

**Lower Platte North
Natural Resources District**

HAZARD MITIGATION PLAN

AUGUST 2020



PLAN PREPARED BY
JEO CONSULTING GROUP

HAZARD MITIGATION PLANNING TEAM

Table 1: LPNNRD HMP Planning Team

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Sean Elliot	Projects & Rural Water Manager	LPNNRD
County Emergency Managers		
Mark Doehling	Emergency Manager	Butler County
Tom Smith	Emergency Manager	Dodge County
Terry Miller	Emergency Manager	Saunders County
Communities		
Jean Andrews	Floodplain & Zoning Administrator	Dodge County
Scott Huppert	Highway Superintendent	Dodge County
Lottie Mitchell	Executive Assistant	City of Fremont
Jennifer Dam	Director of Planning	City of Fremont
Theresa Busse	City Clerk & Floodplain Administrator	City of North Bend
Daryl Holmberg	City Council	City of Schuyler
Lora Johnson	City Clerk & Floodplain Administrator	City of Schuyler
State Agencies		
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JEO Consulting Group		
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*Ellana Haakenstad	Planner	JEO Consulting Group

**served in an advisory/consultant role*

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Village of Bellwood
City of David City
Village of Dwight
Village of Garrison
Village of Linwood
Village of Octavia
Village of Surprise
Village of Ulysses

Dodge County Appendix

Dodge County
City of Fremont
Village of Inglewood
City of North Bend

Saunders County Appendix

Saunders County
Village of Cedar Bluffs
Village of Colon
Village of Ithaca
Village of Leshara
Village of Malmö
Village of Mead

Village of Memphis
Village of Morse Bluff
Village of Prague
City of Wahoo
Village of Weston
City of Yutan

Partial Counties Appendix

Village of Lindsay
City of Newman Grove
Village of Platte Center
Village of Richland
Village of Rogers
City of Schuyler

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Lower Platte North NRD
Ames Diking and Drainage District
Cedar Bluffs Fire Department
Cedar Bluffs Public Schools
Colon Fire Department
Cotterell Diking and Drainage District
David City Fire Department
David City Public Schools
Dwight Fire Department
East Central District Health Department
Lake Ventura SID #3
Linwood Fire Department
Mead Public Schools
North Bend Drainage District
North Bend Fire Department
Platte Township
Platte Valley Drainage District
Pohocco Township
Schuyler Fire Department
Weston Fire Department
Woodcliff Lakes SID #8
Yutan Fire Department

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LIST OF ACRONYMS

ACS – American Community Survey	NDOT – Nebraska Department of Transportation
BCA – Benefit Cost Analysis	NeDNR – Nebraska Department of Natural Resources
CFR – Code of Federal Regulations	NEMA – Nebraska Emergency Management Agency
CIKR – Critical Infrastructure and Key Resources	NFIP – National Flood Insurance Program
CRS – Community Rating System	NFS – Nebraska Forest Service
DFIRM – Digital Flood Insurance Rate Map	NIPP – National Infrastructure Protection Plan
DHS – Department of Homeland Security	NOAA – National Oceanic and Atmospheric Administration
DMA 2000 – Disaster Mitigation Act of 2000	NPDP – National Performance of Dam Program
EAB – Emerald Ash Borer	NPS – National Park Service
EAP – Emergency Action Plan	NRC – National Response Center
ELAP – Emergency Assistance for Livestock, Honeybees, and Farm-Raised Fish Program	NRD – Natural Resources District
EPA – Environmental Protection Agency	NSFHA – No Special Flood Hazard Area
EPZ – Emergency Planning Zone	NTAS – National Terrorism Advisory System
ESL – English as Second Language	NWS – National Weather Service
F&W – Fish and Wildlife	PDM – Pre-Disaster Mitigation Program
FBI – Federal Bureau of Investigations	PDSI – Palmer Drought Severity Index
FEMA – Federal Emergency Management Agency	PHMSA – U.S. Pipeline and Hazardous Material Safety Administration
FIRM – Flood Insurance Rate Map	P.L. – Public Law
FMA – Flood Mitigation Assistance Program	PSHA – Probabilistic Seismic Hazard Analysis
FR – FEMA’s Final Rule	RMA – Risk Management Agency
GIS – Geographic Information Systems	SBA – Small Business Administration
HMA – Hazard Mitigation Assistance	SFHA – Special Flood Hazard Area
HMGP – Hazard Mitigation Grant Program	SPIA – Sperry-Piltz Ice Accumulation Index
HMP – Hazard Mitigation Plan	SSA – Sector-Specific Agency
HRCC – High Plains Regional Climate Center	START – National Consortium for the Study of Terrorism and Responses to Terrorism
HSAS – Homeland Security Advisory System	SURE – Supplemental Revenue Assistance Payments
IP – Office of Infrastructure Protection	TAP – Tree Assistance Program
JEO – JEO Consulting Group, Inc.	TORRO – Tornado and Storm Research Organization
LEOP – Local Emergency Operations Plan	USACE – United States Army Corps of Engineering
LFD – Livestock Forage Disaster Assistance Program	USDA – United States Department of Agriculture
LGA – Liquid Gallon	USGS – United States Geological Survey
LIP – Livestock Indemnity Program	WUI – Wildland Urban Interface
LPNRD – Lower Platte North Natural Resources District	
MHSW – Mobile Home Single Wide	
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	

EXECUTIVE SUMMARY

INTRODUCTION

This plan is an update to the Lower Platte North Natural Resources District (LPNNRD) Hazard Mitigation Plan (HMP) approved on July 5, 2015. This 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 natural and human-caused hazards are evaluated; at-risk facilities and vulnerable people are assessed for threats and potential vulnerabilities; and strategies and mitigation measures are identified. Hazard mitigation planning increases the ability to effectively function in the face of natural and human-caused disasters. The goal of the process is to reduce risk and vulnerability of hazard events to people, property, and infrastructure.

Table 2: Participating Jurisdictions

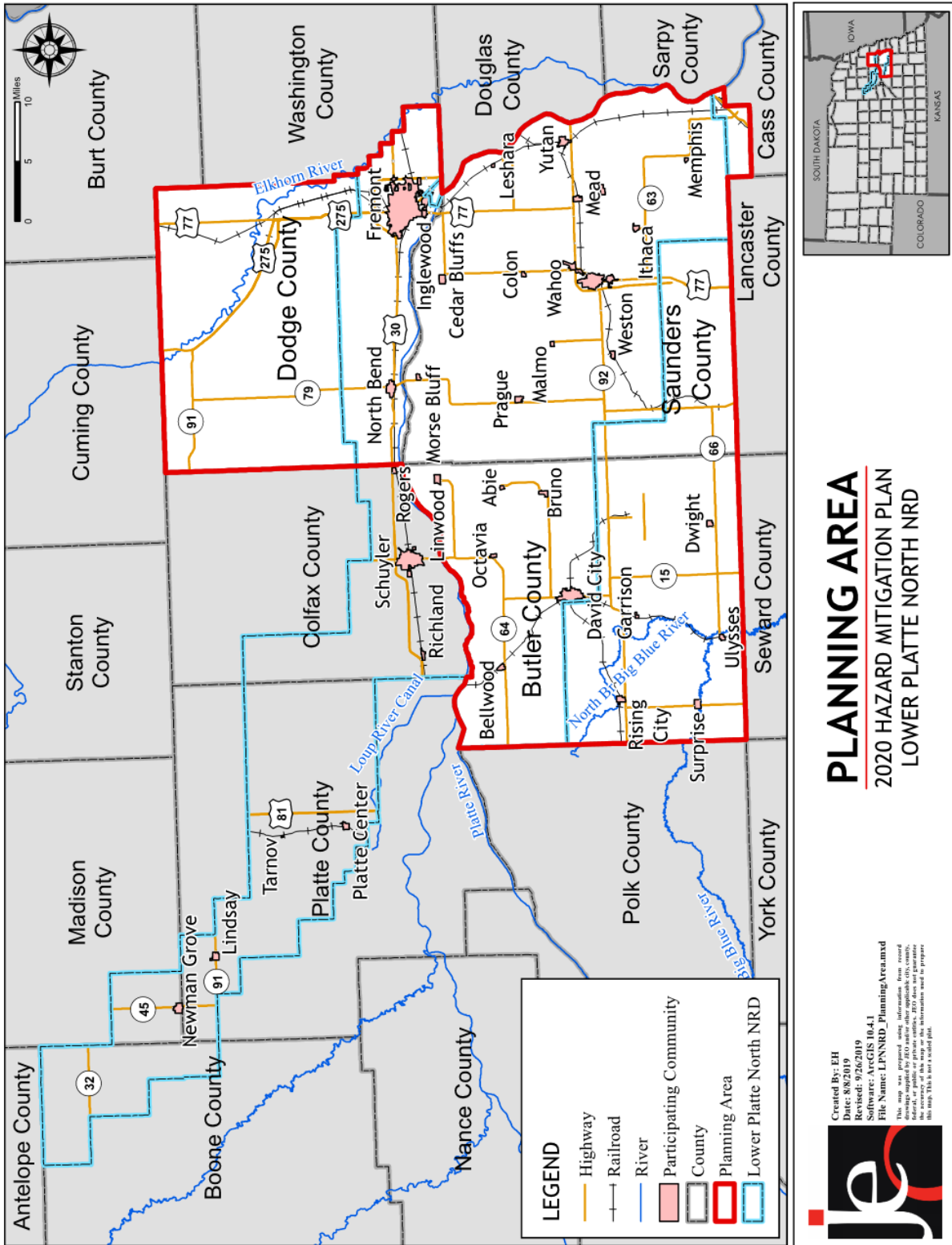
Participating Jurisdictions	
Lower Platte North Natural Resources District	
Butler County	
Village of Abie	Village of Garrison
Village of Bellwood	Village of Linwood*
City of David City	Linwood Volunteer Fire Department*
David City Volunteer Fire Department*	Village of Octavia
David City Public School District	Village of Surprise
Village of Dwight	Village of Ulysses
Dwight Volunteer Fire Department*	Platte Township
Dodge County	
Ames Diking and Drainage District*	Lake Ventura SID #3*
Cotterell Diking and Drainage District*	City of North Bend
City of Fremont	North Bend Volunteer Fire Department*
Village of Inglewood	North Bend Drainage District*
Saunders County	
Village of Cedar Bluffs	Village of Memphis
Cedar Bluffs Suburban Fire Protection District*	Village of Morse Bluff
Cedar Bluffs Public School District*	Platte Valley Drainage District*
Village of Colon	Pohocco Township*
Colon Volunteer Fire Department*	Village of Prague
Village of Ithaca	City of Wahoo
Village of Leshara	Village of Weston*
Village of Malmo	Weston Volunteer Fire & Rescue Department*
Village of Mead	City of Yutan
Mead Public School District	Yutan Volunteer Fire Department*
Woodcliff Lakes SID #8	
Other Jurisdictions	

Executive Summary

Participating Jurisdictions	
East Central District Health Department*	Village of Richland* (Colfax County)
Village of Lindsay (Platte County)	Village of Rogers (Colfax County)
City of Newman Grove (Madison County)	City of Schuyler (Colfax County)
Village of Platte Center (Platte County)	Schuyler Fire Department

**Denotes participants who did not participate in the region's 2015 HMP*

Figure 1: Map of Planning Area



GOALS AND OBJECTIVES

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

Goals from the previous HMP were reviewed by the Planning Team and determined to be relevant for this plan update. The goals identified in 2015 were carried forward and utilized for this 2020 plan update. The 2020 goals and objectives are as follows:

GOAL 1: PROTECT THE HEALTH AND SAFETY OF RESIDENTS

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

Objective 1.2: Improve real-time monitoring of hazards with stream gauges, weather stations, and other technology where data gaps are identified.

GOAL 2: REDUCE FUTURE LOSSES FROM HAZARD EVENTS

Objective 2.1: Provide protection for existing structures, future development, critical facilities, services, utilities, and trees.

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

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

GOAL 3: INCREASE PUBLIC AWARENESS AND EDUCATION REGARDING VULNERABILITY TO HAZARDS

Objective 3.1: Develop and provide information to the public and property owners about their risk and vulnerability to hazards

GOAL 4: IMPROVE EMERGENCY MANAGEMENT CAPABILITIES

Objective 4.1: Develop or update City and/or County Emergency Response Plan(s) and procedures, and increase the capability to respond

Objective 4.2: Develop or improve Evacuation Plans and procedures

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

GOAL 5: PURSUE MULTI-OBJECTIVE OPPORTUNITIES (WHENEVER POSSIBLE)

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

Objective 5.2: When possible, implement projects that achieve several goals

GOAL 6: ENHANCE OVERALL RESILIENCE AND PROMOTE SUSTAINABILITY

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

SUMMARY OF CHANGES

Several changes were made to the 2020 Lower Platte North Natural Resources District Hazard Mitigation Plan and planning process, including: specific flood recovery measures from the 2019 flood; greater efforts to reach out to and include stakeholder groups; increased participation from special districts like fire departments, diking and drainage districts, and school districts; an expanded risk assessment; and the inclusion of additional mitigation strategies. This update also works to unify the various planning mechanisms in place throughout the participating communities (i.e. comprehensive plans, local emergency operation plans, zoning ordinances, building codes, etc.) to ensure that the goals and objectives identified in those planning mechanisms are consistent with the strategies and projects included in this plan.

PLAN IMPLEMENTATION

Various communities across the planning area have implemented hazard mitigation projects following the 2015 LPNNRD Hazard Mitigation Plan. A few examples of completed projects include adding backup generators, constructing a new well, improving snow removal programs, removing hazardous trees, improving lagoons and lift stations, and assessing infrastructure.

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 LPNNRD work with a range of entities to complete projects; potential partners for future project implementation include but are not limited to Nebraska Forest Service (NFS), Nebraska Department of Transportation (NDOT), Nebraska Department of Natural Resources (NeDNR), Nebraska Emergency Management Agency (NEMA), and the United States Department of Agriculture (USDA).

HAZARD PROFILES

The hazard mitigation plan includes a description of the hazards considered and includes 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 a discussion of any locally felt impacts the local risk assessment. The following table provides an overview of the risk assessment for each hazard and the losses associated with each hazard.

Executive Summary

Table 3: Hazard Occurrences

Hazard		Previous Occurrence Events/Years	Approximate Annual Probability	Likely Extent/Event
Agricultural Disease	Animal Disease ¹	49/6	100%	3 animals
	Plant Disease ²	45/19	100%	Unavailable
Chemical Spills – Fixed Site ³		37/30	100%	0 – 2,000 gallons 25 – 20,000lbs
Chemical Spills – Transportation ⁴		27/49	55%	0 – 1,000 gallons 0 – 800lbs
Dam Failure ⁵		2/108	2%	Unavailable
Drought ⁶		412/1,492 months	28%	D2 (Severe Drought)
Extreme Heat ⁷		Avg 4 days/year	100%	≥100°F
Flooding ⁸	Flash Flood	52/24	100%	Some inundation of structures (<1% of structures) and roads near streams. Some evacuations of people may be necessary (<1% of population)
	Flood	98/24	100%	
Grass/Wildfires ⁹		784/9	100%	0 – 300 acres Some homes and structures threatened or at risk
Hail ⁸		461/24	100%	Avg 1.2” Range 0.75-4.0”
High Winds ⁸		60/24	100%	Avg 50 mph Range 35 – 60 EG
Levee Failure ^{10, 11}		8/120	7%	Unavailable
Severe Thunderstorms ⁸	Thunderstorm Wind	290/24	100%	2 – 5 in rain Avg 56 EG winds Range 50 – 100 EG
	Heavy Rain	7/24	30%	
	Lightning	6/24	26%	
Severe Winter Storms ⁸	Blizzard	27/24	100%	20° - 30° below zero 1 – 16 in snow 0.25 in ice 25 – 50 mph winds
	Extreme Cold/Wind Chill	13/24	57%	
	Heavy Snow	14/24	61%	
	Ice Storm	8/24	35%	
	Winter Storm	131/24	100%	
	Winter Weather	31/24	100%	
Terrorism & Civil Disorder ^{12, 13}		0/78	<0.01%	While there are no historic events in the region, a future event could be severe
Tornadoes ⁸		38/24	100%	Avg EF0 Range EF0 – EF2

N/A: Data not available

1 - NDA, 2014 - 2019

2 - USDA RMA, 2000 - 2018

3 - NRC, 1990 - February 2019

4 - PHSMA, 1971 - May 2019

5 - Stanford NPDP, 1911 - 2018

6 - NOAA, 1895 - April 2019

7 - NOAA Regional Climate Center, 1897 - May 2019

8 - NCEI, 1996 - February 2019

9 - NFS, 2010 - 2018

10 - USACE NLD, 1900 - 2019

11 - USACE, 2019

12 - University of Maryland, 1970 - 2017

13 - University of Illinois, 1940 - 2017

The following provides loss estimates for hazards with sufficient data. Descriptions of major events are included in *Section Seven: Community Profiles*.

Table 4: Hazard Loss History

Hazard Type		Count	Property Damage	Crop Damage
Agricultural Disease	Animal Disease ¹	49	2,966 animals	N/A
	Plant Disease ²	45	N/A	\$251,636
Chemical Spills - Fixed Site ³ 2 injuries		37	\$0	N/A
Chemical Spills – Transportation ⁴		27	\$79,774	N/A
Dam Failure ⁵		2	\$0	N/A
Drought ⁶		412/1,492 months	N/A	\$83,436,465
Extreme Heat ⁷ 1 fatality		Avg. 4 days/year	N/A	\$9,913,734
Flooding ⁸	Flash Flood	52	\$492,500	\$4,955,821
	Flood	98	\$4,518,000	
Grass/Wildfires ⁹ 3 injuries, 2 fatalities		784	4,506 acres	\$15,781
Hail ⁸		461	\$14,251,000	\$22,118,481
High Winds ⁸		60	\$5,000	\$3,628,608
Levee Failure ^{10, 11}		8	N/A	N/A
Severe Thunderstorms ⁸ 17 injuries	Thunderstorm Wind	290	\$850,000	N/A
	Heavy Rain	7	\$0	\$29,140,836
	Lightning	6	\$303,000	N/A
Severe Winter Storms ⁸ 1 fatality	Blizzard	27	\$0	\$1,195,961
	Extreme Cold/Wind Chill	13	\$0	
	Heavy Snow	14	\$3,000,000	
	Ice Storm	8	\$0	
	Winter Storm	131	\$0	
	Winter Weather	31	\$0	
Terrorism & Civil Disorder ^{12, 13}		0	\$0	N/A
Tornadoes ⁸		38	\$2,093,000	\$14,157
Totals		2,188	\$25,592,274	\$154,671,480

N/A: Data not available

1 - NDA, 2014 - 2019

2 - USDA RMA, 2000 - 2018

3 - NRC, 1990 - February 2019

4 - PHSMA, 1971 - May 2019

5 - Stanford NPDP, 1911 - 2018

6 - NOAA, 1895 - April 2019

7 - NOAA Regional Climate Center, 1897 - May 2019

8 - NCEI, 1996 - February 2019

9 - NFS, 2010 - 2018

10 - USACE NLD, 1900 - 2019

11 - USACE, 2019

12 - University of Maryland, 1970 - 2017

13 - University of Illinois, 1940 - 2017

Executive Summary

Events like agricultural disease, extreme heat, grass and wildfires, hail, severe thunderstorms, and severe winter storms will occur annually. Other hazards like drought, dam failure, earthquakes, and or civil disorder will occur less often. The scope of events and how they will manifest themselves locally is not known and cannot be fully predicted. regarding hazard occurrences. Historically, drought, hail, flooding, grass/wildfire, severe thunderstorms, and severe winter storms have resulted in the most significant damages within the planning area, are the most frequently occurring events in the planning area, have led to injuries or fatalities of residents or persons in the area, or are of top concern for the local planning teams. A high-level description of these hazards is provided below.

DROUGHT

Drought is a regular and reoccurring phenomenon in the planning area and the State of Nebraska. Historical data shows that droughts have occurred with regularity across the planning area and the state, with recent research indicating this trend will continue and potentially intensify. The most common impacts of drought affect the agricultural sector. Over \$83 million in total crop loss has been reported for the planning area since 1895, but drought equally impacts rangeland by reducing the total amount of cattle pastures can support.

Prolonged drought events can have a profound effect on the planning area and individual communities. Expected impacts from prolonged drought include, but are not limited to: economic losses in the agricultural sector; loss of employment in the agricultural sector; limited or strained water supplies for both residential and firefighting uses; and decrease in recreational opportunities.

FLOODING

Flooding is one of the most significant hazards seen across the planning area and can occur multiple times a year. Flash flooding, riverine flooding, and flooding as a result of ice jams are expected to be continual hazards for the planning area due to the proximity to the Platte River, Elkhorn River, Big Blue River/Wahoo Creek, and others. National Centers for Environmental Information (NCEI) data shows that flooding has occurred 150 times since 1996. These events have resulted in over \$5 million in estimated property damages, and another \$5 million in estimated crop losses.

Most recently, the March 2019 flood event heavily impacted communities and agricultural land along the Platte and Elkhorn Rivers. Many communities have identified new mitigation measures in this plan update and new special districts such diking and drainage districts have join the planning effort to be eligible to mitigation funding. Additionally Fremont and Schuyler conducted a flood risk reduction and parcel level flood risk assessments as a part of this plan update, and those reports can be found in Appendices F and G. Flood events have damaged across the planning area municipal infrastructure, businesses, and residential homes; forced residents to evacuate; damaged agricultural fields; and close and/or damage roadways and major transportation corridors.

GRASS/WILDFIRE

Grass/wildfire events can occur annually with magnitudes spanning between a few to millions of acres per event. Grass/wildfire events are closely tied to other hazard events, such as drought, flooding, or lightning in thunderstorms. Over 4,000 acres have burned due to grass/wildfire in the planning area since 2010, causing three injuries, two deaths, and damaging rangeland, homes, structures, or other jurisdictional assets. Impacts from widespread grass/wildfire events can include but are not limited to economic losses in the agricultural sector; damage to homes,

buildings, and infrastructure; destruction of crops; injuries or death to livestock; obstruction of transportation routes; loss of power; and loss of recreational opportunities.

HAIL

Hail occurs on an annual basis across the planning area, typically in conjunction with severe thunderstorms. Hail is one of the most frequently occurring hazards and impacts both the agricultural sector and physical properties. The National Centers for Environmental Information (NCEI) has recorded 461 hail events in 24 years. These events have caused over \$14 million dollars in property damages and \$22 million dollars in crop losses. Common impacts resulting from hail include, but are not limited to: damage to roofs, windows, and siding; damage to mechanical systems located outdoors including HVAC systems; damage to vehicles; destruction of crops; and cattle livestock injuries or death.

SEVERE THUNDERSTORMS

Thunderstorms differ from many other hazards in that they are generally large in magnitude, have a long duration, and travel across large areas and through multiple jurisdictions within a single region. Additionally, thunderstorms often occur in series, with one area potentially impacted multiple times in one day. Severe thunderstorms are most likely to occur between the months of May and August with the highest number of events occurring in June. The NCEI recorded a total of 303 severe thunderstorm events in 24 years. These events include thunderstorm wind, heavy rain, and lightning strikes. Severe thunderstorms caused \$1,153,000 in property damages. Typical impacts resulting from severe thunderstorms include but are not limited to: loss of power; obstruction of transportation routes; grass/wildfires starting from lightning strikes; localized flooding from heavy rains; and concurrent damages from hail and high winds.

Vulnerable populations who may be at greater risk to severe thunderstorm impacts include: residents of mobile homes (14% of housing units); citizens residents 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. Several jurisdictions have reported updating or joining weather alert programs (CodeRed/AlertSense/Reverse 911) or have discussed a need for updates to emergency warning sirens.

SEVERE WINTER STORMS

Severe winter storms are an annual occurrence for the planning area. Winter storms can bring extreme cold temperatures, freezing rain and ice, and heavy or drifting snow. Blizzards are particularly dangerous and can have significant impacts throughout the planning area. Severe winter storms typically occur between November and March. The NCEI reported 222 severe winter storm events in the last 24 years that caused over \$3 million dollars in property damages. Impacts resulting from severe winter storms include but are not limited to: hypothermia and frost bite; closure of transportation routes; downed power lines and power outages; collapsed roofs from heavy snow loads; closure of critical facilities; and injury or death to cattle. The most vulnerable citizens within the planning area are children, the elderly, individuals and families below the poverty line, and those new to the area. Residents in this planning area may also be more at risk to severe winter storms due to occupations which require them to be outside despite hazardous weather conditions.

MITIGATION STRATEGIES

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

SECTION ONE: INTRODUCTION

HAZARD MITIGATION PLANNING

Hazard events are inevitable, but mitigation reduces risk and is a socially and economically responsible action to lessen the impact of natural and human-caused hazard events.

Natural hazards, such as severe winter storms, tornadoes and high winds, severe thunderstorms, flooding, extreme heat, drought, and agriculture diseases (plant and animal) are part of the world around us. Their occurrence is natural and inevitable, and there is little that can be done to control their force and intensity. Human-caused hazards are a product of society and include levee failure, dam failure, chemical and radiological fixed site hazards, major transportation incidents, and terrorism. The Lower Platte North Natural Resources District (LPNNRD) is 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.

The LPNNRD prepared this multi-jurisdictional multi-hazard mitigation plan in an effort to reduce impacts from natural and human-caused hazards. This plan demonstrates the District's 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 communities and jurisdictions within the planning area eligible for Federal grant and cost-sharing opportunities to implement mitigation actions to address the following objectives:

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



DISASTER MITIGATION ACT OF 2000

The U.S. Congress passed the Disaster Mitigation Act 2000 (DMA) to amend the Robert T. Stafford Disaster Relief and Emergency Assistance Act. Section 322 of the DMA 2000 requires that state and local governments develop, adopt, and routinely update a hazard mitigation plan to remain eligible for pre- and post-disaster mitigation funding.¹ These funds are called Hazard Mitigation Assistance (HMA).

¹ Federal Emergency Management Agency. 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.

Section One: Introduction

This plan was developed in accordance with current state and federal rules and regulations governing local hazard mitigation plans. The plan shall be monitored and updated on a routine basis to maintain compliance with the legislation – Section 322, Mitigation Planning, of the Robert T. Stafford Disaster Relief and Emergency Assistance Act, as enacted by Section 104 of the DMA 2000 (P.L. 106-390)² and by FEMA’s Final Rule (FR)³ published in the Federal Register on November 30, 2007, at 44 Code of Federal Regulations (CFR) Part 201.

HAZARD MITIGATION ASSISTANCE

On June 1, 2009, FEMA initiated the Hazard Mitigation Assistance (HMA) program integration, which aligned the 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 reliance on federal disaster funds.⁴

Each HMA program was authorized by separate legislative actions, and as such, each program differs slightly in scope and intent. The Federal Emergency Management Agency (FEMA) administers these programs under the Department of Homeland Security (DHS).⁴

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

- FEMA Mitigation Directorate

- **HMGP⁵**: To qualify for post-disaster mitigation funds, local jurisdictions must have adopted a mitigation plan that is approved by FEMA. HMGP provides funds to states, territories, Indian tribal governments, local governments, and eligible private non-profits following a presidential disaster declaration. The DMA 2000 authorizes up to seven percent of HMGP funds available to a state after a disaster to be used for the development of state, tribal, and local mitigation plans.
- **FMA⁶**: To qualify to receive grant funds to implement projects such as acquisition or elevation of flood-prone homes, local jurisdictions must prepare a mitigation plan. Furthermore, local jurisdictions must be participating communities in the National Flood Insurance Program (NFIP). The goal of FMA is to reduce or eliminate claims under the NFIP.
- **PDM⁷**: To qualify for pre-disaster mitigation funds, local jurisdictions must adopt a mitigation plan that is approved by FEMA. PDM assists states, territories, Indian tribal governments, and local governments in implementing a sustained pre-disaster hazard mitigation program.

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

3 Federal Emergency Management Agency: Federal Register. 2007. "Mitigation Planning Final Rule." <https://www.fema.gov/media-library/assets/documents/23672>.

4 Federal Emergency Management Agency. 2018. "Hazard Mitigation Assistance." <https://www.fema.gov/hazard-mitigation-assistance>.

5 Federal Emergency Management Agency. "Hazard Mitigation Grant Program." 2017. <https://www.fema.gov/hazard-mitigation-grant-program>.

6 Federal Emergency Management Agency. 2017. "Flood Mitigation Assistance Grant Program." <https://www.fema.gov/flood-mitigation-assistance-grant-program>.

7 Federal Emergency Management Agency. 2017. "Pre-Disaster Mitigation Grant Program." <https://www.fema.gov/pre-disaster-mitigation-grant-program>.

PLAN FINANCING AND PREPARATION

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

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SECTION TWO: PLANNING PROCESS

INTRODUCTION

The process utilized to develop a hazard mitigation plan is often as important as the final planning document. For this planning process, LPNNRD adapted the four-step hazard mitigation planning process outlined by FEMA to fit their needs. The following pages outline the development of the Regional Planning Team; outreach to and development of local planning team meetings; scheduled project meetings and attendees; public outreach efforts including key stakeholders and neighboring jurisdictions; information relative to the risk assessment process; plan review and adoption; and ongoing plan maintenance.

Requirement §201.6(b): Planning process. An open public involvement process is essential to the development of an effective plan. In order to develop a more comprehensive approach to reducing the effects of natural disasters, the planning process shall include:

- (1) An opportunity for the public to comment on the plan during the drafting stage and prior to plan approval;
- (2) An opportunity for neighboring communities, local and regional agencies involved in hazard mitigation activities, and agencies that have the authority to regulate development, as well as businesses, academia and other private and non-profit interests to be involved in the planning process; and
- (3) Review and incorporation, if appropriate, of existing plans, studies, reports, and technical information.

Requirement §201.6(c)(1): The plan shall document the planning process used to develop the plan, including how it was prepared, who was involved in the process, and how the public was involved.

MULTI-JURISDICTIONAL APPROACH

According to FEMA, “A multi-jurisdictional hazard mitigation plan is a plan jointly prepared by more than one jurisdiction.” The term ‘jurisdiction’ means ‘local government’, defined by Title 44 Part 201, Mitigation Planning in the CFR as “any county, municipality, city, town, township, public authority, school district, special district, intrastate district, council of governments, regional or interstate government entity, or agency or instrumentality of a local government; any Indian tribe or authorized tribal organization, any rural community, unincorporated town or village, or other public entity.” For the purposes of this plan, a ‘taxing authority’ was utilized as the qualifier for jurisdictional participation. The LPNNRD utilized the multi-jurisdiction planning process through the cooperation of communities, counties, regional emergency management, and natural

Section Two: Planning Process

resource districts. FEMA recommends this multi-jurisdictional approach because:^{8, 9, 10}

- It provides a comprehensive approach to the mitigation of hazards that span 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.

HAZARD MITIGATION PLANNING PROCESS

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

Organization of Resources

- Focus on the resources needed for a successful mitigation planning process. Essential steps include: Organizing interested community members; and Identifying technical expertise needed.

Assessment of Risk

- Identify the characteristics and potential consequences of the hazard. Identify how much of the jurisdiction can be affected by specific hazards and the potential impacts on local assets.

Mitigation Plan Development

- Determine priorities and identify possible solutions to avoid or minimize the undesired effects. The result is the hazard mitigation plan and strategy for implementation.

Plan Implementation and Progress Monitoring

- Bring the plan to life by implementing specific mitigation projects and changing day-to-day operations. It is critical that the plan remains relevant to succeed. Thus, it is important to conduct periodic evaluations and revisions, as needed.

ORGANIZATION OF RESOURCES

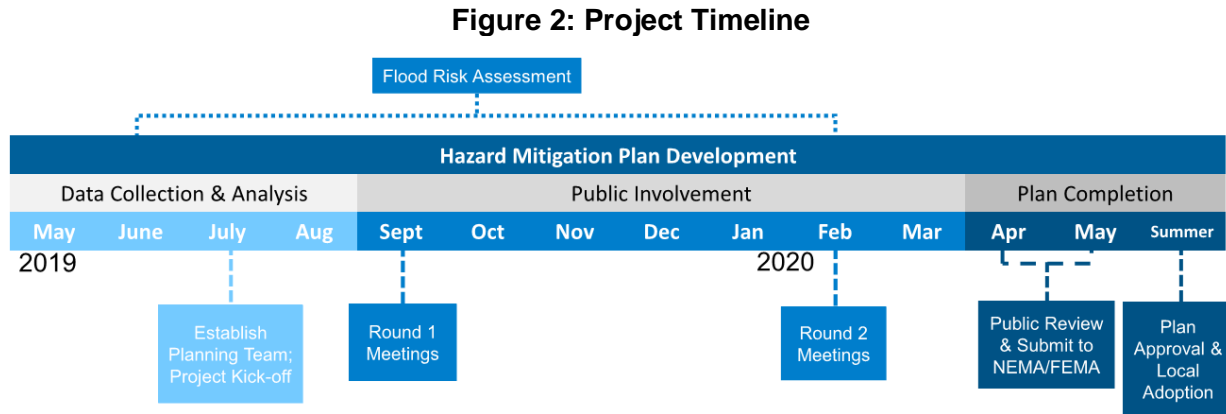
The LPNDRD secured funding for their multi-jurisdictional hazard mitigation plan (HMP) in July of 2018. JEO Consulting Group, INC. (JEO) was contracted in April 2019 to facilitate the planning process and compose the multi-jurisdictional hazard mitigation plan. Tom Mountford (Assistant Manager of LPNDRD) led the development of the plan and served as the primary point-of-contact throughout the project. A timeline of this plan update process is provided in Figure 2.

8 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.

9 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.

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

Figure 2



PLANNING TEAM

At the beginning of the planning process, the Planning Team, comprised of key regional representatives and the consultant, was established to guide the planning process and provide key information. A list of Planning Team members can be found in the following table. Additional technical support was provided to the planning team by staff from NEMA and the Nebraska Department of Natural Resources (NeDNR).

Table 5: Hazard Mitigation Planning Team

Name	Title	Jurisdiction
Lower Platte North Natural Resources Department		
Tom Mountford	Assistant Manager	LPNNRD
Sean Elliot	Projects & Rural Water Manager	LPNNRD
County Emergency Managers		
Tom Smith	Emergency Manager	Dodge County
Terry Miller	Emergency Manager	Saunders County
Communities		
Jean Andrews	Floodplain & Zoning Administrator	Dodge County
Scott Huppert	Highway Superintendent	Dodge County
Theresa Busse	City Clerk & Floodplain Administrator	City of North Bend
Daryl Holmber	City Council	City of Schuyler
Laura Johnson	City Clerk & Floodplain Administrator	City of Schuyler
JEO Consulting Group		
*Becky Appleford	Project Coordinator	JEO Consulting Group
*Karl Dietrich	Planner	JEO Consulting Group
*Mary Baker	Resiliency Strategist	JEO Consulting Group
*Ellana Haakenstad	Planner	JEO Consulting Group

*Served as a consultant or advisory role

A kick-off meeting was held on July 2, 2019, to discuss the planning process. The meeting provided an overview of the hazard mitigation plan update and the Planning Team’s roles and responsibilities. The Planning Team reviewed the goals and objectives used in the 2015 regional HMP and determined them to still be relevant for this plan update. Hazards identified within the

Section Two: Planning Process

2019 Nebraska State Hazard Mitigation Plan were evaluated at the regional level to determine which were to be profiled in the risk and vulnerability assessment. For a complete list of hazards reviewed, see Section Four: Risk Assessment. The planning team also discussed public outreach opportunities. Table 6 shows the Kick-off Meeting attendees.

Table 6: Kick-off Meeting Attendees

Name	Title	Jurisdiction
Lower Platte North Natural Resources Department		
Tom Mountford	Assistant Manager	LPNNRD
Sean Elliot	Projects & Rural Water Manager	LPNNRD
County Emergency Managers		
Tom Smith	Emergency Manager	Dodge County
Terry Miller	Emergency Manager	Saunders County
Communities		
Jean Andrews	Floodplain & Zoning Administrator	Dodge County
Scott Huppert	Highway Superintendent	Dodge County
Theresa Busse	City Clerk & Floodplain Administrator	City of North Bend
Daryl Holmber	City Council	City of Schuyler
Laura Johnson	City Clerk & Floodplain Administrator	City of Schuyler
JEO Consulting Group		
*Becky Appleford	Project Coordinator	JEO Consulting Group
*Mary Baker	Resiliency Strategist	JEO Consulting Group
*Ellana Haakenstad	Planner	JEO Consulting Group

Table 7 shows the date, location, and agenda items of the kick-off meeting.

Table 7: Meeting Location, Time, and Agenda Items

Location and Time	Agenda Items
Lower Platte North NRD 511 Commercial Park Rd Wahoo, NE July 2, 2019 10:00 am	<ul style="list-style-type: none"> - Overview of Hazard Mitigation Plan update - Roles and responsibilities of the Planning Team - Review plan goals and objectives - Regional hazard identification - Public involvement strategy

PUBLIC INVOLVEMENT AND OUTREACH

A wide range of stakeholder groups were contacted and encouraged to contribute to the planning process. There were 47 stakeholder groups identified and contacted to participate. These included three airports, nine assisted living facilities, one fire department, four hospitals, a Latinx resource center, 10 long term care facilities, 15 police and sheriff departments, a water management coalition, and three rural health clinics. Participating entities included: Fremont Fire Department, Leisure lake, Woodcliff Lakes SID, Cedar Bluffs Suburban Fire Protection District; Weston Volunteer Fire and Rescue Department; Yutan Volunteer Fire Department, and East Central District Health Department. These entities provided input which was incorporated into the appropriate community profiles (see Section Seven).

Table 8: Notified Stakeholder Groups

Organizations	
Fremont Municipal Airport	Saunders Medical Center
Wahoo Municipal Airport	South Haven Living Center
David City Municipal Airport	Schuyler Care & Rehabilitation Center
Edgewood Fremont Senior Living	Mid-Nebraska Lutheran Home
NYE Square	Boone County Sheriff
Pathfinder Place	Butler County Sheriff
Providence Place of Fremont	David City Police Department
Shalimar Gardens Assisted Living	Colfax County Sheriff
Shiloh Place Assisted Living	Schuyler Police Department
The Newman House	Fremont Police Department
Liberty House	Dodge County Sheriff
Saunders House	Dodge Police Department
Wahoo Fire & Rescue	Madison County Sheriff
Butler County Health Care Center	Newman Grove Police Department
Methodist Fremont Health	Platte County Sheriff
Saunders Medical Center	Saunders County Sheriff
CHI Health Schuyler	Cedar Bluffs Police Department
Comite Latino de Schuyler	Wahoo Police Department
David Place	Yutan Police Department
St Joseph's Villa and Court	Joint Water Management Advisory Board
Dunklau Gardens	Wittler Family Medicine
Nye Point & Legacy Health & Rehabilitation Center	Boone County Health Center
Premier Estates of Fremont	Saunders Medical Center
Birchwood Manor	

NEIGHBORING JURISDICTIONS

Neighboring jurisdictions were notified of the plan update with a project announcement letter. Letters were sent to county emergency managers and clerks. The following table indicates which entities were notified.

Table 9: Notified Neighboring Jurisdictions

Notified Nebraska Jurisdictions	
Antelope County	Madison County
Boone County	Platte County
Burt County	Polk County
Cass County	Sarpy County
Colfax County	Seward County
Cuming County	Washington County
Douglas County	York County
Lancaster County	

Section Two: Planning Process

PARTICIPANT INVOLVEMENT

Participants play a key role in identifying hazards; providing a record of historical disaster occurrences and localized impacts; identification and prioritization of potential mitigation projects and strategies; and the development of annual review procedures. To be a participant in the development of this plan update participants were required to:

- Participate in the planning process by either attending a public meeting or contacting the project representative for a one-on-one meeting
- Assist in data collection by completing and returning all worksheets
- Review drafts and provide revisions for jurisdictional profiles
- Pass a resolution adopting the approved hazard mitigation plan

Some jurisdictions sent multiple representatives to meetings – those who had only one representative were encouraged to take meeting materials back to their community for a diverse input on the meeting documents. Sign-in sheets listing attendance of all meetings can be found in Appendix A.

Outreach to eligible jurisdictions included an invitation letter and a reminder postcard prior to all public meetings, and reminder emails or phone calls to complete the worksheets after all public meetings. Table 10 provides a summary of the outreach activities utilized in this process.

Table 10: Outreach Activity Summary

Action	Intent
Project Website	Informed the public and local/planning team members of all activities (https://jeo.com/lpnr-d-hmp)
Project Announcement	Project announcement sent to potential participants and neighboring jurisdictions
Round 1 Invitation Letters and Postcard Reminders	Sent to participants and stakeholders to invite them to the first round of public meetings. Letters were sent 30 days prior to the meeting and postcards were sent one week prior to the meeting
Round 2 Invitation Letters and Postcard Reminders	Sent to participants and stakeholders to invite them to the second round of public meetings. Letters were sent 30 days prior to the meeting and postcards were sent one week prior to the meeting
Press Release	Sent to local newspapers to announce the plan and describe the purpose of the plan
Follow-up Emails and Phone Calls	Correspondence was provided to assist participating jurisdictions with the collection and submission of required local data
Project Flyer	Flyers were posted about the HMP and how to get involved at multiple locations throughout the region
Word-of-Mouth	The Planning Team discussed the plan with potential participants throughout the planning process

ASSESSMENT OF RISK

ROUND 1 MEETINGS: HAZARD IDENTIFICATION

At the Round 1 meetings, jurisdictional representatives (i.e. the local planning teams) reviewed the hazards identified by the Regional Planning Team for this HMP. Each jurisdiction identified hazards of top concern based on historical occurrences, damages and local impacts, and current capabilities and vulnerabilities. The local planning teams also reviewed and updated demographic, governance, housing, and capabilities from their 2015 HMP jurisdictional profile.

