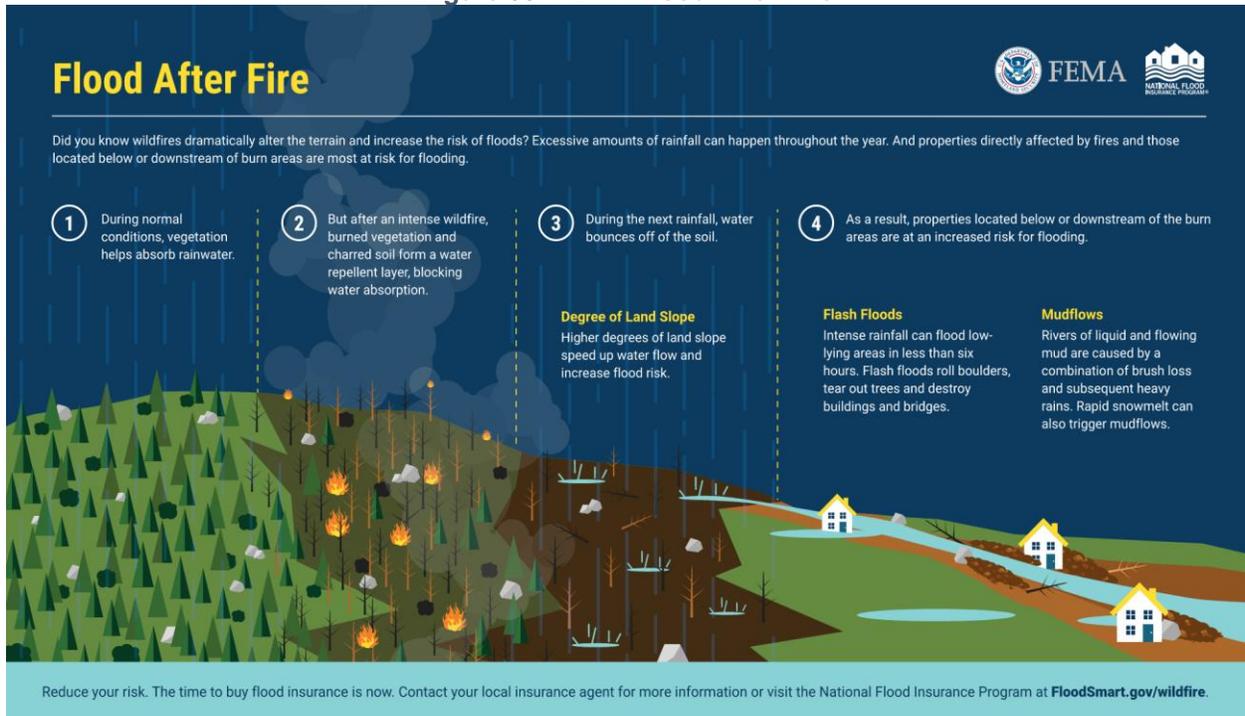
Source: NFS, 2000-2020

Extent

Overall, 2,059 wildfires were reported in the planning area and burned 41,288 acres in total. Of these, 58 fires burned 100 acres or more, with the largest wildfire burning 7,500 acres in Gage County in April 2000. The average area burned per wildfire was less than 21 acres indicating while many fires may occur, they are typically small in nature and easily contained.

Wildfire also contributes to an increased risk from other hazard events, compounding damages and straining resources. FEMA has provided additional information in recent years detailing the relationship between wildfire and flooding (Figure 59). Wildfire events remove vegetation and harden soil, reducing infiltration capabilities during heavy rain events. Subsequent severe storms that bring heavy precipitation can then escalate into flash flooding, dealing additional damage to jurisdictions.

Figure 59: FEMA Flood After Fire

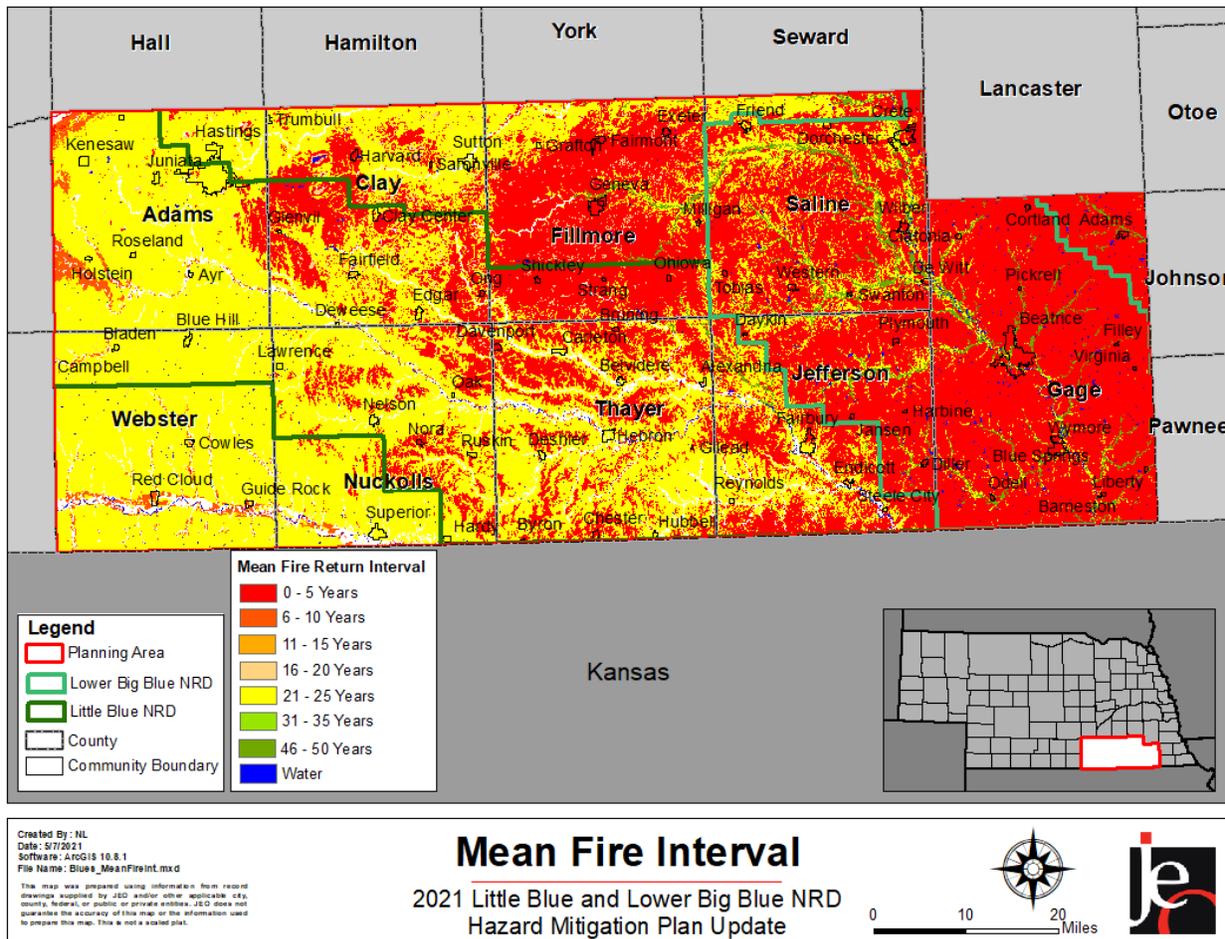


Source: FEMA, 2020⁸²

Figure 60 shows the USGS' Mean Fire Return Interval. This model considers a variety of factors, including landscape, fire dynamics, fire spread, fire effects, and spatial context. These values show how often fires occur in each area under natural conditions.

⁸² FEMA and NFIP. 2020. "Flood After Fire." Accessed September 2020. https://www.fema.gov/media-library-data/1573670012259-3908ab0344ff8bf5d537ee0c6fb531d/101844-019_FEMA_FAF_Infographic-ENG-web_v8_508.pdf.

Figure 60: Mean Fire Return Interval



Probability

Probability of wildfire occurrence is based on the historic record provided by the Nebraska Forest Service and reported potential by participating jurisdictions. With a grass/wildfire occurring in all 20 reported years (Figure 56) there is a 100 percent annual probability of wildfires occurring in the planning area each year.

Community Top Hazard Status

The following table lists jurisdictions which identified Grass/Wildfire as a top hazard of concern:

Jurisdictions	
Clay County	Village of Chester
Fillmore County	Village of Davenport
Thayer County	Village of Glenvil
Beatrice Public Schools	Village of Ong
South Central USD 5 (Lawrence-Nelson-Sandy Creek)	Village of Ruskin
City of Blue Hill	Village of Western
City of Superior	

Regional Vulnerabilities

Periods of drought can occur throughout the year while extreme heat conditions during summer months greatly increase the potential for and magnitude of wildland fires. Drought has a high probability of occurring in the planning area and the planning area sees, on average, six days above 100°F each year. During a severe drought, dry conditions, and/or windy conditions, large wildfires can more easily spread.

Wildfire poses a threat to a range of demographic groups. Wildfire, wildfire within the WUI, and urban fire could result in major evacuations of residents in impacted and threatened areas. Groups and individuals lacking reliable transportation could be trapped in dangerous locations. Lack of transportation is common among the elderly, low-income individuals, and racial minorities, including on tribal reservation lands. Wildfires can cause extensive damage to both urban and rural building stock and properties including critical facilities and infrastructure, as well as agricultural producers which support the local industry and economy. Damaged homes can reduce available housing stock for residents, causing them to leave the area. Additionally, fire events threaten the health and safety of residents and emergency response personnel. Recreation areas, timber and grazing land, wildlife habitat, and scenic views can also be threatened by wildfires.

Development across the planning area may be located within the WUI, particularly in large municipalities such as the City of Beatrice with a large amount of intermix overlap. Local officials can adopt codes and ordinances that can guide growth in ways to mitigate potential losses from wildfires. These may include more stringent building code standards, setback requirements, or zoning regulations. Other notable vulnerabilities exist for fire departments which service both urban and rural areas as many fire districts lack adequate staff to respond to multi-fire complexes or events in separate areas. The utilization and development of mutual aid agreements or memorandum of understandings are an important tool for districts to share resources and/or coverage.

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

Table 74: Regional Grass/Wildfire Vulnerabilities

SECTOR	VULNERABILITY
PEOPLE	-Risk of injury or death for residents and firefighting personnel -Displacement of people and loss of homes -Lack of transportation poses risk to low-income individuals, families, and elderly -Transportation routes may be blocked by fire, preventing evacuation efforts
ECONOMIC	-Damages to buildings and property can cause significant losses to business owners -Loss of businesses
BUILT ENVIRONMENT	-Property damages
INFRASTRUCTURE	-Damage to power lines and utility structures
CRITICAL FACILITIES	-Risk of damages
CLIMATE	-Changes in seasonal temperature and precipitation normals can increase frequency and severity of wildfire events -Changes in climate can help spread invasive species, changing potential fuel loads in wildland areas

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SECTOR	VULNERABILITY
OTHER	-Increase chance of landslides, erosion, and land subsidence -May lead to poor water quality -Post fire, flash flooding events may be exacerbated

Hazardous Materials

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

Chemicals are found everywhere. They purify drinking water, increase crop production and simplify household chores. But chemicals also can be hazardous to humans or the environment if used or released improperly. Hazards can occur during production, storage, transportation, use or disposal. You and your community are at risk if a chemical is used unsafely or released in harmful amounts into the environment where you live, work or play.⁸³

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

Chemical manufacturers are one source of hazardous materials, but there are many others, including service stations, hospitals, and hazardous materials waste sites. Varying quantities of hazardous materials are manufactured, used, or stored in an estimated 4.5 million facilities in the United States—from major industrial plants to local dry-cleaning establishments or gardening supply stores.

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

The Environmental Protection Agency (EPA) requires the submission of the types and locations of hazardous chemicals being stored at any facility within the state over the previous calendar year. This is completed by submitting a Tier II form to the EPA as a requirement of the Emergency Planning and Community Right-to-Know Act of 1986. Likewise, the U.S. Department of Transportation, through the U.S. Pipeline and Hazardous Materials Safety Administration (PHMSA), has broad jurisdiction to regulate the transportation of hazardous materials, including the discretion to decide which materials shall be classified as hazardous. These materials are placed into one of nine hazard classes based on their chemical and physical properties. The hazard schedules may be further subdivided into divisions based on their characteristics. Because the properties and characteristics of materials are crucial in understanding the dynamics of a spill during a transportation incident, it is important for response personnel to understand the hazard classes and their divisions.

⁸³ Federal Emergency Management Agency. 2017. "Hazardous Materials Incidents." <https://www.ready.gov/hazardous-materials-incidents>.

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The transportation of hazardous materials is defined by 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 1,000,000 shipments per day. Nationally, the U.S. has had 108 fatalities associated with the transport of hazardous materials between 2007 through 2016. 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.

Fixed-sites are those that involve chemical manufacturing sites and stationary storage facilities while transportation spills include any incident that occurs during the movement or transport of a chemical. Table 75 demonstrates the nine classes of hazardous material according to the 2012 Emergency Response Guidebook.

Table 75: Hazardous Material Classes

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

Source: *Emergency Response Guidebook, 2016*⁸⁴

⁸⁴ U.S. Department of Transportation Pipeline and Hazardous Materials Safety Administration. 2016. “2016 Emergency Response Guidebook.” <https://www.phmsa.dot.gov/hazmat/outreach-training/erg>.

Location

Nebraska has approximately 3,624 facilities across the state that house hazardous materials according to the Tier II reports submitted to the Nebraska Department of Environment and Energy (NDEE) in 2019. Of those, 263 locations are located in the planning area. These locations are shown in Figure 61. A listing of hazardous material storage sites can be found in *Section Seven: Community Profiles* for each jurisdiction.

Figure 61: Fixed Chemical Sites in the Planning Area

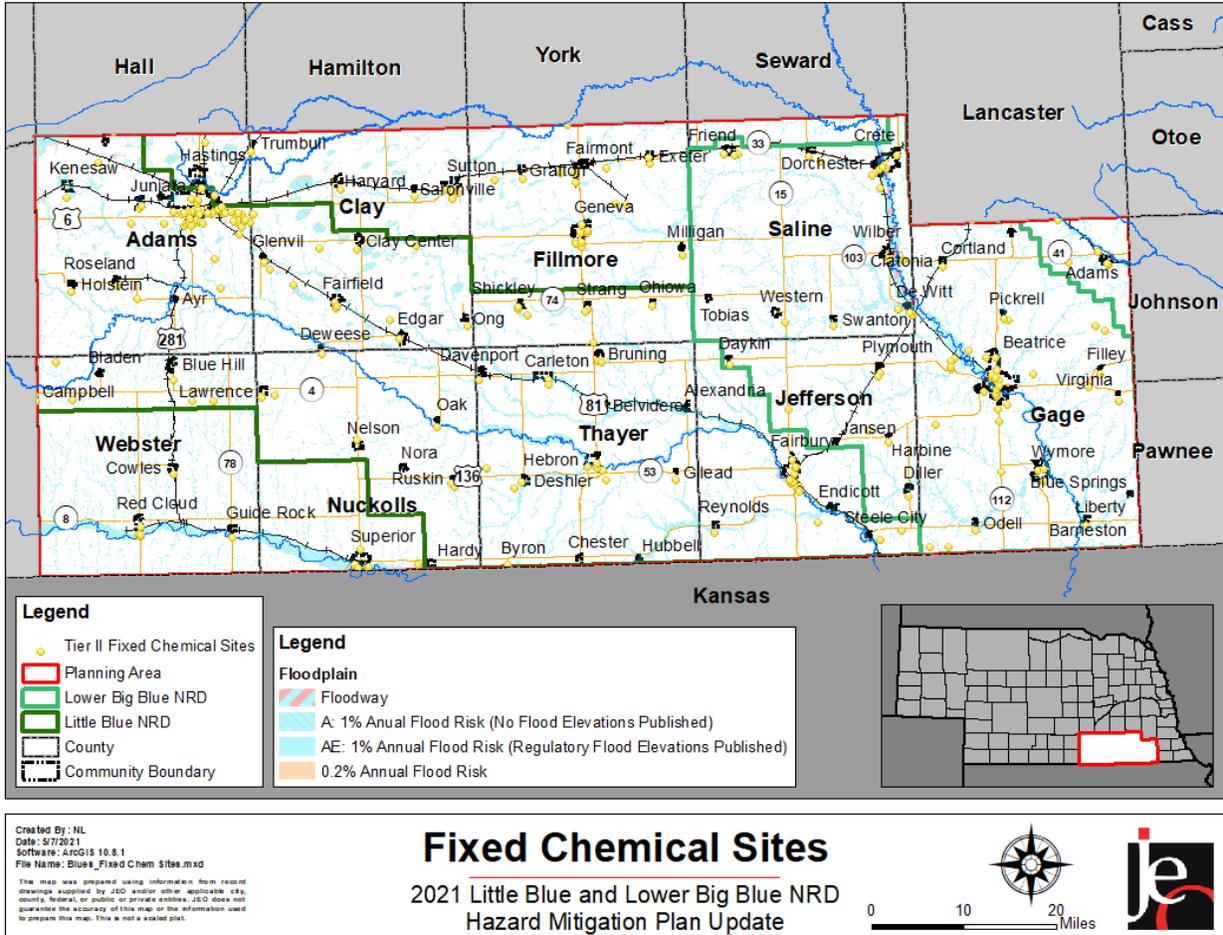
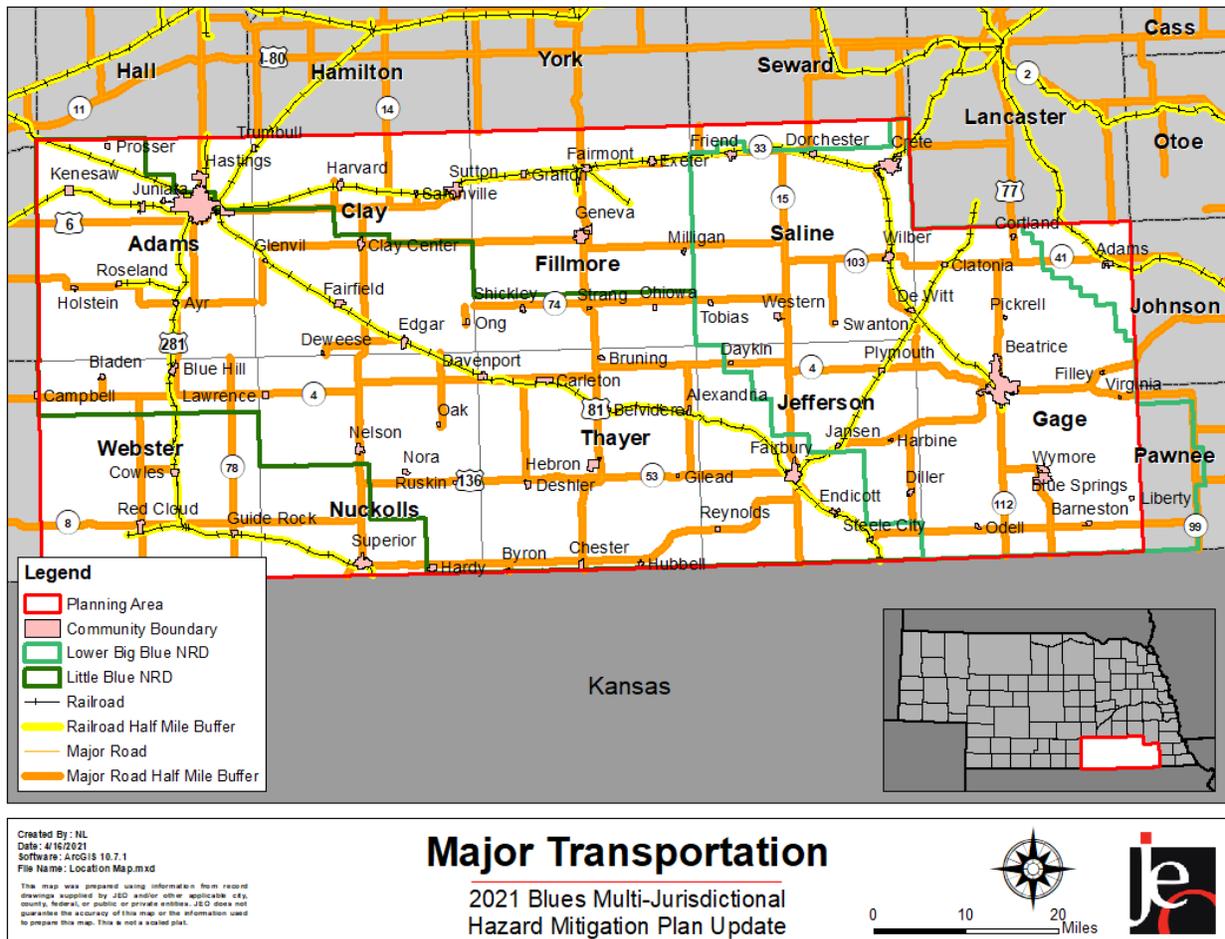


Figure 62: Major Transportation Corridors in the Planning Area



Hazardous materials releases during transportation primarily occur on major transportation routes as identified in Figure 62. Participating communities specifically reported transportation along railroads and highways as having the potential to impact their communities. Railroads providing service through the planning area have developed plans to respond to chemical releases along rail routes. A large number of spills also typically occur during the loading and unloading of chemicals for highway and pipeline chemical transport. The most heavily trafficked corridors in the planning area include US Route 34, which runs east to west through the northern part of the planning area, from Hastings to Fairmont to Crete; US Route 136, which is an east-west arterial running along the southern part of the planning area, from Red Cloud to Fairbury to Beatrice; and US Routes 281, 81, and 77, which are north-south arterials serving several of the planning area counties.

According to PHMSA, there are several gas transmission and hazardous liquid pipelines located in the planning area. Maps of pipelines and incidents from PHMSA for each of the nine counties in the planning area can be seen below (Figure 63 through Figure 71).⁸⁵

⁸⁵ Pipeline and Hazardous Materials Safety Administration. 2020. "National Pipeline Mapping System." <https://www.npms.phmsa.dot.gov/>.

