



## Chadron State College

### RESOLUTION

**WHEREAS**, the Federal Disaster Mitigation Act of 2000 was signed into law on October 30, 2000, placing new emphasis on state and local mitigation planning for natural hazards and requiring communities to adopt a hazard mitigation action plan to be eligible for pre-disaster and post-disaster federal funding for mitigation purposes; and

**WHEREAS**, a Hazard Mitigation Plan was prepared by the Region 23 Emergency Management Agency, with assistance from JEO Consulting Group, Inc. of Lincoln, NE.

**WHEREAS**, the purpose of the mitigation plan was to lessen the effects of disasters by increasing the disaster resistance of the Emergency Management Agency and participating jurisdictions located within the planning boundary by identifying the hazards that affect Chadron State College and prioritize mitigation strategies to reduce potential loss of life and property damage from those hazards, and

**WHEREAS**, FEMA regulations require documentation that the plan has been formally adopted by the governing body of Chadron State College in the form of a resolution and further requesting approval of the plan at the Federal Level; and

**NOW, THEREFORE**, the Board of Trustees of the Nebraska State Colleges on behalf of Chadron State College does herewith adopt the Region 23 Emergency Management Agency Hazard Mitigation Plan Update in its entirety; and

PASSED AND APPROVED this \_\_\_\_\_ day of \_\_\_\_\_, 202\_\_.

---

Board Chair, Jess Zeiss

# HAZARD MITIGATION PLANNING TEAM

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Connie Shell	City of Crawford
Dashielle Rohan	Village of Harrison
Doak Nickerson	Nebraska Forest Service
Everette Langford	Sheridan County
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## LIST OF ACRONYMS

ACS – American Community Survey  
BCA – Benefit Cost Analysis  
CFR – Code of Federal Regulations  
CRS – Community Rating System  
DFIRM – Digital Flood Insurance Rate Map  
DHS – Department of Homeland Security  
DMA 2000 – Disaster Mitigation Act of 2000  
EAP – Emergency Action Plan  
ELAP – Emergency Assistance for Livestock, Honeybees, and Farm-Raised Fish Program  
ESL – English as Second Language  
FEMA – Federal Emergency Management Agency  
FIRM – Flood Insurance Rate Map  
FMA – Flood Mitigation Assistance Program  
FR – FEMA's Final Rule  
GIS – Geographic Information Systems  
HMA – Hazard Mitigation Assistance  
HMGP – Hazard Mitigation Grant Program  
HMP – Hazard Mitigation Plan  
HPRCC – High Plains Regional Climate Center  
JEO – JEO Consulting Group, Inc.  
LEOP – Local Emergency Operations Plan  
LFD – Livestock Forage Disaster Assistance Program  
LIP – Livestock Indemnity Program  
MHSW – Mobile Home Single Wide  
MPH – miles per hour  
NCEI – National Centers for Environmental Information  
NDA – Nebraska Department of Agriculture  
NDEE – Nebraska Department of Energy and Environment  
NDOT – Nebraska Department of Transportation  
NDMC – National Drought Mitigation Center  
NeDNR – Nebraska Department of Natural Resources  
NEMA – Nebraska Emergency Management Agency  
NFIP – National Flood Insurance Program  
NFS – Nebraska Forest Service  
NOAA – National Oceanic and Atmospheric Administration  
NPDP – National Performance of Dams Program  
NRC – National Response Center  
NRD – Natural Resources District  
NWS – National Weather Service  
PDM – Pre-Disaster Mitigation Program  
PDSI – Palmer Drought Severity Index  
PHMSA – U.S. Pipeline and Hazardous Material Safety Administration  
P.L. – Public Law  
RMA – Risk Management Agency  
SBA – Small Business Administration  
SFHA – Special Flood Hazard Area  
SPEED – Social Political and Economic Event Database Project  
SPIA – Sperry-Piltz Ice Accumulation Index  
START – National Consortium for the Study of Terrorism and Responses to Terrorism  
SURE – Supplemental Revenue Assistance Payments  
TAP – Tree Assistance Program  
TORRO – Tornado and Storm Research Organization  
UNWNRD – Upper Niobrara White Natural Resources District  
USDA – United States Department of Agriculture  
USGS – United States Geological Survey  
WUI – Wildland Urban Interface

# EXECUTIVE SUMMARY

## INTRODUCTION

This plan is an update to the Region 23 Emergency Management Agency Multi-Hazard Mitigation Plan (HMP) approved in 2015. The plan update was developed in compliance with the requirements of the Disaster Mitigation Act of 2000 (DMA 2000).

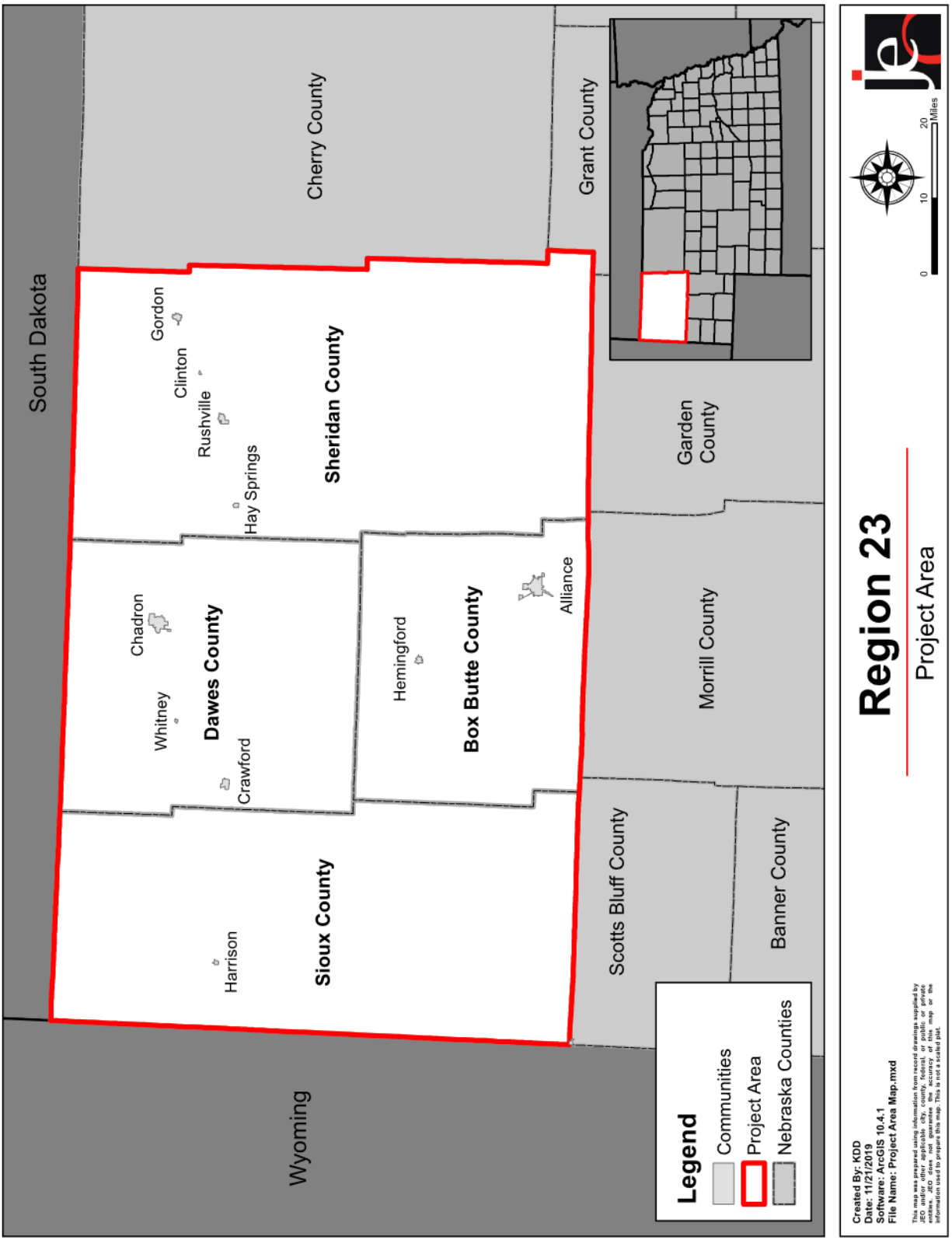
Hazard mitigation planning is a process in which hazards are identified and profiled; people and facilities at-risk are identified and assessed for threats and potential vulnerabilities; and strategies and mitigation measures are identified. Hazard mitigation planning increases the ability of communities to effectively function in the face of natural and human-caused disasters. The goal of the process is to reduce risk and vulnerability, in order to lessen impacts to life, the economy, and infrastructure. Plan participants are listed in the following table and illustrated in the following planning area map. Chadron Public Schools and Hemingford Public Schools were new participating jurisdictions in this plan update. The communities of Whitney and Clinton did not participate in the HMP.

**Table 1: Participating Jurisdictions**

PARTICIPATING JURISDICTIONS	
REGION 23 EMERGENCY MANAGEMENT AGENCY	
<b>BOX BUTTE COUNTY</b>	<b>SHERIDAN COUNTY</b>
CITY OF ALLIANCE	CITY OF GORDON
VILLAGE OF HEMINGFORD	CITY OF HAY SPRINGS
<b>DAWES COUNTY</b>	CITY OF RUSHVILLE
CITY OF CHADRON	<b>SIoux COUNTY</b>
CITY OF CRAWFORD	VILLAGE OF HARRISON
CHADRON PUBLIC SCHOOLS	Hemingford Public Schools
CHADRON STATE COLLEGE*	UPPER NIOBRARA WHITE NRD

*\*Chadron State College participated in this planning process and is integrated within the City of Chadron's Community Profile in Section Seven.*

Figure 1: Map of Planning Area



## **GOALS AND OBJECTIVES**

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

Goals from the 2015 HMP were reviewed, and the Planning Team agreed that they are still relevant and applicable for this plan update. Jurisdictions that participated in this plan update agreed that the goals identified in 2015 would be carried forward and utilized for the 2020 plan with minor modifications. Objective 6.2 was a new addition for this process. The goals for this plan update are as follows:

### **GOAL 1: PROTECT 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).

### **GOAL 2: REDUCE FUTURE LOSSES FROM HAZARD EVENTS**

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

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

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

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

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

### **GOAL 4: IMPROVE EMERGENCY MANAGEMENT CAPABILITIES**

Objective 4.1: Develop or improve Emergency Response Plan and procedures and abilities.

Objective 4.2: Develop or improve Evacuation Plan and procedures.

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

Objective 4.4: Increase regional EOC capacity.

Objective 4.5: Provide Shelters for the public.

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

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

Objective 5.2: When possible implement projects 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.)

Objective 6.2: Integrate the Community Wildfire Protection Plan update to align with Hazard Mitigation Plan goals and actions.

## SUMMARY OF CHANGES

The hazard mitigation planning process undergoes several changes during each plan update to best accommodate the planning area and specific conditions. Changes from the 2015 Hazard Mitigation Plan and planning process in this update included: a full invitation of all jurisdictions to project kick-off meeting; greater efforts to reach out to and include stakeholder groups, such as fire districts; a more specific hazard risk assessment applicable to the planning area; and the inclusion of additional mitigation strategies. This update also works to unify the various planning mechanisms in place throughout the participating communities (i.e. comprehensive plans, local emergency operation plans, zoning ordinances, building codes, etc.) to ensure that the goals and objectives identified in those planning mechanisms are consistent with the strategies and projects included in this plan. Other changes as described in the 2015 Region 23 Hazard Mitigation Plan review are described in the table below.

COMMENT/REVISION FROM 2015 REVIEW TOOL	LOCATION OF REVISION	SUMMARY OF CHANGE
Describe use of Survey Monkey	N/A	Survey Monkey was not used in this HMP update.
Indicate any dams or levees outside of the planning area whose failure could impact people and property in the planning area.	Section Four: Dam Failure	Table 42 identifies potential upstream dams whose failure could impact the planning area.
Communities participating in NFIP's designated mitigation action status	Community profiles as appropriate	Newest guidance by NEMA and FEMA has indicated continued participation in the NFIP is not a mitigation action. While communities will continue to participate in the program, this action has been removed from mitigation action lists.
Plans updating comprehensive plans should include Hazard Mitigation goals or an explanation for exclusion	Community profiles as appropriate	Community profiles Plan Integration sections discuss Comprehensive Plans as available
Plans should describe changes in development and impact to hazard prone areas	Community profiles as appropriate	A description of development changes since last plan is included in "Future Development Trends" section of each community profile.
Written proof of all jurisdiction's governing bodies have adopted the plan must be submitted to FEMA.	Appendix A	Adoption resolution template provided to each community post-plan approval is provided in Appendix A. As resolutions are passed by local bodies, scanned copies are provided to NEMA.

The most notable change in this Hazard Mitigation Plan update was the concurrent update to the Pine Ridge Area Community Wildfire Protection Plan (CWPP). The HMP and CWPP were developed together to build upon wildfire risk assessment and mitigation strategies for the planning area. All local fire districts in the four-county planning area were encouraged to attend meetings and engage in the planning process.

It should be noted as well that due to the COVID-19 outbreak, numerous changes were made in the midst of the planning process to plan meeting dates and requirements. To best protect residents and staff members in the planning area, Round 2 meetings were held via an online or phone one-on-one format rather than in-person public workshop meetings. Additional changes are described in Section Two.

## PLAN IMPLEMENTATION

Various communities across the planning area have implemented hazard mitigation projects following the 2015 Hazard Mitigation Plan. A few examples of completed projects include comprehensive and stormwater master plan updates, equipment upgrades, alert and warning sirens, floodplain regulation, and others. 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 Region have been able to work with a range of entities to complete projects; potential partners for future project implementation include, but are not limited to: Nebraska Forest Service (NFS), Nebraska Department of Transportation (NDOT), Nebraska Department of Natural Resources (NeDNR); Nebraska Emergency Management Agency (NEMA); and United States Department of Agriculture (USDA).

## HAZARD PROFILES

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

**Table 2: Hazard Occurrences**

HAZARD	PREVIOUS OCCURRENCE EVENTS/YEARS	APPROXIMATE ANNUAL PROBABILITY	LIKELY EXTENT
AGRICULTURAL ANIMAL DISEASE	42/6	100%	~13 animals per event
AGRICULTURAL PLANT DISEASE	111/20	100%	Unavailable
DAM FAILURE	1/109	<1%	Varies by Structure
DROUGHT & EXTREME HEAT	437/1,489 months of drought	29%	D1-D2
	Avg 4 days per year >100°F	100%	>100°F
FLOODING	24/24	100%	Some inundation of structures (<1% of structures) and roads near streams. Some evacuations of people may be necessary (<1% of population)
HIGH WINDS & TORNADOES	217/24	100%	Avg: EF0
			Range EF0-EF2 ≤50 mph Avg 47mph; Range 35-59 EG ≥1" rainfall
SEVERE THUNDERSTORMS	1,302/24	100%	Avg 55 mph winds; Hail range 0.75-4.25" (H2-H4); average 1.24"
SEVERE WINTER STORMS	362/24	100%	0.5" – 0.75" Ice 20°-40° below zero (wind chill) 4-9" snow 35-50 mph winds
TERRORISM & CIVIL DISORDER	0/73	<1%	Varies by event
WILDFIRE	2,098/19	100%	<250 acres Some homes and structures threatened or at risk

EG – estimated gusts

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

**Table 3: Hazard Loss History**

HAZARD TYPE		Count	Property	Crop <sup>2</sup>
<b>Agricultural Disease</b>	Animal Disease <sup>1</sup>	42	530 animals	N/A
	Plant Disease <sup>2</sup>	111	N/A	\$1,989,865
<b>Dam Failure<sup>5</sup></b>		1	\$0	N/A
<b>Drought<sup>6</sup></b>		437/1,489 months	\$0	\$20,688,052
<b>Extreme Heat<sup>7,8</sup></b>		Avg 4 days per year	\$0	\$5,533,235
<b>Flooding<sup>7</sup></b>	Flash Flood	22	\$562,000	\$109,388
	Flood	2	\$0	
<b>High Winds and Tornadoes<sup>7</sup></b> <i>1 fatality</i>	High Winds	146	\$129,000	\$11,996,572
	Tornadoes	71	\$1,355,000	
<b>Severe Thunderstorms<sup>7</sup></b> <i>8 injuries</i>	Hail	993	\$2,302,200	\$9,253,643
	Heavy Rain	36	\$0	
	Lightning	5	\$1,467,000	
	Thunderstorm Wind	286	\$1,211,400	
<b>Severe Winter Storms<sup>7</sup></b> <i>1 death, 2 injuries</i>	Blizzard	50	\$74,000	\$22,145,515
	Extreme Cold/Wind Chill	50	\$0	
	Heavy Snow	42	\$0	
	Ice Storm	0	\$0	
	Winter Storm	169	\$85,000	
	Winter Weather	51	\$15,000	
<b>Terrorism and Civil Disorder<sup>3,4</sup></b>		0	\$0	N/A
<b>Wildfire<sup>9</sup></b> <i>12 injuries</i>		2,098	445,416 acres	\$222,905
<b>Total</b>		<b>4,383</b>	<b>\$7,200,600</b>	<b>\$71,939,175</b>

N/A: Data not available  
1 NDA (2014-2019)  
2 USDA RMA (2000-2019)  
3 SPEED (1946-2018)  
4 START (1970-2018)

5 Stanford NPDP (1911-2019)  
6 NOAA (1895-2019)  
7 NOAA (1996-2019)  
8 HPRCC (1902-2018)  
9 NFS (2000-2018)

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



## **DROUGHT**

Drought can be a slow onset and long lasting phenomenon which occurs regularly in the state and planning area. 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, particularly to livestock production in the western panhandle. Over twenty million dollars in total crop loss was reported for the planning area since 2000, but drought impacts rangeland as well by reducing the total amount of cattle pastures can support.

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

## **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 and producing a range of associated hazards including hail, strong winds, heavy rain, and lightning strikes. 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 1,320 severe thunderstorm events in 24 years across the four county planning area. These events caused nearly \$5 million in property damages. Typical impacts resulting from severe thunderstorms include, but are not limited to: loss of power; obstruction of transportation routes; grass/wildfires starting from lightning strikes; localized flooding; and damages discussed in the hazard profiles for hail and high winds.

Vulnerable populations related to severe thunderstorms include: residents of mobile homes (10% of housing units); citizens with decreased mobility; and those caught outside during storm events. Most residents within the planning area are familiar with severe thunderstorms and know how to appropriately prepare and respond to events. The Region utilizes a Code Red alert system which participating jurisdictions encourage residents to sign up for.

## **SEVERE WINTER STORMS**

Severe winter storms occur regularly across the entire State of Nebraska and in 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 for residents, the local economy, transportation corridors, and infrastructure. Severe winter storms typically occur between November and March. The NCEI reported 362 severe winter storm events that caused over \$174,000 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. Additionally, proximity to the Pine Ridge Reservation increases risk to those traveling in the area or sharing resources. 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 especially cattle ranching.

## **WILDFIRE**

Wildfire has occurred across all portions of the planning area and is a hazard of top concern for all communities. Due to the topographic and vegetative composition of the Nebraska panhandle, wildfire events occur regularly and with great magnitude. Wildfire is exacerbated by drought, extreme heat, and flooding conditions which modify vegetative and soil conditions. There are two main fire seasons in the planning area. The early fire season occurs once snowmelt and the last spring frost (when the previous year's cured vegetation dries) occurs until early May. The late season begins mid- to late summer as fine fuels, such as grasses and forbs, begin to dry. In most years the late season extends to mid-November, coinciding with agriculture crop harvests, leaf drop, and curing of prairie grasses.

Vulnerable areas to wildfire include remote or rural areas without sufficient transportation corridors for emergency response; areas of heavy fuel loads such as forested parks; community boundaries near heavy fuel loads or as part of the WUI; and previously burned areas with dead trees or brush. The planning area is serviced by 13 volunteer fire departments with mutual aid agreements. According to the NFS, 2,098 fires between 2000 and 2018 burned over 445,000 acres of land within the fire district boundaries.

### **MITIGATION STRATEGIES**

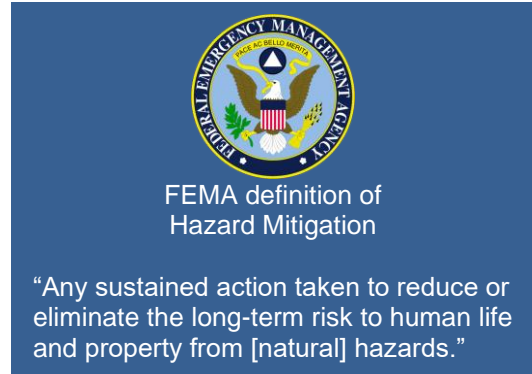
There are a wide variety of strategies that can be used to reduce the impacts of hazards for the built environment and planning area residents. *Section Five: Mitigation Strategy* shows the mitigation actions chosen by the participating jurisdictions to prevent future losses.

# SECTION ONE INTRODUCTION

## HAZARD MITIGATION PLANNING

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

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



The Region 23 Emergency Management Agency (EMA) prepared this multi-jurisdictional hazard mitigation plan in an effort to reduce impacts from natural and human-caused hazards and to better protect the people and property of the region from the effects of these hazards. This plan demonstrates a regional commitment to reducing risks from hazards and serves as a tool to help decision makers establish mitigation activities and resources. Further, this plan was developed to make Region 23 EMA and participating jurisdictions eligible for federal pre-disaster funding programs and to accomplish the following objectives:

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

## DISASTER MITIGATION ACT OF 2000

The U.S. Congress passed the Disaster Mitigation Act 2000 to amend the Robert T. Stafford Disaster Relief and Emergency Assistance Act<sup>1</sup>. Section 322 of the DMA 2000 requires that state and local governments develop, adopt, and routinely update a hazard mitigation plan to remain eligible for pre- and post-disaster mitigation funding.<sup>2</sup> These funds include the Hazard Mitigation Grant Program (HMGP)<sup>3</sup>, Pre-Disaster

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

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

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

Mitigation Program (PDM)<sup>4</sup>, and the Flood Mitigation Assistance Program (FMA)<sup>5</sup>. The Federal Emergency Management Agency (FEMA) administers these programs under the Department of Homeland Security (DHS).<sup>6</sup>

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

## HAZARD MITIGATION ASSISTANCE

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

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

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

- FEMA Mitigation Directorate

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

## PLAN FINANCING AND PREPARATION

Regarding plan financing and preparation, in general, Region 23 EMA 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.

<sup>4</sup> Federal Emergency Management Agency. “Pre-Disaster Mitigation Grant Program.” Last modified July 11, 2017. <https://www.fema.gov/pre-disaster-mitigation-grant-program>.

<sup>5</sup> Federal Emergency Management Agency. “Flood Mitigation Assistance Grant Program.” Last modified July 11, 2017. <https://www.fema.gov/flood-mitigation-assistance-grant-program>.

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

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

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

# 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, Region 23 EMA adapted the four-step hazard mitigation planning process outlined by FEMA to fit the needs of the participating jurisdictions. The following pages will outline how the Regional Planning Team was established; the function of the Regional Planning Team; critical project meetings and community representatives; outreach efforts to the general public; key stakeholders and neighboring jurisdictions; general information relative to the risk assessment process; general information relative to local/regional capabilities; plan review and adoption; and ongoing plan maintenance.

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

(1) An opportunity for the public to comment on the plan during the drafting stage and prior to plan approval;

(2) An opportunity for neighboring communities, local and regional agencies involved in hazard mitigation activities, and agencies that have the authority to regulate development, as well as businesses, academia and other private and non-profit interests to be involved in the planning process; and

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

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

## MULTI-JURISDICTIONAL APPROACH

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

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

Both FEMA and NEMA recommend this multi-jurisdictional approach through the cooperation of counties, regional emergency management, and natural resource districts. Region 23 EMA utilized the multi-jurisdiction planning process recommended by FEMA (Local Mitigation Plan Review Guide<sup>10</sup>, Local Mitigation Planning Handbook<sup>11</sup>, and Mitigation Ideas: A Resource for Reducing Risk to Natural Hazards<sup>12</sup>) to develop this plan.

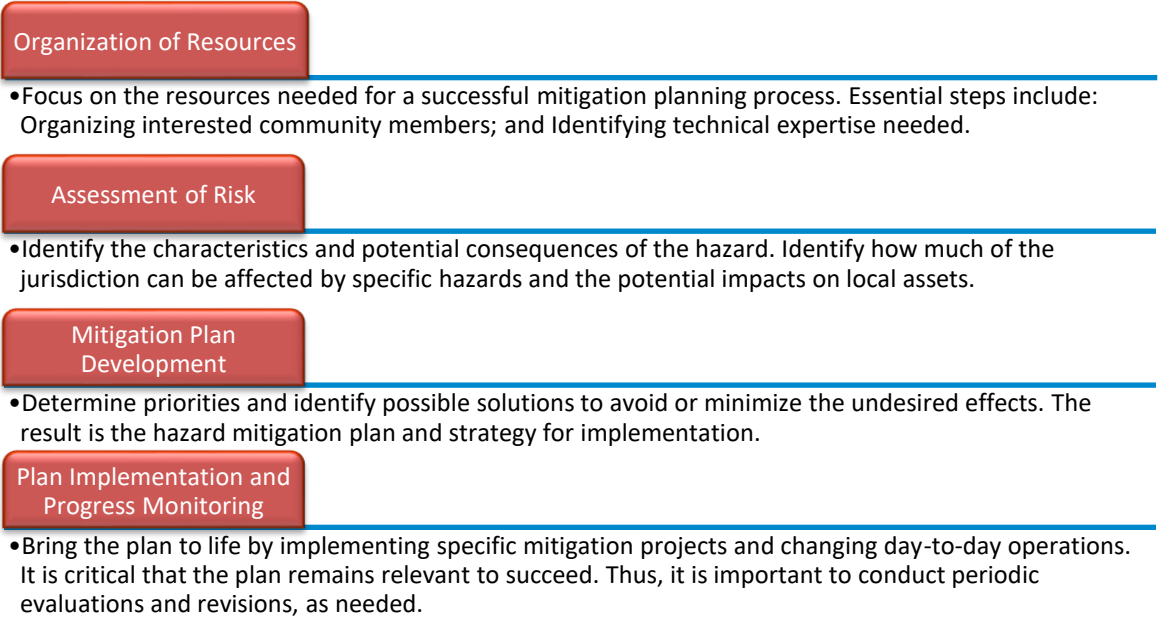
<sup>10</sup> Federal Emergency Management Agency. 2011. “Local Mitigation Plan Review Guide.” [https://www.fema.gov/media-library-data/20130726-1809-25045-7498/plan\\_review\\_guide\\_final\\_9\\_30\\_11.pdf](https://www.fema.gov/media-library-data/20130726-1809-25045-7498/plan_review_guide_final_9_30_11.pdf).

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

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

## HAZARD MITIGATION PLANNING PROCESS

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

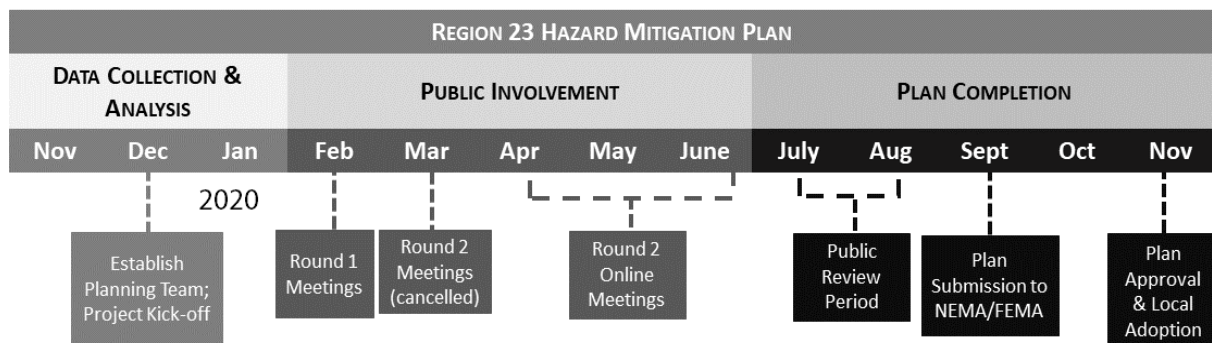


## ORGANIZATION OF RESOURCES

### PLAN UPDATE PROCESS

Region 23 EMA secured funding for their multi-jurisdictional hazard mitigation plan (HMP) in January 2019. JEO Consulting Group, INC. (JEO) was contracted in January 2019 to guide and facilitate the planning process and assemble the multi-jurisdictional hazard mitigation plan. For the planning area, Nan Gould (Region 23 EMA Director) led the development of the plan and served as the primary point-of-contact throughout the project. A clear timeline of this plan update process is provided in Figure 2.

Figure 2: Project Timeline



### PLANNING TEAM

At the beginning of the planning process Region 23 and JEO staff identified key contacts who would be the regional Hazard Mitigation Planning Team. This Planning Team, comprised of local participants, officials, engaged agencies, and the consultant, was established to guide the planning process, review the existing

plan, and serve as a liaison to plan participants throughout the planning area. A list of Planning Team members can be found in Table 4. Additional technical support was provided to the Planning Team by staff from NEMA and the NeDNR.

**Table 4: Hazard Mitigation Planning Team Members**

NAME	TITLE	JURISDICTION
BARB STRAUB	Village Administrator	Village of Hemingford
BARBARA KEEGAN	Highway Superintendent	Box Butte County
BRENDA BARRY-SCHOMMER	Safety Coordinator	Chadron State College
BRENT KUSEK	Community Development Director	City of Alliance
CAROLINE WINCHESTER	Superintendent	Chadron Public Schools
CHARLES ISOM	Superintendent	Hemingford Public Schools
CHERYL WELCH	Council Member	City of Chadron
CONNIE ROFFERS	City Clerk	City of Rushville
CONNIE SHELL	Mayor	City of Crawford
DAN BISHOP	Public Works Director	City of Gordon
DASHIELL ROHAN	Board Member	Village of Harrison
DAWN RAY	Support Services	Pioneer Manor/City of Hay Springs
DOAK NICKERSON	Northwest District Forester	Nebraska Forest Service
DUSTY BRYNER	Police Chief	Village of Hemingford
EVERET LANGFORD	Fire Fighter and Deputy	City of Hay Springs, Sheridan County
FRED MCCARTNEY	Forest Fuel Management Specialist	Nebraska Forest Service
GLEN SPAUGH	City Manager	City of Gordon
GREGORY YANKER	City Manager	City of Chadron
J.W. GEISER	Commissioner	Sioux County
JAKE STEWART	Board Member	Dawes County
JAMES KROTZ	County Commissioner	Sheridan County
JANE DAILEY	City Clerk	City of Crawford
JANET JOHNSON	Building/Zoning Official	City of Chadron
JERRY MACK	High School Principal	Chadron Public Schools
JIM KEEGAN	Deputy	Region 23 EMA
JIM MILES	Maintenance Supervisor	Hemingford Public Schools
JOHN ANNEN	Board Member	Village of Hemingford
KARL DAILEY	Sheriff	Dawes County
LYNN WEBSTER	Assistant Manager	UNW NRD
MIKE MCGINNIS	Commissioner	Box Butte County
MILO RUST	Public Works Director	City of Chadron
MISTY SKAVDAHL	Region 23 Deputy	Region 23 EMA
NAN GOULD	Director	Region 23 EMA
PAT O'BRIEN	General Manager	UNW NRD
PHILLIP SKAVDAHL	Board Chairman	Village of Harrison
RICHARD MCKAY	Mayor	City of Hay Springs
RICK WACKER	Board Member	Village of Hemingford
SETH PETERSON	Fire Management Specialist	Nebraska Forest Service
SHAD BRYNER	Fire Chief	Village of Hemingford
TIM BUSKIRK	District Ranger	USFS Pine Ridge District
TROY SHOEMAKER	Fire Chief	City of Alliance

NAME	TITLE	JURISDICTION
*BROOKE WELSH	Project Coordinator	JEO Consulting Group
*PHIL LUEBBERT	Planner	JEO Consulting Group

*\*Served as a consultant or advisory role*

A kick-off meeting was held on December 4<sup>th</sup>, 2019 to discuss an overview of the planning process between JEO staff and the Planning Team. Preliminary discussion was held over hazards to be included in this plan, changes to be incorporated since the last plan, goals and objectives, identification of key stakeholders to include in the planning process, and a general schedule for the plan update. This meeting also assisted in clarifying the role and responsibilities of the Planning Team and strategies for public engagement throughout the planning process. Table 5 shows Kick-off Meeting attendees.

**Table 5: Kick-off Meeting Attendees**

NAME	TITLE	JURISDICTION
CHERYL WELCH	Council Member	City of Chadron
CONNIE SHELL	Mayor	City of Crawford
DASHIELL ROHAN	Board Member	Village of Harrison
DOAK NICKERSON	Northwest District Forester	Nebraska Forest Service
EVERETTE LANGFORD	Commissioner	Sheridan County
FRED MCCARTNEY	Forest Fuel Management Specialist	Nebraska Forest Service
GLEN SPAUGH	City Manager	City of Gordon
GREGORY YANKER	City Manager	City of Chadron
J.W. GEISER	Commissioner	Sioux County
JANE DAILEY	City Clerk	City of Crawford
JIM KEEGAN	Deputy	Region 23 EMA
KARL DAILEY	Sheriff	Dawes County
MILO RUST	Public Works Director	City of Chadron
MISTY SKAVDAHL	Region 23 Deputy	Region 23 EMA
NAN GOULD	Director	Region 23 EMA
PHILLIP SKAVDAHL	Board Chairman	Village of Harrison
SETH PETERSON	Fire Management Specialist	Nebraska Forest Service
TIM BUSKIRK	District Ranger	USFS Pine Ridge District
TROY SHOEMAKER	Fire Chief	City of Alliance
*BROOKE WELSH	Project Coordinator	JEO Consulting Group
*PHIL LUEBBERT	Planner	JEO Consulting Group

Table 6 shows the data and location of meetings held for the Kick-off Meeting.

**Table 6: Kick-off Meeting Location and Time**

LOCATION AND TIME	AGENDA ITEMS
<b>REGION 23 EMA</b> <b>250 MAIN ST</b> <b>CHADRON, NE</b> <b>DECEMBER 4<sup>TH</sup>, 2019</b> <b>6:00PM</b>	<ul style="list-style-type: none"> <li>-Consultant and Planning Team Responsibilities</li> <li>-Overview of plan update process and changes from 2015 HMP</li> <li>-Review and adoption of goals and objectives</li> <li>-Dates/Locations for meetings</li> <li>-Plan Goals/Objectives</li> <li>-Overview of CWPP update and integration</li> </ul>

**PUBLIC INVOLVEMENT AND OUTREACH**

To notify and engage the public in the planning process a wide range of stakeholder groups were contacted and encouraged to participate. There were 33 stakeholder groups or entities that were identified and sent letters to participate. These included five airports, seven assisted living facilities, three hospitals or health



care providers, four chamber of commerce, four county extension offices, four Farm Service Agencies, two National Weather Service stations, two local public power districts, and the American Red Cross. While no other entities were incorporated as participating jurisdictions, the following entities attended meetings: Panhandle Public Power District, Nebraska Forest Service, Nebraska Emergency Management Agency, Chadron Community Hospital, Pioneer Manor Nursing Home, Panhandle Public Health District, and Chadron State College. These entities provided input which was incorporated into the appropriate community profiles (see *Section Seven*).

**Table 7: Notified Stakeholder Groups**

ORGANIZATIONS		
ALLIANCE CHAMBER OF COMMERCE	GORDON CHAMBER OF COMMERCE	NIOBRARA ELECTRIC ASSOCIATION
ALLIANCE MUNICIPAL AIRPORT	GORDON COUNTRYSIDE CARE	OGLALA SIOUX LAKOTA NURSING HOME
AMERICAN RED CROSS	GORDON MEMORIAL HOSPITAL DISTRICT	PANHANDLE PUBLIC HEALTH DEPARTMENT
BOX BUTTE COUNTY EXTENSION	GORDON MUNICIPAL AIRPORT	PANHANDLE PUBLIC POWER DISTRICT
BOX BUTTE COUNTY FARM SERVICE AGENCY	HAY SPRINGS MUNICIPAL AIRPORT	PIONEER MANOR NURSING HOME
BOX BUTTE GENERAL HOSPITAL	HEMINGFORD CHAMBER OF COMMERCE	PONDEROSA VILLA
CHADRON CHAMBER OF COMMERCE	HEMINGFORD COMMUNITY CARE CENTER	RUSHVILLE FARM SERVICE AGENCY
CHADRON COMMUNITY HOSPITAL CORP.	HIGHLAND PARK CARE CENTER	SCOTTS BLUFF FARM SERVICE AGENCY
CHADRON MUNICIPAL AIRPORT	MODISETT AIRPORT	SHERIDAN COUNTY EXTENSION
CREST VIEW CARE CENTER	NATIONAL WEATHER SERVICE	SIOUX COUNTY EXTENSION
DAWES COUNTY EXTENSION	NATIONAL WEATHER SERVICE	
DAWES COUNTY FARM SERVICE AGENCY	NEBRASKA DOT	

**NEIGHBORING JURISDICTIONS**

Neighboring jurisdictions were notified and invited to participate in the planning process. The following table indicates which neighboring communities or entities were notified of the planning process. Invitation and informational letters were sent to county clerks, county and regional emergency managers, Regional Emergency Management Agencies, and NRDs. There was no other participation from jurisdictions outside of the planning area.

**Table 8: Notified Neighboring Jurisdictions**

NOTIFIED NEBRASKA JURISDICTIONS	
CHERRY COUNTY, NE	OGLALA LAKOTA COUNTY, SD
FALL RIVER COUNTY, SD	OGLALA SIOUX TRIBE
GARDEN COUNTY, NE	REGION 21 EMERGENCY MANAGEMENT
GOSHEN COUNTY, WY	REGION 22 EMERGENCY MANAGEMENT
MIDDLE NIOBRARA NRD	REGION 24 EMERGENCY MANAGEMENT
MORRILL COUNTY, NE	REGION 26 EMERGENCY MANAGEMENT
NIOBRARA COUNTY, WY	SCOTTS BLUFF COUNTY, NE
NORTH PLATTE NRD	UPPER LOUP NRD

**PARTICIPANT INVOLVEMENT**

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

To be a participant in the development of this plan update, jurisdictions were required to have at a minimum one representative present at the Round 1 and Round 2 meeting or attend a follow-up meeting with a JEO staff member. Some jurisdictions sent multiple representatives to meetings. For jurisdictions who had only one representative, they were encouraged to bring meeting materials back to their governing bodies, to include a diverse input on the meeting documents. Sign-in sheets from all public meetings can be found in *Appendix A*. Jurisdictions that were unable to attend the scheduled public meetings were able to request a meeting with JEO staff to satisfy the meeting attendance requirement. This effort enabled jurisdictions which could not attend a scheduled public meeting to participate in the planning process.

Outreach to eligible jurisdictions included notification prior to all public meetings, phone calls and email reminders of upcoming meetings, and invitations to complete surveys and worksheets required for the planning process. Table 9 provides a summary of outreach activities utilized in this process.

**Table 9: Outreach Activity Summary**

ACTION	INTENT
PROJECT WEBSITE	Informed the public and local/planning team members of past, current, and future activities ( <a href="https://jeo.com/region-23-hazard-mitigation-plan-update">https://jeo.com/region-23-hazard-mitigation-plan-update</a> )
PROJECT ANNOUNCEMENT	Project announcement shared with local media outlets and participating jurisdictions to be posted on social media
ROUND 1 MEETING LETTERS OR EMAILS (30-DAY NOTIFICATION)	Sent to participants, stakeholders, and neighboring jurisdictions to discuss the agenda/dates/times/ locations of the first round of public meetings
ROUND 2 MEETING LETTERS OR EMAILS (30-DAY NOTIFICATION)	Sent to participants to discuss the agenda/dates/times/locations of the second round of public meetings
PRESS RELEASE	Sent to local newspapers to announce the plan and describe the purpose of the plan
NOTIFICATION PHONE CALLS	Called potential participants to remind them about upcoming meetings
FOLLOW-UP EMAILS AND PHONE CALLS	Correspondence was provided to remind and assist participating jurisdictions with the collection and submission of required local data
PROJECT FLYER	Flyers were posted about the Region 23 EMA HMP and how to get involved. Flyers were posted at multiple locations throughout all counties and shared with all planning team members and stakeholders at meetings
WORD-OF-MOUTH	Staff discussed the plan with jurisdictions throughout the planning process

**ASSESSMENT OF RISK**

**ROUND 1 MEETINGS: HAZARD IDENTIFICATION**

At the Round 1 meetings, jurisdictional representatives (i.e. the local planning team members) reviewed the hazards identified at the kick-off meeting and conducted risk and vulnerability assessments based on these hazards' previous occurrence and the communities' exposure. (For a complete list and regional overview of hazards reviewed, see *Section Four: Risk Assessment*.)

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

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

AGENDA ITEMS	
GENERAL OVERVIEW OF THE HMP AND CWPP PLAN UPDATE PROCESS, DISCUSS PARTICIPATION REQUIREMENTS, BEGIN THE PROCESS OF RISK ASSESSMENT AND IMPACT REPORTING, UPDATE CRITICAL FACILITIES, CAPABILITIES ASSESSMENT, AND STATUS UPDATE ON CURRENT MITIGATION PROJECTS	
LOCATION AND TIME	Date
REGION 23 EMA OFFICE CHADRON NE, 6:00PM MT	WEDNESDAY, FEBRUARY 12 <sup>TH</sup> , 2020
PANHANDLE PUBLIC HEALTH DEPARTMENT HEMINGFORD NE, 6:00PM MT	THURSDAY, FEBRUARY 13 <sup>TH</sup> , 2020

The intent of these meetings was to familiarize local planning team members with the plan update process, expected actions for the coming months, the responsibilities of being a participant, and to collect preliminary information to update the HMP. Data collected at these meetings included: updates to mitigation actions from the 2015 Region 23 HMP; review, confirm, or update hazards of top concerns from each jurisdiction; and to begin reviewing and updating community profiles for demographics and capabilities.

These meetings also served as an opportunity to discuss the integration of the Pine Ridge Area Community Wildfire Protection Plan (CWPP) alongside the HMP. CWPPs do not have a federally regulated update cycle. Region 23 EMA, as the project sponsor, combined the update process for the HMP and CWPP for the area. An introduction to the CWPP and preliminary data collection was completed at Round 1 Meetings as well.

The following tables show the attendees for each jurisdiction who attended Round 1 meetings or had a one-on-one discussion for Round 1 information with JEO staff. All county and community jurisdictions attended a Round 1 Meeting or an in-person one-on-one meeting.

**Table 11: Round 1 Meeting Attendees**

NAME	TITLE	JURISDICTION
CHADRON – WEDNESDAY, FEBRUARY 12, 2020		
AARON FORSBERG	Emergency Preparedness Coordinator	Chadron Community Hospital
BRENDA BARRY-SCHOMMER	Safety Coordinator	Chadron State College
CHERYL WELCH	Council Member	City of Chadron
DAN RAY	Support Services	Pioneer Manor of Hay Springs
DASHIELL ROHAN	Board Member	Village of Harrison
DR. CAROLINE WINCHESTER	Superintendent	Chadron Public Schools
EVERETTE LANGFORD	Commissioner	Sheridan County
GLEN SPAUGH	City Manager	City of Gordon
GREGORY YANKER	City Manager	City of Chadron
JAKE STEWART	Commissioner	Dawes County
JAMES KROTZ	Commissioner	Sheridan County
JANE DAILEY	City Clerk	City of Crawford
KARL DAILEY	Sheriff	Dawes County
LYNN WEBSTER	Assistant Manager	Upper Niobrara White NRD
MILO RUST	Public Works Director	City of Chadron
NAN GOULD	Coordinator	Region 23 EMA
PAT O'BRIEN	General Manager	Upper Niobrara White NRD
PHILLIP SKAVDAHL	Board Chairman	Village of Harrison
RICHARD MCKAY	Mayor	City of Hay Springs

NAME	TITLE	JURISDICTION
BROOKE WELSH	Project Coordinator	JEO Consulting Group
PHIL LUEBBERT	Planner	JEO Consulting Group
HEMINGFORD – THURSDAY, FEBRUARY 13, 2020		
BARBARA KEEGAN	Highway Superintendent	Box Butte County
CHARLES ISON	Superintendent	Hemingford Public Schools
J.W. GEISER	Commissioner	Sioux County
JIM KEEGAN	Board Chairman	Village of Hemingford
JOSEPH GREEN	Recovery Planning Specialist	NEMA
RICHARD WACKER	Board Member	Village of Hemingford
RYAN REIBER	Manager	Panhandle Public Power District
SETH PETERSON	Fire Management Specialist	Nebraska Forest Service
SHAD BRYNER	Fire Chief	Hemingford Fire District
SHAVIN BARNHART	Preparedness and Community Health Educator	Panhandle Public Health District
TABI PROCHEZKA	Deputy Director of Health and Preparedness	Panhandle Public Health District
TROY SHOEMAKER	Fire Chief	City of Alliance
BROOKE WELSH	Project Coordinator	JEO Consulting Group
PHIL LUEBBERT	Planner	JEO Consulting Group

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

NAME	TITLE	JURISDICTION
RUSHVILLE – THURSDAY, FEBRUARY 13, 2020		
CONNIE ROFFERS	City Clerk	City of Rushville
BROOKE WELSH	Project Coordinator	JEO Consulting Group
PHIL LUEBBERT	Planner	JEO Consulting Group

## MITIGATION PLAN DEVELOPMENT

### ROUND 2 MEETINGS: MITIGATION STRATEGIES

Round 2 meetings are designed to identify and prioritize mitigation measures and evaluate potential integration of the HMP alongside other local planning mechanisms. Mitigation actions and plan integration are essential components in effective hazard mitigation plans. Participating jurisdictions were asked to identify any new mitigation actions to pursue alongside continued actions from the 2015 HMP and provide copies or descriptions of current community plans in which hazard mitigation goals and principals can 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 include, but was not limited to: local hazard prioritization results; identified critical facilities and their location within the community; future development areas; and expected growth trends (refer to *Appendix B*).

Round 2 meetings were originally scheduled for late March 2020. However, due to the prevalence of and the state's imposed directed health measures surrounding the coronavirus disease 2019 (COVID-19) pandemic, in person meetings were cancelled and materials and information was shared via online formats. All participating jurisdictions were provided Round 2 materials to review and complete. Regular email updates were provided to planning team members as changes to the schedule were determined to suit the COVID-19 response. Also, all jurisdictions were given the opportunity to have a one-on-one video or phone conference with the consultant in order to meet plan participation requirements and complete required information. The following table lists the dates and times of one-on-one meetings for communities who selected this route.

**Table 13: Round 2 Alternate Meeting Dates**

COMMUNITY	DATE
REGION 23 EMA	April 17, 2020
BOX BUTTE COUNTY	June 16, 2020
CITY OF ALLIANCE	June 2, 2020
VILLAGE OF HEMINGFORD	May 18, 2020
DAWES COUNTY	June 16, 2020
CITY OF CHADRON	April 23, 2020
CITY OF CRAFORD	June 5, 2020
SHERIDAN COUNTY	May 26, 2020
CITY OF GORDON	June 1, 2020
CITY OF HAY SPRINGS	June 17, 2020
CITY OF RUSHVILLE	June 16, 2020
SIOUX COUNTY	June 20, 2020
VILLAGE OF HARRISON	June 1, 2020
CHADRON PUBLIC SCHOOLS	April 21, 2020
HEMINGFORD PUBLIC SCHOOLS	April 28, 2020
UPPER NIOBRARA WHITE NRD	June 10, 2020

During one-on-one Round 2 calls, the general schedule, public review period, and submission and adoption requirements were also shared with local planning teams.

## DATA SOURCES AND INFORMATION

Effective hazard mitigation planning requires the review and inclusion of a wide range of data, documents, plans, and studies. The following table identifies many of the sources utilized during this planning process. Specific references are included as footnotes when used as applicable. The following table is not exhaustive as many studies, plans, or data resources at the local level are not publicly available. Individual examples of plan integration are identified in *Section Seven: Community Profiles*.

**Table 14: General Plans, Documents, and Information**

DOCUMENTS	
Disaster Mitigation Act of 2000 DMA <a href="https://www.fema.gov/media-library/assets/documents/4596?id=1935">https://www.fema.gov/media-library/assets/documents/4596?id=1935</a>	Mitigation Ideas: A Resource for Reducing Risk to Natural Hazards (2013) <a href="https://www.fema.gov/media-library/assets/documents/30627">https://www.fema.gov/media-library/assets/documents/30627</a>
Final Rule (2007) <a href="https://www.fema.gov/media-library/assets/documents/23672">https://www.fema.gov/media-library/assets/documents/23672</a>	National Flood Insurance Program Community Status Book (2020) <a href="https://www.fema.gov/national-flood-insurance-program-community-status-book">https://www.fema.gov/national-flood-insurance-program-community-status-book</a>
Hazard Mitigation Assistance Unified Guidance (2013) <a href="https://www.fema.gov/media-library/assets/documents/103279">https://www.fema.gov/media-library/assets/documents/103279</a>	National Response Framework (2016) <a href="https://www.fema.gov/media-library/assets/documents/117791">https://www.fema.gov/media-library/assets/documents/117791</a>
Hazard Mitigation Assistance Guidance and Addendum (2015) <a href="https://www.fema.gov/media-library/assets/documents/103279">https://www.fema.gov/media-library/assets/documents/103279</a>	Robert T. Stafford Disaster Relief and Emergency Assistance Act (2016) <a href="https://www.fema.gov/media-library/assets/documents/15271">https://www.fema.gov/media-library/assets/documents/15271</a>
Local Mitigation Plan Review Guide (2011) <a href="https://www.fema.gov/media-library/assets/documents/23194">https://www.fema.gov/media-library/assets/documents/23194</a>	The Census of Agriculture (2012) <a href="https://www.agcensus.usda.gov/Publications/2012/Full_Report/Census_by_State/Nebraska/">https://www.agcensus.usda.gov/Publications/2012/Full_Report/Census_by_State/Nebraska/</a>
Local Mitigation Planning Handbook (2013) <a href="https://www.fema.gov/media-library/assets/documents/31598">https://www.fema.gov/media-library/assets/documents/31598</a>	The Census of Agriculture (2017) <a href="https://www.nass.usda.gov/Publications/AgCensus/2017/Full_Report/Volume_1_Chapter_2_County_Level/Nebraska/">https://www.nass.usda.gov/Publications/AgCensus/2017/Full_Report/Volume_1_Chapter_2_County_Level/Nebraska/</a>
Mitigation Ideas: A Resource for Reducing Risk to Natural Hazards (2013)	What is a Benefit: Guidance on Benefit-Cost Analysis on Hazard Mitigation Projects <a href="http://www.fema.gov/benefit-cost-analysis">http://www.fema.gov/benefit-cost-analysis</a>

<https://www.fema.gov/media-library/assets/documents/30627>

PLANS AND STUDIES

Region 23 Hazard Mitigation Plan (2015) <a href="https://jeo.com/sites/default/files/inline-files/Main%20Section.pdf_min.pdf">https://jeo.com/sites/default/files/inline-files/Main%20Section.pdf_min.pdf</a>	National Climate Assessment (2014) <a href="https://nca2014.globalchange.gov/">https://nca2014.globalchange.gov/</a>
Flood Insurance Studies <a href="http://www.fema.gov/floodplain-management/flood-insurance-study">http://www.fema.gov/floodplain-management/flood-insurance-study</a>	Nebraska Drought Mitigation and Response Plan (2000) <a href="http://carc.nebraska.gov/docs/NebraskaDrought.pdf">http://carc.nebraska.gov/docs/NebraskaDrought.pdf</a>
Fourth National Climate Assessment (2018) <a href="https://nca2018.globalchange.gov/">https://nca2018.globalchange.gov/</a>	State of Nebraska Hazard Mitigation Plan (2019) <a href="https://nema.nebraska.gov/sites/nema.nebraska.gov/files/doc/hazmitplan2019.pdf">https://nema.nebraska.gov/sites/nema.nebraska.gov/files/doc/hazmitplan2019.pdf</a>

DATA SOURCES/TECHNICAL RESOURCES

Arbor Day Foundation – Tree City Designation <a href="https://www.arborday.org/">https://www.arborday.org/</a>	Nebraska Department of Natural Resources <a href="http://www.dnr.ne.gov">http://www.dnr.ne.gov</a>
Environmental Protection Agency - Chemical Storage Sites <a href="https://myrtk.epa.gov/info/search.jsp">https://myrtk.epa.gov/info/search.jsp</a>	Nebraska Department of Natural Resources – Dam Inventory <a href="http://prodmaps2.ne.gov/html5DNR/?viewer=daminventory">http://prodmaps2.ne.gov/html5DNR/?viewer=daminventory</a>
Federal Emergency Management Agency <a href="http://www.fema.gov">http://www.fema.gov</a>	Nebraska Department of Natural Resources – Flood Risk Map Products <a href="https://prodmaps2.ne.gov/Html5DNR/index.html?viewer=outreach">https://prodmaps2.ne.gov/Html5DNR/index.html?viewer=outreach</a>
FEMA Flood Map Service Center <a href="https://msc.fema.gov/portal/advanceSearch">https://msc.fema.gov/portal/advanceSearch</a>	Nebraska Department of Revenue – Property Assessment Division <a href="http://www.revenue.ne.gov/PAD">www.revenue.ne.gov/PAD</a>
High Plains Regional Climate Center <a href="http://climod.unl.edu/">http://climod.unl.edu/</a>	Nebraska Department of Transportation <a href="http://dot.nebraska.gov/">http://dot.nebraska.gov/</a>
National Agricultural Statistics Service <a href="http://www.nass.usda.gov/">http://www.nass.usda.gov/</a>	Nebraska Emergency Management Agency <a href="http://www.nema.ne.gov">http://www.nema.ne.gov</a>
National Centers for Environmental Information <a href="https://www.ncei.noaa.gov/">https://www.ncei.noaa.gov/</a>	Nebraska Forest Service – Wildland Fire Protection Program <a href="http://nfs.unl.edu/fire">http://nfs.unl.edu/fire</a>
National Consortium for the Study of Terrorism and Responses to Terrorism (START) <a href="http://www.start.umd.edu/gtd/">http://www.start.umd.edu/gtd/</a>	Nebraska Forest Service (NFS) <a href="http://www.nfs.unl.edu/">http://www.nfs.unl.edu/</a>
National Drought Mitigation Center – Drought Impact Reporter <a href="http://droughtreporter.unl.edu/map/">http://droughtreporter.unl.edu/map/</a>	Nebraska Public Power District Service <a href="http://econdev.nppd.com/">http://econdev.nppd.com/</a>
National Drought Mitigation Center – Drought Monitor <a href="http://droughtmonitor.unl.edu/">http://droughtmonitor.unl.edu/</a>	Nebraska State Historical Society <a href="http://www.nebraskahistory.org/histpres/index.shtml">http://www.nebraskahistory.org/histpres/index.shtml</a>
National Environmental Satellite, Data, and Information Service <a href="http://www.nesdis.noaa.gov/">http://www.nesdis.noaa.gov/</a>	Stanford University - National Performance of Dams Program <a href="https://npdp.stanford.edu/">https://npdp.stanford.edu/</a>
National Fire Protection Association <a href="https://www.nfpa.org/">https://www.nfpa.org/</a>	Storm Prediction Center Statistics <a href="http://www.spc.noaa.gov">http://www.spc.noaa.gov</a>
National Flood Insurance Program <a href="https://www.fema.gov/national-flood-insurance-program">https://www.fema.gov/national-flood-insurance-program</a>	United States Army Corps of Engineers – National Levee Database <a href="http://nld.usace.army.mil/egis/f?p=471:1:0::NO">http://nld.usace.army.mil/egis/f?p=471:1:0::NO</a>
National Flood Insurance Program <a href="https://dnr.nebraska.gov/floodplain/flood-insurance">https://dnr.nebraska.gov/floodplain/flood-insurance</a>	United States Army Corps of Engineers – National Inventory of Dams <a href="https://nid.sec.usace.army.mil/ords/f?p=105:1:.....">https://nid.sec.usace.army.mil/ords/f?p=105:1:.....</a>
National Historic Registry <a href="http://www.nps.gov/nr">http://www.nps.gov/nr</a>	United States Census Bureau <a href="http://www.census.gov">http://www.census.gov</a>
National Oceanic Atmospheric Administration (NOAA) <a href="http://www.noaa.gov/">http://www.noaa.gov/</a>	United States Census Bureau <a href="https://factfinder.census.gov/faces/nav/jsf/pages/index.xhtml">https://factfinder.census.gov/faces/nav/jsf/pages/index.xhtml</a>
National Weather Service <a href="http://www.weather.gov/">http://www.weather.gov/</a>	United States Department of Agriculture <a href="http://www.usda.gov">http://www.usda.gov</a>
Natural Resources Conservation Service <a href="http://www.ne.nrcs.usda.gov">www.ne.nrcs.usda.gov</a>	United States Department of Agriculture – Risk Assessment Agency <a href="http://www.rma.usda.gov">http://www.rma.usda.gov</a>

Nebraska Association of Resources Districts <a href="http://www.nrdnet.org">http://www.nrdnet.org</a>	United States Department of Agriculture – Web Soil Survey <a href="https://websoilsurvey.nrcs.usda.gov/app/WebSoilSurvey.aspx">https://websoilsurvey.nrcs.usda.gov/app/WebSoilSurvey.aspx</a>
Nebraska Climate Assessment Response Committee <a href="http://carc.agr.ne.gov">http://carc.agr.ne.gov</a>	United States Department of Commerce <a href="http://www.commerce.gov/">http://www.commerce.gov/</a>
Nebraska Department of Education <a href="http://nep.education.ne.gov/">http://nep.education.ne.gov/</a>	United States Department of Transportation – Pipeline and Hazardous Materials Safety Administration <a href="https://www.phmsa.dot.gov/">https://www.phmsa.dot.gov/</a>
Nebraska Department of Education <a href="http://educdirsrc.education.ne.gov/">http://educdirsrc.education.ne.gov/</a>	United States Geological Survey <a href="http://www.usgs.gov/">http://www.usgs.gov/</a>
Nebraska Department of Environment and Energy <a href="http://www.deq.state.ne.us/">http://www.deq.state.ne.us/</a>	United States National Response Center <a href="http://www.nrc.uscg.mil/">http://www.nrc.uscg.mil/</a>
Nebraska Department of Health and Human Services <a href="http://dhhs.ne.gov/Pages/default.aspx">http://dhhs.ne.gov/Pages/default.aspx</a>	United States Small Business Administration <a href="http://www.sba.gov">http://www.sba.gov</a>
Nebraska Department of Natural Resource – Geographic Information Systems (GIS) <a href="https://dnr.nebraska.gov/data">https://dnr.nebraska.gov/data</a>	UNL – College of Agricultural Sciences and Natural Resources – Schools of Natural Resources <a href="http://casnr.unl.edu">http://casnr.unl.edu</a>

## PUBLIC REVIEW

All participating jurisdictions were provided an opportunity to review and provide comments on the draft HMP prior to its submission. A copy of the draft HMP and community profiles were posted to the project website and all planning team members were notified of its posting via email. Due to changes in the planning process from COVID-19, many jurisdictions conducted one-on-one meetings with the consultant or completed necessary reviews with provided information. As jurisdictions met requirements and provided completed materials and follow up, individual sections of the plan were provided to them. Received comments and suggested changes were incorporated into the draft plan prior to final review by participating jurisdictions. The final draft of the HMP was available online at <https://jeo.com/region-23-hazard-mitigation-plan-update> from July 1, 2020 through July 15, 2020. A shortened public review period was utilized to submit the HMP for state and federal approval prior to previous plan expiration.

