NORTHWESTERN ENERGY'S

WILDFIRE MITIGATION PLAN

2025

Version 3.0

NorthWestern Energy

Delivering a Bright Future

Contents

Revision History

Review Date	Revision	Revisions
July 2022	1.0	Enhanced Wildfire Mitigation Plan was filed with the Montana Public Utilities and posted to the NorthWestern Energy website.
April 2024	2.0	NorthWestern Energy redesigned the document as a comprehensive plan including both established wildfire strategies and the enhanced components from the plan published in 2022. This redesign restructured the document, expanded the context on efforts prior to 2022 plan, updated risk methodology, included NorthWestern's Public Safety Power Shutoff plan and described 2023 accomplishments.
May 2025	3.0	NorthWestern Energy expanded the Plan's scope to encompass the South Dakota service territory. The Public Safety Power Shut-Off Implementation Plan is now a stand-alone document that can be accessed through the website. Section 2 was updated to reflect the accomplishments within the 2024 calendar year.

Definitions & Acronyms

Advanced Metering Infrastructure (AMI) – This describes a modern class of utility meters equipped with computers and communication equipment that enable real-time, remote communication and monitoring. This technology allows customers and utilities to better understand changes in usage patterns over time and can also provide general information such as service outages, service quality, or safety alerts.

Assessment – An engineering assessment to gather data visually on transmission or distribution systems for considerations regarding future repairs or upgrades. The method, aerial or ground, and the cadence in which assessments are completed are based on the individual strategy.

Breaker – Also referred to as a circuit breaker or a substation breaker, these devices are used to interrupt short circuits or overload currents that may occur on the system.

Cutout – A device that is attached to a crossarm or pole to hold a fuse. When the fuse is left open, the cutout must be capable of insulating the downstream system from the live overhead lines. Historically, these were porcelain. Modern cutouts can also be made of a polymer-based material.

Cycle trimming – This term describes a standard utility process of trimming the encroaching vegetation on a circuit at given time-based intervals. The length of this interval varies on a circuit-by-circuit basis because of vegetation growth rates.

Distribution – Any electrical infrastructure below a transmission or sub-transmission voltage. A distribution system will carry electricity from a substation to the customers at their residences or places of business.

Electrical Section Identifier (ESID) – Generated by NorthWestern Energy, this identifier describes a section of line between two protective devices.

Enhanced Powerline Safety Settings (EPSS) – System protection settings on electrical devices that can lower the risk of electric infrastructure ignitions during wildfire risk conditions. EPSS may include, but is not limited to, faster de-energization of equipment when a fault is detected and/or settings which disable automatic reclosing.

Exception – A general term adopted by NorthWestern Energy to describe any identified asset in the field that is deemed to have a general status that is outside the parameters of the original installed design limits. Examples of an exception include, but are not limited to, loose guy wires, dropped insulating pins, or missing animal protection.

Fault – In general terms this describes any abnormal electrical current on the system. In the case of a utility, faults will often come in the form of tree contacts or downed electrical wires. Faults such as these may result in an interruption of service.

Fuse – An electrical device which protects the system against over-current. Fuses can be used to isolate individual customers or sectionalize larger unprotected sections of line. The most common form of this device converts overcurrent energy into heat energy and produces an expulsive release of energy when it operates.

Galloping – This is a term used to describe an oscillating movement of an electrical line with a high amplitude, low frequency motion. Under extreme wind conditions, conductors can come in close proximity to one another.

Grid hardening – This a utility's process to assess potential risks to the electrical system and take proactive actions to mitigate those risk through strategic infrastructure maintenance and upgrade programs.

Hazard tree – The United States Department of Agriculture - Forest Service (USDA-FS) defines a hazard tree as a tree that has a structural defect that makes it likely to fall in whole or in part. As a utility, NorthWestern Energy observes hazard trees in and near its rights of way that could possibly contact the power lines.

Hot spotting – A targeted tree trimming process that considers specific locations, rather than the circuit wide approach utilized in cycle trimming. At NorthWestern Energy, this is typically driven by a Vegetation Coordinator or other trained arborists to locally identify potentially problematic vegetation.

Institute of Electrical and Electronics Engineers (IEEE) – A global technical society dedicated to advancing innovation and technological advancements for the good of the public. Utility groups participate in benchmarking to monitor system reliability and performance. IEEE sets metrics upon which utilities can compare their system's performance.

Incident Command System (ICS) – This is a nationally recognized and standard approach to the command, control and coordination of emergency response. As a utility, NorthWestern Energy usually has a part in this for responses to wildfire, flooding, winter, or other severe events.

Interruption – A broad definition of any loss of power to a customer or piece of equipment. The term can describe momentary operations or sustained outages.

Momentary operations – Commonly referred to as 'momentaries' or 'blinks,' this describes an incident of a single fault current that initiates the single operation of a protective device, such as a recloser or breaker. This is followed immediately by the restoration of power to the system without a sustained outage. This can be the result of galloping wires getting too close, trees encroaching on lines, or avian contacts.

National Electric Safety Code (NESC) – This is the generally accepted United States standard of the safe installation, operation, and maintenance of electrical power and communication utility systems. It includes standards on power substations, overhead lines, and underground lines.

Patrol - Line patrol is a visual inspection to evaluate overhead assets to identify system deficiencies, prioritize repairs, perform repairs, and/or mitigate system problems requiring immediate attention. This is typically performed on the ground. The cadence in which assessments are completed is based on the individual strategy.

Protection strategies – A general term used to describe the engineering approaches used to minimize any undesirable flow of electricity across the electrical system or to the surrounding environment. These strategies can be made from various perspectives. Common protection strategies for a utility include, but are not limited to, the mitigation of ignition potential, the maintaining reliability of service, or the physical protection of devices.

Protective device – This term includes any electrical equipment that is designed to break load at the occurrence of a current draw above set thresholds. By breaking the connection and preventing the flow of electricity, the device protects both the system and customer. Some examples of these devices include fuses, breakers, reclosers, and switchgears.

Public Safety Partner – This term describes any company or entity with which NorthWestern Energy works closely in the event of a safety emergency. In context to an ICS, these often represent government entities and firefighting agencies.

Public Safety Power Shutoff (PSPS) - This describes the practice of proactively de-energizing electric equipment during times of extreme weather in high fire-risk areas to reduce the probability of wildfire ignition by electric utility infrastructure.

Rate review – A legal process, also known as a 'rate case,' which occurs between a publicly owned utility and its public governing body wherein the utility presents a case to adjust the rates of service to its customers in order to adjust cost for capital expenditures over the previous years. The Public Service Commission and Public Utilities Commission are the respective governing bodies in Montana and South Dakota.

Recloser – A recloser is a device with variable settings that can be used to balance reliability and system sensitivity. In the case of an identified fault current, the recloser will 'operate' or 'open' or 'trip,' causing a temporary interruption. Immediately following said operation, the device may 'close' and re-energize the line, depending on device settings, to verify if the fault cleared itself. If the fault is still present this process can be repeated. This device is a cornerstone of protective strategies due to its ability to adjust the number of reclose attempts and trip speed.

Rejected pole – As referred to in NorthWestern Energy's Electric Operation & Maintenance Guidelines, rejected poles are deemed to have lost 33% or more of their remaining design strength at the time of inspection. Following their identification, these poles are prioritized for timely replacement.

Protective Relay – These work in conjunction with a protective device, typically a breaker or recloser. It compares system information such as, voltage or current, to engineered set points in order to control how that protective device operates.

Right-Of-Way (ROW) – The legal right of utilities or other entities to access a designated easement on private property. NorthWestern uses many of these agreements to establish and maintain the transmission and distribution networks that serve its customers.

Risk tree – Any tree that may contact a power line if it falls. Given the relationship of the width of utility rights of way and the height of mature trees, risk trees are found both in and out of the ROW.

Service territory – Any geographical area that is servable via NorthWestern Energy's facilities and infrastructure. This is typically described by the governing body that determines the rates within that given area. NorthWestern Energy's current service territories outlined in this plan include Montana, South Dakota, and Nebraska.

Severe Fire Danger index (SFDI) – A fire danger index that assesses historical events to forecast extreme fire danger. Developed by fire scientists at the Rocky Mountain Research Station, the United States Forest Service utilizes this index to provide critical decision support information to firefighters and fire-prone communities.

Supervisory Control and Data Acquisition (SCADA) – A category of software applications for controlling industrial processes. In a utility context, this system usually provides remote visibility and, in some cases, control of devices within an electrical system.

System Average Interruption Duration Index (SAIDI) – A commonly used reliability index in the utility industry, this describes the length of time that every customer on the system would have been out of power, had the total number of outage minutes over the last twelve months been evenly distributed to each meter. It is fully defined in IEEE Standard 1366-2022.

Splices – A method of connecting two ends of a wire. This often looks like a small sleeve over the wire to re-join a damaged span or section.

Sustained outage – NorthWestern Energy defines this as a system outage of five minutes or greater where customers do not have power. These can be planned or unplanned in nature.

Transmission – Also known as a "bulk electric system," the term transmission primarily refers to high voltage electric lines delivering power between substations and across long distances. Portions of the transmission system are sometimes referred to as sub-transmission in particular use-cases of lower voltage transmission lines.

Vegetation fuels – Any burnable natural material, live or dead.

Wildland-Urban Interface (WUI) – The United States Fire Administration describes this as the zone of transition between unoccupied land with vegetation fuels and human development. In these zones, structures or other human development intermingle with undeveloped wildland or vegetation.

Message from Brian Bird, President & Chief Executive Officer

NorthWestern Energy has over 100 years of history providing safe and reliable service to the customers and communities in which we serve. Due to the growing threat of catastrophic wildfires, we embarked upon a journey in 2022 to develop and execute a plan that enhances our historical initiatives while leveraging new strategies focused on utility wildfire prevention.

NorthWestern's Wildfire Mitigation Plan represents our commitment to protecting our customers and the communities in our service territories from this growing threat. There are inherent risks with operating an electrical grid in wildfire-prone areas. The purpose of this Plan is to identify those risks and implement strategies to reduce or manage these risks. Strategies within this Plan manage the operation of the system as environmental conditions change and reduce the ignition potential through grid enhancements.

We have and will continue to engage with utility neighbors, government agency partners, and the communities we serve to continually enhance our ability to manage wildfire risk and expect the on-going evolution of our strategies for effective wildfire risk mitigation.

We expect this risk to continue to grow in the coming years and decades, but NorthWestern Energy remains committed to providing safe and reliable energy to our customers. Our Wildfire Mitigation Plan is foundational to achieving that mission.

Section 1 - Introduction

Section 1 – Introduction

NorthWestern Energy (NorthWestern) is committed to providing safe and reliable service to its customers. This document will provide a comprehensive understanding of existing, new, and enhanced wildfire mitigation strategies. This plan highlights the increasing wildfire risk within NorthWestern's service territories.

NorthWestern originally introduced this document to the public in 2022 as the Enhanced Wildfire Mitigation Plan. Since 2023 and henceforth, it shall be known as the Wildfire Mitigation Plan (the Plan). The Plan is a living strategic document and will be updated as needed to reflect organizational progress and advancements towards addressing wildfire risk. This version reflects 2025 updates and describes advancements over the prior calendar year.

Drought, insect infestation, forest health cycles, and human migration into the Wildland-Urban Interface are among the contributing factors increasing wildfire risk which are beyond NorthWestern's control. The Plan's objectives are targeted at factors which NorthWestern can influence—notably, the reduction of system ignition potential and management of fire impacts near utility infrastructure. These objectives can be accomplished through activities which are measurable, attainable, and effective at reducing the probability and consequence of ignition.

1.1 – NorthWestern Energy

NorthWestern is a regional provider of electricity, natural gas, and related services to more than 787,00 metered customers in Montana, South Dakota, and Nebraska (Figure 1). The electric system serves more than 318 communities and surrounding rural areas within Montana and South Dakota through more than 29,100 line miles of transmission, distribution, and associated facilities. The natural gas system serves 168 communities and surrounding rural areas of Montana, South Dakota, and Nebraska, through approximately 10,000 miles of transmission and distribution pipelines and storage facilities. NorthWestern employs approximately 1,600 full-time personnel to operate, maintain, and expand this system.

Previous iterations of the Plan specifically focused on the Montana electric service territory due to high fuel density, mountainous topography, and aging infrastructure. Comparatively, the South Dakota electric system possesses a younger asset-life profile and exists primarily in areas of lower ignition consequence such as cultivated agricultural fields. Under certain conditions, wind-driven grassland fires can be equally as consequential as forest fires. Out of an abundance of caution, this release and future releases of the Plan will include an assessment of wildfire risk in both Montana and South Dakota. The Nebraska service territory is solely a natural gas system and is not considered a significant wildfire risk at this time. Strategies within the Plan are deployed as deemed regionally and geographically appropriate.

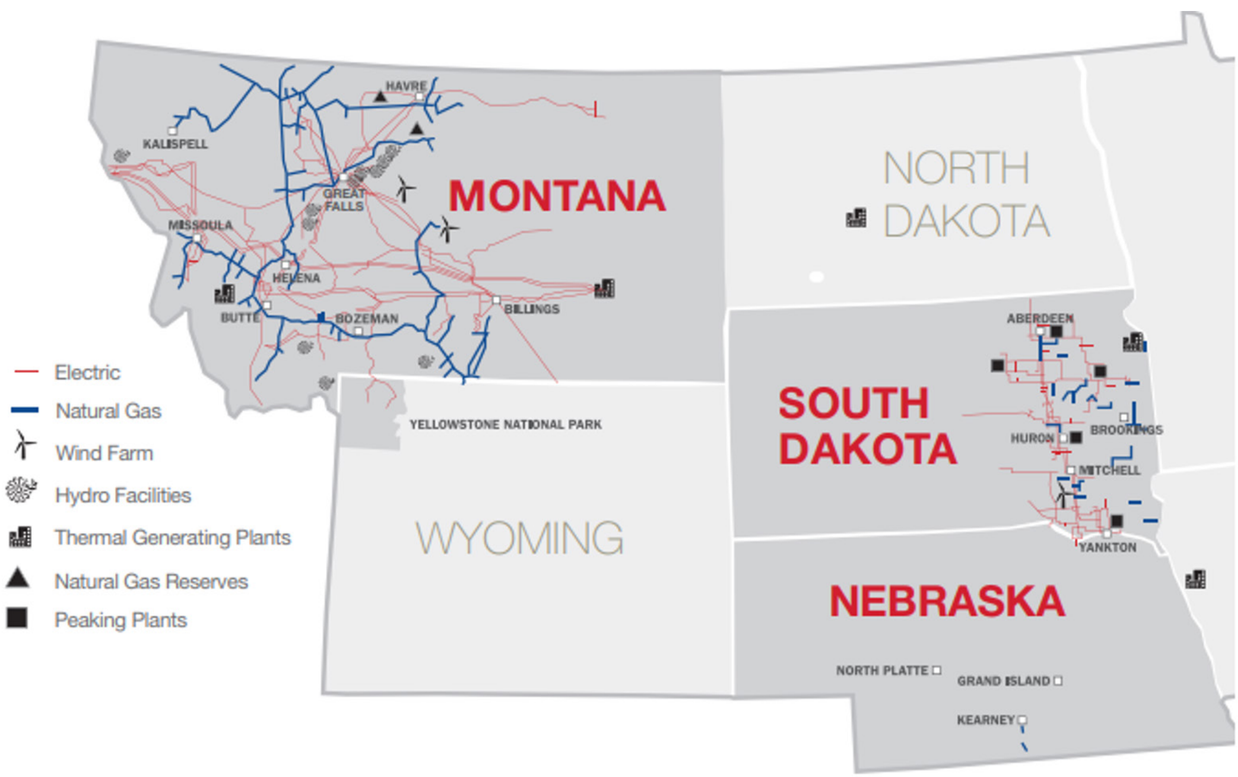


Figure 1: NorthWestern's Service Territories

1.2 – NorthWestern Energy's Historical Wildfire Investments

NorthWestern has demonstrated an extensive history of commitment to delivering safe and reliable service to its customers through significant infrastructure investments (Figure 2). This priority has enabled NorthWestern to react to changing conditions, including an increasing wildfire risk.. While previous investments were not specifically focused on wildfire mitigation, strategic management of transmission and distribution assets proved to have a synchronous benefit of reducing ignition risk.

The 2011-2018 Distribution System Infrastructure Program (DSIP) was a crucial investment that targeted anticipated issues on the Montana distribution system. DSIP was developed to arrest or reverse the trend in aging infrastructure, build margin capacity back into the system, maintain reliability over time, and position NorthWestern to adopt new cost-effective technologies. (Appendix A)

NorthWestern successfully accomplished the DSIP goals in 2018 and currently performs within the top quartiles of reliability metrics compared to its peers.[1] Reliability-focused strategies such as system hardening and vegetation management proved efficacious at mitigating wildfire risk by reducing opportunities for ignition. Utility-caused ignitions can occur from the same event that creates a service interruption, such as the opening of a protective device or contact with a tree branch. The potential spark produced by these events can ignite nearby available fuels. Momentary contacts, which do not evolve into a sustained outage, can also create an ignition and are reported separately. Therefore, integrating existing programs with targeted wildfire initiatives simultaneously addresses the increasing risk of wildfires and actively improves service reliability.

The Hazard Tree and Forest Management programs were designed and implemented in 2019, following the successful conclusion of DSIP. These programs represented a modified approach of integrating reliability and wildfire strategies. The Hazard Tree program was designed to mitigate risk by evaluating structurally deformed or damaged trees within striking distance of overhead infrastructure. Previous programs exclusively addressed vegetation within the ROW. The Forest Management program expanded upon established hardening initiatives and focused on improving infrastructure within forested areas. At the time, forested areas received significant prioritization by wildfire mitigation programs due to the perceived risk of catastrophic wildfires.

Programs like Hazard Tree and Forest Management were sufficient for addressing wildfire risk during the time in which they were developed and implemented. However, changing conditions within the operating environment have driven the need to evaluate existing programs and develop new initiatives. Continuous improvement is necessary to adapt to variable risk conditions.

Historical System Infrastructure Programs	Current System Infrastructure Programs	Historical Wildfire Risk Focused Programs
2010 - 2018	**2018 - Current**	**2019 - 2023**
Distribution System Infrastructure Program (DSIP) • Invested $214M Capital, $37M Expense • Pole Replacement (Poles): 29,982 • Patrol Repairs: 8,366 • T&D Tree Trimming (OH Miles): 7,161 • Rural Reliability (Circuits): 12 • Substation Refurbishments (Subs): 111 • MT Automation (T/D/S): 601 Devices	**Transmission System Infrastructure Program (TSIP)** • Pole Replacement • Approximately $5-10M/yr **Substation System Infrastructure Program (SSIP)** • Component Based • Approximately $6.5-10M/yr **Reliability and Asset Life Programs** • Distribution Pole Replacement • Approximately $9-12M/yr • Section Reliability • Approximately $2.5M/yr	**Hazard Tree Program** • T&D Risk Based • Approximately $3M/yr **Forest Management Program (FM)** • Targeted T&D Approach • Approximately $12M/yr
Asset Stabilization	Modernization	Focused Risk Mitigation

Figure 2 - NorthWestern's Journey to the WMP

1 *Public Service Commission. (February 28, 2025) For Regulated Utilities - Reports. State of Montana. https://www.psc.mt.gov/_docs/Reports/Electric-Reliability/2024/2024_NWE_Electric_Reliability_Report.pdf*

1.3 – Wildfire Conditions in Montana & South Dakota

Owning and operating utility assets within an area at risk of wildfires presents inherent risks and challenges. Wildfires can be destructive, and preventing wildfire ignition is a top priority for many utilities. NorthWestern is no exception. As such, understanding fire behavior and the impact of forecasted conditions are both crucial aspects of wildfire mitigation.

Fire behavior is the result of the interaction between fuels, weather, and terrain.[2] Fuels encompass burnable matter like grass, shrub, timber, understory, etc. As weather conditions change throughout the year, so too does the burnability of each fuel type. The type(s), concentration, and moisture of available fuels impact the flame length, intensity, and spread rate of a potential fire. Tall grasses in the early spring have a high moisture content, rendering ignition and spread of fire relatively difficult. After several months of exposure to sun and low humidity, grasses become "cured" and can be conducive to fire spread. Weather factors like wind speed and direction further influence fire behavior by encouraging a higher rate of spread, which can carry embers to adjacent fuel sources. Wildfires also tend to ignite fuels uphill topographically, as flames spread upwards from their base.

