BONNEVILLE POWER ADMINISTRATION

BPA 2026 WILDFIRE MITIGATION PLAN

Abstract

BPA's Wildfire Mitigation Plan outlines a comprehensive strategy to manage escalating wildfire threats. It prioritizes safety, reliability, and economic power delivery through robust maintenance, infrastructure hardening, situational awareness, and enhanced operations.

Message from the Deputy Administrator and Chief Operating Officer

Wildfires continue to increase in frequency and severity and pose some of the greatest threats to electrical infrastructure in the Pacific Northwest. The Bonneville Power Administration proactively enhances its wildfire mitigation efforts to ensure the safe, reliable operation of its transmission system.

BPA's Wildfire Mitigation Plan coordinates the agency's wildfire mitigation efforts under a unified strategy in alignment with our 2024–2028 Strategic Plan and priorities of the U.S. Department of Energy. BPA released its first WMP in 2020, beginning a new focus to modernize its wildfire mitigation efforts. The WMP is a living document and is updated to incorporate best practices and lessons learned. The 2026 WMP is a completely new edition that highlights BPA's continuous improvements in risk modeling, changes to operational practices, and an increased focus on collaboration with industry peers.

Over the last six years, BPA has enhanced the WMP significantly. In 2021, BPA incorporated its Public Safety Power Shutoff procedures. During wildfire season, BPA may use PSPS to proactively de-energize certain at-risk transmission lines to further mitigate ignition risks to our transmission assets. We continue to enhance our PSPS program to incorporate lessons learned from previous PSPS events.

In 2025, BPA created a new governance framework for the WMP. Composed of a cross-functional team, steering committee, and sponsor advisory group, the framework fosters deeper coordination between inter-agency groups.

The WMP continues to amplify its existing proactive and responsive measures through the wildfire mitigation program hierarchy – encompassing BPA's PSPS, system operations, situational awareness and system maintenance and hardening efforts. From BPA's best-in-class vegetation management program to the agency's complex wildfire risk modeling efforts, BPA remains committed to the safety of its personnel, customers, and communities it serves while delivering reliable power.

The newest iteration of the WMP is a demonstration of how our workforce dedicates itself to continuously improving the resilience and reliability of the Federal Columbia Transmission System and to maintaining public safety. I want to acknowledge and thank the Wildfire Mitigation Plan team for their steadfast efforts to enhance this plan.

Suzanne B Cooper

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Deputy Administrator and COO

Bonneville Power Administration

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BPA Strategic Goal

The 2026 Wildfire Mitigation Plan (WMP) underscores the Bonneville Power Administration's (BPA) unwavering commitment to the safety of its personnel, customers and the communities it serves, while ensuring the reliable and economical delivery of power. In alignment with its 2024-2028 Strategic Plan[1] and Department of Energy priorities[2], BPA aims to preserve safe and reliable system operations, recognizing the escalating threat posed by wildfires over the past decade.

This WMP, the plans fifth iteration since its inception in 2020, outlines a proactive and comprehensive strategy to enhance BPA's resilience to wildfires. Core objectives include significantly reducing the ignition risks from utility operations and increasing the resilience of BPA's transmission assets to active fires. This is achieved through a multi-faceted program encompassing key elements such as robust asset and vegetation inspections and maintenance, strategic infrastructure hardening, advanced situational awareness and optimized system operations to minimize ignition risks and ensure quick response.

BPA's approach integrates continuous improvement through rigorous risk modeling, adherence to operational best practices and collaborative efforts with various stakeholders. The plan highlights specific measures including aerial and ground patrols, LiDAR to guide vegetation management and the strategic replacement of aging infrastructure with more durable materials. Furthermore, it highlights the importance of workforce training, interagency collaboration and the Public Safety Power Shutoff (PSPS) program as a measure of last resort during extreme wildfire hazard weather events. The WMP is a living document and is subject to review and updates to incorporate lessons learned, technological advancements and evolving risks, ensuring BPA remains at the forefront of wildfire mitigation in the Pacific Northwest.

Visit BPA’s wildfire mitigation website[3] for more information about the program.

[1] https://www.bpa.gov/-/media/Aep/about/who-we-are/strategic-plan/2024-2028-strategic-plan.pdf
[2] https://www.bpa.gov/-/media/Aep/about/who-we-are/strategic-plan/strategic-plan-companion.pdf
[3] https://www.bpa.gov/energy-and-services/transmission/wildfire-mitigation

2. Introduction

BPA is one of four non-profit federal Power Marketing Administrations (PMA) under the U.S. Department of Energy and was established by Congress in 1937 to deliver power from federal dams on the Columbia River and its tributaries to the region. BPA provides about one-third of the electric power generated in the Pacific Northwest, primarily from reliable, dispatchable and flexible hydroelectric resources.


BPA transmission structures near Rufus, Oregon. (Photo by Rob M.)

Mitigating the risk both to and from wildfire threat is a critical component of managing the transmission grid in the Pacific Northwest. This WMP describes BPA's strategies, goals and program elements to mitigate potential ignitions from the power system and ensure resilience to fires within the region.

Utility Profile

BPA owns, operates and maintains a vast transmission network, known as the Federal Columbia River Transmission System, that is critical to the delivery of electrical power across the Pacific Northwest and surrounding states. Approximately 140 distribution utilities including cooperatives, municipalities, public utility districts, investor-owned utilities, tribal utilities, federal agencies and other entities comprise BPA's customer base[4].

BPA's service territory encompasses 300,000 square miles across Idaho, Oregon, Washington, western Montana and small parts of eastern Montana, California, Nevada, Utah and Wyoming, shown in Figure 1. Geographically diverse, assessing and mitigating wildfire risks across BPA's service territory can be complex.

[4] https://www.bpa.gov/-/media/Aep/about/publications/general-documents/bpa-facts.pdf

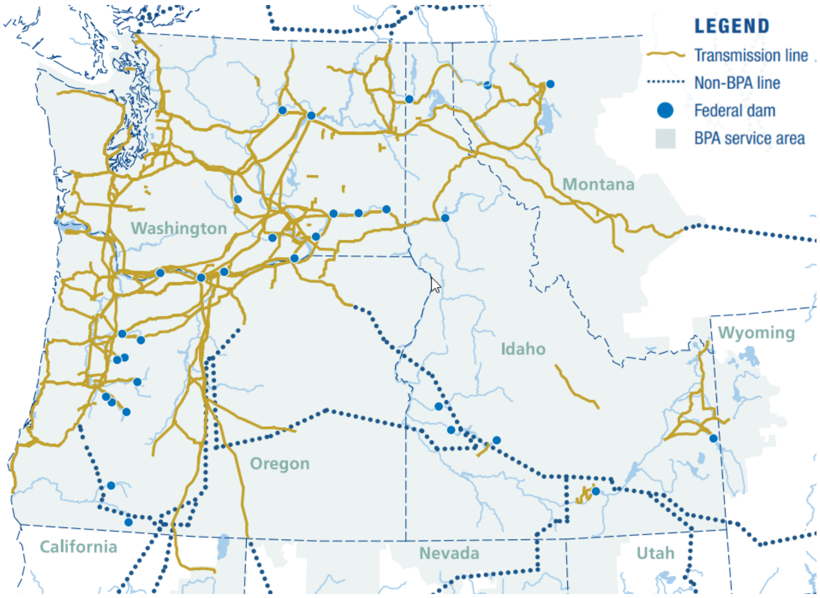


Figure 1 BPA service territory depicting transmission lines and federal dams.

BPA's bulk power system includes roughly 15,000 circuit miles of transmission lines, over 250 substations and approximately 8,000 miles of rights-of-way (ROW) corridors. BPA's transmission system is composed primarily of overhead infrastructure that traverse remote and rural areas.

Table 1 BPA Asset Overview

Asset Type	Description
Substations	250+ substations containing transformers, reactors, circuit breakers and other equipment
Control Centers	Two redundant and geographically dispersed system operations control centers that monitor and control the transmission grid
System Telecommunications	300+ sites and ~3,500 miles of fiber optic cable to control and monitor the grid
Access Roads	11,000+ miles of access roads with bridges, culverts and gates providing access to BPA assets
Wood Lines	~4,800 miles of primarily 115 kV and 230 kV wood lines, including ~73,500 individual wood poles
Steel Lines	~10,300 miles of primarily 230 kV and 500 kV steel lines, including 43,000+ individual steel lattice or pole structures
ROW Corridors	~8,500 miles of linear corridors covering ~200,000 acres of land, including easements and fee-owned land

Historical Fire Information

Throughout the western United States, trends in burned area, magnitude and duration of high wildfire risk periods have continued to increase. An evaluation of wildfire risk within the BPA service territory conducted by Pacific Northwest National Laboratory (PNNL) has observed long-term increases in fire occurrence, earlier seasonal starts, earlier event peaking and later seasonal ends. The following figure provides an overview of historical fire occurrences within the BPA service territory.

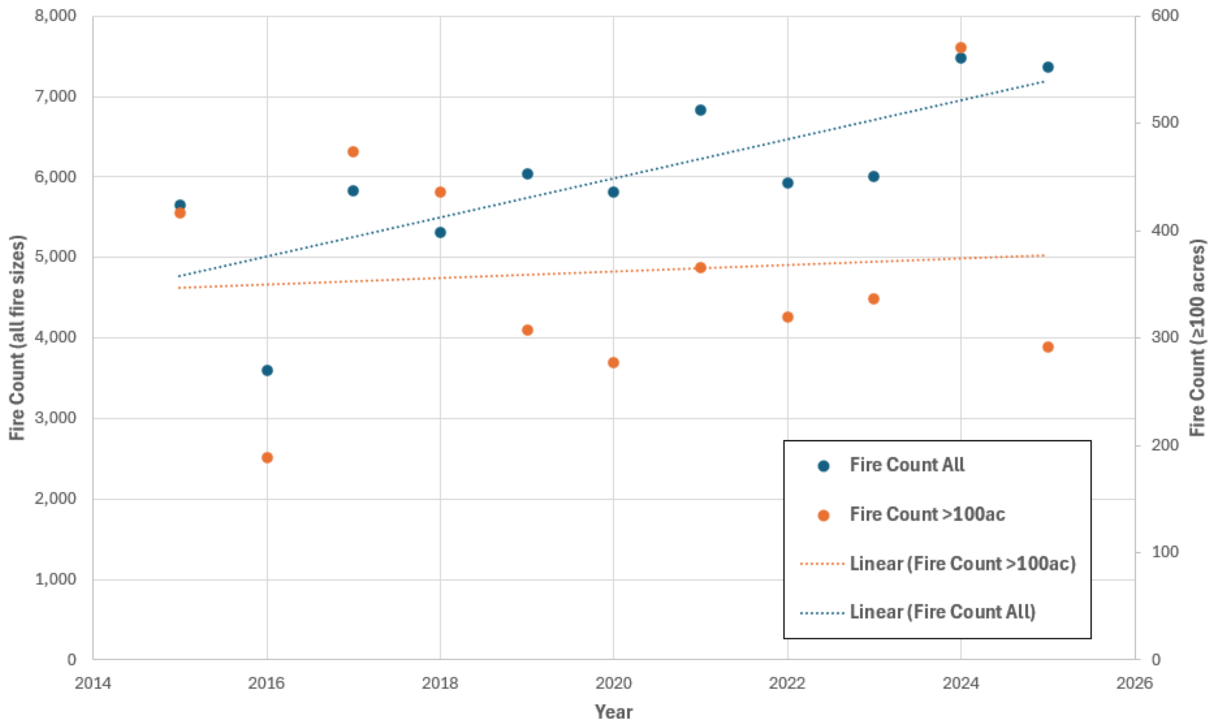


Figure 2 Historical fire occurrence greater than 100 acres within the BPA service territory.

