



OGLALA SIOUX TRIBE AND OGLALA LAKOTA COUNTY HAZARD MITIGATION PLAN

SEPTEMBER 2019



PLAN PREPARED BY
JEO CONSULTING GROUP

HAZARD MITIGATION PLANNING TEAM

NAME TITLE

Alva Good Crow -----	Porcupine Service Center
Beth Perkins -----	IHS Pine Ridge Hospital Public Health Nursing Director
Darla Black -----	Oglala Lakota Nation Vice-President
Delores George Pourier-----	Oglala Lakota Nation Health Administration
Donavan Steele-----	Support Services Program Director
Ed Silver -----	IHS Pine Ridge Hospital IT Supervisor
Frank Maynard -----	Oglala Lakota County, Fall River County Emergency Manager
Frank Means-----	Kyle Rural Water
Hopa Haas -----	Indian Health Services
Jackie Siers -----	Wakpamni District Council Representative
James Red Willow-----	Oglala Lakota Nation 5th Member
Jeff Siscoe-----	Bennett County Emergency Manager
Jesse Big Crow -----	OST District Emergency Management-Planning and Coordinating Specialist
Jim Meeks-----	Eagle Nest District Council Representative
Jim Poppen -----	South Dakota State Hazard Mitigation Officer
John Long -----	BIA Pine Ridge Agency Superintendent
John Whirlwind Horse -----	Support Services Liaison Tribal Education Department
Jon Siedschlaw -----	OST Emergency Management Deputy Director
Karin Eagle-----	Oglala Lakota Nation Media Relations
Kyle White-----	Natural & Water Resources
Lester Richards -----	OST EPP Director
Lyla Hutchinson-----	County Commissioner
Lynx Bettelyoun-----	OST Highway Superintendent
Maretta Champagne -----	Pine Ridge Long Term Recovery Team Outreach Coordinator
Mary Tobacco -----	OST Planning Wakpamni District
Melanie Two Eagle-----	Porcupine Service Center
Robert Ecoffey -----	Chief of Police
Robert Lafferty -----	Oglala Lakota Nation Hazard Mitigation
Robert Pille-----	Water & Sewer
Rodney Rouillard -----	OST Road Maintenance
Shawn Swallow -----	OST Natural Resources
Shelby Ross -----	OST Natural Resources Porcupine District
Stacey Martin-----	Fall River County GIS
Stephen Pourier-----	Utilities Director
Steve Wilson, Sr. -----	OST Emergency Manager
Stevie Lone Dog -----	Oglala Lakota Nation
Thomas Brings -----	OST Natural Resources
Troy Ferguson-----	E-911 and GIS
Valentina Merdanian-----	Oglala County Representative
Vince Martin-----	Oglala Sioux Lakota Housing
Wendell Yellow bull -----	County Commissioner
William Hillman-----	Water & Sewer
*Becky Appleford -----	JEO Consulting Group
*Brooke Welsh -----	JEO Consulting Group
*Ellana Haakenstad -----	JEO Consulting Group
*Jeff Henson -----	JEO Consulting Group
<i>*Served as an advisory or consultant role</i>	

TABLE OF CONTENTS

HAZARD MITIGATION PLANNING TEAM	I
LIST OF FIGURES	V
LIST OF TABLES	VI
LIST OF ACRONYMS	IX
EXECUTIVE SUMMARY	XI
INTRODUCTION	XI
GOALS AND OBJECTIVES	XIII
SUMMARY OF CHANGES	XIV
PLAN IMPLEMENTATION	XV
HAZARD PROFILES	XVI
HAZARDS SUMMARY	XVIII
DROUGHT	XVIII
HAIL	XVIII
SEVERE WINTER STORMS	XVIII
TORNADOES	XVIII
SEVERE THUNDERSTORMS	XIX
MITIGATION STRATEGIES	XIX
SECTION ONE INTRODUCTION	1
HAZARD MITIGATION PLANNING	1
DISASTER MITIGATION ACT OF 2000	1
HAZARD MITIGATION ASSISTANCE	2
PLAN FINANCING AND PREPARATION	3
SECTION TWO PLANNING PROCESS	5
INTRODUCTION	5
MULTI-JURISDICTIONAL APPROACH	5
HAZARD MITIGATION PLANNING PROCESS	6
ORGANIZATION OF RESOURCES	7
PLAN UPDATE PROCESS	7
PLANNING TEAM AND INVOLVEMENT	8
PUBLIC INVOLVEMENT	10
NEIGHBORING JURISDICTIONS	10
OUTREACH	11
ASSESSMENT OF RISK	11
HAZARD IDENTIFICATION	11
MITIGATION PLAN DEVELOPMENT	13
MITIGATION STRATEGIES	13
DATA SOURCES AND INFORMATION	14
PUBLIC REVIEW	16
PLAN ADOPTION	16
PLAN IMPLEMENTATION AND PROGRESS MONITORING	16
SECTION THREE PLANNING AREA PROFILE	17
INTRODUCTION	17
PLANNING AREA GEOGRAPHIC SUMMARY	17
CLIMATE	17

POPULATION AND DEMOGRAPHICS	19
AT-RISK POPULATIONS	21
BUILT ENVIRONMENT AND STRUCTURAL INVENTORY	25
STATE AND FEDERALLY OWNED PROPERTIES	26
ECONOMICS AND LABOR FORCE	26
TRANSPORTATION	28
CRITICAL FACILITIES	29
HISTORIC AND CULTURAL SITES	35
SECTION FOUR RISK ASSESSMENT	37
INTRODUCTION	37
METHODOLOGY	37
AVERAGE ANNUAL DAMAGES AND FREQUENCY	38
HAZARD IDENTIFICATION	39
HAZARD ELIMINATION	39
HAZARD ASSESSMENT SUMMARY TABLES	40
HISTORICAL DISASTER DECLARATIONS	42
PRESIDENTIAL DISASTER DECLARATIONS	42
CLIMATE ADAPTATION	44
HAZARD PROFILES	49
AGRICULTURAL PLANT DISEASE	50
BOMBING RANGE	54
CIVIL DISORDER	56
COMMUNICABLE DISEASE	59
DAM FAILURE	63
DROUGHT	68
EARTHQUAKES	75
EXTREME HEAT	80
FLOODING	84
GRASS/WILDFIRE	92
HAIL	98
HAZARDOUS MATERIALS INCIDENTS	101
HIGH WINDS	107
SEVERE THUNDERSTORMS	111
SEVERE WINTER STORMS	115
TORNADOES	121
SECTION FIVE MITIGATION STRATEGY	127
INTRODUCTION	127
SUMMARY OF CHANGES	127
GOALS	127
MITIGATION ALTERNATIVES (ACTION ITEMS)	128
PARTICIPANT MITIGATION ALTERNATIVES	128
MITIGATION ALTERNATIVE PROJECT MATRIX	129
SECTION SIX PLAN IMPLEMENTATION AND MAINTENANCE	143
MONITORING, EVALUATING, AND UPDATING THE PLAN	143
CONTINUED PUBLIC INVOLVEMENT	144
UNFORESEEN OPPORTUNITIES	144
INCORPORATION INTO EXISTING PLANNING MECHANISMS	144

SECTION SEVEN COMMUNITY PROFILE.....149
PURPOSE OF COMMUNITY PROFILES149

LIST OF FIGURES

Figure 1: Pine Ridge Reservation Planning Area	xii
Figure 2: Project Timeline	7
Figure 3: Pine Ridge Reservation	18
Figure 4: Pine Ridge Reservation Districts.....	19
Figure 5: Historical Population of Oglala Sioux Tribe	20
Figure 6: Population by Age	20
Figure 7: Pine Ridge Reservation Schools.....	23
Figure 8: Occupational Sector for Pine Ridge Reservation	27
Figure 9: Transportation Routes.....	29
Figure 10: Pine Ridge Reservation Critical Facilities.....	32
Figure 11: Kyle Critical Facilities	33
Figure 12: Pine Ridge Village Critical Facilities	34
Figure 13: Great Plains Region	44
Figure 14: Average Temperature (1895-2017).....	44
Figure 15: Climate Division 5, Minimum Temperature 1895 - 2018	45
Figure 16: South Dakota Average Precipitation	46
Figure 17: Drought Severity 2000-2012	46
Figure 18: Tribal Callout in Climate Impact Assessment.....	47
Figure 19: Billion Dollar Disasters in 2017.....	47
Figure 20: Billion Dollar Disasters by Type.....	48
Figure 21: Plant Hardiness Zone Change	49
Figure 22: Badlands Gunnery Range	54
Figure 23: Dam Locations	65
Figure 24: Water Flows over White Clay Dam Spillway	67
Figure 25: Sequence and Impacts of Drought Types	69
Figure 26: Palmer Drought Severity Index	70
Figure 27: U.S. Seasonal Drought Outlook	72
Figure 28: Earthquakes in Pine Ridge Reservation.....	77
Figure 29: 2018 Probability of Damage from Earthquakes.....	78
Figure 30: Earthquake Probability	79
Figure 31: NOAA Heat Index.....	81
Figure 32: Number of Days Above 100°F.....	82
Figure 33: Rivers and Creeks in Pine Ridge Reservation	85
Figure 34: Flood Occurrence.....	86
Figure 35: Special Flood Hazard Area for Batesland	87
Figure 36: Average Monthly Precipitation.....	88
Figure 37: Monthly Events for Floods/Flash Flood (1996-2017).....	89
Figure 38: Mean Fire Return Interval.....	93
Figure 39: Reported Wildfires.....	94
Figure 40: Number of Wildfires by Year for the Planning Area.....	95
Figure 41: Wildfires by Cause for the Planning Area.....	96
Figure 42: Hail Events by Magnitude.....	99
Figure 43: July 2018 Hail Damage to OST Vehicle	99
Figure 44: Major Transportation Routes.....	104
Figure 45: Wind Zones in the U.S.	107

Figure 46: High Wind Events by Month	109
Figure 47: Average Number of Thunderstorms	111
Figure 48: Thunderstorm Wind Events by Month	112
Figure 49: SPIA Index	116
Figure 50: Wind Chill Index Chart	117
Figure 51: Monthly Normal Temperature for Planning Area	117
Figure 52: Monthly Normal (1981-2010) Snowfall in Inches.....	119
Figure 53: Tornado Activity in the United States	121
Figure 54: Historic Tornado Tracks	122
Figure 55: Current Tornado Sirens.....	124
Figure 56: Proposed Tornado Sirens	125
Figure 57: Tornadoes by Month in the Planning Area	125

LIST OF TABLES

Table 1: Participating Jurisdictions	xi
Table 2: Hazard Occurrences	xvi
Table 3: Hazard Loss History	xvii
Table 4: Hazard Mitigation Planning Team	8
Table 5: Kick-Off Meeting Attendees.....	9
Table 6: Notified Stakeholder Groups	10
Table 7: Notified Neighboring Jurisdictions	10
Table 8: Outreach Activity Summary	11
Table 9: Planning Team Meeting #1 Dates and Discussion	12
Table 10: Planning Team Meeting #1 Attendees	12
Table 11: Batesland One-on-one Meeting #1 Date and Discussion	12
Table 12: Batesland One-on-one Meeting #1 Attendees.....	13
Table 13: Planning Team Meeting #2 Date and Location.....	13
Table 14: Planning Team Meeting #2 Attendees	13
Table 15: Batesland One-on-one Meeting #2 Date and Discussion	13
Table 16: Batesland One-on-one Meeting #1 Attendees.....	14
Table 13: General Plans, Documents, and Information.....	14
Table 14: Climate Data for Pine Ridge Reservation	17
Table 15: School Inventory.....	21
Table 16: Oglala Lakota College Centers.....	22
Table 17: Inventory of Care Facilities	24
Table 18: At-Risk Population.....	24
Table 19: Selected Housing Characteristics.....	25
Table 20: State and Federally-Owned Facilities	26
Table 21: Structural Inventory and Parcel Improvements.....	26
Table 22: Employment Statistics	27
Table 23: Housing and Income	27
Table 24: Critical Facilities	30
Table 25: National Historic Registry	35
Table 26: Term Definitions	37
Table 27: Hazards Addressed in the Plan.....	39
Table 28: Regional Risk Assessment.....	40

Table 29: Loss Estimation for the Planning Area	41
Table 30: Presidential Disaster Declarations.....	42
Table 31: Fire Management Assistance Declarations	43
Table 32: Livestock Inventory.....	50
Table 33: Land and Value of Farms in the Planning Area.....	50
Table 34: South Dakota Livestock Diseases	51
Table 35: Common Crop Diseases in South Dakota by Crop Types.....	51
Table 36: Agricultural Plant Disease Losses	52
Table 37: Regional Agricultural Vulnerabilities	53
Table 38: Regional Bombing Range Vulnerabilities	55
Table 39: Civil Disorder Occurrences.....	57
Table 40: Civil Disorder Losses.....	58
Table 41: Regional Civil Disorder Vulnerabilities.....	58
Table 42: Vaccinations Timetable	60
Table 43: Total Cases of Reportable Diseases in the Planning Area (2007-2016)	60
Table 44: Potential Public Health Preparedness Improvements	61
Table 45: Regional Vulnerabilities.....	62
Table 46: Dam Size Classification.....	63
Table 47: Dams in the Planning Area.....	64
Table 48: High Hazard Dams	66
Table 49: Regional Dam Failure Vulnerabilities	67
Table 50: Palmer Drought Severity Index Classification.....	69
Table 51: Historic Droughts.....	70
Table 52: Drought Losses	71
Table 53: Period of Record in Drought.....	71
Table 54: Drought Impacts in Planning Area.....	72
Table 55: Regional Drought Vulnerabilities	74
Table 56: Richter Scale.....	75
Table 57: Modified Mercalli Intensity Scale	75
Table 58: Regional Earthquake Vulnerabilities.....	79
Table 59: Extreme Heat Loss Estimation	82
Table 60: Loss of Electricity - Assumed Damage by Jurisdiction	83
Table 61: Regional Extreme Heat Vulnerabilities	83
Table 62: Planning Area Tributaries and Creeks.....	85
Table 63: FEMA FIRM Panel Status	88
Table 64: Flooding Stages	88
Table 65: Flood Losses.....	90
Table 66: Severe Thunderstorm Injuries and Deaths	90
Table 67: Regional Flooding Vulnerabilities	90
Table 68: Reported Wildfires by County (within the planning area).....	93
Table 69: Reported Wildfires by Size	94
Table 70: Wildfire Losses	96
Table 71: Regional Wildfire Vulnerabilities	97
Table 72: TORRO Hail Scale	98
Table 73: Hail Losses.....	100
Table 74: Regional Hail Vulnerabilities.....	100

Table 75: Hazardous Material Classes.....	102
Table 76: Chemical Tank Locations	103
Table 77: Historical Hazardous Material Fixed Site Spills	105
Table 78: Historical Hazardous Material Transportation Spills 1980-2017	105
Table 79: Hazardous Material Fixed Site Losses	105
Table 80: Hazardous Material Transportation Losses	106
Table 81: Regional Hazardous Material Vulnerabilities	106
Table 82: Beaufort Wind Ranking	108
Table 83: High Wind Losses	109
Table 84: Regional High Wind Vulnerabilities	110
Table 85: Severe Thunderstorms Losses.....	113
Table 86: Severe Thunderstorm Injuries and Deaths	113
Table 87: Regional Thunderstorm Vulnerabilities.....	114
Table 88: Severe Winter Storm Losses.....	118
Table 89: Severe Winter Storms Injuries and Deaths.....	118
Table 90: Regional Severe Winter Storm Vulnerabilities.....	120
Table 91: Enhanced Fujita Scale	123
Table 92: Enhanced Fujita Scale Damage Indicator	123
Table 93: Tornado Losses.....	126
Table 94: Tornado Injuries and Deaths	126
Table 95: Regional Tornado Vulnerabilities.....	126
Table 96: Capability Assessment for OST and OLC	145

LIST OF ACRONYMS

ACS – American Community Survey
BCA – Benefit Cost Analysis
CFR – Code of Federal Regulations
CRS – Community Rating System
DENR – South Dakota Department of Environment and Natural Resources
DHS – Department of Homeland Security
DMA 2000 – Disaster Mitigation Act of 2000
EAP – Emergency Action Plan
EPA – Environmental Protection Agency
ESL – English as Second Language
FBI – Federal Bureau of Investigations
FEMA – Federal Emergency Management Agency
FIRM – Flood Insurance Rate Map
FMA – Flood Mitigation Assistance Program
FR – FEMA's Final Rule
GIS – Geographic Information Systems
HMA – Hazard Mitigation Assistance
HMGP – Hazard Mitigation Grant Program
HMP – Hazard Mitigation Plan
HPRCC – High Plains Regional Climate Center
JEO – JEO Consulting Group
LEOP – Local Emergency Operations Plan
LGA – Liquid Gallon
MHSW – Mobile Home Single Wide
MPH – miles per hour
NCEI – National Centers for Environmental Information
NFIP – National Flood Insurance Program
NOAA – National Oceanic and Atmospheric Administration
NRC – National Response Center
NWS – National Weather Service
OST – Oglala Sioux Tribe
OSLHA – Oglala Sioux (Lakota) Housing Authority
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
SDDPS – South Dakota Department of public Safety – Emergency Management
SFHA – Special Flood Hazard Area
SPIA – Sperry-Piltz Ice Accumulation Index
START – National Consortium for the Study of Terrorism and Responses to Terrorism
TORRO – Tornado and Storm Research Organization
USDA – United States Department of Agriculture
USGS – United States Geological Survey
WUI – Wildland Urban Interface

THIS PAGE LEFT INTENTIONALLY BLANK

EXECUTIVE SUMMARY

INTRODUCTION

This plan is an update to the Oglala Sioux Tribe (OST) and Oglala Lakota County (OLC) Multi-Jurisdictional Hazard Mitigation Plan (HMP) approved in 2014. The plan update was developed in compliance with the requirements of the Disaster Mitigation Act of 2000 (DMA 2000). For the purpose of this plan, a tribal government is identified according to the 44 Code of Federal Regulations (CFR) 201.2-7. Indian Tribal government means any federally recognized governing body of an Indian or Alaska Native Tribe, band, nation, pueblo, village or community that the Secretary of Interior acknowledges to exist as an Indian Tribe under the Federally Recognized Indian Tribe List Act of 1994, 25 U.S.C. 479a.

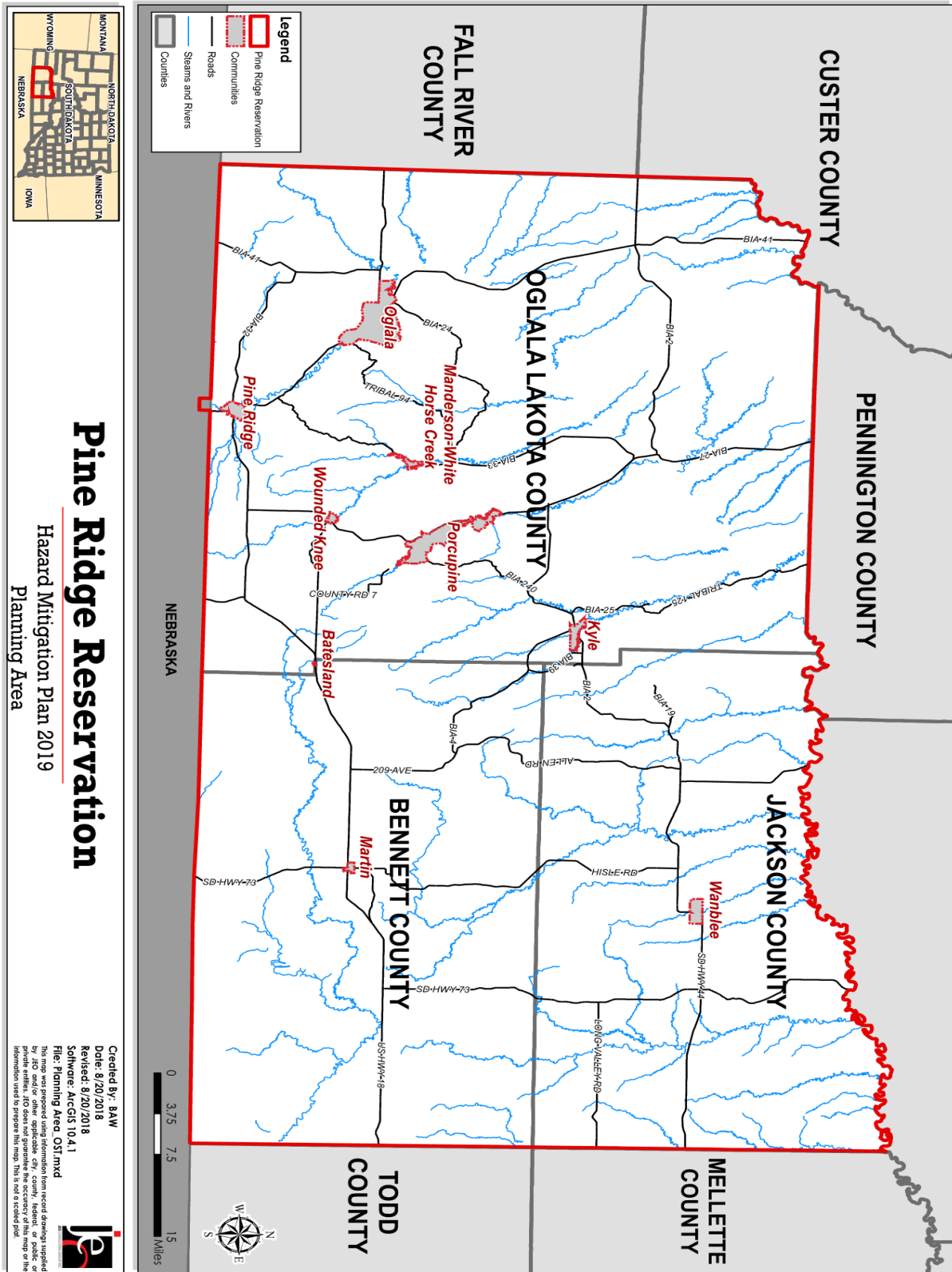
Hazard mitigation planning is a process in which hazards are identified and profiled; people and facilities at risk are identified and assessed for threats and potential vulnerabilities; and strategies and mitigation measures are identified. Hazard mitigation planning increases the ability of jurisdictions 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. The 2014 HMP included the Oglala Sioux Tribe and Oglala Lakota County (at that time named Shannon County) as the only plan participants. Plan participants for this plan update are listed below.

TABLE 1: PARTICIPATING JURISDICTIONS

PARTICIPATING JURISDICTIONS	
Oglala Sioux Tribe	Oglala Lakota County
Batesland	

For the purpose of this plan, hazard events and regional data is included for Jackson and Bennett Counties. Tribal boundaries for the Pine Ridge Reservation (Figure 1) bisect Jackson County, with the southern half of the county falling within tribal jurisdiction, and the entirety of Bennett County. While the Emergency Manager for Bennett County attended meetings as a stakeholder, neither Bennett or Jackson Counties acted as active participants in this plan update and each maintain their own HMPs.

FIGURE 1: PINE RIDGE RESERVATION 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 Pine Ridge Reservation, Oglala Lakota County, and Batesland. 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 residents 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 specific mitigation strategies and projects that will, if implemented, reduce their vulnerability and help build stronger, more resilient communities.

These goals were reviewed at the Kick-off meeting and were agreed upon by the Planning Team. The goals and objectives are fairly consistent with those identified in the previous HMP, as they were determined to still fit the needs of the planning area. The goals for this plan update are as follows:

Goal 1: Protect Citizens from Injuries and Loss of Life from Hazards

- Objective 1.1: Enhance public awareness and public education of natural hazards
- Objective 1.2: Reduce the number of injuries/fatalities from severe weather events
- Objective 1.3: Improve the ability to respond and recover from natural and man-made disasters

Goal 2: Protect Existing and Future Structures within Hazard Areas

- Objective 2.1: Reduce the number of structures lost by natural and man-made disasters
- Objective 2.2: Minimize the impacts on cultural significant sites from natural and man-made disasters
- Objective 2.3: Provide protection for existing structures, future development, critical facilities, services, utilities, and trees to the greatest extent possible.

Goal 3: Reduce the Losses to Critical Facilities, Utilities, and Infrastructure from Natural and Man-Made Hazards

- Objective 3.1: Reduce adverse impacts to critical facilities and infrastructure
- Objective 3.2: Improve warning and communication systems

Goal 4: Preserve the Natural Environment

- Objective 4.1: Reduce the impacts to the environment and cultural resources
- Objective 4.2: Reduce agricultural losses

Goal 5: Support and Assist Community Mitigation Capabilities and Efforts

- Objective 5.1: Educate and encourage local communities to reduce impacts from disasters
- Objective 5.2: Partner with local communities and neighboring jurisdictions to implement mitigation plans
- Objective 5.3: When possible, use existing resources, agencies, and programs to implement the projects

Goal 6: Improve Emergency Management Capabilities

- Objective 6.1: Update and revise the All-Hazards Emergency Response Plan, procedures and abilities; increase the capability to respond
- Objective 6.2: Train personnel for emergency response services
- Objective 6.3: Improve warning systems and ability to communicate to residents and businesses during and following a disaster or emergency.

MITIGATION ACTION PRIORITIES

During the planning process, the local planning teams were asked to review mitigation actions identified in the past plan for changes in status or applicability, as well as to identify any new projects to be included in this update. Selected actions were prioritized by the planning teams as either high (H), medium (M), or low (L) priority. Note that the priority level identified here does not indicate which projects must be completed first, but rather serve as a guide of priorities for participants. The following table summarizes selected mitigation action priorities per participant.

Executive Summary

#	MITIGATION ACTIONS	OST	OLC	BATESLAND
1	Anchor Mobile Homes	H	H	-
2	Conduct Emergency Tabletop Exercise	L	-	-
3	Develop and Implement Building Codes and Zoning	H	H	-
4	Education on Disaster Preparation	M	M	-
5	Education on Mitigation Measures	L	L	-
6	Emergency Operations Center	H	-	-
7	Establish Shelter Locations	H	H	-
8	Improve Snow Removal Resources	-	-	H
9	Improve Emergency Communications System	H	-	-
10	Improve Emergency Transportation System	L	-	-
11	Improve Warning Systems	M	-	H
12	Infrastructure Hardening	H	-	-
13	Inventory all Assets for Critical Facilities Protection	L	-	-
14	Mapping of Flood Risk Areas	H	-	-
15	Mutual Aid Agreements for Emergency Response	M	M	-
16	Protect Critical Facilities in Flood Zones	H	-	-
17	Provide Backup Generators for Critical Facilities	H	-	H
18	Provide Emergency Supply Kits	M	M	-
19	Provide for Structural Fire-Fighting Equipment	H	H	-
20	Rebuild Unsafe Structures	H	-	-
21	Safe Rooms and Storm Shelters	H	H	M
22	Snow Fences	L	L	-
23	Storm Ready Certification	-	M	-
24	Training for First Responder Team	H	H	-
25	Update Emergency Operations Plan	H	H	-

SUMMARY OF CHANGES

Several changes were made to the 2014 Hazard Mitigation Plan and planning process, including: the inclusion of additional hazards of concern for the Oglala Sioux Tribe; greater outreach efforts for planning team member involvement; an expanded climate discussion with potential impacts on the planning area; and changes to mitigation strategies. Mitigation strategy changes included an expanded description of each action, as well as added clarification of jurisdictional responsibility per action. This update also works to unify the various planning mechanisms and organizations throughout the planning area (i.e. local emergency operation plans, tribal and county departments, etc.) to ensure that the goals and objectives identified in the plan are consistent with strategies used in the planning area.

PLAN IMPLEMENTATION

The Oglala Sioux Tribe has begun the process to implement hazard mitigation projects in the planning area including: building a new fire department, proposed new locations for alert sirens, and anchoring mobile homes in the reservation. Despite limited resources, participants in this HMP will need to continue relying upon multi-agency coordination as a means of leveraging resources. Communities throughout the tribe 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: South Dakota Department of Environment and Natural Resources (DENR); South Dakota Department of Public Safety - Emergency Management (SDDPS); 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 for the entire planning area.

TABLE 2: HAZARD OCCURRENCES

HAZARD	PREVIOUS OCCURRENCE EVENTS/YEARS	APPROXIMATE ANNUAL PROBABILITY	LIKELY EXTENT
AGRICULTURAL PLANT DISEASE	32/18	100%	Insufficient Data
BOMBING RANGE	0	Unknown	Insufficient Data
CIVIL DISORDER	4/72	0.1%	Minor Damage (<\$1million)
COMMUNICABLE DISEASE	3,781/6	100%	Unavailable
DAM FAILURE	0	~1%	Varies by Structure
DROUGHT	433/1,477 months	29%	D1-D2
EARTHQUAKES	9/142	~6%	Magnitude <4.0
EXTREME HEAT	Avg. 9 days per year >100°F	100%	>100°F
FLOODING	23/22	100%	Inundation of structures (≤30% of structures) and roads near streams. Some evacuations of people may be necessary (≤30% of population)
GRASS/WILDFIRES	4,423/37	100%	<100 acres
HAIL	440/22	100%	H3-H5 Avg 1.24"; Range 0.75-4.25"
HAZARDOUS MATERIAL INCIDENTS (FIXED, TRANSPORTATION)	8/27 2/18	29% 5%	<50 LGA <100 gallons
HIGH WINDS	139/22	100%	Avg 50 mph Range 35-72 EG
SEVERE THUNDERSTORMS	322/22	100%	≥2" rainfall Avg 56 mph winds; Range 50-83 EG
SEVERE WINTER STORMS	233/22	100%	0.5" Ice 10-20° below zero (wind chills) 4-8" snow 25-40 mph winds
TORNADOES	31/22	100%	Avg: F0 Range EF0-F2

The following table provides loss estimates for hazards with sufficient data.

TABLE 3: HAZARD LOSS HISTORY

HAZARD TYPE		COUNT	PROPERTY	CROP ²
AGRICULTURAL PLANT DISEASE ²		32	N/A	\$619,157
BOMBING RANGE		0	N/A	N/A
CIVIL DISORDER ⁷		4	\$45,000	N/A
COMMUNICABLE DISEASE ⁹		3,781	N/A	N/A
DAM FAILURE ⁵		0	\$0	N/A
DROUGHT ¹		433/1,477 months	N/A	\$42,911,671
EARTHQUAKES ⁸		9	N/A	N/A
EXTREME HEAT ¹		Avg. 9 days per year >100°F	N/A	\$906,970
FLOODING ¹	Flash Flood <i>2 injuries</i>	10	\$4,000	\$47,146
	Flood	13	\$20,000	
GRASS/WILDFIRES ³		4,423	153,582 acres	\$6,089
HAIL ¹		440	\$1,981,000	\$14,190,786
HAZARDOUS MATERIALS	Chemical Fixed Sites ⁴	8	\$700	N/A
	Chemical Transportation ⁶	2	\$2,190	
HIGH WINDS ¹		139	\$75,000	\$1,803,286
SEVERE THUNDERSTORMS ¹ <i>2 deaths, 13 injuries</i>	Thunderstorm Wind	318	\$1,277,500	N/A
	Heavy Rain	3	\$0	\$9,287,058
	Lightning	1	\$1,000	N/A
SEVERE WINTER STORMS ¹ <i>2 deaths, 1 injury</i>	Blizzard	45	\$55,963,000	\$13,454,899
	Extreme Cold/Wind Chill	5	\$0	
	Heavy Snow	26	\$0	
	Ice Storm	2	\$250,000	
	Winter Storm	117	\$10,000	
	Winter Weather	38	\$0	
TORNADOES ¹ <i>1 death, 55 injuries</i>		31	\$3,570,000	\$8,160
TOTAL		9,448	\$63,194,390	\$83,235,222

N/A: Data not available

1 indicates data is from NCEI (January 1996 to December 2017)

2 indicates data is from USDA RMA (2000-2017)

3 indicates data is from USGS (1980 to 2016)

4 indicates data is from U.S. Coast Guard NRC (1990-2016)

5 indicates data is from Stanford NPDP (1911-2017)

6 indicates data is from PHMSA (1980-2017)

7 indicates data is from SPEED (1946-2018)

8 indicates data is from USGS (1872-2013)

9 indicates data is from SD DOH (2011-2016)

in. = inches; EG = Estimated Gust

Events like agricultural disease, extreme heat, grass and wildfires, hail, severe thunderstorms, and severe winter storms will occur annually. Other hazards like drought, dam failure, earthquakes, and terrorism will occur less often. The scope of events and how they will manifest themselves locally is not known regarding hazard occurrences. Historically, drought, hail, severe thunderstorms, severe winter storms, and tornadoes

Executive Summary

have resulted in the most significant damages within the planning area. These hazards are summarized below.

HAZARDS SUMMARY

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. Some of the costliest hazards which have impacted the planning area are discussed below.

DROUGHT

Drought is a regular and reoccurring phenomenon that occurs throughout the planning area and across the State of South Dakota. Historical data shows that droughts have occurred with regularity across the planning area and recent research indicates that trend will continue and potentially intensify in the coming decades, especially with the impacts of climate change. While the most common impacts of drought affect the agricultural sector, with crop losses of nearly \$43 million since 2000, drought can also significantly impact infrastructure and the psychological health of residents. Other expected impacts from drought may include, but are not limited to: economic loss in the agricultural sector; loss of employment in the agriculture sector; limited water supplies for drinking water, fire suppression, livestock, etc.; and a decrease in recreational opportunities.

HAIL

Hail events occur on an annual basis in conjunction with severe thunderstorms. Hail is one of the more frequently occurring hazards and has impacted both the agricultural sector and the built environment. The NCEI has recorded 584 hail events for the planning area. These events have caused nearly \$2 million dollars in property damages and crop damage exceeding \$14 million. Common impacts resulting from hail include, but are not limited to: damage to roofs, windows, and siding; damage to mechanical systems located outdoors including HVAC systems; damage to vehicles; and destruction of crops.

SEVERE WINTER STORMS

Severe winter storms are an annual occurrence for the planning area. Winter storms can bring extreme cold temperatures, freezing rain and ice, and heavy or drifting snow. Blizzards are particularly dangerous and can have significant impacts throughout the planning area. Severe winter storms typically occur between November and March. The NCEI reported 233 severe winter storm weather events that caused over \$56 million in property damages with the majority of damages resulting from blizzards.

Impacts resulting from severe winter storms include but are not limited to: hypothermia and frost bite; closure of transportation routes; downed power lines and power outages; collapsed roofs from heavy snow loads; and closure of critical facilities. The most vulnerable citizens within the planning area are children, the elderly, individuals and families below the poverty line, and those who live off main roads or in isolated locations.

TORNADOES

Tornadoes occur in the planning area on an annual basis. The NCEI reports 31 tornadoes for the planning area since 1996. These tornadic events have caused over \$3.5 million in property damages. Impacts from past tornadoes in the planning area include: damages to homes, vehicles, and agricultural buildings; downing of power lines, and destruction of agricultural fields and equipment.

Vulnerable populations within the planning area include residents living in mobile homes (27.9 percent of the planning area), facilities without storm shelters which house large number of people (such as nursing homes, hospitals, schools, factories, etc.), homeowners without storm shelters or basements, and residents with decreased mobility.

SEVERE THUNDERSTORMS

Thunderstorms differ from many other hazards in that they are generally large in magnitude, have a long duration, and travel across large areas and through multiple jurisdictions within a single region. Additionally, thunderstorms often occur in a series, with one area potentially impacted multiple times in one day. Severe thunderstorms are most likely to occur between the months of May and August with the highest number of events occurring in June. The NCEI recorded 450 severe thunderstorms events in 22 years for the planning area. These events caused nearly \$1.3 million in property damages and over \$9 million in crop damages. One event in 2006 led to the death of one individual and injuries to five others, while a separate lightning event in 2001 killed one and injured one other. 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 profile for hail.

Vulnerable populations related to severe thunderstorms include: residents of mobile homes (27.9 percent of housing units for the planning area); 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.

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.

THIS PAGE LEFT INTENTIONALLY BLANK

SECTION ONE INTRODUCTION

HAZARD MITIGATION PLANNING

Hazard events are inevitable; it is just a matter of when they occur and what steps jurisdictions have taken to mitigate the potential impacts. Mitigation reduces risk and is a socially and economically responsible action to prevent long term risks from natural and human-caused hazard events.

Natural hazards, such as severe winter storms, tornadoes and high winds, severe thunderstorms, flooding, extreme heat, drought, agriculture diseases (plant and animal), earthquakes, and wildfires are part of the world around us. Their occurrence is natural and inevitable, and there is little that can be done to control their force and intensity. Human-caused hazards are a product of the society and can occur with significant impacts to communities. Human-caused hazards include dam failure, chemical fixed site hazards, major transportation incidents, terrorism, civil disorder, and urban fire. These hazard events can occur as a part of normal operation or as a result of human error. All communities in the planning area 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.

OST prepared this multi-jurisdictional hazard mitigation plan in an effort to reduce impacts from natural and human-caused hazards and to better protect the people and property of the region from the effects of hazards. This plan demonstrates the communities' commitment to reducing risks from hazards and serves as a tool to help decision makers establish mitigation activities and resources. Furthermore, this plan was developed to make Oglala Sioux Tribe (OST) 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 of 2000 to amend the Robert T. Stafford Disaster Relief and Emergency Assistance Act¹. Section 322 of the DMA 2000 requires that state and local governments develop, adopt, and routinely update a hazard mitigation plan to remain eligible for pre- and post-disaster mitigation funding.² These funds include the Hazard Mitigation Grant Program (HMGP)³, Pre-

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

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

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

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

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

Requirement §201.7(c)(6): The plan must include assurances that the Indian Tribal government will comply with all applicable Federal statutes and regulations in effect with respect to the periods for which it receives grant funding, including 2 CFR parts 200 and 3002. The Indian Tribal government will amend its plan whenever necessary to reflect changes in Tribal or Federal laws and statutes.

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

HAZARD MITIGATION ASSISTANCE

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

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

- **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.

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

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

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

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

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

PLAN FINANCING AND PREPARATION

Regarding plan financing and preparation, the Oglala Sioux Tribe, as a federally recognized tribe, is an eligible entity which may submit an application for FEMA assistance as either a “sub-applicant” or as an “Applicant”. If HMA funding is awarded, the Applicant becomes the “Grantee” and is responsible for managing the grant and complying with program requirements and other applicable federal, state, territorial, tribal, and local laws and regulations.

FEMA awards funds to States or tribal Applicants, who in-turn provide subawards to local government sub-applicants. Communities within the tribe may submit applications as the sub-applicant to the Applicant, in this case the Oglala Sioux Tribe. If HMA funding is awarded to the community, 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.

Requirement §201.7(a): Plan Requirement

- (1) Indian tribal governments applying to FEMA as a grantee must have an approved Tribal Mitigation Plan meeting the requirements of this section as a condition of receiving non-emergency Stafford Act assistance and FEMA mitigation grants.
- (2) An Indian Tribal government applying to FEMA as a grantee may choose to address severe repetitive loss properties in their plan, as identified in §201.4(c)(3)(v), to receive the reduced cost share for the FMA and SRL programs.
- (3) Indian Tribal governments applying through the State as a subgrantee must have an approved Tribal Mitigation Plan meeting the requirements of this section in order to receive HMGP project grants and, the Administrator, at his discretion may require a Tribal Mitigation Plan for the Repetitive Flood Claims Program. A Tribe must have an approved Tribal Mitigation Plan in order to apply for and receive FEMA mitigation project grants, under all other mitigation grant programs. The provisions in §201.6(a)(3) are available to Tribes applying as subgrantees.
- (4) Multi-jurisdictional plans (e.g. county-wide or watershed plans) may be accepted, as appropriate, as long as the Indian tribal government has participated in the process and has officially adopted the plan. Indian tribal governments must address all the elements identified in this section to ensure eligibility as a grantee or as a subgrantee.

THIS PAGE LEFT INTENTIONALLY BLANK

SECTION TWO PLANNING PROCESS

INTRODUCTION

Requirement §201.7(b)(1): Documentation of 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. This shall include:

- (i) An opportunity for the public to comment on the plan during the drafting stage and prior to plan approval, including a description of how the Indian tribal government defined “public”;
- (ii) As appropriate, an opportunity for neighboring communities, tribal 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 nonprofit interests to be involved in the planning process;
- (iii) Review and incorporation, if appropriate, of existing plans, studies, and reports; and
- (iv) Be integrated to the extent possible with other ongoing tribal planning efforts as well as other FEMA programs and initiatives.

The process utilized to develop a hazard mitigation plan is often as important as the final planning document. For this planning process, OST 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 Planning Team was established; the function of the 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.

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.” 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 the South Dakota Emergency Management recommend this multi-jurisdictional approach through the cooperation of counties and regional emergency management. OST utilized the multi-jurisdictional planning process recommended by FEMA (Local Mitigation Plan Review Guide¹⁰, Local Mitigation Planning Handbook¹¹, and Mitigation Ideas: A Resource for Reducing Risk to Natural Hazards¹²) to develop this plan.

As a Tribal entity, this plan was developed to meet the requirements of Title 44 CFR 201.7, Tribal Mitigation Planning for a Standard Tribal Mitigation Plan. Throughout the development of this plan, the Tribal

¹⁰ Federal Emergency Management Agency. 2011. “Local Mitigation Plan Review Guide.” https://www.fema.gov/media-library-data/20130726-1809-25045-7498/plan_review_guide_final_9_30_11.pdf.

¹¹ Federal Emergency Management Agency. 2013. “Local Mitigation Planning Handbook.” https://www.fema.gov/media-library-data/20130726-1910-25045-9160/fema_local_mitigation_handbook.pdf.

¹² Federal Emergency Management Agency. 2013. “Mitigation Ideas: A Resource for Reducing Risk to Natural Hazards.” https://www.fema.gov/media-library-data/20130726-1904-25045-0186/fema_mitigation_ideas_final508.pdf.

Mitigation Plan Review Guide^{13,14} was reviewed to ensure consistency with FEMA requirements. These tribal planning requirements included, but are not limited to:

- Planning Process
 - An inclusive planning process which brings together tribal leaders, tribal elders, and other partners including the public to discuss and share knowledge and their perception of risk.
 - A discussion of how existing data resources (plans, studies, reports, data, etc.) and other ongoing tribal and federal planning efforts are integrated into the HMP.
- Hazard Identification and Risk Assessment
 - A discussion of natural hazards which impact the planning area and their subsequent effects on the region, which includes previous occurrences and probability for future events.
- Mitigation Strategies
 - A discussion of the tribal government's pre- and post-disaster hazard mitigation policies as well as tribal funding sources for mitigation actions identified in the HMP.
 - Clearly identified goals and an action plan to implement and administer actions identified to reduce long-term vulnerabilities.
- Plan Updates
 - As an update to a previous HMP, revisions must be made to reflect changes in development, progress on mitigation actions, and any changes to priorities for the planning area.
- Assurances and Adoption
 - The tribal government must include assurances to comply with all applicable federal statutes and regulations and provide documentation that the HMP has been adopted by the tribal governing body.

HAZARD MITIGATION PLANNING PROCESS

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

¹³ Federal Emergency Management Agency. December 2017. "FEMA Policy: Tribal Mitigation Plan Review Guide." https://www.fema.gov/media-library-data/1513200002073-dfe90940b732a02dafc8fd798aeccf46/Tribal_Mitigation_Plan_Review_Guide_Policy_2017.pdf.

¹⁴ Federal Emergency Management Agency. December 2017. "Tribal Mitigation Plan Review Guide." https://www.fema.gov/media-library-data/1512757722502-00b8f917b23ece763161c14b04d7eae8/Tribal_Mitigation_Plan_Review_Guide_Dec5_2017_508.pdf.

Organization of Resources

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

Assessment of Risk

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

Mitigation Plan Development

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

Plan Implementation and Progress Monitoring

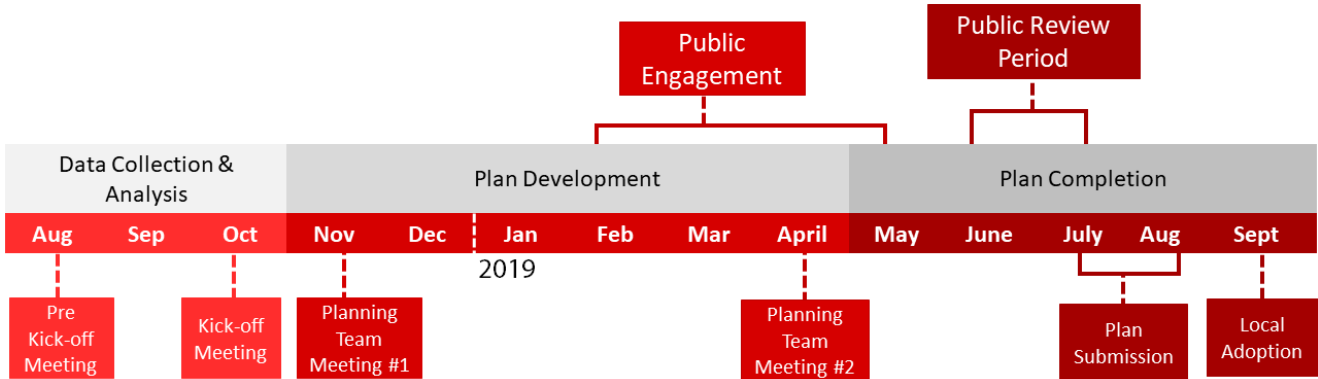
- Bring the plan to life by implementing specific mitigation projects and changing day-to-day operations. It is critical that the plan remains relevant to succeed. Thus, it is important to conduct periodic evaluations and revisions, as needed.

**ORGANIZATION OF RESOURCES
PLAN UPDATE PROCESS**

The Oglala Sioux Tribe secured funding for their hazard mitigation plan (HMP) in August 2015. JEO Consulting Group (JEO) was contracted in June 2018 to guide and facilitate the planning process and assemble the hazard mitigation plan. For the planning area, Steve Wilson (Director of Emergency Management for OST) led the development of the plan and served as the primary point-of-contact throughout the project.

The first activity in the development process for the OST HMP update was coordination of efforts with local, state, and federal agencies and organizations. South Dakota Department of Public Safety (SDDPS) includes emergency management and became involved in the planning process. OST and JEO worked together to identify elected officials and key stakeholders to lead the planning effort. A clear timeline of this plan update process is provided in Figure 2.

FIGURE 2: PROJECT TIMELINE



PLANNING TEAM AND INVOLVEMENT

The Planning Team was comprised of tribal members from a broad range of departments and organizations. Planning Team members attended Planning Team Meetings and contributed to the development of the plan by: reviewing the previous HMP, developing goals and objectives, identifying and discussing hazards of top concern, prioritizing potential mitigation actions or projects, providing new data, and by serving as a liaison for the plan to other residents. Planning Team members will be responsible for the development and implementation of an annual review procedure. In order to be a member of a Planning Team, individuals had to attend at least one meeting with JEO planners. A list of Planning Team members can be found in Table 4. Additional technical support was provided to the Planning Team by staff from SDDPS.

TABLE 4: HAZARD MITIGATION PLANNING TEAM

NAME	TITLE	JURISDICTION
ALVA GOOD CROW	Porcupine Service Center	Oglala Lakota Nation
BETH PERKINS	Public Health Nursing Director	IHS Pine Ridge Hospital
DARLA BLACK	Vice-President	Oglala Lakota Nation
DELORES GEORGE POURIER	Health Administration	Oglala Lakota Nation
DONAVAN STEELE	Support Services Program Director	Oglala Sioux Tribe
ED SILVER	IT Supervisor	IHS Pine Ridge Hospital
FRANK MAYNARD	Emergency Manager	Oglala Lakota County, Fall River County
FRANK MEANS	Kyle Rural Water	Oglala Lakota Nation
HOPA HAAS	Indian Health Services	Oglala Lakota Nation
JACKIE SIERS	Council Representative	Wakpamni District
JAMES RED WILLOW	5 th Member	Oglala Lakota Nation
JEFF SISCOE	Emergency Manager	Bennett County
JESSE BIG CROW	OST District Emergency Management-Planning and Coordinating Specialist	Oglala Lakota District
JIM MEEKS	Council Representative	Eagle Nest District
JIM POPPEN	State Hazard Mitigation Officer	South Dakota Department of Public Safety
JOHN LONG	Superintendent	BIA Pine Ridge Agency
JON WHIRLWIND HORSE	Support Services Liaison	Tribal Education Agency
JON SIEDSCHLAW	Deputy Director	OST Emergency Management
KARIN EAGLE	Media Relations	Oglala Lakota Nation
KYLE WHITE	Natural & Water Resources	Oglala Lakota Nation
LESTER RICHARDS	OST EPP Director	Pine Ridge
LYLA HUTCHINSON	County Commissioner	Oglala Lakota Nation
LYNX BETTELYOUN	Highway Superintendent	Oglala Sioux Tribe
MARETTA CHAMPAGNE	Outreach Coordinator	Pine Ridge Long Term Recovery Team
MARY TOBACCO	OST Planning	Wakpamni District
MELANIE TWO EAGLE	Porcupine Service Center	Oglala Lakota Nation
ROBERT ECOFFEY	Chief of Police	Oglala Lakota Nation
ROBERT LAFFERTY	OST Tribal Hazard Mitigation Project Manager	Oglala Lakota Nation
ROBERT PILLE	Water & Sewer	Oglala Lakota Nation
RODNEY ROUILLARD	OST Road Maintenance	Oglala Lakota Nation
SHAWN SWALLOW	OST Natural Resources	Oglala Lakota Nation
SHELBY ROSS	OST Natural Resources	Porcupine District
STACEY MARTIN	Fall River County GIS	Oglala Lakota Nation
STEPHEN POURIER	Utilities Director	Oglala Lakota Nation
STEVE WILSON, SR.	Emergency Manager	OST Emergency Management

NAME	TITLE	JURISDICTION
STEVIE LONE DOG		Oglala Lakota Nation
THOMAS BRINGS	OST Natural Resources	Oglala Lakota Nation
TROY FERGUSEN	E-911 and GIS	Oglala Lakota Nation
VALENTINA MERDANIAN	Oglala County Representative	Oglala Sioux Tribe
VINCE MARTIN	Oglala Sioux Lakota Housing	Oglala Lakota Nation
WENDELL YELLOW BULL	County Commissioner	District 4
WILLIAM HILLMAN	Water & Sewer	Oglala Lakota Nation
*BECKY APPLEFORD	Project Coordinator	JEO Consulting Group
*BROOKE WELSH	Planner	JEO Consulting Group
*ELLANA HAAKENSTAD	Planner	JEO Consulting Group
*JEFF HENSON	Project Manger	JEO Consulting Group

**Served as a consultant or advisory role*

A pre-kick off meeting was held July 20th with the county emergency managers, OST representative, and the JEO team. This conference call meeting was used to discuss participants to engage in the plan update, identify dates for the kick-off meeting, and outline engagement strategies.

The Kick-off meeting was held October 10, 2018 for OST Planning Team members, identified key stakeholders, and JEO staff. This meeting provided Planning Team members and other stakeholders with: a tabletop exercise highlighting a recent severe weather event; an overview of the planning process and HMP components; discussion of goals and objectives; identification of hazards to profile; and discussion of roles and responsibilities for planning team members. Kick-off meeting attendees are listed in the table below. Sign-in sheets and other materials can be found in *Appendix A*.

TABLE 5: KICK-OFF MEETING ATTENDEES

NAME	TITLE	JURISDICTION
DARLA BLACK	Vice-President	Oglala Lakota Nation
DELORES GEORGE POURIER	Health Administration	Oglala Lakota Nation
FRANK MAYNARD	Emergency Manager	Oglala Lakota County, Fall River County
JACKIE SIERS	Council Representative	Wakpamni District
JAMES RED WILLOW	5 th Member	Oglala Lakota Nation
JOHN LONG	Superintendent	BIA Pine Ridge Agency
KYLE WHITE	Natural & Water Resources	Oglala Lakota Nation
STEVE WILSON SR	Emergency manager	Oglala Lakota Nation
TROY FERGESON	E-911	Oglala Lakota Nation
WENDELL YELLOW BULL	County Commissioner	District 4
WILLIAM HILLMAN	Water & Sewer	Oglala Lakota Nation
JESSE BIG CROW	OST District Emergency Manager	Oglala Lakota District
ROBERT LAFFERTY	OST Tribal Hazard Mitigation Project Manager	Oglala Lakota Nation
ROBERT PILLE	Water & Sewer	Oglala Lakota Nation
SHAWN SWALLOW	OST Natural Resources	Oglala Lakota Nation
THOMAS BRINGS	OST Natural Resources	Oglala Lakota Nation
SHELBY ROSS	OST Natural Resources	Porcupine District
STACEY MARTIN	Fall River County GIS	Oglala Lakota Nation
MARY TOBACCO	OST Planning	Wakpamni District
LESTER RICHARDS	OST EPP Director	Pine Ridge
JON SIEDSCHLAW	Deputy Director	OST Emergency Management
LYLA HUTCHINSON	County Commissioner	Oglala Lakota Nation
MARETTA CHAMPAGNE		Oglala Lakota Nation
VINCE MARTIN	Oglala Sioux Lakota Housing	Oglala Lakota Nation
*JEFF HENSON	Project Manager	JEO Consulting Group
*BROOKE WELSH	Planner	JEO Consulting Group

**Served as a consultant or advisory role*

PUBLIC INVOLVEMENT

The Planning Team emphasized the importance of involving tribal members, departments, county officials, and the public in the planning process. For the purpose of this plan, the Tribe defined the ‘public’ as any tribal residents within the Pine Ridge Reservation, while the County also included all residents who may be non-tribal but reside within the Pine Ridge Reservation boundary.

The Planning Team also identified additional stakeholders that were encouraged to attend and participate in the planning process. The following table identifies stakeholder groups who were invited to attend HMP meetings.

TABLE 6: NOTIFIED STAKEHOLDER GROUPS

ORGANIZATIONS		
Indian Health Services	Bureau of Indian Affairs	Bureau of Indian Affairs School Superintendent
Prairie Winds Casino	Oglala Sioux Tribe Rural Water Supply System	Badlands National Park
Martin Municipal Airport	Pine Ridge Airport	Lacreek Electric Association
Bennett County Rural Health Clinic	Bennett County Hospital and Nursing Home	Nebraska Public Power District

Indian Health Services attended Planning Team meetings, however no other organizations participated during this planning process. Additionally, in order to collect a local perspective on the HMP and identify priorities of concern from tribal members and residents, a public engagement survey was developed and shared at various meeting functions by the Planning Team and provided online at the project website. In total, 12 surveys were collected. This information was used by the planning team and consultant to assist in the identification of hazards of highest risk to the jurisdictions and prioritization of appropriate mitigation actions. A copy of the survey can be found in *Appendix A*.