## PLAN ADOPTION

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

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

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

## PLAN IMPLEMENTATION AND PROGRESS MONITORING

Hazard mitigation plans need to be living documents. To ensure this, the plan must be monitored, evaluated, and updated on a five-year or less cycle. This includes incorporating the mitigation plan into county and local comprehensive or capital improvement plans as they are developed or updated. *Section Six* describes the system that jurisdictions participating in the Region 23 HMP have established to monitor the plan; provides a description of how, when, and by whom the HMP process and mitigation actions will be evaluated; presents the criteria used to evaluate the plan; and explains how the plan will be maintained and updated.

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# SECTION THREE

## PLANNING AREA PROFILE

### INTRODUCTION

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

### PLANNING AREA GEOGRAPHIC SUMMARY

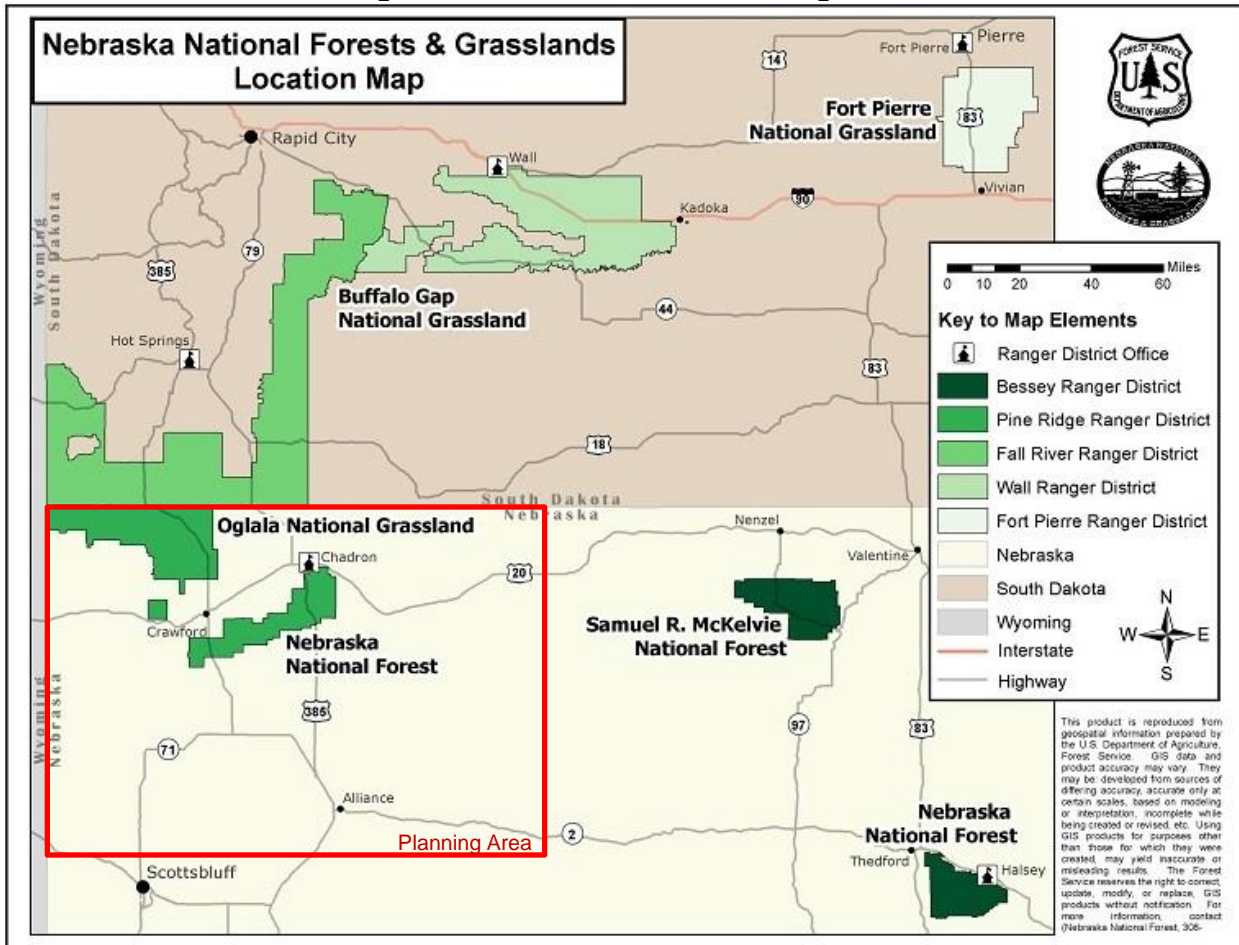
Region 23 EMA's jurisdiction includes the far northwestern corner of Nebraska and spans 7,016 square miles. For the purpose of this plan update the planning area includes all of Box Butte, Dawes, Sheridan, and Sioux counties. The planning area has a diverse range of topographic regions including: valley-side slopes, rolling hills, dissected plains, sandhills, and bluffs and escarpments (Figure 4). Descriptions of these topographic regions are below:

- **Dissected plains:** hilly land with moderate to steep slopes and sharp ridge crests.
- **Valleys:** flat-lying land along major streams and include stream-deposited silt, clay, sand, and gravel materials.
- **Valley-side slopes:** moderately sloping land occurring between escarpments and major stream valleys
- **Rolling Hills:** hilly land with moderate to steep slopes and rounded ridge crests
- **Sandhills:** hilly land composed of low to high dunes of sand stabilized by grass cover
- **Bluffs and Escarpments:** rugged land with very steep and irregular slopes. Exposed bedrock may include shale and limestone.<sup>13</sup>

This region lies in a topographic region of with both plains and a rocky escarpment known as 'Pine Ridge.' Pine Ridge landscape is a rocky escarpment that rises several hundred feet from the surrounding plains. Ponderosa pine woodlands and forest occupy many of the north and east facing slopes with Pine woodland and mixed grass prairie occupying the south and west facing slopes in the region. The region also includes several national forests and grasslands including the southern portion of the Oglala National Grassland and the Nebraska National Forest at Chadron (Figure 3). The region resides in the White River Watershed and the Niobrara River Watershed. Main waterways in the planning area include White River and the Niobrara River. The White River flows into South Dakota where it joins with the Missouri River. The Niobrara River Watershed is comprised of the river as it comes out of Wyoming and flows into Box Butte Reservoir. After it exits the region the Niobrara River is joined by the Snake River. Region 23 is located in the Upper Niobrara White Natural Resources District.

<sup>13</sup> Conservation and Survey Division/Institute of Agriculture and Natural Resources. 2001. "Topographic regions map of Nebraska." <https://digitalcommons.unl.edu/caripubs/62>.

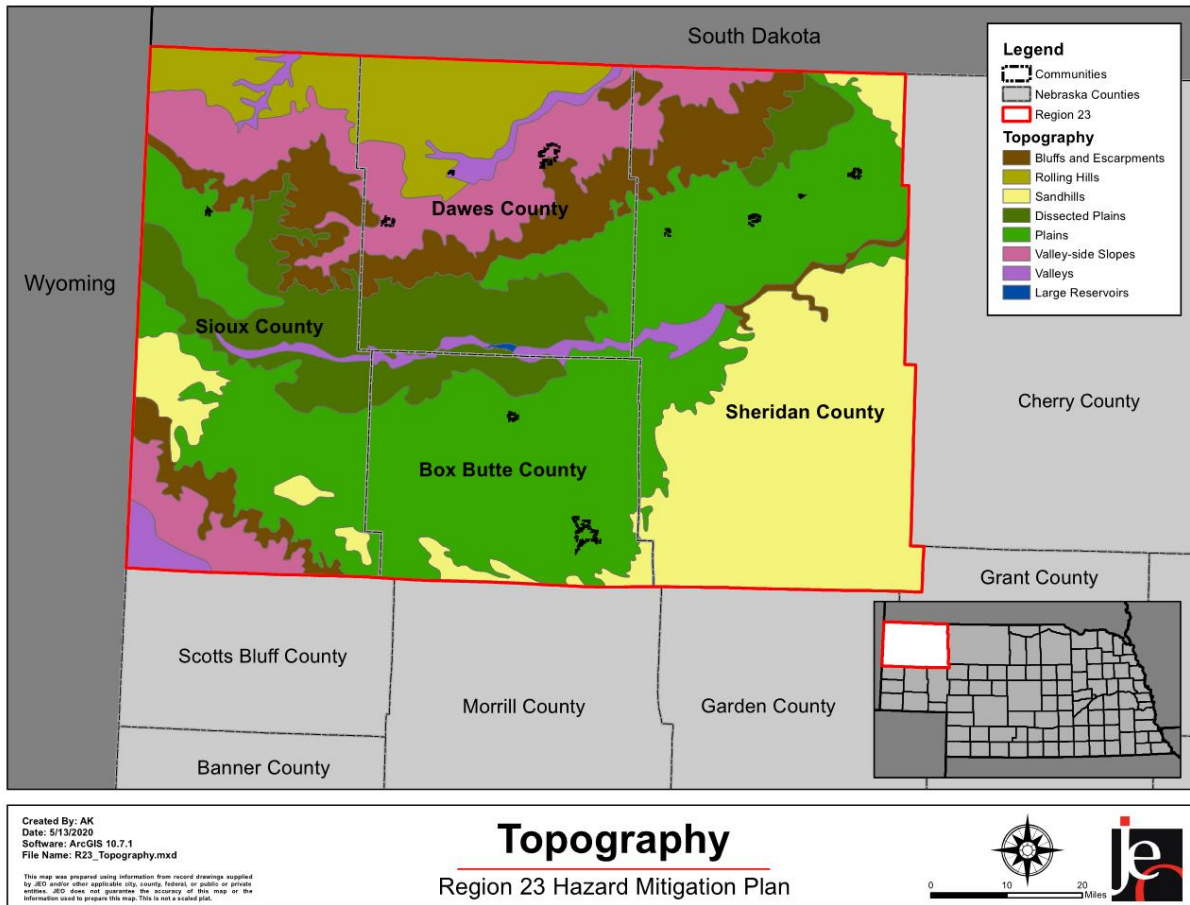
Figure 3: National Forests in Planning Area



Source: USDA Forest Service<sup>14</sup>

<sup>14</sup> United States Department of Agriculture Forest Service. N.d. "Nebraska National Forests and Grasslands." Accessed January 2020. <https://www.fs.usda.gov/nebraska>

Figure 4: Planning Area Topography



## DEMOGRAPHICS AND AT-RISK POPULATIONS

As noted above, the planning area includes all of Box Butte, Dawes, Sheridan, and Sioux counties. While neither the Region 23 EMA or U.S. Census Bureau collects specific demographic information for the region, overall county population served is 26,669. This population includes a range of demographics and persons at risk to natural and human-made disasters.

Table 15: Estimated Population for Planning Area

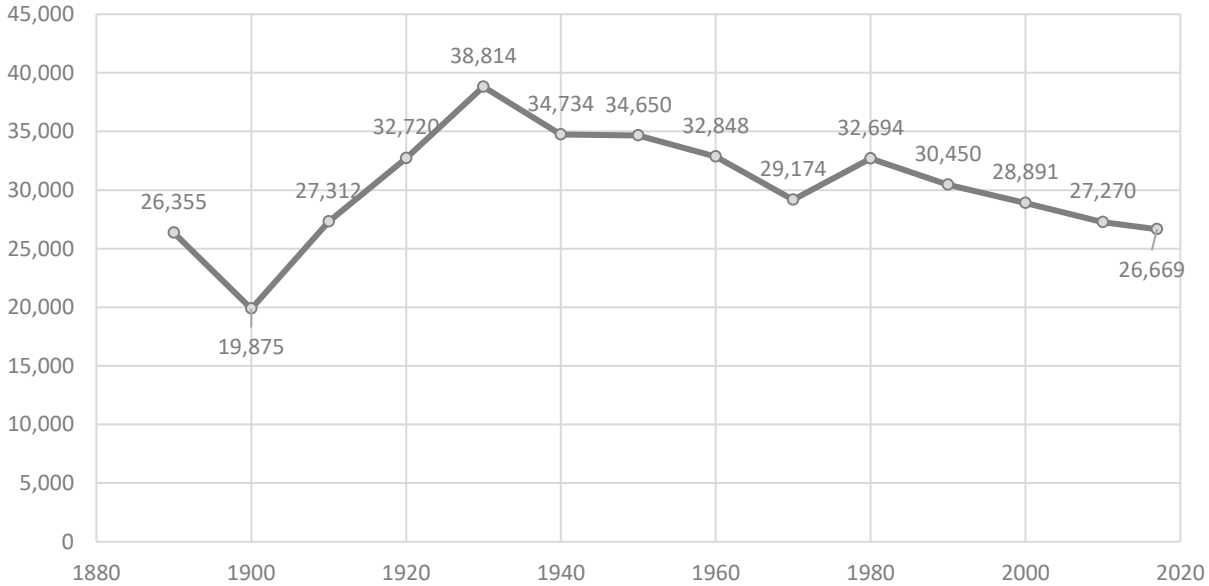
AGE	PLANNING AREA	STATE OF NEBRASKA
<5	5.8%	6.9%
5-19	21.0%	20.7%
20-64	54.2%	57.6%
>64	19.0%	14.8%
<b>MEDIAN</b>	<b>43.1</b>	<b>36.3</b>

Source: U.S. Census Bureau

Community and regional vulnerability is impacted by growing or declining populations. Communities growing quickly may lack resources to provide services for all members of the community in a reasonable timeframe including snow removal, emergency storm shelters, repairs to damaged infrastructure, or even tracking the location of vulnerable populations. Communities experiencing population decline may be more vulnerable to hazards as a result of vacant and/or dilapidated structures, an inability to properly maintain critical facilities and/or infrastructure, and higher levels of unemployment and population living in poverty. It is important for communities to monitor their population changes and ensure that those issues be

incorporated into hazard mitigation plans, as well as other planning mechanisms within the community. Communities with decreasing population are located primarily in more rural areas, away from larger city centers and major transportation corridors.

**Figure 5: Planning Area Population, 1890-2017**



Source: U.S. Census Bureau<sup>15</sup>

The planning area has displayed an overall decline in total population since the 1980s. While the U.S. Census Bureau conducts a formal census every ten years, the estimated population of the four-county planning area in 2017 was 26,669. Subsequent updates to this HMP should include updated census data from the 2020 census to determine if the trend is continuing.

## AT-RISK POPULATIONS

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

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

The National Response Framework defines at-risk populations as “...populations whose members may have additional needs before, during, and after an incident in functional areas, including but not limited to: maintaining independence, communication, transportation, supervision, and medical care.”<sup>16</sup>

Dependent children under 19 years old are one of the most vulnerable populations to disasters.<sup>17</sup> The majority of people in this age group do not have access to independent financial resources, transportation, or cellular telephones. They also lack practical knowledge necessary to respond appropriately during a disaster. Despite this vulnerability, children are generally overlooked in disaster planning because the

<sup>15</sup> United States Census Bureau. “2017 American Fact Finder: S0101: Age and Sex.” [database file]. <https://factfinder.census.gov>.

<sup>16</sup> United States Department of Homeland Security. June 2016. “National Response Framework Third Edition.” [https://www.fema.gov/media-library-data/1466014682982-9bcf8245ba4c60c120aa915abe74e15d/National\\_Response\\_Framework3rd.pdf](https://www.fema.gov/media-library-data/1466014682982-9bcf8245ba4c60c120aa915abe74e15d/National_Response_Framework3rd.pdf).

<sup>17</sup> Flanagan, Gregory, Hallisey, Heitgerd, & Lewis. 2011. “A Social Vulnerability Index for Disaster Management.” *Journal of Homeland Security and Emergency Management*, 8(11): Article 3.

presence of a caretaker is assumed. With nearly 27% of the planning area’s population younger than 19, children are a key vulnerable group to address in the planning process.

Schools house a high number of children and adults within the planning area during the daytime hours of weekdays, as well as during special events on evenings and weekends. The following table identifies the various school districts located within the planning area, and Figure 6 is a map of the school district boundaries. This list is comprehensive and does not represent only the school districts participating in this plan.

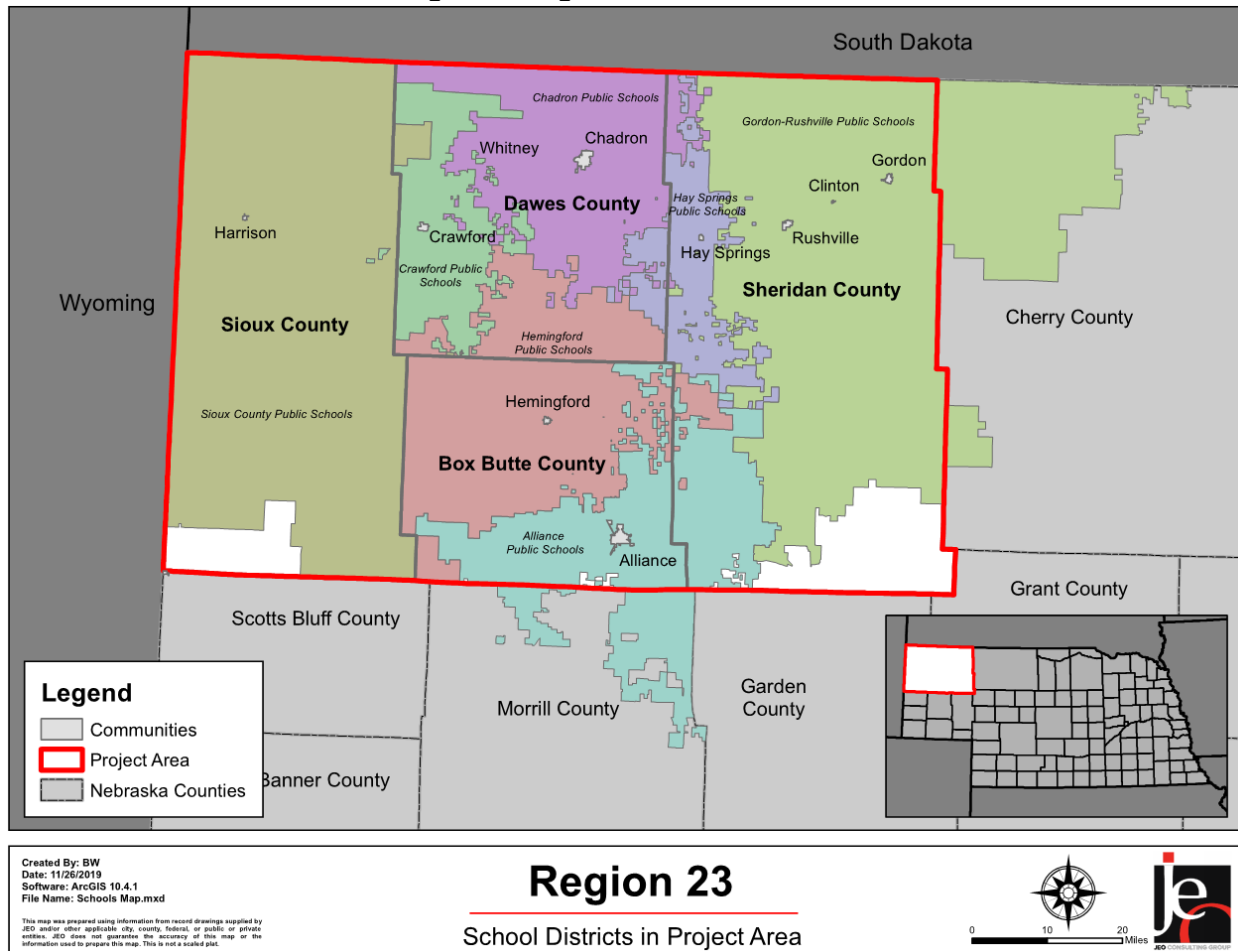
**Table 16: School Inventory**

SCHOOL DISTRICT	TOTAL ENROLLMENT (2018-2019)	TOTAL TEACHERS
<b>ALLIANCE PUBLIC SCHOOLS</b>	1,385	90
<b>CHADRON PUBLIC SCHOOLS</b>	920	70
<b>CRAWFORD PUBLIC SCHOOLS</b>	204	18
<b>GORDON-RUSHVILLE PUBLIC SCHOOLS</b>	616	55
<b>HAY SPRINGS PUBLIC SCHOOLS</b>	201	20
<b>HEMINGFORD PUBLIC SCHOOLS</b>	449	38
<b>SIOUX COUNTY PUBLIC SCHOOLS</b>	100	18

Source: Nebraska Department of Education<sup>18</sup>

<sup>18</sup> Nebraska Department of Education. 2019. "Nebraska Education Profile." Accessed January 2019. <http://nep.education.ne.gov/>.

Figure 6: Regional School Districts



Like minors, seniors (age 65 and greater) are often more significantly impacted by temperature extremes. During prolonged heat waves or periods of extreme cold, seniors may lack resources to effectively address hazard conditions and as a result may incur injury or potentially death. Prolonged power outages (either standalone events or as the result of other contributing factors) can have significant impacts on any citizen relying on medical devices for proper bodily functions. One study conducted by the Center for Injury Research and Policy found that increases in vulnerability related to severe winter storms (with significant snow accumulations) begin at age 55.<sup>19</sup> The study found that on average there are 11,500 injuries and 100 deaths annually related to snow removal. Males over the age of 55 are 4.25 times more likely to experience cardiac symptoms during snow removal.

While the previously identified populations do live throughout the planning area, there is the potential that they will be located in higher concentrations at care facilities. Table 17 identifies the number and capacity of care facilities throughout the planning area. In addition to the facilities listed below, a health clinic facility in Chadron also has three extension offices located in Crawford, Alliance, and Gordon.

<sup>19</sup> Center for Injury Research and Policy. January 2011. "Snow Shoveling Safety." Accessed July 2017. <http://www.nationwidechildrens.org/cirp-snow-shoveling>.

**Table 17: Inventory of Care Facilities**

JURISDICTION	HOSPITALS	HOSPITAL BEDS	HEALTH CLINICS	ADULT CARE HOMES	ADULT CARE BEDS	ASSISTED LIVING HOMES	ASSISTED LIVING BEDS
<b>BOX BUTTE</b>	1	25	1	2	96	3	69
<b>DAWES</b>	1	25	2	2	105	2	38
<b>SHERIDAN</b>	1	25	0	3	157	2	36
<b>SIoux</b>	0	0	0	0	0	0	0

Source: Nebraska Department of Health and Human Services<sup>20,21,22,23</sup>

In addition to residents being classified as at-risk by age, there are other specific groups within the planning area that experience vulnerabilities related to their ability to communicate or their economic status. Table 18 provide statistics per county regarding households with English as a second language (ESL) and population reported as in poverty within the past 12 months.

**Table 18: ESL and Poverty At-Risk Populations**

COUNTY	PERCENT THAT SPEAKS ENGLISH AS SECOND LANGUAGE	FAMILIES BELOW POVERTY LEVEL
<b>BOX BUTTE</b>	6.8%	4.1%
<b>DAWES</b>	5.0%	12.8%
<b>SHERIDAN</b>	4.0%	7.9%
<b>SIoux</b>	0.0%	10.8%

Source: U.S. Census Bureau<sup>24,25</sup>

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

The four county planning area resides to the south and southwest of two tribal Indian reservations in South Dakota: the Oglala Sioux Tribe and the Rosebud Indian Reservation. Residents in the planning area may be part of or travel to these reservations regularly. Native peoples traditionally have a heritage language and tribal elders may only speak their traditional language. Residents who speak English as a second language may struggle with a range of issues before, during, and after hazard events. General vulnerabilities revolve around what could be an inability to effectively communicate with others or an inability to comprehend materials aimed at notification and/or education. When presented with a hazardous situation it is important that all community members be able to receive, decipher, and act on relevant information. An inability to understand warnings and notifications may prevent non-native English speakers from reacting in a timely manner. Further, educational materials related to regional hazards are most often developed in the dominant language for the area, for the planning area that would be English. Residents who struggle with English in the written form may not have sufficient information related to local concerns to effectively mitigate potential impacts. Residents with limited English proficiency would be at an increased vulnerability to all hazards within the planning area.

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

<sup>21</sup> Department of Health and Human Services. December 2019. "Hospitals." <http://dhhs.ne.gov/publichealth/Documents/Hospital%20Roster.pdf>.

<sup>22</sup> Department of Health and Human Services. December 2019. "Long Term Care Facilities." <http://dhhs.ne.gov/publichealth/Documents/LTCRoster.pdf>.

<sup>23</sup> Department of Health and Human Services. December 2019. "Rural Health Clinic." [http://dhhs.ne.gov/publichealth/Documents/RHC\\_Roster.pdf](http://dhhs.ne.gov/publichealth/Documents/RHC_Roster.pdf).

<sup>24</sup> U.S. Census Bureau. 2019. "Language Spoken at Home: 2017 American Community Survey (ACS) 5-year estimates." <https://factfinder.census.gov/faces/nav/jsf/pages/searchresults.xhtml?refresh=#>.

<sup>25</sup> U.S. Census Bureau. 2019. "Selected Economic Characteristics: 2017 ACS 5-year estimate." <https://factfinder.census.gov/faces/nav/jsf/pages/searchresults.xhtml?refresh=#>.

Similar to residents below the poverty line, racial minorities tend to have access to fewer financial and systemic resources that would enable them to implement hazard mitigation projects and to respond and recover from hazard events, including residence in standard housing and possession of financial stability. The mostly homogenous racial profile of the planning area indicates that racial inequity will not significantly affect the community's vulnerability to hazards (Table 19). The largest racial minority group within the planning area is American Indian and Alaskan Native, which is likely strongly influenced by the close proximity of the Oglala Lakota Nation and Rosebud Reservations in South Dakota.

**Table 19: Racial Composition Trends**

RACE	2010		2017		% CHANGE
	NUMBER	% OF TOTAL	NUMBER	% OF TOTAL	
WHITE, NOT HISPANIC	24,529	90%	23,803	89%	(-1%)
BLACK	219	1%	245	1%	0%
AMERICAN INDIAN AND ALASKAN NATIVE	1,251	5%	1,128	4%	(-1%)
ASIAN	179	1%	144	1%	0%
NATIVE HAWAIIAN AND OTHER PACIFIC ISLANDER	3	0%	228	1%	1%
OTHER RACES	577	2%	186	1%	(-1%)
TWO OR MORE RACES	641	2%	935	4%	2%
<b>TOTAL POPULATION</b>	<b>27,399</b>	<b>-</b>	<b>26,669</b>	<b>-</b>	<b>-</b>

Source: U.S. Census Bureau<sup>26,27</sup>

## BUILT ENVIRONMENT AND STRUCTURAL INVENTORY

The US Census provides information related to housing units and potential areas of vulnerability as described in the following discussion.

Of the occupied housing units in the planning area, more than 33 percent are renter occupied. Renter occupied housing units often do not receive many of the updates and retrofits that are needed to make them resilient to disaster impacts. Communities may consider enacting landlord outreach programs aimed at educating property owners about the threats in their area and what they can do to help reduce the vulnerability of the tenants living in their housing units. It should be noted that Dawes County has the highest percentage of renter occupied housing units in the planning area, which is likely due to the present of Chadron State College and renting college students. The City of Chadron, the largest community in the planning area, has more than 48 percent of housing stock occupied by renters.

Sioux County has the highest percentage of unoccupied housing units. Unoccupied homes may not be maintained as well as occupied housing, thus adding to their vulnerability. During disaster events like high winds or tornadoes, these structures may fail and result in debris which can impact other structures as well as humans, resulting in higher damage totals and injuries or fatalities. Some of the participating communities in this planning process have already identified the concern related to older building stock and revitalization efforts. Some of the participating jurisdictions have completed housing or blight studies to help define their needs and an approach to address the concerns.

<sup>26</sup> U.S. Census Bureau. 2019. "Race: 2010 ACS 5-year estimate." <https://factfinder.census.gov/faces/hav/jsf/pages/searchresults.xhtml?refresh=#>.

<sup>27</sup> U.S. Census Bureau. 2019. "Race: 2017 ACS 5-year estimate." <https://factfinder.census.gov/faces/hav/jsf/pages/searchresults.xhtml?refresh=#>.



**Table 20: Housing Characteristics**

JURISDICTION	TOTAL HOUSING UNITS				OCCUPIED HOUSING UNITS			
	Occupied		Vacant		Owner		RENTER	
	#	%	#	%	#	%	#	%
<b>BOX BUTTE COUNTY</b>	4,610	84.4%	849	15.6%	3,305	71.7%	1,305	28.3%
<b>ALLIANCE</b>	3,475	85.8%	575	14.2%	2,353	67.7%	1,122	32.3%
<b>HEMINGFORD</b>	343	75.2%	113	24.8%	257	74.9%	86	25.1%
<b>DAWES COUNTY</b>	35,557	83.9%	683	16.1%	2,222	62.5%	1,335	37.5%
<b>CHADRON</b>	2,180	86.6%	337	13.4%	1,125	51.6%	1,055	48.4%
<b>CRAWFORD</b>	502	79.3%	131	20.7%	388	77.3%	114	22.7%
<b>SHERIDAN COUNTY</b>	2,306	79.1%	610	20.9%	1,622	70.3%	684	29.7%
<b>GORDON</b>	777	87.7%	109	12.3%	491	63.2%	286	36.8%
<b>HAY SPRINGS</b>	274	81.3%	63	18.7%	207	75.5%	67	24.5%
<b>RUSHVILLE</b>	409	47.2%	142	25.8%	249	60.9%	160	39.1%
<b>SIoux COUNTY</b>	579	72.0%	225	28.0%	438	75.6%	141	24.4%
<b>HARRISON</b>	131	64.9%	71	35.1%	103	78.6%	28	21.4%
<b>REGION 23</b>	51,143	92.9%	3,908	7.1%	12,760	66.7%	6,383	33.3%

Source: U.S. Census Bureau<sup>28</sup>

The US Census provides information related to housing units and potential areas of vulnerability. The selected characteristics examined in Table 21 include: lacking complete plumbing facilities; lacking complete kitchen facilities; no telephone service available; housing units that are mobile homes; and housing units with no vehicles.

**Table 21: Selected Housing Characteristics**

	BOX BUTTE	DAWES	SHERIDAN	SIoux	TOTAL
OCCUPIED HOUSING UNITS	4,610 (84.4%)	3,557 (83.9%)	2,306 (79.1%)	579 (72.0%)	11,052
LACKING COMPLETE PLUMBING FACILITIES	0.2%	0.0%	0.3%	0.5%	19 (0.2%)
LACKING COMPLETE KITCHEN FACILITIES	2.1%	3.1%	1.8%	0.3%	252 (2.3%)
NO TELEPHONE SERVICE AVAILABLE	3.1%	1.8%	2.4%	1.2%	270 (2.4%)
HOUSING UNIT WITH NO VEHICLES AVAILABLE	4.5%	5.3%	6.2%	3.8%	557 (5.0%)
MOBILE HOMES	6.4%	10.8%	8.1%	11.7%	1,139 (10.3%)

Source: U.S. Census Bureau, 2019<sup>29</sup>

\*Indicated percentages are determined based on total housing units

Approximately two percent of housing units lack access to landline telephone service. This does not necessarily indicate that there is not a phone in the housing unit, as cellular telephones are now the primary form of telephone service. However, this lack of access to landline telephone service does represent a

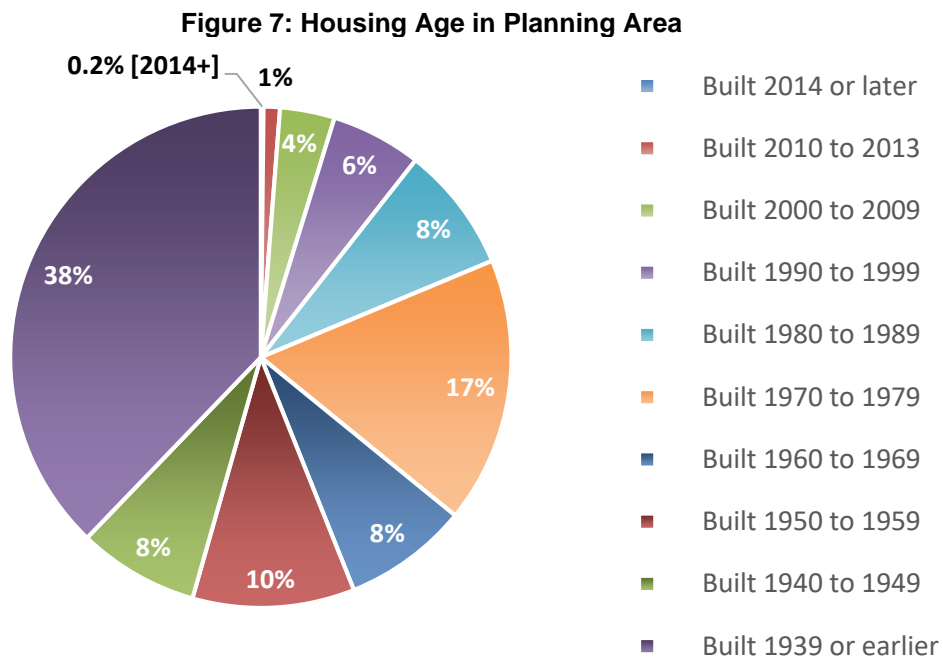
<sup>28</sup> U.S. Census Bureau. 2019. "Selected Housing Characteristics: 2017 ACS 5-year estimate." <https://factfinder.census.gov/faces/nav/jsf/pages/searchresults.xhtml?refresh=#>.

<sup>29</sup> U.S. Census Bureau. 2019. "Selected Housing Characteristics: 2017 ACS 5-year estimate." <https://factfinder.census.gov/faces/nav/jsf/pages/searchresults.xhtml?refresh=#>.

population at increased risk to disaster impacts. Reverse 911 systems are designed to contact households via landline services and as a result, some homes in hazard prone areas may not receive notification of potential impacts in time to take protective actions. Emergency managers should continue to promote the registration of cell phone numbers with Reverse 911 systems. The CodeRed system is available for many communities and residents to use in the planning area. This opt-in program sends emergency alerts and hazard event updates to cellular devices located within specific geographical areas based on cell tower reception.

Approximately ten percent of housing units in the planning area are mobile homes. Dawes County has the highest rate of mobile homes in its housing stock at 10.8 percent. Mobile homes have a higher risk of sustaining damages during high wind events, tornadoes, severe thunderstorms, and severe winter storms. Mobile homes that are either not anchored or are anchored incorrectly can be overturned by 60 mph winds. A thunderstorm is classified as severe when wind speeds exceed 58 mph, placing improperly anchored mobile homes at risk. Furthermore, approximately five percent of all housing units in the planning area do not have a vehicle available. Households without vehicles may have difficulty evacuating during a hazardous event and a reduced ability to access resources in time of need.

The majority of homes within the planning area were built prior to 1980 (81%), with 38% of homes built prior to 1939 (Figure 7). Housing age can serve as an indicator of risk, as structures built prior to state building codes being developed may be more vulnerable. Residents living in these homes maybe at higher risk to the impacts of high winds, tornadoes, severe winter storms, and thunderstorms.



**STATE AND FEDERALLY OWNED PROPERTIES**

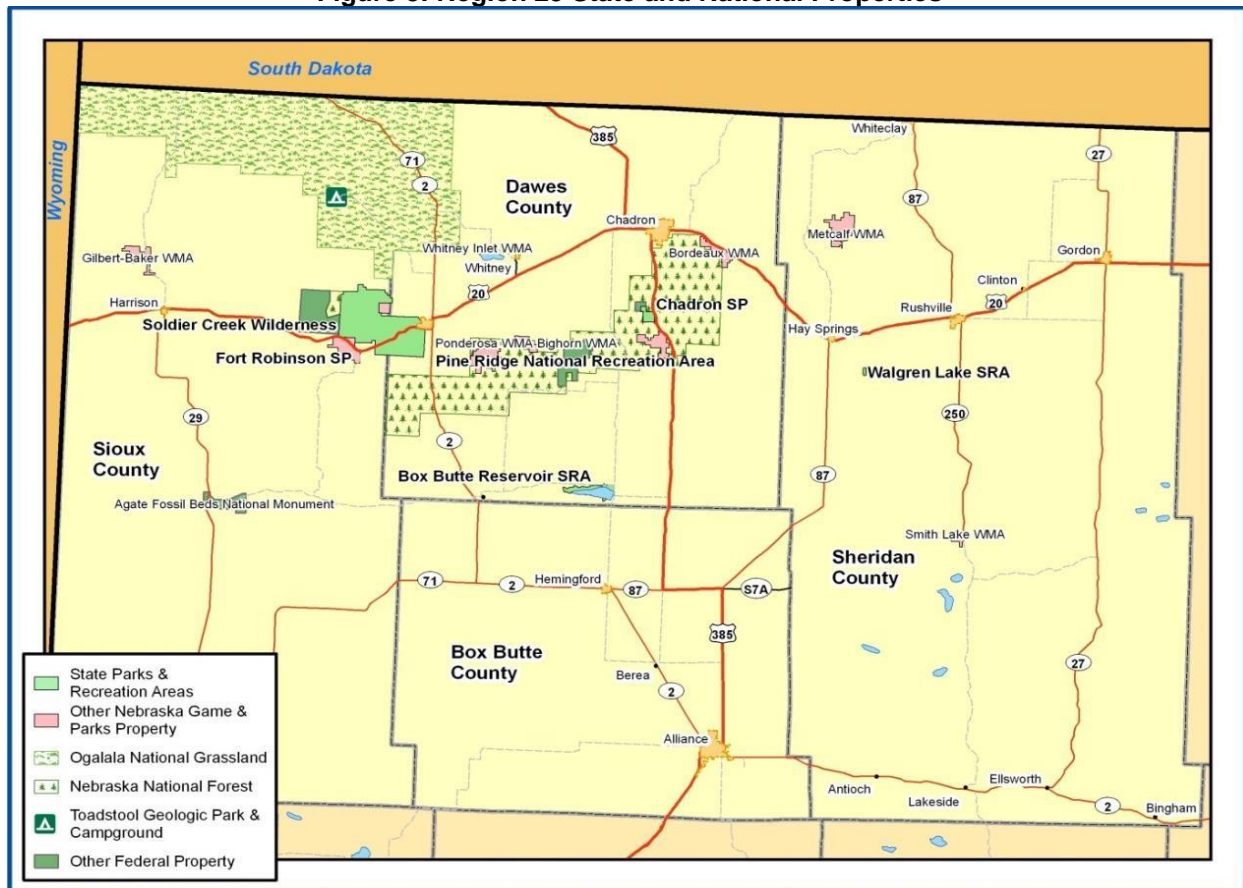
The following table provides an inventory of state and federally-owned properties within the planning area by county. Due to the scenic nature of the Pine Ridge, Niobrara River, and Nebraska National Forest in the planning area numerous state and federal properties are dispersed across the planning area. Many of these scenic areas include campgrounds and other highly vulnerable areas such as picnic areas and nature trails. Visitors or residents in these areas may be unaware of impending hazardous weather, experience difficulty finding adequate shelter, or are in remote areas where emergency services cannot reach them.

**Table 22: State and Federally-Owned Facilities**

FACILITY	COUNTY OR NEAREST COMMUNITY
Nebraska Department of Roads	Box Butte, Dawes, Sheridan, and Sioux Counties
Nebraska Board of Education	Box Butte, Dawes, Sheridan, and Sioux Counties
Box Butte Reservoir SRA	9 miles north of Hemingford
Ponderosa WMA	Box Butte County
Bighorn WMA	Box Butte County
Bordelaux WMA	Box Butte County
Fort Robinson State Park	West of Crawford
Oglala National Grassland	Northern border with SD and Sioux County
Nebraska National Forest	South of Chadron
Smith Lake WMA	Highway 250, central Sheridan County
Agate Fossil Beds National Monument	Agate
Gilbert-Baker Wildlife Area	Sioux County
Soldier Creek Wilderness	Sioux County
Walgren Lake SRA	Sheridan County
Metcalf WMA	Sheridan County

Source: County Assessors, Nebraska Forest Service

**Figure 8: Region 23 State and National Properties**



## HISTORICAL SITES

According to the National Register of Historic Places for Nebraska by the National Park Service (NPS), there are 35 historic sites located in the planning area. Some of the historic sites are in the 1% annual floodplain. This would include the City of Alliance Central Park Fountain in Box Butte County. In Sheridan

County, Colclessar Bridge and Loosveldt Bridge are both in the 1% annual floodplain. Dawes County does not have any historic sites within the 1% annual floodplain. Sioux County does not have a floodplain map.

**Table 23: Historical Sites**

SITE NAME	DATE LISTED	NEAREST COMMUNITY, COUNTY
AGATE FOSSIL BEDS NATIONAL MONUMENT	10/30/2013	Harrison, Sioux
ALLIANCE COMMERCIAL HISTORIC DISTRICT	3/21/2007	Alliance, Box Butte
ANTIOCH POTASH PLANTS	5/16/1979	Antioch, Sheridan
ARMY THEATRE	7/7/1988	Crawford, Sioux
BORDEAUX TRADING POST	3/16/1972	Chadron, Dawes
BOX BUTTE COUNTY COURTHOUSE	1/10/1990	Alliance, Box Butte
CAMP SHERIDAN AND SPOTTED TAIL INDIAN AGENCY	11/19/1974	Hay Springs, Sheridan
CHADRON COMMERCIAL HISTORIC DISTRICT	3/27/2007	Chadron, Dawes
CHADRON PUBLIC LIBRARY	6/21/1990	Chadron, Dawes
CITY OF ALLIANCE CENTRAL PARK FOUNTAIN	11/28/1990	Alliance, Box Butte
COLCLESSER BRIDGE	6/29/1992	Rushville, Sheridan
HAROLD J. COOK HOMESTEAD CABIN	8/24/1977	Agate, Sioux
CO-OPERATIVE BLOCK BUILDING	9/12/1985	Crawford, Dawes
CRITES HALL	9/8/1983	Chadron, Dawes
DAWES COUNTY COURTHOUSE	7/5/1990	Chadron, Dawes
DISTRICT #119 NORTH SCHOOL	8/30/2010	Ellsworth, Sheridan
FORT ROBINSON AND RED CLOUD AGENCY	10/15/1966	Crawford, Dawes
LEE AND GOTTLIEBE FRITZ HOUSE	11/28/2003	Gordon, Sheridan
GOURLEY'S OPERA HOUSE	7/6/1988	Rushville, Sheridan
HOTEL CHADRON	8/15/2002	Chadron, Dawes
HUDSON-MENG BISON KILL SITE	8/28/1973	Crawford, Dawes
LIBRARY	9/8/1983	Chadron, Dawes
LOOSVELDT BRIDGE	6/29/1992	Rushville, Sheridan
MILLER HALL	9/8/1983	Chadron, Dawes
RUNNING WATER STAGE STATION SITE	2/20/1975	Marsland, Box Butte
SANDFORD DUGOUT	3/9/2000	Mitchell, Sioux
SHERIDAN COUNTY COURTHOUSE	1/10/1990	Rushville, Sheridan
SIOUX COUNTY COURTHOUSE	7/5/1990	Harrison, Sioux
SPADE RANCH	2/28/1980	Ellsworth, Sheridan
SPADE RANCH STORE	9/3/2010	Ellsworth, Sheridan
SPARKS HALL	9/8/1983	Chadron, Dawes
US POST OFFICE-CRAWFORD	5/11/1992	Crawford, Dawes
WIND SPRINGS RANCH HISTORIC AND ARCHEOLOGICAL DISTRICT	11/22/2000	Scottsbluff, Sioux
HENRY WOHLERS, SR., HOMESTEAD	10/15/2004	Crawford, Dawes
EDNA WORK HALL	9/8/1983	Chadron, Dawes

Source: National Park Service<sup>30</sup>

In addition to regular government and municipal lands in the planning area, Chadron State College is located in the planning area. Chadron State College is a four-year public college located in the southeast portion of Chadron on the outskirts of the community adjacent to grasslands and the Pine Ridge forest. Chadron State College was founded in 1909 by the Nebraska Legislature to provide a higher education

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

institution in northwest Nebraska. The Board of Education of State Normal Schools selected Chadron as the location of its fourth institution in January, 1910. The school opened in June 1911, although a previous institution dated from the late 1800s.

The 281 acre campus has 25 major buildings, five of which are listed in the National Register of Historic Places. Their replacement value is more than \$60 million and they provide more than 1 million square feet of floor space.

The college has an annual enrollment of approximately 3,000 students. Many majors are offered, but the college specializes in education. Chadron State College is accredited by the Higher Learning Commission of the North Central Association of Colleges and Schools and subject-oriented accrediting agencies. The college's theme is "A tradition of excellence in education and service." For more information about the college, see the City of Chadron's Community Profile in Section Seven.

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# SECTION FOUR RISK ASSESSMENT

## INTRODUCTION

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

**Table 24: Term Definitions**

TERM	DEFINITION
<b>HAZARD</b>	A potential source of injury, death, or damages
<b>ASSET</b>	People, structures, facilities, and systems that have value to the community
<b>RISK</b>	The potential for damages, loss, or other impacts created by the interaction of hazards and assets
<b>VULNERABILITY</b>	Susceptibility to injury, death, or damages to a specific hazard
<b>IMPACT</b>	The consequence or effect of a hazard on the community or assets
<b>HISTORICAL OCCURRENCE</b>	The number of hazard events reported during a defined period of time
<b>EXTENT</b>	The strength or magnitude relative to a specific hazard
<b>PROBABILITY</b>	Likelihood of a hazard occurring in the future

## METHODOLOGY

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

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.

When describing the hazard, this plan will examine the following items: previous occurrences of the hazard within the planning area; locations where the hazard has occurred in the past or is likely to occur in the future; extent of past events and likely extent for future occurrences; and probability of future occurrences. While the identification of vulnerable assets will be conducted across the entire planning area, *Section Seven* will include discussion of community-specific assets at risk for relevant hazards. Analysis for regional risk will examine historic impacts and losses and what is possible should the hazard occur in the future. Risk analysis will include both qualitative (i.e. description of historic or potential impacts) and quantitative data (i.e. assigning values and measurements for potential loss of assets). Finally, each hazard identified the plan will provide a summary statement encapsulating the information provided during each of the previous steps of the risk assessment process.

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

### **AVERAGE ANNUAL DAMAGES AND FREQUENCY**

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

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

- **Total Damages in Dollars:** This is the total dollar amount of all property damages and crop damages as recorded in federal, state, and local data sources. The limitation to these data sources is that dollar figures usually are estimates and often do not include all damages from every event, but only officially recorded damages from reported events.
- **Total Years of Record:** This is the span of years there is data available for recorded events. During this planning process, vetted and cleaned up National Centers for Environmental Information (NCEI) data is available for January 1996 to September 2019. Although some data is available back to 1950, this plan update only utilizes the more current and more accurate data available. Wildfire data is available from the Nebraska Forest Service from 2000 to 2018.
- **Number of Hazard Events:** This shows how often an event occurs. The frequency of a hazard event will affect how a community responds. A thunderstorm may not cause much damage each time, but multiple storms can have an incremental effect on housing and utilities. In contrast, a rare tornado can have a widespread effect on a city.

An example of the Event Damage Estimate is found below:

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

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

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



2000 to 2019. Data for all the hazards are not always available, so only those with an available dataset are included in the loss estimation.

## HAZARD IDENTIFICATION

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

**Table 25: Hazards Addressed in the Plan**

HAZARDS ADDRESSED IN THE PLAN		
AGRICULTURAL DISEASE (ANIMAL AND PLANT)	FLOODING	SEVERE WINTER STORMS
DAM FAILURE	HIGH WINDS AND TORNADOES	TERRORISM
DROUGHT AND EXTREME HEAT	SEVERE THUNDERSTORMS	WILDFIRE

## HAZARD ELIMINATION

Given the location and history of the planning area, several hazards from the 2015 Region 23 EMA HMP as well as the State HMP were eliminated from further review. These hazards are listed below with a brief explanation of why the hazards were eliminated.

### ELIMINATED HAZARDS FROM 2015 REGION 23 HAZARD MITIGATION PLAN:

- **Chemical and Radiological Fixed Facilities** - Both state and local agencies have developed appropriate and extensive plans and protocols relative to the two nuclear facilities located in the state. The existing plans and protocols are reviewed, updated, and exercised on a regular basis. Due to the extensive planning and regulations related to this threat it will not be further profiled in this plan. One active and one inactive nuclear power stations are located along the Missouri River and are not located within or near the planning area. These facilities are tightly regulated by federal agencies. This approach is consistent with the 2019 Nebraska State Hazard Mitigation Plan. Chemical fixed sites as identified by NDEE are listed, as appropriate, in community profiles.
- **Chemical and Radiological Transportation** - There have been no incidents reported in the planning area or the state that have required assistance beyond what is considered regular roadside services. Further, the transportation of radiological materials is heavily regulated and monitored. There are other plans across the state that have thoroughly addressed this threat, therefore it will not be further profiled for this plan. This approach is consistent with the 2019 Nebraska HMP. A discussion of local chemical transportation is included, as appropriate, in community profiles.
- **Civil Disorder** – Civil disorder events have reportedly occurred in large metropolitan areas outside of the planning area and have primarily stemmed from racial tensions, political movements, or economic and labor disputes. No state emergencies related to civil disorder have occurred. Given that no civil disorder events have been recorded in the planning area, this hazard will not be profiled further in this plan. Additionally, other planning mechanisms have been developed to specifically respond to civil disorder events in local law enforcement. Terrorism is profiled in this plan with an emphasis on local concerns and capabilities and brief overview of civil disorder.
- **Earthquake** – The regional planning team indicated earthquakes are not a hazard of top concern. The planning area has experienced seven earthquakes since 1900, none of which exceeded a magnitude of 4.3 on the Richter Scale or had reported damages, injuries, or fatalities. Due to the low probability of events and associated impacts this hazard is not fully profiled in this HMP.

- **Landslides-** While there is data available related to landslides across the state, only two events have occurred within the planning area and neither reported damages. The following table outlines the number of recorded landslide events that have occurred in the planning area. Landslides across the state have been highly localized and did not exceed local capabilities to respond. This approach is consistent with the 2019 Nebraska HMP.

**Table 26: Known Landslides in the Planning Area by County**

COUNTY	NUMBER OF LANDSLIDES	TOTAL ESTIMATED DAMAGES
BOX BUTTE	0	\$0
DAWES	2	\$0
SHERIDAN	0	\$0
SIoux	0	\$0

Source: Nebraska Hazard Mitigation Plan, 2014<sup>31</sup>; University of Nebraska-Lincoln, 2018<sup>32</sup>

- **Levee Failure –** According to the Army Corps of Engineers National Levee Database there are no documented levees located in the planning area. Therefore, levee failure events are not expected to occur in the planning area. Any agricultural berm failure events which may produce localized flooding issues are discussed in more detail in *Section Four: Flooding*.
- **Urban Fire -** Fire departments across the planning area have mutual aid agreements in place to address this threat, and typically this hazard is addressed through existing plans and resources. As such, urban fire will not be fully profiled for this plan. Discussion relative to fire will be focused on wildfire and the potential impacts they could have on the built environment. This approach is consistent with the 2019 Nebraska State Hazard Mitigation Plan.

### HAZARD IDENTIFICATION CHANGES

Additionally, several hazards from the 2015 Region 23 EMA HMP have been modified and combined to provide a more robust and interconnected discussion. The following hazards from the previous HMP have combined hazard profiles in the following section:

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

<sup>31</sup> Nebraska Emergency Management Agency. 2014. "State of Nebraska Hazard Mitigation Plan."

<sup>32</sup> University of Nebraska-Lincoln. 2018. "Database of Nebraska Landslides." <http://snr.unl.edu/data/geologysoils/landslides/landslidedatabase.aspx>.

## HAZARD ASSESSMENT SUMMARY TABLES

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

**Table 27: Regional Risk Assessment**

HAZARD	PREVIOUS OCCURRENCE EVENTS/YEARS	APPROXIMATE ANNUAL PROBABILITY	LIKELY EXTENT
AGRICULTURAL ANIMAL DISEASE	42/6	100%	~13 animals per event
AGRICULTURAL PLANT DISEASE	111/20	100%	Unavailable
DAM FAILURE	1/109	<1%	Varies by Structure
DROUGHT & EXTREME HEAT	437/1,489 months of drought	29%	D1-D2
	Avg 4 days per year >100°F	100%	>100°F
FLOODING	24/24	100%	Some inundation of structures (<1% of structures) and roads near streams. Some evacuations of people may be necessary (<1% of population)
HIGH WINDS & TORNADOES	217/24	100%	Avg: EF0 Range EF0-EF2 ≤50 mph Avg 47mph; Range 35-59 EG
SEVERE THUNDERSTORMS	1,302/24	100%	≥1" rainfall Avg 55 mph winds; Hail range 0.75-4.25" (H2- H4); average 1.24"
SEVERE WINTER STORMS	362/24	100%	0.5" – 0.75" Ice 20°-40° below zero (wind chill) 4-9" snow 35-50 mph winds
TERRORISM & CIVIL DISORDER	0/73	<1%	Varies by event
WILDFIRE	2,098/19	100%	<250 acres Some homes and structures threatened or at risk

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

**Table 28: Loss Estimation for the Planning Area**

HAZARD TYPE		Count	Property	Crop <sup>2</sup>
<b>Agricultural Disease</b>	Animal Disease <sup>1</sup>	42	530 animals	N/A
	Plant Disease <sup>2</sup>	111	N/A	\$1,989,865
<b>Dam Failure<sup>5</sup></b>		1	\$0	N/A
<b>Drought<sup>6</sup></b>		437/1,489 months	\$0	\$20,688,052
<b>Extreme Heat<sup>7,8</sup></b>		Avg 4 days per year	\$0	\$5,533,235
<b>Flooding<sup>7</sup></b>	Flash Flood	22	\$562,000	\$109,388
	Flood	2	\$0	
<b>High Winds and Tornadoes<sup>7</sup></b> <i>1 fatality</i>	High Winds	146	\$129,000	\$11,996,572
	Tornadoes	71	\$1,355,000	
<b>Severe Thunderstorms<sup>7</sup></b> <i>8 injuries</i>	Hail	993	\$2,302,200	\$9,253,643
	Heavy Rain	36	\$0	
	Lightning	5	\$1,467,000	
	Thunderstorm Wind	286	\$1,211,400	
<b>Severe Winter Storms<sup>7</sup></b> <i>1 death, 2 injuries</i>	Blizzard	50	\$74,000	\$22,145,515
	Extreme Cold/Wind Chill	50	\$0	
	Heavy Snow	42	\$0	
	Ice Storm	0	\$0	
	Winter Storm	169	\$85,000	
	Winter Weather	51	\$15,000	
<b>Terrorism and Civil Disorder<sup>3,4</sup></b>		0	\$0	N/A
<b>Wildfire<sup>9</sup></b> <i>12 injuries</i>		2,098	445,416 acres	\$222,905
<b>Total</b>		<b>4,383</b>	<b>\$7,200,600</b>	<b>\$71,939,175</b>

N/A: Data not available  
1 NDA (2014-2019)  
2 USDA RMA (2000-2019)  
3 SPEED (1946-2018)  
4 START (1970-2018)

5 Stanford NPDP (1911-2019)  
6 NOAA (1895-2019)  
7 NOAA (1996-2019)  
8 HPRCC (1902-2018)  
9 NFS (2000-2018)

## HISTORICAL DISASTER DECLARATIONS

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

### FARM SERVICE AGENCY SMALL BUSINESS ADMINISTRATION DISASTERS

The U.S. Small Business Administration (SBA) was created in 1953 as an independent agency of the federal government to aid, counsel, assist, and protect the interests of small business concerns, to preserve free competitive enterprise, and maintain and strengthen the overall economy of our nation. A program of the SBA includes disaster assistance for those affected by major natural disasters. According to the SBA, there were no reported SBA disasters in the planning area between 2001 and 2019.<sup>33</sup>

### PRESIDENTIAL DISASTER DECLARATIONS

Presidential disaster declarations are available via FEMA from 1953 to 2019. Declarations prior to 1962 are not designated by county on the FEMA website and are not included below. The following table describes

<sup>33</sup> Small Business Administration. 2001-2019. [data files]. "Office of Disaster Assistance | Resources." <https://www.sba.gov/offices/headquarters/oda/resources/1407821>.

presidential disaster declarations within the planning area for the period of record. Note that while data is available from 1953 onward, the planning area has received 12 presidential disaster declarations since 1991.

