2023 Wildfire Mitigation Plan

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Table of Contents

Table of Tables

Table of Figures

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1 Introduction

Following the Lake Christine Fire in 2018, Holy Cross Energy (HCE) invested in additional fire mitigation and system resilience efforts across the HCE service territory. We continue to take steps to protect our electric infrastructure and reduce the risk of impacts to our delivery system from wildfire. We conduct safety inspections of our poles, wires, and other key pieces of equipment. In remote areas with harsh terrain, we employe airborne drones for inspection with great results. In high risk areas we further protect our key transmission lines by wrapping our poles with a new fire retardant material.

For HCE, which strives to protect public safety and preserve the reliable delivery of power, wildfire mitigation is top priority. At the writing of this plan, Colorado consumer-owned utilities are not under mandate to have a Wildfire Mitigation Plan (WMP). Notwithstanding, HCE believes the development of a thorough WMP is a prudent and responsible effort to prepare for increased wildfire occurrence in Colorado. While an electric utility can never fully eliminate all risk, HCE is committed to taking practicable actions to prevent the devastation that a wildfire could bring to the people and communities we serve. This WMP lays out the steps we are taking to do so.

1.1 Purpose of the Wildfire Mitigation Plan

Reducing the risk of utility-caused wildfire is essential to HCE's operational practices. HCE's existing programs and procedures, as well as the incorporation of emerging technologies, are intended to

directly or indirectly manage or reduce the risk of its utility infrastructure becoming an origin or contributing factor for wildfire.

The WMP also addresses the unique features of HCE's service area, such as topography, weather, infrastructure, grid configuration, and potential wildfire risks. This plan describes and will expand upon our existing inspection, maintenance, and safety programs as well as community engagement efforts with a focus on strengthening the overall electric system.

HCE believes the strategies and activities described in this WMP are a practical approach to reducing fire-related risk in the near term and will allow for refinement and improvement over time. As HCE gains experience implementing the WMP's mitigation programs and new information emerges, the co-op will assess, evaluate, enhance, and refine its practices.

1.2 Objectives of the WMP

The WMP's main objective is to implement an actionable plan to:

- Create increased reliability and safety;
- Mitigate and recover from wildfires;
- Comply with current Colorado state law, and National Electric Safety Code (NESC) regulations and guidelines;
- Reduce liability; and,
- Continually improve the plan

1.3 HCE Profile and History

HCE was organized in 1939 by a strong and independent group of farmers and ranchers in the Roaring Fork and Eagle River valleys to bring electric service to these rural areas for the first time. In September of 1941, the first lines were energized, bringing the benefits of electricity to about 175 families in the Roaring Fork and upper Eagle River valley. HCE expanded its service area by purchasing the Eagle River Electric Company in 1943 and Mountain Utilities of Aspen in 1954. Service was extended in 1950 to portions of the lower valley, Cattle Creek, Spring Valley, Woody Creek, Crystal River Valley, Fryingpan, and Sweetwater. Eventually, in 1958, it was extended to the upper Vail Valley, Gunnison County, and Marble.

Today, HCE operates from two office locations (Avon and Glenwood Springs), has 171 employees, and serves more than 45,000 members with 60,000 meters. HCE proudly serves its members from major ski resorts in the Aspen and Vail areas to farms, ranches, and friendly rural communities that provide people and resources for the regions economy.

HCE is governed by a 7-member popularly elected Board of Directors that determine policy and appoints the CEO responsible for HCE's overall management and operations.

1.4 The Service Area

Operating in portions of 5 counties[1], HCE is the primary service provider within an area covering over 1,447 square miles in the upper Colorado River Basin in Western Colorado (Figure 1). Spanning approximately 100 miles east to west and 57 miles north to south, the majority of HCE's rights-of-way (ROW) are located on privately owned properties, with portions aligned through federal lands and within various road ROW.

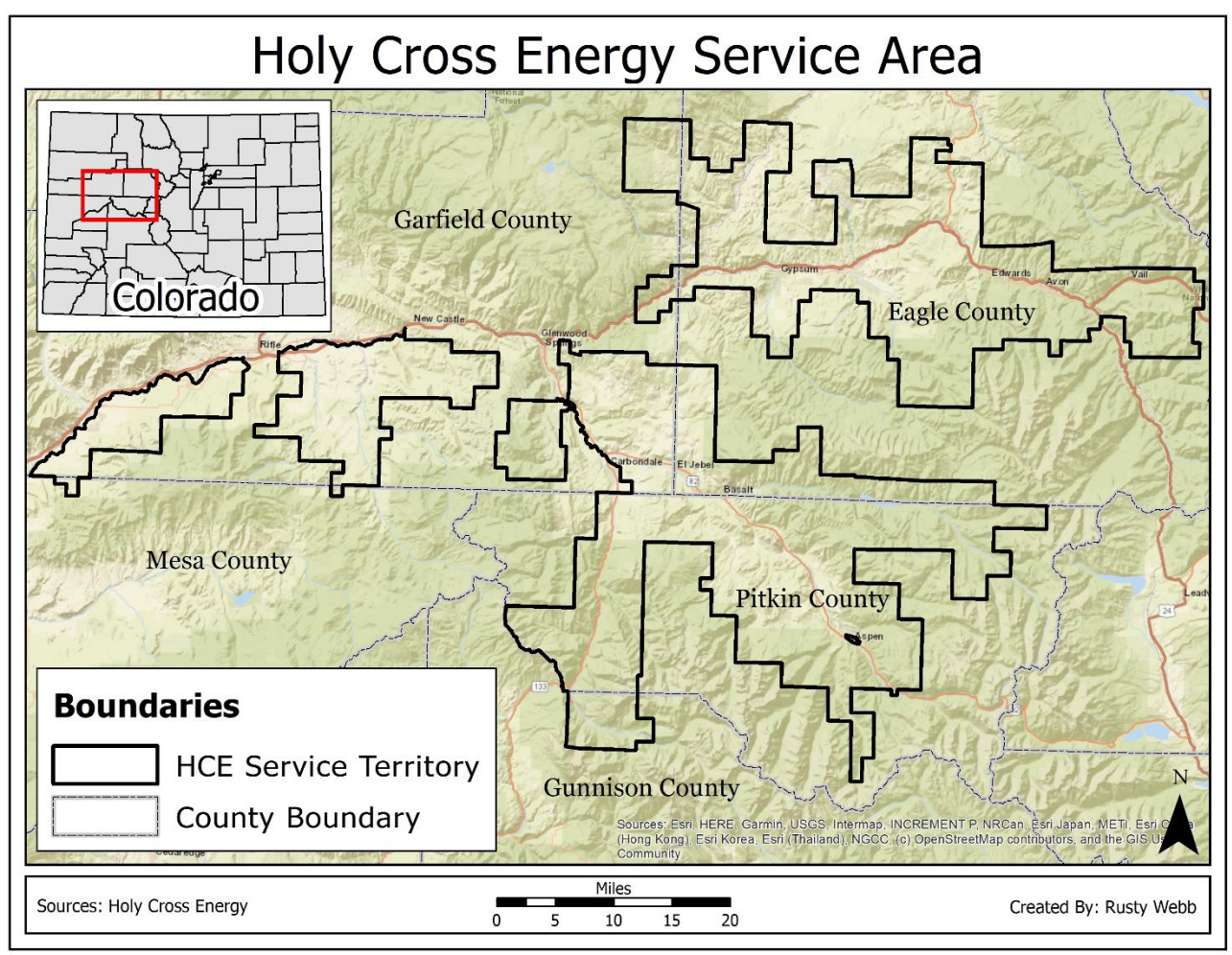
Topography is considerably diverse in slope and aspect, with significant variations in elevation ranging from ~5,200' above mean sea level (AMSL) in the Colorado River valley to ~12,000' AMSL on the upper peaks. While the highest point with HCE assets lies at 11,800 AMSL at the Red Table communications site, the majority of the distribution system lies between 6,000' and 8,000' AMSL.