Figure 63: Adams County Public Map Viewer Map

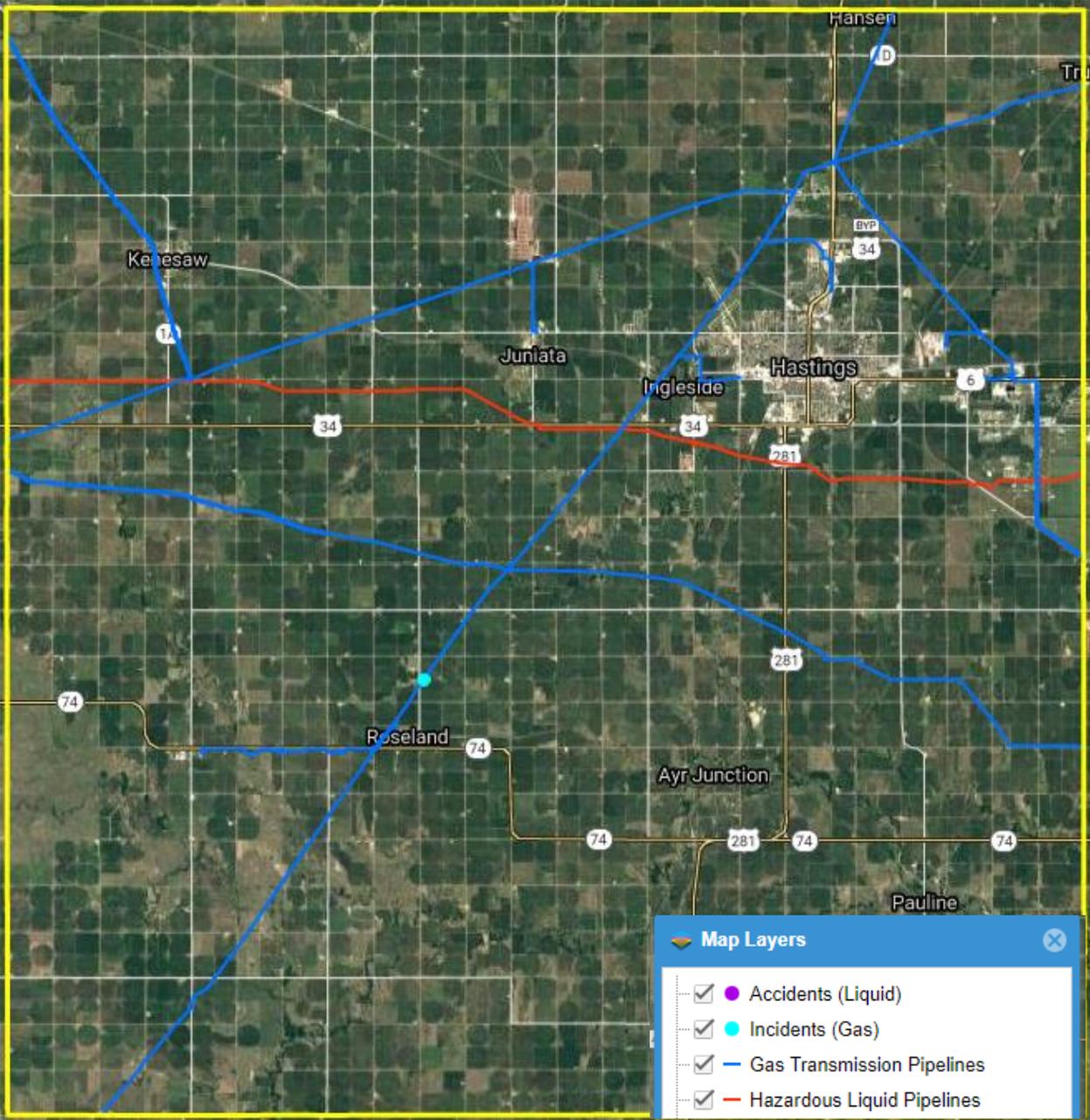


Figure 64: Clay County Public Map Viewer Map

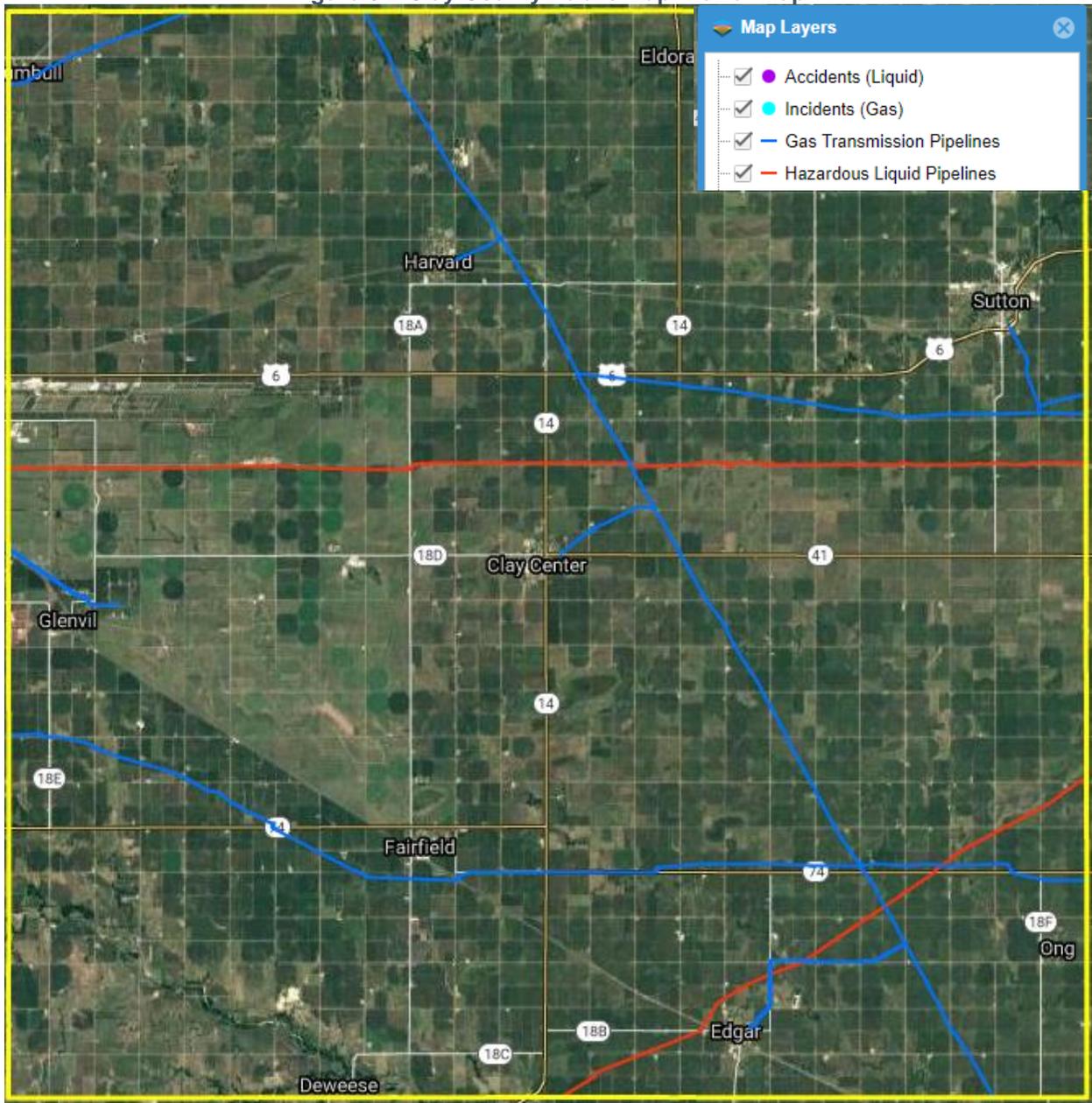


Figure 65: Fillmore County Public Map Viewer Map

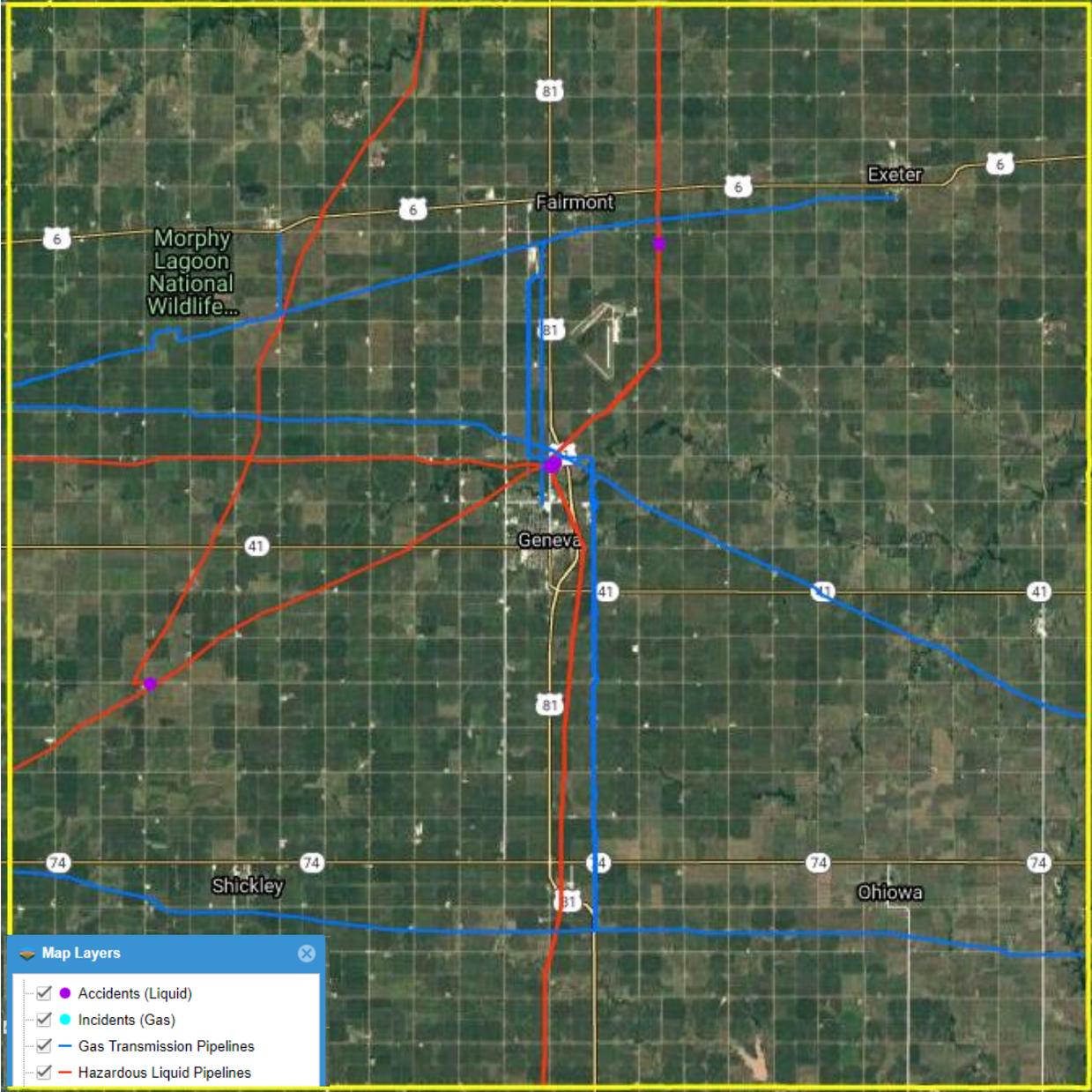
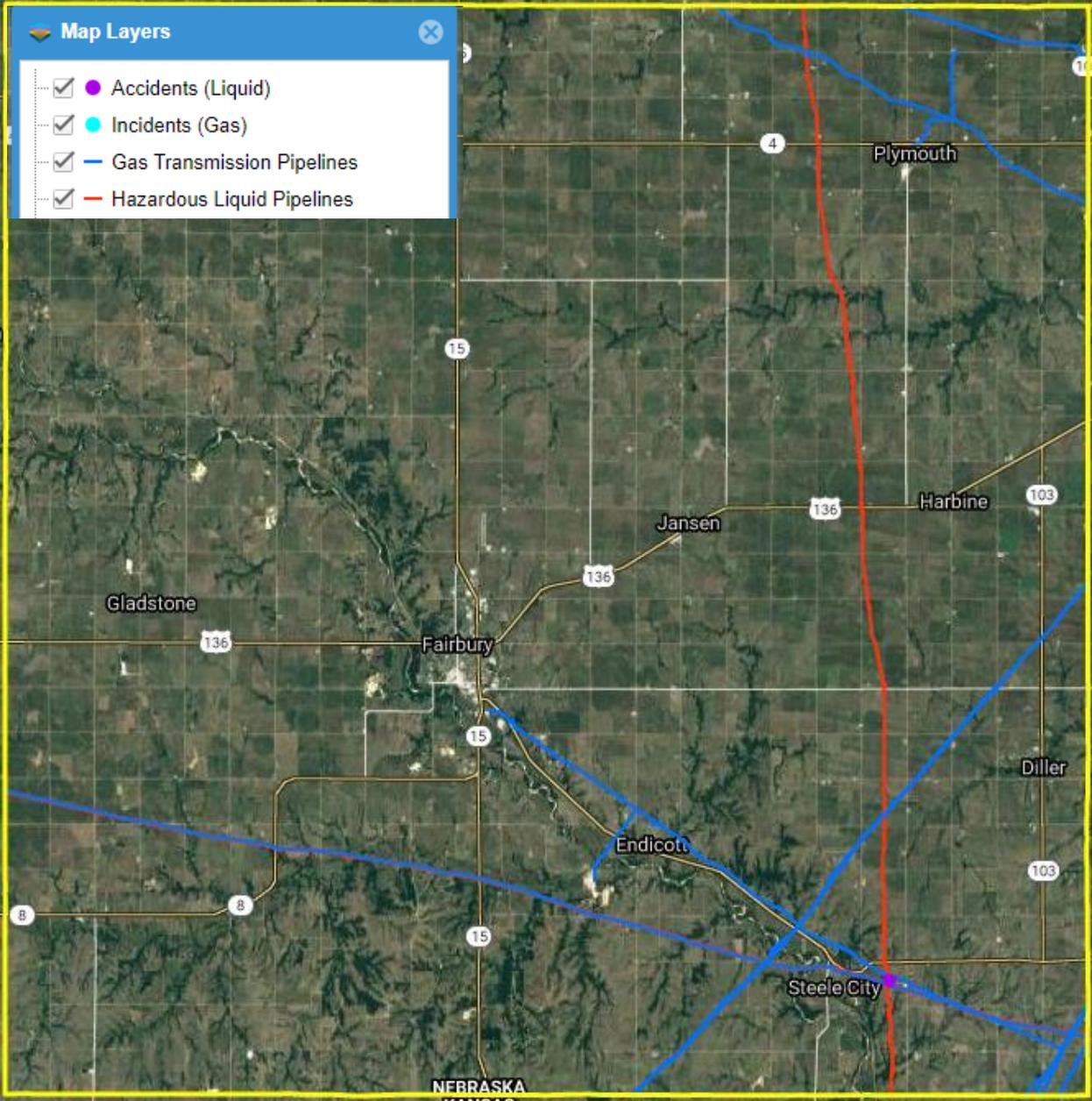


Figure 66: Gage County Public Map Viewer Map



Figure 67: Jefferson County Public Map Viewer Map



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Figure 68: Nuckolls County Public Map Viewer Map

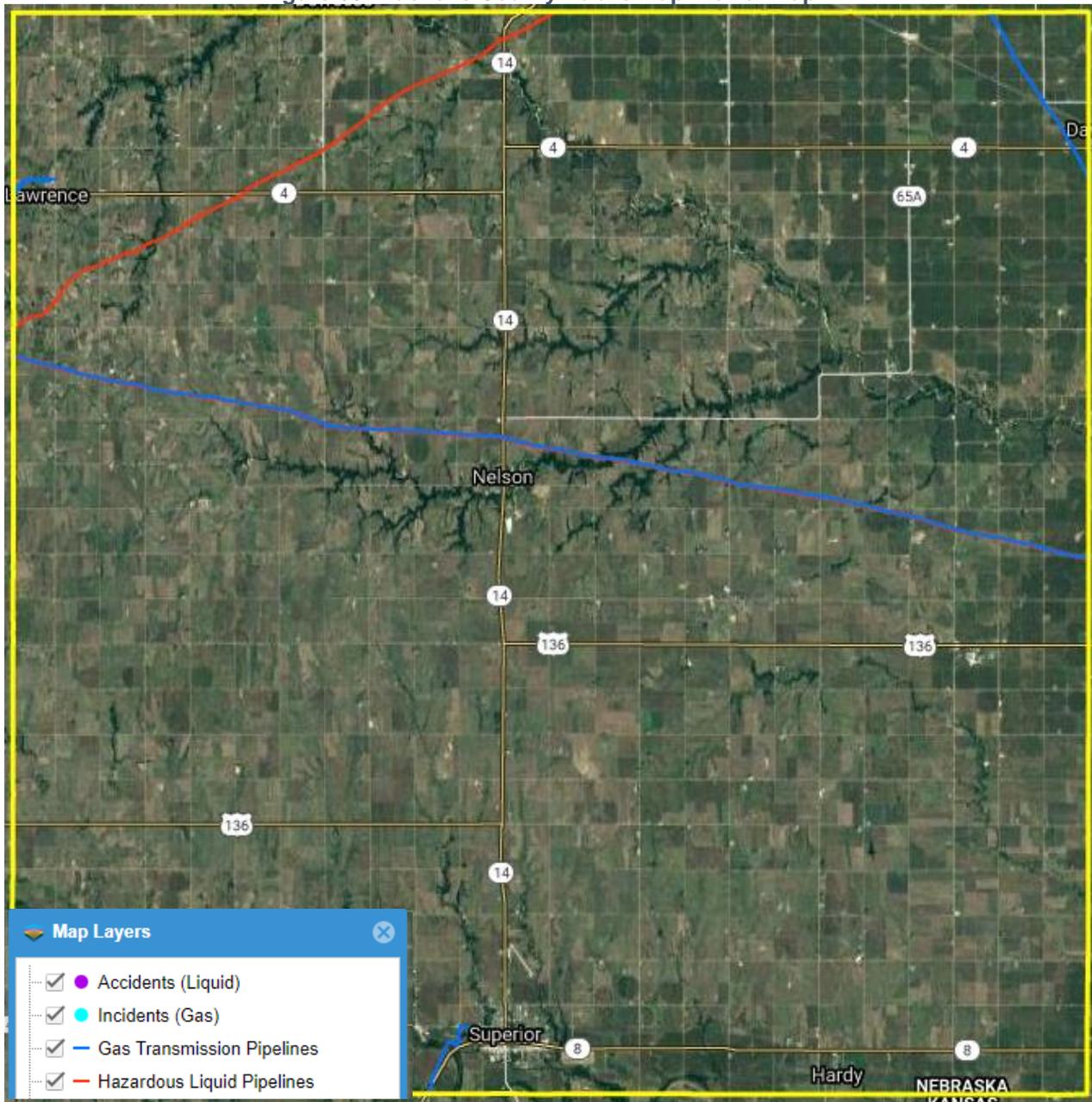
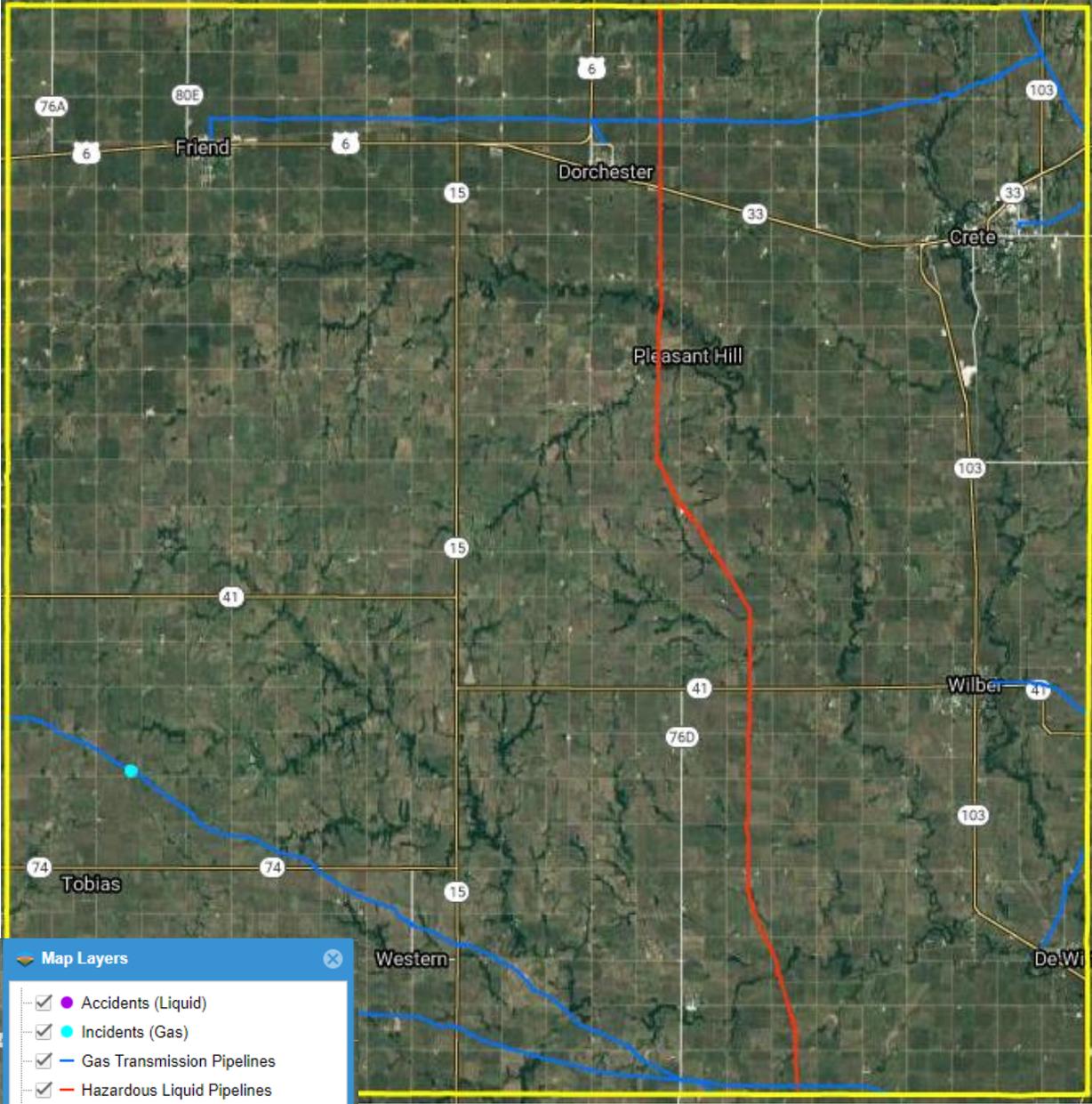


Figure 69: Saline County Public Map Viewer Map



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Figure 70: Thayer County Public Map Viewer Map

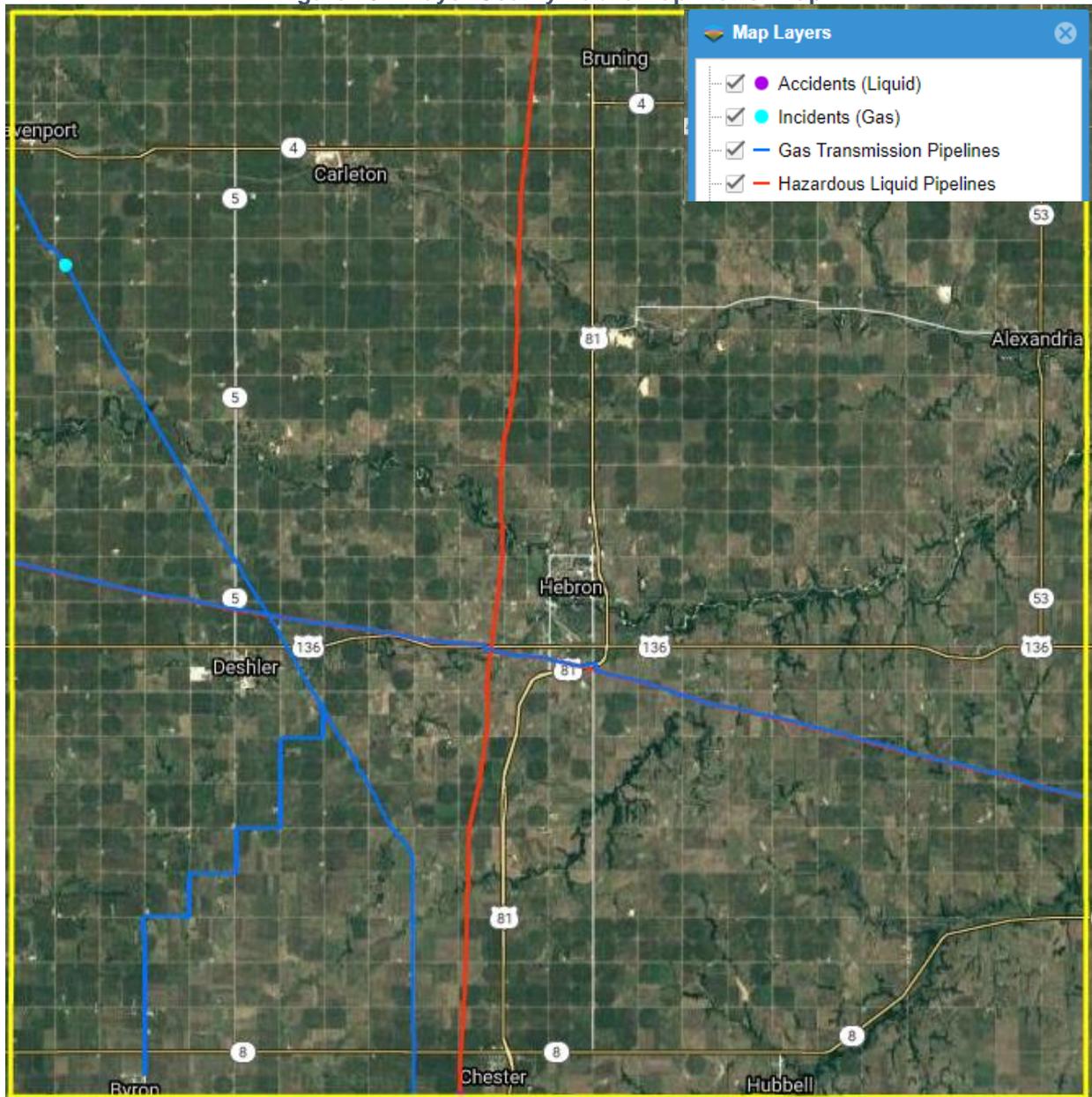
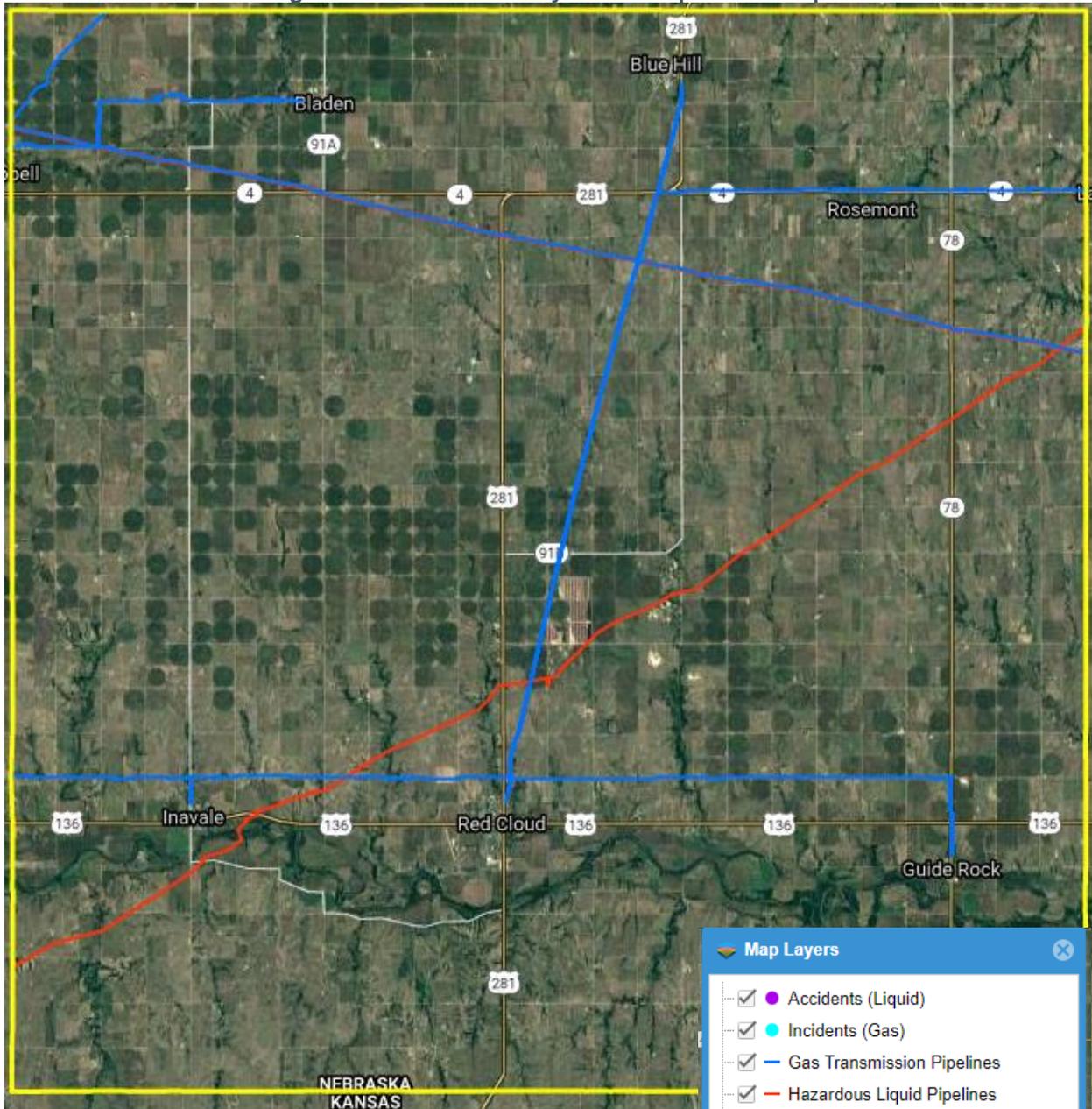


Figure 71: Webster County Public Map Viewer Map



There are ten State Emergency Response Teams (SERTs) stationed across the State of Nebraska which are trained to respond to large scale hazardous material incidents. Each department includes personnel at the technical, incident commander, and safety officer levels. Two SERTs are located in the planning area – one in Beatrice (Gage County) and one in Hastings (Adams County).⁸⁶

⁸⁶ NEMA. June 2020. "Nebraska: Emergency Assistance to a Hazardous Materials Incident." <https://nema.nebraska.gov/sites/nema.nebraska.gov/files/doc/hazmat-blue-book.pdf>.