Local planning teams were asked to update their mitigation projects, critical facilities, and jurisdictional profiles from the 2015 plan. Local planning teams were encouraged to involve other community members and stakeholder groups to the planning process and provide any related plans, studies, and maps for plan integration. Table 11 shows the dates and locations of the Round 1 meetings.

Table 11: Round 1 Meeting Dates and Locations

Agenda Items	
Overview of hazard mitigation plan update, local hazard identification and risk assessment, review and update past mitigation actions, update critical facilities, review past jurisdictional profile, share with local community members, and provide relevant plans/studies/maps for plan integration.	
Location and Time	Date
LPNNRD Office, Wahoo, NE 7:00 pm	Thursday, September 19, 2019
David City Public Library, David City, NE 7:00 pm	Tuesday, September 24, 2019

Follow up one-on-one meetings were held for communities who did not have representatives present at public meetings. The following tables show the attendees for each jurisdiction that attended Round 1 public or one-on-one meetings.

Table 12: Public Round 1 Meeting Attendees

Name	Title	Jurisdiction
Wahoo, NE – Thursday, September 19, 2019		
June Moline	Clerk	Village of Mead
Michael E. Winterfeld	Clerk	SID #3 Lake Ventura
Ron Morrissey		Village of Yutan
Rob Benke	Fire Chief	Cedar Bluff
Jim Ondracek	Fire Chief Chairman	Colon Volunteer Fire Dept.
Bob Bartek		Village of Leshara
Jason Camenzind	Village Board	Village of Leshara
Mel Ruhe-Langfeldt	Chair	Village of Leshara
Harlan Ptomey	Superintendent	Cedar Bluffs Public Schools
Dave Langenfeld	Board of Trustees	SID #8
David Polacek	Village Clerk	Village of Abie
Terry Miller	Director	Saunders Co. EMA
Mitch Polacek	Zoning	Saunders Co.
Melissa Hanell	Administrator	City of Wahoo
Joseph Green	Recovery Planning Specialist	NEMA
Darlene Divis	Village Clerk	Village of Rogers
Janice Noyd	Village Trustee	Village of Rogers
Ron Drews	Platte River DD	Village of Yutan
Tom Mountford	Assistant General Manager	LPNNRD
Dave Schroeter	Utility Superintendent	City of Newman Grove
Cynthia Ourada	Village Clerk	Village of Colon
Dale Rawson	Superintendent of Schools	Village of Mead
Joe Zeleny	Utility Operator	Village of Morse Bluff
Matt Baker	Maintenance Super Water Operator	Village of Cedar Bluffs

Section Two: Planning Process

Name	Title	Jurisdiction
Theresa Busse	City Clerk	City of North Bend
Jean Andrews	Dodge Co. Zoning	City of Fremont
Victor Hanson	Chairman	Village of Ithaca
Bruce Arp	Chairman & Fire Chief	Village of Weston
Kyle Arp	EMS Captain	Wahoo Fire & Rescue
Tom Smith	Director	Dodge County
John Menning	Woodcliff HOA	Saunders Co.
Dennis Polacek	Chairman	Village of Abie
Waylon Fischer	Fire Chief	North Bend Fire
Don Kruger	Rural Board Secretary/Treasurer	North Bend Fire
Haley Stoker	Planning Specialist	NEMA
Don Treptow		Village of Ithaca
Grant Hansen	Board President	City of Ames
Doug Hass		Village of Ithaca
Mark Treptow		Village of Ithaca
Gary Swartz	Village Clerk & Floodplain Administrator	Village of Malmo
Becky Appleford	Project Manager	JEO Consulting Group
Ellana Haakenstad	Planner	JEO Consulting Group
Mary Baker	Resiliency Strategist	JEO Consulting Group
David City, NE – Tuesday, September 24, 2019		
Susan Doehling	Treasurer	Village of Surprise
Chad Denker	Superintendent	David City Public Schools
Michelle Evert	Clerk	Village of Richland
Ken Kurtenbach	Village Board Chair	Village of Lindsay
Josh Slonecker	Village Board Chairperson	Village of Linwood
Brad Sock	Schuyler Fire Department Chief	Village of Schuyler
Greg Janak	Floodplain	Butler County
Joe Birkel	NRD Board	LPNNRD
Jason Gatzemeyer	Emergency Manager	Cuming County
Kathy Eaton	Clerk	Village of Linwood
Jennie Zegers	Treasurer	Village of Octavia
Butch Beringe	Board Member	Village of Octavia
Sean Elliot	Projects/RW Manager	LPNNRD
Mark Doerling	Butler County EMA	Butler County
Terry Schoecher	Board Member	Village of Lindsay
Tami Comte	Deputy City Clerk	David City
Jim Mastny	Board Member & Fire Chief	Village of Dwight
Scott Romshek	Board Member	Village of Bellwood
Tyler Woodard	Public Health Emergency Coordinator	ECDHD
Becky Appleford	Project Manager	JEO
Ellana Haakenstad	Planner	JEO
Mary Baker	Resiliency Strategist	JEO
John Callen	Project Engineer	JEO

Table 13: One-on-One Round 1 Meeting Attendees

Name	Title	Jurisdiction
Lower Platte North Natural Resources Department		
Eric Gottschalk	General Manager	LPNNRD
Tom Mountford	Assistant Manager	LPNNRD
Sean Elliot	Projects & Rural Water Manager	LPNNRD
County Emergency Managers		
Eric Betzen	Emergency Manager	Butler County
Mark Arps	Emergency Manager	Colfax County
Tom Smith	Emergency Manager	Dodge County
Bob Missel	Board of Supervisors	Dodge County
Tim Hofbauer	Emergency Manager	Platte County
Terry Miller	Emergency Manager	Saunders County
Communities		
David Polacek	Village Clerk	Village of Abie
Angie Wellman	Village Clerk/Floodplain Administrator	Village of Bellwood
Paul Nickolite	Utilities Superintendent	Village of Bellwood
Kevin Heise	Board Chairperson/Floodplain Administrator	Village of Bruno
Mike Eason	President	Cotterell Diking and Drainage District
Jean Andrews	Floodplain & Zoning Administrator	Dodge County
Scott Huppert	Highway Superintendent	Dodge County
Brian Newton	City Administrator	City of Fremont
Don Simon	Floodplain Administrator/Chief Building Inspector	City of Fremont
Jennifer Dam	Director of Planning	City of Fremont
Lottie Mitchell	Executive Assistant	City of Fremont
Jim Daro	Village Clerk	Village of Garrison
Albert Nielsen	Board of Trustees Chairperson	Village of Inglewood
Jerry Abrahamson	Board of Trustees Vice Chairperson	Village of Inglewood
Barbara Shelton	Village Clerk	Village of Inglewood
John Nielsen	Board of Trustees	Village of Inglewood
Randy Wagner	Board Chairperson	Lake Ventura
Dave Gautier	Clerk	Village of Memphis
Theresa Busse	City Clerk & Floodplain Administrator	City of North Bend
Larry Ruzicka	President	North Bend Drainage District
Will Eaton	Chairperson	Platte Township
Kent Merryweather		Platte Valley Drainage District #2
Kelly Havlovic	Village Clerk	Village of Prague
George Borreson	Floodplain & Zoning Administrator	Saunders County
Daryl Holmber	City Council	City of Schuyler
Lora Johnson	City Clerk & Treasurer	City of Schuyler
Jim McGowan	Utilities Department	City of Schuyler
Jon Knutson	Mayor	City of Schuyler

Section Two: Planning Process

Name	Title	Jurisdiction
Brad Sock	Fire Chief	Schuyler Fire Department
Jeanine Wasser	Clerk/Floodplain Administrator	Village of Ulysses
David Schauer	Utility Superintendent	Village of Ulysses
Cole Bockelmann	City Administrator/Floodplain Administrator	City of Yutan
Eric Wilk	Utility Superintendent	City of Yutan
Donald Dooley	Fire Chief	Yutan Volunteer Fire Dept.
JEO Consulting Group		
*Becky Appleford	Project Coordinator	JEO Consulting Group
*Mary Baker	Resiliency Strategist	JEO Consulting Group
*Ellana Haakenstad	Planner	JEO Consulting Group

MITIGATION PLAN DEVELOPMENT

ROUND 2 MEETINGS: MITIGATION STRATEGIES

The identification and prioritization of mitigation measures is an essential component in developing effective hazard mitigation plans. At the Round 2 meetings, participating jurisdictions identified new mitigation actions to pursue alongside mitigation actions continued from the 2015 HMP and identified or provided copies of available jurisdiction-specific plans/studies in which the HMP may be integrated. Participating jurisdictions were also asked to review the information collected from the Round 1 meeting related to their community through this planning process for accuracy. Information/data reviewed included, but was not limited to: local hazard prioritization results; identified critical facilities and their location within the community; concentrations of populations identified as ‘highly vulnerable’; future development areas; and expected growth trends. As the last of the public meetings hosted during the plan update process, the remaining project schedule, public review information, and local adoption requirements were also discussed and shared with all jurisdictions. Meeting materials presented at Round 2 meetings can be found in Appendix B.

Table 14 shows the date and location of Round 2 meetings. Meeting attendees are identified in Table 15.

Table 14: Round 2 Meeting Dates and Locations

Agenda Items	
Identify new mitigation actions, review local data and community profile, complete plan integration tool, discuss review process and adoption requirements.	
Location and Time	Date
David City Public Library, David City, NE: 6:30 pm	Tuesday, February 11, 2020
Education Building, Wahoo, NE: 7:00 pm	Thursday, February 13, 2020

Table 15: Round 2 Meeting Attendees

Name	Title	Jurisdiction
David City, February 11, 2020		
Lower Platte North Natural Resources Department		
Sean Elliot	Projects/RW Manager	LPNNRD
Joe Birkel	Director Subdistrict 6	LPNNRD
Counties		
Mark Doehling	Emergency Manager	Butler County
Breann Whitmore	Floodplain Administrator	Butler County
Terry Miller	Emergency Manager	Saunders County
Tim Hofbauer	Emergency Manager	Platte County
Communities		
Dennis Polacek	Village Board Chairperson	Village of Abie
Dave Polacek	Village Clerk	Village of Abie
Jeremy Junck	Board Member	Village of Bellwood
Tami Comte	Deputy City Clerk	David City
Clayton Keller	City Administrator	David City
Jim Mastny	Village Board/Fire Chief	Village of Dwight
Jim Daro	Village Clerk	Village of Garrison
Marianne Zillhen	Board Member	Village of Garrison
Lottie Mitchell	Executive Assistant	City of Fremont
Don Simon	Floodplain Administrator/Chief Building Inspector	City of Fremont
Terry Schoecher	Village Board	Village of Lindsay
Ken Kurtenbach	Village Board Chairperson	Village of Lindsay
Kathy Eaton	Clerk/Floodplain Administrator	Village of Linwood
Jennie Zegers	Treasurer	Village of Octavia
Richard Kopecky	Village Board Chairperson	Village of Octavia
Susan Doehling	Treasurer	Village of Surprise
Marlene Wade	Village Board Chairperson	Village of Prague
Dave Schroeter	Utility Superintendent	City of Newman Grove
Darlene Divis	Village Clerk/Water Commissioner/Floodplain Administrator	Village of Rogers
Janice Noyd	Village Trustee	Village of Rogers
Chad Denker	Superintendent of Schools	David City Public Schools
Waylon Fischer	Fire Chief	North Bend Fire Dept.
Don Kruger	Rural Board Section	North Bend Fire Dept.
Joel Cerny	Fire Chief	Linwood Volunteer Fire Dept.
Joe Green	Recovery Planning Specialist	NEMA
JEO Consulting Group		
Becky Appleford	Project Coordinator	JEO Consulting Group
John Callen	Project Engineer	JEO Consulting Group
Karl Dietrich	Planner	JEO Consulting Group
Anthony Kohel	Intern Planner	JEO Consulting Group
Wahoo, February 13, 2020		

Section Two: Planning Process

Name	Title	Jurisdiction
Lower Platte North Natural Resources Department		
Tom Mountford	Assistant Manager	LPNNRD
Bill Saeger	Director Subdistrict 2	LPNNRD
Counties		
Tom Smith	Emergency Manager	Dodge County
Communities		
Ken Beebe	Secretary	Cotterell Diking and Drainage District
Jennifer Dam	Director of Planning	City of Fremont
Albert Nielsen	Board of Trustees Chairperson	Village of Inglewood
Jerry Abrahamson	Board of Trustees Vice Chairperson	Village of Inglewood
John Nielsen	Board of Trustees	Village of Inglewood
Rebecca Winterfeld	Committee Member	Lake Ventura
Mike Winterfeld	Clerk	Lake Ventura
Matt Baker	Utilities Superintendent	Cedar Bluffs Fire Dept.
Cynthia Ourada	Village Clerk	Village of Colon
Theresa Busse	City Clerk & Floodplain Administrator	City of North Bend
Jason Camenzind	Village Chairperson	Village of Leshara
Mel Ruhe-Langfeldt	Village Chairperson	Village of Leshara
Bruce Arp	Board Chairperson, Floodplain Administrator, and Fire Chief	Village of Weston
Kate Chrisman	College & Career Counselor	Cedar Bluffs Public Schools
Barbara Shelton	Clerk	Village of Inglewood
Victor Hanson	Chairman	Village of Ithaca
Jean Andrews	Zoning Administration	Dodge County
Grant Hansen	Ames Dike President	Ames Dike
JEO Consulting Group		
Becky Appleford	Project Coordinator	JEO Consulting Group
John Callen	Project Engineer	JEO Consulting Group
Karl Dietrich	Planner	JEO Consulting Group
Anthony Kohel	Intern Planner	JEO Consulting Group

Table 16: One-on-One Round 2 Meeting Attendees

Name	Title	Jurisdiction
Lower Platte North Natural Resources Department		
Tom Mountford	Assistant Manager	LPNNRD
Sean Elliott	Projects/Rural Water Manager	LPNNRD
Communities		
Cynthia Ourada	Village Clerk	Village of Colon
Don Simon	Floodplain Administrator/Chief Building Inspector	City of Fremont
Jennifer Dam	Director of Planning	City of Fremont
Lottie Mitchell	Executive Assistant	City of Fremont
Veronica Trujillo	City Engineer	City of Fremont
Gary Swartz	Village Clerk/Floodplain Administrator	Village of Malmo

Name	Title	Jurisdiction
Dr. Dale Rawson	Superintendent	Mead Public Schools
June Moline	Village Clerk/Floodplain Administrator	Village of Mead
Joe Zeleny	Utility Superintendent	Village of Morse Bluff
Ron Drews	Board Member	Platte Valley Drainage District #2
Chuck Emanuel	Board Member	North Bend Drainage District
Larry Ruzicka	President	North Bend Drainage District
Kent Merryweather		Platte Valley Drainage District #2
Jim Ondracek	Fire Chief/Township Chairman	Colon Fire District/Pohocco Township
Cheryl Brandifzn	Economic Development Director	City of Schuyler
Daryl Holmber	City Council	City of Schuyler
William De Roos	City Administrator	City of Schuyler
Jim McGowan	Utilities Department	City of Schuyler
Jon Knutson	Mayor	City of Schuyler
Jeanine Wasser	Clerk/Floodplain Administrator	Village of Ulysses
David Schauer	Utility Superintendent	Village of Ulysses
Donald Hayor	Village Board Member	Village of Ulysses
Dave Langenfeld	Board of Trustees	Woodcliff SID #8
John Menning	Woodcliff HOA	Woodcliff SID #8
Cole Bockelmann	City Administrator/Floodplain Administrator	City of Yutan
Donald Dooley	Fire Chief	Yutan Volunteer Fire Dept.
Melissa Harrell	City Administrator/Treasurer	City of Wahoo
Mark Borchers	Village Board Chairperson/Floodplain Administrator	Village of Platte Center
JEO Consulting Group		
*Becky Appleford	Project Coordinator	JEO Consulting Group
*Mary Baker	Resiliency Strategist	JEO Consulting Group
*Karl Dietrich	Planner	JEO Consulting Group

DATA SOURCES AND TECHNICAL RESOURCES

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

Section Two: Planning Process

Table 17: General Plans, Documents, and Information

Documents	
Disaster Mitigation Act of 2000 DMA https://www.fema.gov/media-library/assets/documents/4596?id=1935	Mitigation Ideas: A Resource for Reducing Risk to Natural Hazards (2013) https://www.fema.gov/media-library/assets/documents/30627
Final Rule (2007) https://www.fema.gov/media-library/assets/documents/23672	National Flood Insurance Program Community Status Book (2018) https://www.fema.gov/national-flood-insurance-program-community-status-book
Hazard Mitigation Assistance Unified Guidance (2013) https://www.fema.gov/media-library/assets/documents/103279	National Response Framework (2019) https://www.fema.gov/media-library/assets/documents/117791
Hazard Mitigation Assistance Guidance and Addendum (2015) https://www.fema.gov/media-library/assets/documents/103279	Robert T. Stafford Disaster Relief and Emergency Assistance Act (2019) https://www.fema.gov/media-library/assets/documents/15271
Local Mitigation Plan Review Guide (2011) https://www.fema.gov/media-library/assets/documents/23194	The Census of Agriculture (2017) https://www.nass.usda.gov/Publications/AgCensus/2017/Full_Report/Volume_1,_Chapter_1_State_Level/Nebraska/nev1.pdf
Local Mitigation Planning Handbook (2013) https://www.fema.gov/media-library/assets/documents/31598	What is a Benefit: Guidance on Benefit-Cost Analysis on Hazard Mitigation Projects http://www.fema.gov/benefit-cost-analysis
Mitigation Ideas: A Resource for Reducing Risk to Natural Hazards (2013) https://www.fema.gov/media-library/assets/documents/30627	
Plans and Studies	
Lower Platte North NRD Hazard Mitigation Plan (2015) https://jeo.com/sites/default/files/inline-files/LPN-NRD_HMP_Final.pdf	National Climate Assessment (2014) https://nca2014.globalchange.gov/
Flood Insurance Studies http://www.fema.gov/floodplain-management/flood-insurance-study	Nebraska Drought Mitigation and Response Plan (2000) https://drought.unl.edu/archive/plans/drought/state/NE_2000.pdf
Fourth National Climate Assessment (2018) https://nca2018.globalchange.gov/	State of Nebraska Hazard Mitigation Plan (2019) https://nema.nebraska.gov/sites/nema.nebraska.gov/files/doc/hazmitplan2019.pdf
Data Sources/Technical Resources	
Arbor Day Foundation – Tree City Designation https://www.arborday.org/	Nebraska Department of Natural Resource – Geographic Information Systems (GIS) https://dnr.nebraska.gov/data
Environmental Protection Agency – Chemical Storage Sites https://deq-iis.ne.gov/tier2/tier2Download.html	Nebraska Department of Natural Resources http://www.dnr.ne.gov
Federal Emergency Management Agency http://www.fema.gov	Nebraska Department of Natural Resources – Dam Inventory http://prodmaps2.ne.gov/html5DNR/?viewer=daminventory

Documents	
FEMA Flood Map Service Center https://msc.fema.gov/portal/advanceSearch	Nebraska Department of Transportation http://dot.nebraska.gov/
High Plains Regional Climate Center http://climod.unl.edu/	Nebraska Emergency Management Agency http://www.nema.ne.gov
National Agricultural Statistics Service http://www.nass.usda.gov/	Nebraska Forest Service – Wildland Fire Protection Program http://nfs.unl.edu/fire
National Centers for Environmental Information https://www.ncei.noaa.gov/	Nebraska Forest Service (NFS) http://www.nfs.unl.edu/
National Consortium for the Study of Terrorism and Responses to Terrorism (START) http://www.start.umd.edu/gtd/	Nebraska Public Power District Service http://nppd.com/
National Drought Mitigation Center – Drought Impact Reporter http://droughtreporter.unl.edu/map/	Nebraska State Historical Society http://www.nebraskahistory.org/histpres/index.shtml
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/	United States Army Corps of Engineers – National Dam Inventory https://nid.sec.usace.army.mil/ords/f?p=105:1:::...
National Flood Insurance Program https://www.fema.gov/national-flood-insurance-program	United States Army Corps of Engineers – National Levee Database https://levees.sec.usace.army.mil/#/
National Flood Insurance Program https://dnr.nebraska.gov/floodplain/flood-insurance	United States Census Bureau http://www.census.gov
National Historic Registry https://www.nps.gov/subjects/nationalregister/index.htm	United States Census Bureau https://factfinder.census.gov/faces/nav/jsf/pages/index.xhtml
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 Assessment Agency http://www.rma.usda.gov
Natural Resources Conservation Service www.ne.nrcs.usda.gov	United States Department of Agriculture – Web Soil Survey https://websoilsurvey.nrcs.usda.gov/app/WebSoilSurvey.aspx
Nebraska Association of Resources Districts http://www.nrdnet.org	United States Department of Commerce www.commerce.gov
Nebraska Climate Assessment Response Committee http://carc.agr.ne.gov	United States Department of Transportation – Pipeline and Hazardous Materials Safety Administration https://www.phmsa.dot.gov/
Nebraska Department of Education	United States Geological Survey

Section Two: Planning Process

Documents	
http://nep.education.ne.gov/	http://www.usgs.gov/
Nebraska Department of Education http://educdirsrc.education.ne.gov/	United States National Response Center www.nrc.uscg.mil
Nebraska Department of Environment and Energy http://www.deq.state.ne.us/	United States Small Business Administration http://www.sba.gov
Nebraska Department of Health and Human Services http://dhhs.ne.gov/Pages/default.aspx	UNL – College of Agricultural Sciences and Natural Resources – Schools of Natural Resources http://casnr.unl.edu
National Flood Insurance Program https://www.fema.gov/national-flood-insurance-program	Nebraska Department of Transportation http://dot.nebraska.gov/

PUBLIC REVIEW

Once the draft of the HMP was completed, a public review period was opened to allow participants and community members at large to review the plan and provide comments and changes. The public review period was open from April 6, 2020 through May 3, 2020. Participating jurisdictions were emailed and mailed a letter notifying them of this public review period. The HMP was also made available on the project website (<https://jeo.com/lpnnrd-hmp> or <https://lpnnrd.org/>) to download the document, and a notification was posted to the LPNNRD website. Received comments and suggested changes were incorporated into the plan.

PLAN ADOPTION

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

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

Once adopted, participants are responsible for implementing projects, tracking progress on objectives, and updating the plan every five years. Those who participated directly in the planning process would be logical champions for maintaining and updating the plan. Specifically, projects and capabilities should be reviewed and updated after major hazard events occur to accurately capture any changes or identified vulnerabilities, such as what occurred post-March 2019 flood season or during the COVID-19 pandemic.

PLAN IMPLEMENTATION AND PROGRESS MONITORING

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

SECTION THREE: PLANNING AREA PROFILE

INTRODUCTION

To identify jurisdictional vulnerabilities, it is vitally important to understand the people and built environment of the planning area. The following section is built to provide a description of the planning area's geography, population, and structural inventory.

PLANNING AREA GEOGRAPHIC SUMMARY

The Lower Platte North NRD includes portions of seven counties: Boone, Madison, Platte, Colfax, Dodge, Saunders, and Butler. Butler, Dodge, and Saunders Counties participated in this plan update and make up the majority of the planning area, spanning approximately 1,894 square miles. The majority of the planning area is characterized by rolling hills, cut through with bluffs and escarpments, plains, and valleys. Some communities included in this plan are located in the handle of LPNNRD, (outside of the three-county planning area), where the topography includes sections of dissected plains (Figure 3). There are four rivers in the planning area: Big Blue River, North Branch Big Blue River, Elkhorn River, and Platte River. The planning area is used primarily for row-crop production and some pasturing.

DEMOGRAPHICS AND AT-RISK POPULATIONS

Jurisdictional profiles (found in *Section Seven: Community Profiles*) will profile local demographics, transportation routes, and structural inventory. To avoid redundancy, this section will highlight only the demographic information of at-risk populations. The three-county planning area serves an estimated population of 47,411. Participating communities in the NRD Panhandle include the City of Newman Grove, Village of Lindsay, Village of Tarnov, Village of Platte Center, Village of Richland, Village of Rogers, and City of Schuyler. This population includes a range of demographics and persons at risk to natural and human-caused disasters.

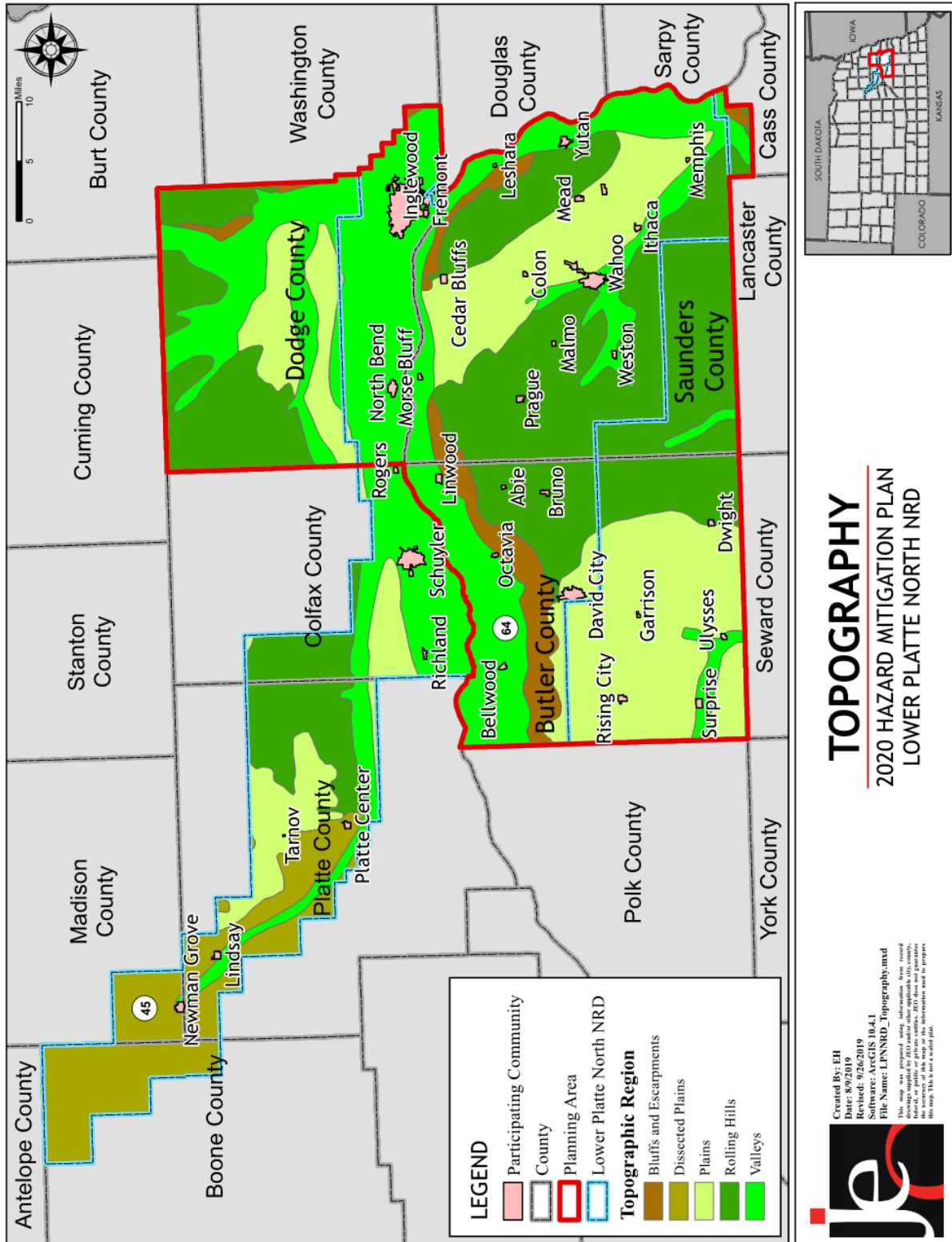
Table 18: Estimated Population for Planning Area

County	Population	Percent of Planning Area
Butler County	8,105	17.1%
Dodge County	10,616	22.4%
Saunders County	20,953	44.2%
Participating Communities in the NRD Panhandle	7,737	16.3%

Source: U.S. Census Bureau¹¹

11 U.S. Census Bureau. "American Fact Finder: DP05: ACS Demographic and Housing Estimates." [datafile]. <https://factfinder.census.gov/>.

Figure 3: Planning Area Topography



AT-RISK POPULATIONS

At-risk populations are most likely to be adversely affected during disaster and significant hazard events due to a lack in available resources for mitigation, preparation, response, and recovery efforts. These groups require additional resources and assistance during and post-disaster events. The most common indicators of vulnerability are age, poverty status, race, ethnicity, English proficiency, medical concerns, and disability. Many at-risk individuals will fall into multiple categories of vulnerability.

AGE

Dependent children under 19 years old are one of the most vulnerable populations to disasters. Many in this age group lack access to independent financial resources, transportation, or safe or reliable housing. They also lack the practical knowledge necessary to respond appropriately during a disaster. Despite this vulnerability, children are generally overlooked in disaster planning because the presence of a caretaker is assumed. With 24% of the planning area's population younger than 18, children are a key vulnerable group to address in the planning process.

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 school districts located within the planning area, and

Like minors, seniors (age 65 and greater) are often significantly impacted by disasters. The elderly is also a generally dependent population, reliant on caretakers and social services for transportation and financial resources. They may suffer from decreased mental (i.e. dementia) and physical (hearing and/or vision loss) ability, allowing them to miss or misinterpret emergency alert systems. They are likely to have decreased mobility and a reliance on medications that make evacuation difficult.

While the elderly lives throughout the planning area, it's likely they will be in higher concentrations at care facilities. Table 20 identifies the location and capacity of care facilities throughout the planning area. Approximately 19% of the population is 65 years or older.

Section Three: Planning Area Profile

Table 20: Inventory of Care Facilities

	Butler County	Dodge County	Saunders County
Hospitals	1	1	1
Hospital Beds	20	75	16
Assisted Living Facilities	1	6	1
Long-Term Care Facilities	26	249	129
Rural Health Clinics	1	2	2

Source: Nebraska Department of Health and Human Services

OTHER INDICATORS OF VULNERABILITY

Other indicators of vulnerability include ethnicity, English proficiency, socioeconomic status, disability, and race. Ethnic minorities, particularly undocumented immigrants, may not be eligible for many policies, resources, and grants that aid in disaster preparation and recovery due to their citizenship status. Language barriers limit educational opportunities on mitigation and can result in miscommunications of emergency messaging during hazard events. Residents below the poverty line are likely to lack resources to prepare for, respond to, or recover from hazard events. They will struggle to prioritize the implementation of mitigation measures over more immediate needs. Those below the poverty line are also more likely to live in substandard housing. Most post-disaster financial aid is tailored to homeowners, while this financial aid will be unavailable to renters and those in substandard housing. Residents with disabilities are often reliant on caretakers, family, and friends and have special needs to accommodate during a disaster. The following table shows the proportion of vulnerable populations in each county within the planning area.

Table 21: Vulnerable Populations

	Butler County	Dodge County	Saunders County
Hispanic	3.0%	11.8%	2.1%
Not Proficient in English	1.9%	6.5%	0.9%
Below the Federal Poverty Line	7.8%	13.2%	9.0%
Disabled	12.0%	13.5%	13.1%

Source: U.S. Census Bureau

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 19: School Inventory

School District	Total Enrollment (2017-2018)
Ashland-Greenwood Public Schools	909
Cedar Bluffs Public Schools	384
David City Public Schools	649
East Butler Public Schools	306
Fremont Public Schools	4,736
Logan View Public Schools	557
Mead Public Schools	243
North Bend Central Public Schools	635
Scribner-Snyder Community Schools	205
Wahoo Public Schools	1,066
Yutan Public Schools	466
Total	10,156

Source: Nebraska Department of Education¹²

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¹² Nebraska Department of Education. 2019. "Nebraska Education Profile." <https://nep.education.ne.gov/>.

Section Three: Planning Area Profile

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Rural Health Clinics	1	2	2

Source: Nebraska Department of Health and Human Services^{13,14,15,16}

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Disabled	12.0%	13.5%	13.1%

Source: U.S. Census Bureau^{17,18}

13 Department of Health and Human Services. 2019. "State of Nebraska Roster: Hospitals."

<http://dhhs.ne.gov/licensure/Documents/Hospital%20Roster.pdf#search=hospital%20roster>.

14 Department of Health and Human Services. 2019. "State of Nebraska: Assisted Living Facilities."

<http://dhhs.ne.gov/licensure/Documents/ALF%20Roster.pdf>.

15 Department of Health and Human Services. 2019. "State of Nebraska Roster: Long Term Care Facilities."

<http://dhhs.ne.gov/licensure/Documents/LTCRoster.pdf#search=long%20term%20care%20facilities%20roster>.

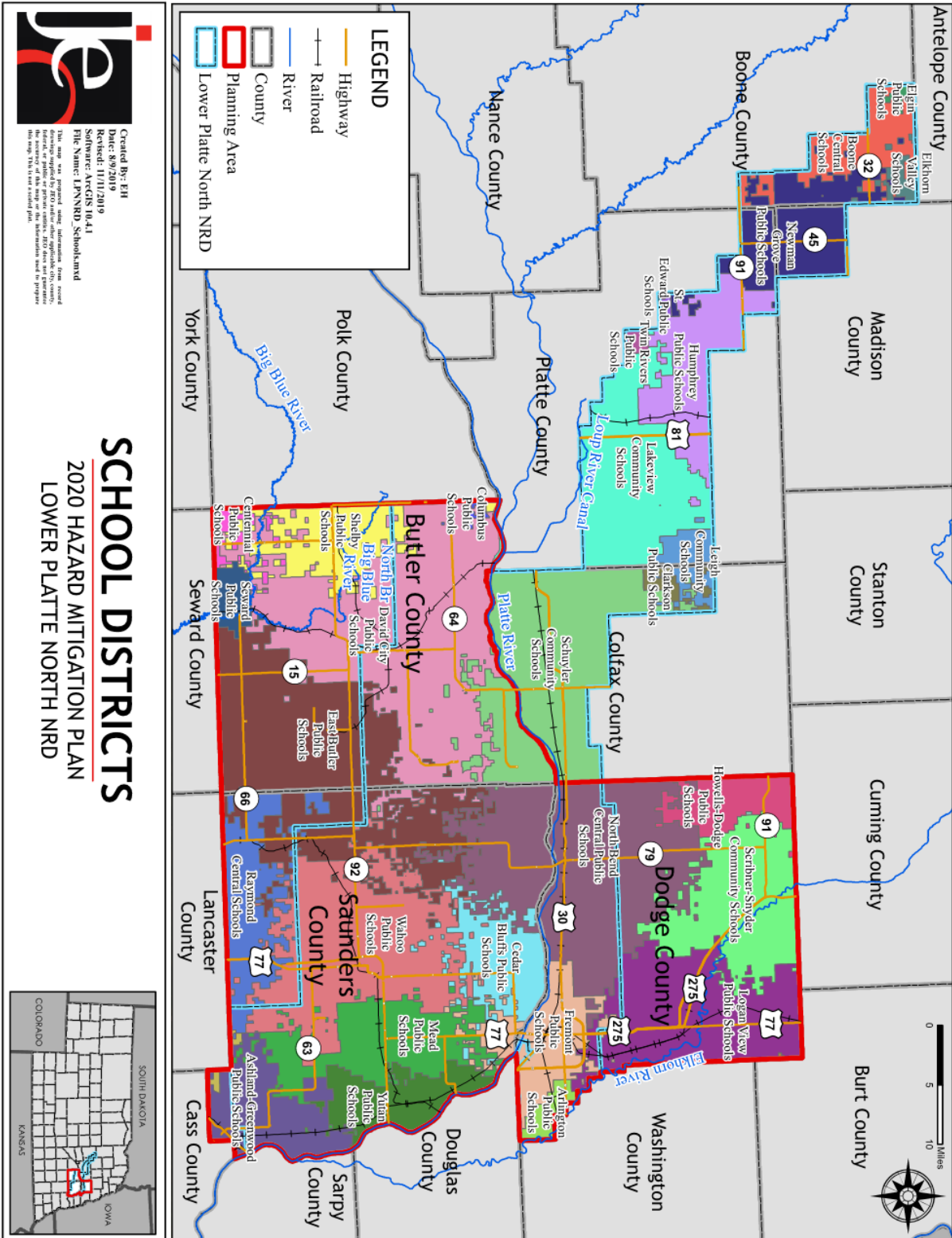
16 Department of Health and Human Services. 2019. "State of Nebraska Roster: Rural Health Clinic."

http://dhhs.ne.gov/licensure/Documents/RHC_Roster.pdf#search=hospital%20roster.

17 U.S. Census Bureau. "American Fact Finder: DP02: Selected Social Demographics." [datafile]. <https://factfinder.census.gov/>.

18 U.S. Census Bureau. "American Fact Finder: DP03: Selected Economic Characteristics." [datafile]. <https://factfinder.census.gov/>.

Figure 4: Regional School Districts



Section Three: Planning Area Profile

Racial minorities tend to have less access to financial and systemic resources that would enable them to implement hazard mitigation projects. A variety of factors can inhibit minorities in responding to and recovering from hazard events, including residences in standard housing or lack of financial stability. The following table shows the planning area's racial makeup.

Table 22: Racial Composition Trends

Race	Butler County	Dodge County	Saunders County
White	96.7%	94.2%	97.3%
American Indian or Alaska Native	0.2%	0.9%	0.2%
Black or African American	0.5%	1.0%	0.3%
Asian	0.5%	0.6%	0.3%
Native Hawaiian or Other Pacific Islander	0.0%	0.0%	0.2%

Source: U.S. Census Bureau¹⁹

BUILT ENVIRONMENT AND STRUCTURAL INVENTORY

Vulnerable populations tend to live in older, more vulnerable structures such as mobile homes, older or poorly maintained structures, structures located in the floodplain, or located near known hazard sites (i.e. chemical storage areas). (Refer to Section Seven: Jurisdictional Profiles for floodplain, chemical storage, and other hazard locations). Often this housing will have lower property values and any hazard mitigation projects or repairs may take a larger portion of the occupants' income than those populations in higher value homes. Mobile homes have a higher risk of sustaining damages during high wind events, tornadoes, severe thunderstorms, and severe winter storms. When not anchored or anchored incorrectly they can be overturned by 60 mph winds, (a thunderstorm is classified as severe when wind speeds exceed 58 mph).

Rental properties are less likely to receive hazard mitigation focused actions and projects, such as adequate storm shelters, and renters are less likely to prepare for disasters or to have access to post-disaster recovery aid. Additionally, phone access is an important component of emergency response, allowing for emergency communications through services like Reverse911. While the lack of a landline telephone service does not necessarily indicate that there is no phone in a housing unit, (as they are increasingly being replaced by cellular telephones) a small percentage of homes lack any access to telephone capabilities. Vehicle availability indicates a population's ability to evacuate during hazard events. Unoccupied housing poses little to no threat to populations during a disaster but are more likely to be damaged, significantly increasing the cost of recovery for counties and communities. Table 23 shows the prevalence of each structural inventory vulnerability by county.

Table 23: Selected Housing Characteristics

Selected Characteristics	Butler County	Dodge County	Saunders County
Mobile Homes	6.3%	5.0%	2.5%
Renter Occupied	20.1%	36.1%	20.9%
No Telephone Service Available	2.2%	3.8%	1.9%
No Vehicles Available	2.8%	5.2%	2.8%

¹⁹ U.S. Census Bureau. "American Fact Finder: DP05: ACS Demographic and Housing Estimates." [datafile]. <https://factfinder.census.gov/>.

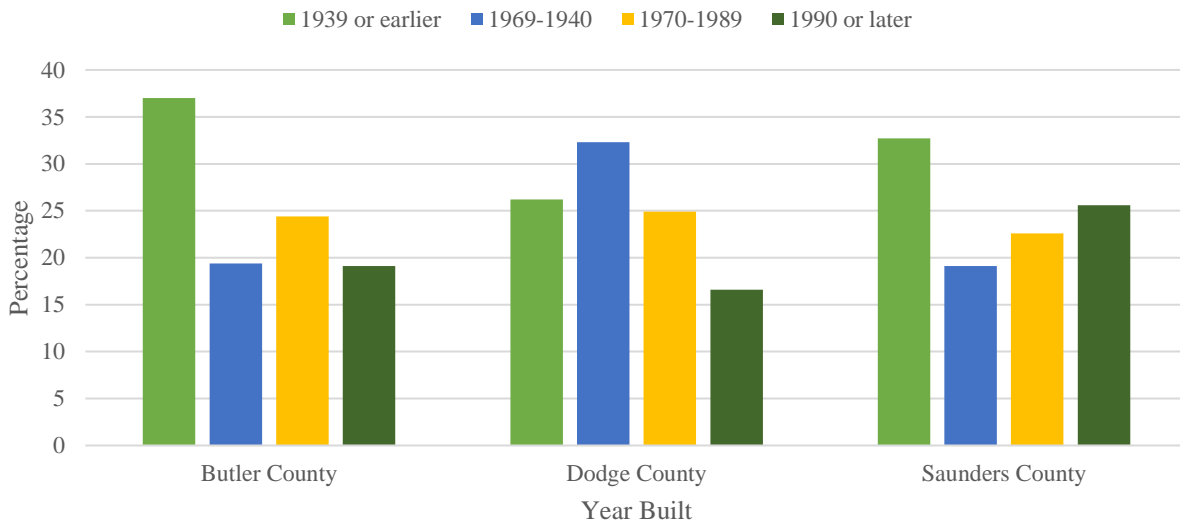
Selected Characteristics	Butler County	Dodge County	Saunders County
Vacant Housing Units	16.5%	9.6%	14.4%

Source: U.S. Census Bureau, 2018²⁰

*Indicated percentages are determined based on occupied housing units

The age of housing may indicate which housing units were built prior to the adoption of state building codes in 1987, making them vulnerable to the impacts of high winds, severe thunderstorms, severe winter storms, or tornadoes. Homes built within a flood hazard area before the adoption of their county’s Flood Rate Insurance Map (FIRM) are not likely to be built above the 1% annual chance floodplain (most FIRM’s in the state were approved in the 1970s). The majority of homes within the planning area were built prior to 1970 (55.5%); an additional 24.0% of homes were built between 1970 and 1989 (Figure 5).