NEIGHBORING JURISDICTIONS

Neighboring jurisdictions were notified and invited to participate in the planning process. The following table indicates which neighboring communities were notified of the planning process. Letters were sent to jurisdictional representatives and county emergency managers, at their respective jurisdictions and disseminated appropriately. Emergency Management from Bennett County participated as a stakeholder during the planning process and provided information regarding coordination between the Tribe and the County.

TABLE 7: NOTIFIED NEIGHBORING JURISDICTIONS

NOTIFIED NEIGHBORING JURISDICTIONS	
Rosebud Sioux Tribe	Fall River County, SD
Custer County, SD	Pennington County, SD
Haakon County, SD	Jones County, SD
Mellette County, SD	Todd County, SD
Dawes County, NE	Sheridan County, NE
Cherry County, NE	Jackson County, SD
Bennett County, SD	Badlands National Park

OUTREACH

Outreach to eligible jurisdictions and the public included notification prior to all public meetings, phone calls and email reminders of upcoming meetings, and invitations to complete surveys and worksheets required for the planning process. Table 8 provides a summary of outreach activities utilized in this process. Copies of letters, press releases, project flyer, and survey can be found in *Appendix A*.

TABLE 8: OUTREACH ACTIVITY SUMMARY

ACTION	INTENT
PROJECT WEBSITE	Informed the public and local/planning team members of past, current, and future activities (https://jeo.com/osthmp)
PROJECT ANNOUNCEMENT	Project announcement posted on OST project website (https://jeo.com/osthmp and http://oglalalaketanation.info/news.html)
PLANNING TEAM MEETING LETTERS AND EMAILS (30-DAY NOTIFICATION)	Sent to participants and identified tribal members to discuss the agenda/dates/times/locations of the all planning team meetings
PRESS RELEASE	Sent to local newspapers (Lakota Country Times and Native Sun) and radio station (KILI) to announce the plan and describe the purpose of the plan. Additional press releases were sent to local newspapers to notify residents of public review period.
NOTIFICATION PHONE CALLS/EMAILS	Called or emailed potential participants to remind them about upcoming meetings
FOLLOW-UP EMAILS AND PHONE CALLS	Correspondence was provided to remind and assist planning team members and participants with the collection and submission of required local data
PROJECT FLYER	Flyers were posted about the OST and OLC HMP and how to get involved. Flyers were posted at multiple locations throughout the counties and reservation
WORD-OF-MOUTH	Tribal members discussed the plan with representatives and residents throughout the planning process
PUBLIC ENGAGEMENT SURVEY	Surveys were shared with OST and OLC residents to provide input throughout the planning process

ASSESSMENT OF RISK

HAZARD IDENTIFICATION

At the Kick-off meeting, planning team representatives reviewed hazards from the 2014 South Dakota State Hazard Mitigation Plan, the previous Oglala Sioux Tribe and Shannon County Hazard Mitigation Plan, and new hazards of top concern for the planning area. These hazards were used to conduct further risk and vulnerability assessments based on their previous occurrence and the communities' exposure to the various hazards. (For a complete list of hazards and discussion of risk and vulnerabilities, see *Section Four: Risk Assessment*.)

The primary function of the Planning Team Meeting #1 was to identify and discuss the top concerns from the jurisdiction. This was an opportunity to gather input from the list of identified hazards on records of historical occurrences, significant impacts, and their effects on residents and the planning area. For the hazards identified by the planning team at the Kick-off meeting, past events were described in detail including: location of damages; specific damages to property, trees, or infrastructure; descriptions of blocked transportation routes; loss of power; and improvements or projects implemented post event. This meeting also provided representatives with an update on the status of the plan, for those representatives who attended the Kick-off meeting, or provide a brief overview of the HMP and planning process to any new jurisdictional representatives. This meeting spanned two time periods, with the same information covered at each meeting. The Planning Team identified a need to offer options to stakeholders to select a time which worked best for them, allowing greater input and engagement.

Table 9 shows the date and agenda for the first Planning Team meetings held for the tribe and county.

TABLE 9: PLANNING TEAM MEETING #1 DATES AND DISCUSSION

DATE AND TIME	AGENDA ITEMS
Wednesday, November 14, 2018 10:00am MT Phone Conference	Status Update on HMP Brief discussion of hazard mitigation In-depth discussion of past hazard events
Wednesday, November 28, 2018 10:00am MT Phone Conference	Status Update on HMP Brief discussion of hazard mitigation In-depth discussion of past hazard events

TABLE 10: PLANNING TEAM MEETING #1 ATTENDEES

NAME	TITLE	JURISDICTION
BETH PERKINS	Public Health Nursing Director	IHS Pine Ridge Hospital
DONAVAN STEELE	Support Services Program Director	Oglala Sioux Tribe
ED SILVER	IT Supervisor	IHS Pine Ridge Hospital
FRANK MEANS	Kyle Rural Water	Oglala Lakota Nation
HOPA HAAS	Indian Health Services	Oglala Lakota Nation
JEFF SISCOE	Emergency Manager	Bennett County
JESSE BIG CROW	OST District Emergency Management-Planning and Coordinating Specialist	Oglala Lakota District
JIM MEEKS	Council Representative	Eagle Nest District
JIM POPPEN	State Hazard Mitigation Officer	South Dakota Department of Public Safety
MARETTA CHAMPAGNE	Outreach Coordinator	Pine Ridge Long Term Recovery Team
MARY TOBACCO	OST Planning	Wakpamni District
ROBERT ECOFFEY	Chief of Police	Oglala Lakota Nation
ROBERT LAFFERTY	OST Tribal Hazard Mitigation Project Manager	Oglala Lakota Nation
SHAWN SWALLOW	OST Natural Resources	Oglala Lakota Nation
STEVIE LONE DOG		Oglala Lakota Nation
STEVE WILSON, SR.	Emergency Manager	OST Emergency Management
TROY FERGUSEN	E-911 and GIS	Oglala Lakota Nation
VALENTINA MERDANIAN	Oglala County Representative	Oglala Sioux Tribe
BROOKE WELSH	Planner	JEO Consulting Group
BECKY APPLEFORD	Project Coordinator	JEO Consulting Group
ELLANA HAAKENSTAD	Planning Intern	JEO Consulting Group

The following tables show the meeting date information and attendees for the Town of Batesland. Batesland held one-on-one meetings with JEO staff to cover relevant information to update the HMP, including: description of the planning process, hazards of top concern, past hazard event descriptions, and critical facility identification.

TABLE 11: BATESLAND ONE-ON-ONE MEETING #1 DATE AND DISCUSSION

DATE AND TIME	AGENDA ITEMS
Wednesday, October 10, 2018 6:30 MT	Description of HMP Process Hazards of Top Concern Past Hazard Events Critical Facilities

TABLE 12: BATESLAND ONE-ON-ONE MEETING #1 ATTENDEES

NAME	TITLE	JURISDICTION
MARK DONOVAN	Mayor	Batesland
NICOLE SCHULTZ	Town Board Member	Batesland
RENA CONROY	Clerk	Batesland
WILLARD CLIFFORD	Water Administrator	Batesland
JEFF HENSON	Project Manager	JEO Consulting Group
BROOKE WELSH	Planner	JEO Consulting Group

MITIGATION PLAN DEVELOPMENT

MITIGATION STRATEGIES

The identification and prioritization of mitigation measures is an essential component in developing effective hazard mitigation plans. At the Round 2 meetings, Planning Team members discussed the status of mitigation actions identified in the previous HMP and identified new mitigation actions to address additional hazards of concern.

There was also a brief discussion about the planning process, when the plan would be available for public review and comment, and additional opportunities to share the public involvement survey with residents. Table 13 shows the date and location of meetings held for the Mitigation Strategies phase of this project. Meeting attendees are identified in Table 14

TABLE 13: PLANNING TEAM MEETING #2 DATE AND LOCATION

DATE AND TIME	AGENDA ITEMS
Tuesday, May 7, 2019 9:00am MT Prairie Winds Casino Oglala, SD	Update past mitigation actions, identify new mitigation actions, review local data, discuss planning area capabilities, complete plan integration discussion, share public engagement survey, and discuss plan review process.

TABLE 14: PLANNING TEAM MEETING #2 ATTENDEES

NAME	TITLE	JURISDICTION
ALVA GOOD CROW	Porcupine Service Center	Oglala Lakota Nation
FRANK MAYNARD	Emergency Manager	Oglala Lakota County, Fall River County
JON WHIRLWIND HORSE	Support Services Liaison	Tribal Education Agency
KARIN EAGLE	Media Relations	Oglala Lakota Nation
LYNX BETTELYOUN	Highway Superintendent	Oglala Sioux Tribe
MELANIE TWO EAGLE	Porcupine Service Center	Oglala Lakota Nation
ROBERT LAFFERTY	OST Tribal Hazard Mitigation Project Manager	Oglala Lakota Nation
RODNEY ROUILLARD	OST Road Maintenance	Oglala Lakota Nation
STEPHEN POURIER	Utilities Director	Oglala Lakota Nation
STEVE WILSON, SR.	Emergency Manager	OST Emergency Management
TROY FERGUSEN	E-911 and GIS	Oglala Lakota Nation
BECKY APPLEFORD	Project Coordinator	JEO Consulting Group
BROOKE WELSH	Planner	JEO Consulting Group

The following tables show the meeting date information and attendees for the Town of Batesland. Batesland held one-on-one meetings with JEO staff to cover relevant information.

TABLE 15: BATESLAND ONE-ON-ONE MEETING #2 DATE AND DISCUSSION

Date and Time	Agenda Items
Monday, April 15, 2019 7:00 MT	Review of Community Profile; Plan Integration Discussion; Mitigation Actions

TABLE 16: BATESLAND ONE-ON-ONE MEETING #1 ATTENDEES

NAME	TITLE	JURISDICTION
MARK DONOVAN	Mayor	Batesland
NICOLE SCHULTZ	Town Board Member	Batesland
RENA CONROY	Clerk	Batesland
WILLARD CLIFFORD	Water Administrator	Batesland
NATHAN KEHN	Board Member	Batesland
BROOKE WELSH	Planner	JEO Consulting Group

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 is a non-exhaustive list of identified sources utilized during this planning process to form risk hazard profiles, help define vulnerability, and shape appropriate mitigation actions for both the tribe and county. Additional resources, plans, or data used to develop this plan and hazard profiles are cited within the appropriate profile.

TABLE 17: GENERAL PLANS, DOCUMENTS, AND INFORMATION

Documents	
Disaster Mitigation Act of 2000 DMA https://www.fema.gov/media-library/assets/documents/4596?id=1935	National Response Framework (2016) https://www.fema.gov/media-library/assets/documents/117791
Final Rule (2007) https://www.fema.gov/media-library/assets/documents/23672	Oglala Sioux Tribe Oglala and White Clay Dams Emergency Action Plan (2016) – <i>controlled copies</i>
Hazard Mitigation Assistance Unified Guidance (2013) https://www.fema.gov/media-library/assets/documents/103279	Robert T. Stafford Disaster Relief and Emergency Assistance Act (2016) https://www.fema.gov/media-library/assets/documents/15271
Hazard Mitigation Assistance Guidance and Addendum (2015) https://www.fema.gov/media-library/assets/documents/103279	The Census of Agriculture (2012) https://www.agcensus.usda.gov/Publications/2012/Full_Report/Census_by_State/Nebraska/
Local Mitigation Plan Review Guide (2011) https://www.fema.gov/media-library/assets/documents/23194	Tribal Mitigation Plan Review Guide (2017) https://www.fema.gov/media-library/assets/documents/18355
Local Mitigation Planning Handbook (2013) https://www.fema.gov/media-library/assets/documents/31598	Tribal Mitigation Plan Review Guide Policy (2017) https://www.fema.gov/media-library/assets/documents/18355
Mitigation Ideas: A Resource for Reducing Risk to Natural Hazards (2013) https://www.fema.gov/media-library/assets/documents/30627	What is a Benefit: Guidance on Benefit-Cost Analysis on Hazard Mitigation Projects http://www.fema.gov/benefit-cost-analysis
National Flood Insurance Program Community Status Book (2018) https://www.fema.gov/national-flood-insurance-program-community-status-book	
Plans/Studies	
Flood Insurance Studies (where applicable) http://www.fema.gov/floodplain-management/flood-insurance-study	South Dakota Geological Survey Program http://www.sdgs.usd.edu/
Fourth National Climate Assessment (2018) https://nca2018.globalchange.gov/	South Dakota State Water Plan (2018) http://denr.sd.gov/dfta/wwf/statewaterplan/17annualbwnr.pdf
National Climate Assessment (2014) https://nca2014.globalchange.gov/	State of South Dakota Hazard Mitigation Plan (2014)

	https://dps.sd.gov/application/files/4315/0161/4508/2014-Hazard-Mitigation-Plan_LR.pdf
South Dakota Drought Mitigation Plan (2015) https://dps.sd.gov/application/files/5615/0161/4504/2015-SD-Drought-Mitigation-Plan_LR.pdf	
Data Sources/Technical Resources	
Arbor Day Foundation – Tree City Designation https://www.arborday.org/	South Dakota Department of Health http://doh.sd.gov
Bureau of Indian Affairs, Great Plains Region https://www.bia.gov/regional-offices/great-plains	South Dakota Department of Education http://doe.sd.gov/
Bureau of Indian Affairs, Pine Ridge Agency https://www.bia.gov/regional-offices/great-plains/south-dakota/pine-ridge-agency	South Dakota Department of Environment and Natural Resources http://denr.sd.gov/
Environmental Protection Agency - Chemical Storage Sites https://myrtek.epa.gov/info/search.jsp	South Dakota Department of Transportation http://www.sddot.com/
Centers for Disease Control and Prevention http://www.cdc.gov	South Dakota Emergency Management https://dps.sd.gov/emergency-services/emergency-management
Federal Emergency Management Agency http://www.fema.gov	South Dakota Game, Fish, & Parks https://gfp.sd.gov/
FEMA Flood Map Service Center https://msc.fema.gov/portal/advanceSearch	South Dakota State Historical Society http://history.sd.gov/
High Plains Regional Climate Center http://climod.unl.edu/	Stanford University - National Performance of Dams Program https://nrdp.stanford.edu/
Lacreek Electric Association, Inc. http://lacreek.com/	Storm Prediction Center Statistics http://www.spc.noaa.gov
National Agricultural Statistics Service http://www.nass.usda.gov/	Trust for America's Health. http://healthyamericans.org/states/
National Centers for Environmental Information https://www.ncei.noaa.gov/	United States Army Corps of Engineers – National Levee Database http://nld.usace.army.mil/egis/f?p=471:1:0::NO
National Consortium for the Study of Terrorism and Responses to Terrorism (START) http://www.start.umd.edu/gtd/	United States Census Bureau http://www.census.gov
National Drought Mitigation Center – Drought Impact Reporter http://droughtreporter.unl.edu/map/	United States Census Bureau https://factfinder.census.gov/faces/nav/jsf/pages/index.xhtml
National Drought Mitigation Center – Drought Monitor http://drought.unl.edu/dm/monitor.html	United States Department of Agriculture http://www.usda.gov
National Environmental Satellite, Data, and Information Service http://www.nesdis.noaa.gov/	United States Department of Agriculture – Risk Assessment Agency http://www.rma.usda.gov
National Fire Protection Association https://www.nfpa.org/	United States Department of Agriculture – Web Soil Survey https://websoilsurvey.nrcs.usda.gov/app/WebSoilSurvey.aspx
National Flood Insurance Program https://www.fema.gov/national-flood-insurance-program	United States Department of Commerce http://www.commerce.gov/
National Historic Registry http://www.nps.gov/nr	United States Department of Transportation – Pipeline and Hazardous Materials Safety Administration https://www.phmsa.dot.gov/

National Oceanic Atmospheric Administration http://www.noaa.gov/	United States Forest Service https://www.fs.fed.us/
National Weather Service http://www.weather.gov/	United States Geological Survey http://www.usgs.gov/
Oglala Lakota College http://www.olc.edu/	United States National Response Center http://www.nrc.uscg.mil/
Oglala Sioux Nation Website http://oglalalakotanation.info/	United States Small Business Administration http://www.sba.gov
Social, Political, and Economic Event Database Project (SPEED) https://clinecenter.illinois.edu/project/human-loop-event-data-projects/SPEED	University of Nebraska-Lincoln – National Drought Mitigation Center http://drought.unl.edu/Planning/DroughtPlans/StatePlanning.aspx?st=sd
South Dakota Department of Agriculture http://sdda.sd.gov/	

PUBLIC REVIEW

Once the draft of the HMP was completed, a public review period was opened to allow for participants and community members at-large to review the plan and provide comments and changes. For the purpose of this plan, the Tribe defined the ‘public’ as any tribal residents within the Pine Ridge Reservation, while the County also included all residents who may be non-tribal but reside within the Pine Ridge Reservation boundary. The public review period was open from June 27, 2019 through July 27, 2019. Participants were emailed and mailed a letter notifying them of this public review period. The HMP was also made available on the project website (<https://jeo.com/osthmp>) to download the document, and notifications were sent to local newspapers and to the OST website. Received comments and suggested changes were incorporated into the plan.

PLAN ADOPTION

Based on FEMA requirements, this 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 §201.7(c)(5): Plan Adoption Process. The plan must be formally adopted by the governing body of the Indian tribal government prior to submittal to FEMA for final review and approval.

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

PLAN IMPLEMENTATION AND PROGRESS MONITORING

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

SECTION THREE

PLANNING AREA PROFILE

INTRODUCTION

To identify jurisdictional vulnerabilities, it is vitally important to understand the people and built environment of the planning area. The following section is meant to provide a description of the characteristics of the planning area to create an overall profile.

PLANNING AREA GEOGRAPHIC SUMMARY

Pine Ridge Reservation

The Pine Ridge Reservation is home to the Oglala Sioux Tribe. The Oglala Sioux Tribe (OST) is a subtribe to the Oglala Lakota Nation. The Pine Ridge Reservation is located in southwest South Dakota and covers 3,469 square miles in Oglala Lakota, Bennett, and Jackson Counties, as well as a small portion of Cherry County in Nebraska. The entirety of Oglala Lakota and Bennett Counties are included in the Pine Ridge Reservation, while only the southern half of Jackson County is within tribal boundaries. The planning area is largely made up of two topographic regions: flat grasslands and steep flat-topped buttes.

Oglala Lakota County

Oglala Lakota County is in southwest South Dakota and is the western-most county located within the Pine Ridge Reservation. The county encompasses 2,097 square miles. Prior to May 2015, the county was named Shannon County but was renamed after the Oglala Lakota people who live within the county. The county is unorganized with the neighboring Fall River County serving as its administration. The only incorporated town in the reservation, Batesland, is found in eastern Oglala Lakota County. A portion of the Badlands National Park lies within the reservation. Roughly 133,000 acres of Badlands intersect the northwest portion of Oglala Lakota County. The White River and White Clay Creek bisect the county, while the Cheyenne River borders Custer County to the northwest.

CLIMATE

For the Pine Ridge Reservation, the normal high temperature for the month of July is 88.1°F. The normal low temperature for the month of January is 9.1°F. On average, the reservation receives 19.6 inches of rain and 34.9 inches of snowfall per year. The following table compares these climate indicators with those of the entire state. Climate data are helpful in determining if certain events are more or less likely to occur in specific geographic locations. A climate summary is provided for the reservation and the state below as the region as a whole is expected to receive similar conditions. For a more in-depth discussion of climate impacts, see *Section Four: Risk Assessment*.

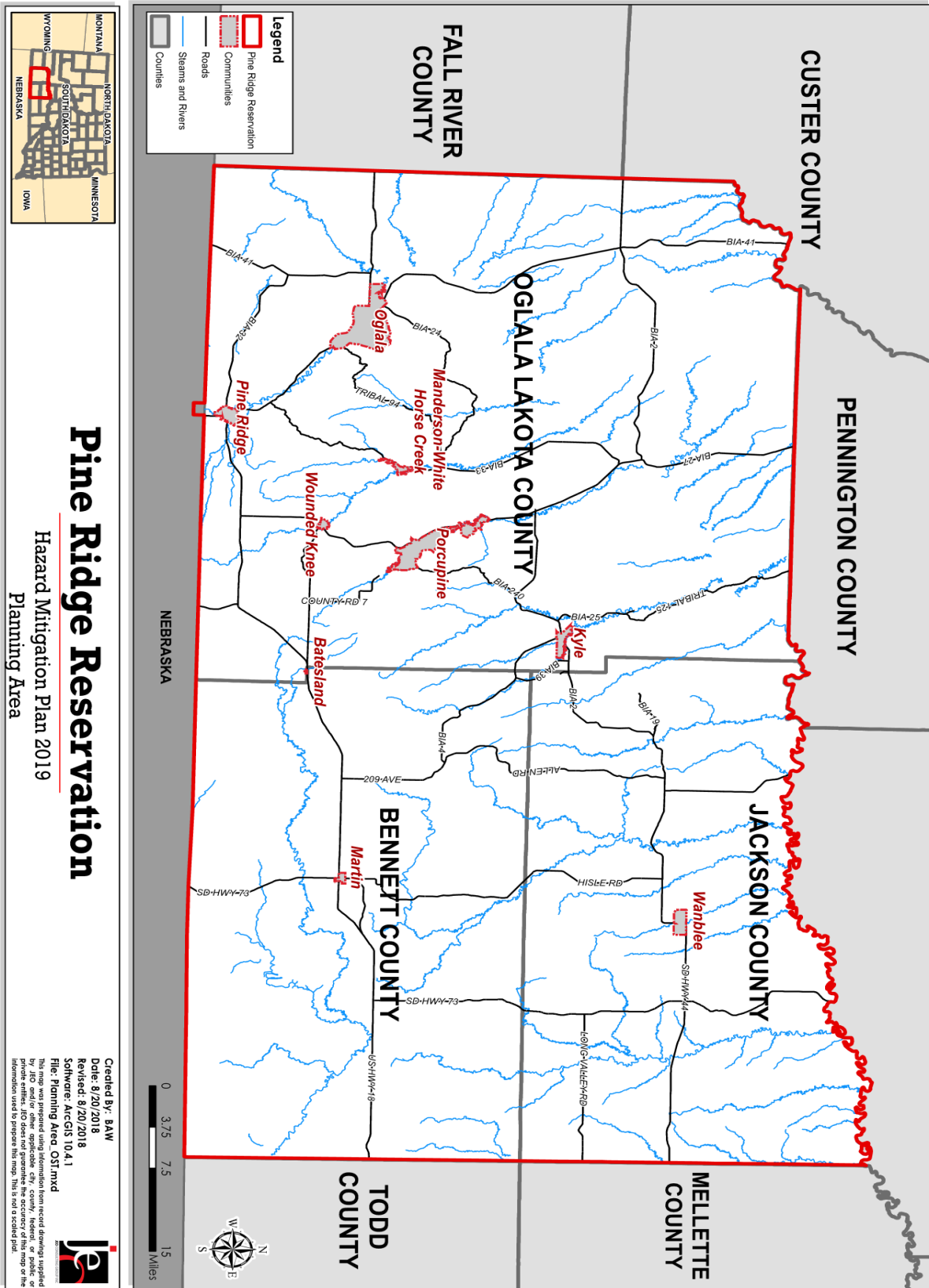
TABLE 18: CLIMATE DATA FOR PINE RIDGE RESERVATION

AGE	PINE RIDGE RESERVATION	STATE OF SOUTH DAKOTA
July Normal High Temp	88.1°F	86.5°F
January Normal Low Temp	9.1°F	5.0°F
Annual Normal Precipitation	19.59 inches	19.21 inches
Annual Normal Snowfall	34.9 inches	24.1 – 36.0 inches

Source: High Plains Regional Climate Center, 1981-2010 Climate Normals; NCEI, Jan 1895-March 2018

*Precipitation includes all rain and melted snow and ice.

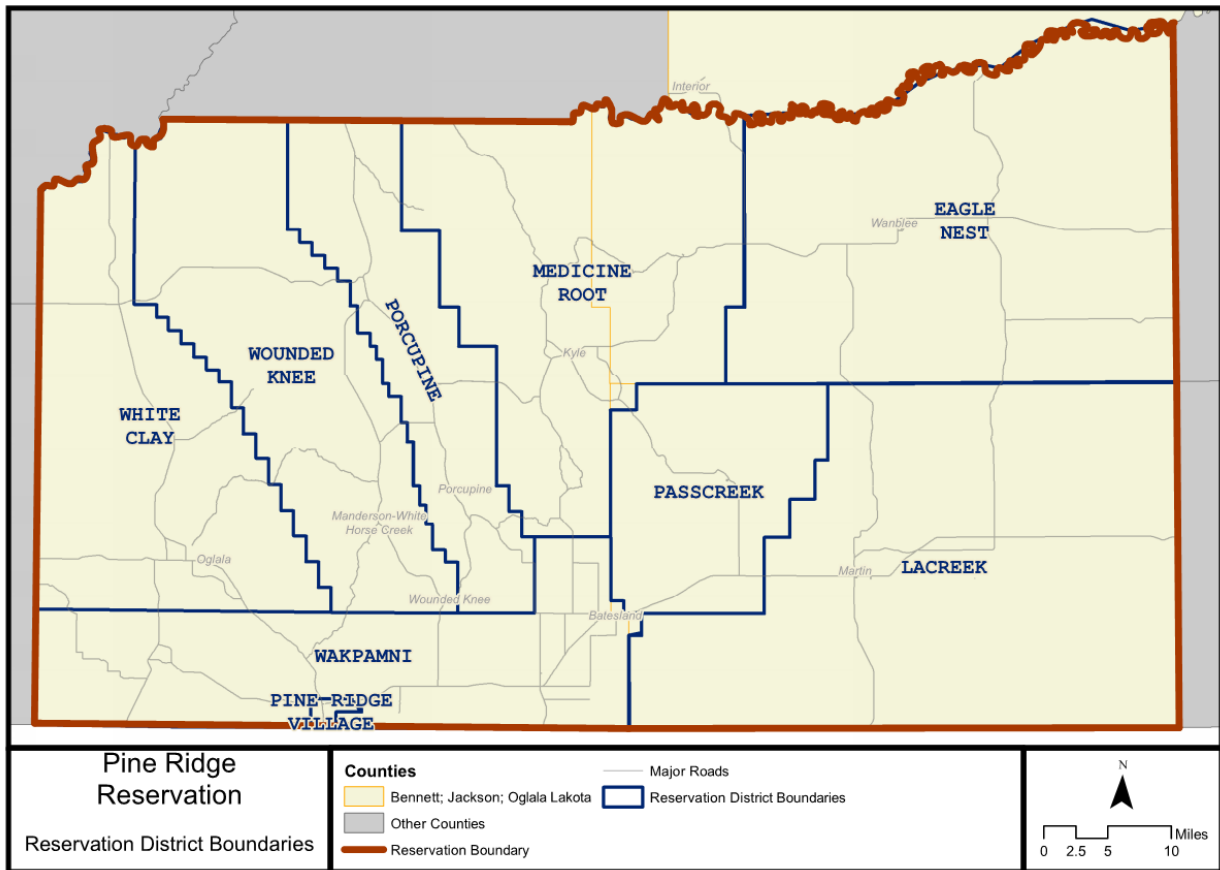
FIGURE 3: PINE RIDGE RESERVATION



The reservation is divided into nine political districts. Each district has one elected council member representative per 1,000 tribal members within the district. These districts include:

- Eagle Nest
- La Creek
- Medicine Root
- Pass Creek
- Pine Ridge
- Porcupine
- Wakpamni
- White Clay
- Wounded Knee

FIGURE 4: PINE RIDGE RESERVATION DISTRICTS



Source: OST Emergency Management

POPULATION AND DEMOGRAPHICS

The historic population of the Oglala Sioux Tribe has increased from 1980 to 2015. The U.S. Census Bureau population estimate of the tribe was 24,650 in 2015. However, the census bureau has not proved to be an effective means of determining tribal populations, so true tribal population counts may be higher than as reported.

FIGURE 5: HISTORICAL POPULATION OF OGLALA SIOUX TRIBE

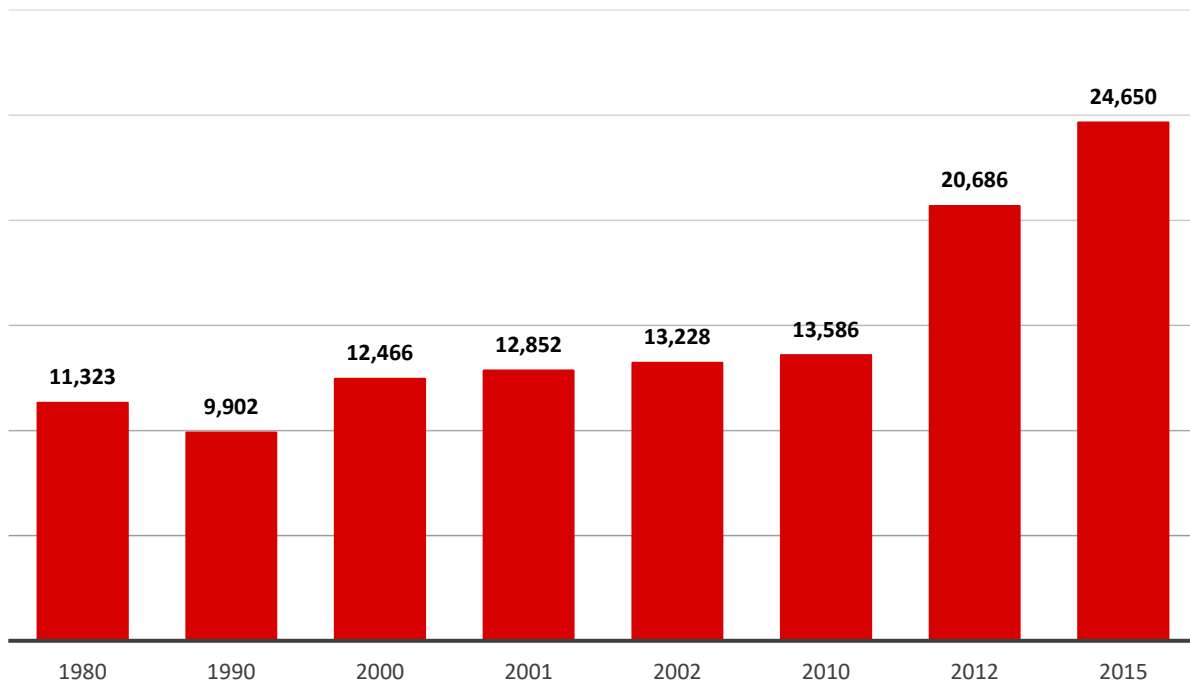
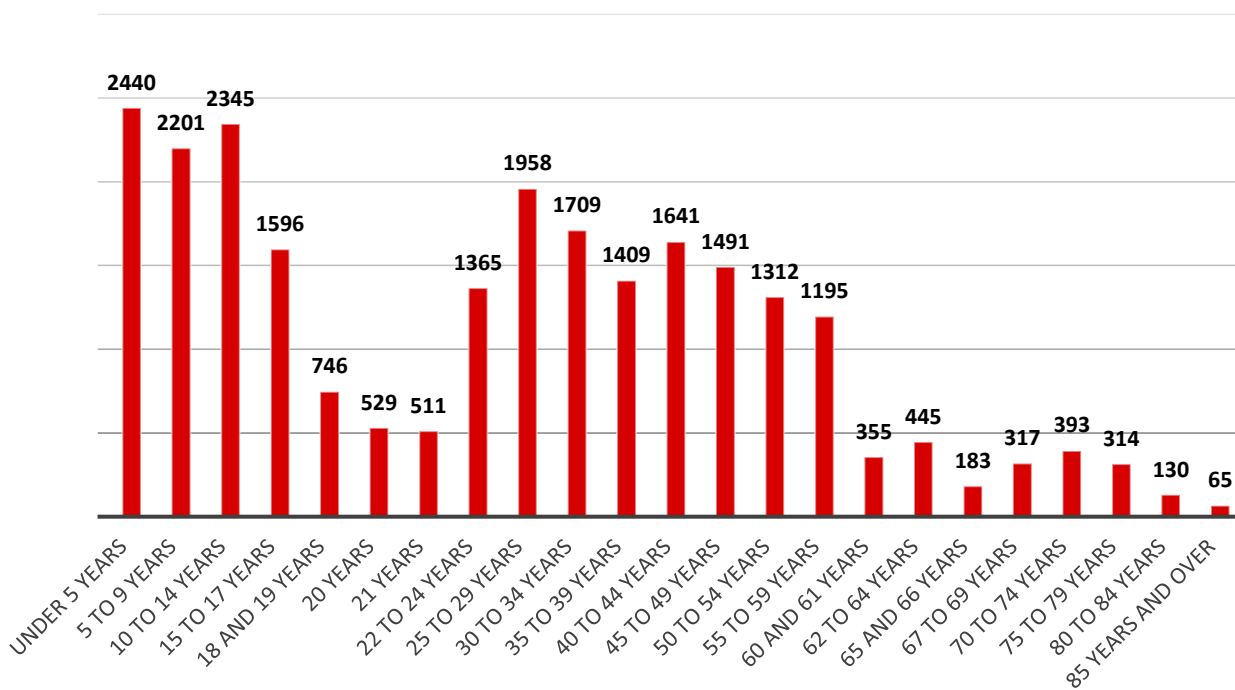


FIGURE 6: POPULATION BY AGE



Elderly and very young populations may be more vulnerable to certain hazards than other population groups. Thirty-five percent of the tribe’s population is 18 years or younger. The median age of the Tribe is 26.3 years old. Approximately 8.9% are older than 60 years old.

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.”¹⁵

There are many schools within the planning area. Schools within the reservation include public schools, Bureau of Indian Affairs schools, grant funded schools, and private schools. Schools house a high number of at-risk residents within the planning area during the daytime hours of weekdays, as well as during special events on evenings and weekends. The following table identifies the various schools located within the planning area, and Figure 7 is a map of school locations throughout the planning area.

TABLE 19: SCHOOL INVENTORY

NUMBER	SCHOOL	LOCATION	TYPE	TOTAL ENROLLMENT (2017-2018)
1	American Horse School	Allen	Grant	291
2	Batesland Elementary	Batesland	Public	181
3	Bennett County High School/Martin High School	Martin	Public	139
4	Bennett County Junior High School/Martin Middle School	Martin	Public	76
5	Crazy Horse School	Wanblee	Grant	299
6	Lakota Immersion School	Pine Ridge	Private	30
7	Lakota Waldorf School	Kyle	Private	30
8	Little Wound Schools	Kyle	Grant	831
9	Loneman School	Oglala	Public	150
10	Long Valley Elementary	Long Valley	Public	35
11	Martin Elementary	Martin	Public	280
12	Oglala Lakota College	Kyle	College	1,246
13	Oglala Lakota County Virtual High School	Batesland	Public	106
14	Pine Ridge Schools	Pine Ridge	BIA	817
15	Porcupine School	Porcupine	Public	120
16	Red Cloud Indian Schools	Pine Ridge	Private	435
17	Red Shirt School	Red Shirt	Public	88
18	Rockyford School	Porcupine	Public	394
19	Tokeya Lakota Woglakapi	Oglala	Private	30
20	Wolf Creek School	Pine Ridge	Public	684
21	Wounded Knee Elementary	Manderson-White Horse Creek	Grant	156

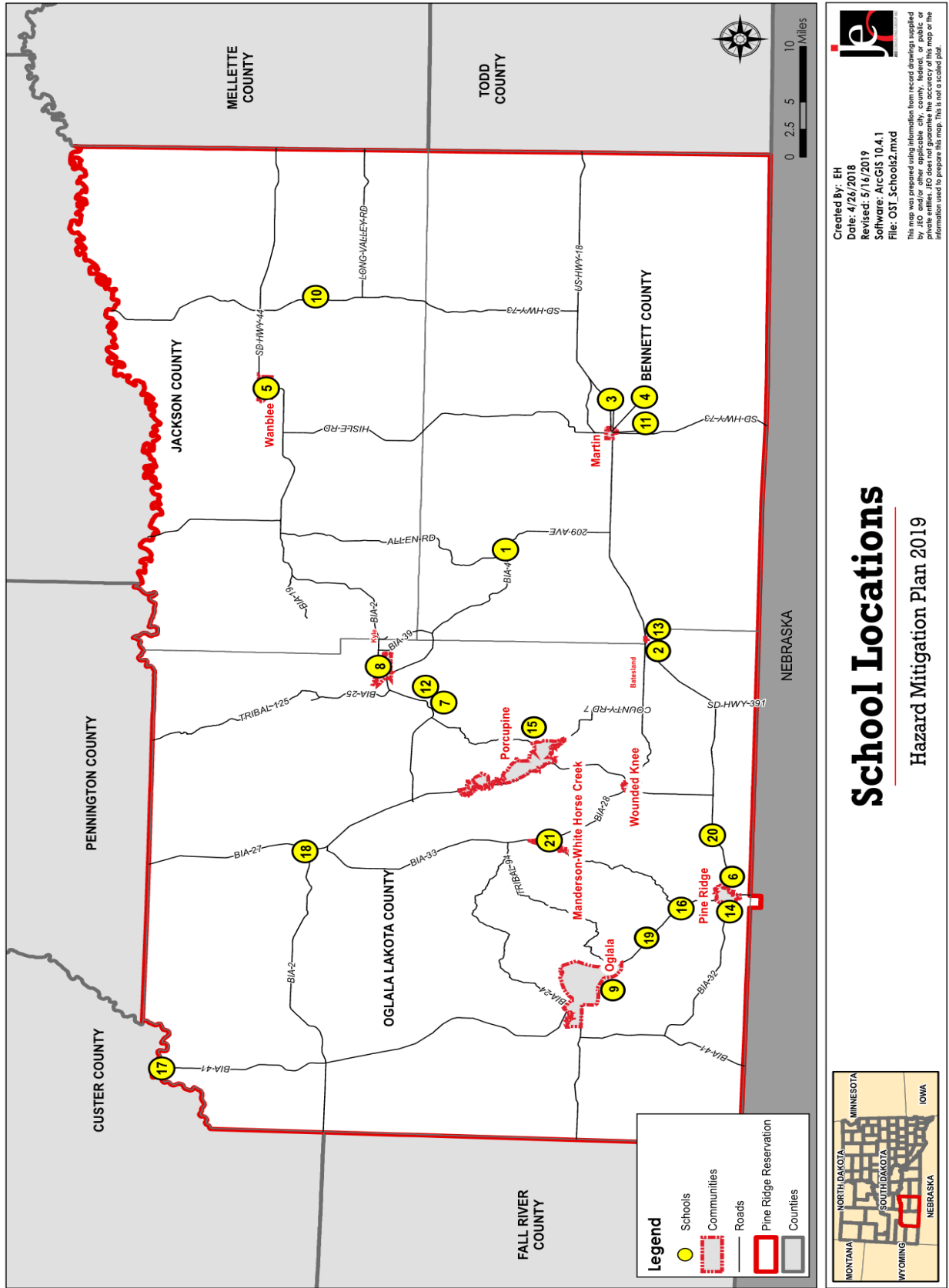
¹⁵ United States Department of Homeland Security. June 2016. “National Response Framework Third Edition.” https://www.fema.gov/media-library-data/1466014682982-9bcf8245ba4c60c120aa915abe74e15d/National_Response_Framework3rd.pdf.

The Oglala Lakota College has a decentralized campus, meant to improve access to students throughout the Oglala Lakota Nation. Piya Wiconi (the administrative office complex) is location in Kyle, South Dakota. The other college locations are listed below. There is a college center in each of the nine districts within the reservation.

TABLE 20: OGLALA LAKOTA COLLEGE CENTERS

NUMBER	SCHOOL	LOCATION	PINE RIDGE RESERVATION DISTRICT
1	Cheyenne River	Eagle Butte	Cheyenne River Reservation
2	Eagle Nest	Wanblee	Eagle Nest
3	East Wakpamni	Batesland	Wakpamni
4	He Sapa	Rapid City	Rapid City area
5	LaCreek	Martin	LaCreek
6	Pahin State	Porcupine	Porcupine
7	Pass Creek	Allen	Pass Creek
8	Pejuta Haka	Kyle	Medicine Root
9	Pine Ridge	Pine Ridge	Pine Ridge Village
10	Oglala	Oglala	White Clay
11	Wounded Knee	Manderson	Wounded Knee

FIGURE 7: PINE RIDGE RESERVATION SCHOOLS



School Locations

Hazard Mitigation Plan 2019

Like minors, seniors (age 65 and greater) are often more significantly impacted by temperature extremes.

During prolonged heat waves, seniors may lack resources to effectively address the hazards and as a result may incur injury or potentially death. Prolonged power outages (either standalone events or as the result of other contributing factors) can have significant impacts on any citizen relying on medical devices for proper bodily functions. One study conducted by the Center for Injury Research and Policy found that increases in vulnerability related to severe winter storms (with significant snow accumulations) begin at age 55.¹⁶ 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 21 identifies the number and capacity of care facilities throughout the planning area. Note that while Rural Health Clinics do not have beds to allow overnight patients, during the day facilities may contain a concentrated number of patients. The Indian Health Service operates a hospital in Pine Ridge. Additionally, there are two health centers in Kyle and Wanblee and three smaller health stations in Allen, Manderson, and Porcupine.

TABLE 21: INVENTORY OF CARE FACILITIES

FACILITY TYPE	LOCATION	NUMBER OF BEDS
Rural Health Clinic	Martin, SD	0
Bennett County Hospital and Nursing Home	Martin, SD	48
Pine Ridge Hospital	Pine Ridge, SD	-

Source: South Dakota Department of Health¹⁷

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

TABLE 22: AT-RISK POPULATION

COMMUNITY	POPULATION THAT SPEAKS ENGLISH AS A SECOND LANGUAGE	PERCENT OF POPULATION	PERCENT OF POPULATION BELOW POVERTY LEVEL
OGLALA LAKOTA COUNTY	3,208	25.2%	53.9%
BENNETT COUNTY	253	8.1%	38.2%
JACKSON COUNTY*	447	15.2%	36.5%
PINE RIDGE RESERVATION	3,849	21.9%	N/A
BATESLAND	31	26.5%	41.0%

Source: U.S. Census Bureau^{18,19}

*Only the southern half of Jackson County is located within tribal boundaries, however data provided represents the entirety of the county.

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-English speakers from reacting in a timely manner.

¹⁶ Center for Injury Research and Policy. January 2011. "Snow Shoveling Safety." Accessed July 2017. <http://www.nationwidechildrens.org/cirp-snow-shoveling>.

¹⁷ South Dakota Department of Health. 2018. "Assisted Living Centers." <https://doh.sd.gov/providers/licensure/assisted-living.aspx>.

¹⁸U.S. Census Bureau. 2018. "Language Spoken at Home: 2016 American Community Survey (ACS) 5-year estimates." <https://factfinder.census.gov/faces/nav/jsf/pages/searchresults.xhtml?refresh=#>.

¹⁹U.S. Census Bureau. 2018. "Selected Economic Characteristics: 2016 ACS 5-year estimate." <https://factfinder.census.gov/faces/nav/jsf/pages/searchresults.xhtml?refresh=#>.

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.

The Planning Team indicated that one-third of the population speak the native Lakota as their first language. However, notifications for hazard events and public outreach materials are distributed in English. The majority of people who speak Lakota are elders, but in recent years there has been an increased push to teach Lakota in grade schools. If the local radio station broadcasts in Lakota, they also provide an English translation.

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 known hazard sites (i.e. chemical storage areas); or older poorly maintained structures. Oglala Lakota County has the highest poverty rate in South Dakota, and residents below the poverty line will be more vulnerable to all hazards within the planning area.

BUILT ENVIRONMENT AND STRUCTURAL INVENTORY

The US Census provides information related to housing units and potential areas of vulnerability. The selected characteristics examined in Table 23 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 23: SELECTED HOUSING CHARACTERISTICS

	Pine Ridge Reservation	Oglala Lakota County	Bennett County	Jackson County	Batesland
OCCUPIED HOUSING UNITS	4,387 (82.4%)	81.8%	84.3%	77.2%	87.1%
LACKING COMPLETE PLUMBING FACILITIES	6.5%	8.8%	1.1%	1.3%	0%
LACKING COMPLETE KITCHEN FACILITIES	4.8%	6.5%	0.6%	1.5%	0%
NO TELEPHONE SERVICE AVAILABLE	11%	6.5%	3.8%	6.1%	11.1%
HOUSING UNITS WITH NO VEHICLES AVAILABLE	12.8%	15.1%	4.6%	8.4%	0%
MOBILE HOMES	27.9%	32.9%	14.1%	22.7%	38.7%

Indicated percentages are determined based on total housing units

Source: U.S. Census Bureau, 2018²⁰

Approximately 11 percent of housing units within the reservation lack access to landline telephone service. This does not necessarily indicate that there is not a phone in the housing unit, as cellular telephones are increasingly a primary form of telephone service. However, this lack of access to landline telephone service does represent a population at increased risk to disaster impacts. Reverse 911 systems are designed to contact households via landline services and as a result, some homes in hazard prone areas may not receive notification of potential impacts in time to take protective actions. Emergency managers should continue to promote the registration of cell phone numbers with Reverse 911 systems.

Nearly thirty percent of housing units in the planning area are mobile homes. Mobile homes have a higher risk of sustaining damages during high wind events, tornadoes, severe thunderstorms, and severe winter storms. Mobile homes that are either not anchored or are anchored incorrectly can be overturned by 60

²⁰ U.S. Census Bureau. 2018. "Selected Housing Characteristics: 2016 ACS 5-year estimate." <https://factfinder.census.gov/faces/nav/jsf/pages/searchresults.xhtml?refresh=#>.

mph winds. A thunderstorm is classified as severe when wind speeds exceed 58 mph, placing improperly anchored mobile homes at risk.

Furthermore, approximately thirteen percent of all housing units do not have a vehicle available. Households without vehicles may have difficulty evacuating during a hazardous event and a reduced ability to access resources in time of need. Many homes throughout the reservation are located on rural roads or set far back from roads, which may increase vulnerability in the case of evacuation or make it difficult for emergency personnel to provide aid.

The Oglala Sioux (Lakota) Housing Authority (OSLHA) serves approximately 14,000 people on the Pine Ridge Reservation and manages more than 1,200 low income rental units and has built over 500 home ownership units for tribe members. There are cluster housing units in each of the nine districts. The Tribe has brought in some Governor Houses for elderly residents. The need for housing is still great for the people of the Pine Ridge Indian Reservation.

OSLHA also adopts projects to improve the safety and efficiency of homes throughout the planning area. Completed projects include mold remediation programs and a rural innovation fund to construct 18 energy efficient low-rent homes in each district. Current projects include: rehabilitate low-rent housing units, construction of safe houses, water upgrades, lagoon upgrades and expansion, block grants, Title VI housing development, and improvements to water, wastewater, and solid waste management systems.²¹

STATE AND FEDERALLY OWNED PROPERTIES

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

TABLE 24: STATE AND FEDERALLY-OWNED FACILITIES

FACILITY	NEAREST COMMUNITY
BADLANDS NATIONAL PARK	Red Shirt/Rockyford
VARIOUS STATE-OWNED PROPERTIES	Reservation-wide
US DEPARTMENT OF ROADS	Highways Reservation-wide
LACREEK NATIONAL WILDLIFE REFUGE	Martin

Source: County Assessors

STRUCTURAL INVENTORY AND VALUATION

The Planning Team requested Geographic Information System (GIS) parcel data from the County Assessor. The data was used to analyze the location, number, and value of property improvements at the parcel level for Oglala Lakota County. Tribal lands and properties are not mapped for parcels. The following table describes the results of this analysis. The data did not contain the number of structures on each parcel.

TABLE 25: STRUCTURAL INVENTORY AND PARCEL IMPROVEMENTS

NUMBER OF PARCELS	TOTAL IMPROVEMENT VALUE	MEAN VALUE OF IMPROVEMENTS PER PARCEL
1,484	\$9,627,260	\$6,487

Source: County Assessors/GIS Workshop

ECONOMICS AND LABOR FORCE

The reservation’s economic base is a mixture of education and arts and entertainment uses. Employment statistics for the Pine Ridge Reservation, counties, state, and participating community are found below. The U.S. Census Bureau defines “not in the labor force” as individuals without a current job and who are not looking for one. These may include students, stay-at-home parents, and retirees. Individuals within the “Population 16 and Over in Labor Force” without a current job but are currently looking for work are included in the unemployment rate.

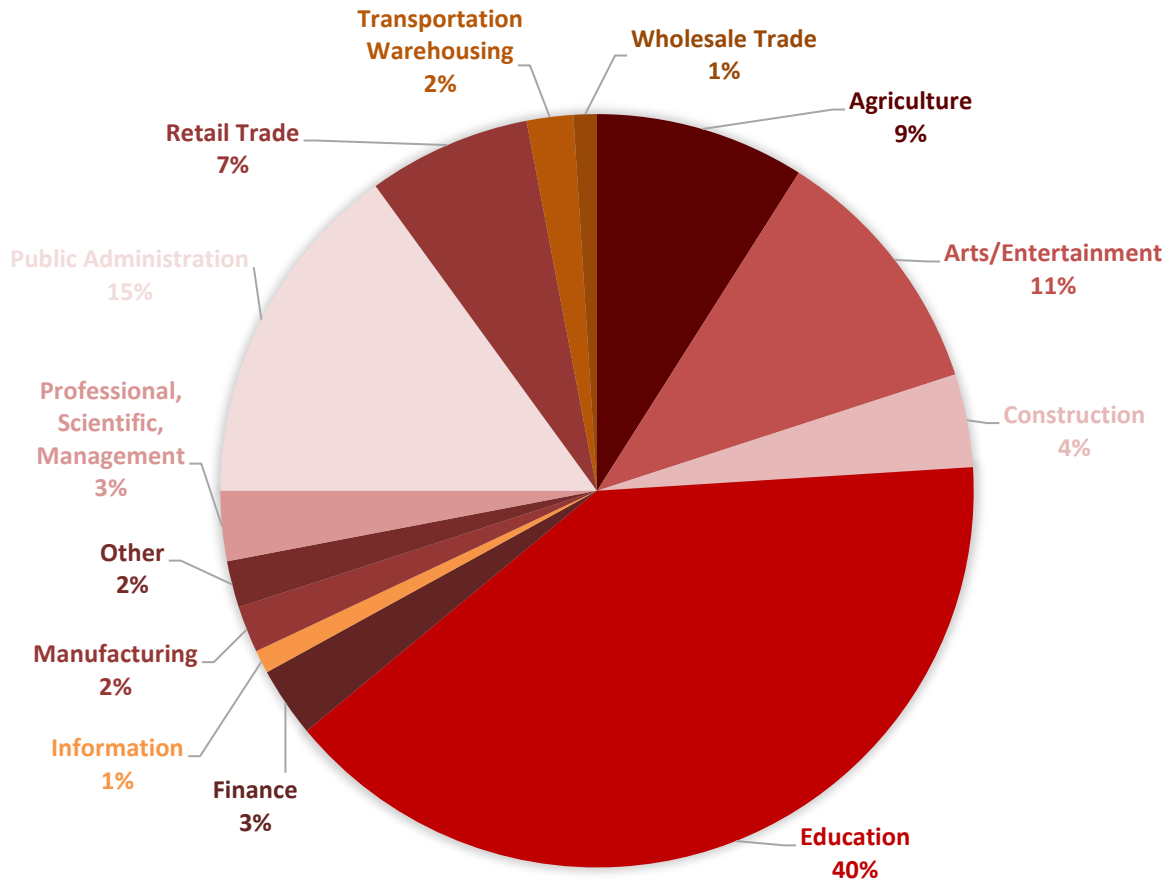
²¹ Oglala Sioux Lakota Housing. 2019. “Current Projects.” <http://oslh.org/category/projects/current/>.

TABLE 26: EMPLOYMENT STATISTICS

	PINE RIDGE RESERVATION	OGLALA LAKOTA COUNTY	BENNETT COUNTY	JACKSON COUNTY	BATESLAND	STATE OF SOUTH DAKOTA
POPULATION 16 AND OVER IN LABOR FORCE	49.4%	46.6%	57.4%	59.6%	47.5%	68.7%
EMPLOYED	37%	33.5%	47.9%	50.1%	43.8%	65.5%
UNEMPLOYED	12.4%	13.1%	9.5%	9.5%	3.8%	2.8%
UNEMPLOYMENT RATE	25.2%	28.1%	16.5%	15.9%	7.9%	4.1%
POPULATION 16 AND OVER NOT IN LABOR FORCE	50.6%	53.4%	42.6%	40.4%	52.5%	31.3%

Source: U.S. Census Bureau²²

FIGURE 8: OCCUPATIONAL SECTOR FOR PINE RIDGE RESERVATION



In comparison to the State of South Dakota, OST has significantly lower median household income, per capita income, and median home value.

TABLE 27: HOUSING AND INCOME

	PINE RIDGE RESERVATION	OGLALA LAKOTA COUNTY	BENNETT COUNTY	JACKSON COUNTY	BATESLAND	STATE OF SOUTH DAKOTA
--	------------------------	----------------------	----------------	----------------	-----------	-----------------------

²² U.S. Census Bureau. 2018. "Selected Economic Characteristics: 2016 ACS 5-year estimate." <https://factfinder.census.gov/faces/nav/jsf/pages/searchresults.xhtml?refresh=#>.