Year	Location of Release	Quantity Spilled	Material Involved	# injured	# evacuated	Property Damage
1999	Hastings (Adams)	2,200 lbs	Ammonia Thiosulfate	0	0	\$0
1994	Beatrice (Gage)	2,000 lbs	Ammonium Nitrate	0	0	\$0
1994	Odell (Gage)	2,000 gals	Fertilizer 7217	0	0	\$0

Source: National Response Center, 1990-2019

Transportation Spills

According to PHMSA, 72 hazardous materials releases occurred during transportation in the planning area between 1990 and 2020. During these events, there were no injuries, no fatalities, and \$1,206,459 in damages. The following table provides a list of the most significant historical transportation chemical spills, including the largest spills and most costly incidents.

Table 77: Historical Chemical Spills 1990-2020

Date of Event	Location of Release	Failure Description	Material Involved	Method of Transportation	Quantity Spilled	Total Damages
6/26/1990	Crete (Saline)	Rupture/Loose Closure	Phosphoric Acid Solution	Highway	950 LGA	\$0
4/23/1991	Exeter (Gage)	Rail Derailment	Ferrous Chloride	Rail	10,000 LGA	\$506,000
7/19/1991	Hastings (Adams)	Rupture	Acetylene	Highway	0	\$88,975
12/24/1994	Beatrice (Gage)	Overfilled	Gasoline	Highway	500 LGA	\$200
3/20/1995	Gilead (Thayer)	Defective Component	Anhydrous Ammonia	Highway	1,460 LGA	\$1,045
4/29/2002	Geneva (Gage)	Accident	Gasoline	Highway	800 LGA	\$85,000
1/16/2006	Strang (Gage)	Puncture	Isohexenes	Highway	1,000 LGA	\$150,000
11/19/2009	Bruning (Thayer)	Accident/Leak	Liquified Petroleum Gas	Highway	1 LGA	\$51,401
1/23/2017	Odell (Gage)	Accident	Liquified Petroleum Gas	Highway	2,600 LGA	\$118,680

Source: PHMSA, 1990-2020

Average Annual Losses

There have been 368 chemical fixed site spills in the planning area reported from the NRC and 72 transportation spills as reported by PHMSA. Neither the NRC nor PHMSA track crop losses from chemical spills. These events reported \$1,206,459 in property damages. This does not include losses from displacement, functional downtime, economic loss, injury, or loss of life.

Table 78: Chemical Fixed Site Losses

Hazard Type	Number of Events	Events per Year	Total Injuries	Total Evacuated	Total Loss	Average Annual Loss
Chemical Spills	368	11.9	1	519	\$0	\$0
Chemical Transportation	72	2.3	0	N/A	\$1,206,459	\$24,129

Source: NRC, 1990-2019; PHMSA, 1990-2020

Extent

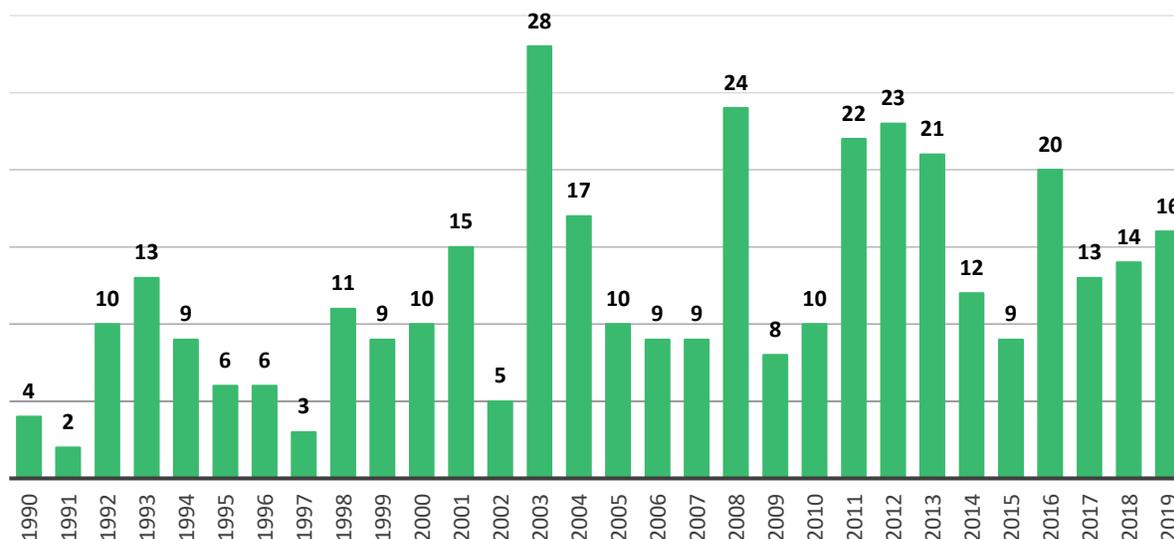
The extent of chemical spills at fixed sites varies and depends on the type of chemical that is released with a majority of events localized to the facility. The probable extent of chemical spills during transportation is difficult to anticipate and depends on the type and quantity of chemical released. There were 368 fixed site and 72 transportation chemical releases that have occurred in the planning area. Fixed chemical spills ranged from one to 12,364 pounds with an average quantity spilled of 475 gallons or pounds of contaminant. Transportation spills ranged from no material released to over 950 liquid gallons of material with an average quantity spilled of 46 liquid gallons.

Of these events, nine spills led to evacuations and one spill event caused injuries. No spill events led to fatalities. 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.

Probability

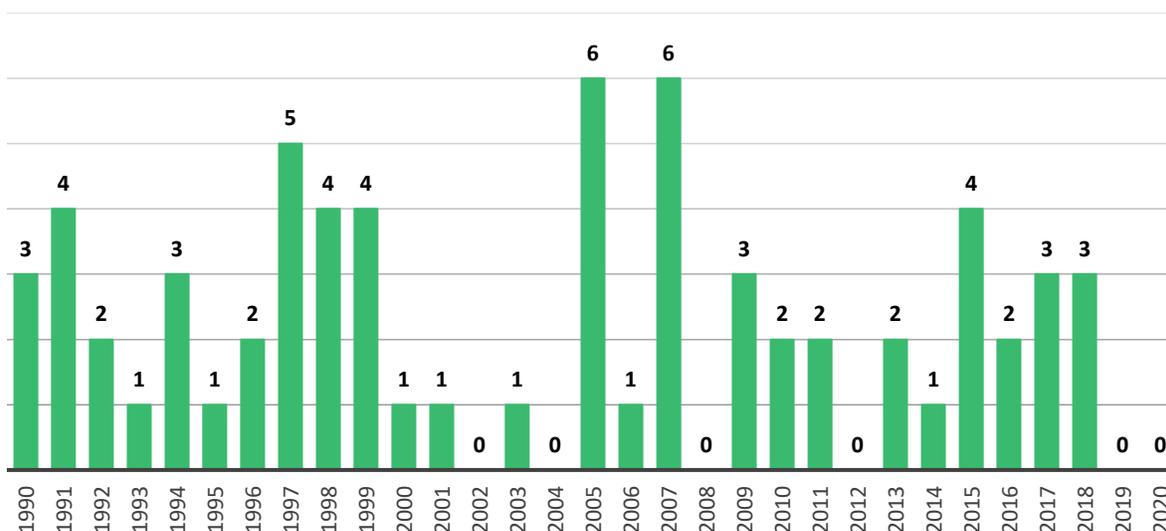
Given the historic record of occurrence for fixed chemical spill events (at least one chemical spill reported in all years), for the purposes of this plan, the annual probability of a fixed chemical spill is 100 percent. Given the historic record of occurrence for chemical transportation spill events (25 out of 31 years with a reported event), for the purposes of this plan, the annual probability of chemical transportation occurrence is 81%.

Figure 73: Chemical Fixed Site Events by Year



Source: NRC, 1990-2019

Figure 74: Chemical Transportation Events by Year



Source: PHMSA, 1990-2020

Community Top Hazard Status

The following table lists jurisdictions which identified Hazardous Materials as a top hazard of concern:

Jurisdictions	
Beatrice Public Schools	Village of Bruning
City of Crete	Village of Clatonia
City of Deshler	Village of Davenport
City of Edgar	Village of Daykin
City of Fairbury	Village of Diller

Jurisdictions	
City of Fairfield	Village of Dorchester
City of Hebron	Village of Filley
City of Superior	Village of Glenvil
City of Wilber	Village of Grafton
Clay County	Village of Hardy
Exeter Milligan Public Schools	Village of Jansen
Fillmore County	Village of Lawrence
Jefferson County	Village of Odell
Saline County	Village of Ong
South Central USD 5 (Lawrence-Nelson-Sandy Creek)	Village of Plymouth
South Heartland District Health Department	Village of Reynolds
Superior Public Schools	Village of Ruskin
Tri-County Public Schools	Village of Swanton
Village of Adams	Village of Tobias
Village of Alexandria	Village of Trumbull
Village of Barneston	Village of Western

Regional Vulnerabilities

To reduce the risk to people and property damage, future development should encourage chemical storage and manufacturing facilities to be built away from critical facilities such as hospitals, schools, daycares, nursing homes, and other residential areas. Likewise development and critical facilities should be built away from major transportation corridors used for chemical transportation. Specific vulnerabilities exist for critical facilities or vulnerable population centers (schools, daycares, hospital, etc.) which are most heavily populated during the daytime as most chemical transportation incidents occur during the weekday daytime hours.

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

Table 79: Regional Hazardous Materials Vulnerabilities

SECTOR	VULNERABILITY
PEOPLE	-Those in close proximity could have minor to moderate health impacts -Possible evacuations -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 -Evacuations and closed transportation routes could impact businesses near spill
BUILT ENVIRONMENT	-Risk of fire or explosion
INFRASTRUCTURE	-Transportation routes can be closed during evacuations or cleanup
CRITICAL FACILITIES	-Risk of fire, explosion, or other damages -Risk of evacuation
CLIMATE	-More extreme weather events and flood events put sites at risk of flooding at greater risk

Levee Failure

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

According to the U.S. Army Corps of Engineers (USACE), there are 132 levee systems in the State of Nebraska which include 304 individual structures and span 346 miles of levee embankments. Within the planning area, there is one federal levee located in Fairbury and three non-USACE levee systems located in the City of Beatrice as reported in USACE’s National Levee Database. The Village of Kenesaw also noted a non-certified dike system, Kenesaw Dike, provides flood protection to the village. This dike is 2.5 miles in length, and presently diverts water to Thirty-Two Mile Creek. The Little Blue NRD constructed this structure on the north side of town.

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

Table 80: USACE Levees in Planning Area

Name	Sponsor	Location	Length (miles)	Risk Level	Population in Leveed Area	Structures in Leveed Area	Property Value in Leveed Area
Fairbury NE	City of Fairbury	Fairbury (Jefferson County)	1.75	Low	645	581	\$90,632,730

Source: USACE Levee Database

According to the USACE National Levee Database, the Fairbury project is a levee system that reduces the occurrence of flooding in Fairbury, Nebraska. The levee system includes 1.7 miles of earthen levee along the Little Blue River. The levee was designed and constructed by USACE in 1970. After construction the project was then turned over to the local sponsor, the City of Fairbury, for operation and maintenance. The local sponsor now owns, operates, and maintains the levee system.

Table 81: Non-USACE Levees in Planning Area

Name	Location	Length (miles)	Population in Leveed Area	Structures in Leveed Area	Property Value in Leveed Area
Indian Creek Levee – Beatrice, NE 2	Beatrice NE	0.45	2	2	\$367,796.42
Big Blue River Levee – Beatrice NE	Beatrice NE	0.56	2	2	\$367,796.42
Indian Creek Levee – Beatrice NE 1	Beatrice NE	0.17	0	0	\$0

Source: USACE Levee Database; *Note non-USACE levees are not screened for risk level

Historical Occurrences

As there is no formal database of historical levee failures, the following sources were consulted: members of the Planning Team, local newspapers and media outlets, Little Blue NRD, Lower Big Blue NRD, and USACE. According to these resources no recorded instances of levee failure have occurred in the planning area.

Extent

Given the one federal levee in the planning area, the extent of federal levee failure is limited to the southwestern portion of Fairbury. If this levee were to fail, approximately 30-percent of the city would be inundated. The City of Beatrice noted that while there are non-credited, non-federal levees (Indian Creek Levee NE-1, Indian Creek Levee NE-2, and the Big Blue River Levee), these levees provide flood protection primarily to agricultural assets outside of the City boundaries. There are a number of agricultural levees in the planning area, however, these levees do not protect people, and their failure would result in only minor crop damages.

USACE, who is responsible for federal levee oversight and inspection of levees, has three ratings for levee inspections. Any levee failure events in the planning area will fall within USACE's rating system; however, it is not currently possible to determine what level of damage each levee system will experience. Non-federal levees are not inspected and thus do not have ratings.

Table 82: 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

Levee Improvements and FEMA Accreditation

In 2004, as it initiated work under the Flood Map Modernization Initiative (Map Mod), FEMA determined that analysis of the role of levees in flood risk reduction would be an important part of the mapping efforts. A report issued in 2005 noted that the status of the Nation's levees was not well understood and the condition of many levees and floodwalls had not been assessed since their original inclusion in the NFIP. As a result, FEMA established policies to address existing levees. As DFIRMs are developed, levees fall under one of the three following categories:

- 1) Accredited Levee - With the exception of areas of residual flooding (interior drainage), if the data and documentation specified in 44 CFR 65.10 is readily available and provided to FEMA, the area behind the levee will be mapped as a moderate-risk area. There is no mandatory flood insurance purchase requirement in a moderate-risk area, but flood insurance is strongly recommended.
- 2) Provisionally Accredited Levee (PAL) - If data and documentation is not readily available, and no known deficiency precludes meeting requirements of 44 CFR 65.10, FEMA can allow the party seeking recognition up to two years to compile and submit full documentation to show compliance with 44 CFR 65.10. During this two-year period of

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provisional accreditation, the area behind the levee will be mapped as moderate-risk with no mandatory flood insurance purchase requirement.

3) De-Accredited Levees – If the information established under 44 CFR 65.10 is not readily available and provided to FEMA, and the levee is not eligible for the PAL designation, the levee will be de-accredited by FEMA. The area behind the levee will be mapped as a high risk area, subject to mandatory flood insurance purchase.

The Fairbury Levee System was a Provisionally Accredited Levee system as of March 2021. The City of Fairbury has expressed intent to improve flood protection provided by the levee and work through the accreditation process.

Probability

Given no historical occurrences of federal levee failure in the planning area, the annual probability of this event occurring is considered to be less than one percent. While it is possible for levee failure to occur in the future, this is considered a low probability.

Community Top Hazard Status

The following table lists jurisdictions which identified Levee Failure as a top hazard of concern:

Jurisdictions	
Little Blue NRD	Village of Kenesaw
City of Sutton	

Regional Vulnerabilities

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

Table 83: Regional Levee Failure Vulnerabilities

SECTOR	VULNERABILITY
PEOPLE	-Those living in federal and non-federal levee protected areas -Residents with low mobility or with no access to a vehicle are move vulnerable during levee failure events -Those without adequate notification (text alerts, sirens, internet or cable access) may be at greater risk
ECONOMIC	-Businesses and industries protected by levees are at risk during failures
BUILT ENVIRONMENT	-All buildings within levee protected areas are at risk to damages
INFRASTRUCTURE	-Major transportation corridors and bridges at risk during levee failures
CRITICAL FACILITIES	-Critical facilities in levee protected areas are at risk
CLIMATE	-Changes in seasonal precipitation and temperature normals can increase strain on infrastructure

Public Health Emergency

According to the World Health Organization, a public health emergency is:

“an occurrence or imminent threat of an illness or health condition, caused by bio terrorism, epidemic or pandemic disease, or (a) novel and highly fatal infectious agent or biological toxin, that poses a substantial risk of a significant number of human fatalities or incidents or permanent or long-term disability” (WHO/DCD, 2001). The declaration of a state of public health emergency permits the governor to suspend state regulations, change the functions of state agencies.⁸⁷

The number of cases that qualifies as a public health emergency depends on several factors including the illness, its symptoms, ease in transmission, incubation period, and available treatments or vaccinations. With the advent of sanitation sewer systems and other improvements in hygiene since the 19th century, the spread of infectious disease has greatly diminished. Additionally, the discovery of antibiotics and the implementation of universal childhood vaccination programs have played a major role in reducing human disease impacts. Today, human disease incidences are carefully tracked by the Centers for Disease Control and Prevention (CDC) and state organizations for possible epidemics and to implement control systems. Novel illnesses or diseases have the potential to develop annually and significantly impact residents and public health systems.

Some of the best actions or treatments for public health emergencies are nonpharmaceutical interventions (NPI). These are readily available behaviors or actions and response measures people and communities can take to help slow the spread of respiratory viruses such as influenza or coronavirus. Understanding NPIs and increasing the capacity to implement them in a timely way, can improve overall community resilience during a pandemic. Using multiple NPIs simultaneously can reduce influenza transmission in communities even before vaccination is available.⁸⁸ Pandemics are global or national disease outbreaks. These types of illnesses, such as influenza, can spread easily person-to-person, cause severe illness, and are difficult to contain. An especially severe pandemic can lead to high levels of illness, death, social disruption, and economic turmoil.

Infectious diseases can spread through the following: airborne transmission (aerosol droplets absorbed by inhalation), biological transmission (ingestion), or contact transmission (touch or absorption through skin/fluids). Transmission may occur either between humans or between humans and the environment including wildlife. Diseases which originate from animals are referred to as *Zoonotic diseases*. Examples of zoonotic diseases include Ebola virus, bird/swine flu (influenza), coronavirus, or other diseases found in bacteria, fungi, or parasites.

Past public health emergency events include:

- 1918 Spanish Flu: the H1N1 influenza virus spread world-wide during 1918 and 1919. It is estimated that at least 50 million people worldwide died during this pandemic with about 675,000 deaths alone in the United States. No vaccine was ever developed and control

⁸⁷ World Health Organization. 2008. Accessed April 2020. “Glossary of humanitarian Terms.” <https://www.who.int/hac/about/definitions/en/>.

⁸⁸ U.S. Department of Health and Human Services. 2017. “Pandemic Influenza Plan: 2017 Update.” <https://www.cdc.gov/flu/pandemic-resources/pdf/pan-flu-report-2017v2.pdf>

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efforts included self-isolation, quarantine, increased personal hygiene, disinfectant use, and social distancing.

- 1957 H2N2 Virus: a new influenza A (H2N2) virus emerged in Eastern Asia and eventually crossed into coastal U.S. cities in summer of 1957. In total 1.1 million people worldwide died of the flu with 116,000 of those in the United States.
- 1968 H3N2 Virus: an influenza A virus discovered in the United States in September 1968 which killed over 100,000 citizens. The majority of deaths occurred in people 65 years and older.
- 2009 H1N1 Swine Flu: a novel influenza A virus discovered in the United States and spread quickly across the globe. This flu was particularly prevalent in young people while those over 65 had some antibody resistance. The CDC estimated the U.S. had over 60.8 million cases and 12,469 deaths.
- 2019 COVID-19: the coronavirus disease 2019 is a contagious disease caused by severe acute respiratory syndrome coronavirus 2 (SARS-CoV-2), which originated in Wuhan China and spread globally. As of March 19, 2021 the CDC reported in the U.S. over 29,431,658 cases and 535,217 deaths attributed to COVID-19. Efforts to control and limit the virus included face coverings, self-isolation, quarantine, increased cleaning measures, and social distancing. Significant impacts to the national and global economy have been caused by COVID-19.

The State of Nebraska Department of Health and Human Services (DHHS) requires doctors, hospitals, and laboratories to report on many communicable diseases and conditions to monitor disease rates for epidemic events. Additionally, regional or county health departments monitor local disease outbreaks and collect data relevant to public health. The following health departments are found in the planning area⁸⁹:

- South Heartland District Health Department
- Public Health Solutions District Health Department
- Clay County Health Department

Location

Human disease outbreaks can occur anywhere in the planning area. Public health emergencies or pandemic threshold levels are dependent on the outbreak type, transmission vectors, location, and season. Normal infectious disease patterns are changing due to increasing human mobility and climate change. Rural populations are particularly at risk for animal-related diseases while urban areas are at greater risk from community spread type illnesses. All residents throughout the planning area are at risk during public health emergencies. All areas within the planning area experienced impacts from COVID-19 specifically during 2019-2021.

Historical Occurrences

Cases and fatalities associated with Public Health Emergencies vary between illness types and severity of outbreak. Past major outbreaks in Nebraska have specifically included the H1N1 Swine Flu in 2009, mumps outbreak in 2019, and COVID-19 in 2020.

- H1N1 Swine Flu (2009) – outbreaks were first reported in mid-April 2009 and spread rapidly. The new flu strand for which immunity was nonexistent in persons under 60 years

⁸⁹ Nebraska Department of Health and Human Services. Accessed December 2020. "Local Health Departments." <http://dhhs.ne.gov/Pages/Local-Health-Departments.aspx>

old was similar in many ways to typical seasonal influenza. Symptoms of H1N1 included fever greater than 100F, cough, and sore throat. County specific counts of H1N1 are not available, however a total of 71 confirmed cases were reported by June 12, 2009.⁹⁰ Outbreaks in Nebraska were typically seen sporadically with occasional cluster outbreaks at summer camps for youth. The U.S. Public Health Emergency for the H1N1 Influenza outbreak expired on June 23, 2010. The CDC developed and encouraged all US residents to receive a yearly flu vaccination to protect against potential exposures. The H1N1 continues to appear annually and persons in the planning area are at risk of infection in the future.