NorthWestern's service territories are vast and geographically diverse. The dense forests of Western Montana present unique characteristics from the expansive grasslands of Eastern Montana and South Dakota. The National Land Cover Database, produced by the United States Geological Survey, provides granular detail of the contiguous United States and Alaska.[3] Fuels vary by land cover type. The predominant land cover types present in the South Dakota service territory are Shrubland, Pasture/Hay, and Cultivated Crops (Figure 3). Conversely, NorthWestern's Montana service territory comprises a more diverse range of land cover types including Evergreen Forests and larger Grasslands.

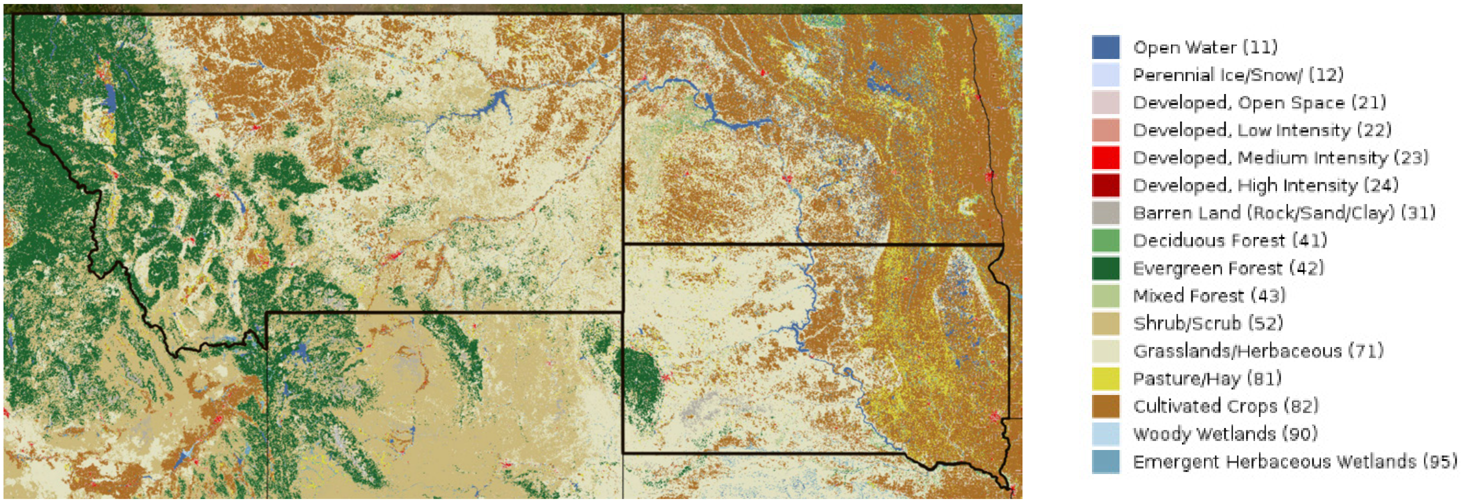


Figure 3: United States National Land Cover Database Map

2 Scott, J. H. & Burgan, R. E. (June 2005). *Standard Fire Behavior Fuel Model: A Comprehensive Set for Use with Rothermel's Surface Fire Spread Model.* Rocky Mountain Research Station, U.S. Department of Agriculture. https://www.fs.usda.gov/rm/pubs_series

3 Earth Resource Observation and Science Center. (September 11, 2018). *National Land Cover Database.* U.S. Geological Survey. https://www.usgs.gov/centers/eros/science/national-land-cover-database

The Wildland-Urban Interface (WUI) describes the areas in which the built environment meets the natural environment. WUI areas encroach upon defensible space for suppression by fire agencies, increase the likelihood of human-caused ignitions, and magnify the consequence of wildfires. From 1990-2010, population growth in high-hazard WUI areas increased by 160% (Figure 4).[4] Development in these areas is particularly vulnerable to impact from wildfire due to the proximity of structures (e.g. homes, schools, hospitals, etc.) and vegetation. Homeowners can protect their property by utilizing fire-resistant building materials and landscaping to maintain a survivable space.[5]

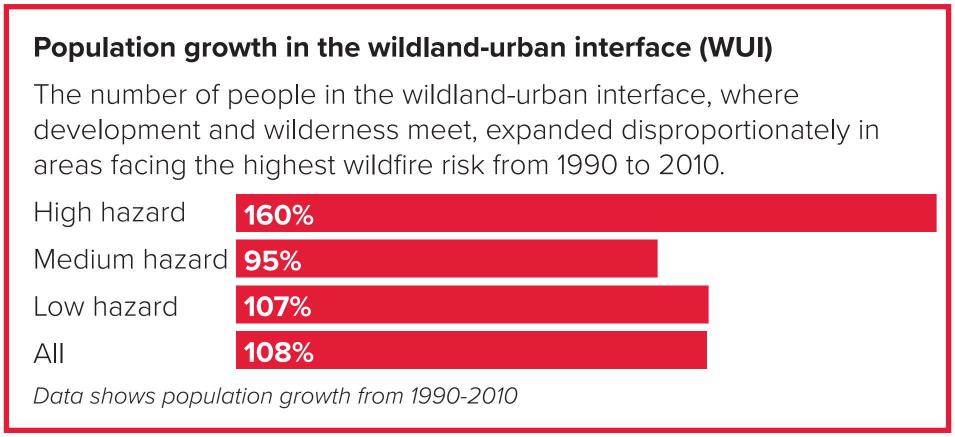


Figure 4: Population Growth in the WUI

The term "fire season" generally refers to the months of the year that present conditions favorable to fire ignition and spread. Typically, this includes the later summer months like July and August when precipitation is less frequent and fuels are drier. Internal data collected over the past decade reveals that observations of NorthWestern facilities near fire activity has expanded from April-October to March-November (Figure 5).

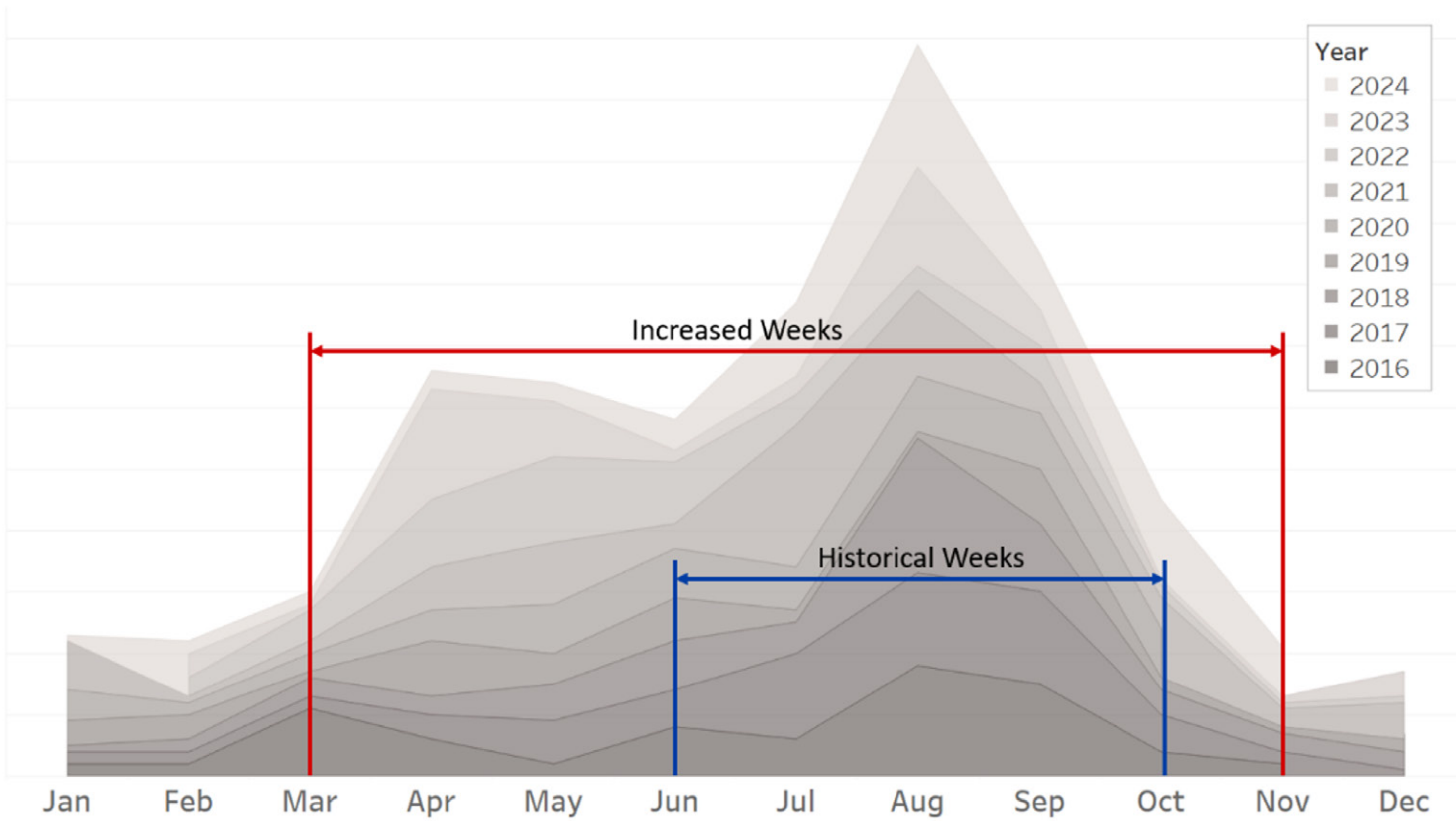


Figure 5: Historic vs. Current Observed Fire Conditions

Emerging and continued research aims to understand the effect of future conditions on wildfire risk and resource

4 Rao, K., Konigs, A., Yebra, M., Diffenbaugh, N., & Williams, P. (February 9, 2022). "The fastest population growth in the West's wildland-urban interface is in areas most vulnerable to wildfires. The Conversation. https://theconversation.com/the-fastest-population-growth-in-the-wests-wildland-urban-interface-is-in-areas-most-vulnerable-to-wildfires-17341

5 National Interagency Fire Center. (2024). Prepare and Protect Your Home. U.S. Department of the Interior. https://www.nifc.gov/fire-information/fire-prevention-education-mitigation/wildfire-mitigation/home management. Fire ecologists utilize the Energy Release Component (ERC) metric to energy availability per unit area of the flaming front of a fire. This measure is dynamic and dependent on daily conditions. Figure 6 illustrates a map view of the forecasted increase in days per year that exceeds the historical 97th percentile of ERC.[6] The dark orange and yellow hues represent an average expected increase of 9-18 days per year by midcentury.

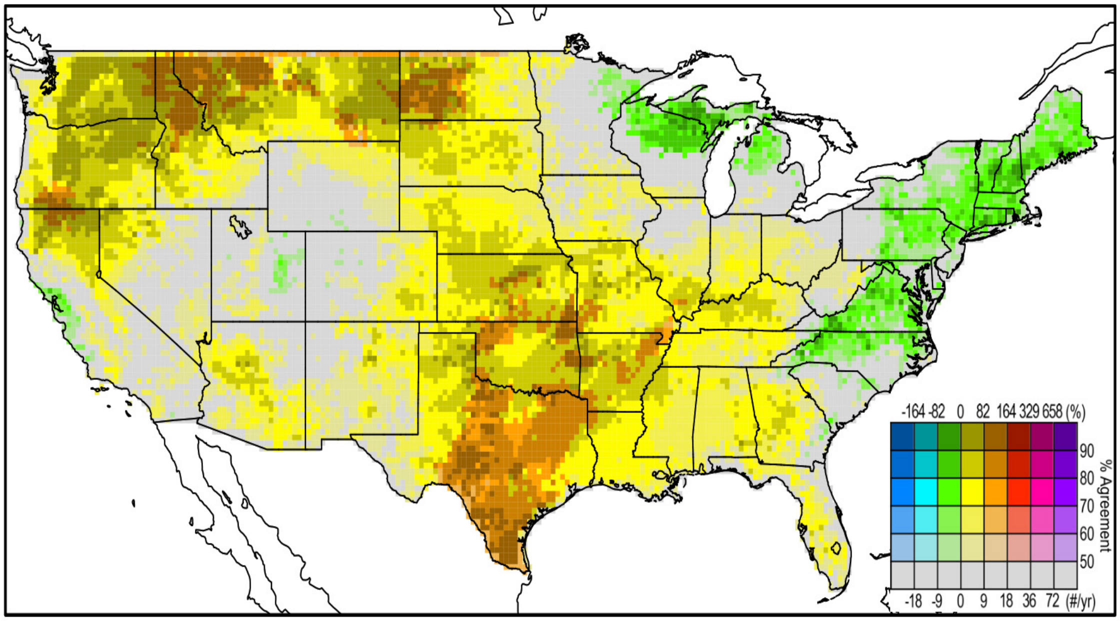


Figure 6: Average Change in Days Exceeding 97th Percentile ERC by Midcentury

** The saturation of the y-axis refers to the percentage of agreement between models while the blue-purple diverging hue of the x-axis refers to the forecasted average change in number of days per year.*

*** The data is derived from the NA-CORDEX 13 dynamic regional climate simulations under the RCP8.5 emissions scenario.*

1.4 – Defining Wildfire Risk

Changing weather conditions and human migration have altered NorthWestern's operating environment. The increased frequency of weather conducive to fire spread and proximity of human settlement to defensible buffers have led to a documented increase in wildfire risk. From 2014-2024, the United States Department of the Interior and United States Department of Agriculture - Forest Service (USDA-FS) spent over $2.9B annually on wildfire suppression. This figure is estimated to increase by as much as 84% by 2050.[7] It is critical, now more than ever, to quantify the system and environmental impact on this risk within NorthWestern's service territories. Although risk can never be fully eliminated, it can be managed.

NorthWestern has utilized preventative maintenance programs for decades. These programs were traditionally focused on reliability and asset health. Recently, new tools and technologies have been developed to assist electric utilities in managing wildfire risk. The significant advancements in technology and increase in wildfire risk drives the need to modify the scope and frequency of certain existing initiatives and develop new targeted wildfire programs. This is accomplished by defining probability, consequence, and risk in the context of wildfires, then developing metrics by which to quantifiably reduce these variables.

NorthWestern defines risk as a composite relationship between probability and consequence. In the context of wildfire, probability represents the potential occurrence of an ignition event based on information such as system, weather, or environmental data. Consequence encompasses factors including impact to existing structures (e.g. homes, schools, hospitals, etc.), total fire volume, and total area burned. Each potential ignition point along the system carries a unique consequence due to the varying presence of fuel types, land cover, and structure density throughout the service territories.

Probability & **Consequence** = **Risk**

6 Kessenich, L., M. Bukovsky, S. McGinnis, L. Mearns, J. Abatzoglou, & A. Cullen. (2025) "Multi fire index examination of future climate change affecting wildfire seasonality and extremes in the contiguous United States." Submitted to Journal of Applied Meteorology and Climatology. December 2024.

7 Farmer, S. & Myers, J. M. (2024). Economic risks: Forest Service estimates cost of fighting wildfires in hotter future. U.S. Department of Agriculture. https://www.fs.usda.gov/about-agency/features/economic-risks-forest-service-estimates-costs-fighting-wildfires-hotter

System performance data can be used as an indicator to quantify the probability of ignition by NorthWestern facilities. Atypical conditions, including airborne debris blown into an energized line, can carry a potential for an ignition. These events are considered ignition events and are represented in risk models by system probability. NorthWestern can estimate this probability based upon historical outage frequency, asset health, and exceptions noted from routine assessments. Probability values can be combined in conjunction with consequence data produced by an external vendor to quantify relative risk across NorthWestern's service territories. Relative risk values can be used to facilitate the prioritization and deployment of targeted wildfire risk mitigation strategies.

Figure 7: Wildfire Hazard Potential 2023

Consequence defines the environmental and structure impact of a potential fire ignited by the electric system. Wildfire Hazard Potential (WHP) is a product developed by the USDA-FS to identify areas of high fuel-load density within the contiguous United States (Figure 7).[8] WHP was used in the prior versions of the Plan as a method of quantifying consequence for system hardening prioritization. As the Plan has matured, an external vendor specializing in wildfire modeling provided enhanced granularity and accuracy of the consequence model throughout NorthWestern's service territories. This fire spread modeling has replaced the role WHP played in early iterations of the plan and is an integral aspect of several mitigation programs. NorthWestern will continue to evaluate the integration of new data sources into the Plan as new resources become available and validated.

NorthWestern incorporates short range forecasts and current system data to initiate agile responses to changing conditions within the operating environment. Consequence simulations provide insights for long-range strategies and can complement real-time weather data to determine risks based upon current conditions. Real-time forecasts and indices are necessary for strategic operational responses to current events. Severe Fire Danger Index (SFDI) is a resource developed by the Rocky Mountain Research Station that can help identify periods of elevated ignition risk. SFDI incorporates inputs like ERC, Burning Index (BI), and Spread Component.[9] Current data such as SFDI can then be used to select special operating modes or inform crews to take extra precautions in the field when necessary. Internal specialists work year-round to assess relative risk on a daily basis and take appropriate action.

8 Forest Service. (June 17, 2024). Wildfire Hazard Potential. U.S. Department of Agriculture. https://research.fs.usda.gov/firelab/products/dataandtools/data-sets/wildfire-hazard-potential

9 Rocky Mountain Research Station. (2022). Anticipating Severe Fire: Severe Fire Danger Index. Forest Service, U.S. Department of Agriculture. https://research.fs.usda.gov/rmrs/news/highlights/anticipating-severe-fire-severe-fire-danger-index

1.5 – Wildfire Mitigation Plan Methodology

In 2020, NorthWestern joined the Pacific Northwest Utility Wildfire Working Group (PNUWWG) as part of a process to evaluate established programs and explore areas of improvement. Member utilities include: Avista, Idaho Power, Chelan County PUD, Rocky Mountain Power, Portland General Electric, Pacific Power, and Puget Sound Energy. Outreach with neighboring utilities fosters enhanced collaboration. These discussions were foundational to the development of the Plan and continued enhancements. PNUWWG members participate in ongoing discussions to gain an understanding of neighboring utility's methods for managing assets in areas of elevated wildfire risk. These conversations address topics ranging from the deployment of new technology to effective public communication strategies. Prior to developing the Plan, NorthWestern conducted an external review of PNUWWG member utility's wildfire mitigation plans and an internal review of policies and procedures. These analyses informed the Plan's four main objectives summarized below:

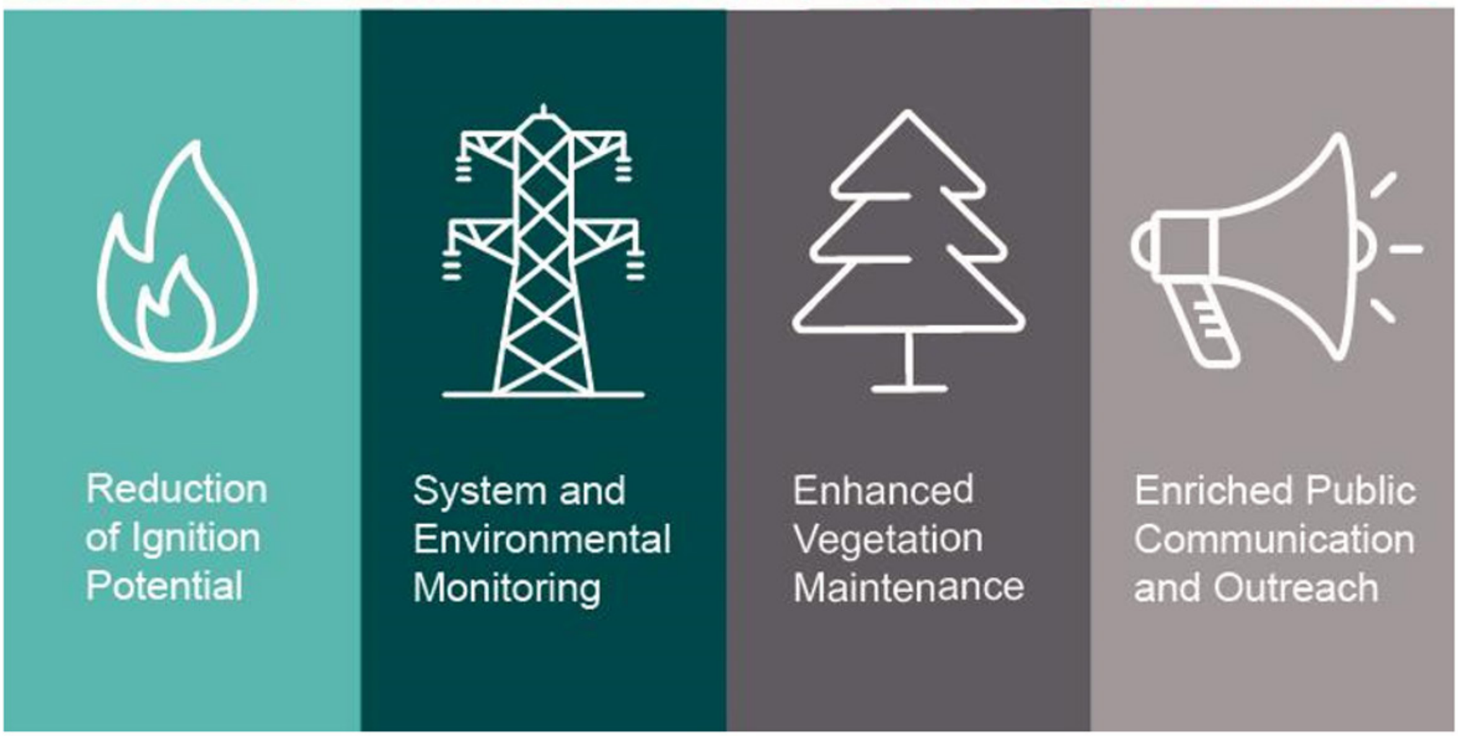


Figure 8: Wildfire Mitigation Plan Objectives

The four objectives served as a foundation upon which proposed enhancements could be deployed. A gap analysis was performed to understand the mitigation efficacy of new strategies. A "current state" score was assigned to initial program performance. This score was then compared to the "improved state" score of enhanced programs. A percent improvement was calculated for each activity to determine if a positive impact had been made. Programs were then cataloged and sorted across five categories targeted at achieving the Plan's four primary objectives - bridging the gaps revealed in the analyses (Table 1). NorthWestern can tailor objectives in these broad categories for NorthWestern's service territories to address regional concerns.