The service area comprises Foothill Shrublands, Subalpine forests, and Mid-Elevation Forest ecoregions within the Southern Rockies (level III ecoregion)[2]. The service area is approximately 40% forested, with many of the remaining vegetation types dominated by pinyon/juniper, alpine meadows, rock and scree, willows and riparian shrublands, Gambel oak, sagebrush, mountain brush, and agricultural grasslands. The forested areas are primarily aspen stands with widespread mixed conifer stands. Agricultural lands around communities include irrigated and non-irrigated pastures, alfalfa fields, and orchards. Variation in vegetation within the service area is caused by diversities in elevation, terrain, climate, soil, and occurrence of wildfire.

Storms originating from the west drop much of their moisture as rain or snow on the mountains and western-facing slopes; a rain-shadow effect prevents most of this precipitation from reaching the eastern plains. The average annual rainfall for the service area is approximately 18". The summers are warm, dry, and mostly clear, and the winters are freezing, snowy, and partly cloudy. Over the course of the year, the temperature typically varies from 8°F to 83°F and is rarely below -7°F or above 90°F [3]. The hottest month is July, with an average high of 83°F.

[1] Pitkin, Eagle, Garfield, Mesa and Gunnison Counties
[2] https://gaftp.epa.gov/EPADataCommons/ORD/Ecoregions/co/co_eco_lg.pdf
[3] Eagle County Regional Airport

Figure 1. HCE Service Area



1.5 The Electric System

The local power network is part of a larger electrical grid serving the greater Western Colorado region. Approximately 52%[4] of the power for the electrical grid comes from local clean and renewable hydroelectric, wind, biomass, and solar generation facilities. The remaining comes from fossil fuels and non-federal market purchases. Electricity is purchased through contracts with Public Service Company (a subsidiary of Xcel Energy), Guzman Energy LLC, and Western Area Power Administration (WAPA), and wheeled over Xcel Energy and HCE-owned transmission lines. In 2020, HCE announced an ambitious goal to go 100% renewable by 2030.

HCE offers a voluntary program to support renewable energy generation in which members may select their fuel source: wind, local hydro, and local solar. A total of 48,556 MWh were purchased by 2,351 HCE members in 2021 through the program. HCE is the partial owner of Unit 3 of the Comanche Generating Station in Pueblo, Colo., a 750MW coal-fired generating unit, but have arranged to sell the energy of its 60MW share of this plant.

HCE owns and operates an electric system with radial transmission and distribution (T&D) facilities serving approximately 60,000 meters. The co-op has distribution lines which originate from 11 different substations, 4 of which it owns and maintains over 3,000 combined miles of overhead and underground T&D lines. Additional bulk energy points of delivery are owned, operated, and maintained by Xcel

[4] HCE 2021 Year in Review: Annual Report

Energy on behalf of HCE. Xcel Energy also operates and maintains HCE-owned transmission lines and the "high" side of HCE-owned substations. Table 1 below provides a high-level overview of HCE assets.

Table 1. Asset Overview

ASSET CLASSIFICATION	ASSET DESCRIPTION
Transmission Line Assets	Approximately 78 miles of overhead (OH) 115kV transmission line, structures, and switches, and 6.26 miles of 115kV underground (UG) construction.
Distribution Line Assets	Approximately 1,108 miles of OH and 1,862 miles of UG conductor, cabling, transformers, voltage regulators, capacitors, switches, line protective devices operating at 14.4kV phase to ground.
Substation Assets	Major equipment such as power transformers, voltage regulators, reactors, protective devices, relays, open-air structures, switchgear, and control houses in 4 HCE-owned substation facilities. Seven additional points of delivery are owned and managed by Xcel energy for HCE.

2 Overview of HCE's Fire Prevention Strategies

2.1 HCE's Fire Prevention Strategies

The proposed wildfire prevention strategies can be categorized into five main mechanisms that align with HCE's best practices. Together, the five components create a comprehensive wildfire preparedness and response plan with a principal focus on stringent construction standards, fire prevention through system design, proactive operations and maintenance programs, and specialized operating procedures and staff training.