Figure 5: Housing Age



Source: U.S. Census Bureau, 2018²¹

STATE AND FEDERALLY OWNED FACILITIES

The following table provides an inventory of state and federally-owned properties within the planning area by county. These are properties that are not under the jurisdiction of LPNNRD but are still a source of vulnerability in the region. Electrical substations and state maintenance buildings are critical for continuity of operations, while recreational areas may house a vulnerable population with no permanent shelter facilities in case of high wind, severe thunderstorm, or tornado events.

20 United States Census Bureau. “American Fact Finder: DP04: Selected Housing Characteristics.” [database file]. <https://factfinder.census.gov/>.

21 United States Census Bureau. “American Fact Finder: DP04: Selected Housing Characteristics.” [database file]. <https://factfinder.census.gov/>.

Section Three: Planning Area Profile

Table 24: State and Federally-Owned Facilities

Facility	Nearest Community
Butler County	
Timber Point Water Management Area	Village of Brainard
State Maintenance Building	David City
Nebraska Public Power District Substation	David City
Redtail Water Management Area	Village of Dwight
Nebraska Public Power District Substation	Village of Rising City
Oxbow Trail Reservoir Recreation Area	Village of Ulysses
Dodge County	
Nebraska Public Power District Substation	City of Fremont
Fremont Lakes State Recreation Area	City of Fremont
Nebraska Public Power District Substation	City of North Bend
Powder Horn Water Management Area	Village of Snyder
Dead Timber State Recreation Area	Village of Snyder
Saunders County	
Jack Sinn Memorial Water Management Area	Village of Ceresco
Memphis Lake State Recreation Area & Water Management Area	Village of Memphis
Bramble Wildlife Management Area	Village of Morse Bluff
Red Cedar Wildlife Management Area	Village of Valparaiso
Larkspur Water Management Area	Village of Valparaiso
Nebraska Public Power District Substation	City of Wahoo
Lake Wanhoo	City of Wahoo

Source: National Park Service²², NebraskaMAP: County Assessor GIS²³, Nebraska Parks & Recreation²⁴

HISTORICAL SITES

According to the National Register of Historic Places for Nebraska, maintained by the National Park Service (NPS), there are 55 historic sites located in the planning area. These are important cultural sites that should be protected from hazard events where possible.

Table 25: Historical Sites

Site Name	Date Listed	Nearest Community	County	Floodplain (Yes/No)
Butler County District No 10 School	12/7/2011	Village of Linwood	Butler	No
Barcal Site	3/24/1972	Village of Abie	Butler	No
Bellwood Archeological Site	8/13/1974	Village of Bellwood	Butler	No
Big Blue River Bridge	6/29/1992	Village of Surprise	Butler	No
Clear Creek Bridge	6/29/1992	Village of Bellwood	Butler	No
David City Park and Municipal Auditorium	11/15/2000	David City	Butler	No
Fremont, Elkhorn and Missouri Valley Railroad Depot	10/11/1979	Village of Dwight	Butler	No

22 National Park Service. 2019. "Nebraska." <https://www.nps.gov/state/ne/index.htm>

23 Nebraska Office of the CIO, Geographic Information Office. 2018. "NebraskaMAP: County Assessor GIS." <http://www.nebraskamap.gov/pages/county-assessor-gis>.

24 Nebraska Game & Parks Commission. 2019. "Public Access ATLAS." <https://maps.outdoornebraska.gov/PublicAccessAtlas/>.

Section Three: Planning Area Profile

Site Name	Date Listed	Nearest Community	County	Floodplain (Yes/No)
Linwood Site	3/16/1972	Village of Linwood	Butler	No
St. Mary of the Assumption Catholic Church, School and Grottoes	12/4/2008	Village of Dwight	Butler	No
Surprise Opera House	7/6/1988	Village of Surprise	Butler	No
Taylor, Chauncey S., House	6/25/1982	David City	Butler	No
Thorpe's Opera House	9/28/1988	David City	Butler	No
Upper Oak Creek Descent Ruts of the Woodbury Cutoff, Ox Bow Trail of the California Road	11/27/1992	Village of Brainard	Butler	No
Charles T Durkee House	8/10/2011	City of Fremont	Dodge	Yes
Barnard Park Historic District	7/12/1990	City of Fremont	Dodge	Yes
Bullock, Samuel, House	9/12/1985	City of Fremont	Dodge	Yes
Dodge County Courthouse	1/10/1990	City of Fremont	Dodge	Yes
Durkee, Charles T., House	8/10/2011	City of Fremont	Dodge	Yes
Fremont Historic Commercial District	2/17/1995	City of Fremont	Dodge	Yes
Fremont Municipal Auditorium	7/11/2002	City of Fremont	Dodge	Yes
Fremont Municipal Power Plant and Pumping Station	7/11/2002	City of Fremont	Dodge	Yes
Fremont Post Office, Old	2/29/1996	City of Fremont	Dodge	Yes
Harder Hotel	11/27/1989	City of Scribner	Dodge	No
Hooper Historic District	5/8/1980	Village of Hooper	Dodge	No
Knoell, Christopher, Farmstead	1/13/1983	City of Fremont	Dodge	Yes
Love-Larson Opera House	9/10/1974	City of Fremont	Dodge	Yes
McDonald, J. D., House	12/10/1980	City of Fremont	Dodge	Yes
North Bend Carnegie Library	9/3/1981	City of North Bend	Dodge	Yes
Nye House	11/23/1977	City of Fremont	Dodge	Yes
Osterman and Tremaine Building	5/23/1978	City of Fremont	Dodge	Yes
Scheider's Opera House	9/28/1988	Village of Snyder	Dodge	No
Schneider, R. B., House	7/15/1982	City of Fremont	Dodge	Yes
Scribner Town Hall	8/30/2010	City of Scribner	Dodge	No
Turner, George and Nancy, House	1/11/1996	City of Fremont	Dodge	Yes
Uehling, Frank, Barn	8/1/1985	Village of Uehling	Dodge	No
Ashland Archeological District	11/29/2000	City of Ashland	Saunders	No
Ashland Bridge	6/29/1992	City of Ashland	Saunders	No
Ashland Public Library	1/27/1983	City of Ashland	Saunders	No
Barnes Oil Company	12/5/2002	City of Ashland	Saunders	No
Israel Beetison House	4/18/1977	City of Ashland	Saunders	No
National Bank of Ashland	1/27/1983	City of Ashland	Saunders	No
St. Stephen's Episcopal Church	1/25/1979	City of Ashland	Saunders	No
Howard Hanson House	1/27/1983	City of Wahoo	Saunders	No
Ithaca Grain Elevator, Old	2/23/2001	Village of Ithaca	Saunders	No

Section Three: Planning Area Profile

Site Name	Date Listed	Nearest Community	County	Floodplain (Yes/No)
Kacirek-Woita General Store	7/8/2014	Village of Weston	Saunders	No
Kirchman, F.J., House	8/21/2003	City of Wahoo	Saunders	No
Leshara Site	3/16/1972	Village of Leshara	Saunders	No
McClellan Site	3/16/1972	Village of Inglewood	Saunders	No
O. K. Market	7/3/1991	City of Wahoo	Saunders	Yes
Pahuk	8/14/1973	Village of Cedar Bluffs	Saunders	No
Rad Plzen cis. 9 Z.C.B.J. (SD10-6)	3/20/1986	Village of Morse Bluff	Saunders	No
Saunders County Courthouse	1/10/1990	City of Wahoo	Saunders	No
Wahoo Burlington Depot	5/9/1985	City of Wahoo	Saunders	Yes
Woodcliff Burials	3/7/1973	Village of Inglewood	Saunders	No
Yutan Site	6/26/1972	City of Yutan	Saunders	No

Source: National Park Service²⁵

²⁵ National Park Service. 2019. "Spreadsheet of NRHP Listed properties." <https://www.nps.gov/subjects/nationalregister/data-downloads.htm>

SECTION FOUR: RISK ASSESSMENT

INTRODUCTION

The purpose of this hazard mitigation plan is to minimize the loss of life and property during hazard events. This section contains risk assessments for each hazard, including: a description of each hazards, regional vulnerabilities and exposures, probability of future occurrences, and potential impacts and losses. This regional risk assessment discusses all hazards identified by the Regional Planning Team across the three-county planning area. Individual participating jurisdictions identified specific hazards of top concern and related mitigation strategies which can be found in their respective Community Profile (Section Seven). The following table defines terms that will be used throughout Section Four.

Table 26: Term Definitions

Term	Definition
Hazard	A potential source of injury, death, or damage
Asset	People, structures, facilities, and systems that have value to the jurisdiction
Vulnerability	Susceptibility to injury, death, or damage from a specific hazard
Impact	The consequence or effect of a hazard on the jurisdiction
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 event to occur in the future
Risk	The potential for future hazards to cause damage, loss, or other impacts from the interaction of hazards and assets

METHODOLOGY

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

This plan will determine the risk of each hazard based on previous occurrences of the hazard, locations where the hazard has occurred in the past or is likely to occur in the future, extent of past events and likely extent for future occurrences, and probability of future occurrences. The 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). Each hazard will be profiled individually in hazard profiles.

Section Four: Risk Assessment

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.

HAZARD IDENTIFICATION

The identification of relevant hazards for LPNNRD began with a review of the 2019 State of Nebraska Hazard Mitigation Plan. The Planning Team reviewed the list of hazards addressed in the state plan and determined which hazards are applicable to the region. These hazards are included in the following table.

Table 27: Hazards Addressed in the Plan

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

HAZARD ELIMINATION

Given the location, history, and capabilities of the planning area, the hazards listed below were not addressed in this plan. An explanation of why each hazard was eliminated from the analysis is provided.

- **Communicable Disease:** The Regional Planning Team chose not to prioritize communicable disease as a hazard; it is adequately addressed by the state and local health departments' planning mechanisms. However, after the impacts of COVID-19 are understood, the Regional Planning Team should reassess communicable disease as a hazard of priority.
- **Earthquakes:** The Regional Planning Team indicated earthquakes are not a hazard of concern. The planning area has experienced one earthquake, a 3.3 on the Richter Scale and two more in neighboring counties. Neither earthquake exceeded 4.4 on the Richter Scale and none reported damages, injuries, or fatalities. This approach is consistent with the 2019 Nebraska HMP.
- **Expansive Soils:** There is no data available to examine historic impacts or project future impacts. Expansive soils in Nebraska are likely to be manifested as localized flooding and will be reported as such. This approach is consistent with the 2019 Nebraska HMP.
- **Landslides:** No landslides have occurred within the planning area and were deemed by the Regional Planning Team to be unlikely to occur in the future. Landslides in Nebraska are highly localized and have not exceeded local capabilities to respond. This approach is consistent with the 2019 Nebraska HMP.
- **Land Subsistence (Sinkholes):** Land subsistence is common only in areas of karst topography; there are no recognized areas of true karst topography in Nebraska. This approach is consistent with the 2019 Nebraska HMP.
- **Power Failure:** Local power utilities across the state have extensive regulations and recovery plans to address power failure. Power failure vulnerabilities and occurrences are included, as appropriate, in hazard profiles. This approach is consistent with the 2019 Nebraska HMP.
- **Radiological Fixed Facilities:** Both state and local agencies have developed appropriate and extensive plans and protocols for the two nuclear facilities located in Nebraska. Due to the extensive planning and regulations already related to this threat it will not be further profiled in this plan. This approach is consistent with the 2019 Nebraska HMP.
- **Radiological Transportation:** There have been no incidents reported in the State that have required assistance beyond what is considered regular roadside services. Further, the transportation of radiological materials is heavily regulated and monitored. Other plans have thoroughly addressed radiological transportation. This approach is consistent with the 2019 Nebraska HMP.
- **Transportation Incidents:** Descriptions of major transportation routes and significant accident events are included in the regional and jurisdictional profiles so they will not be addressed in a hazard profile.
- **Urban Fire:** Fire departments across the planning area have existing plans, resources, and mutual aid agreements that adequately address urban fire. Discussion relative to fire will be focused on wildfire and the potential impacts they could have on the built environment. This approach is consistent with the 2019 Nebraska State Hazard Mitigation Plan.

AVERAGE ANNUAL DAMAGE AND FREQUENCY

FEMA Requirement §201.6(c)(2)(ii) (B) suggests that when appropriate data is available, hazard mitigation plans should provide an estimate of potential dollar losses for structures in vulnerable areas. This data will be included in each hazard profile as average annual losses. These losses can be calculated for hazards that have a robust historic record that includes damage estimates. Additional loss estimates are provided when data is available. Average annual losses are calculated as follows:

Section Four: Risk Assessment

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

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

DATA LIMITATIONS

The data available to calculate annual frequency and annual damages have some limitations:

- **Total Events Recorded:** The total events recorded will show all reported hazard events. If the historical data is missing any events, the true annual frequency will be higher than what is reported here. Similarly, if any events are recorded more than once, the true annual frequency will be lower than what is reported here. The data has been cleaned to remove duplicate reports where possible and feasible.
- **Total Years of Record:** This is the time frame of the available data. Each historical record will have a different time frame or period of record, making it impossible to accurately compare total number of events and total number of losses between hazards. Instead we compare average annual totals.
- **Total Damages in Dollars:** This is the total dollar amount of all property and crop damage. These data are usually estimates that will be missing damages not reported to officials, so the actual total damages and annual damages will likely be higher than the values reported here.

Note that due to the unique shape of the LPNNRD, hazard event reports available only at a county or zonal level are only included for Butler, Dodge, and Saunders Counties. Zonal-based hazard events (such as high winds) are likely underreported in this HMP for participating jurisdictions outside of the three-county planning area. However, these events are recorded and reported in the appropriate local Hazard Mitigation Plan of each county in the LPNNRD panhandle.

HISTORICAL DISASTER DECLARATIONS

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

SMALL BUSINESS ADMINISTRATION DISASTER DECLARATIONS

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 to maintain and strengthen the overall economy of the U.S. One program of the SBA includes disaster assistance for those affected by major natural disasters. The following table summarizes the SBA Disasters Declarations issues for Butler, Dodge, and Saunders Counties in the last decade.

Table 28: SBA Disaster Declarations

Disaster Declaration Number	Declaration Date	Description	Primary Counties	Contiguous Counties
NE-00073	3/29/2019	Severe Winter Storm, Straight-line Winds, Flooding	Boone	Butler, Colfax, Dodge, Madison, Platte, Saunders

Disaster Declaration Number	Declaration Date	Description	Primary Counties	Contiguous Counties
NE-15200	6/29/2017	Severe Storms, Tornadoes, and Straight-line Winds	Saunders	
NE-15226	6/12/2017	Severe Storms, Tornadoes, and Straight-line Winds	Butler, Dodge, Saunders	
NE-00065	6/25/2015	Severe Storms, Tornadoes, Flooding	Saunders	Blaine, Logan
NE-00063	7/28/2014	Tornadoes, Flooding	Butler	
NE-00060	6/17/2014	Severe Storms, Tornadoes, Flooding	Saunders	
NE-00053	12/10/2013	Drought	Butler, Dodge, Saunders	
NE-00051	4/15/2013	Drought		Butler, Dodge, Saunders
NE-00050	4/8/2013	Drought	Butler, Dodge, Saunders	
NE-00049	4/1/2013	Drought		Butler
NE-00044	8/12/2011 8/25/2011	Severe Storms, Tornadoes, Flooding	Dodge	
NE-00041	9/7/2011 8/12/2011 11/18/2011	Flooding		Dodge, Saunders
NE-00038	7/15/2010 8/29/2010 9/1/2010	Severe Storms, Tornadoes, Flooding	Dodge, Saunders	
NE-00035	4/21/2010 6/10/2010	Severe Storms, Ice Jams, Flooding	Butler	
NE-00033	2/25/2010 3/26/2010	Severe Winter Storms, Snowstorm	Butler, Dodge, Saunders	
NE-00021	6/20/2008 6/24/2008 7/29/2008	Severe Storms, Tornadoes, Flooding	Butler, Saunders	
NE-00020	6/20/2008 6/24/2008 7/29/2008	Severe Storms, Tornadoes, Flooding	Butler, Saunders	Dodge
NE-00013	6/6/2007 7/6/2007	Severe Storms, Tornadoes, Flooding	Saunders	

Source: Small Business Administration, 2005-2019²⁶

²⁶ Small Business Administration. 2005-2019. "SBA Disaster Loan Data." <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 1966 to 2019 are summarized in the following table. Declarations prior to 1962 are not designated by county on the FEMA website and are not included below. The planning team did note a flood of historical significance in 1963 near Wahoo in Saunders County. The FEMA database listed a presidential disaster declaration in 1963 for heavy rains in the state but included no counties in that declaration.

Table 29: Presidential Disaster Declarations

Disaster Declaration Number	Declaration Date	Disaster Date	Disaster Type	Declared County/Area
4420	3/21/2019	3/9/2019	Severe Winter Storm, Straight-line Winds, and Flooding	Boone, Butler, Colfax, Dodge, Madison, Platte, Saunders
4387	8/27/2018	6/17/2018	Severe Storms, Tornadoes, Straight-line Winds, and Flooding	Colfax
4375	6/29/2018	4/13/2018	Severe Winter Storm and Straight-line Winds	Boone, Madison, Platte
4325	8/01/2017	6/12/2017	Severe Storms, Tornadoes, and Straight-line Winds	Butler, Dodge, Platte, Saunders
4225	6/25/2015	5/06/2015	Severe Storms, Tornadoes, Straight-line Winds, and Flooding	Saunders
4185	07/28/2014	6/1/2014 – 6/4/2014	Severe Storms, Tornadoes, Straight-line Winds, and Flooding	Butler
4179	06/17/2014	5/11/2014 – 5/12/2014	Severe Storms, Tornadoes, Straight-line Winds, and Flooding	Saunders
4014	8/12/2011	6/19/2011 - 6/21/2011	Severe Storms, Tornadoes, Straight-Line Winds, Flooding	Dodge
1945	10/21/2010	9/13/2010 - 9/14/2010	Severe Storms, Flooding, Tornadoes, Straight-Line Winds	Boone, Madison, Platte, Colfax, Butler, Dodge, Saunders
1924	7/15/2010	6/1/2010 - 8/29/2010	Severe Storms and Flooding	Boone, Madison, Platte, Colfax,

Disaster Declaration Number	Declaration Date	Disaster Date	Disaster Type	Declared County/Area
				Dodge, Saunders
1902	4/21/2010	3/6/2010 - 4/3/2010	Severe Storms, Ice Jams, and Flooding	Boone, Madison, Platte, Colfax, Butler
1878	2/25/2010	12/22/2009 - 1/8/2010	Severe Winter Storms and Snowstorm	Boone, Madison, Platte, Colfax, Butler, Dodge, Saunders
1779	7/18/2008	6/27/2008	Severe Storms, Straight-Line Winds, Flooding	Dodge, Saunders
1770	6/20/2008	5/22/2008 - 6/24/2008	Severe Storms, Tornadoes, Flooding	Platte, Colfax, Butler, Saunders
1714	7/24/2007	5/28/2007 - 6/2/2007	Severe Storms and Flooding	Madison
1706	6/6/2007	5/4/2007 - 5/19/2007	Severe Storms, Flooding, And Tornadoes	Saunders
1674	1/7/2007	12/19/2006 - 1/1/2007	Severe Winter Storms	Boone, Platte, Butler, Madison
1627	1/26/2006	11/27/2006 - 11/28/2006	Severe Winter Storm	Boone, Madison
3245	9/13/2005	8/29/2005 - 10/1/2005	Hurricane Katrina Evacuees	Boone, Madison, Platte, Colfax, Butler, Dodge, Saunders
1517	5/25/2004	5/20/2004	Severe Storms, Tornadoes, Flooding	Dodge, Butler, Saunders
1480	7/21/2003	6/9/2003 - 7/14/2003	Severe Storms and Tornadoes	Platte, Butler
1190	11/1/1997	10/24/1997- 10/26/1997	Severe Snowstorms, Rain, And Strong Winds	Butler, Dodge, Saunders
998	7/19/1993	6/23/1993 - 8/5/1993	Severe Storms and Flooding	Boone, Platte, Colfax, Butler, Dodge, Saunders
983	4/2/1993	3/7/1993 - 3/21/1993	Ice Jams and Flooding	Platte, Colfax, Butler, Dodge, Saunders

Section Four: Risk Assessment

Disaster Declaration Number	Declaration Date	Disaster Date	Disaster Type	Declared County/Area
908	5/28/1991	5/10/1991 - 6/15/1991	Severe Storms and Flooding	Madison, Colfax, Dodge
873	7/4/1990	6/10/1990 - 7/30/1990	Severe Storms, Tornadoes and Flooding	Boone, Madison, Platte, Colfax, Dodge
716	7/3/1984	6/11/1984 - 6/22/1984	Tornadoes and Flooding	Colfax, Dodge, Saunders
552	3/24/1978	3/24/1978	Storms, Ice Jams, Snowmelt and Flooding	Platte, Colfax, Dodge, Saunders
500	4/8/1976	4/8/1976	Ice Storms and High Winds	Madison, Platte, Butler, Saunders
406	10/20/1973	10/20/1973	Severe Storms and Flooding	Saunders
308	7/7/1971	7/7/1971	Floods	Madison
303	2/23/1971	2/23/1971	Floods	Boone, Madison, Platte, Colfax, Dodge, Saunders
228	7/18/1967	7/18/1967	Severe Storms and Flooding	Boone, Madison, Platte, Colfax, Butler, Dodge, Saunders
221	8/31/1966	8/31/1966	Heavy Rains and Flooding	Boone, Platte, Colfax

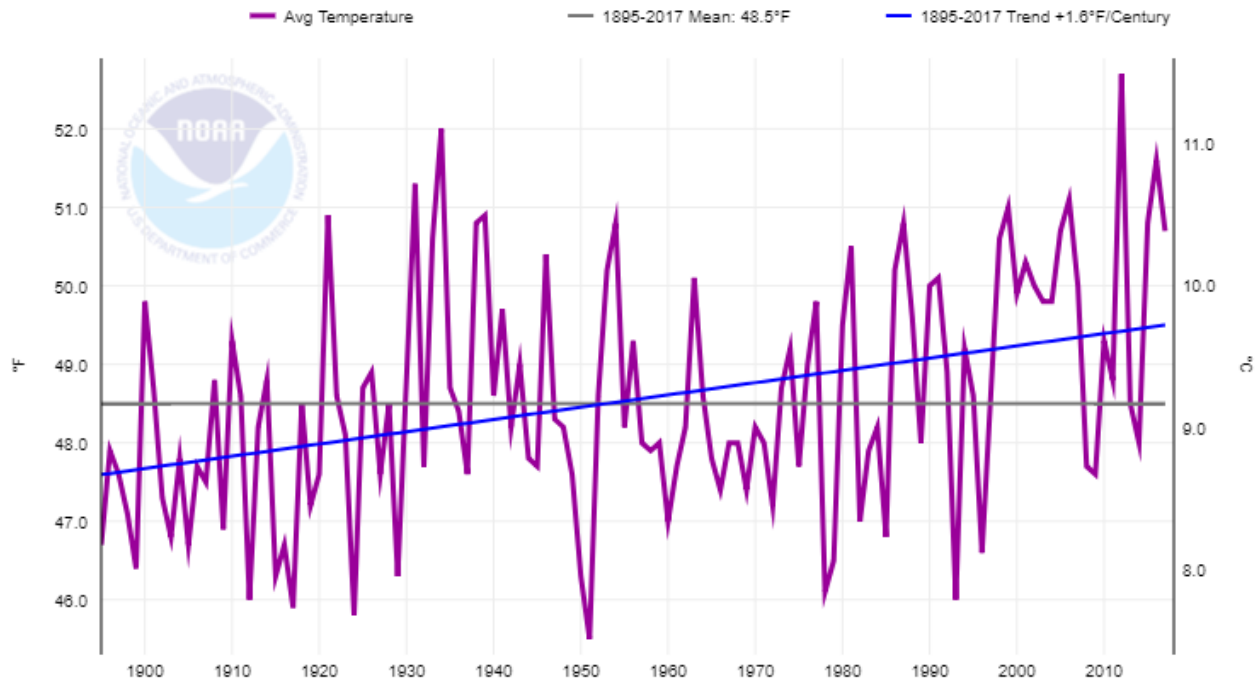
Source: Federal Emergency Management Agency, 1962-2019²⁷

²⁷ Federal Emergency Management Agency. 2019. "Disaster Declarations." Accessed January 2020. <https://www.fema.gov/openfema-dataset-disaster-declarations-summaries-v1>.

CLIMATE ADAPTATION

Since 1895, Nebraska's overall average temperature has increased by about 2°F (Figure 6). This trend will likely contribute to an increase in the frequency and intensity of hazardous events.

Figure 6: Average Temperature
Nebraska, Average Temperature, January-December

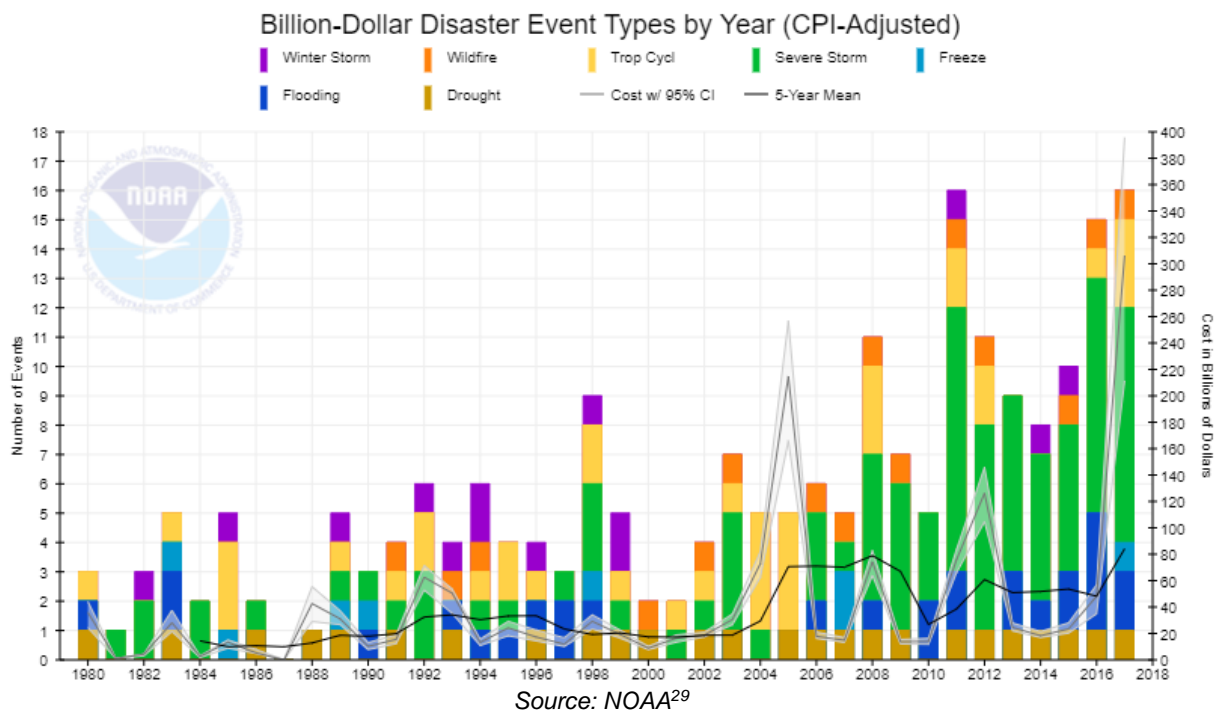


Source: NOAA²⁸

As seen in Figure 7, the United States is experiencing an increase in the number of billion-dollar natural disasters. This trend is likely due to a combination of increased disaster frequency and increased development.

28 NOAA National Centers for Environmental Information. 2018. "Climate at a Glance: Average Temperature." <https://www.ncdc.noaa.gov/cag/statewide/time-series>.

Figure 7: Billion Dollar Disasters



According to a University of Nebraska report (*Understanding and Assessing Climate Change: Implications for Nebraska, 2014*),³⁰ Nebraskans can expect the following impacts from climate change:

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

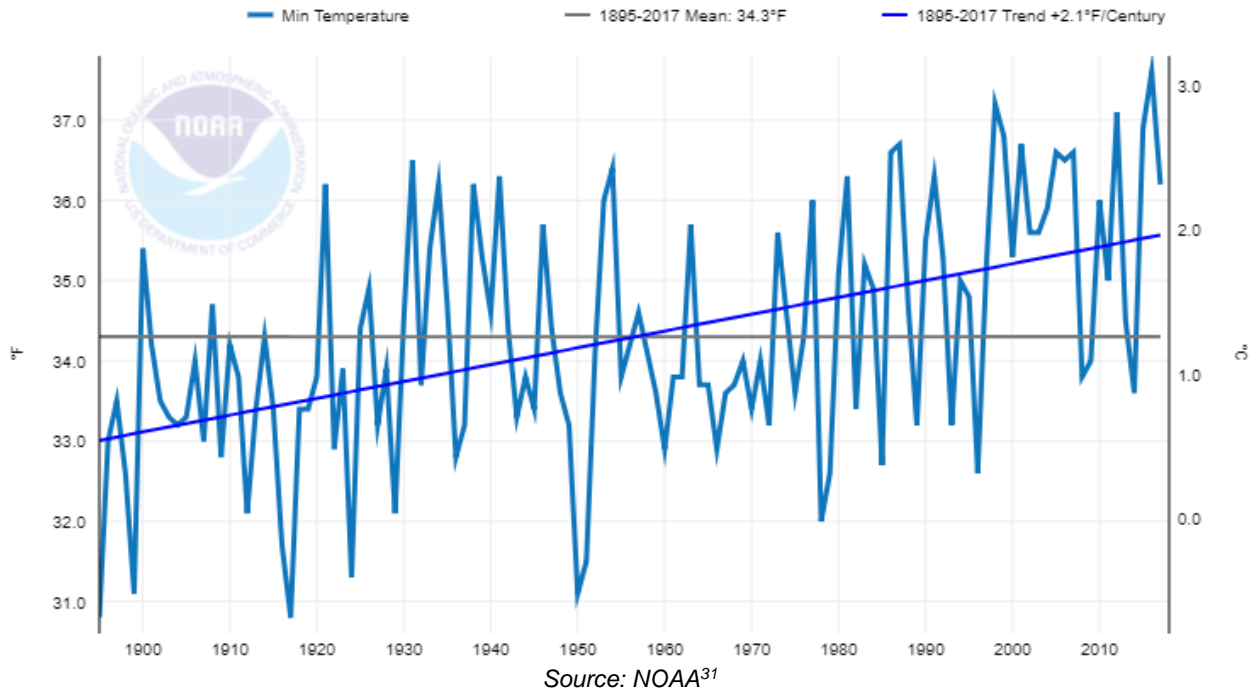
These trends will have a direct impact on water and energy demands. As the number of 100°F days increase, along with warming nights, the stress placed on the energy grid will likely increase and lead to more power outages. Critical facilities and vulnerable populations that are not prepared to handle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

²⁹ NOAA National Centers for Environmental Information. 2019. "2018's Billion Dollar Disasters in Context." <https://www.climate.gov/news-features/blogs/beyond-data/2018s-billion-dollar-disasters-context>.

³⁰ Rowe, C.M., Bathke, D.J., Wilhite, D.A., & Oglesby, R.J. 2014. "Understanding and Assessing Climate Change: Implications for Nebraska." University of Nebraska Lincoln.

Figure 8 shows a trend of increasing minimum temperatures in Climate Division 2, which includes the planning area. High nighttime temperatures can reduce grain yields, increase stress on animals, and lead to an increase in heat-related deaths.

Figure 8: Climate Division 2, Minimum Temperature
Nebraska, Climate Division 2, Minimum Temperature, January-December



The planning area will have to adapt to these climatic changes or experience an increase in economic losses, loss of life, property damage, and crop damage. HMPs are typically informed by *past* events in order to be more resilient to future events; future updates to this plan should consider being informed by *future* projections on the frequency, intensity, and distribution of hazards to address the changing climate.

HAZARD PROFILES

The following profiles will examine the identified hazards across the region. The hazards were identified based on their historical record of occurrence and their potential for occurrence in the future. The planning area is generally uniform in climate, topography, building characteristics, and development trends so overall hazards and vulnerability do not vary greatly across the planning area. Local hazard concerns and events that deviate from the region’s norm are discussed in greater detail in *Section Seven: Community Profiles*.

HAZARD ASSESSMENT SUMMARY TABLES

The following table provides an overview of 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.

³¹ NOAA National Centers for Environmental Information. 2018. "Climate at a Glance: Nebraska Time Series, Minimum Temperature." <http://www.ncdc.noaa.gov/cag/>.

Section Four: Risk Assessment

Table 30: Regional Risk Assessment

Hazard		Previous Occurrence Events/Years	Approximate Annual Probability	Likely Extent/Event
Agricultural Disease	Animal Disease ¹	49/6	100%	3 animals
	Plant Disease ²	45/19	100%	Unavailable
Chemical Spills – Fixed Site ³		37/30	100%	0 – 2,000 gallons 25 – 20,000lbs
Chemical Spills – Transportation ⁴		27/49	55%	0 – 1,000 gallons 0 – 800lbs
Dam Failure ⁵		2/108	2%	Unavailable
Drought ⁶		412/1,492 months	28%	D2 (Severe Drought)
Extreme Heat ⁷		Avg 4 days/year	100%	≥100°F
Flooding ⁸	Flash Flood	52/24	100%	Some inundation of structures (<1% of structures) and roads near streams. Some evacuations of people may be necessary (<1% of population)
	Flood	98/24	100%	
Grass/Wildfires ⁹		784/9	100%	0 – 300 acres Some homes and structures threatened or at risk
Hail ⁸		461/24	100%	Avg 1.2” Range 0.75-4.0”
High Winds ⁸		60/24	100%	Avg 50 mph Range 35 – 60 EG
Levee Failure ^{10, 11}		8/120	7%	Unavailable
Severe Thunderstorms ⁸	Thunderstorm Wind	290/24	100%	2 – 5 in rain Avg 56 EG winds Range 50 – 100 EG
	Heavy Rain	7/24	30%	
	Lightning	6/24	26%	
Severe Winter Storms ⁸	Blizzard	27/24	100%	20° - 30° below zero 1 – 16 in snow
	Extreme Cold/Wind Chill	13/24	57%	

Section Four: Risk Assessment

Hazard		Previous Occurrence Events/Years	Approximate Annual Probability	Likely Extent/Event
	Heavy Snow	14/24	61%	0.25 in ice 25 – 50 mph winds
	Ice Storm	8/24	35%	
	Winter Storm	131/24	100%	
	Winter Weather	31/24	100%	
Terrorism & Civil Disorder ^{12, 13}		0/78	<0.01%	While there are no historic events in the region, a future event could be severe
Tornadoes ⁸		38/24	100%	Avg EF0 Range EF0 – EF2

*Quantification of vulnerable structures provided in Section Seven: Community Profiles

N/A: Data not available

1 - NDA, 2014 - 2019

2 - USDA RMA, 2000 - 2018

3 - NRC, 1990 - February 2019

4 - PHSMA, 1971 - May 2019

5 - Stanford NPDP, 1911 - 2018

6 - NOAA, 1895 - April 2019

7 - NOAA Regional Climate Center, 1897 - May 2019

8 - NCEI, 1996 - February 2019

9 - NFS, 2010 - 2018

10 - USACE NLD, 1900 - 2019

11 - USACE, 2019

12 - University of Maryland, 1970 - 2017

13 - University of Illinois, 1940 - 2017

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

Table 31: Loss Estimation for the Planning Area

Hazard Type		Count	Property Damage	Crop Damage
Agricultural Disease	Animal Disease ¹	49	2,966 animals	N/A
	Plant Disease ²	45	N/A	\$251,636
Chemical Spills - Fixed Site ³ <i>2 injuries</i>		37	\$0	N/A
Chemical Spills – Transportation ⁴		27	\$79,774	N/A
Dam Failure ⁵		2	\$0	N/A
Drought ⁶		412/1,492 months	N/A	\$83,436,465
Extreme Heat ⁷ <i>1 fatality</i>		Avg. 4 days/year	N/A	\$9,913,734
Flooding ⁸	Flash Flood	52	\$492,500	\$4,955,821
	Flood	98	\$ 4,518,000	
Grass/Wildfires ⁹ <i>3 injuries, 2 fatalities</i>		784	4,506 acres	\$15,781
Hail ⁸		461	\$14,251,000	\$22,118,481
High Winds ⁸		60	\$5,000	\$3,628,608
Levee Failure ^{10, 11}		8	N/A	N/A
Severe Thunderstorms ⁸ <i>17 injuries</i>	Thunderstorm Wind	290	\$850,000	N/A
	Heavy Rain	7	\$0	\$29,140,836
	Lightning	6	\$303,000	N/A
Severe Winter Storms ⁸ <i>1 fatality</i>	Blizzard	27	\$0	\$1,195,961
	Extreme Cold/Wind Chill	13	\$0	
	Heavy Snow	14	\$3,000,000	
	Ice Storm	8	\$0	
	Winter Storm	131	\$0	
Winter Weather		31	\$0	
Terrorism & Civil Disorder ^{12, 13}		0	\$0	N/A
Tornadoes ⁸		38	\$2,093,000	\$14,157
Totals		2,188	\$25,592,274	\$154,671,480

N/A: Data not available

1 - NDA, 2014 - 2019

2 - USDA RMA, 2000 - 2018

3 - NRC, 1990 - February 2019

4 - PHSMA, 1971 - May 2019

5 - Stanford NPDP, 1911 - 2018

6 - NOAA, 1895 - April 2019

7 - NOAA Regional Climate Center, 1897 - May 2019

8 - NCEI, 1996 - February 2019

9 - NFS, 2010 - 2018

10 - USACE NLD, 1900 - 2019

11 - USACE, 2019

12 - University of Maryland, 1970 - 2017

13 - University of Illinois, 1940 - 2017

AGRICULTURAL ANIMAL AND PLANT DISEASE

Agriculture Disease is any microbial or viral disease 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 of agricultural products sold was estimated at more than \$21.9 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 \$890 million.³²

The following table shows the population of livestock within the three-county planning area. This count does not include wild populations that are also at risk from animal diseases. Recently, area farmers have added more poultry to their farms. Future planning efforts should consider an analysis of livestock increases in the area, and of this increase's potential risk impact.

Table 32: Livestock Inventory

County	Market Value of 2017 Livestock Sales	Cattle and Calves	Hogs and Pigs	Poultry Egg Layers	Sheep and Lambs
Butler	\$98,228,000	38,374	62,686	D	1,031
Dodge	\$93,904,000	40,845	8,437	2,044	331
Saunders	\$134,975,000	52,792	D	2,768	989
Total	\$327,107,000	132,011	71,123	4,812	2,351

Source: U.S. Department of Agriculture, 2017

*D: Withheld to avoid disclosing data for individual farms

According to the NDA, the primary crops grown throughout the state include alfalfa, corn, sorghum, soybeans, and wheat. However, the majority of the planning area is comprised of rangeland and forage acreage. The following tables provide an overview of the farm inventory in the planning area.

Table 33: Land and Value of Farms in the Planning Area

County	Number of Farms	Harvested cropland (acres)	Market Value of 2017 Crop Sales
Butler	723	297,113	\$161,537,000
Dodge	676	305,697	\$176,598,000
Saunders	1,118	401,777	\$225,489,000
Total	2,517	1,004,587	\$563,624,000

Source: U.S. Department of Agriculture, 2017

*D: Withheld to avoid disclosing data for individual farms

32 U.S. Department of Agriculture. 2019. "2017 Census of Agriculture." <https://www.nass.usda.gov/Publications/AgCensus/2017/>.

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Table 34: Crop Values

County	Corn		Soybeans		Wheat	
	Acres Planted	Value (2017)	Acres Planted	Value (2017)	Acres Planted	Value (2017)
Butler	150,447	\$92,286,000	131,661	\$66,356,000	376	\$42,000
Dodge	158,901	\$99,637,000	140,302	\$74,831,000	D	D
Saunders	209,388	\$128,563,000	174,287	\$88,374,000	1,120	\$370,000
Total	518,736	\$320,486,000	446,250	\$229,561,000	1,496	\$412,000

Source: U.S. Department of Agriculture, 2017

*D: Withheld to avoid disclosing data for individual farms

LOCATION

Given the agricultural presence in the region, animal and plant diseases have the potential to occur across the planning area. Animal and plant diseases will usually be observed in agricultural lands, range or pasture lands, and forests. It is also possible for animal and plant diseases to occur in animals or crops in urban areas. If a major outbreak were to occur, the economy in the entire planning area would be affected, including urban areas.

HISTORICAL OCCURRENCES

ANIMAL DISEASE

The NDA provides an accounting of livestock diseases that have occurred in the state. There were 49 instances of animal diseases reported by the NDA between January 2014 and April 2019 (Table 35). These outbreaks affected 2,966 animals.