- Mumps (2019) –In August 2019, 30 attendees at a Nebraska wedding developed mumps after being exposed to one asymptomatic patient. Transmission from this event resulted in 31 secondary cases, 27 tertiary cases, and three quaternary cases. Isolation and a communitywide third-dose MMR vaccination campaign helped end the outbreak.⁹¹ No reported cases of mumps were found in the planning area.
- COVID-19 (2020) – In January 2020 the CDC confirmed the first case of COVID-19 in the United States and it quickly spread across the country. By March 2020 the World Health Organization declared COVID-19 a pandemic and travel bans were instituted around the globe. Primary symptoms of the infection included cough, fever or chills, shortness of breath or difficulty breathing, fatigue, muscle and body aches, headache, loss of taste or smell, sore throat, and others.

The first confirmed case of COVID-19 in the State of Nebraska was a 36-year old Omaha resident in early March. Counties and cities throughout the planning area have instituted mask mandates and other directed health measures to protect residents from the spread of COVID-19.

The table below displays COVID-19 confirmed cases and deaths as of March 2021.

Table 84: COVID-19 in the Planning Area

County	Total Number of Tests	Confirmed Cases	Fatalities
Adams	11,877	2,771	38
Clay	2,545	674	11
Fillmore	2,116	475	10
Gage	9,637	2,119	19
Jefferson	3,438	627	1
Nuckolls	1,705	407	1
Saline	7,340	1,950	3
Thayer	2,173	480	4
Webster	1,244	322	4
Total	42,075	9,825	91

Source: Nebraska DHHS COVID-19 Dashboard, March 19, 2021

The state has received two Federal Disaster Declarations related to human infectious diseases since 1960, both related to COVID-19.

⁹⁰ CDC. June 2009. "Novel H1N1 Flu Situation Update." <https://www.cdc.gov/h1n1flu/updates/061209.htm>.

⁹¹ Donahue M, Hendrickson B, Julian D, et al. Multistate Mumps Outbreak Originating from Asymptomatic Transmission at a Nebraska Wedding — Six States, August–October 2019. *MMWR Morb Mortal Wkly Rep* 2020;69:666–669. DOI: <http://dx.doi.org/10.15585/mmwr.mm6922a2external icon>.

Table 85: Federal Disaster Declarations – COVID-19

Declaration Number	Event	Incident Period	Declaration Date	Counties Impacted
EM-3483	COVID-19	January 20, 2020	March 13, 2020	All
DR-4521	COVID-19 Pandemic	January 20, 2020	April 4, 2020	All

Source: FEMA, 2021

Average Annual Losses

The national economic burden of influenza medical costs, medical costs plus lost earnings, and total economic burden was \$10.4 billion, \$26.8 billion, and \$87.1 billion respectively in 2007.⁹² However, associated costs with pandemic response are much greater. As of December 2020, estimated costs for COVID-19 in the United States exceed \$16 trillion. Estimated costs for the State of Nebraska or the 9-county planning area are unknown at this time.

Specific costs do not include losses from displacement, functional downtime, economic loss, injury, or loss of life. The direct and indirect effects of significant health impacts are difficult to quantify and will vary depending on the type and spread of the virus. Other notable impacts to the local economy or planning area due to public health impacts included: widespread PPE and medical supply shortages; short or long-term business closures (due to lack of available staffing, safety considerations, or lack of customers); and closure of schools, daycares, or other child-care facilities.

Extent

Those most affected by public health emergencies are typically the very young, the very old, the immune-compromised, the economically vulnerable, and the unvaccinated. Roughly 26% of the planning area's population is 19 years old or younger, and 19% of the planning area is 64 years old or older, while approximately 12% of the population lives below the poverty line. Current estimates for vaccination rates are not publicly available. As of January 2021, vaccine development for COVID-19 was in preliminary rollout to first responders, essential workers, and those over 80 years old in Nebraska.

These factors increase vulnerability to the impacts of pandemics. Refer to *Section Three: Planning Area Profile* for further discussion of age and economic vulnerability in the planning area. It is not possible to determine the extent of individual public health emergency events, as the type and severity of a novel outbreak cannot be predicted. However, depending on the disease type, a significant portion of residents may be at risk to illness or death.

The extent of a public health emergency is also closely tied to the proximity or availability of health centers. The following table identifies hospitals in the planning area.

Table 86: Hospitals in the Planning Area

County	Facility Name	Nearest Community	Total Licensed Beds
Adams	Mary Lanning Healthcare	Hastings	170
Fillmore	Fillmore County Hospital	Geneva	30

⁹² Molinari, N.M., Ortega-Sanchez, I.R., Messonnier, M., Thompson, W.W., Wortley, P.M., Weintraub, E., & Bridges, C.B. April 2007. "The annual impact of seasonal influenza in the US: measuring disease burden and costs." DOI: 10.1016/j.vaccine.2007.03.046.

County	Facility Name	Nearest Community	Total Licensed Beds
Gage	Beatrice Community Hospital & Health Center	Beatrice	25
Jefferson	Jefferson Community Health Center	Fairbury	17
Nuckolls	Brodstone Memorial Hospital	Superior	25
Saline	Crete Area Medical Center	Crete	24
Saline	Warren Memorial Hospital dba Friend Community Health	Friend	19
Thayer	Thayer County Health Services	Hebron	17
Webster	Webster County Community Hospital	Red Cloud	13

Source: Nebraska Department of Health and Human Services⁹³

Immunodeficiency disorders (such as diabetes), obesity, tobacco use, or other pre-existing health complications reduce the ability of the body to fight infection. Diabetes prevalence per county and for the state are listed in the table below.⁹⁴

Table 87: Diabetes Prevalence in the Planning Area (2017)

County	Diagnosed Diabetes Rate (Total Adults Age 20+)
Adams	10.8%
Clay	7.9%
Fillmore	10.7%
Gage	9.7%
Jefferson	6.9%
Nuckolls	5.6%
Saline	10.8%
Thayer	7.1%
Webster	8.1%
State of Nebraska	8.0% (2016 data)

Source: CDC, 2017

Nebraska state law (Title 173) requires all students have the following vaccinations: poliomyelitis, Diphtheria, pertussis, tetanus, measles, mumps, rubella, Hepatitis B, and varicella (chicken pox). The Vaccines for Children program is a federally funded and state-operated vaccine supply program that provides free vaccines to children under 18 who are of American Indian or Alaska Native descent, enrolled in Medicaid, uninsured, or underinsured. Additionally, the HPV vaccination series is recommended for teenagers and influenza vaccinations are recommended yearly for those over six months old. Individuals without vaccinations are at greater risk of contracting diseases or carrying diseases to others.

During the COVID-19 pandemic and under the assumption of future public health epidemic events occurring, it is likely that at least one fatality may occur due to illness in the planning area. However; it is impossible to estimate the total extent of public health emergency impacts.

Probability

There is no pattern as to when public health emergencies will occur. Based on historical records, it is likely that small-scale disease outbreaks will occur annually within the planning area. However, large scale emergency events (such as seen with COVID-19) cannot be predicted.

⁹³ Department of Health and Human Services. September 2020. "Hospitals." <http://dhhs.ne.gov/publichealth/Documents/Hospital%20Roster.pdf>.

⁹⁴ Centers for Disease Control and Prevention. 201y. "Diagnosed diabetes prevalence – Nebraska." <https://gis.cdc.gov/grasp/diabetes/DiabetesAtlas.html>.

Community Top Hazard Status

The following table lists jurisdictions which identified Public Health Emergency as a top hazard of concern:

Jurisdictions	
Fillmore County	South Central USD 5 (Lawrence-Nelson-Sandy Creek)
Gage County	South Heartland District Health Department
City of Wilber	

Regional Vulnerabilities

Public health departments and medical facilities have established monitoring thresholds, surveillance procedures, treatment regimens, and vaccination recommendations for various infectious diseases which may impact the planning area and state.

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

Table 88: Regional Public Health Emergency Vulnerabilities

SECTOR	VULNERABILITY
PEOPLE	<ul style="list-style-type: none"> -Vulnerable populations include the very young, the very old, the unvaccinated, the economically vulnerable, and those with immunodeficiency disorders or other comorbidities. -Institutional settings such as prisons, dormitories, long-term care facilities or health care facilities, meat-packing plants, daycares, and schools are at higher risk to contagious diseases -Poverty, rurality, underlying health conditions, and drug or alcohol use increase chronic and infectious disease rates
ECONOMIC	<ul style="list-style-type: none"> -Large scale or prolonged events may cause businesses to close, which could lead to significant revenue loss and loss of income for workers -Agricultural sector may be impacted due to loss of workers or decline in marketable goods
BUILT ENVIRONMENT	None
INFRASTRUCTURE	<ul style="list-style-type: none"> -Transportation routes may be closed if a quarantine is put in place -Healthcare facilities in the planning area may be overwhelmed quickly by widespread events
CRITICAL FACILITIES	<ul style="list-style-type: none"> -Healthcare facilities in the planning area may be overwhelmed quickly by widespread events -Critical facilities could see suspended action or reduced resources due to sick staff
CLIMATE	<ul style="list-style-type: none"> -Climate change impacts on extreme weather, air quality, transmission of disease via insects and pests, food security, and water quality increase threats of disease
OTHER	<ul style="list-style-type: none"> -Long-term public health emergencies can have negative impacts on resident's mental health

Severe Thunderstorms

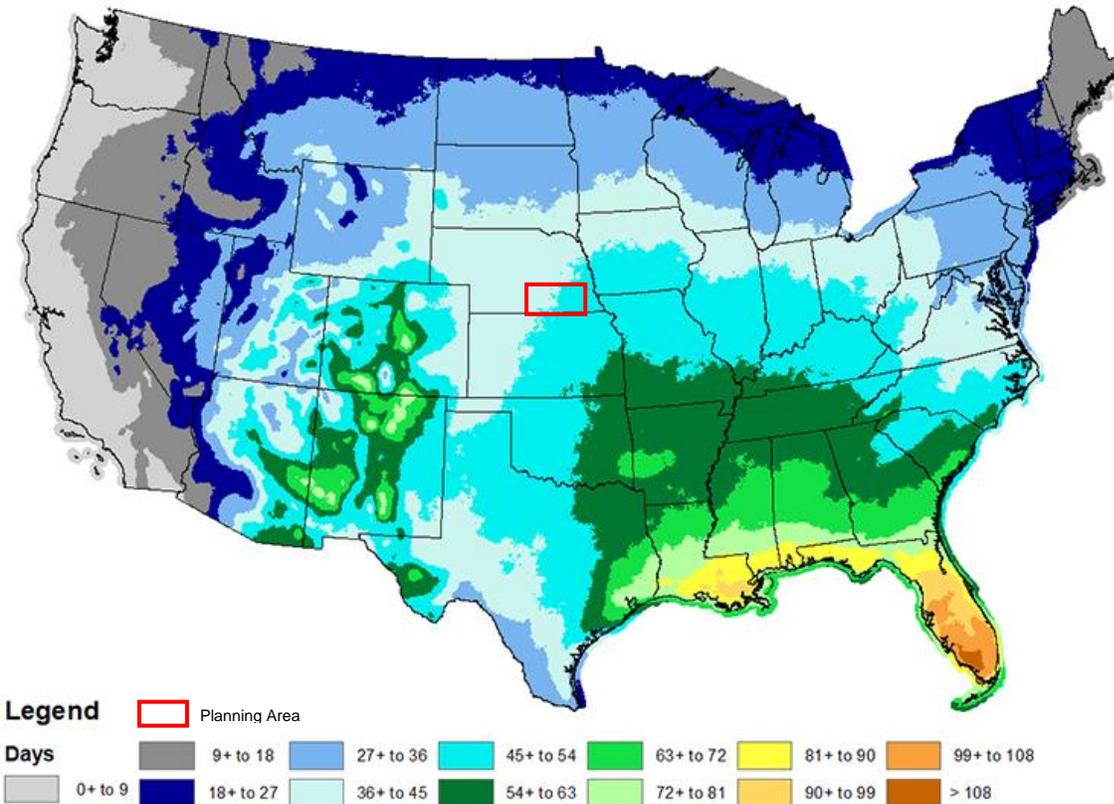
Severe thunderstorms are common and unpredictable seasonal events throughout Nebraska. A thunderstorm is defined as a storm that contains lightning and thunder, which is caused by unstable atmospheric conditions. When the cold upper air sinks and the warm, moist air rises, storm clouds or “thunderheads”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

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

Economically, thunderstorms are generally beneficial in that they provide moisture necessary to support Nebraska’s largest industry, agriculture. The majority of thunderstorms do not cause damage, but when they escalate to severe storms, the potential for damages increases. Damages can include: crop losses from wind and hail; property losses due to building and automobile damages from hail; high wind; flash flooding; and death or injury to humans and animals from lightning, drowning, or getting struck by falling or flying debris. Figure 76 displays the average number of days with thunderstorms across the country each year. The planning area experiences an average of 36 to 54 thunderstorms over the course of one year.

Figure 76: Average Annual Thunderstorms

Annual Mean Thunderstorm Days (1993-2018)



Source: NWS, 2018⁹⁵

Location

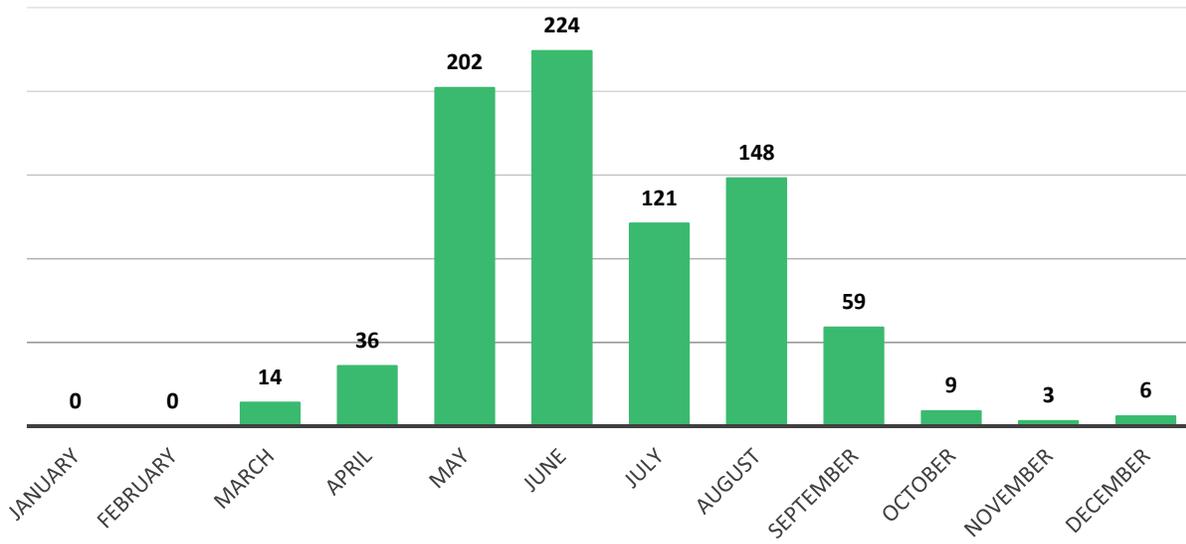
The entire nine-county planning area is at risk to thunderstorms and associated damages from heavy rain, lightning, hail, and thunderstorm level winds.

Historical Occurrences

Severe thunderstorms in the planning area usually occur in the afternoon and evening during the summer months.

⁹⁵ National Weather Service. 2020. "Global Weather: Introduction to Thunderstorms." https://www.weather.gov/jetstream/tstorms_intro#:~:text=It%20is%20estimated%20that%20there,its%20share%20of%20thunderstorm%20occurrences.

Figure 77: Thunderstorm Wind Events by Month



Source: NCEI, 1996-2020

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 822 thunderstorm wind, 196 heavy rain, 25 lightning, and 1,712 hail events in the planning area from January 1996 to April 2020. In total these events were responsible for \$158,896,200 in property damages. The USDA RMA data does not specify severe thunderstorms as a cause of loss, however heavy rains and hail which may be associated with severe thunderstorms caused \$134,205,021 in crop damages. There were nine injuries and two fatalities reported in association with these storm events.

Average Annual Losses

The average damage per event estimate was determined based upon recorded damages from NCEI Storm Events Database since 1996 and number of historical occurrences. This does not include losses from displacement, functional downtime, economic loss, injury, or loss of life. Severe thunderstorms cause an average of \$6,355,848 per year in property damages.

Table 89: High Winds and Tornado Losses

Hazard Type	# of Events ¹	Average # events per year	Total Property Loss ¹	Average Annual Property Loss	Total Crop Loss ²	Average Annual Crop Loss
Hail	1,712	68.5	\$83,647,000	\$3,345,880	\$104,307,459	\$4,967,022
Heavy Rain	196	7.8	\$1,097,000	\$43,880	\$29,897,562	\$1,423,693
Lightning	25	1	\$20,335,000	\$813,400	N/A	N/A
Thunderstorm Winds	822	32.9	\$53,817,200	\$2,152,688	N/A	N/A
Totals	2,755	110.0	\$158,896,200	\$6,355,848	\$134,205,021	\$6,360,715

Source: 1 NCEI (1996-April 2020), 2 USDA RMA (2000-2020)

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. The Tornado and Storm Research Organization (TORRO) scale is used to classify hailstones and provides some detail related to the potential impacts from hail. Table 90 outlines the TORRO Hail Scale.

Table 90: TORRO Hail Ranking

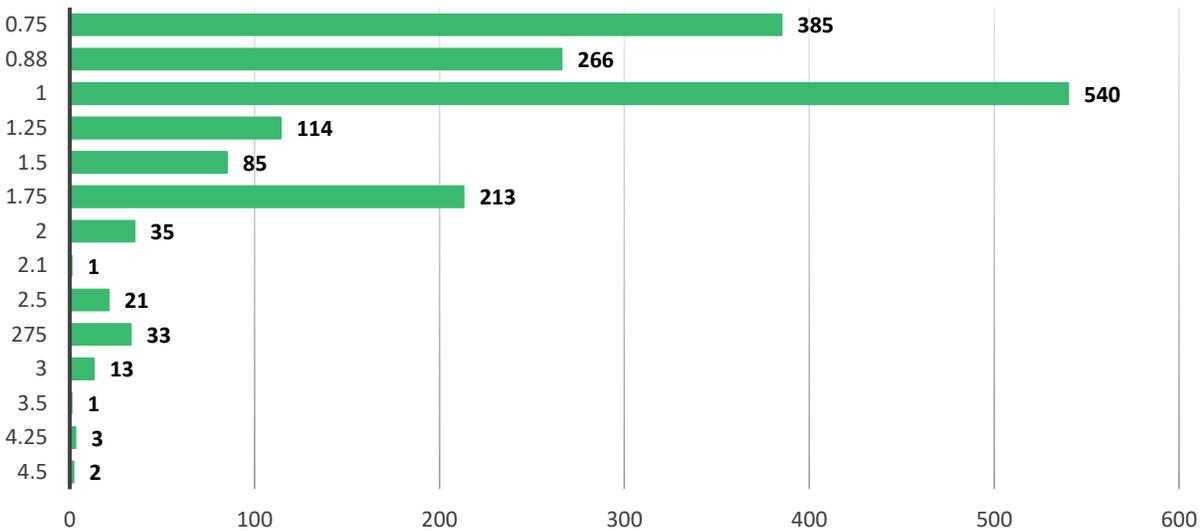
Class	Type of Material	Divisions
H0: Hard Hail	5 mm; 0.2 in (pea size)	No damage
H1: Potentially Damaging	5-15 mm; 0.2-0.6in (marble)	Slight general damage to plants and crops
H2: Significant	10-20 mm; 0.4-0.8 in (grape)	Significant damage to fruit, crops, and vegetation
H3: Severe	20-30 mm; 0.8-1.2 in (walnut)	Severe damage to fruit and crops, damage to glass and plastic structures
H4: Severe	30-40mm; 1.2-1.6 in (squash ball)	Widespread damage to glass, vehicle bodywork damaged
H5: Destructive	40-50 mm; 1.6-2.0 in (golf ball)	Wholesale destruction of glass, damage to tiled roofs; significant risk of injury
H6: Destructive	50-60 mm; 2.0-2.4 in (chicken egg)	Grounded aircrafts damaged, brick walls pitted; significant risk of injury
H7: Destructive	60-75 mm; 2.4-3.0 in (tennis ball)	Severe roof damage; risk of serious injuries
H8: Destructive	75-90 mm; 3.0-3.5 in (large orange)	Severe damage to structures, vehicles, airplanes, risk of serious injuries
H9: Super Hail	90-100 mm; 3.5-4.0 in (grapefruit)	Extensive structural damage, risk of severe or even fatal injuries to persons outdoors
H10: Super Hail	>100 mm; >4 in (melon)	Extensive structural damage; risk of severe or even fatal injuries to persons outdoors.

Source: TORRO, 2017⁹⁶

The NCEI reported 1,712 individual hail events across the planning area. As the NCEI reports events per county, this value overestimates the total amount of thunderstorm events. The average hailstone size was 1.16 inches. Events of this magnitude correlate to an H3 Severe 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 occurrences, to expect larger hailstones to occur in the planning area annually. The planning area has endured five H10 hail events (>4.0 inches) during the period of record. Figure 78 shows hail events based on the size of the hail.

⁹⁶ Tornado and Storm Research Organization. 2017. "Hail Scale." <http://www.torro.org.uk/hyscale.php>.

Figure 78: Hail Events by Magnitude



Source: NCEI, 1996-2020

For the planning area it is reasonable to expect spring (March, April and May) and summer (June, July and August) to have the highest rainfall totals. Using data provided by the High Plains Regional Climate Center the spring months could have an average of 23 days with at least trace amounts of precipitation. Eleven days will receive precipitation totals greater than one tenth of an inch; approximately three days will have more than one half an inch of precipitation; and approximately one day will report rainfall totals equal to or greater than one inch. During the summer months the planning area can expect to receive at least trace amounts of precipitation on 26 days. More than 16 days will report totals greater than or equal to one tenth of an inch; five days will report rainfall totals of at least one half an inch; and two days will report precipitation totals of at least one inch.

Probability

Based on historical records and reported events, severe thunderstorm events are likely to occur on an annual basis. The NCEI reported a severe thunderstorm event (hail, lightning, heavy rain, or thunderstorm winds) in every year on record (1996-2020), resulting in 100 percent chance annually for thunderstorms.

Community Top Hazard Status

The following table lists jurisdictions which identified Severe Thunderstorms as a top hazard of concern:

Jurisdictions	
Little Blue NRD	Village of Bruning
Lower Big Blue NRD	Village of Chester
Adams County	Village of Clatonia
Clay County	Village of Cortland
Gage County	Village of Cowles
Jefferson County	Village of Daykin
Nuckolls County	Village of Deweese
Saline County	Village of DeWitt

SECTION FOUR: RISK ASSESSMENT

Jurisdictions	
Thayer County	Village of Diller
Webster County	Village of Dorchester
Barneston Rural Fire Dept	Village of Endicott
Beatrice Public Schools	Village of Exeter
Exeter Milligan Public Schools	Village of Fairmont
Fillmore Central Public Schools	Village of Filley
Meridian Public Schools	Village of Grafton
SCC - Beatrice Campus	Village of Harbine
South Central USD 5 (Lawrence-Nelson-Sandy Creek)	Village of Hardy
Superior Public Schools	Village of Holstein
Tri-County Public Schools	Village of Hubbell
City of Beatrice	Village of Jansen
City of Blue Hill	Village of Juniata
City of Blue Springs	Village of Lawrence
City Of Clay Center	Village of Liberty
City of Edgar	Village of Milligan
City of Fairbury	Village of Odell
City of Fairfield	Village of Ong
City of Friend	Village of Prosser
City of Geneva	Village of Reynolds
City of Hastings	Village of Saronville
City of Sutton	Village of Steele City
City of Wilber	Village of Strang
City of Wymore	Village of Tobias
Village of Ayr	Village of Trumbull
Village of Barneston	Village of Virginia
Village of Belvidere	Village of Western

Regional Vulnerabilities

Vulnerable populations related to severe thunderstorms include the elderly, those living in mobile homes, and those caught outside during storm events. During severe thunderstorms, it is not uncommon for residents and towns to lose power for a temporary or prolonged period of time. These power outages may prove deadly for elderly citizens that are reliant upon machines to remain alive. The elderly are generally less mobile than many other members of the community, making them more vulnerable to a wide range of threats. Unanchored or improperly anchored mobile homes are at high risk during thunderstorms because they can be turned over by winds of 60 to 70 mph.