- **Design & Construction:** HCE's design and construction practices consist of , equipment, infrastructure and technical standards. These practices aim to improve system hardening to prevent both contact between infrastructure and fuel sources and to improve infrastructure performance in a mix of weather conditions to minimize the risk of HCE's systems becoming a source of ignition.
- **Inspection & Maintenance:** HCE's inspection and maintenance strategies consist of diagnostic activities as well as various methods of maintaining and ensuring equipment and infrastructure is in proper working condition.
- **Operational Practices:** Comprised of proactive day-to-day actions taken to mitigate wildfire risks and to ensure preparedness in high-risk situations, such as dry and windy climatological conditions.
- **Situational & Conditional Awareness:** This component consists of methods to improve system visualization and awareness of environmental conditions. The practices in this category aim to provide tools to improve the other components of the plan.
- **Response & Recovery:** This strategy consists of HCE's procedures in response to wildfire, outages, de-energization, and other emergency events. This component aims to formalize protocols for these situations for thorough and efficient communications, emergency response and recovery.

2.2 Preventative Strategies and Programs

The components described above have several strategies and programs, most of which have already been implemented. Table 2 provides a summary of HCE programs and activities that support wildfire prevention and mitigation, along with a timeframe for implementation. Some are situational, and are not limited to any timeframe, or are scheduled to be completed over several years, while others are in the evaluation or proposal stages.

Table 2. Mitigation Programs and Activities

Design and Construction
Modernized recloser and control upgrade program
Covered jumpers and animal guards
Avian Protection Plan and construction standards
Non-expulsion fuses in select areas
Copper OH Conductor Replacement Program
Fire resistant pole wrap in vulnerable areas
S&C Trip Savers
Inspection and Maintenance
Multi-spectral satellite scans for vegetation encroachment
Vegetation management guidelines (documented)
T&D right-of-way maintenance
Distribution system line patrols
GIS assisted maintenance tracking
sUAS assisted line inspections
Infrared inspections from feeder exit to first point of protection
Enhanced hazard tree identification and removal
Mid-cycle vegetation trimming
Monthly substation inspections
Wood pole testing and treatment
Increased mastication in the ROW

Table 2 (continued)

Operational Practices
Fire-safe settings on field-deployed protection equipment
Fire watch and suppression equipment on worksite during fire season
GIS mapping of vegetation management work
Supervisory Control and Data Acquisition (SCADA)
Geographical Information System (GIS) mapping of maintenance work
Ignition tracking
Investigate all temporary faults on main feeders
Community tree planting and tree safety guidelines on HCE website
Situational Awareness
Red Flag Warning (RFW) monitoring
Industrial Fire Protection Level (IFPL) monitoring
Weather Monitoring-Weather Sentry DTN service
Monitoring active fires in the local region
Access to high altitude fire watch cameras
HCE-developed scoring system to identify high-risk structures
Safety tailgate meetings prior to vegetation management work
Response and Recovery
Crisis Communication Plan
Line patrols before re-energization
Outage response communications
Public Safety Power Shutoff (PSPS) protocols
Coordination with local wildfire collaborative

3 Risk Analysis and Risk Drivers

To establish a baseline understanding of the risks and risk drivers involved, HCE examined its exposure to all fire-related hazards. HCE also examined its asset locations to identify risks unique to its service area. This chapter will provide an overview of the service area properties and associated risks, which are factored into the wildfire mitigation strategy. See section 1.4 for a description of the service area.

3.1 Fire Risk Drivers

HCE staff evaluated its own, as well as other utilities' ignition causes in the region, and applied field experience to determine the key potential risk drivers. The Co-op then bolstered its existing mitigation approaches and incorporated the best available utility practices. This combination of current and soon-to-be-implemented strategies are intended to mitigate the risk drivers identified below.

Six categories were identified as contributors for heightened wildfire risk:

- Fire Weather/drought
- Limited accessibility
- Vegetation type/fuels
- Tree failure/tree mortality
- Foreign contact
- Equipment failure

3.1.1 Fire Weather/Drought

Colorado has seen increasingly warmer temperatures in recent decades as compared to longer-term averages resulting in changes to forest environments.

Warming is expected in Colorado by 2.5°F to 6.5°F by 2050 based on projections from Global Climate Models (GCMs) developed by NOAA, NASA, the National Center for Atmospheric Research, and other research groups[5]. Earlier springs and hotter summers are projected throughout the state, with more frequent and severe heat waves.

The service area can experience very hot and dry weather during late summer and early fall with drought conditions developing quickly. During this time, strong, dry winds, in combination with dry vegetation, can produce extreme fire conditions. This can be exacerbated during an unusually wet spring, as this encourages a large bloom of underbrush that then dries out in the beginning of the fire season. This abundant ground cover becomes ample kindling for wildfire in the late summer and fall and is an abundant fuel source.

3.1.2 Limited Accessibility

The service area is characterized by steep rolling hills, sharp cliffs and rivers and river breaks. It can take hours to reach equipment in some remote locations due to the indirect routes and natural

[5] https://csfs.colostate.edu/colorados-forests-changing-climate/

barriers. Portions of the service area have steep and rugged terrain comprised of river valleys and eroded hillsides. Many circuits are routed cross-country over difficult terrain with no vehicle access. These factors negatively impact outage response and restoral times for HCE line crews. These conditions can also make fire suppression difficult in some areas.

3.1.3 Vegetation Type/Fuels

Colorado's major tree species include bristlecone pine, Colorado blue spruce, Douglas-fir, Engelmann spruce, limber pine, lodgepole pine, narrowleaf cottonwood, broadleaf cottonwood, quaking aspen, piñon pine, plains cottonwood, ponderosa pine, Rocky Mountain juniper, subalpine fir, and white fir. Nearly three-quarters of the state's high-elevation species such as spruce-fir, lodgepole pine and aspen are located on US Forest Service (USFS) lands[4]. The forested areas, without active forest management, tend to grow thick with heavy underbrush making navigation difficult and available fuel for fire abundant.