Table 35: Livestock Diseases Reported in the Planning Area

Year	County	Disease	Population Impacted
2014	Saunders	Anaplasmosis	2
	Saunders	Bluetongue	7
	Saunders	Enzootic Bovine Leukosis	6
	Saunders	Leptospirosis	4
	Butler, Dodge	Paratuberculosis	5
	Butler	Porcine Circovirus	51
	Saunders	Porcine Circovirus Type 2	1
2015	Butler, Dodge	Porcine Reproductive and Respiratory Syndrome	5
	Butler	Paratuberculosis	300
	Dodge	Porcine Delta Coronavirus	500
	Dodge	Porcine Epidemic Diarrhea	500
2016	Dodge	Porcine Reproductive and Respiratory Syndrome	650
	Butler, Dodge	Anaplasmosis	3
	Saunders	Bluetongue	3
	Saunders	Enzootic Bovine Leukosis	2

Year	County	Disease	Population Impacted
	Dodge	Equine Influenza	1
	Saunders	Leptospirosis	4
	Butler	Maedi-Visna/Ovine Progressive Pneumonia	1
	Butler, Dodge, Saunders	Paratuberculosis	4
	Dodge	Porcine Circovirus	1
	Butler, Dodge	Porcine Epidemic Diarrhea	2
	Butler, Saunders	Porcine Reproductive and Respiratory Syndrome	3
	Saunders	Q Fever	1
	Saunders	West Nile Virus	1
2017	Dodge	Anaplasmosis	3
	Saunders	Bluetongue	1
	Dodge	Caprine Arthritis/Encephalitis	1
	Butler	Paratuberculosis	2
	Butler	Porcine Circovirus Type 2	260
	Dodge	Porcine Epidemic Diarrhea	2
	Butler, Dodge	Porcine Reproductive and Respiratory Syndrome	267
	Butler, Dodge	Seneca Valley Virus	14
2018	Saunders	Bluetongue	1
	Dodge	Bovine Viral Diarrhea	1
	Butler	Enzootic Bovine Leukosis	301
	Butler, Dodge, Saunders	Paratuberculosis	54
	Butler	Porcine Epidemic Diarrhea	1
2019 (through April)	Butler	Paratuberculosis	1

Source: Nebraska Department of Agriculture, 2014 – April 2019³³

PLANT DISEASE

A variety of diseases can impact crops; prevalence of these diseases will vary from year to year and is not recorded in any available database. The NDA provides information on some of the most common plant diseases, which are listed below.

Table 36: Common Crop Diseases in Nebraska by Crop Types

Crop Diseases		
Corn	Anthraxnose	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

33 Nebraska Department of Agriculture. May 2019. "Livestock Disease Reporting."
<http://www.nda.nebraska.gov/animal/reporting/index.html>.

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Crop Diseases		
	Maize Chlorotic Mottle Virus	
Soybeans	Anthraxnose	Pod 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 Blight	Wheat Streak Mosaic
Sorghum	Ergot	Zonate Leaf Spot
	Sooty Stripe	

AVERAGE ANNUAL LOSSES

According to the U.S. Department of Agriculture (USDA) Risk Management Agency (RMA) data, from 2000 to 2018 there was \$251,636 in crop damage from plant disease in the planning area. This amounts to an average annual loss of \$13,244. The RMA also does not track losses for livestock, so it is not possible to estimate losses due to animal disease.

EXTENT

There is no standard for measuring the magnitude of agricultural disease. NDA recorded historical animal disease events have impacted an average of 60 animals per outbreak; however, the most common number of livestock affected by an outbreak is one animal. The RMA does not report the number of acres affected by plant disease. While no significant events have occurred in the past, this region is heavily dependent on the agricultural economy so any severe plant or animal disease outbreak would have a large impact on the planning area.

PROBABILITY

Given the historic record of occurrence for animal disease (49 disease incidents reported in 6 years) and the role of agriculture in the planning area, for the purposes of this plan, the annual probability of any agricultural disease occurrence is 100 percent.

REGIONAL VULNERABILITIES

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

Table 37: Regional Agricultural Vulnerabilities

Sector	Vulnerability
People	<ul style="list-style-type: none"> -Those in direct contact with infected livestock -Food availability if food prices increase
Economic	<ul style="list-style-type: none"> -Regional economy is reliant on the agricultural industry -Large scale or prolonged events may impact tax revenues and local capabilities -Land value may drive population changes within the planning area
Built Environment	None
Infrastructure	-Transportation routes can be closed during quarantine
Critical Facilities	None

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CHEMICAL SPILLS - FIXED SITE

The following description for hazardous materials is provided by 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.³⁴

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.

Fixed sites are those that involve chemical manufacturing sites and stationary storage facilities. 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. Products containing hazardous chemicals are used and stored in homes and buildings routinely.

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 1986.³⁵ Table 38 demonstrates the nine classes of hazardous material according to the 2016 Emergency Response Guidebook.

Table 38: Hazardous Material Classes

Class	Type of Material	Divisions
1	Explosives	Division 1.1 – Explosives with a mass explosion hazard Division 1.2 – Explosives with a projection hazard but not a mass explosion hazard Division 1.3 – Explosives which have a fire hazard and either a minor blast hazard or a minor projection hazard or both, but not a mass explosion hazard Division 1.4 – Explosives which present no significant blast hazard Division 1.5 – Very insensitive explosives with a mass explosion hazard Division 1.6 – Extremely insensitive articles which do not have a mass explosion hazard
2	Gases	Division 2.1 – Flammable gases Division 2.2 – Non-flammable, non-toxic gases Division 2.3 – Toxic gases

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

35 Emergency Planning and Community Right-to-Know Act of 1986, Pub. L. No. 116 § 10904. (1986).

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Class	Type of Material	Divisions
3	Flammable liquids (and Combustible liquids)	
4	Flammable solids; Spontaneously combustible materials	Division 4.1 – Flammable solids, self-reactive substances and solid desensitized explosives Division 4.2 – Substances liable to spontaneous combustion Division 4.3 – Substances which in contact with water emit flammable gases
5	Oxidizing substances and Organic peroxides	Division 5.1 – Oxidizing substances Division 5.2 – Organic peroxides
6	Toxic substances and infectious substances	Division 6.1 – Toxic substances Division 6.2 – Infectious substances
7	Radioactive materials	
8	Corrosive materials	
9	Miscellaneous hazardous materials/products, substances, or organisms	

Source: *Emergency Response Guidebook, 2016*³⁶

LOCATION

There are 136 locations across the three-county planning area that house hazardous materials, according to the Tier II reports submitted to NDEE in 2018. A list of chemical storage sites for each jurisdiction can be found in *Section Seven: Community Profiles*.

HISTORICAL OCCURRENCES

According to the U.S. Coast Guard's National Response Center (NRC) database, there have been 37 fixed site chemical spills from 1990 through February 2019 in the planning area and participating communities. There were no reported property damages for these chemical spills. The following table displays the spills that occurred in the planning area and participating communities and resulted in injuries or evacuations. No spills resulted in fatalities.

Table 39: Fixed Site Chemical Spills

Year	Quantity Spilled	Material Involved	Injuries	deaths	Evacuated
2012	Unknown	Sewage	2	0	0
2009	100lbs	Anhydrous Ammonia	0	0	30

Source: NRC, 1990-February 2019³⁷

EXTENT

The extent of chemical spills at fixed sites varies and depends on the type of chemical that is released, with most events localized to the facility. Thirty-seven releases have occurred in the planning area, and the total amount spilled ranged from 1 to 2,000 gallons or 25 to 20,000 pounds of pollutant. Of the 37 chemical spills, two events led to either injuries or evacuations. Anhydrous ammonia and oil were most commonly spilled.

36 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>.

37 U.S. Coast Guard National Response Center. 2019. "Chemical Pollution and Railroad Incidents, 2000-February 2019." [datafile]. <http://www.nrc.uscg.mil/>.

AVERAGE ANNUAL LOSSES

No chemical fixed site spills resulted in damage from January 1990 to February of 2019.

PROBABILITY

Chemical releases at fixed site storage areas are likely in the future. Given the historic record of occurrence (37 chemical fixed site spills reported in 30 years), the annual probability of occurrence for chemical fixed site spills is 100 percent.

REGIONAL VULNERABILITIES

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

Table 40: Regional Chemical Fixed Site Vulnerabilities

Sector	Vulnerability
People	-Those in close proximity could have minor to severe health impacts -Possible evacuation -Hospitals, nursing homes, children, and the elderly are at greater risk due to low mobility
Economic	-A chemical plant or co-op shutdown in smaller communities would have significant impacts to the local economy -A long-term evacuation of the emergency planning zone would have a negative effect on the economy in the area
Built Environment	-Risk of fire or explosion -Damage to road infrastructure from evacuations or rerouting traffic
Infrastructure	-Transportation routes can be closed during evacuations or quarantines
Critical Facilities	-Critical facilities are at risk of evacuation or prolonged shut-down

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CHEMICAL SPILLS - TRANSPORTATION

The U.S. Pipeline and Hazardous Materials Safety Administration (PHMSA) regulates chemical transportation in the U.S to minimize threats to life, property, or the environment. According to PHMSA, hazardous materials traffic in the U.S. now exceeds 1,000,000 shipments per day.³⁸

Nationally, the U.S. has had 103 fatalities and 1,927 injuries associated with the transport of hazardous materials between 2009 and 2018.³⁹ While fatalities and injuries are a low probability risk, chemical spills occur frequently and have the potential to harm many people. A train derailment in Crete, Nebraska, in 1969 allowed anhydrous ammonia to leak from a rupture tanker. The resulting poisonous fog killed nine people and injured 53.

LOCATION

Chemical releases during transportation occurred primarily on major transportation routes as identified in Figure 9. Most chemical releases occurred near the City of Fremont because of the high volume of traffic in the area. There are major roads and railroads, several gas transmission and hazardous liquid pipelines of potential concern.⁴⁰

EXTENT

The probable extent of chemical spills during transportation is difficult to anticipate and depends on the type and quantity of the chemical released. Releases that have occurred during transportation in the planning area ranged in volume up to 1,000 gallons and up to 800 pounds.

HISTORICAL OCCURRENCES

PHMSA reports that 27 chemical spills occurred during transportation in the planning area between 1971 and May 2019. These events caused \$79,774 in property damages. The most common failure events occurred during highway transportation from loose closures and faulty equipment. The most significant events occurred by both highway and railroad, but there have been no significant incidents involving pipelines in the planning area.⁴¹ The following table provides a list of historical chemical spills during transportation in the planning area that caused more than \$1,000 property damage, or where more than 500 pounds or 100 gallons were released.

38 Pipeline and Hazardous Materials Safety Administration. 2017. "Hazardous Materials Regulations." <https://www.phmsa.dot.gov/standards-rulemaking/hazmat/hazardous-materials-regulations>.

39 Pipeline and Hazardous Materials Safety Administration. 2019. "10 Year Incident Summary Reports." <https://www.phmsa.dot.gov/hazmat/library/data-stats/incidents>.

40 Pipeline and Hazardous Materials Safety Administration. 2019. "National Pipeline Mapping System." <https://www.npms.phmsa.dot.gov/>.

41 Pipeline and Hazardous Materials Safety Administration. 2019. "Pipeline Incident Flagged Files." <https://www.phmsa.dot.gov/data-and-statistics/pipeline/pipeline-incident-flagged-files>.

Figure 9: Major Transportation Routes with Half Mile Buffer

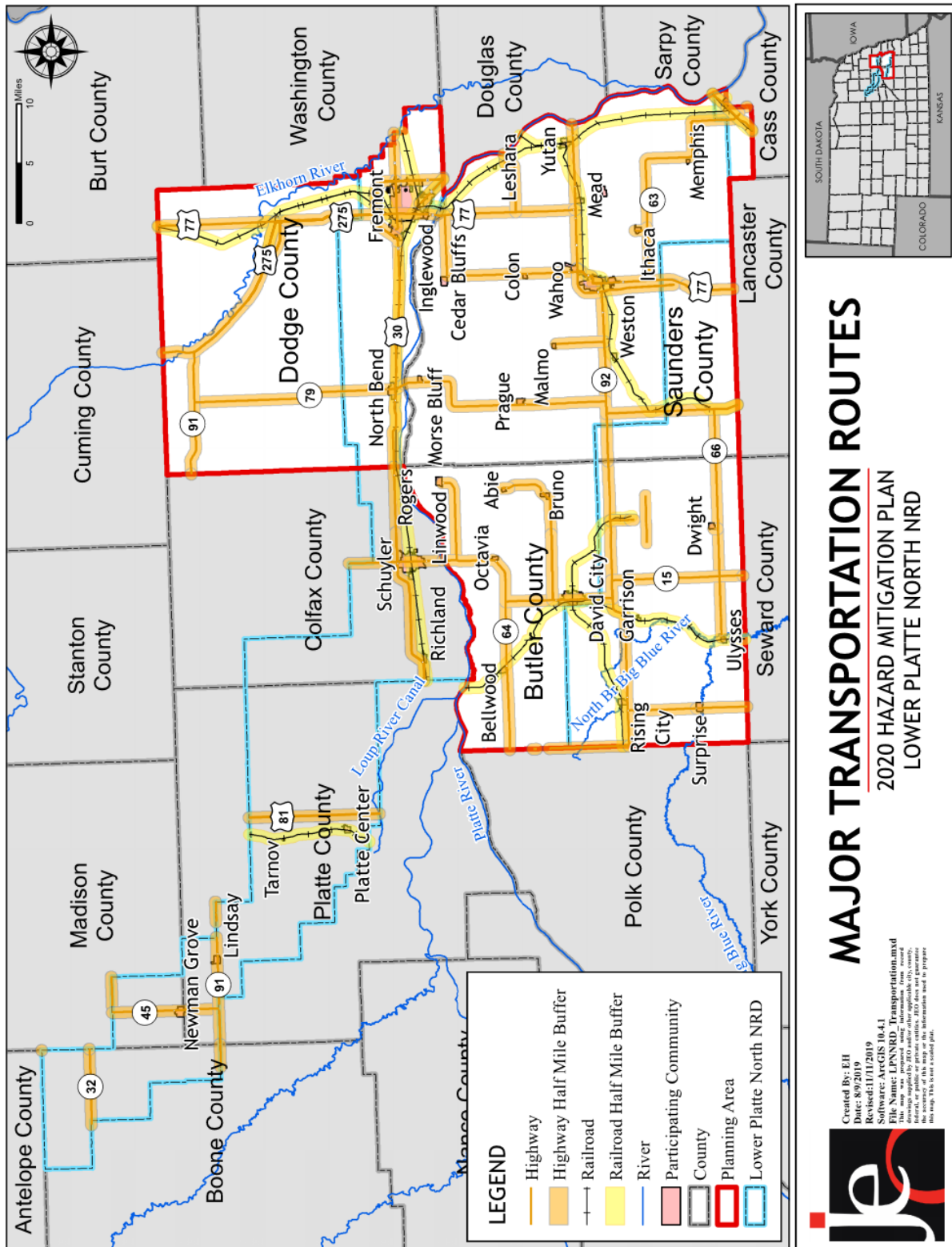


Table 41: Historical Chemical Spills

Year	Location of Release	Failure Description	Material Involved	Method of Transport	Amount	Total Damage	Injuries (Yes/No)
1977	North Bend	Vehicular crash	Gasoline	Highway	1,000 gallons	\$0	No
1978	Weston	Improper preparation for transportation	Ammonium nitrate	Rail	800 pounds	\$0	No
1978	Schuyler	Improper preparation for transportation	Ammonium nitrate	Rail	500 pounds	\$0	No
1990	Fremont	Loose closure component	Hazardous substance	Highway	85 gallons	\$6,305	No
1992	North Bend	Overfilled	Fuel oil	Highway	1,000 gallons	\$5,000	No
1995	Fremont	Improper preparation for transportation	Flammable liquids	Rail	1 gallon	\$8,001	No
1996	Fremont	Improper preparation for transportation	Organochlorine pesticides	Highway	40 pounds	\$1,118	No
1999	Wahoo	Rollover accident	Petroleum gas	Highway	1 gallon	\$57,300	No
2009	Fremont	Missing component	Sulfuric acid	Rail	2 gallons	\$1,106	No

Source: PHMSA, 1971 – May 2019⁴²

AVERAGE ANNUAL DAMAGES

The average annual property damage from chemical transportation spills is shown below. This hazard caused an average of \$2,750 in property damage per year. This does not include losses from displacement, functional downtime, economic loss, injury, or loss of life.

42 Pipeline and Hazardous Materials Safety Administration. May 2019. "Incident Statistics: Nebraska." <https://www.phmsa.dot.gov/hazmat-program-management-data-and-statistics/data-operations/incident-statistics>.

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Table 42: Chemical Transportation Losses

Hazard Type	Number of Events	Events Per Year	Total Property Loss	Average Annual Property Loss
Chemical Transportation Spills	27	<1	\$79,774	\$2,750

Source: PHMSA April 1980 – May 2019

PROBABILITY

Given the historic record of occurrence (27 chemical transportation spills reported in 49 years), the annual probability of occurrence for chemical transportation spills is approximately 55 percent annually.

REGIONAL VULNERABILITIES

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

Table 43: Regional Chemical Transportation Vulnerabilities

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

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.⁴³

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

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

The NeDNR, U.S. Army Corps of Engineers (USACE), and the Federal Energy Regulatory Commission all are involved in regulating dam safety in Nebraska. Dams are classified by the potential hazard each poses to human life and economic loss. The following are classifications and descriptions for each hazard class:

43 Nebraska Department of Natural Resources. 2011. “Department of Natural Resources Rules for Safety of Dam and Reservoirs Statutes.” Nebraska Administrative Code, Title 458, Chapter 1, Part 001.09.

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- **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.

According to USACE's National Inventory of Dams, there are 123 dams located within the planning area with classifications of all levels. The great majority are low hazard. Figure 10 maps the location of significant and high hazard dams in the three-county planning area. It should be noted that the following table and count does not include dams located in the panhandle of the LPNDRD. However, there are no high hazard dams located within or near any participating jurisdiction located within the panhandle. There are no federally regulated dams in the planning area.

Table 44: Dams in the Planning Area

County	Low Hazard	Significant Hazard	High Hazard
Butler	53	4	0
Dodge	7	3	2
Saunders	47	4	3
Total	107	11	5

Source: NeDNR, 2019⁴⁴; USACE, 2020

Dams classified as high hazard 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 such as severe flooding or other natural hazard events.

There are five high hazard dams located within the planning area, two in Dodge County and three in Saunders County.

44 U.S. Army Corps of Engineers. 2019. "National Inventory of Dams." <https://nid.sec.usace.army.mil/ords/f?p=105:1>

Table 45: High Hazard Dams in the Planning Area

County	Dam Name	NID ID	Purpose	Dam Height	Max Storage	Last Inspection Date
Dodge	Dodge Dam	NE02637	Flood Control	26 feet	119 acre-feet	6/14/2018
Dodge	Hooper Dam	NE01277	Flood Control	33 feet	19 acre-feet	6/14/2018
Saunders	Cottonwood Creek 7-A	NE02321	Flood Control	62 feet	2,984 acre-feet	5/31/2017
Saunders	Cottonwood Creek 21-A	NE01887	Flood Control	42 feet	1,043 acre-feet	5/31/2017
Saunders	Lake Wanahoo Dam	NE03108	Flood Control	59 feet	27,356 acre-feet	5/31/2017

UPSTREAM DAMS OUTSIDE THE PLANNING AREA

According to the Butler, Dodge, and Saunders Counties' Local Emergency Operations Plans,⁴⁵⁴⁶⁴⁷ there are several upstream dams that could affect the planning area. If the Kingsley Dam in Keith County were to fail it would affect the Platte River as far east as its junction with the Missouri River. The Platte River runs along the northern border of Butler County and along the county line between Dodge and Saunders Counties. In Butler County, inundation from Kingsley Dam would likely reach over the 100-year floodplain especially in the northern part of the county, which would approach 100% inundation. Beyond flooding along the Platte River from Kingsley Dam, there are no other upstream dams that would impact Dodge or Saunders County.

LOCATION

Communities or areas downstream of a dam, especially high hazard dams, are at greatest risk from dam failures. There are five high hazard dams in the planning area. Two of these are in Dodge County and would impact the Village of Dodge or the City of Hooper. Note that while these communities are located within Dodge County, interested communities participated in the Lower Elkhorn NRD HMP. The remaining three high hazard dams are in Saunders County and would impact the Village of Malmo, Village of Prague, or City of Wahoo.

EXTENT

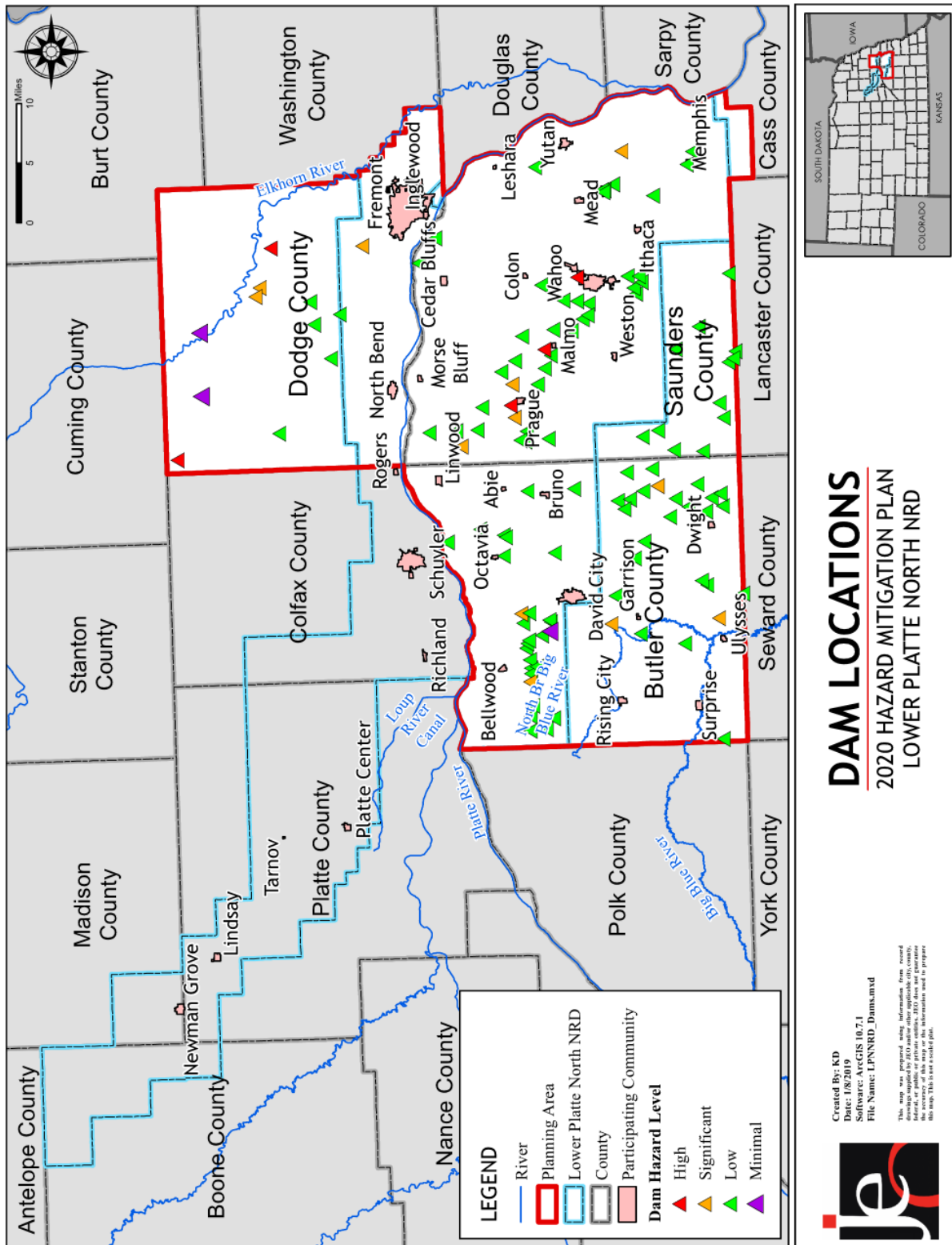
The amount of people and property that would be impacted by a dam failure depends on that dam's inundation area which varies by structure. Inundation maps are not publicly available due to concerns of vandalism and terrorism. Instead the extent of a dam failure is indicated by its hazard classification. 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 the case of a failure. Thus, the five high hazard dams in the planning area would have the greatest impact if they were to fail.

45 Butler County Emergency Management Agency. 2015. "Butler County Local Emergency Operations Plan."

46 Dodge County Emergency Management Agency. 2017. "Dodge County, Nebraska Local Emergency Operations Plan: A Guide to Who Does What."

47 Saunders County Emergency Management Agency. 2019. "Saunders County Local Emergency Operations Plan."

Figure 10: Dam Locations



HISTORICAL OCCURRENCES

According to the Stanford University National Performance of Dams Program, there have been two dam failure events within the planning area. The Hurt Dam, a low hazard dam located outside of the Village of Dwight in Butler County, failed in 1995 and again in 2000. In both incidents there was seepage and piping issues that threatened the structure's integrity. Aside from repair costs to the dam there was no property damage from these incidents.⁴⁸

AVERAGE ANNUAL DAMAGES

Due to a lack of data and the potential for vandalism and terrorism, potential losses are not calculated for dam failure. Community members in the planning area that wish to quantify the threat of dam failure should contact their County Emergency Manager, the LPNDRD, NeDNR, or the United States Army Corps of Engineers.

PROBABILITY

According to the 2019 Nebraska State Hazard Mitigation Plan, the probability of a high hazard dam failing is "very low" due to the high design standards for this class of dam. The probability of low risk dams failing is higher as they age, especially as heavy rain events are anticipated to become more frequent and intense, because they are not designed to the same standard as high-risk dams. With two dam failures over 100 years, the annual probability of dam failure will be 2%.

REGIONAL VULNERABILITIES

Since 2014, the LPNDRD and JEO Consulting Group have partnered to conduct breach analyses for significant hazard dams across the NRD. So far, they have analyzed close to 50 dams. The following table provides information related to regional vulnerabilities; for jurisdictional-specific vulnerabilities, refer to *Section Seven: Community Profiles*.

Table 46: Regional Dam Failure Vulnerabilities

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

48 Stanford University National Performance of Dams Program. 2018. "NPDP Dam Incident Database." [datafile]. https://npdp.stanford.edu/dam_incidents.

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DROUGHT

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

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

-National Drought Mitigation Center

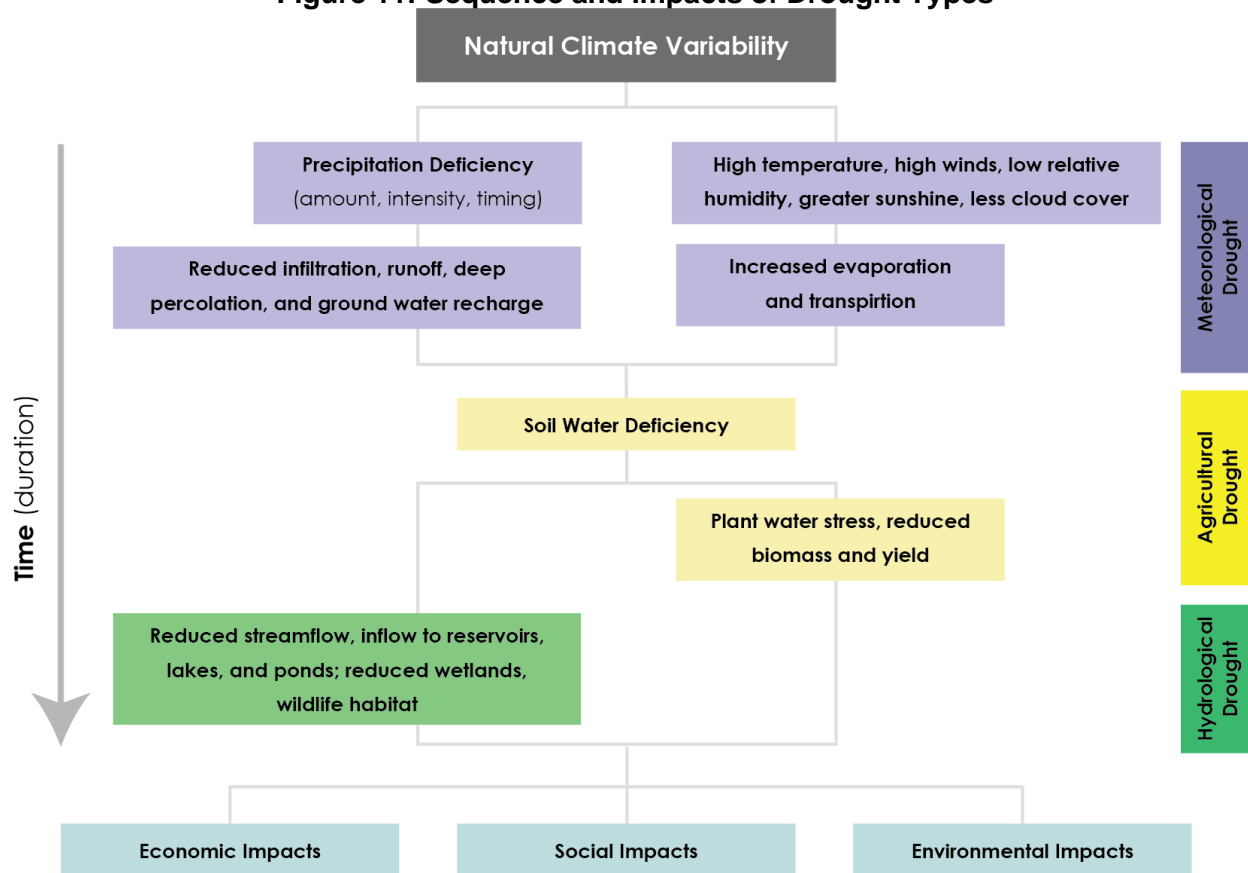
Drought is a slow-onset phenomenon. While many drought impacts are non-structural, there is the potential that during extreme or prolonged drought events structural impacts can occur. Drought normally affects more people than other natural hazards because its impacts are spread over a larger geographical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

- **Meteorological Drought** is defined based on the degree of dryness and the duration of the dry period. Meteorological drought is often the first type of drought to be identified and should be defined regionally as precipitation rates and frequencies (norms) vary.
- **Agricultural Drought** occurs when there is deficient moisture that hinders planting germination, leading to low plant population per hectare and a reduction of final yield. Agricultural drought is closely linked with meteorological and hydrological drought; as agricultural water supplies are contingent upon the two sectors.
- **Hydrologic Drought** occurs when water available in aquifers, lakes, and reservoirs falls below the statistical average. This situation can arise even when the area of interest receives average precipitation. This is due to the reserves diminishing from increased water usage, usually from agricultural use or high levels of evapotranspiration, resulting from prolonged high temperatures. Hydrological drought often is identified later than meteorological and agricultural drought. Impacts from hydrological drought may manifest themselves in decreased hydropower production and loss of water-based recreation.
- **Socioeconomic Drought** occurs when the demand for an economic good exceeds supply due to a weather-related shortfall in water supply. The supply of many economic goods includes but is not limited to, water, forage, food grains, fish, and hydroelectric power.⁴⁹

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

⁴⁹ National Drought Mitigation Center. 2017. "Drought Basics." <http://drought.unl.edu/DroughtBasics.aspx>.

Figure 11: Sequence and Impacts of Drought Types



Source: National Drought Mitigation Center, 2017⁵⁰

HISTORICAL OCCURRENCES

The Palmer Drought Severity Index (PDSI) is utilized by climatologists to standardize global long-term drought analysis. The data for the planning area was collected from Climate Division 6, east central Nebraska. This station’s period of record started in 1895. Figure 12 illustrates this data. The negative Y axis represents a drought, for which ‘-2’ indicates a moderate drought, ‘-3’ a severe drought, and ‘-4’ an extreme drought. The following table details the Palmer classifications.

Table 47: Palmer Drought Severity Index Classification

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

Source: Climate Prediction Center⁵¹

50 National Drought Mitigation Center. 2017. “Types of Drought.” <https://drought.unl.edu/Education/DroughtIn-depth/TypesofDrought.aspx>.

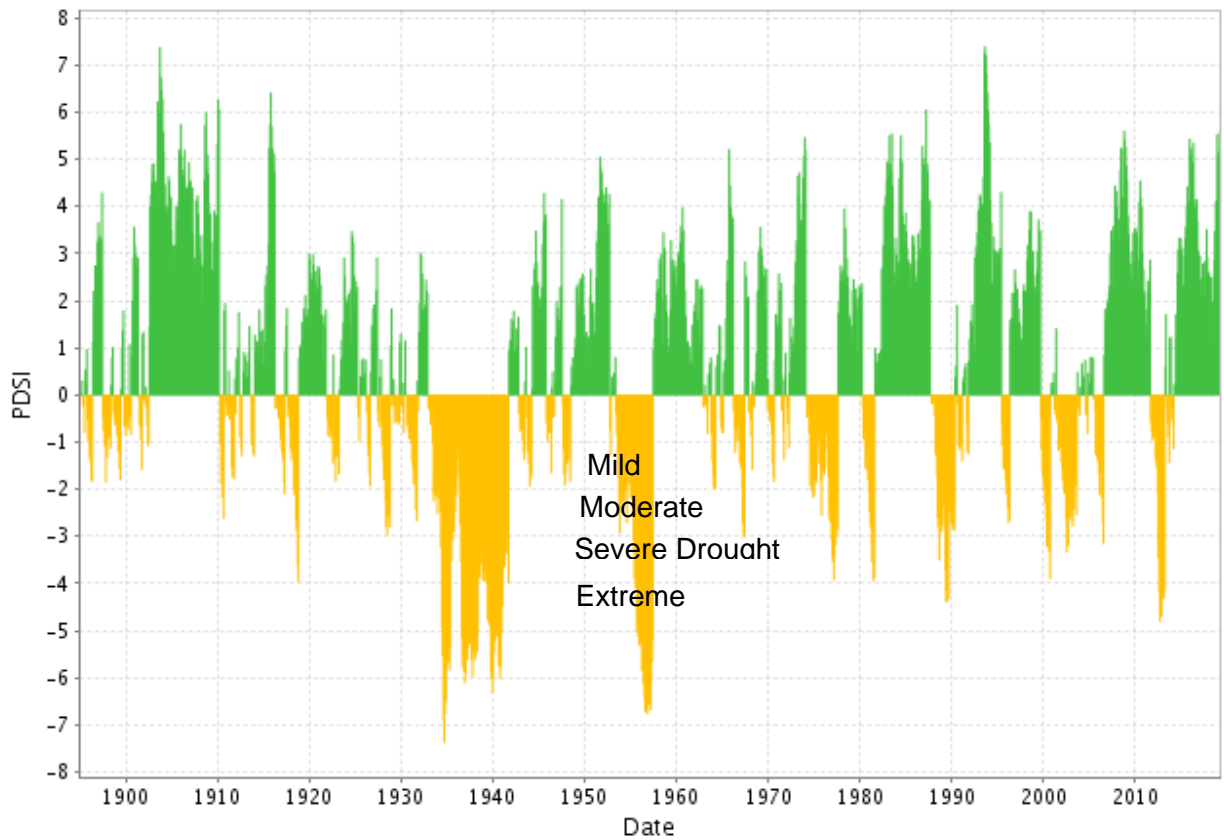
51 National Weather Service. 2005. “Climate Prediction Center - Explanation.” https://www.cpc.ncep.noaa.gov/products/analysis_monitoring/cdus/palmer_drought/wpdanote.shtml.

Table 48: Historic Droughts

Drought Magnitude	Months in Drought	Monthly probability
-1 Magnitude (Mild)	171/1,492	11.5%
-2 Magnitude (Moderate)	103/1,492	6.9%
-3 Magnitude (Severe)	48/1,492	3.2%
-4 Magnitude or Greater (Extreme)	90/1,492	6.0%

Source: NCEI, Jan 1895 – April 2019⁵²

**Figure 12: Palmer Drought Severity Index
NE East Central – PDSI
189501 – 201904**



Source: NCEI, Jan. 1895 – April 2019

LOCATION

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

⁵² National Centers for Environmental Information. April 2019. <https://www7.ncdc.noaa.gov/CDO/CDODivisionalSelect.jsp>.

EXTENT

Using the data from Table 48, a 6% monthly probability for extreme drought is expected. Severe drought has a 3.2% monthly probability, moderate drought has a 6.9% monthly probability, and mild drought has a 11.5% monthly probability. Moderate conditions (incipient dry spell, near normal, or incipient wet spell conditions) occurred in 358 of 1,492 months. These statistics show that the drought conditions occur about 28% of the year and are most likely to be mild.

AVERAGE ANNUAL LOSSES

The annual property estimate was determined based on data recorded in the NCEI Storm Events database from 1996 to February 2019 and which reported no property damages from drought. The annual crop loss was determined based upon the RMA Cause of Loss Historical database from 2000 to 2018. These estimates do not include losses from displacement, functional downtime, economic loss, injury, or loss of life.

Table 49: Loss Estimate for Drought

Hazard Type	Total Property Loss ¹	Average Annual Property Loss ¹	Total Crop Loss ²	Average Annual Crop Loss ²
Drought	\$0	\$0	\$83,436,465	\$ 4,391,393

Source: 1 Indicates data is from NCEI (January 1996 to February 2019); 2 Indicates data is from USDA RMA (2000 to 2018)

The extreme drought in 2012 significantly affected the agricultural sector across the State of Nebraska. 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. Agriculture is a large driver of the local planning area's economy. The 2012 drought forced ranchers across the state 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%.

PROBABILITY

As indicated in Table 48: Historic Droughts, a breakdown of monthly probability is provided. In any given month, there is over an 11 percent probability of a mild drought, and a six percent chance of an extreme drought somewhere in the planning area.

The U.S. Seasonal Drought Outlook provides a short-term drought forecast that can be utilized by local officials and residents to determine the likelihood of drought occurring or continuing. The drought outlook is updated consistently throughout the year and should be reviewed on an ongoing basis.

REGIONAL VULNERABILITIES

The Drought Impact Reporter is a database of drought impacts throughout the United States since 2009. The Drought Impact Reporter has recorded 18 drought-related impacts throughout the region. These impacts are summarized in the following table.

Table 50: Drought Impacts in Planning Area

Category	Date	Affected Counties	Title
Relief, Response & Restrictions, Water Supply & Quality	3/28/2018	Saunders	Additional water source for Lincoln, Nebraska
Fire, Society & Public Health	3/15/2018	Butler, Dodge, Saunders	Drought prevented agricultural burning in Kansas, Oklahoma in 2018
Relief, Response & Restrictions, Water Supply & Quality	10/31/2013	Butler, Dodge, Saunders	Moratorium on new irrigation in Lower Platte North Natural Resources District in eastern Nebraska
Society & Public Health	9/25/2013	Butler, Dodge, Saunders	Drought alleviated some of the flooding that would have otherwise occurred along the Platte River in southern Nebraska
Tourism & Recreation, Water Supply & Quality	4/8/2013	Butler	Low water levels prevent installation of boat docks in Butler County, Nebraska
Relief, Response & Restrictions, Water Supply & Quality	2/12/2013	Saunders	New horizontal well to enhance water supply for Lincoln, Nebraska
Agriculture, Relief, Response & Restrictions, Water Supply & Quality	1/25/2013	Dodge	Water use restrictions for irrigators in the Lower Elkhorn Natural Resources District in northeastern Nebraska
Agriculture, Relief, Response & Restrictions	1/9/2013	Butler, Dodge	Drought-related USDA disaster declarations in 2013
Relief, Response & Restrictions, Water Supply & Quality	8/24/2012	Saunders	Reduced water use from eastern Nebraska well field
Society & Public Health, Tourism & Recreation	8/21/2012	Butler	Hot, dry conditions damage hiker/biker trails in Butler, Cass, Gage, and Lancaster counties in Nebraska
Agriculture	8/7/2012	Butler, Dodge, Saunders	Corn chopped for silage in eastern Nebraska
Agriculture, Water Supply & Quality	8/7/2012	Butler, Dodge, Saunders	Nebraska ranchers hauling water to livestock
Plants & Wildlife, Water Supply & Quality	8/6/2012	Butler	Thousands of fish dead in dry Lower Platte River in Nebraska

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Category	Date	Affected Counties	Title
Agriculture, Relief, Response & Restrictions, Water Supply & Quality	7/19/2012	Butler, Dodge, Saunders	Low flow in several Nebraska rivers brought surface irrigation closures
Fire, Relief, Response & Restrictions	7/4/2012	Dodge, Saunders	Fireworks ban for Nebraska state parks
Fire, Relief, Response & Restrictions	6/28/2012	Butler, Dodge, Saunders	Nebraskans urged to leave the fireworks to the professionals
Plants & Wildlife, Tourism & Recreation, Water Supply & Quality	6/11/2012	Butler, Dodge	Lower Platte River in Nebraska experiencing record low flows
Relief, Response & Restrictions, Water Supply & Quality	1/1/2012	Dodge	More than \$100,000 paid to assist those with dry domestic wells in northeastern Nebraska

Source: NDMC, 2009 – 2019⁶³

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

Table 51: Regional Drought Vulnerabilities

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

53 National Drought Mitigation Center. 2019. "U.S. Drought Impact Reporter." <http://droughtreporter.unl.edu/map/>.

EXTREME HEAT

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

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

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

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

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

LOCATION

This hazard may occur throughout the planning area.