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

Table 91: Regional Severe Thunderstorm Vulnerabilities

SECTOR	VULNERABILITY
PEOPLE	<ul style="list-style-type: none"> -Elderly citizens with decreased mobility may have trouble evacuating or seeking shelter -Mobile home residents are at risk of injury and damage to their property if the mobile home is not properly anchored -Injuries can occur from: not seeking shelter, standing near windows, and shattered windshields in vehicles
ECONOMIC	<ul style="list-style-type: none"> -Damages to buildings and property can cause significant losses to business owners and employees
BUILT ENVIRONMENT	<ul style="list-style-type: none"> -Buildings are at risk to hail damage -Downed trees and tree limbs -Roofs, siding, windows, gutters, HVAC systems, etc. can incur damage
INFRASTRUCTURE	<ul style="list-style-type: none"> -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	<ul style="list-style-type: none"> -Power outages are possible -Critical facilities may sustain damage from hail, lightning, and wind
CLIMATE	<ul style="list-style-type: none"> -Changes in seasonal precipitation and temperature normals can increase frequency and magnitude of severe storm events
OTHER	<ul style="list-style-type: none"> -High winds, hail, lightning, heavy rain, and possibly tornadoes can occur with this hazard

Severe Winter Storms

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

Extreme Cold

Along with snow and ice storm events, extreme cold is dangerous to the well-being of people and animals. What constitutes as extreme cold varies from region to region, but is generally accepted as temperatures that are significantly lower than the average low temperature. For the planning area, the coldest months of the year are January, February, and December. The average low temperature for these months are all below freezing (average low for the three months in the planning area is 16.2°F). The average high temperatures for the months of January, February, and December are near 38.51°F in the planning area.⁹⁷

Freezing Rain

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

Blizzards

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

Location

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

Historical Occurrences

Due to the regional scale of severe winter storms, the NCEI reports events as they occur in each county. According to the NCEI, there were a combined 766 severe winter storm events for the planning area from January 1996 to April 2020. These recorded events caused a total of \$34,546,000 in property damages and \$12,156,696 in crop damages.

The most damaging event was a winter storm in Adams County on October 25, 1997 which caused a reported \$15,000,000 in property damages.

⁹⁷ High Plains Regional Climate Center. 2020. "Monthly Climate Normals 1981-2010." <http://climod.unl.edu/>.

Average Annual Losses

The average damages 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 \$919,542 per year in property damage for the planning area.

Table 92: Severe Winter Storms Losses

Hazard Type	# of Events ¹	Average # events per year	Total Property Loss ¹	Average Annual Property Loss	Total Crop Loss ²	Average Annual Crop Loss
Blizzard	79	3.2	\$105,000	\$4,200	\$12,156,696	\$578,890
Extreme Cold	25	1	\$0	\$0		
Heavy Snow	41	1.6	\$5,500,000	\$220,000		
Ice Storm	51	2.0	\$12,464,000	\$498,560		
Winter Storms	379	15.2	\$16,382,000	\$655,280		
Winter Weather	191	7.64	\$95,000	\$3,800		
Totals	766	30.6	\$34,546,000	\$1,381,840	\$12,156,696	\$578,890

Source: 1 NCEI (1996-2020), 2 USDA RMA (2000-2020)

Extent

The Sperry-Piltz Ice Accumulation Index (SPIA) was developed by the NWS to predict the accumulation of ice and resulting damages. The SPIA assesses total precipitation, wind, and temperatures to predict the intensity of ice storms. Ice Storm Warnings are issued when accumulation of at least 0.25 inches is expected from a storm, which controlling for high winds, would tend to classify ice storms in Nebraska as SPIA Level 2 or higher. The most common accumulation during ice storms was a quarter of an inch. The following figure shows the SPIA index.

Figure 79: SPIA Index
The Sperry-Piltz Ice Accumulation Index, or “SPIA Index”

Copyright, February, 2009

ICE DAMAGE INDEX	*AVERAGE ICE AMOUNT (in inches) <i>Revised: Oct. 2011</i>	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 and widespread utility interruptions with extensive damage to main distribution feeder lines and some high voltage transmission lines/structures. Outages lasting 5 – 10 days.
	0.50 – 0.75	25 – 35	
	0.75 – 1.00	15 – 25	
	1.00 – 1.50	>15	
5	0.50 – 0.75	> – 35	Catastrophic damage to entire exposed utility systems, including both distribution and transmission networks. Outages could last several weeks in some areas. Shelters needed.
	0.75 – 1.00	> – 25	
	1.00 – 1.50	> – 15	
	> 1.50	Any	

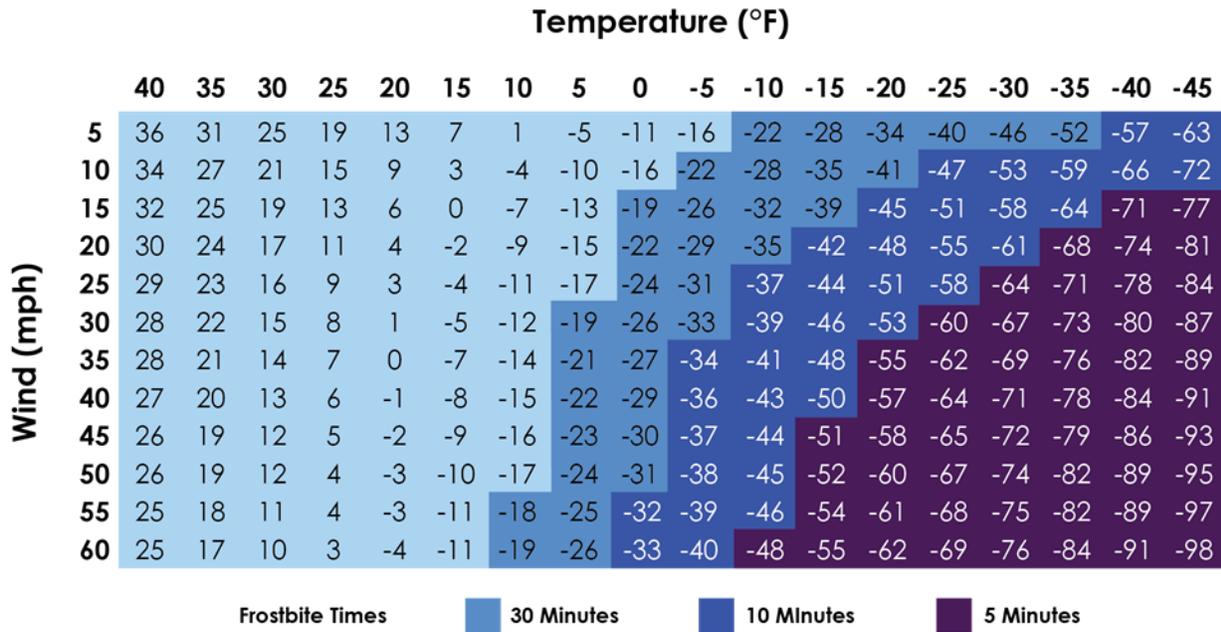
(Categories of damage are based upon combinations of precipitation totals, temperatures and wind speeds/directions.)

Source: SPIA-Index⁹⁸

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. The following figure shows the Wind Chill Index used by the NWS.

⁹⁸ SPIA-Index. 2009. “Sperry-Piltz Ice Accumulation Index.” <https://www.spia-index.com/>.

Figure 80: Wind Chill Index Chart
NWS Windchill Chart



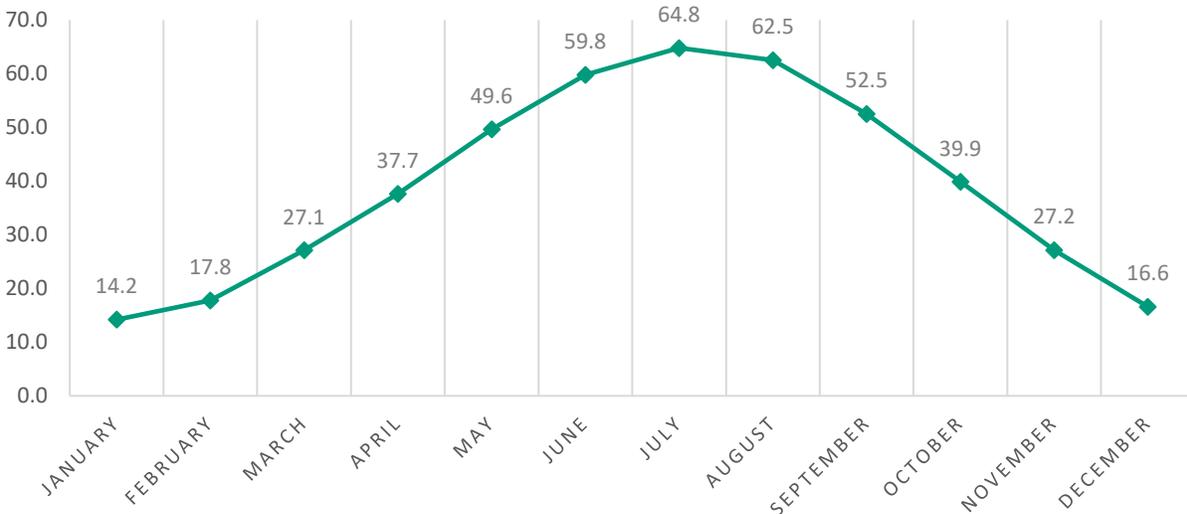
$$\text{Wind Chill (°F)} = 35.74 + 0.6215T - 35.75(V^{0.16}) + 0.4275T(V^{0.16})$$

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



Source: NWS

Figure 81: Monthly Climate Normals Min Temperature (1981-2010)



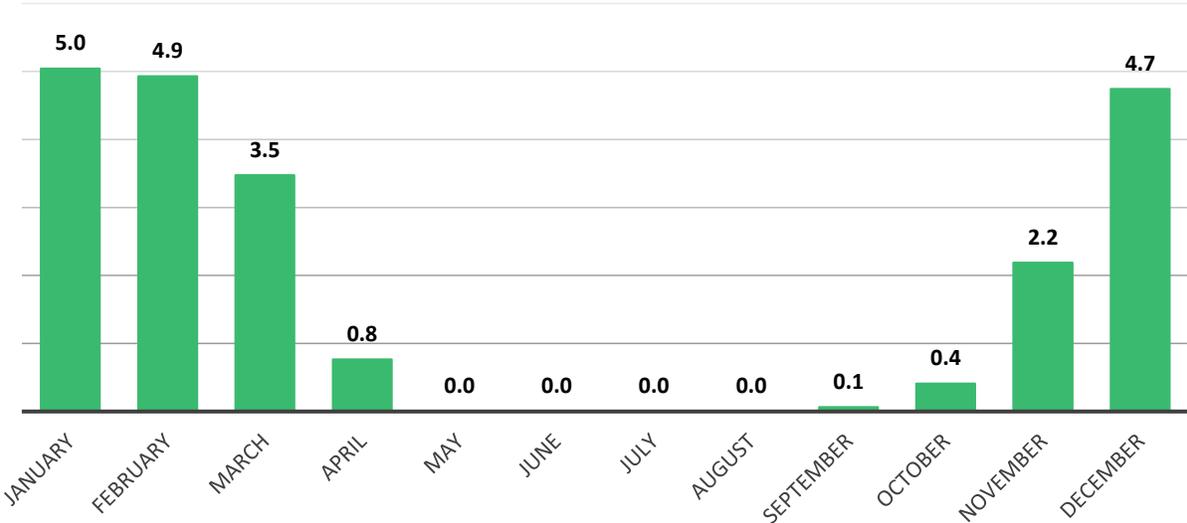
Source: NCEI

SECTION FOUR: RISK ASSESSMENT

Record lows for most reporting weather stations within the planning area monitored by the High Plains Regional Climate Center occurred in the month of January and were recorded at or near a -17°F recorded in 1940.

Average monthly snowfall for the planning area is shown in Figure 82, which shows the snowiest months are between December and February. A common snow event (likely to occur annually) will result in accumulation totals between one and five inches. Often these snow events are accompanied by high winds. It is reasonable to expect wind speeds of 35 to 40 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. It should be noted that, while recent climate trends indicate the frequency and intensity of severe winter storms is increasing, it is anticipated that the extent of snow cover will decrease in future years.

Figure 82: Monthly Normal Snowfall in Inches (1981-2010)



Source: High Plains Regional Climate Center

Probability

Based on historical records and reported events, severe winter storm events are likely to occur on an annual basis. The NCEI reported a severe winter storm event (blizzard, extreme cold, heavy snow, ice storms, winter storms, or winter weather) in every year on record (1996-2020), resulting in 100 percent chance annually for severe winter storms.

Community Top Hazard Status

The following table lists jurisdictions which identified Severe Winter Storms as a top hazard of concern:

Jurisdictions	
Little Blue NRD	Village of Bruning
Adams County	Village of Chester
Clay County	Village of Clatonia
Fillmore County	Village of Davenport
Gage County	Village of Daykin
Jefferson County	Village of Dewese

Jurisdictions	
Nuckolls County	Village of DeWitt
Saline County	Village of Diller
Thayer County	Village of Dorchester
Barneston Rural Fire Dept	Village of Exeter
Beatrice Public Schools	Village of Fairmont
Exeter Milligan Public Schools	Village of Filley
Fillmore Central Public Schools	Village of Grafton
Meridian Public Schools	Village of Guide Rock
SCC - Beatrice Campus	Village of Harbine
South Central USD 5 (Lawrence-Nelson-Sandy Creek)	Village of Hardy
South Heartland District Health Department	Village of Holstein
Superior Public Schools	Village of Juniata
Tri-County Public Schools	Village of Kenesaw
City of Beatrice	Village of Lawrence
City of Blue Springs	Village of Liberty
City of Crete	Village of Milligan
City of Deshler	Village of Odell
City of Fairbury	Village of Ong
City of Friend	Village of Pickrell
City of Hastings	Village of Plymouth
City of Red Cloud	Village of Prosser
City of Superior	Village of Ruskin
City of Wilber	Village of Saronville
City of Wymore	Village of Shickley
Village of Adams	Village of Strang
Village of Alexandria	Village of Tobias
Village of Barneston	Village of Trumbull
Village of Belvidere	Village of Western

Regional Vulnerabilities

Severe winter storms occur on a regional scale and can affect the entire planning area equally. All building stock and infrastructure, including critical facilities, are at risk of being damaged or affected by a severe winter storm. Power outages, which occur almost on an annual basis with severe winter storms in Nebraska, in combination with cold temperatures and below zero wind-chill, can pose a significant threat to human life. Highly vulnerable populations include residents of nursing homes, young children, the elderly, and those living in less than adequate environments. Critical facilities and infrastructure including emergency response and recovery operations, warning and communication systems, wells and water treatment, and many other services vital for returning the jurisdiction's functions to normal, are at risk during severe winter storm events due to potential power outages and other damages. Additionally, the planning area is losing population which is making the area more vulnerable to severe winter weather. The decline in population can make it hard for the counties to be able to provide essential services that are needed during severe winter weather.

The collection of snow and ice on power lines and electrical equipment can cause equipment damage, downed power lines, and a loss of electricity. Snow and ice accumulations on transportation routes can lead to obstruction of traffic flow and hinder emergency response. Severe winter storms can also cause significant damage to trees, with branches downing electrical lines, blocking roadways, or causing building and property damage.

Severe winter storms regularly result in damages to power lines and telephone lines, as well as other infrastructure related to threat communication (i.e. radio and television antennas). This potential for decreased message dissemination combined with potential power outages results in higher levels of vulnerability for a number of groups within the community including: the elderly, individuals and families living below the poverty line, those isolated from social interactions, groups with limited mobility, and residents that are new to the area/region. Elderly citizens are at higher risk of being isolated during severe winter storms as a result of decreased mobility, as well as a diminished ability to remove accumulations of snow and ice from vehicles and driveways. A 2011 study conducted by the Center for Injury Research and Policy found that, on average, there are 11,500 injuries and 100 deaths in the United States annually related to snow removal. People, especially males over the age of 55, are 4.25 times more likely to experience symptoms of cardiac distress during snow removal. The most common injuries and deaths during extreme cold events are hypothermia and frostbite. According to the NCEI, hypothermia occurs when your body loses heat faster than it can be produced. Prolonged exposure to cold will use up the body's stored energy. Hypothermia affects a person's brain, making the victim unable to think clearly. Frostbite is an injury caused by freezing. Frostbite can permanently damage body tissues, and severe cases can lead to amputation. The most common areas on the body for frostbite include the nose, ears, cheeks, chin, fingers, or toes.

Individuals and families below the poverty line and those isolated from social interactions may lack resources or access to resources that could mitigate the impacts of severe winter storms. Needed resources include sufficient food supplies when snowed in, and alternative heating sources during prolonged power outages. Severe winter storms often result in closed or impassable roadways. This increases the vulnerability among segments of the population that already have decreased mobility, making it important that they have a social network that can check on them and ensure they have access to heat and food. Finally, people who are new to the area may not know what to expect from a severe winter storm and what actions are appropriate

in preparing for the event. Threat communication is imperative for informing and educating this portion of the population.

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

Table 93: Regional Severe Winter Storm Vulnerabilities

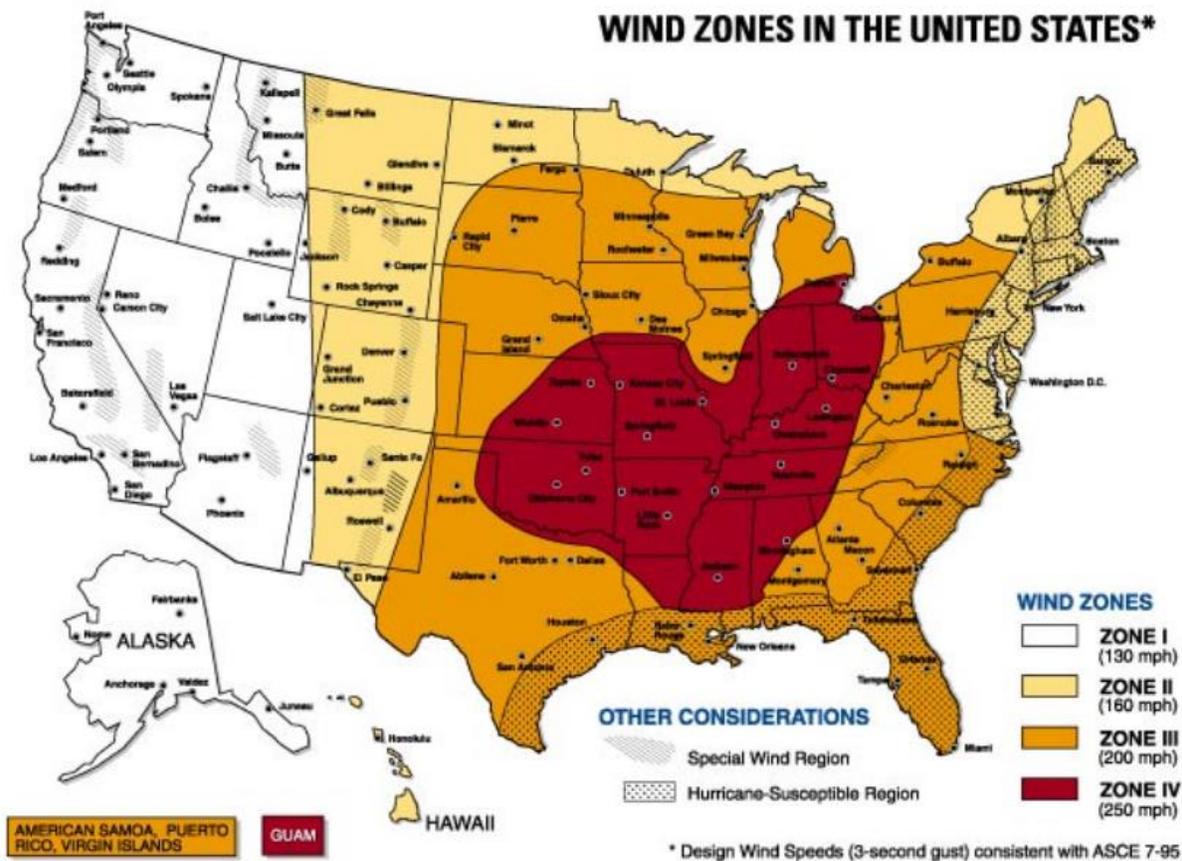
SECTOR	VULNERABILITY
PEOPLE	<ul style="list-style-type: none"> -Elderly citizens are at higher risk to injury or death, especially during extreme cold and heavy snow accumulations -Citizens without adequate heat and shelter at higher risk of injury or death
ECONOMIC	<ul style="list-style-type: none"> -Closed roads and power outages can cripple a region for days, leading to significant revenue loss and loss of income for workers
BUILT ENVIRONMENT	<ul style="list-style-type: none"> -Heavy snow loads can cause roofs to collapse -Significant tree damage possible, downing power lines and blocking roads
INFRASTRUCTURE	<ul style="list-style-type: none"> -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	<ul style="list-style-type: none"> -Emergency response and recovery operations, communications, water treatment plants, and others at risk to power outages, impassable roads, and other damages
CLIMATE	<ul style="list-style-type: none"> -Changes in seasonal precipitation and temperature normals can increase frequency and magnitude of severe storm events. -Winter storms likely to increase in frequency and intensity; however with reduced snow cover

Tornadoes and High Winds

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

The 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.⁹⁹ The NWS issues High Wind Advisories when there are sustained winds of 25 to 39 miles per hour and/or gusts to 57 mph. F 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 primarily in Zone III which has maximum winds of 200 mph equivalent to an EF4/5 tornado.

Figure 83: Wind Zones in the U.S.



Source: FEMA

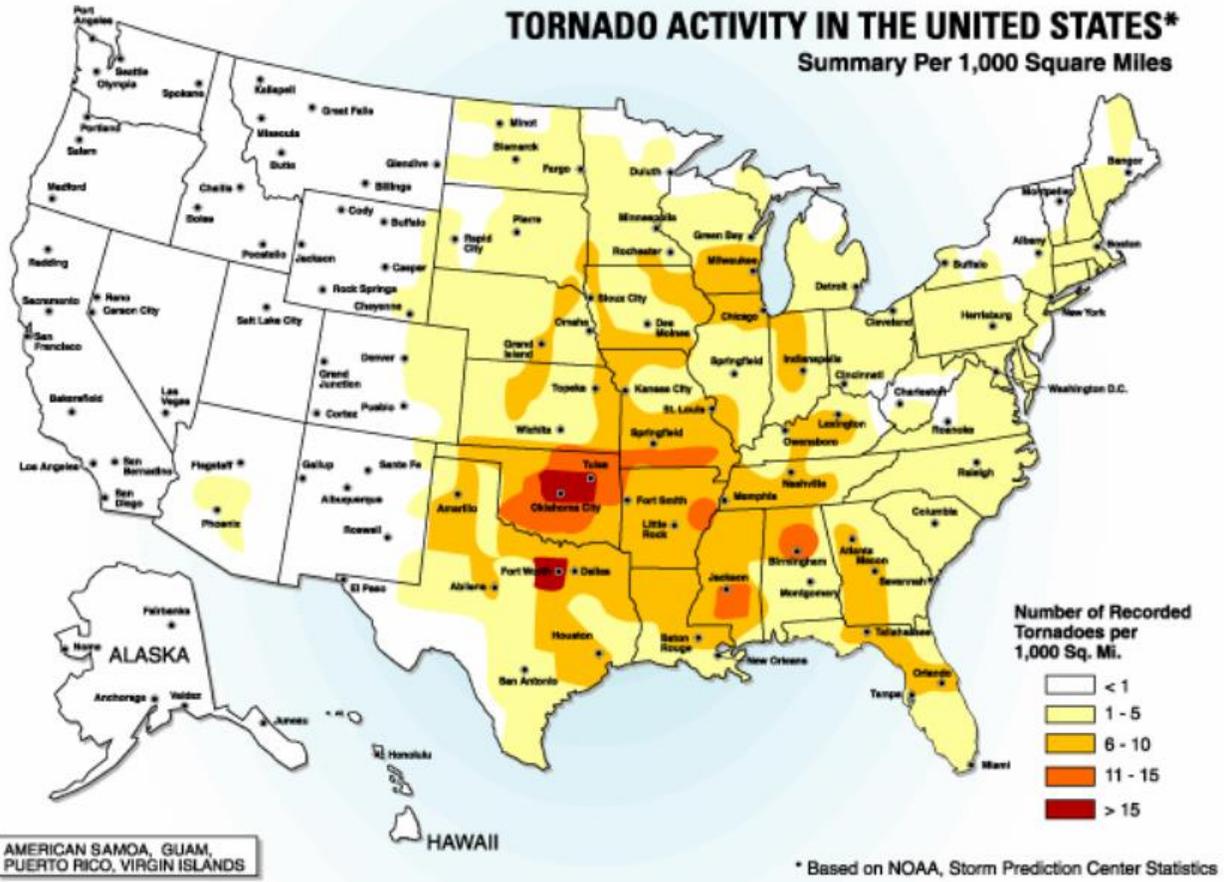
High winds are a critical component of tornado formation. A tornado is typically associated with a supercell thunderstorm. For a rotation to be classified as a tornado, three characteristics must be met:

⁹⁹ National Weather Service. 2017. "Glossary." <http://w1.weather.gov/glossary/index.php?letter=h>.