**Table 29: Presidential Disaster Declarations**

DISASTER DECLARATION NUMBER	DECLARATION DATE	TITLE	AFFECTED COUNTIES	PUBLIC ASSISTANCE
908	5/28/1991	SEVERE STORMS & FLOODING	Dawes, Sioux	N/A
1373	5/16/2001	SEVERE WINTER STORMS, FLOODING AND TORNADOES	Box Butte, Sioux	\$2,982,075.51
1853	7/31/2009	SEVERE STORMS, FLOODING, AND TORNADOES	Box Butte (County)	\$4,491,366.48
1924	7/15/2010	SEVERE STORMS AND FLOODING	Dawes, Sheridan, Sioux	\$49,926,354.50
2660	7/28/2006	DAWES COUNTY FIRE COMPLEX	Dawes (County)	\$1,418,573.71
2661	7/29/2006	SIOUX COUNTY FIRE COMPLEX	Sioux (County)	\$1,773,269.52
3245	9/13/2005	HURRICANE KATRINA EVACUEES	Box Butte, Dawes, Sheridan, Sioux	\$393,813.27
4156	11/26/2013	SEVERE STORMS, WINTER STORMS, TORNADOES AND FLOODING	Dawes, Sheridan, Sioux	\$2,670,513.58
4325	8/1/2017	SEVERE STORMS, TORNADOES, AND STRAIGHT-LINE WINDS	Box Butte, Sheridan, Sioux	\$15,588,072.47
4225	6/25/2015	SEVERE STORMS, TORNADOES, STRAIGHT-LINE WINDS, AND FLOODING	Box Butte, Dawes, Sioux	\$14,267,337.31
4420	3/21/2019	SEVERE WINTER STORM, STRAIGHT-LINE WINDS, AND FLOODING	Box Butte, Dawes, Sheridan, Sioux	\$24,581,846.75
5009	8/30/2012	REGION 23 FIRE COMPLEX	Dawes, Sheridan, Sioux	\$5,281,075.21

Source: Federal Emergency Management Agency, 1953-2019<sup>34</sup>

## CLIMATE ADAPTATION

Located on the Great Plains far from the moderating influence of mountains or large bodies of water, the planning area possesses a highly variable four-season humid continental climate: winters are cold, but relatively dry; springs are generally warm with a regular wind; summers are hot and humid; and fall is generally pleasant but can produce an early season snow event. With little precipitation falling during winter, precipitation is concentrated in the warmer months, when thunderstorms frequently roll in, often producing tornados. Snow tends to fall in light amounts, though blizzards are possible. Snow cover is not very reliable due to both the low precipitation and the frequent thaws during winter.

<sup>34</sup> Federal Emergency Management Agency. 2019. "Disaster Declarations." Accessed January 2020. <https://www.fema.gov/openfema-dataset-disaster-declarations-summaries-v1>.

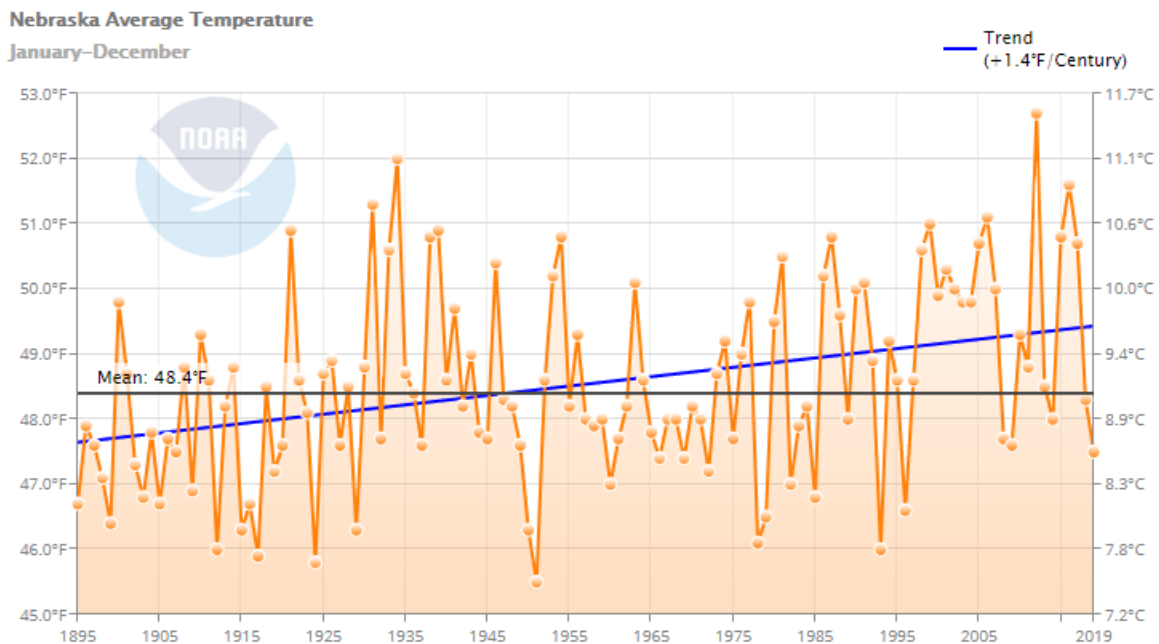
Long term climate trends have increased and will continue to increase the vulnerability to hazards across the planning area. Since 1895, Nebraska's overall average temperature has increased by about 2°F (Figure 9). This trend will likely contribute to an increase in the frequency and intensity of hazardous events, which will cause significant economic, social, and environmental impacts on Nebraskans.

As seen in Figure 10 and Figure 11, the United States is experiencing an increase in the number of billion-dollar natural disasters. Regardless of whether this trend is due to a change in weather patterns or due to increased development, the trend exists.

According to a recent University of Nebraska report (*Understanding and Assessing Climate Change: Implications for Nebraska, 2014*),<sup>35</sup> Nebraskans can expect the following from the future climate:

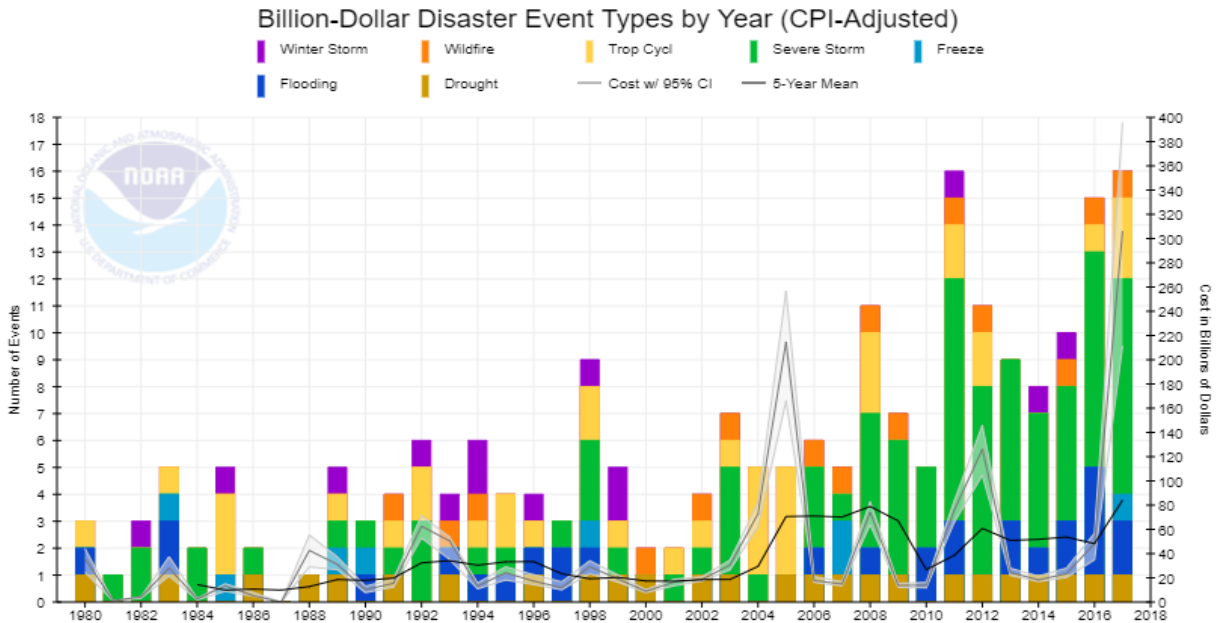
- Increase in extreme heat events
- Decrease in soil moisture by 5-10%
- Increase in drought frequency and severity
- Increase in heavy rainfall events
- Increase in flood magnitude
- Decrease in water flow in the Missouri River from reduced snowpack in the Rocky Mountains
- Additional 30-40 days in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

Figure 9: Average Temperature (1895-2019)



<sup>35</sup> Rowe, C.M., Bathke, D.J., Wilhite, D.A., & Oglesby, R.J. 2014. "Understanding and Assessing Climate Change: Implications for Nebraska."

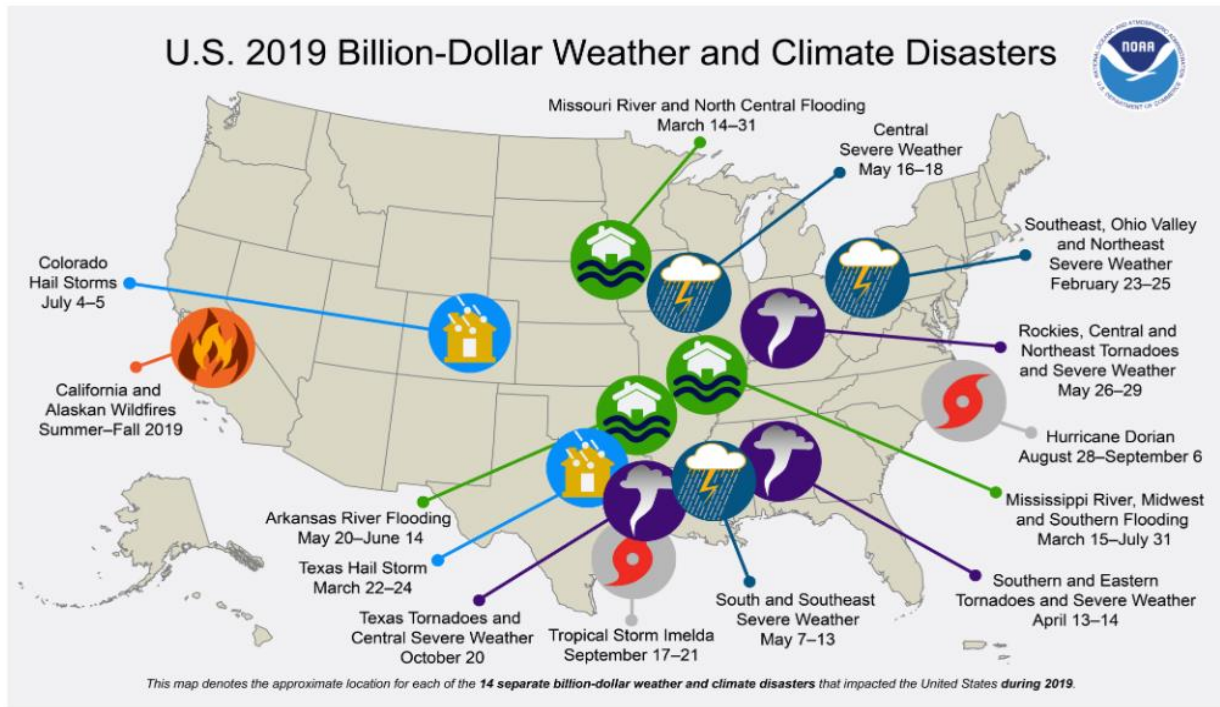
Figure 10: Billion Dollar Disasters



Source: NOAA, 2018

Figure 11: Billion Dollar Weather and Climate Disasters

In 2020 (as of April 8), there have been 2 weather and climate disaster events with losses exceeding \$1 billion each across the United States. These events included 2 severe storm events. Overall, these events resulted in the deaths of 35 people and had significant economic effects on the areas impacted. The 1980-2019 annual average is 6.6 events (CPI-adjusted); the annual average for the most recent 5 years (2015-2019) is 13.8 events (CPI-adjusted).

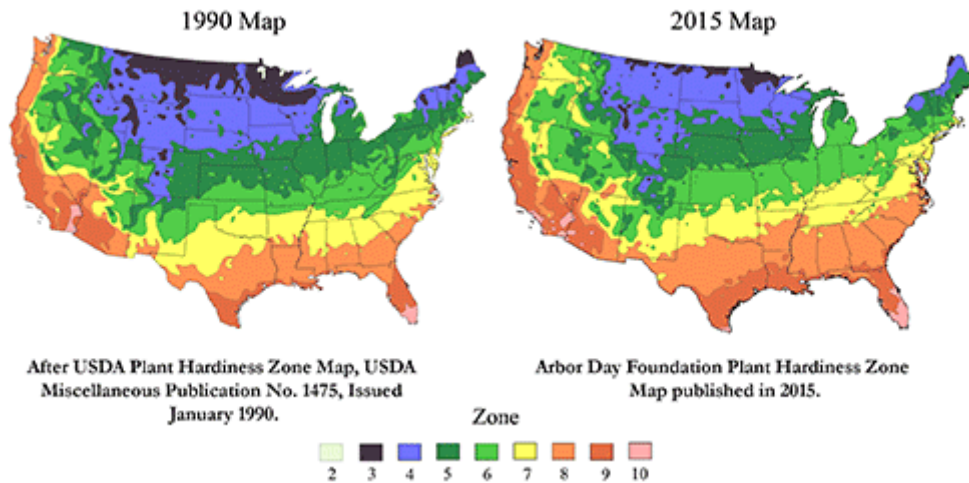


2019 is the fifth consecutive year (2015-2019) in which 10 or more billion-dollar weather and climate disaster events have impacted the United States. Over the last 40 years (1980-2019), the years with 10 or more separate billion-dollar disaster events include 1998, 2008, 2011-2012, and 2015-2019.

Source: NOAA, 2020

These trends will have a direct impact on water and energy demands. As the number of 100°F days increase, along with warming nights, the stress placed on the energy grid will likely increase and possibly lead to more power outages. Critical facilities and vulnerable populations that are not prepared to handle periods of power outages, particularly during heat waves, will be at risk. Furthermore, the agricultural sector will experience an increase in droughts, 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.

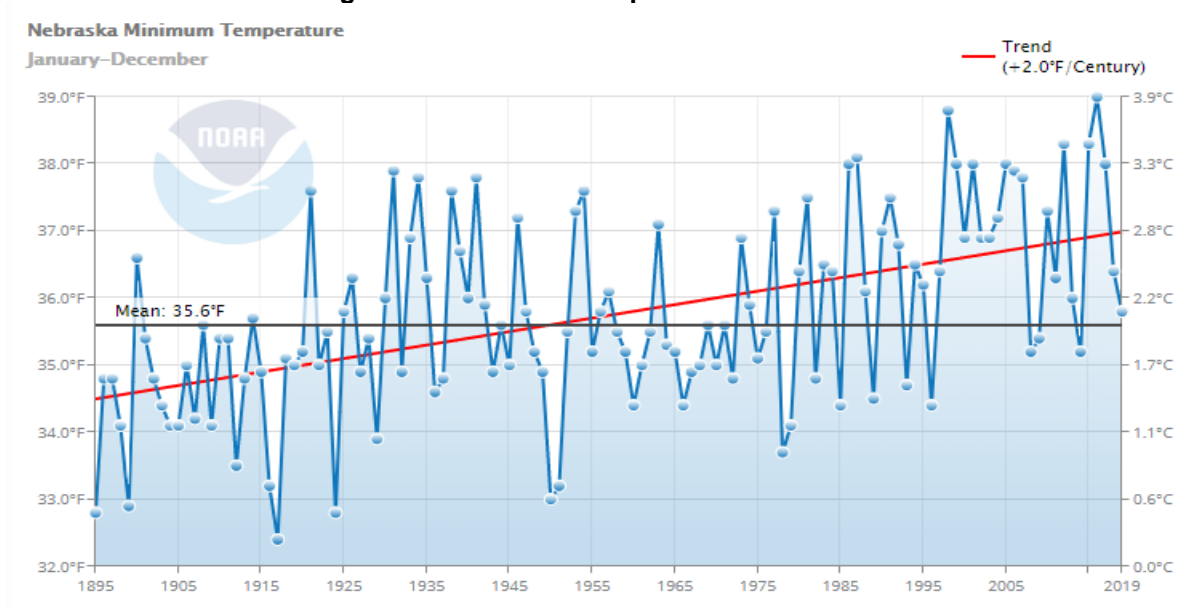
**Figure 12: Plant Hardiness Zone Change**



Source: Arbor Day Foundation, 2018<sup>36</sup>

Figure 13 shows a trend of increasing minimum temperatures in the state. High nighttime temperatures can reduce grain yields, increase stress on animals, and lead to an increase in heat-related deaths.

**Figure 13: Minimum Temperature 1895 – 2018**



Source: NOAA, 2020

<sup>36</sup> Arbor Day Foundation. 2018. "Hardiness Zones." [https://www.arborday.org/media/map\\_change.cfm](https://www.arborday.org/media/map_change.cfm).



The planning area will have to adapt to these changes or experience an increase in economic losses, loss of life, property damages, and agricultural damages. HMPs have typically been informed by *past* events in order to be more resilient to future events, and this HMP includes strategies for the planning area to address these changes and increase resilience. However, future updates to this plan should consider including adaptation as a core strategy to be better informed by *future* projections on the frequency, intensity, and distribution of hazards as well. In an effort to account for future events, this HMP was developed alongside the CWPP to examine increased risk to wildfire events. Due to recorded changes in temperature and precipitation trends, it is reasonable to expect more frequent and severe wildfire events in the future.

## HAZARD PROFILES

Based on research and experiences of the participating jurisdictions, the hazards profiled were determined to either have a historical record of occurrence or the potential for occurrence in the future. As the planning area is generally uniform in climate, topography, building characteristics, and development trends, overall hazards and vulnerability do not vary greatly across the planning area. The following profiles will broadly examine the identified hazards across the region. Hazards of local concern or events which have deviated from the norm are discussed in greater detail in its respective community profile (see *Section Seven* of this plan). The following table identifies the top hazards of concern for participating jurisdictions.

**Table 30: Top Hazards of Concern by Jurisdiction**

JURISDICTION	AG. DISEASE	DAM FAILURE	DROUGHT AND EXTREME HEAT	HIGH WINDS AND TORNADOES	FLOODING	SEVERE THUNDERSTORMS	SEVERE WINTER STORMS	TERRORISM	WILDFIRE
REGION 23 EMA				X		X	X		X
UNWNRD			X	X	X	X	X		
BOX BUTTE CO				X		X	X		X
ALLIANCE				X		X	X		X
HEMINGFORD				X		X	X		X
DAWES CO				X		X	X		X
CHADRON				X		X	X		X
CRAWFORD				X		X			X
SHERIDAN CO			X			X	X		X
GORDON				X		X	X		X
HAY SPRINGS			X	X		X			
RUSHVILLE			X	X	X	X	X		X
SIoux Co			X			X	X		X
HARRISON			X	X		X	X		X
CHADRON SCHOOLS				X				X	
HEMINGFORD SCHOOLS				X	X	X	X		X

# AGRICULTURAL ANIMAL AND PLANT DISEASE

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

The economy of the state of Nebraska is heavily vested in both livestock and crop sales. According to the Nebraska Department of Agriculture (NDA) in 2017, the market value of agricultural products sold was estimated at nearly \$22 billion; this total is split between crops (estimated \$9.31 billion) and livestock (estimated \$12.67 billion). For the planning area, the market value of sold agricultural products exceeded \$521 million.<sup>37</sup>

Table 31 shows the population of livestock within the planning area. This count does not include wild populations that are also at risk from animal diseases.

**Table 31: Livestock Inventory**

COUNTY	MARKET VALUE OF 2017 LIVESTOCK SALES	CATTLE AND CALVES	HOGS AND PIGS	POULTRY EGG LAYERS	SHEEP AND LAMBS
<b>BOX BUTTE</b>	\$69,093,000	53,999	245	631	1,120
<b>DAWES</b>	\$46,980,000	60,912	(D)	777	2,525
<b>SHERIDAN</b>	\$93,144,000	121,175	667	511	144
<b>SIoux</b>	\$58,420,000	93,493	10,244	365	1,896
<b>TOTAL</b>	<b>\$267,637,000</b>	<b>329,579</b>	<b>11,156</b>	<b>2,284</b>	<b>5,685</b>

Source: U.S. Census 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 the value and acres of land in farms for the planning area.

**Table 32: Land and Value of Farms in the Planning Area**

COUNTY	NUMBER OF FARMS	LAND IN FARMS (ACRES)	MARKET VALUE OF 2017 CROP SALES
<b>BOX BUTTE</b>	431	677,164	\$107,840,000
<b>DAWES</b>	491	750,204	\$13,953,000
<b>SHERIDAN</b>	525	1,561,598	\$57,459,000
<b>SIoux</b>	307	1,229,719	\$17,619,000
<b>TOTAL</b>	<b>1,754</b>	<b>4,218,685</b>	<b>\$196,871,000</b>

Source: U.S. Census of Agriculture, 2017

<sup>37</sup> US Department of Agriculture, National Agricultural Statistics Server. 2019. "2017 Census of Agriculture – County Data." Accessed January 2020. [https://www.nass.usda.gov/Publications/AgCensus/2017/Full\\_Report/Volume\\_1\\_Chapter\\_2\\_County\\_Level/Nebraska/](https://www.nass.usda.gov/Publications/AgCensus/2017/Full_Report/Volume_1_Chapter_2_County_Level/Nebraska/).

**Table 33: Crop Values**

COUNTY	CORN		SOYBEANS		WHEAT	
	Acres Planted	Value (2017)	Acres Planted	Value (2017)	Acres Planted	Value (2017)
<b>BOX BUTTE</b>	73,375	\$38,657,000	0	-	79,026	\$11,788,000
<b>DAWES</b>	9,547	\$5,730,000	871	\$305,000	17,970	\$2,324,000
<b>SHERIDAN</b>	51,598	\$27,270,000	1,497	\$577,000	25,380	\$3,612,000
<b>SIoux</b>	15,954	\$9,422,000	0	-	2,756	\$451,000
<b>TOTAL</b>	<b>150,477</b>	<b>\$81,079,000</b>	<b>2,368</b>	<b>\$882,000</b>	<b>125,132</b>	<b>\$18,175,000</b>

Source: U.S. Census of Agriculture, 2012

### LOCATION

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

The main land uses where animal and plant disease will be observed include: agricultural lands; range or pasture lands; and forests. It is possible that animal or plant disease will occur in domestic animals or crops in urban areas. Due to the presence of multiple national forests in the planning area, animal disease outbreaks in wild populations are possible and have the potential to spread to agricultural livestock.

### HISTORICAL OCCURRENCES

#### ANIMAL DISEASE

The NDA provides reports on diseases occurring in the planning area. There were 42 instances of animal diseases reported between January 2014 and November 2019 by the NDA (Table 34). These outbreaks affected 530 animals.

**Table 34: Livestock Diseases Reported in the Planning Area**

YEAR	COUNTY	DISEASE	POPULATION IMPACTED
2014	Box Butte	Anaplasmosis	1
2014	Sheridan	Blue Tongue	7
2014	Sheridan	Paratuberculosis	7
2014	Sheridan	Enzootic Bovine Leukosis	6
2014	Sheridan	Bovine Viral Diarrhea	2
2014	Sheridan	Leptospirosis	9
2014	Sheridan	Rabies	1
2014	Sheridan	Infectious Bovine Rhinotracheitis	2
2014	Sioux	Paratuberculosis	2
2015	Sheridan	Infectious Bovine Rhinotracheitis	60
2016	Box Butte	Paratuberculosis	1
2016	Sheridan	Blue Tongue	6
2016	Sheridan	Paratuberculosis	5
2016	Sheridan	Enzootic Bovine Leukosis	4
2016	Sheridan	Leptospirosis	12
2016	Sheridan	Trichomoniasis	1
2017	Box Butte	Paratuberculosis	1
2017	Dawes	Anaplasmosis	1
2017	Sheridan	Blue Tongue	6
2017	Sheridan	Paratuberculosis	8
2017	Sheridan	Enzootic Bovine Leukosis	6

YEAR	COUNTY	DISEASE	POPULATION IMPACTED
2017	Sheridan	Bovine Viral Diarrhea	1
2017	Sheridan	Leptospirosis	15
2018	Box Butte	Paratuberculosis	3
2018	Box Butte	Bovine Viral Diarrhea	1
2018	Sheridan	Blue Tongue	11
2018	Sheridan	Paratuberculosis	2
2018	Sheridan	Enzootic Bovine Leukosis	3
2018	Sheridan	Bovine Viral Diarrhea	1
2018	Sheridan	Leptospirosis	6
2018	Sheridan	Epizootic Hemorrhagic Disease	2
2019	Box Butte	Bovine Viral Diarrhea	25
2019	Box Butte	Leptospirosis	1
2019	Dawes	Paratuberculosis	1
2019	Dawes	Vesicular Stomatitis	1
2019	Sheridan	Blue Tongue	63
2019	Sheridan	Paratuberculosis	1
2019	Sheridan	Enzootic Bovine Leukosis	10
2019	Sheridan	Bovine Viral Diarrhea	160
2019	Sheridan	Anaplasmosis	13
2019	Sheridan	Leptospirosis	17
2019	Sheridan	Epizootic Hemorrhagic Disease	45

Source: Nebraska Department of Agriculture, January 2014- November 2019<sup>38</sup>

The most prevalent agricultural diseases seen across the planning area and the state include: Chronic Wasting Disease, Vesicular Stomatitis, Epizootic Hemorrhagic Disease, and Bovine Tuberculosis. The economic impacts of outbreaks can negatively impact businesses, farmers, ranchers, and communities reliant on the agricultural sector.

**PLANT DISEASE**

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

**Table 35: Common Crop Diseases in Nebraska by Crop Types**

CROP DISEASES		
<b>CORN</b>	Anthracnose	Southern Rust
	Bacterial Stalk Rot	Stewart's Wilt
	Common Rust	Common Smut
	Fusarium Stalk Rot	Gross's Wilt
	Fusarium Root Rot	Head Smut
	Gray Leaf Spot	Physoderma
	Maize Chlorotic Mottle Virus	
<b>SOYBEANS</b>	Anthracnose	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

<sup>38</sup> Nebraska Department of Agriculture. 2018. "Livestock Disease Reporting." <http://www.nda.nebraska.gov/animal/reporting/index.html>.

CROP DISEASES		
WHEAT	Charcoal Rot	Soybean Rust
	Frogeye Leaf Spot	Stem Canker
	Phytophthora Root and Stem Rot	Sudden Death Syndrome
	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	
OTHER PESTS	Grasshoppers	Western Bean Cutworm
	European Corn Borer	Corn Rootworm
	Corn Nematodes	Bean Weevil
	Mexican Bean Beetle	Soybean Aphids
	Rootworm Beetles	Eastern Ash Borer

At this time, there are no reports of Emerald Ash Borer within the planning area.

### AVERAGE ANNUAL LOSSES

According to the USDA RMA (2000-2019) there were 111 plant disease events in the planning area. While the RMA does not track losses for livestock, annual crop losses from plant disease can be estimated. Agricultural livestock disease losses are determined from the Nebraska Department of Agriculture.

**Table 36: Agricultural Plant Disease Losses**

HAZARD TYPE	NUMBER OF EVENTS	EVENTS PER YEAR	TOTAL CROP LOSS	AVERAGE ANNUAL CROP LOSS
PLANT DISEASE	111	5.6	\$1,989,865	\$99,493

Source: RMA, 2000-2019

**Table 37: Agricultural Livestock Disease Losses**

HAZARD TYPE	NUMBER OF EVENTS	EVENTS PER YEAR	TOTAL ANIMAL LOSSES	AVERAGE ANIMAL LOSSES PER EVENT
ANIMAL DISEASE	43	7	530	13

Source: NDA, 2014-2019

### EXTENT

There is no standard for measuring the magnitude of agricultural disease. Historical events have impacted livestock ranging from a single individual to 160 individuals. The planning area is heavily dependent on the agricultural economy. Any severe plant or animal disease outbreak which may impact this sector would negatively impact the entire planning areas economy.

### PROBABILITY

Given the historic record of occurrence for animal disease (42 outbreaks reported in six years) and plant disease (111 outbreaks in 20 years), for the purposes of this plan, the annual probability of agricultural disease occurrence is 100 percent.

### REGIONAL VULNERABILITIES

According to local planning teams, it is likely that animal and plant diseases will continue to impact the planning area to a moderate extent. While there have not been significant impacts reported in the planning

area previously, due to the economic and regional impacts associated with this hazard, it is a concern for many residents. Large incidents may increase food and basic essential costs, resulting in impacts to the entire population. The following table provides information related to regional vulnerabilities; for jurisdictional-specific vulnerabilities, refer to *Section Seven: Community Profiles*.

**Table 38: Regional Agricultural Disease Vulnerabilities**

SECTOR	VULNERABILITY
<b>PEOPLE</b>	-Those in direct contact with infected livestock -Potential food shortage during prolonged events -Residents in poverty if food prices increase -Regional economy is reliant on the agricultural industry
<b>ECONOMIC</b>	-Large scale or prolonged events may impact tax revenues and local capabilities -Land value may largely drive population changes within the planning area
<b>BUILT ENVIRONMENT</b>	None
<b>INFRASTRUCTURE</b>	-Transportation routes can be closed during quarantine
<b>CRITICAL FACILITIES</b>	None
<b>CLIMATE</b>	-Exacerbate outbreaks, impacts, and/or recovery period -Changes in seasonal normals can promote spread of invasive species and agricultural disease

# DAM FAILURE

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

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

Dams do not include:

- an obstruction in a canal used to raise or lower water;
- a fill or structure for highway or railroad use, but if such structure serves, either primarily or secondarily, additional purposes commonly associated with dams it shall be subject to review by the department;
- canals, including the diversion structure, and levees; or
- water storage or evaporation ponds regulated by the United States Nuclear Regulatory Commission.”<sup>39</sup>

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

**Table 39: Dam Size Classification**

SIZE	EFFECTIVE HEIGHT (FEET) X EFFECTIVE STORAGE (ACRE-FEET)	EFFECTIVE HEIGHT
SMALL	≤ 3,000 acre-feet	and ≤ 35 feet
INTERMEDIATE	> 3,000 acre-feet to < 30,000 acre-feet	or > 35 feet
LARGE	≥ 30,000 acre-feet	Regardless of Height

Source: NeDNR, 2013<sup>40</sup>

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

<sup>39</sup> Nebraska Department of Natural Resources. “Department of Natural Resources Rules for Safety of Dam and Reservoirs.” Nebraska Administrative Code, Title 458, Chapter 1, Part 001.09.

<sup>40</sup> Nebraska Department of Natural Resources. 2013. “Classification of Dams: Dam Safety Section.” <https://dnr.nebraska.gov/sites/dnr.nebraska.gov/files/doc/dam-safety/resources/Classification-Dams.pdf>.



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

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

The NeDNR and U.S. Army Corps of Engineers (USACE) regulate dam safety in Nebraska and across the county. 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:

- **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.

**LOCATION**

According to USACE’s National Institute of Dams, there are a total of 146 dams located within the planning area, with classifications ranging from low to high hazard. Figure 14 maps the location of these dams in the planning area.

**Table 40: Dams in the Planning Area**

COUNTY	LOW HAZARD	SIGNIFICANT HAZARD	HIGH HAZARD
<b>BOX BUTTE</b>	8	0	0
<b>DAWES</b>	40	5	1
<b>SHERIDAN</b>	21	4	2
<b>SIoux</b>	60	5	0
<b>TOTAL</b>	<b>129</b>	<b>14</b>	<b>3</b>

Source: USACE, 2020<sup>41</sup>

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

<sup>41</sup> United States Army Corps of Engineers. January 2020. "National Inventory of Dams." <https://nid.sec.usace.army.mil/ords/f?p=105:1:.....>.

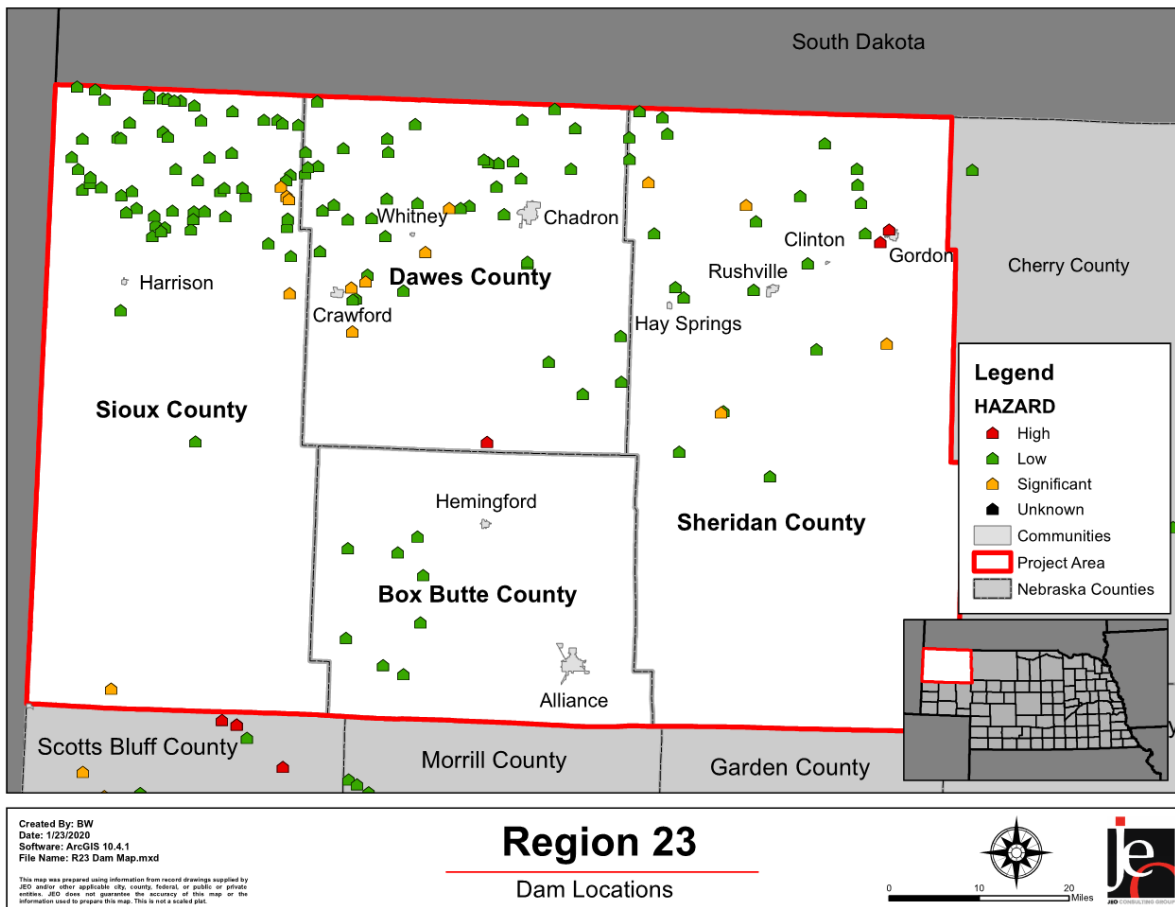
conditions are present. There are three high hazard dams located within the planning area, one in Dawes County and two in Sheridan County.

**Table 41: High Hazard Dams in the Planning Area**

COUNTY	DAM NAME	NID ID	PURPOSE	DAM HEIGHT	MAX STORAGE	LAST INSPECTION DATE
DAWES	BOX BUTTE DAM	NE01069	IRRIGATION	87	47,800	11/1/2016
SHERIDAN	ANTELOPE CREEK 20-A	NE00793	FLOOD CONTROL	24	450	6/21/2018
SHERIDAN	ANTELOPE CREEK 40-B	NE00795	FLOOD CONTROL	32	8,655	6/21/2018

Source: USACE, 2020<sup>42</sup>

**Figure 14: Dam Locations**



<sup>42</sup> United States Army Corps of Engineers. January 2020. "National Inventory of Dams." <https://nid.sec.usace.army.mil/ords/f?p=105:1:.....>

**Upstream Dams Outside the Planning Area**

Additionally, there are several High Hazard dams located upstream of the planning area which, if they were to fail, would likely impact the region. No County Local Emergency Operations Plan (LEOPs) specifically identify upstream dams which could affect the planning area.<sup>43,44,45,46</sup>

**Table 42: High Hazard Dams outside the Planning Area**

COUNTY, STATE	DAM NAME	NID ID	PURPOSE	DAM HEIGHT	MAX STORAGE	LAST INSPECTION DATE
NATRONA, WY	Pathfinder	WY01296	Hydroelectric	214	1,016,500	9/22/2017
OSAGE, WY	White Clay	SD00965	Recreation	41	0	8/8/2012
OSAGE, WY	Oglala	SD00969	Recreation	57	10,800	8/9/2012

Source: USACE, 2020

Areas (i.e. agricultural land, out buildings, county roads, and communities) directly downstream of dams are at greatest risk in the case of dam failure. Both high hazard dams located in Sheridan County are located outside of the community of Gordon. At this time, dam owners, USACE, and the NeDNR have opted to not include dam breach maps or inundation maps in hazard mitigation plans due to the sensitive nature of this information. Requests can be made of the dam owner, USACE, or the Dam Safety Division of NeDNR to view an inundation map specific to a dam.

**HISTORICAL OCCURRENCES**

According to the Stanford University National Performance of Dams Program and the local planning teams, there has been one dam failure event within the planning area.<sup>47</sup> The Johnson Dam in Sheridan county had an unknown incident in 1945. As described by NPDP, “This is the second of two incidents at this dam. Failure the result of loss of filter through riprap (not sure if this applies to both incidents). This is the same Johnson Dam (NPDP ID No. 640) that had an incident in 1942. This dam & incident used to have the NPDP ID No. 642.” Provided information does not indicate the 1942 event led to a failure. No damages were reported with this event.

**AVERAGE ANNUAL LOSSES**

Due to lack of data and the sensitive nature of this hazard, potential losses are not calculated for this hazard. In general, dam failure events would be confined to damage in the inundation area including buildings, agricultural land, and roads. Community members in the planning area that wish to quantify the threat of dam failure should contact Region 23 Emergency Management, Upper Niobrara White NRD, or the Nebraska Department of Natural Resources to view EAPs and breach inundation area maps.

**EXTENT**

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 and location. Note that hazard classification does not indicate the likelihood of a dam failure event to occur, but rather the extent of potential damages that may occur in the case of a failure. Thus, the high hazard dams in the planning area would have the greatest impact if they were to fail.

**PROBABILITY**

For the purpose of this plan, the probability of dam failure will be stated at less than one percent annually as only one dam has failed in the planning area over the past 100 years.

<sup>43</sup> Box Butte County Emergency Management Agency. November 2017. “Box Butte County Nebraska Local Emergency Operations Plan.”

<sup>44</sup> Dawes County Emergency Management Agency. June 2017. “Dawes County Nebraska Local Emergency Operations Plan.”

<sup>45</sup> Sheridan County Emergency Management Agency. May 2018. “Sheridan County Nebraska Local Emergency Operations Plan.”

<sup>46</sup> Sioux County Emergency Management Agency. August 2017. “Sioux County Nebraska Local Emergency Operations Plan.”

<sup>47</sup> Stanford University. 1911-2019. “National Performance of Dams Program Dam Incident Database.” Accessed December 2019. [http://npdp.stanford.edu/dam\\_incidents](http://npdp.stanford.edu/dam_incidents).

**REGIONAL VULNERABILITIES**

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

**Table 43: Regional Dam Failure Vulnerabilities**

SECTOR	VULNERABILITY
<b>PEOPLE</b>	-Those living downstream of high hazard dams -Those at recreational sites situated near high hazard dams -Evacuation needs likely with high hazard dam failure events -Hospitals, nursing homes, and the elderly at greater risk due to low mobility
<b>ECONOMIC</b>	-Loss of downstream agricultural land -Businesses or recreation sites located in inundation areas would be impacted and closed for an extended period of time -Employees of closed businesses may be out of work for an extended period of time
<b>BUILT ENVIRONMENT</b>	-Damage to facilities, recreation areas, and roads
<b>INFRASTRUCTURE</b>	-Rural county transportation routes could be closed for extended period of time
<b>CRITICAL FACILITIES</b>	-Any critical facilities in inundation areas are vulnerable to damages
<b>CLIMATE</b>	-Increased annual precipitation contributes to sustained stress on systems -Changes in water availability and supply can constrain energy production and reservoir stores

# DROUGHT AND EXTREME HEAT

Drought is generally defined as a natural hazard that results from a substantial period of below normal precipitation. Although many erroneously consider it a rare and random event, drought is a normal, recurrent feature of climate. It occurs in virtually all climatic zones, but its characteristics vary significantly from one region to another. A drought often coexists with periods of extreme heat, which together can cause significant social stress, economic losses, and environmental degradation. Extreme heat can also be characterized by long periods of high temperatures in combination with high humidity. During these conditions, the human body has difficulty cooling through the normal method of the evaporation of perspiration. Health risks arise when a person is overexposed to heat or prolonged drought conditions. Extreme heat can also cause people to overuse air conditioners, which can lead to power failures. Power outages for prolonged periods increase the risk of heat stroke and subsequent fatalities due to loss of cooling and proper ventilation. The planning area is largely rural, which presents an added vulnerability to extreme heat and drought events; those suffering from an extreme heat event may be farther away from medical resources as compared to those living in an urban setting while drought conditions can significantly and negatively impact the agricultural economic base.

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

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

~National Drought Mitigation Center

- **Meteorological Drought** – is defined based on the degree of dryness and the duration of the dry period. Meteorological drought is often the first type of drought to be identified and should be defined regionally as precipitation rates and frequencies (norms) vary.
- **Agricultural Drought** – occurs when there is deficient moisture that hinders planting germination, leading to low plant population per hectare and a reduction of final yield. Agricultural drought is closely linked with meteorological and hydrological drought; as agricultural water supplies are contingent upon the two sectors.
- **Hydrologic Drought** – occurs when water available in aquifers, lakes, and reservoirs falls below the statistical average. This situation can arise even when the area of interest receives average precipitation. This is due to the reserves diminishing from increased water usage, usually from agricultural use or high levels of evapotranspiration, resulting from prolonged high temperatures. Hydrological drought often is identified later than meteorological and agricultural drought. Impacts from hydrological drought may manifest themselves in decreased hydropower production and loss of water-based recreation.
- **Socioeconomic Drought** – occurs when the demand for an economic good exceeds supply due to a weather-related shortfall in water supply. The supply of many economic goods includes, but are not limited to, water, forage, food grains, fish, and hydroelectric power.<sup>48</sup>

The National Weather Service (NWS) is responsible for issuing excessive heat outlooks, excessive heat watches, and excessive heat warnings.

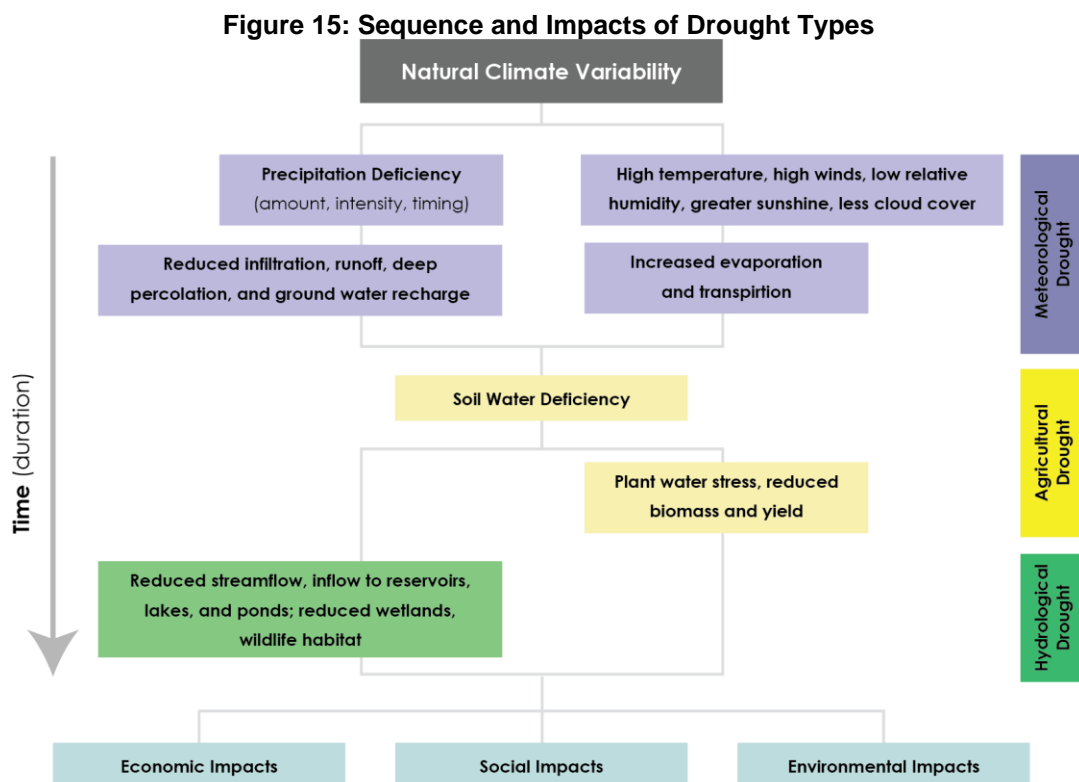
<sup>48</sup> National Drought Mitigation Center. 2017. "Drought Basics." <http://drought.unl.edu/DroughtBasics.aspx>.

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

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

Additionally, government authorities report that civil disturbances and riots are more likely to occur during heat waves or when water supplies are threatened. In cities, pollution becomes a problem with high heat as the heat traps pollutants in densely populated urban areas. Adding pollution to the stresses associated with the heat magnifies the health threat to the urban population.

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



Source: National Drought Mitigation Center, University of Nebraska-Lincoln, 2017<sup>49</sup>

## LOCATION

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

<sup>49</sup> National Drought Mitigation Center. 2017. "Types of Drought." <http://drought.unl.edu/DroughtBasics/TypesofDrought.aspx>.

### HISTORICAL OCCURRENCES

Table 44 indicates it is reasonable to expect extreme drought to occur in 4.4 percent of years of months for the planning area (65 extreme drought months in 1,489 months). Severe drought occurred in 60 months of the 1,489 months of record (4.0 percent of months). Moderate drought occurred in 128 months of the 1,489 months of record (8.6 percent of months), and mild drought occurred in 184 of the 1,489 months of record (12.4 percent of months). Non-drought conditions (incipient dry spell, near normal, or incipient wet spell conditions) occurred in 359 months, or 24.1% percent of months. These statistics show that the drought conditions of the planning area are highly variable. The average annual planning area precipitation is approximately 17 inches according to the NCEI.<sup>50</sup>

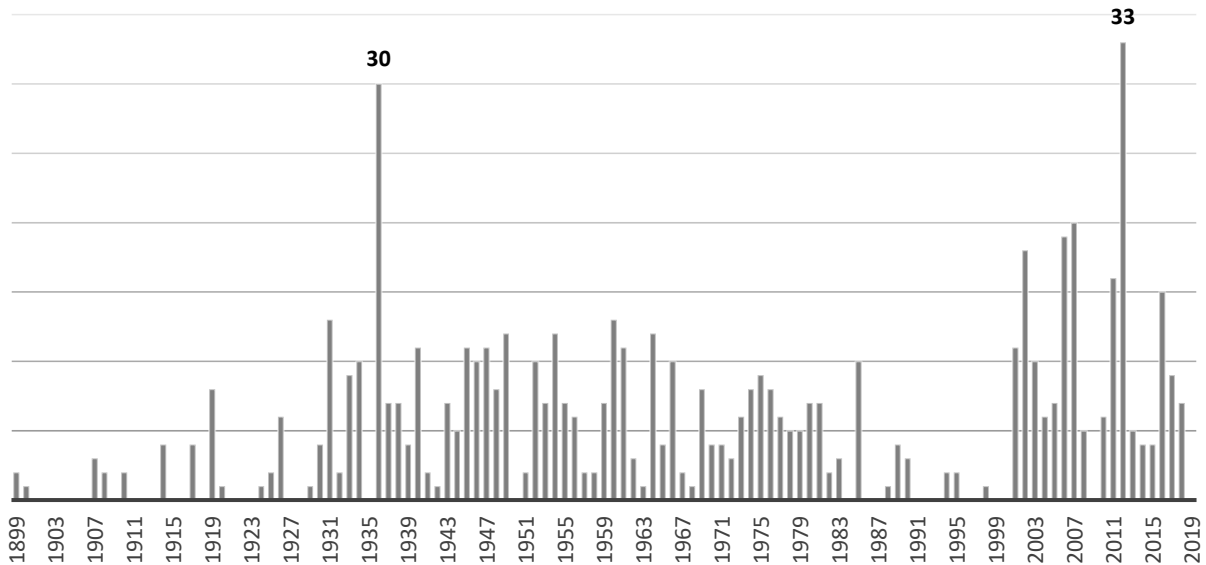
**Table 44: Historic Droughts**

DROUGHT MAGNITUDE	MONTHS IN DROUGHT	PERCENT CHANCE
-1 MAGNITUDE (MILD)	184/1,489	12.4%
-2 MAGNITUDE (MODERATE)	128/1,489	8.6%
-3 MAGNITUDE (SEVERE)	60/1,489	4.0%
-4 MAGNITUDE OR GREATER (EXTREME)	65/1,489	4.4%

Source: NCEI, Jan 1895-Jan 2019<sup>51</sup>

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 2012 with 33 days and in 1936 with 30 days. Conversely, 2019 was the most recent “coolest” year on record, with zero days above 100°F. However, this is likely attributed to lack of reportable data.

**Figure 16: Number of Days Above 100°F**



Source: HPRCC, 1899-2019

The 2012 drought event is the most significant events on record for the planning area; however, the overall event did not warrant a presidential disaster declaration within Nebraska. The whole state of Nebraska was in severe drought conditions from the middle of July in 2012 to the end of May in 2013 and over 70% of the state was in exceptional drought conditions for over eight months. Numerous cities implemented mandatory water restrictions, and some encouraged voluntarily water conservation during the period of drought.

<sup>50</sup> NOAA National Centers for Environmental Information. December 2019. "Data Tools: 1981-2010 Normals." [datafile]. <https://www.ncdc.noaa.gov/cdo-web/datatools/normals>.

<sup>51</sup> National Centers for Environmental Information. 1895-2018. Accessed December 6, 2018. <https://www7.ncdc.noaa.gov/CDO/CDODivisionalSelect.jsp>.

**EXTENT**

A key factor to consider regarding drought and extreme heat situations is the humidity level relative to the temperature. As is indicated in the following figure from the National Oceanic and Atmospheric Administration (NOAA), as the relative humidity increases, the temperature needed to cause a dangerous situation decreases. For example, for 100 percent relative humidity, dangerous levels of heat begin at 86°F whereas a relative humidity of 50 percent, 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 17: 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

- Caution
- Extreme Caution
- Danger
- Extreme Danger



Source: NOAA, 2017<sup>52</sup>

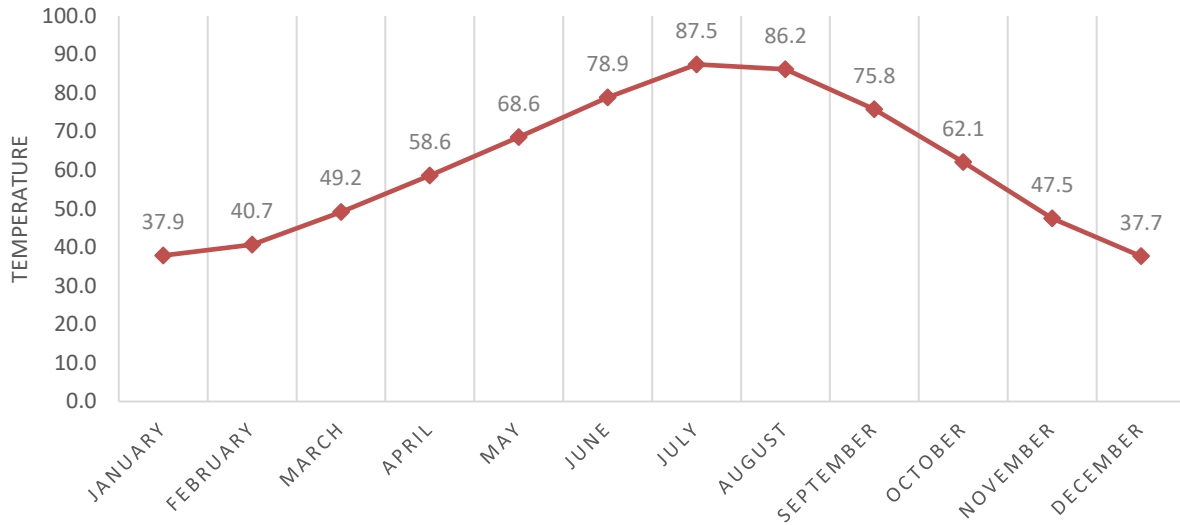
The figure above is designed for shady and light wind conditions. Exposure to full sunshine or strong winds can increase hazardous conditions and raise heat index values by up to 15°F. For the purposes of this plan, extreme heat is being defined as temperatures of 100°F or greater.

For the planning area, the months with the highest temperatures are June, July, and August.

<sup>52</sup> National Oceanic and Atmospheric Administration, National Weather Service. 2017. "Heat Index." [http://www.nws.noaa.gov/om/heat/heat\\_index.shtml](http://www.nws.noaa.gov/om/heat/heat_index.shtml).



Figure 18: Monthly Climate Normals Max Temperature (1981-2010)



Source: NCEI, 2019

The Palmer Drought Severity Index (PDSI) is utilized by climatologists to standardize global long-term drought analysis. The data for the planning area was collected for Climate Division 1 [Panhandle], which includes the planning area. This particular station's period of record started in 1895. Table 45 shows the details of the Palmer classifications. Figure 19 shows drought data from this time period. The negative Y axis represents the extent of a drought, for which '-2' indicates a moderate drought, '-3' a severe drought, and '-4' an extreme drought. The planning area has experienced several 'extreme' droughts and future moderate, severe, and extreme droughts are likely in the future.

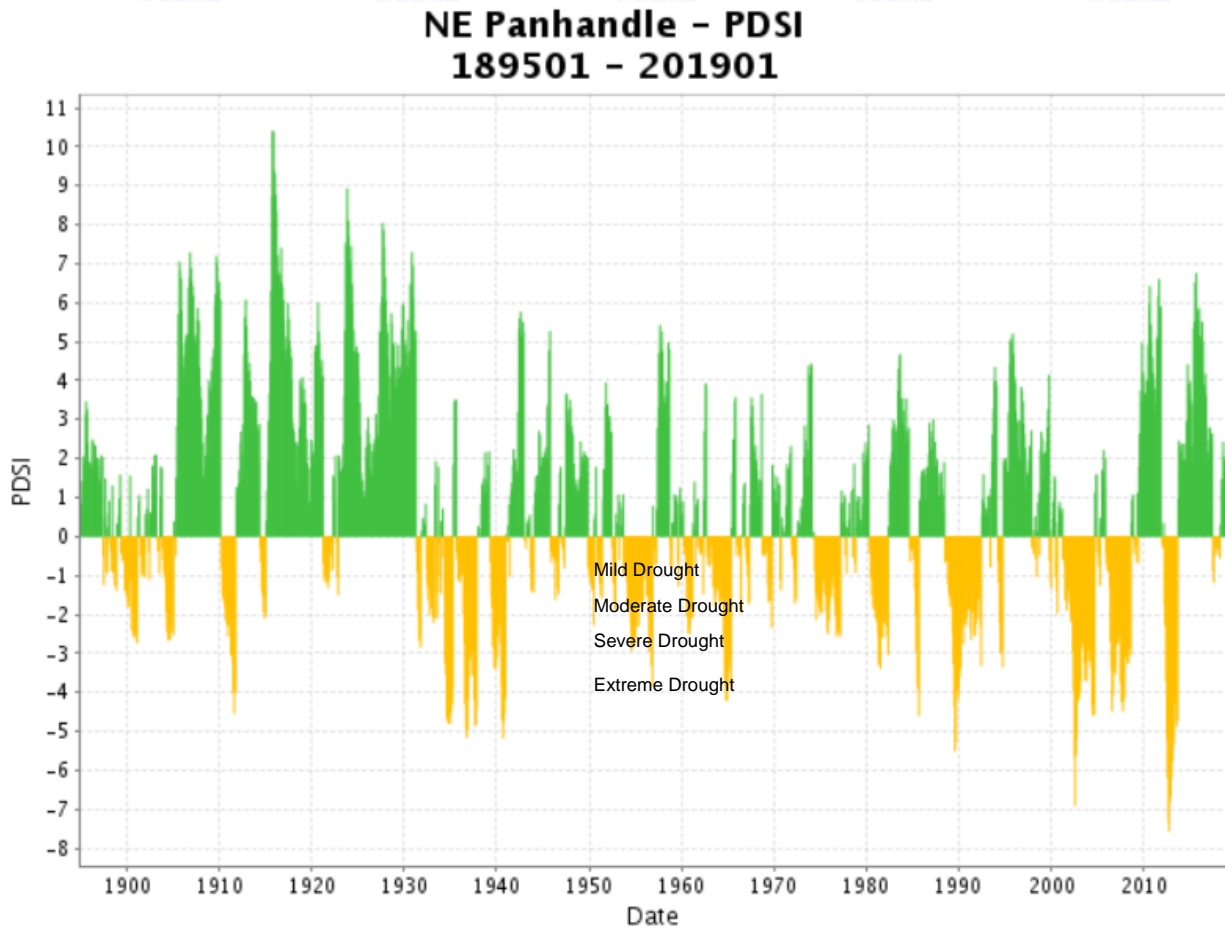
Table 45: Palmer Drought Severity Index Classification

NUMERICAL VALUE	DESCRIPTION	NUMERICAL VALUE	DESCRIPTION
4.0 OR MORE	EXTREMELY WET	-0.5 to -0.99	INCIPIENT DRY SPELL
3.0 TO 3.99	VERY WET	-1.0 to -1.99	MILD DROUGHT
2.0 TO 2.99	MODERATELY WET	-2.0 to -2.99	MODERATE DROUGHT
1.0 TO 1.99	SLIGHTLY WET	-3.0 to -3.99	SEVERE DROUGHT
0.5 TO 0.99	INCIPIENT WET SPELL	-4.0 or less	EXTREME DROUGHT
0.49 TO -0.49	NEAR NORMAL	--	--

Source: Climate Prediction Center<sup>53</sup>

<sup>53</sup> National Weather Service. 2017. "Climate Prediction Center." <http://www.cpc.noaa.gov/>.