EXTENT

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

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

Figure 13: NOAA Heat Index Temperature (°F)

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

Likelihood of Heat Disorders with Prolonged Exposure or Strenuous Activity



Source: NOAA, 2017⁵⁴

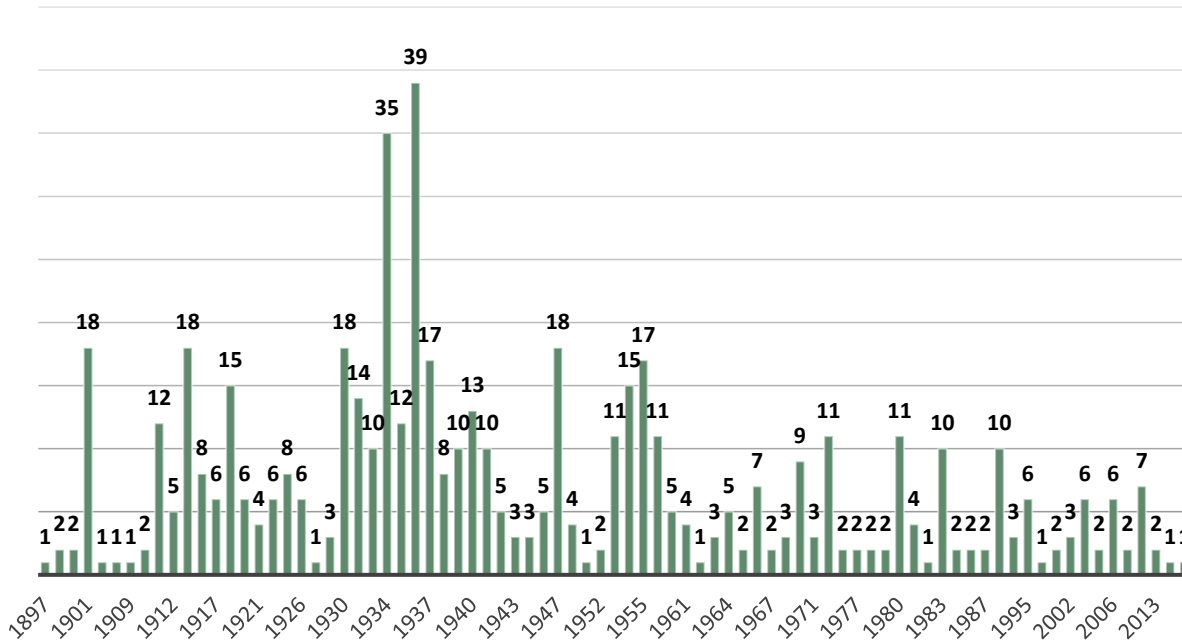
The figure above is designed for shady and light wind conditions. Exposure to full sunshine or strong winds can increase hazardous conditions and raise heat index values by up to 15°F. For the purposes of this plan, extreme heat is being defined as temperatures of 100°F or greater.

HISTORICAL OCCURRENCES

According to the High Plains Regional Climate Center (HPRCC), on average, the planning area experiences four days above 100°F per year. The planning area experienced the most days on record above 100°F in 1936 with 39 days. More recently, in 2012 there were seven above 100°F. While recorded data spanned back to the 1800s, reported data for the last few years is likely much lower than actual experienced heat events. Therefore, the probability for extreme heat events is high.

⁵⁴ National Oceanic and Atmospheric Administration, National Weather Service. 2017. "Heat Index." http://www.nws.noaa.gov/om/heat/heat_index.shtml.

Figure 14: Number of Days Above 100°F



Source: HPRCC, 1897-2019

AVERAGE ANNUAL LOSSES

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

The NCEI database did not report any property damage due to extreme heat events. The annual crop loss was determined based upon the USDA RMA Cause of Loss Historical database from 2000 to 2018. These estimates do not include losses from displacement, functional downtime, economic loss, injury, or loss of life.

Table 52: Extreme Heat Loss Estimation

Hazard Type	Average Number of Days Above 100°F ¹	Property Damages ²	Average Annual Property Damage ²	Total Crop Loss ⁴	Annual Crop Loss ³
Extreme Heat	4	\$0	\$0	\$9,913,733	\$521,775

Source: 1 indicates the data is from HPRCC (1902-2019); 2 NCEI (1996-2019); 3 USDA RMA (2000-2018); 4 - NOAA Regional Climate Center (1897 - May 2019)

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.⁵⁵ In rural areas, the percent of the population affected and duration may increase during extreme events.

⁵⁵ Federal Emergency Management Agency. June 2009. "BCA Reference Guide."

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The assumed damages do not take into account physical damages to utility equipment and infrastructure.

Table 53: Loss of Electricity - Assumed Damage by Jurisdiction

Jurisdiction	2017 Population	Population Affected (Assumed)	Electric Loss of Use Assumed Damage Per Day
Butler	8,105	810	\$102,060
Dodge	36,576	3,658	\$460,908
Saunders	20,953	2,095	\$263,970

Source: United States Census Bureau. "American Fact Finder: DP05: ACS Demographic and Housing Estimates."

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*⁵⁶ which included predictions for extreme heat events in the future dependent on future climate actions. The table below summarizes those findings for the planning area.

Table 54: Extreme Heat Predictions for Days over 100F

Jurisdiction	Historical Average 1971-2000 (days per year)	Midcentury prediction 2036-2065 (days per year)	Late century 2070-2099 (days per year)
Butler	6	35	61
Dodge	6	34	59
Saunders	6	36	62

Source: Union of Concerned Scientists, 1971-2000⁵⁷

PROBABILITY

Extreme heat is a regular part of the climate for the planning area; there is a 100 percent probability that temperatures greater than 100°F will occur annually.

REGIONAL VULNERABILITIES

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

⁵⁶ 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>.

⁵⁷ Union of Concerned Scientists. 2019. "Extreme Heat and Climate Change: Interactive Tool". <https://www.ucsusa.org/global-warming/global-warming-impacts/extreme-heat-interactive-tool?location=lancaaster-county--ne>

Table 55: Regional Extreme Heat Vulnerabilities

Sector	Vulnerability
People	<ul style="list-style-type: none"> -Health impacts including heat exhaustion and heat stroke -Increased risk to vulnerable populations including: people working outdoors, people without air conditioning, young children outdoors or without air conditioning, elderly outdoors or without air conditioning
Economic	<ul style="list-style-type: none"> -Short-term interruption of business -Loss of power -Agricultural losses
Built Environment	<ul style="list-style-type: none"> -Damage to air conditioning/HVAC units if overworked
Infrastructure	<ul style="list-style-type: none"> -Overload or significant stressing of electrical systems -Damages to roadways (prolonged extreme events)
Critical Facilities	<ul style="list-style-type: none"> -Loss of power
Other	<ul style="list-style-type: none"> -Increased risk of wildfire events

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FLOODING

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

RIVERINE FLOODING

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

FLASH FLOODING

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

SHEET FLOODING

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

ICE JAM FLOODING

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

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LOCATION

Table 56 shows current statuses of Flood Insurance Rate Map (FIRM) panels. Digital Flood Insurance Rate Maps (DFIRMs) are available for the Butler, Dodge, and Saunders planning area, and copies of paper maps can be viewed at the FEMA Flood Map Service Center (<https://msc.fema.gov/portal/advanceSearch>). The floodplain map for the Lower Platte North NRD can be seen in the following figure. For jurisdictional-specific vulnerabilities and available maps, refer to *Section Seven: Community Profiles*.

Table 56: FEMA FIRM Panel Status

Location	FIRM Panel	Effective Date
Abie	31023C0180C	August 16,2011
Bellwood	31023C0130C	August 16,2011
Bruno	31023C0190C	August 16,2011
David City	31023C0145C, 31023C0165C, 31023C0255C, 31023C0235C	August 16,2011
Dwight	31023C0360C	August 16,2011
Garrison	31023C0245C	August 16,2011
Linwood	31023C0090C, 31023C0095C	August 16, 2011
Octavia	31023C0160C, 31023C0155C	August 16,2011
Rising City	31023C0210C	August 16,2011
Surprise	31023C0310C, 31023C0305	August 16,2011
Ulysses	31023C0330C	August 16,2011
Butler County	31023C0015C – 31023C0400C	August 16, 2011
Fremont	31053C0380E, 31053C0385E, 31053C0390E, 31053C0405E, 31053C0415E, 31053C0395E, 31053C0425E	January 2, 2008
Inglewood	31053C0395E, 31053C0415E	January 2, 2008
North Bend	31053C0335E, 31053C0350E, 31053C0375E	January 2, 2008
Dodge County	31053C0025E – 31053C0450E	January 2, 2008
Cedar Bluffs	31155C0075D, 31155C0090D	April 5, 2010
Colon	31155C0200D, 31155C0225E	April 5, 2010 & August 3, 2016
Leshara	31155C0235D, 31155C0250D	April 5, 2010
Malmo	31155C0200D	April 5, 2010
Mead	31155C0375D	April 5, 2010
Memphis	31155C0535D, 31155C0550D	April 5, 2010
Morse Bluff	31155C0045D	April 5, 2010
Prague	31155C0155D, 31155C0165D, 31155C0170D, 31155C0160D	April 5, 2010
Wahoo	31155C0225E, 31155C0335E, 31155C0350E, 31155C355E, 31155C0375E	August 3, 2016
Weston	31155C0325D, 31155C0350E	April 5, 2010 & August 3, 2016
Yutan	31155C0250D, 31155C0275D, 31155C0400D, 31155C0425D	April 5, 2010
Saunders County	31155C0025D – 31155C0575D, 31155C0225E – 31155C0375E	April 5, 2010 & August 3, 2016

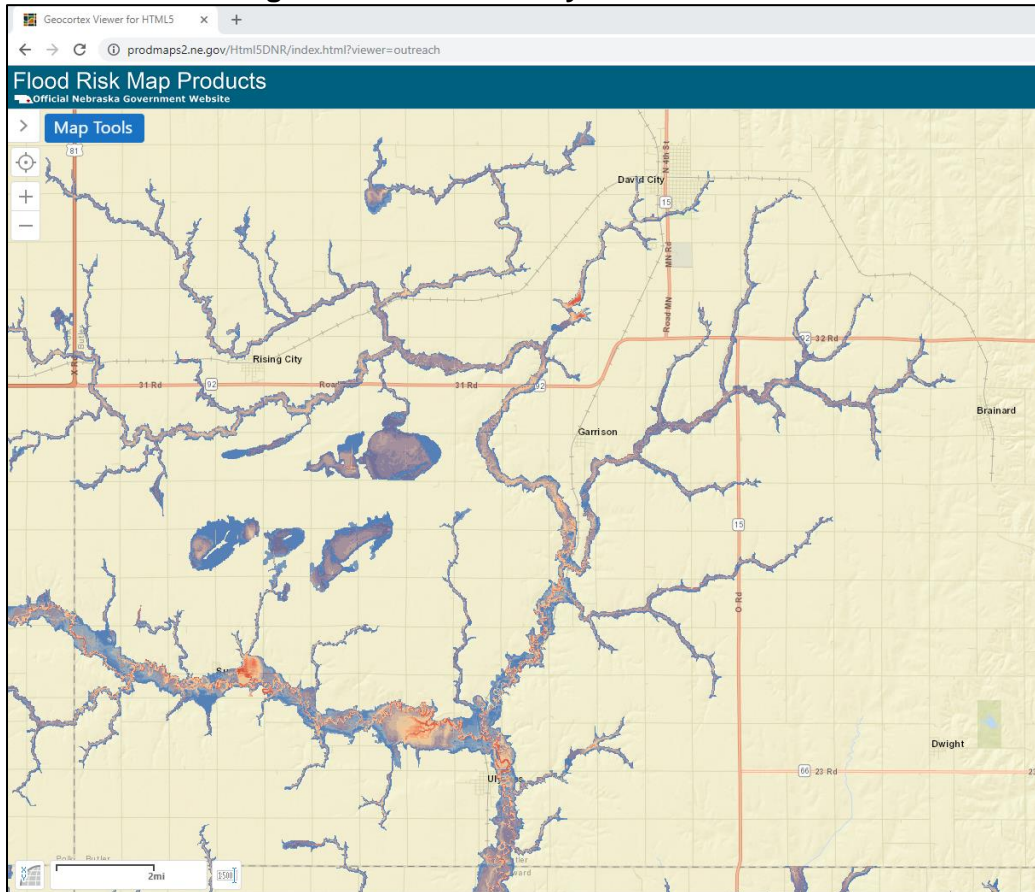
Location	FIRM Panel	Effective Date
Lindsay	31141C0030E, 31141C0035E, 31141C0050E	April 19, 2010
Newman Grove	31119C0310D, 31119C0220D	February 4, 2005
Platte Center	31141C0200E, 31141C0215E	April 19, 2010
Richland	31037C0250D	April 5, 2016
Rogers	31037C0285D	April 5, 2016
Schuyler	31037C0250D, 31037C255D, 31037C0260D, 31037C0275D	April 5, 2016
Tarnov	N/A	N/A

Source: FEMA, 2020⁵⁸

RISK MAP PRODUCTS

Risk Mapping, Assessment, and Planning (Risk MAP) is a FEMA program that provides communities with flood information and tools (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. Only the central and southwestern portions of Butler County have Risk MAP products available. NeDNR hosts the Risk MAP products on an interactive web map, which can be viewed here: <http://prodmaps2.ne.gov/html5dnr/?viewer=outreach>

Figure 15: Butler County Flood Risk MAP



Source: NeDNR Risk MAP Flood Risk Products Interactive Map

⁵⁸ Federal Emergency Management Agency. 2017. "FEMA Flood Map Service Center." <http://msc.fema.gov/portal/advanceSearch>.

EXTENT

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

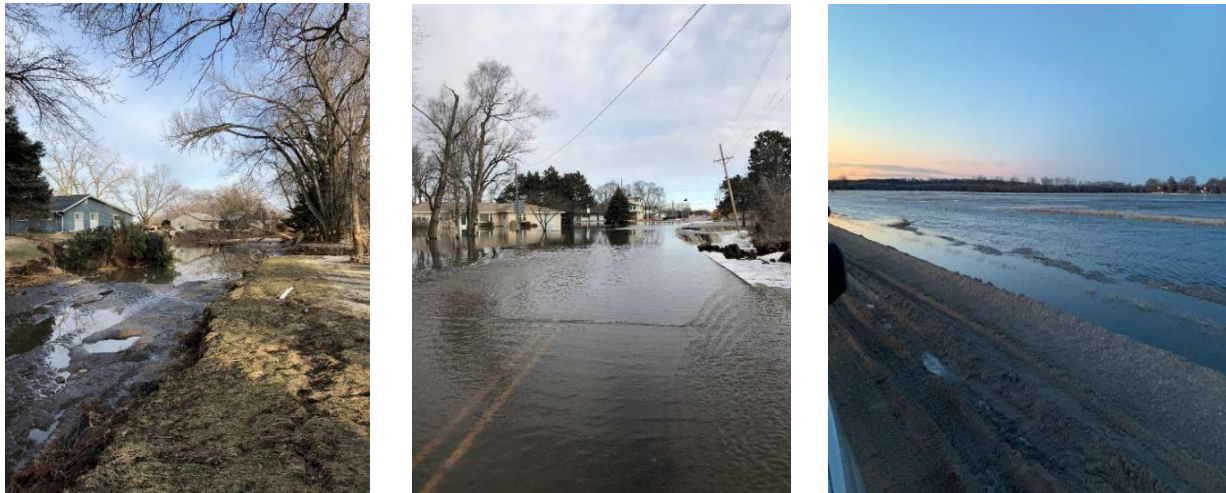
Table 57: Flooding Stages

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

Source: NOAA, 2017⁵⁹

Figure 18 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 19, the most common month for flooding within the planning area is in June, followed closely by May. While it is possible that major flood events will occur, the likely extent of flood events within the planning area is classified as moderate.

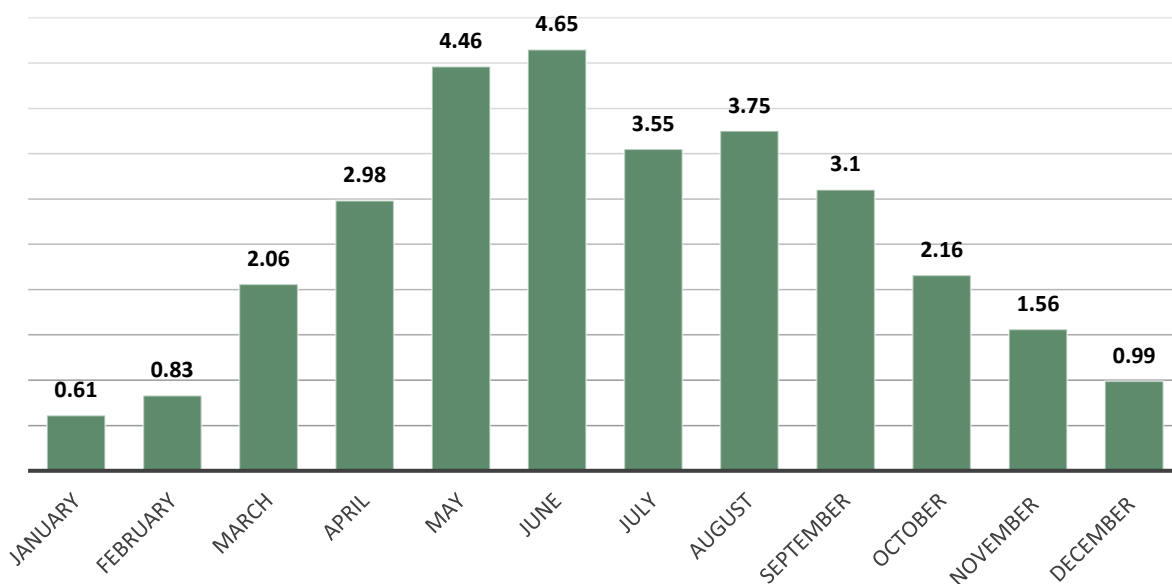
Figure 17: Localized Flooding in Dodge County



Source: Photos courtesy of Dodge County

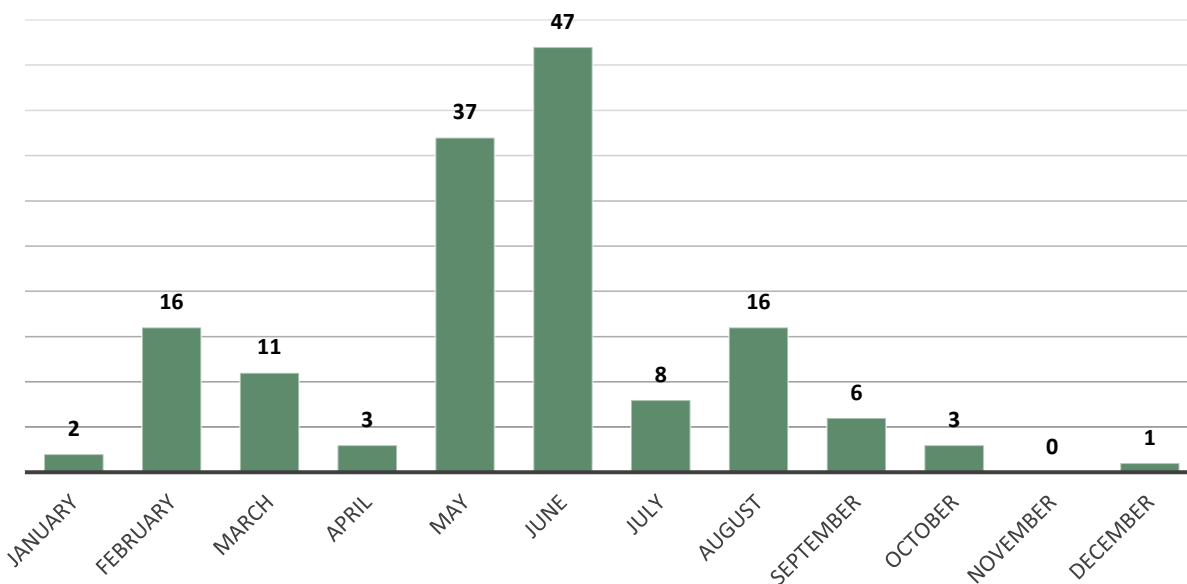
⁵⁹ National Weather Service. 2017. "Flood Safety." <http://www.floodsafety.noaa.gov/index.shtml>.

Figure 18: LPNNRD Average Monthly Precipitation



Source: NCEI, 2019

Figure 19: Monthly Events for Floods/Flash Flood in the LPNNRD



Source: NCEI, 1996-2019

NATIONAL FLOOD INSURANCE PROGRAM (NFIP)

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

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

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

Table 58: NFIP Participants

Jurisdiction	Eligible- Regular Program	Date Current Map	Sanction	Suspension	Rescinded	Participation in NFIP
Abie	-	8/16/2011	8/16/2012	-	-	No
Bellwood	8/16/2011	8/16/2011	-	-	-	Yes
Bruno	1/1/1987	8/16/2011	-	-	-	Yes
David City	8/24/2012	8/16/2011	-	-	-	Yes
Dwight	-	8/16/2011	-	-	1/1/2000	No
Garrison	-	8/16/2011	-	-	-	No
Linwood	1/1/1987	8/16/2011	-	-	-	Yes
Octavia	-	8/16/2011	-	-	-	No
Rising City	2/28/2012	8/16/2011	-	-	3/30/1979	Yes
Surprise	8/16/2011	8/16/2011	-	-	-	Yes
Ulysses	10/31/1983	8/16/2011	-	-	10/31/1983	Yes
Butler County	8/16/2011	8/16/2011	-	-	-	Yes
Fremont	2/1/1979	1/2/2008	-	-	-	Yes
Inglewood	5/4/2007	1/2/2008	-	-	-	Yes
North Bend	3/18/1980	1/2/2008	-	-	-	Yes
Dodge County	8/17/1981	4/17/2020	-	-	-	Yes
Cedar Bluffs	9/24/1984	4/5/2010	-	-	9/24/1984	Yes
Colon	9/21/2010	8/3/2016	-	-	-	Yes
Ithaca	5/1/1987	8/3/2016	-	-	-	Yes
Leshara	4/5/2010	4/5/2010	-	-	-	Yes
Malmo	9/4/1986	4/5/2010	-	-	3/30/1979	Yes
Mead	9/24/1984	8/3/2016	-	-	9/24/1984	Yes
Memphis	-	4/5/2010	4/5/2011	-	-	No
Morse Bluff	-	4/5/2010	4/5/2011	-	-	No
Prague	12/29/2000	4/5/2010	-	-	3/31/1977	Yes
Wahoo	12/1/1977	8/3/2016	-	-	-	Yes
Weston	7/3/1985	8/3/2016	-	-	-	Yes

Section Four: Risk Assessment

Jurisdiction	Eligible-Regular Program	Date Current Map	Sanction	Suspension	Rescinded	Participation in NFIP
Yutan	4/4/1983	4/5/2010	-	-	-	Yes
Saunders County	12/1/1978	8/3/2016	-	-	-	Yes
Lindsay	9/4/1987	4/19/2010	-	-	-	Yes
Newman Grove	7/2/1987	2/4/2005	-	-	-	Yes
Platte Center	2/1/1990	4/19/2010	-	-	-	Yes
Richland	3/4/2014	4/5/2016	-	-	-	Yes
Rogers	9/17/1992	4/5/2016	-	-	-	Yes
Schuyler	3/5/1990	4/5/2016	-	-	-	Yes
Tarnov	-	-	-	-	-	No

Source: Federal Emergency Management Agency, National Flood Insurance Program, 2020

*(L) Indicates Original FIRM by Letter – All Zone A, C, and X; (E) Indicates Entry in Emergency Program - community is part of the Emergency Program and subject to limited coverage.

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, regardless of whether or not a flooding hazard area map has been delineated for the jurisdiction. Jurisdictions are encouraged to initiate activities above the minimum participation requirements, which are described in the Community Rating System (CRS) Coordinator's Manual (FIA-15/2017).⁶⁰ Currently, the City of Fremont is the only jurisdiction in the planning area participating in the CRS program.

Table 59: NFIP Policies in Force and Total Payments

Jurisdiction	Policies In-force	Total Premium (Dollars)	Total Coverage (Dollars)	Total Losses	Total Payments (Dollars)
Abie	N/P	N/A	N/A	N/A	N/A
Bellwood	0	0	0	0	0
Bruno	2	1,289	92,000	0	0
David City	0	0	0	0	0
Dwight	N/P	N/A	N/A	N/A	N/A
Garrison	N/P	N/A	N/A	N/A	N/A
Linwood	0	0	0	4	4,433
Octavia	N/P	N/A	N/A	N/A	N/A
Rising City	2	3,250	274,000	0	0
Surprise	1	530	35,000	0	0
Ulysses	0	0	0	0	0
Butler County	34	30,764	2,559,000	3	83,688
Fremont	820	696,142	129,737,000	528	7,032,301

⁶⁰ Federal Emergency Management Agency. May 2017. "National Flood Insurance Program Community Rating System: Coordinator's Manual FIA-15/2017." Accessed August 2017. <https://www.fema.gov/media-library/assets/documents/8768>.

Jurisdiction	Policies In-force	Total Premium (Dollars)	Total Coverage (Dollars)	Total Losses	Total Payments (Dollars)
Inglewood	28	25,376	2,324,000	15	203,222
North Bend	179	139,629	24,192,000	85	1,003,175
Dodge County	123	120,821	18,078,000	169	1,907,773
Cedar Bluffs	3	1,652	618,000	8	6,326
Colon	1	643	350,000	0	0
Ithaca	5	6,357	392,000	3	40,519
Leshara	3	3,568	426,000	0	0
Malmo	0	0	0	0	0
Mead	0	0	0	0	0
Memphis	N/P	N/A	N/A	N/A	N/A
Morse Bluff	N/P	N/A	N/A	N/A	N/A
Prague	0	0	0	0	0
Wahoo	10	8,169	1,755,000	3	3,600
Weston	0	0	0	0	0
Yutan	1	446	350,000	2	3,759
Saunders County	357	214,351	88,186,000	231	3,873,805
Lindsay	3	4,287	467,000	3	26,690
Newman Grove	8	5,475	540,000	9	66,082
Platte Center	11	10,328	826,000	24	215,811
Richland	0	0	0	0	0
Rogers	10	5,968	593,000	1	0
Schuyler	352	192,068	37,112,000	116	833,488
Tarnov	N/P	N/A	N/A	N/A	N/A
Planning Area Total	1,953	1,471,113	308,906,000	1,204	15,304,672

N/A: Not Applicable; N/P: Not Participate.

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

NFIP REPETITIVE LOSS STRUCTURES

NeDNR was contacted to determine if any existing buildings, infrastructure, or critical facilities are classified as NFIP Repetitive Loss Structures. According to NeDNR, there are nine repetitive loss properties and four severe repetitive flood loss properties located in the planning area as of November 2019.

Table 60: Repetitive Loss and Severe Repetitive Loss Properties

Jurisdiction	Repetitive Loss Properties	Type	Severe Repetitive Loss Properties	Type
Dodge County	4	Single Family	1	Other Non-Residential
Fremont	4	Single Family	3	Single Family
Saunders County	1	Single Family	0	-

Source: NeDNR, November 2019

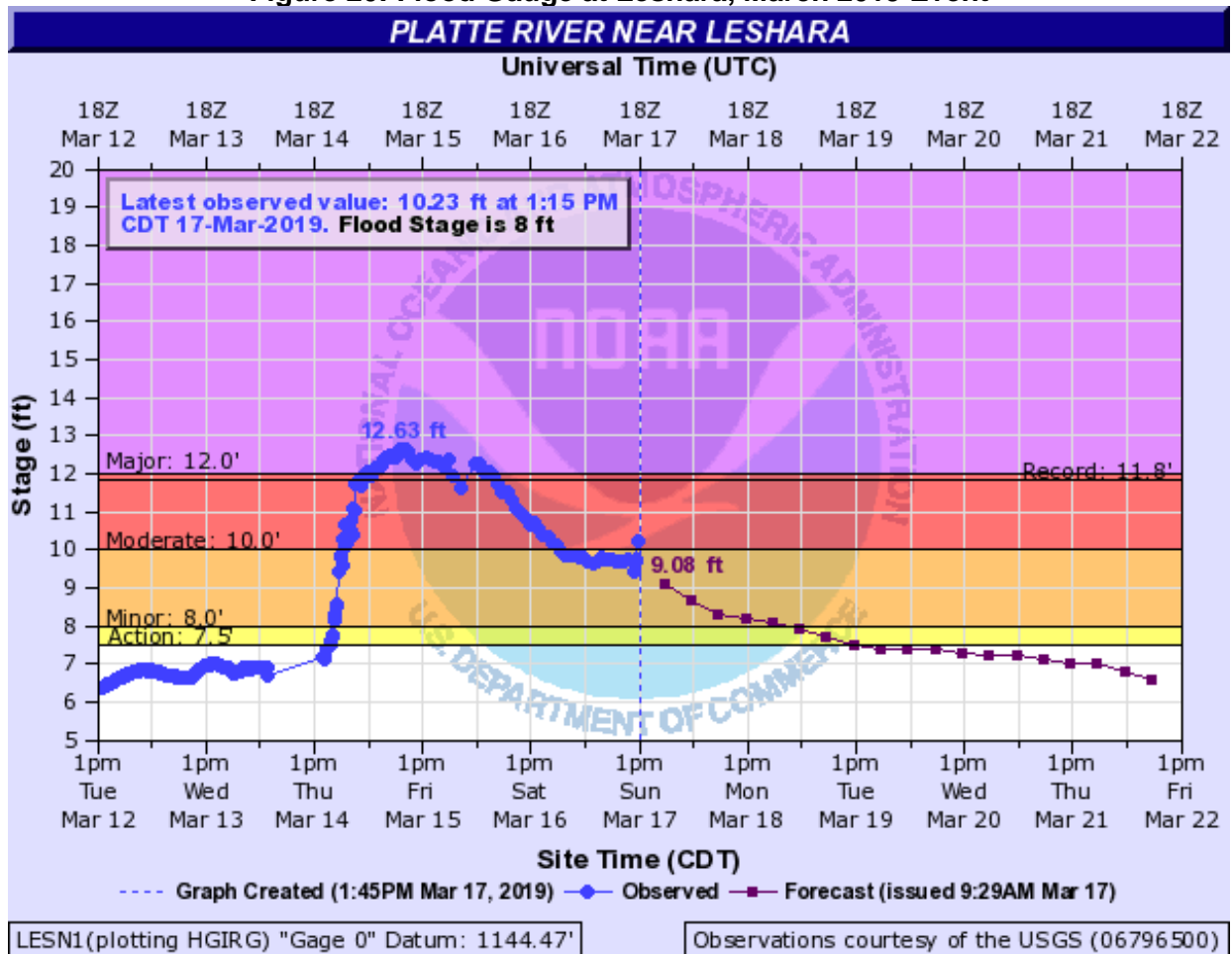
HISTORICAL OCCURRENCES

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, 52 flash flooding events resulted in \$492,500 in property damage, while 98 riverine flooding events caused \$4,518,000 in property damage. USDA RMA data does not distinguish the difference between riverine flooding damages and flash flooding damages. The total crop loss according to the RMA is \$4,955,821.

The March 2019 flood event significantly impacted the entire planning area and most of the eastern side of the State of Nebraska. Winter Storm Ulmer developed on March 12 and slowly moved across the Midwest including Nebraska. Due to heavy precipitation on frozen ground and melting snowpack, numerous water systems were overwhelmed and failed. In other areas, released ice jams destroyed roads, bridges, and levees. Several stream gauges in the planning area reached all-time record levels. The City of Fremont was particularly hard hit, experiencing almost total isolation during the flood event. Numerous communities evacuated residents including Inglewood and all of northern Butler County. In total, 104 cities, 81 counties, and 5 tribal nations in Nebraska received State or Federal Disaster Declarations due to the flood events.

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>.

Figure 20: Flood Gauge at Leshara, March 2019 Event



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 and critical transportation routes across the state were blocked by flood waters or washed out entirely. At least three fatalities occurred across the state during the flood event while the Nebraska National Guard performed dozens of rescues in inundated areas. No fatalities were reported within the LPNDRD 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. During this flood event, several levees within the planning area breached. For more information about these levee failures, refer to the Levee Failure hazard profile.

Section Four: Risk Assessment

FREMONT AND SCHUYLER FLOOD RISK REDUCTION PLAN AND PARCEL LEVEL FLOOD RISK ASSESSMENT

As part of this planning effort, additional funding was requested and allocated through the FEMA Pre-Disaster Mitigation Grant (PDM) program to provide the opportunity for participating communities to complete additional risk assessments for select floodprone properties within interested communities. The Cities of Fremont and Schuyler cost-shared this funding with the NRD to conduct targeted risk assessments for floodprone areas in their communities and their communities' Extraterritorial Jurisdiction (ETJ) as shown on the effective Federal Emergency Management Agency (FEMA) Flood Insurance Rate Map (FIRM). In support of risk assessment objectives of the HMP update and considering the significant impacts of the March 2019 flood event, an in-depth review of selected properties was completed for the purposes of identifying flood risk and flood insurance premium reduction strategies for individual properties at risk of flooding from the Platte River and Elkhorn River.

The overall purpose of this assessment and resulting plan is to identify and prioritize flood risk reduction alternatives on a property by property basis for selected structures in the SFHA. The plan also identifies programmatic actions that can be taken by the communities of Fremont and Schuyler to reduce flood risks and insurance costs for all property owners with floodprone property. Ultimately, this assessment and resulting mitigation actions can be used to both reduce flood damage impacts of future flood events and reduce flood insurance costs for both individual homeowners and the community in general. Findings of the assessment, in conjunction with other ongoing mitigation actions, can be used by Fremont and Schuyler as a planning tool to prioritize flood risk reduction actions within their community. The results of the assessment and relative flooding risk information can also be used as a public engagement tool by the communities to convey relative flood risk information to community residents.

The complete reports for Fremont and Schuyler that detail the results of the assessment and the prioritized flood risk reduction actions can be found in Appendix F and G, respectively.

AVERAGE ANNUAL DAMAGES

The average damage per event estimate was determined based upon NCEI Storm Events Database since 1996 and the number of historical occurrences. This does not include losses from displacement, functional downtime, economic loss, injury, or loss of life. Flooding causes an average of \$208,771 in property damages and \$260,832 in crop losses per year for the planning area.

Table 61: Flood Loss Estimate

Hazard Type	Number of Events ¹	Average Events Per Year	Total Property Loss ¹	Average Annual Property Loss ¹	Total Crop Loss ²	Average Annual Crop Loss ²
Flood Events	150	6	\$5,010,500	\$208,771	\$4,955,821	\$ 260,832

Source: 1 Indicates data is from NCEI (January 1996 to February 2019); 2 Indicates data is from USDA RMA (2000 to 2018)

PROBABILITY

The NCEI reports 98 flooding and 52 flash flooding events for a total of 150 events from January 1996 to February 2019. Based on the historic record and reported incidents by participating communities, there is a 100 percent probability that flooding will occur annually in the planning area.

REGIONAL VULNERABILITIES

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

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

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

- 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

To analyze parcels and populations located in the floodplain, 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. A summary of the results of this analysis for the three-county planning area is provided in the following table. Specific jurisdictional parcel improvements in the floodplain can be found in the corresponding community profile in Section Seven.

Dodge County has the largest percentage of parcel improvements located in the floodplain at over 25 percent, which indicates that Dodge County, particularly along waterways, has the greatest flood vulnerability to people and infrastructure. Dodge County also contributes the largest value of improvements in the floodplain for the planning area with well over 50 percent of the value across three counties. This means that significant flood events in the planning area would impact Dodge County's economy the most as structures and roadways are damaged.

Section Four: Risk Assessment

Table 62: Planning Area Parcel Improvements and Value in the Floodplain

COUNTY	NUMBER OF IMPROVEMENTS	TOTAL IMPROVEMENT VALUE	NUMBER OF IMPROVEMENTS IN FLOODPLAIN	PERCENTAGE OF IMPROVEMENTS IN FLOODPLAIN	VALUE OF IMPROVEMENTS IN FLOODPLAIN
Butler County	3,990	\$345,421,345	709	17.8%	\$58,794,730
Dodge County	14,187	\$1,781,978,465	3,631	25.6%	\$472,942,983
Saunders County	9,468	\$1,298,193,590	2,076	21.9%	\$372,295,208
Planning Area Total	27,645	\$3,425,593,400	6,416	23.2%	\$904,032,921

Source: GIS Workshop/Saunders County Assessor, 2019

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

Table 63: 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 or areas accessible via dirt/gravel roads 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 railways would impact commercial transportation of goods
Built Environment	-Building may be damaged
Infrastructure	-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)

GRASS/WILDFIRE

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

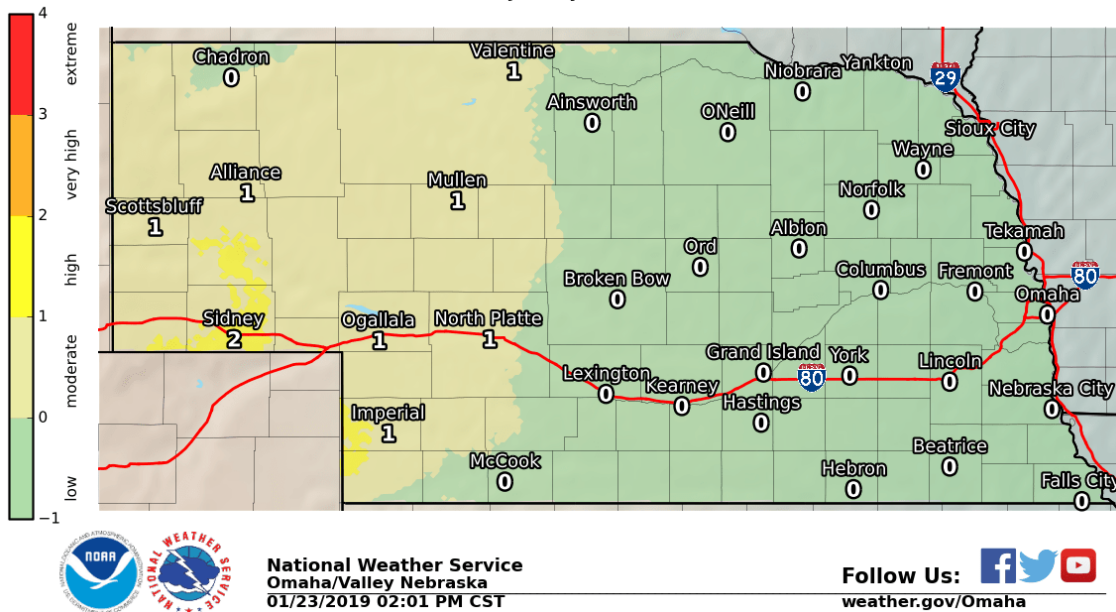
Lightning starts approximately 10,000 forest fires each year, yet ninety percent of forest fires are started by humans.

~National Park Service

Wildfires are a growing hazard in most regions of the United States, posing a threat to life and property, particularly where native ecosystems meet urban developed areas 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.

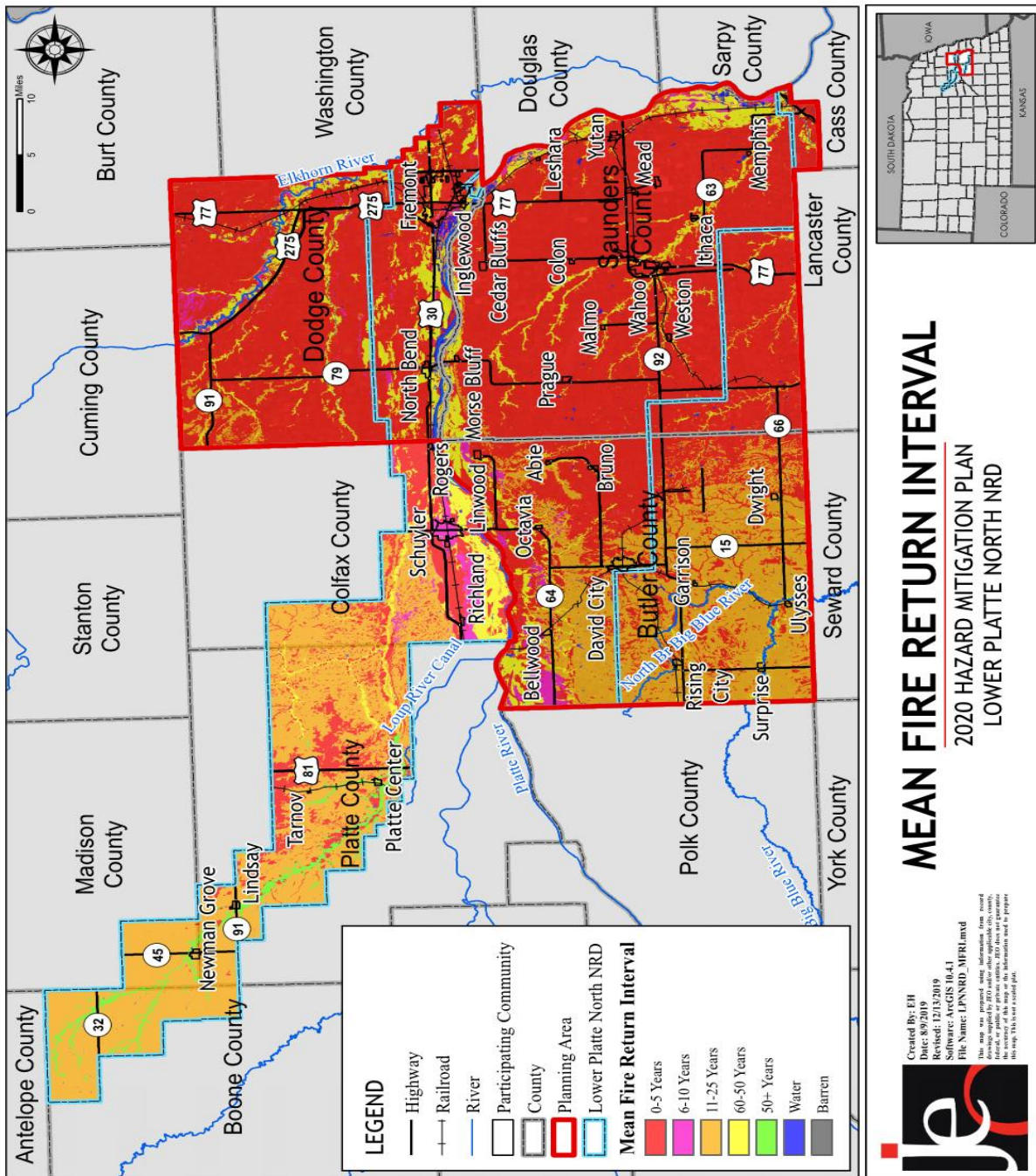
Wildfires are characterized in terms of their physical properties including topography, weather, and fuels. Wildfire behavior is often complex and variably dependent on factors such as fuel type, moisture content in the fuel, humidity, wind speed, topography, geographic location, ambient temperature,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

Figure 21: Rangeland Fire Danger
Valid: January 23, 2019



⁶¹ National Weather Service. January 2019. "Nebraska Fire Danger Map." <https://www.weather.gov/oax/fire>.