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

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

Figure 84: Tornado Activity in the United States



Source: FEMA

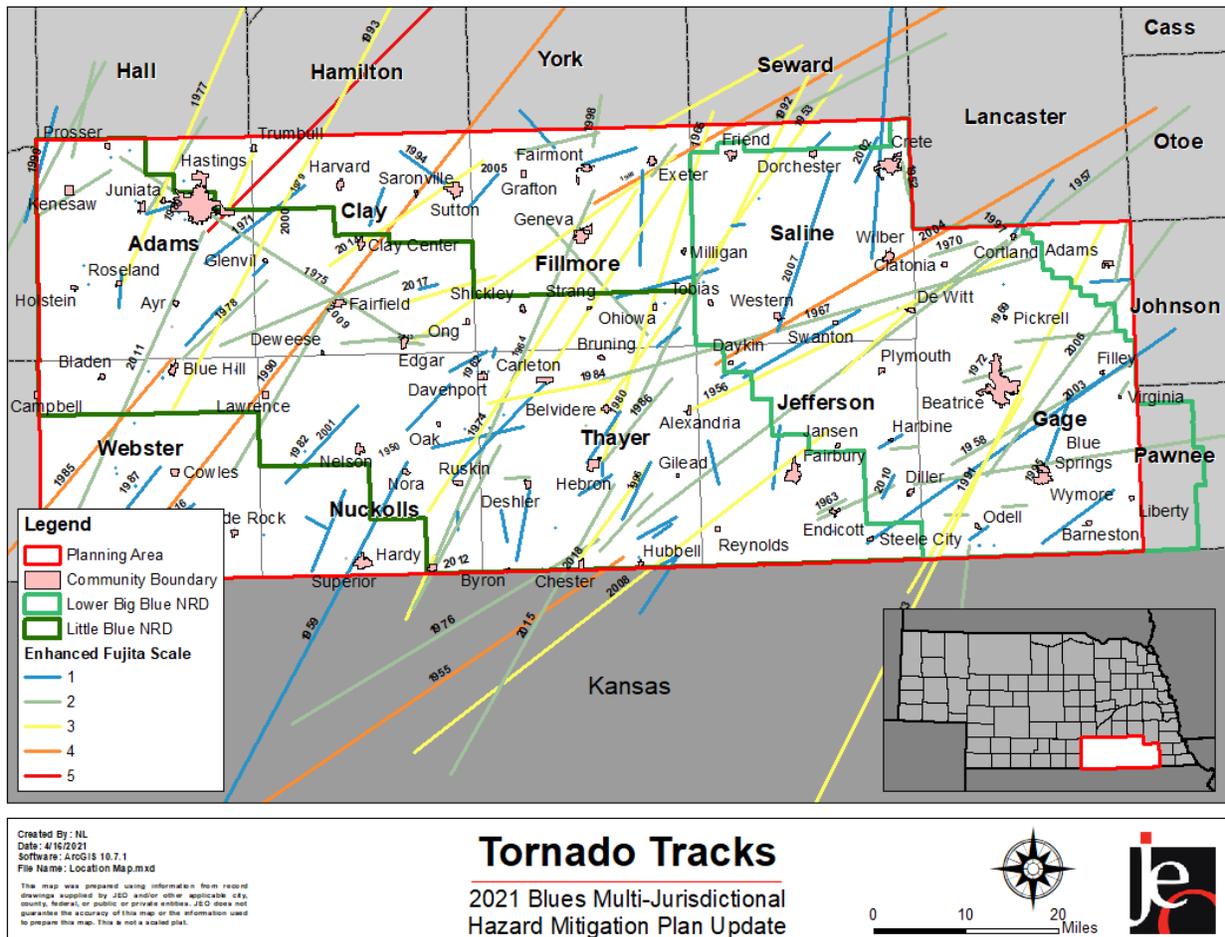
SECTION FOUR: RISK ASSESSMENT

Nebraska is ranked fifth in the nation for tornado frequency with an annual average of 57 tornadoes between 1991 and 2010.¹⁰⁰

Location

High winds and tornadoes can occur throughout the planning area. The impacts would be greater in more densely populated areas, such as in the City of Beatrice or City of Fairbury. The following map shows the historical track locations across the region according to the Midwestern Regional Climate Center. Few significant tornado events have directly impacted communities located in the planning area, but touchdowns and tornado events can occur anywhere within the nine-county planning area.

Figure 85: Tornado Tracks in the Planning Area



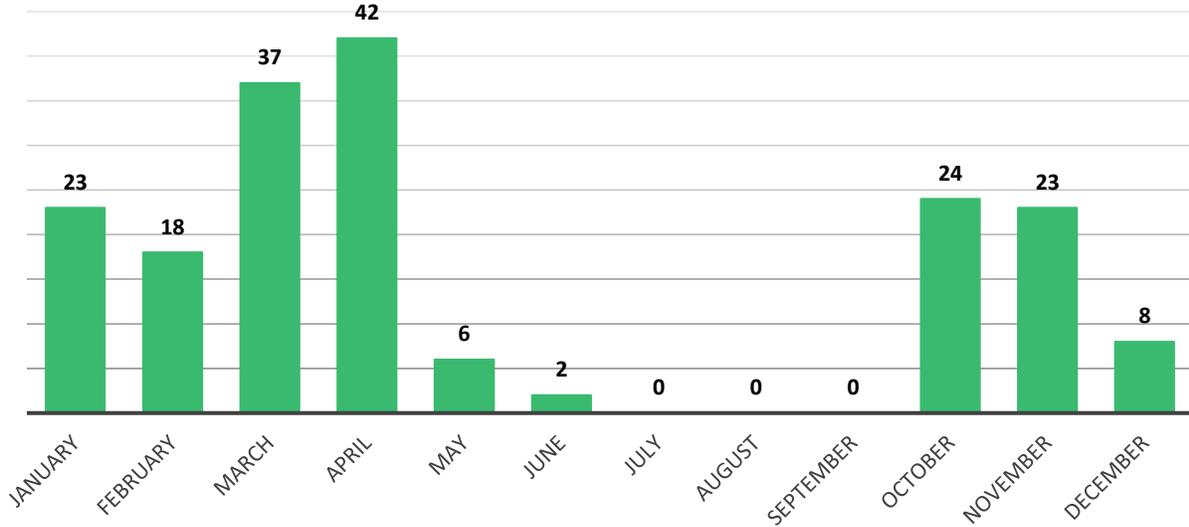
Historical Occurrences

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 183 high wind events that occurred between January 1996 and April 2020 and 148 tornadic events ranging in magnitude from EF/F0 to EF/F4. These events were responsible for \$127,088,580 in property damages (NCEI) and \$10,915,489 in crop damages

¹⁰⁰ National Centers for Environmental Information. 2013. "U.S. Tornado Climatology." <https://www.ncdc.noaa.gov/climate-information/extreme-events/us-tornadoclimatology>.

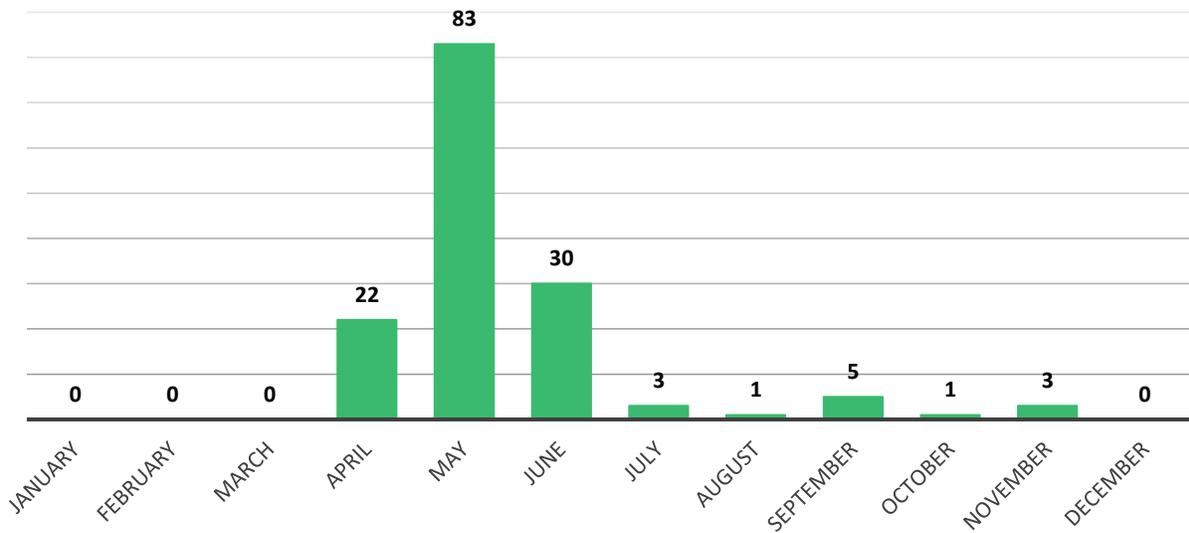
(RMA). As seen in the following figures, the majority of high wind events occur in the spring and winter months, while most tornado events occur in the late spring/early summer. Significant hazard events with direct impacts to communities are discussed in more detail in the applicable *Community Profiles*.

Figure 86: High Wind Events by Month



Source: NCEI, 1996-2020

Figure 87: Tornadoes by Month in the Planning Area



Source: NCEI, 1996-2019

Several events led to either fatalities and/or injuries. Event descriptions from NCEI for the most damaging events (those including injuries, fatalities, or greatest property damage estimates) are provided below.

- 6/22/2003 Tornado** – one fatality and seven injuries. *“A strong tornado set down on the southeast side of Deshler near the fairgrounds and moved west through the south side of*

Deshler. The slow-moving tornado lifted a couple of miles west of town. Thunderstorms erupted during the evening in south-central Nebraska. One storm near Aurora produced very large hail. One stone measured by an NWS Storm Survey team was determined to be the largest sized stone to fall in the United States. It measured 7 inches in diameter and 18.75 inches in circumference. Given the lack of wind, damage was limited to roofs, a few windows and some crop land near town. The storm also produced a couple of brief small tornadoes as it slowly moved through northern Hamilton county. At nearly the same time, another very slow moving storm produced several tornadoes, hail and extremely heavy rains in Thayer county. One tornado moved through the town of Deshler going from the southeast side of town to the west. One man was killed in his garage before he was able to get to shelter. Over 400 homes in Deshler were damaged with four being completely demolished. Nearly 100 homes were moderately to severely damaged. Six businesses in town were considered a complete loss and 25 others reportedly suffered moderate to severe damage. Seven people were injured, most were minor and were from broken glass. Despite ongoing drought conditions, widespread flooding was reported in Thayer and southern Fillmore counties. The flash flood along the Rose Creek at Hubbell provided some of the worst damage. Water was flowing into houses and businesses on main street to the tune of up to 5 feet deep. Boats were the only mode of travel through the business district. Up to 15 residents had to be evacuated by the local Dive and Rescue team using jet skis. The flooding was caused by extremely heavy rainfall in nearby Republic County, Kansas. Flooding and flash flooding was also a problem throughout Thayer county. Rainfall of over 12 inches was reported about 5 miles north of Deshler. Residents reported nearly 5 hours of constant, wind-driven rain. Windows were blown out and the rain just poured into homes. Widespread agricultural damage was done due to the rain. The runoff in the Snake and Spring creeks ravaged Deshler, the town which had already been hammered by tornadoes that evening. Flooding was concentrated in the southern part of town and most widespread near the park and fairgrounds. Major river flooding was reported along the Little Blue River from just west of Hebron to the Jefferson county line. One man at his farmstead near Gilead had to be air lifted to safety by the National Guard as flooding waters rose on his property. Dozens of county roads and bridges were damaged or destroyed. U. S. Highway 81 was restricted to one lane travel at Hebron due to the high water on the road. Portions of Highways 81, 136 and 9 were closed for a time due to high water. The Big Sandy Creek flowed out of its banks at Alexandria and crested at 14.5 feet. Water was flowing over the highway near town and filling back into the town's sewer drains. In all, several million dollars in damage was done by the flooding alone. Some locals said this was the worst flooding in the area in 55 years."

- **5/8/1996 Tornado** – 15 injuries with \$12,000,000 in property damages. *"The beginning of the tornado started 4 1/2 miles west northwest of downtown Beatrice, just north of the Homestead National Monument. The storm damaged trees just north of state highway 4 when it struck several homes, primarily lifting the roofs off of them. The tornado was rated F1 at that point. Around 1/2 mile to the east, the tornado struck a subdivision. The damage was more severe, with collapsed outer walls and roofs off homes. The tornado damage was rated as a strong F2 in this area. The tornado, continuing to move in an east southeast direction, nearly paralleling highway 4, struck a church. Part of the roof was lost off the church. After striking the church, the tornado hit several more homes and barns before entering the heart of the city. The damage path width of the tornado was 1/4 to 1/2 mile wide, with damaging thunderstorm winds out to 1 1/2 mile. The main tornado path remained 1/4 to 1/2 mile wide north of U.S. highway 136, with much of the damage south of highway 136 due to thunderstorm downburst winds. The tornado strength weakened when entering the city, with an F-scale strength between F0-F1. Although much of the damage in the central city area was due to falling trees*

and large tree limbs, other damage noted was roofing torn off of several buildings and a collapsed 200 foot communication tower. After the storm exited the city, it regained strength. The tornado also began curving to the northeast. The storm maintained about F1 strength from about 1 mile east of downtown Beatrice to the storm's dissipation, approximately 3 miles northeast of the city. The strong F2 tornado's path was 9.5 miles long.”

- **5/22/2004 Tornado** – tornado with eight injuries. “This long tracked tornado is often referred to as the Hallam tornado. It initially touched down 3 miles west of Daykin in northern Jefferson county. The tornado was rated an F0 or F1 in Jefferson County damaging farm outbuildings, grain bins and trees. From there the tornado crossed into Saline County southwest of Western and remained an F0 or F1 until it struck the southern portion of Wilber where it strengthened to F2. Roofs were blown off of homes just southeast of Wilber. The tornado traveled from Wilber into Gage County, crossing the county line west of Clatonia where it grew to its most intense stage, F4. The tornado remained nearly at this strength as it crossed into Lancaster county near Hallam with a damage path of around 2 1/2 miles. Many well-built homes were demolished from Clatonia to Hallam, along with grain bins, farm sheds, and outbuildings. Many trees were destroyed or uprooted. In total the tornado was on the ground for around 54 miles with a maximum intensity of f4. Besides the fatality, 38 people sustained injuries, 158 homes were leveled and 57 others were seriously damaged. The dollar amount of damage was estimated at 160 million, with 60 million of that agricultural including 100 cattle and 50 hogs lost. Some 150,000 acres of crop land sustained significant damage. The 5 counties were declared national disaster areas by FEMA.”
- **4/11/2001 Tornado** – tornado with two injuries. “A tornado caused extensive damage in Virginia with most of the damage occurring along a 4 block long and 1 block wide stretch through the center of town. One house was almost completely destroyed causing minor injuries to 2 people living there. Six other homes and businesses sustained extensive damage, and trees and other debris were scattered all over the community.”

Average Annual Losses

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 \$91,383 per year in property damages and \$501,271 per year in crop damages. Tornadoes have caused an average of over \$4 million per year in property damages; however, damages from tornadoes vary greatly depending on the severity or magnitude of each event.

Table 94: High Winds and Tornado Losses

Hazard Type	# of Events ¹	Average # events per year	Total Property Loss ¹	Average Annual Property Loss	Total Crop Loss ²	Average Annual Crop Loss
High Winds	183	7.3	\$2,284,580	\$91,383	\$10,526,687	\$501,271
Tornadoes	148	5.9	\$124,804,000	\$4,992,160	\$388,802	\$18,514

Source: 1 NCEI (1996-April 2020), 2 USDA RMA (2000-Aug 2020)

Extent

The Beaufort Wind Scale can be used to classify wind strength while the magnitude of tornadoes is measured by the Enhanced Fujita Scale. The following table outlines the Beaufort scale

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

Table 95: Beaufort Wind Ranking

Beaufort Wind Force Ranking	Range of Wind	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 overturned
11	64-72 mph	Widespread damages; very rarely experienced
12 - 17	72 - > 200 mph	Hurricane; devastation

Source: Storm Prediction Center, 2017¹⁰¹

The Enhanced Fujita Scale replaced the Fujita Scale in 2007. 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 after the event. The official rating category provides a common benchmark that allows comparisons to be made between different tornadoes. The enhanced scale classifies EF0-EF5 damage as determined by engineers and meteorologists across 28 different types of damage indicators, including different types of building and tree damage. To establish a rating, engineers and meteorologists examine the damage, analyze the ground-swirl patterns, review damage imagery, collect media reports, and sometimes utilize photogrammetry and videogrammetry. Based on the most severe damage to any well-built frame house, or any comparable damage as determined by an engineer, an EF-Scale number is assigned to the tornado.

The following tables 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.¹⁰²

¹⁰¹ Storm Prediction Center: National Oceanic and Atmospheric Administration. 1805. "Beaufort Wind Scale." <http://www.spc.noaa.gov/faq/tornado/beaufort.html>.

¹⁰² Kuligowski, E.D., Lombardo, F.T., Phan, L.T., Levitan, M.L., & Jorgensen, D.P. March 2014. "Final Report National Institute of Standards and Technology(NIST) Technical Investigation of the May 22, 2011, Tornado in Joplin, Missouri."

Table 96: Enhanced Fujita Scale

Storm Category	3 Second Gust (mph)	Damage Level	Damage Description
EF0	65-85	Gale	Some damages to chimneys; breaks branches off trees; pushes over shallow-rooted trees; damages to sign board
EF1	86-110	Weak	The lower limit is the beginning of hurricane wind speed; peels surface off rooms; mobile homes pushed off foundations or overturned; moving autos pushed off the roads; attached garages might be destroyed
EF2	110-135	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	Severe	Roof and some walls torn off well-constructed houses; trains overturned; most trees in forest uprooted.
EF4	166-200	Devastating	Well-constructed houses leveled; structures with weak foundations blown off some distance; cars thrown, and large missiles generated.
EF5	200+	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 EF5 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 97: Enhanced Fujita Scale Damage Indicator

Number	Damage Indicator	Number	Damage Indicator
1	Small barns, farm outbuildings	15	School – 1 story elementary (interior or exterior halls)
2	One- or two-family residences	16	School – Junior or Senior high school
3	Single-wide mobile homes	17	Low-rise (1-4 story) buildings
4	Double-wide mobile homes	18	Mid-rise (5-20 story) buildings
5	Apartment, condo, townhouse (3 stories or less)	19	High-rise (over 20 stories)
6	Motel	20	Institutional buildings (hospital, government, or university)
7	Masonry apartment or motel	21	Metal building systems
8	Small retail buildings (fast food)	22	Service station canopy
9	Small professional (doctor office, branch bank)	23	Warehouse (tilt-up walls or heavy timber)
10	Strip mall	24	Transmission line tower
11	Large shopping mall	25	Free-standing tower

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Number	Damage Indicator	Number	Damage Indicator
12	Large, isolated (“big box”) retail building	26	Free standing pole (light, flag, luminary)
13	Automobile showroom	27	Tree- hardwood
14	Automotive service building	28	Tree -softwood

Source: NOAA; FEMA

Using the NCEI reported events, the most common high wind event in the planning area is a level 9 on the Beaufort Wind Ranking scale. The reported high wind events ranged from 35 mph to 70 mph, with an average speed of 50 mph. Based on the historical record, it is most likely that tornadoes that occur within the planning area will be of EF0 strength. Of the 148 reported tornado events, 87 were EF/F0, 38 were EF/F1, 18 were EF/F2, four were EF3/F3, and one was a F4 event. High winds and tornadoes are likely to occur annually in the planning area.

Probability

Given the historic record of occurrence for high wind events (21 out of 25 years with reported events), for the purposes of this plan, the annual probability of wind event occurrence is 84 percent. However, high wind events may be more common than presented here but have simply not been reported in past years.

Given the historic record of occurrence for tornado events (24 out of 25 years with reported events), for the purposes of this plan, the annual probability of tornado occurrence is 96%. However, it is worth noting that data utilized during this analysis only encompassed through April 2020. Tornado events in 2020 were likely experienced in the planning area but were not reflected here.

Community Top Hazard Status

The following table lists jurisdictions which identified Tornadoes and High Winds as a top hazard of concern:

Jurisdictions	
Little Blue NRD	Village of Bruning
Adams County	Village of Chester
Fillmore County	Village of Clatonia
Gage County	Village of Cortland
Jefferson County	Village of Davenport
Nuckolls County	Village of Daykin
Saline County	Village of Deweese
Thayer County	Village of DeWitt
Webster County	Village of Diller
South Central USD 5 (Lawrence-Nelson-Sandy Creek)	Village of Dorchester
South Heartland District Health Department	Village of Exeter
Beatrice Public Schools	Village of Fairmont
Exeter Milligan Public Schools	Village of Filley
Fillmore Central Public Schools	Village of Glenvil
Meridian Public Schools	Village of Grafton
SCC - Beatrice Campus	Village of Guide Rock
Superior Public Schools	Village of Harbine
Tri-County Public Schools	Village of Hardy

Jurisdictions	
Barneston Rural Fire Dept	Village of Holstein
City of Beatrice	Village of Hubbell
City of Blue Hill	Village of Jansen
City of Blue Springs	Village of Juniata
City of Clay Center	Village of Kenesaw
City of Crete	Village of Lawrence
City of Deshler	Village of Liberty
City of Edgar	Village of Milligan
City of Fairbury	Village of Odell
City of Fairfield	Village of Ohioa
City of Friend	Village of Ong
City of Geneva	Village of Pickrell
City of Hastings	Village of Plymouth
City of Hebron	Village of Prosser
City of Red Cloud	Village of Reynolds
City of Superior	Village of Ruskin
City of Sutton	Village of Saronville
City of Wilber	Village of Shickley
City of Wymore	Village of Steele City
Clay County	Village of Strang
Village of Adams	Village of Swanton
Village of Alexandria	Village of Tobias
Village of Ayr	Village of Trumbull
Village of Barneston	Village of Virginia
Village of Belvidere	Village of Western

Regional Vulnerabilities

Tornadoes and high winds occur with irregularity and can affect the entire planning area. All building stock and above ground infrastructure, including critical facilities, are at risk of being damaged or affected by tornadoes and high winds. Tornadoes and high winds can cause structure loss, downed power lines, loss of electricity, obstruction to traffic flow, and significant damage to trees and center-pivot irrigation systems. A catastrophic event could lead to major economic loss for the jurisdiction. High wind speeds and flying debris can pose a significant threat to human life.

Tornadoes can impact a wide range of people and properties, including people living in mobile homes. Mobile homes that are not anchored or are not anchored properly can be blown over by winds as fast as 60 to 70 mph. A 2007 study conducted by Dr. W. Ashley at Northern Illinois University found that between 1985 and 2005, 44-percent of all tornado-related fatalities occurred in mobile homes while between 20 and 30-percent occurred in permanent homes. Tornado related deaths in mobile homes have increased over the timeframe investigated from 37-percent of all fatalities between 1986 and 1990 to nearly 57-percent of all fatalities from 2001 to 2005. The timing of tornadoes also impacts the vulnerability of people living in mobile homes. The 2007 study found that while only 25.8-percent of tornadoes occur between sunset and sunrise, they account for 42.5-percent of tornado fatalities. This is a result of a number of factors including decreased ability to identify tornadoes in the dark, decreased ability to communicate tornado threats due to a high rate of people sleeping during the night, and a higher number of people in the housing units (i.e. mobile home) during the nighttime.

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Other factors that may increase vulnerability to the threat posed by high winds and tornadoes include age, poverty levels, and home rentals. The 2007 study found that the middle aged (those over 40 years of age) and elderly are more vulnerable which may be a result of decreased mobility, higher rate of auditory complications, or lack of resources need to mitigate potential tornado related impacts.

To reduce damages and potential risks, building codes for new structures can be strengthened, requiring increased rebar in foundations, enhanced nailing patterns for wall sheathing, the use of Simpson Strong Ties and Straps, and require the use of anchors and tie-downs of mobile homes. Additionally, individuals can choose to build to an optional Code Plus Standard, such as Fortified for Safer Living. Safe rooms can be installed in new structures as well as made to adapt to existing structures. In-ground safe rooms can be installed in existing structures for as little as \$4,000. The installation of public safe rooms in areas around vulnerable populations, such as mobile home parks, can increase safety of residents in those areas.

Considerations for future development should include developing tornado safe rooms in or near mobile home parks. The 2003 Tornado Shelters Act authorizes communities to use Community Development Block Grant (CDBG) funds for construction of tornado-safe shelters in manufactured home parks with 20 or more housing units consisting predominately of low- and moderate-income residents.

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

Table 98: Regional Tornadoes and High Winds Vulnerabilities

SECTOR	VULNERABILITY
PEOPLE	<ul style="list-style-type: none"> -Vulnerable populations include those living in mobile homes (especially if improperly anchored), nursing homes, schools, or in substandard housing -People outside during events -Citizens without access to shelter below ground or in reinforced rooms -Elderly with decreased mobility or poor hearing may be at higher risk -Lack of multiple ways to receive weather warnings, especially at night
ECONOMIC	<ul style="list-style-type: none"> -Agricultural losses to both crops and livestock -Damages to businesses and prolonged power outages can cause significant impacts to the local economy, especially with EF3 tornadoes or greater
BUILT ENVIRONMENT	<ul style="list-style-type: none"> -All building stock is at risk of significant damages
INFRASTRUCTURE	<ul style="list-style-type: none"> -Downed power lines and power outages -All above ground infrastructure at risk to damages -Impassable roads due to debris blocking roadways
CRITICAL FACILITIES	<ul style="list-style-type: none"> -All critical facilities are at risk to damages and power outages
CLIMATE	<ul style="list-style-type: none"> -Changes in seasonal precipitation and temperature normals can increase frequency and magnitude of events

Terrorism

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

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

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

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

- Political Terrorism, Bio-terrorism, Cyber-terrorism, Eco-terrorism, Nuclear-terrorism, Narco-terrorism, and 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.