3.1.4 Tree Failure/Tree Mortality

Since portions of HCE's distribution system are located in wooded or heavily treed areas, any tree, either live or dead, is considered a potential threat to the electric system if it is within striking distance of the power lines. Electric utilities that investigate the actual causes of outages often find that the failure of hazardous branches and trees is a significant component of the tree-related outage category[6]. Trees in Colorado's subalpine forests are dying at increasing rates, and it is not entirely attributable to bark beetle infestation and wildfire. Trees are also dying from warmer and drier summers with higher rates of tree mortality related to warmer maximum summer temperatures and greater summer moisture deficits[7]. Occasional heavy winds in early spring can blow down large areas of montane and subalpine forest[8]. Aspen die-off is also a concern. The die-offs are seen most dramatically at lower elevations where drought and hotter temperatures are killing older trees. Drought has also caused substantial tree mortality in broad-leaf cottonwoods.

Tree mortality due to mountain pine beetle, western balsam bark beetle, Spruce beetle, and western spruce budworm has become a contributing factor for tree failure in Colorado. Since the mid-1990s, mountain pine beetle has affected roughly 80%, or about 3.4 million acres of ponderosa-lodgepole pine, while the spruce beetle has caused tree mortality in approximately 40% of Colorado's high-elevation Engelmann spruce forests[9]. Dead and dry trees cause more severe wildfires, and the standing dead trees pose a serious hazard to power lines.

3.1.5 Foreign Contact

As is the case for most electrical utilities, most overhead powerlines on the HCE system are installed with bare wire conductor on insulated structures. The benefits of this type of conductor are its ease of use, troubleshooting and restoration time. Ease of troubleshooting is a large factor in

[6] NRECA Vegetation Management Manual
[7] https://besjournals.onlinelibrary.wiley.com/doi/abs/10.1111/1365-2745.13634
[8] Forest Vegetation of the Colorado Front Range/Robert K. Peet, Dept. of Botany, UNC
[9] CSFS 2020 Forest Insect & Disease Highlights

system reliability. It is also a much more cost-effective method of delivering energy compared with insulated/covered wire or underground construction. The downside to bare wire is its susceptibility to contact from foreign objects such as wildlife, vegetation, and third-party equipment. Protection equipment is utilized to isolate faults, but there are time delays associated with circuit breakers, reclosers and fuses. These time delays, in some cases, may allow sparks prior to interruption. Reducing the time delays and thus reducing the sparks is an important component of this plan and is discussed in detail in later sections.

3.1.6 Equipment Failure

There are many reasons equipment failure can occur during its service life. Most equipment requires regular maintenance for optimal performance. Even though HCE's qualified personnel perform regularly scheduled inspection and maintenance on system equipment, internal defects that are not visible or predictable can be the cause of destructive equipment failure resulting in ejection of sparks and/or molten metal. The failure of components such as hot line clamps, connectors, jumpers, arrestors, and insulators can result in failure and wire to ground contact. Transformers and capacitor banks can have internal shorts potentially resulting in the ejection of materials which could cause an ignition.

3.1.7 Key Risk Consequences

The aforementioned risks have many possible consequences, should any be a contributing factor for an ignition. The list below outlines some of the worst-case scenarios, the prevention of which is the impetus for the development of this WMP:

- Personal injuries or fatalities to the public, employees, and contractors
- Damage to public and/or private property
- Damage and loss of HCE-owned infrastructures and assets
- Impacts to reliability and operations
- Damage claims and litigation costs, as well as fines from governing bodies
- Damage to HCE's reputation and loss of public confidence
- Negative public opinion of the power industry in general
- Loss of natural resources

3.2 Wildfire History and Outlook

Large wildfires are frequent throughout Colorado, primarily in the western two thirds of the state. Figure 2 illustrates the regional large wildfire occurrence from 2000-2021, with the largest fires occurring since 2018. Figures 3 and 4 show the annual occurrence of Red Flag Warnings (RFW) from 2006 through 2021 in Fire Weather Forecast Zone (COZ205) which encompasses nearly all of HCE's service area. This historic data shows that most RFWs occur in June, with some as early as March and as late as October.

In recent years, very large fires have occurred in and around HCE's service territory, notably the 32,432-acre Grizzly Creek fire (2020), and the 12,589-acre Lake Christine fire (2018). Extreme temperatures, low humidity, rough terrain, and gusty winds are just some of the elements that contributed to extreme fire behavior and rapid rates of spread for these large wildfires.

Generally speaking, fire season in Colorado lasts from May through late September, but research indicates that this is changing. Fire seasons from 2003 through 2012 averaged more than 84 days longer than in 1973 to 1982[10]. The largest fire years coincide with warm spring and summer temperatures, and early spring snowmelt. Annual large wildfire frequency in US Forest Service, National Park Service and Bureau of Indian Affairs (BIA) forests is significantly correlated with spring and summer temperature.

Tree mortality has also become a serious risk driver for HCE. Mountain pine beetle infestation has been the most prevalent cause of loss of live trees, although ongoing drought has caused a lot of tree mortality in old growth broad leaf cottonwoods as well. After a major tree mortality event, high canopy fuel flammability may only last a few years, but surface fuels can increase considerably over the same time period. The accumulation of coarse woody surface fuels resulting from multi-year drought and concurrent bark beetle outbreaks combined with the increasing frequency of drought have the potential to lead to heavy and dry fuel loads that under certain weather conditions may result in more extreme fire behavior, particularly in forests where decades of successful fire suppression has caused forest densification[11].