Within the past five years, there have been several fires on the west slope of the Cascade Mountains and on the east slope of the Olympic Mountains, with some areas having no wildfire occurrence in 50-100 years.

Since 2015, there have been 204 fires greater than 25,000 acres within BPA's service territory. Of those, 36 have intersected with transmission assets. Furthermore, 42 fires were greater than 100,000 acres with 13 intersecting with transmission assets[5].

3. Wildfire Mitigation Program Overview

Building upon the foundational understanding of BPA's utility profile and wildfire risks outlined in the Introduction, this section details the overarching goals and structure of BPA's wildfire mitigation program.

[5] https://wfigs-nifc.hub.arcgis.com/

BPA's WMP is designed to safeguard the public and ensure the reliable delivery of electricity through proactive and responsive measures. With nearly 90 years of maintaining safe, reliable power and transmission operations, BPA is adapting to new and emerging risks, such as wildfires, that challenge the grid in an evolving landscape.

BPA's WMP documents strategies, goals and program elements to mitigate potential ignitions and increase resiliency of the utility's assets to wildfire. The wildfire mitigation program hierarchy shown in Figure 3 covers general elements to prepare for and respond to wildfires within the transmission system.

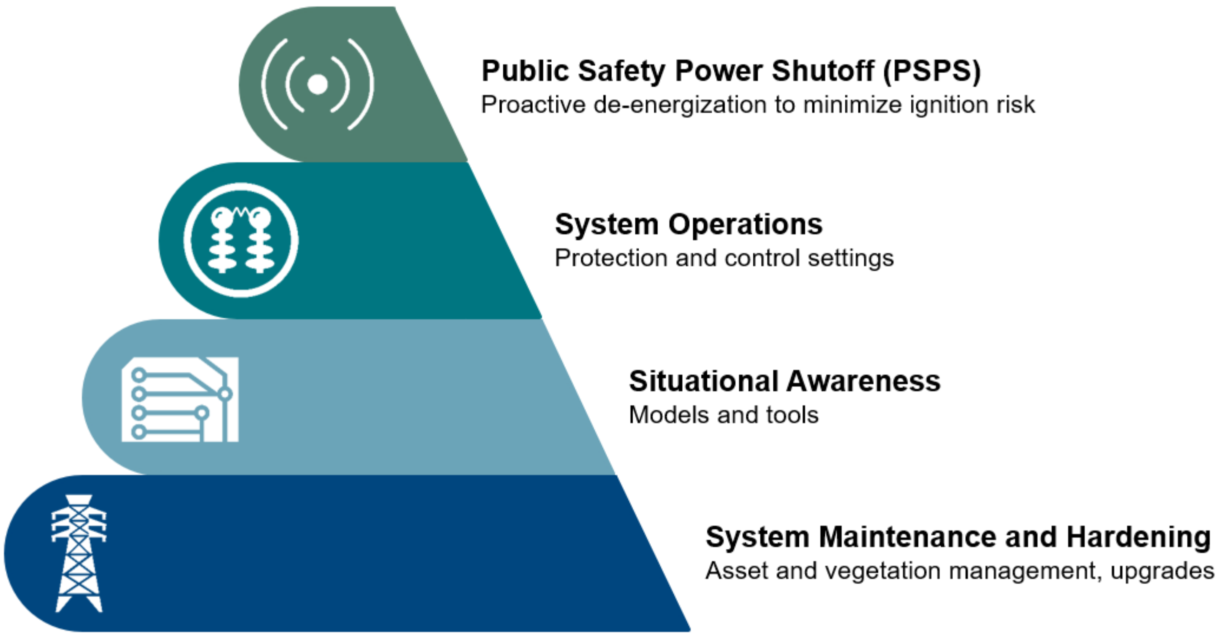


Figure 3 Wildfire mitigation program hierarchy.

System Maintenance and Hardening: The WMP ensures the transmission system is functioning safely and efficiently. This includes regular maintenance, repairs and upgrades.

Situational Awareness: Models, analysis tools and information to allow comprehensive awareness for proactive mitigation strategies.

System Operations: Efficient and effective operational settings are applied to ensure grid reliability, minimize ignition risks and provide for quick response during wildfire events.

PSPS: As a measure of last resort, proactive de-energization of transmission lines during extreme weather to minimize risk of a utility-caused ignition.

BPA continuously aims to improve its wildfire mitigation program through lessons learned and benchmarking from both internal and external collaborations.

4. Governance

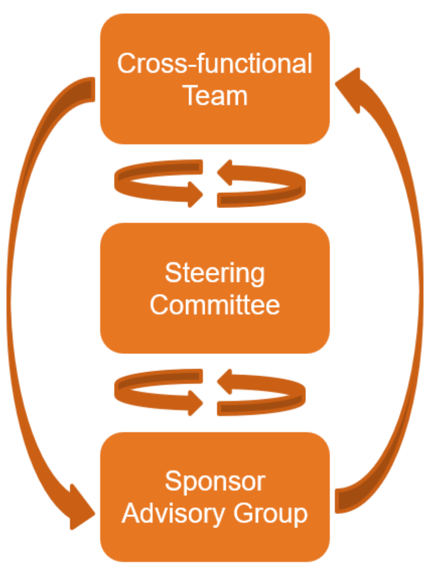
BPA has established a governance framework to manage its WMP. Implementation of BPA's WMP relies on internal and external collaboration, accountability and regular review. With governance in place, BPA endeavors to be better prepared to address the challenges posed by wildfires.

Roles and Responsibilities

While BPA's dedicated Infrastructure Resiliency team resides within Transmission Services, collaboration and input from other organizations within the agency are needed to successfully carry out the program. Wildfire mitigation and response concepts are fostered and developed across BPA organizations. The Infrastructure Resiliency team's role is to compile these ideas and work within a governance structure to prioritize, implement and track wildfire mitigation efforts.

Collaboration occurs across various organizations but is separate from the structure developed to govern wildfire mitigation. In 2025, BPA established a governance structure for wildfire mitigation that includes a cross-functional team to discuss and recommend strategies, a steering committee to provide approval authority and a sponsor advisory group to foster communication with executive level personnel.

The cross-functional team provides expertise for research, discussion and evaluation of wildfire mitigation approaches for implementation and inclusion into the agency's program. The team reviews and evaluates wildfire-related industry developments as well as BPA policies, practices and procedures. The cross-functional team meets twice-monthly, from spring through fall, and monthly from fall through spring. Program recommendations are presented to the steering committee for approval, as needed. The cross-functional team consists of individuals within the following organizations:



Wildfire mitigation governance structure.

- Infrastructure Resiliency
- Continuity of Operations
- Field Strategy & Operational Excellence
- General Counsel
- Geomatics
- Program Management
- Project Portfolio Management
- Real Time Operations
- Transmission Line Engineering
- Transmission Structural & Civil Engineering
- Vegetation Management & Forestry
- Weather & Streamflow Forecasting

The steering committee provides guidance and authorizes decisions for the cross-functional team. When approval is needed, the cross-functional team will make a recommendation to the steering committee including background, industry benchmarking and other requested information to inform the decision. The steering committee consists of BPA Directors and Vice Presidents.

The sponsor advisory group provides executive level input to the cross-functional team. Interactions with other utilities, external governing bodies or constituents may result in ideas to share with the cross-functional team or require more in-depth discussions. Quarterly meetings foster open communication, collaboration and provide opportunities for feedback between the cross-functional team and the sponsor advisory group. The sponsor advisory group consists of BPA Executives.

BPA's Deputy Administrator and Chief Operating Officer have ultimate accountability for this plan. BPA's Senior Vice President of Transmission Services is the owner of the WMP and is responsible for its execution.

Legal and Regulatory Context

BPA is a federal entity and operates in accordance with federal law. Currently there are no specific federal laws or regulations pertaining to electric utility wildfire mitigation. BPA coordinates with states and associated regulatory bodies within BPA's service territory for awareness of emerging rules and guidelines. BPA is not obligated to file this WMP with any state public utilities commissions or similar regulatory bodies.

WMP Cycle

BPA's WMP is a living document that evolves as new information, technologies and best practices become available. BPA follows a structured review cycle to ensure the plan is updated and aligned with agency priorities.

The WMP is regularly reviewed to reflect knowledge gained the preceding year. This includes lessons-learned, operational adjustments and stakeholder input. These revisions aim to ensure BPA can respond to emerging wildfire risks, regulatory needs and evolving system conditions. Updates from the review cycle may result in modifications to the WMP, as needed.

Published updates of the WMP will align with BPA's Integrated Program Review (IPR)[6] and Transmission Strategic Asset Management Plan (SAMP) cycles, which are conducted on two- or three-year cycles to provide consistency between wildfire mitigation strategies, long-term asset planning and financial decision-making.

BPA proactively prepares for each wildfire season, utilizing this plan as strategic and operational guidance. BPA-specific organizational level policies, programs, processes and procedures that support the WMP will be updated based on their respective review cycles.

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[6] https://www.bpa.gov/about/finance/bp-26-ipr

5. Risk Mitigation Planning

Risk analysis helps understand and mitigate potential wildfire threats. Transmission asset failure or vegetation contact during periods of high fire danger can present significant consequences. Such events could result in widespread wildfires with damage to the environment, personal and commercial/industrial property, serious personal injury and even loss of life.

While transmission infrastructure has historically caused fewer wildfires than distribution infrastructure, such ignitions may have the potential to cause more catastrophic fires[7]. Transmission infrastructure is generally less likely to cause wildfires because:

- Transmission conductors have a higher clearance to ground, vegetation and other ignitable materials, decreasing risk for contacts.
- There are fewer transmission infrastructure miles than distribution, making transmission-utility-caused ignitions statistically less likely.
- Transmission systems have fewer points for equipment failure, such as the absence of pole transformers, switches and fuses.

Transmission infrastructure may cause more catastrophic fires because:

- High voltage on transmission lines has greater potential for energy transfer to ignitions.
- Transmission infrastructure is typically sited in more remote areas where ignitions may go undetected for longer durations compared to distribution.

Understanding how drivers of ignition trend across the BPA system is vital to the planning process and informs how BPA quantifies risk by asset location. These trends create probabilistic variables that are combined with asset locations to provide a data-informed understanding of wildfire risk.

[7] https://www.pnnl.gov/sites/default/files/media/file/PNNL-Wildfire-Risk-Mitigation-Best-Practices.pdf

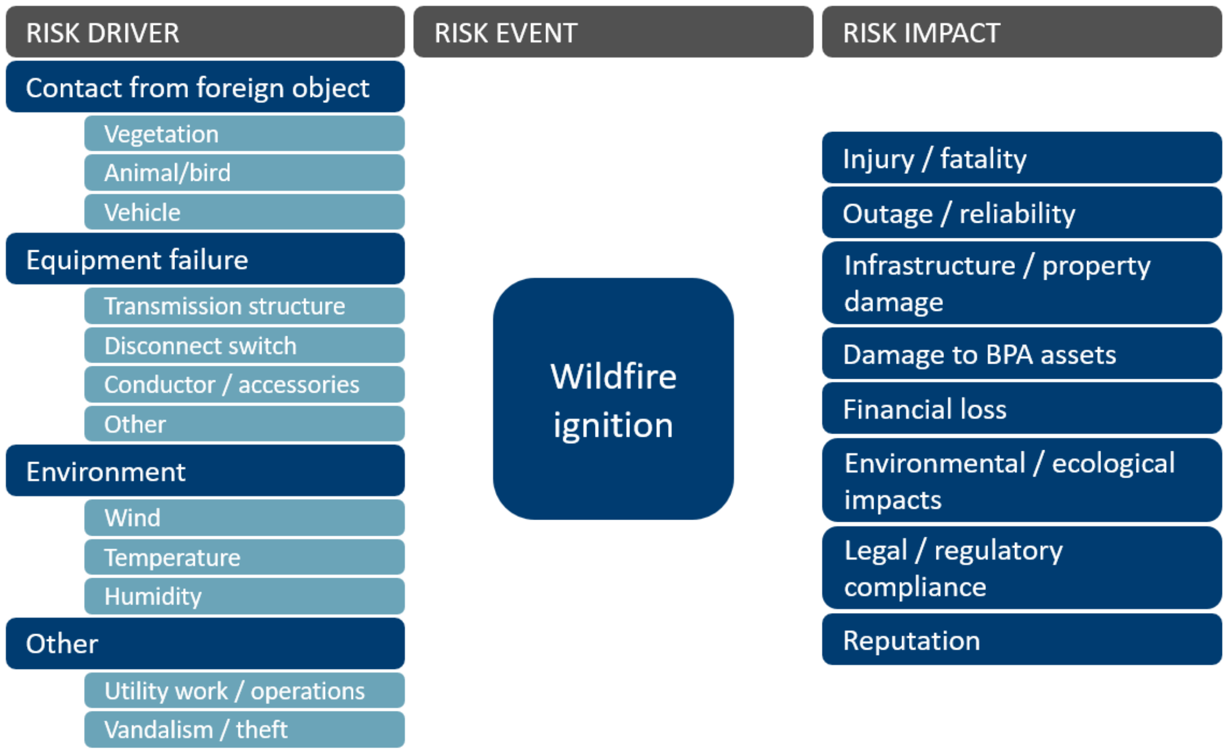


Figure 4 Risk bowtie for utility-caused ignitions.