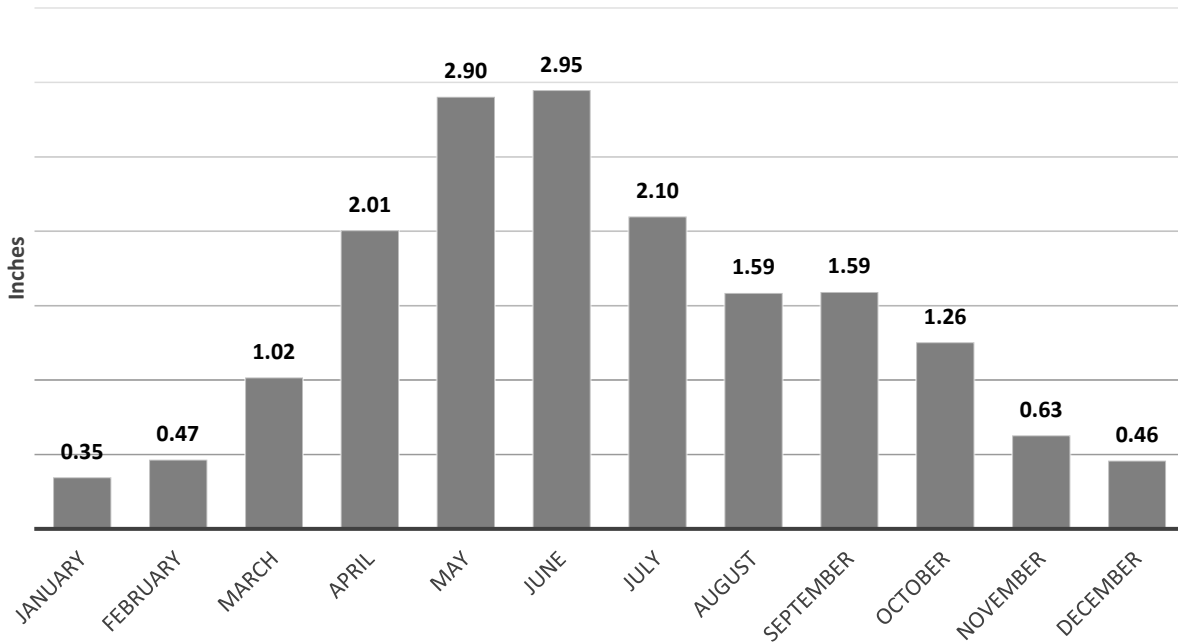
Figure 19: Palmer Drought Severity Index



Source: NCEI, Jan. 1895-Jan-2019

On average, the planning area receives approximately 17 inches of precipitation annually. The following figure shows average precipitation per month in the planning area. Prolonged deviations from the norm showcase drought conditions and influence growing conditions for farmers or resource management needs for ranchers.

Figure 20: Region 23 Average Monthly Precipitation



Source: NCEI, 2019<sup>54</sup>

### AVERAGE ANNUAL LOSSES

The annual property estimate was determined based upon NCEI Storm Events Database since 1996. The annual crop loss was determined based upon the RMA Cause of Loss Historical Database since 2000. This does not include losses from displacement, functional downtime, economic loss, injury, or loss of life. The direct and indirect effects of extreme heat and drought are difficult to quantify. Potential losses such as power outages could affect businesses, homes, and critical facilities. High demand and intense use of air conditioning or water pumps can overload the electrical systems and cause damages to infrastructure. The NCEI database did not report any direct property damage due to extreme heat or drought events.

Table 46: Loss Estimate for Drought

HAZARD TYPE	AVG. NUMBER OF DAYS ABOVE 100°F <sup>1</sup>	TOTAL PROPERTY LOSS <sup>2</sup>	AVERAGE ANNUAL PROPERTY LOSS <sup>2</sup>	TOTAL CROP LOSS <sup>3</sup>	AVERAGE ANNUAL CROP LOSS <sup>3</sup>
<b>DROUGHT</b>	-	\$0	\$0	\$20,688,052	\$1,034,402
<b>EXTREME HEAT</b>	4 days	\$0	\$0	\$5,533,235	\$276,662

Source: 1 HPRCC (1899-2019); 2 Indicates data is from NCEI (Jan 1996 to Sept 2019); 3 Indicates data is from USDA RMA (2000 to 2019)

The USDA reported a total of \$139,957,809 in drought relief to Nebraska from 2008 to 2011 for all five disaster programs: Supplemental Revenue Assistance Payments (SURE); Livestock Forage Disaster Assistance Program (LFD); Emergency Assistance for Livestock, Honeybees, and Emergency Assistance for Livestock, Honey Bees, and Farm-Raised Fish Program (ELAP); Livestock Indemnity Program (LIP); and Tree Assistance Program (TAP).

The extreme drought in 2012 significantly affected the agricultural sector across the State of Nebraska and for the planning area. According to the PDSI, 2012's average severity index was ranked at a -4.47, with

<sup>54</sup> NOAA National Centers for Environmental Information. December 2019. "Data Tools: 1981-2010 Normals." [datafile]. <https://www.ncdc.noaa.gov/cdo-web/datatools/normals>.

extremes in August and September of -7.35 and -7.57 respectively. The Farm Credit Services reported total indemnity payments to Nebraska totaled \$1.49 billion from crop loss. Cattle ranching is a large driver of the local planning area's economy. The 2012 drought forced ranchers to cull herds by as much as 60% to cope with reduced forage production with an estimated loss of \$200 per head by taking cattle to market earlier than normal. Neighborhood plots and small organic farms up to large-scale corn and soybean productions and ranches all faced agricultural declines. Hay production was down 28%, corn was down 16%, and soybean production dropped by 21%.<sup>55</sup> Local planning teams indicated drought conditions had negative impacts to the local economy and agricultural production as increased hay prices and reduced cattle herds harmed residents financially. Additionally, a greater volume of wildfire events in 2012 strained local resources and fire suppression equipment, while destroying many acres of pine forests in the area.

**ESTIMATED LOSS OF ELECTRICITY**

According to the FEMA Benefit Cost Analysis (BCA) Reference Guide, if an extreme heat event occurred within the planning area, the following table assumes the event could potentially cause a loss of electricity for 10 percent of the population at a cost of \$126 per person per day.<sup>56</sup> In rural areas, the percent of the population affected and duration may increase during extreme events. The assumed damages do not take into account physical damages to utility equipment and infrastructure.

**Table 47: Loss of Electricity - Assumed Damage by Jurisdiction**

JURISDICTION	(EST.) 2017 POPULATION	POPULATION AFFECTED (ASSUMED)	ELECTRIC LOSS OF USE ASSUMED DAMAGE PER DAY
<b>BOX BUTTE</b>	11,200	1,120	\$141,120
<b>DAWES</b>	8,972	897	\$113,022
<b>SHERIDAN</b>	5,241	524	\$66,024
<b>SIoux</b>	1,256	126	\$15,876
<b>TOTAL</b>	<b>26,669</b>	<b>2,667</b>	<b>\$336,042</b>

**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. Drought conditions are also likely to occur regularly in the planning year. The following table summarizes the magnitude of drought and monthly probability of occurrence.

**Table 48: Period of Record in Drought**

PDSI VALUE	MAGNITUDE	DROUGHT OCCURRENCES BY MONTH	MONTHLY PROBABILITY
4 OR MORE TO -0.99	NO DROUGHT	1,052/1,489	70.6%
-1.0 TO -1.99	MILD DROUGHT	184/1,489	12.4%
-2.0 TO -2.99	MODERATE DROUGHT	128/1,489	8.6%
-3.0 TO -3.99	SEVERE DROUGHT	60/1,489	4.0%
-4.0 OR LESS	EXTREME DROUGHT	65/1,489	4.4%

Source: NCEI, Jan 1895-Jan 2019

The U.S. Seasonal Drought Outlook (Figure 21) provides a short-term drought forecast that can be utilized by local officials and residents to examine the likelihood of drought developing or continuing depending on the current situation. The drought outlook is updated consistently throughout the year and should be reviewed on an ongoing basis. The following figure provides the drought outlook for December 19, 2019 through March 31, 2020 as an example. According to the U.S. Seasonal Drought Outlook, drought is likely

<sup>55</sup> National Integrated Drought Information System, National Drought Mitigation Center, and University of Nebraska-Lincoln. 2015. "From Too Much to Too Little: how the central U.S. drought of 2012 evolved out of one of the most devastating floods on record in 2011." [https://www.drought.gov/drought/sites/drought.gov.drought/files/media/reports/regional\\_outlooks/CentralRegion2012DroughtAssessment\\_1-5-15.pdf](https://www.drought.gov/drought/sites/drought.gov.drought/files/media/reports/regional_outlooks/CentralRegion2012DroughtAssessment_1-5-15.pdf).

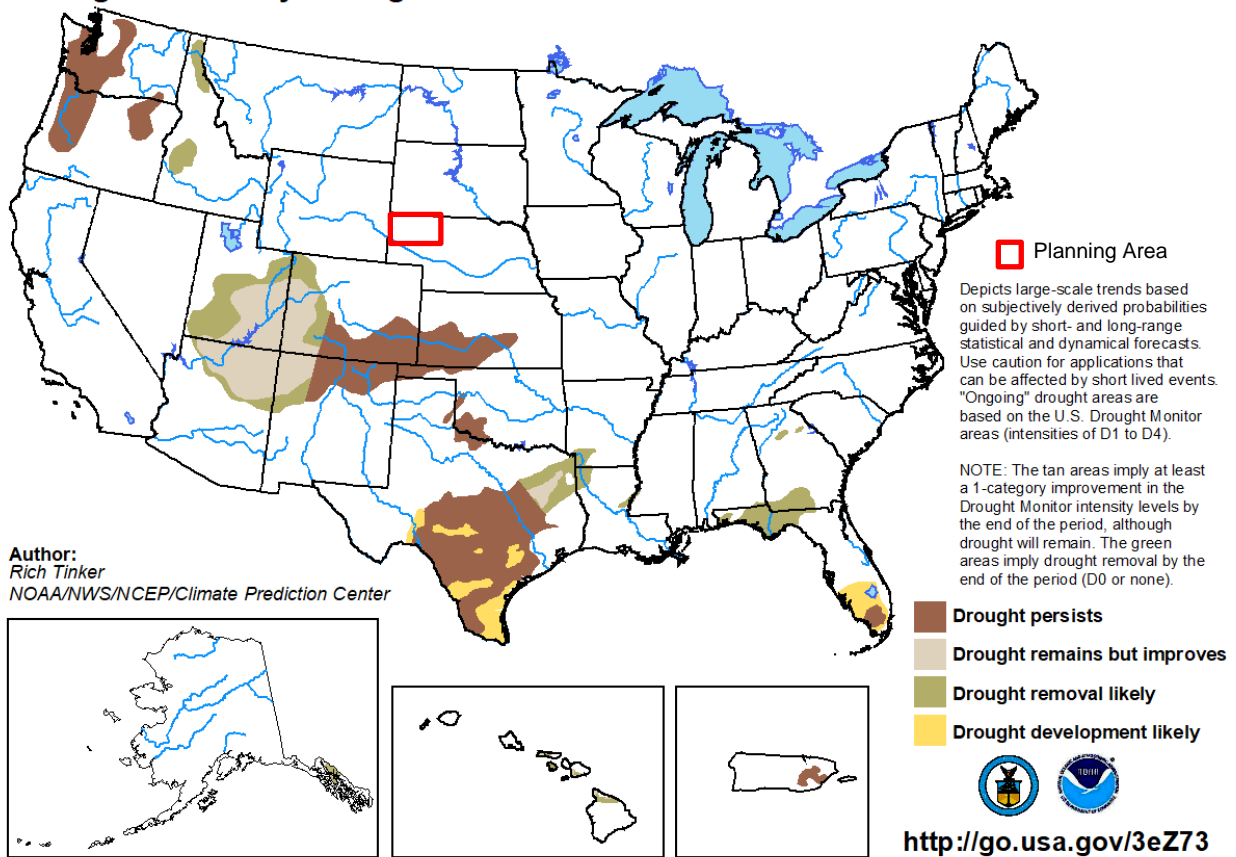
<sup>56</sup> Federal Emergency Management Agency. June 2009. "BCA Reference Guide."

to persist in the southern United States, but the planning area should experience seasonal norms relative to precipitation and temperatures.

Figure 21: U.S. Seasonal Drought Outlook

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

Valid for December 19, 2019 - March 31, 2020  
Released December 19, 2019



Source: NCEI, January 2020

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*<sup>57</sup> 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 49: Extreme Heat Predictions for Days over 100F

JURISDICTION	HISTORICAL AVERAGE	MIDCENTURY PREDICTION	LATE CENTURY
	1971-2000 (DAYS PER YEAR)	2036-2065 (DAYS PER YEAR)	2070-2099 (DAYS PER YEAR)
BOX BUTTE	0	4	20
DAWES	0	7	26
SHERIDAN	0	6	25
SIoux	0	3	17

Source: Union of Concerned Scientists, 1971-2000<sup>58</sup>

<sup>57</sup> 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>.

<sup>58</sup> 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=lancastr-county-ne>

## REGIONAL VULNERABILITIES

The Drought Impact Reporter is a database of drought impacts throughout the United States with data going back to 2000. The Drought Impact Reporter has recorded a total of 15 drought-related impacts throughout the region. This is not a comprehensive list of droughts which may have impacted the planning area. These impacts are summarized in the following table.

**Table 50: Drought Impacts in Planning Area**

CATEGORY	DATE	AFFECTED COUNTIES	TITLE
AGRICULTURE, RELIEF, RESPONSE & RESTRICTIONS	2/7/2014	Sheridan	Drought-Related USDA Disaster Declarations in 2014
AGRICULTURE	10/17/2013	Dawes, Sioux	Cattle producers in Dawes and Sioux counties in the Nebraska panhandle have struggled to hang onto their cattle through a drought and wildfire
FIRE, RELIEF, RESPONSE & RESTRICTIONS, TOURISM & RECREATION	9/3/2013	Box Butte, Dawes, Sheridan, Sioux	Campers in western Nebraska were urged to be particularly careful with campfires over the Labor Day weekend
AGRICULTURE	8/10/2013	Box Butte, Dawes, Sheridan, Sioux	Exceptional drought conditions and late freezes cut into the amount of certified wheat produced in southeastern Colorado, leading to reduced supplies of seed for the next planting
AGRICULTURE, FIRE, RELIEF, RESPONSE & RESTRICTIONS	6/5/2013	Dawes	Nebraska Legislature to seek federal funds for restoring fencing burned in 2012 wildfire in Pine Ridge
SOCIETY & PUBLIC HEALTH	3/1/2013	Box Butte, Dawes, Sheridan, Sioux	County roads in the Nebraska Panhandle and Goshen County, Wyoming deteriorated during the drought
AGRICULTURE, RELIEF, RESPONSE & RESTRICTIONS	5/17/2013	Box Butte, Dawes, Sheridan, Sioux	Drought-related USDA disaster declarations in 2013
AGRICULTURE	10/24/2012	Dawes, Sheridan	Drought and limited feed resources led many ranchers in the Nebraska Panhandle to sell an unusually large number of livestock
AGRICULTURE, WATER SUPPLY & QUALITY	4/23/2019	Box Butte, Dawes, Sheridan, Sioux	Nebraska ranchers hauling water to livestock
AGRICULTURE, RELIEF, RESPONSE & RESTRICTIONS	11/20/2012	Sioux	USDA Designates 8 Counties in Wyoming as Primary Natural Disaster Areas with Assistance to Producers in Surrounding States
AGRICULTURE, RELIEF, RESPONSE & RESTRICTIONS	3/20/2018	Dawes	Cattle sales in Dawes County, Nebraska

CATEGORY	DATE	AFFECTED COUNTIES	TITLE
FIRE, RELIEF, RESPONSE & RESTRICTIONS	2/22/2018	Box Butte, Dawes, Sheridan, Sioux	Nebraskans urged to leave the fireworks to the professionals
AGRICULTURE, RELIEF, RESPONSE & RESTRICTIONS	3/1/2018	Sheridan	Nebraska senator sought action on relief request
PLANTS & WILDLIFE	6/13/2013	Box Butte, Dawes, Sheridan, Sioux	Many trees in western Nebraska died from drought, high temperatures and strong winds in 2012
AGRICULTURE, PLANTS & WILDLIFE	12/17/2012	Box Butte, Dawes, Sheridan, Sioux	Drought led ranchers in western Nebraska to cull cow herds by 25 to 60 percent

Source: NDMC, 2000-2019<sup>59</sup>

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

**Table 51: Drought Related Impacts**

SECTOR	POTENTIAL IMPACTS
<b>ECONOMIC</b>	<ul style="list-style-type: none"> <li>• Annual and perennial crop losses; damage to crop quality Reduced productivity of cropland (wind erosion, etc.) Insect infestation</li> <li>• Plant disease</li> <li>• Loss from dairy and livestock production; Reduced productivity of range land; Forced reduction of foundation stock</li> <li>• Closure/limitation of public lands to grazing; High cost/unavailability of water for livestock; High cost/unavailability of feed for livestock; High livestock mortality rates</li> <li>• Range fires; Loss from timber production; Forest fires; Tree disease</li> <li>• Loss from fishery production; Damage to fish habitat; Loss of young fish due to decreased flows</li> <li>• Loss of national economic growth, retardation of economic development</li> <li>• Income loss for farmers and others directly affected; Loss of farmers through bankruptcy</li> <li>• Loss to recreational and tourism industry</li> <li>• Loss to manufacturers and sellers of recreational equipment</li> <li>• Increased energy demand and reduced supply because of drought-related power curtailments</li> <li>• Costs to energy industry and consumers associated with substituting more expensive fuels (oil) for Hydroelectric power</li> <li>• Loss to industries directly dependent on agricultural production (e.g., machinery)</li> <li>• Decline in food production/disrupted food supply; Increase in food prices</li> <li>• Unemployment from drought-related production declines</li> </ul>

<sup>59</sup> National Drought Mitigation Center. 2019. "U.S. Drought Impact Reporter." Accessed January 2020. <http://droughtreporter.unl.edu/map/>.

SECTOR	POTENTIAL IMPACTS
	<ul style="list-style-type: none"> <li>• Strain on financial institutions (foreclosures, greater credit risk s, capital shortfalls, etc.)</li> <li>• Revenue losses to federal, state, and local governments (from reduced tax base)</li> <li>• Deterred capital investment, expansion</li> <li>• Dislocation of businesses</li> <li>• Loss from impaired navigability of streams, rivers, and canals</li> <li>• Cost of water transport or transfer; Cost of new or supplemental water resource development</li> </ul>
<b>ENVIRONMENTAL</b>	<ul style="list-style-type: none"> <li>• Reduction and degradation of fish and wildlife habitat; Damage to animal species</li> <li>• Lack of feed and drinking water</li> <li>• Increased vulnerability to predation (e.g., from species concentration near water)</li> <li>• Loss of biodiversity</li> <li>• Wind and water erosion of soils</li> <li>• Reservoir and lake drawdown</li> <li>• Damage to plant species</li> <li>• Water quality effects (e.g., salt concentration, increased water temperatures, pH, dissolved oxygen)</li> <li>• Air quality effects (dust, pollutants)</li> <li>• Visual landscape quality (dust, vegetative cover, etc.)</li> <li>• Increased fire hazard</li> </ul>
<b>SOCIAL</b>	<ul style="list-style-type: none"> <li>• Estuarine impacts; changes in salinity levels, reduced flushing</li> <li>• Increased groundwater depletion (mining), land subsidence</li> <li>• Loss of wetlands, cultural sites, recreational areas</li> <li>• Food shortages (decreased nutritional level, malnutrition, famine)</li> <li>• Loss of human life (e.g., food shortages, heat)</li> <li>• Public safety from forest and range fires</li> <li>• Conflicts between water users, public policy conflicts</li> <li>• Increased anxiety</li> <li>• Health-related low flow problems (e.g., diminished sewage flows, increased pollutant concentrations, etc.)</li> <li>• Recognition of institutional constraints on water use</li> <li>• Inequity in the distribution of drought impacts/relief; Decreased quality of life in rural areas; Increased poverty and impacts of poverty</li> <li>• Social unrest, civil strife; loss of confidence in government officials</li> </ul>

Source: NDMC

All segments of the population are vulnerable to the effects of extreme heat, some specific groups have higher levels of vulnerability to extreme heat include the elderly (55 years and older), residents of nursing homes or care facilities, children, those isolated from social interactions, and low-income groups. Elderly residents and people living in nursing homes and care facilities have less tolerance for temperature extremes and can quickly feel the effects of extreme temperatures. Low-income elderly in urban areas are especially at risk from extreme temperatures. Young children under the age of 5 are highly susceptible to the effects of extreme heat. Young children have a smaller body mass to surface ratio making them more vulnerable to heat-related morbidity and mortality. Children also become dehydrated more quickly than adults making for greater concern. Low-income people and families may lack resources that mitigate the impacts of extreme heat such as air conditioning. The following table provides information related to regional vulnerabilities for drought and extreme heat. For jurisdictional-specific vulnerabilities, refer to *Section Seven: Community Profiles*.

**Table 52:Regional Drought and Extreme Heat Vulnerabilities**

SECTOR	VULNERABILITY
<b>PEOPLE</b>	<ul style="list-style-type: none"> <li>-Insufficient water supply</li> <li>-Loss of jobs in agricultural sector</li> <li>-Residents in poverty if food prices increase</li> </ul>



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

# 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.

## LOCATION

Table 53 shows current statuses of Flood Insurance Rate Map (FIRM) panels. Most of the jurisdictions throughout the planning area also have FIRMs at the municipal level. Figure 22 shows the preliminary firm data for the planning area. For jurisdictional-specific maps as well as an inventory of structures in the floodplain, please refer to *Section Seven: Participant Sections*.

Table 53: FEMA FIRM Panel Status

JURISDICTION	PARTICIPATING IN NFIP? (Y/N)	PANEL NUMBER	EFFECTIVE DATE
BOX BUTTE COUNTY	No	310416IND0, 310416IND0, 3104160001A, 3104160002A, 3104160003A, 3104160004A, 3104160005A, 3104160006A, 3104160007A, 3104160008A, 3104160009A, 3104160010A, 3104160011A, 3104160012A, 3104160013A, 3104160014A, 3104160015A, 3104160016A	8/23/1977
ALLIANCE HEMINGFORD	Yes	310011IND0, 3100110005A, 3100110015A	7/16/1987
	No	-	-
DAWES COUNTY	Yes	31045CIND0A, 31045CIND0A, 3104C0025C, 31045C0050C, 31045C0075C, 31045C0125C, 31045C0150C, 31045C0200C, 31045C0225C, 31045C0250C, 31045C0275C, 31045C0300C, 31045C0325C, 31045C0350C, 31045C0375C, 31045C0400C, 31045C0420C, 31045C0425C, 31045C0450C, 31045C0460C, 31045C0475C, 31045C0480C, 31045C0500C, 31045C0525C, 31045C0530C, 31045C0535C, 31045C0540C, 31045C0545C, 31045C0575C, 31045C0600C, 31045C0625C, 31045C0650C, 31045C0675C, 31045C0700C, 31045C0725C, 31045C0750C, 31045C0775C, 31045C0800C, 31045C0825C, 31045C0850C, 31045C0875C, 31045C0900C, 31045C0925C, 31045C0950C, 31045C0975C	6/16/2011
CHADRON	Yes	31045CIND0A, 31045C0460C, 31045C0475C, 31045C0480C, 31045C0500C	6/16/2011
CRAWFORD	Yes	31045CIND0A, 31045C0535C, 31045C0545C	6/16/2011
WHITNEY	No	31045CIND0A, 31045C0420C	6/16/2011
SHERIDAN COUNTY	Yes	310475IND0A, 310475IND0A, 3104759999A, 3104750001B, 3104750002B, 3104750003B, 3104750004B, 3104750005B, 3104750006B, 3104750007B, 3104750008B, 3104750009B, 3104750010B, 3104750011B,	12/1/2008

JURISDICTION	PARTICIPATING IN NFIP? (Y/N)	PANEL NUMBER	EFFECTIVE DATE
		3104750012B, 3104750013B, 3104750014B, 3104750015B, 3104750016B, 3104750017B, 3104750018B, 3104750019B, 3104750020B, 3104750021B, 3104750022B, 3104750023B, 3104750024B, 3104750025B, 3104750026B, 3104750027B, 3104750028B, 3104750029B, 3104750030B, 3104750031B, 3104750032B	
GORDON <sup>^</sup>	Yes	0007A	11/22/1977
HAY SPRINGS	Yes	3102139999B, 310213B	2/1/1993
RUSHVILLE	Yes	310214A	4/2/1976
SIoux COUNTY	No	-	-
HARRISON	No	-	-

Source: FEMA, 2020<sup>60, 61</sup>

<sup>^</sup>The City of Gordon adopted Panel 0007A of Sheridan County FFBM dated November 22, 1977 to use in determining those areas of special flood hazard within the 1-mile extra territorial jurisdiction.

The following figures show available flood hazard area maps for the four county planning area. Dawes County has an available Digital Flood Insurance Map (DFIRM) as provided by FEMA. Box Butte County and Sheridan County flood hazard areas were rendered using HAZUS for this planning effort. There is currently no flood hazard area mapping information available for Sioux County; however, a map of rivers and streams is provided. It is expected that, in general, any floodplain areas will be adjacent to major waterways.

Additionally, it should be noted that there are currently no RiskMap efforts going on in the planning area by the Nebraska Department of Natural Resources.<sup>62</sup> There are also no USGS Water Alert stations located within the planning area.<sup>63</sup>

<sup>60</sup> Federal Emergency Management Agency. 2019. "FEMA Flood Map Service Center." Accessed January 2020. <http://msc.fema.gov/portal/advanceSearch>.

<sup>61</sup> Federal Emergency Management Agency. 2020. "Community Status Book Report." Accessed January 2020. <https://www.fema.gov/cis/NE.html>.

<sup>62</sup> Nebraska Department of Natural Resources. 2020. "Floodplain Map Interactive Maps: Risk MAP Flood Risk Products Map." <https://prodmaps2.ne.gov/Html5DNR/index.html?viewer=outreach>

<sup>63</sup> Nebraska Department of Natural Resources. 2020. "Floodplain Map Interactive Maps: USGS Water Alert System." <https://maps.waterdata.usgs.gov/mapper/wateralert/>

Figure 22: 1% Annual Flood Risk Hazard Area in Box Butte County

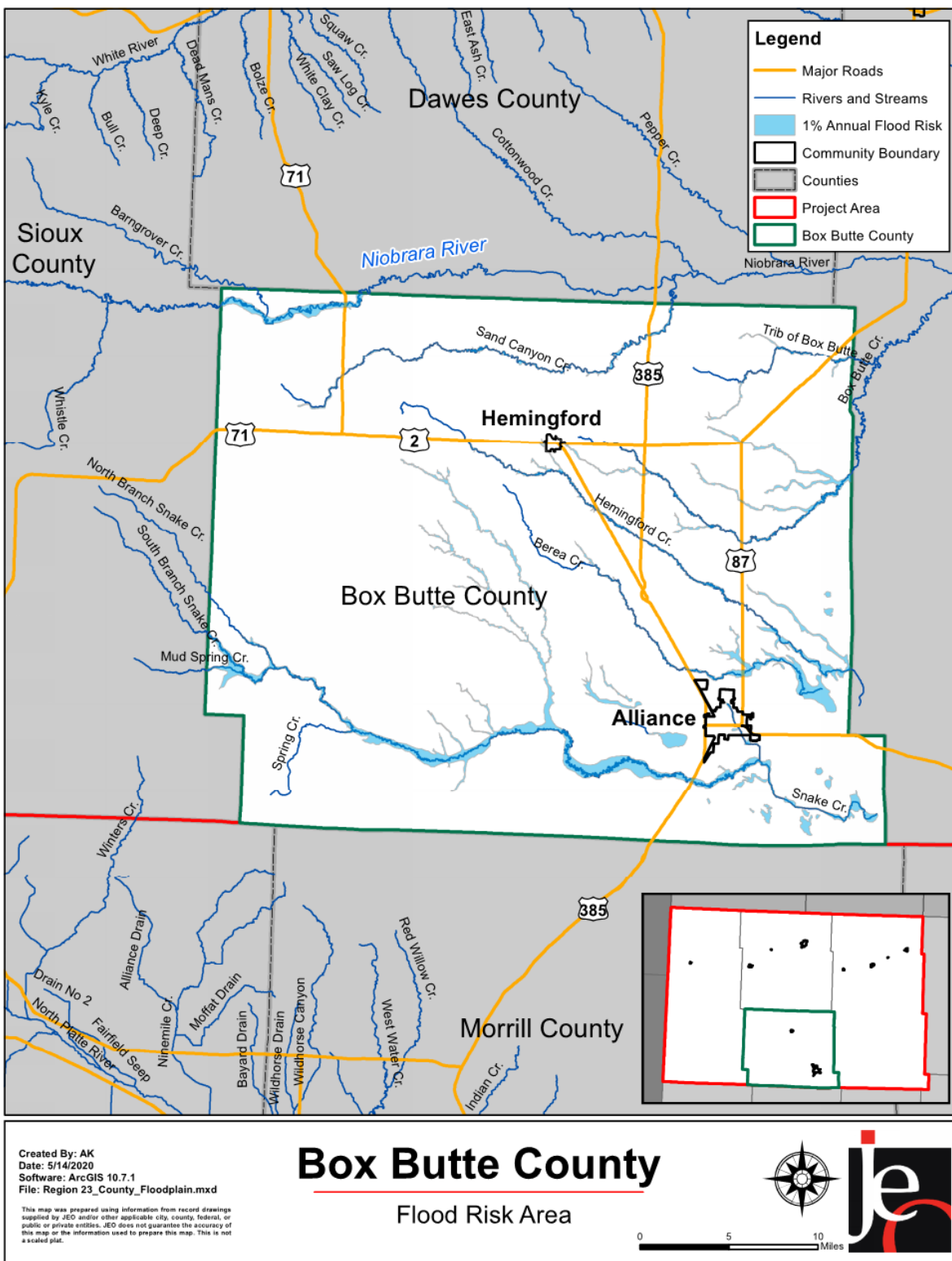


Figure 23: 1% Annual Flood Risk Hazard Area in Dawes County

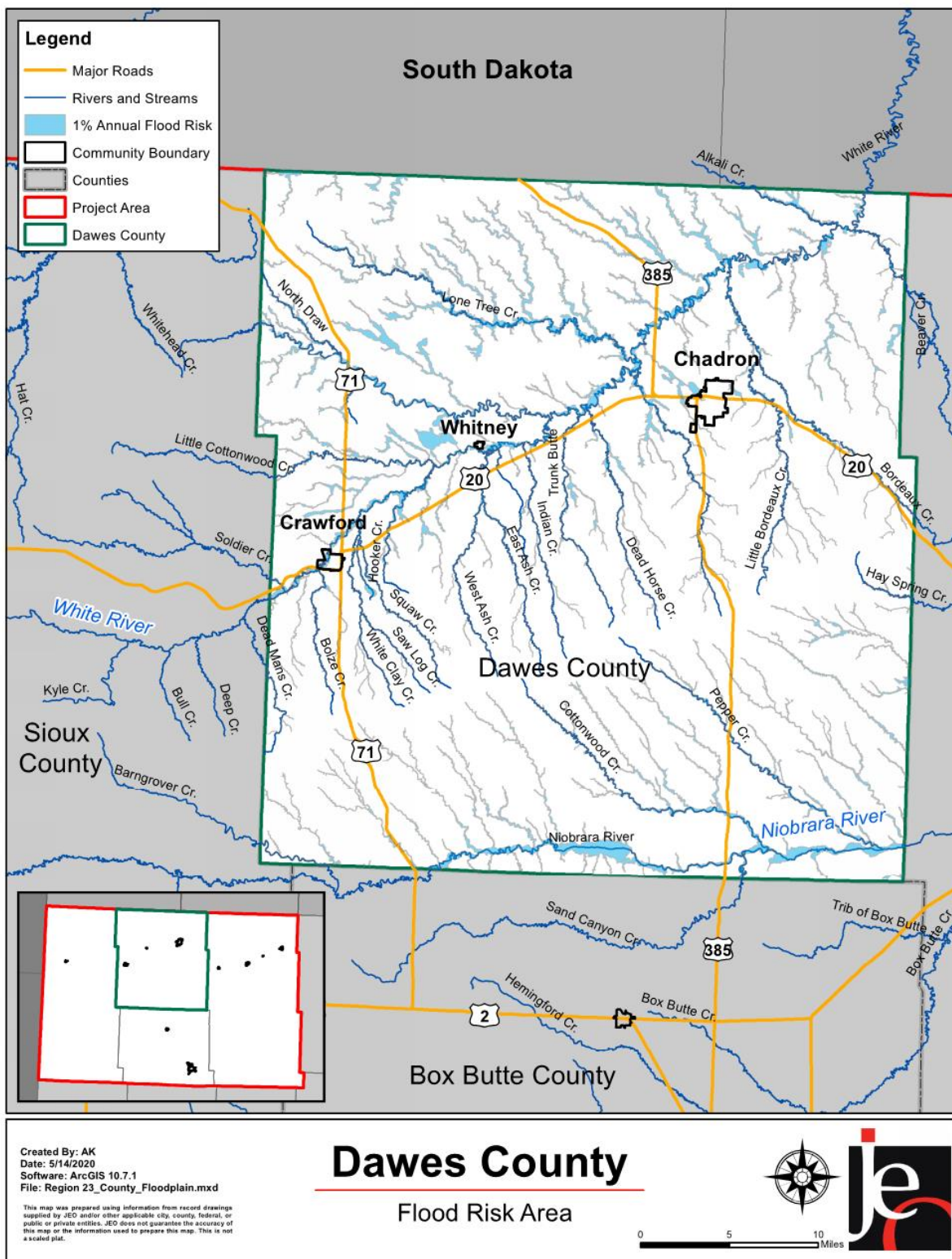


Figure 24: 1% Annual Flood Risk Hazard Area in Sheridan County

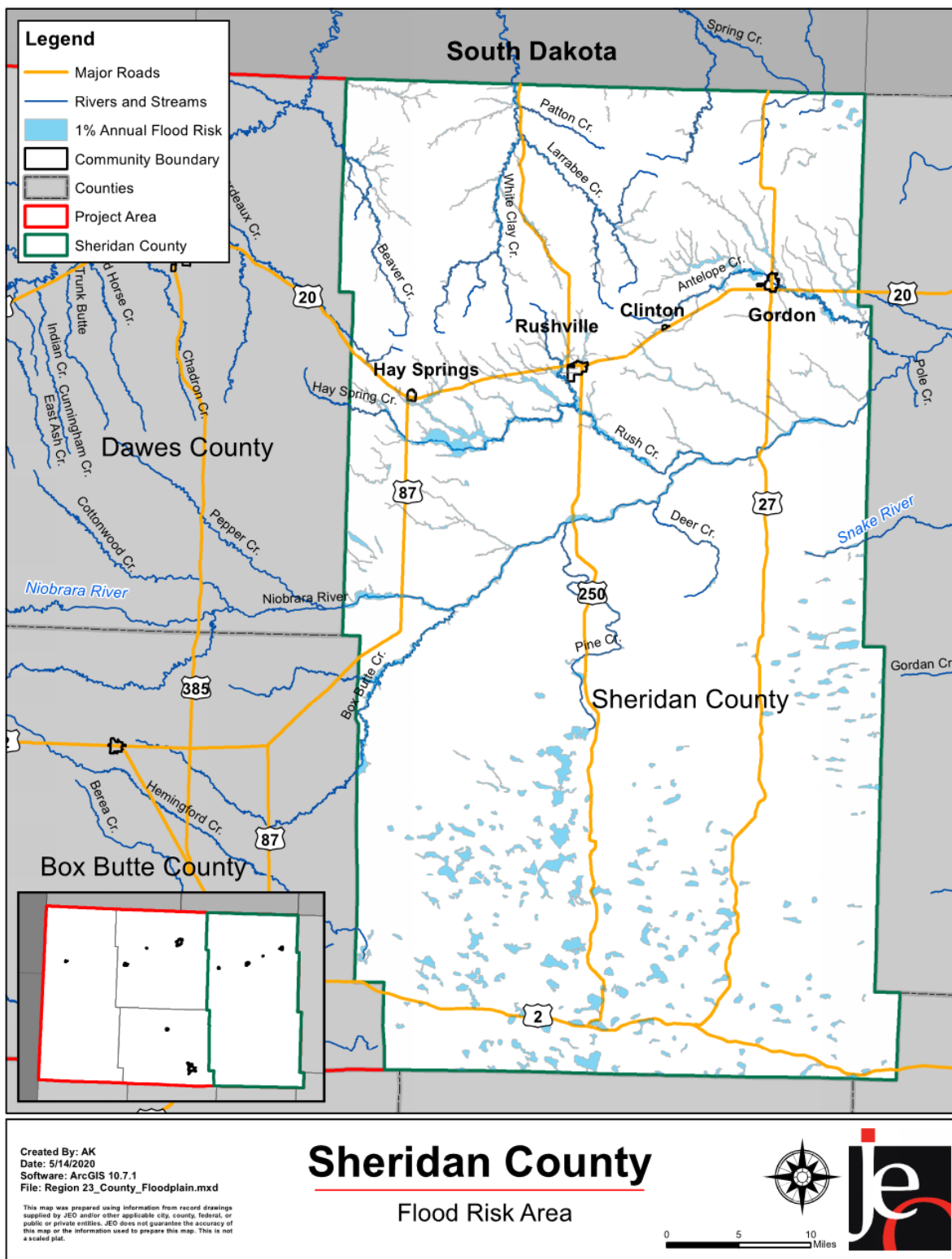
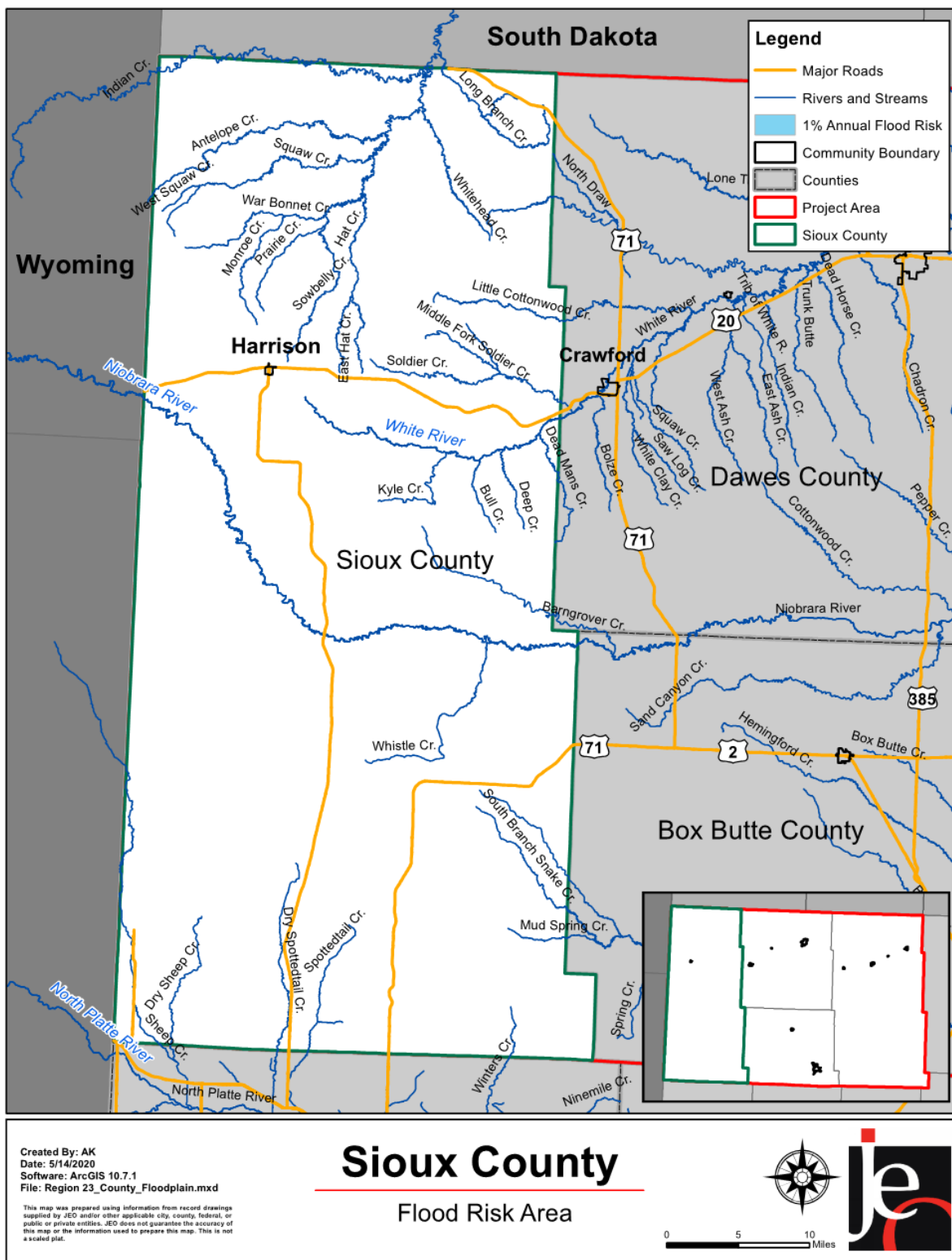


Figure 25: Major Rivers and Streams in Sioux County





**EXTENT**

The NWS has three categories to define the severity of a flood once a river reaches flood stage as indicated in Table 54.

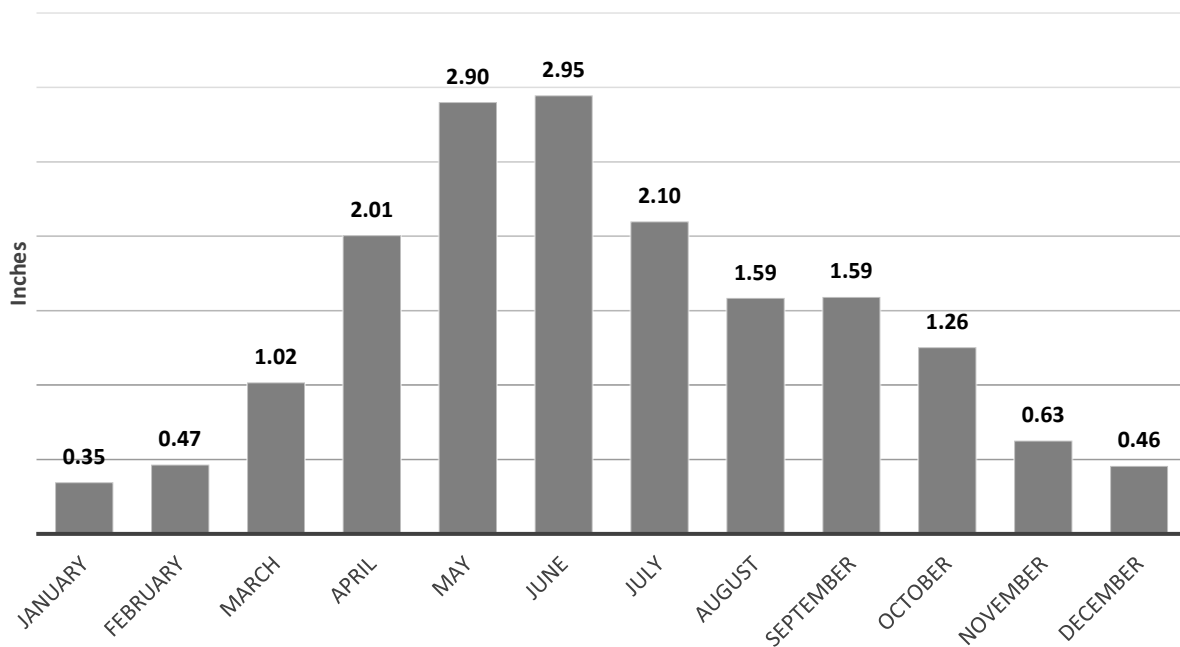
**Table 54: Flooding Stages**

FLOOD STAGE	DESCRIPTION OF FLOOD IMPACTS
<b>MINOR FLOODING</b>	Minimal or no property damage, but possibly some public threat or inconvenience
<b>MODERATE FLOODING</b>	Some inundation of structures and roads near streams. Some evacuations of people and/or transfer of property to higher elevations are necessary
<b>MAJOR FLOODING</b>	Extensive inundation of structures and roads. Significant evacuations of people and/or transfer of property to higher elevations

Source: NOAA, 2017<sup>64</sup>

Figure 26 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 27, the most common months for flooding within the planning area are June and July.

**Figure 26: Region 23 Average Monthly Precipitation**

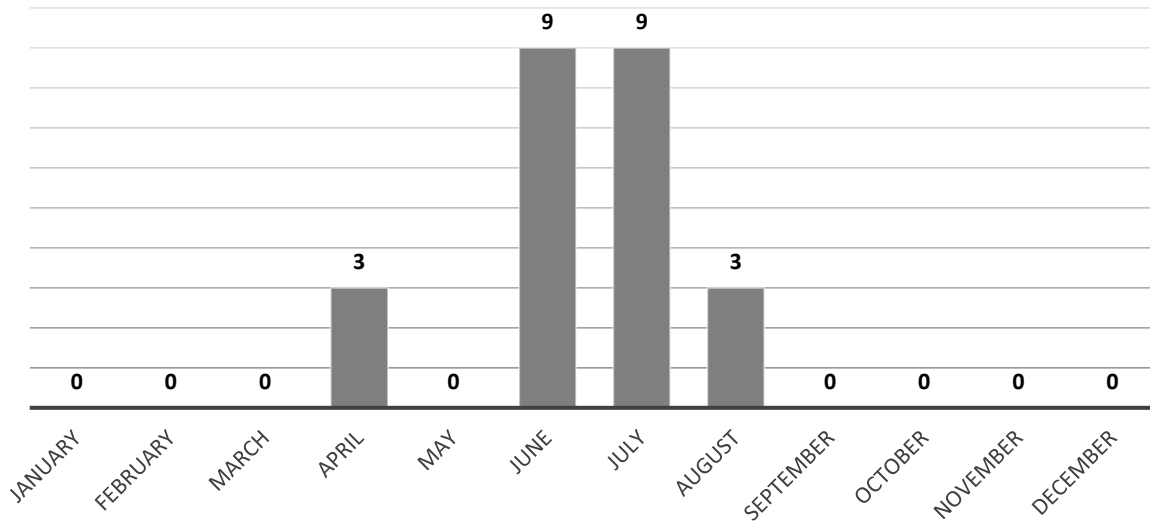


Source: NCEI, 2019<sup>65</sup>

<sup>64</sup> National Weather Service. 2017. "Flood Safety." <http://www.floodsafety.noaa.gov/index.shtml>.

<sup>65</sup> NOAA National Centers for Environmental Information. December 2019. "Data Tools: 1981-2010 Normals." [datafile]. <https://www.ncdc.noaa.gov/cdo-web/datatools/normals>.

Figure 27: Monthly Events for Floods/Flash Floods



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 55: NFIP Participants

JURISDICTION	PARTICIPATE IN NFIP	ELIGIBLE-REGULAR PROGRAM	DATE CURRENT MAP	SANCTION	SUSPENSION	RESCINDED
BOX BUTTE COUNTY	No	-	8/23/1977	-	-	-
ALLIANCE	Yes	7/16/87	7/16/87(M)	-	-	-
HEMINGFORD	No	-	-	-	-	-
DAWES COUNTY	Yes	6/16/2011	06/16/11(M)	-	-	-
CHADRON	Yes	8/1/2009	06/16/11(M)	-	-	-
CRAWFORD	Yes	8/1/1986	06/16/11(M)	-	-	-
WHITNEY	No	6/16/2011	6/16/2011	-	-	-
SHERIDAN COUNTY	Yes	12/1/2008	12/01/08(L)	-	-	-
GORDON <sup>^</sup>	Yes	-	(NSFHA)	-	-	-
HAY SPRINGS	Yes	2/1/1993	02/01/93(L)	-	-	-

JURISDICTION	PARTICIPATE IN NFIP	ELIGIBLE-REGULAR PROGRAM	DATE CURRENT MAP	SANCTION	SUSPENSION	RESCINDED
RUSHVILLE	Yes	-	4/2/1976	-	-	-
SIoux COUNTY	No	-	-	-	-	-
HARRISON	No	-	-	-	-	-

Source: Federal Emergency Management Agency, National Flood Insurance Program, 2017<sup>66</sup>

\*(M) indicates no elevation determined – All Zone A, C, and X; (NSFHA) indicates no special flood hazard area – all Zone C

^The City of Gordon adopted Panel 0007A of Sheridan County FHBMAP dated November 22, 1977 to use in determining those areas of special flood hazard within the 1-mile extra territorial jurisdiction.

**Table 56: NFIP Policies in Force and Total Payments**

JURISDICTION	POLICIES IN-FORCE	TOTAL COVERAGE	TOTAL PREMIUMS	CLOSED LOSSES*	TOTAL PAYMENTS
BOX BUTTE COUNTY	0	\$0	\$0	0	\$0
ALLIANCE	5	\$945,200	\$5,053	2	0
HEMINGFORD	0	\$0	\$0	0	\$0
DAWES COUNTY	5	\$861,600	\$4,646	0	\$0
CHADRON	2	\$460,000	\$2,576	0	\$0
CRAWFORD	0	\$0	\$0	0	\$0
WHITNEY	0	\$0	\$0	0	\$0
SHERIDAN COUNTY	7	\$773,000	\$6,788	0	\$0
GORDON	0	\$0	\$0	0	\$0
HAY SPRINGS	3	\$346,400	\$4,211	0	\$0
RUSHVILLE	0	\$0	\$0	0	\$0
SIoux COUNTY	0	\$0	\$0	0	\$0
HARRISON	0	\$0	\$0	0	\$0

Source: Federal Emergency Management Agency, National Flood Insurance Program, NFIP Community Status Book, 2019<sup>67</sup>

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

The NFIP Emergency Program allows a community to voluntarily participate in the NFIP if: no flood hazard information is available for their area; the community has a Flood Hazard Boundary Map but no FIRM; or the community has been identified as flood-prone for less than a year.

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).<sup>68</sup> Currently no jurisdictions in the planning area participate in the CRS program.

<sup>66</sup> Federal Emergency Management Agency: National Flood Insurance Program. September 2018. "Policy & Claim Statistics for Flood Insurance." Accessed December 2019. <https://www.fema.gov/policy-claim-statistics-flood-insurance>.

<sup>67</sup> Federal Emergency Management Agency: National Flood Insurance Program. December 2019. "Policy & Claim Statistics for Flood Insurance." Accessed December 2019. <https://www.fema.gov/policy-claim-statistics-flood-insurance>.

<sup>68</sup> Federal Emergency Management Agency. December 2019. "National Flood Insurance Program Community Rating System: Coordinator's Manual FIA-15/2017." Accessed December 2019. <https://www.fema.gov/media-library/assets/documents/8768>.

## NFIP REPETITIVE LOSS STRUCTURES

NeDNR was contacted to determine if any existing buildings, infrastructure, or critical facilities are classified as NFIP Repetitive Loss Structures. As of November 2019, there were no repetitive loss properties located in the planning area.

## FLOODING FROM LEVEE FAILURE

While there are no federal or non-federal levees located within the four-county planning area, numerous unmapped agricultural levees and berms are spread out throughout the counties. These levees are not inventoried or mapped, preventing a full risk assessment. However, in the case of an agricultural levee failure event flood impacts would likely be limited to agricultural lands and outbuildings.

## 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, 22 flash flooding events resulted in \$562,000 in property damage, while two riverine flooding events did not report any 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 \$109,388. Descriptions of the most damaging flood events from the NCEI are below:

- **August 3, 1996** – Rush Creek bridge washed out three miles south of Rushville. Five feet of water present in basements 6 miles north of Rushville. Rainfall of five to six inches in and around Rushville.
- **August 15, 1996** – Road washed out 1 mile north of Rushville.
- **July 10, 2005** - Over 2 inches of rain fell in 45 minutes to produce lowland flooding with at least one road washed out.
- **July 9, 2010** – A warm front moved north out of northeastern Colorado the afternoon of 9 June 2010 into southeast Wyoming and the Nebraska Panhandle. The warm front interacted with pre-existing outflow boundaries and later in the evening of the 9th, an approaching upper level jet streak, to produce severe thunderstorms and heavy rainfall across portions of western Nebraska and extreme southeast Wyoming. A rural road was washed out 5 miles north of Rushville.
- **July 11, 2011** – Isolated thunderstorms developed in the Nebraska Panhandle along and north of a stationary front. As storms moved east into deeper low level moisture, coverage and severity increased. Damaging winds, large hail and flash flooding was reported over the eastern Nebraska Panhandle along with portions of north central Nebraska. Report of 6-8 inches of water over 5th Street in Chadron. Canal out of its banks and flowing rapidly.

It should be noted that reported damages do not include impacts from the March 2019 winter storm and flood event. While flooding impacts across central and eastern Nebraska have dominated national media, the concurrent winter storm impacts primarily impacted the planning area. Winter Storm Ulmer developed on March 12 and slowly moved across the Midwest including Nebraska, producing severe blizzard conditions across the panhandle and the planning area. 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. All major transportation routes in the northwestern portion of the country experienced closures or delays during these conditions. Significant snow fall, high winds, and extreme low temperatures buffeted ranchers across the panhandle and threatened cattle and livestock. This event also occurred in the midst of calving season, resulting in the loss of hundreds of calves for ranchers across the state. At least three fatalities occurred during the event while the Nebraska National Guard performed dozens of rescues in inundated areas. No fatalities were reported within the Region 23 planning area during this event. 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 stormmap 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>.

### 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 \$26,417 in property damages and \$5,469 in crop losses per year for the planning area.

**Table 57: Flood Loss Estimate**

HAZARD TYPE	NUMBER OF EVENTS <sup>1</sup>	AVERAGE EVENTS PER YEAR	TOTAL PROPERTY LOSS <sup>1</sup>	AVERAGE ANNUAL PROPERTY LOSS <sup>1</sup>	TOTAL CROP LOSS <sup>2</sup>	AVERAGE ANNUAL CROP LOSS <sup>2</sup>
FLOOD EVENTS	24	1	\$562,000	\$26,417	\$109,388	\$5,469

Source: 1 Indicates data is from NCEI (Jan 1996 to Sept 2019); 2 Indicates data is from USDA RMA (2000 to 2019)

### PROBABILITY

The NCEI reports two flooding and 22 flash flooding events for a total of 24 events from January 1996 to September 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

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

**Table 58: Regional Flooding Vulnerabilities**

SECTOR	VULNERABILITY
PEOPLE	-Low income and minority populations may lack the resources needed for evacuation, response, or to mitigate the potential for flooding

SECTOR	VULNERABILITY
	<ul style="list-style-type: none"> <li>-Elderly or residents with decreased mobility may have trouble evacuating</li> <li>-Residents in low-lying areas, especially campgrounds, are vulnerable during flash flood events</li> <li>-Residents living in the floodplain may need to evacuate for extended periods</li> </ul>
<b>ECONOMIC</b>	<ul style="list-style-type: none"> <li>-Business closures or damages may have significant impacts</li> <li>-Agricultural losses from flooded fields or cattle loss</li> <li>-Closed roads and railways would impact commercial transportation of goods</li> </ul>
<b>BUILT ENVIRONMENT INFRASTRUCTURE</b>	<ul style="list-style-type: none"> <li>-Buildings may be damaged</li> <li>-Damages to roadways and railways</li> </ul>
<b>CRITICAL FACILITIES</b>	<ul style="list-style-type: none"> <li>-Wastewater facilities are at risk, particularly those in the floodplain</li> <li>-Critical facilities, especially those in the floodplain, are at risk to damage (critical facilities are noted within individual community profiles)</li> </ul>
<b>CLIMATE</b>	<ul style="list-style-type: none"> <li>-Changes in seasonal and annual precipitation normals will likely increase frequency and magnitude of flood events</li> </ul>

# HIGH WINDS AND TORNADOES

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

The National Weather Service (NWS) defines high winds as sustained wind speeds of 40 mph or greater lasting for 1 hour or longer, or winds of 58 mph or greater for any duration.<sup>69</sup> The NWS issues High Wind Advisories when there are sustained winds of 25 to 39 miles per hour and/or gusts to 57 mph. Figure 28 shows the wind zones in the United States. The wind zones are based on the maximum wind speeds that can occur from a tornado or hurricane event. The planning area is located in Zone II/III which has maximum winds of 200 mph equivalent to an EF4/5 tornado.

Figure 28: Wind Zones in the U.S.