Figure 22: Mean Fire Return Interval



Source: USGS LANDFIRE Database⁶²

The figure above 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.

⁶² United States Geological Survey. 2019. "Landfire Data Distribution Site." <https://landfire.cr.usgs.gov/viewer/viewer.html>.

LOCATION

As the number of reported wildfires by county indicates, wildfire is a threat throughout the planning area, but especially in southeastern Nebraska. Saunders County has reported the greatest number of fires and greatest amount of acres burned.

Table 64: Reported Wildfires by County

County	Reported Wildfires	Acres Burned
Butler County	216	1,920
Dodge County	191	383
Saunders County	377	2,203
Total	784	4,506

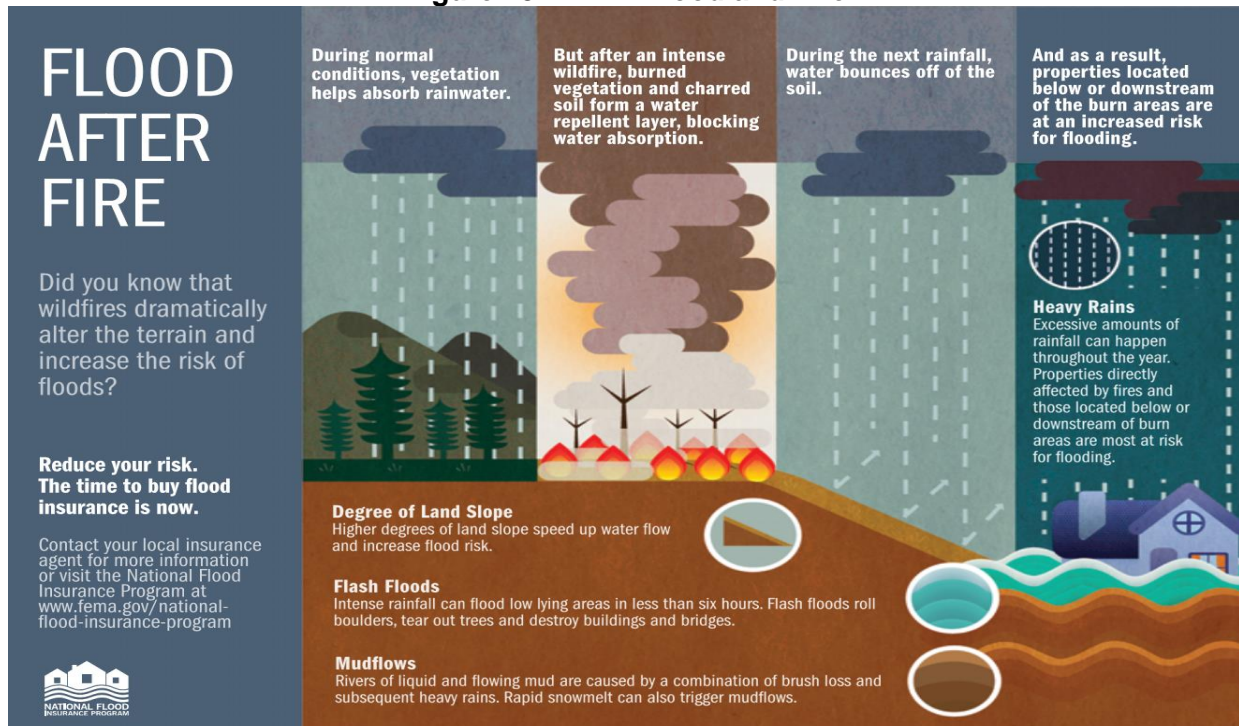
Source: Nebraska Forest Service, 2010-2018⁶³

EXTENT

Figure 24 illustrates the number of wildfires by cause in the planning area from 2010 to 2018, which burned 4,506 acres in total. In total, there were 784 reported wildfires in the planning area.

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. 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 23: FEMA Flood and Fire



Source: FEMA, 2018⁶⁴

⁶³ Nebraska Forest Service. 2000-2014. "Fire Incident Type Summary." Data Files 2010-2018.

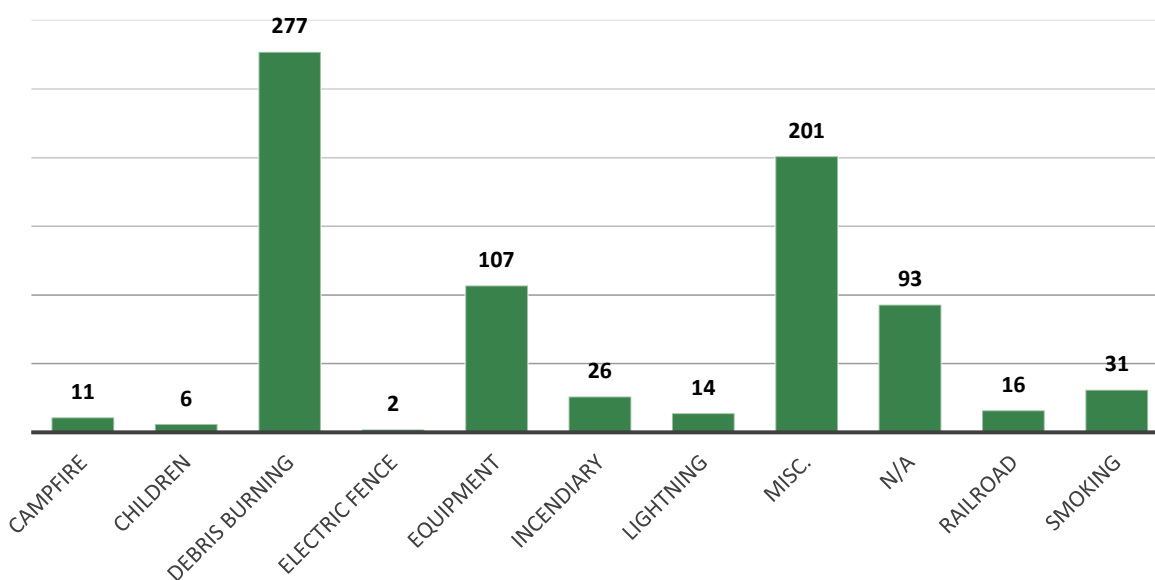
⁶⁴ Federal Emergency Management Agency. 2018. "Flood After Fire." <https://www.fema.gov/flood-after-fire>.

HISTORICAL OCCURRENCES

For the planning area, 25 fire departments reported a total of 784 wildfires, according to the National Forest Service (NFS), from 2000 to 2018. Most fires occurred in 2017 (Figure 25). The reported events burned 4,506 acres. While the RMA lists no damages from fire in the planning area, the NFS reported \$15,781 in crop loss.

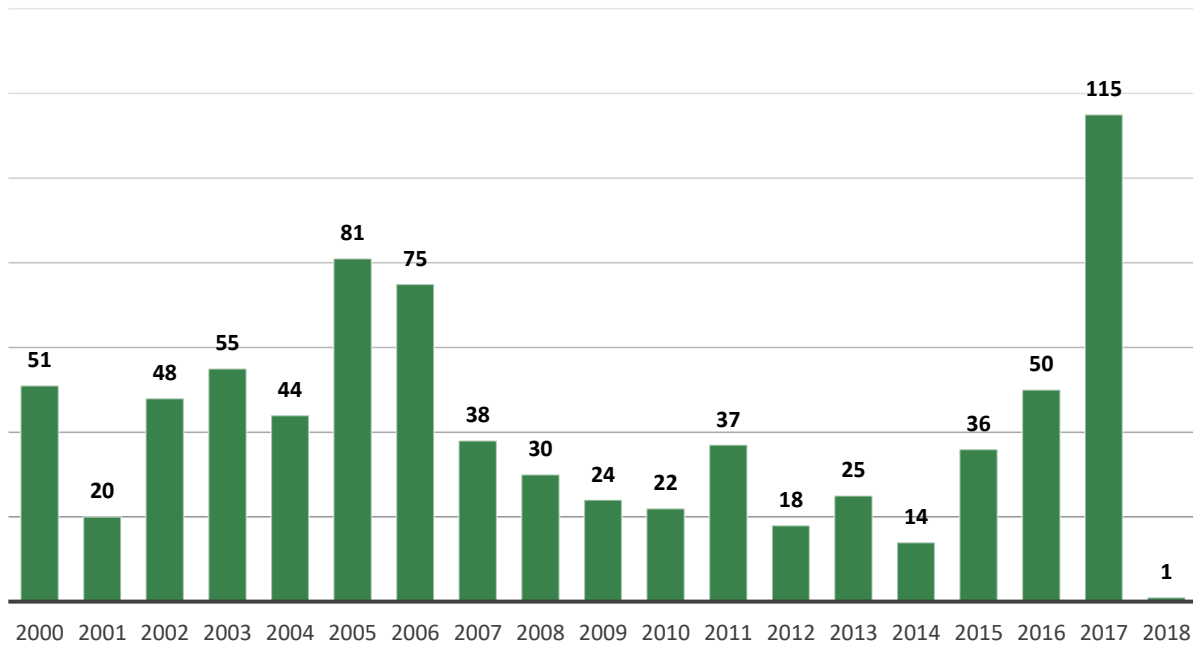
The majority of wildfires in the planning area were caused by debris burning, with miscellaneous reasons being the second most prevalent cause of wildfire in the planning area (Figure 24). Wildfires in the planning area have range in acres burned, with an average event burning six acres.

Figure 24: Wildfires by Cause in the Planning Area



Source: Nebraska Forest Service, 2000-2018

Figure 25: Number of Wildfires by Year in the Planning Area



Source: Nebraska Forest Service, 2000-2018

AVERAGE ANNUAL DAMAGES

The average damage per event estimate was determined based upon records from the Nebraska Forest Service Wildfires Database from 2010 to 2018 and number of historical occurrences. This does not include losses from displacement, functional downtime, economic loss, injury, or loss of life. During this period, 784 wildfires burned 4,506 acres and caused \$15,781 in crop damage in the planning area. These fires also caused three injuries and two fatalities.

Table 65: Wildfire Loss Estimation

Hazard Type	Number of Events	Events Per Year	Average Acres Per Fire	Total Property Loss	Total Crop Loss	Average Annual Crop Loss
Grass/Wildfires	784	41	6	4,506 acres	\$15,781	\$1,753

Source: Nebraska Forest Service, 2010-2018

Table 66: Wildfire Threats

Hazard Type	Injuries	Fatalities	Homes Threatened or Destroyed	Other Structures Threatened or Destroyed
Grass/Wildfires	3	2	37	24

Source: Nebraska Forest Service, 2010-2018

PROBABILITY

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

REGIONAL VULNERABILITIES

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

Table 67: Regional Wildfire Vulnerabilities

Sector	Vulnerability
People	<ul style="list-style-type: none"> -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	<ul style="list-style-type: none"> -Damages to buildings and property can cause significant losses to business owners -Loss of businesses
Built Environment	<ul style="list-style-type: none"> -Property damages
Infrastructure	<ul style="list-style-type: none"> -Damage to power lines and utility structures
Critical Facilities	<ul style="list-style-type: none"> -Risk of damages
Other	<ul style="list-style-type: none"> -Increase chance of landslides and erosion -May lead to poor water quality -Post fire, flash flooding events may be exacerbated

HAIL

Hail is commonly associated with severe thunderstorms, and this association makes hail just as unpredictable. Additionally, hail events in thunderstorms often occur in series, with one area having the potential to be hit multiple times in one day. Severe thunderstorms usually occur in the evening during the spring and can include heavy rain, hail, lightning, and high winds. Hail can destroy property and crops with sheer force, as some hail stones can fall at speeds up to 100 mph.

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

LOCATION

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

EXTENT

The Tornado and Storm Research Organization (TORRO) scale is used to classify hailstones and provides some detail related to the potential impacts from hail. Table 68 outlines the TORRO Hail Scale.

Table 68: TORRO Hail Scale

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

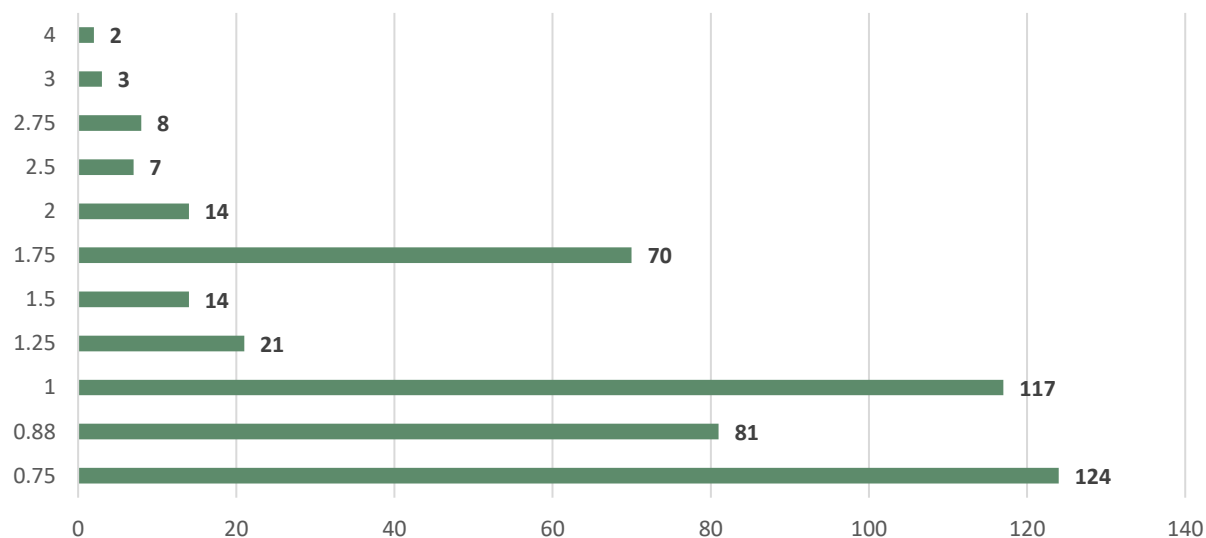
Source: TORRO, 2017⁶⁵

⁶⁵ Tornado and Storm Research Organization. 2017. "Hail Scale." <http://www.torro.org.uk/hscale.php>.

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Of the 461 hail events reported across the planning area, the average hailstone size was 1.2 inches. Events of this magnitude correlate to an H3 and H4 classification. It is reasonable to expect H3 and H4 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 two H10 hail events (>4 inches) during the period of record. The following figure shows hail events based on the size of the hail.

Figure 26: Hail Events by Magnitude



Source: NCEI, 1996-2019

HISTORICAL OCCURRENCES

The NCEI reports events as they occur in each community. A single hail event can affect multiple communities and counties at a time; the NCEI reports these large scale, multi-county events as separate events. The result is a single hail event covering a large portion of the planning area could be reported by the NCEI as several events. The NCEI reports a total of 461 hail events in the planning area between January 1996 and February 2019. These events were responsible for \$14,251,000 in property damages and \$22,118,481 in crop damages. These events resulted in no injuries or fatalities. Several hail events in 2018 damaged property across the planning area.

Specific hail events from NCEI reported by each community are listed in *Section Seven: Community Profiles*.

AVERAGE ANNUAL DAMAGES

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

Table 69: Hail Loss Estimate

Hazard Type	Number of Events ¹	Average Events Per Year	Total Property Loss ¹	Average Annual Property Loss ¹	Total Crop Loss ²	Average Annual Crop Loss ²
Hail Events	461	19	\$14,251,000	\$593,792	\$22,118,482	\$1,164,131

Source: 1 Indicates data is from NCEI (January 1996 to February 2019); 2 Indicates data is from USDA RMA (2000 to 2018)

PROBABILITY

Based on historic records and reported events, hail events are likely to occur several times annually within the planning area. The NCEI reported 461 hail events between 1996 and 2019, or approximately 19 hail occurrences per year.

REGIONAL VULNERABILITIES

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

Table 70: Regional Hail Vulnerabilities

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

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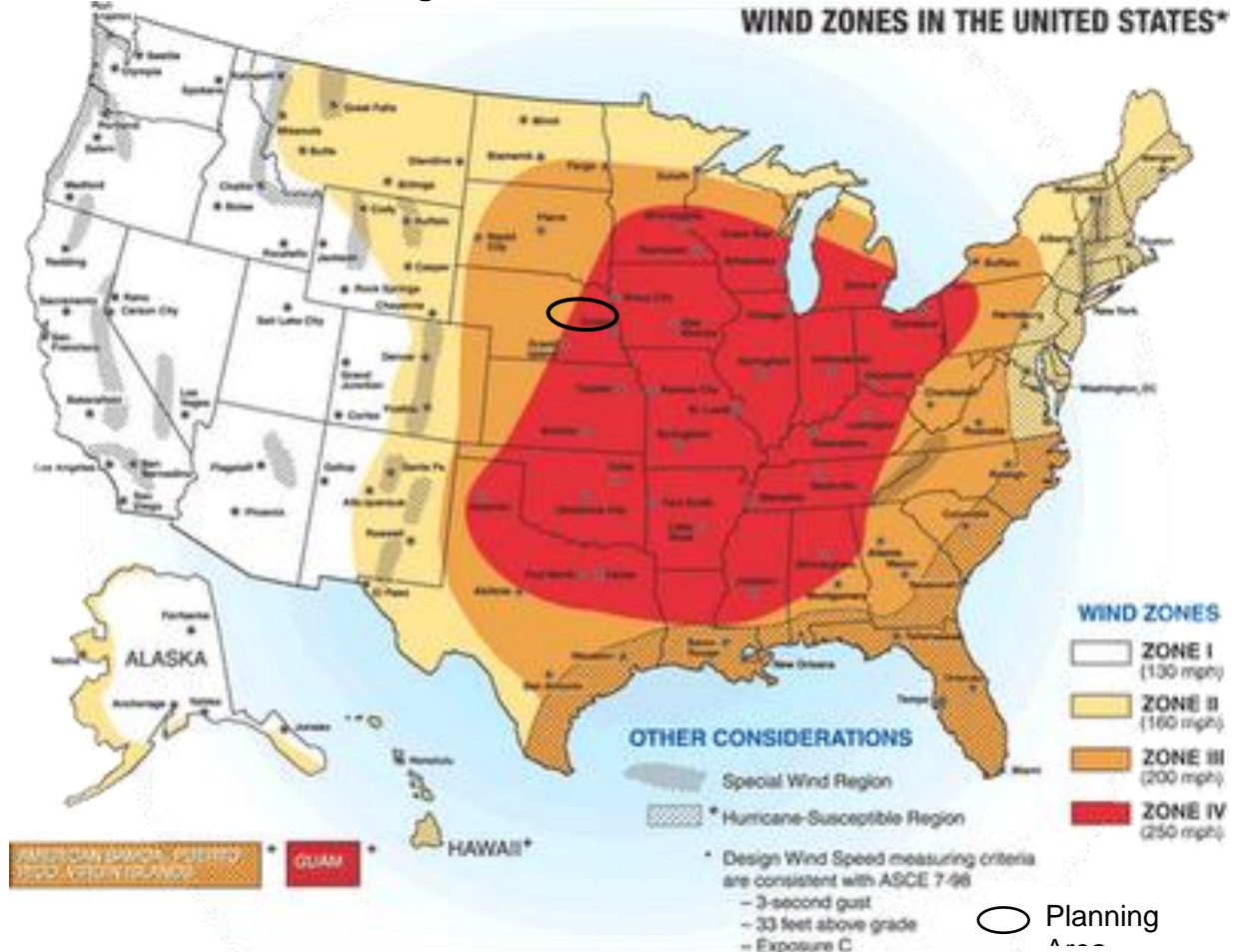
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HIGH WINDS

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

The National Weather Service (NWS) defines high winds as sustained wind speeds of 40 mph or greater lasting for one hour or longer, or winds of 58 mph or greater for any duration.⁶⁶ The NWS issues High Wind Advisories when there are sustained winds of 25 to 39 miles per hour and/or gusts to 57 mph. Figure 27 shows the wind zones in the United States. The wind zones are based on the maximum wind speeds that can occur from a tornado or hurricane event. The planning area is located in Zone III/IV which has maximum winds of 250 mph equivalent to an EF5 tornado.

Figure 27: Wind Zones in the U.S.



Source: FEMA, 2016

⁶⁶ National Weather Service. 2017. "Glossary." <http://w1.weather.gov/glossary/index.php?letter=h>.

LOCATION

High winds commonly occur throughout the planning area.

EXTENT

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

Table 71: Beaufort Wind Ranking

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

Source: Storm Prediction Center, 2017⁶⁷

Using the NCEI reported events, the most common high wind event is a level 9. The reported high wind events had an average of 48mph winds. It is likely that this level of event will occur annually.

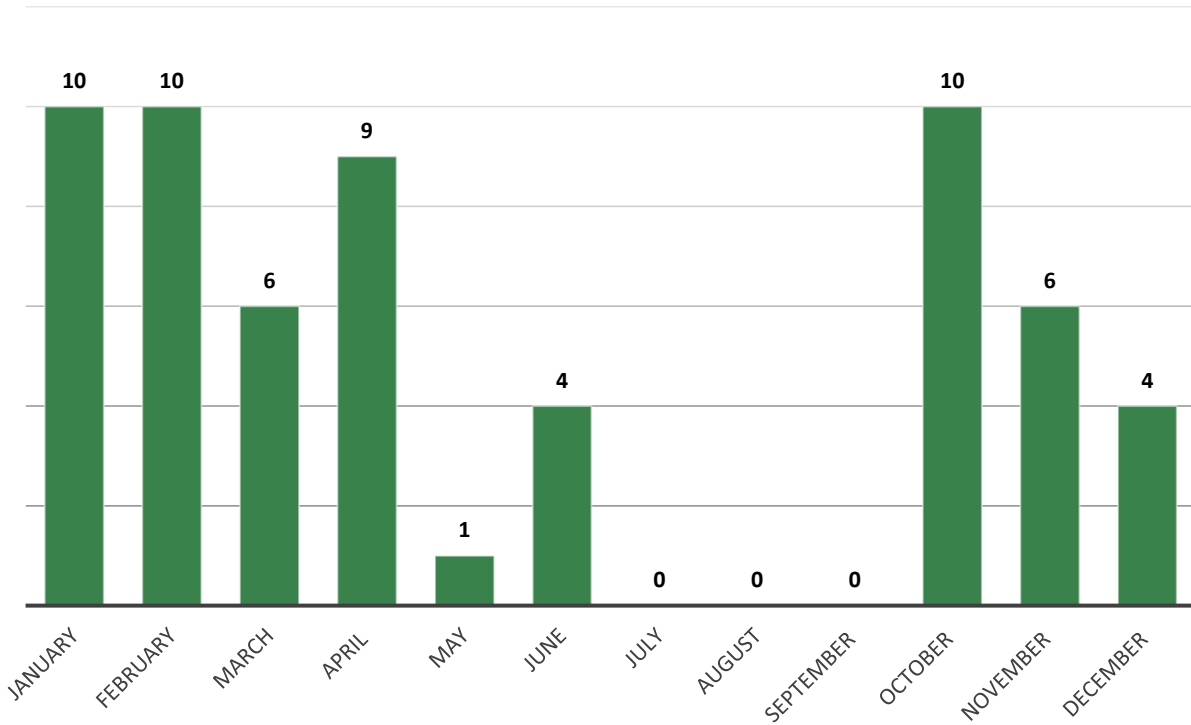
HISTORICAL OCCURRENCES

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

⁶⁷ Storm Prediction Center: National Oceanic and Atmospheric Administration. 1805. "Beaufort Wind Scale." <http://www.spc.noaa.gov/faq/tornado/beaufort.html>.

There were 60 high wind events that occurred between January 1996 and February 2019. As seen in Figure 28, most high wind events occur in the spring and winter months. No high wind events led to injuries or fatalities. The events identified by the NCEI are listed in *Section Seven: Community Profiles* for each county.

Figure 28: High Wind Events by Month



Source: NCEI, 1996-2019

AVERAGE ANNUAL DAMAGES

The average damage per event estimate was determined based upon NCEI Storm Events Database since 1996 and number of historical occurrences. This does not include losses from displacement, functional downtime, economic loss, injury, or loss of life. It is estimated that high wind events can cause an average of \$208 per year in property damage, and an average of \$157,765 per year in crop damage for the planning area.

Table 72: High Wind Loss Estimate

Hazard Type	Number Events ¹	Average Events Per Year	Total Property Loss ¹	Average Annual Property Loss ¹	Total Crop Loss ²	Average Annual Crop Loss ²
High Winds	60	3	\$5,000	\$208	\$3,628,258	\$190,961

Source: 1 Indicates data is from NCEI (January 1996 to February 2019); 2 Indicates data is from USDA RMA (2000 to 2018)

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PROBABILITY

Based on historical records and reported events, it is likely that high winds will occur within the planning area annually. For the period examined, there were 60 reported high wind events reported.

REGIONAL VULNERABILITIES

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

Table 73: Regional High Wind Vulnerabilities

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

LEVEE FAILURE

According to FEMA:

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

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

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

LOCATION

There are 19 levees located across the LPNNRD’s jurisdiction. Most of the levees are located in the three-county planning area. See Figure 29: Leveed Area in the Planning Area for information on levee protected areas. Beyond the USACE’s National Levee Database, there is no known comprehensive list of levees that exists in the planning area especially for private agricultural levees. Thus, it is not possible at this time to document the location of non-federal levees, the areas they protect, nor the potential impact of these levees.

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Table 74: Levees Located within LPNRRD

Name	Sponsor	Location	River	Length (miles)	Protected Area (sq. miles)	FEMA Accredited	USACE Status
Ames/Lake Timberwood Levee*	Undefined	Ames, Dodge County	Platte River	1.03	0.17	No	Not Enrolled
Ames Diking and Drainage District**	Ames Diking District	Morse Bluff, Dodge County	Platte River	3.2	2.66	No	Active
Clear Creek	Undefined	Venice, Saunders County	Clear Creek	0.36	0.16	No	Not Enrolled
Clear Creek – Platte River RB	Lower Platte North NRD	Wann, Saunders County	Platte River	12.25	28.04	No	Active
Cotterell Diking and Drainage District Levee***	Undefined	North Bend, Dodge County	Platte River	3.14	0.45	No	Not Enrolled
Farmland, Fremont, Railroad Levee****	City of Fremont	Fremont, Dodge County	Platte River	2.50	Unknown	No	Not Enrolled
Hooper – Elkhorn RB	Village of Hooper	Hooper – Elkhorn RB	Elkhorn River	2.08	0.40	Provisionally Accredited Levee	Active
Leshara Drainage District	Undefined	Leshara, Saunders County	Platte River	4.09	2.49	No	Not Enrolled
Morse Bluff Drainage District	Undefined	Morse Bluff, Saunders County	Platte River	2.03	1.29	No	Not Enrolled
North Bend Levee*****	Undefined	North Bend, Dodge County	Platte River	5.59	2.85	No	Not Enrolled
Platte Valley Drainage District	Undefined	Valley, Saunders County	Platte River	6.36	6.36	No	Not Enrolled
Platte Valley Drainage District 2	Undefined	Leshara, Saunders County	Platte River	0.75	0.12	No	Not Enrolled
Schuyler – Lost Creek & Platte River LB	Platte Valley Drainage District	Schuyler, Colfax County	Lost Creek	1.88	7.82	No	Inactive
Schuyler – Shell Creek RB	City of Schuyler	Schuyler, Colfax County	Shell Creek	2.18	0.67	Yes	Active

Name	Sponsor	Location	River	Length (miles)	Protected Area (sq. miles)	FEMA Accredited	USACE Status
Scribner – Pebble Creek LB & Elkhorn River RB	City of Scribner	Scribner, Dodge County	Pebble Creek / Elkhorn River	5.44	1.01	Yes	Active
Skull Creek Levee 1	Undefined	Rogers, Saunders County	Skull Creek	1.79	1.87	No	Not Enrolled
Skull Creek Levee 2	Undefined	Rogers, Saunders County	Skull Creek	2.04	1.85	No	Not Enrolled
Union Levee*****	Burlington Northern Sante Fe Railroad / Papio Missouri River NRD	Leshara, Saunders County	Platte River	13.25	29.19	No	Active
Woodcliff	Undefined	Fremont, Saunders County	Platte River	1.87	0.37	No	Not Enrolled

Source: National Levee Database and Local Planning Team

*Ames in the National Levee Database

**Ames Diking – Platte River LB in the National Levee Database

***Platte River Levee 1 in the National Levee Database

****Levee is not in the National Levee Database. Location is from the Fremont local planning team, not mapped

*****Platte River Levee 3 in the National Levee Database

*****Valley – Union and No Name Dikes System – Platte River LB in the National Levee Database

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, and the USACE. In 1972, the Ames Diking – Platte River LB levee breached due to an ice jam. Then in 1978, it overtopped again because of an ice jam. After the March 2019 flood event, USACE reported 41 breaches and numerous damages to federal and non-federal levees across the State of Nebraska. The failure of these structures significantly impacted subsequent flooding in neighboring communities. For a complete event narrative, refer to the Flooding hazard profile. As reported by USACE and the Planning Team, several levees in Dodge County and Saunders County were breached due to ice jams. The breaches are listed below:⁶⁸

- In Dodge County, Morse Bluff's Ames Diking – Platte River LB (NF): The Ames Diking – Platte River Left Bank Levee System was damaged during the 2019 Flood Event, leading to the Levee Sponsor submitting a Public Law (PL) 84-99 Rehabilitation Assistance

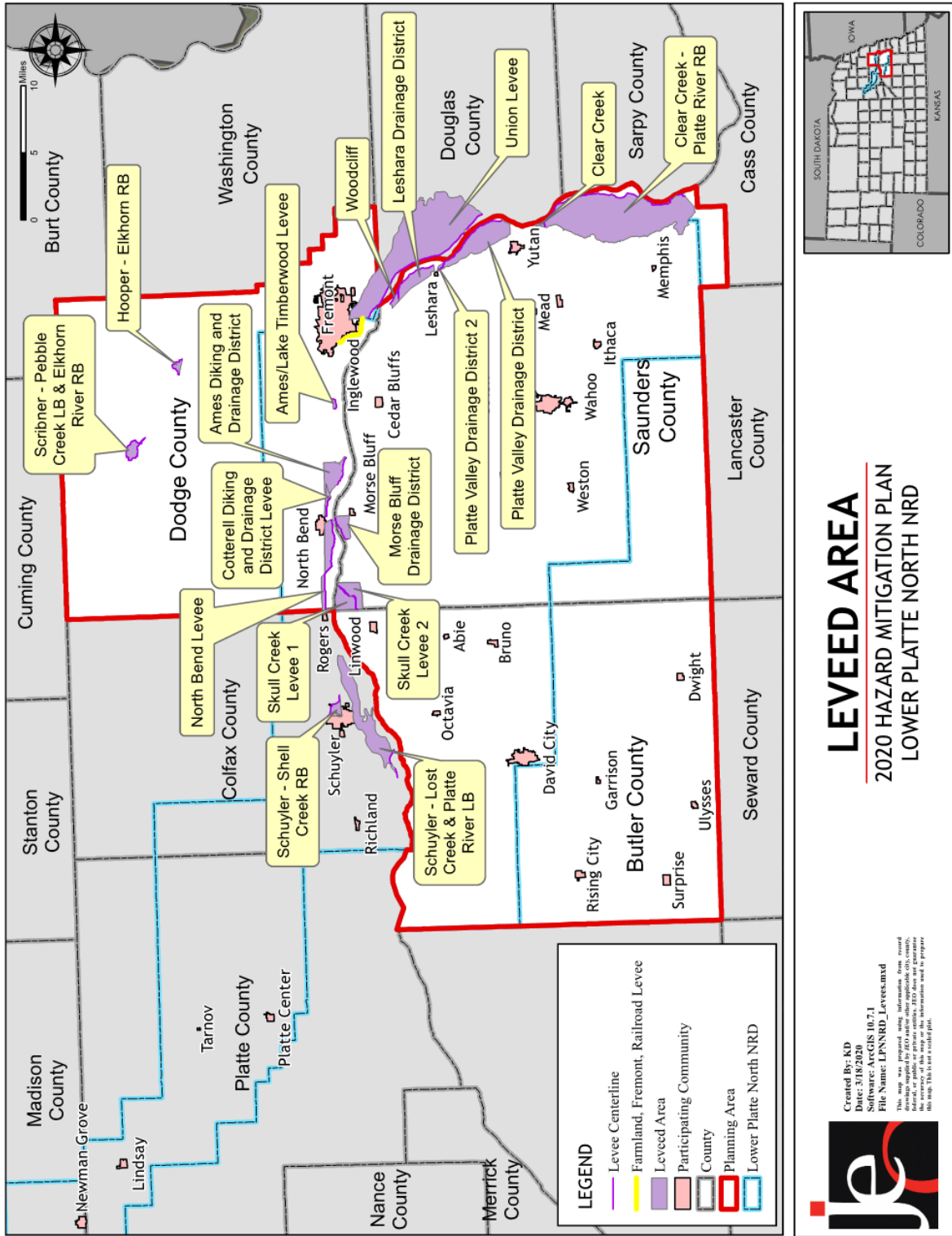
⁶⁸ U.S. Army Corps of Engineers. 2019. "Omaha District System Restoration Team: Levee System Status as of October 3, 2019." <https://www.nwo.usace.army.mil/Omaha-District-System-Restoration-Team/>.

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request to the US Army Corps of Engineers – Omaha District. Contractors are currently repairing the levee system to its authorized level of flood risk management.

- In Dodge County, Leshara's Valley - Union and No Name Dike System – Platte River LB (NF) experienced significant damage during the 2019 flood event. This led to one breach and substantial other damage occurring throughout the Levee System. A priority breach impacting the property and infrastructure behind the Union and No Name Levee System was identified for initial repairs. This construction contract was awarded on March 21, 2019. These initial repairs were directed at stopping the flow from the Platte River into the area behind the levee system and providing an incremental level of flood risk management. Follow-on actions to further repair the levee system and provide additional flood risk management are being coordinated within the PL 84-99 program. As of March 4, 2020, levee designs are being finalized, and construction notices will be released soon.
- In Saunders County, Wann's Clear Creek Platte River RB breached four times during the major flooding of 2019.

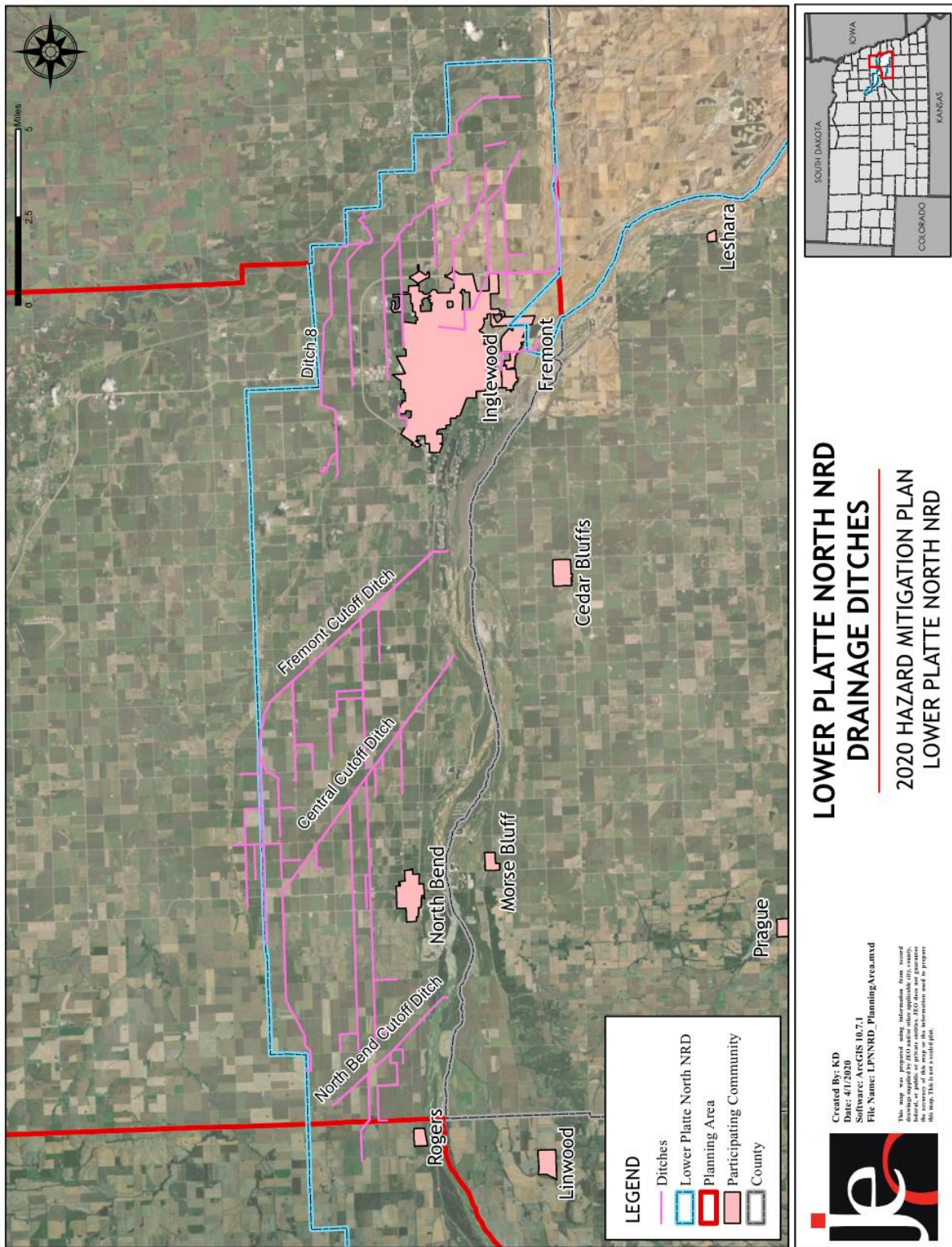
Figure 29: Leveed Area in the Planning Area



LEVEED AREA
 2020 HAZARD MITIGATION PLAN
 LOWER PLATTE NORTH NRD


 Created By: KD
 Date: 3/18/2020
 Software: ArcGIS 10.7.1
 File Name: LPNNRD_Levees.mxd
 This map was prepared using information from records and data provided by participating communities. The accuracy of this map and the information used to prepare it is not guaranteed.

Figure 30: Drainage Ditches in the Planning Area



POTENTIAL LOSSES

To determine potential losses from levee failure, a parcel inventory from the levee breach area was utilized. Based on the nature of the assessor's parcel data, it is not possible to do a true structural inventory with structure-specific impacts. Instead, inundated parcels were used as a proxy for structural data. The following tables show the number of parcels included in the leveed areas within the planning area. A total of 3,516 structures are at risk within the leveed areas, which are valued at \$2,111,933,000. Importantly, the Farmland, Fremont, Railroad Levee is not in the federal database, and therefore does not have a levee delineated area. Therefore, its potential losses cannot be calculated and it is not included in the following table. In future planning efforts, the Farmland, Fremont, Railroad Levee should be reassessed.

Table 75: Potential Losses in Levee Breach Area

Name	Structures at Risk	Property Value	People at Risk
Ames/Lake Timberwood Levee	23	\$8,310,000	43
Ames Diking and Drainage District	54	\$16,500,000	92
Clear Creek	1	\$314,000	0
Clear Creek – Platte River RB	579	\$262,000,000	481
Cotterell Diking and Drainage District Levee	0	\$0	0
Hooper – Elkhorn RB	334	\$58,200,000	549
Leshara Drainage District	18	\$5,770,000	14
Morse Bluff Drainage District	35	\$30,200,000	25
North Bend Levee	160	\$313,000,000	88
Platte Valley Drainage District	16	\$5,680,000	30
Platte Valley Drainage District	1	\$629,000	4
Schuyler – Lost Creek & Platte River LB	118	\$12,700,000	135
Schuyler – Shell Creek RB	257	\$52,100,00	620
Scribner – Pebble Creek LB & Elkhorn River RB	557	\$105,000,000	846
Skull Creek Levee 1	4	\$1,580,000	7
Skull Creek Levee 2	5	\$2,050,000	15
Union Levee	1,354	\$1,290,000,000	6,254
Woodcliff	0	\$0	0
Total	3,516	\$2,111,933,000	9,203

Source: National Levee Database

EXTENT

The 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.