Situational Awareness – Monitoring changes in the operating environment to quantify the impact to probability and consequence of wildfire ignition.

Operational Practices – Close monitoring of momentary outages, development of standard work practices, and establishing of multilayer operational defense strategies to be deployed on the system.

System Preparedness – Proactive maintenance including targeted grid hardening and deployment of technology across the system. The goal of which is the reduction of ignition potential.

Vegetation Management – Proactive efforts to mitigate vegetation contacts, maintain healthy forests, and decrease fuel loading near NorthWestern's ROWs.

Communication & Outreach – Customer education, real-time event communication, and public outreach to affected parties before, during, and after an emergency event.

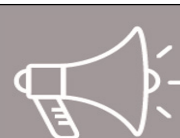
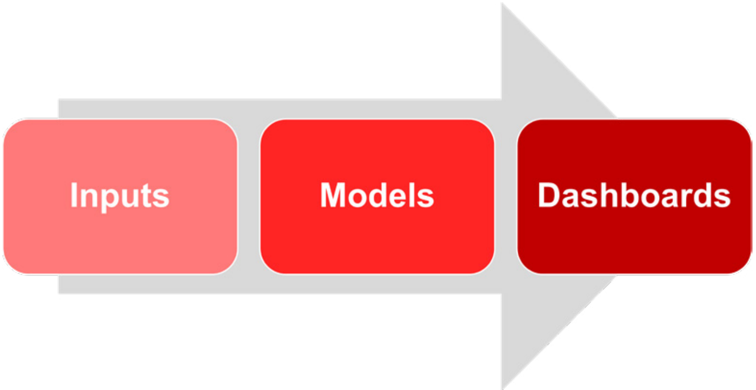
Plan Category	Ignition Potential	System & Environmental Monitoring	Vegetation Management	Communication & Outreach
Situational Awareness				
Operational Practices				
System Preparedness				
Vegetation Management				
Communication & Outreach				

Table 1: Summary of Category Objectives

Further review of the South Dakota system revealed that wildfire mitigation strategies could be deployed effectively to the entire electric operating system. Strategies are implemented or modified as applicable to address regional concerns. The Plan's four objectives and five principal categories remain the same over NorthWestern's electrical service territories.

1.6 – NorthWestern's Suite of Tools

Utilities with mature wildfire prevention plans pursue a multifaceted approach to mitigate utility-involved wildfire risk within their service territories. Since the establishment of the Plan, NorthWestern has collaborated with internal specialists and external vendors to develop tools to mitigate wildfire risk. NorthWestern's Suite of Tools is a decision-making framework encompassing inputs, models, and dashboards. Inputs are stand-alone pieces of information such as fuel conditions, wind speed, or asset health, which quantify metrics for models. Models synthesize inputs through a mathematical or scoring logic process and serve as a foundation for dashboards. Dashboards are visual communication instruments which integrate inputs and models to provide enhanced decision-making abilities. These tools establish a comprehensive, system-wide view which enhances decision making for targeted wildfire programs such as system hardening or EPSS.



The Suite of Tools contains two functional modes: static and dynamic, based upon the update frequency of the data. Dynamic data is updated on a real-time, hourly, daily, or weekly basis. Static data can be updated quarterly, biannually, or yearly. The functional mode of the tools enhances the decision-making capabilities. During periods of elevated ignition risk, it is necessary to have the most up-to-date information. Long-range investment strategies, in contrast, require a high-level historical understanding of the system. The different modes and tools intertwine to form an actionable network of strategies for effective wildfire risk mitigation. Major tool types outlined in the Plan include:

- **Wildfire Consequence Model (WCM):** A static resource, produced by an external vendor, which utilizes fire consequence modeling to quantify impacts to assets at risk within the service territories. This model simulates millions of fires ignited in proximity to overhead lines under historical wind and weather conditions using a fire spread model. This resource can be updated and rerun to align with advancements in fire science or modeling technologies.
- **Infrastructure Resilience Model (IRM):** a static model which integrates internally produced system probability and external consequence data to prioritize assets for various hardening and operational strategies.
- **Wildfire Risk Index Model (WFRI):** a spatial dynamic risk model which combines fire weather indices, asset health information from the IRM, and consequence data from the WCM to drive NorthWestern's EPSS efforts.

- **Fire Weather Dashboard:** a dynamic dashboard which evaluates real-time weather and environmental conditions for associated PSPS evaluations.
- **Work Practice Dashboard:** a dynamic dashboard incorporating forecasted fire weather indices and burn restrictions to indicate which level of NorthWestern's Work Practices Matrix field employees should observe and to which they should adhere.

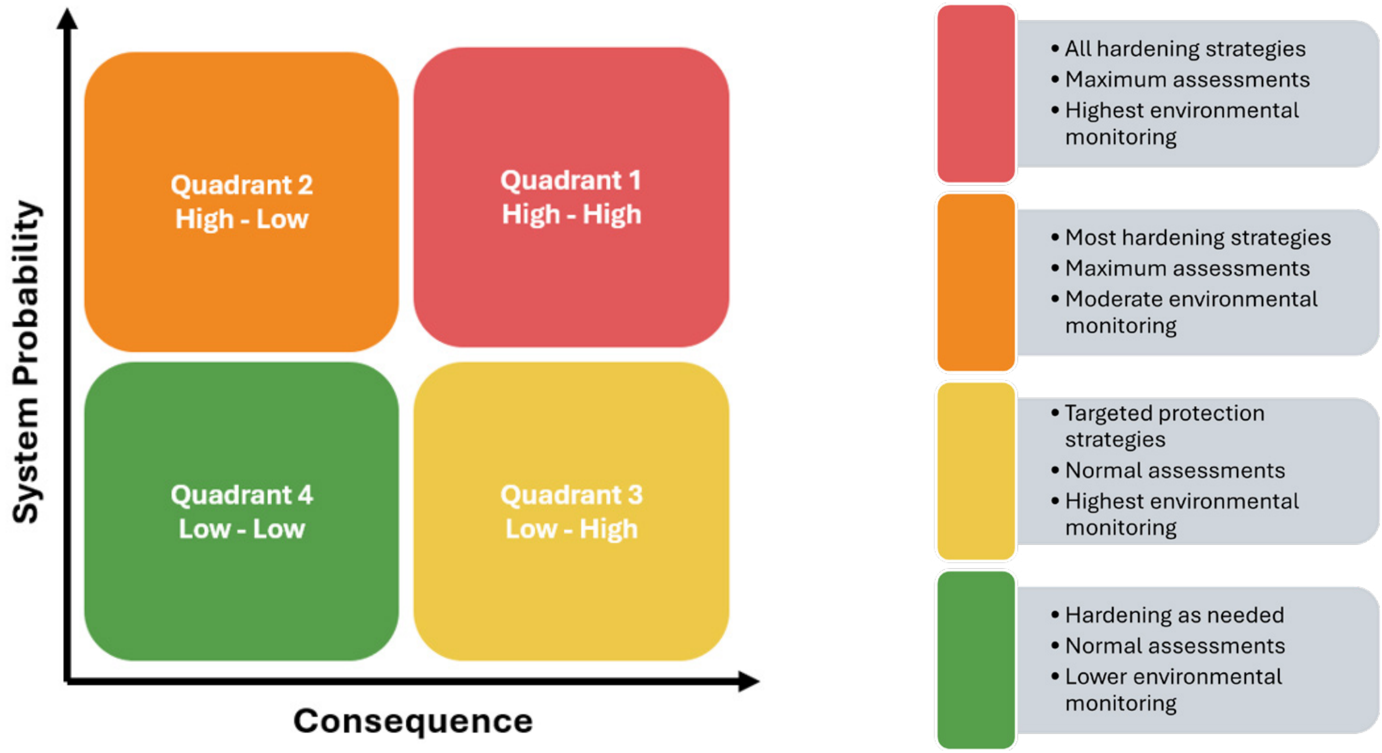


Figure 9: IRM Risk Prioritization

Figure 9 represents the general method of risk prioritization by the IRM. Assets are prioritized into four quadrants: (1) high system high environmental; (2) high system low environmental; (3) low system high environmental; and (4) low system low environmental. All assets are monitored and assessed. The degree of assessment and strategy deployment escalate in proportion to relative risk.

Each tool serves a dedicated general purpose (Appendix C). However, NorthWestern can combine tools or enhance them beyond their original scope to better suit emerging needs within the vast and diverse service territories. The tools in their current state represent years of inter-departmental collaboration and external vendor expertise. NorthWestern will evaluate innovative technologies as they become available and validated within the industry. NorthWestern may integrate new strategies within the existing framework as it deems appropriate.

Section 2 - Plan Summary and Accomplishments

Wildfire Mitigation Plan Summary

Previous Year Accomplishments (2024)

Section 2 – Plan Summary and Accomplishments

2.1 – Wildfire Mitigation Plan Summary

Recent years have shown a steady increase in wildfire activity in the United States. NorthWestern's service territories have faced events in recent history such as drought and insect infestation that have increased the risk of wildfire in both forested areas and grasslands. To make sense of the vast and dynamic range of variables that define wildfire risk, NorthWestern uses a suite of data driven tools to combine the probability of an event occurring with the consequence of potentially experiencing one.

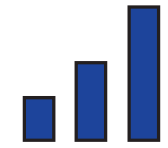
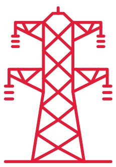
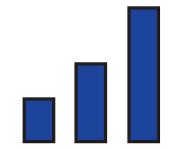
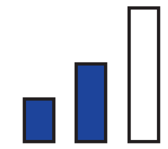
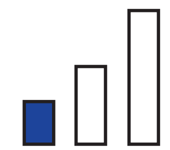
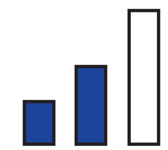
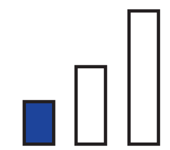
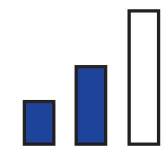
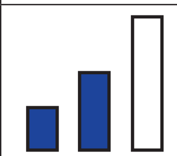
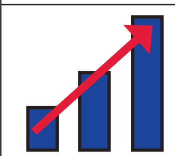
To combat this growing danger, NorthWestern first formalized and began implementing its Wildfire Mitigation Plan in 2022 to consolidate and focus the efforts that the company executes towards mitigating wildfires. The initial publication of the Plan set the roadmap for the following years of enhanced wildfire mitigation activities. The road map transformed goals into a formalized plan that supports NorthWestern's continuing objectives of providing safe and reliable service. In 2023, NorthWestern focused on even more growth and development of enhanced wildfire mitigation activities and Plan strategies, such as the development of the PSPS strategy. As NorthWestern moved through 2024 and into 2025, many of the Plan's initiatives have come to fruition and materialized to serve NorthWestern in its wildfire mitigation efforts. Understanding the impacts and efficiencies of wildfire mitigation programs and activities is critical to effective growth and successful development of NorthWestern's Plan. NorthWestern has begun capturing the benefits and results of programs and activities and will continue to do so into the foreseeable future.

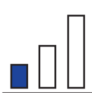
The Plan consists of both established and enhanced activities. Established activities range from grid hardening techniques to fuel reduction strategies, customer education, and alternative protection strategies. Enhanced activities build upon the existing activities with a targeted goal of mitigating wildfire risk. With the new priority of wildfire mitigation, leading edge technologies and strategies have been explored and are being deployed across the utility landscape. NorthWestern actively seeks out and investigates the viability of these solutions and then evaluates or pilots these solutions for possible implementation. These activities are described at length in Sections 3 through 7 of the Plan.

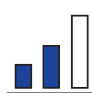
2.2 – Previous Year Accomplishments (2024)

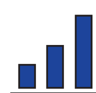
This section summarizes NorthWestern's prior year achievements and tasks executed under the Plan. NorthWestern's 2024 Plan-related work included adding staff, further development of strategies, and implementation planning for execution in 2025 and beyond. During 2024, NorthWestern created multiple new positions to formalize the cross functional efforts that are necessary for successful execution of the Plan.

Table 2 summarizes the overall, continuing benefit for the five categories addressed in the Plan. NorthWestern has realized benefits from the efforts thus far. Details are listed following the table with descriptions of the primary achievements from 2024. These updates are focused on enhanced activities while established activities continued as normal.

	Category	2023	2024	2025	2026	2027
	**Situational Awareness**			-	-	-
	**Operational Practices**			-	-	-
	**System Preparedness**			-	-	-
	**Vegetation Management**			-	-	-
	**Communication & Outreach**			-	-	-


Work has been started and may be associated with new endeavors or in development of activities that are planned to be executed in a future year.


Completed work addresses the majority of the work planned for the year.


All the planned work for the year was completed.

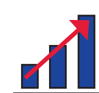

Work completed exceeded what was planned for the year.

Table 2: Annual Benefit Realization

Situational Awareness

- NorthWestern deployed a focused Wildfire Operations Department with resources dedicated to situational awareness, electric line maintenance, and vegetation management.
- The Situational Awareness Team added one full-time meteorologist.
- Specific to Montana:
  - ↳ The WCM was established, with the support of a third-party vendor, to quantify the consequence of potential fires ignited by transmission and distribution facilities.
  - ↳ The WFRI model was extended to the distribution system to determine operational zones which may require Enhanced Powerline Safety Settings (EPSS).
  - ↳ The WFRI model was tailored and extended to transmission system, with further development and application planned for 2025.
  - ↳ Twenty smoke detection cameras equipped with advanced intelligence detection filtering were installed in 10 key locations deemed high-risk as derived from the WCM.
- Specific to South Dakota:
  - ↳ NorthWestern started providing wildfire and weather outlooks on a routine basis to appropriate personnel.
  - ↳ The WFRI model was tailored and extended to the distribution system, with further development and application planned for 2025.

Operational Practices

- The System Performance Team filled all established roles.
- The applied WFRI Model successfully guided operational decisions including EPSS.
- The PSPS Implementation Plan was finalized and published.
- Work Practices and device settings guidelines were developed, with further implementation planned for 2025.
- The Momentary Interruption Review Program was finalized. The document details the process flow of observation and resolution of momentary interruptions.
- Enhanced training resources were developed for NorthWestern field crews and personnel to cover basic wildland fire terminology, identification of key wildfire components (fuels, weather, topography, etc.), use of standard tools, equipment, and methods of extinguishing a fire. This includes training on system defense strategies, including but not limited to EPSS and PSPS. Training was successful and will continue to be implemented and updated to keep pace with technological advances being deployed across the system.
- Specific to Montana:
  - ↳ The System Performance Team is fully operational for monitoring momentary interruptions on the transmission system. The momentary interruption review was piloted on the distribution system.
  - ↳ 200 pilot fault sensing devices were ordered and were deployed on the distribution system. The devices have a multi-sensory array to allow for increased accuracy and information gathered from a fault.
- Specific to South Dakota:
  - ↳ Momentary interruption processes are developed and are pending resource assignments for 2025.

System Preparedness

- The Central Construction Department was successfully restructured, and leadership was added to support increased capital investment on transmission and distribution system mitigation projects.
- Distribution Operation's Central Maintenance Team was finalized with additional resources to manage and optimize proactive maintenance strategies.
- Specific to Montana:
  - ↳ Aerial assessments of the transmission and sub-transmission systems continued as normal.
  - ↳ Four vendors were piloted for the distribution ground assessment and three vendors were piloted for the distribution aerial assessment. There is further development planned in 2025.
  - ↳ Accelerated ground assessment efforts were completed and will continue in 2025.
  - ↳ The inventory equipment list was established. The associated strategy for proactive identification of inventory items was also established. Field data gathering is slated to begin in 2025.
  - ↳ The Lidar acceleration is on pace and is pending completion in 2025.
  - ↳ An investigation of more than 1,000 distribution protective line devices was completed to reflect current protection and communication schemes in 2024. This investigation will be further defined in 2025 to determine viable locations for electronic line device and communication upgrades based on WFRI. Devices have been ordered in anticipation of future construction.
  - ↳ New protective technologies have been deployed in several locations to test functionality. Optimal relay upgrade locations are currently being identified.
  - ↳ The IRM facilitated prioritization for the Wildfire Mitigation Hardening Program. Several hundred miles of overhead distribution and transmission lines were upgraded through construction efforts. Efforts will continue in 2025 with a similar number of line miles identified for mitigation.
  - ↳ Project Management of the Plan continued to assure objectives were achieved by monitoring metrics, scope, schedule, and budget.
  - ↳ The Plan Development and Maintenance Team monitored system data to ensure the mitigation strategies were meeting the objective to reduce overall wildfire risk. Strategies were adjusted where deemed appropriate.
- Specific to South Dakota:
  - ↳ The IRM model is being expanded to cover this region with further development and plans for implementation in the future.
  - ↳ Ground assessments will be formalized for implementation on the distribution and transmission systems in future years.