Source: FEMA, 2016

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

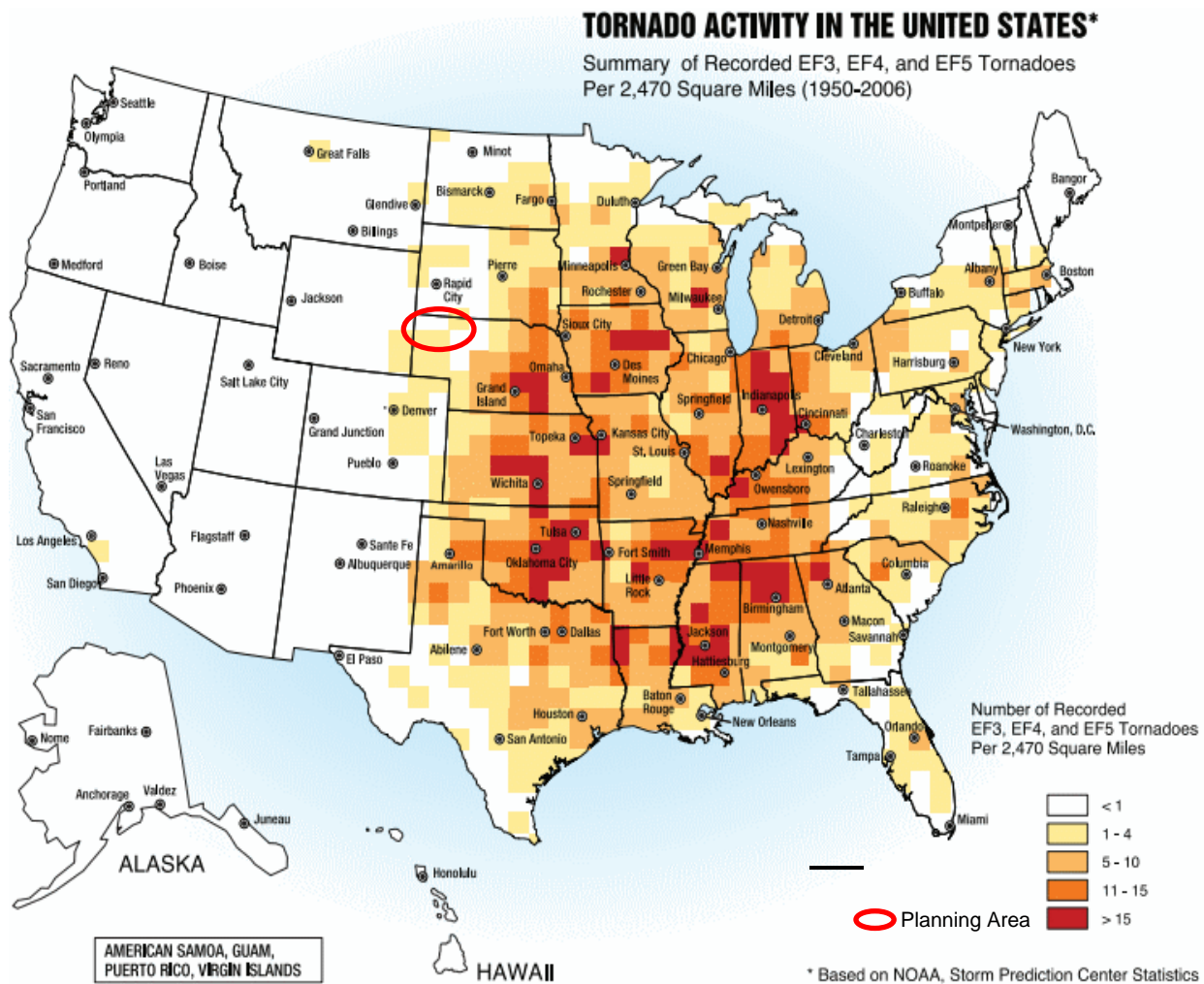
- There must be a microscale rotating area of wind, ranging in size from a few feet to a few miles wide;
- The rotating wind, or vortex, must be attached to a convective cloud base and must be in contact with the ground; and,

<sup>69</sup> National Weather Service. 2017. "Glossary." <http://w1.weather.gov/glossary/index.php?letter=h>.

- The spinning vortex of air must have caused enough damage to be classified by the Fujita Scale as a tornado.

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

Figure 29: Tornado Activity in the United States



Source: FEMA, 2008<sup>70</sup>

Nebraska is ranked fifth in the nation for tornado frequency with an annual average of 57 tornadoes between 1991 to 2010.<sup>71</sup> The following figure shows the tornado activity in the United States as a summary of recorded EF3, EF4, and EF5 tornadoes per 2,470 square miles from 1950-2006.

<sup>70</sup> Federal Emergency Management Agency. August 2008. “Taking Shelter From the Storm: Building a Safe Room for Your Home or Small Business, 3<sup>rd</sup> edition.”

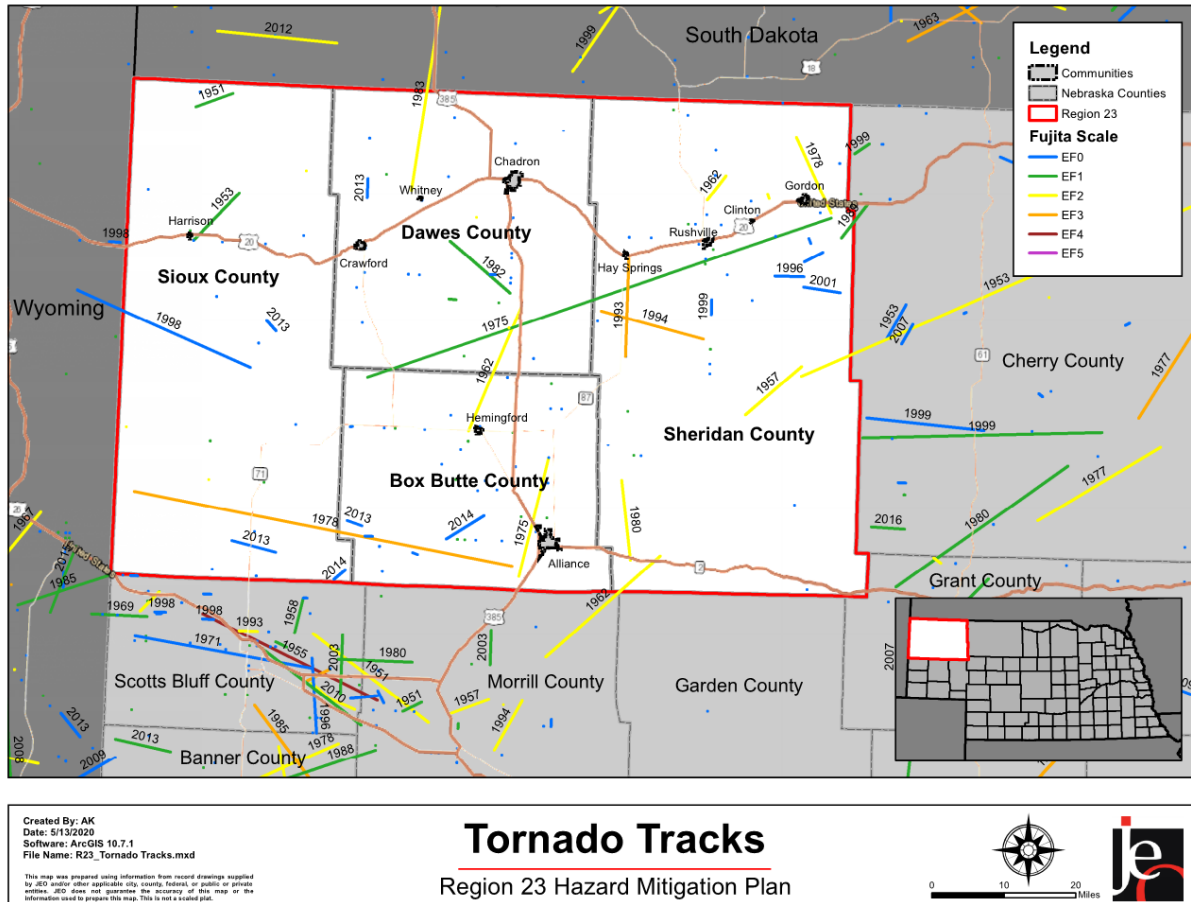
<sup>71</sup> National Centers for Environmental Information. 2013. “U.S. Tornado Climatology.” <https://www.ncei.noaa.gov/climate-information/extreme-events/us-tornado-climatology>.



**LOCATION**

High winds and tornadoes commonly occur throughout the planning area. The impacts would likely be greater in more densely populated areas. The following map shows the historical track locations across the region from 1950 to 2018 according to the Midwestern Regional Climate Center. Few significant tornado events have directly impacted communities located in the planning area, but touchdowns and tornado events can occur anywhere within the four-county planning area.

**Figure 30: Historic Tornado Tracks**



**EXTENT**

The Beaufort Wind Scale can be used to classify wind strength while the magnitude of tornadoes is measured by the Enhanced Fujita Scale. Table 59 outlines the Beaufort scale, provides wind speed ranking, range of wind speeds per ranking, and a brief description of conditions for each ranking.

**Table 59: 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 mobile homes with no anchors turned over
11	64 – 72 mph	Widespread damages; very rarely experienced
12 - 17	72 - > 200 mph	Hurricane; devastation

Source: Storm Prediction Center, 2017<sup>72</sup>

The Enhanced Fujita Scale replaced the Fujita Scale in 2007. The Enhanced Fujita Scale does not measure tornadoes by their size or width, but rather the amount of damage caused to human-built structures and trees after the event. The official rating category provides a common benchmark that allows comparisons to be made between different tornadoes. The enhanced scale classifies EF0-EF5 damage as determined by engineers and meteorologists across 28 different types of damage indicators, including different types of building and tree damage. To establish a rating, engineers and meteorologists examine the damage, analyze the ground-swirl patterns, review damage imagery, collect media reports, and sometimes utilize photogrammetry and videogrammetry. Based on the most severe damage to any well-built frame house, or any comparable damage as determined by an engineer, an EF-Scale number is assigned to the tornado. The following tables summarize the Enhanced Fujita Scale and damage indicators. According to a recent report from the National Institute of Science and Technology on the Joplin Tornado, tornadoes rated EF3 or lower account for around 96 percent of all tornado damages.<sup>73</sup>

**Table 60: Enhanced Fujita Scale**

STORM CATEGORY	3 SECOND GUST (MPH)	DAMAGE LEVEL	DAMAGE DESCRIPTION
<b>EF0</b>	65-85 mph	Gale	Some damages to chimneys; breaks branches off trees; pushes over shallow-rooted trees; damages to sign boards.
<b>EF1</b>	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.
<b>EF2</b>	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.
<b>EF3</b>	136-165 mph	Severe	Roof and some walls torn off well-constructed houses; trains overturned; most trees in forest uprooted.

<sup>72</sup> Storm Prediction Center: National Oceanic and Atmospheric Administration. 1805. "Beaufort Wind Scale." <http://www.spc.noaa.gov/faq/tornado/beaufort.html>.

<sup>73</sup> Kuligowski, E.D., Lombardo, F.T., Phan, L.T., Levitan, M.L., & Jorgensen, D.P. March 2014. "Final Report National Institute of Standards and Technology (NIST) Technical Investigation of the May 22, 2011, Tornado in Joplin, Missouri."

STORM CATEGORY	3 SECOND GUST (MPH)	DAMAGE LEVEL	DAMAGE DESCRIPTION
EF4	166-200 mph	Devastating	Well-constructed houses leveled; structures with weak foundations blown off some distance; cars thrown, and large missiles generated.
EF5	200+ mph	Incredible	Strong frame houses lifted off foundations and carried considerable distances to disintegrate; automobile sized missiles fly through the air in excess of 100 meters; trees debarked; steel re-enforced concrete structures badly damaged.
EF NO RATING	--	Inconceivable	Should a tornado with the maximum wind speed in excess of F5 occur, the extent and types of damage may not be conceived. A number of missiles such as iceboxes, water heaters, storage tanks, automobiles, etc. will create serious secondary damage on structures.

Source: NOAA; FEMA

**Table 61: 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

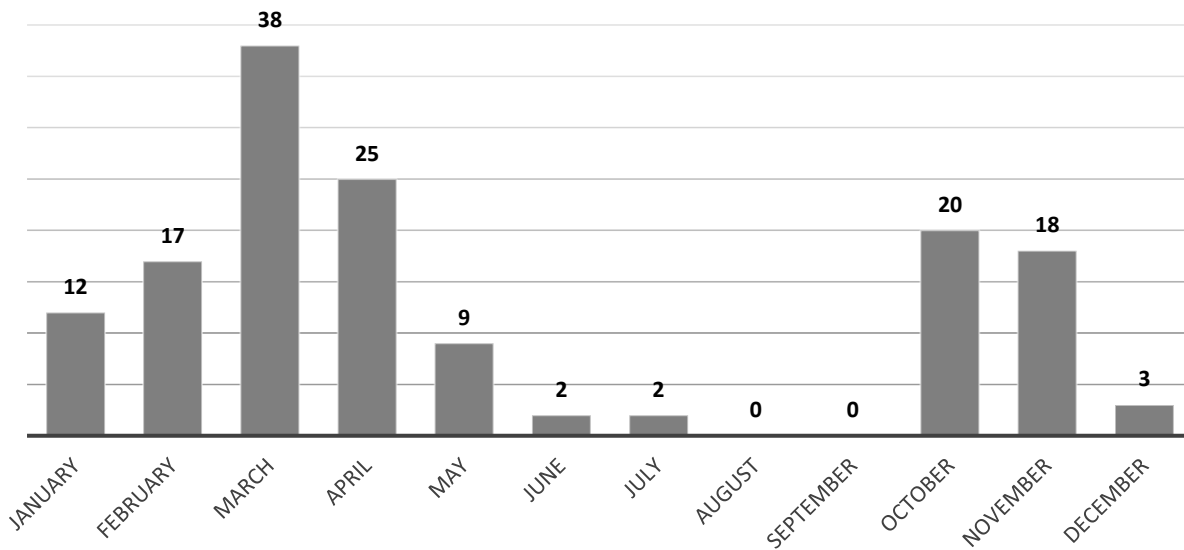
Source: NOAA; FEMA

Using the NCEI reported events, the most common high wind event is a level 9. The reported high wind events had an average of 47 mph winds. Based on the historic record, it is most likely that tornadoes that occur within the planning area will be of EF0 strength. Of the 71 reported events, four were EF1 and two were EF2. High wind and tornadoes are likely to occur annually in the planning area.

### HISTORICAL OCCURRENCES

Due to the regional scale of high winds, the NCEI reports events as they occur in each county. While a single event can affect two or more counties at a time, the NCEI reports them as separate events. There were 146 high wind events that occurred between January 1996 and September 2019 and 71 tornadic events ranging from a magnitude of EF0 to EF2. These events were responsible for \$104,500 in property damages. As seen in Figure 31, most high wind events occur in the spring and winter months. One tornado in 2017 caused one fatality. The most damaging tornadoes occurred in Box Butte County (2017, \$1,000,000) and Sheridan County (2006, \$150,000). Significant hazards which impacted communities in the planning area are described in the appropriate Community Profiles.

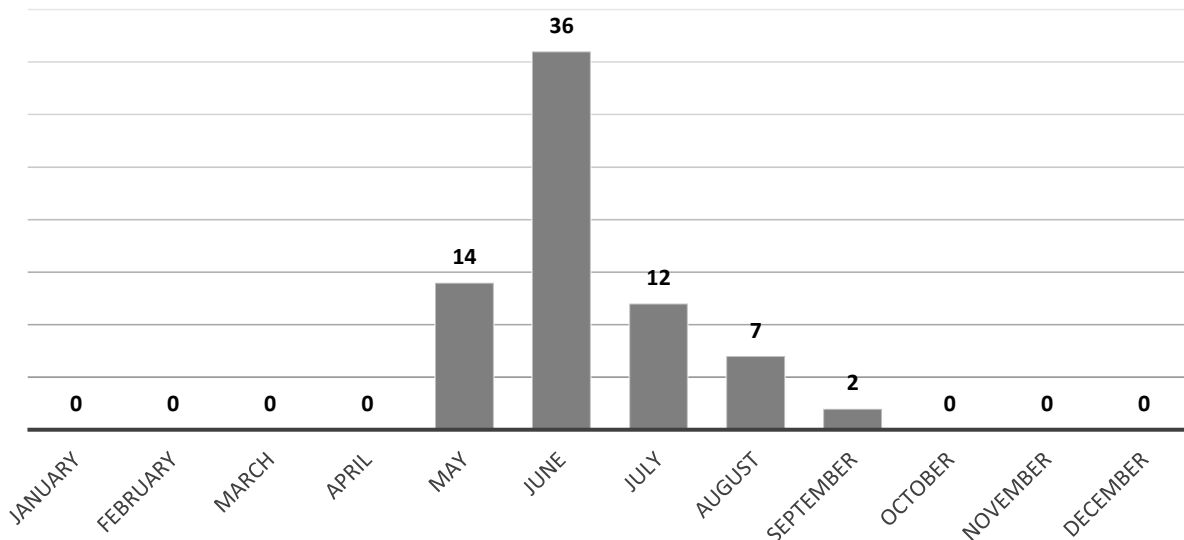
Figure 31: High Wind Events by Month



Source: NCEI, 1996-2019

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. Overall the planning area is vulnerable to high wind or tornado events throughout the entire year.

Figure 32: 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. It is estimated that high wind events can cause an average of \$5,375 per year in property damage, and an average of \$599,829 per year in crop damage for the planning area. Tornadoes cause an average of \$56,458 per year in property damage. The RMA did not report crop damages due to tornadic events, but damage to rangeland from tornadoes is still a concern for the planning area.

**Table 62: High Wind Loss Estimate**

HAZARD TYPE	NUMBER OF EVENTS <sup>1</sup>	AVERAGE EVENTS PER YEAR	TOTAL PROPERTY LOSS <sup>1</sup>	AVERAGE ANNUAL PROPERTY LOSS <sup>1</sup>	TOTAL CROP LOSS <sup>2</sup>	AVERAGE ANNUAL CROP LOSS <sup>2</sup>
<b>HIGH WINDS</b>	146	6.1	\$129,000	\$5,375	\$11,996,572	\$599,829
<b>TORNADOES</b>	71	3	\$1,355,000	\$56,458	\$0	\$0

Source: 1 Indicates data is from NCEI (Jan 1996 to Sept 2019); 2 Indicates data is from USDA RMA (2000 to 2019)

**PROBABILITY**

Based on historical records and reported events, it is likely that high winds and tornadic events will occur within the planning area annually. For the 24 years examined, there were 146 reported high wind events and 71 tornadoes.

**REGIONAL VULNERABILITIES**

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

**Table 63: Regional High Wind and Tornado Vulnerabilities**

SECTOR	VULNERABILITY
<b>PEOPLE</b>	-Vulnerable populations include those living in mobile homes (especially if they are not anchored properly), nursing homes, and/or schools -People outdoors during events -Citizens without access to shelter below ground or in safe room -Elderly with decreased mobility or poor hearing may be higher risk -Lack of multiple ways of receiving weather warnings, especially at night
<b>ECONOMIC</b>	-Agricultural losses to both crops and livestock -Damages to businesses and prolonged power outages can cause significant impacts to the local economy, especially with EF3 tornadoes or greater
<b>BUILT ENVIRONMENT</b>	-All building stock is at risk of significant damages -Downed power lines and power outages
<b>INFRASTRUCTURE</b>	-All above ground infrastructure at risk to damages -Impassable roads due to debris blocking roadways
<b>CRITICAL FACILITIES</b>	-All critical facilities are at risk to damages and power outages
<b>CLIMATE</b>	-Changes in seasonal precipitation and temperature normals can increase frequency and magnitude of severe storm events

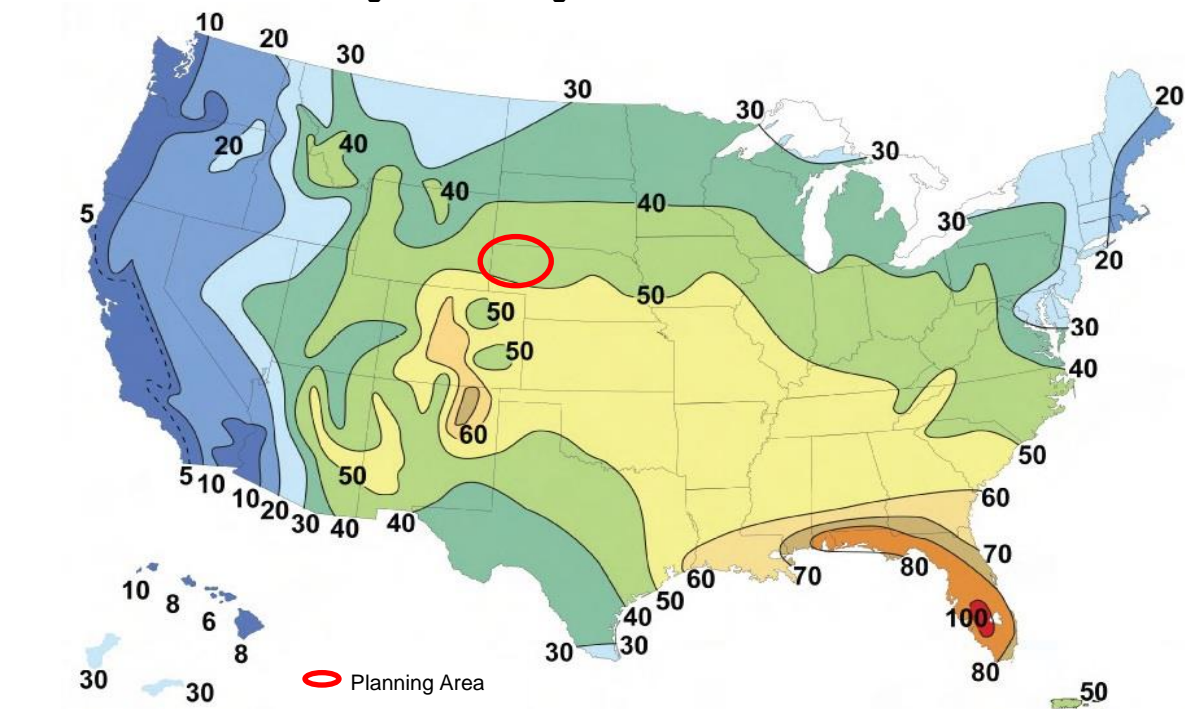
# SEVERE THUNDERSTORMS

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. Additionally, hail is a common component of thunderstorms and 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 summer months. Hail can destroy property and crops with sheer force, as some hail stones can fall at speeds up to 100 mph.

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 and/or produce hail, 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; death or injury to humans and animals from lightning, drowning, or getting struck by falling or flying debris; 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. Figure 33 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 33: Average Number of Thunderstorms



Source: NWS, 2017<sup>74</sup>

<sup>74</sup> National Weather Service. 2017. "Introduction to Thunderstorms." [http://www.srh.noaa.gov/jetstream/tstorms/tstorms\\_intro.html](http://www.srh.noaa.gov/jetstream/tstorms/tstorms_intro.html).

## LOCATION

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

## EXTENT

The geographic extent of a severe thunderstorm event may be large enough to impact the entire planning area (such as in the case of a squall line, derecho, or long-lived supercell) or just a few square miles, in the case of a single cell that marginally meets severe criteria. The NWS defines a thunderstorm as severe if it contains hail that is one inch in diameter or capable of winds gusts of 58 mph or higher. The Tornado and Storm Research Organization (TORRO) scale is used to classify hailstones and provides some detail related to the potential impacts from hail. Table 64 outlines the TORRO Hail Scale.

**Table 64: TORRO Hail Scale**

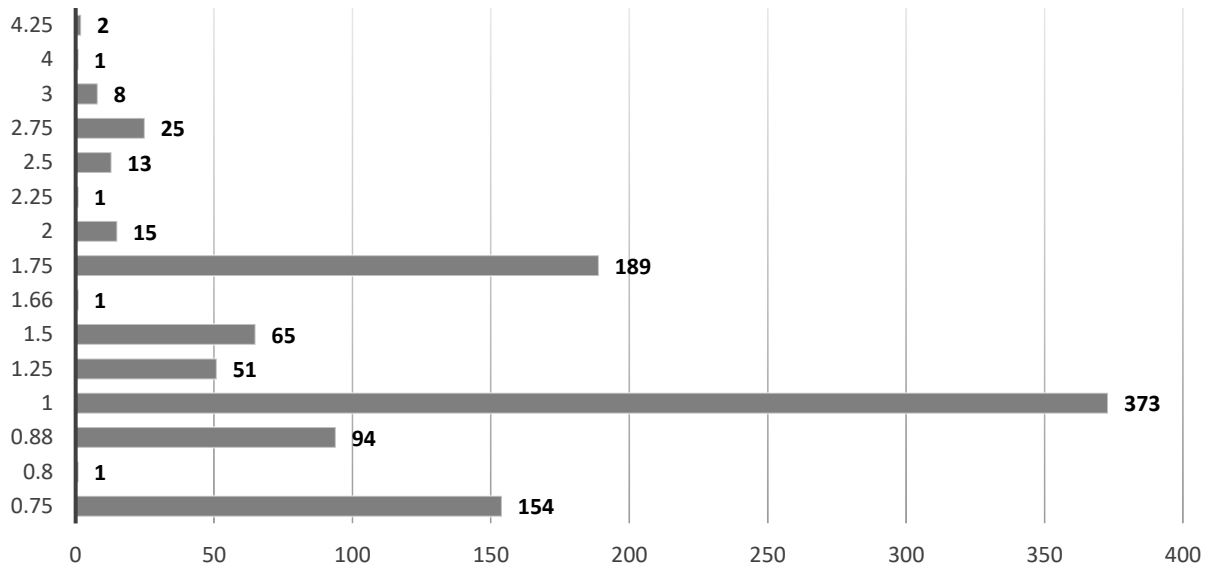
CLASS	TYPE OF MATERIAL	DIVISIONS
H0: Hard Hail	5 mm; (Pea size); 0.2 in	No damage
H1: Potentially Damaging	5 -15 mm (Marble); 0.2 – 0.6 in	Slight general damage to plants and crops
H2: Significant	10 -20 mm (Grape); 0.4 – 0.8 in.	Significant damage to fruit, crops, and vegetation
H3: Severe	20 -30 mm (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, 2017<sup>75</sup>

The NCEI reported 993 individual hail events across the planning area. As the NCEI reports events per county, this value overestimates the total amount of thunderstorm events. The average hailstone size was 1.24 inches. Events of this magnitude correlate to an H4 Severe classification. It is reasonable to expect 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 (>4.0 inches) during the period of record. Figure 34 shows hail events based on the size of the hail.

<sup>75</sup> Tornado and Storm Research Organization. 2017. "Hail Scale." <http://www.torro.org.uk/hscale.php>.

Figure 34: Hail Events by Magnitude

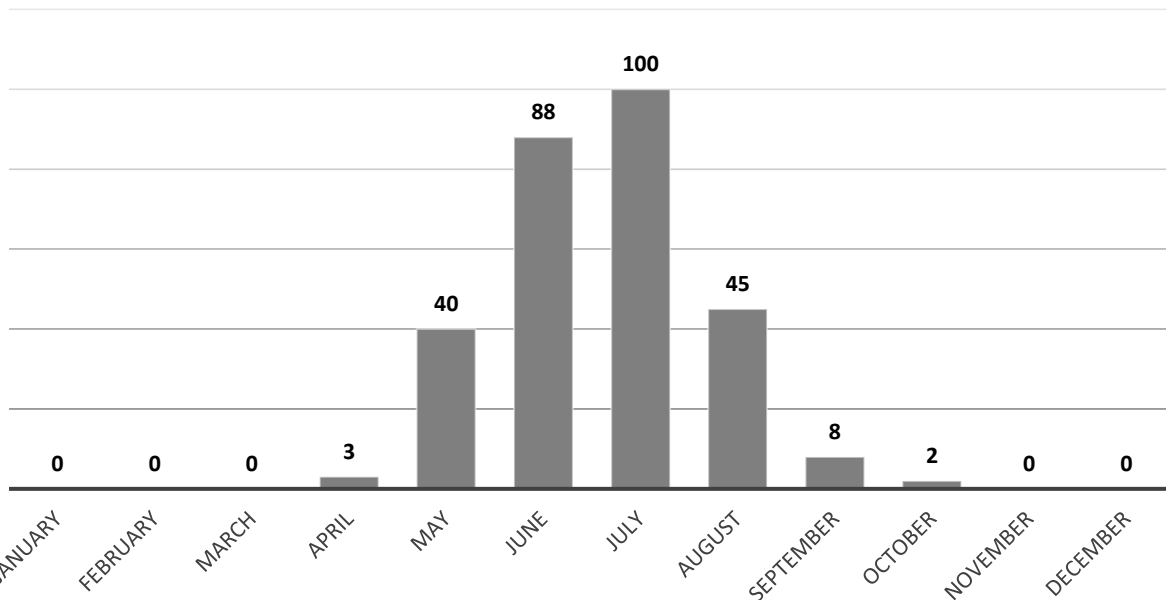


Source: NCEI, 1996-2019

**HISTORICAL OCCURRENCES**

Severe thunderstorms in the planning area usually occur in the afternoon and evening during the summer months (Figure 35).

Figure 35: 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 286 thunderstorm wind, 36 heavy rain, five lightning, and 993 hail events in the planning area from January 1996 to September 2019. In total these events were responsible for \$4,980,600 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 \$9,253,643 in crop damages. There were eight injuries reported in association with these storms, but no fatalities.

**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 cause an average of \$207,525 per year in property damages.

**Table 65: Severe Thunderstorms Loss Estimate**

HAZARD TYPE	NUMBER OF EVENTS <sup>1</sup>	AVERAGE EVENTS PER YEAR	TOTAL PROPERTY LOSS <sup>1</sup>	AVERAGE ANNUAL PROPERTY LOSS	TOTAL CROP LOSS <sup>2</sup>	AVERAGE ANNUAL CROP LOSS
HAIL	993	41.4	\$2,302,200	\$95,925		
HEAVY RAIN	36	1.5	\$0	\$0		
LIGHTNING	5	0.2	\$1,467,000	\$61,125	\$9,253,643	\$462,682
THUNDERSTORM WIND	286	11.9	\$1,211,400	\$50,475		
<b>TOTAL</b>	<b>1,302</b>	<b>55</b>	<b>\$4,980,600</b>	<b>\$207,525</b>	<b>\$9,253,643</b>	<b>\$462,682</b>

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

**PROBABILITY**

Based on historical records and reported events, severe thunderstorms events and storms with hail are likely to occur on an annual basis. The NCEI reported a total of 1,302 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 66: Regional Thunderstorm Vulnerabilities**

SECTOR	VULNERABILITY
PEOPLE	-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 -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 and employees
BUILT ENVIRONMENT	-Buildings are at risk to hail damage -Downed trees and tree limbs -Roofs, siding, windows, gutters, HVAC systems, etc. can incur damage
INFRASTRUCTURE	-High winds and lightning can cause power outages and down power lines -Roads may wash out from heavy rains and become blocked from downed tree limbs

SECTOR	VULNERABILITY
<b>CRITICAL FACILITIES</b>	-Power outages are possible -Critical facilities may sustain damage from hail, lightning, and wind
<b>CLIMATE</b>	-Changes in seasonal precipitation and temperature normals can increase frequency and magnitude of severe storm events
<b>OTHER</b>	-High winds, hail, lightning, heavy rain, and possibly tornadoes can occur with this hazard

# SEVERE WINTER STORMS

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

## EXTREME COLD

Along with snow and ice storm events, extreme cold is dangerous to the well-being of people and animals. What constitutes extreme cold varies from region to region, but is generally accepted as temperatures that are significantly lower than the average low temperature. For the planning area, the coldest months of the year are January, February, and December. The average low temperature for these months are all below freezing (average low for the three months is 12.3°F). The average high temperatures for the months of January, February, and December are near 39°F.<sup>76</sup>

## FREEZING RAIN

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

## BLIZZARDS

Blizzards are particularly dangerous due to drifting snow and the potential for rapidly occurring whiteout conditions, which greatly inhibits vehicular traffic. Heavy snow is usually the most defining element of a winter storm. Large snow events can cripple an entire jurisdiction for several days by hindering transportation, knocking down tree limbs and utility lines, 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 36 shows the SPIA index.

<sup>76</sup> High Plains Regional Climate Center. 2017. "Monthly Climate Normals 1981-2010." <http://climod.unl.edu/>.

Figure 36: SPIA Index

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

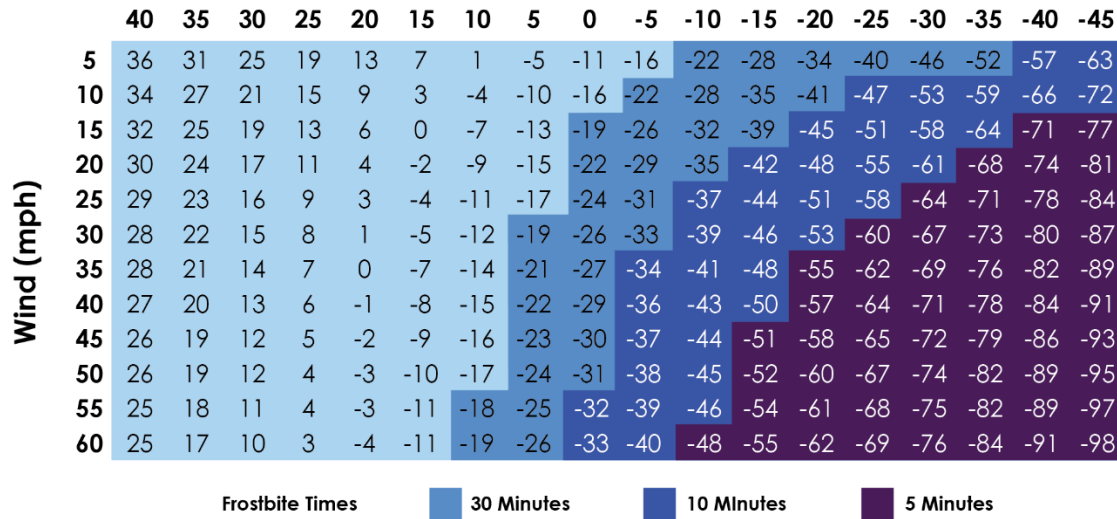
*(Categories of damage are based upon combinations of precipitation totals, temperatures and wind speeds/directions.)*

Source: SPIA-Index, 2017<sup>77</sup>

The Wind Chill Index was developed by the NWS to determine the decrease in air temperature felt by the body on exposed skin due to wind. The wind chill is always lower than the air temperature and can quicken the effects of hypothermia or frost bite as it gets lower. Figure 37 shows the Wind Chill Index used by the NWS.

<sup>77</sup> SPIA-Index. 2009. "Sperry-Piltz Ice Accumulation Index." Accessed June 2017. <http://www.spia-index.com/index.php>.

Figure 37: Wind Chill Index Chart  
Temperature (°F)



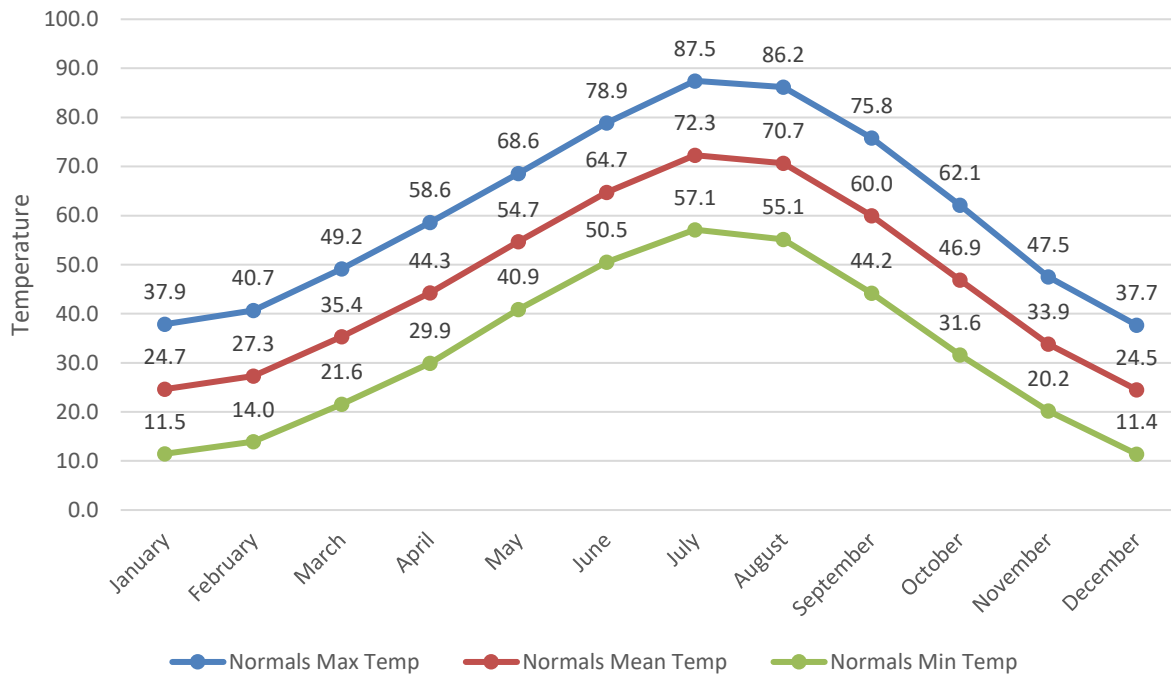
$$\text{Wind Chill (°F)} = 35.74 + 0.6215T - 35.75(V^{0.16}) + 0.4275T(V^{0.16})$$

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



Source: NWS, 2017<sup>78</sup>

Figure 38: Monthly Climate Normals Temperature (1981-2010)



Source: NCEI, 2019

<sup>78</sup> National Weather Service. 2001. "Wind Chill Chart." [http://www.nws.noaa.gov/om/cold/wind\\_chill.shtml](http://www.nws.noaa.gov/om/cold/wind_chill.shtml).

### 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 362 severe winter storm events for the planning area from January 1996 to September 2019. These recorded events caused a total of \$174,000 in reported property damages and \$22,145,515 in crop damages.

According to the NCEI, one winter storm event lead to one death in 2013 and two winter weather events in 1997 and 1999 caused one injury respectively in vehicular accidents from icy road conditions. Ice accumulation was not reported.

### 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 \$7,250 per year in property damage and \$1,107,276 per year in crop damages for the planning area.

**Table 67: Severe Winter Storm Loss Estimate**

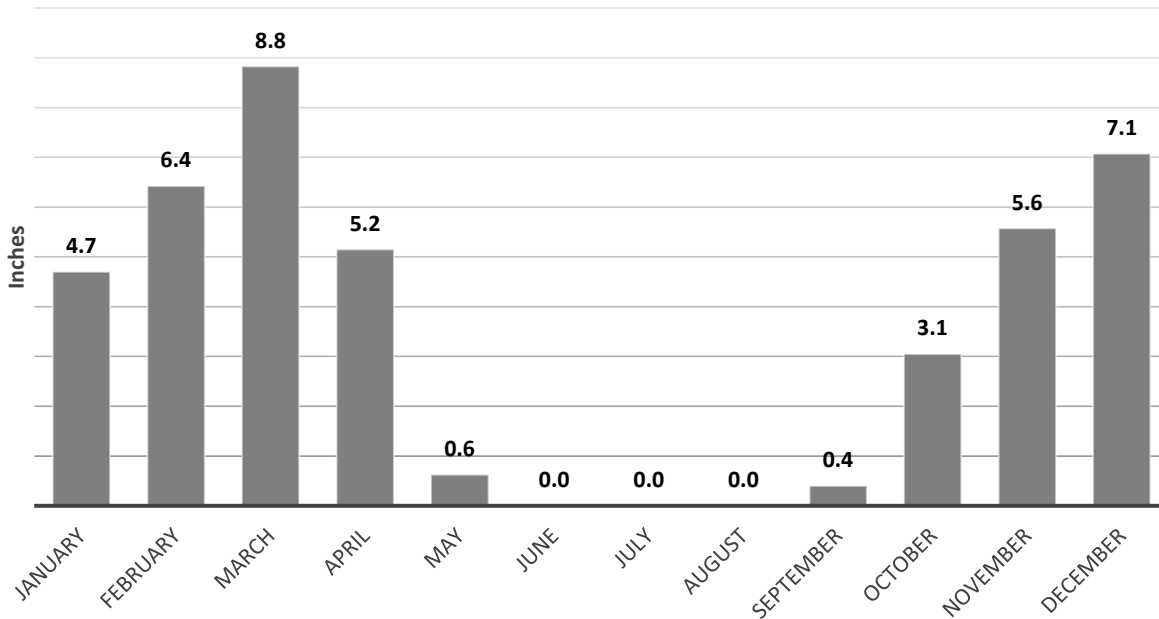
HAZARD TYPE	NUMBER OF EVENTS <sup>1</sup>	AVERAGE EVENTS PER YEAR <sup>1</sup>	TOTAL PROPERTY LOSS <sup>1</sup>	AVERAGE ANNUAL PROPERTY LOSS <sup>1</sup>	TOTAL CROP LOSS <sup>2</sup>	AVERAGE ANNUAL CROP LOSS <sup>2</sup>
BLIZZARD	50	2.1	\$74,000	\$3,083	\$22,145,515	\$1,107,276
HEAVY SNOW	42	1.8	\$0	\$0		
ICE STORM	0	0	\$0	\$0		
WINTER STORM	169	7	\$85,000	\$3,542		
WINTER WEATHER	51	2.1	\$15,000	\$625		
EXTREME COLD/WIND CHILL	50	2.1	\$0	\$0		
<b>TOTAL</b>	<b>362</b>	<b>15.1</b>	<b>\$174,000</b>	<b>\$7,250</b>	<b>\$22,145,515</b>	<b>\$1,107,276</b>

Source: 1 Indicates data is from NCEI (Jan 1996 to Sept 2019); 2 Indicates data is from USDA RMA (2000 to 2019)

### PROBABILITY

Average monthly snowfall for the planning area is shown in Figure 39, which shows the snowiest months are between November and April. A common snow event (likely to occur annually) will result in accumulation totals between one and five inches. Often these snow events are accompanied by high winds. It is reasonable to expect wind speeds of 25 to 35 mph with gusts reaching 50 mph or higher. Strong winds and low temperatures can combine to produce extreme wind chills of 20°F to 40°F below zero.

Figure 39: 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 68: Regional Severe Winter Storm Vulnerabilities**

SECTOR	VULNERABILITY
<b>PEOPLE</b>	-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
<b>ECONOMIC</b>	-Closed roads and power outages can cripple a region for days, leading to significant revenue loss and loss of income for workers
<b>BUILT ENVIRONMENT</b>	-Heavy snow loads can cause roofs to collapse -Significant tree damage possible, downing power lines and blocking roads
<b>INFRASTRUCTURE</b>	-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
<b>CRITICAL FACILITIES</b>	-Emergency response and recovery operations, communications, water treatment plants, and others are at risk to power outages, impassable roads, and other damages

# TERRORISM AND CIVIL DISORDER

Terrorism and civil disorder are broad terms typically used by law enforcement to describe groups of people protesting major socio-political problems by choosing not to observe a law or regulation or 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. Though peaceful public demonstrations are allowed under US Federal law, any domestic situations such as a strike or riot involving three or more people could be considered civil disorder if the demonstration has devolved into having a potential for causing injuries, casualties, or property damage.<sup>79,80</sup>

U.S. Code on civil disorder considers the following actions to be civil disorder:

- (1) Whoever teaches or demonstrates to any other person the use, application, or making of any firearm or explosive or incendiary device, or technique capable of causing injury or death to persons, knowing or having reason to know or intending that the same will be unlawfully employed for use in, or in furtherance of, a civil disorder which may in any way or degree obstruct, delay, or adversely affect commerce or the movement of any article or commodity in commerce or the conduct or performance of any federally protected function; or
- (2) Whoever transports or manufactures for transportation in commerce any firearm, or explosive or incendiary device, knowing or having reason to know or intending that the same will be used unlawfully in furtherance of a civil disorder; or
- (3) Whoever commits or attempts to commit any act to obstruct, impede, or interfere with any fireman or law enforcement officer lawfully engaged in the lawful performance of his official duties incident to and during the commission of a civil disorder which in any way or degree obstructs, delays, or adversely affects commerce or the movement of any article or commodity in commerce or the conduct or performance of any federally protected function

Threat assessment, mitigation, and response to civil disorder and terrorism are federal and state directives that work in conjunction with local law enforcement. Civil disorder and terrorism is addressed at the federal level by the US Department of Homeland Security and at the state level by the Nebraska Emergency Management Agency.

## 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 centered around the vulnerability of water systems located throughout the planning area, the tampering of water supplies, or protests occurring on campus at Chadron State College by students, faculty, or residents.

## EXTENT

Incidents of civil disorder can vary greatly in scale and magnitude, depending on the location of the attack, number of protesters, and reasoning for unrest.

## HISTORICAL OCCURRENCES

To identify any incidence of civil disorder or terroristic events, the University of Illinois Social, Political and Economic Event Database Project (SPEED), maintained since the end of World War II (1946-2018) was consulted.<sup>81</sup> For any identified events, details of the incidents were found in the Global Terrorism Database between 1970-2018, as maintained by the University of Maryland and National Consortium for the Study of Terrorism and Responses to Terrorism (START) database and archival newspaper reports.<sup>82</sup> According to these sources database, there have been no civil disorder events in the planning area. However, the

<sup>79</sup> Civil Disorders, 18 U.S. Code § 231-233 (1992)

<sup>80</sup> Terrorism, 28 U.S. Code § 0.85.

<sup>81</sup> The Social, Political and Economic Event Database Project (SPEED). 2018. Event Data File [Data file]. Retrieved from <https://clinecenter.illinois.edu/project/human-loop-event-data-projects/SPEED>.

<sup>82</sup> 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>.



Chadron Public School District experienced the first school shootings in Nebraska in February 1995 when a middle school student shot and injured one staff member. No other injuries were reported from the event.

**AVERAGE ANNUAL DAMAGES**

According to the START Global Terrorism Database (1970-2018) and the SPEED database of civil disorder events (1946-2018), there have been no civil disorder events that have occurred in the planning area. As there were no terrorist events within the planning area, there were no average annual damages.

**PROBABILITY**

Given zero incidences over a 73-year period, the annual probability for civil disorder in the planning area has a less than one percent chance of occurring during any given year. This does not indicate that an event will never occur within the planning area, only that the likelihood of such an event is incredibly low. One school shooting has taken place in the planning area. Due to the volatile nature of school shootings, the probability of future events can not be determined.

**REGIONAL VULNERABILITIES**

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

**Table 69: Regional Terrorism and Civil Disorder 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 businesses 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 may be damaged -Public property including signs, community art, or public park facilities may be at risk to damage
CRITICAL FACILITIES	-Police stations and government offices are at a higher risk
CLIMATE	-Activism pertaining to climate can place first responders and residents at risk

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

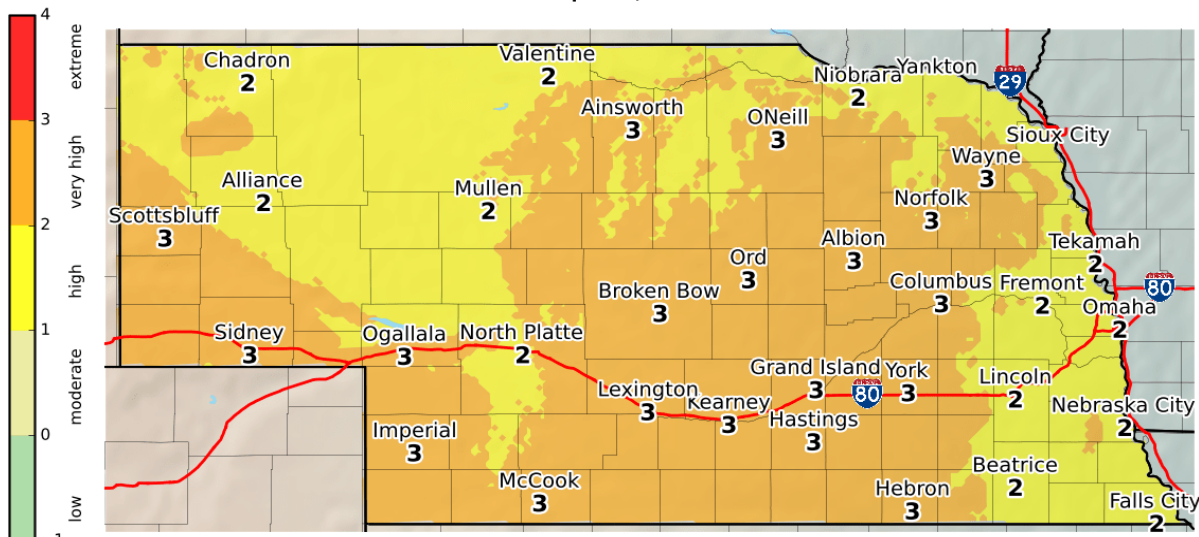
Lightning starts approximately 10,000 forest fires each year, yet ninety percent of forest fires are started by humans.

~National Park Service

Wildfires are a growing hazard in most regions of the United States, posing a threat to life and property, particularly where rural or 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 factor 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 40). Fire danger predictions are updated regularly and should be reviewed frequently by community leaders and fire department officials.

**Figure 40: Rangeland Fire Danger**  
**Nebraska Rangeland Fire Danger - \*Does not account for snow cover\***  
Valid: April 10, 2020



National Weather Service  
Omaha/Valley Nebraska  
04/10/2020 11:01 AM CDT

Follow Us:   
weather.gov/Omaha

Source: NWS, 2019<sup>83</sup>

<sup>83</sup> National Weather Service. January 2019. "Nebraska Fire Danger Map." <https://www.weather.gov/oax/fire>.

## COMMUNITY WILDFIRE PROTECTION PLAN

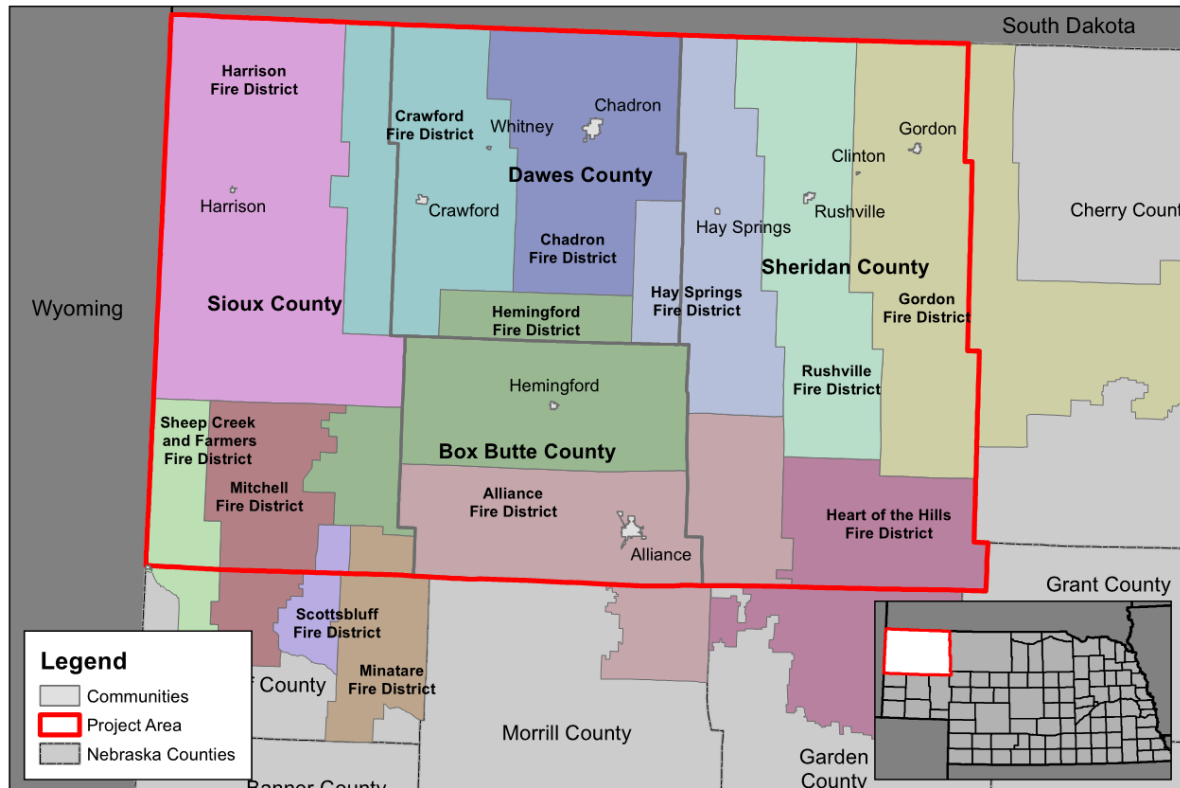
The NFS updated the 2013 Community Wildfire Protection Plan concurrently with this HMP update. The update of this plan allows the NFS to build and expand upon the original plan that was developed in 2003. The 2020 plan update expanded the CWPP planning area to include the entirety of Box Butte, Dawes, Sheridan and Sioux Counties. The plan also expands the WUI to include the all of the new CWPP boundary. The expanded WUI will allow the NSF to utilize US Forest Service grant funding to cost share fuel mitigation treatments throughout the Pine Ridge region.

The CWPP includes a discussion of fire history and characteristics in the planning area; regulatory support and standards of CWPPs; planning area goals and objectives to reduce overall fire hazard risk; priority landscapes, wildland urban interface areas, areas of concern for fire districts in the planning area; response procedures and capabilities; and an action plan to evaluate risk, devise response actions, and improve overall resiliency. Included in the CWPP is a county-specific considerations profile which identifies fire events and impacts specific to that county, as well as county specific capabilities and areas of top concern. Specific concerns per county or applicable community are discussed in more detail in *Section Seven: Community Profiles* as appropriate.

## LOCATION

For the planning area, thirteen fire districts were identified to report events: Alliance Fire Department, Hemingford Fire Department, Chadron Fire Department, Crawford Fire Department, Gordon Fire Department, Hay Springs Fire Department, Heart of the Hills Fire Department, Rushville Fire Department, Harrison Fire Department, Minatare Fire Department, Mitchell Fire Department, Scottsbluff Rural Fire Department, and Sheep Creek and Farmers Fire District (part of the Morrill Fire District).

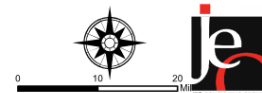
Figure 41: Fire Districts in the Planning Area



Created By: BW  
 Date: 11/26/2019  
 Software: ArcGIS 10.4.1  
 File Name: Fire District Map.mxd

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

**Region 23**  
 Fire Districts in Project Area



The Wildland Urban Interface has been expanded for this plan update and as part of the 2020 CWPP update. The new WUI and CWPP boundary includes the entire four-county planning area.

As the number of reported wildfires and number of acres burned indicates, wildfire is a severe threat throughout the planning area.

**Table 70: Reported Wildfires by Agency**

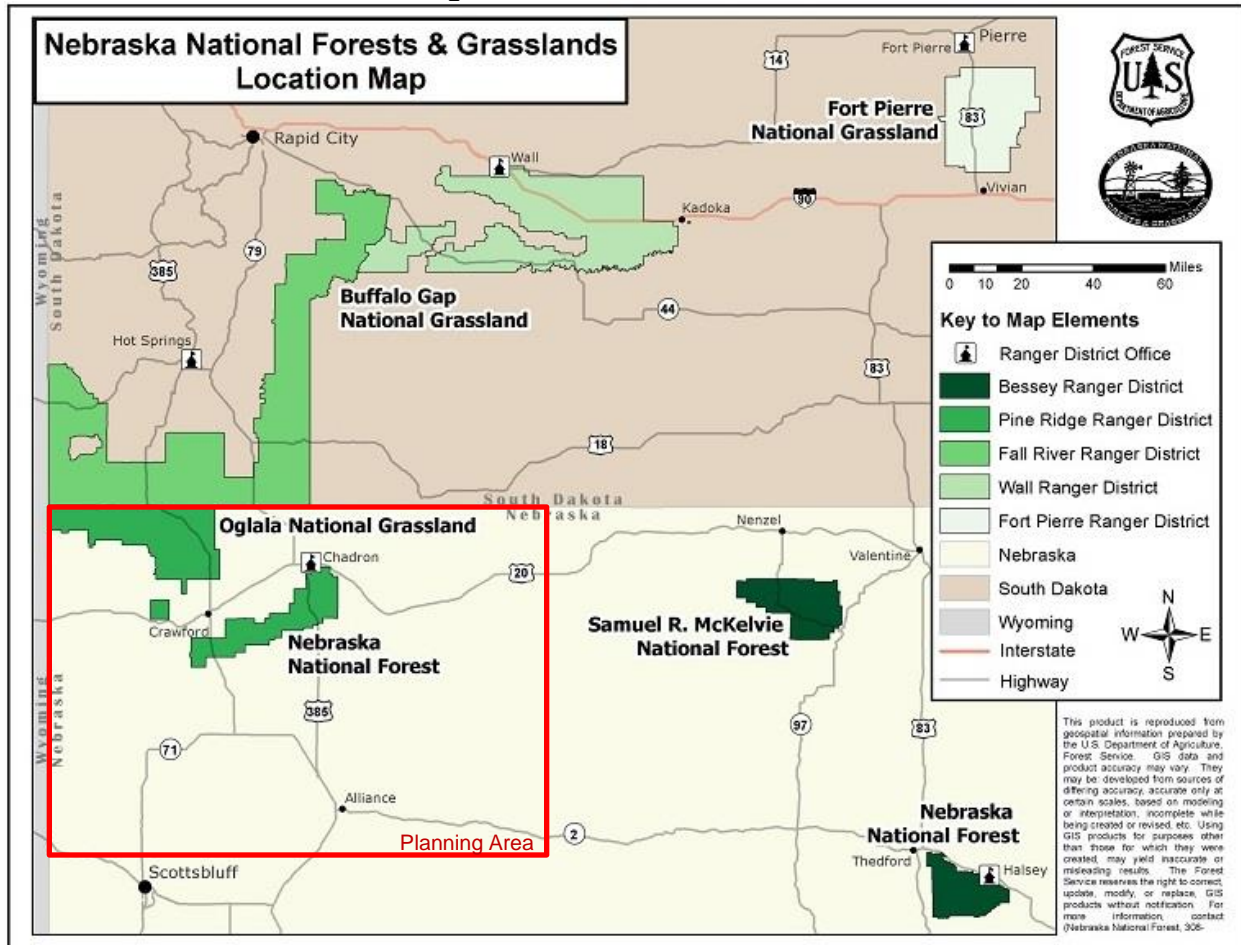
FIRE DISTRICT	REPORTED WILDFIRES	ACRES BURNED
ALLIANCE	256	4,292
CHADRON	86	465
CRAWFORD	133	982
GORDON	48	5,224
HARRISON	27	252
HAY SPRINGS	68	722
HEART-OF-THE-HILLS	19	1,595
HEMINGFORD	14	98
MINATARE	269	6,139
MITCHELL	34	4,088
MORRILL (SHEEP CREEK & FARMERS)	55	1,515
RUSHVILLE	76	5,251
SCOTTSBLUFF RURAL	322	2,473
<b>TOTAL</b>	<b>2,098</b>	<b>445,416</b>

Source: Nebraska Forest Service, 2000-2018<sup>84</sup>

Additionally, the Nebraska National Forest at Chadron, the Oglala National Grassland, and Fort Robinson State Park are located within the planning area. In total, these areas encompass more than 1.2 million acres in Nebraska and South Dakota. Only the most southern portion of the Oglala National Grassland is located within the planning area (Figure 42). These areas are at higher risk to wildfire due to high fuel loads and long distances from fire department resources. Wildfires that begin in the forest may spread into surrounding range land areas. For more information about these areas, fuel load reduction strategies, and the WUI, refer to the CWPP.

<sup>84</sup> Nebraska Forest Service. 2000-2014. "Fire Incident Type Summary." Data Files 2000-2018.