	SOUTH DAKOTA					
MEDIAN HOUSEHOLD INCOME	\$30,908	\$26,330	\$45,820	\$41,510	\$48,125	\$52,078
PER CAPITA INCOME	\$10,584	\$9,286	\$15,011	\$17,601	\$12,032	\$27,516
MEDIAN HOME VALUE	\$31,300	\$19,800	\$60,900	\$54,700	\$18,100	\$146,700
MEDIAN RENT	\$472	\$464	\$490	\$448	N/A	\$676
% OF INDIVIDUALS WITH INCOME BELOW POVERTY RATE	50.8%	53.9%	38.2%	36.5%	41%	14%

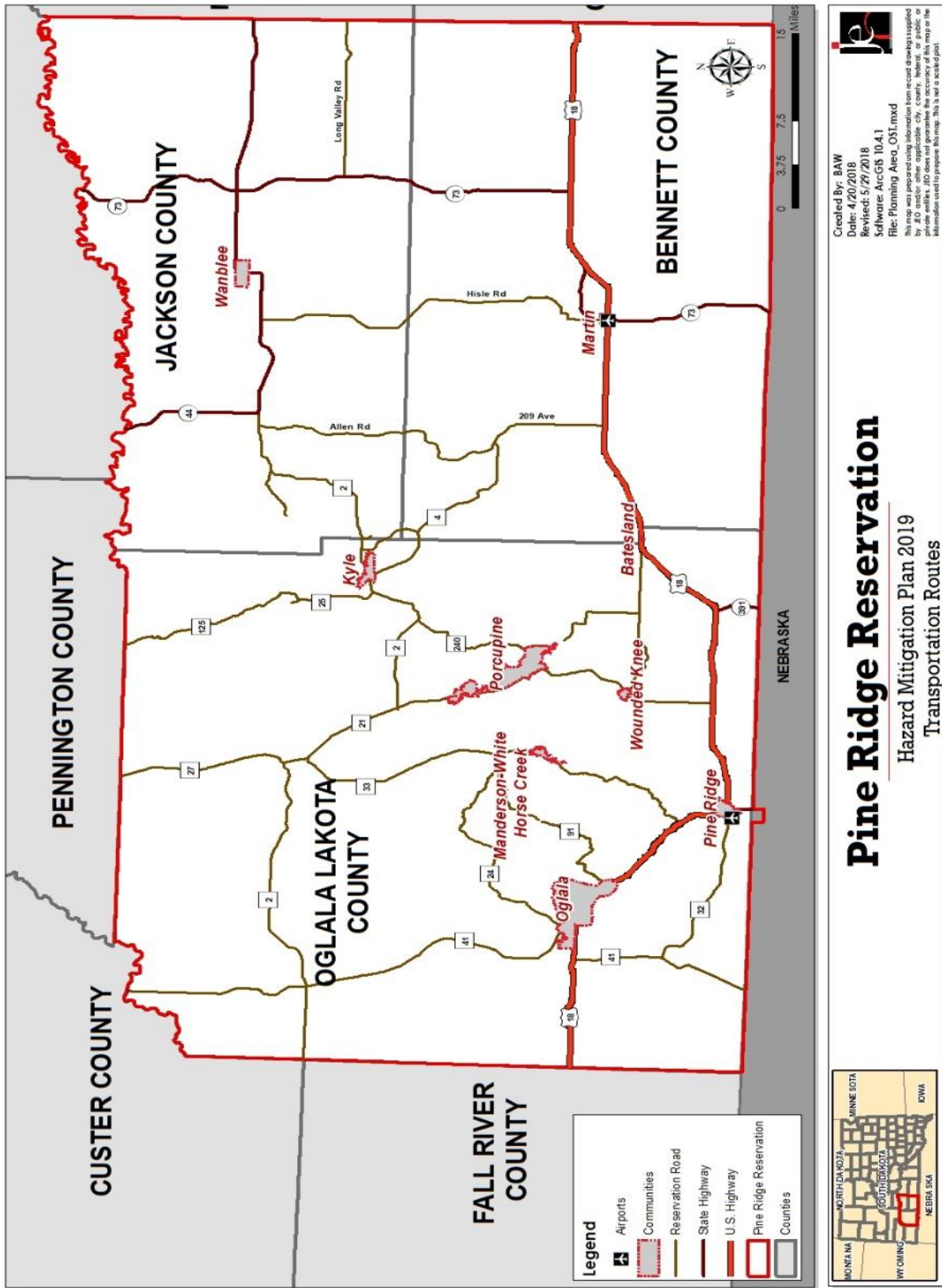
Source: U.S. Census Bureau

TRANSPORTATION

Transportation routes are necessary for delivery of critical supplies and as potential evacuation routes. The Pine Ridge Reservation is bisected by U.S. Highway 18. Other paved roads include South Dakota Highways 73, 61, and 44, and BIA 2, 41, 33, 94, 125, and 27. Many homes and communities are accessible only by gravel and dirt roads, making them inaccessible during severe winter storms, flooding, or heavy rain events. There are no railroads located within the planning area. Two airports, Pine Ridge Airport and Martin Municipal Airport, are located within the planning area.

The mean travel time to work is 19.9 minutes. Most commuters drive alone to work (69.8%), while 14% carpool and 6.9% walk.

FIGURE 9: TRANSPORTATION ROUTES



CRITICAL FACILITIES

Critical facilities are vital for disaster response, providing shelter to the public, and essential for returning the jurisdiction's functions to normal during and after a disaster. Critical facilities were identified and reviewed by members of the Planning Team. GIS maps and analysis were provided by the OST GIS and Fall River County GIS departments. Fall River County serves Oglala Lakota County for their GIS and other administrative needs. The following tables and figures provide a summary of the critical facilities for the jurisdictions. Critical facilities located in Kyle and Pine Ridge Village can be seen in Figure 11 and Figure 12. The list of critical facilities is extensive and includes facilities other than those maintained solely by the tribe. Critical facilities specific to Batesland can be found in their community profile in *Section Seven*.

TABLE 28: CRITICAL FACILITIES

CF NUMBER	NAME	EMERGENCY SHELTER (Y/N)	GENERATOR (Y/N)
1	Batesland School	Yes	No
2	Red Cloud Middle School	Yes	No
3	Pine Ridge High School	Yes	No
4	Wolf Creek Elementary	Yes	No
5	Rockyford Elementary	Yes	No
6	Porcupine Elementary	Yes	No
7	Wounded Knee Elementary	Yes	No
8	Kyle Fire Department	No	No
9	Pine Ridge Fire Department	No	No
10	Batesland Fire Department	No	No
11	Emergency Management Office	No	Yes
12	Pine Ridge Airport	No	No
13	Little Wound School	Yes	No
14	OLC Piya Wiconi	No	No
15	Lonemen School	Yes	No
16	Redshirt School	Yes	No
17	Dialysis Center	No	Yes
18	Manderson Clinic	No	Yes
19	Pine Ridge Hospital	No	Yes
20	Kyle Health Center	No	Yes
21	OST Ambulance Center	No	No
22	Porcupine Police Station	No	No
23	Green Valley Volunteer Fire Department	No	No
24	Long Valley Volunteer Fire Department	No	No
25	Wanblee Health Center	No	Yes
26	Crazy Horse School	Yes	Yes
27	Allen Clinic	No	Yes
28	American Horse School	Yes	No
29	Tuthill Volunteer Fire Department	No	No
30	Vetel Volunteer Fire Department	No	No
31	Martin Fire Department	No	Yes
32	Martin Airport	No	Yes
33	Martin Hospital	No	Yes
34	BIA Building	No	Yes
35	Kyle Police Department	No	Yes
36	Martin Police Department	No	No
37	KILI Radio Station	No	No
38	Oglala Ambulance Base	No	No
39	Martin Indian Health Clinic	No	No
40	Oglala CAP Office	Yes	No

CF NUMBER	NAME	EMERGENCY SHELTER (Y/N)	GENERATOR (Y/N)
41	Red Cloud CAP Building	Yes	No
42	Justice Center	No	Yes
43	Adult Offenders Facility (AOF)	No	Yes
44	Cell Tower	No	Yes
45	Cell Tower	No	Yes
46	Cell Tower	No	Yes
47	Cell Tower	No	Yes
48	Cell Tower	No	Yes
49	Cell Tower	No	Yes
50	Cell Tower	No	Yes
51	Cell Tower	No	Yes
52	Cell Tower	No	Yes
53	Cell Tower	No	Yes
54	Cell Tower	No	Yes

FIGURE 10: PINE RIDGE RESERVATION CRITICAL FACILITIES

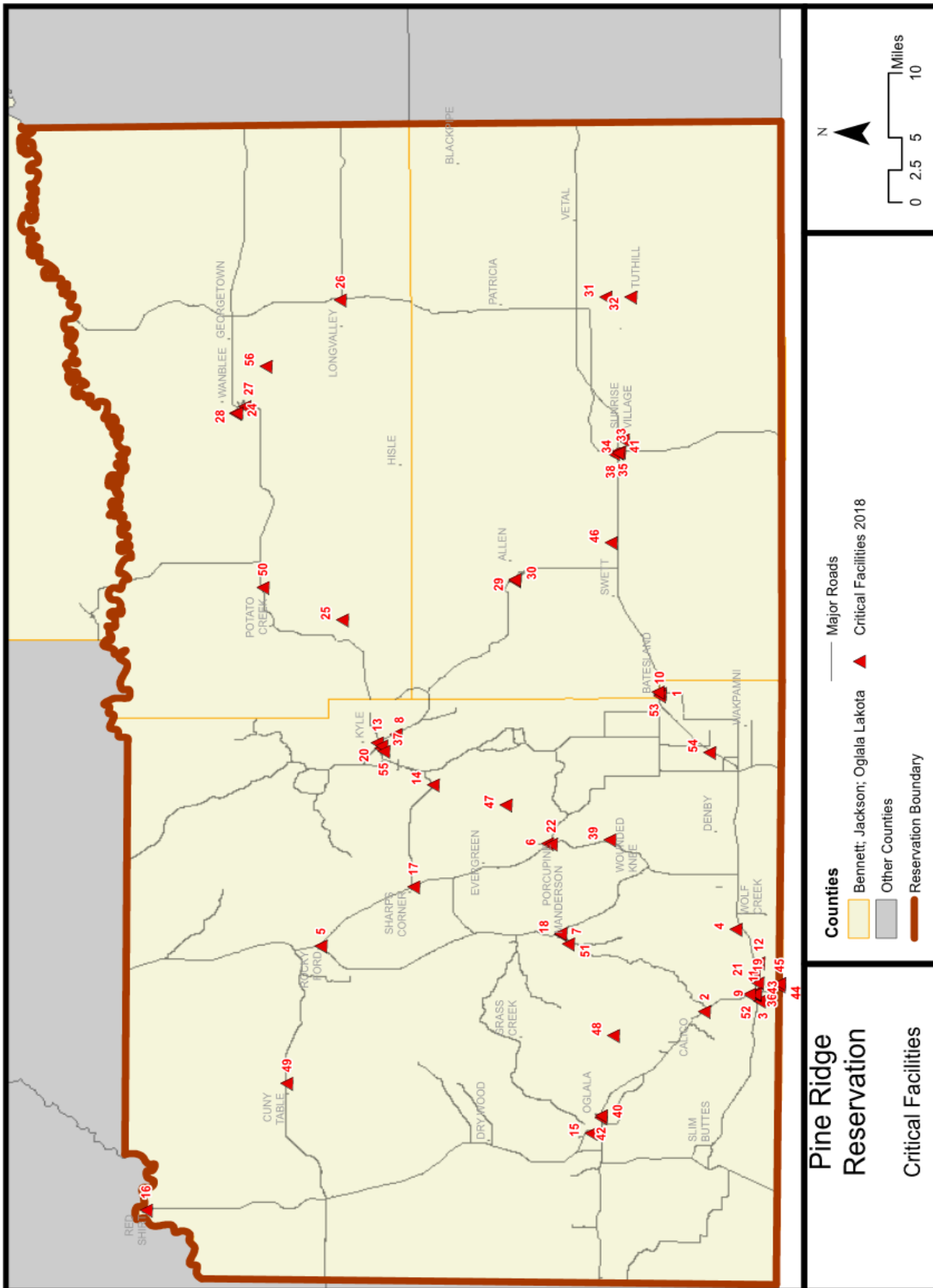


FIGURE 11: KYLE CRITICAL FACILITIES

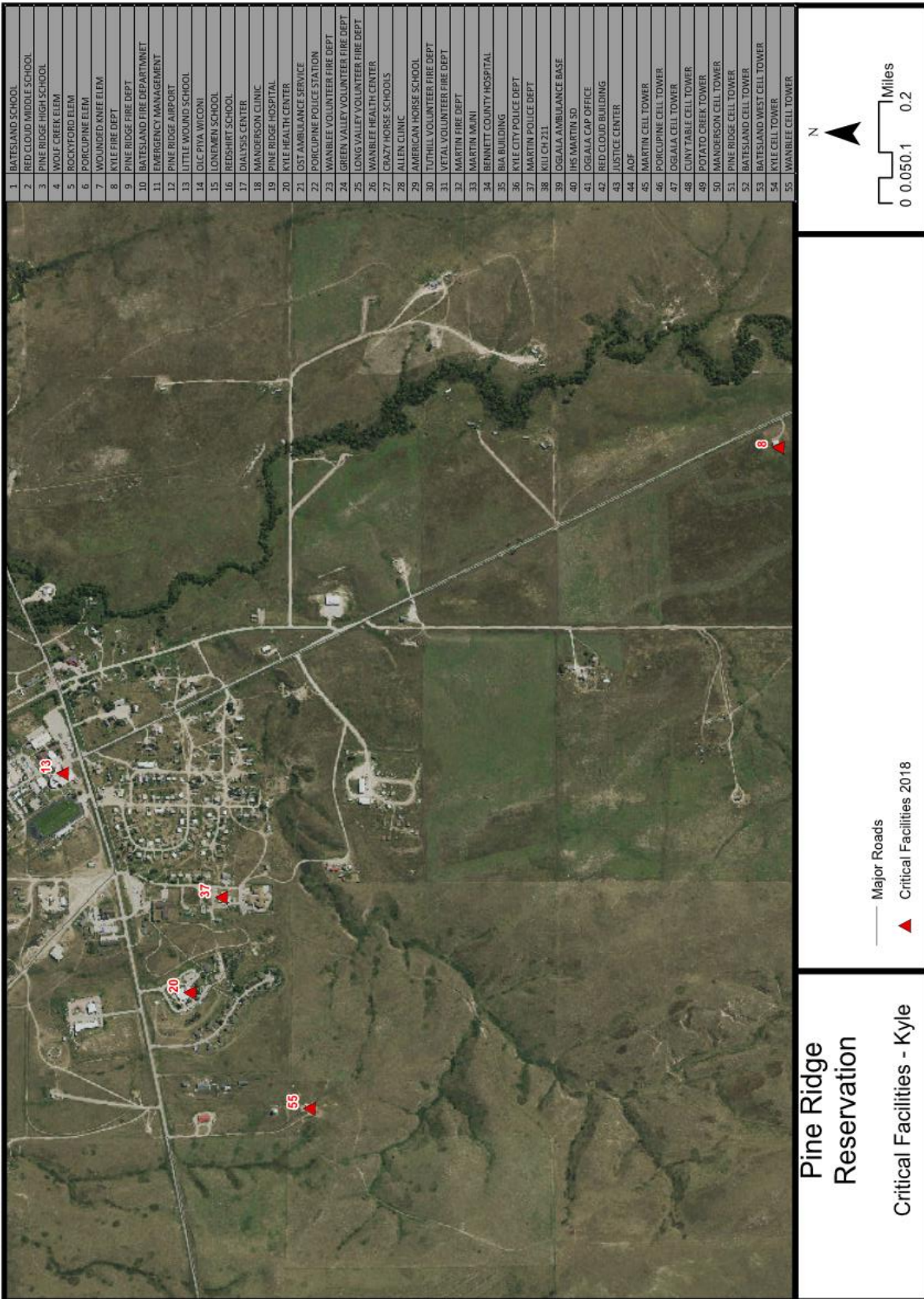
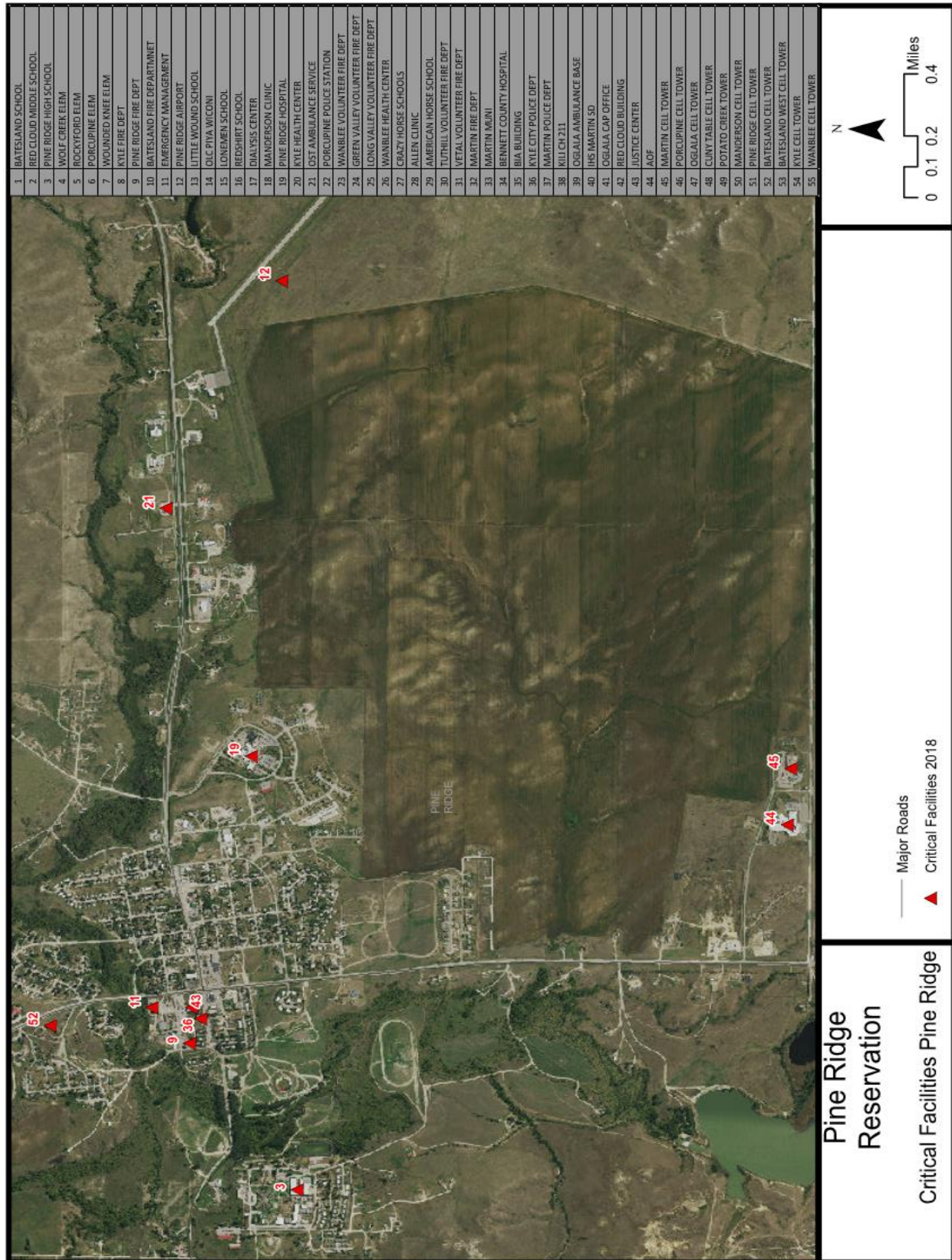


FIGURE 12: PINE RIDGE VILLAGE CRITICAL FACILITIES



HISTORIC AND CULTURAL SITES

Historic and cultural sites are particularly important to tribal members. A site older than 50 years may be considered a cultural resource and may require protection. Sites that contain cultural resources such as old buildings, fossils, tipi rings, fire pits, old bones and flake chips from the making of arrowheads are protected. To aid in their protection, their locations are not public information. Some culturally important sites include Stronghold Table, the Wounded-Knee Massacre Site, Bigfoot Trail, and the old prison camp. Many residents have private facilities and sites for ceremonies and cultural events. The National Register of Historic Places for South Dakota, which were verified by the Planning Team, identifies some historic sites which are listed in the table below.

TABLE 29: NATIONAL HISTORIC REGISTRY

SITE NAME	ADDRESS	DATE LISTED
Inland Theatre	306 Main St Martin, SD	7/30/2013
Lip's Camp	Address Restricted Wanblee, SD	6/11/1975
Wounded Knee Massacre Site	11 miles west of Batesland, SD	10/15/1966

Source: National Park Service²³

²³ National Park Service. "National Register of Historic Places: Bennett/Jackson/Oglala Lakota South Dakota." Accessed January 2018. <https://npgallery.nps.gov/NRHP/AdvancedSearch/>.

THIS PAGE LEFT INTENTIONALLY BLANK

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. The following table defines terms that will be used throughout this section of the plan.

TABLE 30: TERM DEFINITIONS

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

METHODOLOGY

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

Requirement §201.7(c)(2): 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. The risk assessment shall include:

- (i) A description of the type, 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.
- (ii) 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. All plans approved after October 1, 2008 must also address NFIP insured structures that have been repetitively damaged by floods. The plan should describe vulnerability in terms of:
 - (A) The types and numbers of existing and future buildings, infrastructure, and critical facilities located in the identified hazard areas;
- (iii) For multi-jurisdictional plans, the risk assessment section 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. 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

Requirement §201.7(c)(2): A risk assessment that provides the factual basis for activities proposed in the strategy to reduce losses from identified hazards. Tribal risk assessments must provide sufficient information to enable the Indian tribal government to identify and prioritize appropriate mitigation actions to reduce losses from identified hazards. The risk assessment shall include:

- (ii)(B): An estimate of the potential dollar losses to vulnerable structures identified in paragraph (c)(2)(ii)(A) of this section and a description of the methodology used to prepare the estimate;
- (ii)(C): A general description of land uses and development trends within the tribal planning area so that mitigation options can be considered in future land use decisions;

FEMA **Requirement §201.7(c)(2)(ii)(B)** suggests that when the appropriate data is available, hazard mitigation plans should also provide an estimate of potential dollar losses for structures in vulnerable areas. This risk assessment methodology includes an overview of assets at risk and provides historic average annual dollar losses for all hazards for which historic event data is available. Additional loss estimates are provided separately for those hazards for which sufficient data is available. These estimates can be found within the relevant hazard profiles.

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

- **Total Damages in Dollars:** This is the total dollar amount of all property damages and crop damages as recorded in federal, state, and local data sources. The limitation to these data sources is that dollar figures usually are estimates and often do not include all damages from every event, but only officially recorded damages from reported events.
- **Total Years of Record:** This is the span of years there is data available for recorded events. Vetted and cleaned up National Centers for Environmental Information (NCEI) data is available for January 1996 to December 2017. Although some data is available back to 1950, this plan update only utilizes the more current and more accurate data available. Wildfire data is available from the Federal Wildland Fire Occurrence Database from 1980 to 2016.
- **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. The collected data was from 2000 to 2017. 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 South Dakota Hazard Mitigation Plan. The Tribal Planning Team 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 31: HAZARDS ADDRESSED IN THE PLAN

Hazards Addressed in the Plan		
Agricultural Plant Disease	Earthquakes	Hazardous Materials Incidents (Transportation)
Bombing Range	Extreme Heat	High Winds
Civil Disorder	Flooding	Severe Thunderstorms
Communicable Disease	Grass/Wildfires	Severe Winter Storms
Dam Failure	Hail	Tornadoes
Drought	Hazardous Materials Incidents (Fixed)	

HAZARD ELIMINATION

Given the location and history of the planning area, the hazards listed below were eliminated from further review. An explanation of why the hazards were eliminated is also provided.

Avalanche: No historic occurrence; due to topography of the planning area this type of hazard has a very low probability of future occurrence.

Coastal Erosion: While it is likely that the planning area will be impacted by a changing climate there is no coast line located in the planning area. This hazard has been eliminated for this reason.

Expansive Soils: There is limited information available regarding past impacts from expansive soils. Modern building practices often take this hazard into account and incorporate mitigation. The Department of Transportation does normal maintenance and accounts for this hazard in their construction practices. For these reasons, this hazard has been eliminated and is consistent with the 2016 South Dakota State HMP.

Hurricane: Given the location of the planning area in the great plains, hurricanes are not expected to occur. This is supported by the historical record.

Land Subsidence (Sinkholes): Land subsistence is common in areas of karst topography or areas limestone erosion. While the Black Hills to the northwest includes karst topography, area within the planning area is minimal and was not identified as a priority for the Planning Team.

Landslides: According to the 2016 South Dakota State HMP, there are no reports of landslides in the planning area. The Planning Team also reported no impacts from landslides. This hazard has been eliminated for these reasons.

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

Nuclear Accidents: The two closest nuclear reactors are in Nebraska: Fort Calhoun in Blair, Nebraska which is 305 miles away from the planning area and is currently going through the decommissioning process, and Cooper Station in Brownsville, Nebraska which is 365 miles away. No nuclear incidents have occurred within the planning area. Due to the extensive planning and regulations related to this threat by state and federal regulators, it will not be further profiled in this plan.

Tsunami: Given the location of the planning area in the great plains, tsunamis are not expected to occur. This is supported by the historical record.

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

HAZARD ASSESSMENT SUMMARY TABLES

The following table provides an overview of the data contained in the hazard profiles. Hazards listed in this table and throughout the section are in alphabetical 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 32: REGIONAL RISK ASSESSMENT

HAZARD	PREVIOUS OCCURRENCE EVENTS/YEARS	APPROXIMATE ANNUAL PROBABILITY	LIKELY EXTENT
AGRICULTURAL PLANT DISEASE	32/18	100%	Insufficient Data
BOMBING RANGE	0	Unknown	Insufficient Data
CIVIL DISORDER	4/72	0.1%	Minor Damage (<\$1million)
COMMUNICABLE DISEASE	3,781/6	100%	Unavailable
DAM FAILURE	0	~1%	Varies by Structure
DROUGHT	433/1,477 months	29%	D1-D2
EARTHQUAKES	9/142	~6%	Magnitude <4.0
EXTREME HEAT	Avg. 9 days per year >100°F	100%	>100°F
FLOODING	23/22	100%	Inundation of structures (≤30% of structures) and roads near streams. Some evacuations of people may be necessary (≤30% of population)
GRASS/WILDFIRES	4,423/37	100%	<100 acres
HAIL	440/22	100%	H3-H5 Avg 1.24"; Range 0.75-4.25"
HAZARDOUS MATERIAL INCIDENTS (FIXED, TRANSPORTATION)	8/27 2/18	29% 5%	<50 LGA <100 gallons
HIGH WINDS	139/22	100%	Avg 50 mph Range 35-72 EG
SEVERE THUNDERSTORMS	322/22	100%	≥2" rainfall Avg 56 mph winds; Range 50-83 EG
SEVERE WINTER STORMS	233/22	100%	0.5" Ice 10-20° below zero (wind chills) 4-8" snow 25-40 mph winds
TORNADOES	31/22	100%	Avg: F0 Range EF0-F2

The following table provides loss estimates for hazards with sufficient data.

TABLE 33: LOSS ESTIMATION FOR THE PLANNING AREA

HAZARD TYPE		COUNT	PROPERTY	CROP ²
AGRICULTURAL PLANT DISEASE ²		32	N/A	\$619,157
BOMBING RANGE		0	N/A	N/A
CIVIL DISORDER ⁷		4	\$45,000	N/A
COMMUNICABLE DISEASE ⁹		3,781	N/A	N/A
DAM FAILURE ⁵		0	\$0	N/A
DROUGHT ¹		433/1,477 months	N/A	\$42,911,671
EARTHQUAKES ⁸		9	N/A	N/A
EXTREME HEAT ¹		Avg. 9 days per year >100°F	N/A	\$906,970
FLOODING ¹	Flash Flood 2 injuries	10	\$4,000	\$47,146
	Flood	13	\$20,000	
GRASS/WILDFIRES ³		4,423	153,582 acres	\$6,089
HAIL ¹		440	\$1,981,000	\$14,190,786
HAZARDOUS MATERIALS	Chemical Fixed Sites ⁴	8	\$700	N/A
	Chemical Transportation ⁶	2	\$2,190	
HIGH WINDS ¹		139	\$75,000	\$1,803,286
SEVERE THUNDERSTORMS ¹ 2 deaths, 13 injuries	Thunderstorm Wind	318	\$1,277,500	N/A
	Heavy Rain	3	\$0	\$9,287,058
	Lightning	1	\$1,000	N/A
SEVERE WINTER STORMS ¹ 2 deaths, 1 injury	Blizzard	45	\$55,963,000	\$13,454,899
	Extreme Cold/Wind Chill	5	\$0	
	Heavy Snow	26	\$0	
	Ice Storm	2	\$250,000	
	Winter Storm	117	\$10,000	
	Winter Weather	38	\$0	
TORNADOES ¹ 1 death, 55 injuries		31	\$3,570,000	\$8,160
TOTAL		9,448	\$63,194,390	\$83,235,222

N/A: Data not available

1 indicates data is from NCEI (January 1996 to December 2017)

2 indicates data is from USDA RMA (2000-2017)

3 indicates data is from USGS (1980 to 2016)

4 indicates data is from U.S. Coast Guard NRC (1990-2016)

5 indicates data is from Stanford NPDP (1911-2017)

6 indicates data is from PHMSA (1980-2017)

7 indicates data is from SPEED (1946-2018)

8 indicates data is from USGS (1872-2013)

9 indicates data is from SD DOH (2011-2016)

in. = inches; EG = Estimated Gust

HISTORICAL DISASTER DECLARATIONS

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

PRESIDENTIAL DISASTER DECLARATIONS

The presidential disaster declarations involving the planning area from 2001 to 2017 are summarized in the following table. Prior to 2013, tribal reservations were included in County or State based Presidential emergency or major disaster declarations. The Sandy Recovery Improvement Act of 2013 amended the Robert T. Stafford Disaster Relief and Emergency Assistance Act to allow federally recognized Indian tribal governments the ability to request a disaster declaration.

TABLE 34: PRESIDENTIAL DISASTER DECLARATIONS

DISASTER DECLARATION NUMBER	TITLE	INCIDENT PERIOD	DESIGNATED COUNTIES
DR-4237	Oglala Sioux Tribe of the Pine Ridge Reservation Severe Storms, Straight-line Winds, and Flooding	May 8, 2015-May 29, 2015	Oglala Sioux Tribe of the Pine Ridge Reservation
DR-1280	South Dakota Severe Storms, Flooding, And Tornadoes	June 04, 1999 - June 18, 1999	Oglala Lakota
DR-4298	South Dakota Severe Winter Storm	December 24, 2016 - December 26, 2016	Jackson, Oglala Sioux Tribe of the Pine Ridge Reservation
DR-4233	South Dakota Severe Storms, Tornadoes, Straight-line Winds, and Flooding	June 17, 2015 - June 24, 2015	Jackson, Oglala Lakota
DR-4155	South Dakota Severe Winter Storm, Snowstorm, and Flooding	October 03, 2013 - October 17, 2013	Shannon, Jackson, Oglala Sioux Tribe of the Pine Ridge Reservation
DR-4125	South Dakota Severe Storms, Tornado, and Flooding	May 24, 2013 - May 31, 2013	Bennett, Oglala Sioux Tribe of the Pine Ridge Reservation
DR-4115	South Dakota Severe Winter Storm and Snowstorm	April 08, 2013 - April 10, 2013	Shannon County
DR-1984	South Dakota Flooding	March 11, 2011 - July 22, 2011	Jackson
DR-1886	South Dakota Severe Winter Storm and Snowstorm	December 23, 2009 - December 27, 2009	Shannon
DR-1811	South Dakota Severe Winter Storm and Record and Near Record Snow	November 05, 2008 - November 07, 2008	Bennett, Jackson, Shannon
DR-1774	South Dakota Severe Storms and Flooding	June 02, 2008 - June 12, 2008	Jackson
DR-1759	South Dakota Severe Winter Storm and Record and Near Record Snow	May 01, 2008 - May 02, 2008	Bennett, Jackson
DR-1702	South Dakota Severe Storms, Tornadoes, and Flooding	May 04, 2007 - June 08, 2007	Jackson
DR-1647	South Dakota Severe Winter Storm	April 18, 2006 - April 20, 2006	Jackson, Bennett
DR-1531	South Dakota Severe Storms and Flooding	May 28, 2004 - June 16, 2004	Jackson
DR-1330	South Dakota Winter Storm	April 18, 2000 - April 20, 2000	Jackson
DR-1173	South Dakota Severe Storms/Flooding	February 03, 1997 - May 24, 1997	Bennett, Jackson, Shannon
DR-1156	South Dakota Severe Winter Storms/Blizzards	January 03, 1997 - January 31, 1997	Bennett, Jackson, Shannon

Source: Federal Emergency Management Agency, 2001-2017²⁴

*Only counties within planning area are included. Shannon County was renamed to Oglala Lakota County in 2015. Records prior to then retain Shannon County listings.

²⁴ Federal Emergency Management Agency. 2017. "Disaster Declarations." Accessed July 2017. <https://www.fema.gov/disasters>.

The following table summarizes the Fire Management Assistance Declarations for the State of South Dakota from 2003 to 2018. Not all of these events may have occurred within the Pine Ridge Reservation but did impact the state overall.

TABLE 35: FIRE MANAGEMENT ASSISTANCE DECLARATIONS

DISASTER NUMBER	TITLE	INCIDENT PERIOD	PUBLIC ASSISTANCE DOLLARS
FM-5272	South Dakota Vineyard Fire	August 11, 2018 - August 14, 2018	-
FM-5229	South Dakota Legion Lake Fire	December 12, 2017 – December 14, 2017	-
FM-5010	South Dakota Wellnitz Fire	August 31, 2012 – September 2, 2012	\$6,664.22
FM-2996	South Dakota Myrtle Fire	July 19, 2012 – July 23, 2012	\$622,320.74
FM-2716	South Dakota Boxelder Fire	July 18, 2007 – July 31, 2007	\$387,966.83
FM-2710	South Dakota Alabaugh Canyon Fire	July 7, 2007 – July 20, 2007	\$1,953,897.04
FM-2658	South Dakota East Ridge Fire	July 27, 2006 – August 7, 2006	\$1,543,488.86
FM-2569	South Dakota Skyline #2 Fire	July 16, 2005 – July 17, 2005	\$14,231.10
FM-2565	South Dakota Ricco Fire	July 9, 2005 – July 19, 2005	\$428,064.13
FM-2557	South Dakota Camp Five Fire	April 17, 2005 – April 19, 2005	-
FM-2513	South Dakota Mill Road Fire	November 20, 2003 – November 21, 2003	\$45,685.46

Source: Federal Emergency Management Agency, 2003-2018²⁵

²⁵ Federal Emergency Management Agency. 2018. "Disaster Declarations." Accessed October 2018. <https://www.fema.gov/disasters>.

CLIMATE ADAPTATION

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

The planning area is located in the Great Plains region of the United States, which stretches from Montana and North Dakota southward in a vertical line to Texas (Figure 13). The Great Plains region features relatively flat plains with some areas raising to over 5,000 feet in elevation. Significant weather extremes impact this area including winter storms, extreme heat and cold, severe thunderstorms, drought, and flood-producing rainfall.

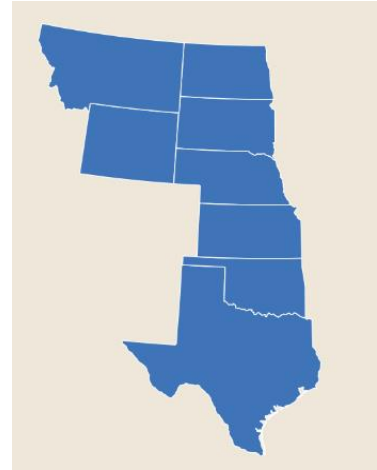
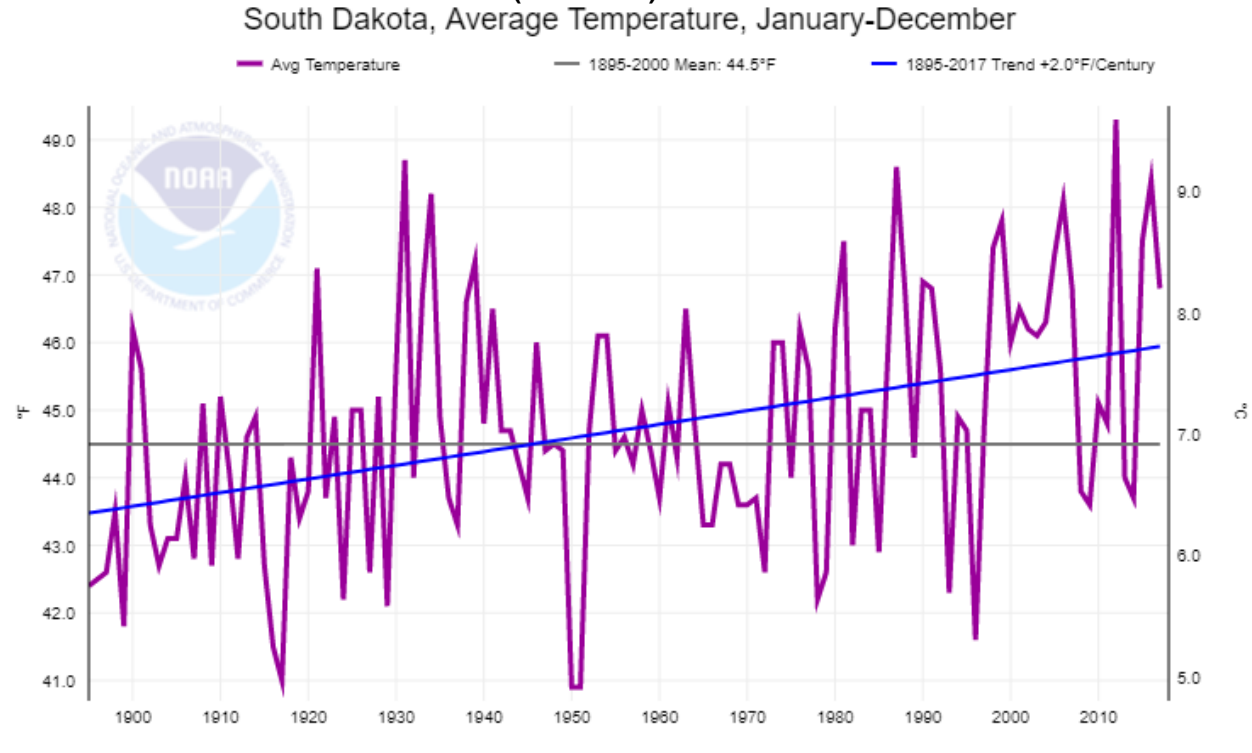


FIGURE 13: GREAT PLAINS REGION

TEMPERATURE

Since 1895, South Dakota’s overall average temperature has increased by about 2°F (Figure 14). 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 tribal members. Climate modeling suggests warmer temperatures conditions will continue in the coming decades and rise steadily into mid-century.

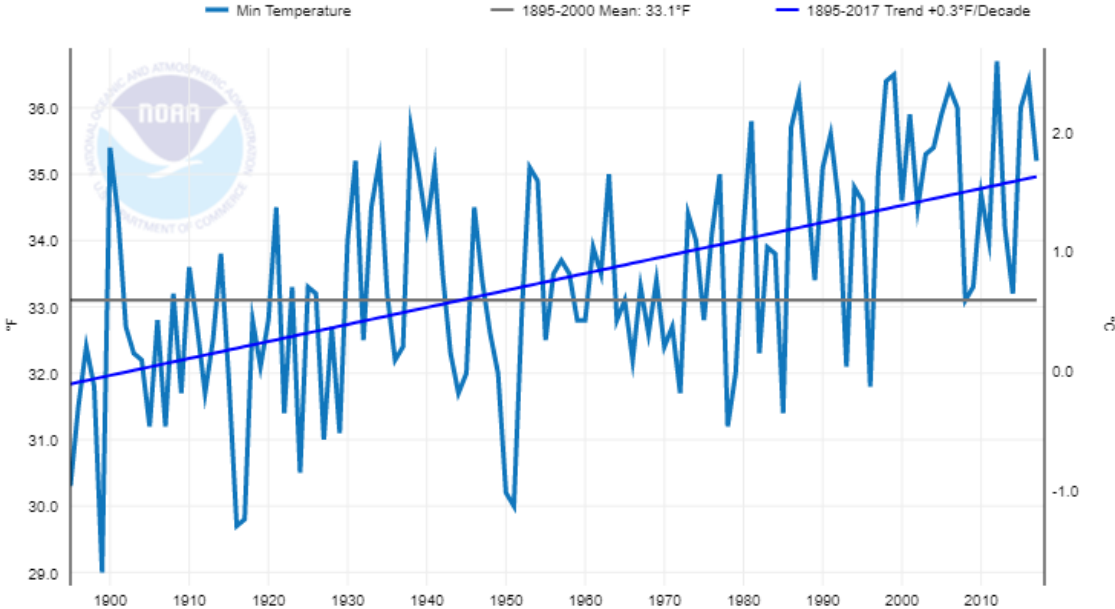
FIGURE 14: AVERAGE TEMPERATURE (1895-2017)



Source: NOAA, 2018

Figure 15 shows a trend of increasing minimum temperatures in South Dakota’s Climate Division 5, which includes the planning area. High nighttime temperatures can reduce grain yields, increase stress on animals, and lead to an increase in heat-related deaths.

FIGURE 15: CLIMATE DIVISION 5, MINIMUM TEMPERATURE 1895 - 2018
South Dakota, Climate Division 5, Minimum Temperature, January-December



Source: NOAA, 2018

PRECIPITATION

Changing extremes in precipitation are anticipated in the coming decades, particularly in the increasing likelihood of greater rain and snow fall as well as more intense drought periods. Seasonal variations will be heightened, with more frequent and greater intensity rainfall expected in the spring and winter and hotter, drier periods in the summer. Since 1895, yearly annual precipitation for South Dakota has increased slightly. This trend is expected to continue as the impacts of climate change continue to be felt. Climate modeling may show only moderate changes in precipitation and streamflow, however most of the great plains region is already at risk to large annual and seasonable variability as seen by flooding and drought events occurring in concurrent years. There are likely going to be more days with a heavy precipitation event (rainfall of greater than one inch per day) across the region. Groundwater and reservoir sources of water are increasingly important to communities and residents in the great plains region to meet water needs during periods of shortage.

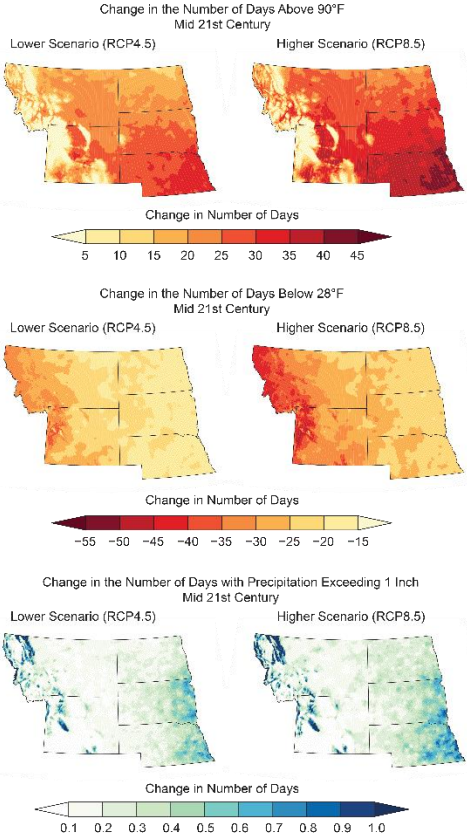
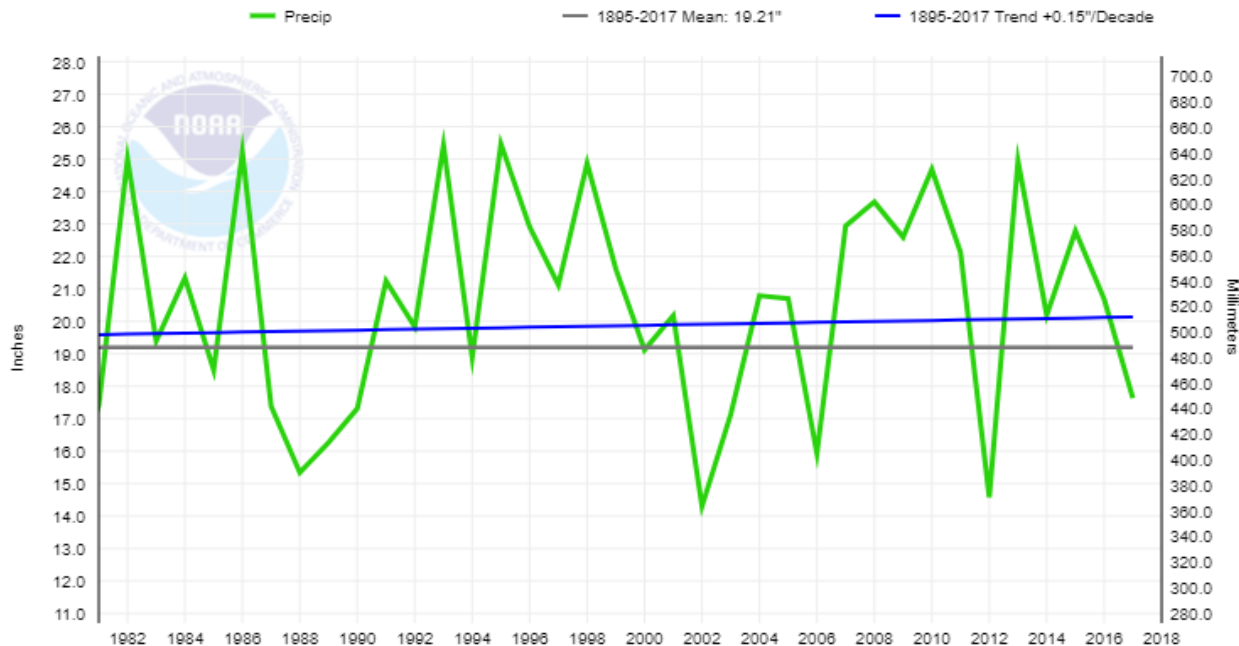


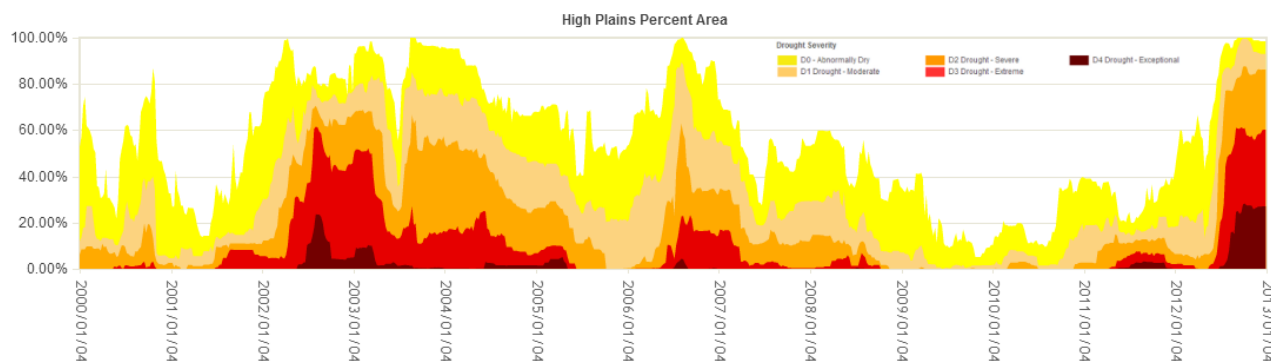
FIGURE 16: SOUTH DAKOTA AVERAGE PRECIPITATION
 South Dakota, Precipitation, January-December



Source: NOAA, 2018

Changes in precipitation is tied to changes in drought patterns. Figure 17 shows the percent of area in the High Plains (Kansas, South Dakota, and North Dakota) which experienced significant increases in moderate to exceptional drought in 2012. Record dryness occurred in South Dakota between July and September of 2012. The Northern Plains will remain vulnerable to periodic drought as most of projected increases in precipitation is anticipated to occur during the winter months, while increasing temperatures lead to increased soil drying.²⁶

FIGURE 17: DROUGHT SEVERITY 2000-2012



Source: NOAA, 2018

²⁶ Meilillo, J.M., Richmond, T., and Yohe, G., eds. 2014. Climate Change Impacts in the United States: The Third National Climate Assessment. U.S. Global Change Research Program, 841 pp. doi:10.7930/J0Z31WJ2.

CLIMATE IMPACTS

According to the Third National Climate Assessment, the United States as a whole is experiencing significant changes in temperature, precipitation, and significant weather events as a result of climate change. Challenges that are expected to impact communities, residents, and environments as a result of these changes include: resolving increasing competition among land, water, and energy resources; developing and maintaining sustainable agricultural systems; conserving vibrant and diverse ecological systems; and enhancing the resilience of the region's people to the impacts of climatic extremes.²⁷ The Oglala Lakota Nation is working to mitigate the impacts of climate change by building connections and adapting to changing conditions.

The United States is experiencing an increase in the number of billion-dollar natural disasters (Figure 19). In 2017, 16 billion-dollar weather and climate disasters impacted the United States.²⁸

FIGURE 18: TRIBAL CALLOUT IN CLIMATE IMPACT ASSESSMENT

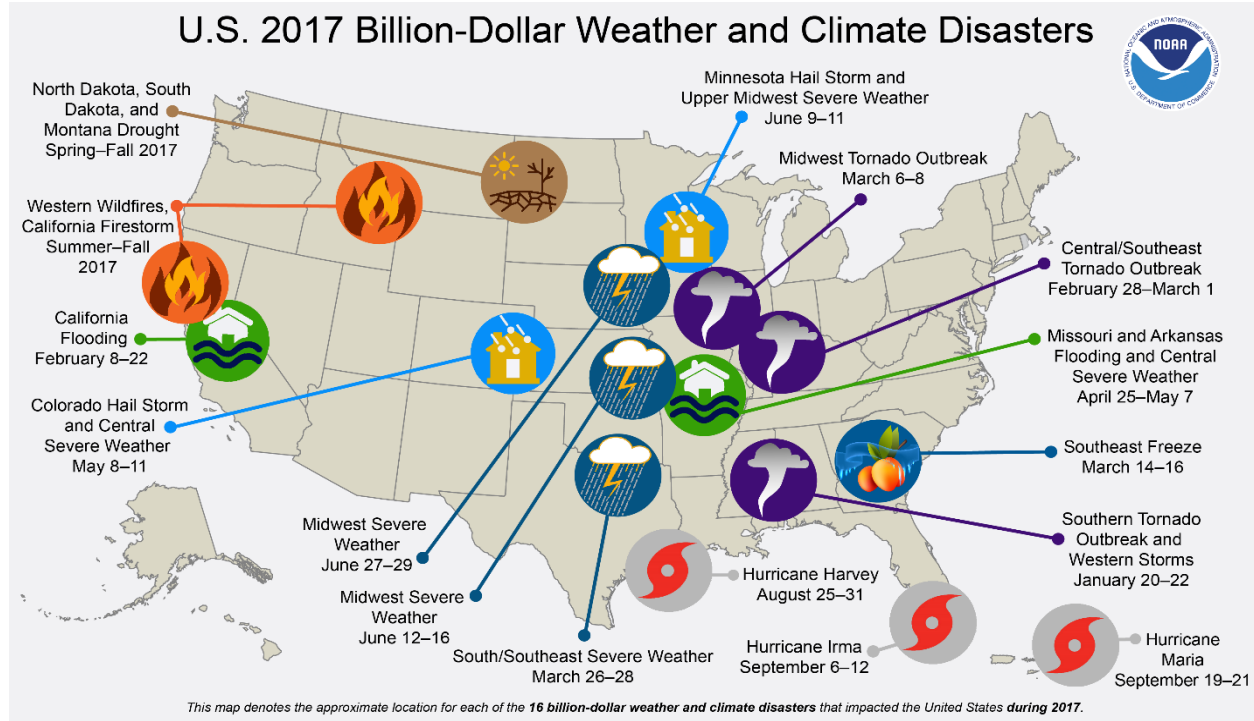


The Oglala Lakota tribe in South Dakota is incorporating climate change adaptation and mitigation planning as they consider long-term sustainable development. Their Oyate Omniciye plan is a partnership built around six livability principles related to transportation, housing, economic competitiveness, existing communities, federal investments, and local values. Their vision incorporates plans to reduce and adapt to future climate change while protecting cultural resources.⁶

©Aaron Huey

Source: National Climate Assessment

FIGURE 19: BILLION DOLLAR DISASTERS IN 2017

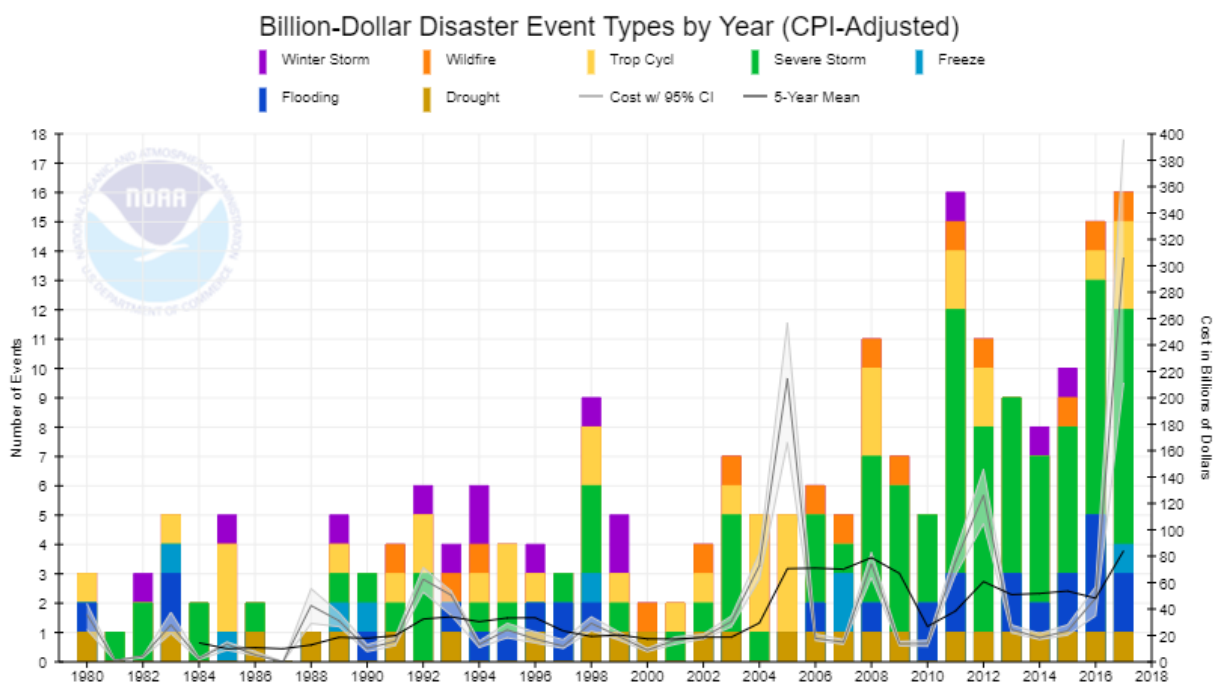


Source: National Oceanic and Atmospheric Administration, 2018

²⁷ Melillo, J.M., Richmond, T., and Yohe, G., eds. 2014. Climate Change Impacts in the United States: The Third National Climate Assessment. U.S. Global Change Research Program, 841 pp. doi:10.7930/J0Z31WJ2.