Vegetation Management

- Vegetation Management Team has been bolstered to execute increased responsibilities across NorthWestern's service territories and the enhanced proactive vegetation efforts listed in the Plan.
- A third-party vendor has been identified to pilot remote sensing and analysis of the vegetation growth in proximity to NorthWestern's ROW.
- Enhanced efforts of cycle trimming and proactive vegetation maintenance have been completed for the year including increased miles of line called out in the Plan.
- The Risk Tree Program continued with enhanced efforts.
- Vegetation Hot Spotting continued as normal.
- Efforts towards fuel reduction partnerships have continued with federal, state, and local groups.[10]

Communication & Outreach

- Peer to peer relationships with neighboring utilities have been actively maintained and additions will continue to be sought out. A continuation of virtual and in-person meetings will continue as needed going forward.
- Public Safety Partnerships were actively grown through interactions and attendance with general community members, public safety providers, and the government. Internal and external engagement with key stakeholders will continue across the service territories, including South Dakota, to ensure information is relayed and the needs of the organization are met.
- NorthWestern facilitated enhanced stakeholder engagement about the Plan. Multiple efforts were spearheaded this year to increase stakeholder awareness and readiness about the Plan through fact sheets, presentations, website alerts, email alerts, education, summits, training, virtual exercises, advertising, and a formalization of a hierarchal system for communicating important announcements like PSPS.
- Voluntary interest in PSPS resulted in more than 100,000 views on NorthWestern's website.
- Direct external communication with high consequence area customers occurred for approximately 39,000 customers during the months of July and August.
- Broad reach coverage (i.e., TV, radio, YouTube, Reddit) across Montana approached 250,000 customers and more than 10,000 clicks. This accounts for approximately 25% of Montana's population.

10 U.S. Fire Administration. (2024). What is the Cohesive Strategy and Why Was it Created? U.S. Department of Homeland Security. https://www.usfa.fema.gov/wui/cohesive-strategy/ https://www.usfa.fema.gov/wui/cohesive-strategy/

Section 3 - Situational Awareness

Situational Awareness Data Models

Wildfire Consequence Models

System Monitoring

Weather Monitoring

Wildfire Situational Awareness Team

Section 3 – Situational Awareness

3.1 – Overview and Key Activities

This category describes the programs and tools that NorthWestern employs to strategically monitor the electric transmission and distribution systems. The term, situational awareness, describes the ability to understand the current system and environmental conditions. This is important for proactive monitoring of weather and wildfire conditions and will inform reactive decision making should an event occur. Cognizance of this category provides NorthWestern with the opportunity to understand the impact of changing environmental conditions on relative risk. The following tools and activities will provide the situational awareness necessary to guide Operational Practices.

Key Activities

- Dedicated Wildfire Situational Awareness Team to monitor conditions within the operating environment.
- Multiple dynamic, forecasting tools which monitor conditions and drive operational decisions such as field work practices and system settings.
- Enhanced weather information through a hybrid approach of third-party weather data and network of strategically placed weather stations.
- Remote system visibility with the addition of smoke detection cameras equipped with advanced intelligence detection filtering.

3.2 – Established Activities

In years prior to this Plan, NorthWestern conducted environmental monitoring through public, readily accessible data to assess necessary proactive and reactive actions for a wildfire event. A fire notification email list was generated to share pertinent conditions and other impactful information throughout the organization. Third-party weather data often informs many system and operational decisions. Using this information, NorthWestern has adjusted device settings at the discretion of local personnel. Typically, these adjusted settings would limit the reclosing abilities of certain protective devices on the system, thus limiting the ignition probability.

NorthWestern has recognized an opportunity to enhance the practices described above as wildfire risk increases, and emerging technology becomes available to address risk. The necessary Situational Awareness activities can be described in two main groups: situational analysis efforts and situational monitoring efforts. Analyses will use various data sources to assess current and future conditions. The monitoring efforts will increase NorthWestern's awareness of the current conditions and provide necessary information for system models.

3.3 – Enhanced Plan Efforts

3.3.1 – Situational Analysis

Situational Awareness Data Models

These dynamic risk models will utilize a range of internal and external data to provide a comprehensive assessment of near-term wildfire risk. These enhanced data observation platforms are intended to assist the Wildfire Situational Awareness Team. The models will provide a dynamic view of wildfire risk based on forecasted changing environmental conditions. These will be forward-looking tools for preemptive decision making of system settings and field work practices rather than the informal seasonally based process as it has been previously. Reference Appendix C for further details.

Wildfire Consequence Model

Consequence modeling is a strategy commonly deployed by utilities to assess the potential impact of fires ignited by their systems. NorthWestern partners with a contracted vendor to produce this information. As outlined in Section 1.4, the consequence data is applied to key models and dashboards within the Suite of Tools. Consequence modeling enhances situational awareness and provides logical prioritization for preventative maintenance programs, system settings, and work practices.

3.3.2 – Situational Monitoring

System Monitoring

The deployment of technologies such as field cameras will increase NorthWestern's capacity to monitor the system for a wildfire. Modern technologies identify wildfires using video footage and advanced smoke detection algorithms. Given Montana's mountainous topography, view shed analyses are required to optimize camera deployment with visibility of the high-risk wildfire zones. The cameras are connected to a network that notify local first responders as soon as smoke has been detected, indicating the presence of a fire, regardless of ignition source.

Weather Monitoring

This initiative will provide weather monitoring to understand changing environmental conditions across the service territories. Through deployment of owned, contracted, or public weather stations, NorthWestern can better understand local weather patterns and conditions. NorthWestern plans to use the risk models to drive the priority and location of these installations. The supplemental weather data from these devices will be connected to internal models to help drive the forecasted risk across the service territories in real time. Knowledge and analysis from a full-time on-staff meteorologist will also supplement the Wildfire Operations Department's understanding and interpretation of weather predictions.

Wildfire Situational Awareness Team

This team is responsible for continuously monitoring environmental conditions, wildfire risks, weather patterns, and potential ignition consequence. The team maintains a comprehensive understanding of these conditions and provides operational recommendations to reduce and mitigate these risks. In order to do so, the team includes a set of cross disciplinary roles such as a Wildfire Specialist, Geospatial Data Analyst, and Meteorologist. Additional resource needs are continually evaluated based on NorthWestern's ability to deploy the technology and improved awareness described above.

Section 4 - Operational Practices

Section 4 – Operational Practices

4.1 – Overview and Key Activities

The Operational Practices portion of the Plan encompasses monitoring system operations, deploying operational defense strategies, and modifying necessary field work practices to align with changing conditions. Advancing system technologies provide utilities with the ability to actively change and guide how the electrical grid reacts during atypical conditions. With the rapid growth in fire risk, NorthWestern can leverage existing devices and implement new operational strategies tailored towards managing fire risk to balance reliability and ignition probability in all seasons. NorthWestern will employ a more robust Operational Practices strategy than previously used.

In parallel to this, system performance initiatives assess and respond to momentary service interruptions on the electrical system. Typically, unintended line contacts are momentary in nature. To manage unintended contacts, the industry has developed protective devices such as breakers and reclosers that have technologies to identify a line contact through a spike in current and open the circuit to isolate the conductor from the energy source. After a pre-determined amount of time, the device will close the circuit and re-energize the conductor. If the current has returned to acceptable levels and the contact has cleared, the circuit will remain closed, preventing a sustained outage. This event is classified as a momentary outage and requires an investigation because of the probability for ignition.

Historically, NorthWestern approached service interruption analysis from a reliability stance. This meant that sustained outage events received priority to investigate, correct, and mitigate. Reliability-driven programs have served NorthWestern and its customers well through the harsh climate that prevails in the service territories. Because of environmental shifts, the growth in fire season, and the population increases in the WUI, NorthWestern's has pivoted to focus on preventing possible ignition events. This means that all interruptions, momentary and sustained alike, are systematically investigated. Monitoring momentary interruptions allows for proactive mitigation of system issues and reduces possible service outages on the system. This approach will reduce both current and future ignition potential.

As situational awareness on the distribution and transmission systems increases, NorthWestern can deploy more targeted strategies guiding the sensitivity of system settings and adjusted field work practices during elevated risk conditions. Depending on model forecasts and local knowledge, operational defense strategies may include actions such as modifying system protective settings, eliminating reclosing, increasing recloser operating speeds, or initiating a PSPS. NorthWestern may also use this information in active high-risk zones to adjust work practices such as tool choice, vehicle access routes, or the potential stoppage of proactive work.

Key Activities

- Dedicated team evaluating system performance by investigating momentary operations on transmission and distribution systems.
- Established process to mitigate system issues causing momentary service interruptions.
- EPSS to optimize safe reclosing settings during high-risk events.
- PSPS strategy during extreme wildfire hazard conditions.
- Operating procedures to guide work before, during, and after wildfire events.
- Enhanced internal fire safety training for field personnel on proactive measures during periods of elevated ignition risk and reactive measures during wildfire events.
- Acquisition of mobile generating units to be used during emergency events.

4.2 – Established Activities

There are several programs at NorthWestern that address reliability. However, these focus on sustained outages impacting customer reliability or transmission availability, not necessarily momentary service interruptions. At the Plan's inception, the organization did not include a dedicated team to review momentary outages. Whereas there existed established programs to address reliability regardless of outage length and frequency. The Plan calls for a development of a new team specifically monitoring momentaries and identifying mitigations strategies to reduce ignition potential. More details can be found in the following sections.

In Montana, the Section Reliability Program has been, and continues to be, a reliability-based program focused on sustained outages. Its purpose is to take a targeted approach to improve reliability on the electric distribution system. Most sections between protective devices were assigned an Electric Section Identifier (ESID) that is connected to outage data. NorthWestern uses several outage metrics that are common within the industry to prioritize sections with chronic reliability issues. This approach provides a strategy to mitigate sections of circuits that may not meet the criteria for traditional circuit-wide reliability approaches. A program such as this, also provides the ancillary benefit of mitigating sections of line that have a high volume of operations that could result in an ignition.

In South Dakota, the Circuit Reliability efforts have served, and continue to serve, a similar purpose. This program targets entire circuits with the lowest performing reliability metrics and seeks out improvements that can be made to improve reliability. Because of the more consistent rural layout of South Dakota's electrical grid, there has not yet been a need to take a more granular approach, as is done in the Montana territories. Additional details on both Circuit Reliability and Section Reliability can be found in Appendix A.

NorthWestern has historically been committed to modernizing the grid, especially since the DSIP efforts, and has continued to expand to the transmission system by upgrading aging electromechanical relays to modern microprocessor relays. Modern relay technology allows for a communication network to be installed that can centralize the operational visibility and control of all connected relays. These modern microprocessor-based relays allow NorthWestern to situationally adjust protection schemes during varying conditions based on the relevant data. At the Plan's inception, 89% of the transmission relays and 65% of the distribution relays were microprocessor based. On the distribution side specifically, there are also a significant amount of modern microprocessor relay-based protection systems in service in devices downstream of a substation that provide functionality similar to modern microprocessor relay installations typically located within substations. Modern microprocessor relays provide NorthWestern the ability to situationally adjust protection schemes during varying conditions that allow for alternate protection modes with increased sensitivity, faster operating speeds, or reclosing functionality disabled.

During periods of elevated ignition risk, NorthWestern has taken additional precautions to support not only safe and reliable operations of the electrical power system but also to reduce the risk of ignitions. Individual protection devices were set to preemptively block reclosing during fire season on a case-by-case basis. It is common practice, in most cases, during fire season to complete a patrol of the faulted line prior to re-energization. This provides a visual assessment on the condition of the line, reducing the potential of closing in on a fault that could cause an ignition event.

PSPS is the practice of proactively de-energizing electric equipment during times of extreme weather in high fire-risk areas to reduce the probability of electric utility infrastructure causing a wildfire ignition. Historically, NorthWestern has utilized a similar approach in past practices on a case-by-case basis during safety-sensitive situations. A formal PSPS plan was adopted in 2024. This document is updated as necessary and is accessible through NorthWestern's website at NorthWesternEnergy.com/PSPS.

NorthWestern's historical operational practices have been based on operating guidelines focused on mitigating actions that can be taken when the risk of wildfire increases. These practices were designed to provide consistent direction to NorthWestern employees on accepted procedures before, during, and after an active fire impacting NorthWestern's facilities. Operational guidelines can help employees follow necessary steps to establish contact and work with local authorities, including those outlined in the Incident Command (ICS) process. Historically, NorthWestern may have adjusted both protection settings of the system and work procedures during periods of elevated ignition risk, driven by changing environmental conditions.

When responding to wildfire events within its service territories, NorthWestern may initiate an ICS process in coordination with its Public Safety Partners, including local Disaster and Emergency Services (DES) Coordinators, local, tribal, and state government entities, Department of Natural Resources and Conservation, United States Bureau of Land Management, and USDA-FS, etc. The ICS process is a nationally established cross-organization process that enables private and public entities to collaborate in response to an emergency incident, including wildfires.

4.3 – Enhanced Plan Efforts

4.3.1 – System Performance

System Performance

The Plan calls for a dedicated engineering-based team to monitor System Performance. This group is intended to observe line interruptions, primarily those which are momentary in nature, and direct appropriate follow-up actions.

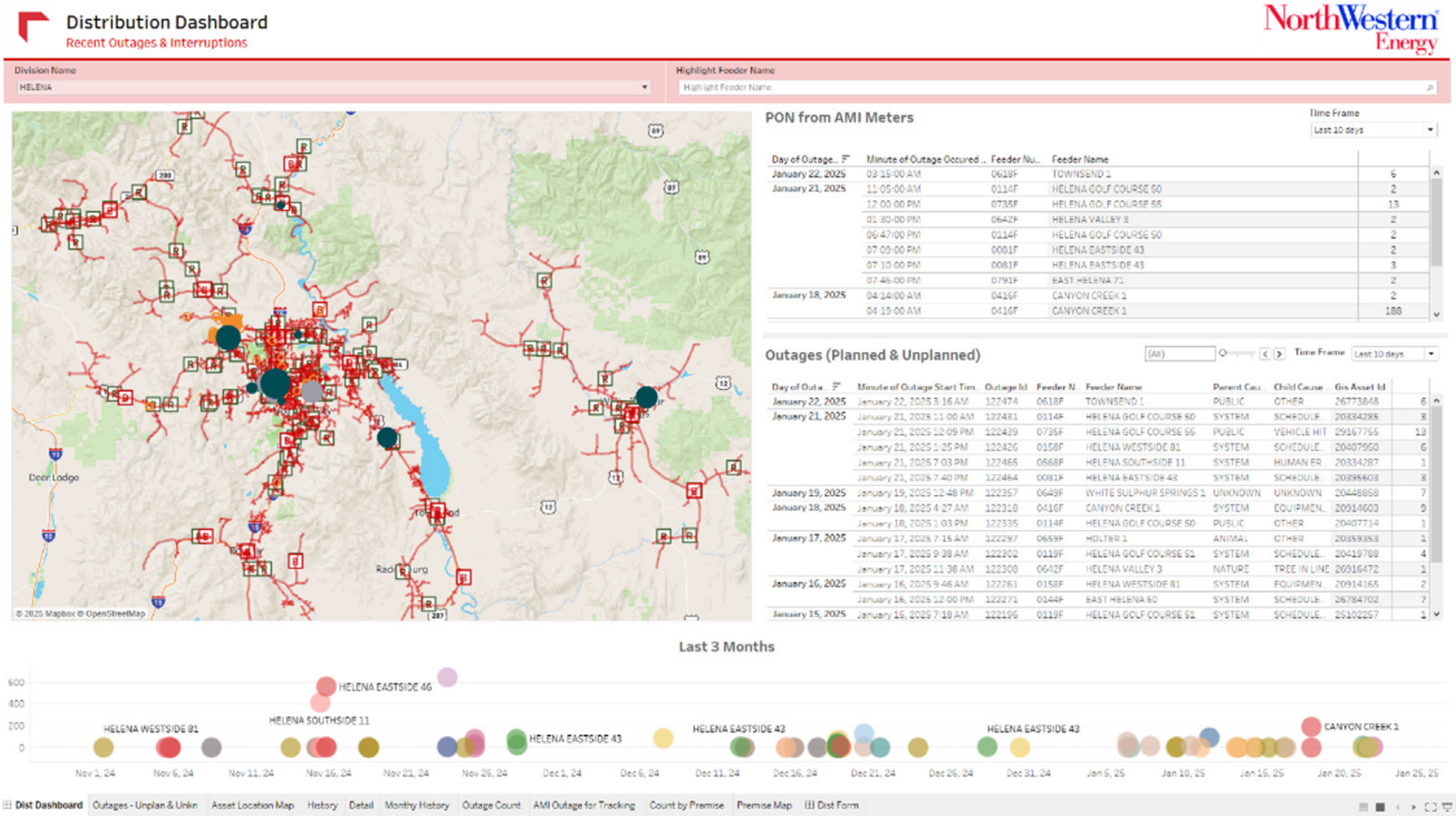


Figure 10: Example of AMI Monitoring Dashboard

The process of resolving momentary operations on the system begins with data monitoring. By gathering multiple data sources from internal systems and deployed grid technologies, the System Performance Team can identify and locate momentary operations on the system. The technologies available for this vary widely from the transmission to the distribution system. For instance, on the distribution system one method of observing outages and operations is at the meter level. AMI meters installed on the system can report momentary interruptions in service. With this data, the System Performance Engineers utilize data visualization tools such as the one shown in Figure 10 to observe which circuits are experiencing multiple events. These meters are critical for a comprehensive view of the effects of momentary interruptions, as well as reporting sustained outages.

Once a line operation occurs, an engineer conducts a review of data and a targeted inspection of the system to identify the root cause of the interruption. Assessment of physical asset data, historical reliability data, and local area knowledge can aid in identifying the source of the momentary interruption.

Following this, appropriate teams (e.g. engineering, vegetation management, etc.) are involved to confirm the cause and remediation response. Because this effort is system-wide and there is a large variance in solutions, it is not feasible to use a single dedicated construction team. The resolution may come in many forms, including but not limited to transmission reconstruction, distribution reconstruction, or vegetation removal.

4.3.2 – Operational Defense Strategies

Enhanced Powerline Safety Settings (EPSS)

Transmission and distribution protective devices allow for dynamic response to changing conditions, including heightened wildfire risk. NorthWestern has historically implemented a non-reclose strategy during wildfire season, which was typically driven by the time of year and local knowledge of experienced employees. Modern dynamic risk models provide a more comprehensive understanding of current and forecasted environmental conditions. With this information, the models can help drive decisions about activating operational defense strategies, such as modified protective settings.

One of NorthWestern's tools for choosing device settings and sensitivity is the WFRI Model. It determines when more advanced protection schemes should be considered to minimize wildfire risk for current and short-range forecast conditions. NorthWestern recognizes that protection schemes that are more sensitive will reduce wildfire risk at the expense of customer reliability. With the help of tools such as the WFRI Model, NorthWestern aims to minimize the tradeoff between risk mitigation and reliability impacts. NorthWestern may adjust operational protection schemes based on wildfire risk (Figure 11) and other relevant factors.

	Wildfire Risk	Risk Description	Operational Defense Strategy
Safety Risk Based Operation	**Extreme**	Fire Start Imminent *Uncontrollable*	PSPS Evaluation
	Very High	Fire Start Easily *Control Limited*	Fire Season Operating Mode 2
	High	Fire Start Caution *Control Challenging*	Fire Season Operating Mode 1
	Moderate	Fire Start Challenging *Control Achievable*	Normal Operations
Reliability Performance Based Operation	**Low**	Fire Start Difficult *Control Easily*	Normal Operations

Figure 11: Example of an Operational Defense Strategy Matrix

When employing EPSS or PSPS, NorthWestern recognizes the importance of the balance between safe operations of the system and maintaining reliable service. As previously discussed, NorthWestern has historically used a segmentation approach on distribution circuits. By breaking the approximately 600 distribution feeders into 33,000 ESIDs, NorthWestern can not only model the risk at a granular level but also utilize this approach to minimize customer outages when deploying EPSS or PSPS. The future installation of additional protection devices with the ability to adjust protection settings will further aid in finding this balance by improving situational awareness and the opportunity to further segment distribution feeders.

Public Safety Power Shutoff (PSPS)

Our Public Safety Power Shutoff Plan

NorthWestern Energy's complete PSPS Implementation Plan can be found at **NorthWesternEnergy.com/PSPS.**

In addition to the technologies, procedures, and protection schemes discussed above, NorthWestern Energy has also developed a PSPS strategy designed to address situations where the risks of continuing to operate electrical equipment are unacceptably high. This strategy describes how NorthWestern may proactively de-energize sections of its electrical infrastructure as a tool to help protect life, property, and natural resources based on current wildfire conditions. The use of PSPS events as a method for combating wildfire risk has been made possible by modern advancements in the flexibility of electrical infrastructure and by improvements in the accuracy of environmental models and forecasts. NorthWestern developed its PSPS implementation strategy following a thorough review of its own existing emergency response plans, planned outage procedures, and a review of peer utility PSPS plans. This approach enabled NorthWestern to tailor its PSPS strategy to the unique conditions across its service territories. While PSPS events are used to reduce the risk of utility-caused wildfires during extreme fire weather, NorthWestern does not automatically de-energize lines for encroaching wildfires. Instead, NorthWestern will coordinate with emergency management to assess the active situation and consider appropriate operational responses, including de-energization when appropriate.