[10] Westerling, A.L. 2016 Increasing Western US Forest Wildfire Activity; https://royalsocietypublishing.org/doi/10.1098/rstb.2015.0178

[11] Reed et al. Fire Ecology (2023) 19:16 https://doi.org/10.1186/s42408-023-00175-6

Figure 2. Wildfire Perimeters 2000-2021

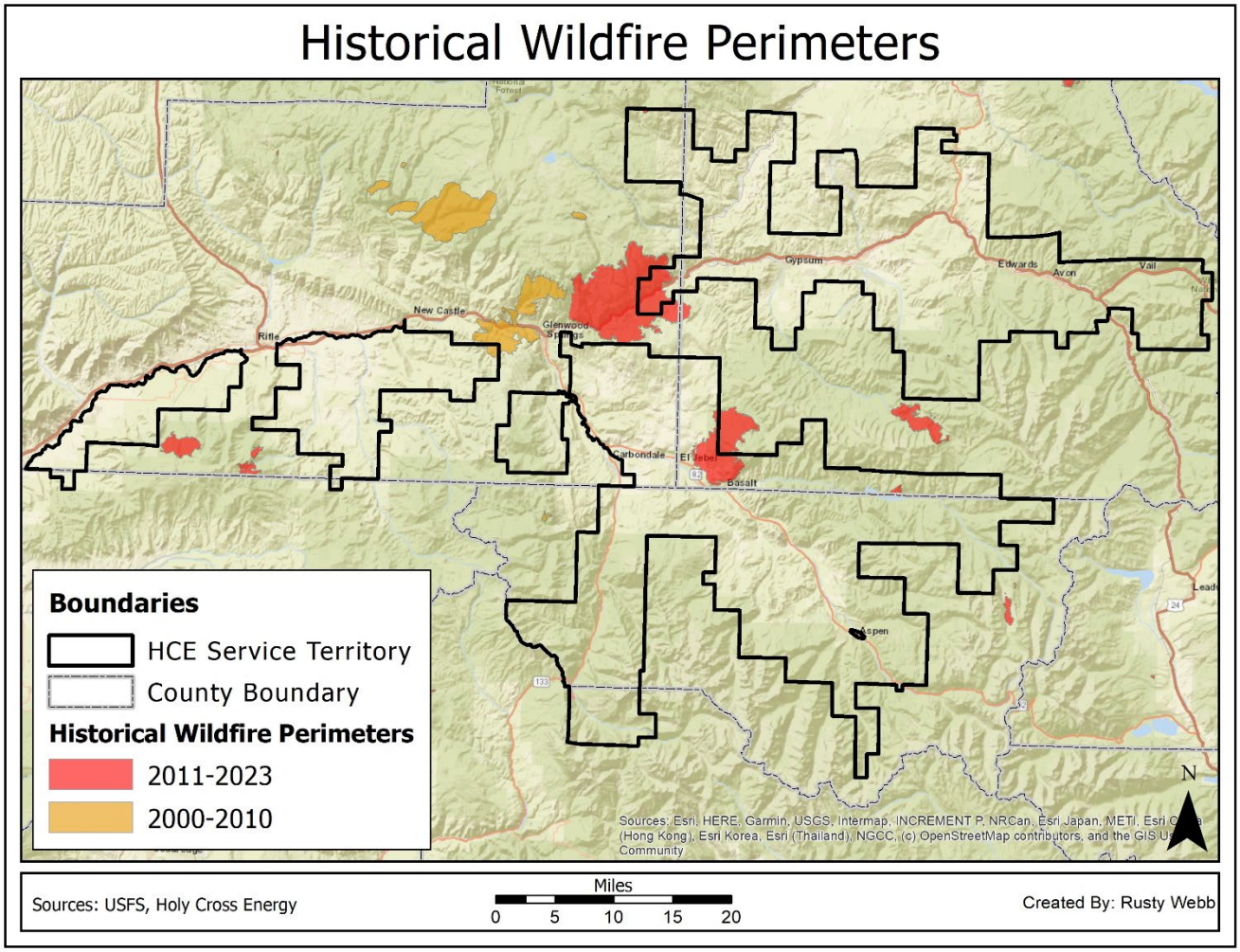


Figure 3. Red Flag Warnings 2006-2021

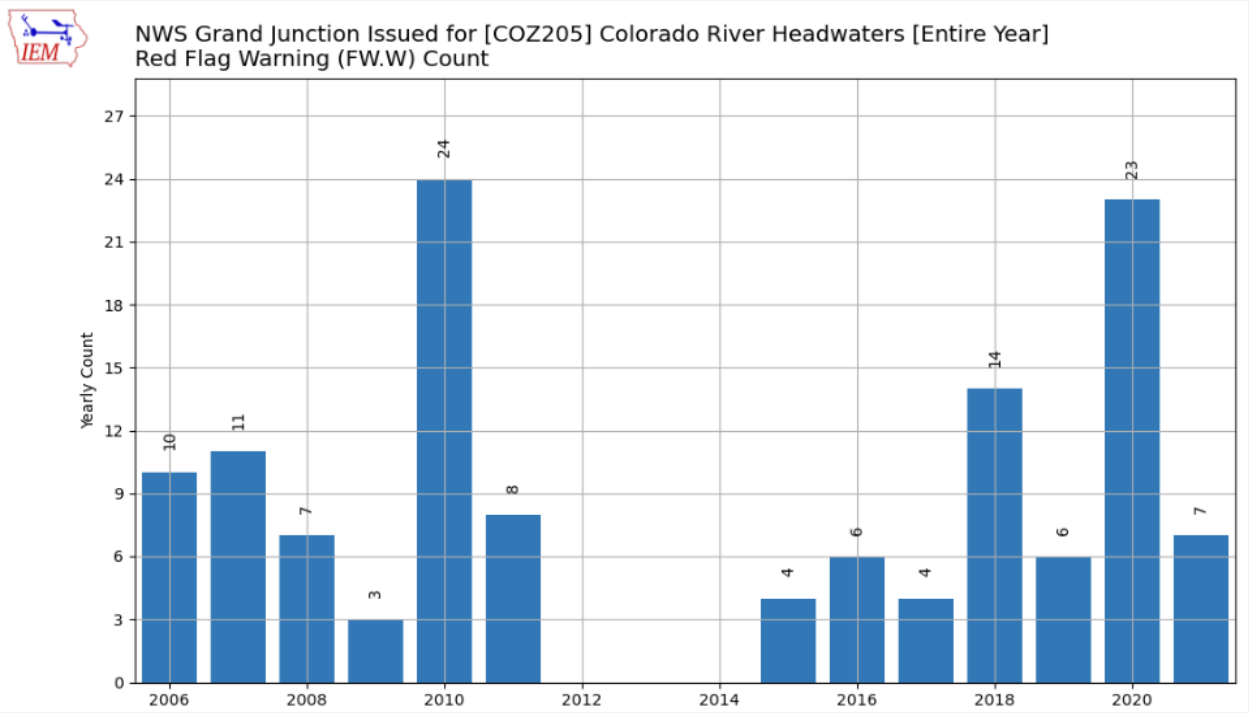
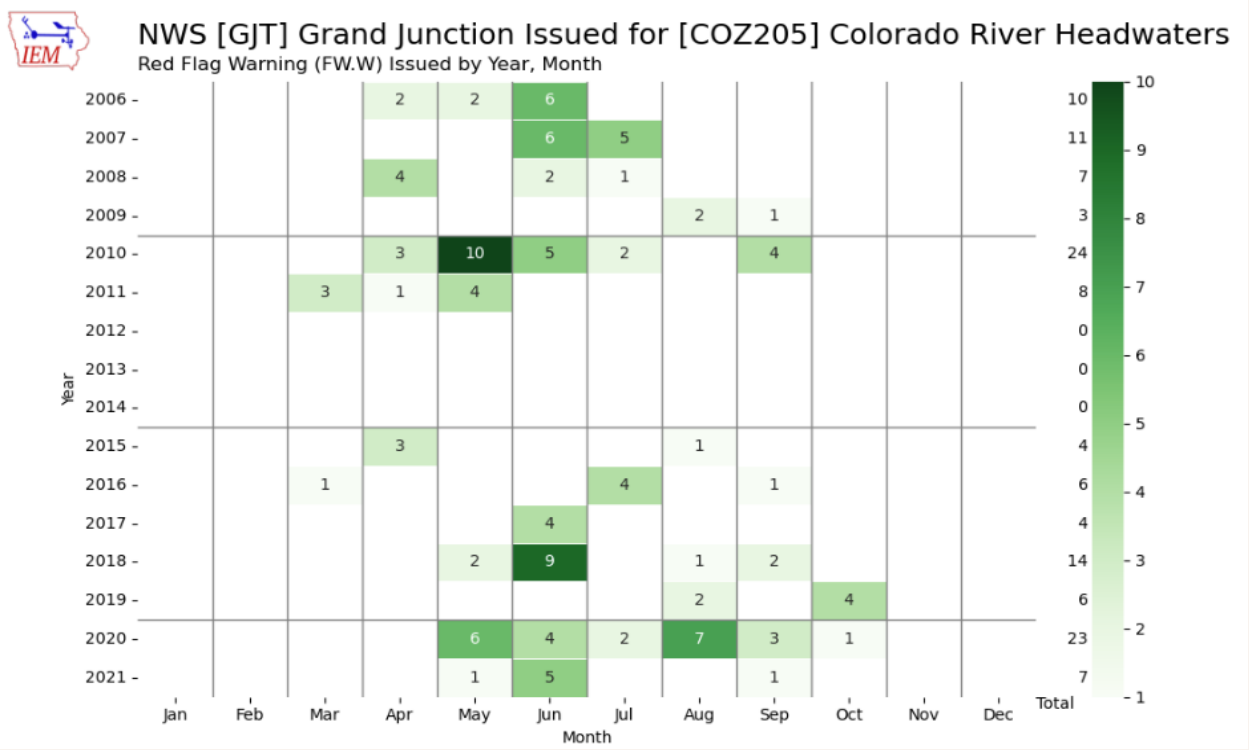