²⁸ NOAA National Centers for Environmental Information (NCEI). 2018. U.S. Billion-Dollar Weather and Climate Disasters <https://www.ncei.noaa.gov/billions/>

FIGURE 20: BILLION DOLLAR DISASTERS BY TYPE

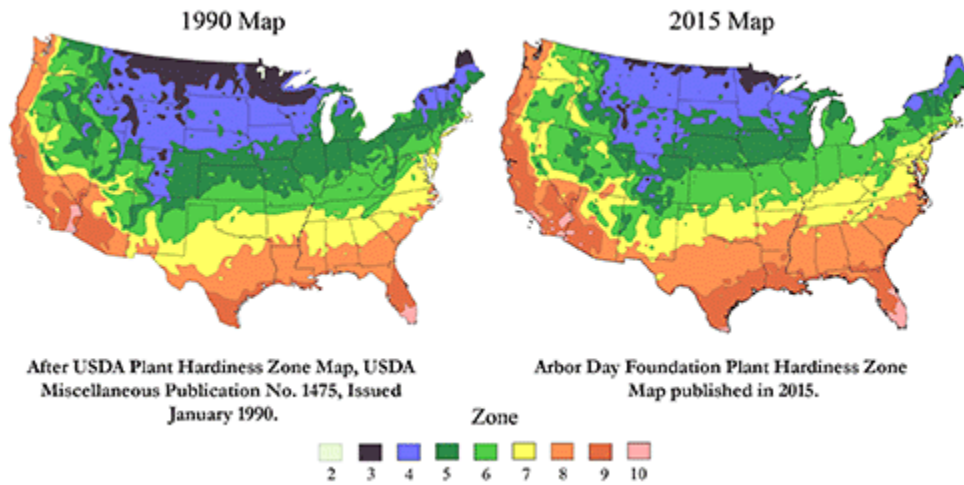


Source: National Oceanic and Atmospheric Administration, 2018

These trends will have a direct impact on 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 or winter storms, will be at risk. While increases in extreme heat will create greater stress on water losses, public health, and demand for air conditioning, warmer winters are also expected to occur which lowers winter heating demand, reduced cold stress on livestock, and produces longer growing seasons. Fossil fuel and renewable energy production and infrastructure is expanding across the northern great plains, and increasingly severe weather events put added stress on these systems. Energy sector vulnerabilities also include the transmission and transportation of energy resources. Roads, pipelines, and rail lines are all at risk of damages from flooding, extreme heat, erosion, or added stress from increased residential demands.²⁹

Furthermore, the agricultural sector will experience an increase in droughts, changes in the growth cycle as winters warm, changes in the timing and magnitude of rainfall, and greater populations of overwintering insects. These added stressors on agriculture could have devastating economic effects if new agricultural and livestock management practices are not adopted.

²⁹ USGCRP, 2018: Impacts, Risks, and Adaptation in the United States: Fourth National Climate Assessment, Volume II: Report-in-Brief [Reidmiller, D.R., C.W. Avery, D.R. Easterling, K.E. Kunkel, K.L.M. Lewis, T.K. Maycock, and B.C. Stewart (eds.)]. U.S. Global Change Research Program, Washington, DC, USA, 186 pp.

FIGURE 21: PLANT HARDINESS ZONE CHANGE

Source: Arbor Day Foundation, 2018³⁰

The planning area will have to adapt to these changes or experience an increase in economic losses, loss of life, property damages, and crop damages. HMPs have typically been informed by *past* events in order to be more resilient to future events, and this HMP includes strategies for the planning area to address these changes and increase resilience. Future updates to this HMP should include additional climate information and analysis, in order to continuously prepare for the expected impacts of climate change.

HAZARD PROFILES

Based on research and past experiences, the hazards profiled were determined to either have a historical record of occurrence or the potential for occurrence in the future. As the planning area is generally uniform in climate, topography, building characteristics, and development trends, overall hazards and vulnerability do not vary greatly across the planning area. The following profiles will examine the identified hazards across the region.

³⁰ Arbor Day Foundation. 2018. "Hardiness Zones." https://www.arborday.org/media/map_change.cfm.

AGRICULTURAL 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 South Dakota's and the planning area's economy.

The economy of the state of South Dakota is heavily vested in agriculture. According to the South Dakota Department of Agriculture (SDDA) in 2017, the market value of agricultural products sold was estimated at more than \$10 billion; this total is split between crops (estimated \$6 billion) and livestock (estimated \$4 billion).³¹

Table 36 shows the population of livestock within the planning area. The Planning Team indicated that cattle and horses encompass the majority of livestock found in the reservation. This count does not include wild populations that are also at risk from animal diseases. Available data for Jackson County is based upon the entirety of the county. Thus, values may be inflated and not truly represent conditions solely within the Pine Ridge Reservation.

TABLE 36: LIVESTOCK INVENTORY

COUNTY	MARKET VALUE OF 2012 LIVESTOCK SALES	CATTLE AND CALVES	HOGS AND PIGS	SHEEP AND LAMBS
OGLALA LAKOTA	\$23,567,000	33,260	50	58
BENNETT	\$39,882,000	72,141	294	(D)
JACKSON	\$33,943,000	50,501	(D)	606
Total	\$97,392,000	155,902	344	664

Source: U.S. Census of Agriculture, 2012³²

(D) Withheld to avoid disclosing data for individual farms

According to the SDDA, the primary crops grown throughout the state include corn, soybeans, hay, wheat, and alfalfa. The following tables provide the value and acres of land in farms for the planning area.

TABLE 37: LAND AND VALUE OF FARMS IN THE PLANNING AREA

COUNTY	NUMBER OF FARMS	LAND IN FARMS (ACRES)	MARKET VALUE OF 2012 CROP SALES
OGLALA LAKOTA	174	1,101,176	\$8,720,000
BENNETT	219	606,496	\$22,270,000
JACKSON	299	1,157,939	\$17,969,000
Total	692	2,865,611	\$48,959,000

Source: U.S. Census of Agriculture, 2012

³¹ U.S. Department of Agriculture. 2017. "2017 State Agriculture Overview South Dakota." <https://www.nass.usda.gov>.

³² U.S. Department of Agriculture, National Agricultural Statistics Server. 2012. "2012 Census of Agriculture – County Data."

LOCATION

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

The main land uses where animal and plant disease will be observed include: agricultural lands; range or pasture lands; and forests. It is possible that animal or plant disease will occur in domestic animals or crops in urban areas.

HISTORICAL OCCURRENCES

Animal Disease

The South Dakota State Hazard Mitigation Plan provides reports on diseases that have been known to occur in the state which are listed in the table below. According to the USDA “Cattle Death Loss” report South Dakota lost over 155,000 cattle to non-predator losses, including disease. These losses cost the state cattle industry an estimated \$52 million in lost revenue. While county historical occurrences of animal disease are not available, animal disease outbreaks may still occur throughout the planning area.

TABLE 38: SOUTH DAKOTA LIVESTOCK DISEASES

DISEASES		
Anthrax	Foot and Mouth Disease	Tuberculosis
Avian Influenza	Johne’s Disease/Paratuberculosis	Vesicular Stomatitis
Bovine Spongiform Encephalopathy “Mad Cow Disease”	Porcine Reproductive and Respiratory Syndrome	West Nile Virus
Brucellosis	Psuedorabies	
Chronic Wasting Disease	Trichomoniasis	

Plant Disease

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

TABLE 39: COMMON CROP DISEASES IN SOUTH DAKOTA BY CROP TYPES

CROP	DISEASES	
Corn	<ul style="list-style-type: none"> • Anthracnose • Damping-Off • Eyespot • Goss’s Bacterial Wilt and Blights • Gray Leaf Spot 	<ul style="list-style-type: none"> • Holcus Spot • Maize Dwarf Mosaic • Northern Corn Leaf Blight • Stalk Rot Complex
Soybeans	<ul style="list-style-type: none"> • Asian Soybean Rust • Bacterial Blight and Wilt • Bean Pod Mottle • Brown Spot • Brown Stem Rot • Charcoal Rot • Downy Mildew • Frogeye Leaf Spot • Fusarium Root Rot and Wilt 	<ul style="list-style-type: none"> • Northern Stem Canker • Pod and Stem Blight • Pythium Damping Off & Seed Decay • Pytophthora Root and Stem Rot • Soybean Cyst Nematode • Soybean Mosaic • Sudden Death Syndrome
Wheat	<ul style="list-style-type: none"> • Barley Yellow Dwarf • Common Root Rot • Covered Smut and Common Bunt • Dryland Root and Crown Rot • Leaf Rust • Loose Smut • Scab 	<ul style="list-style-type: none"> • Stem Rust • Stripe Rust • Take All • Tan Spot, Septoria Leaf Blotch and other Leaf Spot Diseases • Vomitoxin • Wheat Stream Mosaic

CROP	DISEASES	
Alfalfa	<ul style="list-style-type: none"> • Anthracnose • Bacterial Blight and Wilt • Common Leaf Spot • Damping-Off • Fusarium Root Rot and Wilt • Pythium Damping Off and Seed Decay 	<ul style="list-style-type: none"> • Pytophthora Root and Stem Rot • Root and Crown Rot Complex • Spring Black Stem and Leaf Spot • Stem Nematode • Summer Black Stem and Leaf Spot • Verticillium Wilt
Flaxseed	<ul style="list-style-type: none"> • Anthracnose • Aster yellows • Fusarium Root Rot and Wilt 	<ul style="list-style-type: none"> • Pasmó • Rhizoctonia Seedling Blight and Root Rot
Sunflowers	<ul style="list-style-type: none"> • Leaf Blight • Apical Chloriosis • Downy Mildew 	<ul style="list-style-type: none"> • Phoma Black Stem • Phomopsis Stem Canker • Sclerotinia Wilt, Stalk Rot, and Head Rot
Oats	<ul style="list-style-type: none"> • Barley Yellow Dwarf • Common Root Rot • Covered Smut and Common Bunt • Dryland Root and Crown Rot • Leaf Rust • Loose Smut 	<ul style="list-style-type: none"> • Scab • Stem Rust • Tan Spot, Septoria Leaf Blotch, and other Leaf Spot Diseases • Vomitoxin

AVERAGE ANNUAL LOSSES

Using data from the USDA RMA (2000-2017), annual crop losses from plant disease can be estimated. Crop loss events are categorized by county, so some events may be included which did not affect tribal lands. However, the RMA does not track losses for livestock, so it is not possible to estimate losses due to animal disease.

TABLE 40: AGRICULTURAL PLANT DISEASE LOSSES

COUNTY	NUMBER OF EVENTS	TOTAL CROP LOSS	AVERAGE ANNUAL CROP LOSS
OGLALA LAKOTA	5	\$77,507	\$4,306
BENNETT	17	\$311,895	\$17,328
JACKSON	10	\$229,754	\$12,764
TOTAL	32	\$619,157	\$34,398

Source: USDA RMA, 2000-2017

EXTENT

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

PROBABILITY

Given the historic record of occurrence of 32 plant disease outbreaks reported in 18 years, for the purposes of this plan, the annual probability of occurrence for agricultural plant disease is 100 percent. Agricultural animal disease probability cannot be calculated due to lack of available data.

REGIONAL VULNERABILITIES

The following table provides information related to regional vulnerabilities.

TABLE 41: REGIONAL AGRICULTURAL VULNERABILITIES

SECTOR	VULNERABILITY
PEOPLE	-Those in direct contact with infected livestock -Potential food shortage during prolonged events -Residents in poverty if food prices increase
ECONOMIC	-Regional economy is reliant on the agricultural industry -Large scale or prolonged events may impact tax revenues and local capabilities -Land value may largely drive population changes within the planning area
BUILT ENVIRONMENT	None
INFRASTRUCTURE	-Transportation routes can be closed during quarantine
CRITICAL FACILITIES	None
CLIMATE CHANGE	-Rising temperatures and more severe weather events may add stress to livestock or damage/destroy agricultural crops

BOMBING RANGE

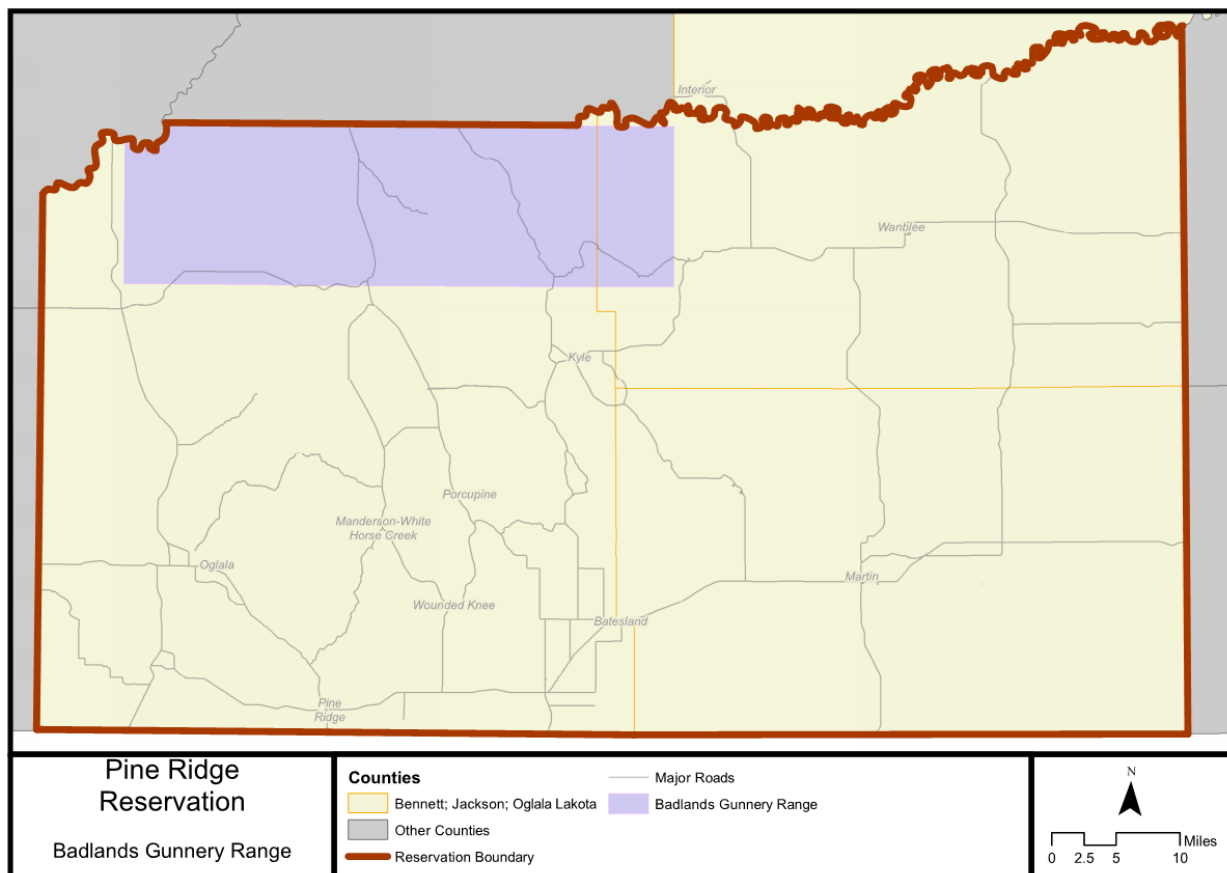
Between 1942 and 1968 the United States Air Force and South Dakota National Guard used over 340,000 acres in southwest South Dakota as a bombing and gunnery range. The area, subsequently called the Badlands Bombing Range, Badlands Gunnery Range, and Badlands Bomb Plot, was federally acquired by eminent domain in 1942 and was used to test artillery munitions and as a training area for military personnel. The Badlands Bomb Plot officially closed in 1968, with some of the land remaining under federal control and over 200,000 acres returned to the Oglala Sioux Tribe. The U.S. Air Force and Oglala Sioux Tribe are currently working on agreements to restore the remaining lands to tribal control. In 2008, a \$1.6 million agreement between the tribe and US Air Force contractors was used to detonate and remove unexploded ordnances on Tribal land which was completed in the fall of 2011.³³

The local planning team included Bombing Range as a hazard of concern due to the persistent risk to health and safety for community members. Throughout the bombing range, discarded and remaining bomb ordnances are still present and have the potential to detonate, injuring people, livestock, or infrastructure.

LOCATION

The bombing range is located in the northwest corner of the planning area, through Oglala Lakota and Jackson Counties.

FIGURE 22: BADLANDS GUNNERY RANGE



Source: OST Emergency Management

³³ Walker, K. 2011. Ellsworth contractors work with tribe to destroy bombs." Air Combat Command: U.S. Air Force. <https://web.archive.org/web/20131216060433/http://www.acc.af.mil/news/story.asp?id=123275231>.

HISTORICAL OCCURRENCES

While finding remaining bombs or munitions is relatively uncommon, the Planning Team indicated that the frequency by which materials are found depends on how active residents may be across the reservation. Often hikers or farmers find materials in open areas and take them home as either building materials or curiosities. In 2018, at least two known bomb ordnances were confiscated by the Tribal Department of Natural Resources.

AVERAGE ANNUAL LOSS

Due to the lack of sufficient bombing data, limited resources, and no recorded damages with the reports of historical occurrences, it is not feasible to utilize the 'event damage estimate formula' to estimate potential losses for the planning area.

EXTENT

There is no standard for measuring the estimated damage or likelihood of damages or injuries from unexploded ordnances on the reservation. Remaining bomb casings, munitions, or other artillery may be already detonated or still 'live', which poses risk to livestock and residents. However, historical events indicate a relatively small extent of damages for the planning area.

PROBABILITY

Given the lack of historical data, it is difficult to provide a probability of occurrence for bombing range threats. For the purpose of this plan, finding remnant bomb materials may be likely but the probability of an explosion causing injuries or damages is low.

REGIONAL VULNERABILITIES

The Tribal Natural Resources Department manages the current protocol to confiscate or remove bomb materials when found. Local law enforcement is often involved in the process, however limited resources hinder the ability of law enforcement to properly regulate, secure the area, or take proactive steps to remove these materials. Some areas in the reservation still need to be fully cleared of bomb materials and mapped. The following table provides information related to regional vulnerabilities.

TABLE 42: REGIONAL BOMBING RANGE VULNERABILITIES

SECTOR	VULNERABILITY
PEOPLE	-Live munitions pose major safety risk to people -Potential carcinogenic materials used in bombs pose a health risk to residents
ECONOMIC BUILT ENVIRONMENT	-Tribal land held under federal control limits potential economic growth -Possible damage to infrastructure
INFRASTRUCTURE	-Bomb casings and materials used in buildings or infrastructure are at risk of explosion, causing damage
CRITICAL FACILITIES	-None
CLIMATE CHANGE	-None
OTHER	-Concerns stem from wildfire detonating bombs across the landscape

CIVIL DISORDER

Civil disorder is a broad term that is typically used by law enforcement to describe a group of people protesting major socio-political problems by choosing not to observe a law or regulation. 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.³⁴

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 are federal and state directives that work in conjunction with local law enforcement. Civil disorder is addressed at the federal level by the US Department of Homeland Security and at the state level by the South Dakota Office of Homeland Security. Efforts are currently being taken by the OST Emergency Management department to update the Tribal Emergency Plans.

LOCATION

Civil disorder could occur throughout the entire planning area. Urban areas are most likely to see situations involving residents of the Reservation. Rural areas may be host to environmental justice protestors.

EXTENT

Instances of civil disorder can vary greatly in scale and magnitude, depending on the location of the event and the number of participants.

HISTORICAL OCCURRENCES

Previous accounts of civil disorder were identified from the University of Illinois Social, Political and Economic Event Database Project (SPEED), maintained since the end of World War II.³⁵ Details of the incidents were found in the Global Terrorism START database and archival newspaper reports. According to the SPEED database, there have been four incidents of civil disorder in the planning area since 1946. Some concerns exist regarding the potential social impacts from Keystone XL pipeline protestors on the neighboring Rosebud Reservation as well as uranium mining in the Black Hills and the transport of materials through the Reservation. To date there have been no large civil disorder events on the Reservation involving the pipeline or uranium mining, though 1,117 protestors were arrested from the Rosebud Reservation. The Public Safety Department responded to an active shooter threat at Red Cloud School where an armed person was on school grounds. Though this was not an act of civil disorder, school safety is a priority, so it is mentioned in this narrative. Table 43 describes past civil disorder events in the planning area.

³⁴ Civil Disorders, 18 U.S. Code § 231-233 (1992)

³⁵ 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>.

TABLE 43: CIVIL DISORDER OCCURRENCES

YEAR	LOCATION	INJURIES	DEATHS	PROPERTY DAMAGE	DESCRIPTION ¹
1973 ¹	Wounded Knee	1	2	Unknown	Around two hundred members of the American Indian Movement (AIM) took over and occupied Wounded Knee after two events: a tribal member was murdered, and the Tribal members were unable to impeach a tribal president they accused of corruption. AIM occupied Wounded Knee for 71 days, the longest-lasting occurrence of civil disorder in US history. They took eleven hostages, whose release was negotiated after two days; only one of them decided to leave the occupied town. Two AIM members were shot and killed and at least one was wounded. A member of the US Marshalls was wounded as well. The occupation ended with the disarmament of AIM.
1975 ¹	Pine Ridge	0	3	\$20,000 ²	A shootout between AIM member and two Federal Bureau of Investigations (FBI) agents occurred when FBI agents were searching for Jimmy Eagle, who was accused of assaulting a white man and his son. The FBI agents and one American Indian were killed. Several conflicts between the FBI and AIM occurred in 1975 because of this shootout, including small arms fired at an FBI helicopter.
1975 ³	Pine Ridge	0	0	Unknown	Aim is suspected of planting bombs at four separate Bureau of Indian Affairs (BIA) buildings, allegedly in protest of “Columbus Day”. The main BIA Office, BIA Law and Order Building, OST Courthouse, and an electrical transformer were all targeted. The OST tribal office was also damaged. The buildings were empty, so no injuries occurred.
1999 ⁴	Whiteclay, NE	0	0	>\$80,000	About 2,000 members of the Oglala Sioux Tribe marched from the Pine Ridge to Whiteclay, Nebraska to protest the village’s egregious sale of alcohol to tribal members. The march turned to civil disorder, with tribal members and law enforcement clashing. There were no official reports of injuries or deaths, though reporters witnessed serious physical altercations throughout the event. There are also no official reports of property damage, but reporters observed looting and destruction of public property.

1 indicates data is from the New York Times archive
 2 indicates data is from the Global Terrorism Database
 3 indicates data is from the Albuquerque Journal archive
 4 indicates data is from the Lincoln Journal Star archive

AVERAGE ANNUAL DAMAGES

The SPEED database of civil disorder events contains information covering 1946 – 2018. The average damage per event estimate was determined based upon the information available in Global Terrorism START database where available, and local news reports. The bombing in 1975 produced an estimated \$45,000 in damages to property, or \$625 per year over the 70-year time frame. This does not include unreported losses or losses from displacement, functional downtime, or economic loss. The following table describes estimated damages of events in the planning area.

TABLE 44: CIVIL DISORDER LOSSES

YEAR	LOCATION	ESTIMATED DAMAGE	DESCRIPTION OF DAMAGE
1973	Wounded Knee	Minor (likely <\$1 million) ¹	Ransacked trading post
1975	Pine Ridge	Unknown	Helicopter damage, likely other damage
1975	Pine Ridge	\$45,000 ¹	Buildings and transformer damaged
1999	Whiteclay, NE	Unknown	Stores looted, police cars and street signs damaged

1 indicates data is from the Global Terrorism START database³⁶

PROBABILITY

Given four incidents over the course of 72 years, the planning area has a 0.1% chance of a civil disorder incident occurring during any given year.

REGIONAL VULNERABILITIES

The following table provides information related to regional vulnerabilities.

TABLE 45: REGIONAL CIVIL DISORDER VULNERABILITIES

SECTOR	VULNERABILITY
PEOPLE	-Police officers and first responders at risk of injury or death -Protestors at risk of injury or death
ECONOMIC	-Damaged businesses can cause loss of revenue and loss of income for workers -Risk of violence in an area may reduce income flowing in and out of that area -Severe civil disorder events are often accompanied by looting
BUILT ENVIRONMENT	-Targeted buildings may sustain heavy damage -Public property may be at risk if it is easily damaged
INFRASTRUCTURE	-Any easily removed or damaged public infrastructure such as street signs or public art may be at risk
CRITICAL FACILITIES	-Police stations and government offices are at a higher risk
CLIMATE CHANGE	-Activism on climate change issues may lead to public unrest

³⁶ University of Maryland National Consortium for the Study of Terrorism and Responses to Terrorism. 2017. "Global Terrorism Database." https://www.nrcs.usda.gov/wps/portal/nrcs/detail/ne/soils/surveys/?cid=nrcs142p2_029746.

COMMUNICABLE DISEASE

Infectious or communicable disease is any illness caused by an infectious agent or its toxin that is transmitted from an infected person, animal, or reservoir to a susceptible host, either directly or indirectly through an intermediate plant or animal host, vector, or inanimate environment.³⁷ With the advent of sanitation sewer systems and other improvements in hygiene since the 19th century, the spread of infectious disease has greatly diminished. Additionally, the discovery of antibiotics and the implementation of universal childhood vaccination programs have played a major role in reducing human disease impacts. Today, human disease incidences are carefully tracked by the Centers for Disease Control (CDC) and the South Dakota Department of Health (SD DOH) for possible epidemics and to implement control systems.

According to the CDC, an epidemic refers to an, often sudden, increase in the number of cases of a disease above what is normally expected in a given population and area. The number of cases that qualifies a disease rate as an epidemic depends on the prevalence of that specific disease: common diseases are epidemics when their incidence rates surpass normal seasonal levels, while rare or previously unknown disease occurrences may qualify as epidemics after only one case of infection. Both chronic and infectious diseases can become epidemic in a population, but for the purposes of this plan, communicable diseases, (including contamination, plague, and infestations,) are of more concern due to their generally acute timeline.

SD DOH requires that healthcare providers report cases of any of 67 specified infectious agents and 9 outbreak types, allowing the Office of Disease Prevention Services to monitor disease rates for epidemic events. The 67 specific infectious agents are rare in South Dakota, so a small number of cases can qualify as an epidemic. The 9 outbreak types are more common, meaning reports are only made when the number of cases is high. The reportable illnesses include: lead exposure; carbon monoxide poisoning; antibiotic resistant infections; vector-, food-, and waterborne illnesses; health-care associated infections; emerging diseases; influenza; West Nile Virus; tuberculosis; HIV/AIDS; bioterror agents; sexually transmitted infections (STIs); community-associated MRSA (CA-MRSA); and vaccine-preventable diseases.

LOCATION

Epidemic threshold levels are dependent on disease, location, and season. Normal infectious disease patterns are changing due to increasing human mobility and climate change. Rural populations, including much of the Oglala Sioux Tribe planning area, are particularly at risk for vector- and waterborne illnesses.

EXTENT

Those most affected by communicable diseases are typically the very young, the very old, the economically vulnerable, those with immunodeficiency disorders, and the unvaccinated. Higher rates of health risk behaviors that have been associated with American Indian reservations include: alcohol misuse, sexual risk behaviors, sexual abuse, mental health illnesses like depression and PTSD, and insufficient water infrastructure. Tribal areas often experience higher rates of CA-MRSA, STIs, and waterborne illnesses than non-Tribal areas. Roughly 35% of the planning area's population is 18 years old or younger, and 8.9% of the planning area is 60 years old or older, while 50.8% of the population lives below the poverty line. These factors increase vulnerability to the impacts of communicable diseases. Refer to *Section Three: Planning Area Profile* for further discussion of age and economic vulnerability in the Pine Ridge Reservation.

Immunodeficiency disorders like HIV/AIDS and diabetes reduce the ability of the body to fight infection. From 2013-2017, 9% of the American Indian population in South Dakota had a positive HIV/AIDS diagnosis³⁸ compared to the national rate of 14.4%³⁹ making HIV/AIDS a low risk factor for the community.

³⁷ Mauricio Barreto, Maria Teixeria, Eduardo Hage Carmo. 2006. "Infectious Disease Epidemiology," *Journal of Epidemiology and Community Health* 60,(3):192-195.

³⁸ South Dakota Department of Health. 2018. "South Dakota HIV/AIDS Surveillance Report – February 2018." <https://doh.sd.gov/documents/diseases/infectious/2018HIVAIIDSSurveillancereport.pdf>

³⁹ Centers for Disease Control and Prevention. 2018. "HIV Surveillance Supplemental Report." *Estimated HIV incidence and prevalence in the United States, 2010-2015*. <https://www.cdc.gov/hiv/pdf/library/reports/surveillance/cdc-hiv-surveillance-supplemental-report-vol-23-1.pdf>

Diabetes prevalence is 12.3% in the planning area (2013).⁴⁰ These rates are higher than the national average (9.1%, 2015).⁴¹ HIV/AIDS and diabetes prevalence in the planning area indicating a slightly increased vulnerability to infectious disease in the population. The extent to which each of these populations is affected by communicable diseases further depends on the attack rate and duration of the disease, and the extent to which herd immunity has been established by the community through effective vaccination programs. Herd immunity occurs when high vaccination rates make the incidence and subsequent spread of a disease unlikely.

The State of South Dakota has implemented a lenient vaccination program primarily aimed at children (Table 46). The following vaccinations are not required by state law, but are highly encouraged: influenza B, pneumococcal meningitis, human papillomavirus, hepatitis A, and hepatitis B. SD DOH provides vaccines for children eligible for the federal Vaccines for Children Program at the Pine Ridge Indian Health Service Public Health Service Hospital and the Kyle Health Center in Oglala Lakota County; the South Dakota Department of Health Child and Family Services and the Bennett County Community Health Clinic in Bennett County; and Indian Health Service Wanblee in the portion of Jackson County within the planning area.

The CDC’s 2016 data on 3-vaccine series coverage in children 19-35 months indicates vaccination rates of 79.9% (this includes only early childhood program and school required vaccinations). The National Department of Health and Human Services reports 2017-2018 flu vaccination rates of 10.8% in Oglala Lakota County, 5.9% in Bennett County, and 5.9% in Jackson County. The flu vaccine is available both in the hospital and for use at home visits.

TABLE 46: VACCINATIONS TIMETABLE

SCHOOL AGE	VACCINE REQUIRED
Early Childhood	Diphtheria; Pertussis; Tetanus; Poliovirus; Measles; Mumps; Rubella
Entering 6 th Grade	Meningococcal Meningitis

HISTORICAL OCCURRENCES

From 2014 – 2018, the SD DOH Office of Disease Prevention Services identified one Salmonella outbreak in June of 2016, linked to contaminated bean sprouts. For the planning area STIs, streptococcus pneumonia, and community-associated MRSA are the most common infections.

TABLE 47: TOTAL CASES OF REPORTABLE DISEASES IN THE PLANNING AREA (2007-2016)

DISEASE	OGLALA LAKOTA COUNTY	BENNETT COUNTY	JACKSON COUNTY	TOTAL
Campylobacteriosis	9	10	5	24
Chlamydia	2,126	178	154	2,458
Cryptosporidiosis	3	2	2	7
Giardiasis	8	4	1	13
Gonorrhea	736	67	34	837
Hepatitis B, Chronic	0	0	0	0
Hepatitis C, Chronic	92	9	3	104
Legionellosis	0	0	0	0
Methicillin-resistant Staphylococcus aureus, invasive (MRSA)	45	6	3	54
Pertussis	4	1	0	5
Rabies	0	5	0	5
Salmonellosis	25	3	3	31

⁴⁰ Centers for Disease Control and Prevention. 2018. "Diagnosed diabetes prevalence – South Dakota." <https://www.cdc.gov/diabetes/data/countydata/countydataindicators.html>

⁴¹ Center for Disease Control and Prevention. 2018. "Diagnosed Diabetes, Age-Adjusted Percentage, Adults with Diabetes – Total, 2015." <https://gis.cdc.gov/grasp/diabetes/DiabetesAtlas.html>

DISEASE	OGLALA LAKOTA COUNTY	BENNETT COUNTY	JACKSON COUNTY	TOTAL
Shigellosis	193	1	0	194
Streptococcus pneumoniae	30	0	1	31
Shiga toxin-producing E. coli	1	3	0	4
Tularemia	3	0	0	3
Varicella	0	1	0	1
West Nile Disease	3	3	3	9
Tuberculosis	1	0	0	1
Total	3,279	293	209	3,781

Source: South Dakota Department of Health Office of Disease Prevention Services. *Infectious Diseases in South Dakota, 2016.*⁴²

PROBABILITY

Based on historical records, an average of 378 reportable diseases are recorded each year across the three-county area. It is likely that cases of communicable disease will occur annually within the planning area, however, records from the South Dakota Department of Health are only available at the county level. Thus, community specific outbreaks are unknown and the probability of an epidemic cannot be calculated.

REGIONAL VULNERABILITIES

Health care access is critical for those exposed to acute infectious diseases. There are five health care providers available throughout the planning area: two in Bennett County, two in Oglala Lakota County, and one in Jackson County. The nearest intensive care and hospital facilities are in located in Rapid City, South Dakota.

An independent study conducted in 2016 by Trust for America’s Health gave South Dakota a score of five out of ten for their efforts to reduce vulnerability to the spread of infectious diseases.⁴³ This score is based on South Dakota’s public health department funding, National Health Security Preparedness Index score, public health department accreditation, flu vaccination rate, climate change preparedness, food safety, mitigation of healthcare-associated infections, public health laboratory biosafety training and expertise, and emergency healthcare access. This moderate score suggests that South Dakota is vulnerable to epidemic outbreaks. Trust for America provided suggestions for the State to improve their preparedness score which are listed below.

TABLE 48: POTENTIAL PUBLIC HEALTH PREPAREDNESS IMPROVEMENTS

INDICATOR	DESCRIPTION
NATIONAL HEALTH SECURITY PREPAREDNESS INDEX	Meet or exceed the overall national average score (6.7) for the National Health Security Preparedness Index, as of 2016
PUBLIC HEALTH ACCREDITATION	Have at least one accredited public health department
CLIMATE CHANGE READINESS	Receive a grade of A or B in States at Risk: America’s Preparedness Report Card
FOOD SAFETY	Increase the speed of DNA fingerprinting using pulsed-field gel electrophoresis testing for all reported cases of E. coli
EMERGENCY HEALTHCARE ACCESS	Have a formal access program or a program in progress for getting private sector health care staff and supplies into restricted areas during a disaster

⁴² South Dakota Department of Health Office of Disease Prevention Services. 2017. "Infectious Diseases in South Dakota, 2016." <https://doh.sd.gov/statistics/2016Vital/InfectiousDiseases.pdf>.

⁴³ Trust for America’s Health. 2017. "Key Health Data About South Dakota - Public Health Preparedness." <http://healthyamericans.org/states/?stateid=SD#section=2,year=2013,code=undefined>.

The following table provides information related to regional vulnerabilities.

TABLE 49: REGIONAL VULNERABILITIES

SECTOR	VULNERABILITY
PEOPLE	<ul style="list-style-type: none"> - Vulnerable populations include: the very young, the very old, the unvaccinated, the economically vulnerable, and those with immunodeficiency disorders. - The nearest intensive care and hospital facilities to the planning area are in Rapid City, reducing access to patients (especially those in the southeastern portion of the planning area) - Poverty, diabetes, rurality, and alcohol use increase chronic and infectious disease rates
ECONOMIC	<ul style="list-style-type: none"> - Large scale or prolonged events may cause businesses to close temporarily, which could lead to significant revenue loss and loss of income for workers
BUILT ENVIRONMENT	None
INFRASTRUCTURE	<ul style="list-style-type: none"> - Transportation routes may be closed if a quarantine is put in place - Healthcare clinics in the planning area may be overwhelmed quickly by widespread events
CRITICAL FACILITIES	<ul style="list-style-type: none"> - Healthcare clinics in the planning area may be overwhelmed quickly by widespread events
CLIMATE CHANGE	<ul style="list-style-type: none"> -Climate change impacts on extreme weather, air quality, transmission of disease via insects and pests, food security, and water quality increase threats of disease

DAM FAILURE

According to South Dakota’s legislature, dams are “any artificial barrier, including appurtenant works, which impounds or diverts water and which is:

- 25 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 water storage elevation or
- has an impounding capacity at maximum water storage elevation of 50 acre-feet or more.

A barrier is not considered a dam for the purpose of this chapter if the height does not exceed 6 feet regardless of storage capacity or if the storage capacity at maximum water storage elevation does not exceed 15 acre-feet regardless of height⁴⁴

South Dakota 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 50: DAM SIZE CLASSIFICATION

SIZE	STORAGE CAPACITY (ACRE-FEET)	EFFECTIVE HEIGHT (FEET)
Small	50 to 1000	25-40
Intermediate	1001 to 50,000	41 to 100
Large	Greater than 50,000	Greater than 100

Source: South Dakota, 2018⁴⁵

The effective height of a dam is defined as the difference in elevation in feet between the lowest point in the cross section taken along the centerline of the dam and the crest of the emergency spillway. If there is no emergency spillway, the top of the dam is the upper limit.

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

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

- **Category 1 Dam** – a high hazard dam whose failure may cause loss of life;
- **Category 2 Dam** – a significant hazard dam whose failure may cause damage to buildings, highways, railroads, bridges, or public utilities; loss of a water supply reservoir for a water distribution system; other extensive economic loss; or the reservoir is the only source of water for a water distribution system;

⁴⁴ State of South Dakota. “South Dakota Codified Laws 74:02:08:01. Definitions.” <http://www.sdlegislature.gov/>.

⁴⁵ State of south Dakota. “74:02:08:06. Classification of dams – Size.” <http://www.sdlegislature.gov/>.

- **Category 3 Dam** – a low hazard dam whose failure may cause limited damage to agricultural lands or county and township roads or minimum economic loss.

In total, there are 36 dams located within the planning area which range from low to high hazard. Hazard classification is defined by FEMA’s *Federal Guidelines for Dam Safety: Hazard Potential Classification Systems for Dams*:

- **Low Hazard** – Dams assigned the low hazard potential classification are those where failure or misoperation result in no probable loss of human life and low economic and/or environmental losses. Losses are principally limited to the owner’s property;
- **Significant Hazard Potential** – Dams assigned the significant hazard potential classification are those dams where failure or misoperation result in no probable loss of human life but can cause economic loss, environmental damage, disruption of lifeline facilities, or can impact other concerns. Significant hazard potential classification dams are often located in predominantly rural or agricultural areas but could be located in areas with population and significant infrastructure;
- **High Hazard** – Dams assigned the high hazard potential classification are those where failure or misoperation will probably cause loss of human life as well as economic, environmental, and lifeline losses.

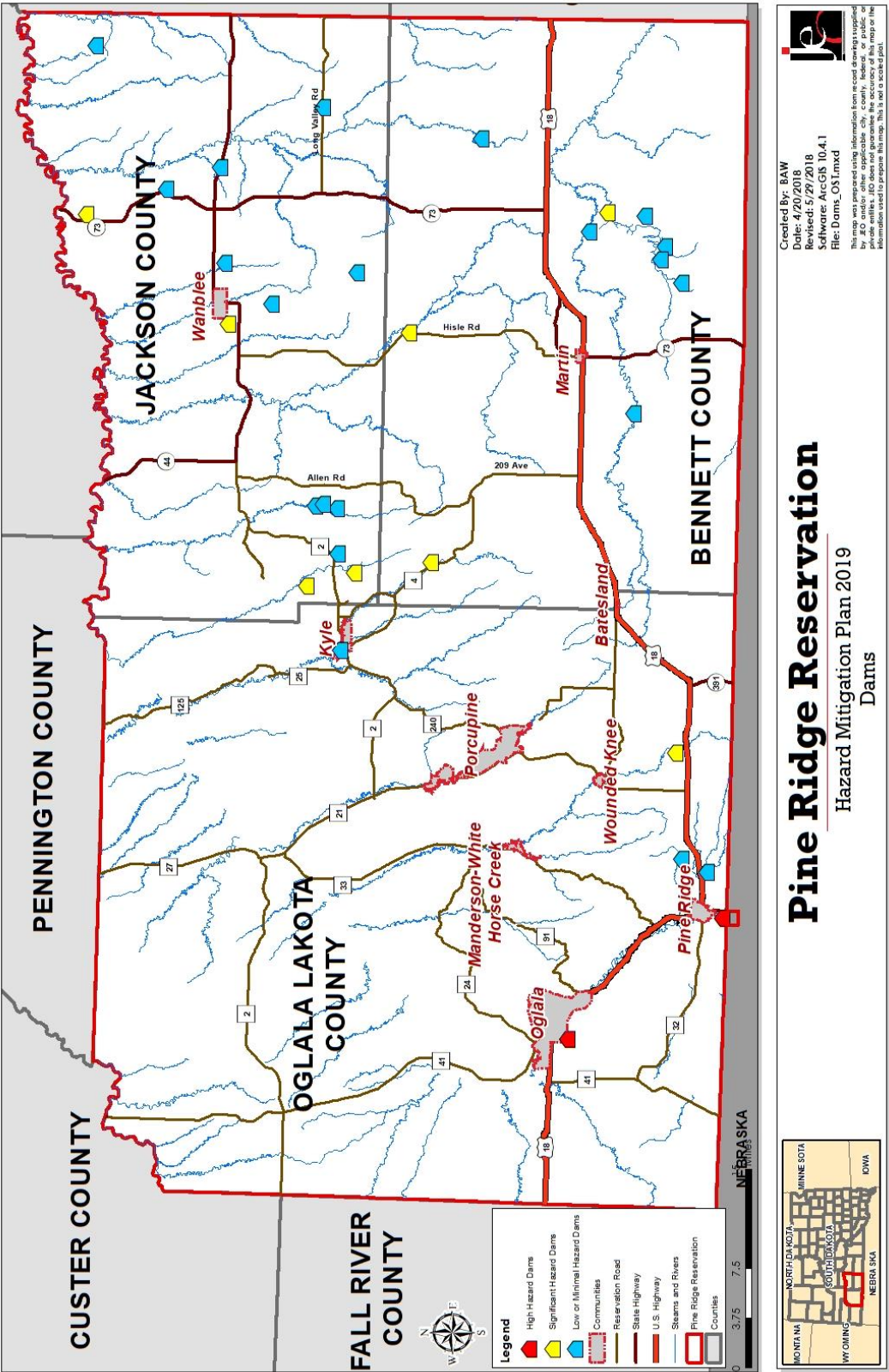
TABLE 51: DAMS IN THE PLANNING AREA

COUNTY	SIGNIFICANT HAZARD	HIGH HAZARD
OGLALA LAKOTA COUNTY	1	2
BENNETT COUNTY	3	0
JACKSON COUNTY	4	0
Total	7	2

Source: South Dakota Hazard Mitigation Plan, 2014

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

FIGURE 23: DAM LOCATIONS



Pine Ridge Reservation
 Hazard Mitigation Plan 2019
 Dams

TABLE 52: HIGH HAZARD DAMS

DAM NAME	OWNER	LOCATION	STREAM NAME	MAXIMUM STORAGE (ACRE-FEET)	EMERGENCY ACTION PLAN
Oglala Dam	Oglala Sioux Tribe	Oglala	White Clay Creek	10,800	Yes
White Clay Dam	Oglala Sioux Tribe	Pine Ridge	White Clay Creek	N/A	Yes

Source: South Dakota HMP, 2014

LOCATION

Communities or areas downstream of a dam, especially high hazard dams, are at greatest risk of dam failure. The two high hazard dams are located in Oglala Lakota County with one located just outside Oglala and the other located outside White Clay.

Dam owners and the South Dakota Department of Natural Resources have opted, at this time, to not include dam breach maps or inundation maps in hazard mitigation plans due to the sensitive nature of this information. Requests can be made of the dam owner or the Dam Safety Division of SDDNR to view an inundation map specific to a dam.

The Oglala Dam and White Clay Dam are both in the process of being inspected and repaired for damages. Oglala Dam in particular was found to have damage to the spillway. The Bureau of Reclamation is overseeing the dam repairs. A major transportation route, Highway 18, runs directly north of the Oglala Dam and is at risk of road washouts and damage when the spillway is used. The Planning Team also stated that when the spillway is used, water enters Oglala and cuts off access to several homes. A dam in Kyle is also currently being inspected. Inspections and repairs are expected to be completed by the end of 2019.

EXTENT

While a breach of a high hazard dam would certainly impact those in inundation areas, the total number of people and property exposed to this threat would vary based on the dam location. Since inundation maps are not made publicly available for security reasons, it is not possible to provide a full description of potential damages. Note that there are only two high hazard dams located within the planning area.

HISTORICAL OCCURRENCES

According to the Stanford University National Performance of Dams Program⁴⁶, the State of South Dakota Hazard Mitigation Plan, and the local planning team there have been no dam failure events within the planning area. While no dam failure events have occurred in the planning area, testing of the high hazard dam spillways has been done in the past five years. The Planning Team noted that during these tests, notification protocols were lacking as many tribal members were unaware water was going to be released along spillways, which in turn closed major transportation routes and cut off access to homes and businesses.

Additionally, the Planning Team noted that concerns exist when people swim in the dams and become sick from poor water quality. Water quality testing is done occasionally on inlets and outlets, but the tribe expressed a need for more consistent and regular testing protocols.

In March 2019 severe flooding and high-water flows caused both the Oglala Dam and White Clay Dam to overtop. The Oglala Dam experienced a washout and teams worked to place sandbags to divert water flows. The reservoir was eventually drained to prevent additional flood risks to nearby residents. High water flows overtopped the spillway on the White Clay Dam (Figure 24). Both dams experienced damages during the flooding event with repairs expected to be done through late 2019.

⁴⁶ Stanford University. 1911-2016. "National Performance of Dams Program Dam Incident Database." Accessed August 2017. http://npdp.stanford.edu/dam_incidents.

FIGURE 24: WATER FLOWS OVER WHITE CLAY DAM SPILLWAY



Source: Rapid City Journal, 2019⁴⁷

AVERAGE ANNUAL DAMAGES

Due to lack of data and the sensitive nature of this hazard, potential losses are not calculated for this hazard. Community members in the planning area that wish to quantify the threat of dam failure should contact their County Emergency Management or South Dakota Department of Natural Resources.

PROBABILITY

Historically, there have been no high hazard dam failure events in the planning area. The South Dakota State Hazard Mitigation Plan states that many of the state’s small dams fail due to insufficient spillway size after heavy rain events. For the purpose of this plan, the probability of dam failure will be stated at less than one percent annually as no dams have failed in the planning area over the past 100 years.

REGIONAL VULNERABILITIES

The following table provides information related to regional vulnerabilities.

TABLE 53: REGIONAL DAM FAILURE VULNERABILITIES

SECTOR	VULNERABILITY
PEOPLE	-Those living downstream of high hazard dams -Evacuation likely with high hazard dams -Hospitals, nursing homes, and the elderly at greater risk due to low mobility
ECONOMIC	-Businesses located in the inundation areas would be impacted and closed for an extended period of time -Employees working in the inundation area may be out of work for an extended period of time
BUILT ENVIRONMENT	-Damage to homes and buildings
INFRASTRUCTURE	-Transportation routes could be closed for extended period of time
CRITICAL FACILITIES	-Critical facilities in inundation areas are vulnerable to damages
CLIMATE CHANGE	-Rising temperatures and increased severity and frequency of heavy rainfall cause damage and added stress to aging infrastructure

⁴⁷ Rapid City Journal, March 26, 2019. "PHOTOS: Flooding on Pine Ridge." https://rapidcityjournal.com/news/photos-flooding-on-pine-ridge/collection_d1c401d3-9baf-52da-9cd1-ee0578461673.html#1.

DROUGHT

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

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

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.

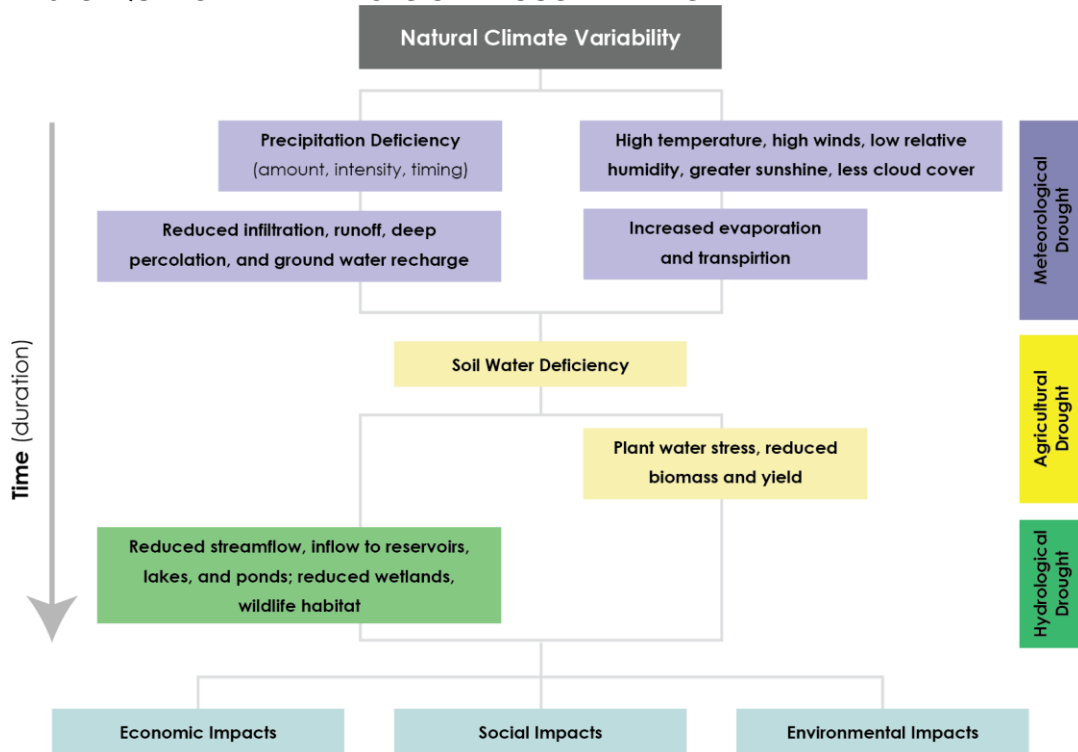
~National Drought Mitigation Center

- **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.⁴⁸

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

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

FIGURE 25: SEQUENCE AND IMPACTS OF DROUGHT TYPES



Source: National Drought Mitigation Center, University of Nebraska-Lincoln, 2017⁴⁹

HISTORICAL OCCURRENCES

The Palmer Drought Severity Index (PDSI) is utilized by climatologists to standardize global long-term drought analysis. The data for the planning area was collected for Climate Division 8, which includes the planning area. This particular station’s period of record started in 1895. Figure 26 shows the data from this time period. The negative Y axis represents a drought, for which ‘-2’ indicates a moderate drought, ‘-3’ a severe drought, and ‘-4’ an extreme drought. Table 54 shows the details of the Palmer classifications.

TABLE 54: 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 Center⁵⁰

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

⁵⁰ National Weather Service. 2017. “Climate Prediction Center.” <http://www.cpc.noaa.gov/>.

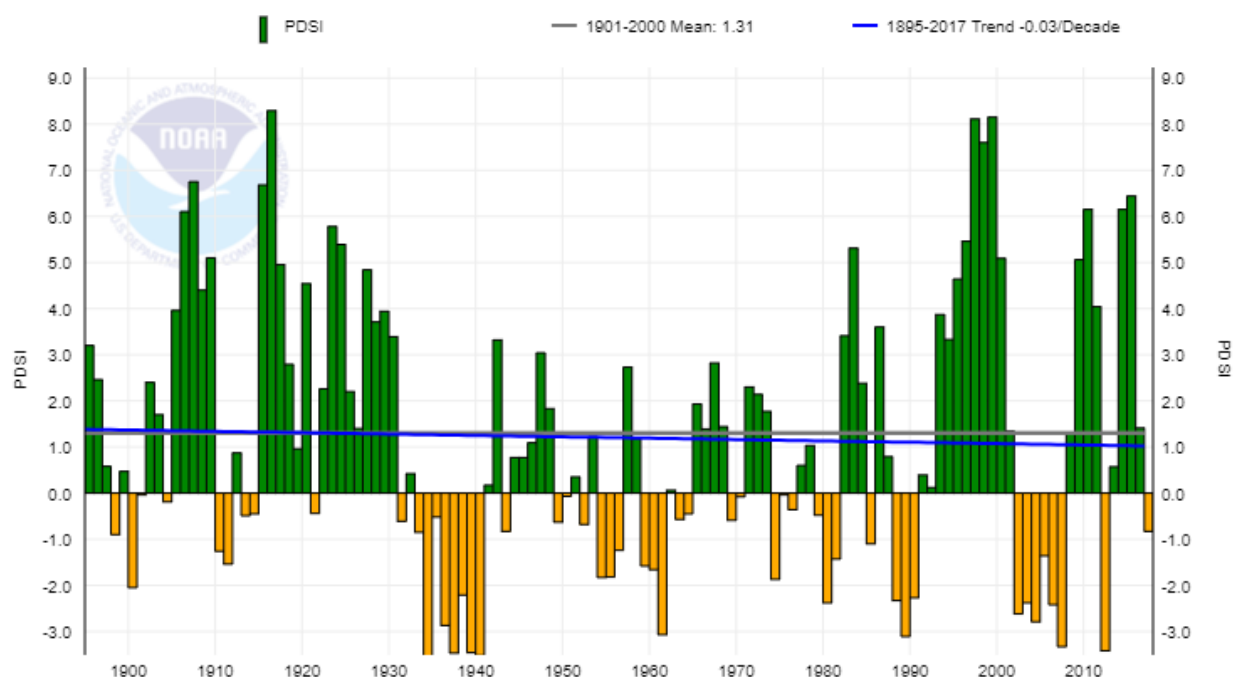
TABLE 55: HISTORIC DROUGHTS

DROUGHT MAGNITUDE	MONTHS IN DROUGHT	PERCENT CHANGE
-1 MAGNITUDE	180/1,477	12.19%
-2 MAGNITUDE	138/1,477	9.34%
-3 MAGNITUDE	67/1,477	4.54%
-4 MAGNITUDE OR GREATER	48/1,477	3.25%

Source: NCEI, Jan 1895-Jan 2018⁵¹

FIGURE 26: PALMER DROUGHT SEVERITY INDEX

South Dakota, Climate Division 5, PDSI, January-December



Source: NCEI, Jan. 1895-Jan. 2018

LOCATION

The entire planning area is susceptible to impacts resulting from drought, but the northern portion of the reservation is most prone to dryness.

EXTENT

Using the data from Table 55, it is reasonable to expect extreme drought to occur in 3.3 percent of years of months for the planning area (48 extreme drought months in 1,477 months). Severe drought occurred in 67 months of the 1,477 months of record (4.5 percent of months). Moderate drought occurred in 138 months of the 1,477 months of record (9.3 percent of months), and mild drought occurred in 180 of the 1,477 months of record (12.2 percent of months). Non-drought conditions (incipient dry spell, near normal, or incipient wet spell conditions) occurred in 1,044 months, or 70.7% percent of months. These statistics show that the drought conditions of the planning area are highly variable.