NorthWestern Energy's PSPS Implementation Plan principally comprises three distinct strategies:

1. A situational awareness strategy, which describes how NorthWestern will monitor environmental conditions that may warrant a PSPS event and how it will make decisions to escalate and deescalate PSPS events.
2. An operational strategy, which describes how NorthWestern will prepare for and carry out a de-energization and re-energization with considerations on customer impact.
3. A communication strategy, which describes how NorthWestern will communicate internally and externally about a PSPS event.

In addition, NorthWestern's three-staged approach to conducting PSPS events, as seen in Figure 12, mirrors the approach used by many other utilities.

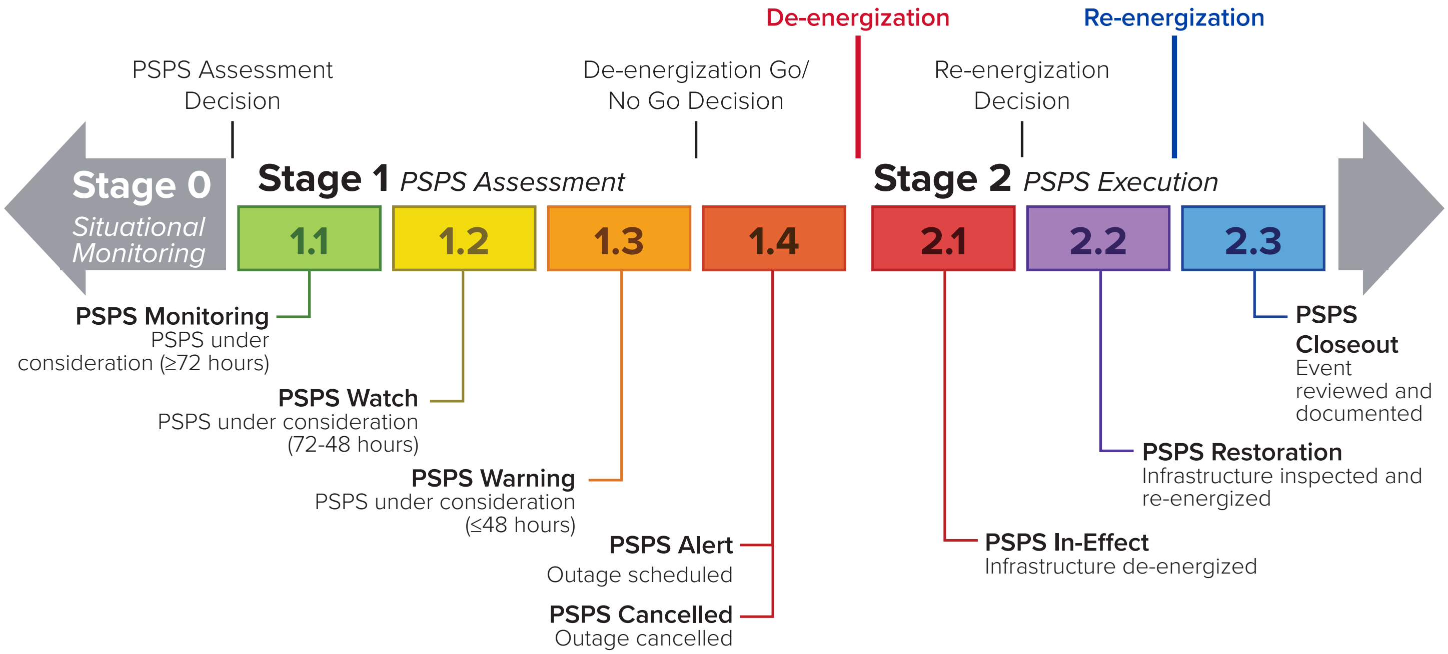


Figure 12: PSPS Events Multi-Staged Approach

Stage 0, or Situational Monitoring, is always in effect, even during times when no specific PSPS events are being considered. During this stage, NorthWestern's Situational Awareness Team actively monitors environmental conditions, potential customer impacts, current operational considerations and the possibility of PSPS events to address apparent and forecasted risk factors.

The point at which NorthWestern begins considering a specific and localized PSPS event, is Stage 1 of the PSPS strategy, known as PSPS Assessment. In this stage, NorthWestern assembles a broad interdepartmental team of subject matter experts and decision makers. This team closely monitors conditions and risk factors alongside the Situational Awareness Team and adjusts the necessary planning and communications based on the likelihood and timing of the potential PSPS de-energization that is being considered.

Finally, Stage 2 of NorthWestern's PSPS implementation strategy, PSPS Execution, begins in the event electrical equipment is de-energized. This stage continues until the system has been fully re-energized and the PSPS event has been reviewed and documented. Ultimately, by establishing this deliberate and disciplined approach to PSPS events, NorthWestern is equipped to utilize PSPS events as a tool for mitigating wildfire risks as appropriate. NorthWestern Energy's complete PSPS Implementation Plan can be found at NorthWesternEnergy.com/PSPS.

Mobile Generating Units

In an effort to assist some customers during emergency events, such as a PSPS, the Plan calls for the acquisition of mobile generating units to be used as temporary or back-up power while the system is being restored. These units will be placed at strategic locations as emergencies arise and may also be used to power an emergency communication center with NorthWestern representatives on site during extreme events.

4.3.3 – Work Practices

Field Work Practices

NorthWestern recognizes that any field work done out on the system poses a wildfire risk and should be considered carefully. The company developed a Field Work Practices Model that works similarly to a weather forecast. Shown in Table 3 is an example of how Field Work Practices may be adjusted based on consequence zones and SFDI. This is to be used as a general guideline for adjusting how work is performed on systems within these areas during changing conditions. All crews deployed in the field can view current environmental conditions, fire advisories, and adjusted work practices for the day.

<table>
<tr><td colspan="2" rowspan="2"></td><th colspan="2">NorthWestern Energy Risk and Work Practice Matrix</th></tr>
<tr><th>Zone 1
(Urban Exclusion Areas)</th><th>Zone 2
(All Areas Outside of Zone 1)</th></tr>
<tr><th rowspan="5">Severe Fire Danger Index (SFDI)</th><th>Severe</th><td>Non-Emergency Work
Approval Required

Follow Wildland Fire Restrictions including Agency Issued Exemptions If Applicable

Utilization of fire Prevention Field Practices</td><td>NO Non-Emergency Work
Emergency Work Approval Required

Follow Wildland Fire Restrictions including Agency Issued Exemptions If Applicable

Utilization of Fire Prevention Field Practices</td></tr>
<tr><th>Very High</th><td>Proceed with Work

Follow Wildland Fire Restrictions including Agency Issued Exemptions If Applicable

Utilization of Fire Prevention Field Practices</td><td>Non-Emergency Work
Approval Required

Follow Wildland Fire Restrictions including Agency Issued Exemptions If Applicable

Utilization of Fire Prevention Field Practices</td></tr>
<tr><th>High</th><td>Proceed with Work

Follow Wildland Fire Restrictions including Agency Issued Exemptions If Applicable

Utilization of Fire Prevention Field Practices</td><td>Proceed with Work

Follow Wildland Fire Restrictions including Agency Issued Exemptions If Applicable

Utilization of Fire Prevention Field Practices</td></tr>
<tr><th>Moderate</th><td rowspan="2">Proceed with Work

Follow Wildland Fire Restrictions including Agency Issued Exemptions If Applicable</td><td rowspan="2">Proceed with Work

Follow Wildland Fire Restrictions including Agency Issued Exemptions If Applicable</td></tr>
<tr><th>Low</th></tr>
</table>

Table 3: Work Practice Matrix

Internal Training

NorthWestern identifies ways to continuously improve fire safety training and provide relevant information for employees. It is important for frontline employees to have the knowledge and information they need to communicate with the communities in which they work. Employee training will include topics such as the methods NorthWestern employs to proactively and responsibly address wildfire risk and the actions NorthWestern takes to continuously improve the integrity of the system and its reliability. Training covers basic wildland fire terminology, identification of key wildfire components (fuels, weather, topography, etc.), use of standard tools, equipment, and methods of extinguishing a fire. NorthWestern also trains employees on how to guide customers to various informational resources they can use during an emergency.

For NorthWestern to exercise tools such as PSPS effectively and efficiently, the management and decision-making parties within the company partake in table-top exercises of simulated weather and wildfire conditions. These simulated events give NorthWestern personnel the opportunity to learn and be prepared for an emergency type situation before it arises.

Section 5 - System Preparedness

Aerial Assessment
Aerial Exception Repairs
Ground Assessment
Ground Exception Repairs
Pole Inspection, Treatment, & Replacement
Rejected Component Repairs
Inventory
Section Refurbishment
Lidar
Substation Equipment and Line Device Upgrades
Wildfire Mitigation Hardening Program
Targeted Cutout Replacement
Critical Communication Resiliency Zones
Project Management Team
Plan Development & Maintenance Team
Construction & Operations Engineering

Section 5 – System Preparedness

5.1 – Overview and Key Activities

This category groups the construction and maintenance activities performed by NorthWestern employees which can directly or indirectly mitigate wildfire risk. These activities encompass a broad range of initiatives including enhanced proactive maintenance to targeted grid hardening or deployment of advanced technologies on the transmission and distribution systems; all with the intent of reducing ignition potential. The system preparedness portion of the Plan is the largest component in terms of work, resources required, and estimated time of completion.

Key Activities

- Increased scope and cadence of ground and aerial assessments with additional maintenance budget to repair exceptions.
- Additional inventory and Lidar to evaluate portions of the system that require refurbishment or hardening to reduce ignition potential.
- Targeted hardening strategy for transmission and distribution driven by a suite of tools to mitigate system and environmental conditions.
- Accelerated installation of substation and various line devices with communications equipment to add situational awareness and operational flexibility to the transmission and distribution systems.

5.2 – Established Activities

NorthWestern has a strong history of asset replacement and maintenance strategies. The company has always prioritized maintenance of the transmission and distribution systems to continue providing safe, and reliable service. Since 2010, NorthWestern has made significant investments to stabilize asset life profiles, improve reliability, and modernize the grid. Although these investments were not developed to specifically address wildfire risk, there were ancillary benefits of reducing ignition potential and preparing the grid for the wildfire mitigation components discussed in the Plan.

NorthWestern uses its annual aerial and ground patrol to assess and repair concerns on the transmission and distribution systems. NorthWestern performs an annual aerial assessment on the entire transmission system. A ground patrol is performed biennially on the distribution system. The objective of these programs is to locate and report line exceptions that pose potential safety, or reliability concerns on the overhead distribution system. In both cases, exceptions are collected, prioritized, and dispatched with appropriate corrective action.

The transmission and distribution Forest Management Program was initiated in 2019. It was designed to reduce risk exposure in forested areas throughout the system (Appendix A). This program evolved to encompass the entire system as part of the Wildfire Mitigation Hardening Program as discussed in section 5.2.2 of this document. The Forest Management Program identified and prioritized the sections of the electric system at greatest risk of experiencing a wildfire within forested areas. The strategy used a comprehensive methodology to identify the risk of a particular section of line. Similarly to current methods, the program used a combination of environmental risk and system performance risk to identify the total risk. These targeted sections of line were prioritized for engineering investigation and appropriate mitigation efforts to reduce the wildfire risk, based on their risk values.

Breaking the grid into smaller sections allows for a targeted approach to mitigate higher perceived section risk. Under this approach, the distribution circuits have been split into sections delineated by protective devices along the circuit. The distribution sections are also referred to as ESIDs. Transmission circuits were split up into polygons based on a specified distance to a forested area(s).

Due to varying size and complexity, NorthWestern must take a unique assessment of resolvable hazards on any identified high-risk area. Distribution sections are assessed in the field by an engineer, at which time precise locational data and visual assessments are gathered. The data is subsequently modeled in a design software to evaluate exceptions that could cause a fault, including galloping and blowout.

The transmission line data for the identified sections is collected with Lidar technology. The data is then incorporated into a design software looking for similar exceptions as are found on distribution. An engineered solution is then developed to mitigate those exceptions and reduce the available risk. Figure 14 and Figure 15 provide an example of the Lidar data with a blowout analysis and a galloping analysis, respectively.

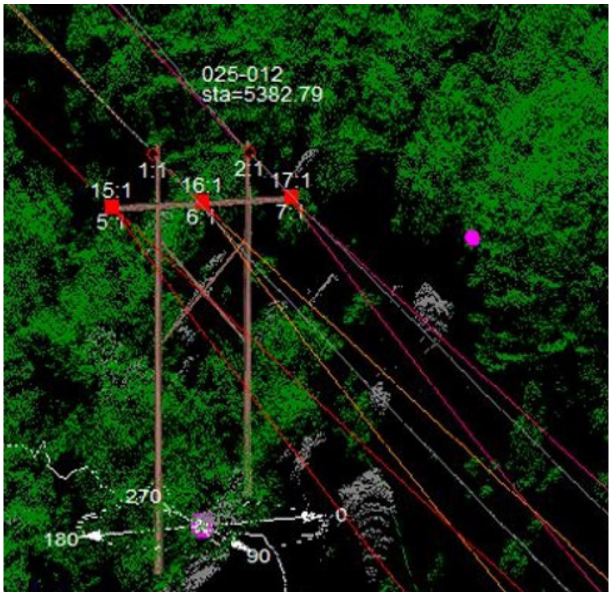


Figure 14: PLS CADD Showing Vegetation Blowout

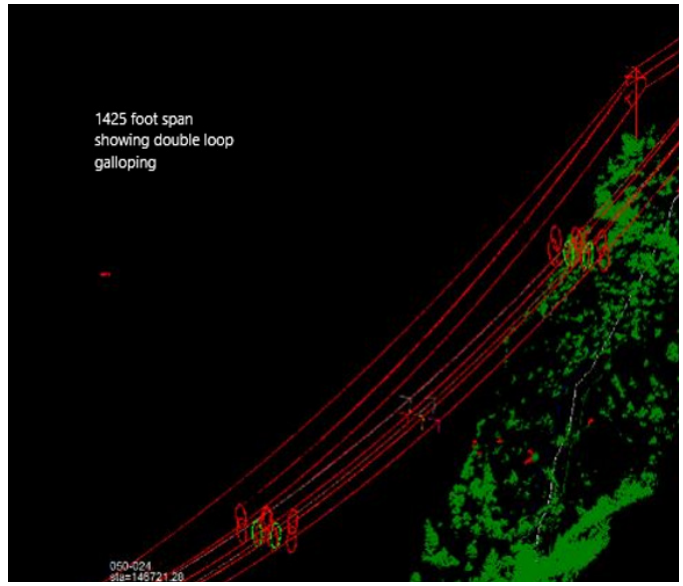


Figure 15: PLS CADD Showing Galloping

It is important to note that not all sections of line will require an engineered solution to mitigate risk. When engineering is required however, the solutions may include complete structure rebuilds, installation of underground cable, or execution of vegetation management recommendations. A coordination study is also completed to assess proper relaying and fuse sizing which can reduce sparks from unnecessary fuse operations.

On the transmission and distribution systems, NorthWestern has established a pole inspection and treatment program to maintain the integrity of the deployed poles and evaluate where proactive replacement is warranted. This inspection allows another visual assessment of the system in addition to the aerial and ground patrols listed above. Both transmission and distribution inspections are currently executed at 10% of the system per year. This means that each pole will be inspected once every 10 years. During the inspection, the appropriate poles are treated to extend the remaining life of the asset. NorthWestern also tests poles to determine the remaining design strength. If a pole does not meet these testing requirements, it is proactively replaced to avoid asset failure that could result in an outage or ignition.

On the distribution system specifically, NorthWestern is also installing ELF current-limiting dropout fuses in designated areas. The ELF current-limiting dropout fuse is a fuse technology that interrupts fault currents while also preventing the release of any gas, sparks, or debris when compared to traditional expulsion dropout fuses. These features decrease the probability of an ignition event occurring.

Of these efforts made by NorthWestern prior to the formalization of the Plan, most will transition into an enhanced effort moving into the future. Between these enhanced efforts and the addition of new assessments and personnel resources to manage this effort, NorthWestern strives to comprehensively address the preparedness of the system for wildfire.

5.3 – Enhanced Plan Efforts

5.3.1 – Assessment & Repair

Engineering Aerial Assessment

Performing comprehensive assessments from multiple vantage points, both aerial and ground, is considered to be an industry-wide best practice for evaluating the condition, structure, and associated components of electric facilities. This portion of the Plan calls for the continuation of complete annual engineering aerial assessments on the transmission facilities in Montana and the incorporation of an engineering aerial (drone) assessment of approximately 10-20% of the distribution system annually. Drone assessments in other areas of the service territories are currently pending. Evaluation will be performed using resources within the Suite of Tools. During this engineering assessment, exceptions are gathered and processed into a work plan for future repair.

Aerial Exception Repairs

Aerial exceptions gathered during the annual Montana transmission aerial assessment will continue to be repaired. As part of the new distribution aerial program, collected exceptions will be repaired on an annual basis.

Engineering Ground Assessment

In both Montana and South Dakota, NorthWestern will begin 100% engineering ground assessment of the sub-transmission system for five consecutive years. A 20% engineering ground assessment of the transmission system will be completed for five consecutive years in Montana—for a 100% cycle completion within five years (Table 4). The engineering ground assessment will be conducted by a contracted resource focused on wildfire specific exceptions as part of the data gathering process. Once the exceptions are processed, they will then be used to generate a work plan for future repair.

NorthWestern will also accelerate distribution ground assessments to cover 100% of the distribution system in both Montana and South Dakota. Because of the Montana distribution system's size, half of the system will continue to be patrolled by qualified NorthWestern journeyman linemen as a base ground patrol, while the other half of the system will be assessed by a contract resource focused on wildfire specific components (Table 4). The schedule will alternate every other year, so the entire system receives both a base patrol and wildfire specific assessment every two years.

Territory	Resource	Distribution	Sub-Transmission	Transmission
Montana	Contracted	50%	100%	20%
	Internal	50%	-	-
South Dakota	Contracted	-	-	NA
	Internal	100%	100%	NA

Table 4: Assessment percentages by State, Voltage, and Resource Type

While both the ground patrol and engineering ground assessment aim to gather data which capture exceptions, ground patrol is performed by qualified workers with the ability to perform immediate repairs when required. In contrast, engineering ground assessments are part of a larger process, and focus on data collection for repairs at a later date. NorthWestern will process repairs within the work plan and complete them within 12 months of identification where feasible.

Ground Exception Repairs

Applicable ground exceptions gathered during the annual ground assessments and patrols should be repaired within 12 months from the date of collection where feasible.

Rejected Component Repairs

In the event transmission structure components are rejected during an inspection, but the pole(s) is not rejected, the identified components are replaced in conjunction with other construction activities in that location. Components include but are not limited to cross arms, insulators, and guy wires. This activity will formalize a process to proactively replace rejected components, regardless of pole rating, moving forward.

Inventory

NorthWestern is in the process of creating an inventory of specific components in the field that could present an increased risk of ignition from the system. This inventory will aid in engineering efforts of the section refurbishment initiative listed below. Inventory items were evaluated by subject matter experts across fourteen specific categories. Components that are part of the inventory may include but are not limited to: guy strain insulators, sleeves/splices, porcelain cutouts, phase spacers, drop pins, wildlife guards, and out of tension spans.

Lidar

Accelerated completion of Lidar for the remaining transmission and sub-transmission system within three years from the adoption of the Plan. Lidar is required to complete the engineering model for the Wildfire Mitigation Hardening Program and Section Refurbishment.

5.3.2 – Construction

Substation Equipment and Line Device Upgrades

NorthWestern will accelerate the existing long-term plan of modernizing substation and line device equipment. This effort includes replacement of manual devices with electronically controlled breakers and reclosers supported by a communication backbone to fully recognize their protection and operational benefits.