A root cause analysis, commonly referred to as a bowtie method framework, is a visual representation of causal relationships between risk drivers, an event and impacts. BPA identified risk drivers related to utility-caused ignitions, as shown in Figure 5, with mitigation measures described throughout Section 6. Each mitigation measure is designed to minimize risk driver frequencies and decrease potential impacts.

As wildfires occur in the general landscape, there is inherent risk to BPA's infrastructure. These risks can include infrastructure damage, access limitations and declining transmission reliability. BPA's infrastructure hardening efforts increase resiliency to mitigate potential ignitions and damage from encroaching wildfires, as described more in Section 6.

BPA's transmission organization is developing a risk-based, decision-making value framework that captures key value measures, financial parameters and risks, and is aligned with overall organizational goals. For new construction, or expansion projects, prioritization is based on factors such as compliance standards, customer needs, reliability requirements and economic benefits. For operations and maintenance, or sustain projects, prioritization is determined by applying a consequence and probability matrix. Consequence factors such as compliance, public relations and safety are used with probability factors such as health and land restrictions to assign a project-level priority.

BPA's Transmission organization publishes SAMPs for each asset category, which cover a 10-year outlook and are released externally. The SAMP[8] discusses asset management capabilities in more detail,

[8] https://www.bpa.gov/-/media/Aep/finance/strategic-asset-management-plans/2024-transmission-samp.pdf

including risk-based decision making. Through these efforts, including collaboration with asset partners, BPA has improved its foundation to strategically plan for and prioritize future investments.

Wildfire mitigation strategies often yield co-benefits by enhancing the transmission system's overall resiliency, reliability and safety. For example, vegetation management can reduce wildfire ignition risk and add to reliability during winter storms, reducing the likelihood that vegetation will encounter lines. Table 2 shows how each of BPA's wildfire mitigation strategies contributes to these broader benefits.

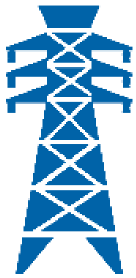
Table 2 Co-benefits of wildfire mitigation strategies.

Program element	Safety benefit: protection from or reduction in the likelihood of causing danger, risk, or injury.	Reliability benefit: provide uninterrupted service, even under system stress.	Resiliency benefit: preparation for and adaptation to changing conditions; rapid recovery from operational disruptions.
Asset inspections and maintenance	X	X	
Vegetation inspections and maintenance	X	X	
Infrastructure hardening	X	X	X
Situational awareness	X	X	X
System operations	X	X	
Public Safety Power Shutoff (PSPS)	X	X	X
Workforce training	X		X

6. System Maintenance and Hardening

Building upon the risk analysis outlined in Section 5, BPA's wildfire mitigation program prioritizes system maintenance and hardening as foundational elements. This encompasses asset inspections and maintenance, vegetation inspections and maintenance and infrastructure hardening.

Asset Inspections and Maintenance



A key part of BPA's wildfire resiliency is inspections and maintenance of assets to ensure they are in good working order. BPA performs and documents maintenance and inspection activities in accordance with the North American Electric Reliability Corporation (NERC) Facilities Design, Connections and Maintenance Standard, FAC-501-WECC: Transmission Maintenance[9]. BPA curates a multitude of inspection standards and guides for field crews that follow Electric Power Research Institute (EPRI) field guide ratings to assess observed conditions and plan corrective actions.

The inspection practices in BPA's Transmission Maintenance and Inspection Plan are both time- and condition-based. Table 3 details inspection frequencies based on asset type.

Table 3 Asset inspection frequency.

Asset type	Working patrol	Aerial patrol	Asset Inspection
Wood pole structures and hardware	Annually	Semi-annually	Initial: 20 years Subsequent: Every 10 years
Non-wood pole structures and hardware	Annually	Semi-annually	Every 10 years
Lattice structures and hardware	Annually	Semi-annually	Every 10 years
Sectionalizing switches and hardware	Annually	Semi-annually	Every 6 years

For maintenance actions, BPA uses a reliability centered philosophy. Therefore, BPA's maintenance practices are typically condition-based, employing optimized preventive maintenance strategies where applicable.

BPA works to maintain the integrity of the electrical system by performing thorough inspections, assigning appropriate maintenance condition ratings, and making necessary repairs.

Working patrol

All lines are visually patrolled annually unless a modified frequency is established. These patrols are typically conducted on the ground or by helicopter, and conditions are documented within inspection systems. Working patrols include inspecting every structure on the line, including terminal spans and substation dead-end structures, and include driving or walking the ROW between each structure. Every effort is made to correct imminent problems while on site.

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[9] https://prod.nerc.com/globalassets/standards/reliability-standards/fac/fac-501-wecc-4.pdf

Patrols are used to obtain information on asset conditions enabling necessary maintenance actions can be taken to ensure a high standard of system reliability.

Aerial patrol

Each line is patrolled aerially two times per maintenance year. Routine patrols are scheduled on all high capacity 500 kV lines prior to the heavy load period so that defects may be repaired when outages are available. Additional non-routine, non-emergency aerial patrols are conducted, as needed. Every effort is made to correct imminent problems while on site.

Not all lines are aerial patrolled in their entirety. Certain areas have limitations such as endangered species habitat or sensitive military service areas.

Each line is patrolled, when practical, following an unexplained interruption or upon request from the system operations dispatcher or designated field leadership. These specific patrols are only counted in the frequency report if the line is due for a routine patrol, or if the line has not been patrolled for more than two months.

Asset Inspection

Visual, climbing and intrusive inspections are used to detect potential defects that could result in failure. BPA standards and guides outline asset-specific inspection criteria for items including, but not limited to:

- Wood poles, cross arms and cross braces
- Non-wood poles
- Lattice steel structures
- Conductor and accessories
- Insulators
- Overhead ground wire
- Guy systems and anchor rods
- Grounding, bonding and cathodic protection
- Foundations/footings
- Disconnect switches
- Fiber-optic cables and accessories
- Obstruction marking and lighting

Inspection timelines outlined in Table 3 are based on asset type and are performed during working patrol.

Access roads are the transportation network for BPA's transmission system. These roads are typically gravel and traverse varying terrain to provide access to transmission lines, substations and telecommunication sites. Transmission line maintenance crews report adverse conditions as they are discovered during routine work.

Wood pole decay.

Land Use Inspections

Most of the real property rights for BPA's approximately 8,000 linear miles of ROW corridors consist of easements. Landowners may use BPA's ROW for purposes that are not expressly prohibited by easement rights and do not interfere with BPA's ability to access the real property and construct, operate and maintain the transmission lines. During annual inspections, field staff report possible incompatible uses, electrical clearance concerns and obstructions such as buildings, roadways, vehicle storage or irrigation. These reports are then evaluated for safety and compatible land use. Any coordination with the landowner to remedy incompatible use is led by BPA's real property services team.

BPA has multiple guidelines and publications available to educate landowners. Land use application processes are maintained to ensure safety within the ROWs[10].

General Maintenance Procedures

Regular maintenance of the transmission system enables efficient, cost-effective operations that enhance reliability and resiliency. Maintenance corrective actions are determined based on data collected during patrols and inspections. Timelines and priorities for maintenance corrections are aligned with EPRI field guide ratings[11] and can be shifted based upon system reliability and safety.

[10] https://www.bpa.gov/environmental-initiatives/land-and-right-of-ways/land-and-right-of-ways-resources/land-and-rights-of-way-resource-library
[11] https://transmission.epri.com/resources/documents/main-docs/TSFieldGuides.pdf

Emergency Maintenance Procedures

Low growing, pollinator friendly Oregon sunshine (Eriophyllum lanatum) flowers underneath transmission lines near Appleton, Wash. (Photo by Beth B.)

Each line is patrolled, when practical, following an unexplained interruption or when requested by the system operations dispatcher or designated field leadership. These emergency patrols are not counted in the frequency report unless the line is due for a routine patrol, or if the line has not been patrolled for more than two months.

Any damages are inspected, recorded and quickly relayed back to system operations dispatch and field leadership. Any necessary work to restore the line to service, either temporary or permanent, is performed to minimize customer outages and transmission operations congestion.

Vegetation Inspections and Maintenance

BPA's Vegetation Management Program (VMP) strives to establish and maintain safe and reliable operation of its facilities by ensuring that all vegetation on BPA easements and fee-owned land is managed consistently with BPA's legal rights and applicable standards. Integrated Vegetation Management (IVM)[12] is employed to promote and establish low-growing plant communities that are compatible with BPA's operations and designed to out-compete tall growing species.

BPA adheres to the (NERC) FAC-003, Transmission Vegetation Management[13] standard. (NERC) FAC-003 applies to transmission lines greater than 200 kV. BPA implements this standard on all its transmission lines, including a large portion of its portfolio that operates below the 200 kV threshold.

Maintaining vegetation near BPA ROW is important to prevent trees, branches or other vegetation from contacting or coming within flashover distance of power lines. Vegetation encroachment can cause electricity to arc from a transmission line to vegetation within proximity causing electrical outages and possibly igniting fires. Another goal of BPA's VMP is to manage and reduce potential fuel sources, especially in areas of high burn probability. In general, less vegetation and fuel loading results in reduced wildfire ignition risk, and fires that burn for less time and at a lower intensity.

Through its mature VMP, BPA continually addresses the reliability and safety risks that vegetation overgrowth creates on its extensive transmission system.

Vegetation Inspections

As defined in (NERC) FAC-003, vegetation inspections are performed annually and at regular intervals for all BPA transmission corridors. During inspections, vegetation both on and off the ROW that could pose a

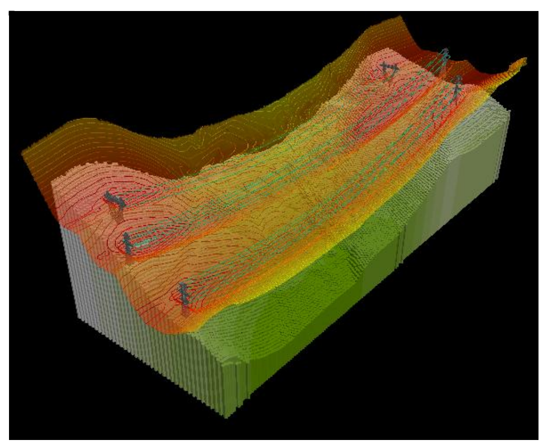
[12] https://www.epa.gov/sites/default/files/2016-03/documents/ivm_fact_sheet.pdf
[13] https://www.nerc.com/globalassets/standards/reliability-standards/fac/fac-003-5.pdf

reliability risk to transmission lines are identified for future treatment. Encroachments into BPA's defined action thresholds ensure that no vegetation encroaches into the Minimum Vegetation Clearance Distance (MVCD). BPA relies on a mix of patrol methods to collect vegetation data and goes beyond the minimum requirements defined in (NERC) FAC-003, as described in Table 4.