Figure 42: National Forest Areas



Source: USDA Forest Service<sup>85</sup>

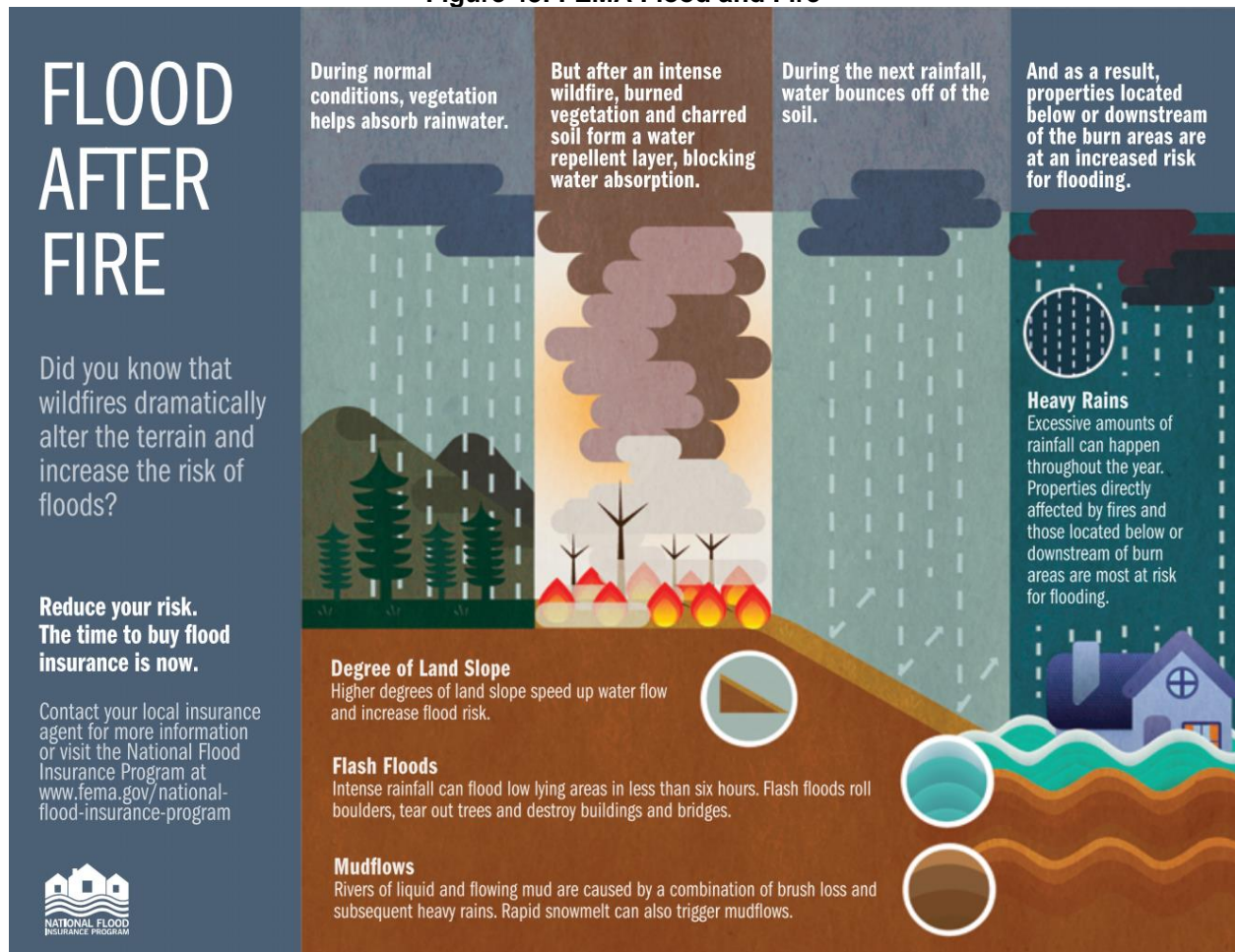
<sup>85</sup> United States Department of Agriculture Forest Service. N.d. "Nebraska National Forests and Grasslands." Accessed January 2020. <https://www.fs.usda.gov/nebraska>

**EXTENT**

Figure 44 illustrates the number of wildfires by cause in the planning area from 2000 to 2018, which burned 445,416 acres in total. In total, there were 2,098 reported wildfires in the planning area. Of these, 118 fires burned 100 acres or more, with the largest wildfire burning over 77,000 acres in Sheridan County in August 2012. The Region 24 (Cherry, Brown, Rock, Keya Paha, and Boyd counties) Complex fire burned in three of the four counties in the planning area as well as in South Dakota in late July 2012. These concurrent wildfire systems strained resources across the panhandle. .

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 43: FEMA Flood and Fire**



Source: FEMA, 2018<sup>86</sup>

**HISTORICAL OCCURRENCES**

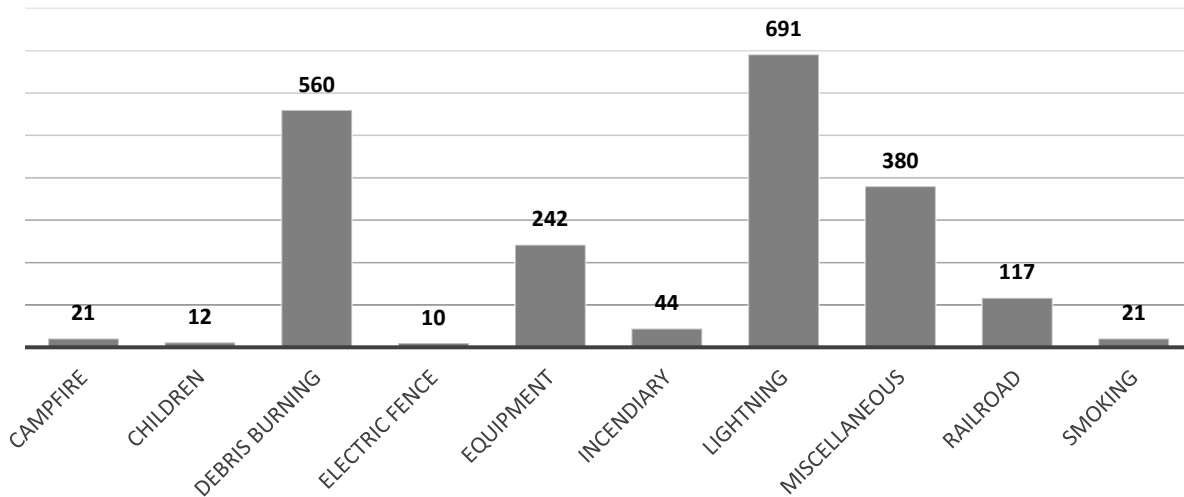
The western portion of the State of Nebraska is particularly vulnerable to wildfire events. Local fire districts reported a total of 2,098 wildfires, according to the Nebraska Forest Service (NFS), from 2000 to 2018. Most fires occurred in 2006 and 2012 (Figure 45). The reported events burned 445,416 acres. The NFS also reported \$227,420 in crop damages and \$1,267,162 in property damages. Wildfire events caused 12 injuries, threatened 118 homes and 127 other structures, and destroyed 12 homes and 57 other structures.

<sup>86</sup> Federal Emergency Management Agency. 2018. "Flood After Fire." <https://www.fema.gov/flood-after-fire>.

Between 1953 and 2019, three presidential disaster declarations have been issued regarding wildfire events in the planning area. These include the Dawes County Fire Complex (2006, #2660), Sioux County Fire Complex (2006, #2661), and the Region 23 Fire Complex (2012, #5009).

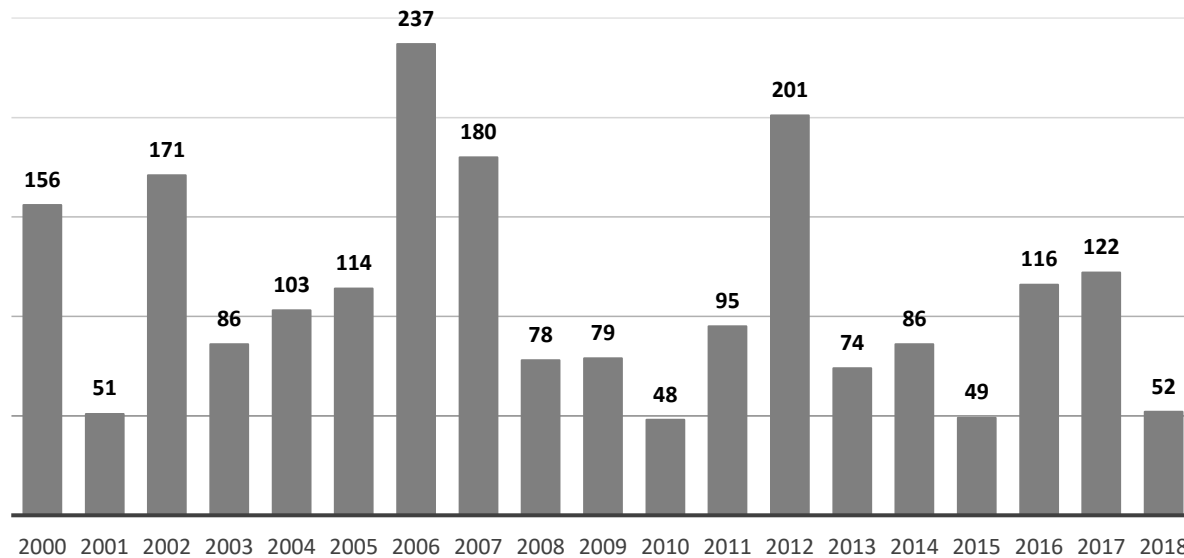
The majority of wildfires in the planning area are caused by lightning (29.4%), with debris burning as the second leading cause (22.8%) (Figure 44). Wildfires in the planning area have ranged from zero to 77,159 acres, with an average event burning 218 acres.

**Figure 44: Wildfires by Cause in the Planning Area**



Source: Nebraska Forest Service, 2000-2018

**Figure 45: Number of Wildfires by Year in the Planning Area**



Source: Nebraska Forest Service, 2000-2018

Fires in the planning area have occurred in most years. Major fire events which burned more than 10,000 acres are listed below. For a comprehensive list of past wildfire events in the planning area, please see the *Local Fire History* section of the CWPP.

- **1989 - Fort Robinson Fire Complex:** burned 49,000 acres in Dawes and Sioux Counties
- **2000 - Warbonnet Fire:** burned 11,504 acres in northwest Sioux County.
- **2000 - Sheridan Co. Fire:** the Gordon Fire District reported a 26,000 acre lightning fire and a 2,500 acre equipment fire.
- **2006 - Thayer Fire:** burned over 40,000 acres northeast of Harrison.
- **2006 - Spotted Tail Fire:** threatened Chadron and much of the city had to be evacuated. According to the *Rapid City Journal*, "Some 68,000 acres of Pine Ridge forest in Dawes and Sioux counties burned following a string of intense lightning fires on July 26. At least four homes and several other structures along with about 500 miles of fences were destroyed. One of the fires, the Spotted Tail Fire, began about 12 miles south of Chadron and burned to the edge of the Chadron State College campus. At least 1,000 firemen from 20 states helped battle the blazes. Temperatures of more than 100 degrees added to the misery."
- **2012 - Region 23 Complex:** two fires burned 58,450 acres in the Crawford and Chadron Fire Districts.
  - Douthit Fire: Burned 29,730 acres in the Cottonwood/Little Cottonwood watersheds in Sioux and Dawes Counties.
  - West Ash Fire: The 28,720-acre fire forced an evacuation of Whitney. Intense suppression efforts kept this fire from crossing US 385 and moving into the 2006 Spotted Tail burn area. Had these efforts failed, it is likely Chadron would have again been threatened. Many of the areas previously burned, again burned, with great intensity.
- **2012 - Wellnitz Fire:** burned 77,684 acres in Sheridan County, Nebraska and South Dakota. 48,681 of these acres were in the Hay Springs and Rushville fire districts. A successful back fire was all that kept the fire from threatening Hay Springs.

It is important to note that there is no comprehensive fire event database. Fire events, magnitude, and local responses are reported voluntarily by local fire departments and local reporting standards can vary between departments. Actual fire events and their impacts are likely underreported in the available datasets.

**AVERAGE ANNUAL DAMAGES**

Wildfires can cause extensive damage to property, recreational areas, crop and rangeland, and to human life. The average damage per event estimate was determined based upon records from the Nebraska Forest Service Wildfires Database from 2000 to 2018 and number of historical occurrences. This does not include losses from displacement, functional downtime, economic loss, injury, or loss of life. During the 19-year period, 2,098 wildfires burned 445,416 acres and caused \$1,267,162 in property damages and \$227,420 in crop damages to the planning area. Damages caused by wildfires extend past the loss of building stock, recreation areas, timber, forage, wildlife habitat, and scenic views. Secondary effects of wildfires, including erosion, landslides, introduction of invasive species, and changes in water quality, all increase due to the exposure of bare ground and loss of vegetative cover following a wildfire, and can often be more disastrous than the fire itself in long-term recovery efforts.

**Table 71: Wildfire Loss Estimation**

Hazard Type	Number of Events	Events Per Year	Property Loss	Average Annual Property Loss	Total Crop Loss	Average Annual Crop Loss
Wildfires	2,098	110	\$1,267,162	\$66,693	\$227,420	\$11,969

Source: Nebraska Forest Service, 2000-2018



**Table 72: Wildfire Threats**

Hazard Type	Injuries	Homes Threatened or Destroyed	Other Structures Threatened or Destroyed	Total Acres Burned	Average Acres Per Fire
Wildfires	12	130	184	445,416 acres	212

Source: Nebraska Forest Service, 2000-2018

**PROBABILITY**

The probability of 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. The majority of fires are likely to be small and short-lived in nature. Large fire events or those that exceed 100 acres are likely to occur annually and require multi-agency response from fire departments.

**REGIONAL VULNERABILITIES AND CAPABILITIES**

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

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

Development across the planning area will be located within the WUI. Local officials can adopt codes and ordinances that can guide growth in ways to mitigate potential losses from wildfires. These may include more stringent building code standards, setback requirements, or zoning regulations.

The following table provides more information related to regional vulnerabilities; for jurisdictional-specific vulnerabilities or identified mitigation actions to reduce wildfire risk, refer to *Section Seven: Community Profiles*.

**Table 73: Regional Wildfire Vulnerabilities**

SECTOR	VULNERABILITY
PEOPLE	-Risk of injury or death for residents and firefighting personnel -Displacement of people and loss of homes -Lack of transportation poses risk to low income individuals, families, and elderly -Transportation routes may be blocked by fire, preventing evacuation efforts
ECONOMIC	-Damages to buildings and property can cause significant losses to business owners -Loss of businesses
BUILT ENVIRONMENT	-The entire planning area is located within the WUI and is at risk of damage during wildfire events -Property damages
INFRASTRUCTURE	-Damage to power lines and utility structures

SECTOR	VULNERABILITY
CRITICAL FACILITIES	-Potential loss of firefighting equipment and resources -All community critical facilities are at risk of damages
CLIMATE	-Increase chance of landslides and erosion -May lead to poor water quality -Post fire, flash flooding events may be exacerbated
OTHER	-Several fire departments in the planning area have conflicting communication equipment (radios), which prevent clear and easy communication during hazard event response

# SECTION FIVE MITIGATION STRATEGY

## INTRODUCTION

The primary focus of the mitigation strategy is to identify action items to reduce the effects of hazards on existing infrastructure and property based on the established goals and objectives. These actions should consider the most cost effective and technically feasible manner to address risk.

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.

The Regional Planning Team voted to maintain the same list of goals from the 2015 HMP. These goals and objectives were then shared with all planning team members at the Round 1 public meetings.

## SUMMARY OF CHANGES

The development of the mitigation strategy for this plan update includes the addition of new mitigation actions, updated status or removal of past mitigation actions, and revisions to the mitigation alternative selection process or descriptions of mitigation actions for consistency across the planning area.

## 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 (ACTION ITEMS)

After establishing the goals, mitigation alternatives were evaluated and prioritized by local planning teams. These actions 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 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. This prioritized list of alternatives helped participants determine which actions will best assist their respective jurisdiction in alleviating damages in the event of a disaster. The listed priority

**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.

does not indicate which actions will be implemented first, but will serve as a guide in determining the order in which each action should be implemented.

These projects are the core of a hazard mitigation plan. The planning teams were instructed that each alternative must be directly related to the goals of the plan and the hazards of top concern for their jurisdiction. Alternatives must be specific activities that are concise and can be implemented individually. Mitigation alternatives were evaluated based on referencing the community's risk assessment and capability assessment. Communities were encouraged to choose mitigation actions that were realistic and relevant to the concerns identified.

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

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

### **PARTICIPANT MITIGATION ALTERNATIVES**

Mitigation alternatives identified by participants of the Region 23 HMP are found in the Mitigation Alternative Project Matrix below. Additional information about selected actions can be found in respective *Section Seven: Community Profiles*. Each action includes the following information in the respective community profile:

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

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

**MITIGATION ALTERNATIVE PROJECT MATRIX**

During public meetings, each participant was asked to review mitigation projects listed in the 2015 HMP and identify new potential mitigation alternatives, if needed, to reduce the effects of hazards. Selected projects varied per jurisdiction depending upon the significance of each hazard present. The information listed in the following tables is a compilation of new and on-going mitigation alternatives identified by jurisdiction. Completed and removed mitigation alternatives can be found in the respective community profile.

Table 74: Mitigation Alternatives Selected by Each Jurisdiction

REGION 23 HMP UPDATE - 2020		REGION 23 EMA	UNWRD	CHADRON PUBLIC SCHOOLS	HEMINGFORD PUBLIC SCHOOLS	CHADRON STATE COLLEGE	BOX BUTTE COUNTY	ALLIANCE	HEMINGFORD	DAWES COUNTY	CHADRON	CRAWFORD	SHERIDAN COUNTY	GORDON	HAY SPRINGS	RUSHVILLE	SIoux COUNTY	HARRISON
MITIGATION ALTERNATIVES	Goal	Special Districts					Box Butte County	Dawes County			Sheridan County			Sioux County				
<b>ADOPT A NO-ADVERSE IMPACT APPROACH TO FLOODPLAIN MANAGEMENT</b>	2						X							X				
<b>ALERT/WARNING SIRENS</b>	4	X									X	X						X
<b>BACKUP POWER GENERATORS</b>	2		X	X	X	X	X	X	X	X	X	X	X			X		X
<b>BECOME A TREE CITY USA</b>	2											X		X				
<b>CIVIL SERVICE IMPROVEMENTS</b>	4					X	X	X	X		X			X				
<b>COMPLETE/UPDATE COMMUNITY WILDFIRE PROTECTION PLAN</b>	2, 6							X										
<b>COMPREHENSIVE CITY DISASTER/EMERGENCY RESPONSE RESCUE PLAN</b>	4	X					X	X	X									
<b>DAM ENGINEERING ANALYSIS/REPAIRS AND REINFORCEMENT</b>	2		X											X				
<b>DATABASE OF VULNERABLE POPULATIONS</b>	2									X								
<b>DEVELOP CONTINUITY PLANS FOR CRITICAL COMMUNITY SERVICES</b>	2, 3						X		X	X				X				
<b>DRAINAGE STUDY/STORMWATER MASTER PLAN</b>	2						X	X	X			X		X		X		

REGION 23 HMP UPDATE - 2020		REGION 23 EMA	UNWNRD	CHADRON PUBLIC SCHOOLS	HEMINGFORD PUBLIC SCHOOLS	CHADRON STATE COLLEGE	BOX BUTTE COUNTY	ALLIANCE	HEMINGFORD	DAWES COUNTY	CHADRON	CRAWFORD	SHERIDAN COUNTY	GORDON	HAY SPRINGS	RUSHVILLE	SIoux COUNTY	HARRISON
<b>DROUGHT MONITORING PLAN AND PROCEDURES</b>	2										X							
<b>EDUCATE BUSINESSES IN THE VALUE OF CONTINUITY PLANNING</b>	3						X											
<b>ELECTRICAL SYSTEM LOOPED DISTRIBUTION/REDUNDANCIES</b>	2							X					X					
<b>EMERGENCY COMMUNICATION</b>	4			X			X	X	X					X				
<b>EVACUATION PLAN</b>	4						X	X									X	X
<b>EVALUATE FLOOD RISK</b>	2		X															
<b>EXPAND WATER STORAGE CAPACITY</b>	2		X					X			X							
<b>FIRE PREVENTION PROGRAM</b>	4		X								X			X				X
<b>FIRE WISE COMMUNITY</b>	2						X				X							
<b>FIRST AID TRAINING</b>	3						X											
<b>FLOODPLAIN MAPPING</b>	2						X											
<b>FLOODPLAIN REGULATION ENFORCEMENT AND UPDATES</b>	2												X	X				
<b>GROUNDWATER/IRRIGATION/WATER CONSERVATION AND MANAGEMENT PRACTICES</b>	2						X	X					X	X			X	

REGION 23 HMP UPDATE - 2020		REGION 23 EMA	UNWRD	CHADRON PUBLIC SCHOOLS	HEMINGFORD PUBLIC SCHOOLS	CHADRON STATE COLLEGE	BOX BUTTE COUNTY	ALLIANCE	HEMINGFORD	DAWES COUNTY	CHADRON	CRAWFORD	SHERIDAN COUNTY	GORDON	HAY SPRINGS	RUSHVILLE	SIoux COUNTY	HARRISON
<b>HAIL RESISTANT ROOFING</b>	2						X			X								
<b>HAZARDOUS FUELS REDUCTION</b>	2	X											X				X	
<b>HAZARDOUS TREE REMOVAL</b>	2						X		X	X	X			X				
<b>IMPLEMENT LOW IMPACT DEVELOPMENT PRACTICES</b>	2						X											
<b>IMPROVE SNOW/ICE REMOVAL PROGRAMS</b>	4						X	X	X		X			X				
<b>INSTALL VEHICULAR BARRIERS</b>	2						X											
<b>NEW MUNICIPAL WELL</b>	2								X									
<b>PARTICIPATE IN NFIP</b>	2																X	
<b>POWER AND SERVICE LINES</b>	2								X				X	X				
<b>PRESERVE NATURAL AND BENEFICIAL FUNCTIONS OF A FLOODPLAIN</b>	2													X				
<b>PROMOTE USE OF HIGHER BUILDING CODES</b>	6						X											
<b>PUBLIC EDUCATION/AWARENESS</b>	3	X	X				X	X	X	X	X	X	X	X	X		X	X
<b>RE-EVALUATE FLOOD ZONE</b>	2														X			
<b>SAFE ROOMS</b>	2				X		X	X	X			X		X			X	
<b>SOURCE WATER CONTINGENCY PLAN</b>	2		X						X		X							
<b>STABILIZE/ANCHOR FERTILIZER, FUELS, AND PROPANE TANKS</b>	2						X											



REGION 23 HMP UPDATE - 2020		REGION 23 EMA	UNWNRD	CHADRON PUBLIC SCHOOLS	HEMINGFORD PUBLIC SCHOOLS	CHADRON STATE COLLEGE	BOX BUTTE COUNTY	ALLIANCE	HEMINGFORD	DAWES COUNTY	CHADRON	CRAWFORD	SHERIDAN COUNTY	GORDON	HAY SPRINGS	RUSHVILLE	SIoux COUNTY	HARRISON
<b>STORMWATER SYSTEM AND DRAINAGE IMPROVEMENTS</b>	2						X	X	X		X	X	X	X	X	X	X	
<b>STREAM BANK STABILIZATION/GRADE CONTROL STRUCTURES/CHANNEL IMPROVEMENTS</b>	2										X			X				
<b>VULNERABLE POPULATIONS HOUSING</b>	1													X				
<b>WARNING SYSTEMS</b>	4						X		X	X								
<b>WEATHER RADIOS</b>	4									X				X		X	X	
<b>WILDFIRE HAZARD IDENTIFICATION AND MITIGATION SYSTEM</b>	2												X	X				
<b>WINDBREAKS/LIVING SNOW FENCE</b>	2						X		X	X			X	X				

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# SECTION SIX PLAN IMPLEMENTATION AND MAINTENANCE

## MONITORING, EVALUATING, AND UPDATING THE PLAN

Each participating jurisdiction in the Region 23 HMP is 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 responsible party for the various implementation actions will report on the status of all projects and include which implementation processes worked well, any difficulties encountered, how coordination efforts are proceeding, and which strategies could be revised.

As projects or mitigation actions are implemented, a detailed timeline of how that project was completed should 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, local planning team members and other identified relevant stakeholders should review the original draft of the mitigation plan and recommend applicable changes.

Review and updating of this plan will occur every five years at the minimum. At the discretion of each governing body, updates may be incorporated more frequently, especially in the event of a major hazard or as additional mitigation needs are identified. Local planning team members should engage with the public, other elected officials, and multiple departments as they review and update the plan. The persons overseeing the evaluation process will review the goals and objectives of the previous plan and evaluate them to determine whether they are still pertinent and current. Among other questions, they may want to consider the following:

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

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

In addition, the governing body will be responsible for ensuring that the HMP's goals are incorporated into applicable revisions other planning mechanisms per community, as identified in the *Plan Integration* section

**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.

of each participant's profile. These plans may include: Comprehensive Plan, Capital Improvement or 1&6 year Plans, Zoning Ordinances, Floodplain Ordinances, Building Codes, and/or Watershed Management Plans. Future updates of this HMP will review and update discussions of plan integration per community as appropriate.

### **CONTINUED PUBLIC INVOLVEMENT**

To ensure continued plan support and input from the public and business owners, public involvement should remain a top priority for each participating jurisdiction. 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
- Social Media
- Local radio stations
- Local newspapers
- Regionally-distributed newspaper

Any amendments to the HMP as determined through public involvement or community actions must be submitted to NEMA for inclusion in the final HMP.

### **INTEGRATING OTHER CAPABILITIES**

There are a number of state and federal agencies with capabilities that can be leveraged during HMP updates or mitigation action implementation. A description of some regional resources is provided below.

#### **Nebraska Emergency Management Agency**

NEMA is an agency as part of the Military Department in the State of Nebraska. NEMA is responsible for emergency management, which is usually divided into four phases: preparedness, response, recovery, and mitigation.

NEMA is responsible for developing the state hazard mitigation plan, which serves as a comprehensive set of guidelines for hazard mitigation across the state. The state hazard mitigation officer and other mitigation staff members play an active role in assisting in the development local hazard mitigation plans. Representatives from the state hazard mitigation program serve as technical guides to local planning teams and regularly participate in local mitigation planning meetings. The state hazard mitigation program also oversees the HMGP, PDM, and FMA; and works with the Governor's taskforce to prioritize projects requesting funding assistance through the HMGP, PDM, and FMA.

The main objective in NEMA's preparedness process is to develop plans and procedures to help facilitate any response that may need to occur during a hazard event. NEMA assists communities in the development of county or city/village planning documents; assists with the development of exercises for existing plans and procedures; conducts trainings for communities officials, assist emergency management related groups (Citizen Emergency Response Teams, Citizen Corps, Medical Reserve Corps, Fire Corps, and other interest groups); and provide technical resources and expertise throughout the state.

NEMA's role during a response is to assist communities in responding to hazard events *when the need for assistance exceeds the local capabilities and resources*. This includes facilitating and tracking grants, coordinating local needs, providing state and federal level assistance through activation of Emergency Operation Centers (EOC) , Mass Critical Shelters, Emergency Alert Systems (EAS) and providing technical, logistical, and administrative resources and expertise before, during, and after incidents. The main purpose of the recovery phase is to perform actions that allow the return of normal living, or better conditions, which may include vital life saving measures. The secondary role of the recovery phase is grant administration and tracking, project monitoring, damage assessment, collaborating with communities on effective recovery

options and opportunities, serving as liaison between federal level entities and local representatives, and serving as a technical resource throughout the recovery process.

For more information regarding the plans and NEMA's responsibilities as well as their ongoing projects, please go to <http://www.nema.ne.gov>.

### **Nebraska Department of Natural Resources**

The NeDNR is committed to providing Nebraska's citizens and leaders with the data and analyses they need to make appropriate natural resource decisions for the benefit of all Nebraskans both now and in the future. The state agency is responsible in the area of surface water, groundwater, floodplain management, dam safety, natural resource planning, integrated water management, storage of natural resources and related data, and administration of state funds.

NeDNR plays a significant role in protecting and conserving water resources through the oversight of surface and groundwater status and integrated water management. The NeDNR is also responsible for a non- structural program of floodplain management, coordination and assistance with the National Flood Insurance Program as well as the Flood Mitigation Assistance Program, reviewing and approving engineering plans for new dams, rehabilitating old dams, and high hazard dam emergency preparedness plans. NeDNR was very active throughout the hazard planning process and provided extensive resources and technical support for hazard risk and vulnerability analysis such as flood and dam failure. NeDNR also works with communities in many capacities including assisting in the completion of Benefit Cost Analysis (BCA).

For more information regarding NeDNR's responsibilities as well as their ongoing projects, please go to <http://dnr.ne.gov/>.

The Silver Jackets program is also worth mentioning for their extensive role in providing a formal and consistent strategy for an interagency approach to planning and implementing measures to reduce the risks associated with flooding and other natural hazards. It brings together multiple state, federal, and sometimes tribal and local agencies to learn from one another and apply their knowledge to reduce risk. At this time the Silver Jackets do not have any projects taking place in the Region 23 planning area.

### **Nebraska Forest Service**

The NFS is responsible for the care of existing forests within the state. The state agency is responsible for ensuring the health of state forests, ensuring that the forests are managed so they can provide logs for lumber, protection of wildland from fire.

The NFS achieves these goals through a variety of programs. The Rural Forestry Assistance program provides assistance to landowners in need of forest management help. Some of these services include assistance and advice on forest and woodlot management, windbreak establishment, and management, reforestation and other forestry related issues. The forest health program is responsible for maintain a list of the most prominent pest problems in Nebraska along with the trees affected, control recommendations, and timing. The wildland fire protection program is responsible for protecting wildlands from fire. The state does not have a fire suppression force within the forest service like other states. They rely on local firefighters to handle the suppression of these fires. The agency does provide air support and equipment to the local firefighters if the assistance is needed. The agency also focuses on prevention of fire.

The Nebraska Forest Service facilitated the development of the CWPP as part of this HMP update.

For more information regarding the NFS's responsibilities as well as their ongoing projects, please go to <http://nfs.unl.edu/>

### **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. Region 23 EMA, as the plan sponsor,

provides an opportunity to jurisdictions to compile proposed amendments annually and send them to NEMA for a plan amendment. Such amendments should include all applicable information for each proposal including description of changes, identified funding, responsible agencies, etc.

## **INCORPORATION INTO EXISTING PLANNING MECHANISMS**

The Planning Team utilized a variety of plan integration tools to help communities determine how their existing planning mechanisms were related to the Hazard Mitigation Plan. Utilizing FEMA's *Integrating the Local Natural Hazard Mitigation Plan into a Community's Comprehensive Plan*<sup>87</sup> guidance, as well as FEMA's *2015 Plan Integration*<sup>88</sup> guide, each community engaged in a plan integration discussion. This discussion was facilitated by a Plan Integration Worksheet. This document offered an easy way for participants to notify the Planning Team of existing planning mechanisms, and if they interface with the HMP.

Each community referenced all relevant existing planning mechanisms and provided information on how these did or did not address hazards and vulnerability. Summaries of plan integration are found in each participant's *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.

<sup>87</sup> Federal Emergency Management Agency. November 2013. "FEMA Region X Integrating the Local Natural Hazard Mitigation Plan into a Community's Comprehensive Plan." <https://www.fema.gov/media-library-data/1388432170894-6f744a8afa8929171dc62d96da067b9a/FEMA-X-IntegratingLocalMitigation.pdf>.

<sup>88</sup> Federal Emergency Management Agency. July 2015. "Plan Integration: Linking Local Planning Efforts." [https://www.fema.gov/media-library-data/1440522008134-ddb097cc285bf741986b48fdcef31c6e/R3\\_Plan\\_Integration\\_0812\\_508.pdf](https://www.fema.gov/media-library-data/1440522008134-ddb097cc285bf741986b48fdcef31c6e/R3_Plan_Integration_0812_508.pdf).

# SECTION SEVEN: COMMUNITY PROFILES

## PURPOSE OF COMMUNITY PROFILES

Community Profiles contain information specific to jurisdictions participating in the Region 23 EMA 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 individual participants, in *Section Seven: Community Profiles* varies due in large part to the extent of the geographical area, the jurisdiction's designated representatives (who were responsible for completing meeting worksheets), identification of hazards, 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, and the jurisdiction's capabilities. The hazards not examined in depth can be found in *Section Four: Risk Assessment*.

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# Community Profile

## DAWES COUNTY

Region 23 Emergency Management Agency  
Multi-Jurisdictional Hazard Mitigation Plan Update

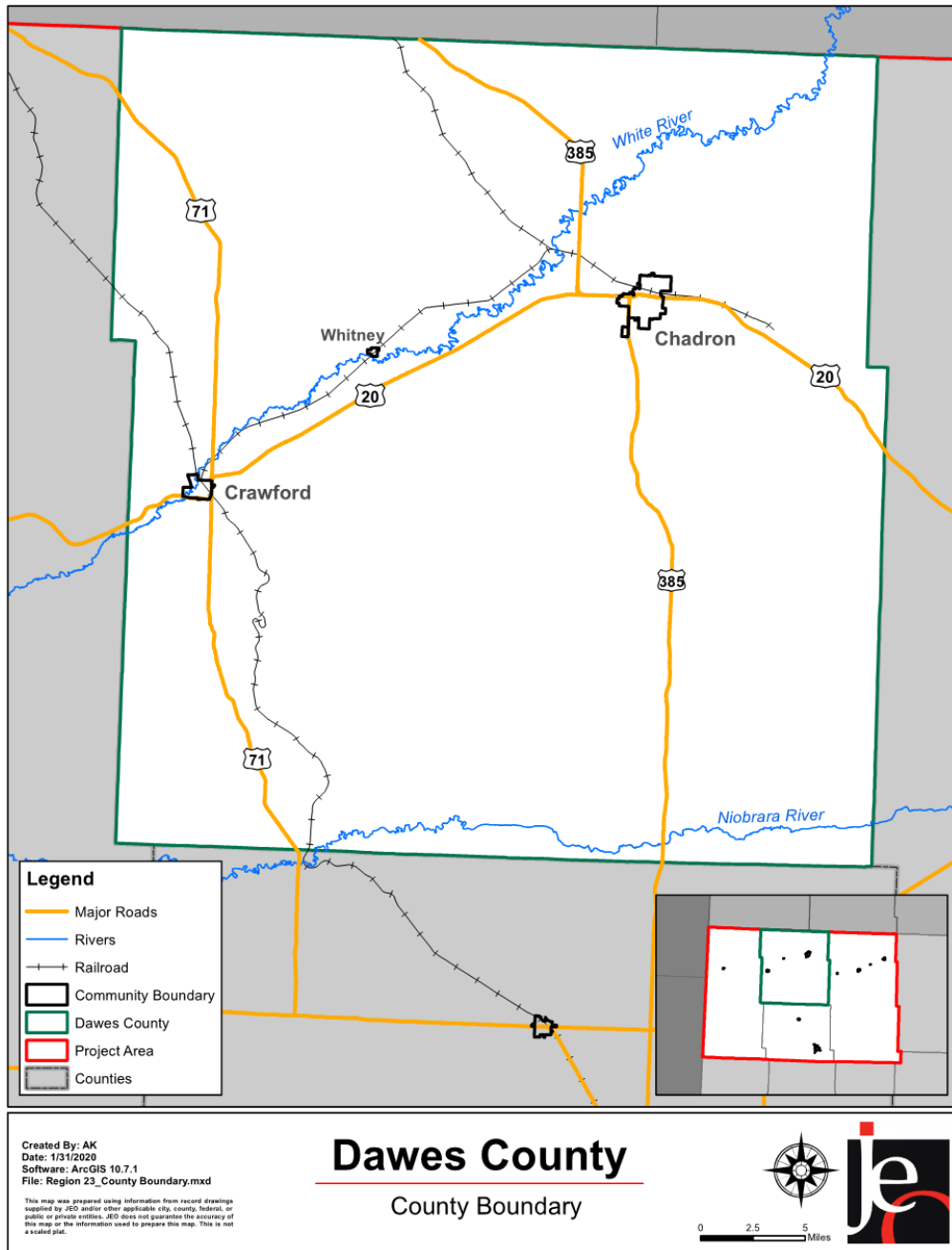
2020

**Local Planning Team**

Table DWS.1: Dawes County Local Planning Team

NAME	TITLE	JURISDICTION
JAKE STEWART	Board Member	Dawes County
KARL DAILEY	Sheriff	Dawes County

Figure DWS.1: Dawes County



## Location, Geography, and Climate

Dawes County is located in north western Nebraska and is bordered by Sioux, Box Butte, and Sheridan counties in Nebraska and Fall River and Oglala Lakota counties in South Dakota. The total area of Dawes County is 1,401 square miles. The Niobrara River flows along the southern border of the county and the White River bisects the northwestern corner. Dawes County is comprised of Rolling Hills, valleys, Valley-Side Slopes, Bluffs and Escarpments, Dissected Palins, and Plains topographic regions<sup>1</sup>, with the majority of land used as rangeland for livestock.

### Climate

For Dawes County, the normal high temperature for the month of July is 89.8°F and the normal low temperature for the month of January is 10.2°F. On average, Dawes County receives 18.05 inches of precipitation and 42.7 inches of snowfall per year. The table below compares climate indicators with those of the entire state. Climate data is helpful in determining if certain events are higher or lower than normal. For example, if the high temperatures in the month of July are running well into the 90s, high heat events may be more likely which could impact vulnerable populations.

**Table DWS.2: Dawes County Climate Normals**

	DAWES COUNTY	STATE OF NEBRASKA
<b>JULY NORMAL HIGH TEMP</b>	89.8°F	87.4°F
<b>JANUARY NORMAL LOW TEMP</b>	10.2°F	13.8°F
<b>ANNUAL NORMAL PRECIPITATION</b>	18.05"	23.8"
<b>ANNUAL NORMAL SNOWFALL</b>	42.7"	25.9"

*Source: NCEI 1981-2010 Climate Normals<sup>2</sup>, High Plains Regional Climate Center, 1981-2010<sup>3</sup>  
 Precipitation includes all rain and melted snow and ice.*

## Transportation

Dawes County’s major transportation corridors include Nebraska Highway 2/71 running north-south, U.S. Highway 385 running north-south, and U.S. Highway 20 running east-west. Major county roads which connect Crawford to Chadron and Chadron to Hemingford are of top concern for the County. A Burlington Northern Santa Fe rail line also runs through the western portion of the county while a Nebraska Northwest Railroad Inc. line runs east from Ft. Robinson (west of Crawford) to Chadron and then north into South Dakota. Rail lines commonly transport hazardous materials through the county including coal, oil, or waste materials. The county also has an air landing strip located near Chadron.

Past hazard events, specifically flooding, have closed major routes in the county for months at a time. Numerous critical facilities for the county or communities are located along these major routes including the airport, the hospital, the hazmat facility, courthouse, and Chadron State College. This information is important to hazard mitigation plans insofar as it suggests possible evacuation corridors in the county, as well as areas more at risk to transportation incidents.

### Chemical Transportation

Hazardous materials are commonly transported by a range of transportation methods, including highways, rail, air, and pipeline. Railway and highway transportation spills are the most frequently occurring chemical transportation incidents. While incident proximity will always occur near or on transportation methods, it is not possible to predict precise locations of possible future events. Proximity of pipelines, rail lines, and highways near critical facilities or vulnerable population

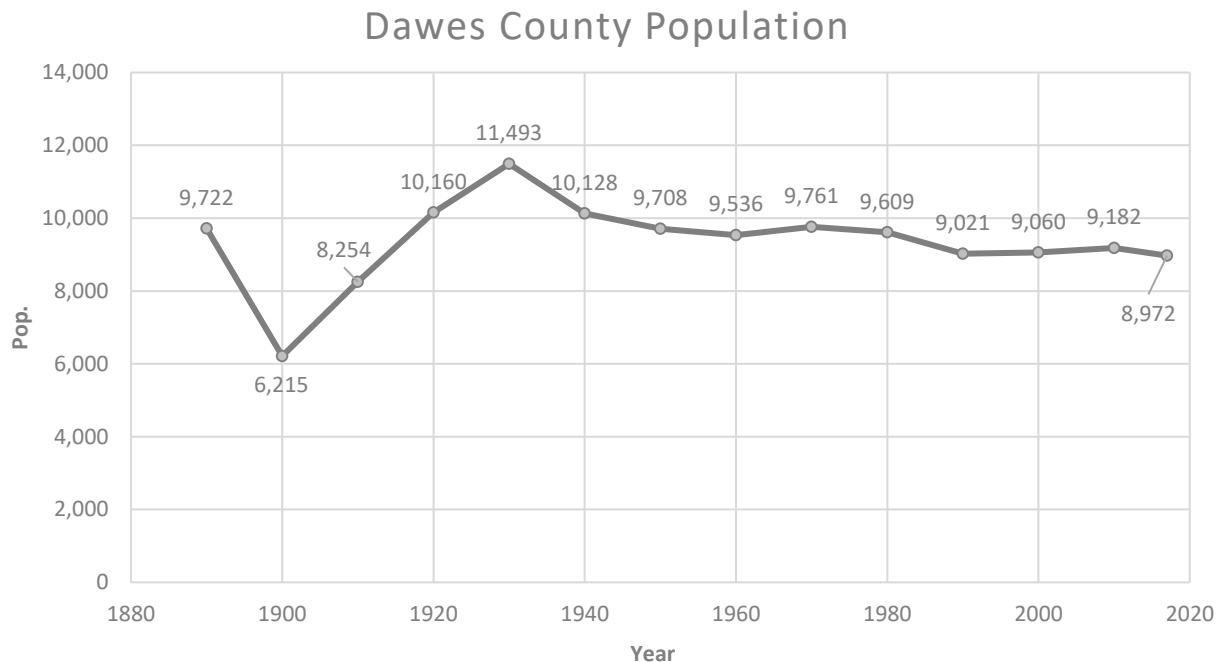
<sup>1</sup> Center for Applied Rural Innovation. "Topographic Regions Map of Nebraska." 2001. <http://digitalcommons.unl.edu/caripubs/62>.  
<sup>2</sup> National Centers for Environmental Information. "1981-2010 U.S. Climate Normals." Accessed December 2019. <https://www.ncdc.noaa.gov/cdo-web/datatools>.  
<sup>3</sup> High Plains Regional Climate Center. "Monthly Climate Normals 1981-2010 – Chadron NE." Accessed December 2019. <http://climod.unl.edu/>.

centers, including schools, daycares, nursing homes, and/or hospitals, increases overall vulnerability to chemical transportation spills. A BNSF rail line, a DM&E rail line, state highway 2/71, and U.S. Highways 385 and 20 are all commonly used to transport hazardous chemicals across the County. Private entities, local emergency response units, and state resources have strict regulatory oversight and emergency action plans in place to respond to significant chemical spills. For the County, local fire departments, Dawes County Sheriff, and Nebraska State Patrol would respond to chemical transportation incidents. While the local fire departments have some training, additional training is needed.

## Demographics

The following figure displays the historical population trend from 1890 to 2017. This figure indicates that the population of Dawes County has remained relatively stable since the 1950s. This is notable for hazard mitigation as communities with stable populations will likely have similar housing, transportation, and emergency response needs over time. Stable populations can represent consistent tax revenue income for the county which could make implementation of mitigation actions more fiscally available.

Figure DWS.2: Population 1890 – 2017



Source: U.S. Census Bureau<sup>4</sup>

The following table indicates the State of Nebraska has a higher percentage of people under the age of five; however Dawes County has a greater proportion of residents over 64. This is relevant to hazard mitigation insofar as the very young and elderly populations may be at greater risk from certain hazards than others. For a more elaborate discussion of this vulnerability, please see *Section Four: Risk Assessment*.

<sup>4</sup> United States Census Bureau. "2017 American Fact Finder: S0101: Age and Sex." [database file]. <https://factfinder.census.gov>.

**Table DWS.3: Population by Age**

AGE	DAWES COUNTY	STATE OF NEBRASKA
<5	5.5%	6.9%
5-64	77.0%	78.3%
>64	17.5%	14.8%
<b>MEDIAN</b>	<b>34.0</b>	<b>36.2</b>

Source: U.S. Census Bureau<sup>5</sup>

The following table indicates that median household income and per capita income for the county is slightly lower than the State of Nebraska. Median home value and rent are also both lower than the rest of the state. These economic indicators are relevant to hazard mitigation because they indicate the relative economic strength compared to the state as a whole. Areas with economic indicators which are relatively low may influence a county's level of resilience during hazardous events.

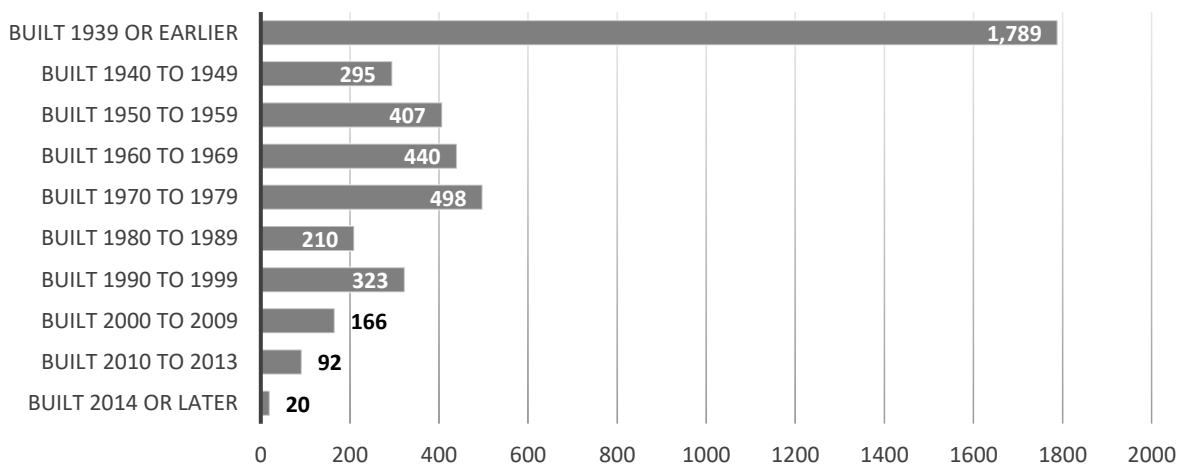
**Table DWS.4: Housing and Income**

	DAWES COUNTY	STATE OF NEBRASKA
<b>MEDIAN HOUSEHOLD INCOME</b>	<b>\$46,146</b>	<b>\$56,675</b>
<b>PER CAPITA INCOME</b>	<b>\$28,811</b>	<b>\$29,866</b>
<b>MEDIAN HOME VALUE</b>	<b>\$107,500</b>	<b>\$142,000</b>
<b>MEDIAN RENT</b>	<b>\$632</b>	<b>\$773</b>

Source: U.S. Census Bureau<sup>6,7</sup>

The following figure indicates that the majority of housing in Dawes County was built prior to 1939 (42.2%). According to 2017 ACS 5-year estimates, the county has 4,240 housing units with 83.9% percent of those units occupied. There are approximately 460 mobile homes in the county. The local planning team indicated mobile homes are located primarily west and south of the City of Chadron at City Dams, State Park, and Chadron Eagle's Rest Park. Housing age can serve as an indicator of risk as structures built prior to state building codes may be at greater risk. Finally, residents that live in mobile homes may be more vulnerable to the impacts of high winds, tornadoes, and severe winter storms.

**Figure DWS.3: Housing Units by Year Built**



Source: U.S. Census Bureau<sup>8</sup>

<sup>5</sup> United States Census Bureau. "2017 American Fact Finder: S0101: Age and Sex." [database file]. <https://factfinder.census.gov>.

<sup>6</sup> United States Census Bureau. "2017 American Fact Finder: DP04: Selected Housing Characteristics." [database file]. <https://factfinder.census.gov>.

<sup>7</sup> United States Census Bureau. "2017 American Fact Finder: DP03: Selected Economic Characteristics." [database file]. <https://factfinder.census.gov>.

<sup>8</sup> United States Census Bureau. "2017 American Fact Finder: DP04: Selected Housing Characteristics." [database file]. <https://factfinder.census.gov>.

**Table DWS.5: Housing Units**

JURISDICTION	TOTAL HOUSING UNITS				OCCUPIED HOUSING UNITS			
	Occupied		Vacant		Owner		Renter	
	Number	Percent	Number	Percent	Number	Percent	Number	Percent
<b>DAWES COUNTY</b>	3,557	83.9%	683	16.1%	2,222	62.5%	1,335	37.5%
<b>NEBRASKA</b>	748,405	90.8%	75,771	9.2%	494,189	66.0%	254,216	34.0%

Source: U.S. Census Bureau<sup>9</sup>

## Major Employers

According to 2016 Business Patterns Census Data, Dawes County had 262 business establishments. The following table presents the number of establishments, number of paid employees, and the annual payroll in thousands of dollars. Communities which have a diverse economic makeup may be more resilient following a hazardous event, especially if certain industries are more impacted than others.

**Table DWS.6: Business in Dawes County**

	TOTAL BUSINESSES	NUMBER OF PAID EMPLOYEES	ANNUAL PAYROLL (IN THOUSANDS)
<b>TOTAL FOR ALL SECTORS</b>	262	2,155	\$64,373

Source: U.S. Census Bureau<sup>10</sup>

Agriculture is also important to the economic fabric of Dawes County, and the state of Nebraska as a whole. Dawes County's 491 farms cover 750,204 acres of land, over 83% of the county's total area. Crop and livestock production are the visible parts of the agricultural economy, but many related businesses contribute as well by producing, processing, and marketing farm and food products. These businesses generate income, employment and economic activity throughout the region.

**Table DWS.7: Dawes County Agricultural Inventory**

DAWES COUNTY AGRICULTURAL INVENTORY	
<b>NUMBER OF FARMS</b>	491
<b>LAND IN FARMS</b>	750,204

Source: USDA 2017 Census of Agriculture<sup>11</sup>

## Future Development Trends

Few changes have occurred in the county over the past five years. The local planning team indicated additional housing development has occurred outside the city limits of Chadron. The county's population has remained relatively stable over the past several decades due to steady employers. The major employers in the county include Chadron State College, Walmart, Forest Service, Job Corp, the County and City governments, and the state roads department.

At this time there are no new housing or commercial developments planned in the next five years. In the unincorporated areas new structures will most likely be new farming operations.

<sup>9</sup> United States Census Bureau. "2017 American Fact Finder: DP04: Selected Housing Characteristics." [database file]. <https://factfinder.census.gov>.

<sup>10</sup> United States Census Bureau. "2016 American Fact Finder: Geography Area Series County Business Patterns 2015 Business Patterns." [database file]. <https://factfinder.census.gov>.

<sup>11</sup> United States Department of Agriculture, National Agricultural Statistics Server. 2019. "2017 Census of Agriculture – County Data." <https://www.nass.usda.gov/Publications/AgCensus/2017/index.php>.

## Structural Inventory and Valuation

GIS parcel data as of December 2019 was requested from GIS Workshop, which the county hires to manage the County Assessor data. This data was analyzed for the location, number, and value of property improvements at the parcel level. The data did not contain the number of structures on each parcel. A summary of the results of this analysis is provided in the following table.

**Table DWS.8: Dawes County Parcel Valuation**

NUMBER OF PARCELS	NUMBER OF IMPROVEMENTS	TOTAL IMPROVEMENT VALUE	NUMBER OF IMPROVEMENTS IN FLOODPLAIN	VALUE OF IMPROVEMENTS IN FLOODPLAIN
7,447	4,017	\$507,749,479	751	\$118,896,717

Source: County Assessor

## Critical Infrastructure/Key Resources

### Hazardous Materials

#### Chemical Storage Fixed Sites

According to the Tier II System reports submitted to the Nebraska Department of Environment and Energy, there 21 chemical storage sites throughout Dawes County which house hazardous materials; however, there are none located in unincorporated Dawes County. The local planning area indicated the following chemical sites are of concern for the county: Dawes County Weed Department, Chadron Hospital, Westco., and Crow Butte businesses. For a description and map of chemical sites located in incorporated areas, please see the jurisdiction's participant section.

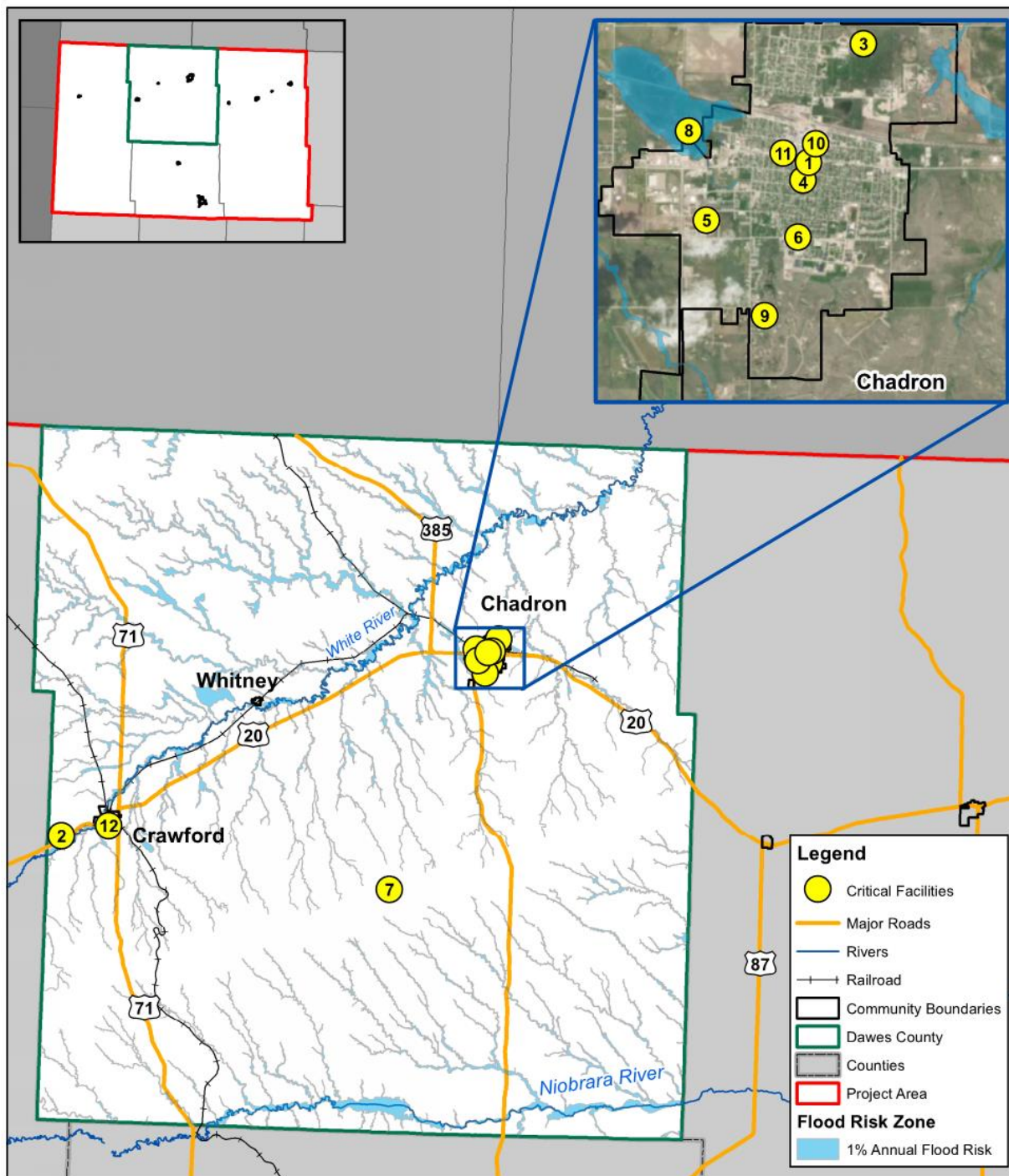
### Critical Facilities

Each participating jurisdiction identified critical facilities vital for disaster response, providing shelter to the public, and are essential for returning the jurisdiction's functions to normal during and after a disaster per the FEMA Community Lifelines guidance. Critical facilities were identified during the original planning process and updated by the local planning team as a part of this plan update. The following table and figure provide a summary of the critical facilities for the jurisdiction.

**Table DWS.9: Dawes County Critical Facilities**

CF Number	Name	Shelter (Y/N)	Generator (Y/N)	Floodplain (Y/N)
1	Nebraska State Patrol	N	N	N
2	Fort Robinson State Park	Y	N	Y
3	Dawes County Fairgrounds	Y	N	N
4	Dawes County Courthouse	Y	Y	N
5	Community Hospital	Y	Y	N
6	Chadron State College	Y	Y	N
7	Radio Tower	N	N	N
8	Radio Tower	N	N	Y
9	Radio Tower	N	N	N
10	Region 23 EMA Office	N	N	N
11	Chadron Fire Dept	N	Y	N
12	Crawford Rural Fire Dept	N	N	N

Figure DWS.4: Critical Facilities



Created By: AK  
 Date: 6/12/2020  
 Software: ArcGIS 10.7.1  
 File: Region 23\_County\_CF\_Floodplain.mxd

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

# Daws County

## Critical Facilities



0 5 10 Miles



## Historical Occurrences

The following table provides a statistical summary for hazards that have occurred in the county. The property damages from the NCEI Storm Events Database (January 1996 – September 2019) should be considered only as broad estimates. Sources include but are not limited to: emergency management; local law enforcement; Skywarn spotters; NWS damage surveys; newspaper clipping services; insurance industry; and the general public. Crop damages reports come from the USDA Risk Management Agency for Dawes County between 2000 and 2019.