Advanced relayed technology enables open phase detection and preemptive notification of potential line contacts. This initiative includes upgrading electro-mechanical or outdated relays with new electronic relays. New relays are used in conjunction with piloted sub-transmission line devices to allow for operational control.

Line devices in high-risk areas are being evaluated for both transmission and distribution. For transmission, a pilot for sub-transmission line devices is occurring at various locations. Pending success, implementation could occur across the service territories. For distribution, hydraulic devices are being replaced with electronic line devices. Furthermore, line devices will broaden the Advanced Distribution Management System and allow for remote indication and control capabilities.

Communication upgrades that accompany substation equipment or line devices are evaluated for each individual location by subject matter experts. Upgrades could be fiber, cellular, radio, or microwave. The benefit of the initiative is additional situational awareness, protection flexibility, and expedited operational response.

Wildfire Mitigation Hardening Program

This program is an extension of the Forest Management Program and now reflects the intent of a targeted approach to harden the transmission and distribution systems to reduce wildfire ignition sources based on the IRM described in Appendix C. NorthWestern expanded this initiative to include distribution as well as transmission both in and out of designated forested areas. This program will now build upon the Forest Management Program's engineering approach of field-based risk identification to determine appropriate mitigation solutions to reduce the likelihood of ignition. Grid hardening solutions include, but are not limited to:

- Overhead construction moved to underground construction to eliminate ignition potential.
- Reframing structures or inserting poles to reduce galloping.
- Vegetation clearing to mitigate conflicts.
- Upgrading to current design standards to reduce ignition sources.
- Installing new, larger conductor to eliminate splices and address aging conductor health.

Targeted Cutout Replacement

All cutouts have the potential to crack or sustain damage, potentially resulting in mechanical failure. Porcelain cutouts, specifically, have been observed across the utility industry to experience cracking at an unacceptable rate. This initiative calls for proactive replacement of porcelain cutouts with a polymer-based cutout to reduce failures that result in an ignition. This item is being investigated in conjunction with Inventory to appropriately use allocated resources.

Section Refurbishment

Based on findings from the inventory initiative, NorthWestern will develop engineered solutions, as necessary, for the refurbishment of the system to reduce ignition potential on sections of the transmission and distribution systems.

Critical Communication Resiliency Zones

Targeted at remote, critical communication sites, this initiative will create outage resiliency zones by installing small micro grid applications or burying electric facilities. This strategy will ensure these sites have reduced the likelihood of service interruptions during severe weather events and wildfires.

5.3.3 – Implementation and Engineering Resources

Project Management Team

The Project Management Team consists of dedicated employees to ensure successful completion of the Plan's construction activities by monitoring scope, schedule, and budget.

Plan Development & Maintenance Team

This will be a dedicated team of employees within Asset Management to continue developing and updating Plan strategies through data analytics, targeting the highest risk components while working closely with the Construction and Wildfire Mitigation Teams to ensure the Plan objectives are met.

Construction & Operations Engineering

This team will consist of both engineering and supervision for construction and maintenance activities related to wildfire prevention. The size and resources needed for this initiative will be adjusted to ensure successful execution of activities within the Plan.

Section 6 - Vegetation Management

Vegetation Aerial Assessment
Vegetation Ground Assessment
Remote Sensing & Analysis
Proactive Maintenance Program
Risk Tree Program
Vegetation Hot Spotting
Fuel Reduction Partnerships
Clear Fall ROW Zones
Vegetation Analyst & Scheduler
Vegetation Coordinator

Section 6 – Vegetation Management

6.1 – Overview and Key Activities

Trees are an important part of many landscapes and are common within power line corridors. Coexisting in the same general space leads trees to be one of the primary causes of electric service interruptions. The historical best practices related to energy company vegetation management emphasized three main components: public safety (climbable trees), compliance (transmission interruptions), and service reliability. This strategy has served NorthWestern well for years in providing safe and reliable electrical service.

The operating environment is now much different from prior years. Factors such as the locations where communities are built, to the general health of urban and rural forests, are contributing to this change. These components add to the complexity of an already difficult task surrounding the management of living organisms. Due to this changing operating landscape, the vegetation management scope within the enhanced activities below, strengthens the existing programs at NorthWestern while also increasing situational awareness with a focus on risk mitigation of vegetation-related faults.

Key Activities

- Enhanced vegetation-focused ground and aerial assessments with additional maintenance budget to address vegetation conflicts.
- Increased proactive maintenance that is technology and data driven to target high wildfire risk zones.
- Fuels mitigation through partnerships and ROW clear fall zones.

6.2 – Established Activities

Most tree encroachments are addressed through NorthWestern's long established vegetation maintenance programs. The foundation of the Proactive Maintenance Program assumes a healthy forest and matches performance and time-based cycles to balance the needs of the system, the public, and the vegetation itself. This approach has allowed NorthWestern to maximize the time between maintenance cycles while maintaining system reliability. This historic maintenance approach puts a premium on safety and service reliability.

Ground assessments are currently completed on NorthWestern's distribution system according to the Electric Distribution Operation and Maintenance (O&M) Guidelines. Much like the aerial transmission program, resources are coordinated during the assessment process for efficiency. Trees that have grown into or close to electric lines are recorded and scheduled for hot spotting. Vegetation Coordinators assess locations with trees growing towards the lines. Coordinators facilitate the trim or removal of trees as necessary to maintain reliable service.

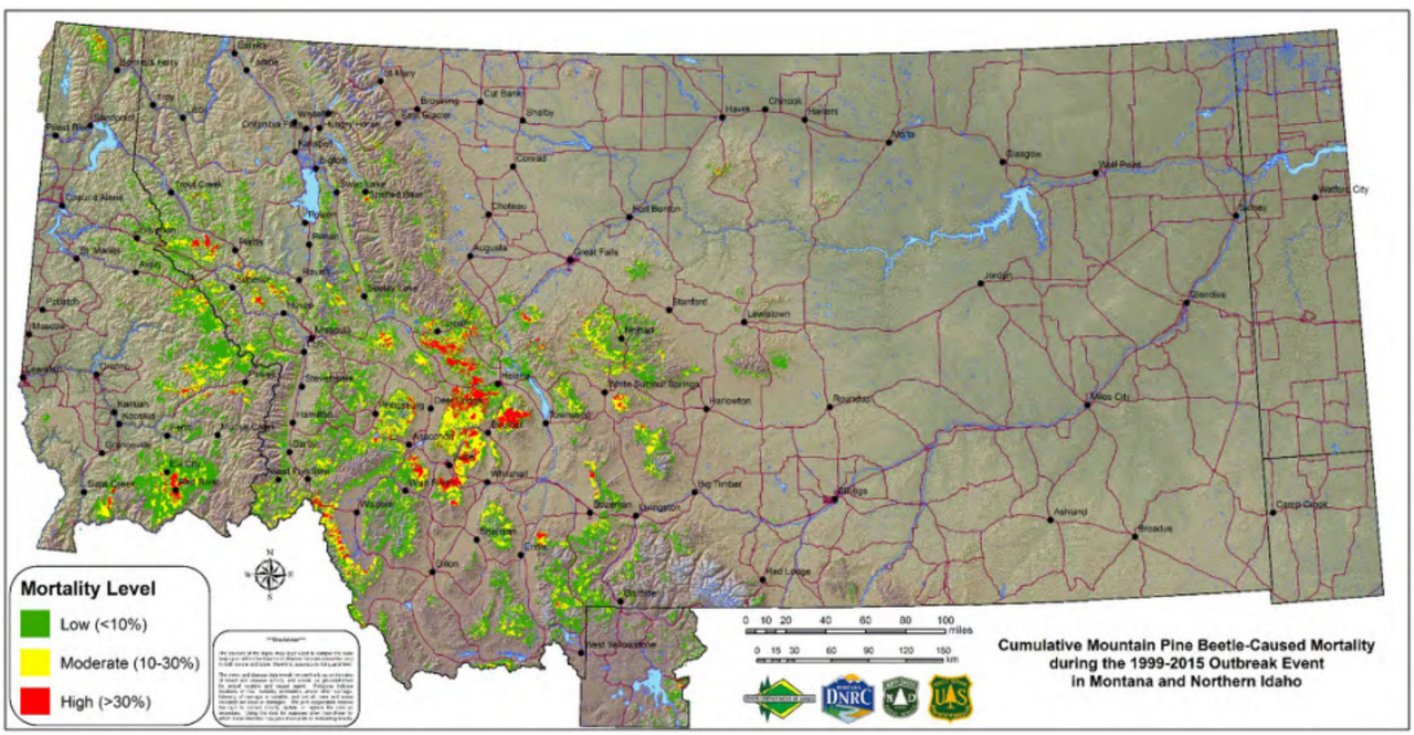


Figure 16: MPB Infested Areas

The Mountain Pine Beetle (MPB) infestation resulted in increased tree mortality across NorthWestern's Montana service territories. This increased tree mortality subsequently increased the probability associated with vegetation fall-ins (dead or diseased trees falling into power lines), which is a known risk condition. The design of the Hazard Tree Program was to mitigate risk of fall-ins and enhance safety by addressing hazard trees inside of and outside of electric facility ROW. The Montana Public Service Commission approved the Hazard Tree Program in NorthWestern's 2018 Electric Rate Case.

NorthWestern's Hazard Tree Program is well established and designed to reduce the probability of beetle-killed trees contacting or falling into its electric facilities. The Hazard Tree Program's goal was to mitigate risk and enhance safety by trimming or removing trees outside of ROW that could fall into transmission and distribution lines. This program became an absolute priority due to the scope of the MPB infestation, as illustrated in Figure 16. Since the program's inception, NorthWestern has cleared more than 1,200 miles of impacted forests and reduced the risk specific to the MPB infestation. Reference Appendix A for further details on this program.

The expansive grasslands of Eastern South Dakota have not experienced an insect infestation to the magnitude of the MPB infestation experienced by Montana's forests. The Vegetation Management Team continually watches neighboring states and monitors infestations that could approach the service territories future. Although vegetation management efforts are executed in both service territories, much of the Plan efforts are targeted towards Montana.

NorthWestern maintains a positive history of close collaboration with emergency responders and fire agencies. These relationships began with focus on safety and goal of educating agencies regarding potential hazards surrounding NorthWestern facilities during an emergency. On a limited basis, this cross communication has proven fruitful and has historically occurred in conjunction with the USDA-FS and slash pile cleanups. Removal of slash piles reduces forest floor fuel density, which is especially important in areas adjacent to electric facilities.

6.3 – Enhanced Plan Efforts

6.3.1 – Vegetation Assessment

Vegetation Aerial Assessment

NorthWestern plans to maintain the existing aerial transmission vegetation assessment program which assesses 100% of Montana's overhead transmission system each year from a helicopter. The Plan calls for an expansion of the aerial program to include Montana's overhead distribution system. This added aerial assessment may be either a manned or unmanned flight depending on operational efficiencies and will be coordinated with other internal maintenance stakeholders.

Vegetation Ground Assessment

The Plan adds a vegetation-specific ground assessment on NorthWestern's transmission system completed by an arborist on a four-year cycle. Adding the ground assessment to the transmission ROW provides a ground level, detailed view of the vegetation condition not available during the aerial assessment. This method will greatly reduce the opportunity for at-risk vegetation to turn into a hazardous condition before NorthWestern has an opportunity to perform proactive maintenance. On the distribution side, ground assessments will be maintained at current levels recommended in the Electric Distribution O&M Guidelines.

Vegetation Analytics

There are now several possible remote technologies (satellite imagery analytics, PhoDAR, Lidar, etc.) with specific vegetation-related advancements that offer expanded situational awareness. These remote data collection methods and associated analytics may provide both a comprehensive view of NorthWestern's system over time as well as very specific, detailed vegetation conflicts. The Plan includes investigation investment levels to consider third-party vendor(s) which may provide the Vegetation Management Team an additional non-biased analysis which may enhance the strategy of the proactive maintenance program.

6.3.2 – Vegetation Maintenance

Proactive Maintenance Program

NorthWestern is enhancing the proactive cycle-based vegetation approach to harden the system against vegetation encroachments while also aggressively increasing pruning practices in areas of high consequence, thereby reducing ignition potential from vegetation conflicts. This program is executed at the circuit or feeder level and includes all efforts to trim, remove, or replace encroaching vegetation.

In the cases of trees planted underneath the electric lines, full tree mature height is often overlooked, eventually requiring ongoing maintenance for adequate clearances. In appropriate locations, NorthWestern may offer a replacement tree to landowners with full canopy heights that will not interfere with the overhead powerlines.

Primarily in Montana's more forested region, vegetation height is so great that trees well outside the established ROW might contact the overhead powerlines during a windstorm or other significant weather event. In working with local landowners, NorthWestern can seek to establish a "clear zone" for falling vegetation to reduce or eliminate the probability for vegetation contact in critical areas.

Additionally, wide ROWs can function as a fire break or access point for emergency services in the event of a wildfire. NorthWestern can continue to establish beneficial partnerships with private landowners or local, state, federal, and tribal agencies. These successful channels of collaboration efficiently reduce fuel sources and protect critical infrastructure, namely electric facilities.

Risk Tree Program

The Risk Tree Program increases the scope of the Hazard Tree Program to consider all structurally compromised trees within striking distance of overhead electric lines. This will broaden the focus that was specific to the MPB based Hazard Tree Program. It will also include a broader data model that considers additional risk factors such as terrain, accessibility, vegetation density, wildfire history, prevailing wind direction, and operations within the WUI.

Vegetation Hot Spotting

Vegetation hot spotting continues to respond to concerns observed during existing and enhanced ground assessments, and aerial assessments. The enhanced assessments are anticipated to return a greater amount of required work to be completed. Vegetation Coordinators or contracted utility arborists will coordinate this work.

6.3.3 – Implementation Resources

Vegetation Analyst

This role is targeted at maintaining and updating external data connections with field data. A portion of this role will include setting and maintaining control points for improved implementation efficiency and quality assurance.

Vegetation Coordinator

Heavy dependence is placed on the existing Vegetation Coordinators in organizing and managing all the components of the Vegetation Management Department. The Vegetation Coordinator, a certified utility arborist, works with field crews determining the proper mitigation methods, planning work scope, and working with impacted landowners for successful outcomes for all stakeholders.

Section 7 - Communication & Outreach

Print and Media Communication

PSPS Readiness

Peer to Peer Relationships

Public Safety Partners

Wildfire Summit

Section 7 – Communication & Outreach

7.1 – Overview and Key Activities

Safety is one of NorthWestern's core values. Ensuring the safety of employees, customers, and members of the public requires a variety of strategies. This is accomplished by publishing educational resources on NorthWestern's wildfire mitigation efforts, communicating as changing conditions threaten reliability, and developing planned outreach for all stages of a potential safety event. NorthWestern collaborates with designated Public Safety Partners to align wildfire mitigation efforts and promote availability of information in the event of a safety incident.

The NorthWestern electric service territories cover a vast geographic area of predominantly rural development. Nearly two thirds Montana towns have a population of fewer than 1,000 residents. More than half of South Dakota is classified as rural by the United States Census. The largest communities within the service territories, such as Bozeman or Billings, are comparatively much smaller than areas served by other investor-owned utilities. NorthWestern prides itself on being an integral part of the communities in which they serve, which establishes a foundation of trust. This presents itself in a range of involvement from community volunteering, participation in local government, service in first responder roles, to helping a neighbor's cat down from a tree with a bucket truck. Beyond community volunteering, most customers are acquainted with an employee in some capacity. NorthWestern employees are often friends, family members, neighbors, or simply a friendly face within the community. This provides a unique and effective channel for understanding customer needs.

NorthWestern understands the demographic diversity of its customers. The reliability and communication requirements can be distinct between rural and urban communities. Therefore, communication strategies must fulfill a diverse range of customer expectations. A rural customer might be more resilient to a long-duration outage and might not expect frequent communication regarding restoration time. Conversely, an urban customer might not be as prepared and might look for an immediate outage notification with specific details. NorthWestern acknowledges this contrast and strives to meet all customer needs.

Key Activities

- Continuation of communication activities established prior to the Plan.
- Enhanced targeted wildfire customer communication and outreach.
- External engagement with industry, public office, and fire agency stakeholders.
- Assessment of PSPS stakeholder readiness and formalization of a PSPS strategy.

7.2 – Established Activities

The delivery of safe and reliable energy services is the foundation of a thriving community's economic vitality. Commerce, medical needs, and entertainment all rely on a constant flow of power. NorthWestern provides exceptional reliability compared to its peers. However, extreme weather events within the service territories, like wildfires or unexpected winter storms, often carry the potential to interrupt service. This can adversely affect public safety. To combat this, NorthWestern provides customers with a variety of resources to prepare themselves for natural disasters. NorthWestern's social media and other outreach platforms inform customers about potential service interruptions. Collaboration with local, state, inter-agency, tribal, and federal partners ensures messaging is clear and consistent.

NorthWestern publishes general information throughout the year to help customers prepare for natural disasters, access programs, and update contact information. This information is distributed through billing inserts, brochures, social media posts, NorthWestern's YouTube channel, and paid advertising. Customers and the public can also access two 24/7 contact call centers and numerous walk-in offices. General information and resources accessible year-round include:

- Emergency phone numbers and contact resources.
- Wildfire preparation tips.
- Educational resources on NorthWestern's wildfire mitigation efforts.
- Hazard Tree Removal resources.
- Instructions on updating contact information.
- Natural disaster preparedness for events like earthquakes, floods, or windstorms.
- Planned and unplanned outage education.

NorthWestern Resources

Wildfire Safety:

https://northwesternenergy.com/safety/community-safety/wildfire-safety

Outage Map:

https://northwesternenergy.com/outages/outage-map

Customer Service and Contact Info:

https://northwesternenergy.com/customer-service

The Voice Response Unit (VRU) is a valuable tool within NorthWestern's two 24/7 contact call centers. The VRU provides pre-recorded messages that contain information related to a customer's specific service area. When many customers must be reached in a short period of time, this tool becomes particularly valuable. It is efficient and effective at contacting the impacted customers.

Outages can occur for a variety of reasons. Unforeseen events like extreme weather, vehicle collisions with infrastructure, or animal contacts with energized equipment are all potential causes of unplanned outages. NorthWestern's online Outage Map provides the location of reported and confirmed outages. Customers can access this information to learn about the impact of the outage and expected restoration time. The Outage Map is a dynamic resource that is updated in real time. Social media, VRU, or other means of public outreach may be deployed depending on the magnitude of the interruption.

NorthWestern utilizes a Public Information Officer (PIO) to communicate necessary information during active safety events. The PIO is a key component of the ICS discussed in Section 4.2. During an active emergency event, the DES representative, incident commander, or PIO handles external communication. NorthWestern's primary functions during a potential incident are supporting Public Safety Partners' outreach efforts and maintaining safe, reliable service to customers and first responders. Maintaining communication during an active safety event is paramount.

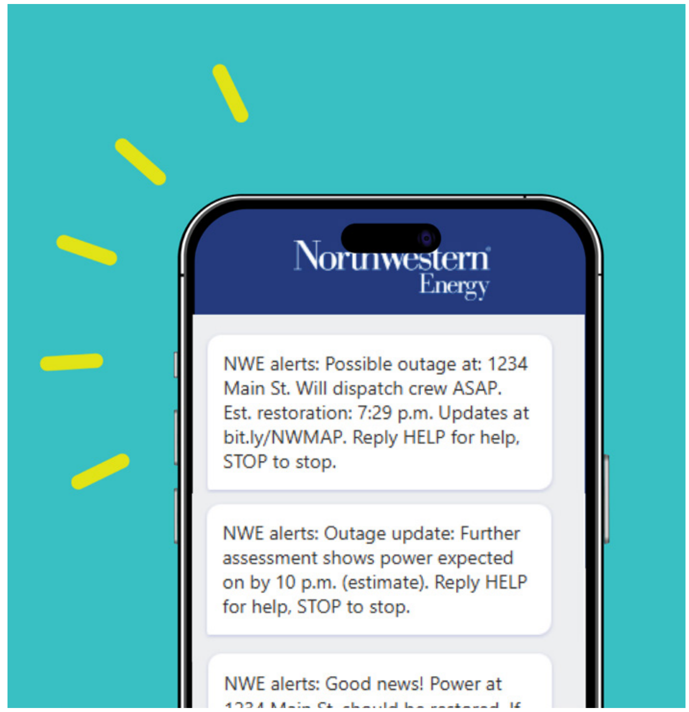
7.3 – Enhanced Plan Efforts

7.3.1 – Customer Engagement

Print and Media Communication

This initiative is targeted at increasing public awareness about wildfire prevention and outage preparedness. A variety of channels are utilized including fact sheets, news articles, community presentations, social media posts, paid advertising, and resources on NorthWestern's website. An additional emphasis has been placed on collaboration with Public Safety Partners during fire season to coordinate media outreach efforts.