Table 4 Vegetation inspection frequency and description.

Patrol type	Frequency	Description
Ground	Twice annually • Performed during annual asset inspections. • Summer readiness patrols completed prior to the growing season.	Visual inspections noting any vegetation encroachments or likely encroachments into the ROW.
Aerial	Entire system: Twice annually in spring and fall Orchard areas: Twice annually in spring and fall	Helicopter inspections enable visual checks more quickly than ground inspections.
LiDAR	Approx. every three years	BPA uses LiDAR data in various ways, including creating a maximum vegetation height model.

Twice-yearly aerial patrols with visual inspections are performed for all ROW corridors. Annual ground patrols include visual vegetation inspections under, along and outside of BPA's ROWs and transmission infrastructure. LiDAR data provides secondary protection to ensure tree-wire conflicts do not occur. Evaluation of species, growth rate, overall tree health and proximity to infrastructure are included in patrols. Proper identification of vegetation issues also considers electrical attributes including conductor span length, operating temperature and atmospheric conditions that can affect conductor sag.



LiDAR derived maximum vegetation height model for cycle maintenance.

LiDAR is collected on all BPA lines approximately every three years, at strategically defined intervals. This data is used for engineering design, geospatial location and to guide vegetation management actions. LiDAR data is also used to create models that display the relationship between BPA's transmission infrastructure and MVCDs within the ROWs. These models are accessible from mobile devices and validation is performed during visual ground patrols.

Routine Vegetation Management and Maintenance

Performing regular IVM cyclical vegetation maintenance and clearing within the ROW helps keep transmission corridors clear and manages fuels to avoid or reduce wildfire impacts. Maintenance is performed at regular intervals dependent on geographic area and vegetation growth rates within the BPA system. Variables used to determine the length of vegetation maintenance cycles include species, growth rate and precipitation which can vary significantly across BPA's service territory. For example, wetter conditions along ROWs west of the Cascade Range are maintained on a three-year cycle, and those that are drier and with slower growth east of the Cascades are maintained on a three or six-year cycle.

Routine maintenance encompasses approximately nine-tenths of all vegetation activities. Methods include, but may not be limited to, mechanical mowing, mastication, pruning, removal and bare-ground herbicide application around wood poles and other facilities. All vegetation-related clearing is designed to meet environmental requirements for the project as identified in the National Environmental Policy Act process and in accordance with other applicable environmental regulations as identified during the environmental review process[14].

BPA has established its own clearance threshold distances, which exceed MVCD in (NERC) FAC-003. Distances are measured from vegetation to the conductor at all operating conditions as noted in Table 5. Danger brush is defined as any vegetation that is less than or equal to the defined clearance distance from the conductor. Danger trees are defined as any tree located outside of the ROW that may be a present or future hazard to the transmission line.

Table 5 Vegetation clearance thresholds by voltage.

Voltage	Imminent Threat (As Observed)	Danger Trees	Danger Brush	Cycle Maintenance
≥ 200 kV	MVCD + 5’	MVCD + 5’	< 15’	15-20’
< 200 kV	MVCD + 5’	MVCD + 5’	< 10’	10-15’
Fiber optic	N/A	N/A	< 3’	3-10’

Maintenance is prioritized based on the prevention of encroachment into the MVCD. Annual work plans are created and may be modified for reasons such as change in expected growth rates or permitting delays. Vegetation removal actions may be impacted by legal constraints such as private property rights, pre-existing maintenance agreements, environmental laws (including the Endangered Species Act[15]) or unsafe conditions. Even while negotiations or legal action with other entities, sovereign nations or landowners are under way, vegetation management activities continue to prevent encroachment into the imminent threat clearance category and be documented as such.

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[14] https://www.bpa.gov/learn-and-participate/public-involvement-decisions/laws-and-requirements
[15] https://www.fws.gov/law/endangered-species-act

Prior to any vegetation work along the ROW, BPA sends notices to underlying and adjoining landowners. These notices include the scope and schedule of proposed work as well as how to contact BPA if there are any questions. BPA also coordinates with public land managers prior to vegetation work.

Tree removal along a BPA ROW corridor.

While performing vegetation work, debris is cut, lopped, scattered and then dispersed to maximize contact with the ground to promote decomposition. Bare-ground herbicides are used around wood structures and other infrastructure facilities to manage vegetation growth, re-sprouting and to decrease fire threats both to and from transmission infrastructure. In some circumstances, helicopters equipped with aerial saws may be used to trim treetops and limbs when more traditional manual efforts are unsafe or inaccessible. Use of helicopters reduces environmental disturbance on the ground while also safely gaining access to remote, mountainous areas, especially those recently impacted by fire.

To perform vegetation maintenance work, BPA contracts with third-party vegetation clearing crews certified as Utility Specialists by the International Society of Arboriculture[16]. Their actions are designed to comply with all state and federal laws and regulations pertaining to fire prevention. These crews are required to carry firefighting equipment, use chainsaws with spark arresters and provide a fire watcher when necessary.

Once contracted work is complete, quality control audits are conducted within 14 calendar days of completion to ensure the work meets vegetation management standards.

Corrective Maintenance

While BPA strives to maintain corridors regularly, unanticipated corrective actions are often required. Corrective maintenance encompasses less than one-tenth of all vegetation activities and is prioritized based on internal guidelines and professional judgement.

[16] https://www.isa-arbor.com/Credentials/Types-of-Credentials/ISA-Certified-Arborist-Utility-Specialist

Remediation after the 2024 Darlene 3 fire near LaPine, Oregon.

Remediation

Post-fire work includes inspection and potential clearing of dead and burnt trees from BPA access roads and potential removal of trees that could impact transmission lines or infrastructure. Ground tree-felling crews are used as well as helicopters to top trees in inaccessible areas. Prompt remediation minimizes the risk of dead trees falling and contacting the conductor and helps prevent future outages or ignitions.

Outage Reporting

BPA maintains records that comply with (NERC) FAC-003 reporting requirements of sustained outages from all vegetation related causes, both planned and unplanned. Automatic notifications are sent to BPA's vegetation management team if an outage type is categorized as a "tree or vegetation source." When a vegetation-caused outage is identified, personnel strive to collect necessary evidence from the scene including tree type, cause of failure and weather conditions at time of failure. This information is compiled into a tree-caused outage report. All reports are maintained and included in an annual summary.

Partnerships and Accreditations

In 2014, BPA was the first PMA and one of seven inaugural utilities to receive accreditation for its use of IVM from the Right-of-Way Stewardship Council[17]. The Right-of-Way Stewardship Council established management standards based on ten principles and 35 criteria points[18]. Additionally, accreditation includes a formal application process and third-party reviews to ensure compliance. BPA has maintained this accreditation since 2014.

[17] https://rowstewardship.org/
[18] https://rowstewardship.org/standards.php

Desirable, low growing plants like kinnikinnick (Arctostaphylos uva-ursi) flourishing in Montana without incompatible trees in the ROW. (Photo by Kyle G.)

BPA has been collaborating with the United States Forest Service (USFS) on fuel reduction projects near BPA assets. This includes defensible space around substations, timber fringe removal and the implementation of adapted wire zone - border zone concepts, as shown in Figure 6. The objectives of this collaboration include:

- Reduce forest fuels
- Mitigate wildfire impacts to critical infrastructure and communities
- Restore vegetation conditions that are resilient to natural disturbances
- Provide wood products that contribute to local and regional economies and the sustainable supply of timber from USFS lands
- Maintain a suitable transportation system to support long-term management
- Reduce likelihood of tree strikes to transmission lines
- Reduce ladder and surface fuels to lessen fire intensity and flame length, should a fire occur

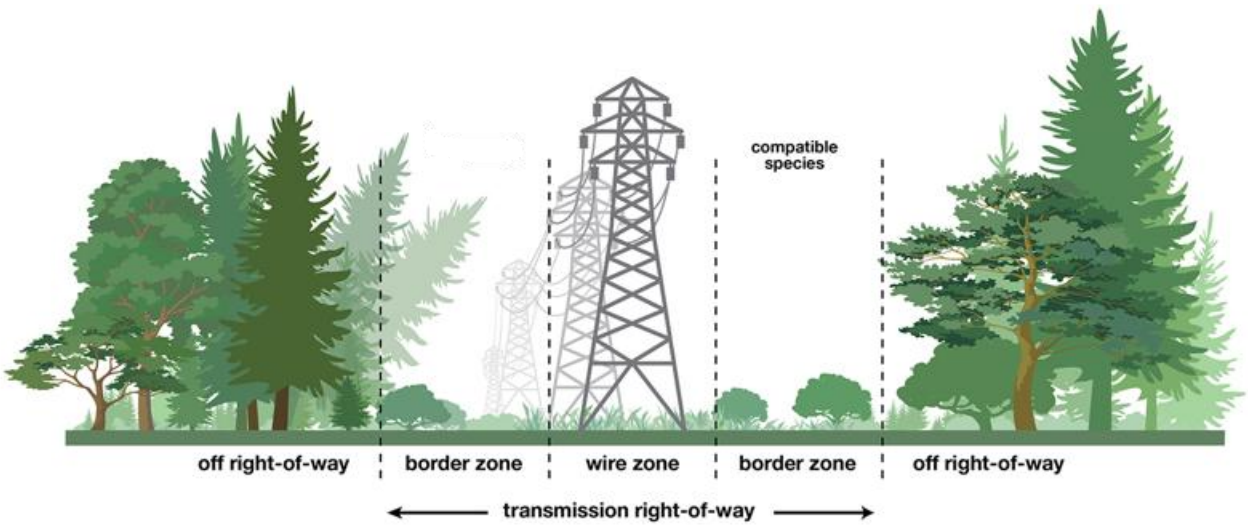


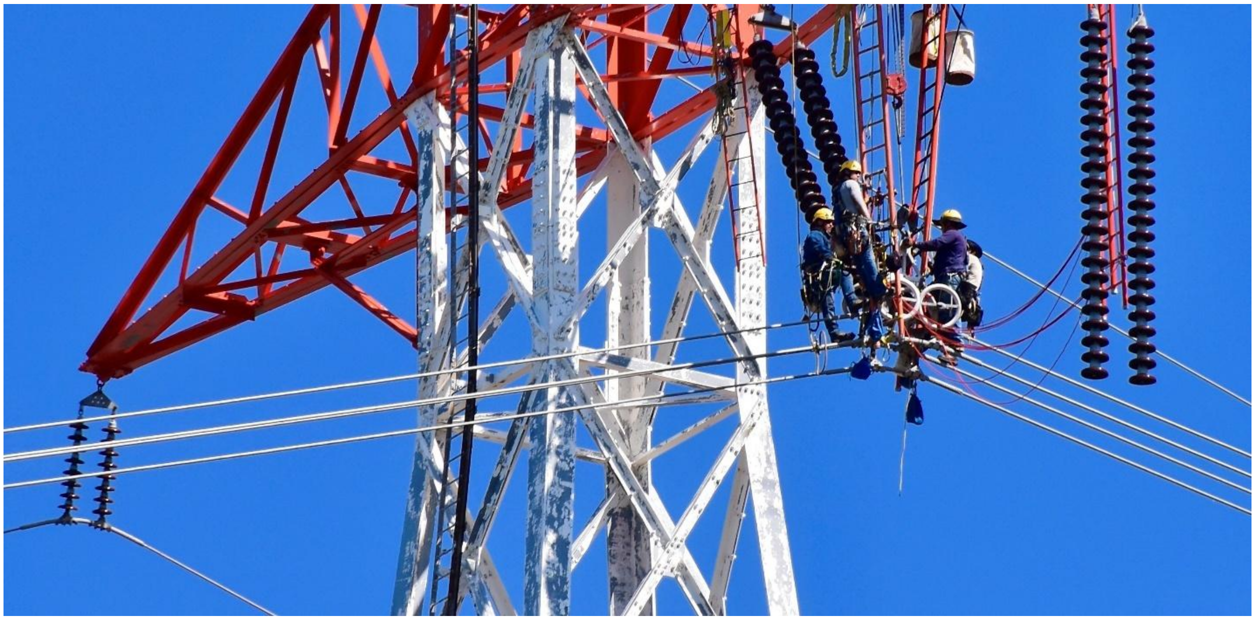
Figure 5 Adapted wire zone - border zone concept for BPA ROWs.