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

AVERAGE ANNUAL LOSSES

Impacts from drought exacerbate wildfire and agricultural loss which significantly impact the economic base of the planning area. Drought impacts water availability for farmers and ranchers. 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. RMA values for Jackson County may be higher than actual conditions felt in the planning area, as only the southern half of Jackson County is located within the Pine Ridge Reservation.

TABLE 56: DROUGHT LOSSES

COUNTY	TOTAL CROP LOSS	AVERAGE ANNUAL CROP LOSS
OGLALA LAKOTA	\$8,340,742	\$463,375
BENNETT	\$17,070,999	\$948,389
JACKSON	\$17,499,930	\$972,218
TOTAL	\$42,911,671	\$2,383,982

Source: USDA RMA, 2000 to 2017

Extreme drought in 2012 severely affected the agricultural sector across the state of South Dakota. Pasture land experienced severe loss of productivity. As a result, the USDA estimates over \$900 million of crop insurance and over \$160 million from the Livestock Forage Program (LFP) fund were paid out.⁵² According to the PDSI, 2012's average severity index was ranked at a -3.42, with extremes in September and October of -5.75 and -5.31 respectively.

PROBABILITY

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

TABLE 57: PERIOD OF RECORD IN DROUGHT

PDSI VALUE	MAGNITUDE	DROUGHT OCCURRENCES	MONTHLY
		BY MONTH	PROBABILITY
4 or more to -0.99	No Drought	1,044/1,477	70.68%
-1.0 to -1.99	Mild Drought	180/1,477	12.19%
-2.0 to -2.99	Moderate Drought	138/1,477	9.34%
-3.0 to -3.99	Severe Drought	67/1,477	4.54%
-4.0 or less	Extreme Drought	48/1,477	3.25%

Source: NCEI, Jan 1870-Jan 2018

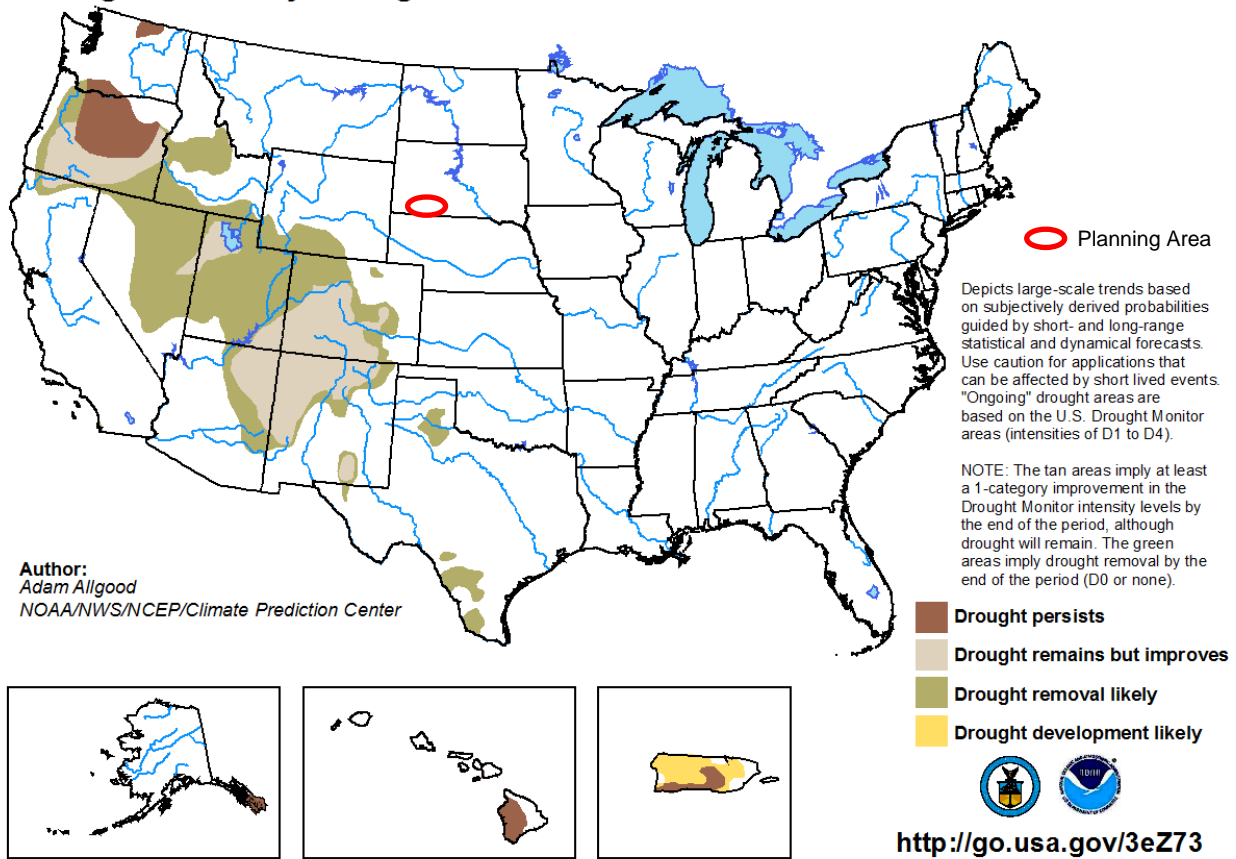
The U.S. Seasonal Drought Outlook (Figure 27) provides a short-term drought forecast that can be utilized by local officials and residents to examine the likelihood of drought developing or continuing depending on the current situation. The following figure provides the drought outlook for February 21, 2019 through May 31, 2019. According to the U.S. Seasonal Drought Outlook, drought is likely to lighten through the southwest United States, and no parts of South Dakota are currently in drought conditions. The planning area should experience seasonal norms relative to precipitation and temperatures.

⁵² South Dakota Drought Task Force. November 2015. "South Dakota Drought Mitigation Plan." https://dps.sd.gov/application/files/5615/0161/4504/2015-SD-Drought-Mitigation-Plan_LR.pdf.

FIGURE 27: U.S. SEASONAL DROUGHT OUTLOOK

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

Valid for February 21 - May 31, 2019
Released February 21



Source: NCEI, February 2019

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 42 drought-related impacts impacting Oglala Lakota County, Bennett County, and Jackson County. These impacts are summarized in the following table. The Natural Resources department monitors drought reports weekly from the US Drought Monitor. The Tribe is currently working on their first drought management plan in conjunction with the Great Plains Tribal Water Alliance. A drought vulnerability assessment is in progress with an estimated completion by the end of 2018. Drought risks damage to agriculture, livestock, and firefighting resources. A new fire department is currently being developed to respond to structural and wildland fire, but the location has not yet been determined. There are drought triggers identified for water restrictions. Roughly one million gallons are used every year for residential use. Some water users may use residential water for agriculture and livestock.

TABLE 58: DROUGHT IMPACTS IN PLANNING AREA

CATEGORY	DATE	TITLE
Agriculture	2017	Crop production down in South Dakota
Fire; Relief, Response & Restrictions	2012	Drought and high temperatures exacerbated South Dakota's fire season
Agriculture; Relief, Response & Restrictions	2017	Drought emergency in South Dakota
Plants & Wildlife	2017	Drought hurt South Dakota's pheasant population

CATEGORY	DATE	TITLE
Society & Public Health	2012	Drought pulled down personal income in South Dakota by 0.2 percent in 2012
Agriculture	2012	Drought reduced corn and soybean production in South Dakota
Relief, Response & Restrictions; Society & Public Health	2016	Drought Task Force activated in South Dakota
Agriculture	2013	Drought, high feed prices a concern for buyers at buffalo auction in Rapid City, South Dakota
Agriculture	2012	Drought, other factors hurt livestock industry in South Dakota
Agriculture	2012	Drought, reduced forage add to challenges for sheep producers in South Dakota
Plants & Wildlife; Tourism & Recreation	2012	Dry weather in 2012 caused an unusually high number of deaths among adult pheasants in South Dakota
Agriculture; Relief, Response & Restrictions	2012	Farmers in South Dakota were eligible to receive \$1 billion in crop insurance payments in 2012
Plants & Wildlife	2017	Fewer ducks in South Dakota
Agriculture; Fire	2012	Grass fires reported in South Dakota
Agriculture; Relief, Response & Restrictions	2012	Hay available for South Dakota ranchers affected by fire in 2012
Agriculture; Plants & Wildlife	2017	Hay supplies short in western, north central South Dakota
Agriculture; Plants & Wildlife; Society & Public Health	2013	High hay prices led the International Society for the Protection of Mustangs and Burros in Lantry, South Dakota to give away some of its wild horses and request hay donations
Agriculture; Relief, Response & Restrictions; Water Supply & Quality	2013	High number of irrigation permits issued in South Dakota
Fire	2011	Lack of snow cover prolongs occurrences of grass fires in South Dakota
Fire; Relief, Response & Restrictions	2012	Lengthy fire season in South Dakota
Agriculture; Society & Public Health	2017	Long line of trucks at sale barn in Aberdeen, South Dakota
Agriculture; Society & Public Health	2013	Net farm profit in South Dakota fell nearly 40 percent in 2013
Plants & Wildlife; Tourism & Recreation	2017	Pheasant population down in South Dakota
Agriculture	2011	Respiratory problems have arisen among cattle in dry, dusty parts of South Dakota
Agriculture; Relief, Response & Restrictions	2017	S.D. senator requested use of CRP hay rather than destruction per mid-contract management practices
Agriculture; Relief, Response & Restrictions	2012	Senator from South Dakota contacted secretary of the U.S. Dept. of Agriculture about assistance for producers
Agriculture; Plants & Wildlife	2017	South Dakota crop production lower, due to drought
Relief, Response & Restrictions; Society & Public Health	2012	South Dakota Drought Task Force activated
Agriculture	2017	South Dakota farmers putting seed deeper for moisture
Agriculture; Relief, Response & Restrictions	2012	South Dakota livestock producers were urged to have their drought-affected forage tested for high nitrate levels
Relief, Response & Restrictions; Water Supply & Quality	2013	South Dakota officials requesting limited water releases from Missouri River reservoirs

CATEGORY	DATE	TITLE
Agriculture; Relief, Response & Restrictions; Water Supply & Quality	2012	South Dakota received an unusually high number of applications for irrigation permits in 2012
Agriculture	2012	South Dakota sheep ranchers were selling their livestock
Agriculture; Relief, Response & Restrictions	2011	South Dakota State University created a hay hotline
Agriculture; Plants & Wildlife	2016	South Dakota's alfalfa hay fields, pastures deteriorating
Business & Industry	2012	South Dakota's GDP up only 1.9 percent in 2012
Society & Public Health	2017	South Dakotans praying for rain
Agriculture	2013	Soybean yields in South Dakota affected by drought and heat
Agriculture; Relief, Response & Restrictions	2012	The governor of South Dakota eased restrictions on height and weight requirements for trucks transporting hay
Plants & Wildlife; Tourism & Recreation	2013	The South Dakota Game, Fish and Parks Commission recommended offering thousands fewer deer licenses and tags during rifle, archery and muzzleloader seasons
Agriculture	2012	The U.S. Department of Agriculture forecasted South Dakota's average corn yield lower than usual
Agriculture; Relief, Response & Restrictions	2012	USDA conservation easement holders in South Dakota urged to consider management options

Source: NDMC, 2011-2018⁵³

The following table provides information related to regional vulnerabilities.

TABLE 59: REGIONAL DROUGHT VULNERABILITIES

SECTOR	VULNERABILITY
PEOPLE	-Insufficient water supply -Loss of jobs in agricultural sector -Residents in poverty if food prices increase
ECONOMIC	-Closure of water intensive businesses (carwashes, pools, etc.) -Loss of tourism dollars -Decrease of land prices → jeopardizes educational funds -Decreases water availability for farmers and ranchers
BUILT ENVIRONMENT	-Cracking of foundations (residential and commercial structures) -Damages to landscapes
INFRASTRUCTURE	-Damages to waterlines below ground -Damages to roadways (prolonged extreme events) -Stressing of electrical systems (brownouts during peak usage) -Reduction of water availability and water quality, even from the Mni Wiconi Water Project. Could be exacerbated by spills from the Keystone XL pipeline
CRITICAL FACILITIES	None
CLIMATE CHANGE	-Increased drought risk from climate change is expected, potential damages to agriculture, people, and infrastructure
OTHER	-Increase in wildfires and wildfire intensity

⁵³ National Drought Mitigation Center. 2018. "U.S. Drought Impact Reporter." <http://droughtreporter.unl.edu/map/>.

EARTHQUAKES

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

TABLE 60: RICHTER SCALE

RICHTER MAGNITUDES	EARTHQUAKE EFFECTS
LESS THAN 3.5	Generally not felt, but recorded.
3.5 – 5.4	Often felt, but rarely causes damage.
UNDER 6.0	At most, slight damage to well-designed buildings. Can cause major damage to poorly constructed buildings over small regions.
6.1 – 6.9	Can be destructive in areas up to about 100 kilometers across where people live.
7.0 – 7.9	Major earthquake. Can cause serious damage over larger areas.
8 OR GREATER	Great earthquake. Can cause serious damage in areas several hundred kilometers across.

Source: FEMA, 2016⁵⁴

TABLE 61: MODIFIED MERCALLI INTENSITY SCALE

SCALE	INTENSITY	DESCRIPTION OF EFFECTS	CORRESPONDING RICHTER SCALE MAGNITUDE
I	Instrumental	Detected only on seismographs	
II	Feeble	Some people feel it	< 4.2
III	Slight	Felt by people resting, like a truck rumbling by	
IV	Moderate	Felt by people walking	
V	Slightly Strong	Sleepers awake; church bells ring	< 4.8
VI	Strong	Trees sway; suspended objects swing, objects fall off shelves	< 5.4
VII	Very Strong	Mild Alarm; walls crack; plaster falls	< 6.1
VIII	Destructive	Moving cars uncontrollable; masonry fractures, poorly constructed buildings damaged	
IX	Ruinous	Some houses collapse; ground cracks; pipes break open	< 6.9
X	Disastrous	Ground cracks profusely; many buildings destroyed; liquefaction and landslides widespread	< 7.3
XI	Very Disastrous	Most buildings and bridges collapse; roads, railways, pipes and cables destroyed; general triggering of other hazards	< 8.1
XII	Catastrophic	Total destruction; trees fall; ground rises and falls in waves	> 8.1

Source: FEMA, 2016

⁵⁴ Federal Emergency Management Agency. 2016. "Earthquake." <https://www.fema.gov/earthquake>.

LOCATION

According to the State of South Dakota's Hazard Mitigation Plan, the eastern flank of the Black Hills and the southwestern corner of the state may experience earthquake events. However, these events are likely to be small and rare with minimal to no damages.

EXTENT

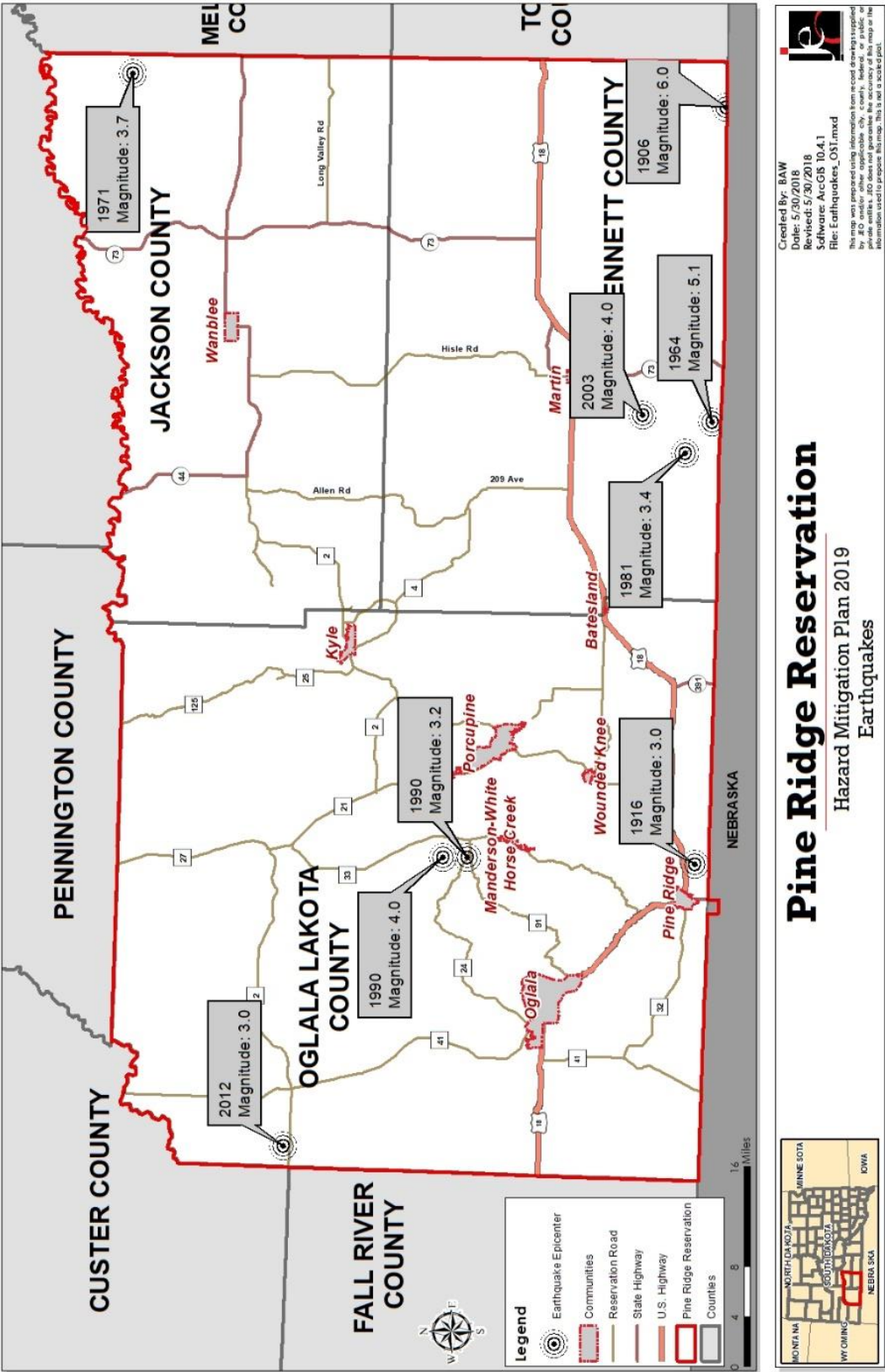
Based on average magnitude of previous events, if an earthquake were to occur in the planning area, it would likely measure 4.0 or less on the Richter Scale.

HISTORICAL OCCURRENCES

According to the United States Geological Survey (USGS) from 1872 to 2013, there have been nine earthquakes in the planning area.⁵⁵ Figure 28 shows historical earthquake events in the planning area

⁵⁵ United States Geological Survey. Accessed May 2018. "Earthquakes in South Dakota (1872-2013)."
<http://www.sdgs.usd.edu/publications/maps/earthquakes/earthquakes.htm/>

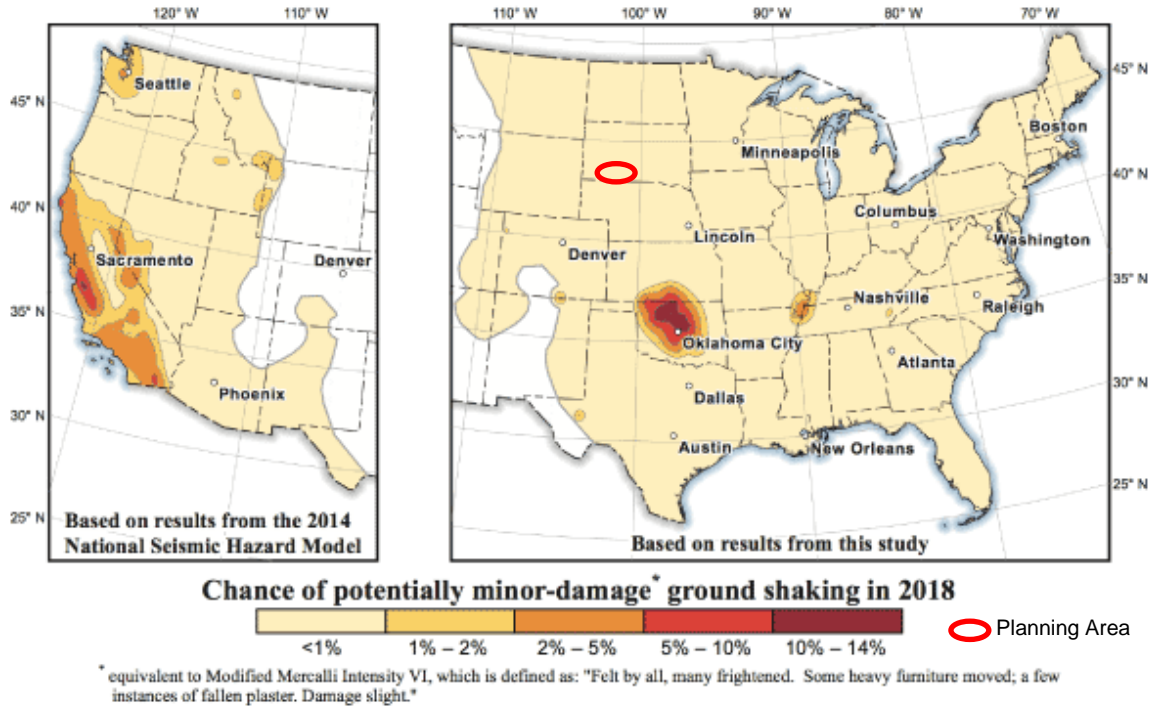
FIGURE 28: EARTHQUAKES IN PINE RIDGE RESERVATION



AVERAGE ANNUAL LOSSES

Due to the lack of sufficient earthquake data, limited resources, low risk for a large magnitude earthquake in the area, and no recorded damages with the reports of historical occurrences, it is not feasible to utilize the 'event damage estimate formula' to estimate potential losses for the planning area. Figure 29 shows the probability of damage from earthquakes, according to the USGS. The figure shows that the planning area has a less than one percent chance of damages from earthquakes.

FIGURE 29: 2018 PROBABILITY OF DAMAGE FROM EARTHQUAKES



Source: USGS, 2018⁵⁶

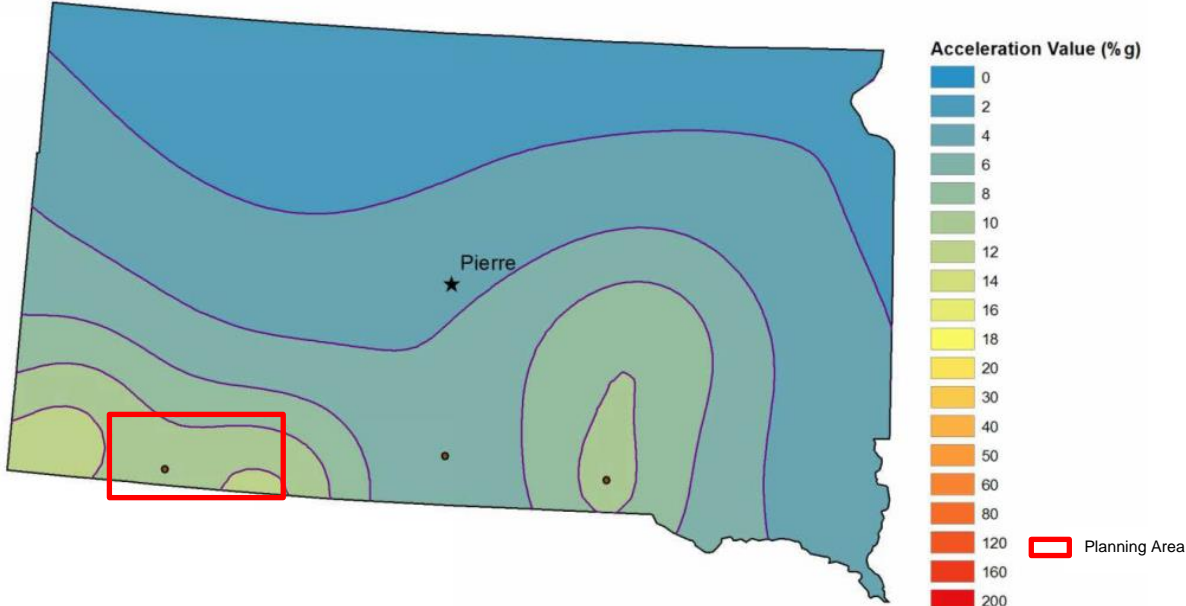
PROBABILITY

The following figure summarizes the probability of a 5.0 or greater earthquake occurring in the planning area within 50 years. With nine earthquakes occurring in the planning area in 142 years, for the purposes of this plan, there is six percent chance of an earthquake occurring each year. However, the USGS estimates for the state only a 10 percent chance of exceeding a 5.1 magnitude earthquake in any one 50-year period.⁵⁷ The local Planning Team indicated the planning area will occasionally feel tremors from earthquakes, however significant impacts have not been observed and earthquakes are not a top concern.

⁵⁶ United States Geological Survey. 2018. "Short-term Induced Seismicity Models: 2018 One-Year Model." <https://earthquake.usgs.gov/hazards/induced/index.php#2017>.

⁵⁷ State of South Dakota. 2016. "State Hazard Mitigation Plan: Identification Risk Assessment."

FIGURE 30: EARTHQUAKE PROBABILITY



Source: 2016 State of South Dakota Hazard Mitigation Plan, USGS National Earthquake Information Center Map shows the two-percent probability of exceedance in 50 years of peak ground acceleration

REGIONAL VULNERABILITIES

The following table provides information related to regional vulnerabilities.

TABLE 62: REGIONAL EARTHQUAKE VULNERABILITIES

SECTOR	VULNERABILITY
PEOPLE	-Falling objects
ECONOMIC	-Short-term interruption of business
BUILT ENVIRONMENT	-Cracking of foundations (residential and commercial structures) -Damage to structures
INFRASTRUCTURE	-Damages to subterranean infrastructure (e.g. waterlines, gas lines, etc.) -Damages to roadways
CRITICAL FACILITIES	-Same as all other structures
CLIMATE CHANGE	-None

EXTREME HEAT

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

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

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

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

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

LOCATION

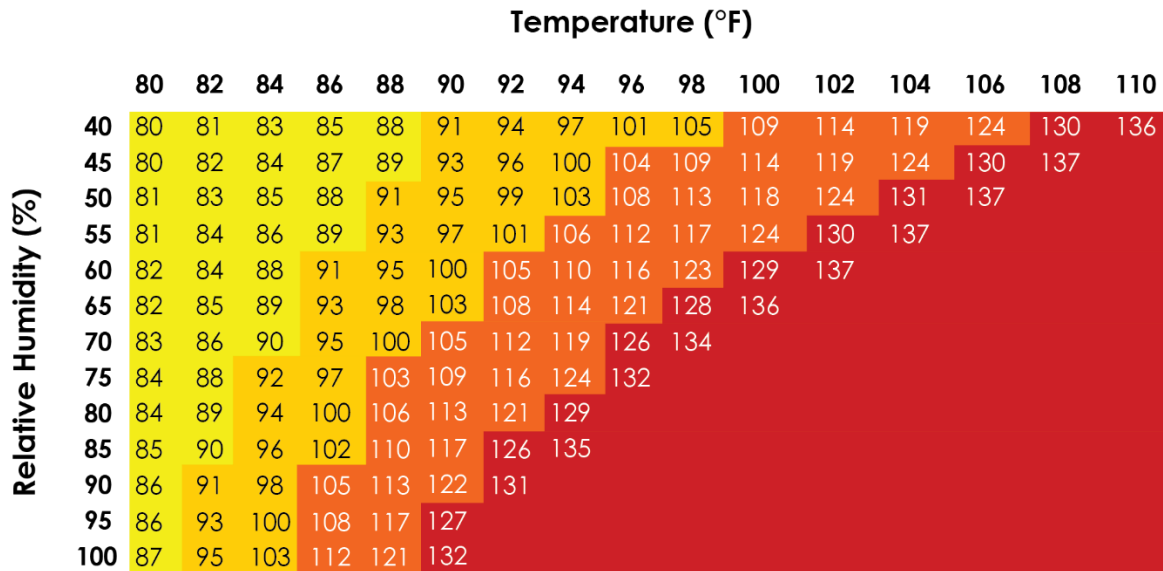
This hazard may occur throughout the planning area.

EXTENT

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

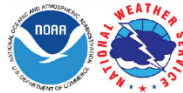
$$100\% \text{ Relative Humidity} + 86^{\circ}\text{F} = 112^{\circ}\text{F Heat Index}$$

FIGURE 31: NOAA HEAT INDEX



Likelihood of Heat Disorders with Prolonged Exposure or Strenuous Activity

Caution
 Extreme Caution
 Danger
 Extreme Danger



Source: NOAA, 2018⁵⁸

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. Consideration for high heat events should also include an understanding of changing climate trends. The region is experiencing an increase in the average temperature each year. This trend will likely manifest in more days each year with temperatures of 100°F or greater. Since 1895, South Dakota’s overall average temperature has increased by about 2°F.

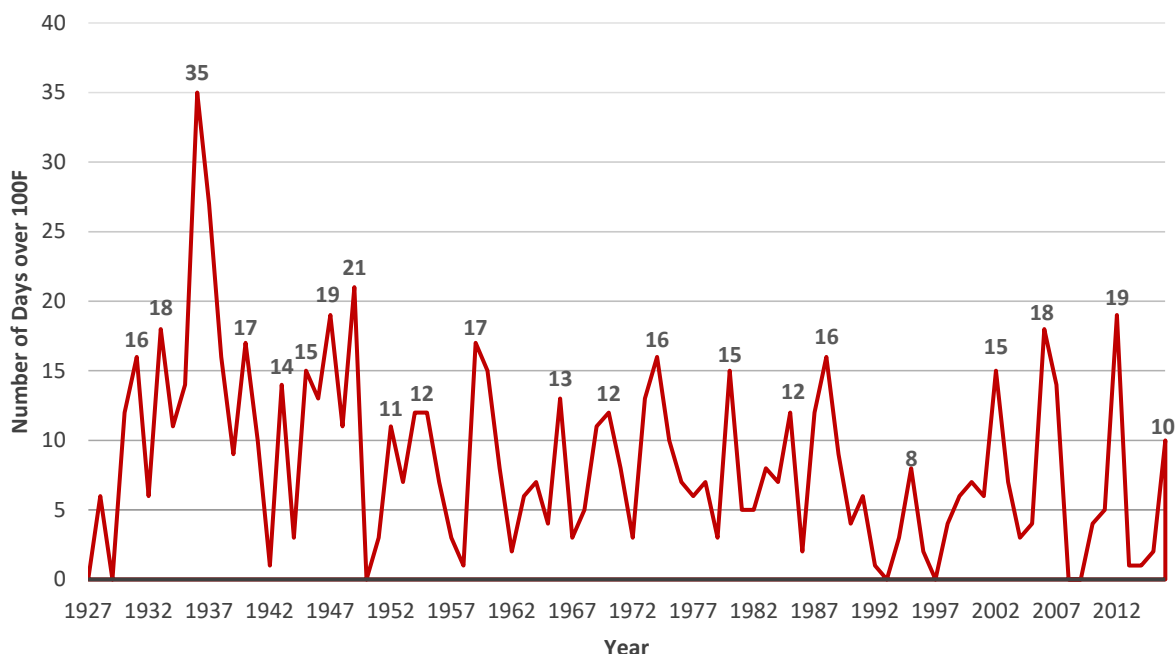
HISTORICAL OCCURRENCES

According to the High Plains Regional Climate Center (HPRCC), on average, the planning area experiences 9 days above 100°F. The planning area experienced 35 days above 100°F in 1936, which was the most 100°F days on record. More recently, 2012 had 19 days above 100°F. Conversely, 2008 and 2009 were the most recent “coolest” years on record, with no days above 100°F. However, due to the expected impacts from climate change, a greater number of extreme heat days are expected in by mid-century.⁵⁹

⁵⁸ National Oceanic and Atmospheric Administration, National Weather Service. 2017. “Heat Index.” http://www.nws.noaa.gov/om/heat/heat_index.shtml.

⁵⁹ Melillo, J.M., Richmond, T., and Yohe, G., eds. 2014. Climate Change Impacts in the United States: The Third National Climate Assessment. U.S. Global Change Research Program, 841 pp. doi:10.7930/J0Z31WJ2.

FIGURE 32: NUMBER OF DAYS ABOVE 100°F



Source: HPRCC, 1927-2016

AVERAGE ANNUAL LOSSES

The direct and indirect effects of extreme heat are difficult to quantify. Potential losses such as power outages could affect businesses, homes, and critical facilities. High demand and intense use of air conditioning can overload the electrical systems and cause damages to infrastructure. Values for Jackson County are based upon the entirety of the county and may be inflated as only the southern half of the county is located within the Pine Ridge Reservation.

The NCEI database did not report any property damage due to extreme heat events.

TABLE 63: EXTREME HEAT LOSS ESTIMATION

COUNTY	TOTAL CROP LOSS	ANNUAL CROP LOSS
OGLALA LAKOTA	\$186,951	\$10,386
BENNETT	\$560,243	\$31,125
JACKSON	\$159,776	\$8,876
TOTAL	\$906,970	\$50,387

Source: USDA RMA, 2000-2017

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.⁶⁰ 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.

⁶⁰ Federal Emergency Management Agency. June 2009. "BCA Reference Guide." <https://www.fema.gov/media-library/assets/documents/18870>.

TABLE 64: LOSS OF ELECTRICITY - ASSUMED DAMAGE BY JURISDICTION

JURISDICTION	2015 POPULATION	POPULATION AFFECTED (ASSUMED)	ELECTRIC LOSS OF USE ASSUMED DAMAGE PER DAY
OGLALA LAKOTA COUNTY	14,263	1,426	\$179,676
BENNETT COUNTY	3,445	345	\$43,470
JACKSON COUNTY*	3,268	329	\$41,454
TOTAL	20,976	2,100	\$264,600

*indicates population for the entire county, not solely the parts of Jackson County located within the planning area

The Planning Team stated that tribal residents are vulnerable to high heat events as much of the populace can not afford to run air conditioning continuously throughout the summertime or other high heat event periods. Additionally, many homes throughout the reservation may have poor temperature control insulation and do not remain cool when air conditioning is running. There is a lack of public facilities with easy access to air conditioning for many residents who may live in remote areas. The Pine Ridge Hospital noted that heat stroke and heat exhaustion cases are relatively rare, but dehydration and heat stress is common during Sundance Season typically held between June and August.

PROBABILITY

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

REGIONAL VULNERABILITIES

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

TABLE 65: REGIONAL EXTREME HEAT VULNERABILITIES

SECTOR	VULNERABILITY
PEOPLE	-Heat exhaustion -Heat Stroke -Vulnerable populations include: -People working outdoors -People without air conditioning -Young children outdoors or without air conditioning -Elderly outdoors or without air conditioning
ECONOMIC	-Short-term interruption of business -Loss of power -Agricultural losses
BUILT ENVIRONMENT	None
INFRASTRUCTURE	-Overload of electrical systems -Damages to roadways
CRITICAL FACILITIES	-Loss of power
CLIMATE CHANGE	-Increases in extreme heat conditions are likely, adding stress on livestock, crops, people, and infrastructure

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

The primary rivers in the planning area are the White River, Little White River, and Cheyenne River. The planning area has numerous primary tributaries as listed in the table below and shown in Figure 33. Table 67 shows current statuses of Flood Insurance Rate Map (FIRM) panels. The only jurisdiction in the planning area that has a FIRM is Batesland.

TABLE 66: PLANNING AREA TRIBUTARIES AND CREEKS

Creek and Tributary Names			
Alkali Creek	East Fork Willow Creek	Lost Turkey Creek	Slim Butte Creek
American Horse Creek	East Horse Creek	Medicine Root Creek	South Fork of Cedar Creek
Bad Hair Creek	East Prong Wolf Creek	Middle Fork Willow Creek	South Prong Wolf Creek
Bear Creek	Elm Creek	Mule Creek	Spring Creek
Bear-in-the-Lodge Creek	Fast Horse Creek	Nancy Hanks Creek	Squaw-Humper Creek
Big Hollow Creek	Fish Creek	No Flesh Creek	Stinking Water Creek
Black Pipe Creek	Fog Creek	North Cottonwood Creek	Threemile Creek
Blacktail Creek	Gay Creek	Palmer Creek	Turtle Creek
Brush Creek	Grass Creek	Pass Creek	West Fork Mule Creek
Buzzard Creek	Hay Creek	Paulmyer Creek	West Fork Willow Creek
Cain Creek	Herd Camp Creek	Pearson Creek	West Horse Creek
Cedar Bluff Creek	Hume Creek	Peck Creek	White Clay Creek
Cedar Creek	Janis Creek	Pepper Creek	White Horse Creek
Cheyenne Creek	Lake Creek	Phister Creek	Wild Horse Creek
Clifford Creek	Limekiln Creek	Plum Creek	Willow Creek
Corn Creek	Little Beam Creek	Porcupine Creek	Wind Creek
Cottonwood Creek	Little Dog Spring Creek	Potato Creek	Wolf Creek
Craven Creek	Little Grass Creek	Red Stone Creek	Wounded Knee Creek
Deep Creek	Little Squaw-Humper Creek	Redwater Creek	
Eagle Nest Creek	Long Creek	Sand Creek	
East Fork Mule Creek	Lost Dog Creek	Settin Up Creek	

FIGURE 33: RIVERS AND CREEKS IN PINE RIDGE RESERVATION

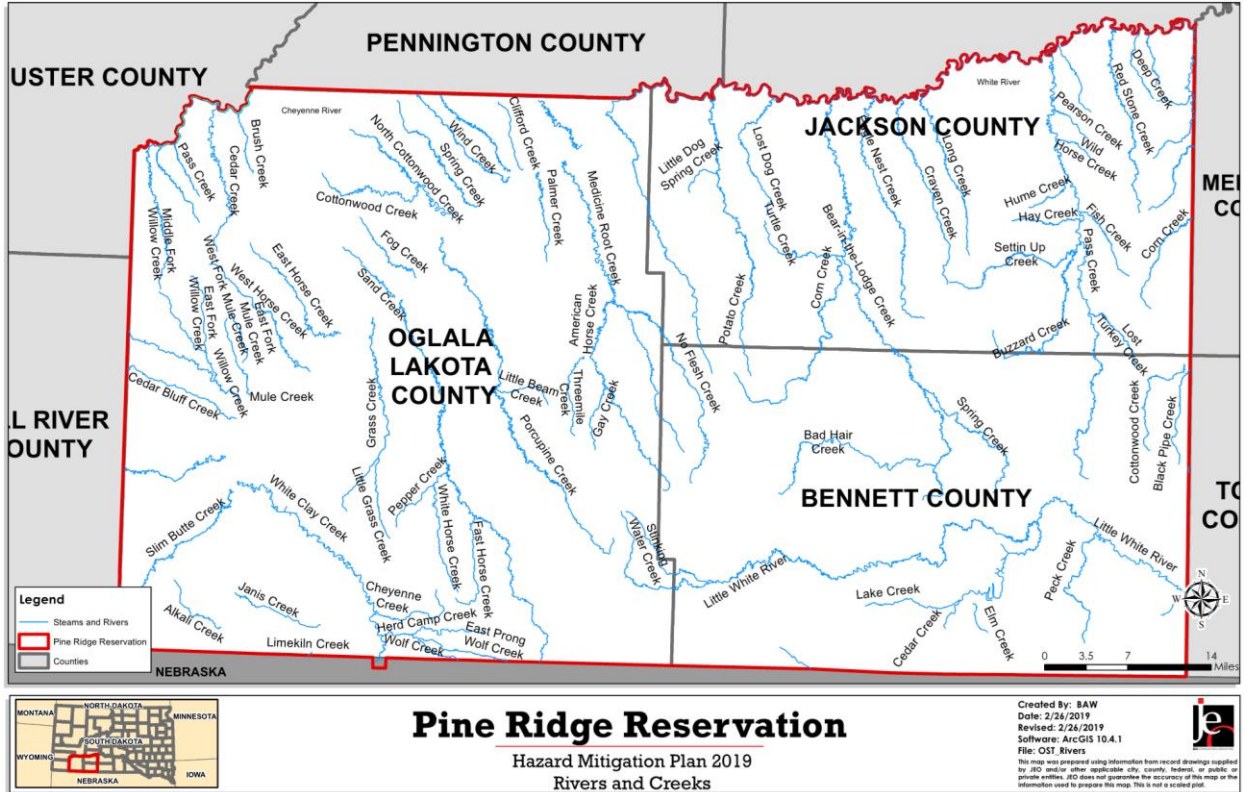
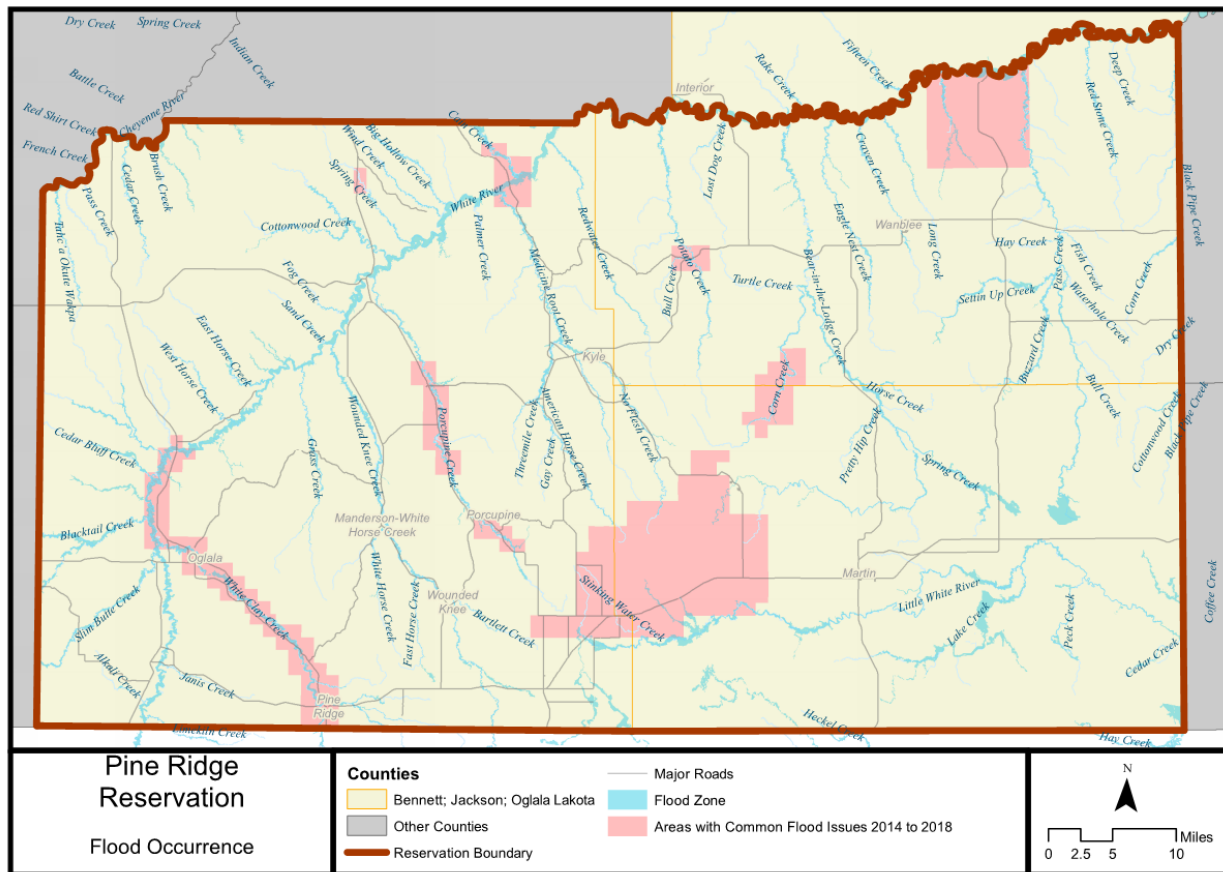


FIGURE 34: FLOOD OCCURRENCE



Source: OST Emergency Management

Figure 34 shows the flood zones in the Pine Ridge Reservation, along with those areas known to have recurring flooding. Figure 35 shows the Special Flood Hazard Zone (SFHZ) next to the boundaries for the Town of Batesland. A few homes and the town’s sewer lagoon are located in the SFHZ.

FIGURE 35: SPECIAL FLOOD HAZARD AREA FOR BATESLAND

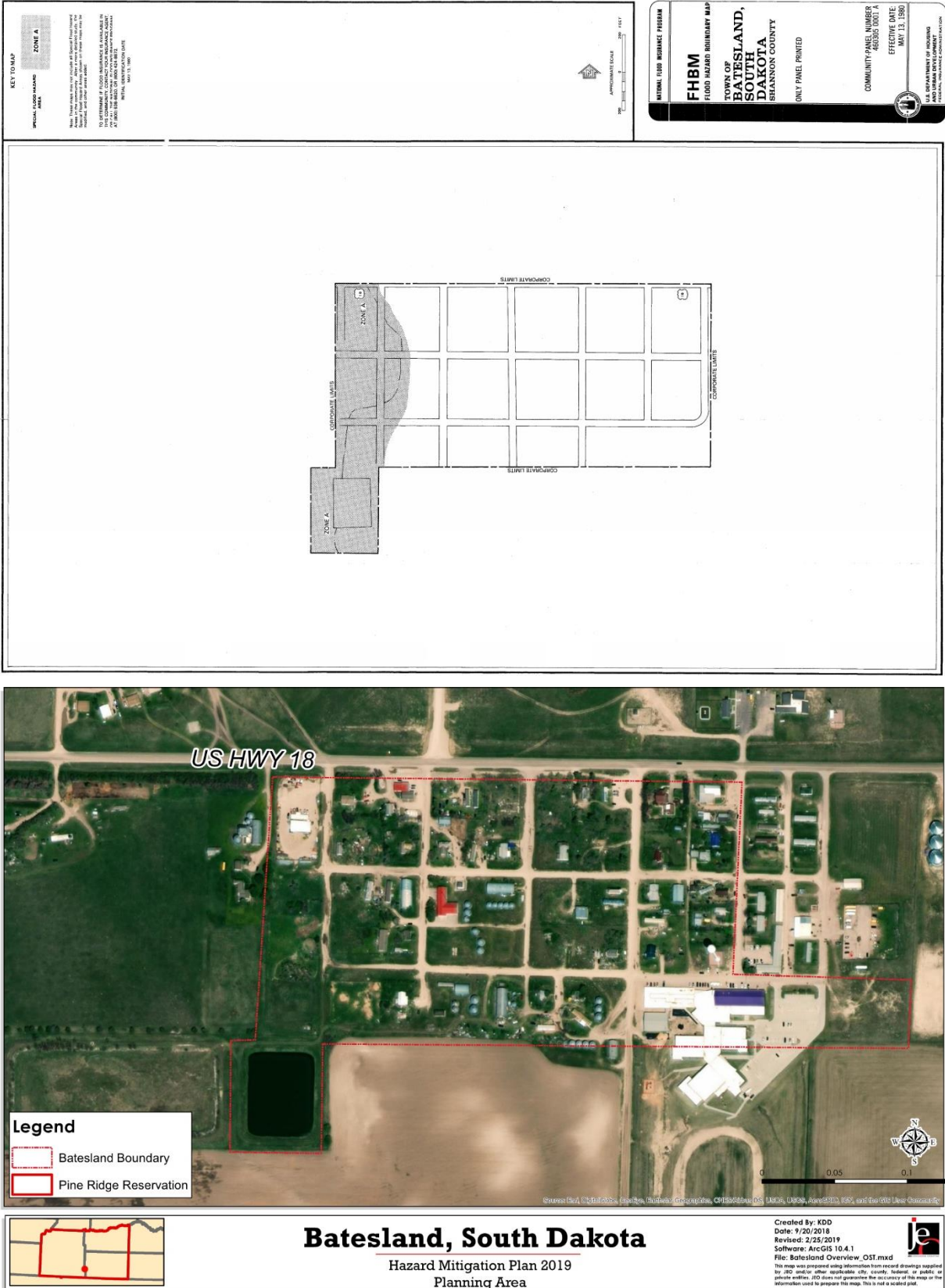


TABLE 67: FEMA FIRM PANEL STATUS

JURISDICTION	PANEL NUMBER	EFFECTIVE DATE
Oglala Lakota County	-	-
Batesland	4603050001A	5/13/1980

Source: FEMA, 2018⁶¹

EXTENT

The NWS has three categories to define the severity of a flood once a river reaches flood stage as indicated in Table 68.

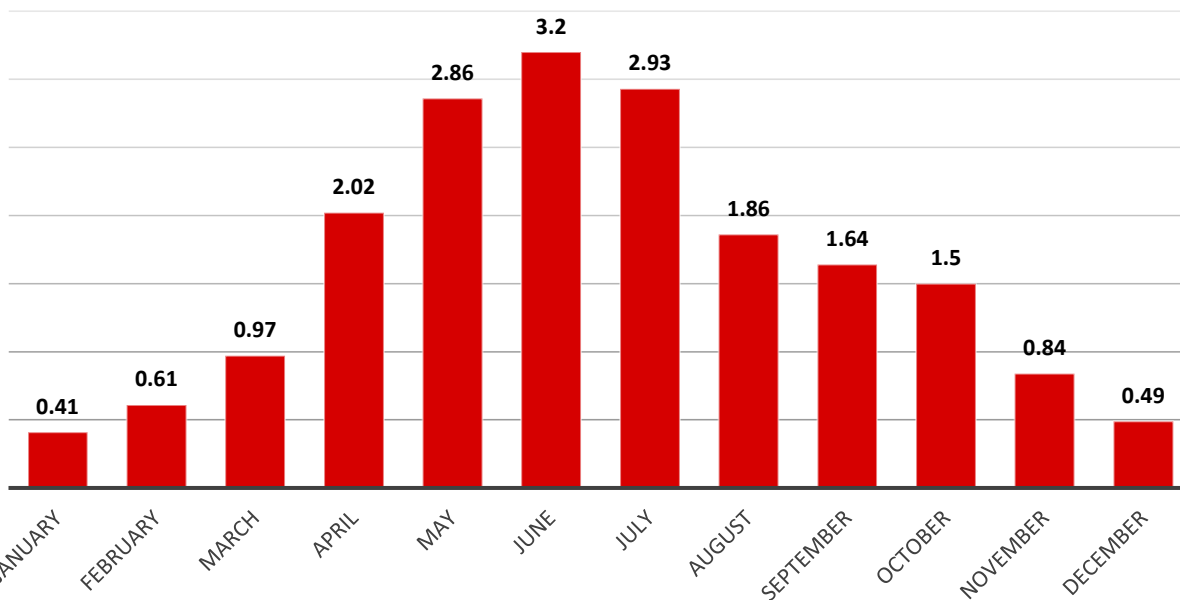
TABLE 68: FLOODING STAGES

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

Source: NOAA, 2017⁶²

Figure 36 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 37, the most common months for flooding within the planning area are May and June. While it is possible that major flood events will occur, the likely extent of flood events within the planning area is classified as moderate.

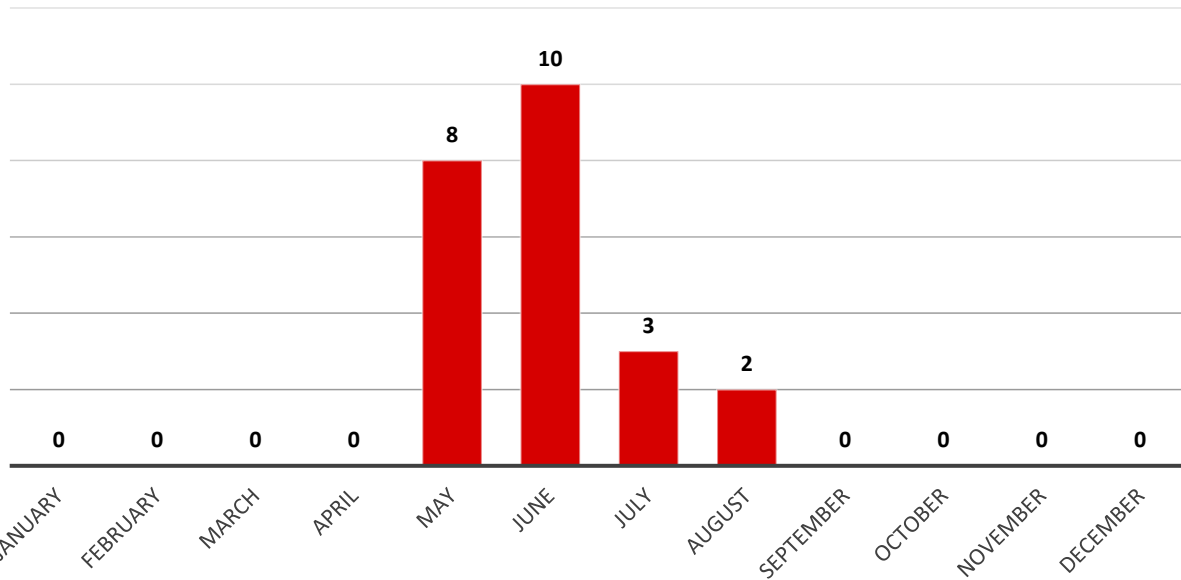
FIGURE 36: AVERAGE MONTHLY PRECIPITATION



Source: HPRCC, 2018

⁶¹ Federal Emergency Management Agency. 2018. "FEMA Flood Map Service Center." <http://msc.fema.gov/portal/advanceSearch>.

⁶² National Weather Service. 2017. "Flood Safety." <http://www.floodsafety.noaa.gov/index.shtml>.

FIGURE 37: MONTHLY EVENTS FOR FLOODS/FLASH FLOOD (1996-2017)

Source: NCEI, 1996-2017

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.

There are currently no participating communities within the planning area. This plan highly recommends and strongly encourages each community and the tribe to participate with the NFIP. 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).⁶³

NFIP REPETITIVE LOSS STRUCTURES

South Dakota Department of Public Safety was contacted to determine if any existing buildings, infrastructure, or critical facilities are classified as NFIP Repetitive Loss Structures. There are no state listed repetitive loss properties located in the planning area.

HISTORICAL OCCURRENCES

According to the NCEI, flash flooding resulted in \$4,000 in property damage, while riverine flooding caused \$20,000 in property damage. USDA RMA data does not distinguish the difference between riverine flooding damages and flash flooding damages. The total crop loss according to the RMA is \$47,146.

⁶³ Federal Emergency Management Agency. May 2017. "National Flood Insurance Program Community Rating System: Coordinator's Manual FIA-15/2017." Accessed August 2017. <https://www.fema.gov/media-library/assets/documents/8768>.

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 \$24,000 in property damages and \$47,146 in crop losses for the planning area.