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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.

A rising type of terrorism of concern is the increased prevalence of cyber-terrorism. The National Conference of State Legislatures defines cyberterrorism as: *the use of information technology by terrorist groups and individuals to further their agenda. This can include use of information technology to organize and execute attacks against networks, computer systems and telecommunications infrastructures, or for exchanging information or making threats electronically. Examples are hacking into computer systems, introducing viruses to vulnerable networks, web site defacing, denial of service attacks, or terroristic threats made via electronic communication.*"

Additionally, the NDA developed the Nebraska Livestock Emergency Disease Response System (LEDRS) in response to concerns for biosecurity and agro-terrorism. This system includes a team of state and local veterinarians committed to monitoring and responding to agricultural related diseases.

Location

Terrorist attacks can 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. Specific concerns exist for local school districts as the frequency of school shootings have increased over the past decade. Urban areas, schools, and government buildings are more likely to see terroristic activity. However, water systems of any size could be vulnerable as well as computer systems from cyber-terrorism.

There are nine established hate groups in Nebraska which are tracked through the Nebraska Military Department and the Southern Poverty Law Center's Hate Map. Four of these groups either do or may exist within the planning area.

Table 99: Hate Groups in the Planning Area

Group Name	Focus	Location
AC Skins	Racist Skinhead	Statewide
Patriot Front	White Nationalist	Statewide
Proud Boys	General Hate	Statewide
Third Reich Books	Neo-Nazi	Fairbury

Source: SPLC, 2020¹⁰³

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 the database, one event was reported in two counties in the planning area between 1970-2017.¹⁰⁴ These events caused no property damages, one death, and seven injuries within the planning area.

Table 100: Terrorism Losses

Date	Location	Perpetrator Group	Fatalities	Injuries	Target Type	Property Damage
5/4/2002	Fillmore and Thayer County	Anti-government extremists	0	0	Civilians	\$0

Source: START, 1970-2017

According to the START Database, these events occurred:

Between the dates of May 3-7, 2002, eighteen pipe bombs were found in rural mailboxes in five Midwestern states in the U.S.A., collectively causing seven injuries and leading to widespread panic in the region. Most of the explosives came with typewritten notes that bemoaned the power of the government and threatened more attacks. In the incidents that occurred on May 4-5, 2002, seven bombs were found in mailboxes in the southern and central counties of Nebraska. None of these bombs detonated and no injuries were suffered. On May 7, 2002, the FBI and Nevada state authorities arrested Luke Helder, a 21-year-old college student, who confessed to being responsible for all of the bombs.

Several communities across the State of Nebraska have experienced cyber-attack incidents which impacted local networks or capabilities. Due to the sensitive nature of this information, further details and discussion is not included in this plan. Communities should take additional steps to ensure adequate cybersecurity measures are in place for community websites or information technology networks.

Threat assessment, mitigation, and response to terrorism are federal and state directives that work in conjunction with local law enforcement. Terroristic events are addressed at the federal level by the U.S. Department of Homeland Security and at the state level by the Nebraska Emergency Management Agency. By and large, most acts of terrorism in the United States, and

¹⁰³ Southern Poverty Law Center. 2021. "Hate Groups in Nebraska." <https://www.splcenter.org/hate-map?state=NE>

¹⁰⁴ National Consortium for the Study of Terrorism and Responses to Terrorism (START). 2016. Global Terrorism Database [Data file]. Retrieved from <https://www.start.umd.edu/gtd>.

specifically Nebraska, are committed by white nationalists, white supremacists, Neo-Nazis, and other far-rightwing organizations.¹⁰⁵

Average Annual Losses

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. If a terrorist event were to occur in the planning area, damages can range from minimal (in rural areas, <\$1 million) to significant (in metropolitan areas, >\$10 million).

Table 101: Terrorism Incident Losses

Hazard Type	# of Events ¹	Average # events per year	Total Property Loss ¹	Average Annual Property Loss	Total Crop Loss ²	Average Annual Crop Loss
Terrorism	2	0.04	\$0	\$0	N/A	N/A

Source: 1 NCEI (1996-2019), 2 USDA RMA (2000-2019)

Extent

Terrorist attacks can vary greatly in scale and magnitude, depending on the location, method, and target of the attack. Previous terrorist attacks in the planning area have been limited to pipe bombs in mailboxes; however, local concerns have also been identified for community computer systems, rural water supplies, and equipment. Since 2001, biased crimes against Middle Eastern/Muslim populations, Jewish populations, and African-Americans have increased steadily.¹⁰⁶

Probability

Given one year with a reported incident over the 48 years, the annual probability for terrorism in the planning area is stated as less than 1% annually. This does not indicate that a terrorist event will occur with that frequency within the planning area as terrorist events are typically clustered in timeframe due to extenuating circumstances.

Community Top Hazard Status

The following table lists jurisdictions which identified Terrorism as a top hazard of concern:

Jurisdictions	
City of Wilber	Superior Public Schools
South Central USD 5 (Lawrence-Nelson-Sandy Creek)	Tri-County Public Schools

Regional Vulnerabilities

Terroristic events are most likely occur at high visibility target locations. Special districts including school districts and public health districts identified specific concerns related to terrorism. School shootings or bomb threats have increased over the past decade prompting additional security measures and drills in the districts. Additionally, as climate change continues to impact local

¹⁰⁵ McGarrity, M.C. May 8, 2019. "Confronting the Rise of Domestic Terrorism in the Homeland, Statement Before the House Homeland Security Committee." <https://www.fbi.gov/news/testimony/confronting-the-rise-of-domestic-terrorism-in-the-homeland>.

¹⁰⁶ FBI. 2021. "Hate Crime Statistics." [1996-2019]. <https://www.fbi.gov/services/cjis/ucr/hate-crime>.

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communities at a more local level, environmental issues may be leveraged as a motive for violence. This motive may apply to either “eco-warriors” or climate-change deniers.

Vulnerable populations are most likely to feel the impacts of terrorist attacks as well as are more likely to be targeted. These may include racial minorities; religious organizations such as churches, mosques, or synagogues; public-assistance housing; state and/or federally owned properties; and/or facilities which house vulnerable populations closely together (hospitals or schools).

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

Table 102: Regional Terrorism Vulnerabilities

SECTOR	VULNERABILITY
PEOPLE	-Police officers and first responders at risk of injury or death -Media personnel at risk
ECONOMIC	-Damaged businesses can cause loss of revenue and loss of income for workers -Agriculture attacks could cause significant economic losses for the region
BUILT ENVIRONMENT	-Targeted buildings may sustain heavy damage
INFRASTRUCTURE	-Water supply, power plants, utilities all at risk of damage
CRITICAL FACILITIES	-Police stations and governmental offices are at higher risk
CLIMATE	-Activism pertaining to climate can place first responders and residents at risk

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SECTION FIVE

MITIGATION STRATEGY

Introduction

The primary focus of the mitigation strategy is to identify action items to reduce the effects and impacts from the identified top hazards of concern per community. These action items should help reduce impacts on existing infrastructure and property in a cost effective and technically feasible manner. Mitigation strategy development is also based upon the established Goals and Objectives as determined by the Regional Planning Team at the Kick-off meeting.

At the Kick-off Meeting the Regional Planning Team reviewed the goals from the 2016 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. Participating jurisdictions were provided a copy of the Goals and Objectives at meetings to review and provide comments. For the purposes of this plan, all jurisdictions used 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.*

Goals and Objectives

Below is the list of goals and objectives as determined by the Regional Planning Team and reviewed by participating jurisdictions. These goals and objectives provided specific direction to guide participants in reducing future hazard related losses and in their selection of mitigation actions.

GOAL 1: PROTECT THE HEALTH AND SAFETY OF THE PUBLIC

- Objective 1.1: Continue compliance with NFIP for participating communities; encourage joining NFIP if not currently participating
- Objective 1.2: Construct safe rooms in schools, public buildings, and in select locations at popular outdoor venues
- Objective 1.3: Update or obtain additional outdoor warning sirens as needed in the project area
- Objective 1.4: Develop additional emergency notification methods to alert the public of potential hazards
- Objective 1.5: Provide educational opportunities for the public to promote preparedness in the project area

GOAL 2: PROTECT CRITICAL FACILITIES, CRITICAL INFRASTRUCTURE, AND MAINTAIN THEIR OPERATION AFTER A HAZARD

- Objective 2.1: Protect power lines throughout the NRDs by burying them or reinforcing them
- Objective 2.2: Obtain backup power systems and emergency equipment required to keep critical facilities, critical infrastructure, and emergency operations running after a hazard event
- Objective 2.3: Develop studies to determine infrastructure systems that require updating

GOAL 3: PROTECT EXISTING PROPERTIES AND NATURAL RESOURCES

- Objective 3.1: Implement or strengthen regulations and building codes promoting development and construction that protects existing and future development or properties
- Objective 3.2: Protect existing infrastructure or critical facilities from flooding
- Objective 3.3: Perform studies to determine locations of concern and determine projects to mitigate against the hazards
- Objective 3.4: Protect public structures and recreational facilities against hazard events and damages from trees
- Objective 3.5: Improve drainage through creeks where necessary
- Objective 3.6: Develop and implement planning mechanisms which address hazard mitigation actions and maintenance procedures for structures throughout the planning area to protect against hazard events

GOAL 4: PROMOTE MULTI-AGENCY COORDINATION AND RESOURCES

- Objective 4.1: Maximize funding opportunities through grant money and other outside sources
- Objective 4.2: Prioritize projects based on greatest risk
- Objective 4.3: Encourage individual property owners to develop independent measures to protect their property and not rely on public funding
- Objective 4.4: Promote the efficient use of all public, private, and allocated funds

Mitigation Alternatives (Action Items)

After establishing the goals, mitigation alternatives were prioritized. The alternatives considered included: the mitigation actions identified per community/jurisdiction in the previous plan; additional mitigation actions discussed during the planning process; and recommendations from JEO for additional mitigation actions based on identified needs. JEO reviewed identified mitigation actions per community and provided suggestions to each participant to address gaps or vulnerabilities unaddressed in the hazards of top concern.

This prioritized list of alternatives helped participants determine which actions will best assist their respective jurisdiction in alleviating damages in the event of a disaster. The listed priority does not indicate which actions will be implemented first but will serve as a guide in determining the order in which each action should be implemented.

These projects are the core of a hazard mitigation plan. The planning teams were instructed that each alternative must be directly related to the goals of the plan and identified hazards of top concern per community. 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 the following information: description of the action; which hazard(s) the action mitigated; responsible party; priority; cost estimate; potential funding sources; and estimated timeline. This information was established through input from participants and determination by JEO.

It is important to note that not all of the mitigation actions identified by a community may ultimately be implemented due to limited capabilities, prohibitive costs, low benefit-cost ratio, or other concerns. These factors may not be identified during the planning process. 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 and pursue additional mitigation actions not identified in this HMP. Such actions should be discussed and noted in the HMP during the annual plan maintenance process.

Finally, not all mitigation actions may be eligible for funding through the Hazard Mitigation Assistance programs (HMGP, BRIC, or FMA). Ineligibility for these grant programs should not preclude a community from identifying or pursuing a mitigation action. Numerous funding sources have been identified across the state and planning area to assist jurisdictions fund projects (see *Appendix D*). All mitigation strategies aimed at reducing risk to natural or human-caused hazards should be identified and discussed in the HMP.

Mitigation Action Descriptions

- Mitigation actions identified by participants of the Little Blue NRD and Lower Big Blue NRD HMP are found in the Mitigation Alternative Project Matrix below. Additional information about selected actions can be found in *Section Seven: Community Profiles*. Each action includes the following information in the respective community profile:
- Mitigation Action – general title of the action item

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

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

Mitigation Action Matrix

Throughout this planning process, each jurisdiction was asked to review mitigation projects from the 2016 HMP and identify new potential mitigation alternatives to further reduce the effects of hazards. Selected projects varied amongst jurisdictions depending upon the significance of each hazard present. The following tables are a compilation of new and continuing mitigation alternatives identified by participating jurisdictions. Completed and removed mitigation alternatives can be found in the respective community profile.

Table 103: Mitigation Actions Selected per Jurisdiction – NRDs, Adams, Clay Counties

Mitigation Alternatives	Goal / Obj.	Little Blue NRD	Lower Big Blue NRD	Adams County	Ayr	Hastings	Juniata	Kenesaw	Prosser	Clay County	Clay Center	Deweese	Edgar	Fairfield	Glenvil	Ong	Saronville	Sutton	Trumbull	
		NRD	Adams County					Clay County												
Additional Personnel for Emergency Response	2.2																			
Alert Notification System	1.4									X										
Alert Sirens	1.3		X			X				X		X			X				X	X
Assess Vulnerability and Develop Drought Response Protocols	3.3																			
Backup Generators	2.2	X		X	X	X	X		X			X			X	X	X	X	X	X
Backup Municipal and Project Records	2.2	X			X				X			X								
Bank Stabilization	3.5		X				X													
Bury Power and Service Lines	2.1					X													X	
City Park and Critical Facility Flood Protection Project	3.4																			
Civil Service Improvements	2.2																			
Cold Storage Equipment	2.2																			
Communication Center Development	1.4																			
Community Rating System	4.2																			
Comprehensive Disaster/Emergency Response Plan and Exercise	3.6			X																
Continuity Planning	3.6																			
Coordinate with Red Cross Shelter	1.2						X													

Mitigation Alternatives	Goal / Obj.	Little Blue NRD	Lower Big Blue NRD	Adams County	Ayr	Hastings	Juniata	Kenesaw	Prosser	Clay County	Clay Center	Deweese	Edgar	Fairfield	Glenvil	Ong	Saronville	Sutton	Trumbull
		NRD	Adams County					Clay County											
Create/Update Community Wide Master Plan to Prioritize all Flood Related Projects	4.2													X					
Dam/Levee/Floodwall Construction and Improvements	3.2	X	X			X		X										X	
Develop a Drought Management Plan	3.6		X	X			X												
Develop an Agricultural Disease Response Action Plan	3.6														X				
Develop Stream Buffer Ordinance	3.1					X													
DeWitt Flood Mitigation Project	3.2		X																
Elevate Pad Mounted Transformers and Switch Gear	3.2																	X	
Emergency Communication	1.4	X																	
Emergency Equipment Purchase and/or Upgrades	2.2		X			X									X				
Emergency Exercise: Dam Failure	3.3		X																
Emergency Exercise: Hazardous Spill	3.3																		
Emergency Fuel Supply Plan	3.6																		
Emergency Operations	1.4																		
Emergency Water Main Shutoff Valves	3.2		X												X				
Evacuation Planning	3.6																		
Facilities for Vulnerable Populations	1.2																		
Fire Station Improvements	2.2																		

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Mitigation Alternatives	Goal / Obj.	Little Blue NRD	Lower Big Blue NRD	Adams County	Ayr	Hastings	Juniata	Kenesaw	Prosser	Clay County	Clay Center	Deweese	Edgar	Fairfield	Glennville	Ong	Saronville	Sutton	Trumbull	
		NRD	Adams County					Clay County												
Firewise Community	4.2																			
First Aid Training	1.5	X																		
Flood Mitigation Study and/or Parcel Level Flood Mitigation Plan	3.3							X												
Floodplain Early Alert System	1.4	X	X																X	
Floodplain Management	3.1																			
Floodplain Mapping/Remapping	3.6	X	X		X		X													
Floodplain Ordinance Update	3.1					X														
Grade Control Structures	3.2													X						
Grass/Wildfire Training	3.3																			
Green Infrastructure	2.3					X														
Hazardous Material Cleanup and Relocation	3.4																			
Hazardous Tree Removal	3.4																			
Hazmat Training	1.5			X																
Higher Building Codes and Standards	3.1										X									
Improve and Revise Snow/Ice Removal Program or Resources	3.4						X													X
Improve or Acquire Property at High Risk to Flooding	3.2																	X		
Improve Water Supply Resources	3.3						X													
Infrastructure Protection	2.2																			
Install Vehicular Barriers	2.2																			

Mitigation Alternatives	Goal / Obj.	Little Blue NRD	Lower Big Blue NRD	Adams County	Ayr	Hastings	Juniata	Kenesaw	Prosser	Clay County	Clay Center	Deweese	Edgar	Fairfield	Glennville	Ong	Saronville	Sutton	Trumbull	
		NRD	Adams County					Clay County												
Interior Ditches and Culvert Improvements	3.2							X						X						
Map/Relocate Critical Infrastructure	3.2																			
Medical Chair Lift	2.2																			
Mutual Aid	4.1																			
Native Species Integration	3.3																			
Pandemic Response Plan	3.6																			
Pond Filling	3.2																			
Protect and Improve Roads and Bridges	3.4			X		X														
Provide Backup Power Systems and Redundancies	2.2														X					
Public Education and Outreach	1.5		X										X	X	X					
Railroad Transportation Corridor Improvements	3.4					X														
Rebuild 306 Transmission Line and Loop	2.1																			
Remove Flow Constrictions	3.5			X														X		
Safe Room/Storm Shelters	1.2	X		X	X		X	X	X					X	X	X	X	X		
Shelter in Place Training	1.5													X						
Shelter Supplies	1.2																			
Static Detectors	2.1																			
Storm Shelter Identification	1.2																		X	

SECTION FIVE: MITIGATION STRATEGY

Mitigation Alternatives	Goal / Obj.	Little Blue NRD	Lower Big Blue NRD	Adams County	Ayr	Hastings	Juniata	Kenesaw	Prosser	Clay County	Clay Center	Deweese	Edgar	Fairfield	Glennville	Ong	Saronville	Sutton	Trumbull
		NRD	Adams County					Clay County											
Stormwater System and Drainage Improvements	3.2					X							X	X					
Stream and Channel Renovations	3.5		X				X												
Surge Protectors	2.1																		
Tornado Safety Program	1.5																		
Train Derailment Response Training	3.6																		
Tree Care Ordinance	3.1																		
Tree City USA	3.4							X											
Tree Inventory and Planting Guidance	3.4																	X	
Update Master Plan	3.1		X																
Urban Fire Prevention Program: Planning and Training	1.5																		
Vehicular Shed	2.2																		
Vulnerable Populations Database	4.4						X												
Wastewater System Improvements	3.2						X												
Water Conservation Awareness Program	1.5	X																	
Water Meters	2.3						X												
Water System Improvements	2.2		X																
Water Tower Improvement	2.2																		
Weather Radios	4.3						X												
Well System Improvements	2.2															X			
Wind Break Study	2.3																		

Mitigation Alternatives	Goal / Obj.	Little Blue NRD	Lower Big Blue NRD	Adams County	Ayr	Hastings	Juniata	Kenesaw	Prosser	Clay County	Clay Center	Deweese	Edgar	Fairfield	Glenvil	Ong	Saronville	Sutton	Trumbull	
		NRD	Adams County					Clay County												
Zoning Ordinance Updates	3.1																			

Table 104: Mitigation Actions Selected per Jurisdiction – Fillmore and Gage Counties

Mitigation Alternatives	Goal / Obj.	Fillmore County	Exeter	Fairmont	Geneva	Grafton	Milligan	Ohiova	Shickley	Strang	Gage County	Adams	Barneston	Beatrice	Blue Springs	Clatonia	Cortland	Filley	Liberty	Odell	Pickrell	Virginia	Wymore	
		Fillmore County										Gage County												
Additional Personnel for Emergency Response	2.2													X										
Alert Notification System	1.4								X		X													
Alert Sirens	1.3							x			X			X										
Assess Vulnerability and Develop Drought Response Protocols	3.3								X															X
Backup Generators	2.2		X	X	X	X					X				X	X						X	X	
Backup Municipal and Project Records	2.2																		X					

SECTION FIVE: MITIGATION STRATEGY

Mitigation Alternatives	Goal / Obj.	Fillmore County	Exeter	Fairmont	Geneva	Grafton	Milligan	Ohiowa	Shickley	Strang	Gage County	Adams	Barneston	Beatrice	Blue Springs	Clatonia	Cortland	Filley	Liberty	Odell	Pickrell	Virginia	Wymore	
		Fillmore County										Gage County												
Bank Stabilization	3.5										X													
Bury Power and Service Lines	2.1			X					X		X			X		X						X		
City Park and Critical Facility Flood Protection Project	3.4																							
Civil Service Improvements	2.2		X						X	X						X								X
Cold Storage Equipment	2.2																							
Communication Center Development	1.4				X																			
Community Rating System	4.2													X										
Comprehensive Disaster/Emergency Response Plan and Exercise	3.6										X													
Continuity Planning	3.6										X													
Coordinate with Red Cross Shelter	1.2																							
Create/Update Community Wide Master Plan to Prioritize all Flood Related Projects	4.2													X										

Mitigation Alternatives	Goal / Obj.	Fillmore County	Exeter	Fairmont	Geneva	Grafton	Milligan	Ohiowa	Shickley	Strang	Gage County	Adams	Barneston	Beatrice	Blue Springs	Clatonia	Cortland	Filley	Liberty	Odell	Pickrell	Virginia	Wymore	
		Fillmore County									Gage County													
Dam/Levee/Floodwall Construction and Improvements	3.2								X															
Develop a Drought Management Plan	3.6																							
Develop an Agricultural Disease Response Action Plan	3.6																							
Develop Stream Buffer Ordinance	3.1																							
DeWitt Flood Mitigation Project	3.2																							
Elevate Pad Mounted Transformers and Switch Gear	3.2																							
Emergency Communication	1.4							X						X										X
Emergency Equipment Purchase and/or Upgrades	2.2													X										
Emergency Exercise: Dam Failure	3.3																							
Emergency Exercise: Hazardous Spill	3.3																							
Emergency Fuel Supply Plan	3.6										X									X				X

SECTION FIVE: MITIGATION STRATEGY

Mitigation Alternatives	Goal / Obj.	Fillmore County	Exeter	Fairmont	Geneva	Grafton	Milligan	Ohiowa	Shickley	Strang	Gage County	Adams	Barneston	Beatrice	Blue Springs	Clatonia	Cortland	Filley	Liberty	Odell	Pickrell	Virginia	Wymore	
		Fillmore County										Gage County												
Emergency Operations	1.4																							
Emergency Water Main Shutoff Valves	3.2																			X				
Evacuation Planning	3.6																							
Facilities for Vulnerable Populations	1.2																							
Fire Station Improvements	2.2													X										
Firewise Community	4.2																							
First Aid Training	1.5																							
Flood Mitigation Study and/or Parcel Level Flood Mitigation Plan	3.3																							
Floodplain Early Alert System	1.4								X		X													
Floodplain Management	3.1																							
Floodplain Mapping/Remapping	3.6																							
Floodplain Ordinance Update	3.1																							
Grade Control Structures	3.2																							

Mitigation Alternatives	Goal / Obj.	Fillmore County	Exeter	Fairmont	Geneva	Grafton	Milligan	Ohiowa	Shickley	Strang	Gage County	Adams	Barneston	Beatrice	Blue Springs	Clatonia	Cortland	Filley	Liberty	Odell	Pickrell	Virginia	Wymore	
		Fillmore County										Gage County												
Grass/Wildfire Training	3.3																							
Green Infrastructure	2.3																							
Hazardous Material Cleanup and Relocation	3.4																							
Hazardous Tree Removal	3.4								X									X						
Hazmat Training	1.5																							
Higher Building Codes and Standards	3.1																							
Improve and Revise Snow/Ice Removal Program or Resources	3.4	X									X													
Improve or Acquire Property at High Risk to Flooding	3.2													X										
Improve Water Supply Resources	3.3																			X				X
Infrastructure Protection	2.2				X									X										
Install Vehicular Barriers	2.2			X																				
Interior Ditches and Culvert Improvements	3.2							X		X	X									X	X			

SECTION FIVE: MITIGATION STRATEGY

Mitigation Alternatives	Goal / Obj.	Fillmore County	Exeter	Fairmont	Geneva	Grafton	Milligan	Ohiowa	Shickley	Strang	Gage County	Adams	Barneston	Beatrice	Blue Springs	Clatonia	Cortland	Filley	Liberty	Odell	Pickrell	Virginia	Wymore
		Fillmore County										Gage County											
Map/Relocate Critical Infrastructure	3.2											X											X
Medical Chair Lift	2.2																						
Mutual Aid	4.1																						
Native Species Integration	3.3																						
Pandemic Response Plan	3.6		X																				
Pond Filling	3.2		X																				
Protect and Improve Roads and Bridges	3.4													X									
Provide Backup Power Systems and Redundancies	2.2			X					X					X									
Public Education and Outreach	1.5		X	X		X								X								X	
Railroad Transportation Corridor Improvements	3.4											X											
Rebuild 306 Transmission Line and Loop	2.1																						
Remove Flow Constrictions	3.5	X																					
Safe Room/Storm Shelters	1.2		X	X		X		X				X	X	X	X	X		X			X	X	X