**Table DWS.10: Severe Weather Events for Dawes County**

HAZARD TYPE		Count	Property	Crop
Agricultural Disease	Animal Disease <sup>1</sup>	3	3	N/A
	Plant Disease <sup>2</sup>	19	N/A	\$290,080
Dam Failure <sup>3</sup>		0	\$0	N/A
Drought and Extreme Heat <sup>4,5</sup>	Drought	253/1,489 months	\$0	\$4,237,397
	Extreme Heat	Avg 8 days/year	\$0	\$647,950
Flooding <sup>5</sup>	Flash Flood	5	\$1,000	\$54,232
	Flood	2	\$0	
High Winds and Tornadoes <sup>5</sup>	High Winds	49	\$45,500	\$1,549,484
	Tornadoes	11	\$0	\$0
Severe Thunderstorms <sup>5</sup>	Hail	187	\$366,500	\$5,864,842
	Heavy Rain	6	\$0	\$764,649
	Lightning	2	\$405,000	N/A
	Thunderstorm Wind <i>1 injury</i>	70	\$405,000	N/A
Severe Winter Storms <sup>5</sup>	Blizzard	17	\$2,000	
	Extreme Cold/Wind Chill	11	\$0	
	Heavy Snow	11	\$0	\$1,865,444
	Ice Storm	0	\$0	
	Winter Storm	39	\$25,000	
	Winter Weather	18	\$0	
Terrorism <sup>7</sup>		0	\$0	N/A
Wildfires <sup>8</sup> <i>2 injuries</i>		533	99,280 acres	\$37,260
		<b>947</b>	<b>\$1,250,000</b>	<b>\$15,311,348</b>

N/A: Data not available

1 NDA (2014-2019)

2 USDA RMA (2000-2019)

3 Stanford NPDP (1911-2018)

4 NOAA (1895-2019)

5 NCEI (January 1996 to Sept 2019)

6 HPRCC (1987-2019)

7 GTD (1970-2017)

8 NFS (2010-2018)

## County Hazard Prioritization

For an in-depth discussion regarding area wide hazards, please see *Section Four: Risk Assessment*. The hazards discussed in detail below were selected by the local planning team from the regional hazard list as the relevant hazards for the community. The selected hazards were then prioritized by the local planning team based on historical hazard occurrences, potential impacts, and the community's capabilities.

### High Winds and Tornadoes

The county planning team identified high winds as a significant concern for the county. According to the NCEI, there were 49 high wind events and 11 tornadic events with a total of \$45,500 in property damage and \$1,549,484 in crop damage. High winds and tornadoes can cause significant damage to critical facilities, down power lines and trees, and block transportation routes with debris. There are several shelter locations identified throughout the county which can be used by residents seeking shelter during tornado events. Storm sirens are located throughout the county.

### Severe Thunderstorms

Severe thunderstorms are likely to occur annually across the planning area; however, the planning team indicated due to their frequency, residents are likely well prepared to cope with such events. The NCEI reported a total of 265 thunderstorm events, which included hail, heavy rain, lightning, and thunderstorm wind. These events totaled \$1,176,500 in property damages and \$6,629,500 in crop damages. A summary of the events with recorded damages can be found in the participant sections where they occurred. Property damages include downed trees and tree limbs. One thunderstorm wind event in 2001 reported one injury and loss of power in Crawford.

### Severe Winter Storms

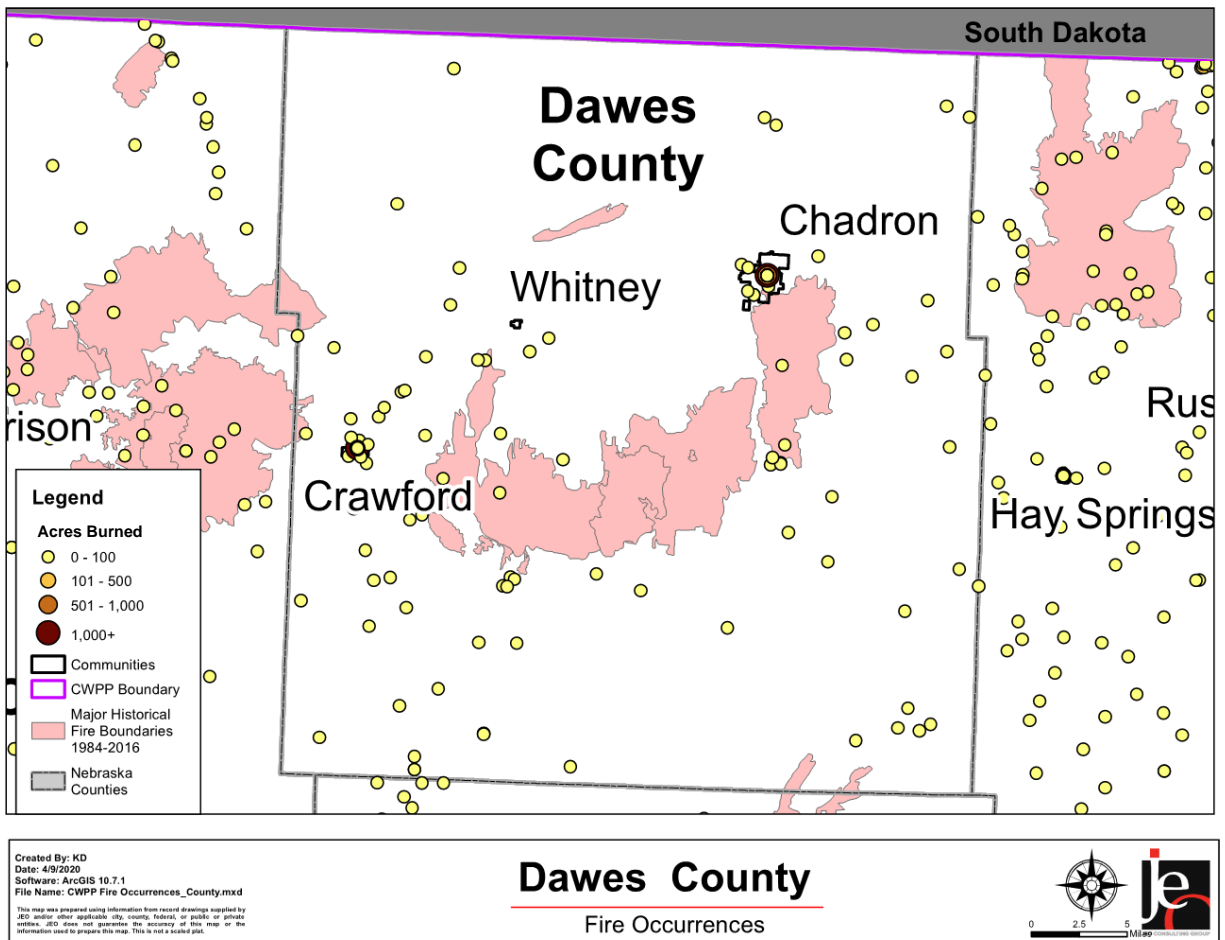
Severe winter storms are likely to occur annually across the planning area; however, the planning team indicated due to their frequency, residents are likely well prepared to cope with such events. The NCEI reported 96 severe winter storm events in Dawes County from 1996 through December 2019. These events resulted in \$27,000 in property damage and \$1,865,444 in crop damage. Most recorded events included a combination of factors including snow, wind, and ice. There were 11 reported events resulting solely from extreme cold temperatures. Extreme low temperature events in Dawes County have reported wind chills between 20 and 40 degrees below zero.

### Wildfire

The local planning team identified grass and wildfire as the greatest threat to Dawes County. The entire county falls within the WUI as defined in the CWPP. According to the Nebraska Forestry Department there were 533 reported fires by Chadron and Crawford Fire Departments from 2000 to 2018 which consumed a total of 99,280 total acres. The county has seen numerous large-scale fires including the Fort Robinson Fire complex (1989, 49,000 acres burned), the Spotted Trail fire (2006, 69,000 acres burned), and the Region 23 Complex fire (2012, 58,450 acres burned). Past fires also resulted in \$37,260 in damages to crops, destroyed at least six homes, and destroyed 15 other structures. The local planning team noted that property damages in 2006 alone were at least \$300,000 and damages in total have exceed \$1 million since 2000. Of the reported fires the most frequent cause is lightning followed by burning debris. The local planning teams indicated greatest concerns regarding wildfire include the presence of forested areas in the county (high fuel loads for wildfire events), impacts to the local economy from burned rangeland, resource availability to combat wildfires, and the terrain and distance between resources and events. Local officials have also identified the Pine Ridge and the Niobrara River as being at high risk. The communities of Chadron, Crawford, and Marsland and the Fort Robinson State Park all lie within

areas of concern. Crow Butte Resources, a uranium mining operation in the Squaw Creek watershed, sits near the forested Pine Ridge and also lies within the area of concern.

Figure DWS.5: Wildfire Events in Dawes County



## Governance

A community's governance structure impacts its capability to implement mitigation actions. Dawes County is governed by a three member board of commissioners. The county also has the following offices and departments:

- County Clerk
- County Assessor
- County Treasurer
- County Attorney
- Emergency Management
- Highway Superintendent
- Sheriff's Office
- Zoning Administrator
- Safety Committee
- Weed Superintendent
- VSO Office

- Building and Grounds
- County Court

## Capability Assessment

The capability assessment consisted of a Capability Assessment Survey completed by the jurisdiction and a review of local existing policies, regulations, plans, and the programs. The survey is used to gather information regarding the jurisdiction's planning and regulatory capability; administrative and technical capability; fiscal capability; and educational and outreach capability.

**Table DWS.10: Capability Assessment**

Survey Components/Subcomponents		Yes/No
<b>PLANNING &amp; REGULATORY CAPABILITY</b>	Comprehensive Plan	Yes
	Capital Improvements Plan	No
	Economic Development Plan	Yes
	Emergency Operational Plan	Yes
	Floodplain Management Plan	No
	Storm Water Management Plan	No
	Zoning Ordinance	Yes
	Subdivision Regulation/Ordinance	No
	Floodplain Ordinance	Yes
	Building Codes	Yes
	National Flood Insurance Program	Yes
	Community Rating System	No
	Community Wildfire Protection Plan	Yes
	Other (if any)	
<b>ADMINISTRATIVE &amp; TECHNICAL CAPABILITY</b>	Planning Commission	Yes
	Floodplain Administration	Yes
	GIS Capabilities	Yes
	Chief Building Official	Yes
	Civil Engineering	No
	Local Staff Who Can Assess Community's Vulnerability to Hazards	Yes
	Grant Manager	No
	Mutual Aid Agreement	Yes
	Other (if any)	
<b>FISCAL CAPABILITY</b>	Capital Improvement Plan/ 1 & 6 Year plan	Yes
	Applied for grants in the past	Yes
	Awarded a grant in the past	No
	Authority to Levy Taxes for Specific Purposes such as Mitigation Projects	Yes
	Gas/Electric Service Fees	No
	Storm Water Service Fees	No
	Water/Sewer Service Fees	No
	Development Impact Fees	No

Survey Components/Subcomponents		Yes/No
	General Obligation Revenue or Special Tax Bonds	No
	Other (if any)	
<b>EDUCATION &amp; OUTREACH CAPABILITY</b>	Local citizen groups or non-profit organizations focused on environmental protection, emergency preparedness, access and functional needs populations, etc. Ex. CERT Teams, Red Cross, etc.	Yes
	Ongoing public education or information program (e.g., responsible water use, fire safety, household preparedness, environmental education)	No
	Natural Disaster or Safety related school programs	Yes
	StormReady Certification	Yes
	Firewise Communities Certification	No
	Tree City USA	No
	Other (if any)	

Overall Capability	Limited/Moderate/High
Does your county have the financial resources need to implement mitigation projects?	Moderate
Does your county have the staff/expertise to implement projects?	Moderate/High
Does your county have the community support to implement projects?	Moderate/High
Does your county staff have the time to devote to hazard mitigation?	Moderate

## Plan Integration

The Dawes County Comprehensive Plan was last updated in 2014 and was developed by the Panhandle Area Development District. The plan provides an overall description of overall economic health, local transportation routes and avenues, land use, housing needs, and energy resources. The major driver of the plan was to improve community livability and engage the county in positive healthy living.

The County has building codes which are updated as needed. The Zoning and Subdivision resolutions were adopted in 2002 and are updated on an as needed basis. The codes and ordinances limit development in hazardous areas, such as the floodplain, but do not limit or prohibit development in the WUI or near chemical fixed sites. The local planning team has identified the need to update building codes to address hail resistant roofing.

The Dawes County LEOP, last updated June 2017, incorporates mitigation by: identifying hazards of concern requiring emergency action; specific responsibilities of individual communities or community roles; scenarios that would require evacuation; sheltering locations; an animal disease response plan; media contacts; and other information for the county. This plan is updated every

five years by Region 23 Emergency Management Agency. The county sheriff's department has Mutual Aid Agreements and Memorandums of Understanding between all surrounding counties through the Panhandle Mutual Aid agreement.

## Mitigation Strategy

### Completed Actions

MITIGATION ACTION	CIVIL SERVICE IMPROVEMENTS
<b>DESCRIPTION</b>	Mobile Command for Law Enforcement, Radio Supplies, etc., newer SUV/Truck for quick response for emergency rescue and response equipment.
<b>HAZARD(S)</b>	All hazards
<b>STATUS</b>	Mobile command unit became operational in 2019 at the Courthouse. The project was paid for through the county budget.

### New and Ongoing Actions

MITIGATION ACTION	BACKUP POWER GENERATORS
<b>DESCRIPTION</b>	Provide a portable or stationary source of backup power to Dawes County Courthouse, Dawes County Office building, Dawes County Road shop, and as portable power source for Dawes County Law enforcement.
<b>HAZARD(S)</b>	All Hazards
<b>ESTIMATED COST</b>	\$30,000+ per generator
<b>FUNDING</b>	Tax Dollars, General Fund, Region 23 EMA, HMGP, PDM
<b>TIMELINE</b>	5+ years
<b>PRIORITY</b>	High
<b>LEAD AGENCY</b>	Dawes County Commissioners, Dawes County Sheriff
<b>STATUS</b>	This project has not yet been started. Generators are needed at the courthouse, county offices, road shops, and Sheriff Office. An additional generator is needed for the new emergency response trailer.

MITIGATION ACTION	DATABASE OF VULNERABLE POPULATIONS
<b>DESCRIPTION</b>	Work with stakeholders to develop a database of vulnerable populations and the organizations which support them
<b>HAZARD(S)</b>	All Hazards
<b>ESTIMATED COST</b>	Staff Time
<b>FUNDING</b>	General Fund
<b>TIMELINE</b>	2 – 5 years
<b>PRIORITY</b>	Medium
<b>LEAD AGENCY</b>	Dawes County Roads Department, County Sheriff
<b>STATUS</b>	This project has not yet been started.

MITIGATION ACTION		DEVELOP CONTINUITY PLANS FOR CRITICAL COMMUNITY SERVICES
DESCRIPTION		Continuity planning helps to ensure that services can be maintained during and after a disaster
HAZARD(S)		All Hazards
ESTIMATED COST		Staff Time
FUNDING		General Fund
TIMELINE		5+ years
PRIORITY		High
LEAD AGENCY		Dawes County Roads Department
STATUS		This project has not yet been started.

MITIGATION ACTION		HAIL RESISTANT ROOFING
DESCRIPTION		Encourage the use of hail resistant roofing for any new construction
HAZARD(S)		Severe Thunderstorms
ESTIMATED COST		Staff Time
FUNDING		General Fund
TIMELINE		1 year
PRIORITY		Low
LEAD AGENCY		Dawes County Roads Department
STATUS		Building codes need to be updated to include language encouraging hail resistant roofing.

MITIGATION ACTION		HAZARDOUS TREE REMOVAL
DESCRIPTION		Identify and remove hazardous limbs and/or trees
HAZARD(S)		Severe Thunderstorms, Severe Winter Storms, Tornadoes and High Winds
ESTIMATED COST		\$20,000
FUNDING		County Budget
TIMELINE		2-5 years
PRIORITY		Medium
LEAD AGENCY		Dawes County Roads Department
STATUS		This is an ongoing action. The County removes hazardous trees as they become apparent.

MITIGATION ACTION		PUBLIC AWARENESS/EDUCATION
<b>DESCRIPTION</b>	Considerations for activities include outreach projects and the distribution of maps and environmental education materials to increase public awareness of natural hazards to public and private property owners, property renters, businesses, and local officials. Other activities include providing education to citizens on water conservation methods. Purchasing and using equipment such as overhead projectors and laptops can allow for easier ways to educate the public during meetings.	
<b>HAZARD(S)</b>	All Hazards	
<b>ESTIMATED COST</b>	\$500+	
<b>FUNDING</b>	General Fund	
<b>TIMELINE</b>	5+	
<b>PRIORITY</b>	Medium	
<b>LEAD AGENCY</b>	Dawes County Commissioners	
<b>STATUS</b>	Education and outreach efforts is a collaboration between Region 23 Emergency Management and the county. Region 23 receives funding specifically to assist with public awareness.	

MITIGATION ACTION		WARNING SYSTEMS
<b>DESCRIPTION</b>	Improve city cable TV interrupt warning system and implement telephone interrupt systems such as Reverse 911, emergency text messaging warning system, etc.	
<b>HAZARD(S)</b>	All Hazards	
<b>ESTIMATED COST</b>	\$5,000+	
<b>FUNDING</b>	General Fund, Region 23 EMA, PDM, HMGP	
<b>TIMELINE</b>	2-5 years	
<b>PRIORITY</b>	High	
<b>LEAD AGENCY</b>	Dawes County Roads Department, Region 23 EMA	
<b>STATUS</b>	The county utilizes the CodeRed alert system managed by Region 23 EMA. New sirens are needed in Crawford and Whitney.	

MITIGATION ACTION		WEATHER RADIOS
<b>DESCRIPTION</b>	Conduct an inventory of weather radios at schools and other critical facilities and provide new radios as needed	
<b>HAZARD(S)</b>	All Hazards	
<b>ESTIMATED COST</b>	\$50 per radio	
<b>FUNDING</b>	Region 23 EMA, Dawes County General Fund, Taxes, PDM, HMGP	
<b>TIMELINE</b>	1 year	
<b>PRIORITY</b>	High	
<b>LEAD AGENCY</b>	Dawes County Sheriff	
<b>STATUS</b>	Currently the Sheriff Deputy is visiting with Crawford Schools to determine need for weather radios.	



**Removed Actions**

<b>MITIGATION ACTION</b>		<b>ADOPT A NO-ADVERSE IMPACT APPROACH TO FLOODPLAIN MANAGEMENT</b>
<b>DESCRIPTION</b>		No Adverse Impact floodplain management reduces the cumulative impacts of floodplain development on flood heights
<b>HAZARD(S)</b>		Flooding
<b>REASON FOR REMOVAL</b>		Flooding is not a hazard of top concern for the county and this project was determined to no longer be a priority.
<b>MITIGATION ACTION</b>		<b>MAINTAIN GOOD STANDING IN THE NFIP</b>
<b>DESCRIPTION</b>		Maintain good standing in the NFIP
<b>HAZARD(S)</b>		Flooding
<b>REASON FOR REMOVAL</b>		While the County will continue to participate in the NFIP program, this is no longer considered a mitigation action by FEMA.
<b>MITIGATION ACTION</b>		<b>WINDBREAKS/LIVING SNOW FENCE</b>
<b>DESCRIPTION</b>		Installation of windbreaks and/or living snow fences to increase water storage capacity in soil and reduce blowing snow.
<b>HAZARD(S)</b>		Drought and Extreme Heat, Severe Thunderstorms, Severe Winter Storms, Tornadoes and High Winds
<b>REASON FOR REMOVAL</b>		This project is currently not a priority for the county due to financial and time constraints.

# Community Profile

## CITY OF CHADRON & CHADRON STATE COLLEGE

Region 23 Emergency Management Agency  
Multi-Jurisdictional Hazard Mitigation Plan Update

2020

## Local Planning Team

**Table CHD.1: Chadron Local Planning Team**

NAME	TITLE	JURISDICTION
<b>CHERYL WELCH</b>	Council Member	City of Chadron
<b>GREGORY YANKER</b>	City Manager	City of Chadron
<b>BRENDA BARRY-SCHOMMER</b>	Safety Coordinator	Chadron State College
<b>MILO RUST</b>	Public Works Director	City of Chadron
<b>JANET JOHNSON</b>	Building/Zoning Official	City of Chadron

## Location and Geography

The City of Chadron is located in the northeastern portion of Dawes County and covers an area of 3.9 square miles. The City of Chadron is the county seat for Dawes County. There are no major waterways located near the City of Chadron.

## Transportation

Chadron’s major transportation corridors include U.S. Highway 385 which averages 3,480 vehicles per day and U.S. Highway 20 which averages 2,285 vehicles per day.<sup>12</sup> Highway 385 is the primary north south and Highway 20 is the primary east west transportation corridor used for local traffic. Within Chadron, Main Street, 1<sup>st</sup> St, and 10<sup>th</sup> Streets are most commonly used. The Chadron Municipal Airport is located in Chadron and is the only public airport in Dawes County.

A Nebraska Northwest Railroad Inc. line is located within the city and extends both east and west outside of town. Railroads can commonly transport hazardous materials including coal, oil, and waste products; however, the local planning team indicated only empty cars are located within town. A BNSF rail line is located west of town with active transportation. One derailment has occurred in Chadron with no reported damages, injuries, or fatalities. Past major transportation incidents include a general aviation aircraft crash in 2019 with three fatalities, a BNSF train derailment near Dakota Junction, and several small-scale vehicular accidents. Transportation information is important to hazard mitigation plans because it suggests possible evacuation corridors in the community, as well as areas more at risk to transportation incidents.

### **Chemical Transportation**

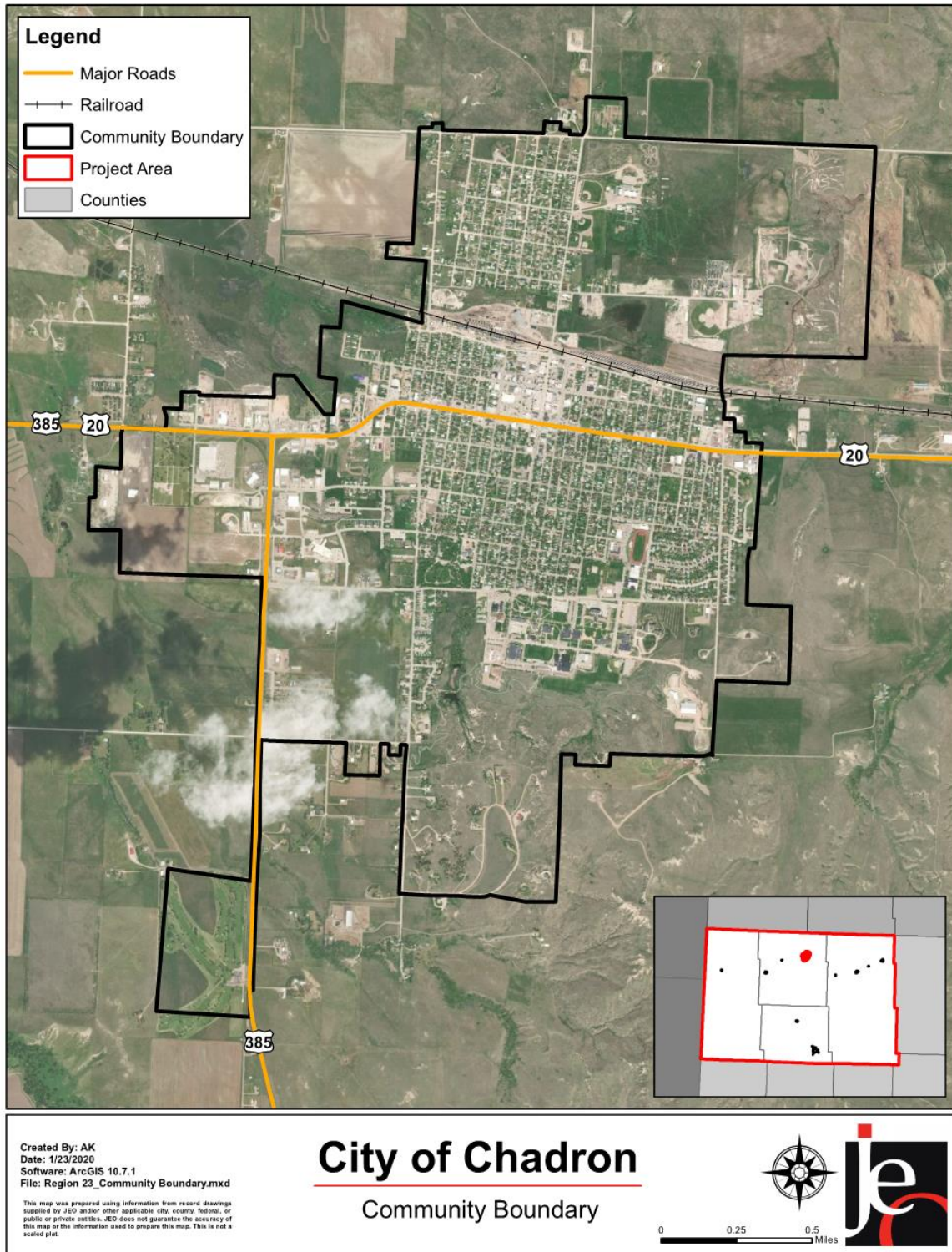
Hazardous materials are commonly transported by a range of transportation methods, including highways, rail, air, and pipeline. Railway and highway transportation spills are the most frequently occurring chemical transportation incidents. While incident proximity will always occur near or on transportation routes, it is not possible to predict precise locations of possible future events. Proximity of pipelines, rail lines, and highways near critical facilities or vulnerable population centers, including schools, daycares, nursing homes, and/or hospitals, increases overall vulnerability to chemical transportation spills. The local planning team indicated rail cars located in the City are empty, but other products including petroleum, propane, and fuel is commonly transported through the City via semi-trucks.

The local volunteer fire department would be responsible for responding to hazardous chemical spills in town. All volunteers have basic wildland and structural fire-fighting training. The VFD has firefighting gear but not HazMat gear. Any past chemical spills events have been minor petroleum spills which have been below the reporting threshold. The local planning team also indicated

<sup>12</sup> Nebraska Department of Roads. "Traffic Flow Map of the State Highways: State of Nebraska." [map]. Scale 1"= 20 miles. State of Nebraska: Department of Roads, 2015. <http://www.roads.nebraska.gov/media/2510/2014-statewide-traffic-flow-map.pdf>

several critical facilities or vulnerable populations are located near main chemical transportation routes, including the hospital, NDOT office, the Prairie Pines senior housing, and some subsidized housing. Private entities, local emergency response units, and state resources have strict regulatory oversight and emergency action plans in place to respond to significant chemical spills.

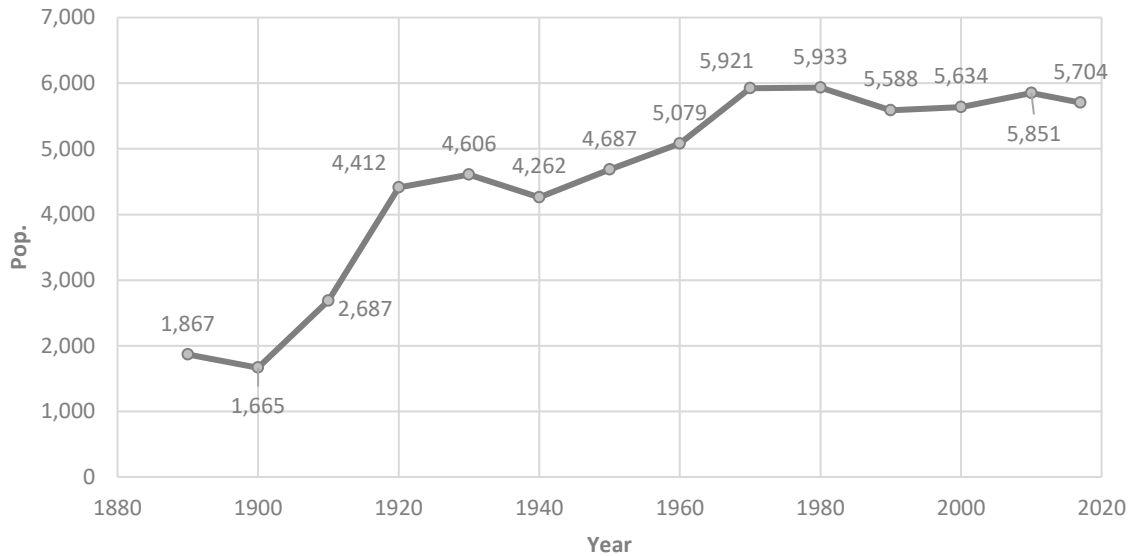
Figure CHD.1: City of Chadron



## Demographics

Chadron’s population has grown steadily since the 1920s. Growing populations can lead to increased tax revenues to pursue mitigation projects. Chadron’s population accounted for 64% percent of Dawes County’s population in 2017.<sup>13</sup>

Figure CHD.2: Estimated Population 1890 – 2017



Source: U.S. Census Bureau<sup>14</sup>

The young, elderly, minorities, and poor may be more vulnerable to certain hazards than other groups. In comparison to the County, Chadron’s population was:

- **Younger.** The median age of Chadron was 27.9 years old in 2017, compared with the County average of 34.0 years. Chadron’s population has remained relatively stable since 2010, when the median age was 27.8 years old. Chadron had a larger proportion of people under 20 years old (29.3%) than the County (27.6%).<sup>15</sup>
- **More ethnically diverse.** Since 2010, Chadron grew more ethnically diverse. In 2010, 2.7% of Chadron’s population was Black or African American 2.3% was American Indian and Alaska Native. By 2017, about 2.4% of Chadron’s population was Black or African American 4.3% was American Indian and Alaska Native. During that time, the Black or African American and American Indian population in the County grew from 1.9% and 4.4% in 2010 to 1.6% and 2.9% in 2017, respectively.<sup>16</sup>
- **Similar likelihood to be at the federal poverty line.** The poverty rate in Chadron (12.7% of families living below the federal poverty line) is similar to the County’s poverty rate (12.8%) in 2017.<sup>17</sup>

<sup>13</sup> United States Census Bureau. "2017 American Fact Finder: S0101: Age and Sex." [database file]. <https://factfinder.census.gov/>.

<sup>14</sup> United States Census Bureau. "2017 American Fact Finder: S0101: Age and Sex." [database file]. <https://factfinder.census.gov/>.

<sup>15</sup> United States Census Bureau. "2017 American Fact Finder: S0101: Age and Sex." [database file]. <https://factfinder.census.gov/>.

<sup>16</sup> United States Census Bureau. "2017 American Fact Finder: DP05: ACS Demographic and Housing Estimates." [database file]. <https://factfinder.census.gov/>.

<sup>17</sup> United States Census Bureau. "2017 American Fact Finder: DP03: Selected Economic Characteristics." [database file]. <https://factfinder.census.gov/>.

## Employment and Economics

The City's economic base is a mixture of industries. In comparison to Dawes County, Chadron's economy had:

- **Similar mix of industries.** Both Dawes County and Chadron's major employment sectors, accounting for 10% or more of employment each, were: Retail, Educational Services, and Arts and Entertainment in 2017. Additionally, Dawes County's industries also included Agriculture/Fishing/Forestry.<sup>18</sup>
- **Lower household income.** Chadron's median household income in 2017 (\$44,773) was about \$1,373 lower than the County (\$46,146).<sup>19</sup>
- **Fewer long-distance commuters.** About 81% percent of workers in Chadron commuted for fewer than 15 minutes, compared with about 74% of workers in Dawes County. About 14% of workers in Chadron commute 30 minutes or more to work, compared to about 15% of the County workers.<sup>20</sup>

## Major Employers

Major employers in the City include Chadron State College, Chadron Community Hospital, the City, United States Forest Service, United States Department of Agriculture, and Chadron Public Schools. Chadron is the largest municipality located within the county and draws many surrounding residents for employment; however, some residents may also commute to the Pine Ridge Reservation for work.

## Housing

In comparison to Dawes County, Chadron's housing stock was:

- **Less owner occupied.** About 51.6% of occupied housing units in Chadron are owner occupied compared with 62.5% of occupied housing in Dawes County in 2017.<sup>21</sup>
- **Similarly aged housing stock.** Chadron and Dawes County have a similar share of housing built prior to 1970 (81.2% compared to 80.9%).<sup>22</sup>
- **Fewer multifamily homes.** Chadron contains fewer multifamily housing with five or more units per structure compared to the County (5.0% compared to 8.0%). About 71.9% of housing in Chadron was single-family detached, compared with 77.3% of the County's housing. Chadron has a smaller share of mobile and manufactured housing (9.9%) compared to the County (10.8%).<sup>23</sup> Chadron's mobile homes are located primarily west or south of town. The City has been undertaking an effort to reduce the total number of vacant and/or dilapidated mobile homes located within its jurisdictional boundaries.

This housing information is relevant to hazard mitigation insofar as the age of housing may indicate which housing units were built prior to state building codes being developed. Further, unoccupied housing may suggest that future development may be less likely to occur. Finally, communities with a substantial number of mobile homes may be more vulnerable to the impacts of high winds, tornadoes, and severe winter storms.

<sup>18</sup> United States Census Bureau. "2017 American Fact Finder: DP03: Selected Economic Characteristics." [database file]. <https://factfinder.census.gov/>.

<sup>19</sup> United States Census Bureau. "2017 American Fact Finder: DP03: Selected Economic Characteristics." [database file]. <https://factfinder.census.gov/>.

<sup>20</sup> United States Census Bureau. "2017 American Fact Finder: S0802: Means of Transportation to Work by Selected Characteristics." [database file]. <https://factfinder.census.gov/>.

<sup>21</sup> United States Census Bureau. "2017 American Fact Finder: DP04: Selected Housing Characteristics." [database file]. <https://factfinder.census.gov/>.

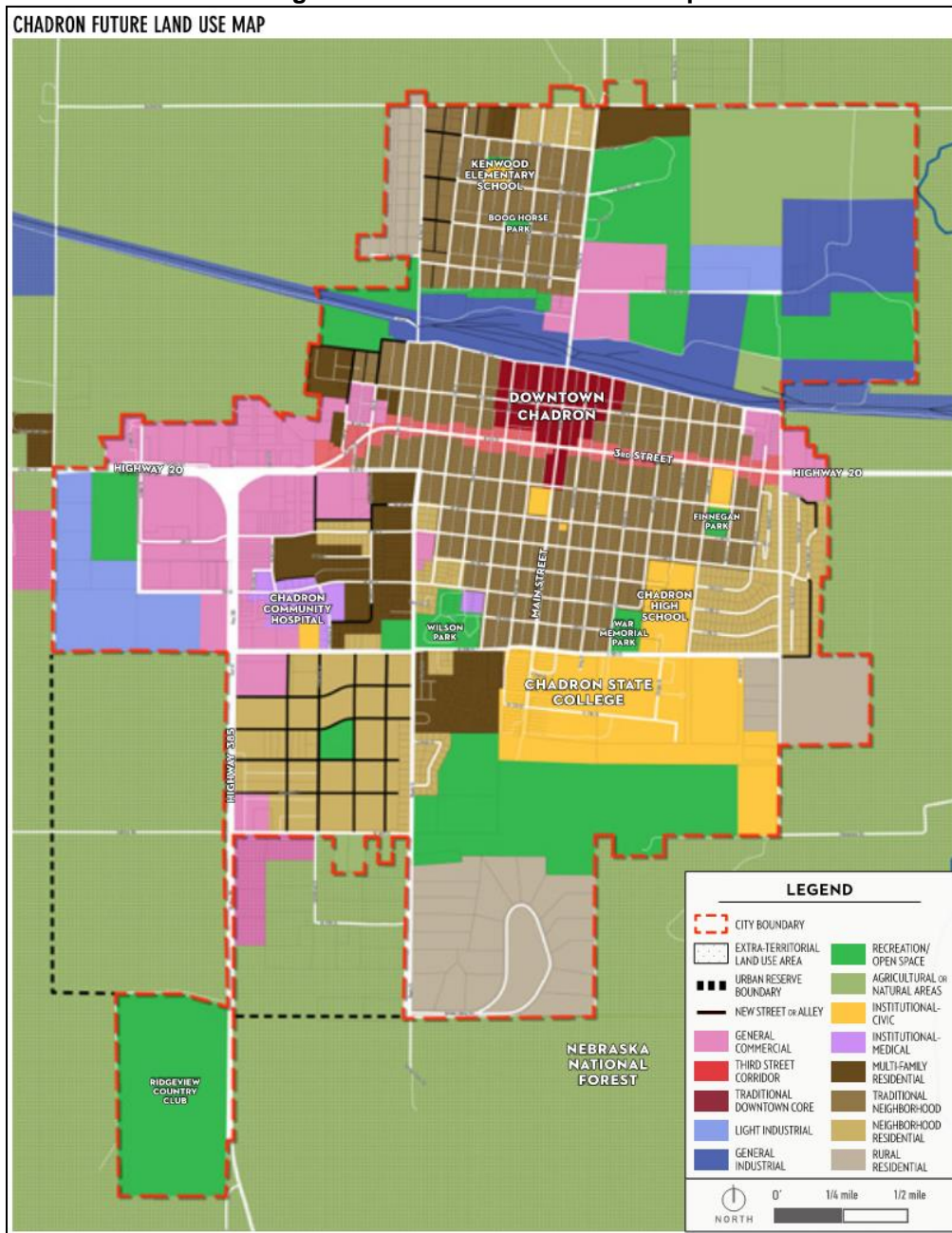
<sup>22</sup> United States Census Bureau. "2017 American Fact Finder: DP04: Selected Housing Characteristics." [database file]. <https://factfinder.census.gov/>.

<sup>23</sup> United States Census Bureau. "2017 American Fact Finder: DP04: Selected Housing Characteristics." [database file]. <https://factfinder.census.gov/>.

## Future Development Trends

Chadron has seen several new commercial developments added over the last five years, including a hotel, retail space, and a restaurant. Some existing businesses in the downtown area have been renovated, as well. Additionally, several multi-family units have been built over that time. Chadron's population has increased steadily over the past few decades and remains relatively stable. The planning team indicated that good employment opportunities and affordable housing have attracted people to the community. Additionally, cultural events offered at Chadron State College attract residents, students, and tourists. No new housing or commercial developments are planned at this time, but the planning team indicated that an industrial park has recently been subdivided to allow for future business opportunity and other lots on East Niobrara Avenue are available.

**Figure CHD.3: Future Land Use Map**



## Structural Inventory and Valuation

The planning team requested GIS parcel data from the County Assessor as of December 2019. This data allowed the planning team to analyze the location, number, and value of property improvements at the parcel level. The data did not contain the number of structures on each parcel. A summary of the results of this analysis is provided in the following table.

**Table CHD.2: Chadron Parcel Valuation**

NUMBER OF PARCELS	NUMBER OF IMPROVEMENTS	TOTAL IMPROVEMENT VALUE	NUMBER OF IMPROVEMENTS IN FLOODPLAIN	VALUE OF IMPROVEMENTS IN FLOODPLAIN
2,265	2,037	\$281,574,709	3	\$507,260

Source: County Assessor

Several Letters of Map Amendment (LOMAs) have been approved by FEMA for the City of Chadron and are described in the table below. Only one of the LOMAs reference a property located within city limits, the Holiday Inn at 247 Ash Street valued at \$5,332,452. All other structures are located within the ETJ.

**Table CHD.3: Chadron Letter of Map Amendments**

PRODUCT ID	EFFECTIVE DATE	DESCRIPTION OF CHANGE
12-07-0255A-310357	12/08/2011	Residential structure at 235 Goffena Road removed from the SFHA.
12-07-3115A-310357	09/18/2012	Structure (Hay Shed) at 254 Goffena Road removed from SFHA.
13-07-0213A-310357	12/18/2012	Structure at 20 Old Country Club Road removed from the SFHA.
16-07-1528A-310357	07/11/2016	A portion of property at 247 Ash Street in the Buettner Addition subdivision removed from the SFHA.
18-07-1023A-310357	03/16/2018	Residential structure at 167 Goffena Road removed from the SFHA.

Source: County Assessor

## Critical Infrastructure/Key Resources

### Hazardous Materials

#### Chemical Storage Fixed Sites

According to the Tier II System reports submitted to the Nebraska Department of Environment and Energy, there are 10 chemical storage sites in Chadron that contain hazardous chemicals. According to the U.S. Coast Guard National Response Center, three fixed chemical spills have occurred in the planning area with no reported damages, injuries, or fatalities.

**Table CHD.4: Chemical Storage Fixed Sites**

FACILITY NAME	ADDRESS
CHADRON COMMUNITY HOSPITAL	821 Morehead St
WESTCO PROPANE PLANT	170 Bordeaux St
CHADRON PLANT	741 E Niobrara Ave
AT&T MICROWAVE TOWER 1300	Wayside Rd
WESTCO CHADRON BULK & WHSE	Jct 1st & Maple Sts
CENTURYLINK	130 E 4th St
WAPA CHADRON SUBSTATION	N Main St
CHADRON COMMUNITY HOSPITAL	825 Centennial Dr



<b>ATC WAYSIDE 88997</b>	Wayside Rd
<b>NDOT CHADRON YARD</b>	430 Stockade Rd

Source: Nebraska Department of Environment and Energy<sup>24</sup>

The local planning team indicated several changes to chemical storage sites have occurred in the past few years which may not be reflected in the list above. These include several facilities which are no longer occupied (Chadron Community Hospital facility, NDOT Chadron Yard 50400, and NDOT Chadron Yard 50500), inaccurate addresses (Westco Chadron Bulk and WHSE located at 131 Taylor Ave), facilities located outside of the jurisdictional boundary (AT&T Microwave Tower 1300 and WAPA Chadron Substation), and a new NDOT Yard located at 430 and 638 Stockade Road.

<sup>24</sup> Nebraska Department of Environment and Energy. "Search Tier II Data." Accessed April 2020. <https://deg-iis.ne.gov/tier2/search.faces>.

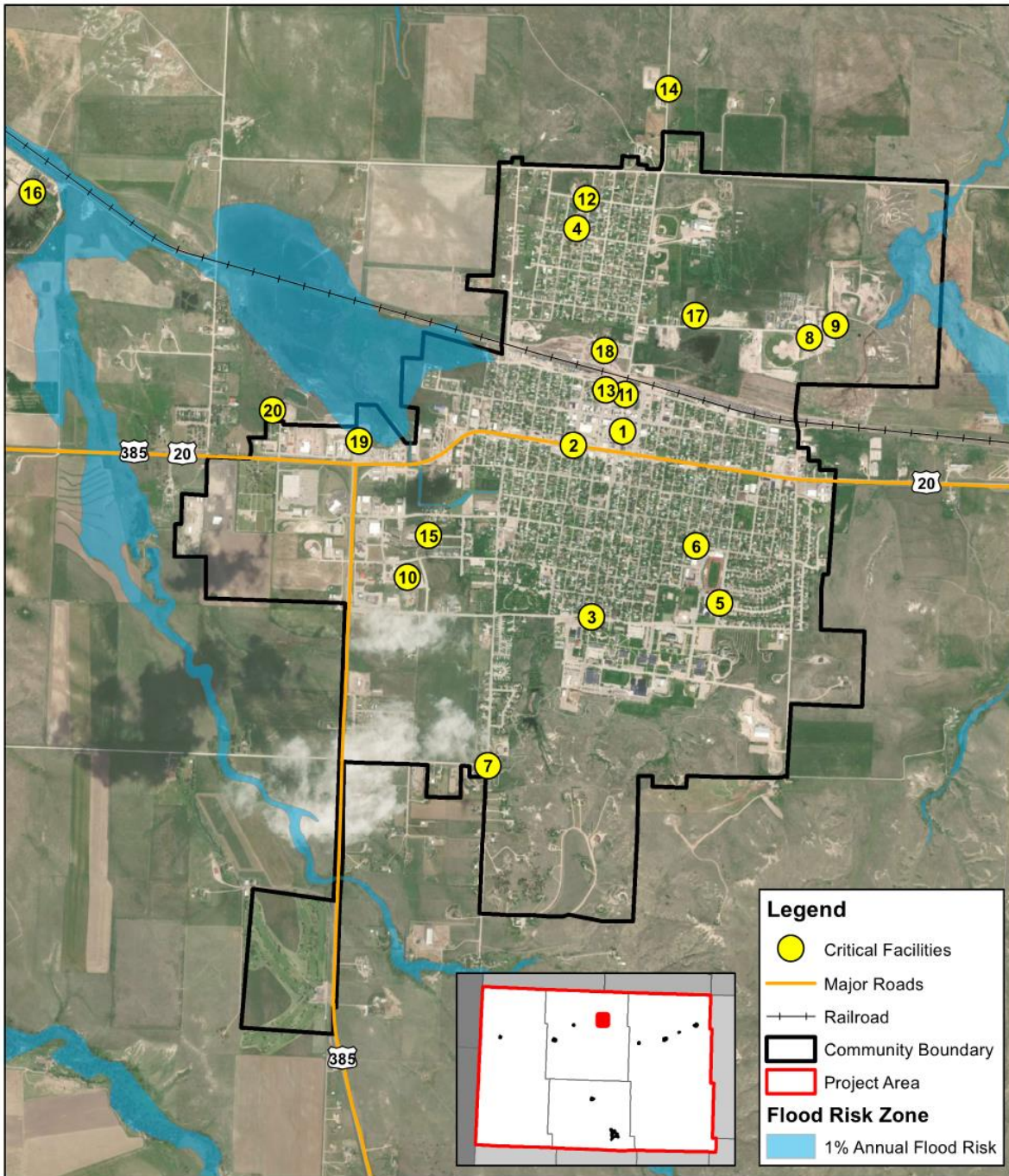
### Critical Facilities

Each participating jurisdiction identified critical facilities vital for disaster response, providing shelter to the public, and essential for returning the jurisdiction's functions to normal during and after a disaster per the FEMA Community Lifelines guidance. Critical facilities were identified during the original planning process and updated by the local planning team as a part of this plan update. The following table and figure provide a summary of the critical facilities for the jurisdiction.

**Table CHD.5: Critical Facilities**

CF Number	Name	Shelter (Y/N)	Generator (Y/N)	Floodplain (Y/N)
1	City Hall	N	N	N
2	Chadron Fire Hall	N	Y	N
3	Chadron State College	Y	Y	N
4	Chadron Intermediate School	N	N	N
5	Chadron Senior High School	Y	N	N
6	Chadron Middle School	Y	N	N
7	Water Treatment Plant	N	N	N
8	Street Department	N	N	N
9	SWANN Sanitation	N	N	N
10	Community Hospital	N	N	N
11	Crestview Care Facility Center	N	N	N
12	Police Department	N	Y	N
13	NPPD	N	N	N
14	NPPD Sub Station	N	N	N
15	Prairie Pine Lodge	N	N	N
16	Wastewater Treatment Plant	N	Y	N
17	Lift Station 1	N	N	N
18	Lift Station 2	N	N	N
19	Lift Station 3	N	N	N
20	Lift Station 4	N	N	N

Figure CHD.4: Critical Facilities



Created By: AK  
 Date: 6/11/2020  
 Software: ArcGIS 10.7.1  
 File: Region 23\_Critical Facility\_Floodplain.mxd

This map was prepared using information from record drawings supplied by JEO and/or other applicable city, county, federal, or public or private entities. JEO does not guarantee the accuracy of this map or the information used to prepare this map. This is not a scaled plot.  
 This Flood Risk Hazard Area was developed using HAZUS 4.2 as the digital FRM was unavailable. This map should only be used for planning purposes and does not reflect the regulatory floodplain.

# City of Chadron

## Critical Facilities

0 0.25 0.5 Miles

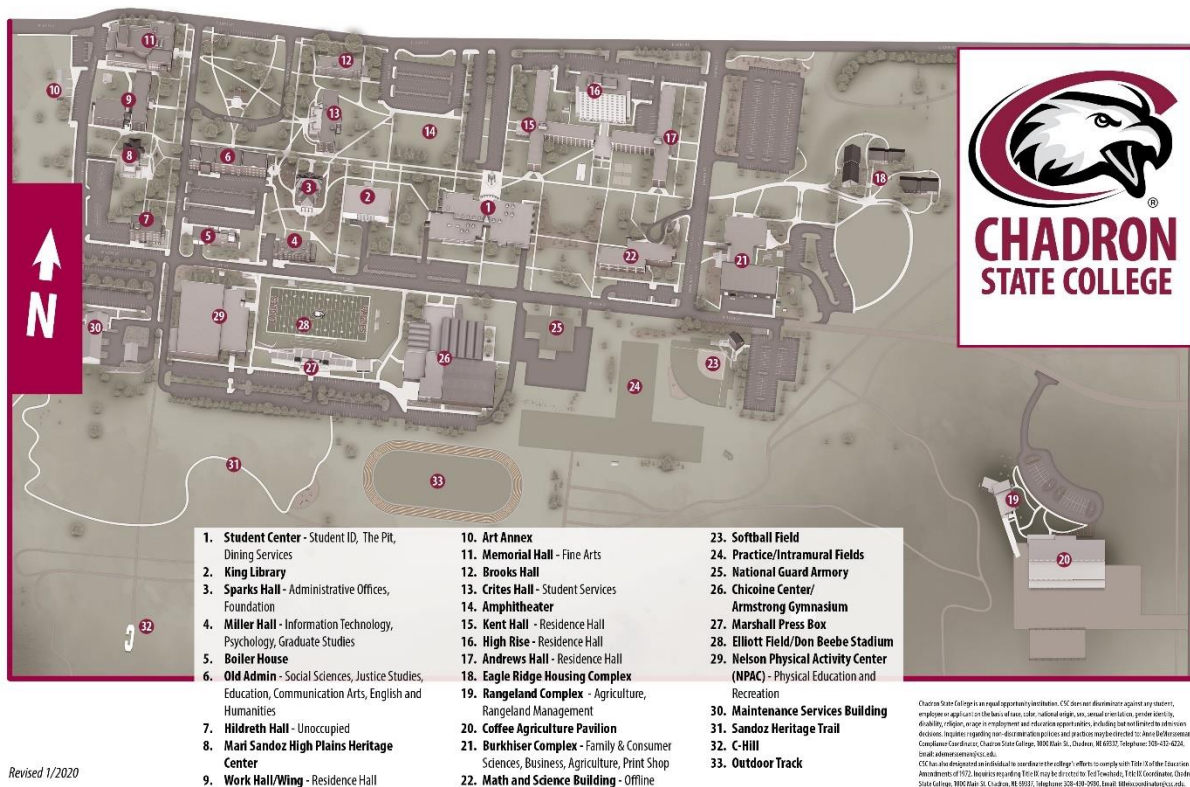
## Chadron State College

Chadron State College is a four-year public college located in the southeast portion of Chadron on the outskirts of the community. Chadron State College was founded in 1909 by the Nebraska Legislature to provide a higher education institution in northwest Nebraska. The Board of Education of State Normal Schools selected Chadron as the location of its fourth institution in January 1910. The school opened in June 1911.

Chadron State College has an annual enrollment of approximately 3,000 students. Many majors are offered, but the college specializes in education. Chadron State College is accredited by the Higher Learning Commission of the North Central Association of Colleges and Schools and subject-oriented accrediting agencies. The college's theme is "A tradition of excellence in education and service." The following figures display the location of Chadron State College within the City of Chadron as well as the campus facilities.

Due to the similar risks, response capabilities, and shared resources available, Chadron State College and the City of Chadron work closely together during emergency events and are profiled together in this HMP. Identified mitigation actions would be a joint venture and are included together in the *Mitigation Strategy* section.

Figure CHD.5: Chadron State College Campus Map



Source: Chadron State College Website

The campus is adjacent to grasslands and the Pine Ridge forest. The 281-acre campus has 25 major buildings, five of which are listed in the National Register of Historic Places. Their replacement value is more than \$60 million and the campus provides more than 1 million square feet of floor space. Chadron State College does not have any buildings within the one percent annual floodplain, but the entire campus is located in the WUI.

## **Hazards of Top Concern**

The college identified Severe Thunderstorms, Severe Winter Storms, and Wildfire as hazards of top concern. While the City of Chadron also identified each of these hazards, a brief discussion of campus specific concerns is provided below:

### **Severe Thunderstorms**

Several thunderstorms occur annually in the area which affects campus. A major hailstorm in the late 1980s caused severe damage to facility buildings. Hail damage has historically affected roofs, utilities, and trees. Heavy rains have caused localized ponding at Eagle Ridge 1, 2, and 3 buildings. Crites Hall historically experienced flooding issues, but measures have been taken recently to resolve the issue. A campus horticulturist monitors and guides the removal of hazardous trees and tree limbs. The planning team also indicated that all rooms have emergency exit signs and most buildings have basements. Additionally, the school performs a tornado drill annually.

### **Severe Winter Storms**

Severe winter storms cause class cancellations and shutdowns several times annually, especially during late winter and early spring months. College maintenance staff clear parking lots and sidewalks, but equipment is in need of updating. Primary concerns for severe winter storms are for the safety of staff and students as they traverse campus or travel in surrounding areas. The College has had several power outages lasting up to 12 hours. A power substation is located on the east side of campus and powerlines are buried. There are generators at the food service center, utilities building (for heating purposes), Miller (IT) building, and recreational facility. The seven residence halls do not have generators.

### **Wildfire**

Wildfire is of high concern for the college. In the summer of 2006, a wildfire spread to the edge of campus borders and prompted evacuations of staff on campus. Local fire departments and surrounding VFDs all responded to the event. Facility roofs were watered to prevent continued spread and all vehicles were moved out of the approaching area. The college does not have their own resources to respond to fires.

## **Historical Occurrences**

See the Dawes County community profile for historical hazard events.

## **Hazard Prioritization**

For an in-depth discussion regarding area wide hazards, please see *Section Four: Risk Assessment*. The hazards discussed in detail below were selected by the local planning team from the regional hazard list as the relevant hazards for the community. The selected hazards were then prioritized by the local planning team based on historical hazard occurrences, potential impacts, and the community's capabilities.

### **High Winds and Tornadoes**

The local planning team identified high winds and tornadoes as a significant concern for the community. According to the NCEI, there were 49 high wind events in Dawes County and four tornadoes which passed near Chadron since 1996. All tornadoes were either EF/F 0 with no reported damages, injuries, or fatalities. High wind events report between 60 and 75 miles per hour. Winds of this magnitude, according to the Beaufort Wind Force Ranking, can cause trees to uproot, considerable structure damage, and overturning of improperly anchored mobile homes. The City has removed several hazardous buildings at risk to high winds and tornadoes and has

been working to reduce the overall number of vacant and dilapidated mobile homes in town. The City also follows and enforces the local building code for wind speed.

### **Severe Thunderstorms**

Severe thunderstorms are a common occurrence across the planning area and include impacts from heavy rain, thunderstorm winds, lightning strikes, and hail. Heavy rains and hailstorms are a top threat for the City of Chadron. NCEI data records 96 hail events with a total of \$292,000 in property damages. Severe thunderstorm damages totaled \$642,000 for the City. The City's Storm Water Master Plan identifies several stormwater infrastructure deficiencies which the City is addressing. In addition, the local building code has updated requirements for residential homes, city facilities, and infrastructure.

### **Severe Winter Storms**

Severe winter storms are a normal part of the regional climate. The planning teams estimated that severe winter storms were highly probable in the future, but given the frequency of occurrence residents across the county are prepared for the events and able to effectively cope with their occurrences. According to the NCEI, Dawes County has experienced 96 severe winter storm events including blizzards, winter storms, winter weather, extreme cold, and ice storms. These events have caused there were 37 severe winter storms in Chadron. These events resulted in \$27,000 in property damage but no injuries or fatalities. The City removes snow from local roads, but current resources are not sufficient to meet local needs.

### **Wildfires**

Wildfire is a top hazard of concern for the City and the planning area as a whole. According to the Nebraska Forestry Department there were 86 reported fires by the Chadron Fire Department from 2000 to 2018 which consumed a total of 465 acres. The most significant fire to impact the city was the 2006 Spotted Tail Fire. This event threatened the southern portion of Chadron and much of the city evacuated. According to the Rapid City Journal, "Some 68,000 acres of Pine Ridge forest in Dawes and Sioux counties burned following a string of intense lightning fires on July 26. At least four homes and several other structures along with about 500 miles of fences were destroyed. One of the fires, the Spotted Tail Fire, began about 12 miles south of Chadron and burned to the edge of the Chadron State College campus. At least 1,000 firemen from 20 states helped battle the blazes. Temperatures of more than 100 degrees added to the misery." The City of Chadron lies within the WUI according to the CWPP. The Chadron Fire Department has mutual aid agreements with the fire departments in the surrounding areas, but during large scale events it is possible nearby fire department would be unable to lend assistance due to addressing the needs of their respective community/protection area. The Nebraska Forest Service has worked on to reduce fire fuel loads in the area.

## **Governance**

A community's governance indicates the number of boards or offices that may be available to help implement hazard mitigation actions. Chadron has a number of offices or departments that may be involved in implementing hazard mitigation initiatives. The City has a City Manager and a five member council and the following offices.

- City Manager
- City Clerk
- City Attorney
- Business Improvement District
- Housing Authority

- Planning Commission
- Community Development Advisory Committee
- Planning Commission
- Property Maintenance Code-Problem Resolution Team
- Zoning Board
- Police Department
- Volunteer Fire Department
- Streets Department
- Water/Sewer Department
- Parks/Cemetery Board
- Airport Authority

## Capability Assessment

The capability assessment consisted of a Capability Assessment Survey completed by the jurisdiction and a review of local existing policies, regulations, plans, and the programs. The survey is used to gather information regarding the jurisdiction's planning and regulatory capability; administrative and technical capability; fiscal capability; and educational and outreach capability.