Table 76: 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

PROBABILITY

Three levees within the planning area (Ames Diking, Leshara' s Valley – Union and No Name Dike System, and Clear Creek Levee Systems) were breached during the 2019 March flood event. Since there have been eight levee failure incidents in 120 years, the probability of levee failure is 7%. It should be noted that until permanent repairs are made to damaged levee systems, there is an increased risk of failure. As outlined in the historical occurrences section, the USACE is currently overseeing repairs and working with contractors to complete permanent repairs as soon as practical.

REGIONAL VULNERABILITIES

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

Table 77: Regional Levee Failure Vulnerabilities

Sector	Vulnerability
People	-Those living in federal levee protected areas -Residents with low mobility or with no access to a vehicle may have more difficulty evacuating
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

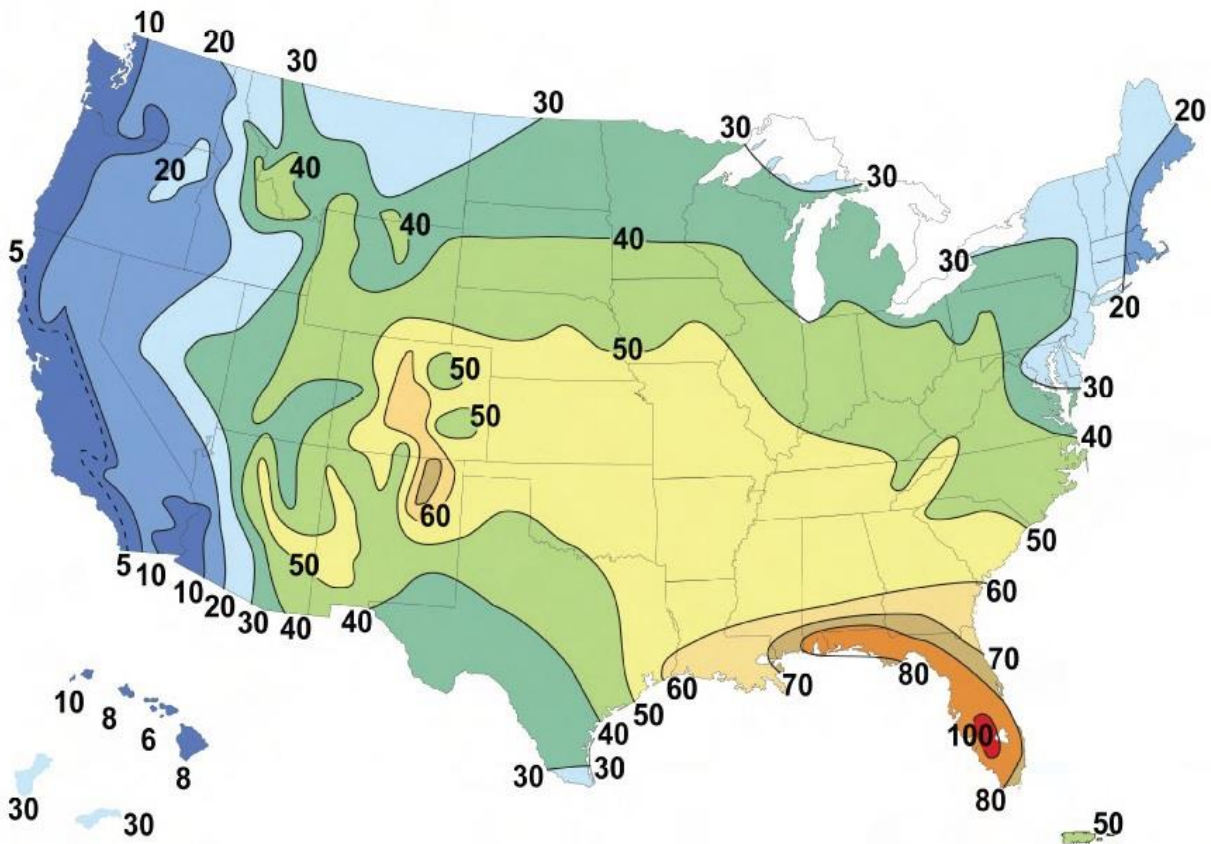
SEVERE THUNDERSTORMS

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 31 displays the average number of days with thunderstorms across the country each year. The planning area experiences an average of 40 to 50 thunderstorms over the course of one year.

Figure 31: Average Number of Thunderstorms



Source: NWS, 2017⁶⁹

LOCATION

The entire planning area is at risk of severe thunderstorms.

EXTENT

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

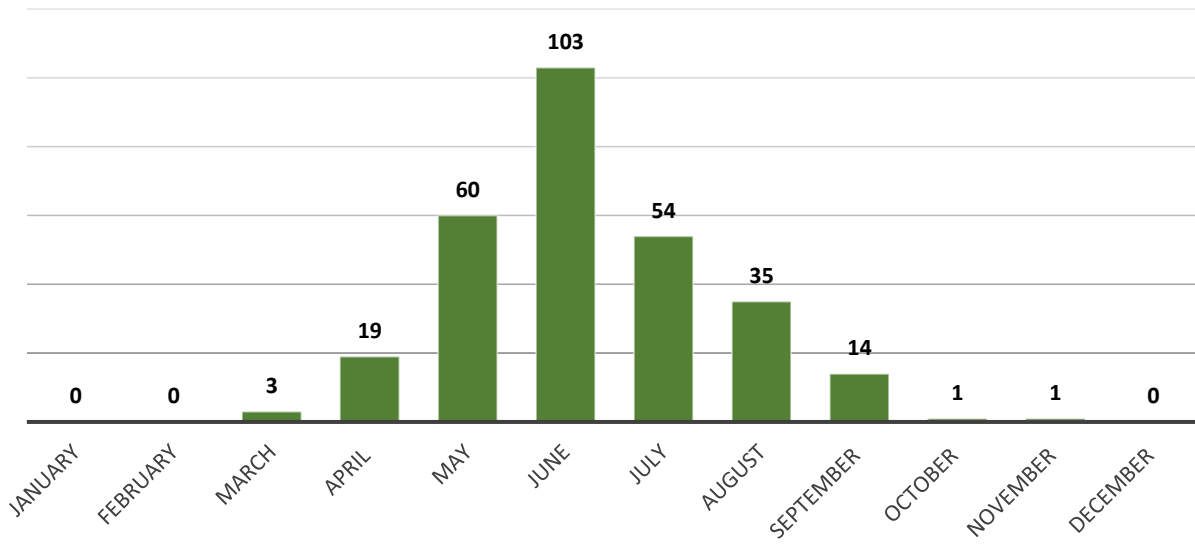
The NWS defines a thunderstorm as severe if it contains hail that is one inch in diameter or capable of winds gusts of 58 mph or higher.

HISTORICAL OCCURRENCES

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

⁶⁹ National Weather Service. 2017. "Introduction to Thunderstorms." http://www.srh.noaa.gov/jetstream/tstorms/tstorms_intro.html.

Figure 32: Thunderstorm Wind Events by Month



Source: NCEI, 1996-2019

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 290 thunderstorm wind, seven heavy rain, and six lightning events in the planning area from January 1996 to February 2019 for a total of 303 thunderstorm events. Severe thunderstorm events were responsible for \$1,153,000 in property damages. The USDA RMA data does not specify severe thunderstorms as a cause of loss, however heavy rains which may be associated with severe thunderstorms caused \$29,140,836 in crop damages. Seventeen injuries were reported in association with these storms.

AVERAGE ANNUAL DAMAGES

The average damage per event estimate was determined based upon recorded damages from NCEI Storm Events Database since 1996 and number of historical occurrences. This does not include losses from displacement, functional downtime, economic loss, injury, or loss of life. Severe thunderstorms and lightning cause an average of \$28,391 per year in property damages.

Table 78: Severe Thunderstorms Loss Estimate

Hazard Type	Number of Events ¹	Average Events Per Year	Total Property Loss ¹	Average Annual Property Loss	Total Crop Loss ²	Average Annual Crop Loss
Thunderstorm Wind	290	12.	\$850,000	\$35,417	N/A	N/A
Heavy Rain	7	0.3	\$0	\$0	\$29,140,836	\$1,533,728
Lightning	6	0.3	\$303,000	\$12,625	N/A	N/A
Total	303	13	\$1,153,000	\$48,042	\$29,140,836	\$1,533,728

Source: 1 Indicates data is from NCEI (January 1996 to February 2019); 2 Indicates data is from USDA RMA (2000 to 2018)

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PROBABILITY

Based on historical records and reported events, severe thunderstorms are likely to occur on an annual basis. The NCEI reported 303 severe thunderstorm events between 1996 and 2019, resulting in 100 percent chance annually for thunderstorms.

REGIONAL VULNERABILITIES

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

Table 79: Regional 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 risk of injury and damage to their property if the mobile home is not anchored properly
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
Infrastructure	<ul style="list-style-type: none">-High winds and lightning can down power lines and cause power outages-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

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

Along with snow and ice storm events, extreme cold is dangerous to the well-being of people and animals. What constitutes extreme cold varies from region to region but is generally accepted as temperatures that are significantly lower than the average low temperature. For the planning area, the coldest months of the year are January, February, and December. The average low temperature for these months is all below freezing (average low for the three months is 13.5°F). The average high temperatures for the months of January, February, and December are near 39°F.⁷⁰

FREEZING RAIN

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

BLIZZARDS

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

LOCATION

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

EXTENT

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

⁷⁰ High Plains Regional Climate Center. 2019. "Monthly Climate Normals 1981-2010." <http://climod.unl.edu/>.

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Figure 33: SPIA Index

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	

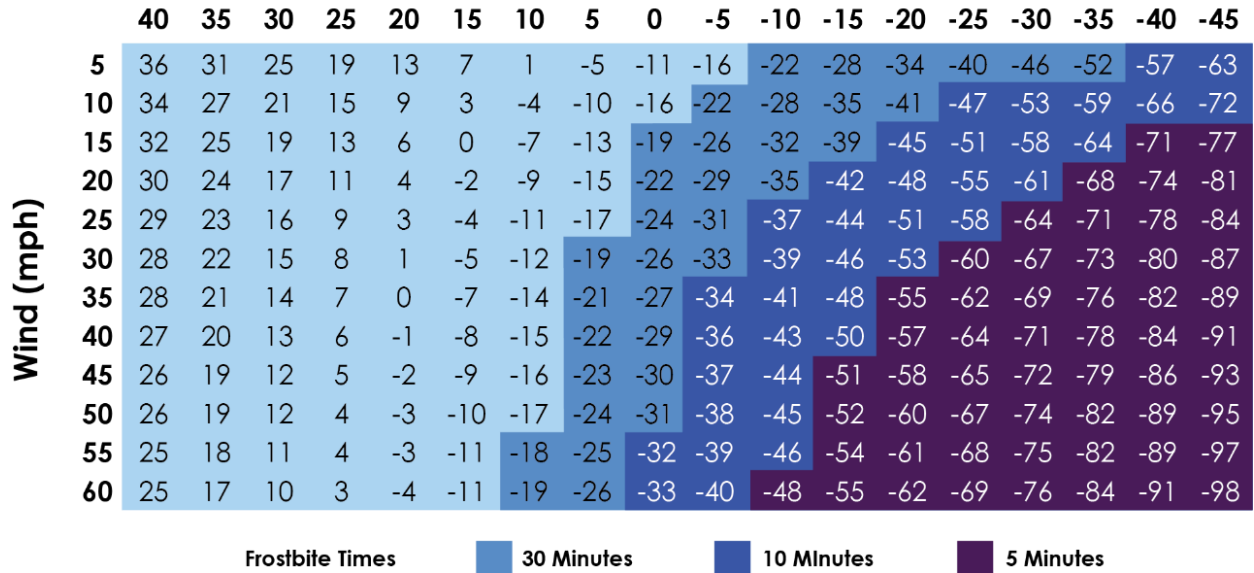
(Categories of damage are based upon combinations of precipitation totals, temperatures and wind speeds/directions.)

Source: SPIA-Index, 2017⁷¹

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.

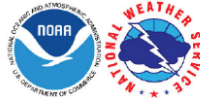
⁷¹ SPIA-Index. 2009. "Sperry-Piltz Ice Accumulation Index." Accessed June 2017. <http://www.spia-index.com/index.php>.

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



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

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

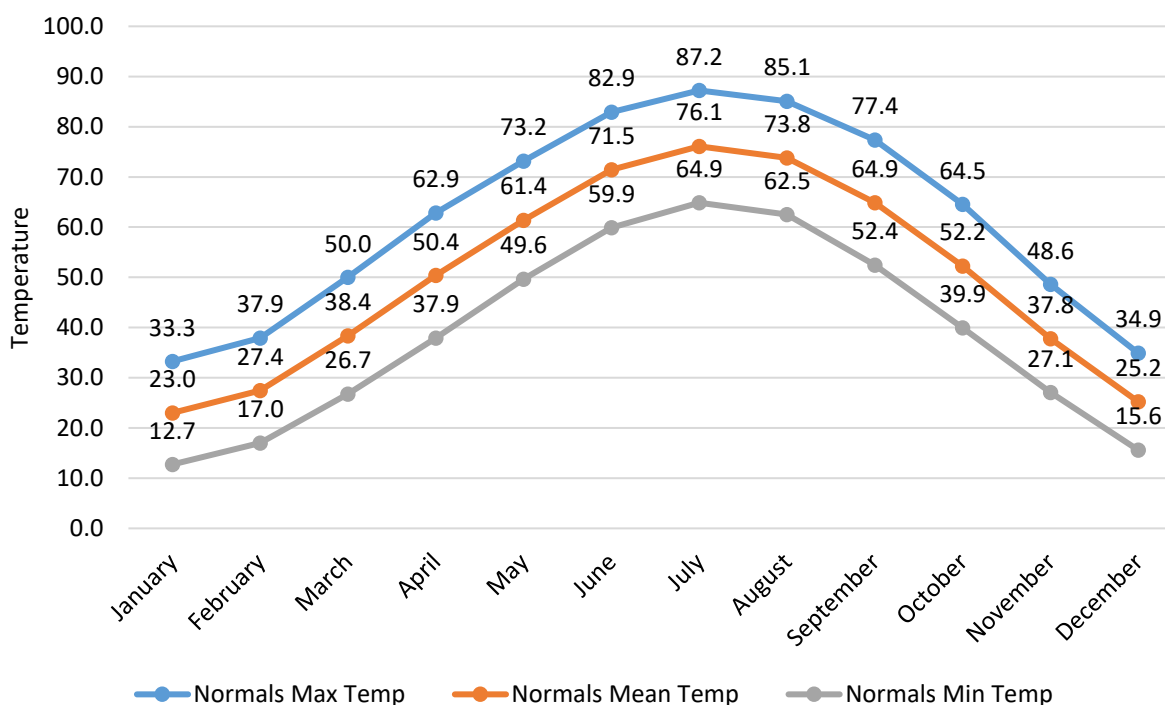


Source: NWS, 2017⁷²

⁷² National Weather Service. 2001. "Wind Chill Chart." http://www.nws.noaa.gov/om/cold/wind_chill.shtml.

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Figure 35: Monthly Climate Normals Temperature (1981-2010)



Source: NCEI, 2019

HISTORICAL OCCURRENCES

Due to the regional scale of severe winter storms, the NCEI reports events as they occur in each county. According to the NCEI, there were a combined 224 severe winter storm events for the planning area from January 1996 to February 2019. These recorded events caused a total of \$3,000,000 in property damages and \$1,195,961 in crop damages. According to the NCEI, one fatality was reported in 2003 from severe winter storms. Ice accumulation was not reported.

Additional information for these events from NCEI and as reported by each community can be found in the appropriate *Community Profile*.

AVERAGE ANNUAL DAMAGES

The average damage per event estimate was determined based upon NCEI Storm Events Database since 1996 and includes aggregated calculations for each of the six types of winter weather as provided in the database. This does not include losses from displacement, functional downtime, economic loss, injury, or loss of life. Severe winter storms have caused an average of \$125,000 per year in property damage for the planning area.

Table 80: Severe Winter Storm Loss Estimate

Hazard Type	Number of Events ¹	Average Events Per Year ¹	Total Property Loss ¹	Average Annual Property Loss ¹	Total Crop Loss ²	Average Annual Crop Loss ²
Blizzard	27	1	\$0	\$0	\$1,195,961	\$62,945
Heavy Snow	14	0.5	\$3,000,000	\$125,000		
Ice Storm	8	0.4	\$0	\$0		

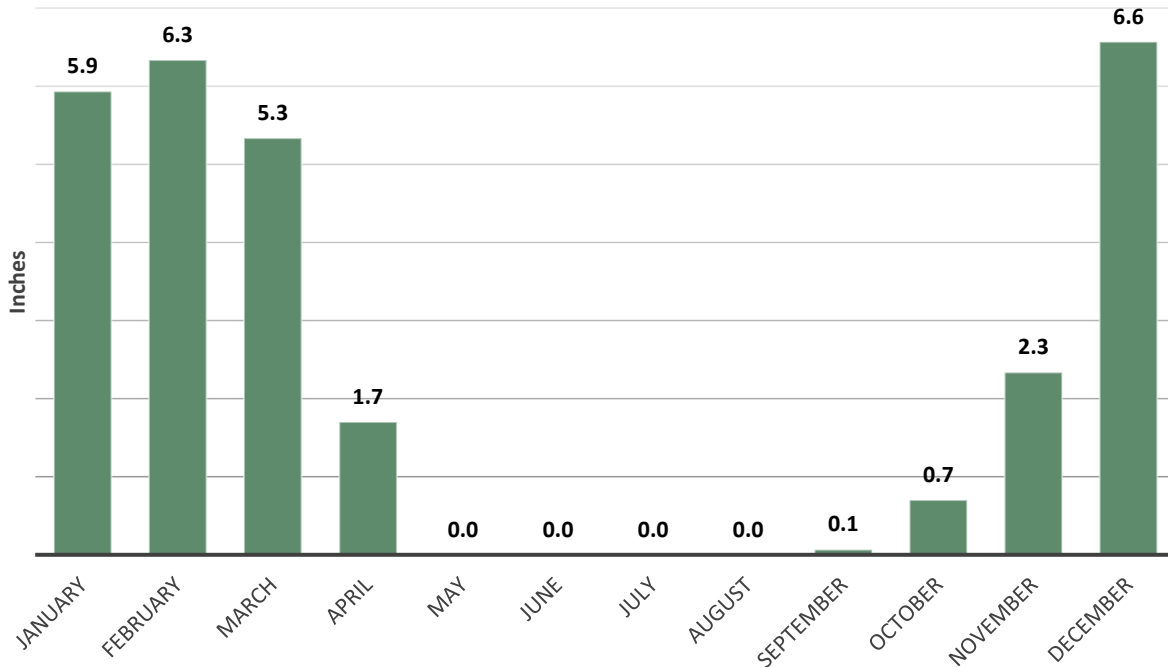
Hazard Type	Number of Events ¹	Average Events Per Year ¹	Total Property Loss ¹	Average Annual Property Loss ¹	Total Crop Loss ²	Average Annual Crop Loss ²
Winter Storm	131	6	\$0	\$0		
Winter Weather	31	1.3	\$0	\$0		
Extreme Cold/Wind Chill	13	1	\$0	\$0		
Severe Winter Storms	224	9	\$3,000,000	\$125,000	\$1,195,961	\$62,945

Source: 1 Indicates data is from NCEI (January 1996 to February 2019); 2 Indicates data is from USDA RMA (2000 to 2018)

PROBABILITY

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

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



Source: High Plains Regional Climate Center, 2019

REGIONAL VULNERABILITIES

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

Table 81: 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 are at risk to power outages, impassable roads, and other damages

TERRORISM/CIVIL DISORDER

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

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

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

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

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

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

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

- A terrorist *incident* is a violent act or an act dangerous to human life, in violation of the criminal laws of the United States, or of any state, to intimidate or coerce a government, the civilian population, or any segment thereof, in furtherance of political or social objectives.

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- Terrorism *prevention* is a documented instance in which a violent act by a known or suspected terrorist group or individual with the means and a proven propensity for violence is successfully interdicted through investigative activity.

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

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

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

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

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

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

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

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

- Agriculture and Food – Department of Agriculture; Food and Drug Administration
- Banking and Finance – Department of the Treasury
- Communications – Department of Homeland Security
- Defense Industrial Base – Department of Defense
- Energy – Department of Energy
- Government Facilities – Department of Homeland Security

- Information Technology – Department of Homeland Security
- National Monuments and Icons – Department of the Interior
- Postal and Shipping – Transportation Security Administration
- Healthcare and Public Health – Department of Health and Human Services
- Transportation Systems – Transportation Security Administration; U.S. Coast Guard
- Water – Environmental Protection Agency

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

The Department of Homeland Security and its affiliated agencies are responsible for disseminating any information regarding terrorist activities in the country. The system in place is the National Terrorism Advisory System (NTAS). In 2011, NTAS replaced the Homeland Security Advisory System (HSAS) which was the color-coded system put in place after the September 11th attacks by Presidential Directive 5 and 8 in March of 2002.

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

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

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

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

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

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

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

LOCATION

Civil disorder or terrorism can occur throughout the entire planning area. Urban areas are more likely to see protesters, while rural areas may experience environmental justice protesters. Local concerns are primarily related to agro-terrorism, tampering with water supplies, or school violence.

EXTENT

Terrorist attacks can vary greatly in scale and magnitude, depending on the location of the attack, number of protesters, and reason for unrest.

HISTORICAL OCCURRENCES

Previous accounts of terrorism in the planning area were gathered from the Global Terrorism Database, maintained by the University of Maryland and the National Consortium for the Study of Terrorism and Responses to Terrorism (START). This database contains information for over 140,000 terrorist attacks. According to this database, there have been no terrorist incidents in the planning area between 1970 - 2017.⁷³

AVERAGE ANNUAL DAMAGES

The average damage per event estimate was determined based upon the START Global Terrorism Database information since 1970. This does not include losses from displacement, functional downtime, or economic loss. If a terrorist event were to occur damages would likely be minor (<\$1 million).

PROBABILITY

Given that there have been no incidences in the planning area, the annual probability for terrorism in the planning area has a less than 0.01 percent chance of occurring during any given year. This does not indicate that a terrorist event will never occur within the planning area, only that the likelihood of such an event is incredibly low.

REGIONAL VULNERABILITIES

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

Table 82: Regional Terrorism Vulnerabilities

Sector	Vulnerability
People	-Police officers and first responders at risk of injury or death -Protestors and civilians at risk of injury or death
Economic	-Damaged business can cause loss of revenue and loss of income for workers -Agricultural attacks could cause significant economic losses for the region -Severe civil disorder events are often accompanied by looting -Risk of violence in an area can reduce income flowing into and out of that area
Built Environment	-Targeted buildings may sustain heavy damage -Public property may be at risk of damage
Infrastructure	-Water supply, power plants, utilities all at risk of damage
Critical Facilities	-Police stations and governmental offices are at higher risk -Public property including signs, community art, or public park facilities may be at risk to damage

⁷³ National Consortium for the Study of Terrorism and Responses to Terrorism (START). 2016. Global Terrorism Database [Data file]. Retrieved from <https://www.start.umd.edu/gtd>.

TORNADOES

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

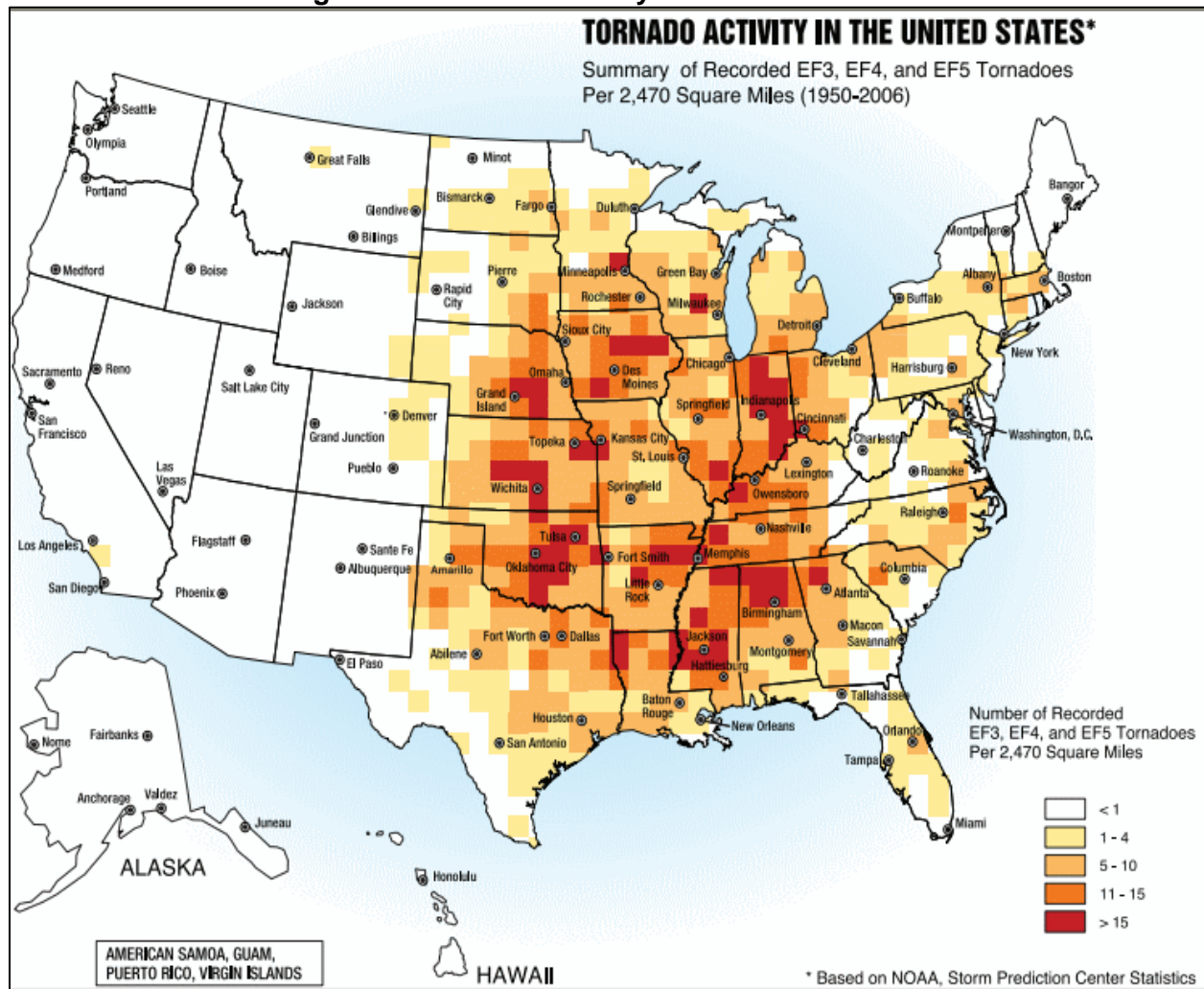
- There must be a microscale rotating area of wind, ranging in size from a few feet to a few miles wide;
- The rotating wind, or vortex, must be attached to a convective cloud base and must be in contact with the ground; and,
- The spinning vortex of air must have caused enough damage to be classified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

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

Nebraska is ranked fifth in the nation for tornado frequency with an annual average of 57 tornadoes between 1991 to 2010.⁷⁴ The following figure shows the tornado activity in the United States as a summary of recorded EF3, EF4, and EF5 tornadoes per 2,470 square miles from 1950-2006.

⁷⁴ National Centers for Environmental Information. 2013. “U.S. Tornado Climatology.” <https://www.ncdc.noaa.gov/climate-information/extreme-events/us-tornado-climatology>.

Figure 37: Tornado Activity in the United States



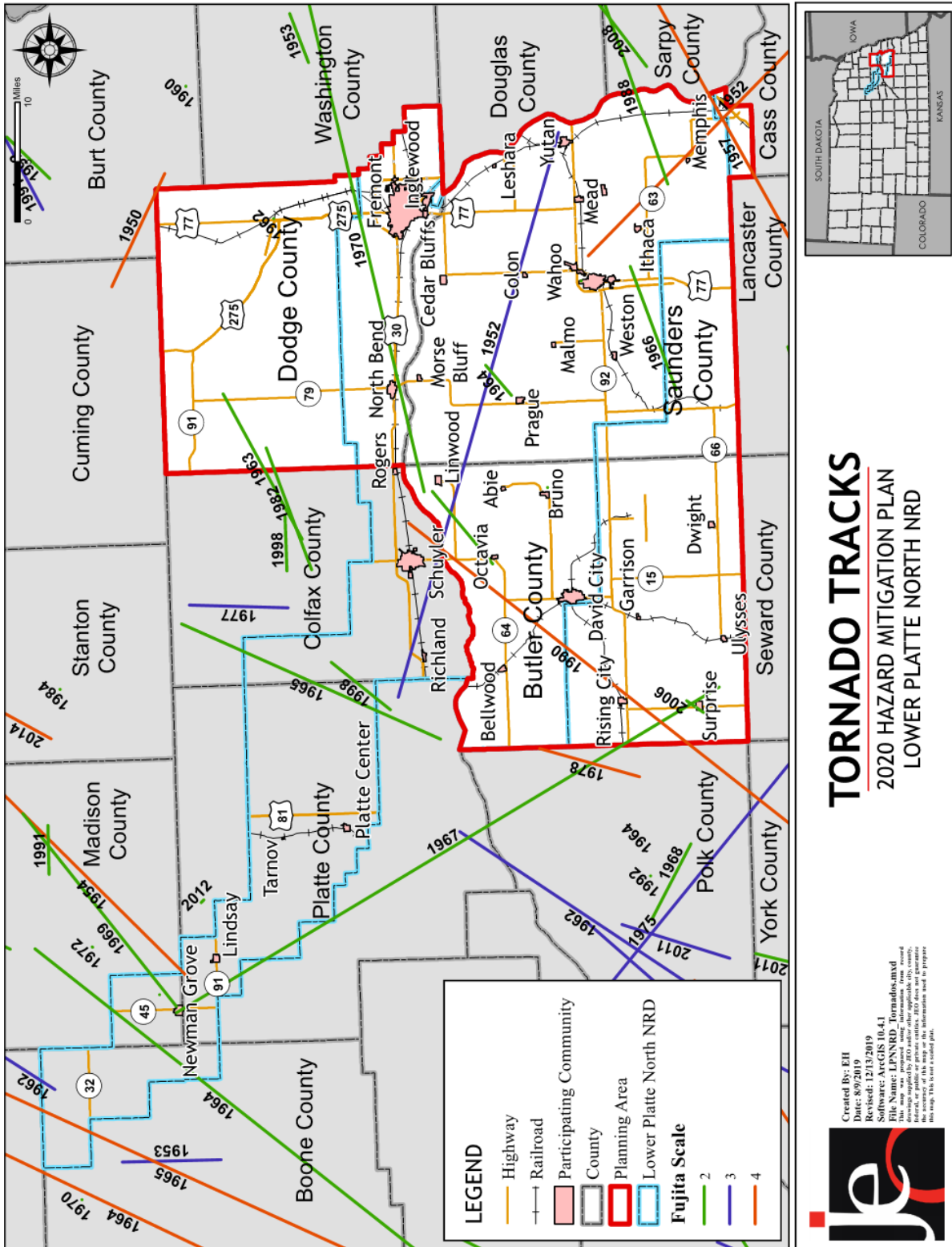
Source: FEMA, 2008⁷⁵

LOCATION

Tornadoes can occur anywhere in the planning area. Impacts of tornadoes will be felt most in densely populated areas. The following map shows the historical track locations across the region from 1950 to 2017 according to the Midwestern Regional Climate Center. Note that this map shows tornado tracks both within or that cross into the boundaries of the Lower Platte North NRD, including the surrounding planning area.

⁷⁵ Federal Emergency Management Agency. August 2008. "Taking Shelter From the Storm: Building a Safe Room for Your Home or Small Business, 3rd edition."

Figure 38: Historic Tornado Tracks



EXTENT

After a tornado passes through an area, an official rating category is determined, which provides a common benchmark that allows comparisons to be made between different tornadoes. The magnitude of tornadoes is measured by the Enhanced Fujita Scale. The Enhanced Fujita Scale does not measure tornadoes by their size or width, but rather the amount of damage caused to human-built structures and trees. The Enhanced Fujita Scale replaced the Fujita Scale in 2007. The enhanced scale classifies EF0-EF5 damage as determined by engineers and meteorologists across 28 different types of damage indicators, including different types of building and tree damage. To establish a rating, engineers and meteorologists examine the damage, analyze the ground-swirl patterns, review damage imagery, collect media reports, and sometimes utilize photogrammetry and videogrammetry. Based on the most severe damage to any well-built frame house, or any comparable damage as determined by an engineer, an EF-Scale number is assigned to the tornado. Table 83 and Table 84 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.⁷⁶

Table 83: Enhanced Fujita Scale

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

Source: NOAA; FEMA

⁷⁶ 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 84: 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 home (MHSW)	17	Low-rise (1-4 story) bldg.
4	Double-wide mobile home	18	Mid-rise (5-20 story) bldg.
5	Apartment, condo, townhouse (3 stories or less)	19	High-rise (over 20 stories)
6	Motel	20	Institutional bldg. (hospital, govt. or university)
7	Masonry apartment or motel	21	Metal building system
8	Small retail bldg. (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
12	Large, isolated ("big box") retail bldg.	26	Free-standing pole (light, flag, luminary)
13	Automobile showroom	27	Tree - hardwood
14	Automotive service building	28	Tree - softwood

Source: NOAA; FEMA

Based on the historic record, it is most likely that tornadoes that occur within the planning area will be of EF0 strength. Of the 38 reported events, nine were EF1.

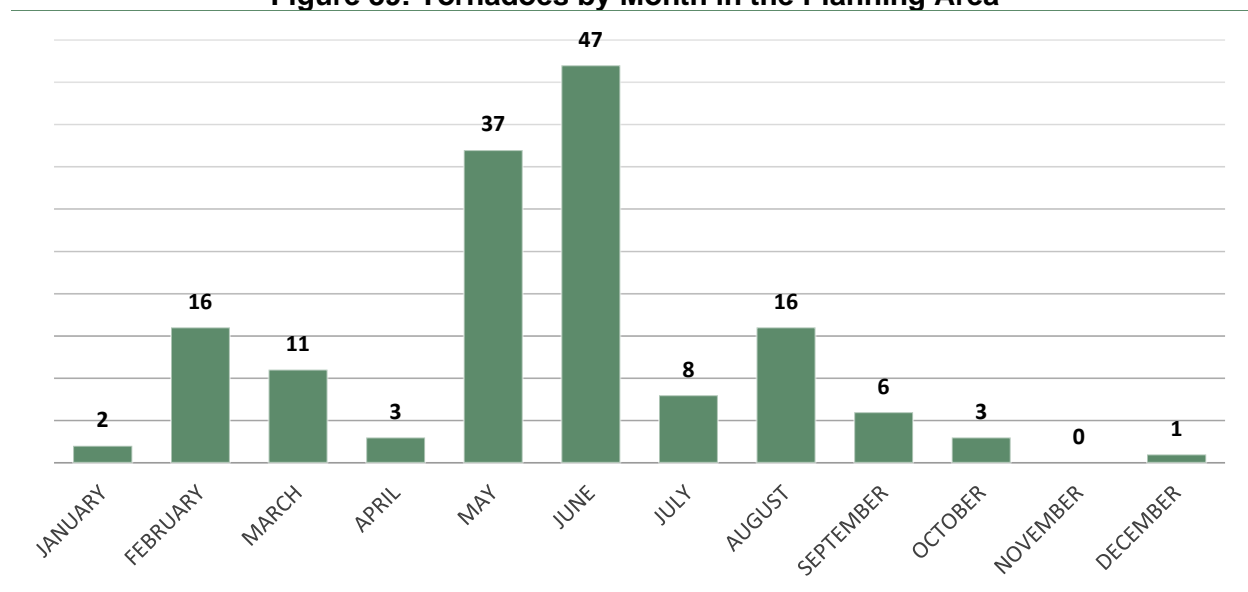
HISTORICAL OCCURRENCES

NCEI cites 38 tornadic events ranging from a magnitude of EF0 to EF2 between 1996 and 2018. These events were responsible for \$2,093,000 in property damages. No deaths or injuries were reported for these events.

Jurisdiction-specific events from NCEI and as reported by each community are listed in *Section Seven: Community Profiles*. The following figure shows that the month of June is the busiest month of the year with the highest number of tornadoes in the planning area.

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Figure 39: Tornadoes by Month in the Planning Area



Source: NCEI, 1996-2019

AVERAGE ANNUAL DAMAGES

The average damage per event estimate was determined based upon NCEI Storm Events Database since 1996 and number of historical occurrences. This does not include losses from displacement, functional downtime, economic loss, injury, or loss of life. Tornadoes cause an average of \$89,913 per year in property damage. The RMA reported \$14,157 in crop damages due to tornadic events, so damage to rangeland from tornadoes is a concern for the planning area.

Table 85: Tornado Loss Estimate

Hazard Type	Number of Events ¹	Average Events Per Year	Total Property Loss ¹	Average Annual Property Loss ¹	Total Crop Loss ²	Average Annual Property Loss ²
Tornadoes	38	2	\$2,093,000	\$87,208	\$14,157	\$745

Source: 1 Indicates data is from NCEI (January 1996 to February 2019); 2 Indicates data is from USDA RMA (2000 to 2018)

PROBABILITY

Given the 38 events over the course of 24 years, there is roughly a 100 percent probability that a tornadic event will occur in the planning area in any given year.

REGIONAL VULNERABILITIES

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

Table 86: Regional Tornado Vulnerabilities

Sector	Vulnerability
People	<ul style="list-style-type: none"> -Citizens living in mobile homes are at risk to death or injury -Citizens without access to shelter below ground or in safe room -Elderly with decreased mobility or poor hearing may be higher risk -Vulnerable populations including nursing homes and children at schools -Lack of multiple ways of receiving weather warnings, especially at night
Economic	-Significant economic losses possible, especially with EF3 tornadoes or greater
Built Environment	-All building stock are at risk of significant damages
Infrastructure	<ul style="list-style-type: none"> -All above ground infrastructure at risk to damages -Impassable roads due to debris blocking roadways
Critical Facilities	-All critical facilities at risk to significant damages and power outages

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SECTION FIVE: MITIGATION STRATEGY

INTRODUCTION

The primary focus of the mitigation strategy is to establish goals and objectives, and identify action items to reduce the effects of hazards on existing infrastructure and property in a cost effective and technically feasible manner. The establishment of goals and objectives took place during the kick-off meeting with the regional planning team.

Meeting participants reviewed the goals from the 2015 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 are followed by mitigation actions.

A preliminary list of goals and objectives was provided to the Planning Team and participants at the Round 1 public meetings. The Regional Planning Team voted to maintain the same list of goals from the 2015 HMP.

SUMMARY OF CHANGES

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

Requirement §201.6(c)(3)(i): [The hazard mitigation strategy shall include a] description of mitigation goals to reduce or avoid long-term vulnerabilities to the identified hazards.

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

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

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

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

Section Five: Mitigation Strategy

GOALS

Below is the final list of goals as determined for this plan update. These goals provide direction to guide participants in reducing future hazard related losses.

GOAL 1: PROTECT HEALTH AND SAFETY OF RESIDENTS

GOAL 2: REDUCE FUTURE LOSSES FROM HAZARD EVENTS

GOAL 3: INCREASE PUBLIC AWARENESS AND EDUCATION ON THE VULNERABILITY TO HAZARDS

GOAL 4: IMPROVE EMERGENCY MANAGEMENT CAPABILITIES

GOAL 5: PURSUE MULTI-OBJECTIVE OPPORTUNITIES (WHENEVER POSSIBLE)

GOAL 6: ENHANCE OVERALL RESILIENCE AND PROMOTE SUSTAINABILITY

MITIGATION ALTERNATIVES

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 also provided each participant a preliminary list of mitigation alternatives to be used as a starting point which was tailored to the hazards of top concern identified by jurisdictions. Once mitigation actions were identified for inclusion, the actions were then prioritized by the local planning teams. 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 local planning teams were instructed that each selection action must be directly related to the goals of the plan and the hazards of top concern for their jurisdiction. Actions must be specific activities that are concise and can be implemented individually. Mitigation actions 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 actions 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, but the jurisdiction is encouraged to update their plan with any changes or additional mitigation actions that are identified in between plan updates.

PARTICIPANT MITIGATION ACTIONS

Mitigation actions identified by participants of the Lower Platte North NRD HMP are found in the Mitigation Action 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: List of any potential funding mechanisms to fund the action
- Timeline: General timeline as established by planning participants
- Priority: 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: Description of what has been done, if anything, to implement the action item

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

MITIGATION ACTION PROJECT MATRIX

During public meetings, each participant was asked to review mitigation projects listed in the 2015 HMP and identify new potential mitigation actions to reduce the effects of hazards. Selected projects varied from community to community depending upon the significance of each hazard present. The information listed below is a compilation of new and ongoing mitigation actions identified by jurisdiction and organized by the goal to be met. Completed and removed mitigation actions can be found in the respective community profile.