TABLE 69: FLOOD LOSSES

COUNTY	NUMBER OF EVENTS ¹	NUMBER OF EVENTS PER YEAR	TOTAL PROPERTY LOSS ¹	AVERAGE ANNUAL PROPERTY LOSS ¹	TOTAL CROP LOSS ²	AVERAGE ANNUAL CROP LOSS ²
Oglala Lakota	14	0.7	\$22,000	\$1,000	\$0	\$0
Bennett	7	0.3	\$2,000	\$91	\$29,332	\$1,630
Jackson	2	0.1	\$0	\$0	\$17,814	\$990
TOTAL	23	1.1	\$24,000	\$1,091	\$47,146	\$2,619

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

TABLE 70: SEVERE THUNDERSTORM INJURIES AND DEATHS

COUNTY	INJURY/DEATH	DATE	HAZARD
Oglala Lakota	2 injuries	1998	Flash Flood

Source: NCEI, 1996- 2017

PROBABILITY

The NCEI reports 23 flooding/flash flooding events from January 1996 to December 2017. Based on the historic record and reported incidents by participating communities flooding will likely 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.

There are no building codes or floodplain regulations in place for the Pine Ridge Reservation or Oglala Lakota County. The local Planning Team indicated many residents live in areas near creeks and rivers which are prone to flooding. Additionally, many driveways and roads to residences are unpaved and are washed out during heavy rain or flood events.

The following table is a summary of regional vulnerabilities.

TABLE 71: REGIONAL FLOODING VULNERABILITIES

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

	-Residents in low-lying areas or along creeks and rivers are vulnerable during flash flood events -Residents living in the floodplain may need to evacuate for extended periods
ECONOMIC	-Business closures or damages may have significant impacts -Agricultural losses from flooded fields or lost livestock -Closed roads and railways would impact commercial transportation of goods
BUILT ENVIRONMENT INFRASTRUCTURE	-Buildings damages -Damages to roadways
CRITICAL FACILITIES	-Wastewater facilities are at risk, particularly those in flood risk areas -Critical facilities, especially those in the floodplain, are at risk to damage
CLIMATE CHANGE	-Increased risk of more severe and frequent flooding events

GRASS/WILDFIRE

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

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

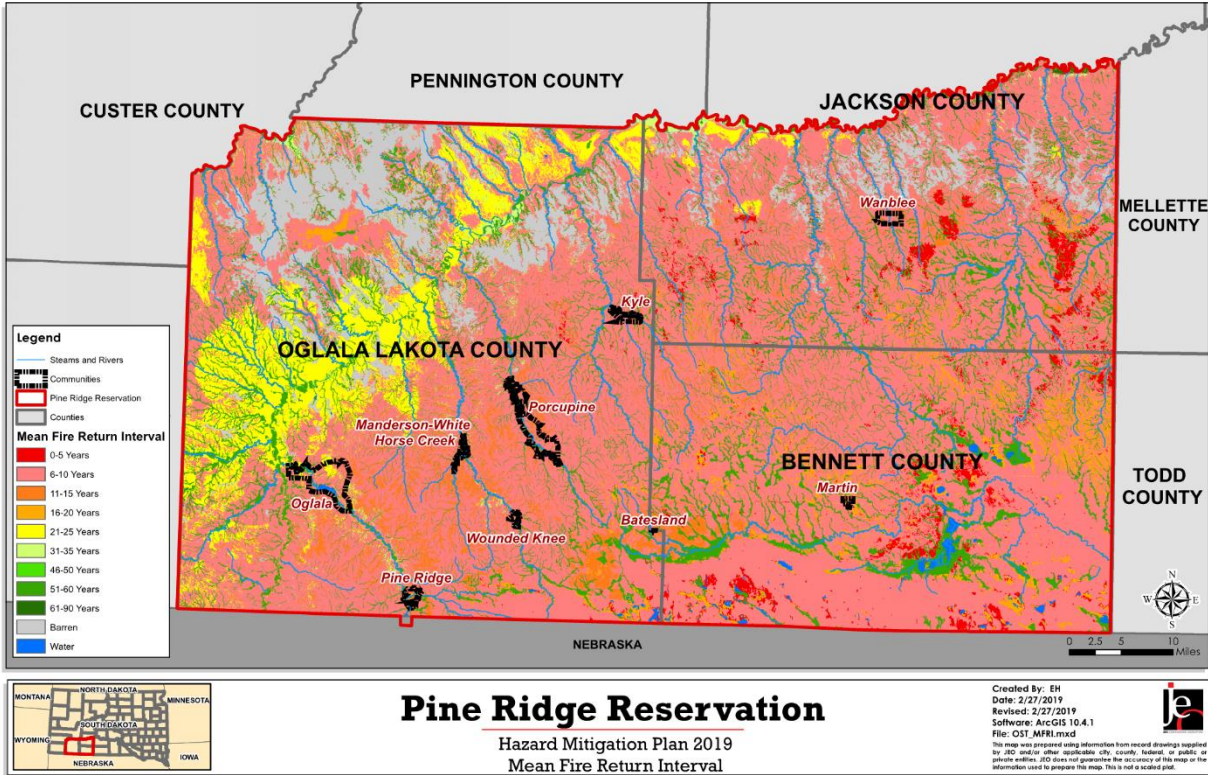
~National Park Service

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

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

Figure 38 shows the USGS' Mean Fire Return Interval. This model considers a variety of factors, including landscape, fire dynamics, fire spread, fire effects, and spatial context. The interval values show how often fires occur in each area under natural conditions. A majority of the planning area is in the 6 to 10-year mean fire return interval category, indicating that there is a significant risk of fire across the planning area and within the Pine Ridge Reservation. The communities of Martin and Wanblee are nearest to areas with a 0 to 5-year return interval.

FIGURE 38: MEAN FIRE RETURN INTERVAL



Source: USGS LANDFIRE Database⁶⁴

LOCATION

Wildfire counts from the USGS LANDFIRE Database for the Pine Ridge Reservation are reported by county in Table 72. As the number of reported wildfires by county indicates, the greatest threat of wildfire is in Oglala Lakota County. Most fires occur around populated areas and transportation routes (Figure 39) and burn less than 100 acres.

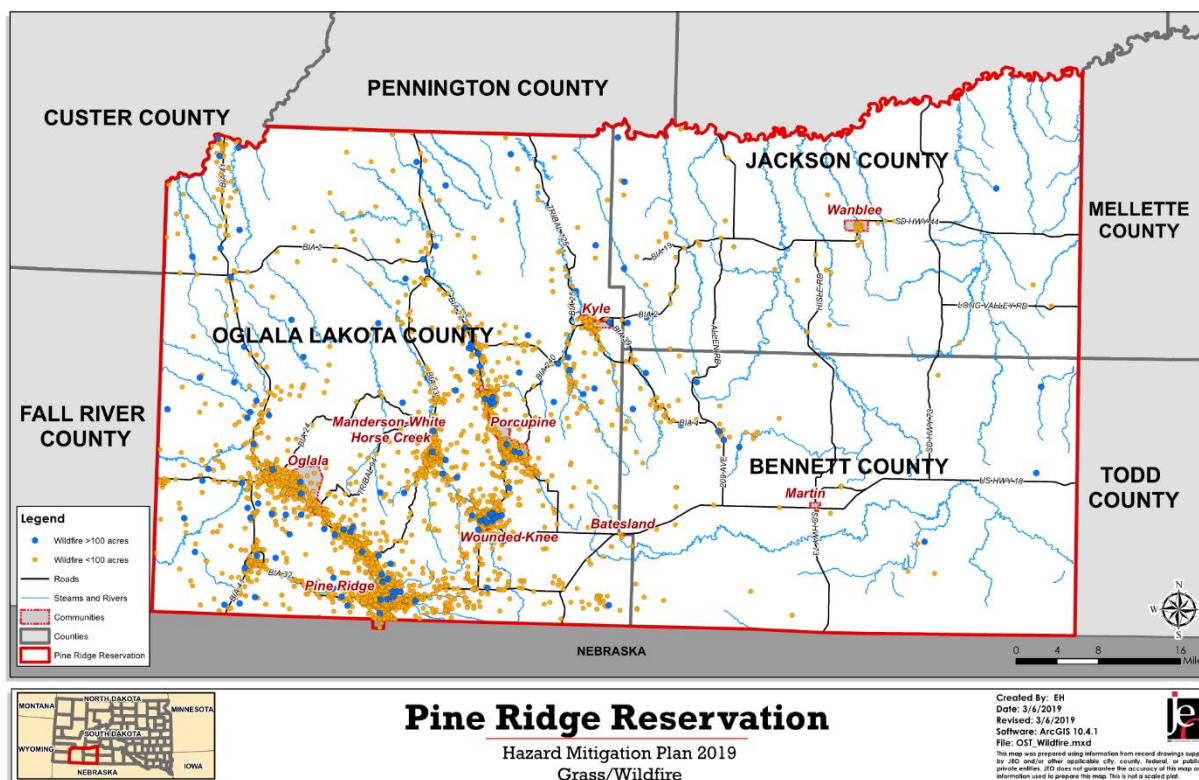
TABLE 72: REPORTED WILDFIRES BY COUNTY (WITHIN THE PLANNING AREA)

COUNTY	REPORTED WILDFIRES	ACRES BURNED
OGLALA LAKOTA	4,267	140,293
BENNETT	87	9,692
JACKSON	69	3,597
TOTAL	4,423	153,582

Source: USGS LANDFIRE Database, 1980-2016

⁶⁴ United States Geological Survey. 2017. "Landfire Data Distribution Site." <https://landfire.cr.usgs.gov/viewer/viewer.html>.

FIGURE 39: REPORTED WILDFIRES



Source: USGS LANDFIRE Database

EXTENT

Table 73 illustrates the number of wildfires by size in the planning area from 1980 to 2016. The planning area experienced 4,423 wildfires in a 37-year period which burned 153,582 acres in total. The majority of fires burned less than 0.2 acres. One hundred forty-four of the fires burned 100 acres or more, with the largest wildfire reportedly burning 22,454 acres near the community of Pine Ridge between July 7th and July 17th, 2007.

TABLE 73: REPORTED WILDFIRES BY SIZE

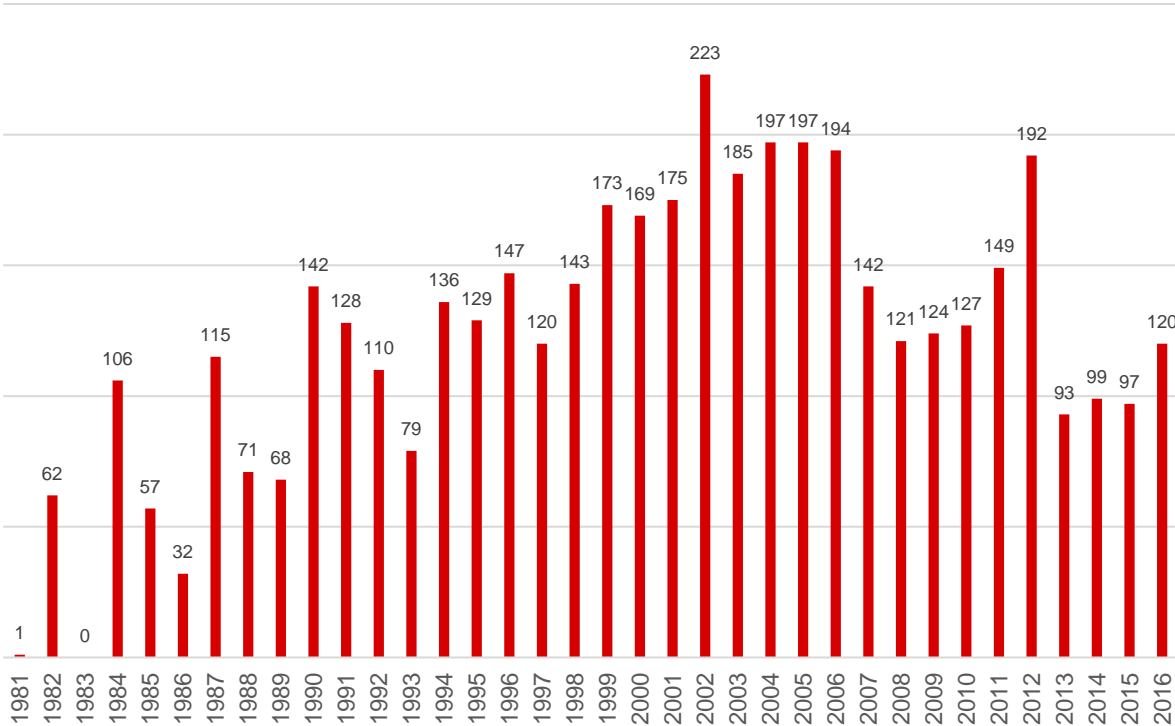
SIZE CATEGORY (ACRES)	REPORTED WILDFIRES	TOTAL ACRES BURNED
0.0 – 0.2	2,417	259
0.3 – 9.9	1,552	2,661
10.0 – 99.9	310	9,283
100.0 – 299.9	79	12,674
300.0 – 999.9	40	20,523
1000.0 – 4,999.9	18	31,351
5,000.0 +	7	76,831
TOTAL	4,423	153,582

Source: USGS LANDFIRE Database, 1980-2016

HISTORICAL OCCURRENCES

There were 4,423 reported wildfires in the planning area over a 37-year period. Most fires occurred in 2002, 2004, and 2005. Grass/wildfire in the planning area has become more frequent since the 1980s, but frequency decreased between 2006 to 2008 and 2012 to 2013 (Figure 40).

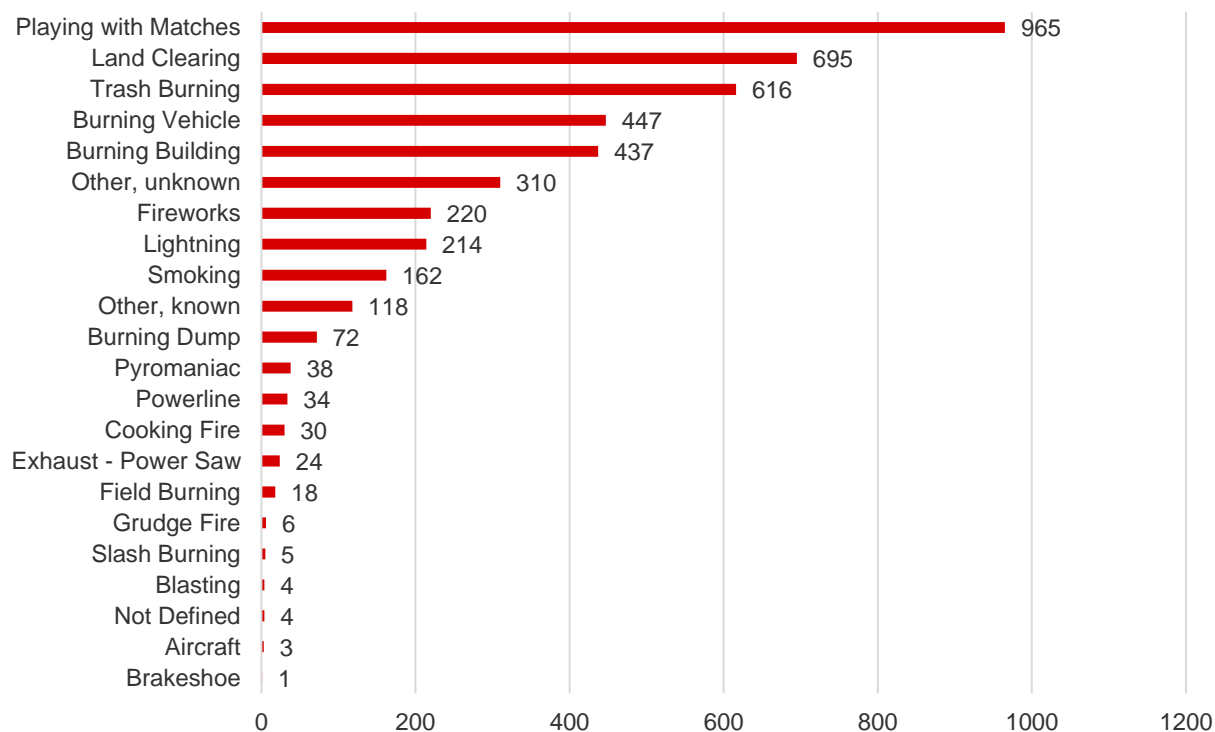
FIGURE 40: NUMBER OF WILDFIRES BY YEAR FOR THE PLANNING AREA



Source: USGS LANDFIRE Database, 1980-2016

Figure 41 shows wildfires by cause. Less than one percent of the recorded wildfires started from natural causes (i.e. lightning), but they burned 33% of the total affected acreage. Wildfires are most likely to be started by people playing with matches (22%, 9,691 acres), followed by clearing land (16%, 7,052 acres). The largest fire on record burned 22,454 acres in 2007 and was caused by fireworks.

FIGURE 41: WILDFIRES BY CAUSE FOR THE PLANNING AREA



Source: USGS LANDFIRE Database, 1980-2016

AVERAGE ANNUAL DAMAGES

The average damage per event estimate was determined based reports from the USDA’s Risk Management Agency from 2000 to 2017. This only includes reported agricultural losses – property damage from grass and wildfire has not been reported in any publicly available datasets so total damages are likely much higher than reported here. These damage estimates do not include losses from displacement, functional downtime, economic loss, injury, or loss of life. During the 37-year period, wildfires burned 153,582 acres and caused \$6,089 in crop damage in the planning area.

TABLE 74: WILDFIRE LOSSES

HAZARD TYPE	NUMBER OF EVENTS ¹	AVERAGE EVENTS PER YEAR ¹	TOTAL ACRES BURNED ¹	AVERAGE ACRES PER FIRE ¹	TOTAL CROP LOSS ²
GRASS/WILDFIRES	4,423	120	153,582	35	\$6,089

¹ Indicates data is from USGS LANDFIRE Database (1980 to 2016); ² Indicates data is from USDA RMA (2000 to 2017)

PROBABILITY

Probability of grass/wildfire occurrence is based on the historic record provided by the USGS LANDFIRE database and input from the planning team. Based on the historic record of 4,423 fires in 37 years, there is a 100 percent annual probability of wildfires occurring in the planning area each year.

REGIONAL VULNERABILITIES

The local planning team indicated grass/wildfire is a top concern for the Oglala Sioux Tribe and Oglala Lakota County due to its impact on agriculture, one of the largest economic sectors for the planning area. Grass/wildfire causes damage to acreages used for grazing and hay production, and can destroy rancher’s fence lines, which reduces the overall number of cattle that can be supported per acre. There is a need for additional firefighting equipment for local volunteer fire departments in the planning area, with specific

concerns regarding fire suppression resources during periods of drought. Water supplies to combat grass/wildfires come from fire hydrants or tanker trucks, with dam and lake water available as a last resort. A new fire department is currently in development, but the location has not yet been determined.

The planning team indicated there are verbal mutual aid agreements in place between volunteer fire departments across the planning area and Martin Fire Department has a contract with the BIA to provide assistance in the case of wildfire events. The BIA fire department can respond to grass/wildfire events, but not structural fires. The BIA conducts fuel management projects such as prescribed burns to help mitigate grass/wildfire potential.

Warning sirens are located in Oglala, Pine Ridge, Wounded Knee, Kyle, Wanblee, Alan, and Manderson which can notify residents of hazardous events including grass/wildfire. Reverse 911 is being implemented in early 2019 and will provide notifications to residents who sign up for the program via cellphones. The local planning team indicated door-to-door notifications may be used dependent on personnel and advanced warning.

The following table provides information related to regional vulnerabilities.

TABLE 75: REGIONAL WILDFIRE VULNERABILITIES

SECTOR	VULNERABILITY
PEOPLE	<ul style="list-style-type: none"> -Risk of injury or death -Displacement of people and loss of homes -Lack of transportation poses risk to low income individuals, families, and elderly
ECONOMIC	<ul style="list-style-type: none"> -Loss of grazing land and feed supply for cattle -Loss of businesses
BUILT ENVIRONMENT	<ul style="list-style-type: none"> -Property damages -Bomb explosions caused by extreme heat conditions on the bombing range
INFRASTRUCTURE	<ul style="list-style-type: none"> -Transportation routes may be closed -Damage to power lines
CRITICAL FACILITIES	<ul style="list-style-type: none"> -Risk of damages
CLIMATE CHANGE	<ul style="list-style-type: none"> -Rising temperatures and changes to precipitation patterns increase wildfire frequency and intensity -Firefighting resources may strain water availability and quality

HAIL

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

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

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

LOCATION

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

EXTENT

The Tornado and Storm Research Organization (TORRO) scale is used to classify hailstones and provides some detail related to the potential impacts from hail. Table 76 outlines the TORRO Hail Scale.

TABLE 76: TORRO HAIL SCALE

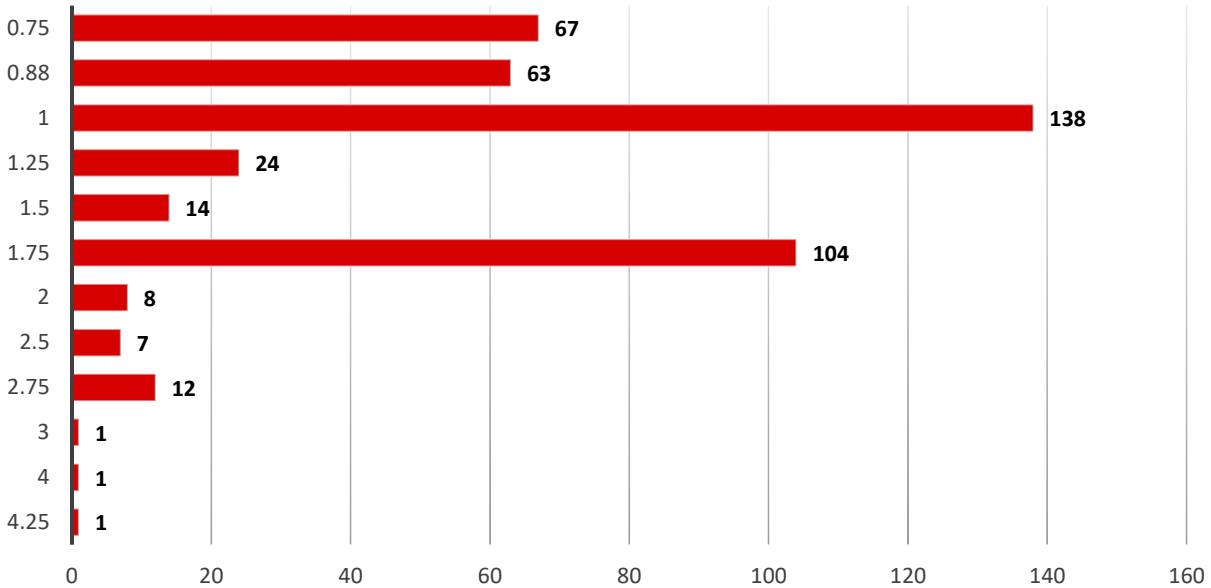
CLASS	TYPE OF MATERIAL	DIVISIONS
H0: Hard Hail	5 mm; (Pea size); 0.2 in	No damage
H1: Potentially Damaging	5 -15 mm (Marble); 0.2 – 0.6 in	Slight general damage to plants and crops
H2: Significant	10 -20 mm (Grape); 0.4 – 0.8 in.	Significant damage to fruit, crops, and vegetation
H3: Severe	20 -30 mm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

Source: TORRO, 2017⁶⁵

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

Of the 440 hail events reported for the planning area, the average hailstone size was 1.26 inches. Events of this magnitude correlate to an H4 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 occurrence, to expect larger hailstones to occur in the planning area annually. The planning area has endured one H10 hail events (>4.0 inches) during the period of record. Figure 42 shows hail events based on the size of the hail.

FIGURE 42: HAIL EVENTS BY MAGNITUDE



Source: NCEI, 1996-2017

HISTORICAL OCCURRENCES

The NCEI reports events as they occur in each community. A single hail event can affect multiple communities and counties at a time; the NCEI reports these large scale, multi-county events as separate events. The result is a single hail event covering a large portion of the planning area could be reported by the NCEI as several events. The NCEI reports a total of 440 hail events in the planning area between January 1996 and December 2017. These events were responsible for \$1,981,000 in property damages and \$14,190,786 in crop damages. These events resulted in no injuries or fatalities.

FIGURE 43: JULY 2018 HAIL DAMAGE TO OST VEHICLE



In July of 2018, severe storms included heavy rain, winds up to 80 mph, and baseball- to softball-sized hail which damaged about 300 homes and more than 100 vehicles. Some injuries were reported, but luckily there were no fatalities associated with these storms. Recovery efforts since these storms have included the cooperation of multiple agencies and non-profits across the reservation.

AVERAGE ANNUAL DAMAGES

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

TABLE 77: HAIL LOSSES

COUNTY	NUMBER OF EVENTS	EVENTS PER YEAR	TOTAL PROPERTY LOSS ¹	AVERAGE ANNUAL PROPERTY LOSS ¹	TOTAL CROP LOSS ²	AVERAGE ANNUAL CROP LOSS ²
OGLALA LAKOTA	228	10.9	\$591,000	\$26,864	\$2,973,433	\$165,191
BENNETT	149	7.1	\$1,287,000	\$58,500	\$5,711,551	\$317,308
JACKSON	63	3.0	\$103,000	\$4,682	\$5,505,802	\$305,878
TOTAL	440	21	\$1,981,000	\$90,045	\$14,190,786	\$788,377

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

PROBABILITY

Based on historic records and reported events, severe thunderstorms with hail are likely to occur several times annually within the planning area. The NCEI reported 440 hail events between 1996 and 2017, or approximately 20 hail occurrences per year.

REGIONAL VULNERABILITIES

The following table provides information related to regional vulnerabilities.

TABLE 78: REGIONAL HAIL VULNERABILITIES

SECTOR	VULNERABILITY
PEOPLE	-Injuries can occur from: not seeking shelter, standing near windows, and shattered windshields in vehicles
ECONOMIC	-Damages to buildings and property can cause significant losses to business owners
BUILT ENVIRONMENT	-Roofs, siding, windows, gutters, HVAC systems, etc. can incur damage
INFRASTRUCTURE	-Power lines and utilities can be damaged
CRITICAL FACILITIES	-Property damages and power outages
CLIMATE CHANGE	-More frequent and severe weather events may include hail events
OTHER	-High winds, lightning, heavy rain, and possibly tornadoes can occur with this hazard

HAZARDOUS MATERIALS INCIDENTS

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

Chemicals are found everywhere. They purify drinking water, increase crop production and simplify household chores. But chemicals also can be hazardous to humans or the environment if used or released improperly. Hazards can occur during production, storage, transportation, use or disposal. You and your community are at risk if a chemical is used unsafely or released in harmful amounts into the environment where you live, work or play.⁶⁶

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

Hazardous materials come in the form of explosives, flammable and combustible substances, poisons, and radioactive materials. Hazardous materials incidents are technological (meaning non-natural hazards created or influenced by humans) events that involve large-scale releases of chemical, biological or radiological materials. Hazardous materials incidents generally involve releases at fixed-site facilities that manufacture, store, process or otherwise handle hazardous materials or along transportation routes such as major highways, railways, navigable waterways and pipelines. Typical sources of hazardous materials are chemical manufacturers, service stations, hospitals, and hazardous materials waste sites. Varying quantities of hazardous materials are manufactured, used, or stored in an estimated 4.5 million facilities in the United States—from major industrial plants to local dry-cleaning establishments or gardening supply stores. According to the Pipeline and Hazardous Materials Safety Administration (PHMSA), hazardous materials transportation in the U.S. now exceeds 1,000,000 shipments per day.⁶⁷

The Environmental Protection Agency (EPA) requires the submission of the types and locations of hazardous chemicals being stored at any facility within the state over the previous calendar year. This is completed by submitting a Tier II form to the EPA as a requirement of the Emergency Planning and Community Right-to-Know Act of 1986.⁶⁸ The EPA and DOT supervise hazardous material transportation; they regulate who is able to transport, track transportation, provide guidelines for spill response, and mandate consistent labeling of containers.⁶⁹ Table 79 demonstrates the nine classes of hazardous material according to the 2016 Emergency Response Guidebook.

Multiple departments including fire departments, state Department of Transportation, Environmental and Natural Resources, Emergency Management, and local law enforcement are involved in resolving hazardous material incidents. The State of South Dakota has a Duty Officer Program for spills to assist and provide additional resources.

⁶⁶ Federal Emergency Management Agency. 2017. "Hazardous Materials Incidents." <https://www.ready.gov/hazardous-materials-incidents>.

⁶⁷ U.S. Department of Transportation. 2018. "2012 Economic Census: Transportation." <https://www.census.gov/econ/cfs/2012/ec12tcf-us-hm.pdf>.

⁶⁸ Emergency Planning and Community Right-to-Know Act of 1986, Pub. L. No. 116 § 10904. (1986).

⁶⁹ Standards Applicable to Transporters of Hazardous Waste. 40 CFR §263. 1980.

TABLE 79: HAZARDOUS MATERIAL CLASSES

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

Source: *Emergency Response Guidebook, 2016*⁷⁰

LOCATION

There are 28 locations across the planning area that house hazardous materials, according to the Tier II reports submitted to the South Dakota Department of Environment and Natural Resources (SDDENR) in 2018. A listing of chemical storage sites can be found in Table 80: Chemical Tank Locations.

Chemical releases can occur during transportation, primarily on major transportation routes as identified in Figure 44. A large number of spills also occur during the loading and unloading of chemicals. Primary transportation routes of concern include Highway 18 and BIA roads. OST specifically reported transportation along railroads as having the potential to impact communities. There are no railroads located within the planning region. Additionally, according to the National Pipeline mapping System, there are no gas transmission or hazardous liquid pipelines located within the planning area.⁷¹

⁷⁰ U.S. Department of Transportation Pipeline and Hazardous Materials Safety Administration. 2016. "2016 Emergency Response Guidebook." <https://www.phmsa.dot.gov/hazmat/outreach-training/erg>.

⁷¹ National Pipeline Mapping System. 2018. "Public Map Viewer." <https://www.npms.phmsa.dot.gov/>

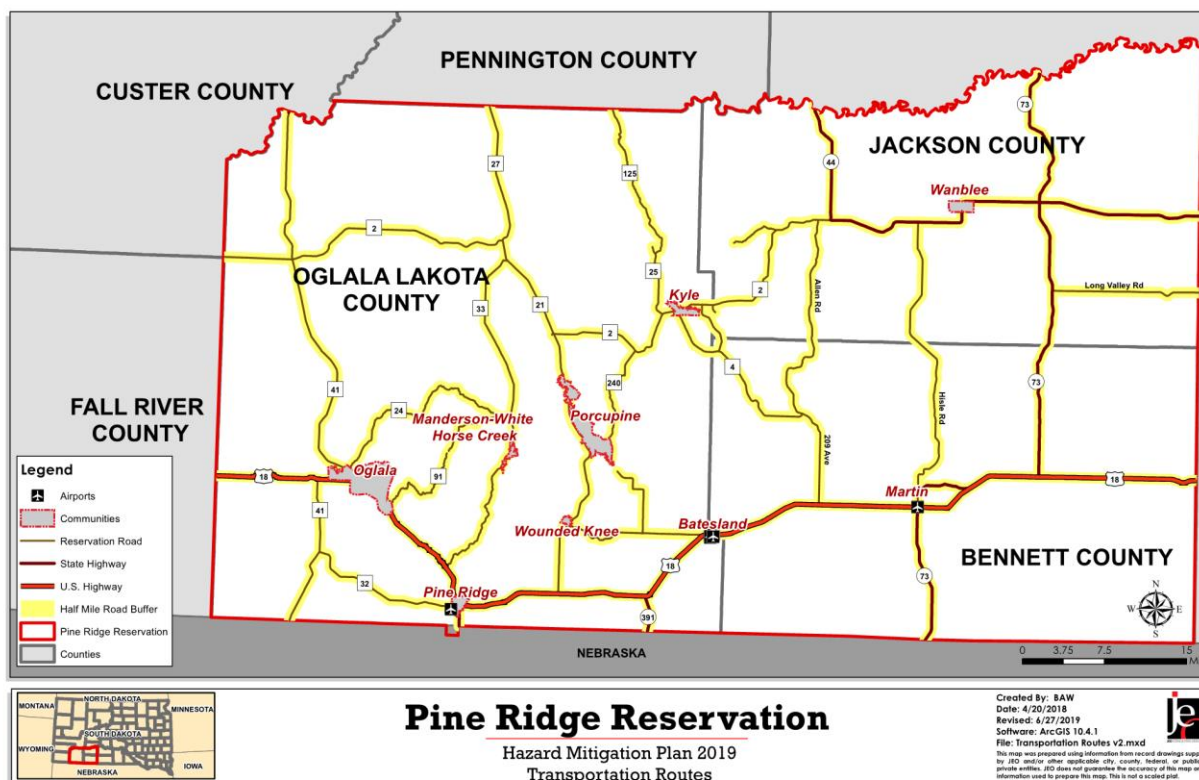
TABLE 80: CHEMICAL TANK LOCATIONS

FACILITY NAME	LOCATION	TYPE	OWNER
BIA Road Shop	Kyle	Above Ground Storage Tank	BIA
BIA	Kyle	Above Ground Storage Tank	BIA
BIA (roads)	Pine Ridge	Above Ground Storage Tank	BIA
Batesland Highway Yard	Batesland	Above Ground Storage Tank	Oglala Lakota County
Batesland COOP	Batesland	Above Ground Storage Tank	Bennett County Co-Op Assn.
Batesland Bus Garage	Batesland	Above Ground Storage Tank	Oglala Lakota County School District 65-1
Lynn's Dakotamart	Martin	Underground Storage Tank	Lynn's Dakotamart
Bennett County Hwy Dept	Martin	Above Ground Storage Tank	Bennett County Hwy Dept.
Fresh Start #29	Martin	Above Ground Storage Tank	Fresh Start Convenience Stores
Mueller's Feed Mill, Inc.	Martin	Above Ground Storage Tank	Mueller's Feed Mill, Inc.
Fresh Start	Martin	Underground Storage Tank	Fresh Start Convenience Stores
SD Dept. of Transportation	Martin	Underground Storage Tank	SD Dept. of Transportation
K J's Pit Stop	Martin	Underground Storage Tank	Kyle Turnwall
Farmers Spraying Service	Martin	Above Ground Storage Tank	Valburg Aerial Spraying
Marty Vanderploeg	Martin	Above Ground Storage Tank	Marty Vanderploeg
Loneman School	Oglala	Above Ground Storage Tank	Loneman School
Angel's	Kyle	Underground Storage Tank	Monna L. Patton
Porcupine Trading Post	Porcupine	Underground Storage Tank	Paul Iron Cloud
Red Cloud Indian School Inc.	Pine Ridge	Underground Storage Tank	Red Cloud Indian School Inc.
Pine Ridge Oil Co Inc	Pine Ridge	Underground Storage Tank	Pine Ridge Oil Co Inc.
Twiss Country Store	Porcupine	Underground Storage Tank	Harold & Sandra Koenig
Yellow Birds	Pine Ridge	Underground Storage Tank	Darrel J. Steele
Big Bat's Conoco	Pine Ridge	Underground Storage Tank	Muddy Creek Oil & Gas Inc.
Richard A Keiff's/Kyle Grocery	Kyle	Underground Storage Tank	Richard A Keiffs
Reddy Mart	Pine Ridge	Underground Storage Tank	Steve Reddy
Our Lady of Lourdes	Porcupine	Underground Storage Tank	Holy Rosary Mission
Cubby's C-Store	Oglala	Underground Storage Tank	Cubby's C-Store
Wanblee Mart	Wanblee	Underground Storage Tank	Wanblee Mart

Source: South Dakota Department of Environment and Natural Resources, 2018⁷²

⁷² South Dakota Department of Environment and Natural Resources. June 2018. "Tanks Database Viewer."
<https://arcgis.sd.gov/server/denr/tanksdb/default.html>.

FIGURE 44: MAJOR TRANSPORTATION ROUTES WITH ½ MILE BUFFER



EXTENT

The extent of hazardous material spills varies and depends on the type of material that is released. Eight fixed site releases have occurred in the planning area, with the total amount spilled ranged from 0 gallons to 300 gallons of pollutant. Releases that have occurred during transportation in the planning area ranged from 15 to 147 liquid gallons (LGA). The planning team indicated that most material spills are small, but spilled fuel is the largest contributor and concern for the area. Many are from overfilled gasoline tanks. There have also been some incidents of septic tanks in low lying areas being flooded. Most semi-trailers passing through the reservation do not carry hazardous materials, however they are not required to report when they do. No hazardous material spills in the planning area have resulted in deaths or injuries. Based on historic records, it is likely that any spill involving hazardous materials will not affect an area larger than a quarter mile from the spill location.

HISTORICAL OCCURRENCES

According to the U.S. Coast Guard’s National Response Center database (NRC), there have been eight fixed site chemical spills from 1990 – 2018 in the planning area with \$700 in property damages reported for these spills. PHSMAs reports two hazardous material transportation incidents in the planning area. Past events include a 615-gallon fuel spill near Wanblee and another fuel spill from a plane crash north of Batesland. The following table displays the spills that have occurred throughout the planning area.

TABLE 81: HISTORICAL HAZARDOUS MATERIAL FIXED SITE SPILLS

YEAR OF EVENT	LOCATION OF RELEASE	QUANTITY SPILLED	MATERIAL INVOLVED	NUMBER OF INJURIES	PROPERTY DAMAGE
1993	Martin	300 gallons	Oil; diesel	0	\$0
2004	Martin	75 gallons	Oil; tar	0	\$700
2008	Allen	Unknown	Sewage	0	\$0
2012	Wanblee	Unknown	Sewage	0	\$0
2013	Pine Ridge	Unknown	Unknown	0	\$0
2015	Red Shirt	Unknown	Unknown	0	\$0
2017	Pine Ridge	Unknown	Tires (fire)	0	\$0
2017	Red Shirt	Unknown	Unknown	0	\$0

Source: National Response Center, 1990-2018

PHMSA reports that two chemical spills occurred during transportation in the planning area between 1980 and 2017. During these events, there were no injuries, no fatalities, no evacuations, and \$2,190 in damages. The following table provides a list of historical chemical spills during transportation in the planning area.

TABLE 82: HISTORICAL HAZARDOUS MATERIAL TRANSPORTATION SPILLS 1980-2017

DATE OF EVENT	LOCATION OF RELEASE	FAILURE DESCRIPTION	MATERIAL INVOLVED	METHOD OF TRANSPORTATION	AMOUNT IN GALLONS	TOTAL DAMAGE
6/15/1993	Pine Ridge	Overfill storage tank while unloading	Diesel Fuel	Highway	147	\$2,165
2/6/1997	Pine Ridge	Equipment malfunction	Unleaded Gasoline	Highway	15	\$25

Source: PHMSA, April 1980– December 2017⁷³

AVERAGE ANNUAL DAMAGES

Using data from Table 83: Hazardous Material Fixed Site Losses, average annual damages from hazardous material fixed site spills can be estimated.

TABLE 83: HAZARDOUS MATERIAL FIXED SITE LOSSES

COUNTY	NUMBER OF EVENTS	EVENTS PER YEAR	TOTAL DAMAGES	AVERAGE ANNUAL PROPERTY LOSS
OGLALA LAKOTA	4	0.1	\$0	\$0
BENNETT	3	0.1	\$700	\$24
JACKSON	1	0.1	\$0	\$0
TOTAL	8	0.3	\$700	\$24

Source: National Response Center, 1990-2018

The average damage per event estimate was determined based upon PHMSA's Incidents Reports since 1980 and the number of historical occurrences. This does not include losses from displacement, functional downtime, economic loss, injury, or loss of life. This hazard causes an average of \$58 per year in property damages.

⁷³ Pipeline and Hazardous Materials Safety Administration. 2017. "Office of Hazardous Materials Safety: Incident Reports Database Search." Accessed December 2017. <https://www.phmsa.dot.gov/hazmat/library/data-stats/incidents>.

TABLE 84: HAZARDOUS MATERIAL TRANSPORTATION LOSSES

COUNTY	NUMBER OF EVENTS	TOTAL DAMAGES	AVERAGE ANNUAL PROPERTY LOSS
OGLALA LAKOTA	2	\$2,190	\$58
BENNETT	0	\$0	\$0
JACKSON	0	\$0	\$0
TOTAL	2	\$2,190	\$58

Source: PHMSA, April 1980– December 2017⁷⁴

PROBABILITY

Given the historic record of occurrence (eight hazardous material fixed site spills reported in 29 years), the annual probability of occurrence for fixed site spills is 29 percent. The historical record indicates that hazardous material releases during transport have a five percent chance of occurring annually in the planning area, with two events over a 38-year period.

REGIONAL VULNERABILITIES

The following table provides information related to regional vulnerabilities.

TABLE 85: REGIONAL HAZARDOUS MATERIAL VULNERABILITIES

SECTOR	VULNERABILITY
PEOPLE	-Those in close proximity to spills could have minor to moderate health impacts -Possible evacuation -Hospitals, nursing homes, and the elderly at greater risk due to low mobility
ECONOMIC	-A long-term evacuation residents or businesses in affected areas would have a negative effect on the economy in the area -Evacuations and closed transportation routes could impact businesses near spill
BUILT ENVIRONMENT INFRASTRUCTURE	-Risk of fire or explosion -Transportation routes can be closed during evacuations
CRITICAL FACILITIES	-Critical facilities are at risk of evacuation -Critical facilities near major transportation corridors are at risk
CLIMATE CHANGE	-None

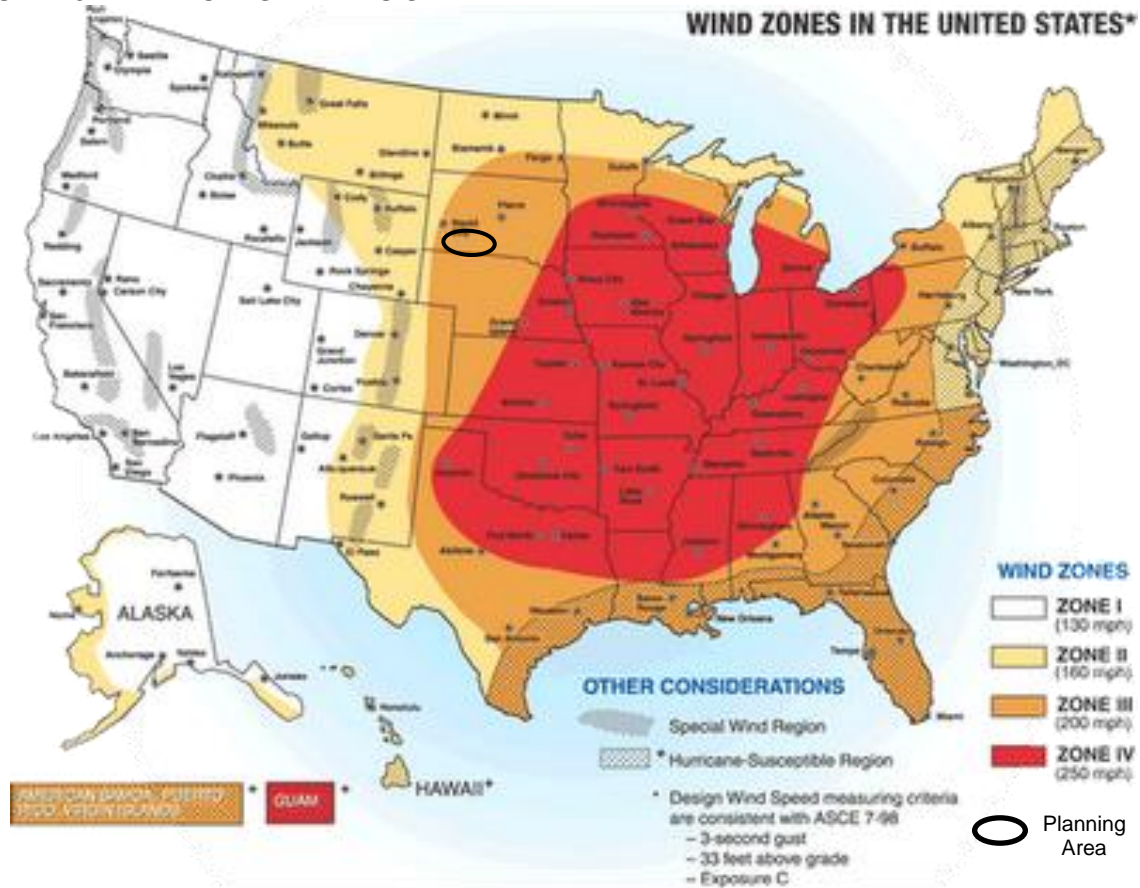
⁷⁴ Pipeline and Hazardous Materials Safety Administration. 2017. "Office of Hazardous Materials Safety: Incident Reports Database Search." Accessed December 2017. <https://www.phmsa.dot.gov/hazmat/library/data-stats/incidents>.

HIGH WINDS

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

The National Weather Service (NWS) defines high winds as sustained wind speeds of 40 mph or greater lasting for 1 hour or longer, or winds of 58 mph or greater for any duration.⁷⁵ 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 45 shows the wind zones in the United States. The wind zones are based on the maximum wind speeds that can occur from a tornado or hurricane event. The planning area is located in Zone III which has maximum winds of 200 mph equivalent to an EF4 tornado.

FIGURE 45: WIND ZONES IN THE U.S.



Source: FEMA, 2016

LOCATION

The planning area is prone to straight-line winds.

EXTENT

The Beaufort Wind Scale can be used to classify wind strength. Table 86 outlines the scale, provides wind speed ranking, range of wind speeds per ranking, and a brief description of conditions for each ranking.

⁷⁵ National Weather Service. 2017. "Glossary." <http://w1.weather.gov/glossary/index.php?letter=h>.

TABLE 86: BEAUFORT WIND RANKING

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

Source: Storm Prediction Center, 2017⁷⁶

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

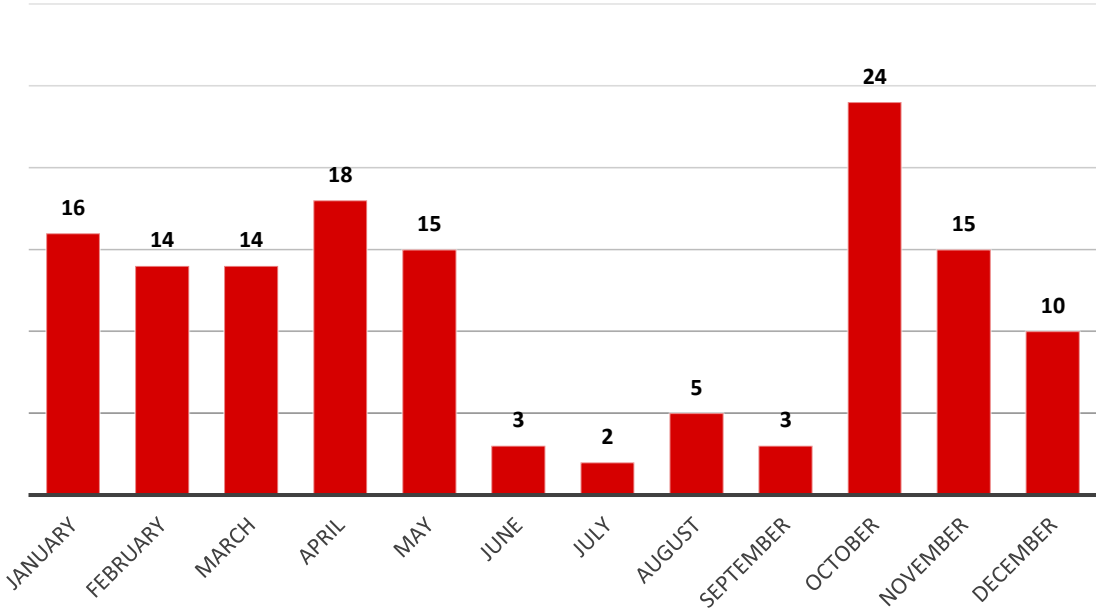
HISTORICAL OCCURRENCES

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

There were 139 high wind events that occurred between January 1996 and December 2017. As seen in Figure 46, most high wind events occur in the spring and winter months. There were no injuries related to any high wind events.

⁷⁶ Storm Prediction Center: National Oceanic and Atmospheric Administration. 1805. "Beaufort Wind Scale." Accessed August 2017. <http://www.spc.noaa.gov/faq/tornado/beaufort.html>.

FIGURE 46: HIGH WIND EVENTS BY MONTH



Source: NCEI, 1996-2017

AVERAGE ANNUAL DAMAGES

The average damage per event estimate was determined based upon NCEI Storm Events Database since 1996 and number of historical occurrences. This does not include losses from displacement, functional downtime, economic loss, injury, or loss of life. It is estimated that high wind events can cause an average of \$3,571 per year in property damage, and an average of \$106,076 per year in crop damage for the planning area. A current project across the reservation is working to anchor mobile homes or trailers to prevent damages. OST has anchored roughly 100 homes already, with 20 more on the list for 2018. OST Emergency Management indicated an additional 100 homes may be added for 2019 depending on funding availability. In 2018, 12 trailer homes were destroyed by high wind events.

TABLE 87: HIGH WIND LOSSES

COUNTY	NUMBER OF EVENTS	EVENTS PER YEAR	TOTAL PROPERTY LOSS ¹	AVERAGE ANNUAL PROPERTY LOSS	TOTAL CROP LOSS ²	AVERAGE ANNUAL CROP LOSS ²
OGLALA LAKOTA	48	2.3	\$0	\$0	\$506,239	\$28,124
BENNETT	35	1.7	\$25,000	\$1,136	\$870,197	\$48,344
JACKSON	56	2.7	\$50,000	\$2,273	\$426,850	\$23,714
TOTAL	139	6.7	\$75,000	\$3,409	\$1,803,286	\$100,183

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

PROBABILITY

Based on historical records and reported events, it is likely that high winds will occur within the planning area annually. For the 22 years examined, there were 139 reported high wind events reported.

REGIONAL VULNERABILITIES

The following table provides information related to regional vulnerabilities.

TABLE 88: REGIONAL HIGH WIND VULNERABILITIES

SECTOR	VULNERABILITY
PEOPLE	<ul style="list-style-type: none"> -Vulnerable populations include those living in mobile homes, especially if they are not anchored properly -People outdoors during events
ECONOMIC	<ul style="list-style-type: none"> -Agricultural losses -Damages to businesses and prolonged power outages can cause significant impacts to the local economy
BUILT ENVIRONMENT	<ul style="list-style-type: none"> -All building stock are at risk to damages from high winds
INFRASTRUCTURE	<ul style="list-style-type: none"> -Downed power lines and power outages -Downed trees blocking road access
CRITICAL FACILITIES	<ul style="list-style-type: none"> -All critical facilities are at risk to damages from high winds
CLIMATE CHANGE	<ul style="list-style-type: none"> -More frequent and severe weather events may include high winds

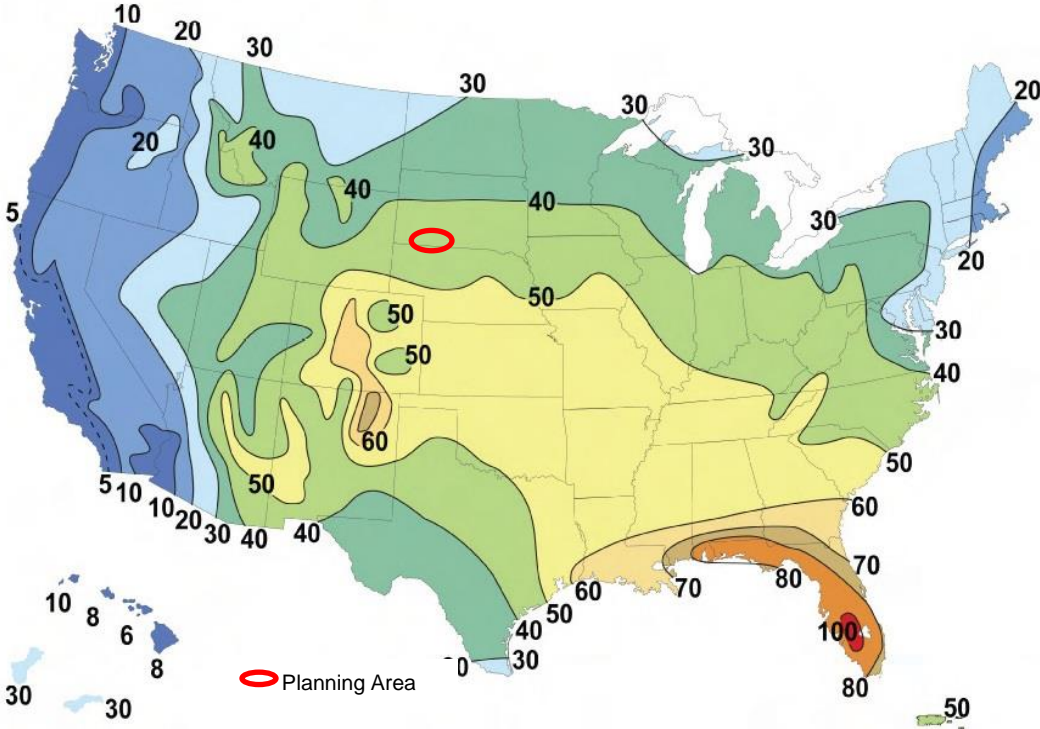
SEVERE THUNDERSTORMS

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

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

Economically, thunderstorms are generally beneficial in that they provide moisture necessary to support South Dakota’s largest industry, agriculture. The majority of thunderstorms do not cause damage, but when they escalate to severe storms, the potential for damages increases. Damages can include: crop losses from wind and hail; property losses due to building and automobile damages from hail; high wind; flash flooding; and death or injury to humans and animals from lightning, drowning, or getting struck by falling or flying debris. Figure 47 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 47: AVERAGE NUMBER OF THUNDERSTORMS



LOCATION

The entire planning area is at risk of severe thunderstorms.

⁷⁷ National Weather Service. 2017. "Introduction to Thunderstorms." http://www.srh.noaa.gov/jetstream/tstorms/tstorms_intro.html.