Guidelines for logging operations are also maintained and shared with public and private logging companies and timber sale managers. The guidelines include safety information for logging personnel, general practices when working around transmission lines and instructions limiting logging in fringe areas.

Infrastructure Hardening

Building on over 80 years of providing safe and reliable power, BPA continues to enhance its transmission operations through infrastructure hardening. With power demand growing, driven largely by data centers and other energy-intensive industries, grid expansion to accommodate new generation will require transmission infrastructure buildout in an evolving landscape. BPA will continue to deliver power through resilient systems with the ability to withstand high-impact events, including wildfires.

Layers of resilience based on individual assets, geographic location and surrounding environment are needed to address wildfire risks across BPA's system. Even with comprehensive infrastructure hardening, residual ignition risks persist due to factors such as faulty equipment, blowing debris and malicious intent. Hardening the transmission system reduces potential ignitions and adds to resiliency from fires in the landscape.



Transmission line insulator replacement near Bonneville Dam. (Photo by Rob M.)

Design and Construction Standards

BPA maintains over 500 internal standards and guides that encompass reliability criteria, engineering policies, equipment selection and application criteria, material and equipment specifications, and construction specifications. These documents are in addition to, and are oftentimes more stringent than, industry standard and code libraries maintained by organizations such as:

- American National Standards Institute
- American Society of Civil Engineers
- American Society for Testing and Materials International
- International Code Council
- Institute of Electrical and Electronics Engineers
- National Electric Safety Code
- North American Electric Reliability Corporation
- National Fire Protection Association
- Occupational Safety and Health Administration

BPA's standards and guides span areas from material specifications to ensure quality wood poles are delivered, to design standards that specify conductor clearance limits. These documents undergo regular review cycles to incorporate emerging technologies, lessons-learned and industry best practices.

BPA gathers remote sensing datasets, including aerial imagery and LiDAR, for ROW corridors, substations, telecommunication sites and other facilities. The data is collected approximately every three years and used to assign geospatial locations of assets, perform engineering analysis and analyze clearances to transmission lines. High-resolution aerial imagery, both oblique and orthorectified, provide the ability to perform "desk analyses" without the need for travel. Additional benefits for vegetation management are noted in subsection "Vegetation Inspections and Maintenance."

New Construction

When considering new infrastructure, current design standards and technology are used to ensure efficiency and longevity. BPA also uses long-term probabilistic wildfire risk models, discussed in Section 7, as one input to siting of new assets.

Upgrades

Regular equipment upgrades ensure the delivery of safe, reliable power to customers. Projects are planned and prioritized with BPA's asset management framework and the Transmission SAMP.

Upgrades include rebuilding existing lines and replacing specific equipment that has reached the end of its service life. BPA operates a capital expansion program to meet the needs of load service customers and suppliers through projects identified in the Transmission Service Request Study and Expansion Process[19]. The capital sustain program ensures that all parts of the transmission system are reliable and have sufficient capacity.

[19] https://www.bpa.gov/energy-and-services/transmission/acquiring-transmission/tsep

Steel Lines

For steel lines, insulator replacement projects comprise approximately half of the sustain efforts. Risks can increase as the transmission system continues to age. Individual insulator failures can cause an outage if the remaining functional insulators are insufficient to prevent flashovers. While commonly caused by gunfire, these failures can also result from age, lightning or wear-related issues. If an entire insulator assembly mechanically fails, the conductor may fall and can potentially cause an ignition.

Conductor fittings are examined and replaced, as necessary, during insulator replacement projects. Plastic and fiberglass marker spheres are being replaced with modern aluminum spheres. Damaged steel components are repaired as needed.

Construction of a prop structure to remediate a clearance concern near Covington, Washington. (Photo by Travis A.)

Obsolete conductors present a unique risk. If there are failures, the conductor cannot be repaired because new material is no longer available, and the installation of replacement equipment will require long-duration outages for new design, material acquisition and construction. In 2008, BPA began the replacement of obsolete 2.5” expanded conductors to reduce risk to the system. This effort has become more critical as system loads have grown, and more capacity is needed on many of the 500 kV lines for system expansion projects.

Impairment, or conductor clearance, mitigation constitutes a significant part of BPA’s sustain efforts. These electrical clearance concerns are addressed either as components of larger projects, such as reconductoring and insulator replacements, or as stand-alone projects.

Wood Lines

Fire retardant wrap after the 2024 Swawilla I Fire near Keller, Washington.

Wood line rebuilds become necessary due to age, deteriorating component conditions and capacity needs. As wood structures age, their reliability decreases, and risk of failure can increase, leading to more frequent outages and ignition risks. Wood rot, insect damage and weathering can weaken the structural integrity of poles and components, increasing their susceptibility to failure. Older transmission lines were not designed to accommodate increased energy loads, leading to potential overloading and inefficiencies. Outside of wood line rebuilds, BPA created a program to specifically address pole replacement as they age.

Wood poles inherently lack resilience to wildfires. To address this, BPA installs fire retardant wraps on existing wood poles and strategically replaces them with non-wood materials. In 2023, BPA began installing fire retardant wraps to wood poles within high fire risk areas. In both 2024 and 2025, multiple poles were spared from fire damage due to wrap installation. For areas that see fires annually, wood poles are being replaced with steel or ductile iron as the poles age out of service. Both measures increase resiliency to poles, whether wood or non-wood, from fire risks.

Insulator replacement, conductor replacement and impairment mitigation are addressed similarly to the steel lines program.

Rebuilding old wood pole transmission lines with more durable materials and advanced technology enhances the reliability, safety and efficiency of the power grid. This proactive approach helps ensure a stable power supply and reduces the chance of utility-caused ignitions.

Line Disconnect Switches

Line disconnect switches play a vital role in isolating sections of the power grid for maintenance, repairs and during emergencies. Outdated or malfunctioning switches can hinder the safe de-energization of specific segments, complicating routine operations and prolonging outage durations, including during

Public Safety Power Shutoff events. Proactive upgrades to modern switches ensure more reliable isolation and reduce the risk of ignitions.

Upgrading to modern switches ensures a more reliable isolation and re-energization process. While BPA already employs graveled areas directly around disconnect switches for grounding purposes, there is a high risk of sparks or molten metal emanating from switching activities that could extend beyond the improved surfaces. To address this risk, BPA is expanding rocked areas around switches in alignment with the 2021 California Power Line Fire Prevention Field Guide[20].

Access road network along BPA transmission lines near Flathead Lake in Montana.

Access Roads

Over 11,000 miles of BPA-maintained access roads serve as the transportation backbone for maintaining the transmission system. These roads not only support BPA assets but can also provide fire suppression crews access to remote areas. Wildfire risk models, further detailed in Section 7, serve as one of multiple inputs for prioritizing maintenance actions for access roads.

Supply Chain

Ensuring adequate material stocking levels for post-fire restoration is critical for rapid re-energization. BPA maintains an emergency stocking of critical components including poles, insulators, conductor and other ancillary equipment. Materials are available at various maintenance facilities throughout the service territory. Portable temporary steel structures, shared with PacifiCorp, are also stored in Vancouver, Washington.

7. Situational Awareness

Beyond physical infrastructure, robust situational awareness is critical for effective wildfire mitigation. Situational awareness is crucial in wildfire mitigation because it provides the understanding necessary to make informed, timely decisions by allowing individuals and responders to perceive, comprehend and project the changing conditions of fire potential, intensity and its environment. This comprehensive awareness facilitates risk mitigation, protects lives and property and enhances response coordination through proactive, rather than reactive,

[20] 34c031f8-c9fd-4018-8c5a-4159cdff6b0d-cdn-endpoint.azureedge.net/-/media/osfm-website/what-we-do/community-wildfire-preparedness-and-mitigation/prevention-field-guides/2021-power-line-fire-prevention-field-guide-ada-final_jf_20210125.pdf

strategies. BPA's program leverages meteorology, advanced modeling and specialized tools to achieve this, aligning with the program hierarchy outlined in Section 3.

Weather

Meteorology assists wildfire mitigation by providing crucial data for risk assessment, prevention and response. Accurate weather forecasts enable utilities to identify high-risk periods, implement PSPS procedures and focus infrastructure hardening efforts. Real-time weather monitoring provides situational awareness, allowing for timely decisions on de-energizing lines and dispatching resources to monitor conditions on the ground.

BPA’s meteorological team uses various National Weather Service (NWS) products and other observational data sources to provide short- and medium-range forecasts.

Medium-range forecasting provides internal seasonal forecasts for fire potential and fuel conditions within the preliminary summer, summer and preliminary fall periods. This provides for two-to-three-month future outlooks.

Short-range forecasting provides hazards, locations, timing and areas affected in a summary format. The team uses public weather models and customizable graphics using StormVista. StormVista’s models forecast approximately 14 days in advance with three- to six-hourly timesteps, while its high-resolution models forecast only two to three days in advance with finer hourly timesteps. This capability highlights short range (five to seven day) fire potential and enables spot forecasts for any active fires near BPA assets. Internal Geographic Information System (GIS) tools are used to create transmission weather alerts for any lightning and/or wind gust threats potentially reaching PSPS criteria, as described more in Section 9.