Figure 4. Red Flag Warnings by Year/Month

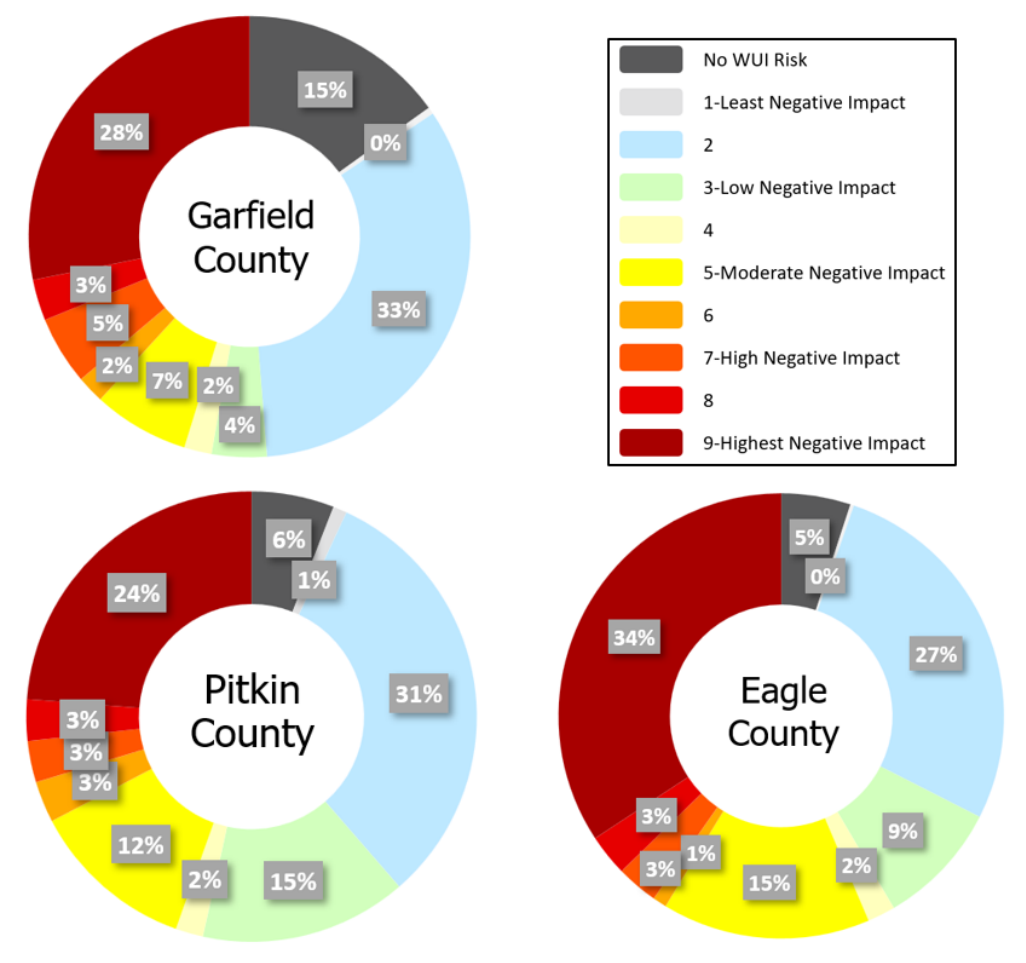


3.2.1 Wildland Urban Interface

The USFS defines the Wildland Urban Interface (WUI) as a place where humans and their development meet or intermix with wildland fuel (Figure 6). The number of people living in areas at risk of wildland fire increased by nearly 50 percent from 2012 to 2017, based on new Colorado Wildfire Risk Assessment data. Approximately half of Colorado's population now lives in the WUI, with 2.9 million of the state's 5.7 million citizens residing in these vulnerable areas[12].

The WUI is composed of both interface and intermix communities. The distinction between the two is based on the characteristics and distribution of houses and wildland vegetation across the landscape. Intermix WUI refers to areas where housing and wildland vegetation intermingle, while interface WUI refers to areas where housing is in the vicinity of a large area of dense wildland vegetation. Figures 5 show the distribution of the residents within the WUI classified wildfire impact on lives and property[13] for the 3 primary counties served by HCE.

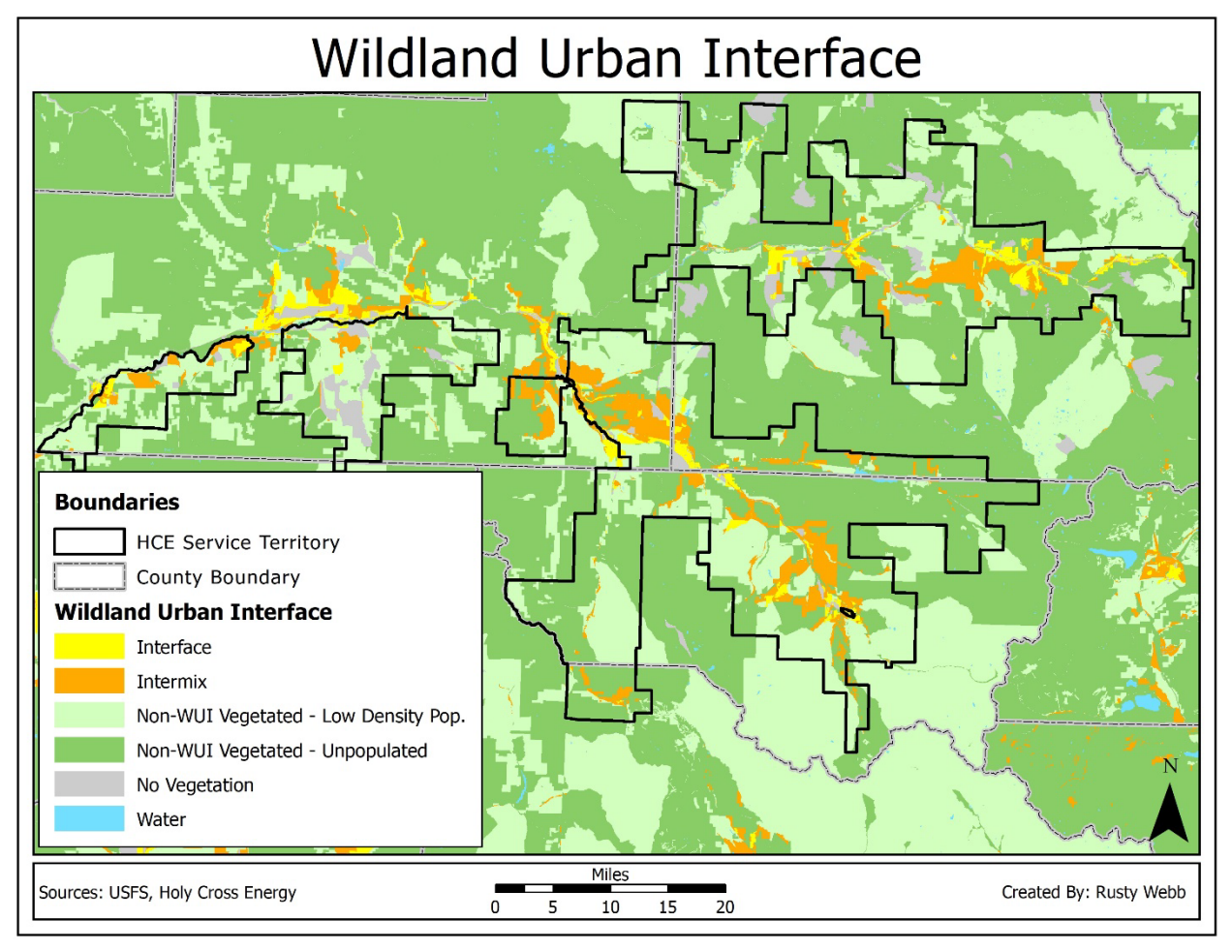
Figure 5. WUI Risk Index by County



[12] https://co-pub.coloradoforestatlas.org/api/docs/Eagle_WUIR_Infosheet.pdf

[13] Colorado State Forest Service.

Figure 6. Wildland Urban Interface Map



3.2.2 Wildfire Threat Assessment Mapping

The Wildfire Risk map used in this WMP is a composite map developed by the Colorado State Forest Service and made available on the Colorado Forest Atlas as a public resource for wildfire risk mitigation and planning. The Wildfire Risk layer depicted in Figure 7 combines the Values at Risk Rating (VAR) and the Burn Probability (BP) layers. The purpose of this composite is to identify areas with the greatest potential impacts from wildfire.