EXTENT

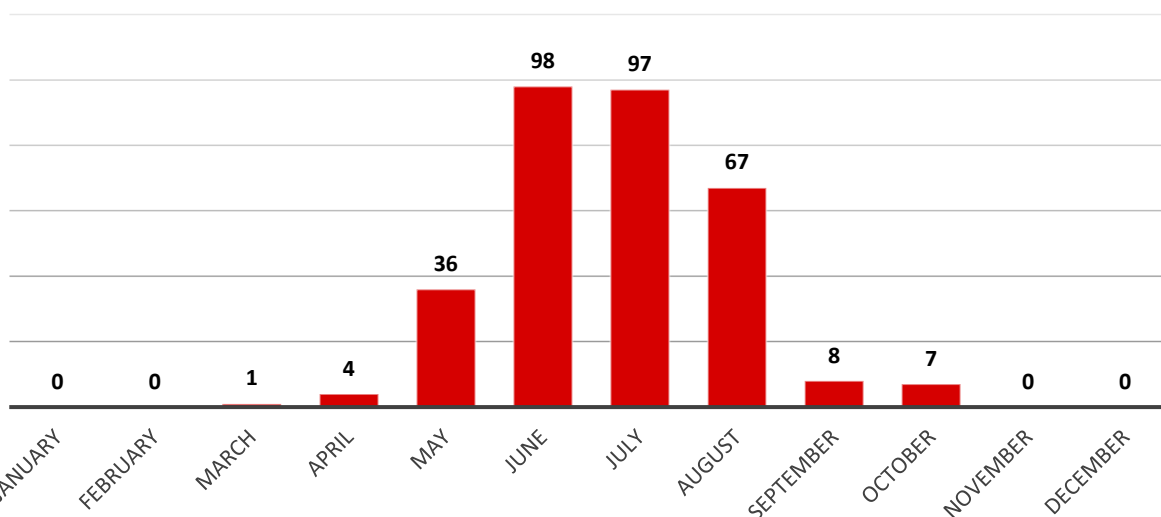
The geographic extent of a severe thunderstorm event may be large enough to impact the entire planning area (such as in the case of a squall line, derecho, or long-lived supercell) or just a few square miles, in the case of a single cell that marginally meets severe criteria.

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

HISTORICAL OCCURRENCES

Severe thunderstorms in the planning area usually occur in the afternoon and evening during the spring and summer months (Figure 48).

FIGURE 48: THUNDERSTORM WIND EVENTS BY MONTH



Source: NCEI, 1996-2017

The NCEI reports events as they occur in each community. A single severe thunderstorm event can affect multiple communities and counties at a time; the NCEI reports these large scale, multi-county events as separate events. The result is a single thunderstorm event covering the entire region could be reported by the NCEI as several events. The NCEI reports a total of 318 thunderstorm wind, three heavy rain, and one lightning event in the planning area from January 1996 to December 2017. Severe thunderstorm events were responsible for \$1,278,500 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 \$9,287,058 in crop damages. There were two deaths and 13 injuries reported in association with these storms.

In particular, a severe storm on August 14, 2017 damaged 65 homes with large hail, strong winds, and heavy rain which flooded some local roads. Another storm in May of 2018 which hit areas from Wounded Knee to Porcupine damaged several homes with large hail and strong wind gusts. July of 2018 produced several large severe thunderstorm events which damaged over 300 homes and 100 vehicles with baseball-to softball-sized hail, winds over 80 mph, and heavy rain. As of winter 2018 the tribe is still working to repair many of the homes that had been damaged by the July storms.

AVERAGE ANNUAL DAMAGES

The average damage per event estimate was determined based upon recorded damages from NCEI Storm Events Database since 1996 and number of historical occurrences. This does not include losses from displacement, functional downtime, economic loss, injury, or loss of life. Severe thunderstorms and lightning cause an average of \$58,114 per year in property damages.

TABLE 89: SEVERE THUNDERSTORMS LOSSES

COUNTY	HAZARD TYPE	NUMBER OF EVENTS ¹	EVENTS PER YEAR	TOTAL PROPERTY LOSS ¹	AVERAGE ANNUAL PROPERTY LOSS	TOTAL CROP LOSS ²	AVERAGE ANNUAL CROP LOSS
Oglala Lakota	Thunderstorm Wind	193	9.2	\$710,000	\$32,273	\$1,671,067	\$92,837
	Heavy Rain	1	0.05	\$0	\$0		
	Lightning	1	0.05	\$1,000	\$45		
Bennett	Thunderstorm Wind	84	4	\$125,000	\$5,682	\$4,052,803	\$225,156
	Heavy Rain	0	0	\$0	\$0		
	Lightning	0	0	\$0	\$0		
Jackson	Thunderstorm Wind	41	2	\$442,500	\$20,114	\$3,563,188	\$197,955
	Heavy Rain	2	0.1	\$0	\$0		
	Lightning	0	0	\$0	\$0		
TOTAL		322	15	\$1,278,500	\$58,114	\$9,287,058	\$515,948

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

TABLE 90: SEVERE THUNDERSTORM INJURIES AND DEATHS

COUNTY	INJURY/DEATH	DATE	HAZARD
Oglala Lakota	1 injury; 1 death	2001	Lightning
Jackson	2 injuries	2001	Thunderstorm Wind
Oglala Lakota	1 injury	2003	Thunderstorm Wind
Oglala Lakota	5 injuries; 1 death	2006	Thunderstorm Wind
Oglala Lakota	3 injuries	2012	Thunderstorm Wind
Bennett	1 injury	2013	Thunderstorm Wind

Source: NCEI, 1996- 2017

PROBABILITY

Based on historical records and reported events, severe thunderstorms are likely to occur on an annual basis. The NCEI reported 322 severe thunderstorm events between 1996 and 2017; resulting in a 100 percent chance annually for thunderstorms.

REGIONAL VULNERABILITIES

Local storm notifications is shared via local radio stations (KILI) and social media (Facebook). The Tribe and Oglala Lakota County are currently working to develop Reverse 911 protocols for easier public notification and localized notifications. The Planning Team noted that it is vital to use both radio and social media outlets in order to reach all residents of the Pine Ridge Reservation, as many elders solely use radio and many younger residents solely use social media.

A need for both additional sirens and shelter locations was identified by the Planning Team. Several communities across the reservation are expanding and spreading out, highlighting a need for additional sirens to cover populated areas including Wanblee, Allen, Kyle, Porcupine, Manderson, Oglala, and Pine Ridge. There are few structures that can be used by the general public as a storm shelter during hazard events. Most homes across the reservation are not built to withstand severe weather events. The hospital, police stations, and schools may serve as shelter locations, however Red Shirt Table School is the only tornado rated safe room in the planning area.

The following table provides information related to regional vulnerabilities.

TABLE 91: REGIONAL THUNDERSTORM VULNERABILITIES

SECTOR	VULNERABILITY
PEOPLE	<ul style="list-style-type: none"> -Elderly citizens are vulnerable as they are less mobile than other members of the community -Mobile home residents are risk of injury and damage to their property if the mobile home is not anchored properly -Residents in rural areas or on unpaved road may be cut off from emergency services
ECONOMIC	<ul style="list-style-type: none"> -Closed businesses from damage or closed roads are likely to lose revenue and loss of income to workers
BUILT ENVIRONMENT	<ul style="list-style-type: none"> -Buildings are at risk to hail damage -Downed trees and tree limbs
INFRASTRUCTURE	<ul style="list-style-type: none"> -High winds and lightning can cause power outages and down power lines -Roads may wash out from heavy rains and become blocked from downed tree limbs
CRITICAL FACILITIES	<ul style="list-style-type: none"> -Power outages are possible -Critical facilities may sustain damage from hail, lightning, and wind
CLIMATE CHANGE	<ul style="list-style-type: none"> -Climate change impacts may increase the frequency and intensity of severe thunderstorm events

SEVERE WINTER STORMS

Severe winter storms are an annual occurrence in South Dakota. 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 11.3°F). The average high temperatures for the months of January, February, and December are near 34.8°F.⁷⁸

FREEZING RAIN

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

BLIZZARDS

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

LOCATION

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

EXTENT

The Sperry-Piltz Ice Accumulation Index (SPIA) was developed by the NWS to predict the accumulation of ice and resulting damages. The SPIA assesses total precipitation, wind, and temperatures to predict the intensity of ice storms. Figure 49 shows the SPIA index.

⁷⁸ High Plains Regional Climate Center. 2018. "Monthly Climate Normals 1981-2010." <http://climod.unl.edu/>.

FIGURE 49: SPIA INDEX

ICE DAMAGE INDEX	*AVERAGE ICE AMOUNT (in inches) <i>Revised: Oct. 2011</i>	WIND (mph)	DAMAGE AND IMPACT DESCRIPTIONS
0	<0.25	<15	Minimal risk of damage to exposed utility systems; no alerts or advisories needed for crews, few outages.
1	0.10 – 0.25	15 – 25	Some isolated or localized utility interruptions are possible, typically lasting only a few hours. Roads and bridges may become slick and hazardous.
	0.25 – 0.50	>15	
2	0.10 – 0.25	25 – 35	Scattered utility interruptions expected, typically lasting 12 to 24 hours. Roads and travel conditions may be extremely hazardous due to ice accumulation.
	0.25 – 0.50	15 – 25	
	0.50 – 0.75	>15	
3	0.10 – 0.25	> – 35	Numerous utility interruptions with some damage to main feeder lines and equipment expected. Tree limb damage is excessive. Outages lasting 1 – 5 days.
	0.25 – 0.50	25 – 35	
	0.50 – 0.75	15 – 25	
	0.75 – 1.00	>15	
4	0.25 – 0.50	> – 35	Prolonged and widespread utility interruptions with extensive damage to main distribution feeder lines and some high voltage transmission lines/structures. Outages lasting 5 – 10 days.
	0.50 – 0.75	25 – 35	
	0.75 – 1.00	15 – 25	
	1.00 – 1.50	>15	
5	0.50 – 0.75	> – 35	Catastrophic damage to entire exposed utility systems, including both distribution and transmission networks. Outages could last several weeks in some areas. Shelters needed.
	0.75 – 1.00	> – 25	
	1.00 – 1.50	> – 15	
	> 1.50	Any	

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

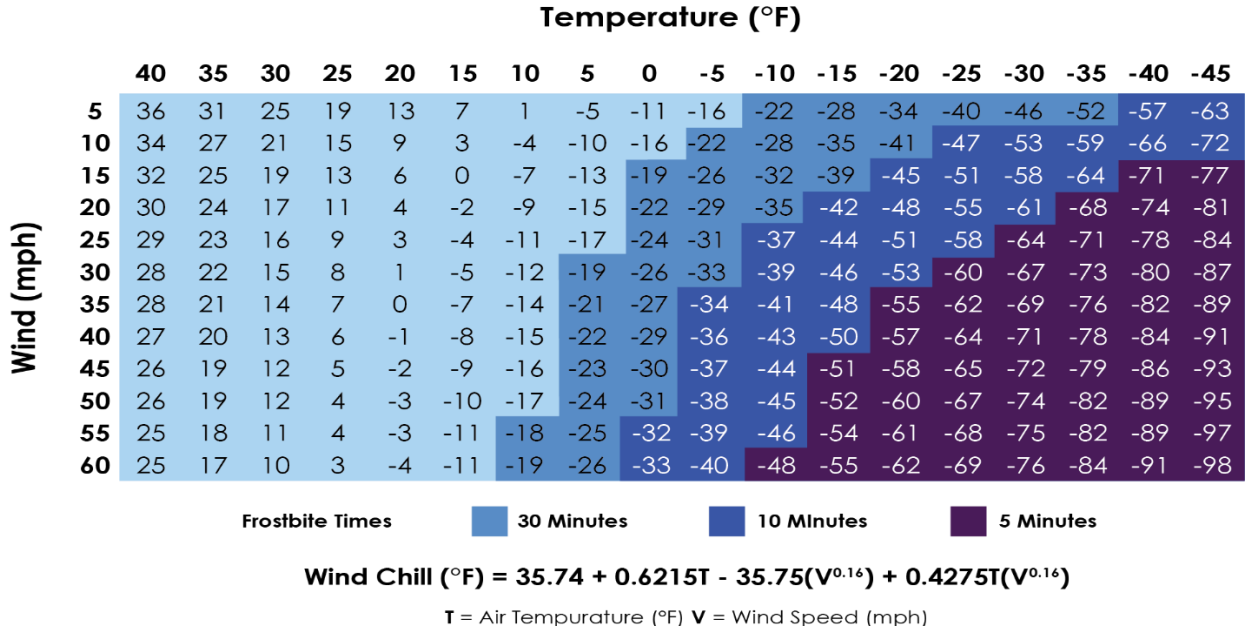
Source: SPIA-Index, 2017⁹

According to the NCEI, two ice storms were reported between January 1996 and December 2017. One of the storms in March of 2002 resulted in two deaths and one injury, as well as reported \$250,000 in damages. Both storms were located in Jackson County, however NCEI does not indicate specific communities for ice storms so it is unknown if these events impacted the Pine Ridge Reservation. Ice accumulation was not reported.

The Wind Chill Index was developed by the NWS to determine the decrease in air temperature felt by the body on exposed skin due to wind. The wind chill is always lower than the air temperature and can quicken the effects of hypothermia or frost bite as it gets lower. Figure 50 shows the Wind Chill Index used by the NWS.

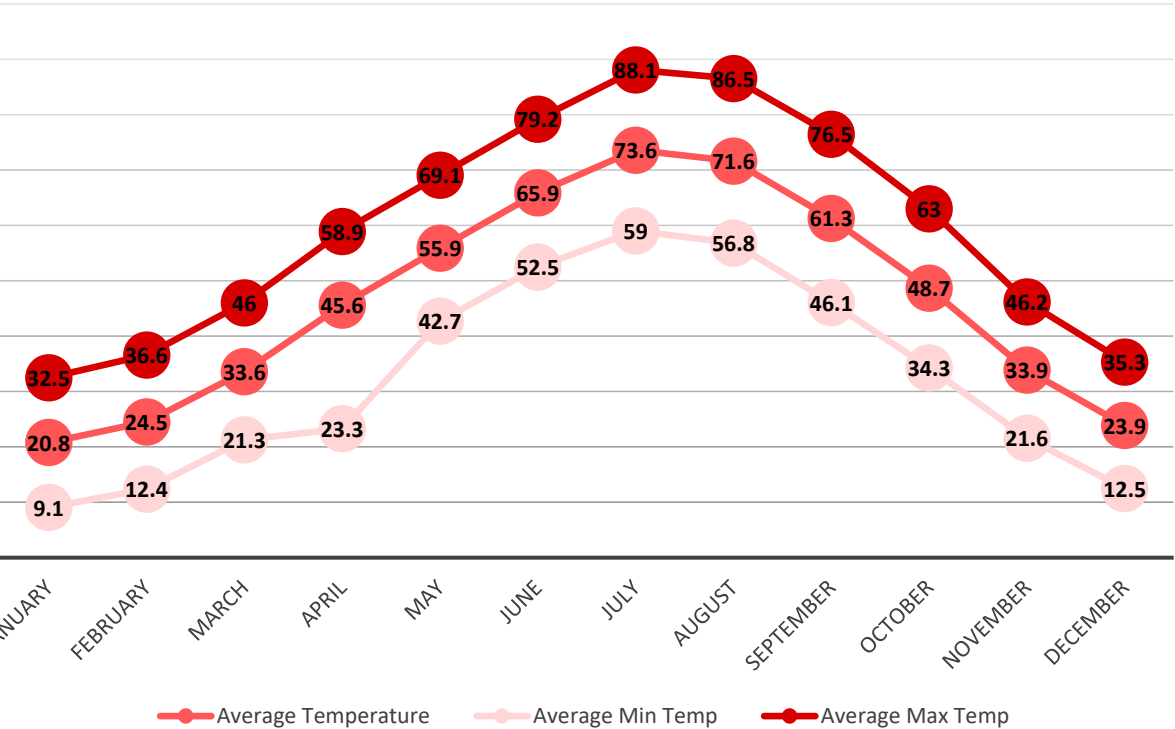
⁷⁹ SPIA-Index. 2009. "Sperry-Piltz Ice Accumulation Index." Accessed June 2017. <http://www.spia-index.com/index.php>.

FIGURE 50: WIND CHILL INDEX CHART



Source: NWS, 2017⁸⁰

FIGURE 51: MONTHLY NORMAL TEMPERATURE FOR PLANNING AREA



Source: NCEI, Jan 1895-March 2018

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

The coldest months of the year are December, January, and February and normal lows for these months average around 11°F as shown in Figure 51.

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 233 severe winter storm events for the planning area from January 1996 to December 2017. These recorded events caused a total of \$56,223,000 in property damages, two deaths, and one injury.

The NCEI recorded a total of 45 blizzard events, causing \$55,963,000 in property damages; two ice storm events, causing \$250,000 in property damages; 117 winter storm events with \$10,000 in property damages; and 26 heavy snow events, 38 winter weather events and five extreme cold/wind chill events each causing no damages.

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 \$2,555,591 per year in property damage for the planning area.

TABLE 92: SEVERE WINTER STORM LOSSES

COUNTY	HAZARD TYPE	NUMBER OF EVENTS ¹	EVENTS PER YEAR	TOTAL PROPERTY LOSS ¹	AVERAGE ANNUAL PROPERTY LOSS	TOTAL CROP LOSS ²	AVERAGE ANNUAL CROP LOSS
Oglala Lakota	Blizzard	13	0.6	\$1,100,000	\$50,000		
	Extreme Cold	1	0.05	\$0	\$0		
	Heavy Snow	10	0.5	\$0	\$0		
	Ice Storm	0	0	\$0	\$0	\$2,793,510	\$155,195
	Winter Storm	37	1.8	\$5,000	\$227		
	Winter Weather	17	0.8	\$0	\$0		
Bennett	Blizzard	14	0.7	\$51,025,000	\$2,319,318		
	Extreme Cold	2	0.1	\$0	\$0		
	Heavy Snow	9	0.4	\$0	\$0		
	Ice Storm	0	0	\$0	\$0	\$4,453,066	\$247,393
	Winter Storm	39	1.9	\$0	\$0		
	Winter Weather	11	0.5	\$0	\$0		
Jackson	Blizzard	18	0.9	\$3,838,000	\$174,455		
	Extreme Cold	2	0.1	\$0	\$0		
	Heavy Snow	7	0.3	\$0	\$0		
	Ice Storm	2	0.1	\$250,000	\$11,364	\$6,208,323	\$344,907
	Winter Storm	41	2.0	\$5,000	\$227		
	Winter Weather	10	0.5	\$0	\$0		
TOTAL		233	11.1	\$56,223,000	\$2,555,591	\$13,454,899	\$747,495

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

TABLE 93: SEVERE WINTER STORMS INJURIES AND DEATHS

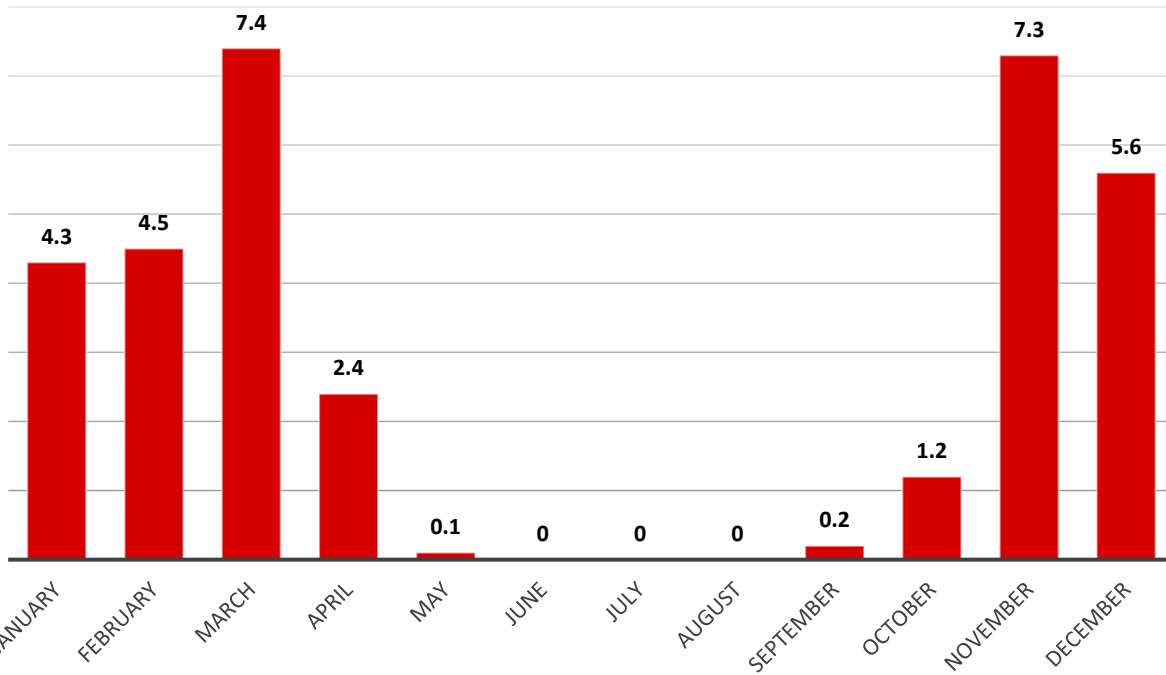
COUNTY	INJURY/DEATH	DATE	HAZARD
Jackson	2 deaths; 1 injury	2002	Ice Storm

Source: NCEI, 1996- 2017

PROBABILITY

Average monthly snowfall for the planning area is shown in Figure 52, which shows the snowiest months are between November and March. A common snow event (likely to occur annually) will result in accumulation totals between one and seven 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 52: MONTHLY NORMAL (1981-2010) SNOWFALL IN INCHES



Source: High Plains Regional Climate Center, 2018

REGIONAL VULNERABILITIES

The Planning Team stated severe winter storms as the most probable time for residents to lose power or to be without power for multiple days. Ice storms and ice accumulation damages power lines and prohibits or severely hinders transportation for both residents and utilities. Many communities across the planning area are spread out and there are few paved roads within or between communities, making access to supplies or emergency resources difficult during hazardous events. Roads are cleared by several departments: the state clears state highways; the BIA clears major roads; and tribal roads are cleared by the OST Motor Fuels Department. The Planning Team noted a need for additional or replacement snow clearing equipment.

Extreme cold is a top concern for tribal members, particularly those with homes that may have been damaged from summer time storms and lose heat rapidly. Additionally, many residents in the planning area can not afford to run a furnace continually during the winter. Not all homes in the planning area have furnaces or propane heaters and rely on wood burning sources of heat. There are some tribal programs in place which provide split and corded wood to residents, but additional funds are necessary to continue or expand the program. Some reservation districts and programs assist the Pine Ridge Reservation by providing matching funds to help pay energy bills during the winter including the Pine Ridge Retreat Center (<http://www.pineridgeretreatcenter.org/energy-assistance-matching-fund.html>) and the Running Strong for American Indian Youth program (<http://indianyouth.org/programs/detail/emergency-assistance-programs>).

The following table provides information related to regional vulnerabilities.

TABLE 94: REGIONAL SEVERE WINTER STORM VULNERABILITIES

SECTOR	VULNERABILITY
PEOPLE	-Elderly citizens at higher risk of injury or death, especially during extreme cold and heavy snow accumulations -Citizens without adequate heat and shelter at higher risk of injury or death
ECONOMIC	-Closed roads and power outages can cripple a region for days, leading to significant revenue loss and loss of income for workers
BUILT ENVIRONMENT	-Heavy snow loads can cause roofs to collapse
INFRASTRUCTURE	-Significant tree damage possible, downing power lines and blocking roads -Heavy snow and ice accumulation can lead to downed power lines and prolonged power outages -Transportation may be difficult or impossible during blizzards, heavy snow, and ice events
CRITICAL FACILITIES	-Emergency response and recovery operations, communications, water treatment plants, and others are at risk to power outages, impassable roads, and other damages
CLIMATE CHANGE	-Climate change impacts may increase the frequency and intensity of severe winter storm events

TORNADOES

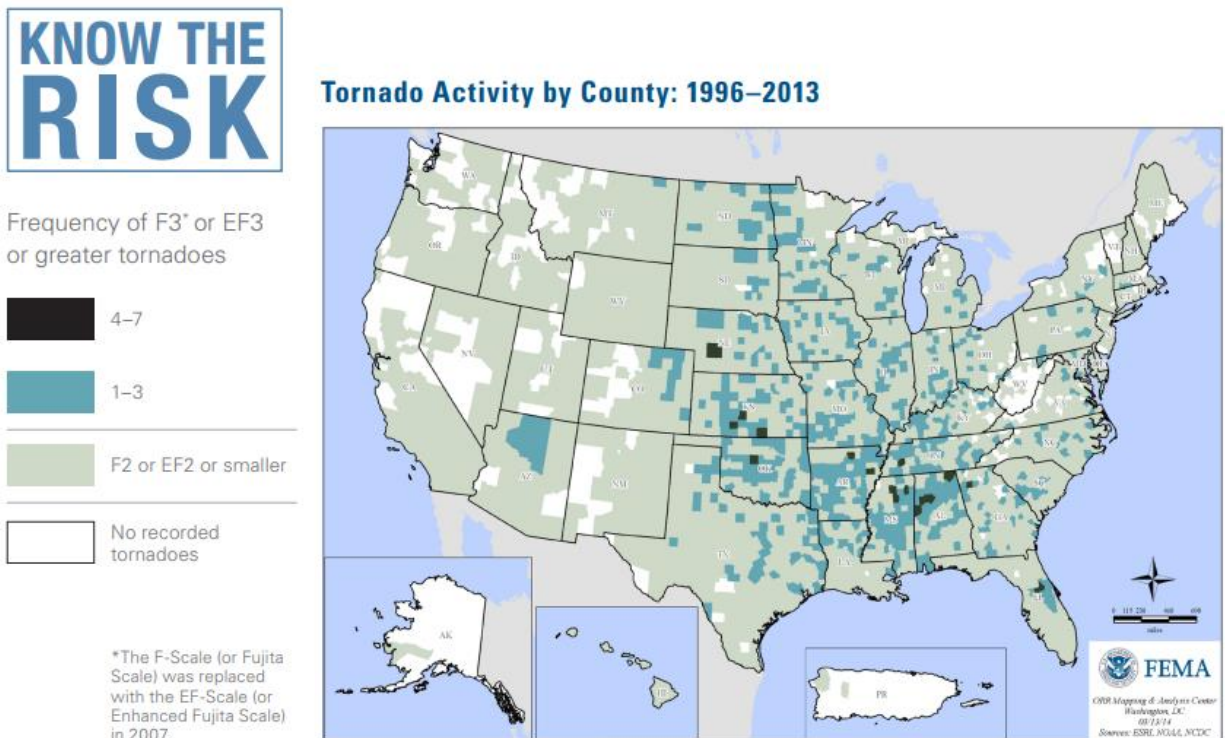
A tornado is typically associated with a supercell thunderstorm. For a rotation to be classified as a tornado, three characteristics must be met:

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

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

South Dakota is ranked 15th in the nation for tornado frequency with an annual average of 36 tornadoes between 1991 to 2010.⁸¹ The following figure shows the tornado activity in the United States as a summary of recorded tornadoes of EF3 intensity or greater from 1996-2013.

FIGURE 53: TORNADO ACTIVITY IN THE UNITED STATES



Source: FEMA, 2014⁸²

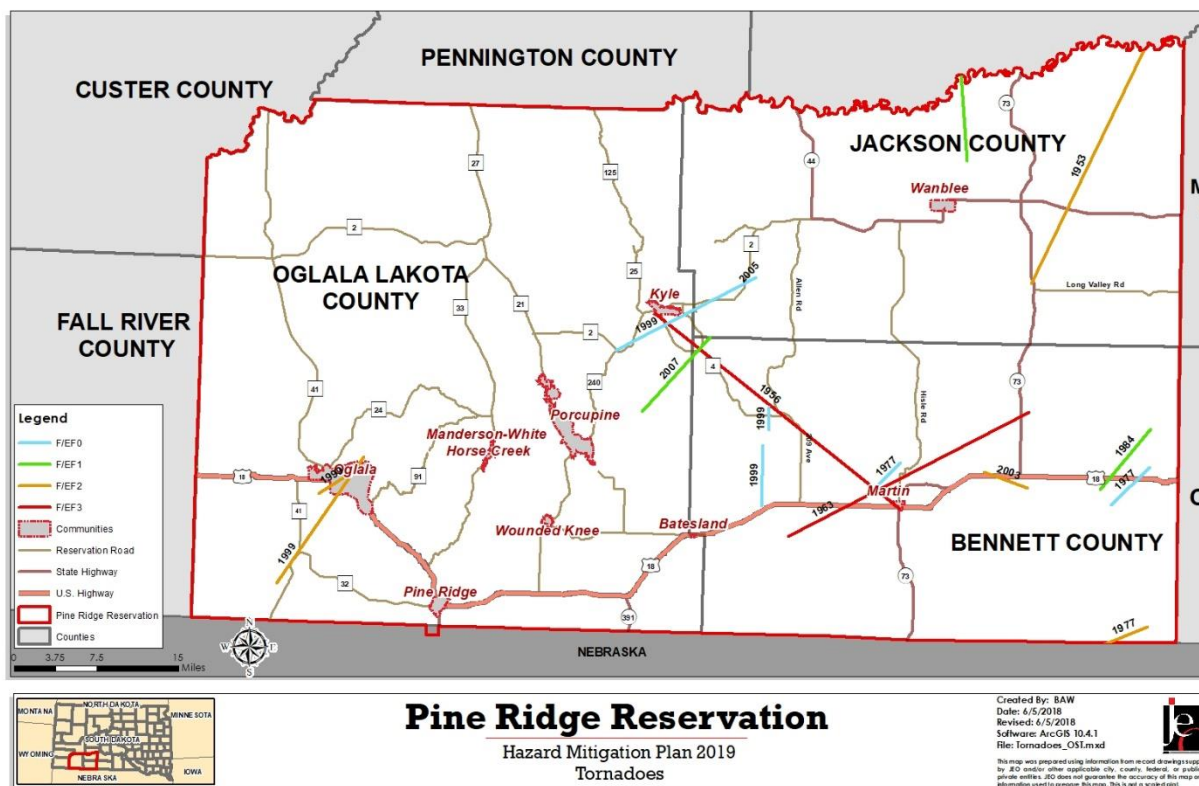
81 National Centers for Environmental Information. 2013. "U.S. Tornado Climatology." <https://www.ncdc.noaa.gov/climate-information/extreme-events/us-tornado-climatology>.

82 Federal Emergency Management Agency. 2014. "How to Prepare for a Tornado." https://www.fema.gov/media-library-data/1409003506195-52740fd2983079a211d041f7aea6b85d/how_to_prepare_tornado_033014_508.pdf.

LOCATION

Tornadoes can occur anywhere in the planning area. The impacts would likely be greater in more densely populated areas. The following map shows the historical track locations across the region from 1950 to 2016. Note that this map only shows tornado tracks greater than one mile in length, but not individual touchdowns.

FIGURE 54: HISTORIC TORNADO TRACKS



EXTENT

After a tornado passes through an area, an official rating category is determined, which provides a common benchmark that allows comparisons to be made between different tornadoes. The magnitude of tornadoes is measured by the Enhanced Fujita Scale. The Enhanced Fujita Scale does not measure tornadoes by their size or width, but rather the amount of damage caused to human-built structures and trees. The Enhanced Fujita Scale replaced the Fujita Scale in 2007. The enhanced scale classifies EF0-EF5 damage as determined by engineers and meteorologists across 28 different types of damage indicators, including different types of building and tree damage. To establish a rating, engineers and meteorologists examine the damage, analyze the ground-swirl patterns, review damage imagery, collect media reports, and sometimes utilize photogrammetry and videogrammetry. Based on the most severe damage to any well-built frame house, or any comparable damage as determined by an engineer, an EF-Scale number is assigned to the tornado. Table 95 and Table 96 summarize the Enhanced Fujita Scale and damage indicators. According to a recent report from the National Institute of Science and Technology on the Joplin, Missouri Tornado, tornadoes rated EF3 or lower account for around 96 percent of all tornado damages.⁸³

⁸³ Kuligowski, E.D., Lombardo, F.T., Phan, L.T., Levitan, M.L., & Jorgensen, D.P. March 2014. "Final Report National Institute of Standards and Technology (NIST) Technical Investigation of the May 22, 2011, Tornado in Joplin, Missouri."

TABLE 95: ENHANCED FUJITA SCALE

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

Source: NOAA; FEMA

TABLE 96: ENHANCED FUJITA SCALE DAMAGE INDICATOR

NUMBER	DAMAGE INDICATOR	NUMBER	DAMAGE INDICATOR
1	Small barns, farm outbuildings	15	School - 1-story elementary (interior or exterior halls)
2	One- or two-family residences	16	School - Junior or Senior high school
3	Single-wide mobile home (MHSW)	17	Low-rise (1-4 story) bldg.
4	Double-wide mobile home	18	Mid-rise (5-20 story) bldg.
5	Apartment, condo, townhouse (3 stories or less)	19	High-rise (over 20 stories)
6	Motel	20	Institutional bldg. (hospital, govt. or university)
7	Masonry apartment or motel	21	Metal building system
8	Small retail bldg. (fast food)	22	Service station canopy
9	Small professional (doctor office, branch bank)	23	Warehouse (tilt-up walls or heavy timber)
10	Strip mall	24	Transmission line tower
11	Large shopping mall	25	Free-standing tower
12	Large, isolated ("big box") retail bldg.	26	Free standing pole (light, flag, luminary)
13	Automobile showroom	27	Tree - hardwood
14	Automotive service building	28	Tree - softwood

Source: NOAA; FEMA

Based on the historic record, it is most likely that tornadoes that occur within the planning area will be of EF0 strength. Of the 31 reported events, three were F/EF1 and three were F/EF2. Currently, there are eight tornado sirens on the Reservation (Figure 55). There is one per major community. The Tribe is hoping to add 15 more tornado sirens to cover more area of the Reservation (Figure 56).

FIGURE 55: CURRENT TORNADO SIRENS

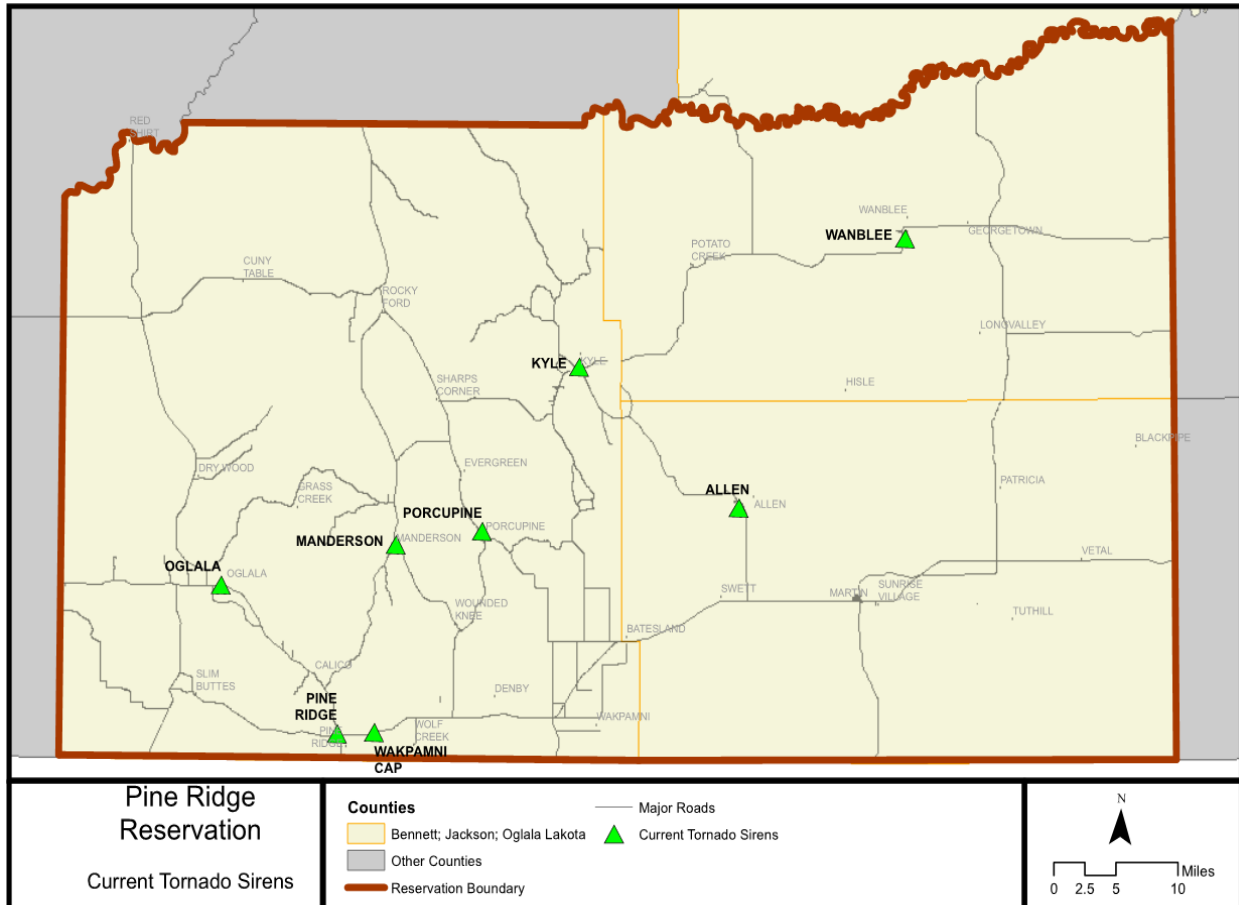
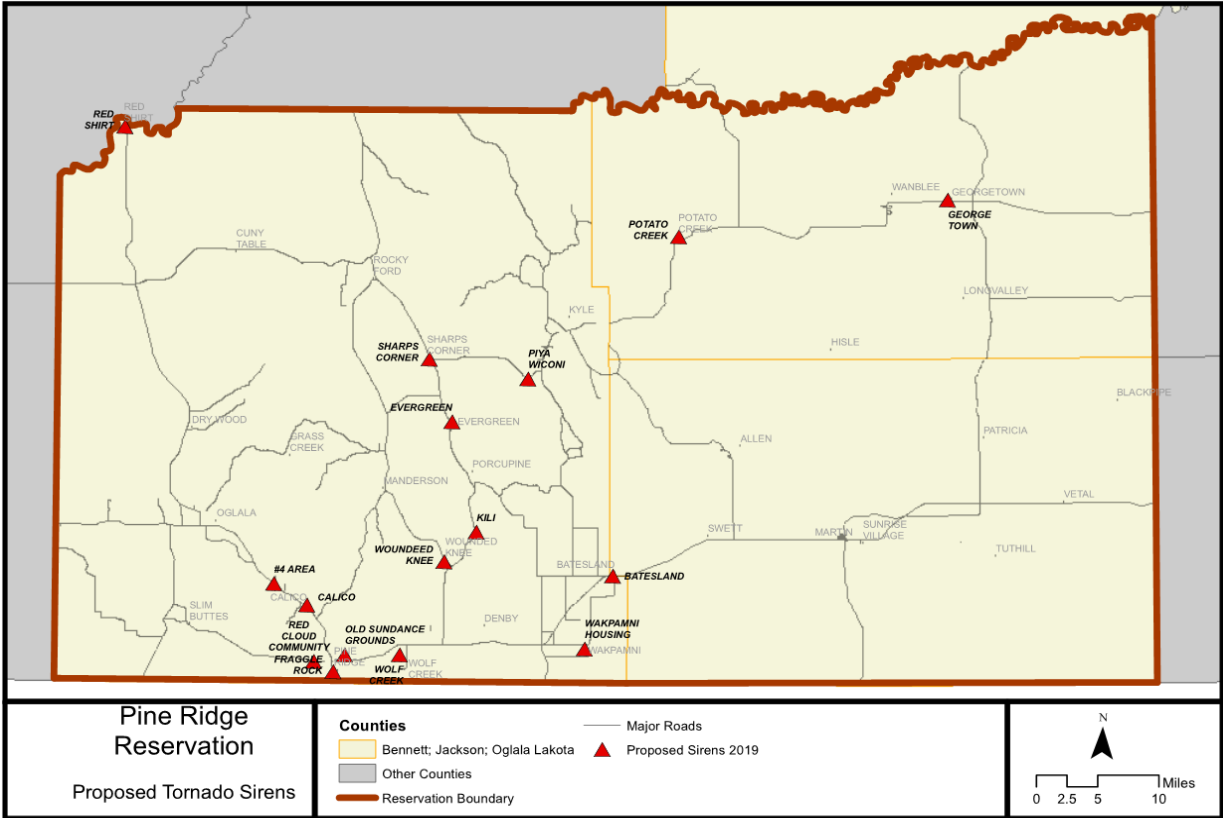


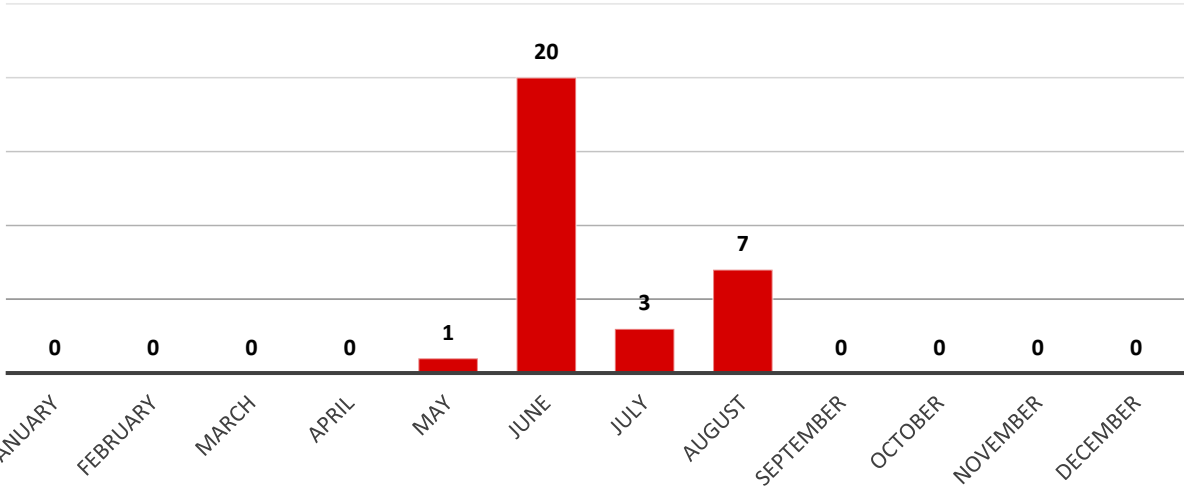
FIGURE 56: PROPOSED TORNADO SIRENS



HISTORICAL OCCURRENCES

NCEI cites 31 tornadic events ranging from a magnitude of EF0 to EF2 between 1996 and 2017. These events were responsible for \$3,570,000 in property damages. One tornadic event in 1999 led to the death of one individual and injuries to 54 others. A tornado near Allen in 2013 caused \$100,000 in damages and injured one person. Most recently, a tornado in July 2018 destroyed a home near Kyle. The following figure shows that the month of June is the busiest month of the year with the highest number of tornadoes in the planning area.

FIGURE 57: TORNADOES BY MONTH IN THE PLANNING AREA



Source: NCEI, 1996-2017

AVERAGE ANNUAL DAMAGES

The average damage per event estimate was determined based upon NCEI Storm Events Database since 1996 and number of historical occurrences. This does not include losses from displacement, functional downtime, economic loss, injury, or loss of life. Tornadoes cause an average of \$162,273 per year in property damage. The biggest concern with tornadoes is the proper anchoring of mobile homes to protect them from tornadoes. Due to a housing shortage across the reservation, moving or relocated families impacted by damaged or destroyed homes can also be costly and time-consuming.

TABLE 97: TORNADO LOSSES

COUNTY	NUMBER OF EVENTS	EVENTS PER YEAR	TOTAL PROPERTY LOSS ¹	AVERAGE ANNUAL PROPERTY LOSS	TOTAL CROP LOSS ²	AVERAGE ANNUAL CROP LOSS ²
OGLALA LAKOTA	14	0.6	\$3,395,000	\$154,318	\$0	\$0
BENNETT	10	0.5	\$175,000	\$7,955	\$0	\$0
JACKSON	7	0.3	\$0	\$0	\$8,160	\$453
TOTAL	31	1.4	\$3,570,000	\$162,273	\$8,160	\$453

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

TABLE 98: TORNADO INJURIES AND DEATHS

COUNTY	INJURY/DEATH	DATE	HAZARD
Oglala Lakota	1 death; 54 injuries	1999	Tornado
Bennett	1 injury	2013	Tornado

Source: NCEI, 1996- 2017

PROBABILITY

Given the 31 events over the course of 22 years, there is a 100 percent probability that a tornadic event will occur in the planning area in any given year.

REGIONAL VULNERABILITIES

The following table provides information related to regional vulnerabilities.

TABLE 99: REGIONAL TORNADO VULNERABILITIES

SECTOR	VULNERABILITY
PEOPLE	-Citizens living in mobile homes are at risk to death or injury -Citizens without access to shelter below ground or in safe room -Elderly with decreased mobility or poor hearing may be higher risk -Lack of multiple ways of receiving weather warnings, especially at night
ECONOMIC	-Significant economic losses possible, especially with EF3 tornadoes or greater
BUILT ENVIRONMENT	-All building stock are at risk of significant damages -There is a need for certified high wind and tornado shelters
INFRASTRUCTURE	-All above ground infrastructure at risk to damages -Impassable roads due to debris blocking roadways -Additional warning sirens are needed in order to cover all communities
CRITICAL FACILITIES	-Current sirens do not have back up generators, but do have battery packs -All critical facilities at risk to significant damages and power outages
CLIMATE CHANGE	-Climate change impacts may increase the frequency and intensity of tornadoes; potential damages to homes, infrastructure, and injuries to people and livestock

SECTION FIVE MITIGATION STRATEGY

INTRODUCTION

The primary focus of the mitigation strategy is to establish goals and objectives, and identify action items to reduce the effects of hazards on existing infrastructure and property in a cost effective and technically feasible manner. The establishment of goals and objectives took place during the Planning Team meetings.

Meeting participants reviewed the goals from the 2014 HMP and discussed recommended additions and modifications. The intent of each goal and set of objectives is to develop strategies to account for risks associated with hazards and identify ways to reduce or eliminate those risks. Each goal and set of objectives is followed by 'mitigation alternatives,' or actions.

A preliminary list of goals and objectives was provided to the Planning Team and participants at the Kick-Off Meeting. The Planning Team made minimal changes to the goals and objectives. Participating jurisdictions utilized the same goals and objectives.

SUMMARY OF CHANGES

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

GOALS

Below is the final list of goals as determined by the Planning Team. These goals provide direction to guide participants in reducing future hazard related losses.

Goal 1: Protect Citizens from Injuries and Loss of Life from Hazards

Goal 2: Protect Existing and Future Structures within Hazard Areas

Goal 3: Reduce the Losses to Critical Facilities, Utilities, and Infrastructure from Natural and Man-Made Hazards

Goal 4: Preserve the Natural Environment

Goal 5: Support and Assist Community Mitigation Capabilities and Efforts

Goal 6: Improve Emergency Management Capabilities

Requirement §201.7(c)(3): A mitigation strategy that provides the Indian tribal government's blueprint for reducing the potential losses identified in the risk assessment, based on existing authorities, policies, programs and resources, and its ability to expand on and improve these existing tools. This section shall include:

- (i) A description of mitigation goals to reduce or avoid long-term vulnerabilities to the identified hazards.
- (ii) 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.
- (iii) An action plan describing how the actions identified in paragraph (c)(3)(ii) of this section will be prioritized, implemented, and administered by the Indian Tribal government.
- (iv) A discussion of the Indian tribal government's pre- and post-disaster hazard management policies, programs, and capabilities to mitigate the hazards in the area, including: An evaluation of tribal laws, regulations, policies, and programs related to hazard mitigation as well as to development in hazard-prone areas; and a discussion of tribal funding capabilities for hazard mitigation projects.
- (v) Identification of current and potential sources of Federal, tribal, or private funding to implement mitigation activities.
- (vi) An Indian Tribal government applying to FEMA as a grantee may request the reduced cost share authorized under §79.4(c)(2) of this chapter of the FMA and SRL programs if they have an approved Tribal Mitigation Plan meeting the requirements of this section that also identifies actions the Indian Tribal government has taken to reduce the number of repetitive loss properties (which must include severe repetitive loss properties), and specifies how the Indian Tribal government intends to reduce the number of such repetitive loss properties.

MITIGATION ALTERNATIVES (ACTION ITEMS)

After establishing the goals, mitigation alternatives were prioritized. The alternatives considered included: the mitigation actions in the previous plan; additional mitigation actions discussed during the planning process; and recommendations from JEO for additional mitigation actions. JEO provided each participant a preliminary list of mitigation alternatives to be used as a starting point. The prioritized list of alternatives helped participants determine which actions will best assist their respective jurisdiction in alleviating damages in the event of a disaster. The listed priority does not indicate which actions will be implemented first but will serve as a guide in determining the order in which each action should be implemented.

These projects are the core of a hazard mitigation plan. The group was instructed that each alternative must be directly related to the goals of the plan. Alternatives must be specific activities that are concise and can be implemented individually.

Mitigation alternatives were evaluated based on referencing the community's risk assessment and capability assessment. Communities were encouraged to choose mitigation actions that were realistic and relevant to the concerns identified.

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

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

PARTICIPANT MITIGATION ALTERNATIVES

The following are specific actions listed by participants of the Oglala Sioux Tribe HMP intended to be utilized in the implementation of mitigation alternatives. Each action is described by the following:

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

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

MITIGATION ALTERNATIVE PROJECT MATRIX

During meetings Planning Team members were asked to review mitigation projects listed in the 2014 HMP and new potential mitigation actions to be included in this update. The following table is a summary of all mitigation actions identified by either the Oglala Sioux Tribe, Oglala Lakota County, or Community of Batesland. The following sections discuss mitigation actions as identified by the Oglala Sioux Tribe and Oglala Lakota County in more depth. Mitigation actions for the community of Batesland can be found in *Section Seven: Community Profile*.

#	MITIGATION ACTIONS	OST	OLC	BATESLAND
1	Anchor Mobile Homes	X	X	
2	Conduct Emergency Tabletop Exercise	X		
3	Develop and Implement Building Codes and Zoning	X	X	
4	Education on Disaster Preparation	X	X	
5	Education on Mitigation Measures	X	X	
6	Emergency Operations Center	X		
7	Establish Shelter Locations	X	X	
8	Improve Snow Removal Resources			X
9	Improve Emergency Communications System	X		
10	Improve Emergency Transportation System	X		
11	Improve Warning Systems	X		X
12	Infrastructure Hardening	X		
13	Inventory all Assets for Critical Facilities Protection	X		
14	Mapping of Flood Risk Areas	X		
15	Mutual Aid Agreements for Emergency Response	X	X	
16	Protect Critical Facilities in Flood Zones	X		
17	Provide Backup Generators for Critical Facilities	X		X
18	Provide Emergency Supply Kits	X	X	
19	Provide for Structural Fire-Fighting Equipment	X	X	
20	Rebuild Unsafe Structures	X		
21	Safe Rooms and Storm Shelters	X	X	X
22	Snow Fences	X	X	
23	Storm Ready Certification		X	
24	Training for First Responder Team	X	X	
25	Update Emergency Operations Plan	X	X	

UGLALA SIOUX TRIBE MITIGATION ACTIONS

Completed Actions:

No mitigation actions identified in the 2014 HMP were completed.

New and Ongoing Actions:

PARTICIPANT		OGLALA SIOUX TRIBE
MITIGATION ACTION 1		Anchor Mobile Homes
DESCRIPTION	Require mobile homes located in the jurisdiction to be properly anchored. Anchor pre-existing homes.	
HAZARD(S) ADDRESSED	High Winds, Severe Thunderstorms, Tornadoes	
ESTIMATED COST	\$100,000	
FUNDING	HMGP, Tribal Funds	
TIMELINE	1 year	
PRIORITY	High	
LEAD AGENCY	OST Emergency Management, Housing Authority	
STATUS	This is an ongoing project by the Tribe. Roughly 100 homes have already been anchored with 20 more expected within 2019. An additional 100 homes may be added to the list of properties to be anchored. This is a collaborative effort between the Oglala Sioux Tribe and Oglala Lakota County.	

PARTICIPANT		OGLALA SIOUX TRIBE
MITIGATION ACTION 2		Conduct Emergency Tabletop Exercise
DESCRIPTION	Utilize tabletop emergency exercises to prepare for hazardous events. Ensure that businesses and residents have appropriate plans in place.	
HAZARD(S) ADDRESSED	All hazards	
ESTIMATED COST	\$20,000	
FUNDING	Homeland Security, Tribal Funds	
TIMELINE	5+ years	
PRIORITY	Low	
LEAD AGENCY	OST Emergency Management	
STATUS	This is a new mitigation action.	

PARTICIPANT		OGLALA SIOUX TRIBE
MITIGATION ACTION 3		Develop and Implement Building Codes and Zoning
DESCRIPTION	Develop, implement, and enforce building standards and codes to provide additional protection to natural hazards. Develop zoning ordinances to prevent development in high hazard areas.	
HAZARD(S) ADDRESSED	All hazards	
ESTIMATED COST	\$0, Staff Time	
FUNDING	Tribal and County Funds	
TIMELINE	5+ years	
PRIORITY	High	
LEAD AGENCY	Tribal Council, Housing Authority	
STATUS	This is a new action. Development of codes and zoning should occur within one year, full enforcement in place within five years. This is a collaborative effort between the Oglala Sioux Tribe and Oglala Lakota County.	

PARTICIPANT	OGLALA SIOUX TRIBE
MITIGATION ACTION 4	Education on Disaster Preparation
DESCRIPTION	Educate staff and residents about hazard vulnerability and mitigation measures. Include information for utility shut off protocols. Integrate hazard mitigation discussions into school curriculums. Activities may include classroom modules profiling certain hazards and discussing preparedness measures. Educational materials, such as brochures and fliers, can be developed and provided to parents to increase community-wide hazard awareness.
HAZARD(S) ADDRESSED	All hazards
ESTIMATED COST	\$5,000+
FUNDING	National Association of Voluntary Organizations Active in Disaster (VOAD), Tribal and County Funds
TIMELINE	5+ years
PRIORITY	Medium
LEAD AGENCY	OST Emergency Management
STATUS	Education is an ongoing action. This is a collaborative effort between the Oglala Sioux Tribe and Oglala Lakota County. Disaster preparedness education is provided through schools, board postings, workshops, tribal/county meetings, etc.

PARTICIPANT	OGLALA SIOUX TRIBE
MITIGATION ACTION 5	Education on Mitigation Measures
DESCRIPTION	Establish a community education program to increase awareness related to household and community-wide mitigation measures in place.
HAZARD(S) ADDRESSED	All hazards
ESTIMATED COST	\$3,000+
FUNDING	DHS, HMGP, Tribal and County Funds
TIMELINE	5+ years
PRIORITY	Low
LEAD AGENCY	OST Emergency Management
STATUS	Not yet started. This will be a collaborative effort between the Oglala Sioux Tribe and Oglala Lakota County.