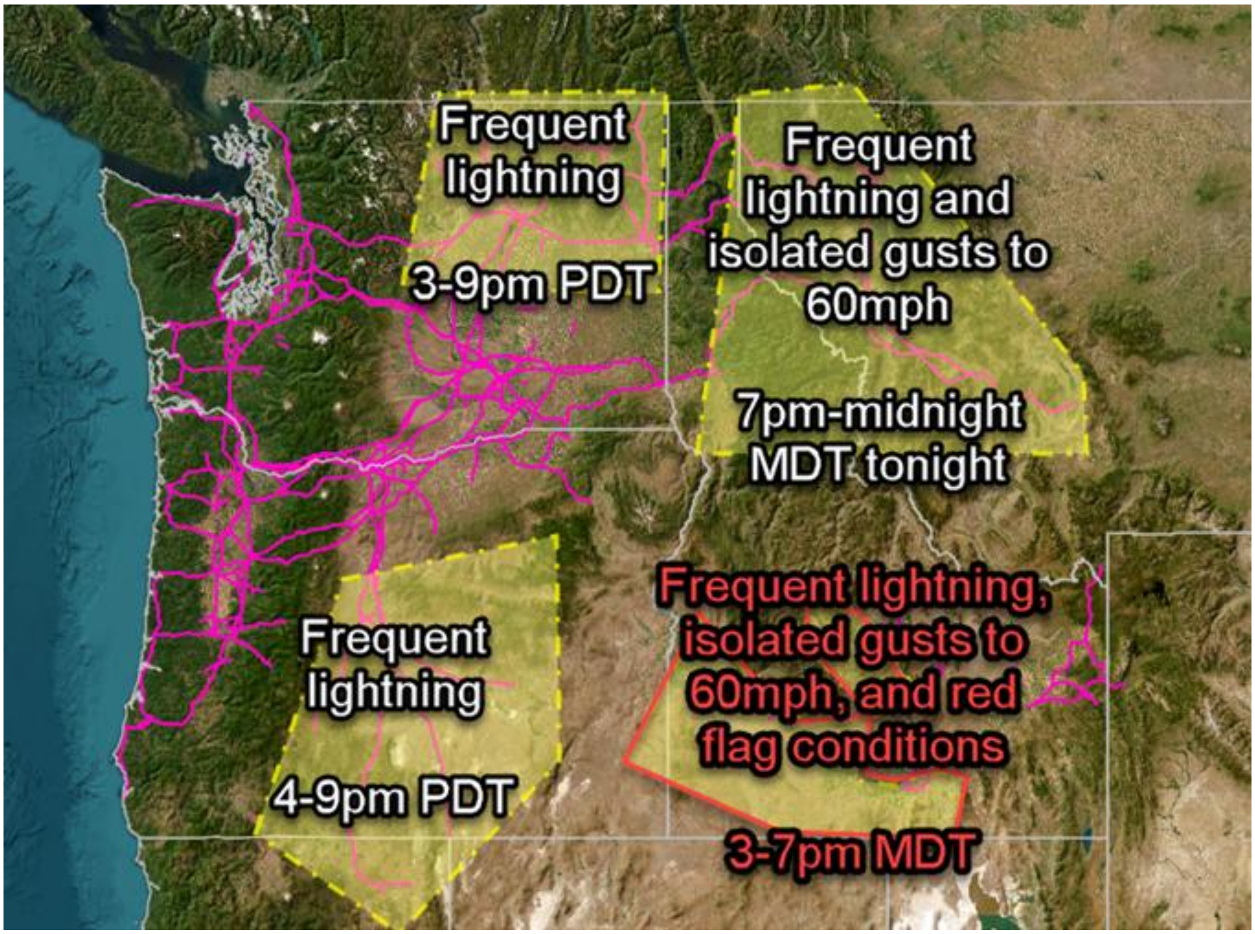
Transmission weather alerts are issued when hazardous conditions occur throughout the year. When NWS Red Flag Conditions[21] overlap with a transmission weather alert that includes high winds/gusts, BPA’s PSPS process is triggered. If Red Flag Conditions overlap with a transmission weather alert that includes frequent lightning without high winds/gusts, then the PSPS process will not be triggered. If the PSPS process is triggered, the meteorology team specifies which areas are at high risk for wildfire conditions. NWS Storm Prediction Center fire weather products may also be used during this process. The meteorological team refers to the following observational data for real-time temperature, relative humidity and wind gust information across BPA’s service territory:

- Automated Surface Observing System: A network of weather stations operated by the NWS. These stations are a joint effort of the NWS, the Federal Aviation Administration and the Department of Defense, collecting information on wind speed and direction, temperature, visibility and precipitation type.
- Automated Weather Observing System: An airport weather system that provides real-time, automated data on airport conditions, including wind, temperature, dew point, visibility and sky conditions.
- Remote Automatic Weather Stations: Automated, solar-powered weather monitoring units strategically placed in remote locations to collect, store and transmit meteorological data for

[21] https://www.weather.gov/dtx/fire_defs

various applications, most notably wildfire management, but also air quality, resource management and research. These stations measure key weather variables like wind speed, temperature, relative humidity and precipitation, with data relayed via satellite to a central computer system at the National Interagency Fire Center (NIFC).

The team coordinates with the Storm Prediction Center, NWS and Geographic Area Coordination Centers to discuss current weather scenarios and forecasts. The Northwest Coordination Center morning briefing document, NIFC situation report document and internal GIS applications are utilized to determine current fires near any of BPA's assets to include in the internal fire weather forecast discussions.



Example transmission weather alert produced by BPA's meteorology team.

Wildfire Risk Modeling

Wildfire risk modeling helps utilities proactively identify high-risk areas, prevent ignitions, safeguard infrastructure, protect communities, ensure service continuity and optimize mitigation investments. Since early 2022, BPA has partnered with a team of wildfire physicists, geospatial analysts and data scientists at PNNL to develop probabilistic wildfire risk models for its service territory. The PNNL team applies and advances industry best practices and uses the latest remote sensing to establish current landscape and vegetation states, as well as observed ignitions, meteorology and fire behavior to derive wildfire risk model outputs tailored to BPA's business requirements and customer base[22]. An evaluation conducted by PNNL reveals that fire occurrence trends in the BPA service territory show an average year-over-year increase in fire counts, with emerging threats in areas not historically prone to high fire risks.

Understanding current and projected wildfire risks helps prioritize mitigation efforts, including vegetation management, infrastructure hardening, consequence analysis and PSPS planning. The models have continuously evolved, with significant improvements in data and methodology, particularly in the 2024 and 2025 iterations. These newer models provide more robust risk estimates by incorporating more recent historical atmospheric and fire data reflecting fire behaviors that have changed over the past decade.

BPA's ongoing work with PNNL focuses on several key areas:

- **Vegetation fuelscapes:** Focuses on developing multilayered spatial datasets that incorporate topography, vegetation characteristics (canopy cover, height, base height, bulk density) and defined fire behavior fuel models. Machine learning, incorporated in 2023, and data engineering for canopy characteristics are used to update vegetation types, cover, height and fire behavior fuel models.
- **Wildfire behavior modeling:** The Large-Fire Simulator uses historical meteorological and fire occurrence data to produce burn probabilities and flame length estimates under two main scenarios.
    - Corridor ignitions constrained to BPA ROWs and substations to assess the risk of BPA asset-caused fires.
    - Landscape ignitions allowing fires to ignite freely across the BPA service territory landscape to represent natural and human-caused events.
- **Consequence modeling:** Assessing potential public health and safety consequences if a BPA asset were to cause a fire. This model integrates the Centers for Disease Control and Prevention and Agency for Toxic Substances and Disease Registry Social Vulnerability Index[23], Fire and Emergency Medical Services (EMS) locations and drive time evacuation estimates from all buildings/structures, simplifying and updating the analysis for more focused health and safety consequence scenarios. The BPA-PNNL methodology applied is motivated by the same goals as the USFS Pacific Northwest Quantitative Wildfire Risk Assessment and uses some of the same publicly available datasets, but like the wildfire risk modeling process, is tailored to BPA's requirements[24].
- **Long-term future wildfire risk modeling:** Investigating long-term future wildfire risk to inform BPA's planning and decision-making. This involves assessing potential future changes in burn probability, fire size, frequency, and timing using the Energy Release Component (ERC) as a proxy for wildfire risk under future conditions. Preliminary analysis for 2030–2039 and 2040–2049

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[22] Chalishazar, e. a. (2023). *Wildfire Risk Evaluation Framework for Grid Operations and Planning.* IEEE Power & Energy Society General Meeting (PESGM).

[23] https://www.atsdr.cdc.gov/place-health/php/svi/index.html

[24] Reilley, e. a. (2024). *Socially vulnerable US Pacific Northwest communities are more likely to experience wildfires.* Environmental Research Letters 19(9).

suggests a notable increase in ERC across the region, indicating a potential for more frequent and severe wildfires.

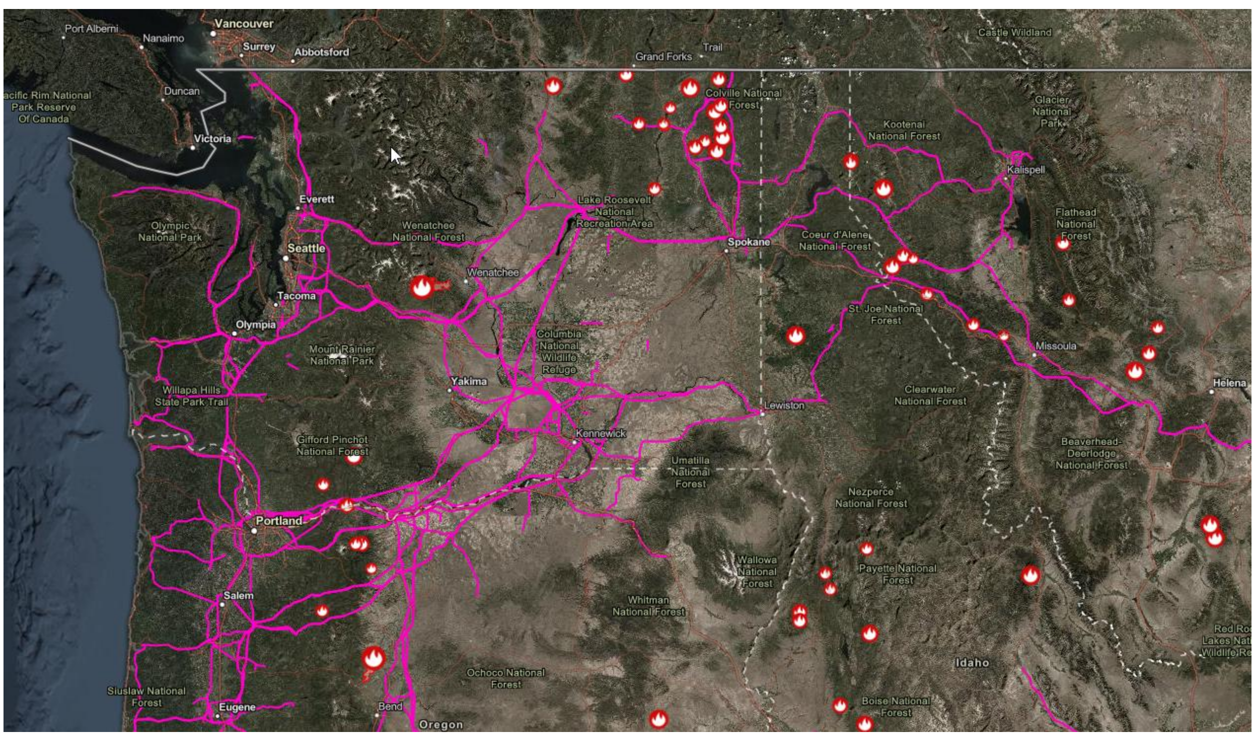
These models, data and analyses are critical inputs for informing wildfire risk mitigation actions, preventing fires originating from BPA assets, and prioritizing infrastructure hardening measures against adjacent fires.

Situational Awareness Tools

BPA maintains an internal GIS-based situational awareness viewer to obtain a common operating picture that provides near real-time situational awareness across all levels of BPA's operations. This tool provides decision makers situational awareness with integrated critical information and analytical tools designed to mitigate, respond to and recover from wildfire hazards and threats using both agency and publicly available data. The objective is to streamline information, enhance efficiency and reduce duplication of effort.

BPA also voluntarily maintains tools such as the public-facing Wildfire Activity in the BPA Service Area map[25], which conveys wildfire ignition data from federal and state sources.

Other internal GIS and data reporting tools allow BPA to review wildfire risk models, asset location and health information, and weather hazards (supplied both internally from BPA's meteorology team and externally from NWS and NIFC) during PSPS events. These tools allow for quick visualization to aid in PSPS decision making.



Map of wildfire activity in the BPA service area.

[25] https://data-bpagis.hub.arcgis.com/apps/c3c0d406cffb4f41b2b2cfb0b4810af3/explore

8. System Operations

Building on situational awareness, effective system operations help manage and mitigate wildfire threats. This section details BPA operational practices, which align with the program hierarchy outlined in Section 3. Effective wildfire mitigation requires robust system operational practices to minimize ignition risks, ensure grid reliability and enable rapid response during fire events. BPA integrates several key operational components, including established system operations guidelines, Supervisory Control and Data Acquisition (SCADA) systems, Remedial Action Schemes (RAS) and dedicated system operations control centers to manage and mitigate wildfire threats. BPA may also preemptively de-energize transmission lines to reduce the risk of wildfire caused by utility infrastructure. For more information about the PSPS Program, see Section 9.