Table CHD.6: Capability Assessment

Survey Components/Subcomponents		Yes/No
<b>PLANNING &amp; REGULATORY CAPABILITY</b>	Comprehensive Plan	Yes
	Capital Improvements Plan	Yes
	Economic Development Plan	Yes
	Emergency Operational Plan	Yes
	Floodplain Management Plan	Yes
	Storm Water Management Plan	Yes
	Zoning Ordinance	Yes
	Subdivision Regulation/Ordinance	Yes
	Floodplain Ordinance	Yes
	Building Codes	Yes
	National Flood Insurance Program	Yes
	Community Rating System	<i>No (currently under development)</i>
	Community Wildfire Protection Plan	Yes
Other (if any)	<i>Wellhead Protection Plan</i>	
<b>ADMINISTRATIVE &amp; TECHNICAL CAPABILITY</b>	Planning Commission	Yes
	Floodplain Administration	Yes
	GIS Capabilities	Yes
	Chief Building Official	Yes
	Civil Engineering	<i>Contracted</i>
	Local Staff Who Can Assess Community's Vulnerability to Hazards	Yes
	Grant Manager	Yes
	Mutual Aid Agreement	Yes

Survey Components/Subcomponents		Yes/No
	Other (if any)	
<b>FISCAL CAPABILITY</b>	Capital Improvement Plan/ 1 & 6 Year plan	Yes
	Applied for grants in the past	Yes
	Awarded a grant in the past	Yes
	Authority to Levy Taxes for Specific Purposes such as Mitigation Projects	Yes
	Gas/Electric Service Fees	No
	Storm Water Service Fees	No
	Water/Sewer Service Fees	Yes
	Development Impact Fees	Yes
	General Obligation Revenue or Special Tax Bonds	Yes
	Other (if any)	<i>Fire Department Revenue, Property Taxes and Bonds for Aquatic Center</i>
<b>EDUCATION &amp; OUTREACH CAPABILITY</b>	Local citizen groups or non-profit organizations focused on environmental protection, emergency preparedness, access and functional needs populations, etc. Ex. CERT Teams, Red Cross, etc.	Yes
	Ongoing public education or information program (e.g., responsible water use, fire safety, household preparedness, environmental education)	No
	Natural Disaster or Safety related school programs	No
	StormReady Certification	<i>No (Chadron State College – Yes)</i>
	Firewise Communities Certification	No
	Tree City USA	Yes
	Other (if any)	

Overall Capability	Limited/Moderate/High
Does your county have the financial resources needed to implement mitigation projects?	Limited
Does your county have the staff/expertise to implement projects?	Limited
Does your county have the community support to implement projects?	Moderate/High
Does your county staff have the time to devote to hazard mitigation?	Limited



## Plan Integration

The City's Comprehensive Plan was last updated in February 2015. The plan evaluates a range of demographic, housing, economic, environmental, and land use characteristics of the community. It also identifies numerous community facilities as included in the critical facilities list (city hall, police and fire, schools, etc.) and provides an overview of Chadron State College as well. In general, the plan calls for sustained growth and limiting development impacts to natural areas. It encourages infill development, encourages elevation of structures in the floodplain, the use of drought tolerant landscaping, and other mitigation principles. The city has identified the need for future updates to include more discussion on the WUI and long term management strategies. The Downtown Master Plan was developed in 2013. The Plan's major emphasis is capitalizing on the Downtown area's history and historic architecture and reinvestment. The plan proposes numerous design and public space enhancements as well such as along Main Street and 1<sup>st</sup>, 2<sup>nd</sup>, and 3<sup>rd</sup> streets. The City will be adopting the 2018 IBC in the fall of 2020. Specific amendments to building codes and zoning ordinances are done as needed.

The City developed a Community Housing Study in September 2017. The study provides an overview of the community including a historic overview, demographics, community development, and overall housing stock, age, and needs. The study also discusses community improvement projects planned such as the Chadron Community Hospital, airport improvements, and street improvements. Through the study and the public outreach efforts housing needs identified included: additional housing for low and middle income families; housing for existing/new employees; single family housing; rehabilitation of owner and renter-occupied housing; housing choices for first-time homebuyers; and retirement housing for low to moderate-income elderly persons. The study encourages future development to avoid floodplain and wetland locations, sites near chemical storage areas, or sites near high traffic volume areas for safety.

The City's Capital Improvement Plan is updated annually and identifies projects or equipment the City has allocated resources to acquiring. The city's annual municipal budget is relatively limited to maintenance efforts. There is currently a bond debt for some community facilities and stormwater improvement projects. The Stormwater Master Plan identifies numerous project areas to improve stormwater drainage in the City, specifically along Main Street. The City also has a Floodplain Management Plan which limits development in the floodplain to a BFE of at least 1-foot.

The City's Snow Removal Plan is updated annually or as needed. The plan outlines responsibilities for the City's Street Department to clear snow after severe winter storm events. The plan also identifies emergency routes including: Main Street, Chadron Avenue, Morehead Street, Second Street, and Third Street. The City has an ordinance in place to prevent parking on snow emergency routes.

The City of Chadron has an annex to the Dawes County LEOP, last updated June 2017. The LEOP incorporates mitigation by: identifying hazards of concern requiring emergency action; specific responsibilities of individual communities or community roles; scenarios that would require evacuation; sheltering locations; an animal disease response plan; media contacts; and other information for the county. This plan is updated every five years by Region 23 Emergency Management Agency.

## Mitigation Strategy

### Completed Actions

MITIGATION ACTION	COMPREHENSIVE CITY DISASTER/EMERGENCY RESPONSE/RESCUE PLAN
DESCRIPTION	Update comprehensive city/village disaster and emergency response /rescue plan.
HAZARD(S)	All Hazards
STATUS	This plan was updated in June 2017 with the assistance of Region 23 Emergency Management

MITIGATION ACTION	DRAINAGE STUDY/STORMWATER MASTER PLAN
DESCRIPTION	Drainage studies can be conducted to identify and prioritize improvements to address site specific localized flooding/drainage problems. Storm water master plans can be conducted to perform a community-wide storm water evaluation, identifying multiple problem areas, and potentially multiple drainage improvements for each.
HAZARD(S)	All Hazards
STATUS	This plan was updated in June 2018 by a bond and general funds.

MITIGATION ACTION	EMERGENCY COMMUNICATION
DESCRIPTION	Establish an action plan to improve communication between agencies to better assist residents and businesses during and following emergencies. Establish inner-operable communications.
HAZARD(S)	All Hazards
STATUS	Code Red is now available to all residents for emergency alerts.

MITIGATION ACTION	WINDBREAKS/LIVING SNOW FENCE
DESCRIPTION	Installation of windbreaks and/or living snow fences to increase water storage capacity in soil and reduce blowing snow/ soil.
HAZARD(S)	High Winds, Severe Thunderstorms, Severe Winter Storms
STATUS	The City of Chadron works with the UNWNRD for tree replacement and installation of trees in needed areas annually.

### Ongoing or New Actions

MITIGATION ACTION	ALERT/WARNING SIRENS
DESCRIPTION	Perform an evaluation of existing alert sirens in order to determine sirens which should be replaced or upgraded. Install new sirens where lacking.
HAZARD(S)	All Hazards
ESTIMATED COST	\$25,000
FUNDING	General Fund, PDM, HMGP
TIMELINE	1 year
PRIORITY	Low
LEAD AGENCY	Police Department
STATUS	This project has not yet been started.

MITIGATION ACTION		BACKUP POWER GENERATORS
<b>DESCRIPTION</b>	Provide a portable or stationary source of backup power to redundant power supplies, municipal wells, lift stations, and other critical facilities and shelters	
<b>HAZARD(S)</b>	Severe Thunderstorms, Severe Winter Storms, Tornadoes and High Winds	
<b>ESTIMATED COST</b>	\$15,000 - \$30,000 per generator	
<b>FUNDING</b>	Utility Rates, HMGP, PDM	
<b>TIMELINE</b>	2-5 years	
<b>PRIORITY</b>	High	
<b>LEAD AGENCY</b>	Public Works and Chadron State College	
<b>STATUS</b>	The Water Treatment Plant needs a generator and other portable generators are also needed. The Chadron State College identified the need for a backup generator at residence halls.	

MITIGATION ACTION		CIVIL SERVICE IMPROVEMENTS
<b>DESCRIPTION</b>	Improve emergency rescue and response equipment and facilities by providing additional or updating existing emergency response equipment. This can include fire trucks, ATV's, water tanks/trucks, snow removal equipment, etc. This would also include developing backup systems for emergency vehicles and identifying and training additional personnel for emergency response.	
<b>HAZARD(S)</b>	All Hazards	
<b>ESTIMATED COST</b>	Varies by need	
<b>FUNDING</b>	General Obligation Bonds, General Fund, Property/Sales Tax, PDM, HMGP	
<b>TIMELINE</b>	5+ years	
<b>PRIORITY</b>	Medium	
<b>LEAD AGENCY</b>	Public Works and Chadron State College	
<b>STATUS</b>	Equipment is continually replaced on an as-needed basis. Additional needs should be evaluated. Chadron State College identified the need for improved snow removal equipment.	

MITIGATION ACTION		DROUGHT MONITORING PLAN AND PROCEDURES
<b>DESCRIPTION</b>	Develop and implement a plan/program to monitor the effects of drought.	
<b>HAZARD(S)</b>	Drought and Extreme Heat	
<b>ESTIMATED COST</b>	\$10,000	
<b>FUNDING</b>	General Fund, NRD, HMGP, PDM	
<b>TIMELINE</b>	5+ years	
<b>PRIORITY</b>	Low	
<b>LEAD AGENCY</b>	UNWNRD, Chadron Public Works	
<b>STATUS</b>	This project has not yet been started.	

MITIGATION ACTION		EXPAND WATER STORAGE CAPACITY
<b>DESCRIPTION</b>	Evaluate the need to expand water storage capacity through a new water tower, stand pipe, etc. to provide a safe water supply for the community and additional water for fire protection. Establish emergency water supplies such as dry hydrants and individual or community cisterns for defending structures from wildland fires.	
<b>HAZARD(S)</b>	Drought and Extreme Heat, Wildfire	
<b>ESTIMATED COST</b>	\$30,000	
<b>FUNDING</b>	Utility Rates, Bonds	
<b>TIMELINE</b>	5+ years	
<b>PRIORITY</b>	Medium	
<b>LEAD AGENCY</b>	Public Works	
<b>STATUS</b>	The Water System Master Plan was completed in June 2018 but still requires full implementation. Strategies to expand water capacity are outlined in the plan.	

MITIGATION ACTION		FIRE PREVENTION PROGRAM
<b>DESCRIPTION</b>	The Nebraska Forest Service Wildland Fire Protection Program provides services in wildfire suppression training, equipment, pre-suppression planning, wildfire preventions, and aerial fire suppression.	
<b>HAZARD(S)</b>	Wildfire	
<b>ESTIMATED COST</b>	Varies by scope	
<b>FUNDING</b>	NFS, HMGP, PDM, General Funds	
<b>TIMELINE</b>	5+ years	
<b>PRIORITY</b>	High	
<b>LEAD AGENCY</b>	City Administration, NFS	
<b>STATUS</b>	Fire Suppression in the surrounding area is an ongoing action. The City removes hazardous trees as needed and works with the NFS to respond to fire events and suppression training as needed.	

MITIGATION ACTION		FIRE WISE COMMUNITY
<b>DESCRIPTION</b>	Work with the Nebraska Forest Service and US Forest Service to become a Fire Wise Communities/USA participant. Develop a Community Wildfire Protection Plan. Train land owners about creating defensible space. Enact ordinances and building codes to increase defensible space, improve building materials to reduce structure ignitability, and increase access to structures by responders. Develop and implement brush and fuel thinning projects.	
<b>HAZARD(S)</b>	Wildfire	
<b>ESTIMATED COST</b>	\$20,000+	
<b>FUNDING</b>	NFS, HMGP, PDM, General Fund	
<b>TIMELINE</b>	5+ years	
<b>PRIORITY</b>	High	
<b>LEAD AGENCY</b>	City Administrator, NFS, USDA	
<b>STATUS</b>	This project has not yet been started.	

MITIGATION ACTION		HAZARDOUS TREE REMOVAL
DESCRIPTION	Identify and remove hazardous limbs and/or trees.	
HAZARD(S)	Drought and Extreme Heat, Severe Thunderstorms, Severe Winter Storms, Tornadoes and High Winds	
ESTIMATED COST	\$250+ per tree	
FUNDING	General Fund, Private owners	
TIMELINE	5+ years	
PRIORITY	High	
LEAD AGENCY	Public Works	
STATUS	Hazardous trees are removed on an as needed basis.	

MITIGATION ACTION		IMPROVE SNOW/ICE REMOVAL PROGRAM
DESCRIPTION	Improve the snow routes and snow/ice removal procedures for streets. Improvements should address plowing snow, ice removal, parking during snow and ice removal, and removal of associated storm debris.	
HAZARD(S)	Severe Winter Storms	
ESTIMATED COST	\$20,000+	
FUNDING	Streets Fund	
TIMELINE	2 – 5 years	
PRIORITY	Medium	
LEAD AGENCY	Public Works	
STATUS	This is an ongoing effort to update and revise plan as needed.	

MITIGATION ACTION		PUBLIC AWARENESS/EDUCATION
DESCRIPTION	Considerations for activities include outreach projects and the distribution of maps and environmental education materials to increase public awareness of natural hazards to public and private property owners, property renters, businesses, and local officials. Other activities include providing education to citizens on water conservation methods. Purchasing and using equipment such as overhead projectors and laptops will allow for easier ways to educate the public during meetings.	
HAZARD(S)	All Hazards	
ESTIMATED COST	\$500+	
FUNDING	General Funds, Utility Funds	
TIMELINE	5+ years	
PRIORITY	Low	
LEAD AGENCY	All departments (managers) responsible for own education efforts	
STATUS	Education and outreach is an ongoing effort.	

MITIGATION ACTION		SOURCE WATER CONTINGENCY PLAN
<b>DESCRIPTION</b>	Villages and cities can evaluate and locate new sources of groundwater to ensure adequate supplies to support the existing community and any additional growth which may occur. Water sources for fire protection may also be developed.	
<b>HAZARD(S)</b>	Drought and Extreme Heat, Wildfire	
<b>ESTIMATED COST</b>	\$10,000+	
<b>FUNDING</b>	Utility Rates, Bonds	
<b>TIMELINE</b>	5+ years	
<b>PRIORITY</b>	Medium	
<b>LEAD AGENCY</b>	Public Works	
<b>STATUS</b>	The Master Plan completed in 2018 identified some needs but additional project implementation is needed.	

MITIGATION ACTION		STORMWATER SYSTEM AND DRAINAGE IMPROVEMENTS
<b>DESCRIPTION</b>	Smaller communities may utilize storm water systems including ditches, culverts, or drainage ponds to convey runoff. Undersized systems can contribute to local flooding. Drainage improvements may include ditch upsizing, ditch cleanout and culvert improvements. Retention and detention facilities may also be implemented to decrease runoff rates while also decreasing the need for other storm water system improvements. Bridges typically serve as flow restrictions along streams and rivers. Cleanout and reshaping of channel segments at bridge crossings can increase conveyance, reducing the potential for flooding. Replacement or modification of bridges may be necessary to provide greater capacity, maintain or improve structural integrity during flood events, and eliminate flooding threats and damages.	
<b>HAZARD(S)</b>	Flooding	
<b>ESTIMATED COST</b>	Varies by scope	
<b>FUNDING</b>	General Fund, Bonds, Grants	
<b>TIMELINE</b>	5+ years	
<b>PRIORITY</b>	Medium	
<b>LEAD AGENCY</b>	Public Works	
<b>STATUS</b>	Improvements are an ongoing action throughout Chadron.	

<b>MITIGATION ACTION</b>		<b>STREAM BANK STABILIZATION/GRADE CONTROL STRUCTURES/CHANNEL IMPROVEMENTS</b>
<b>DESCRIPTION</b>	Stream bank degradation has occurred along many rivers and creeks. Stabilization improvements including rock rip rap, vegetative cover, j-hooks, boulder vanes, etc. can be implemented to reestablish the channel banks. Channel stabilization can protect structures, increase conveyance and provide flooding benefits.	
<b>HAZARD(S)</b>	Flooding	
<b>ESTIMATED COST</b>	\$50,000 – \$100,000+	
<b>FUNDING</b>	General Funds	
<b>TIMELINE</b>	5+ years	
<b>PRIORITY</b>	Low	
<b>LEAD AGENCY</b>	Public Works	
<b>STATUS</b>	This project has not yet been started. The Stormwater Master Plan has identified several potential projects including: rebuilding the channel from Fifth and Maple to under Highway 20; rebuilding the headwall at Fifth and Maple; and various stormwater system upgrades along Main Street.	

**Removed Actions**

<b>MITIGATION ACTION</b>		<b>GROUNDWATER/IRRIGATION/WATER CONSERVATION MANAGEMENT PLAN AND PRACTICES</b>
<b>DESCRIPTION</b>	Develop and implement a plan/ best management practices to conserve water use and reduce total use (high water use to low water use) and consumption of groundwater resources by citizens and irrigators of agricultural land during elongated periods of drought Identify water saving irrigation projects of improvements such as sprinklers of soil moisture monitoring. Potential restrictions on water could include limitation on lawn watering, car washing, farm irrigation restrictions, or water sold to outside sources. Implement BMPs through water conservation practices such as changes in irrigation management, education on no-till agriculture and use of xeriscaping in communities.	
<b>HAZARD(S)</b>	Drought and Extreme Heat	
<b>REASON FOR REMOVAL</b>	This project falls under the responsibility of the NRD. The City would provide input and city information as part of the project.	

<b>MITIGATION ACTION</b>		<b>HAZARDOUS FUELS REDUCTION</b>
<b>DESCRIPTION</b>	The Nebraska Forest Service (NFS) Forest Fuels Reduction Program creates strategically located corridors of thinned forests across the landscape reduces fire intensity, improves fire suppression effectiveness, increases firefighters safety, and better protects lives and property.	
<b>HAZARD(S)</b>	Wildfire	
<b>REASON FOR REMOVAL</b>	This type of project is managed by the NFS. The City collaborates with the NFS as needed.	

**MITIGATION ACTION**                      **MAINTAIN GOOD STANDING IN THE NATIONAL FLOOD INSURANCE PROGRAM**

<b>DESCRIPTION</b>	Maintain Good Standing in the National Flood Insurance Program
<b>HAZARD(S)</b>	Flooding
<b>REASON FOR REMOVAL</b>	While the community will continue to participate in the NFIP, this is no longer considered a mitigation action.

**MITIGATION ACTION**                      **POWER AND SERVICE LINES**

<b>DESCRIPTION</b>	Communities can work with their local Public Power District or Electricity Department to identify vulnerable transmission and distribution lines and plan to bury lines underground or retrofit existing structures to be less vulnerable to storm events. Electrical utilities shall be required to use underground construction methods where possible for future installation of power lines.
<b>HAZARD(S)</b>	Severe Thunderstorms, Severe Winter Storms, Tornadoes and High Winds
<b>REASON FOR REMOVAL</b>	The City leases all power lines and infrastructure from NPPD. Any hardening or burying of power lines would be the responsibility of the NPPD.

**MITIGATION ACTION**                      **WARNING SYSTEMS**

<b>DESCRIPTION</b>	Improve city cable TV interrupt warning system and implement telephone interrupt system such as Reverse 911, emergency text messaging warning system, etc.
<b>HAZARD(S)</b>	High Winds and Tornadoes, Severe Thunderstorms, Severe Winter Storms
<b>REASON FOR REMOVAL</b>	This is no longer a priority for the community as many residents are reliant on cellular phones and alternate types of emergency alert systems such as Code Red and Alert Sense.

**MITIGATION ACTION**                      **WEATHER RADIOS**

<b>DESCRIPTION</b>	Conduct an inventory of weather radios at schools and other critical facilities and provide new radios as needed.
<b>HAZARD(S)</b>	High Winds and Tornadoes, Severe Thunderstorms, Severe Winter Storms
<b>REASON FOR REMOVAL</b>	This is no longer a priority for the community as many residents are reliant on cellular phones and alternate types of emergency alert systems such as Code Red and Alert Sense.



# Community Profile

## CITY OF CRAWFORD

Region 23 Emergency Management Agency  
Multi-Jurisdictional Hazard Mitigation Plan Update

2020

## Local Planning Team

Table CFD.1: Crawford Local Planning Team

NAME	TITLE	JURISDICTION
CONNIE SHELL	Mayor	City of Crawford
JANE DAILEY	Clerk and Treasurer	City of Crawford

## Location and Geography

The City of Crawford is located in eastern Dawes County and covers an area of 1.18 square miles. The White River is located along the northwest side of the city while the White Clay Creek, Squaw Creek and English Creek tributaries of the White River run approximately one mile east of the city.

## Transportation

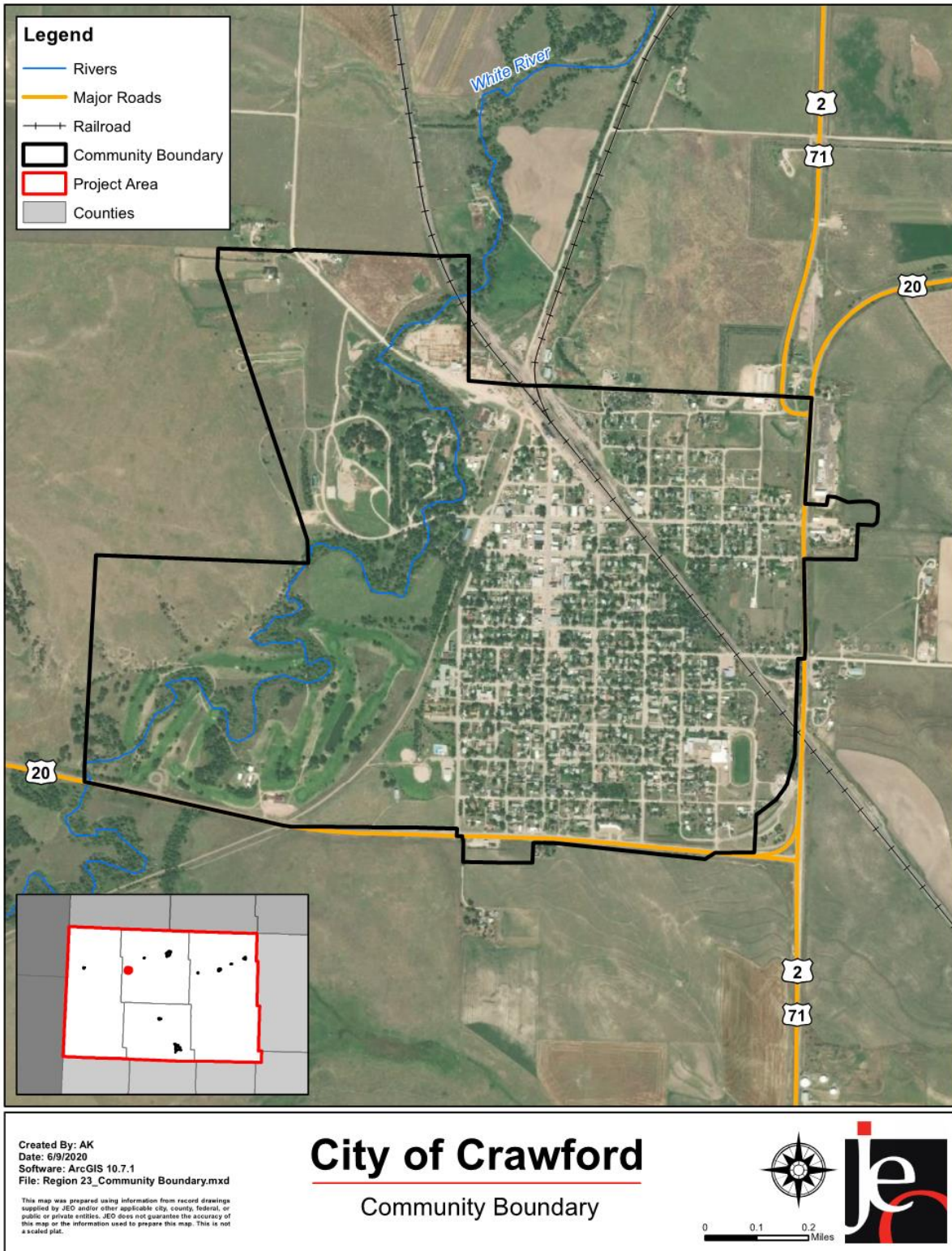
Crawford's major transportation corridors include Nebraska State Highway 71 averages 1,070 vehicles per day and U.S. Highway 20 which averages 1,515 vehicles per day.<sup>25</sup> A Burlington Northern Santa Fe rail line and a DM&E rail line bisect the city. Railroads commonly transport hazardous materials including coal, oil, and waste products through town, which is a major concern for the community. Additionally, any hazardous chemical incidents involving the railroad through town may block major streets and access for residents. Transportation information is important to hazard mitigation plans because it suggests possible evacuation corridors in the community, as well as areas more at risk to transportation incidents.

### Chemical Transportation

Hazardous materials are commonly transported by a range of transportation methods, including highways, rail, air, and pipeline. Railway and highway transportation spills are the most frequently occurring chemical transportation incidents. While incident proximity will always occur near or on transportation methods, it is not possible to predict precise locations of possible future events. Proximity of pipelines, rail lines, and highways near critical facilities or vulnerable population centers, including schools, daycares, nursing homes, and/or hospitals, increases overall vulnerability to chemical transportation spills. A BNSF and a DM&E rail line bisect Crawford and the main highways are commonly used transport hazardous chemicals through Crawford. Private entities, local emergency response units, and state resources have strict regulatory oversight and emergency action plans in place to respond to significant chemical spills. In the case of a chemical spill, the local volunteer fire department and Dawes County Sheriff's Office would respond. Concerns exist for vulnerable populations and residential areas the railroad bisects. The local gas station is located downtown at the major intersection of Highways 20 and 2/71 as well.

<sup>25</sup> Nebraska Department of Roads. "Traffic Flow Map of the State Highways: State of Nebraska." [map]. Scale 1"= 20 miles. State of Nebraska: Department of Roads, 2015. <http://www.roads.nebraska.gov/media/2510/2014-statewide-traffic-flow-map.pdf>

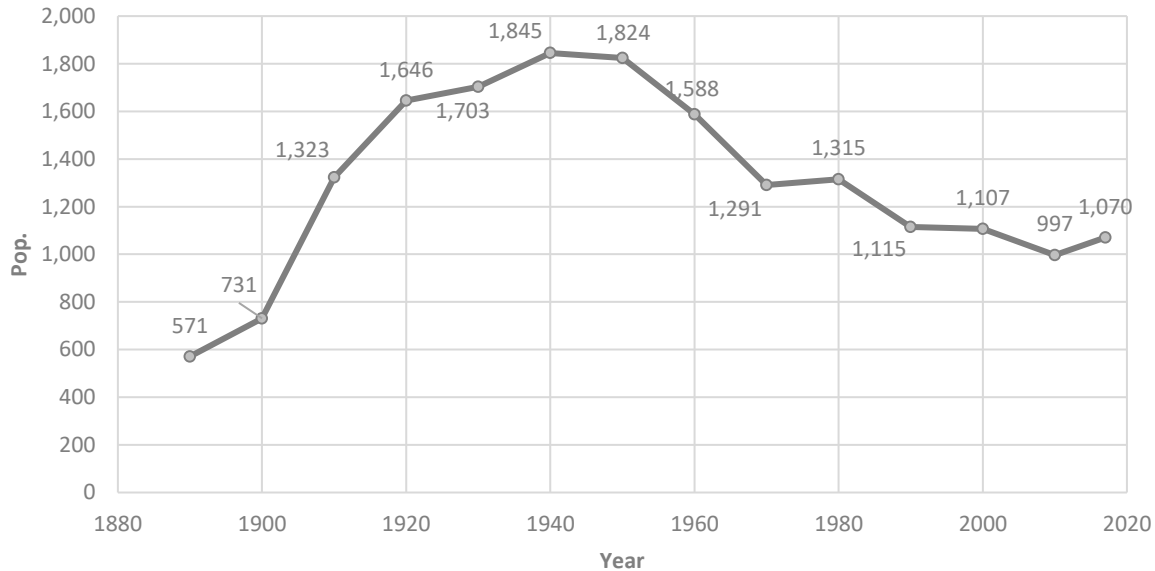
Figure CFD.1: City of Crawford



## Demographics

Crawford's population has declined steadily since the 1940s. Declining populations make communities more vulnerable to hazards as it leads to more unoccupied or vacant housing units and decreasing tax revenues to pursue mitigation projects. Crawford's population accounted for 12% percent of Dawes County's population in 2017.<sup>26</sup>

Figure CFD.2: Estimated Population 1890 – 2017



Source: U.S. Census Bureau<sup>27</sup>

The young, elderly, minorities, and poor may be more vulnerable to certain hazards than other groups. In comparison to the County, Crawford's population was:

- **Older.** The median age of Crawford was 52.3 years old in 2017, compared with the County average of 34.0 years. Crawford's population has grown older since 2010, when the median age was 44.3 years old. Crawford had a smaller proportion of people under 20 years old (24.0%) than the County (27.6%).<sup>28</sup>
- **Less ethnically diverse.** Since 2010, Crawford grew less ethnically diverse. In 2010, 93.8% of Crawford's population was white and 3.0% was two or more races. By 2017, about 99.3% of Crawford's population was white while 0.7% was two or more races. During that time, the white population and two or more races populations in the County grew from 94.0% and 1.1% in 2010 to 89.7% and 3.0% in 2017, respectively.<sup>29</sup>
- **Less likely to be at the federal poverty line.** The poverty rate in Crawford (9.4% of families living below the federal poverty line) is lower than the County's poverty rate (12.8%) in 2017.<sup>30</sup>

<sup>26</sup> United States Census Bureau. "2017 American Fact Finder: S0101: Age and Sex." [database file]. <https://factfinder.census.gov/>.

<sup>27</sup> United States Census Bureau. "2017 American Fact Finder: S0101: Age and Sex." [database file]. <https://factfinder.census.gov/>.

<sup>28</sup> United States Census Bureau. "2017 American Fact Finder: S0101: Age and Sex." [database file]. <https://factfinder.census.gov/>.

<sup>29</sup> United States Census Bureau. "2017 American Fact Finder: DP05: ACS Demographic and Housing Estimates." [database file]. <https://factfinder.census.gov/>.

<sup>30</sup> United States Census Bureau. "2017 American Fact Finder: DP03: Selected Economic Characteristics." [database file]. <https://factfinder.census.gov/>.

## Employment and Economics

The City's economic base is a mixture of industries. In comparison to Dawes County, Crawford's economy had:

- **Similar mix of industries.** Dawes County and Crawford's major employment sectors, accounting for 10% or more of employment each include Retail, Educational Services, and Arts and Entertainment in 2017. Additionally, Dawes County's industries also included Agriculture/Fishing/Forestry, while Crawford's include Construction.<sup>31</sup>
- **Lower household income.** Crawford's median household income in 2017 (\$36,316) was about \$9,830 lower than the County (\$46,146).<sup>32</sup>
- **Similar long-distance commuters.** About 68.3% percent of workers in Crawford commuted for fewer than 15 minutes, compared with about 74% of workers in Dawes County. Both Crawford and Dawes County have approximately 15% of workers who commute 30 minutes or more to work.<sup>33</sup>

## Major Employers

The major employers in the City include the Public School district, Ponderosa Villa, and BNSF Railroad. A small amount of residents may commute to Chadron for work.

## Housing

In comparison to Dawes County, Crawford's housing stock was:

- **More owner occupied.** About 77.3% of occupied housing units in Crawford are owner occupied compared with 62.5% of occupied housing in Dawes County in 2017.<sup>34</sup>
- **Older housing stock.** Crawford has a slightly greater amount of houses built prior to 1970 than the county, 89.7% compared to 80.9% respectively.<sup>35</sup>
- **Fewer multifamily homes.** Crawford contains fewer multifamily housing with five or more units per structure compared to the County (1.3% compared to 8.0%). About 86.6% of housing in Crawford was single-family detached, compared with 77.3% of the County's housing. Crawford has a smaller share of mobile and manufactured housing (8.5%) compared to the County (10.8%).<sup>36</sup> The local planning team indicated that the current planning and zoning regulations only allow single-wide trailers/mobile homes with a conditional use permit to help reduce total amount of mobile home parking.

This housing information is relevant to hazard mitigation insofar as the age of housing may indicate which housing units were built prior to state building codes being developed. Further, unoccupied housing may suggest that future development may be less likely to occur. Finally, communities with a substantial number of mobile homes may be more vulnerable to the impacts of high winds, tornadoes, and severe winter storms.

## Future Development Trends

The City of Crawford has experienced several changes over the past five years. New buildings for commercial use and the Rural Fire Department have been built and efforts to clean up and/or demolish dilapidated buildings using Brownfield assistance have been made. However, the City's

<sup>31</sup> United States Census Bureau. "2017 American Fact Finder: DP03: Selected Economic Characteristics." [database file]. <https://factfinder.census.gov/>.

<sup>32</sup> United States Census Bureau. "2017 American Fact Finder: DP03: Selected Economic Characteristics." [database file]. <https://factfinder.census.gov/>.

<sup>33</sup> United States Census Bureau. "2017 American Fact Finder: S0802: Means of Transportation to Work by Selected Characteristics." [database file]. <https://factfinder.census.gov/>.

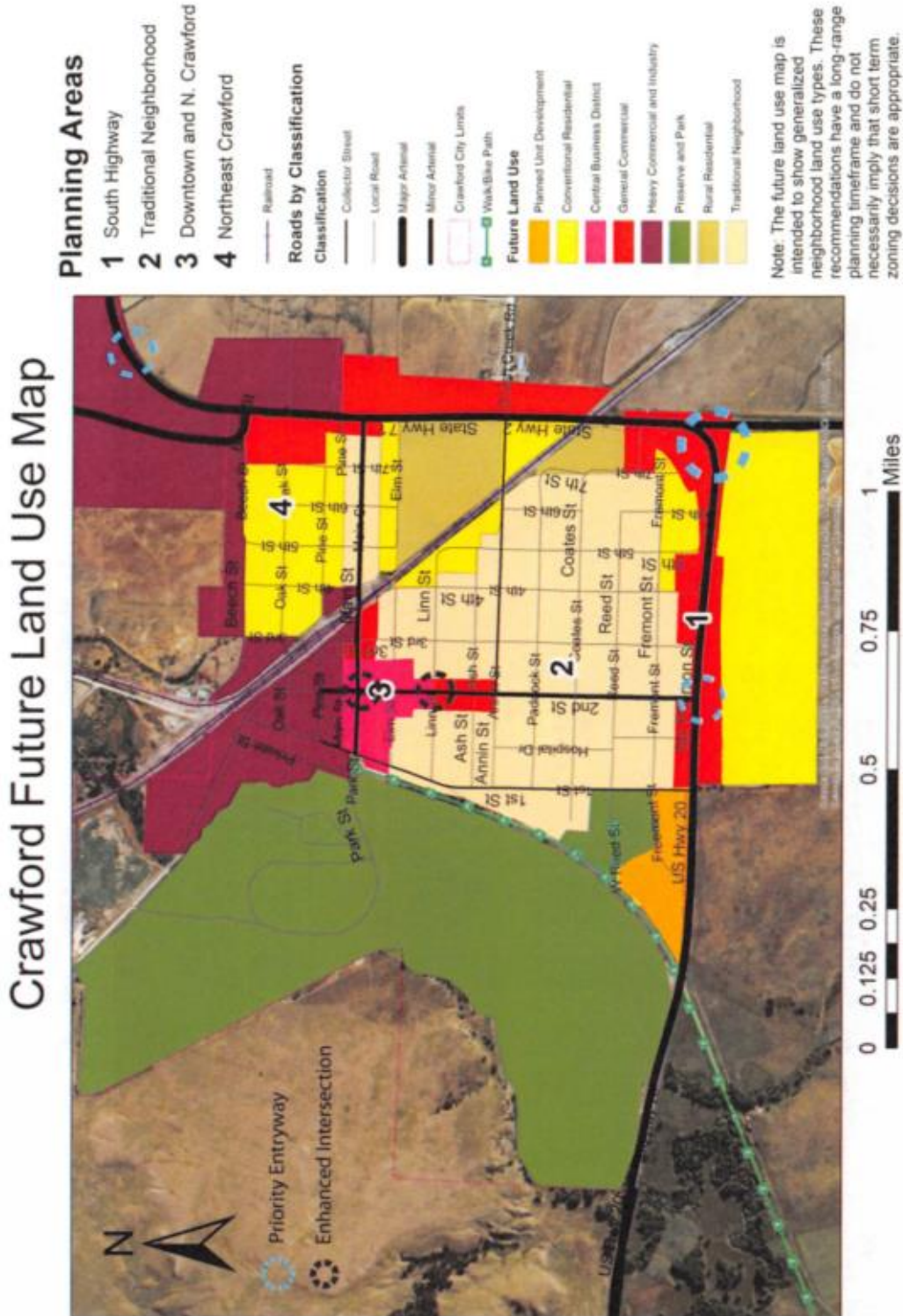
<sup>34</sup> United States Census Bureau. "2017 American Fact Finder: DP04: Selected Housing Characteristics." [database file]. <https://factfinder.census.gov/>.

<sup>35</sup> United States Census Bureau. "2017 American Fact Finder: DP04: Selected Housing Characteristics." [database file]. <https://factfinder.census.gov/>.

<sup>36</sup> United States Census Bureau. "2017 American Fact Finder: DP04: Selected Housing Characteristics." [database file]. <https://factfinder.census.gov/>.

population is declining which the local planning team attributes to a lack of high paying jobs and families moving away to be with other family members. In the next five years the City may see an expansion in the nursing home and low-income facilities; however, no set plans have been made at this time.

Figure CFD.3: Future Land Use Map



## Structural Inventory and Valuation

The planning team requested GIS parcel data from the County Assessor as of December 2019. This data allowed the planning team to analyze the location, number, and value of property improvements at the parcel level. The data did not contain the number of structures on each parcel. A summary of the results of this analysis is provided in the following table.

**Table CFD.2: Crawford Parcel Valuation**

NUMBER OF PARCELS	NUMBER OF IMPROVEMENTS	TOTAL IMPROVEMENT VALUE	NUMBER OF IMPROVEMENTS IN FLOODPLAIN	VALUE OF IMPROVEMENTS IN FLOODPLAIN
735	631	\$34,630,320	5	\$1,164,680

Source: County Assessor

## Critical Infrastructure/Key Resources

### Hazardous Materials

#### Chemical Storage Fixed Sites

According to the Tier II System reports submitted to the Nebraska Department of Environment and Energy, there are seven chemical storage sites in Crawford that contain hazardous chemicals. According to the U.S. Coast Guard National Response Center, no fixed chemical spills have occurred in the community. Additionally, the local planning team identified the Pine Ridge Bulk Plant as an additional possible chemical storage fixed site which is not listed in the NDEE registry.

**Table CFD.3: Chemical Storage Fixed Sites**

FACILITY NAME	ADDRESS
HERITAGE SEED COMPANY INC	324 Main St
WESTCO BULK PLANT	20 W Ash Creek Rd
PINE RIDGE SERVICE CENTER	547 2nd St
WESTCO PROPANE PLANT	6 Oak St
NDOT CRAWFORD YARD 50800	3621 Highway 20
CENTURYLINK*	440 2nd St
CROW BUTTE RESOURCES	86 Crow Butte Rd

Source: Nebraska Department of Environment and Energy<sup>37</sup>

\*The local planning team indicated this facility is no longer in operation.

### Critical Facilities

Each participating jurisdiction identified critical facilities vital for disaster response, providing shelter to the public, and essential for returning the jurisdiction's functions to normal during and after a disaster per the FEMA Community Lifelines guidance. Critical facilities were identified during the original planning process and updated by the local planning team as a part of this plan update. The following table and figure provide a summary of the critical facilities for the jurisdiction.

**Table CFD.4: Critical Facilities**

CF Number	Name	Shelter (Y/N)	Generator (Y/N)	Floodplain (Y/N)
1	Crawford Community Building	Y	N	N
2	Legend Buttes Health Services	N	N	N
3	Bethlehem Lutheran Church	N	N	N

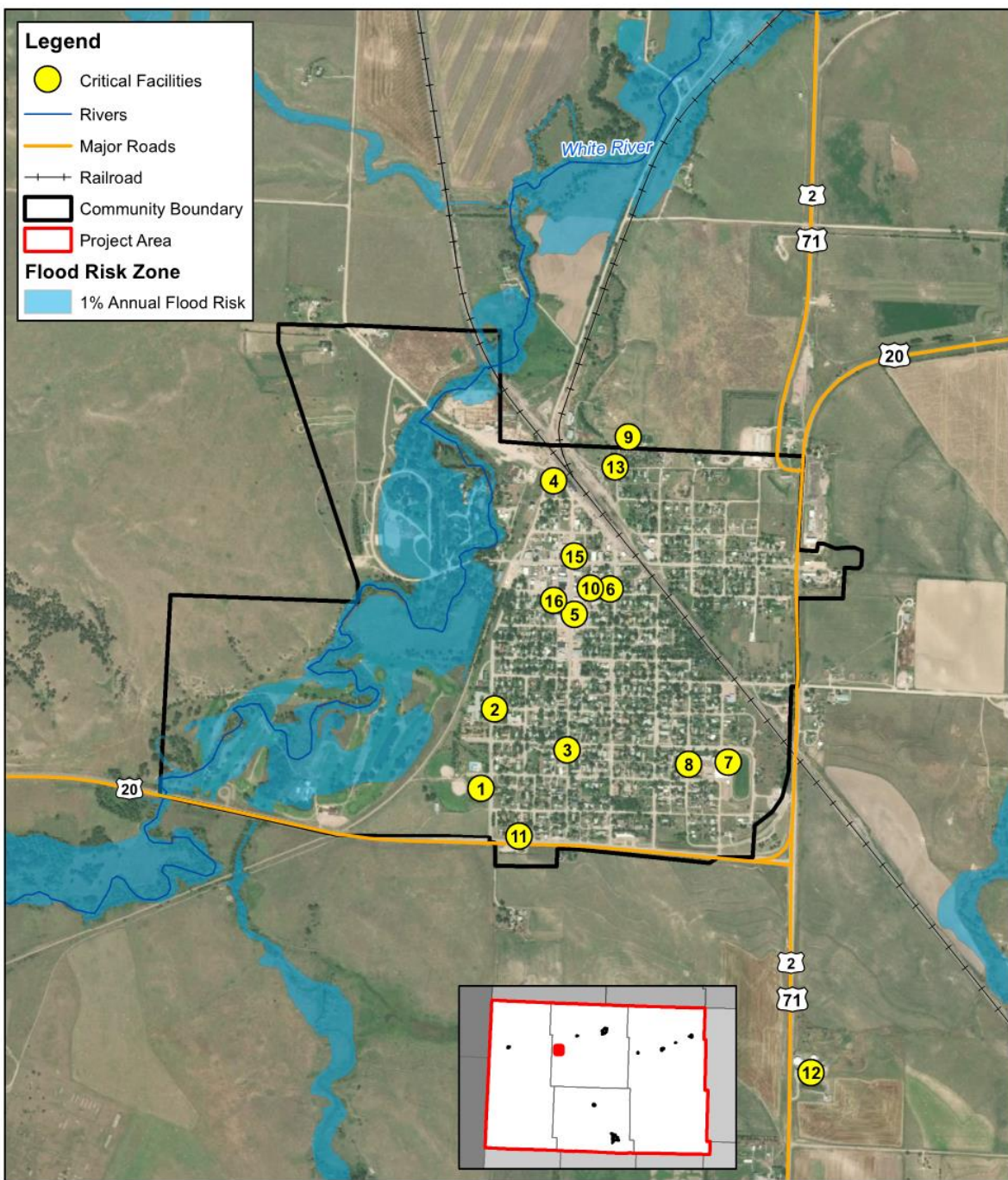
<sup>37</sup> Nebraska Department of Environment and Energy. "Search Tier II Data." Accessed November 2018. <https://deq-iis.ne.gov/tier2/search.faces>.

CF Number	Name	Shelter (Y/N)	Generator (Y/N)	Floodplain (Y/N)
4	NPPD Sub Station	N	N	N
5	Senior Center	N	N	N
6	Methodist Church	N	N	N
7	Crawford High School	N	N	N
8	Crawford Elementary School	N	N	N
9	Sewer Plant	N	N	N
10	Warning Siren	N	N	N
11	Crawford Rural Fire Dept	N	N	N
12	Water Treatment Plant*	N	N	N
13	Sewer Lift Station	N	N	N
14	Cell Phone Tower*	N	N	N
15	Grocery/Pharmacy Store	N	N	N
16	City Hall	N	N	N

\*Not mapped: Cell Phone Tower located south of town along Hwy 2/71



Figure CFD.4: Critical Facilities



Created By: AK  
 Date: 6/9/2020  
 Software: ArcGIS 10.7.1  
 File: Region 23\_Critical Facility\_Floodplain.mxd

This map was prepared using information from record drawings supplied by JEO and/or other applicable city, county, federal, or public or private entities. JEO does not guarantee the accuracy of this map or the information used to prepare this map. This is not a scaled plot.  
 This Flood Risk Hazard Area was developed using HAZUS 4.2 as the digital FRM was unavailable. This map should only be used for planning purposes and does not reflect the regulatory floodplain.

# City of Crawford

## Critical Facilities



0 0.2 0.4 Miles

## Historical Occurrences

See the Dawes County community profile for historical hazard events.

## Hazard Prioritization

For an in-depth discussion regarding area wide hazards, please see *Section Four: Risk Assessment*. The hazards discussed in detail below were selected by the local planning team from the regional hazard list as the relevant hazards for the community. The selected hazards were then prioritized by the local planning team based on historical hazard occurrences, potential impacts, and the community's capabilities.

### High Winds and Tornadoes

The local planning team identified tornadoes and high winds significant concern for the community. In total there were 49 windstorms reported that had winds reported between 60 and 75 miles per hour. Winds of this magnitude, according to the Beaufort Wind Force Ranking, can cause trees to uproot, considerable structure damage, and overturning of improperly anchored mobile homes. According to the NCEI data, there were two tornadoes which have passed near Crawford. Both tornadoes were either EF/F 0 and reported no damages. The current warning siren in Crawford needs to be replaced and the City is currently awaiting funding. There are currently no FEMA certified safe rooms located within Crawford; however, the local planning team indicated the community center and local churches would be used as shelters or emergency supply depots if needed. Many residents have basements in the community.

### Severe Thunderstorms

Severe thunderstorms are a regular part of the climate for Dawes County and Crawford. The local planning team identified severe thunderstorms as the greatest threat for the community. The NCEI recorded 50 thunderstorm events with one injury and \$506,500 in damages to property. Of these events, hail is a top threat and accounted for 43 of reported events. Severe thunderstorms and hail can result in loss of electricity, blocked roadways, damages to trees, and flooding. Blocked roadways, as a result of downed trees, may also present life safety concerns to those needing immediate medical attention and prevent emergency response vehicles from reaching residents. The City removed hazardous trees as needed and replaces trees as part part of the Nebraska Statewide Arboretum. Additionally, the City has completed a stormwater drainage study and is currently creating a Stormwater Master Plan to identify and remediate areas of localized flooding in the city.

### Wildfire

The local planning team identified grass/wildfire as a significant threat for the city. According to the Nebraska Forestry Department there were 372 reported fires by the Crawford Fire Department from 2000 to 2018 which consumed a total of 67,266 acres. The Crawford Fire Department received a USDA grant in 2016 to relocate and construct a new fire hall. The old fire hall was insufficient to meet local needs including equipment storage. However, the new fire hall does not have a backup generator. According to the CWPP there have been five major fires since 1984. The City of Crawford lies within the WUI as defined by the CWPP. The Crawford Fire Department has mutual aid agreements with the fire departments in the surrounding areas, but during large scale events it is possible nearby fire department would be unable to lend assistance due to addressing the needs of their respective community/protection area.

## Governance

A community's governance indicates the number of boards or offices that may be available to help implement hazard mitigation actions. Crawford has a number of offices or departments that

may be involved in implementing hazard mitigation initiatives. The City has a mayor and a four member council and the following offices.

- City Clerk
- City Attorney
- Planning Commission
- Streets Department
- Water/Sewer Department
- Park Board
- Golf Board
- Ponderosa Villa Board (nursing home)
- Community Redevelopment Authority

### Capability Assessment

The capability assessment consisted of a Capability Assessment Survey completed by the jurisdiction and a review of local existing policies, regulations, plans, and the programs. The survey is used to gather information regarding the jurisdiction’s planning and regulatory capability; administrative and technical capability; fiscal capability; and educational and outreach capability.

**Table CFD.5: Capability Assessment**

Survey Components/Subcomponents		Yes/No
<b>PLANNING &amp; REGULATORY CAPABILITY</b>	Comprehensive Plan	Yes
	Capital Improvements Plan	No
	Economic Development Plan	No
	Emergency Operational Plan	Yes
	Floodplain Management Plan	No
	Storm Water Management Plan	No
	Zoning Ordinance	Yes
	Subdivision Regulation/Ordinance	Yes
	Floodplain Ordinance	Yes
	Building Codes	Yes
	National Flood Insurance Program	Yes
	Community Rating System	No
	Community Wildfire Protection Plan	Yes
	Other (if any)	<i>Wellhead Protection Plan</i>
<b>ADMINISTRATIVE &amp; TECHNICAL CAPABILITY</b>	Planning Commission	Yes
	Floodplain Administration	Yes
	GIS Capabilities	No
	Chief Building Official	No
	Civil Engineering	No
	Local Staff Who Can Assess Community’s Vulnerability to Hazards	Yes
	Grant Manager	No
	Mutual Aid Agreement	Yes
	Other (if any)	

Survey Components/Subcomponents		Yes/No
<b>FISCAL CAPABILITY</b>	Capital Improvement Plan/ 1 & 6 Year plan	Yes
	Applied for grants in the past	Yes
	Awarded a grant in the past	No
	Authority to Levy Taxes for Specific Purposes such as Mitigation Projects	Yes
	Gas/Electric Service Fees	No
	Storm Water Service Fees	No
	Water/Sewer Service Fees	Yes
	Development Impact Fees	No
	General Obligation Revenue or Special Tax Bonds	Yes
	Other (if any)	
<b>EDUCATION &amp; OUTREACH CAPABILITY</b>	Local citizen groups or non-profit organizations focused on environmental protection, emergency preparedness, access and functional needs populations, etc. Ex. CERT Teams, Red Cross, etc.	No
	Ongoing public education or information program (e.g., responsible water use, fire safety, household preparedness, environmental education)	No
	Natural Disaster or Safety related school programs	No
	StormReady Certification	No
	Firewise Communities Certification	No
	Tree City USA	No
	Other (if any)	

Overall Capability	Limited/Moderate/High
Does your city have the financial resources need to implement mitigation projects?	Limited
Does your city have the staff/expertise to implement projects?	Limited
Does your city have the community support to implement projects?	Moderate
Does your city staff have the time to devote to hazard mitigation?	Moderate

## Plan Integration

The City's Comprehensive Plan was last updated in 2017 and provides an overview of the community including demographics, economics, land use, utilities and infrastructure, public facilities, transportation corridors, and housing. The plan identifies several critical facilities as discussed in this HMP. The plan does not discuss natural hazards but outlines future growth opportunities for the community which should be evaluated for hazard potential.

The City utilizes the International Building Codes and International Residential Codes. Additional revisions or updates are made as needed. The Zoning and Floodplain Regulations were last updated in April 2011. While current codes and ordinances do not prevent development in the floodplain or hazardous areas, they do require special permitting and requirements. The floodplain is located only within city park areas. The city also has a one- and six-year plan that is updated annually. The plan identifies projects the city plans to pursue including street repairs and replacing a bridge in the city park located within the floodplain.

The City of Crawford has an annex to the Dawes County LEOP, last updated June 2017. The LEOP incorporates mitigation by: identifying hazards of concern requiring emergency action; specific responsibilities of individual communities or community roles; scenarios that would require evacuation; sheltering locations; an animal disease response plan; media contacts; and other information for the county. This plan is updated every five years by Region 23 Emergency Management Agency. The city also has an emergency water plan which is shared with city officials, local health departments, and emergency departments. The plan is reviewed and updated annually. The plan outlines actions to be taken in the case of: power outages, water outage, equipment failures, water contamination, drought, flood, severe weather, fire, terrorism, and earthquake hazards. Communication protocols, available emergency equipment, and emergency water use restrictions are also described.

## Mitigation Strategy

### Completed Actions

MITIGATION ACTION	FLOODPLAIN REGULATION ENFORCEMENT AND UPDATES
<b>DESCRIPTION</b>	Continue to enforce local floodplain regulations for structures located in the 1% annual floodplain. Strict enforcement of the type of development and elevations of structures should be considered through issuance of building permits by the city of Crawford. Continue education of building inspectors or Certified Floodplain Managers
<b>HAZARD(S)</b>	Flooding
<b>STATUS</b>	In 2016 the Nebraska Department of Natural Resources reviewed all City processes and regulations. Some educational floodplain management materials were also shared with the City.

### Ongoing or New Actions

MITIGATION ACTION	ALERT/WARNING SIRENS
<b>DESCRIPTION</b>	Perform an evaluation of existing alert sirens in order to determine sirens which should be replaced or upgraded. Install new sirens where lacking.
<b>HAZARD(S)</b>	All Hazards
<b>ESTIMATED COST</b>	\$15,000+
<b>FUNDING</b>	Tax Revenue, CDBG, PDM, HMGP
<b>TIMELINE</b>	1 year
<b>PRIORITY</b>	High
<b>LEAD AGENCY</b>	City Clerk, City Administrator
<b>STATUS</b>	The City has submitted a Notice of Interest to NEMA/FEMA for this project. The project would be located at the public library.

MITIGATION ACTION		BACKUP POWER GENERATORS
<b>DESCRIPTION</b>	Provide a portable or stationary source of backup power to redundant power supplies, municipal wells, lift stations, and other critical facilities and shelters.	
<b>HAZARD(S)</b>	Severe Thunderstorms, Severe Winter Storms, Tornadoes and High Winds	
<b>ESTIMATED COST</b>	\$30,000+ per generator	
<b>FUNDING</b>	Tax Revenue, PDM, HMGP	
<b>TIMELINE</b>	2 – 5 years	
<b>PRIORITY</b>	High	
<b>LEAD AGENCY</b>	Water Department	
<b>STATUS</b>	This project is not yet started. Generators are needed at the water plant, gallery, and well field.	

MITIGATION ACTION		BECOME A TREE CITY USA
<b>DESCRIPTION</b>	Work to become a Tree City USA through the National Arbor Day Foundation in order to receive direction, technical assistance, and public education on how to establish a hazardous tree identification and removal program in order to limit potential tree damage and damages caused by trees in a community when a storm event occurs.	
<b>HAZARD(S)</b>	Drought and Extreme Heat, Severe Thunderstorms, Severe Winter Storms, Tornadoes and High Winds	
<b>ESTIMATED COST</b>	\$1,000+	
<b>FUNDING</b>	Tax Revenue	
<b>TIMELINE</b>	2 – 5 years	
<b>PRIORITY</b>	Low	
<b>LEAD AGENCY</b>	Park Board	
<b>STATUS</b>	The Community Redevelopment Authority of the City of Crawford has become a member of the NE Statewide Arboretum.	

MITIGATION ACTION		DRAINAGE STUDY/STORMWATER MASTER PLAN
<b>DESCRIPTION</b>	Drainage studies can be conducted to identify and prioritize improvements to address site specific localized flooding/drainage problems. Storm water master plans can be conducted to perform a community-wide storm water evaluation, identifying multiple problem areas, and potentially multiple drainage improvements for each.	
<b>HAZARD(S)</b>	All Hazards	
<b>ESTIMATED COST</b>	\$10,000	
<b>FUNDING</b>	Cost share with USDA	
<b>TIMELINE</b>	2 – 5 years	
<b>PRIORITY</b>	Medium	
<b>LEAD AGENCY</b>	Streets Department	
<b>STATUS</b>	This project is currently underway. The initial Stormwater Drainage Study was completed in December 2017 and the Stormwater Master Plan is currently in the works.	

MITIGATION ACTION		PUBLIC AWARENESS/EDUCATION
<b>DESCRIPTION</b>	Through activities such as outreach projects, distribution of maps and environmental education increase public awareness of natural hazards to both public and private property owners, renters, businesses, and local officials about hazards and ways to protect people and property from these hazards. Also, educate citizens on water conservation methods, evacuation plans, etc. In addition, purchasing equipment such as overhead projectors and laptops.	
<b>HAZARD(S)</b>	All Hazards	
<b>ESTIMATED COST</b>	\$500+	
<b>FUNDING</b>	Tax Revenue	
<b>TIMELINE</b>	1 year	
<b>PRIORITY</b>	Medium	
<b>LEAD AGENCY</b>	City Clerk, Water/Wastewater Departments, Streets Department	
<b>STATUS</b>	This is an ongoing action to share information with the public for water consumption or preventative actions.	

MITIGATION ACTION		SAFE ROOMS
<b>DESCRIPTION</b>	Design and construct storm shelters and safe rooms in highly vulnerable areas such as mobile home parks, campgrounds, school, and other areas	
<b>HAZARD(S)</b>	Severe Thunderstorms, Severe Winter Storms, Tornadoes and High Winds	
<b>ESTIMATED COST</b>	\$250/sf standalone, \$150/sf retrofit	
<b>FUNDING</b>	Tax Revenue, PDM, HMGP	
<b>TIMELINE</b>	5+ years	
<b>PRIORITY</b>	Medium	
<b>LEAD AGENCY</b>	City Council	
<b>STATUS</b>	This project has not yet been started. The Community Center is in need of a safe room.	

MITIGATION ACTION		STORMWATER SYSTEM AND DRAINAGE IMPROVEMENTS
<b>DESCRIPTION</b>		<p>Smaller communities may utilize storm water systems comprising of ditches, culverts, or drainage ponds to convey runoff. Undersized systems can contribute to localized flooding. Drainage improvements may include ditch upsizing, ditch cleanout and culvert improvements. Retention and detention facilities may also be implemented to decrease runoff rates while also decreasing the need for other storm water system improvements. Bridges typically serve as flow restrictions along streams and rivers.</p> <p>Cleanout and reshaping of channel segments at bridge crossings can increase conveyance, reducing the potential for flooding. Replacement or modification of bridges may be necessary to provide greater capacity, maintain or improve structural integrity during flood events, and eliminate flooding threats and damages.</p>
<b>HAZARD(S)</b>		Flooding
<b>ESTIMATED COST</b>		\$10,000 - \$100,000+
<b>FUNDING</b>		Tax Revenue, Loans, HMGP, PDM
<b>TIMELINE</b>		2 – 5 years
<b>PRIORITY</b>		Medium
<b>LEAD AGENCY</b>		City Council, Water/Wastewater Departments
<b>STATUS</b>		An initial Stormwater Drainage Study was completed in December 2017. A Stormwater Master Plan will identify specific needs for the City.

**Removed Actions**

MITIGATION ACTION		MAINTAIN GOOD STANDING IN THE NFIP
<b>DESCRIPTION</b>		Maintain Good Standing in the National Flood Insurance Program
<b>HAZARD(S)</b>		Flooding
<b>REASON FOR REMOVAL</b>		While the City will continue to participate in the NFIP, this is no longer considered a mitigation action by FEMA.