NorthWestern is launching a Preference Center in 2025. This initiative gives customers control of their preferred contact method and frequency. Through this interface, customers can select their digital contact preference. Relevant information including outage notifications, wildfire safety alerts, and PSPS initiation can be distributed through this platform.



PSPS Readiness

NorthWestern and its partners conducted a readiness analysis to ensure customers and other stakeholders are prepared for a potential PSPS-related event. Assessment of customer readiness began in 2023 with the help of a contracted vendor who had extensive experience with PSPS processes nationwide. This process distributed billing inserts to Montana customers to provide context regarding PSPS procedures. NorthWestern directly contacted customers in high-consequence areas to promote preparation and awareness of potential wildfire notifications. Relevant metrics were reported, and a dedicated PSPS page was created on NorthWestern's website in 2024 to meet potential customer needs. This page includes a map describing the areas of proposed and current de-energization resulting from a PSPS event. NorthWestern will continue to develop additional resources to establish the best method(s) for facilitating PSPS readiness amongst customers.

7.3.2 – Partnerships & Additional Outreach

Peer to Peer Relationships

Collaboration with peer utilities and organizations is a vital aspect of developing successful wildfire mitigation strategies. NorthWestern is a member utility of several organizations including Western Electrical Institute, Edison Electrical Institute, EUCI, and PNUWWG. Membership within these organizations fosters innovation and allows utilities to discuss the unique challenges within their service territories. NorthWestern employees are present at pertinent conferences and meetings throughout the year with these organizations.

Public Safety Partners

NorthWestern employs designated wildfire mitigation personnel to align internal efforts with those of complementary organizations and agencies. Public Safety Partners include but are not limited to local fire departments, community leaders, government offices, tribal representatives, and federal agencies. During a potential incident, NorthWestern will provide the services, support, and communication necessary for the various Public Safety Partners to fulfill their duties. A calling tree has been developed to notify all identified stakeholders, from local community leaders to federal government offices, of pertinent event details. NorthWestern strives to maintain strong, productive relationships with current partners and expand to new opportunities and stakeholder partners.

Wildfire Summit

NorthWestern plans to host regular Wildfire Summits with a variety of peer utilities, electrical cooperatives, Public Safety Partners, and resource management groups to foster collaboration and work towards a shared goal of effective wildfire mitigation. The events may include presentations on a range of topics including resource management and public responses.

Section 8 - Conclusion

Section 8 – Conclusion

NorthWestern recognizes the inherent risks associated with owning and operating an electric system. Utilities across the Western United States face an increasing risk of wildfires. These natural disasters devastate communities and require modification of existing industry practices. Numerous factors contributing to an increase in frequency of conditions conducive to the ignition and spread of wildfire are beyond NorthWestern's control. The Plan focuses on mitigation efforts that NorthWestern can directly manage.

NorthWestern evaluated the challenges associated with wildfire prevention and identified the four objectives with the Plan: (1) Reduction of Ignition Potential, (2) System and Environmental Monitoring, (3) Enhanced Vegetation Management, and (4) Enhanced Public Communication and Outreach. NorthWestern can achieve these objectives through strategies and practices which are measurable, attainable, and effective at mitigating the risk of wildfire within the service territories. The Plan expands upon a strong foundation established through decades of dedication to the delivery of safe and reliable service to customers.

NorthWestern estimates making over $350M in incremental investments in the Montana service territory between the years 2023-2028 and making approximately $15M of incremental investments in the South Dakota service territory between 2025-2030. These investments expand upon the improvements made to NorthWestern's system in prior decades through established programs. The implementation of established, enhanced, and new activities on the transmission and distribution systems will further mitigate wildfire risk within the service territories. These investments will support NorthWestern's ongoing commitment to the safety of its customers and the communities in which they serve.

Appendices

Historical Program Details

Outage Reporting and Reliability

NorthWestern's Suite of Tools

Estimated Montana Enhanced Costing

Proposed South Dakota Enhanced Costing

Appendix A – Historical Program Details

Distribution System Infrastructure Program

One program that has been foundational to NorthWestern's reliability efforts is the Distribution System Infrastructure Program (DSIP). The program spanned from 2011 through 2018 in Montana. Through DSIP, NorthWestern's vision was a distribution system that is reliable, able to grow, optimized, responsive to all customers, energy efficient, cost effective, and state of the art. The objectives identified to achieve this vision were to arrest or reverse the trend in aging infrastructure, restore margin capacity back into the system, maintain reliability performance over time, and increase that performance for customers as well as position NorthWestern to adopt new technologies. NorthWestern targeted these efforts to the Montana system because the South Dakota system is much younger by comparison. In the financial summary shown below, the primary projects of the program that are applicable to wildfire mitigation are listed and their associated costs split to Capital and Expense, DSIP, and Base cost.

	DSIP	Base	Project Units Complete
Expense Projects - $64.1M			
Tree Trimming	$21,256,400	$16,610,585	12,238 Circuit Miles
Pole Inspections	$9,161,793	$4,820,341	14,174 Circuit Miles
OH Electric Repairs (P2's)	$3,936,884	$-	8553 Repairs
Rural Reliability Improvement	$5,324,441	$-	14 Circuits
Substation Upgrades	$1,321,565	$-	*111 Substations
Automation	$853,464	$-	*76 Substations *35 Base Stations
Farm Taps	$62,423	$-	*24 Farm Taps
Gas Repairs (G1's)	$756,204	$-	7,254 Repairs
Capital Projects - $296.5M			
Pole Replacement	$84,305,064	$20,964,951	32,172 Poles
Underground Cable Replacement	$80,023,261	$13,921,908	1,802,557 Trench Feet
Substation Upgrades	$21,814,271	$-	*111 Substations
Capacity Upgrades	$21,075,627	$-	27 Projects
Gas One Plan (Includes Gas Historic Block Refurbishment)	$39,357,724	$5,238,424	276 Blocks
Rural Reliability Improvement			
Automation	$9,375,685	$-	*76 Substations *35 Base Stations
Farm Taps	$442,441		*24 Farm Taps

**Combination of Capital and Expense*

While this program was not aimed at just the wildfire-prone areas, the volume of work was so great that there was still an overlap with these areas. During DSIP, NorthWestern replaced many poles to current standards, completed rural reliability improvements, and trimmed or removed over 12,000 circuit miles of vegetation. The grid automation platform started with DSIP and allows the Distribution Operations Center (DOC) to react quicker to needed changes in operational practices given changing environmental conditions. The DSIP work is also responsible for the initiation of the current pole inspection protocol that has become a standard annual program for NorthWestern, extending beyond the completion of the DSIP. Once every ten years, this program inspects every pole on the system, treats the poles that can be treated, and replaces those that are deemed a rejected pole. By proactively replacing these poles, NorthWestern mitigates both outages and ignition events throughout its service territories.

Forest Management Program

This program goal was to develop a risk methodology to prioritize appropriate mitigation strategies for the approximately 20,000 distribution and 9,500 transmission spans identified within forested areas that NorthWestern operates. It was designed by Asset Management with the intent of reducing risk exposure in forested areas throughout NorthWestern's electrical system. Resources within the Suite of Tools evaluate system and consequence data to obtain relative risk by segment, A risk assessment was completed for each line segment on the transmission and distribution system that was identified as a forested area. The methodology involves a combination of the information below to generate an overall segment risk.

Risk Category	Transmission Risk Indicator	Distribution Risk Indicator
Environmental	Number of Spans in Forested Areas	Number of Spans in Forested Areas
Environmental	Wildfire Hazard Potential	Wildfire Hazard Potential
Environmental	Customer Count within 2 mile buffer	Customer Count within 2 mile buffer
Environmental	Single Egress	Single Egress
System	Number of Outages	Number of Outages
System	Line Assessment Expectations	Line Patrol Expectations
System	Pole Inspections	Pole Inspections
System	Average Span Length	Span Length
System	Poles per Structure	Number of Conductors
System	Voltage Level	Voltage Level
System	Distribution Underbuilds	Pole Equipment /Attachments

Although there may be several mitigation strategies, the following solutions were used to prevent or manage fire risk potential in forested areas. The strategy implemented was dependent on the unique segment and its associated risk.

Mitigation of Outages: Asset Replacement (System Hardening)

Asset Replacement

Utilize system hardening strategies by proactively replacing aging assets such as poles, crossarms, and hardware. Replacements should utilize current construction framing standards that increase conductor spacing to reduce the potential for conductor contacts. Ensure that conductor galloping concerns are addressed during segment refurbishments. Any vegetation concerns on an ESID identified for correction should be referred to the Vegetation Management Team.

For a pole approaching the end of its design strength to meet replacement criteria, it must also have one of the following items (this does not pertain to any poles have fully reached the end of their design strength):

- Deteriorating cross arm, including but not limited to:
- Sunk or leaning (steel or wood pins)
- Cracked or split wood
- Arms racked off in the center, pulling away from the pole
- Burn marks
- Heavy moss
- Wood pins
- Porcelain equipment
- Tight clustered equipment/TX banks (not meeting clearance standards, creating animal or squirrel issues)
- Span lengths greater than 325 feet

Reconductoring

In addition to the pole replacement criteria above, the conductor size, type, and condition should also be considered in determining replacement for reliability and/or asset condition risk concerns. Conductors in question include #6 Cu, #8 Cu, as well as solid and stranded steel wire. Both stranded and solid steel wire are extremely difficult to distinguish from #6 Cu or 3-strand #8 Cu when standing at ground level. Therefore, conductor size and type listed in the GIS database (especially when the GIS database indicates anything other than an ACSR conductor) should be verified with local personnel to determine its properties.

Any stranded or solid steel wire, along with #8 Cu, should be automatically considered for replacement or reconductoring. Any verified #6 Cu should be further investigated to determine asset health or other factors that may drive a reconductor. Factors to consider for replacement or reconductoring of #6 Cu include:

- Spans or areas with multiple splices.
- Spans or areas where conductors are noticeably sagged unequally.
- Spans or areas where local knowledge is aware of a history of reliability issues, such as conductors slapping together in the wind, spans with multiple splices over the years, or spans no longer sagged equally.
- Spans of mixed conductor, such as #6 Cu with #4 ACSR. Conductors with unequal properties and characteristics typically require more spacing to accommodate differences in sagging under various loading conditions and behavior when blown by the wind. Note that this should not be an automatic consideration for reconductoring since sufficient horizontal and/or vertical spacing can be designed into the framing to accommodate this. Replacement or reconductoring to eliminate mixed conductors should be considered where local knowledge is aware of reliability issues with the mixed conductor spans.

When reconductoring, typically #4 ACSR would be the conductor of choice. However, due to the location of the ESID and potential loading factors, an upgrade to 1/0 ACSR may be required. Factors to consider include:

- Ampacity considerations: If current or future loading reaches 50A, which is typically about 70 residential premises, the reconductor choice should be a minimum of 1/0 ACSR.
- Location of ESID: For areas close to the main line with potential for growth beyond the ESID in question, the reconductor choice should be a minimum of 1/0 ACSR.

Other Considerations

When replacing wire in an ESID, the following is considered:

- Pole loading: Conductors of different sizes will have different tensions with opposing forces on a pole. These considerations should be considered, and the pole should have an adequate design to support those differences.
- Fuse coordination: Collaborate with the coordination group to understand the effects of different conductor sizes on the holistic coordination scheme for the circuit.
- Planning considerations: If both upstream and downstream segments have a larger than #4ACSR conductor, it warrants a review to see if the segment being addressed should be reconductored for capacity reasons. Also, consider loop feed possibilities to other sources in the downstream analysis when assessing conductor sizing. Consult the Distribution Planning group for input on conductor sizing if any of these considerations apply.

Depending on the main outage contributor for the selected ESID, the following are recommendations for potential mitigations. All expense items should be identified but will be handled under a separate program:

- Conductor spacing with consideration to wind loading: Increase the horizontal distance between phase and neutral by replacing a pole near the end of its design strength with current framing standards and checking for sagging issues. Resag, reconductor, or insert additional mid-span poles as required. Even though this is for fire mitigation, snow bracket installation should be considered at the time of construction.
- Lightning: See Risk Prevention.
- Animals: Replace poles near or past the end of its design strength with current framing standards and/or install animal protection specific to species (raptor, squirrel, etc.).
- Equipment: Replace obsolete equipment, such as porcelain, or equipment with visible deterioration that would cause an outage on poles near or past the end of its design strength.

Proactively Manage Risk: New Technology Systems, Updates to Existing Systems

The following technology strategies can be implemented to reduce forest management risks.

Recloser Strategy

For ESID's targeted under this program protected by an electronic or hydraulic recloser, evaluate the recloser supplying this ESID for replacement or upgrades as follows:

- If the device is currently a hydraulic recloser and communication is not possible at the existing location, replace with a new hydraulic recloser if the trip parameters can be adjusted to reduce fault clearing time or if the existing fault current interrupting rating is exceeded.
- If the device is currently a hydraulic recloser and communications is possible at the existing location, replace with an electronic recloser with the ArcSense firmware activated and communications installed. The ArcSense feature can only be used at recloser locations where the minimum loading is greater than 50 Amps of load. The ArcSense feature deactivates and has to re-tune the algorithm when loading drops below 50 Amps.
- If the device is currently an electronic recloser with communications at the existing location, upgrade the relay firmware to activate the ArcSense firmware if minimum loading through the recloser is greater than 50 Amps.

ELF Fuse Strategy

For ESID's targeted under this program with fused taps being supplied from the targeted ESID, considerations may be made to deploy ELF tap fuses using the following guidelines:

- ELF fuses only provide a benefit when fault current levels are 800 Amps or greater due to the ELF fuses' reduced fault clearing energy in this fault current region.
- ELF fuses are not recommended at less than 800 Amps of fault current because the fault clearing energy is similar to standard K fuses and ELF fuses do not coordinate well in series with downstream devices (including other ELF fuses).
- ELF fuses are only rated for 3 phase 15 kV applications that fit existing standard 110 kV BIL cut-outs for the following ELF fuse sizes and voltage rating: 6 Amp, 8 Amp, 12 Amp, 18 Amp, and 20 Amp ELF fuses at the 15 kV ELF fuse voltage rating.
- ELF fuses rated at 15 kV and 25 Amps or larger will NOT fit the standard 110 kV BIL cut-outs.
- ELF fuses 25 Amps or larger that fit the 110 kV BIL cut-outs are only rated at 8.3 kV and can only be installed on single phase installations.
- In general, ELF fuses do not coordinate when placed in series. They should be limited to deployment on short taps and service transformer installations to reduce the impact of this mis-coordination.
- Because of the aforementioned application limitations of the ELF style fuse, only 8 Amp ELF and 20 Amp ELF fuses will be stocked in inventory and used in the field on small taps.

Fault Indicator Strategy

The program called for installation of fault indicators using the following guidelines:

- Install fault indicators immediately after any save fuse or main-line solid door locations that are downstream of any reclosers that are planned to be seasonally used in the non-reclose state.
- Important to note these fuses will require the replacement of any downstream fuse locations to a current limiting fuse for coordination to be maintained.

Additional Technology Considerations

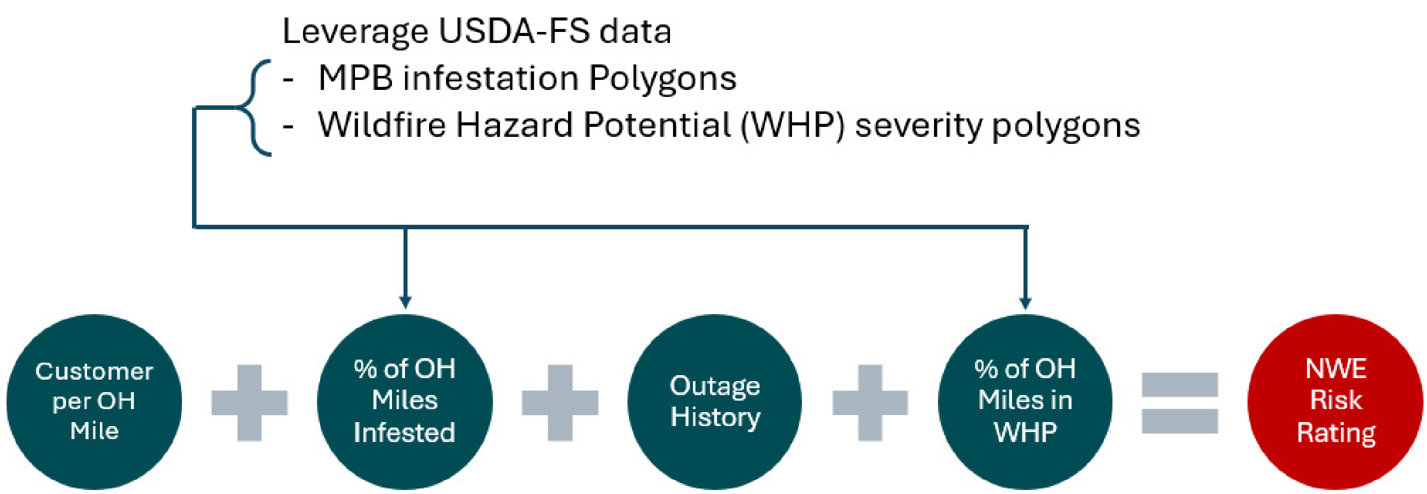
- ABB Surge Arrestor with Spark Prevention Unit. A surge arrestor designed to be used in place of a traditional arrestor although with an added component designed to limit sparks produced when clearing an over-voltage situation.
- Osmose, FireSheath or other pole wrap materials can be used with ESIDs identified as critical use. The use of these could limit the amount of damage seen in a fire, resulting in faster times to restoration.
- During pole replacement, put consideration into the use of composite structures in ESIDs identified as critical use to limit the amount of damage seen in a fire, resulting in faster times to restoration.
- Underground – considerations made to the potential because of burying certain ESID's in high fire threat areas.

Hazard Tree Program

A major part of NorthWestern's power line maintenance comes in the form of vegetation management within ROW—typically 10-40 feet wide for distribution lines and 40-100 feet wide for transmission lines. The threat addressed by the Hazard Tree Program are the hazard trees which lay outside of the ROW. A hazard tree is defined as a structurally unsound danger tree. The American National Standards Institution (ANSI) standard A300 defines a danger tree as any tree on or off the ROW that could contact an electrical supply line when it fails.

The Mountain Pine Beetle (MPB) infestation in Montana has increased tree mortality rate in and around NorthWestern's ROW. This leaves the overhead lines in these affected areas at a higher risk for fall-ins and possible resulting fire ignitions. Through the Hazard Tree Program, NorthWestern intended to mitigate risk, enhance safety and improve reliability of the transmission and distribution electric infrastructure by proactively addressing hazard trees.

Because of the immense magnitude of the beetle infestation, the volume of hazard trees located near NorthWestern's ROW have increased over 100-fold. Ten years prior to the infestation, NorthWestern might have cleared 30 hazard trees per 10-line miles and now can clear nearly 3,000 hazard trees per 10 line miles. This increase in hazard trees poses dangers to NorthWestern's customers, first responders, and forests. Fall-ins are one of the driving sources of outages in the forested areas of the system. It is essential for NorthWestern to maintain reliable power to its customers in the harsh weather seasons that are common in the Montana service territory. If a fall-in tree remains in contact with a line after falling, it can energize the surrounding earth and possibly become an ignition source for a wildfire. These can create threatening conditions to people working on public lands, people recreating on public lands, and first responders.