Supervisory Control and Data Acquisition (SCADA)

BPA utilizes a sophisticated supervisory control and data acquisition system for real-time monitoring and control of its extensive transmission network. The SCADA system allows system operations dispatchers to:

- Monitor grid conditions: Gain instantaneous visibility into system parameters such as voltage, current, power flow and equipment status across the BPA Balancing Authority Area (BAA)/Transmission Operator Provider (TOP) footprint.
- Control equipment: Remotely operate certain circuit breakers, switches and other devices to manage power flow and isolate faults.
- Manage alarms: Receive and respond to alarms indicating abnormal operating conditions, including those potentially related to wildfires.
- Maintain jurisdictional control: Both BPA control centers have simultaneous monitoring of the entire BPA BAA/TOP footprint. In case of a control center loss, the functioning center can assume control of all SCADA functions for the inoperable center's jurisdiction, as defined in system operations guidelines.

Remedial Action Schemes (RAS)

Remedial action schemes are critical to BPA's operational strategy, enabling increased operating transfer capability on long transmission lines. RAS consists of detection equipment, controllers, response equipment and communication links to detect, analyze and correct abnormal conditions in the Bulk Electric System.

In the context of wildfire mitigation, RAS schemes provide a low-cost means to increase operating transfer capability, enabling BPA to meet transmission obligations and support load growth and renewable energy interconnections. They more than double transmission capacity, thereby avoiding substantial infrastructure construction costs. The components of RAS include detection equipment (e.g., line loss, over-current, under/over-voltage), controllers (at substations and control centers), response equipment (e.g., dropping generation, reconfiguring the transmission network, shedding load) and highly reliable communication links.

During a control center outage, and per system operations guidelines, RAS functions are meticulously managed. Senior dispatchers may consider reducing total transfer capability if large amounts of generation drop are armed, especially during the initial loss of a control center, to manage risk and minimize impact on the Bulk Electric System. This includes considering canceling non-urgent or emergency system maintenance, prioritizing critical services as quickly as possible, and reviewing logging systems to verify outstanding clearances, hold orders and work permits.

Control Centers

BPA operates two primary control centers, Dittmer Control Center (DCC) in Vancouver, Washington, and Munro Control Center (MCC) in Spokane, Washington. These centers are fundamental to maintaining grid reliability and implementing wildfire mitigation strategies.

Each control center maintains set jurisdictional boundaries. DCC primarily oversees the BPA BAA and serves as the TOP for 500 kV and 230/115 kV transmission in the Puget Sound area. MCC mainly provides the TOP function for the 230 kV and below transmission system outside the Puget Sound area. Both centers continuously monitor the entire BPA BAA/TOP footprint. Each control center serves as the backup for the other, equipped with redundant software, hardware and communication systems to act as a fully functional, stand-alone control center. This redundancy is critical for ensuring continuous monitoring and control during emergencies, including those related to wildfires.

BPA control center.

Operational Practices

BPA's operational framework is designed to ensure the continued reliable operation of the Bulk Electric System under various conditions, including heightened wildfire risk. This involves proactive measures and clear protocols for event response, as detailed in various system operations guidelines.

BPA defines wildfire conservative operation season as a designated period based on environmental conditions when elevated wildfire risk necessitates more conservative operational protocols. During this time, which is adjustable based on environmental conditions, specific system operations restrictions and considerations are implemented.

Flash Testing Prohibition

Flash testing, a method of fault location involving the deliberate energization of a line to observe an electrical arc or flash, is strictly prohibited during the wildfire conservative operation season. This practice carries a risk of ignition in dry conditions.

Transmission Line Testing Restrictions

Certain transmission lines, identified by field leadership, have restrictions on manual testing or require automatic reclosing to be disabled during the wildfire conservative operation season. For lines with restrictions, caution tags are applied within SCADA systems. All such lines are patrolled using normal transmission line maintenance protocols prior to testing, unless a clear non-wildfire cause for the fault (e.g., human-initiated, sympathetic fault, terminal equipment failure) is identified.

Testing of Faulted Transmission Lines (outside specific restrictions)

All other faulted lines are evaluated for a cause, with attempts to locate the fault prior to manual test energization. Before manually testing, fire weather conditions are verified for the effective times of any NWS Fire Weather Watch or NWS Red Flag Warning. Manual testing is prohibited if the fault data places the fault in a Fire Weather Watch area, or in an NWS Red Flag Warning area (or within five miles thereof). Lines that cannot be tested due to fire weather restrictions are patrolled using normal protocols, except in extreme public safety circumstances (e.g., restoring power for firefighting, controlling water flow at hydro facilities, or addressing large load shed in evacuation areas). The senior system dispatcher makes the final decision in consultation with other dispatchers and directors.

Requests to De-energize Lines

BPA may receive requests from field personnel, utility customers or fire suppression crews to de-energize lines in real-time. The BPA real-time transmission scheduling and hydro scheduling desks are informed of the request. Additionally, the request is communicated to the Reliability Coordinator (RC), Network and System Operations Center and via the Grid Messaging System. Additional notes identify the specific reason for removal and any work to be done, as needed, and when safe and cleared to do so.

Restoration of Service

After a de-energization event, particularly after PSPS events, BPA follows defined restoration protocols outlined in system operations guidelines to safely and efficiently re-energize lines. Restoration begins when weather conditions have improved, as advised by the PSPS Team or Incident Management Team. Transmission field leadership and field crews, in conjunction with local authorities, determine when it is safe to patrol. If de-energization threshold conditions were not met, a patrol may not be necessary. Otherwise, lines removed from service are patrolled covering the transmission weather alert area plus a five-mile buffer, or to the line terminal, whichever is shorter. Exceptions for public safety can allow testing without a patrol, with the senior system dispatcher making the decision in consultation with others. BPA generally attempts to inform affected customers when patrols begin. Following patrols or in approved cases without a patrol, lines are test energized once. If the line relays out of service, additional patrols are conducted based on fault location data. Multiple line sections may allow for isolation of faulted sections and retesting of remaining sections. The jurisdictional senior system dispatcher updates the Open Access Same-Time Information System with line information and restoration time.

Additional Considerations During Wildfire Operation Season

High wind events: In high wind events without a Red Flag Warning or Fire Weather Watch, consultation with transmission line maintenance determines if lines in heavily wooded areas require a full patrol before re-energization to ensure no trees have fallen. This aligns with the broader risk assessment principles outlined in system operations guidelines.

Hot weather operations: System operations guidelines define extreme weather operations and outline actions to be taken during periods when ambient temperature exceeds normal operating assumptions. This guideline is important for preventing equipment failure, mitigating operational risks and maintaining system reliability, which can indirectly support wildfire mitigation efforts by reducing stress on the grid that may lead to utility-caused ignitions. Heatwave alerts are issued based on forecasted load center average temperatures (e.g. ≥ 79°F for three or more days) or high temperatures (e.g., > 104°F for two or more days). Systems dispatch implements Restricted Maintenance Operations, evaluates minimum generation needs and assists in operating plan development. Real time study engineers may run temperature tools, identify substations exceeding seasonal assumptions, adjust heatwave ratings and develop operating plans, including potential line de-energization or load shedding, if necessary, to prevent cascading outages.

Tools and Applications

BPA system operations leverage a suite of advanced tools and applications to enhance situational awareness, facilitate decision-making and ensure compliance with operational standards:

- NWS website: Dispatchers regularly consult the NWS website to verify effective times for Fire Weather Watches or Red Flag Warnings. This ensures accurate and up-to-date information for making critical operational decisions, such as manual line testing prohibitions. Forecasted temperatures for heatwave periods are also consulted to inform adjustments to operational parameters.
- BPA internal GIS viewers: Internal GIS tools can visualize grid infrastructure alongside real-time environmental data. They display NWS Fire Weather Warnings, which assist dispatchers in understanding the spatial extent of wildfire threats.
- Wildfire Activity in the BPA Service Area Map: This public-facing map provides an additional layer of information on current wildfire activity, helping to contextualize NWS Fire Weather Warnings and potential impacts on BPA's assets.
- Integrated Transmission Operations Application: Used for creating and tracking information tags related to transmission lines with restrictions on manual testing during wildfire season, ensuring proper documentation and visibility for operational teams.
- Grid Messaging System: Utilized for broadcasting critical information, such as control center status during an outage or details regarding de-energization requests, to relevant internal and external stakeholders, including the RC and Network and System Operations Center.

- Operational Planning Analysis: Used by real-time study engineers to conduct studies, particularly during hot weather operations, incorporating forecasted temperatures and heatwave ratings to develop comprehensive operating plans and identify potential exceedances.
- Real-time operations internal site: Serves as a central repository for posting important information, such as systems operations meeting notes, ensuring that all relevant personnel have access to the latest operational directives and discussions.

These tools collectively support BPA's proactive and reactive wildfire mitigation strategies by providing comprehensive data, enhancing communication and streamlining operational procedures.

9. Public Safety Power Shutoff (PSPS) Program

While optimized system operations minimize daily risks, the PSPS program provides an essential safeguard during periods of heightened wildfire danger. Both natural and human-caused wildfires are a common occurrence in BPA's service territory. BPA must be vigilant of wildfire risk, both to and from its facilities. This can include de-energizing facilities to prevent wildfires and keep the public safe. While de-energizations can be disruptive, they provide a critical safeguard against potential catastrophic wildfires initiated by transmission system equipment.

BPA first implemented its PSPS program in 2021 based on industry benchmarking and best practices. BPA defines a PSPS as proactively turning off power system equipment to remove potential ignition sources during extreme wildfire hazard weather events. PSPS is a measure of last resort that will be decided based on risk considerations of the specific situation. Other wildfire-related de-energizations do not fall in the category of PSPS, such as de-energizing a line based on a request from on-the-ground emergency responders who need ROW access to fight an active wildfire in the vicinity[26]. If a wildfire is active, system operations staff follow existing protocols to de-energize equipment in real time for the safety of suppression personnel.

[26] https://www.bpa.gov/-/media/Aep/wildfire/wildfire-de-energization-fact-sheet.pdf

Scooper tankers approaching the Columbia River to suppress the 2025 Burdoin Fire near Bingen, Washington. (Photo by Janice L.)

Internal documentation outlines clear protocols for PSPS implementation (when, why, and how). Where applicable, this documentation integrates with existing business processes and plans, ensuring proactive and coordinated information sharing for decision-making.

BPA's PSPS process involves multiple steps including representation from various internal organizations, as shown in Figure 7. The purpose of the PSPS Team is to ensure timely and effective communication about, and coordination of, PSPS-related activities. The PSPS Team relies on expertise from system operations, engineering, meteorology, vegetation management, risk analysis, communications and other key business areas.

To maintain readiness and ensure operational capability, each spring a tabletop exercise is performed to walk through the PSPS plan. Exercises may consist of both planned and short/no-notice events to improve the agency's preparedness and emphasize the value of integrating continuity functions into daily operations. These exercises may also be integrated with other exercises in the BPA continuity test, training, and exercise program.