Section Five: Mitigation Strategy

Table 87: Mitigation Actions Selected by Each Jurisdiction:

Mitigation Actions	Goal	Lower Platte North NRD	Butler County	Village of Abie	Village of Bellwood	Village of Bruno	Village of David City	Village of Dwight	Village of Garrison	Village of Linwood	Village of Octavia	Village of Rising City	Village of Surprise	Village of Ulysses
		LPN NRD	Butler County											
2nd Street Stormwater System Improvement	2.1							X						
Above Ground Stormwater System and Drainage Improvements	2.1						X			X			X	
Acquire High Risk Flooding Property	1.1, 2.1, 5.2													
Additional Personnel for Emergency Response	1.1, 4.1, 5.2													
Alert/Warning Sirens	1.1, 4.3, 5.2	X					X	X						
Assess Vulnerability to Drought Risk	2.2							X						
Assessment of All Utility	2.2													

Section Five: Mitigation Strategy

Mitigation Actions	Goal	Lower Platte North NRD	Butler County	Village of Abie	Village of Bellwood	Village of Bruno	Village of David City	Village of Dwight	Village of Garrison	Village of Linwood	Village of Octavia	Village of Rising City	Village of Surprise	Village of Ulysses
		LPN NRD	Butler County											
Poles in the City														
Backup and Emergency Generators	1.1	X	X	X			X	X	X		X		X	
Backup Records	2.1													
Build a New Fire Station	2.1													
Capital Improvements Program	2.3, 5.1, 5.2													
Civil Service Improvements	1.1, 2.1, 4.3, 5.2							X						
Community Education and Awareness	1.1, 3.1, 5.2	X			X									
Community Rating System	1.1, 2.1, 5.2													
Complete/Update Wildfire Protection Plan	2.2													
Comprehensive Disaster / Emergency	2.2, 4.1,													

Section Five: Mitigation Strategy

Mitigation Actions	Goal	Lower Platte North NRD	Butler County	Village of Abie	Village of Bellwood	Village of Bruno	Village of David City	Village of Dwight	Village of Garrison	Village of Linwood	Village of Octavia	Village of Rising City	Village of Surprise	Village of Ulysses
		LPN NRD	Butler County											
Response Plan	4.2, 5.1, 5.2, 6.1													
Construct a Retention Pond	2.1													
Continuity Planning	2.2, 4.3, 5.2													
Control Air-In Filtration	1.1													
Culvert Upsizing and Cleaning	2.1													X
Curb and Gutter	2.1													X
Database of Vulnerable Population	1.1													
Develop Weather Alert Protocol	1.1, 3.1, 4.3, 5.2													
Dodge County Platte River Communities Flood Mitigation...	2.2	X												

Section Five: Mitigation Strategy

Mitigation Actions	Goal	Lower Platte North NRD	Butler County	Village of Abie	Village of Bellwood	Village of Bruno	Village of David City	Village of Dwight	Village of Garrison	Village of Linwood	Village of Octavia	Village of Rising City	Village of Surprise	Village of Ulysses
		LPN NRD	Butler County											
Drainage Study/Storm water Master Plan	2.2							X						
Dredge Lagoons	2.1													
Drought Management Plan	2.2							X						
Electrical System Looped Distribution/Redundancies	1.1, 2.1, 5.2						X							
Emergency Communications	1.1, 3.1, 5.2		X											
Emergency Exercise	1.1, 3.1, 5.2													
Emergency Exercise: Agricultural Disease Outbreak	1.1, 3.1, 5.2													
Emergency Exercise: Flooding	1.1, 3.1, 5.2													

Section Five: Mitigation Strategy

Mitigation Actions	Goal	Lower Platte North NRD	Butler County	Village of Abie	Village of Bellwood	Village of Bruno	Village of David City	Village of Dwight	Village of Garrison	Village of Linwood	Village of Octavia	Village of Rising City	Village of Surprise	Village of Ulysses
		LPN NRD	Butler County											
Emergency Exercise: Hazardous Spill	1.1, 3.1, 5.2													
Emergency Exercise: Levee Failure	1.1, 3.1, 5.2													
Emergency Operations Center	1.1													
Enroll in the National Flood Insurance Program	2.1													
Evaluate Water Supply	2.2													
Event Cancellation and Notification Procedures	1.1, 3.1, 5.2													
Expand Water Storage Capacity	1.1	X						X						
Facility Floodproof	2.1													

Section Five: Mitigation Strategy

Mitigation Actions	Goal	Lower Platte North NRD	Butler County	Village of Abie	Village of Bellwood	Village of Bruno	Village of David City	Village of Dwight	Village of Garrison	Village of Linwood	Village of Octavia	Village of Rising City	Village of Surprise	Village of Ulysses
		LPN NRD	Butler County											
Facilities for Vulnerable Populations	1.1													
Fire Prevention Program: Planning and Training	2.2, 3.1, 5.2													
First Aid Training	1.1, 3.1, 5.2													
Flood Control Projects	1.1, 2.1, 5.2	X												
Flood Damage Repair	1.1, 2.1, 5.2													
Floodplain Management	1.1, 2.1, 5.2		X											
Gas Infrastructure GPS	2.1													
Hazardous Tree Removal	1.1, 2.1, 5.2						X	X	X					X
Implement Drought Water	2.3, 5.1,			X										

Section Five: Mitigation Strategy

Mitigation Actions	Goal	Lower Platte North NRD	Butler County	Village of Abie	Village of Bellwood	Village of Bruno	Village of David City	Village of Dwight	Village of Garrison	Village of Linwood	Village of Octavia	Village of Rising City	Village of Surprise	Village of Ulysses
		LPN NRD	Butler County											
Conservation Regulations	5.2, 6.1													
Improve Construction Standards and Building Survivability	2.3, 5.1, 5.2, 6.1						X							
Improve Emergency Text Warning System	1.1, 3.1, 5.2													
Improve Flood and Dam Failure Warning System	1.1, 4.3, 5.2	X												
Incorporate Native Species into Municipal Landscapes	2.1													
Infrastructure Assessment Study	2.2													
Infrastructure Hardening	1.1, 2.1, 5.2						X							
Install Permanent	2.1													

Section Five: Mitigation Strategy

Mitigation Actions	Goal	Lower Platte North NRD	Butler County	Village of Abie	Village of Bellwood	Village of Bruno	Village of David City	Village of Dwight	Village of Garrison	Village of Linwood	Village of Octavia	Village of Rising City	Village of Surprise	Village of Ulysses
		LPN NRD	Butler County											
Effluent Pumping Station														
Install Vehicular Barriers	1.1, 2.1, 5.2													
Lake Drainage Device	2.1	X												
Levee Failure Evacuation Plan	4.2													
Levee/Flood wall Construction and/or Improvements	1.1, 2.1, 5.2	X												
Line Old Sewer Main	2.1													
Monitor Water Supply	2.2							X						
Mutual Aid	1.1, 4.1, 4.3, 5.1, 5.2													

Section Five: Mitigation Strategy

Mitigation Actions	Goal	Lower Platte North NRD	Butler County	Village of Abie	Village of Bellwood	Village of Bruno	Village of David City	Village of Dwight	Village of Garrison	Village of Linwood	Village of Octavia	Village of Rising City	Village of Surprise	Village of Ulysses
		LPN NRD	Butler County											
New Collection System	2.1													
New Municipal Well	1.1							X						
Parcel Level Evaluation of Flood Prone Properties	2.2													
Power, Service, and Electrical Lines	1.1, 2.1, 5.2						X							X
Provide Short Term Residency Shelters	1.1													
Redundant Gas and Utility System	1.1, 2.1, 5.2													
Relocate Municipal Infrastructure	1.1, 2.1, 5.2													
Review and Update Security Procedure	2.2													

Section Five: Mitigation Strategy

Mitigation Actions	Goal	Lower Platte North NRD	Butler County	Village of Abie	Village of Bellwood	Village of Bruno	Village of David City	Village of Dwight	Village of Garrison	Village of Linwood	Village of Octavia	Village of Rising City	Village of Surprise	Village of Ulysses
		LPN NRD	Butler County											
and Equipment														
Safe Rooms and Storm Shelters	1.1	X			X		X							
Sewer System Master Plan	2.2													
School Emergency Communications	1.1, 3.1, 4.1, 4.3, 5.2													
Shelter in Place	1.1, 3.1, 5.2													
Source Water Contingency Plan and Improvements	2.2	X												
Stormwater Drainage Study and Improvements	2.1, 2.2, 5.2													
Stormwater System	2.1	X			X									

Section Five: Mitigation Strategy

Mitigation Actions	Goal	Lower Platte North NRD	Butler County	Village of Abie	Village of Bellwood	Village of Bruno	Village of David City	Village of Dwight	Village of Garrison	Village of Linwood	Village of Octavia	Village of Rising City	Village of Surprise	Village of Ulysses
		LPN NRD	Butler County											
Improvements														
Stream Bank Stabilization/Grade Control Structures/Channel Improvements	2.1						X						X	
Stream Gauges	1.1, 4.3, 5.2													
Tornado Safety	1.1, 3.1, 5.2													
Tree City USA	2.1													
Tree Planting and Maintenance Plan	2.1													
Update Comprehensive Plan	2.3, 5.1, 5.2, 6.1						X							
Update Lagoon	2.2													

Section Five: Mitigation Strategy

Mitigation Actions	Goal	Lower Platte North NRD	Butler County	Village of Abie	Village of Bellwood	Village of Bruno	Village of David City	Village of Dwight	Village of Garrison	Village of Linwood	Village of Octavia	Village of Rising City	Village of Surprise	Village of Ulysses
		LPN NRD	Butler County											
Update Zoning Regulations	2.3, 5.1, 5.2, 6.1				X									
Upgrade Water Meters	2.2													
Water Availability Study	2.2							X						
Water System Improvements	1.1, 2.1, 5.2	X												
Weather Radios	1.1, 4.3, 5.2						X							
Well Improvements	2.1													
Windbreaks/Living Snow Fence	2.1	X												

Section Five: Mitigation Strategy

Mitigation Actions	Goal	Dodge County	City of Fremont	Village of Inglewood	Lake Ventura SID #3	City of North Bend	Woodcliff SID #8	Saunders County	Village of Cedar Bluffs	Village of Colon	Village of Ithaca	Village of Leshara	Village of Malmo	Village of Mead
		Dodge County							Saunders County					
2nd Street Stormwater System Improvement	2.1													
Above Ground Stormwater System and Drainage Improvements	2.1				X									
Acquire High Risk Flooding Property	1.1, 2.1, 5.2	X						X			X			
Additional Personnel for Emergency Response	1.1, 4.1, 5.2													
Alert/Warning Sirens	1.1, 4.3, 5.2		X					X	X		X	X		X
Assess Vulnerability to Drought Risk	2.2				X									
Assessment of All Utility Poles in the City	2.2													
Backup and Emergency Generators	1.1		X	X	X		X		X		X	X	X	X
Backup Records	2.1	X			X									X
Build a New Fire Station	2.1													
Capital Improvements Program	2.3, 5.1, 5.2													
Channel/Ditch Improvements	1.1, 2.1, 5.2		X											

Section Five: Mitigation Strategy

Mitigation Actions	Goal	Dodge County	City of Fremont	Village of Inglewood	Lake Ventura SID #3	City of North Bend	Woodcliff SID #8	Saunders County	Village of Cedar Bluffs	Village of Colon	Village of Ithaca	Village of Leshara	Village of Malmo	Village of Mead
		Dodge County							Saunders County					
Civil Service Improvements	1.1, 2.1, 4.3, 5.2	X						X						
Community Education and Awareness	1.1, 3.1, 5.2	X	X			X		X			X	X		
Community Rating System	1.1, 2.1, 5.2		X											
Complete/Update Wildfire Protection Plan	2.2													
Comprehensive Backflow Prevention for Homeowners	1.1, 2.2, 5.2		X											
Comprehensive Disaster / Emergency Response Plan	2.2, 4.1, 4.2, 5.1, 5.2, 6.1	X	X		X			X		X				
Construct a Retention Pond	2.1													
Continuity Planning	2.2, 4.3, 5.2	X			X			X						
Control Air-In Filtration	1.1													
Culvert Upsizing and Cleaning	2.1			X						X		X		
Curb and Gutter	2.1													

Section Five: Mitigation Strategy

Mitigation Actions	Goal	Dodge County	City of Fremont	Village of Inglewood	Lake Ventura SID #3	City of North Bend	Woodcliff SID #8	Saunders County	Village of Cedar Bluffs	Village of Colon	Village of Ithaca	Village of Leshara	Village of Malmo	Village of Mead
		Dodge County							Saunders County					
Database of Vulnerable Population	1.1							X						
Develop Weather Alert Protocol	1.1, 3.1, 4.3, 5.2							X						
Dodge County Platte River Communities Flood Mitigation and Resiliency Plan	2.2	X	X	X	X	X								
Drainage Study/Stormwater Master Plan	2.2	X	X		X	X	X	X			X		X	
Dredge Lagoons	2.1													
Drought Management Plan	2.2				X									
Electrical System Looped Distribution/Redundancies	1.1, 2.1, 5.2													
Emergency Communications	1.1, 3.1, 5.2										X			
Emergency Exercise	1.1, 3.1, 5.2				X									
Emergency Exercise: Agricultural Disease Outbreak	1.1, 3.1, 5.2	X												

Section Five: Mitigation Strategy

Mitigation Actions	Goal	Dodge County	City of Fremont	Village of Inglewood	Lake Ventura SID #3	City of North Bend	Woodcliff SID #8	Saunders County	Village of Cedar Bluffs	Village of Colon	Village of Ithaca	Village of Leshara	Village of Malmo	Village of Mead
		Dodge County							Saunders County					
Emergency Exercise: Flooding	1.1, 3.1, 5.2	X												
Emergency Exercise: Hazardous Spill	1.1, 3.1, 5.2	X												
Emergency Exercise: Levee Failure	1.1, 3.1, 5.2	X												
Emergency Operations Center	1.1		X		X									
Enroll in the National Flood Insurance Program	2.1											X		
Evaluate Water Supply	2.2													
Event Cancellation and Notification Procedures	1.1, 3.1, 5.2							X						
Expand Water Storage Capacity	1.1										X			X
Facility Floodproofing	2.1				X									
Facilities for Vulnerable Populations	1.1							X						
Fire Prevention Program: Planning and Training	2.2, 3.1, 5.2													
First Aid Training	1.1, 3.1, 5.2	X			X			X						

Section Five: Mitigation Strategy

Mitigation Actions	Goal	Dodge County	City of Fremont	Village of Inglewood	Lake Ventura SID #3	City of North Bend	Woodcliff SID #8	Saunders County	Village of Cedar Bluffs	Village of Colon	Village of Ithaca	Village of Leshara	Village of Malmo	Village of Mead
		Dodge County						Saunders County						
Flood Damage Repair	1.1, 2.1, 5.2					X								
Floodplain Management	1.1, 2.1, 5.2	X	X											
Floodplain Regulation Enforcement and Updates	1.1, 2.1, 5.2		X											
Floodprone Property Mitigation	1.1, 2.1, 5.2	X						X						
Gas Infrastructure GPS	2.1													
Hazardous Tree Removal	1.1, 2.1, 5.2										X		X	
Implement Drought Water Conservation Regulations	2.3, 5.1, 5.2, 6.1													
Improve Construction Standards and Building Survivability	2.3, 5.1, 5.2, 6.1							X						
Improve Emergency Text Warning System	1.1, 3.1, 5.2											X		
Improve Flood and Dam Failure Warning System	1.1, 4.3, 5.2	X	X											
Improve Highway Drainage	1.1		X											

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Mitigation Actions	Goal	Dodge County	City of Fremont	Village of Inglewood	Lake Ventura SID #3	City of North Bend	Woodcliff SID #8	Saunders County	Village of Cedar Bluffs	Village of Colon	Village of Ithaca	Village of Leshara	Village of Malmo	Village of Mead
		Dodge County							Saunders County					
Incorporate Native Species into Municipal Landscapes	2.1				X									
Infrastructure Assessment Study	2.2				X			X						
Infrastructure Hardening	1.1, 2.1, 5.2				X			X						
Install Permanent Effluent Pumping Station	2.1									X				
Install Vehicular Barriers	1.1, 2.1, 5.2													
Lake Drainage Device	2.1						X							
Levee Failure Evacuation Plan	4.2	X			X									
Levee/Floodwall Construction and/or Improvements	1.1, 2.1, 5.2	X	X		X		X				X			
Line Old Sewer Main	2.1													
Monitor Water Supply	2.2													
Mutual Aid	1.1, 4.1, 4.3, 5.1, 5.2	X												
New Collection System	2.1													

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Mitigation Actions	Goal	Dodge County	City of Fremont	Village of Inglewood	Lake Ventura SID #3	City of North Bend	Woodcliff SID #8	Saunders County	Village of Cedar Bluffs	Village of Colon	Village of Ithaca	Village of Leshara	Village of Malmo	Village of Mead
		Dodge County							Saunders County					
New Detention Cells	1.1, 2.1, 5.2		X											
New Municipal Well	1.1													
NIMS Training			X											
Parcel Level Evaluation of Flood Prone Properties	2.2						X							
Power, Service, and Electrical Lines	1.1, 2.1, 5.2				X							X		
Provide Short Term Residency Shelters	1.1	X												
Redundant Gas and Utility System	1.1, 2.1, 5.2													
Relocate Municipal Infrastructure	1.1, 2.1, 5.2									X				
Review and Update Security Procedure and Equipment	2.2													
Safe Rooms and Storm Shelters	1.1	X			X	X		X		X	X	X		
Sewer System Master Plan	2.2													
School Emergency Communications	1.1, 3.1, 4.1, 4.3, 5.2													
Shelter in Place	1.1, 3.1, 5.2	X												

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Mitigation Actions	Goal	Dodge County	City of Fremont	Village of Inglewood	Lake Ventura SID #3	City of North Bend	Woodcliff SID #8	Saunders County	Village of Cedar Bluffs	Village of Colon	Village of Ithaca	Village of Leshara	Village of Malmo	Village of Mead
		Dodge County							Saunders County					
Stormwater Drainage Study and Improvements	2.1, 2.2, 5.2													
Stormwater System Improvements	2.1	X		X		X		X			X			
Stream Bank Stabilization/Grade Control Structures/Channel Improvements	2.1	X	X		X		X	X			X			
Stream Gauges	1.1, 4.3, 5.2							X						
Tornado Safety	1.1, 3.1, 5.2	X												
Tree City USA	2.1													
Tree Planting and Maintenance Plan	2.1													
Update Comprehensive Plan	2.3, 5.1, 5.2, 6.1	X				X				X		X		X
Update Lagoon	2.2													
Update Zoning Regulations	2.3, 5.1, 5.2, 6.1	X												
Upgrade Water Meters	2.2					X								
Water Availability Study	2.2													

Section Five: Mitigation Strategy

Mitigation Actions	Goal	Dodge County	City of Fremont	Village of Inglewood	Lake Ventura SID #3	City of North Bend	Woodcliff SID #8	Saunders County	Village of Cedar Bluffs	Village of Colon	Village of Ithaca	Village of Leshara	Village of Malmo	Village of Mead
		Dodge County							Saunders County					
Water System Improvements	1.1, 2.1, 5.2													
Weather Radios	1.1, 4.3, 5.2													
Well Improvements	2.1												X	

Mitigation Actions	Goal	Village of Memphis	Village of Morse Bluff	Village of Prague	City of Wahoo	Village of Weston	City of Yutan	Village of Lindsay	City of Newman Grove	Village of Platte Center	Village of Richland	Village of Rogers	City of Schuyler	Village of Tarnov
		Saunders County							Other Jurisdictions					
2nd Street Stormwater System Improvement	2.1													
Above Ground Stormwater System and Drainage Improvements	2.1													
Acquire High Risk Flooding Property	1.1, 2.1, 5.2	X			X								X	

Section Five: Mitigation Strategy

Mitigation Actions	Goal	Village of Memphis	Village of Morse Bluff	Village of Prague	City of Wahoo	Village of Weston	City of Yutan	Village of Lindsay	City of Newman Grove	Village of Platte Center	Village of Richland	Village of Rogers	City of Schuyler	Village of Tarnov	
		Saunders County							Other Jurisdictions						
Additional Personnel for Emergency Response	1.1, 4.1, 5.2				X										
Alert/Warning Sirens	1.1, 4.3, 5.2	X						X				X			
Assess Vulnerability to Drought Risk	2.2														
Assessment of All Utility Poles in the City	2.2				X										
Backup and Emergency Generators	1.1	X			X	X		X	X			X	X		
Backup Records	2.1		X					X							
Build a New Fire Station	2.1														
Capital Improvements Program	2.3, 5.1, 5.2				X										
Civil Service Improvements	1.1, 2.1, 4.3, 5.2				X										
Community Education and Awareness	1.1, 3.1, 5.2	X		X	X								X		
Community Rating System	1.1, 2.1, 5.2				X										
Complete/Update Wildfire Protection Plan	2.2														

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Mitigation Actions	Goal	Village of Memphis	Village of Morse Bluff	Village of Prague	City of Wahoo	Village of Weston	City of Yutan	Village of Lindsay	City of Newman Grove	Village of Platte Center	Village of Richland	Village of Rogers	City of Schuyler	Village of Tarnov
		Saunders County							Other Jurisdictions					
Comprehensive Disaster / Emergency Response Plan	2.2, 4.1, 4.2, 5.1, 5.2, 6.1				X									
Construct a Retention Pond	2.1													
Continuity Planning	2.2, 4.3, 5.2							X						
Control Air-In Filtration	1.1													
Culvert Upsizing and Cleaning	2.1													
Curb and Gutter	2.1													
Database of Vulnerable Population	1.1													
Develop Weather Alert Protocol	1.1, 3.1, 4.3, 5.2													
Drainage Study/Stormwater Master Plan	2.2	X											X	
Dredge Lagoons	2.1					X								
Drought Management Plan	2.2													
Electric Distribution System Master Plan	2.3				X									

Section Five: Mitigation Strategy

Mitigation Actions	Goal	Village of Memphis	Village of Morse Bluff	Village of Prague	City of Wahoo	Village of Weston	City of Yutan	Village of Lindsay	City of Newman Grove	Village of Platte Center	Village of Richland	Village of Rogers	City of Schuyler	Village of Tarnov	
		Saunders County							Other Jurisdictions						
Electrical System Looped Distribution/Redundancies	1.1, 2.1, 5.2														
Emergency Communications	1.1, 3.1, 5.2														
Emergency Exercise	1.1, 3.1, 5.2												X		
Emergency Exercise: Agricultural Disease Outbreak	1.1, 3.1, 5.2														
Emergency Exercise: Flooding	1.1, 3.1, 5.2														
Emergency Exercise: Hazardous Spill	1.1, 3.1, 5.2														
Emergency Exercise: Levee Failure	1.1, 3.1, 5.2														
Emergency Operations Center	1.1														
Enroll in the National Flood Insurance Program	2.1	X													
Evaluate Water Supply	2.2			X											
Event Cancellation and Notification Procedures	1.1, 3.1, 5.2														

Section Five: Mitigation Strategy

Mitigation Actions	Goal	Village of Memphis	Village of Morse Bluff	Village of Prague	City of Wahoo	Village of Weston	City of Yutan	Village of Lindsay	City of Newman Grove	Village of Platte Center	Village of Richland	Village of Rogers	City of Schuyler	Village of Tarnov	
		Saunders County							Other Jurisdictions						
Expand Water Storage Capacity	1.1														
Facility Floodproofing	2.1														
Facilities for Vulnerable Populations	1.1														
Fire Prevention Program: Planning and Training	2.2, 3.1, 5.2														
First Aid Training	1.1, 3.1, 5.2														
Flood Damage Repair	1.1, 2.1, 5.2								X						
Floodplain Management	1.1, 2.1, 5.2														
Gas Infrastructure GPS	2.1				X										
Hazardous Tree Removal	1.1, 2.1, 5.2					X				X					
Implement Drought Water Conservation Regulations	2.3, 5.1, 5.2, 6.1				X										
Improve Construction Standards and Building Survivability	2.3, 5.1, 5.2, 6.1														
Improve Emergency Text Warning System	1.1, 3.1, 5.2			X	X					X					

Section Five: Mitigation Strategy

Mitigation Actions	Goal	Village of Memphis	Village of Morse Bluff	Village of Prague	City of Wahoo	Village of Weston	City of Yutan	Village of Lindsay	City of Newman Grove	Village of Platte Center	Village of Richland	Village of Rogers	City of Schuyler	Village of Tarnov	
		Saunders County							Other Jurisdictions						
Improve Flood and Dam Failure Warning System	1.1, 4.3, 5.2														
Improve Snow and Ice Removal Program	2.3												X		
Incorporate Native Species into Municipal Landscapes	2.1														
Infrastructure Assessment Study	2.2														
Infrastructure Hardening	1.1, 2.1, 5.2														
Install Permanent Effluent Pumping Station	2.1														
Install Vehicular Barriers	1.1, 2.1, 5.2														
Lake Drainage Device	2.1														
Levee Failure Evacuation Plan	4.2														
Levee/Floodwall Construction and/or Improvements	1.1, 2.1, 5.2						X		X						
Line Old Sewer Main	2.1					X									
Monitor Water Supply	2.2														

Section Five: Mitigation Strategy

Mitigation Actions	Goal	Village of Memphis	Village of Morse Bluff	Village of Prague	City of Wahoo	Village of Weston	City of Yutan	Village of Lindsay	City of Newman Grove	Village of Platte Center	Village of Richland	Village of Rogers	City of Schuyler	Village of Tarnov	
		Saunders County							Other Jurisdictions						
Mutual Aid	1.1, 4.1, 4.3, 5.1, 5.2				X										
New Collection System	2.1		X												
New Municipal Well	1.1		X										X		
NIMS Training	4.1												X		
Parcel Level Evaluation of Flood Prone Properties	2.2														
Power, Service, and Electrical Lines	1.1, 2.1, 5.2				X	X									
Provide Short Term Residency Shelters	1.1														
Redundant Gas and Utility System	1.1, 2.1, 5.2				X										
Relocate Municipal Infrastructure	1.1, 2.1, 5.2														
Review and Update Security Procedure and Equipment	2.2				X										
Safe Rooms and Storm Shelters	1.1	X		X	X								X		
Sewer System Master Plan	2.2				X										
School Emergency Communications	1.1, 3.1,														

Section Five: Mitigation Strategy

Mitigation Actions	Goal	Village of Memphis	Village of Morse Bluff	Village of Prague	City of Wahoo	Village of Weston	City of Yutan	Village of Lindsay	City of Newman Grove	Village of Platte Center	Village of Richland	Village of Rogers	City of Schuyler	Village of Tarnov
		Saunders County							Other Jurisdictions					
	4.1, 4.3, 5.2													
Shelter in Place	1.1, 3.1, 5.2													
Stormwater Drainage Study and Improvements	2.1, 2.2, 5.2				X									
Stormwater System Improvements	2.1	X		X					X				X	
Stream Bank Stabilization/Grade Control Structures/Channel Improvements	2.1	X							X					
Stream Gauges	1.1, 4.3, 5.2								X					
Tornado Safety	1.1, 3.1, 5.2													
Tree City USA	2.1	X							X					
Tree Planting and Maintenance Plan	2.1				X									
Update Comprehensive Plan	2.3, 5.1, 5.2, 6.1							X						
Update Lagoon	2.2		X										X	
Update Zoning Regulations	2.3, 5.1, 5.2, 6.1													

Section Five: Mitigation Strategy

Mitigation Actions	Goal	Village of Memphis	Village of Morse Bluff	Village of Prague	City of Wahoo	Village of Weston	City of Yutan	Village of Lindsay	City of Newman Grove	Village of Platte Center	Village of Richland	Village of Rogers	City of Schuyler	Village of Tarnov
		Saunders County							Other Jurisdictions					
Upgrade Water Meters	2.2													
Water Availability Study	2.2													
Water System Improvements	1.1, 2.1, 5.2													
Weather Radios	1.1, 4.3, 5.2			X										
Well Improvements	2.1													
Windbreaks/Living Snow Fence	2.1												X	

Mitigation Actions	Goal	David City Fire Dept.	David City Public Schools	Dwight Fire Dept.	Linwood Fire Dept.	Platte Township	Schuyler Fire Dept.	Ames Dike and Drainage District	North Bend Drainage District	North Bend Fire Dept.	East Central District Health Dept.	Cedar Bluffs Public Schools	Cedar Bluffs Fire Dept.	Colon Fire Dept.	Cotterell Diking and Drainage District	Mead Public Schools	Platte Valley Drainage District	Pohocco Township	Wahoo Fire & Rescue	Weston Fire Dept.	Yutan Fire Dept.	
		Special Districts																				
2nd Street Stormwater System Improvement	2.1																					

Section Five: Mitigation Strategy

Mitigation Actions	Goal	David City Fire Dept.	David City Public Schools	Dwight Fire Dept.	Linwood Fire Dept.	Platte Township	Schuyler Fire Dept.	Ames Dike and Drainage District	North Bend Drainage District	North Bend Fire Dept.	East Central District Health Dept.	Cedar Bluffs Public Schools	Cedar Bluffs Fire Dept.	Colon Fire Dept.	Cotterell Diking and Drainage District	Mead Public Schools	Platte Valley Drainage District	Pohocco Township	Wahoo Fire & Rescue	Weston Fire Dept.	Yutan Fire Dept.	
		Special Districts																				
Above Ground Stormwater System and Drainage Improvements	2.1								X													
Acquire High Risk Flooding Property	1.1, 2.1, 5.2																					
Additional Personnel for Emergency Response	1.1, 4.1, 5.2																					
Alert/Warning Sirens	1.1, 4.3, 5.2	X		X																		
Assess Vulnerability to Drought Risk	2.2			X																		
Assessment of All Utility Poles in the City	2.2																					
Backup and Emergency Generators	1.1	X	X	X	X		X			X	X		X	X							X	
Backup Records	2.1	X														X						
Build a New Fire Station	2.1									X												
Build a New Training Facility	4.1						X															
Capital Improvements Program	2.3, 5.1, 5.2																					

Section Five: Mitigation Strategy

Mitigation Actions	Goal	David City Fire Dept.	David City Public Schools	Dwight Fire Dept.	Linwood Fire Dept.	Platte Township	Schuyler Fire Dept.	Ames Dike and Drainage District	North Bend Drainage District	North Bend Fire Dept.	East Central District Health Dept.	Cedar Bluffs Public Schools	Cedar Bluffs Fire Dept.	Colon Fire Dept.	Cotterell Diking and Drainage District	Mead Public Schools	Platte Valley Drainage District	Pohocco Township	Wahoo Fire & Rescue	Weston Fire Dept.	Yutan Fire Dept.
		Special Districts																			
Civil Service Improvements	1.1, 2.1, 4.3, 5.2			X	X		X				X		X	X				X			X
Community Education and Awareness	1.1, 3.1, 5.2				X						X		X			X					X
Community Rating System	1.1, 2.1, 5.2																				
Complete/Update Wildfire Protection Plan	2.2																				
Comprehensive Disaster / Emergency Response Plan	2.2, 4.1, 4.2, 5.1, 5.2, 6.1	X																			
Construct a Retention Pond	2.1							X													
Continuity Planning	2.2, 4.3, 5.2																				
Control Air-In Filtration	1.1															X					
Culvert Upsizing and Cleaning	2.1																				
Curb and Gutter	2.1																				
Database of Vulnerable Population	1.1																				

Section Five: Mitigation Strategy

Mitigation Actions	Goal	David City Fire Dept.	David City Public Schools	Dwight Fire Dept.	Linwood Fire Dept.	Platte Township	Schuyler Fire Dept.	Ames Dike and Drainage District	North Bend Drainage District	North Bend Fire Dept.	East Central District Health Dept.	Cedar Bluffs Public Schools	Cedar Bluffs Fire Dept.	Colon Fire Dept.	Cotterell Diking and Drainage District	Mead Public Schools	Platte Valley Drainage District	Pohocco Township	Wahoo Fire & Rescue	Weston Fire Dept.	Yutan Fire Dept.
		Special Districts																			
Develop Weather Alert Protocol	1.1, 3.1, 4.3, 5.2																				
Dodge County Platte River Communities Flood Mitigation and Resiliency Plan	2.2					X		X	X						X						
Drainage Study/Stormwater Master Plan	2.2																				
Dredge Lagoons	2.1																				
Drought Management Plan	2.2																				
Electrical System Looped Distribution/Redundancies	1.1, 2.1, 5.2	X																			
Emergency Communications	1.1, 3.1, 5.2																				
Emergency Exercise	1.1, 3.1, 5.2																				
Emergency Exercise: Agricultural Disease Outbreak	1.1, 3.1, 5.2																				
Emergency Exercise: Flooding	1.1, 3.1, 5.2																				

Section Five: Mitigation Strategy

Mitigation Actions	Goal	David City Fire Dept.	David City Public Schools	Dwight Fire Dept.	Linwood Fire Dept.	Platte Township	Schuyler Fire Dept.	Ames Dike and Drainage District	North Bend Drainage District	North Bend Fire Dept.	East Central District Health Dept.	Cedar Bluffs Public Schools	Cedar Bluffs Fire Dept.	Colon Fire Dept.	Cotterell Diking and Drainage District	Mead Public Schools	Platte Valley Drainage District	Pohocco Township	Wahoo Fire & Rescue	Weston Fire Dept.	Yutan Fire Dept.	
		Special Districts																				
Emergency Exercise: Hazardous Spill	1.1, 3.1, 5.2																					
Emergency Exercise: Levee Failure	1.1, 3.1, 5.2																					
Emergency Operations Center	1.1																					
Enroll in the National Flood Insurance Program	2.1																					
Evaluate Water Supply	2.2			X																		
Event Cancellation and Notification Procedures	1.1, 3.1, 5.2																					
Expand Water Storage Capacity	1.1			X																		
Facility Floodproofing	2.1																					
Facilities for Vulnerable Populations	1.1																					
Fire Prevention Program: Planning and Training	2.2, 3.1, 5.2	X																				
First Aid Training	1.1, 3.1, 5.2	X	X								X											

Section Five: Mitigation Strategy

Mitigation Actions	Goal	David City Fire Dept.	David City Public Schools	Dwight Fire Dept.	Linwood Fire Dept.	Platte Township	Schuyler Fire Dept.	Ames Dike and Drainage District	North Bend Drainage District	North Bend Fire Dept.	East Central District Health Dept.	Cedar Bluffs Public Schools	Cedar Bluffs Fire Dept.	Colon Fire Dept.	Cotterell Diking and Drainage District	Mead Public Schools	Platte Valley Drainage District	Pohocco Township	Wahoo Fire & Rescue	Weston Fire Dept.	Yutan Fire Dept.	
		Special Districts																				
Flood Damage Repair	1.1, 2.1, 5.2								X						X							
Floodplain Management	1.1, 2.1, 5.2																					
Gas Infrastructure GPS	2.1																					
Hazardous Tree Removal	1.1, 2.1, 5.2	X	X	X		X											X					
Implement Drought Water Conservation Regulations	2.3, 5.1, 5.2, 6.1																					
Improve Construction Standards and Building Survivability	2.3, 5.1, 5.2, 6.1																					
Improve Emergency Text Warning System	1.1, 3.1, 5.2			X																		
Improve Flood and Dam Failure Warning System	1.1, 4.3, 5.2																					
Incorporate Native Species into Municipal Landscapes	2.1																					
Infrastructure Assessment Study	2.2																					

Section Five: Mitigation Strategy

Mitigation Actions	Goal	David City Fire Dept.	David City Public Schools	Dwight Fire Dept.	Linwood Fire Dept.	Platte Township	Schuyler Fire Dept.	Ames Dike and Drainage District	North Bend Drainage District	North Bend Fire Dept.	East Central District Health Dept.	Cedar Bluffs Public Schools	Cedar Bluffs Fire Dept.	Colon Fire Dept.	Cotterell Diking and Drainage District	Mead Public Schools	Platte Valley Drainage District	Pohocco Township	Wahoo Fire & Rescue	Weston Fire Dept.	Yutan Fire Dept.
		Special Districts																			
Infrastructure Hardening	1.1, 2.1, 5.2																				
Install Permanent Effluent Pumping Station	2.1																				
Install Vehicular Barriers	1.1, 2.1, 5.2		X																		
Lake Drainage Device	2.1																				
Levee Failure Evacuation Plan	4.2																				
Levee/Floodwall Construction and/or Improvements	1.1, 2.1, 5.2							X							X		X				
Line Old Sewer Main	2.1																				
Monitor Water Supply	2.2			X																	
Mutual Aid	1.1, 4.1, 4.3, 5.1, 5.2																				
New Collection System	2.1		X																		
New Municipal Well	1.1		X																		
Parcel Level Evaluation of Flood Prone Properties	2.2																				

Section Five: Mitigation Strategy

Mitigation Actions	Goal	David City Fire Dept.	David City Public Schools	Dwight Fire Dept.	Linwood Fire Dept.	Platte Township	Schuyler Fire Dept.	Ames Dike and Drainage District	North Bend Drainage District	North Bend Fire Dept.	East Central District Health Dept.	Cedar Bluffs Public Schools	Cedar Bluffs Fire Dept.	Colon Fire Dept.	Cotterell Diking and Drainage District	Mead Public Schools	Platte Valley Drainage District	Pohocco Township	Wahoo Fire & Rescue	Weston Fire Dept.	Yutan Fire Dept.
		Special Districts																			
Power, Service, and Electrical Lines	1.1, 2.1, 5.2	X																			
Provide Short Term Residency Shelters	1.1																				
Redundant Gas and Utility System	1.1, 2.1, 5.2																				
Relocate Municipal Infrastructure	1.1, 2.1, 5.2																				
Review and Update Security Procedure and Equipment	2.2																				
Safe Rooms and Storm Shelters	1.1	X														X					
Sewer System Master Plan	2.2																				
School Emergency Communications	1.1, 3.1, 4.1, 4.3, 5.2		X																		
Shelter in Place	1.1, 3.1, 5.2																				
Stormwater Drainage Study and Improvements	2.1, 2.2, 5.2																				
Stormwater System Improvements	2.1			X		X															
Stream Bank Stabilization/Grade	2.1																				

Section Five: Mitigation Strategy

Mitigation Actions	Goal	David City Fire Dept.	David City Public Schools	Dwight Fire Dept.	Linwood Fire Dept.	Platte Township	Schuyler Fire Dept.	Ames Dike and Drainage District	North Bend Drainage District	North Bend Fire Dept.	East Central District Health Dept.	Cedar Bluffs Public Schools	Cedar Bluffs Fire Dept.	Colon Fire Dept.	Cotterell Diking and Drainage District	Mead Public Schools	Platte Valley Drainage District	Pohocco Township	Wahoo Fire & Rescue	Weston Fire Dept.	Yutan Fire Dept.	
		Special Districts																				
Control Structures/Channel Improvements																						
Stream Gauges	1.1, 4.3, 5.2																					
Tornado Safety	1.1, 3.1, 5.2																					
Tree City USA	2.1																					
Tree Planting and Maintenance Plan	2.1																					
Update Comprehensive Plan	2.3, 5.1, 5.2, 6.1																					
Update Lagoon	2.2		X																			
Update Zoning Regulations	2.3, 5.1, 5.2, 6.1																					
Upgrade Water Meters	2.2																					
Water Availability Study	2.2																					
Water System Improvements	1.1, 2.1, 5.2			X																		
Weather Radios	1.1, 4.3, 5.2		X																			
Well Improvements	2.1			X																		

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SECTION SIX: PLAN IMPLEMENTATION AND MAINTENANCE

MONITORING, EVALUATING, AND UPDATING THE PLAN

Participants of the LPNNRD HMP will be responsible for monitoring (annually at a minimum), 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 and business owners. Unless otherwise specified by each participant's governing body, the governing body will be responsible for implementation of the recommended projects. The 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.

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.)?

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.

Section Six: Plan Implementation and Maintenance

- Have either the nature, magnitude, and/or type of risks changed?
- Are there implementation problems?
- Are current resources appropriate to implement the plan?
- Were the outcomes as expected?
- Did the plan partners participate as originally planned?
- Are there other agencies which should be included in the revision process?

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

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

CONTINUED PUBLIC INVOLVEMENT

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

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

UNFORESEEN OPPORTUNITIES

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

INCORPORATION INTO EXISTING PLANNING MECHANISMS

The Planning Team utilized a variety of plan integration tools to help communities determine how their existing planning mechanisms were related to the Hazard Mitigation Plan. Utilizing FEMA's *Integrating the Local Natural Hazard Mitigation Plan into a Community's Comprehensive Plan*⁷⁷ guidance, as well as FEMA's *2015 Plan Integration*⁷⁸ guide, each community engaged in a plan integration discussion. This discussion was facilitated by a Plan Integration Worksheet, created by the Planning Team. This document offered an easy way for participants to notify the Planning Team of existing planning mechanisms, and if they interface with the HMP.

⁷⁷ Federal Emergency Management Agency. November 2013. "FEMA Region X Integrating the Local Natural Hazard Mitigation Plan into a Community's Comprehensive Plan." <https://www.fema.gov/media-library-data/1388432170894-6f744a8afa8929171dc62d96da067b9a/FEMA-X-IntegratingLocalMitigation.pdf>.

⁷⁸ Federal Emergency Management Agency. July 2015. "Plan Integration: Linking Local Planning Efforts." https://www.fema.gov/media-library-data/1440522008134-ddb097cc285bf741986b48fdcef31c6e/R3_Plan_Integration_0812_508.pdf.

Section Six: Plan Implementation and Maintenance

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

Section Six: Plan Implementation and Maintenance

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SECTION SEVEN: COMMUNITY PROFILES

PURPOSE OF COMMUNITY PROFILES

Community Profiles contain information specific to jurisdictions participating in the LPNNRD 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
- Location/Geography
- Climate (County Level)
- Demographics
- Transportation
- Future Development Trends
- Parcel Improvements and Valuations
- Critical Infrastructure and Key Resources
- Historical Hazard Events (County Level)
- Hazard Prioritization
- Governance
- Capability Assessment
- Plan Integration
- Mitigation Actions

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

The hazard prioritization information, as provided by local planning teams, 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, and occurrence and risk of each hazard type.

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, potential impacts, and the jurisdiction's capabilities. The hazards not examined in depth can be found in *Section Four: Risk Assessment*.