NorthWestern used available data such as customer density, vegetation related outages, MPB severity index, WHP index, area access, land permitting, resource efficiency, and more to prioritize lines. The above image describes the general approach and where the MPB severity plays a role in increasing an areas risk. Certified utility arborists, known as Vegetation Coordinators within NorthWestern, are tasked with inspecting trees and working with landowners for access and permitting. They work ahead of crews, identifying hazard trees and coordinating crews to remove them. Below is shown the historical costing information for the program since 2018.

	Program	2018A	2019A	2020A	2021A	2022A	2023A
Transmission	MT Veg Mgmt-ET Proactive	$878,398	$698,460	$482,094	$598,932	$818,679	$1,220,704
	MT Veg Mgmt-ET Hotspot	$269,795	$860,770	$492,162	$519,338	$905,533	$1,003,508
	MT Veg Mgmt-ET Hazard	$794,096	$1,674,342	$1,039,205	$1,798,426	$650,864	$108,800
Distribution	MT Veg Mgmt-ED Proactive	$1,896,099	$2,733,840	$3,145,282	$3,828,850	$2,614,987	$3,973,575
	MT Veg Mgmt-ED Hotspot	$414,299	$739,025	$597,502	$173,554	$2,164,707	$516,863
	MT Veg Mgmt-ED Hazard	$2,467,039	$5,801,071	$2,991,351	$2,135,949	$2,786,538	$3,166,346

Section Reliability

The purpose of this program is to take a targeted approach to improve reliability on the electric distribution system. Each section of line between protective devices is assigned an Electric Section Identifier (ESID) and connected to outage data. Several outage metrics are used to prioritize sections with chronic reliability issues. This approach provides a strategy to mitigate sections on circuits that may not meet the criteria for a traditional circuit-wide reliability program.

The program began in Q3 of 2020 with the goal of quantitatively measuring SAIDI reduction at a cost of $1M/SAIDI minute or less through a prioritized and targeted approach by sections of circuit. Firstly, sections that qualify for the targeted process are identified and evaluated. A detailed review of the selected sections is completed to identify the appropriate remediation solutions based on the known outage data. Work is then reviewed across relevant stakeholder groups to confirm that other remediation efforts have not already been completed or work is not already planned under another program for the same section.

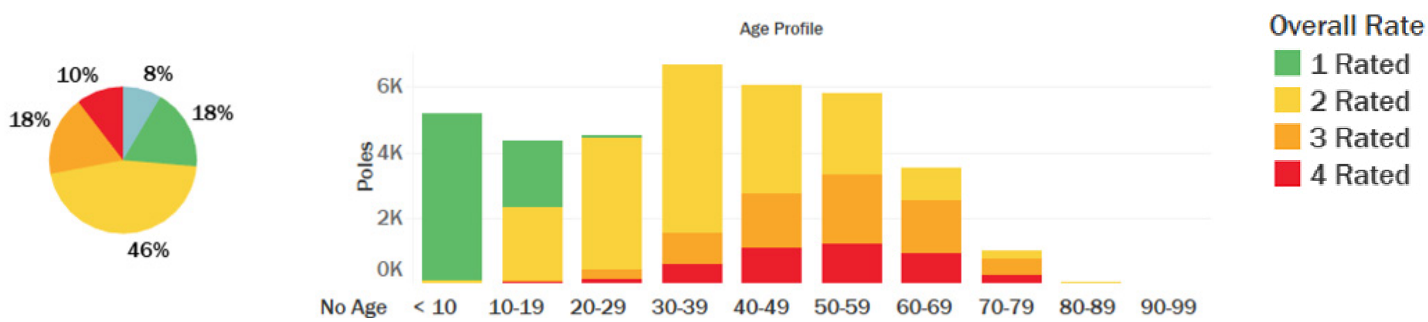
Reliability Data Details

Catastrophic and Major Event Days are excluded from the analysis as these outages occur when the system is under stresses beyond that of normal operating conditions. Planned outages are excluded from the analysis in addition to vegetation-caused outages as these are analyzed under a different program. The intent of this program is to identify outages caused by Distribution components and therefore Generation, Substation and Transmission-caused outages are not included in the analysis.

A factor increasing the weight of more recent metrics based on outage year is then applied. In doing so, more emphasis is placed on the most recent outages. This weight factor is also applied to Circuit SAIDI (Customer Minutes Interrupted (CMI)/Number of Customers on Circuit) and Outage Count. Circuit SAIDI is based on circuit customer count and is therefore used instead of System SAIDI to more equally represent circuits that may not have very many customers but are still experiencing extended outages. Sections that have both a Weighted Circuit SAIDI greater than or equal to 250 minutes and a Weighted Outage Count greater than or equal to 10 are selected for a detailed evaluation.

Pole Replacement Criteria

As of 2022, pole rejection rates have increased year over year for the last three years. While the average age of the rated 3 poles was 47 years old, the inspection data at the inception of the program shows there is a bubble of 3 rated Lodge Pole Pines (3-LPP) in the 50-60 year old range, as shown below. Replacing the 3-LPP will proactively manage the volume of 3-LPP approaching the rejection criteria while targeting reliability improvements.



In order for a 3-LPP to meet replacement criteria it must also have one of the following items:

- Deteriorating Cross Arm, including but not limited to:
  - ↳ Sunk/leaning (steel or wood pins)
  - ↳ Cracked or split wood
  - ↳ Arms are racked off in the center or pulling away from pole
  - ↳ Burn marks
  - ↳ Heavy moss
- Wood Pins
- Porcelain Equipment
- Tight clustered equipment/Tx Banks (not to clearance standards, creating animal/squirrel issues)

- Span lengths greater than 325 feet

Outage Remediation Solutions

Depending on main outage contributor for selected section, the following are recommendations of potential mitigations. All expense items should be identified but will be handled under a separate program.

- Conductor Spacing, including Wind and Snow/Ice Loading- increase horizontal distance between phase and neutral by replacing 3-LPP with current framing standards and check for sagging issues. Resag, reconductor or additional mid span poles may be required. If snow issues, install snow brackets.
- Lightning- add arrestors to replaced 3-LPP.
- Animals- replace 3-LPP with current framing standards and/or install animal protection specific to species (raptor, squirrel, etc.) for sections that would require at least $25,000 of mitigation. Identify any non-standard framing that would require additional animal protection.
- Equipment- replace obsolete equipment, such as porcelain, or equipment with visible deterioration that would cause an outage.
- Underground- refer to underground programs.

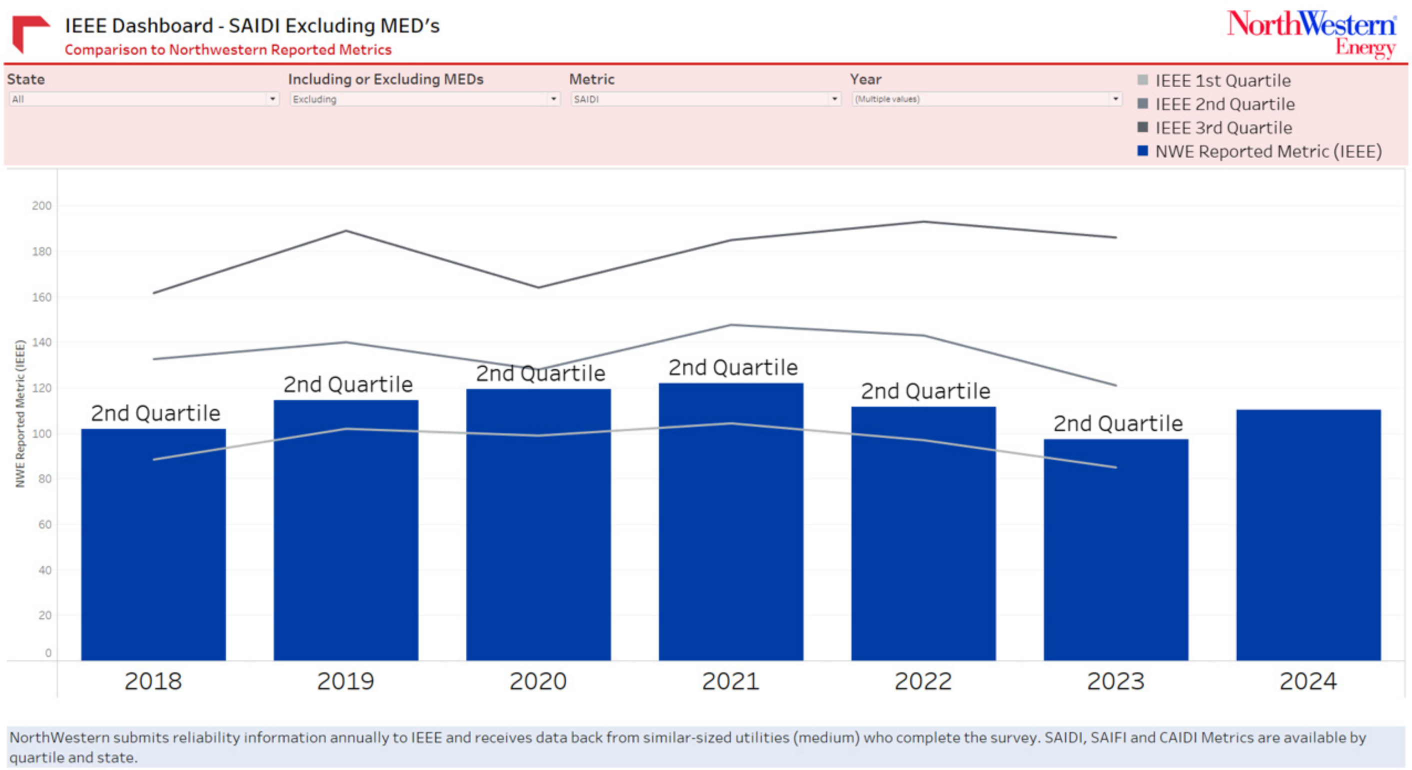
Circuit Reliability

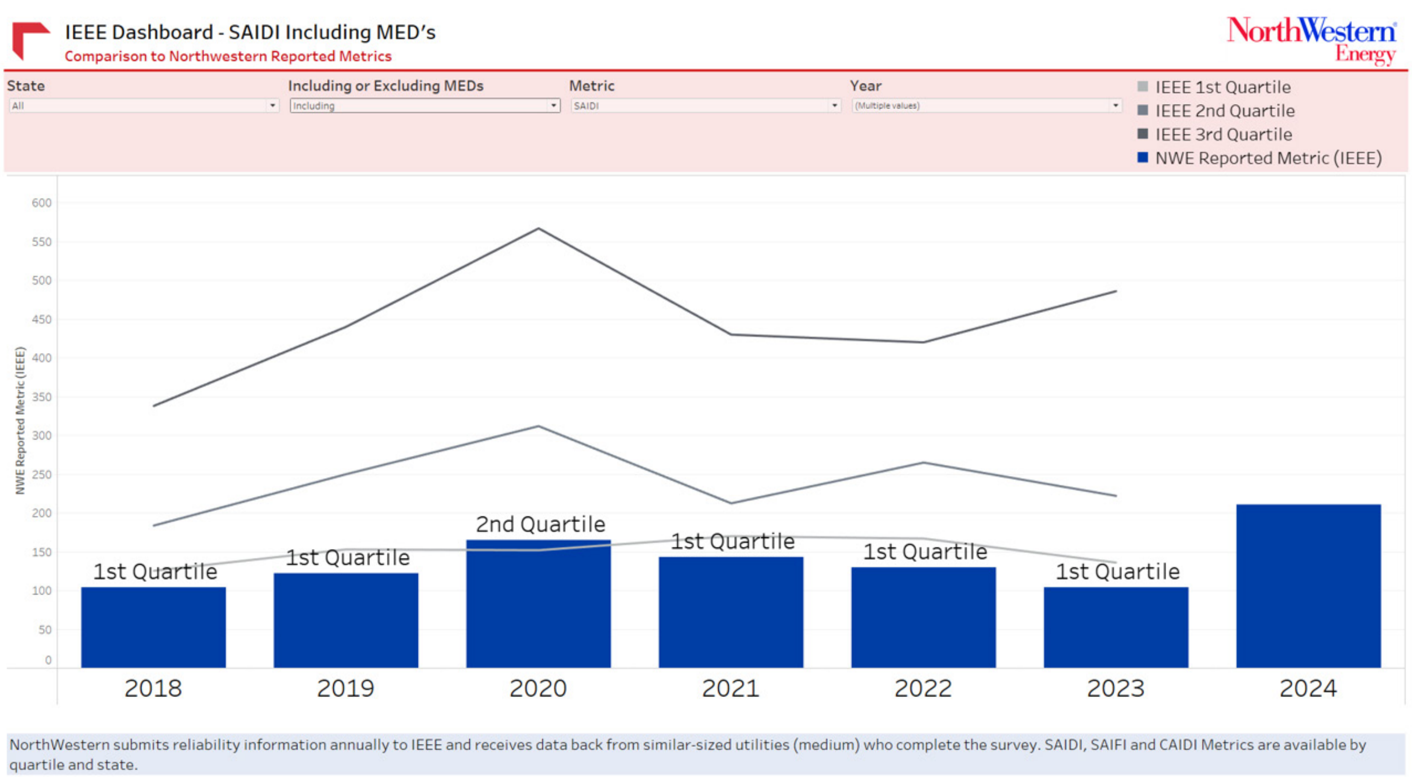
This effort has been available to the South Dakota service territory since 2015. The targeted goal of this work is to improve reliability across the South Dakota electrical system. As a result of the size and low customer density of the area, system improvement programs have taken place on a circuit wide basis rather than the section wide approach as is done in Montana.

Improvement funds are targeted to the circuits that need it most through monitoring of multiple reliability metrics, primarily SAIDI and SAIFI metrics as defined by IEEE reporting standards. These improvements can come in the form of animal guarding, raptor framing, new transformers, new targeted smart switch locations, or any number of other solutions tailored to the circuit getting improved.

Appendix B – Outage Reporting and Reliability

NorthWestern's electric distribution customers in Montana and South Dakota have seen consistent reliability in recent years. Annual IEEE benchmarking compares the performance of utilities within the United States. Utility companies report SAIDI with and without Major Event Days (MEDs) based on IEEE Standard 1366-2022. NorthWestern steadily ranks within the top 1st-2nd quartiles including MEDs, and 2nd-3rd quartiles excluding MEDs of IEEE and EEI comparisons against peer utilities nationwide. Recent regional storms in Montana and South Dakota produced devastating stresses beyond the system's normal capacity. The 2023 hailstorm in South Dakota and 2024 Missoula windstorm in Montana resulted in daily SAIDI which far exceeded the threshold for an MED. Events like these are rare. Designing a system to withstand these events would be neither feasible nor cost effective. IEEE Standard 1366-2022 defines these events as Catastrophic (CAT) and recommends they be reported and analyzed separately.





NorthWestern's expansive service territories encompass a variety of geography, microclimates, and human development interfaces. Prevention of all outages is not feasible. However, improvements in data collection and innovations in modern technology have allowed NorthWestern to work towards the reduction of customer interruptions.

Outage causes fluctuate throughout the year. During fire season, traditionally summer months, frequent reported outage causes include vegetation contacting lines, equipment failures like blown fuses, and animal contacts. Scheduled maintenance and planned outages are a necessary part of the process to achieve improved reliability metrics. These types of outages are a result of improvements to the distribution system and prevent much longer outages from occurring. Regardless of outage cause, areas with more customers tend to experience more frequent outages of shorter duration. This is due to the increased volume of assets and is remedied by the vicinity of response crews. In contrast, rural areas with comparatively more line miles per customer, experience less frequent outages of longer duration. NorthWestern swiftly responds to any outage reported on its system.

Transmission outages also contribute to a significant percentage of interruptions. These systems originate from NorthWestern's system and merge with assets from other regional utilities. Most operations from this system do not result in a distribution customer outage. A significant percentage of outages experienced on NorthWestern's transmission system are considered "momentary." Momentary outages present as "blinks" in energy delivery. Most of the remaining transmission outages are due to maintenance. During maintenance outages, service to customers continues through alternate methods like a different transmission line or portable substations. The largest causes of unplanned outages are weather, unknown, and hardware. Unknown outages occur most often in rural areas with many miles of lines. Accessing these remote locations can be difficult, especially during inclement weather.

Appendix C – NorthWestern's Suite of Tools

NorthWestern's Suite of Tools is a specialized framework for decision making. The Suite of Tools encompasses inputs, models, and dashboards sourced from internal proprietary information, external vendors, and open-source data. These resources can be static or dynamic in nature depending upon the update frequency of the data. Tool types within this framework include:

Inputs – standalone data which quantify specific metrics like wind speed, fuel conditions, or system health.

Models – a mathematic synthesis, scoring logic process, or simulation which produces a composite output.

Dashboards – a user-friendly display of one or more tools to facilitate actionable decision making.

The table below outlines the mode, title, general inputs, and purpose of each tool. Initial iterations of the Plan discussed two primary models: the "static model" and the "dynamic model." Enhancements to these models and the development of new resources warranted an expansion of the framework. Key tools were chosen to display the broad scope of work addressed. NorthWestern may modify the scope of each tool to fit the regional needs within the service territories. New resources will be evaluated for integration as technology becomes available and validated for an appropriate use case.

Mode	Tool	Input(s)	Purpose
Static	Wildfire Consequence Model (WCM)	Historical fire behavior	Simulates the path, spread, and intensity of fires potentially ignited from electrical infrastructure. The output quantifies consequence throughout the Montana and South Dakota service territories.
		Available fuels	
		Structure locations	
		Forecasted conditions	
	Infrastructure Resilience Model (IRM)	System probability	Determines relative risk across the system and guides prioritization of long-range program planning.
		Consequence	
Dynamic	Wildfire Risk Index Model (WFRI)	System probability	Combines risk data with current conditions to evaluate appropriate defensive strategies like EPSS and modified line patrols.
		Fire weather indices	
		Consequence	
	Fire Weather Dashboard	Current conditions	Assesses real-time weather forecasts and fuel data to initiate PSPS procedures based on established thresholds.
		Relevant forecasts	
		Consequence	
	Work Practice Dashboard	Fire weather indices	Assesses real-time indices and fire agency advisories to select Work Practice Matrix level to be observed by field personnel.
		Burn restrictions	

Appendix D – Estimated Montana Enhanced Costing Details

Enhanced Incremental Costs*	2023 A	2024 A	2025 B	2026 F	2027 F	2028 F
Situational Awareness	$172,289	$1,026,983	$2,314,132	$1,743,917	$1,755,230	$1,766,750
Operational Practices	$103,818	$1,241,651	$3,124,812	$1,215,689	$1,227,002	$1,238,522
System Preparedness	$507,493	$36,191,664	$46,436,737	$65,883,011	$65,426,950	$65,425,526
Vegetation Management	$1,024,287	$6,626,115	$10,238,003	$11,688,499	$11,699,812	$11,341,453
Communication & Outreach	$103,818	$1,586,000	$1,314,588	$1,215,690	$1,227,003	$1,238,523
Total:	**$1,911,706**	**$46,672,412**	**$63,428,272**	**$81,746,805**	**$81,335,999**	**$81,010,774**

**Costing is subject to change and updated on an annual basis.*

A - Actual

B - Budgeted

F - Forecasted

Appendix E – Proposed South Dakota Enhanced Costing Details

Proposed Enhanced Incremental Costs*	2025 B	2026 F	2027 F	2028 F	2029 F	2030 F
Situational Awareness	$125,000	$510,000	$585,000	$150,000	$225,000	$150,000
Operational Practices	$533,000	$205,500	$205,500	$205,500	$205,500	$205,500
System Preparedness	$-	$1,613,800	$1,858,900	$1,613,800	$1,613,800	$1,613,800
Vegetation Management	$-	$436,601	$436,601	$436,601	$436,601	$436,601
Communication & Outreach	$35,000	$80,000	$80,000	$80,000	$80,000	$80,000
Total :	**$693,000**	**$2,845,901**	**$3,166,001**	**$2,485,901**	**$2,560,901**	**$2,485,901**

**Costing is subject to change and updated on an annual basis.*

B - Budgeted

F - Forecasted

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