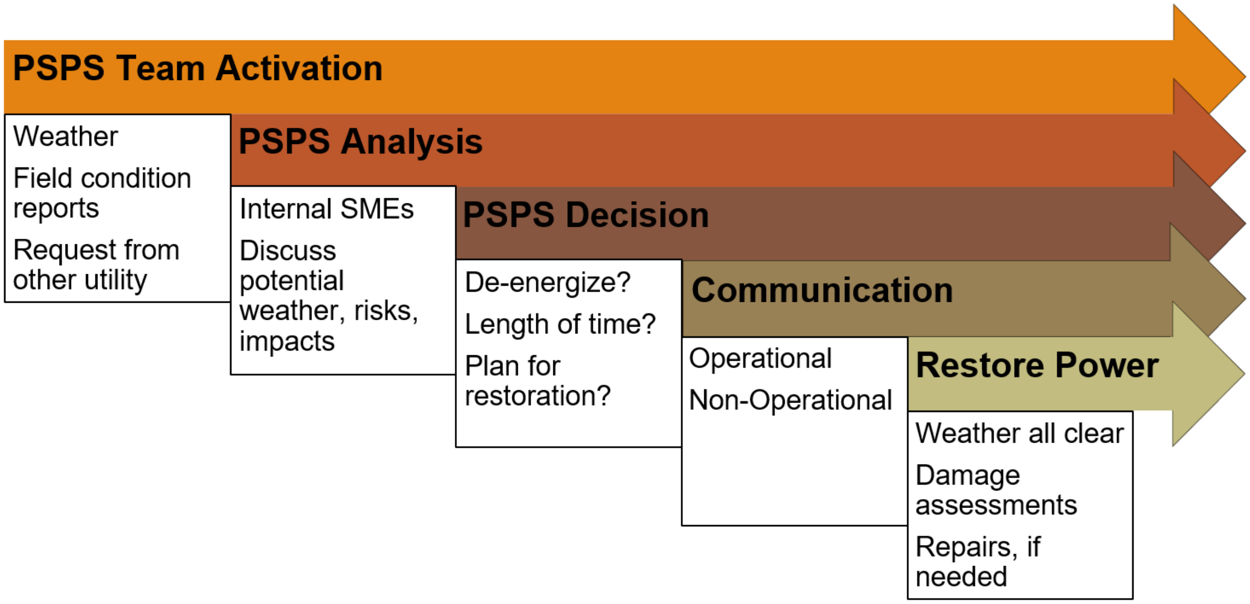


Figure 6 BPA's PSPS process.

PSPS Team Activation

Wildfire season is condition-based, not confined by specific dates, and is monitored by BPA's meteorology team. When severe weather conditions pose an increased risk of wildfire danger there are at least three triggers to stand up the PSPS team:

- BPA meteorology team weather alert forecasting ≥ 60 mph wind gusts and NWS Red Flag Conditions;
- Field observations of ground conditions that warrant review by the PSPS Team; or
- BPA receives a PSPS de-energization request from another utility.

The team strives to convene within 30 minutes of the triggering event.

PSPS Analysis

When the PSPS team convenes, asset, vegetation and wildfire risk model information are geospatially overlaid with the forecasted weather alert for review. After assets or lines within that area are identified, engineers assess system stability, field personnel provide additional details on asset health and existing and planned outages for BPA and other utilities are identified (as established by the RC). Transmission systems operations personnel performs urgent outage studies to identify loads that may not be served, transmission curtailments, or generator restrictions that may be experienced by BPA or other interconnected utilities if line(s) are de-energized.

PSPS Decision

BPA Transmission System Operations has the sole decision authority on whether to enact a PSPS. If the decision to de-energize is made, BPA will implement its urgent outage process. If lines remain energized, the PSPS team will continue to monitor the situation and reconvene, if necessary.

An Incident Management Team may or may not be stood up, following agency policy, to support PSPS decision-making and communications.

Communication

Timely communication is critical for PSPS events. When meteorology forecasts allow, BPA's goal is to notify customer utilities at least two days in advance of any potential PSPS de-energizations. Communication is also made just before shutting off power and after re-energization.

BPA has two paths for communication: operational and non-operational. Operational communications occur through standard outage processes and methods within system operations. This includes coordination with the RCs and affected BAAs, TOPs, Hydro Duty Schedulers and both federal and non-federal plant operators. BPA transmission dispatchers also post PSPS de-energizations to the Open Access Same-Time Information System. Non-operational communications occur through a pre-defined call tree involving multiple roles within BPA contacting their counterparts at other utilities, local/regional/tribal/federal governments, industry groups, operations and maintenance peers, emergency response organizations and others as needed.

BPA does not post any PSPS de-energization information on its website or communicate with end-use customers such as homeowners or businesses. BPA's utility customers have reflected their preference to communicate directly with their individual end-use customers.

Restore Power

Once the high-risk fire weather has passed, and it is safe to do so, BPA personnel visually inspect de-energized lines for any damage (exceptions may be made, as warranted). If there is any damage, repairs are made as quickly as possible with priority given to any load loss. When assets are safe to re-energize, BPA dispatch personnel restore power to affected areas, as described in Section 8.

PSPS History

Since 2021, BPA has enacted PSPS de-energizations eight times, as shown in Table 6. It is important to note that PSPS de-energization does not necessarily result in load or generation loss. In many instances, redundancy in system design allows power to continue to flow to downstream customers, eliminating any impacts to load.

Table 6 2021–2025 BPA PSPS de-energizations.

Date	Location	Load Impacts
June 2021	OR	Yes
September 2022	WA	No
September 2022	OR	No
July 2024	OR	Yes
August 2024	OR	No
August 2024	WA	No
August 2024	MT	No
October 2024	MT	No

10. Workforce Training

Beyond strategic planning and operational responses, a skilled and knowledgeable workforce is fundamental for successful wildfire mitigation. Training contributes to safety, operational efficiency and preparedness through the development of a skilled and capable workforce. BPA promotes wildfire training through interagency and industry collaborations, PSPS tabletop exercises and staff training materials.

Interagency and Industry Collaboration

BPA accelerates staff learning and skill development through interagency and industry collaboration. Participating in these groups provide utilities a platform to address the complex challenges posed by wildfire. This collaboration can significantly improve wildfire mitigation programs by fostering networks, sharing best practices and driving innovation. See Section 11, Communication and Outreach.

PSPS Tabletop Exercises

BPA performs annual internal tabletop exercises designed to test the agency's ability to respond to a PSPS event. These exercises simulate a PSPS scenario in a low-stress environment, allowing participants to discuss their roles, procedures and potential challenges without affecting actual operations. A debrief is completed in which participants discuss lessons learned, strengths identified and areas requiring improvement in the PSPS program plan.

Staff Training

Wildfire safety training is available for all BPA employees performing fieldwork in hazardous fire areas to provide knowledge on proper precautions and fire mitigation measures. The training includes information about:

- Types, properties and stages of wildfires
- Fire season tools and personal protective equipment
- Air Quality Index and BPA's wildfire smoke exposure program
- Vehicle readiness and parking
- Situational awareness
- Communication protocols
- Evacuation planning and procedures
- Industrial Fire Precaution Levels
- Power tool spark safety
- Working in burned areas after a fire

Technical Training Requirements

Role-based training is provided to applicable staff supporting wildfire mitigation actions. Content includes, but is not limited to:

- Heat stress
- First aid and CPR
- Evacuation procedures
- Fire prevention during hot work operations
- Incident Command System fundamentals

11. Communication and Outreach

Beyond training, effective wildfire mitigation also relies on transparent communication and strategic outreach. BPA's customer base is primarily composed of public and private utilities across the Pacific Northwest, including municipalities, cooperatives, investor-owned and tribal entities. These utilities then resell power to their end-use residential, commercial and industrial customers. Additionally, BPA sells power to utilities in the Southwest and California, often as surplus power from the Northwest. By participating in annual customer outreach, interagency meetings and industry collaboration, BPA ensures open communication with the utility community and key stakeholders.

Customer Engagement

Annual spring meetings are held to inform entities that may potentially be affected by PSPS events. Potential operational impacts, including load, generation and customer effects, are discussed for each transmission line identified in a high-risk area within BPA's service territory. Communication procedures and contact information are also shared. This provides an opportunity to identify any additional lines at elevated risk that BPA should be made aware of within other utilities' service territories.

Industry Collaboration

BPA staff attend and actively engage in multiple conferences, seminars and events each year, benefiting from dedicated discussions on specific aspects of wildfire mitigation and planning. These forums offer valuable insights through discussions of case studies and lessons learned from past wildfire incidents, enabling attendees to gain real-world experience and enhance their decision-making skills. Multiple forums, from international working groups to regional discussions, allow processes, practices and ideas to be shared and support improvement. Examples of these collaborations include:

International

- Centre for Energy Advancement through Technological Innovation
- Electric Power Research Institute
- International Wildfire Risk Mitigation Consortium
- Individual utilities

National

- Department of Energy
- North American Transmission Forum
- Power Marketing Administrations
- United States Forest Service
- Individual utilities

Regional

- Emergency Support Function #12-Energy, State Emergency Operations Centers
- Federal Emergency Management Agency Region 10 Regional Response Coordination Center
- Oregon Wildfire and Electric Collaborative
- Washington Utility Wildfire Mitigation Planning Workgroup
- Individual utilities

12. Continuous Improvement

Effective communication and outreach are integral to a program that is constantly evolving. Continuous improvement enables BPA to adapt to evolving risks, incorporate new technologies, drive cost-effectiveness and ensure ongoing regulatory compliance. BPA uses maturity models, lessons-learned exercises and benchmarking against other utilities to ensure ongoing development.

International Wildfire Risk Mitigation Consortium (IWRMC) Maturity Model

BPA adopted the International Wildfire Risk Mitigation Consortium Maturity Model in 2023. This model provides a structured and consistent framework and language to understand the current state of BPA's program relative to electric utilities across the globe and outlines a trajectory for continuous improvement. It also provides BPA and the other IWRMC member utilities a structure to guide regular working meetings and best practice planning sessions.

BPA's maturity model scores have increased each year with above-average scores in asset management and inspections, vegetation management and inspections, and emergency planning and preparedness.

SMEs across BPA continue to use the model to gauge how new processes and methods are increasing resiliency over time.

Lessons-Learned

BPA strives to continuously improve and conducts lessons-learned exercises throughout the year including:

- Annual internal feedback from SMEs involved in wildfire identification, response and restoration activities.
- Annual post-fire season discussion with PSPS-affected utility customers.
- Event reviews after all PSPS Team activations, whether or not de-energization occurs.

Documentation is tracked and stored on an internal site with visibility for general awareness across internal viewers. These exercises provide valuable information to mature competencies, programs and plans.

Utility Benchmarking

Benchmarking against other utilities is important for driving continuous improvement, identifying areas for greater efficiency, and improving overall performance. By comparing metrics such as reliability, performance, operational costs, and investment priorities, BPA can identify its strengths and weaknesses relative to its industry counterparts. All data is accessed through published WMPs and other publicly released documents. Ten different PMA, investor-owned and municipal utilities are used for benchmarking based on their infrastructure, regional coordination and collaboration, comparable PSPS protocols and similar wildfire risk profiles.

Appendix A-Acronyms

BAA: Balancing Authority Area

BPA: Bonneville Power Administration

DCC: Dittmer Control Center

EMS: Emergency Medical Services

EPRI: Electric Power Research Institute

ERC: Energy Release Component

GIS: Geographic Information System

IPR: Integrated Program Review

IVM: Integrated Vegetation Management

IWRMC: International Wildfire Risk Mitigation Consortium

LiDAR: Light Detection and Ranging

MCC: Munro Control Center

MVCD: Minimum Vegetation Clearance Distance

NERC: North American Electric Reliability Corporation

NIFC: National Interagency Fire Center

NWS: National Weather Service

PMA: Power Marketing Administrations

PNNL: Pacific Northwest National Laboratory

PSPS: Public Safety Power Shutoff

RAS: Remedial Action Schemes

RC: Reliability Coordinator

ROW: Right-of-way

SAMP: Strategic Asset Management Plan

SCADA: Supervisory Control and Data Acquisition

TOP: Transmission Operator Provider

USFS: United States Forest Service

VMP: Vegetation Management Program

WMP: Wildfire Mitigation Plan

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