Mitigation Alternatives	Goal / Obj.	Fillmore County										Gage County									
		Exeter	Fairmont	Geneva	Grafton	Milligan	Ohiowa	Shickley	Strang	Adams	Barneston	Beatrice	Blue Springs	Clatonia	Cortland	Filley	Liberty	Odell	Pickrell	Virginia	Wymore
Shelter in Place Training	1.5		X																		
Shelter Supplies	1.2	X																			
Static Detectors	2.1								X												
Storm Shelter Identification	1.2						X														
Stormwater System and Drainage Improvements	3.2			X	X		X			X	X				X		X			X	
Stream and Channel Renovations	3.5																				
Surge Protectors	2.1																				
Tornado Safety Program	1.5																				
Train Derailment Response Training	3.6	X																			
Tree Care Ordinance	3.1																				
Tree City USA	3.4								X												
Tree Inventory and Planting Guidance	3.4										X										
Update Master Plan	3.1																				
Urban Fire Prevention Program: Planning and Training	1.5																				
Vehicular Shed	2.2																				

SECTION FIVE: MITIGATION STRATEGY

Mitigation Alternatives	Goal / Obj.	Fillmore County	Exeter	Fairmont	Geneva	Grafton	Milligan	Ohiowa	Shickley	Strang	Gage County	Adams	Barneston	Beatrice	Blue Springs	Clatonia	Cortland	Filley	Liberty	Odell	Pickrell	Virginia	Wymore	
		Fillmore County										Gage County												
Vulnerable Populations Database	4.4																							
Wastewater System Improvements	3.2													X										
Water Conservation Awareness Program	1.5																							
Water Meters	2.3																							
Water System Improvements	2.2													X										
Water Tower Improvement	2.2						X														X			
Weather Radios	4.3								X											X				X
Well System Improvements	2.2																X							
Wind Break Study	2.3																							
Zoning Ordinance Updates	3.1																							

Table 105: Mitigation Actions Selected per Jurisdiction – Jefferson and Nuckolls County

Mitigation Alternatives	Goal / Obj.	Jefferson County	Daykin	Diller	Endicott	Fairbury	Harbine	Jansen	Plymouth	Reynolds	Steele City	Nuckolls County	Hardy	Lawrence	Nelson	Ruskin	Superior
		Jefferson County											Nuckolls County				
Additional Personnel for Emergency Response	2.2																
Alert Notification System	1.4																
Alert Sirens	1.3		X		X	X					X				X	X	X
Assess Vulnerability and Develop Drought Response Protocols	3.3																
Backup Generators	2.2	X	X	X	X		X	X			X	X	X		X	X	X
Backup Municipal and Project Records	2.2						X										
Bank Stabilization	3.5										X						X
Bury Power and Service Lines	2.1																
City Park and Critical Facility Flood Protection Project	3.4					X											
Civil Service Improvements	2.2			X											X		
Cold Storage Equipment	2.2																
Communication Center Development	1.4																
Community Rating System	4.2																
Comprehensive Disaster/Emergency Response Plan and Exercise	3.6																
Continuity Planning	3.6																
Coordinate with Red Cross Shelter	1.2																
Create/Update Community Wide Master Plan to Prioritize all Flood Related Projects	4.2														X		

SECTION FIVE: MITIGATION STRATEGY

Mitigation Alternatives	Goal / Obj.	Jefferson County	Daykin	Diller	Endicott	Fairbury	Harbine	Jansen	Plymouth	Reynolds	Steele City	Nuckolls County	Hardy	Lawrence	Nelson	Ruskin	Superior
		Jefferson County										Nuckolls County					
Dam/Levee/Floodwall Construction and Improvements	3.2					X											
Develop a Drought Management Plan	3.6																
Develop an Agricultural Disease Response Action Plan	3.6																
Develop Stream Buffer Ordinance	3.1																
DeWitt Flood Mitigation Project	3.2																
Elevate Pad Mounted Transformers and Switch Gear	3.2																
Emergency Communication	1.4									X		X					
Emergency Equipment Purchase and/or Upgrades	2.2		X										X				
Emergency Exercise: Dam Failure	3.3																
Emergency Exercise: Hazardous Spill	3.3					X										X	X
Emergency Fuel Supply Plan	3.6		X														
Emergency Operations	1.4																
Emergency Water Main Shutoff Valves	3.2																
Evacuation Planning	3.6															X	
Facilities for Vulnerable Populations	1.2															X	
Fire Station Improvements	2.2														X		
Firewise Community	4.2																
First Aid Training	1.5									X							
Flood Mitigation Study and/or Parcel Level Flood Mitigation Plan	3.3																

Mitigation Alternatives	Goal / Obj.	Jefferson County	Daykin	Diller	Endicott	Fairbury	Harbine	Jansen	Plymouth	Reynolds	Steele City	Nuckolls County	Hardy	Lawrence	Nelson	Ruskin	Superior	
		Jefferson County										Nuckolls County						
Floodplain Early Alert System	1.4																	
Floodplain Management	3.1																	X
Floodplain Mapping/Remapping	3.6																	
Floodplain Ordinance Update	3.1																	
Grade Control Structures	3.2																	
Grass/Wildfire Training	3.3																	
Green Infrastructure	2.3																	X
Hazardous Material Cleanup and Relocation	3.4																	
Hazardous Tree Removal	3.4												X					X
Hazmat Training	1.5																	
Higher Building Codes and Standards	3.1																	
Improve and Revise Snow/Ice Removal Program or Resources	3.4												X					
Improve or Acquire Property at High Risk to Flooding	3.2					X												X
Improve Water Supply Resources	3.3					X												
Infrastructure Protection	2.2																	
Install Vehicular Barriers	2.2																	
Interior Ditches and Culvert Improvements	3.2			X								X		X				
Map/Relocate Critical Infrastructure	3.2					X											X	
Medical Chair Lift	2.2																	
Mutual Aid	4.1																	
Native Species Integration	3.3																	X

SECTION FIVE: MITIGATION STRATEGY

	Goal / Obj.	Jefferson County	Daykin	Diller	Endicott	Fairbury	Harbine	Jansen	Plymouth	Reynolds	Steele City	Nuckolls County	Hardy	Lawrence	Nelson	Ruskin	Superior
Mitigation Alternatives		Jefferson County										Nuckolls County					
Pandemic Response Plan	3.6																
Pond Filling	3.2																
Protect and Improve Roads and Bridges	3.4																
Provide Backup Power Systems and Redundancies	2.2					X											
Public Education and Outreach	1.5			X	X							X		X			
Railroad Transportation Corridor Improvements	3.4																
Rebuild 306 Transmission Line and Loop	2.1					X											
Remove Flow Constrictions	3.5														X		
Safe Room/Storm Shelters	1.2	X					X	X			X	X		X	X	X	X
Shelter in Place Training	1.5																
Shelter Supplies	1.2																
Static Detectors	2.1																
Storm Shelter Identification	1.2									X					X		
Stormwater System and Drainage Improvements	3.2					X				X							
Stream and Channel Renovations	3.5																
Surge Protectors	2.1																
Tornado Safety Program	1.5																
Train Derailment Response Training	3.6																
Tree Care Ordinance	3.1																
Tree City USA	3.4																

Mitigation Alternatives	Goal / Obj.	Jefferson County	Daykin	Diller	Endicott	Fairbury	Harbine	Jansen	Plymouth	Reynolds	Steele City	Nuckolls County	Hardy	Lawrence	Nelson	Ruskin	Superior	
		Jefferson County										Nuckolls County						
Tree Inventory and Planting Guidance	3.4									X								
Update Master Plan	3.1																	
Urban Fire Prevention Program: Planning and Training	1.5																	
Vehicular Shed	2.2																	
Vulnerable Populations Database	4.4																	
Wastewater System Improvements	3.2					X			X					X				
Water Conservation Awareness Program	1.5																	
Water Meters	2.3																	
Water System Improvements	2.2												X					X
Water Tower Improvement	2.2																	
Weather Radios	4.3														X			X
Well System Improvements	2.2			X												X		
Wind Break Study	2.3																	X
Zoning Ordinance Updates	3.1																	

SECTION FIVE: MITIGATION STRATEGY

Table 106: Mitigation Actions Selected per Jurisdiction – Saline and Thayer County

Mitigation Alternatives	Goal / Obj.	Saline County	Crete	DeWitt	Dorchester	Friend	Swanton	Tobias	Western	Wilber	Thayer County	Alexandria	Belvidere	Bruning	Chester	Davenport	Deshler	Hebron	Hubbell	
		Saline County										Thayer County								
Additional Personnel for Emergency Response	2.2																			
Alert Notification System	1.4																			
Alert Sirens	1.3	X	X		X	X			X		X		X	X	X		X		X	
Assess Vulnerability and Develop Drought Response Protocols	3.3														X					
Backup Generators	2.2			X	X		X	X	X	X		X					X		X	
Backup Municipal and Project Records	2.2							X												
Bank Stabilization	3.5			X																
Bury Power and Service Lines	2.1			X	X					X									X	
City Park and Critical Facility Flood Protection Project	3.4																			
Civil Service Improvements	2.2	X		X					X			X				X			X	
Cold Storage Equipment	2.2																			
Communication Center Development	1.4																			
Community Rating System	4.2																X			
Comprehensive Disaster/Emergency Response Plan and Exercise	3.6										X	X	X							
Continuity Planning	3.6		X															X		
Coordinate with Red Cross Shelter	1.2																			

SECTION FIVE: MITIGATION STRATEGY

Mitigation Alternatives	Goal / Obj.	Saline County	Crete	DeWitt	Dorchester	Friend	Swanton	Tobias	Western	Wilber	Thayer County	Alexandria	Belvidere	Bruning	Chester	Davenport	Deshler	Hebron	Hubbell	
		Saline County										Thayer County								
Create/Update Community Wide Master Plan to Prioritize all Flood Related Projects	4.2		X	X																
Dam/Levee/Floodwall Construction and Improvements	3.2			X																
Develop a Drought Management Plan	3.6																			
Develop an Agricultural Disease Response Action Plan	3.6																			
Develop Stream Buffer Ordinance	3.1																			
DeWitt Flood Mitigation Project	3.2																			
Elevate Pad Mounted Transformers and Switch Gear	3.2			X																
Emergency Communication	1.4			X																
Emergency Equipment Purchase and/or Upgrades	2.2																		X	
Emergency Exercise: Dam Failure	3.3																		X	
Emergency Exercise: Hazardous Spill	3.3		X											X					X	
Emergency Fuel Supply Plan	3.6																		X	
Emergency Operations	1.4										X									
Emergency Water Main Shutoff Valves	3.2																			
Evacuation Planning	3.6																			
Facilities for Vulnerable Populations	1.2														X				X	
Fire Station Improvements	2.2																			

SECTION FIVE: MITIGATION STRATEGY

Mitigation Alternatives	Goal / Obj.	Saline County	Crete	DeWitt	Dorchester	Friend	Swanton	Tobias	Western	Wilber	Thayer County	Alexandria	Belvidere	Bruning	Chester	Davenport	Deshler	Hebron	Hubbell	
		Saline County										Thayer County								
Firewise Community	4.2														X					
First Aid Training	1.5												X	X				X		
Flood Mitigation Study and/or Parcel Level Flood Mitigation Plan	3.3			X									X							
Floodplain Early Alert System	1.4	X		X																X
Floodplain Management	3.1		X										X							X
Floodplain Mapping/Remapping	3.6			X													X			
Floodplain Ordinance Update	3.1																			
Grade Control Structures	3.2			X																
Grass/Wildfire Training	3.3										X									
Green Infrastructure	2.3																			
Hazardous Material Cleanup and Relocation	3.4			X			X		X											
Hazardous Tree Removal	3.4																			
Hazmat Training	1.5																			
Higher Building Codes and Standards	3.1													X			X	X		
Improve and Revise Snow/Ice Removal Program or Resources	3.4			X											X					
Improve or Acquire Property at High Risk to Flooding	3.2			X								X					X		X	
Improve Water Supply Resources	3.3		X																	
Infrastructure Protection	2.2			X																
Install Vehicular Barriers	2.2												X							
Interior Ditches and Culvert Improvements	3.2			X	X		X					X		X						

SECTION FIVE: MITIGATION STRATEGY

Mitigation Alternatives	Goal / Obj.	Saline County	Crete	DeWitt	Dorchester	Friend	Swanton	Tobias	Western	Wilber	Thayer County	Alexandria	Belvidere	Bruning	Chester	Davenport	Deshler	Hebron	Hubbell	
		Saline County										Thayer County								
Map/Relocate Critical Infrastructure	3.2		X	X																
Medical Chair Lift	2.2																			
Mutual Aid	4.1			X																
Native Species Integration	3.3																			
Pandemic Response Plan	3.6																			
Pond Filling	3.2																			
Protect and Improve Roads and Bridges	3.4			X																
Provide Backup Power Systems and Redundancies	2.2		X							X										X
Public Education and Outreach	1.5		X	X	X			X					X		X			X	X	
Railroad Transportation Corridor Improvements	3.4																			
Rebuild 306 Transmission Line and Loop	2.1																			
Remove Flow Constrictions	3.5		X														X			
Safe Room/Storm Shelters	1.2			X	X	X	X	X	X	X	X									
Shelter in Place Training	1.5																			
Shelter Supplies	1.2																			
Static Detectors	2.1																			
Storm Shelter Identification	1.2																	X		
Stormwater System and Drainage Improvements	3.2			X		X				X	X	X		X				X		
Stream and Channel Renovations	3.5																	X		
Surge Protectors	2.1		X																	

SECTION FIVE: MITIGATION STRATEGY

Mitigation Alternatives	Goal / Obj.	Saline County	Crete	DeWitt	Dorchester	Friend	Swanton	Tobias	Western	Wilber	Thayer County	Alexandria	Belvidere	Bruning	Chester	Davenport	Desler	Hebron	Hubbell	
		Saline County										Thayer County								
Tornado Safety Program	1.5																			X
Train Derailment Response Training	3.6											X								
Tree Care Ordinance	3.1												X							
Tree City USA	3.4			X	X															
Tree Inventory and Planting Guidance	3.4			X					X				X							
Update Master Plan	3.1																			
Urban Fire Prevention Program: Planning and Training	1.5																			
Vehicular Shed	2.2																			
Vulnerable Populations Database	4.4																			
Wastewater System Improvements	3.2																			
Water Conservation Awareness Program	1.5																			
Water Meters	2.3																			
Water System Improvements	2.2								X						X					
Water Tower Improvement	2.2																			
Weather Radios	4.3	X										X							X	
Well System Improvements	2.2																			
Wind Break Study	2.3																			
Zoning Ordinance Updates	3.1				X															

Table 107: Mitigation Actions Selected per Jurisdiction – Webster County and Special Districts

Mitigation Alternatives	Goal / Obj.	Webster County	Blue Hill	Cowles	Guide Rock	Red Cloud	South Heartland District Health Dent.	Adams Central Schools	Beatrice Public Schools	Exeter Milligan Schools	Fillmore Central Schools	Meridian Public Schools	South Central United District	Superior Public Schools	Tri-County Public Schools	Southeast Community College	Barneston Fire District
		Webster County						Special Jurisdictions									
Additional Personnel for Emergency Response	2.2																
Alert Notification System	1.4																
Alert Sirens	1.3	X	X		X			X							X		
Assess Vulnerability and Develop Drought Response Protocols	3.3																
Backup Generators	2.2	X			X		X	X		X			X	X	X	X	X
Backup Municipal and Project Records	2.2	X															
Bank Stabilization	3.5	X															
Bury Power and Service Lines	2.1		X												X		
City Park and Critical Facility Flood Protection Project	3.4																
Civil Service Improvements	2.2				X												
Cold Storage Equipment	2.2						X										
Communication Center Development	1.4																
Community Rating System	4.2																
Comprehensive Disaster/Emergency Response Plan and Exercise	3.6																
Continuity Planning	3.6									X	X				X		
Coordinate with Red Cross Shelter	1.2																

SECTION FIVE: MITIGATION STRATEGY

Mitigation Alternatives	Goal / Obj.	Webster County	Blue Hill	Cowles	Guide Rock	Red Cloud	South Heartland District Health Dent	Adams Central Schools	Beatrice Public Schools	Exeter Milligan Schools	Fillmore Central Schools	Meridian Public Schools	South Central United District	Superior Public Schools	Tri-County Public Schools	Southeast Community College	Barneston Fire District	
		Webster County						Special Jurisdictions										
Create/Update Community Wide Master Plan to Prioritize all Flood Related Projects	4.2																	
Dam/Levee/Floodwall Construction and Improvements	3.2					X												
Develop a Drought Management Plan	3.6																	
Develop an Agricultural Disease Response Action Plan	3.6																	
Develop Stream Buffer Ordinance	3.1																	
DeWitt Flood Mitigation Project	3.2																	
Elevate Pad Mounted Transformers and Switch Gear	3.2																	
Emergency Communication	1.4						X						X	X	X			
Emergency Equipment Purchase and/or Upgrades	2.2												X					X
Emergency Exercise: Dam Failure	3.3																	
Emergency Exercise: Hazardous Spill	3.3																	
Emergency Fuel Supply Plan	3.6																	
Emergency Operations	1.4																	
Emergency Water Main Shutoff Valves	3.2																	
Evacuation Planning	3.6																	
Facilities for Vulnerable Populations	1.2																	
Fire Station Improvements	2.2																	

Mitigation Alternatives	Goal / Obj.	Webster County	Blue Hill	Cowles	Guide Rock	Red Cloud	South Heartland District Health Dent	Adams Central Schools	Beatrice Public Schools	Exeter Milligan Schools	Fillmore Central Schools	Meridian Public Schools	South Central United District	Superior Public Schools	Tri-County Public Schools	Southeast Community College	Barneston Fire District
		Webster County						Special Jurisdictions									
Firewise Community	4.2																
First Aid Training	1.5														X		
Flood Mitigation Study and/or Parcel Level Flood Mitigation Plan	3.3																
Floodplain Early Alert System	1.4																
Floodplain Management	3.1																
Floodplain Mapping/Remapping	3.6																
Floodplain Ordinance Update	3.1																
Grade Control Structures	3.2																
Grass/Wildfire Training	3.3																
Green Infrastructure	2.3																
Hazardous Material Cleanup and Relocation	3.4																
Hazardous Tree Removal	3.4	X				X								X	X		
Hazmat Training	1.5																
Higher Building Codes and Standards	3.1															X	
Improve and Revise Snow/Ice Removal Program or Resources	3.4															X	
Improve or Acquire Property at High Risk to Flooding	3.2																
Improve Water Supply Resources	3.3																
Infrastructure Protection	2.2														X		
Install Vehicular Barriers	2.2												X		X		

SECTION FIVE: MITIGATION STRATEGY

Mitigation Alternatives	Goal / Obj.	Webster County	Blue Hill	Cowles	Guide Rock	Red Cloud	South Heartland District Health Dent	Adams Central Schools	Beatrice Public Schools	Exeter Milligan Schools	Fillmore Central Schools	Meridian Public Schools	South Central United District	Superior Public Schools	Tri-County Public Schools	Southeast Community College	Barneston Fire District
		Webster County						Special Jurisdictions									
Interior Ditches and Culvert Improvements	3.2				X												
Map/Relocate Critical Infrastructure	3.2		X						X								
Medical Chair Lift	2.2						X										
Mutual Aid	4.1		X														
Native Species Integration	3.3																
Pandemic Response Plan	3.6																
Pond Filling	3.2																
Protect and Improve Roads and Bridges	3.4					X				X							
Provide Backup Power Systems and Redundancies	2.2		X			X											
Public Education and Outreach	1.5			X											X	X	
Railroad Transportation Corridor Improvements	3.4																
Rebuild 306 Transmission Line and Loop	2.1																
Remove Flow Constrictions	3.5																
Safe Room/Storm Shelters	1.2					X	X		X		X	X	X		X	X	
Shelter in Place Training	1.5																
Shelter Supplies	1.2																
Static Detectors	2.1																

Mitigation Alternatives	Goal / Obj.	Webster County	Blue Hill	Cowles	Guide Rock	Red Cloud	South Heartland District Health Dent	Adams Central Schools	Beatrice Public Schools	Exeter Milligan Schools	Fillmore Central Schools	Meridian Public Schools	South Central United District	Superior Public Schools	Tri-County Public Schools	Southeast Community College	Barneston Fire District
		Webster County						Special Jurisdictions									
Storm Shelter Identification	1.2																
Stormwater System and Drainage Improvements	3.2																
Stream and Channel Renovations	3.5																
Surge Protectors	2.1																
Tornado Safety Program	1.5																
Train Derailment Response Training	3.6																
Tree Care Ordinance	3.1																
Tree City USA	3.4																
Tree Inventory and Planting Guidance	3.4																
Update Master Plan	3.1																
Urban Fire Prevention Program: Planning and Training	1.5				X												
Vehicular Shed	2.2													X			
Vulnerable Populations Database	4.4																
Wastewater System Improvements	3.2																
Water Conservation Awareness Program	1.5																
Water Meters	2.3																
Water System Improvements	2.2					X											
Water Tower Improvement	2.2																
Weather Radios	4.3												X		X		

SECTION FIVE: MITIGATION STRATEGY

Mitigation Alternatives	Goal / Obj.	Webster County	Blue Hill	Cowles	Guide Rock	Red Cloud	South Heartland District Health Dept	Adams Central Schools	Beatrice Public Schools	Exeter Milligan Schools	Fillmore Central Schools	Meridian Public Schools	South Central United District	Superior Public Schools	Tri-County Public Schools	Southeast Community College	Barneston Fire District	
		Webster County						Special Jurisdictions										
Well System Improvements	2.2																	
Wind Break Study	2.3																	
Zoning Ordinance Updates	3.1																	

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SECTION SIX

PLAN IMPLEMENTATION AND MAINTENANCE

Introduction

Participants of the Little Blue NRD and Lower Big Blue NRD HMP will be responsible for monitoring, evaluating, and updating the plan during its five-year lifespan. Hazard mitigation projects will be prioritized by each participant's governing body with support and suggestions from the public, business owners, and stakeholders. Unless otherwise specified by each participant's governing body and/or lead agencies identified in the mitigation action, the participant's governing body will be responsible for implementation of the recommended projects. The lead agency (or appropriate department/staff) identified on each mitigation action will report on the status of projects and include which implementation processes worked well, any difficulties encountered, how coordination efforts are proceeding, and which strategies could be revised.

Requirement §201.6(c)(4)(i): [The plan maintenance process shall include a] section describing the method and schedule of monitoring, evaluating, and updating the mitigation plan within a five year cycle.

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

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

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

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

- Do the goals and objectives address current and expected conditions?
- If any of the recommended projects have been completed, did they have the desired impact on the goal for which they were identified? If not, what was the reason it was not successful (lack of funds/resources, lack of political/popular support, underestimation of the amount of time needed, etc.)?
- Have either the nature, magnitude, and/or type of risks changed?

- Are there implementation problems?
- Are current resources appropriate to implement the plan?
- Were the outcomes as expected?
- Did the plan partners participate as originally planned?
- Are there other agencies which should be included in the revision process?

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

Continued Public Involvement

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

- Public spaces around the jurisdiction
- City/Village Halls
- 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 Little Blue NRD and Lower Big Blue NRD will compile lists 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*¹⁰⁷ guidance, as well as FEMA's *2015 Plan Integration*¹⁰⁸ guide, each community engaged in a plan integration discussion. This discussion was facilitated by a Plan Integration Worksheet. This document offered an easy way for participants to identify and explore planning mechanisms which amplify and interface with the HMP.

¹⁰⁷ Federal Emergency Management Agency. November 2013. "FEMA Region X Integrating the Local Natural Hazard Mitigation Plan into a Community's Comprehensive Plan." https://www.fema.gov/media-library-data/20130726-1908-25045-0016/integrating_hazmit.pdf.

¹⁰⁸ Federal Emergency Management Agency. July 2015. "Plan Integration: Linking Local Planning Efforts." https://www.fema.gov/media-librarydata/1440522008134-ddb097cc285bf741986b48fdcef31c6e/R3_Plan_Integration_0812_508.pdf.

SECTION SEVEN

COMMUNITY PROFILES

Purpose of Community Profiles

Community Profiles contain information specific to jurisdictions participating in the Little Blue NRD and Lower Big Blue NRD HMP planning effort. Community Profiles were developed with the intention of highlighting each jurisdiction's unique characteristics that affect its risk to hazards. Community Profiles 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. Community Profiles may include the following elements:

- Local Planning Team members
- 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
- Plan Maintenance
- Mitigation Actions

In addition, maps specific to each jurisdiction are included such as: jurisdictional boundary; identified critical facilities; dam or levee locations; flood prone areas; and a future land use map (when available). The hazard prioritization information, as provided by individual participants, in *Section Seven: Community Profiles* 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, occurrence and risk of each hazard type, and locally supplied information.

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. A discussion of certain hazards selected for each Community Profile were prioritized by the local planning team based on the identification of hazards of greatest concern, hazard history, and the jurisdiction's capabilities. The hazards not examined in depth can be found in *Section Four: Risk Assessment*.