PARTICIPANT	OGLALA SIOUX TRIBE
MITIGATION ACTION 6	Emergency Operations Center
DESCRIPTION	Identify and establish an Emergency Operations Center
HAZARD(S) ADDRESSED	All hazards
ESTIMATED COST	Unknown
FUNDING	Mennonite Disaster Service, Tribal Funds
TIMELINE	2-5 years
PRIORITY	High
LEAD AGENCY	OST Emergency Management
STATUS	A new EOC facility with a safe room is currently being built east of Pine Ridge Village.

PARTICIPANT		OGLALA SIOUX TRIBE
MITIGATION ACTION 7		Establish Shelter Locations
DESCRIPTION	Identify and evaluate current storm shelters locations in communities and schools. These structures do not serve as FEMA approved safe rooms and is not intended for long-term recovery, such as displacement from floods, fires, etc. The buildings could be used for short term sheltering during high heat events for those without A/C.	
HAZARD(S) ADDRESSED	Extreme Heat, Severe Thunderstorms, Severe Winter Storms	
ESTIMATED COST	\$200-\$250 per sq ft.	
FUNDING	HMGP, PDM, Tribal and County Funds	
TIMELINE	5+ years	
PRIORITY	High	
LEAD AGENCY	OST Emergency Management	
STATUS	CAP buildings, Casino, and schools act as shelter and distribution sites. Additional safe rooms designated for tornadoes are needed. This is a collaborative effort between the Oglala Sioux Tribe and Oglala Lakota County.	

PARTICIPANT		OGLALA SIOUX TRIBE
MITIGATION ACTION 8		Improve Emergency Communications System
DESCRIPTION	Evaluate and/or upgrade as needed emergency responder radio system.	
HAZARD(S) ADDRESSED	All hazards	
ESTIMATED COST	Varies by need	
FUNDING	Homeland Security, Tribal Funds	
TIMELINE	5+ years	
PRIORITY	High	
LEAD AGENCY	Police, Fire Department, OST Emergency Management	
STATUS	This is an ongoing action. It is a consistent priority to update and replace equipment as needed.	

PARTICIPANT		OGLALA SIOUX TRIBE
MITIGATION ACTION 10		Improve Emergency Transportation System
DESCRIPTION	Evaluate and upgrade emergency transportation equipment as needed.	
HAZARD(S) ADDRESSED	Flooding	
ESTIMATED COST	Unknown	
FUNDING	HMGP, PDM, DOT, BIA, Tribal Funds	
TIMELINE	5+ years	
PRIORITY	Low	
LEAD AGENCY	Transportation Department	
STATUS	There is a need for additional emergency transportation equipment, specifically fire trucks and ambulances. These resources are especially needed when evacuating residents from high hazard areas during flood events.	

PARTICIPANT		OGLALA SIOUX TRIBE
MITIGATION ACTION 11		Improve Warning Systems
DESCRIPTION	Evaluate and/or improve current warning systems. Upgrade warning system equipment and methods.	
HAZARD(S) ADDRESSED	All hazards	
ESTIMATED COST	\$15,000+	
FUNDING	HMGP, PDM, Tribal Funds	
TIMELINE	2-5 years	
PRIORITY	Medium	
LEAD AGENCY	OST Emergency Management	
STATUS	New locations for sirens have been proposed. OST is currently working on setting up Alert911 app for residents to receive notifications about hazard events.	

PARTICIPANT		OGLALA SIOUX TRIBE
MITIGATION ACTION 12		Infrastructure Hardening
DESCRIPTION	Harden critical facilities to withstand high winds, hail, heavy snow, etc by: hardening roofs, hail resistant barriers to HVAC systems, shatter-proofing windows, building tie-downs and anchors, and other architectural designs that reduce damage.	
HAZARD(S) ADDRESSED	All hazards	
ESTIMATED COST	Varies by structure	
FUNDING	PDM, HMGP, Tribal Funds	
TIMELINE	5+ years	
PRIORITY	High	
LEAD AGENCY	OST Housing Authority, OST Emergency Management	
STATUS	This is a new mitigation action.	

PARTICIPANT		OGLALA SIOUX TRIBE
MITIGATION ACTION 13		Inventory All Assets for Critical Facilities Protection
DESCRIPTION	Conduct inventory of supplies in all critical facilities to be used in the case of severe hazard event.	
HAZARD(S) ADDRESSED	All hazards	
ESTIMATED COST	Unknown	
FUNDING	Individual agencies	
TIMELINE	5+ years	
PRIORITY	Low	
LEAD AGENCY	Individual agencies	
STATUS	This is an ongoing action. Search and Rescue, Fire Department, and Police Departments, Clinics, etc are responsible for inventorying their own facilities and equipment.	

PARTICIPANT		OGLALA SIOUX TRIBE
MITIGATION ACTION 14		Mapping of Flood Risk Areas
DESCRIPTION	Conduct mapping of floodplain and develop flood risk hazard maps for regulatory use. Update FIRM maps to reflect accurate flood inundation areas within the jurisdiction	
HAZARD(S) ADDRESSED	Flooding	
ESTIMATED COST	\$25,000	
FUNDING	HMGP, PDM, Tribal Funds	
TIMELINE	2-5 years	
PRIORITY	High	
LEAD AGENCY	OST Emergency Management	
STATUS	This is a new mitigation action.	

PARTICIPANT		OGDLALA SIOUX TRIBE
MITIGATION ACTION 15		Mutual Aid Agreements for Emergency Response
DESCRIPTION	Establish formal mutual aid agreements with neighboring jurisdictions and entities.	
HAZARD(S) ADDRESSED	All hazards	
ESTIMATED COST	Staff time	
FUNDING	N/A	
TIMELINE	2-5 years	
PRIORITY	Medium	
LEAD AGENCY	OST Emergency Management	
STATUS	This action is currently in progress. Formal agreements are needed between the counties, tribe, and emergency services. The tribe is currently developing agreements between departments. This is a collaborative effort between the Oglala Sioux Tribe and Oglala Lakota County.	

PARTICIPANT		OGDLALA SIOUX TRIBE
MITIGATION ACTION 16		Protect Critical Facilities in Flood Zones
DESCRIPTION	Relocate or remove facilities and homes damaged by flooding.	
HAZARD(S) ADDRESSED	Flooding	
ESTIMATED COST	Varies by structure	
FUNDING	HMGP, PDM, Tribal Funds	
TIMELINE	5+ years	
PRIORITY	High	
LEAD AGENCY	OST Emergency Management, Housing Authority	
STATUS	This is an ongoing project. Homes damaged by flooding should be repaired or relocated out of flood risk hazard areas. The first priority for the tribe is to identify critical facilities or resident homes in high risk areas to flooding for relocation/elevation, infrastructure hardening, or removal. While no official FEMA flood maps are currently available for the Pine Ridge Reservation, local planning team members are familiar with residential homes and critical facilities most prone to flooding.	

PARTICIPANT		OGDLALA SIOUX TRIBE
MITIGATION ACTION 17		Provide Backup Generators for Critical Facilities
DESCRIPTION	Provide portable or stationary source of backup power to critical facilities and shelter locations.	
HAZARD(S) ADDRESSED	All hazards	
ESTIMATED COST	\$100,000	
FUNDING	HMGP, Tribal Funds, School Funds	
TIMELINE	1 year	
PRIORITY	High	
LEAD AGENCY	OST Emergency Management	
STATUS	OST Emergency Management has a grant for four backup generators and is currently seeking 25% match for funding. Generators would be placed at: Wolf Creek, Rockyford, Red Shirt, and Oglala Lakota County Schools. Additional generators are needed at CAP offices.	

PARTICIPANT		OGLALA SIOUX TRIBE
MITIGATION ACTION 18		Provide Emergency Supply Kits
DESCRIPTION	Put together and distribute emergency supply kits to critical facilities to be used in the case of a hazard events.	
HAZARD(S) ADDRESSED	All hazards	
ESTIMATED COST	\$100 per kit	
FUNDING	Tribal and County Funds, private donations, faith-based organizations	
TIMELINE	1 year	
PRIORITY	Medium	
LEAD AGENCY	OST Emergency Management	
STATUS	Kits are needed at CAP offices and all shelter locations. This is a collaborative effort between the Oglala Sioux Tribe and Oglala Lakota County.	

PARTICIPANT		OGLALA SIOUX TRIBE
MITIGATION ACTION 19		Provide Structural Fire-Fighting Equipment
DESCRIPTION	Evaluate and improve fire-fighting equipment	
HAZARD(S) ADDRESSED	Grass/wildfire, Drought	
ESTIMATED COST	\$1,000,000	
FUNDING	HMGP, Assistance to Firefighters Grant	
TIMELINE	2-5 years	
PRIORITY	High	
LEAD AGENCY	Tribal Housing	
STATUS	In progress. Funding has been secured for a new fire department facility, a new vehicle, and some personnel. This is a collaborative effort between the Oglala Sioux Tribe and Oglala Lakota County.	

PARTICIPANT		OGLALA SIOUX TRIBE
MITIGATION ACTION 20		Rebuild Unsafe Structures
DESCRIPTION	Rebuild or repair tribal properties damaged by past hazard events.	
HAZARD(S) ADDRESSED	All hazards	
ESTIMATED COST	Varies by structure	
FUNDING	HMGP, PDM, BIA Housing Improvement Grants, Tribal funds	
TIMELINE	5+ years	
PRIORITY	High	
LEAD AGENCY	Housing Authority	
STATUS	This is an ongoing project. Homes throughout the reservation have been damaged by past events and are in need of repair.	

PARTICIPANT		OGLALA SIOUX TRIBE
MITIGATION ACTION 21		Safe Rooms and Storm Shelters
DESCRIPTION	Identify and evaluate existing safe rooms and/or storm shelters. Improve and/or construct safe rooms and/or storm shelters at shelter locations or critical facilities.	
HAZARD(S) ADDRESSED	All hazards	
ESTIMATED COST	\$100,000	
FUNDING	HMGP, PDM, BIA School Grants, Tribal and County Funds	
TIMELINE	5+ years	
PRIORITY	High	
LEAD AGENCY	OST Emergency Management	
STATUS	FEMA certified safe rooms are needed throughout the jurisdiction. A safe room should be added to the County Shop in Batesland and shelter locations in local schools and CAP offices should be reinforced to meet FEMA tornado-rated requirements. A new safe room will be included in the new EOC currently under construction east of Pine Ridge. This is a collaborative effort between the Oglala Sioux Tribe and Oglala Lakota County.	

PARTICIPANT		OGLALA SIOUX TRIBE
MITIGATION ACTION 22		Snow Fences
DESCRIPTION	Construct snow fences to protect main transportation routes and critical facilities from excessive snow drifting and road closure.	
HAZARD(S) ADDRESSED	Severe Winter Storms	
ESTIMATED COST	\$50 per 100 linear feet	
FUNDING	HMGP, PDM, DOT, Tribal and County Funds	
TIMELINE	2-5 years	
PRIORITY	Low	
LEAD AGENCY	Streets	
STATUS	This is a new mitigation action. Snow fences are needed along county and tribal roads throughout the reservation. This is a collaborative effort between the Oglala Sioux Tribe and Oglala Lakota County.	

PARTICIPANT		OGLALA SIOUX TRIBE
MITIGATION ACTION 24		Training for First Responder Team
DESCRIPTION	Develop or improve training programs for all emergency response personnel and first responders.	
HAZARD(S) ADDRESSED	All hazards	
ESTIMATED COST	Unknown	
FUNDING	Individual agencies, Assistance to Firefighters Grants	
TIMELINE	2-5 years	
PRIORITY	High	
LEAD AGENCY	Police, Fire, OST Emergency Management, OLC Emergency Management	
STATUS	This is an ongoing action. Search and Rescue, Fire Department, and Police Departments undergo training annually. This is a collaborative effort between the Oglala Sioux Tribe and Oglala Lakota County.	

PARTICIPANT		OGLALA SIOUX TRIBE	
MITIGATION ACTION 25		Update Emergency Operations Plan	
DESCRIPTION	Complete and/or update an Emergency Operations Plan.		
HAZARD(S) ADDRESSED	All hazards		
ESTIMATED COST	\$5,000		
FUNDING	Tribal Funds		
TIMELINE	1 year		
PRIORITY	High		
LEAD AGENCY	OST Emergency Management		
STATUS	OST is currently working on an EOP update with an expected completion of late summer 2019.		

Removed Actions:

The following mitigation actions from the 2014 HMP have been removed or combined with other similar mitigation actions. Note that these changes apply to both the Oglala Sioux Tribe and Oglala Lakota County mitigation actions as identified in the 2014 HMP. Additional removed actions that are specific to Oglala Lakota County are also listed at the end of this section.

MITIGATION ACTION		ESTABLISH BUILDING CODES	
PARTICIPANT	Oglala Sioux Tribe and Oglala Lakota County		
REASON FOR REMOVAL	This project has been consolidated with Mitigation Action #3.		

MITIGATION ACTION		ESTABLISH SCHOOL SHELTERS	
PARTICIPANT	Oglala Sioux Tribe and Oglala Lakota County		
REASON FOR REMOVAL	This project has been consolidated with Mitigation Action #7.		

MITIGATION ACTION		GUIDANCE FOR EVACUATORS	
PARTICIPANT	Oglala Sioux Tribe and Oglala Lakota County		
REASON FOR REMOVAL	This action was identified as not needed as information about evacuation is already included in the Local Emergency Operations Plan.		

MITIGATION ACTION		INSTRUCTION ON UTILITY SHUT OFF	
PARTICIPANT	Oglala Sioux Tribe and Oglala Lakota County		
REASON FOR REMOVAL	This project has been consolidated with Mitigation Action #4.		

MITIGATION ACTION		PROVIDE FOR PLANNING AND ZONING FOR BUILDING PROJECTS	
PARTICIPANT	Oglala Sioux Tribe and Oglala Lakota County		
REASON FOR REMOVAL	This project has been consolidated with Mitigation Action #3.		

MITIGATION ACTION		PROVIDE IMPROVED WEATHER ALERT SYSTEM	
PARTICIPANT	Oglala Sioux Tribe and Oglala Lakota County		
REASON FOR REMOVAL	This project has been consolidated with Mitigation Action #11.		

MITIGATION ACTION		PROVIDE SIRENS IN ALL LARGE POPULATION AREAS	
PARTICIPANT	Oglala Sioux Tribe and Oglala Lakota County		
REASON FOR REMOVAL	This project has been consolidated with Mitigation Action #11.		

MITIGATION ACTION		SEEK FUNDING FOR MITIGATION PROJECTS	
PARTICIPANT	Oglala Sioux Tribe and Oglala Lakota County		
REASON FOR REMOVAL	This was determined not to be a need as funding allocation is integrated into all mitigation projects.		

OGLALA LAKOTA COUNTY MITIGATION ACTIONS**Completed Actions:**

No mitigation actions identified in the 2014 HMP were completed.

New and Ongoing Actions:

PARTICIPANT		OGLALA LAKOTA COUNTY
MITIGATION ACTION #1	Anchor Mobile Homes	
DESCRIPTION	Require mobile homes located in the jurisdiction to be properly anchored. Anchor pre-existing homes.	
HAZARD(S) ADDRESSED	High Winds, Severe Thunderstorms, Tornadoes	
ESTIMATED COST	\$100,000	
FUNDING	HMGP, County and Tribal Funds	
TIMELINE	1 year	
PRIORITY	High	
LEAD AGENCY	OLC Emergency Management	
STATUS	The tribe is currently working to anchor tribal properties. Any non-tribal residents in mobile homes also need to be anchored. This is a collaborative effort between the Oglala Sioux Tribe and Oglala Lakota County.	

PARTICIPANT		OGLALA LAKOTA COUNTY
MITIGATION ACTION #3	Develop and Implement Building Codes and Zoning	
DESCRIPTION	Develop, implement, and enforce building standards and codes to provide additional protection to natural hazards. Develop zoning ordinances to prevent development in high hazard areas.	
HAZARD(S) ADDRESSED	All hazards	
ESTIMATED COST	\$0, Staff Time	
FUNDING	County and Tribal Funds	
TIMELINE	5+ years	
PRIORITY	High	
LEAD AGENCY	OLC Emergency Management, OLC Administration	
STATUS	This is a new action. Development of codes and zoning should occur within one year, full enforcement in place within five years. This is a collaborative effort between the Oglala Sioux Tribe and Oglala Lakota County.	

PARTICIPANT	
MITIGATION ACTION #4	
OGDLALA LAKOTA COUNTY	
Education on Disaster Preparation	
DESCRIPTION	Educate staff and residents about hazard vulnerability and mitigation measures. Include information for utility shut off protocols. Integrate hazard mitigation discussions into school curriculums. Activities may include classroom modules profiling certain hazards and discussing preparedness measures. Educational materials, such as brochures and fliers, can be developed and provided to parents to increase community wide hazard awareness.
HAZARD(S) ADDRESSED	All hazards
ESTIMATED COST	\$5,000+
FUNDING	National Association of Voluntary Organizations Active in Disaster (VOAD)
TIMELINE	5+ years
PRIORITY	Medium
LEAD AGENCY	OLC Emergency Management
STATUS	Education is an ongoing action. This is a collaborative effort between the Oglala Sioux Tribe and Oglala Lakota County.

PARTICIPANT	
MITIGATION ACTION #5	
OGDLALA LAKOTA COUNTY	
Education on Mitigation Measures	
DESCRIPTION	Establish a community education program to increase awareness related to household and community wide mitigation measures in place.
HAZARD(S) ADDRESSED	All hazards
ESTIMATED COST	\$3,000+
FUNDING	DHS, HMGP, County and Tribal Funds
TIMELINE	5+ years
PRIORITY	Low
LEAD AGENCY	OLC Emergency Management
STATUS	Not yet started. This will be a collaborative effort between the Oglala Sioux Tribe and Oglala Lakota County.

PARTICIPANT	
MITIGATION ACTION #7	
OGDLALA LAKOTA COUNTY	
Establish Shelter Locations	
DESCRIPTION	Identify and evaluate current storm shelters locations in communities and schools. These structures do not serve as FEMA approved safe rooms and is not intended for long-term recovery, such as displacement from floods, fires, etc. The buildings could be used for short term sheltering during high heat events for those without A/C.
HAZARD(S) ADDRESSED	Extreme Heat, Severe Thunderstorms, Severe Winter Storms
ESTIMATED COST	\$200-\$250 per sq ft.
FUNDING	HMGP, PDM, County and Tribal Funds
TIMELINE	5+ years
PRIORITY	High
LEAD AGENCY	OLC Emergency Management
STATUS	CAP buildings, Casino, and schools act as shelter and distribution sites. Additional safe rooms designated for tornadoes are needed. This is a collaborative effort between the Oglala Sioux Tribe and Oglala Lakota County.

PARTICIPANT		OGDLALA LAKOTA COUNTY
MITIGATION ACTION #15		Mutual Aid Agreements for Emergency Response
DESCRIPTION	Establish formal mutual aid agreements with neighboring jurisdictions and entities.	
HAZARD(S) ADDRESSED	All hazards	
ESTIMATED COST	Staff time	
FUNDING	N/A	
TIMELINE	2-5 years	
PRIORITY	Medium	
LEAD AGENCY	OLC Emergency Management	
STATUS	This action is currently in progress. Formal agreements are needed between the counties, tribe, and emergency services. The tribe is currently developing agreements between departments. This is a collaborative effort between the Oglala Sioux Tribe and Oglala Lakota County.	

PARTICIPANT		OGDLALA LAKOTA COUNTY
MITIGATION ACTION #18		Provide Emergency Supply Kits
DESCRIPTION	Put together and distribute emergency supply kits to critical facilities to be used in the case of a hazard events.	
HAZARD(S) ADDRESSED	All hazards	
ESTIMATED COST	\$100 per kit	
FUNDING	County and Tribal Funds	
TIMELINE	1 year	
PRIORITY	Medium	
LEAD AGENCY	OLC Emergency Management	
STATUS	Kits are needed at CAP offices and all shelter locations. This is a collaborative effort between the Oglala Sioux Tribe and Oglala Lakota County.	

PARTICIPANT		OGDLALA LAKOTA COUNTY
MITIGATION ACTION #19		Provide Structural Fire-Fighting Equipment
DESCRIPTION	Evaluate and improve fire-fighting equipment	
HAZARD(S) ADDRESSED	Grass/wildfire, Drought	
ESTIMATED COST	\$1,000,000	
FUNDING	HMGP, County Funds	
TIMELINE	2-5 years	
PRIORITY	High	
LEAD AGENCY	Tribal Housing, OLC Emergency Management	
STATUS	In progress. Funding has been secured for a new fire department facility, a new vehicle, and some personnel. This is a collaborative effort between the Oglala Sioux Tribe and Oglala Lakota County.	

PARTICIPANT		UGLALA LAKOTA COUNTY
MITIGATION ACTION #21		Safe Rooms and Storm Shelters
DESCRIPTION	Identify and evaluate existing safe rooms and/or storm shelters. Improve and/or construct safe rooms and/or storm shelters at shelter locations or critical facilities.	
HAZARD(S) ADDRESSED	All hazards	
ESTIMATED COST	\$100,000	
FUNDING	HMGP, PDM, County Funds, Tribal Funds	
TIMELINE	5+ years	
PRIORITY	High	
LEAD AGENCY	OLC and OST Emergency Management	
STATUS	FEMA certified safe rooms are needed throughout the jurisdiction. A safe room should be added to the County Shop in Batesland and shelter locations in local schools and CAP offices should be reinforced to meet FEMA tornado-rated requirements. This is a collaborative effort between the Oglala Sioux Tribe and Oglala Lakota County.	

PARTICIPANT		UGLALA LAKOTA COUNTY
MITIGATION ACTION #22		Snow Fences
DESCRIPTION	Construct snow fences to protect main transportation routes and critical facilities from excessive snow drifting and road closure.	
HAZARD(S) ADDRESSED	Severe Winter Storms	
ESTIMATED COST	\$50 per 100 linear feet	
FUNDING	HMGP, PDM, DOT, County Funds	
TIMELINE	2-5 years	
PRIORITY	Low	
LEAD AGENCY	Streets	
STATUS	This is a new mitigation action. Snow fences are needed along county and tribal roads throughout the reservation. This is a collaborative effort between the Oglala Sioux Tribe and Oglala Lakota County.	

PARTICIPANT		UGLALA LAKOTA COUNTY
MITIGATION ACTION #23		Storm Ready Certification
DESCRIPTION	Work to become a Storm Ready Certified county through the National Weather Service	
HAZARD(S) ADDRESSED	All hazards	
ESTIMATED COST	\$0	
FUNDING	County Funds	
TIMELINE	1 year	
PRIORITY	Medium	
LEAD AGENCY	OLC Emergency Management	
STATUS	This is a new mitigation action.	

PARTICIPANT		OGLALA LAKOTA COUNTY
MITIGATION ACTION #24	Training for First Responder Team	
DESCRIPTION	Develop or improve training programs for all emergency response personnel and first responders.	
HAZARD(S) ADDRESSED	All hazards	
ESTIMATED COST	Unknown	
FUNDING	Individual agencies	
TIMELINE	2-5 years	
PRIORITY	High	
LEAD AGENCY	Police, Fire, OST Emergency Management, OLC Emergency Management	
STATUS	This is an ongoing action. Search and Rescue, Fire Department, and Police Departments undergo training annually. This is a collaborative effort between the Oglala Sioux Tribe and Oglala Lakota County.	

PARTICIPANT		OGLALA LAKOTA COUNTY
MITIGATION ACTION #25	Update Emergency Operations Plan	
DESCRIPTION	Complete and/or update an Emergency Operations Plan.	
HAZARD(S) ADDRESSED	All hazards	
ESTIMATED COST	\$5,000	
FUNDING	County Funds	
TIMELINE	1 year	
PRIORITY	High	
LEAD AGENCY	County Emergency Management	
STATUS	The County is currently working on an EOP update with an expected completion of fall 2019.	

Removed Actions:

In addition to the removed mitigation actions listed on page 135-136, the following mitigation actions from the 2014 HMP have also been removed for Oglala Lakota County, as they are all solely the responsibility of the Oglala Sioux Tribe.

- Improve Emergency Communications System
- Improve Warning Systems
- Inventory all Assets for Critical Facilities Protection
- Protect Critical Facilities in Flood Zones
- Provide Backup Generators for Critical Facilities
- Rebuild Unsafe Structures

SECTION SIX

PLAN IMPLEMENTATION AND MAINTENANCE

MONITORING, EVALUATING, AND UPDATING THE PLAN

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

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

Review and updating of this plan will occur at least every five years. At the discretion of each governing body, updates may be incorporated more frequently, especially in the event of a major hazard. The governing body will start meeting to discuss mitigation updates at least six months prior to the deadline for completing the plan review. The persons overseeing the evaluation process will review the goals and objectives of the previous plan and evaluate them to determine whether they are still pertinent and current. Among other questions, they may want to consider the following:

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

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

In addition, the governing body will be responsible for ensuring that the HMP's goals are incorporated into applicable revisions of each participant's comprehensive plan and any new planning projects undertaken

Requirement §201.7(c)(4)(i): A plan maintenance process that includes:

- (i) A section describing the method and schedule of monitoring, evaluating, and updating the mitigation plan.
- (ii) A system for monitoring implementation of mitigation measures and project closeouts.
- (iii) A process by which the Indian tribal government incorporates the requirements of the mitigation plan into other planning mechanisms such as reservation master plans or capital improvement plans, when appropriate.
- (iv) Discussion on how the Indian tribal government will continue public participation in the plan maintenance process.
- (v) A system for reviewing progress on achieving goals as well as activities and projects identified in the mitigation strategy.

by the participant. The HMP will also consider any changes in plan development or current plans and incorporate the information accordingly in its next update.

CONTINUED PUBLIC INVOLVEMENT

To ensure continued plan support and input from the public and business owners, public involvement will remain a top priority for the tribe, Oglala Lakota County, and Batesland. 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
- Town Hall
- Websites
- Local radio stations
- Local newspapers
- Regionally-distributed newspaper

UNFORESEEN OPPORTUNITIES

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

INCORPORATION INTO EXISTING PLANNING MECHANISMS

The Planning Team utilized a variety of plan integration tools to help jurisdictions 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*⁸⁴ guidance, as well as FEMA's *2015 Plan Integration*⁸⁵ guide, each jurisdiction 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. Both the Oglala Sioux Tribe and Oglala Lakota County referenced relevant existing planning mechanisms and provided information on how these did or did not address hazards and vulnerability.

In addition to discussing plan integration, a capability assessment was conducted for each jurisdiction which provided a review of their policies, programs, and fiscal capabilities to mitigate identified hazards. Summaries of plan integration and capabilities are found in the table below. Plan integration and capabilities for Batesland can be found in the *Community Profile*. When specific planning mechanisms are lacking or do not exist, the HMP may be used as a guide for future activity and development in the community.

84 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>.

85 Federal Emergency Management Agency. July 2015. "Plan Integration: Linking Local Planning Efforts." https://www.fema.gov/media-library-data/1440522008134-ddb097cc285bf741986b48fdce31c6e/R3_Plan_Integration_0812_508.pdf.

TABLE 100: CAPABILITY ASSESSMENT FOR OST AND OLC

Survey Components/Subcomponents		OST	OLC
<i>Planning and Regulatory Capability</i>	Comprehensive Plan	No	No
	Capital Improvements Plan	No	No
	Economic Development Plan	No	No
	Tribal Emergency Operations Plan	Yes	Yes (Tribal)
	Floodplain Management Plan	No	No
	Storm Water Management Plan	No	No
	Zoning Ordinance	No	No
	Subdivision Regulation/Ordinance	No	No
	Floodplain Ordinance	No	No
	Building Codes	No	No
	National Flood Insurance Program	No	No
	Community Rating System	No	No
	Wildland Fire Plan	Yes (BIA)	No
	Transportation Plan	Yes, OST Transportation Dept.	No
	Land Use Plan	No	No
	Storm Water Ordinance	No	No
	Historical Preservation Ordinance	Yes, THPO	No
	Debris Management Plan	No	No
Other (if any)	Environmental Review Code	No	
<i>Administrative & Technical Capability</i>	Planning Commission	No	No
	Floodplain Administration	No	No
	GIS Capabilities	Yes	Yes
	Chief Building Official	No	No
	Civil Engineering	Yes	No
	Local Staff Who Can Assess Community's Vulnerability to Hazards	Yes	No
	Grant Manager	Yes	No
	Mutual Aid Agreement	Yes (currently updating)	Yes (fire only)
	Emergency Management	Yes	Yes
	Other (if any)		
<i>Fiscal Capability</i>	Capital Improvement Plan/ 1 & 6 Year plan	No	No
	Applied for grants in the past	Yes	Yes
	Awarded a grant in the past	Yes	Yes

Survey Components/Subcomponents		OST	OLC
	Authority to Levy Taxes for Specific Purposes such as Mitigation Projects	Yes	Yes
<i>Fiscal Capability</i>	Gas/Electric Service Fees	No	No
	Storm Water Service Fees	No	No
	Water/Sewer Service Fees	No	No
	Development Impact Fees	No	No
	General Obligation Revenue or Special Tax Bonds	No	Yes
	Other (if any)		
<i>Education and Outreach Capability</i>	Local citizen groups or non-profit organizations focused on environmental protection, emergency preparedness, access and functional needs populations, etc.	Yes (CERT, American Red Cross, Salvation Army, VOAD)	No
	Ongoing public education or information program (e.g., responsible water use, fire safety, household preparedness, environmental education)	Yes	Yes (tribal)
	Natural Disaster or Safety related school programs	Yes	Yes (tribal)
	StormReady Certification	No	No
	Firewise Communities Certification	No	No
	Tree City USA	No	No
	Other (if any)		

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

The Oglala Sioux Tribe is regulated by Tribal ordinances, codes, and policies that address the Tribe's capacity to implement pre- and post-disaster mitigation activities. OST has a long history of grant management and fiscal responsibility from the many years of managing multiple federal grants with experienced grant writers and contract and procurement personnel to administer these grants. Tribal procurement regulations are well defined and adhered to in order to ensure that the grant requirements are fulfilled. The Tribe is dependent on these federal grants to meet the basic needs of the Tribe and takes the administration of these grants very seriously.

OLC and OST emergency management reviewed existing codes, ordinances, resolutions, and policies to ensure that mitigation projects are in compliance and meet benefit-cost criteria for HMA funding. The Tribe understands that many federal grants, including HMA grants, require matching funds to support the projects. The OST has limited financing available to accommodate these matching requirements, however has comprehensive experience in utilizing in-kind labor for local share. For additional information regarding potential funding sources, please see *Appendix D: Hazard Mitigation Project Funding Guidebook*.

The tribal environmental review code states that there is a historical, cultural, and spiritual relationship between the Oglala Sioux people and the natural environment. As such, it is the Tribe's policy to protect and preserve the Pine Ridge Indian Reservation environment and to provide a safe and habitable place for its people. This is being done by establishing procedures to monitor growth and development within the Tribe's jurisdiction. The code states that any new development on the reservation requires a permit and a permit will only be granted if the development is low impact.

OST and OLC currently do not have comprehensive plans, zoning ordinances, or floodplain ordinances. During the Planning Team Meeting #2, there was a thorough discussion regarding the lack of zoning ordinances for the planning area. Several Planning Team members noted that having zoning and floodplain ordinances would be beneficial in reducing the risk to hazards for their communities and residents. While the Tribe and County have identified in *Section Five: Mitigation Strategy* the development of building codes and zoning ordinances as a high priority for the planning area, it was noted by the Planning Team that there is a lack of support for such measures to be implemented in the near future.

The Oglala Lakota County Local Emergency Operations Plan (LEOP) discusses fires, floods, and severe storms, but does not identify specific mitigation actions. The LEOP is currently under revision, with an expected completion by the end of summer 2019.

Local schools throughout the reservation have their own emergency response plans which identify emergency procedures in the case of hazard events, but do not identify specific mitigation actions.

Conclusion

The Oglala Sioux Tribe and Oglala Lakota County have a range of plans, programs, and regulations in place to increase resiliency to natural and human-caused hazards. Tribal staff and community members are able to identify and discuss hazards of highest concern for the reservation in order to implement specific projects to improve overall community resilience. OST in particular has been very successful in winning grants, including HMA funding in the past. Many projects identified in this plan will draw upon multiple departments and will be multi-jurisdictional endeavors for both OST and OLC. Participants may also leverage help from other county, regional, and/or state agencies or departments in order to accomplish identified goals. These outside entities may include the South Dakota Department of Public Safety, Bennett County Emergency Management, Jackson County Emergency Management, South Dakota Department of Transportation, South Dakota Department of Agriculture, among others. Partnering with these entities may assist in effectively leveraging funding for projects.

THIS PAGE LEFT INTENTIONALLY BLANK

SECTION SEVEN

COMMUNITY PROFILE

PURPOSE OF COMMUNITY PROFILES

This community profile contains information specific to the Community of Batesland which is participating in the Oglala Sioux Tribe and Oglala Lakota County HMP planning effort. Batesland is the only non-tribal, incorporated community in the planning area. The community profile is developed with the intention of highlighting the jurisdiction's unique characteristics that affect its risk to hazards. Profiles may serve as a short reference of identified vulnerabilities and mitigation actions for a jurisdiction as they implement the mitigation plan. Information from the community was collected at one-on-one meetings and used to establish the plan. The community profile 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 the community are included such as: jurisdiction identified critical facilities or flood prone areas. The hazard prioritization information, as provided by Batesland in this section may vary due in large part to the extent of the geographical area, the jurisdiction's designated representatives (who were responsible for completing meeting worksheets and attending meetings), 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. The discussion of certain hazards selected within this 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*.

COMMUNITY PROFILE

TOWN OF BATESLAND

Oglala Sioux Tribe and Oglala Lakota County
Hazard Mitigation Plan Update

2019

Local Planning Team

Table BTL.1: Batesland Local Planning Team

Name	Title
Mark Donovan	Mayor
Nicole Schultz	Board Member
Rena Conroy	Clerk
Willard Clifford	Water Administrator
Nathan Kehn	Board Member

Location and Geography

The Town of Batesland is located in the eastern portion of Oglala Lakota County and covers an area of 0.1 square miles.

Figure BTL.1: Town of Batesland



Transportation

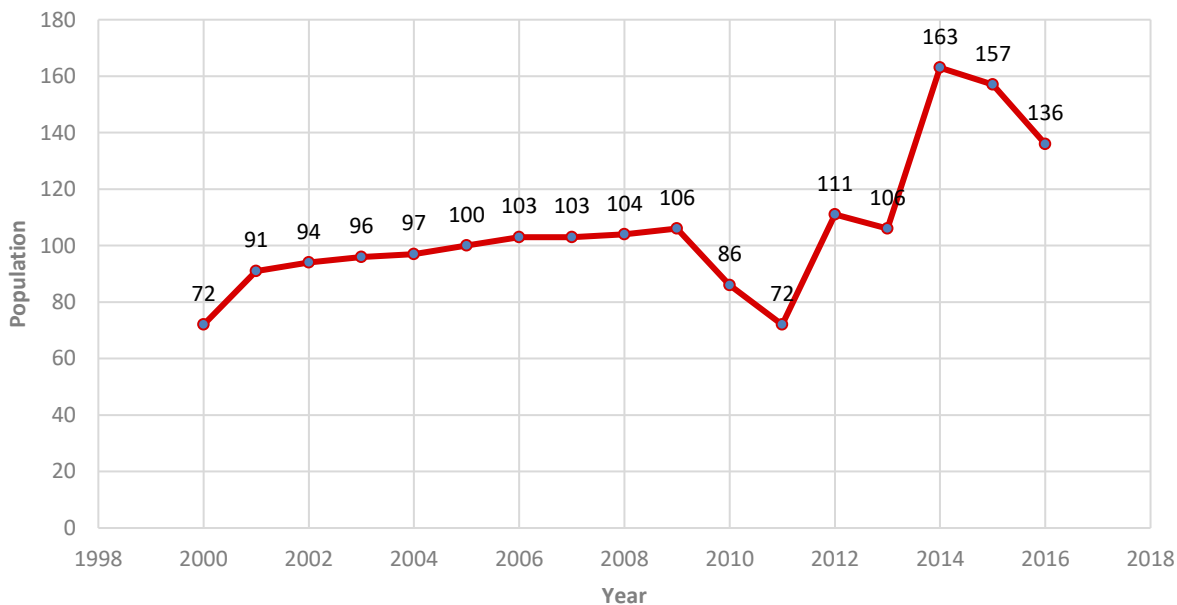
Batesland’s major transportation corridors include U.S. Highway 18 with an average of 1,026 vehicles and 133 trucks traveling through per day. There are no rail lines located within the county. There are no commercial or private airports located within the community. Transportation information is important to hazard mitigation plans because it suggests possible evacuation corridors in the community, as well as areas more at risk to transportation incidents.

The Planning Team indicated that U.S. Highway 18 is highly important to the community as the primary route into and out of the community. Additionally, the highway sees large amounts of walking traffic along its edges. Chemical transportation (such as fertilizer, gas, and propane) also occurs along this route through Batesland.

Demographics

Batesland's population grew from about 72 people in 2000 to 117 people in 2017, an average annual increase of 4%. However, the Planning Team indicated that the population of Batesland is relatively stable, and the majority of the population (~98%) are tribe members. Most of the housing and residents are tribe members who live outside of the official community boundaries, specifically to the north of U.S. Highway 18. Batesland's population accounted for five percent of Oglala Lakota County's population in 2016.ⁱ New housing developments to the north of town have led to an increase in the local population.

Figure BTL.2: Population 2000 - 2010



Source: U.S. Census Bureau

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

- Similarly aged.** The median age of Batesland was 27.6 years old in 2016, compared with the County average of 24.6 years. Batesland's population grew younger since 2010, when the median age was 31.5 years old. Batesland had a slightly smaller proportion of people under 20 years old (35.9%) than the County (41.5%).ⁱⁱ
- Less ethnically diverse.** Since 2010, Batesland grew less ethnically diverse. In 2010, 81% of Batesland's population was American Indian and 19% was white. By 2016, 97% of the population was American Indian with the remaining 3% being white. In 2016 the county included 93% American Indian, 5% White, and 2% of the population was two or more races.ⁱⁱⁱ
- Less likely to be below the federal poverty line.** The poverty rate in Batesland (41% of families living below the federal poverty line) was lower than the County's poverty rate (54%) in 2016.^{iv} The county has the highest poverty rate in South Dakota.

Employment and Economics

The Batesland economic base is primarily based on finance and education. In comparison to Oglala Lakota County, the town's economy had:

- **Similar mix of industries.** Batesland's major employment sectors, accounting for 10% or more of employment each, were: Finance and Insurance; and Educational Services.^v
- **Higher household income.** Batesland's median household income in 2016 (\$48,125) was about \$21,800 higher than the County (\$26,330).^{vi}
- **More long-distance commuters.** About 54% percent of workers in Batesland commuted for fewer than 15 minutes, compared with about 58% of workers in Oglala Lakota County. About 40% of workers in Batesland commute 30 minutes or more to work, compared to about 20% of the County workers.^{vii}

Major Employers

The major employer in Batesland is the school and farmers surrounding the community with both agricultural row crops and livestock. The Planning Team indicated that a moderate amount of residents commute to Pine Ridge for work, but others commute to Batesland.

Housing

In comparison to Oglala Lakota County, Batesland's housing stock was:

- **More occupied.** Batesland has a slightly higher occupancy rate (87.1%) of housing than the county (81.8%).
- **Less renter-occupied.** About 14.8% of occupied housing units in Batesland are renter occupied, compared with 46.6% of occupied housing in Oglala Lakota County.^{viii}
- **Older housing.** Batesland had a larger share of housing built prior to 1970 than the county (35.6% compared to 22%).^{ix}
- **More multifamily.** The predominant housing type in the town is single family detached (61.3%), while the remainder of homes in Batesland are mobile homes (38.7%). The county is similar with single family detached homes (60.2%) and mobile homes (32.9%) providing the majority of housing. Mobile homes are located throughout the town.^x

The Planning Team indicated that housing within the community boundaries is non-tribal, but there is a significant amount of tribal housing around Batesland outside of town limits. There is a housing shortage throughout the community and reservation. There are some available lots for housing development in town, however they need to be cleaned up before being developed. Some of these lots are now empty due to properties being destroyed by fire.

Housing information is relevant to hazard mitigation 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, tornados, and severe winter storms.

Future Development Trends

The planning team discussed several changes that have occurred in Batesland in the past five years. In particular a new AT&T tower has been built in town. A second, older tower is located about six miles west of town. Tribal members are eligible for special rates and service agreements with AT&T. However, the majority of non-tribal residents have phone and internet through Great

Plains service provider. The planning team indicated that service can be inconsistent during weather events (wind, rain, snow, etc.), leaving both residents and businesses who use phone service to run transactions with reduced communication and economic capabilities.

Red Rock Housing neighborhood is located north of Highway 18 and a new housing neighborhood, Johnson Holy Rock, has been developed east of Red Rock Housing. An annexation on the southeast side of town changed Batesland’s corporate limits in 2013. In order to accommodate a project with the public school, a section of town in the southeast corner was annexed.

A well near the water tower has also been decommissioned in the last few years. The water tower has been refurbished and new water lines were buried in 2014 – 2015. The community has a combined water system but have reported minimal to no problems with stormwater.

Batesland has one school that serves Pre-K through eighth grade in town and then also utilizes an online or virtual high school program which allows students to complete classwork from home. Internet service is a priority for the schools to maintain functionality. The school has an agreement with Golden West internet provider for service.

Structural Inventory and Valuation

GIS parcel data was requested from the County Assessor. 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.

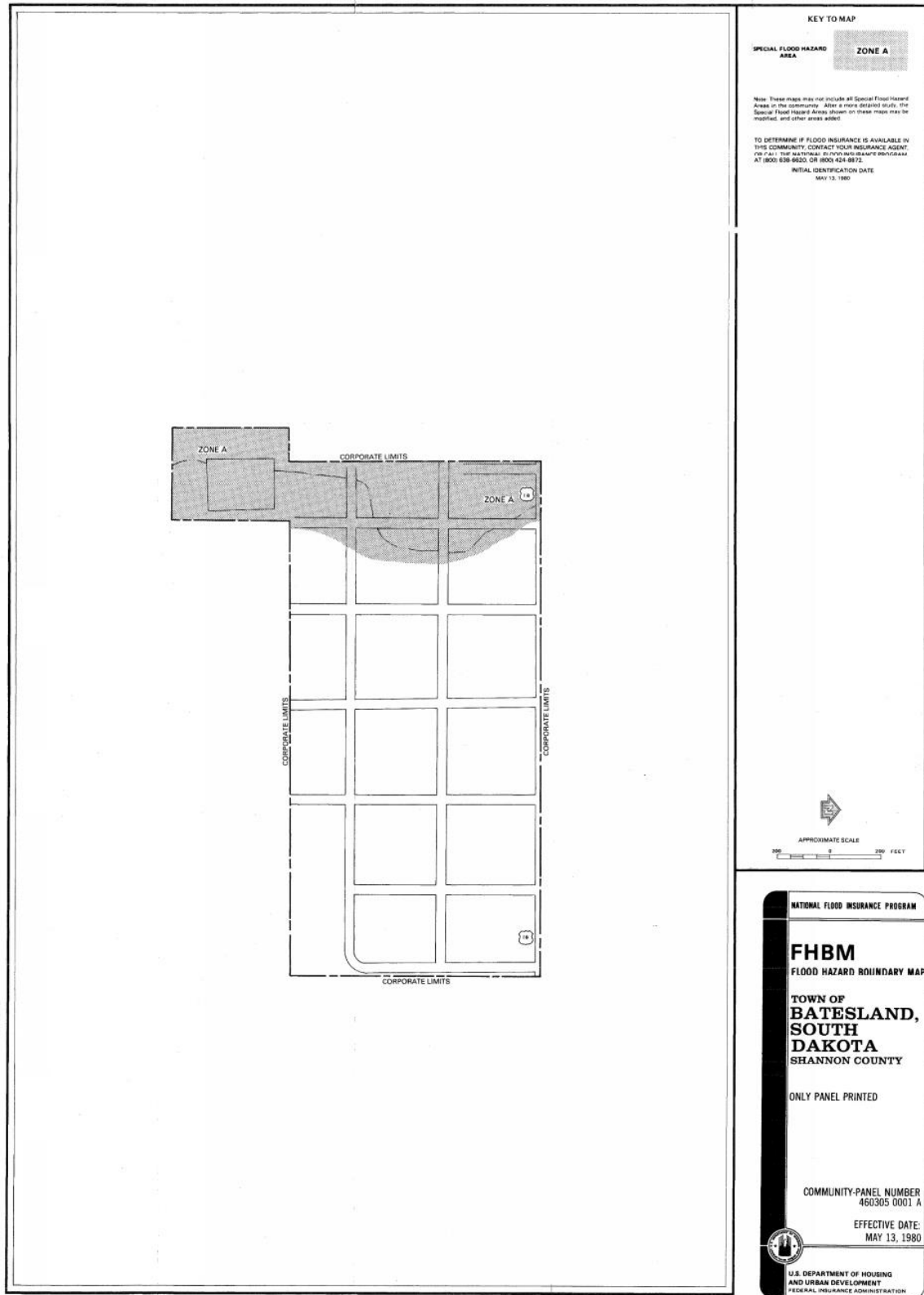
Batesland does not participate in the National Flood Insurance Program, however the community does have a special flood hazard area identified (Figure BTL.3). This flood hazard area allows an estimated number and value of improvements located in the floodplain for Batesland.

Table BTL.2: Structural Inventory/Parcel Improvements

Number of Improvements	Total Improvement Value	Number of Improvements in Floodplain	Value of Improvements in Floodplain
110	\$433,180	19	\$39,040

Source: County Assessor^{xi}

Figure BTL.3: Batesland FIRM



Critical Infrastructure/Key Resources

Chemical Storage Fixed Sites

According to the Tier II System reports submitted to the South Dakota Department of Environment and Natural Resources, there are three chemical storage sites in Batesland which house hazardous chemicals.

Table BTL.3: Chemical Storage Fixed Sites

Facility Name	Address	In Floodplain (Y/N)
Oglala Lakota County Highway Yard	Dakota St	Y
Batesland COOP/Handi Stop	101 E Hwy 18	N
Batesland Bus Garage	Birch St	N

Source: South Dakota Department of Environment and Natural Resources, 2018^{xii}

Historic Sites

According to the National Register of Historic Places and National Park Service, there are no historical sites located in Batesland.^{xiii}

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. 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 BTL.4: Critical Facilities

CF Number	Name	Red Cross Shelter (Y/N)	Generator (Y/N)	Located in Floodplain (Y/N)
1	Batesland Elementary School	No	No	No
2	Church	No	No	No
3	Fire Station	No	No	No
4	Handi Stop	No	No	No
5	Lagoon	No	No	Yes
6	Lakota College Center	No	No	No
7	Oglala Lakota County Highway Yard	No	No	Yes
8	Oglala Lakota Headstart	No	No	No
9	Town Building	No	No	No
10	Water Tower	No	No	No

Figure BTL.4: Critical Facilities



Hazard Prioritization and Historical Occurrences

For an in-depth discussion regarding area wide hazards and other historical hazard events, please see *Section Four: Risk Assessment*. The hazards discussed in detail below were prioritized by the local planning team based on the identification of hazards of greatest concern, hazard history, and the jurisdiction's capabilities.

Hail

Hail is a concern for the local planning team because of the high amount of damage it can cause to existing property and infrastructure. Severe hail events during the summer of 2018 damaged houses and trees including broken windows and siding. Between January 1996 and July 2018, severe hail events have caused over one million dollars' worth of damages. The Oglala Lakota County School recently (within the past five years) repaired and updated their roof due to sustained damages from storm events, however, the roof was not reinforced with hail impact resistant materials.

Severe Thunderstorms

Concerns regarding severe thunderstorms focus on the potential for damages and secondary impacts from storms. Lightning is commonly associated with severe thunderstorms and can cause fires after striking land or buildings. Lightning strikes in Batesland have been known to blow electrical panels in homes and facilities, leaving them without power for extended periods of time. Some older homes, the school, and the water tower do have lightning rods to mitigate risk to strikes.

Additionally, heavy rain events and storms have been known to cause localized flooding and block roads across town. Water from heavy rains has accumulated and damaged the parking lot of the HandiStop gas and grocery store in Batesland. However, the planning team indicated that the lagoon on the southwest side of town and culverts throughout town have not contributed any significant problems to localized flooding.

Severe Winter Storms

Severe winter storms have the potential to cause power outages, property damage, and block major transportation routes due to accumulating snow or ice. While South Dakota state resources will remove snow from U.S. Highways, the school in Batesland will remove snow from other roads in order for buses to move throughout the community. Batesland has aid agreements with the county for snow removal resources if required, but the town lacks snow removal resources. Blocked or inaccessible transportation routes can hinder response from emergency services. Ambulances and medical aid will often come from Martin in neighboring Bennett County for non-tribal members, while most tribe members will use Indian Health Services which come from Pine Ridge.

Ice storms in 2008 caused \$750,000 in damages to trees and property and left parts of Batesland without power for several days. Since 1996, severe winter storms have caused over \$1,105,000 in damages.

Tornadoes

The local planning team is concerned about tornadoes affecting the community due to the high potential of significant damage. Currently there are no safe rooms or backup generators located within the community. The Batesland Elementary School is used as a general shelter location. Additionally, the planning team indicated a need for updated warning sirens, as the only siren in

town is near the fire department and needs to be rewired to be accessible from the interior of the building. A F1 level tornado hit the town in 2004 and caused over \$100,000 in damages. The tornado removed roofs from homes, destroyed a mobile home, damaged part of the roof on the town building and chain link fence, took siding off of the side of the school, and caused foundational issues in homes nearby.

Governance

A community’s governance indicates the number of boards or offices that may be available to help implement hazard mitigation actions. The community also employs a water administrator and clerk who can assist in the implementation of this plan. The community is served by a volunteer fire department.

Capability Assessment

The capability assessment consisted of two main components: 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 BTL.5: Capability Assessment

<i>Survey Components/Subcomponents</i>		<i>Yes/No</i>
<i>Planning & Regulatory Capability</i>	Comprehensive Plan	No
	Capital Improvements Plan	No
	Economic Development Plan	No
	Emergency Operational Plan	No
	Floodplain Management Plan	No
	Storm Water Management Plan	No
	Zoning Ordinance	No
	Subdivision Regulation/Ordinance	No
	Floodplain Ordinance	No
	Building Codes	No
	National Flood Insurance Program	No
	Community Rating System	No
	Other (if any)	
<i>Administrative & Technical Capability</i>	Planning Commission	No
	Floodplain Administration	No
	GIS Capabilities	Yes
	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)		

Section Seven | Batesland Community Profile

<i>Fiscal Capability</i>	Capital Improvement Plan/ 1 & 6 Year plan	No
	Applied for grants in the past	No
	Awarded a grant in the past	No
	Authority to Levy Taxes for Specific Purposes such as Mitigation Projects	Yes
	Gas/Electric Service Fees	Yes
	Storm Water Service Fees	No
	Water/Sewer Service Fees	Yes
	Development Impact Fees	No
	General Obligation Revenue or Special Tax Bonds Other (if any)	No
<i>Education & Outreach Capability</i>	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)	Yes
	Natural Disaster or Safety related school programs	Yes
	StormReady Certification	No
	Firewise Communities Certification	No
	Tree City USA	No
	Other (if any)	

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

Plan Integration

There are no zoning or planning ordinances currently in place for Batesland. The Planning Team indicated it is unlikely that any will be put in place over the next five years. For a description of OLC and OST plans, please see *Section Six*.

Plan Integration	Yes/No
Comprehensive Plan	No
Zoning Ordinances	No
Emergency Operations Plan	Water EOP through the Rural Water District
Local Emergency Operations Plan	Yes – Oglala Lakota County
Building Codes	No
Floodplain Regulations/Ordinances	No
Wellhead Protection Plan	Yes – through the Rural Water District

Mitigation Strategy

Ongoing Mitigation Actions

Mitigation Action	Improve Warning Systems
Description	Evaluate and improve current warning systems. Replace currently insufficient warning sirens or install new sirens as appropriate.
Hazard(s) Addressed	Severe Thunderstorms, Severe Winter Storms, Tornadoes
Estimated Cost	\$15,000+
Funding	General budget, HMGP, PDM
Timeline	1 year
Priority	High
Lead Agency	Town Board
Status	A new siren is needed in town. Current siren by Fire Hall needs rewired.

Mitigation Action	Improve Snow Removal Resources
Description	Improve capabilities to rescue those stranded in blizzards and increase capabilities to remove snow from roadways after an event.
Hazard(s) Addressed	Severe Winter Storms
Estimated Cost	Snow Blower - \$800; Truck mounted plow - \$2,000; ATV plow - \$1,500+
Funding	General budget, private donations, USDA Rural Development grant
Timeline	1 year
Priority	High
Lead Agency	Town Board
Status	The town currently lacks equipment to clear roads and relies on Oglala Lakota County Road Department to clear roads in town. The school clears roads only for bus routes.

Mitigation Action	Safe Rooms and Storm Shelters
Description	Design and construct storm shelters and safe rooms for residents in town
Hazard(s) Addressed	Severe Thunderstorms, Severe Winter Storms, Tornadoes
Estimated Cost	\$200-\$250 per sq ft
Funding	General budget, HMGP, PDM, private donations
Timeline	2-5 years
Priority	Medium
Lead Agency	Town Board
Status	There are currently no safe rooms in Batesland.

Mitigation Action		Provide Backup Generators for Critical Facilities	
Description		Provide portable or stationary sources of backup power to redundant power supplies, municipal wells, lift stations, and other critical facilities and shelters	
Hazard(s) Addressed		All Hazards	
Estimated Cost		\$3,500+ depending on needs	
Funding		General budget, HMGP, PDM	
Timeline		1 year	
Priority		High	
Lead Agency		Fire Department	
Status		A portable generator is needed and should be stored at the Fire Hall.	

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

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

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

^{iv} United States Census Bureau. "American Fact Finder: DP03: Selected Economic Characteristics." [database file]. <https://factfinder.census.gov/>.

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

^{vi} United States Census Bureau. "American Fact Finder: DP03: Selected Economic Characteristics." [database file]. <https://factfinder.census.gov/>.

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

^{viii} United States Census Bureau. "American Fact Finder: DP04: Selected Housing Characteristics." [database file]. <https://factfinder.census.gov/>.

^{ix} United States Census Bureau. "American Fact Finder: DP04: Selected Housing Characteristics." [database file]. <https://factfinder.census.gov/>.

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

^{xi} County Assessor. Personal correspondence, December, 2018.

^{xii} South Dakota Department of Environment and Natural Resources. June 2018. "Tanks Database Viewer." <https://arcgis.sd.gov/server/denr/tanksdb/default.html>.

^{xiii} National Park Service. "National Register of Historic Places: Bennett County South Dakota." Accessed August 2018.