The **Values at Risk Rating** (VAR) is a key component of the Wildfire Risk layer. It is an overall rating that combines the following four risk ratings into a single measure of values-at-risk:

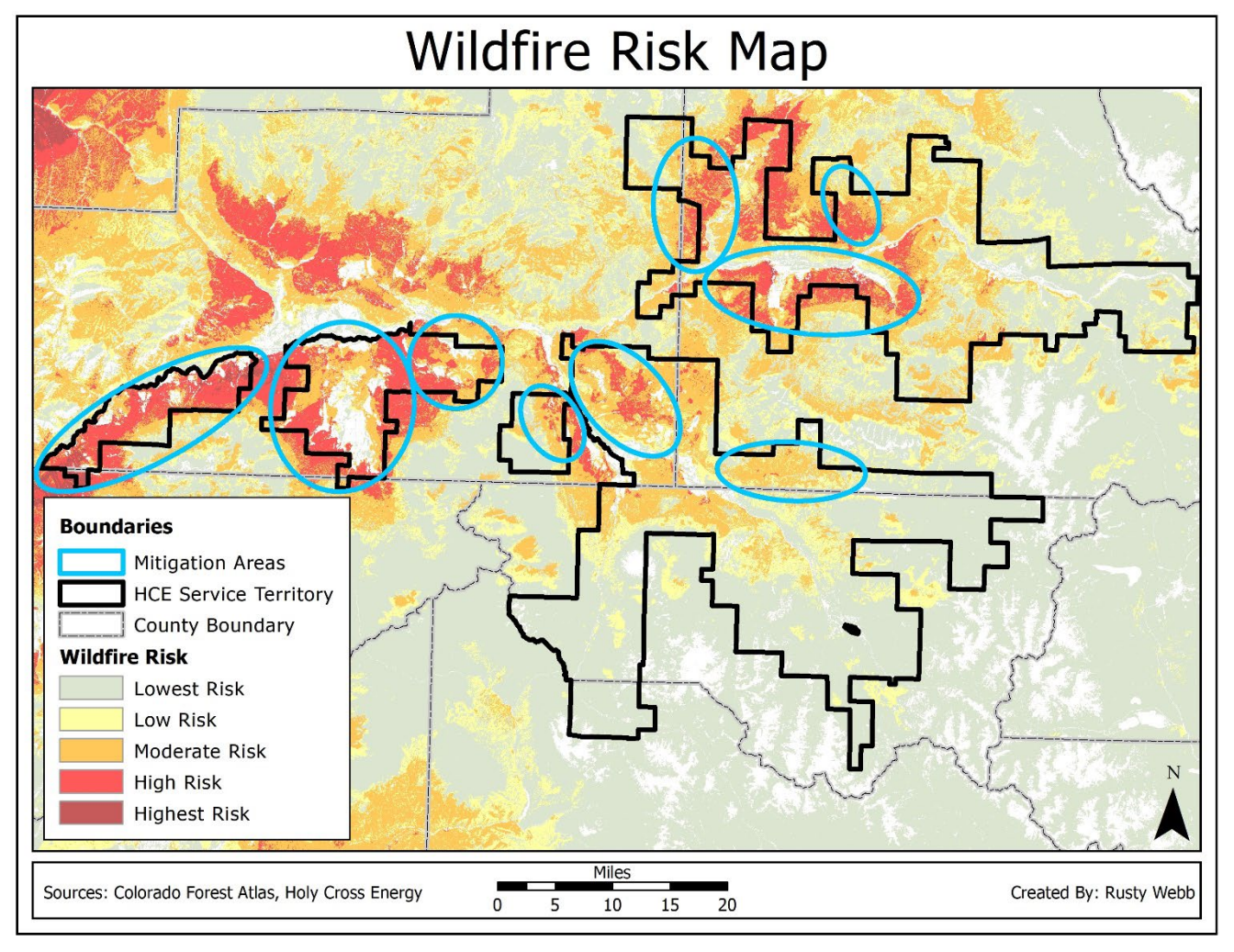
- Wildland Urban Interface (WUI);
- Forest Assets;
- Riparian Assets; and,
- Drinking Water Importance Areas.

The WUI component is a key element of the composite risk since it represents where people live in the wildland and urban fringe areas that are susceptible to wildfires and damages.
Calculating the VAR at a given location requires spatially defined estimates of the likelihood and intensity of fire integrated with the identified resource value. This interaction is quantified through the use of response functions that estimate expected impacts to resources or assets at the specified fire intensity levels. The measure of fire intensity level used in the Colorado assessment is flame length for a location. Response Function outputs were derived for each input data set and then combined to derive the Values at Risk Rating.

Burn Probability (BP) is the annual probability of any location burning due to a wildfire. The annual BP was calculated as the number of times that a cell was burned, and the number of iterations used to run the models. The annual BP was estimated for Colorado by using a stochastic (Monte Carlo) wildfire simulation approach with Technosylva's Wildfire Analyst software.

HCE has identified areas within the service territory that are rated by the Colorado State Forest Service (COFS) as High or Highest risk areas. The blue polygons in risk map represent areas where HCE is conducting focused fire mitigation strategies.

Figure 7. Wildfire Risk Potential



4 Operational Practices

This chapter outlines HCE's existing fire mitigation efforts and identifies new processes and programs the Co-op may employ moving forward. Some of these programs are multi-year and programmatic, while others are situational and based on environmental conditions such as Red Flag Warnings. HCE continues to explore new technologies and approaches to determine their ability to reduce the risk of ignition and improve system reliability.

HCE has initiated several new programs, such as sUAS and infrared inspections, circuit recloser upgrades, and reconductoring projects. HCE has also identified areas within our service territory that are rated by the Colorado State Forest Service as extreme or elevated fire-threat areas. In these areas, HCE has focused on utilizing non-expulsion fuses and increased line patrol and maintenance. HCE make ongoing efforts to update its practices as new information emerges and adopt improved strategies. Table 3 depicts the activities currently being utilized to address key wildfire risk factors.

Table 3. Activities That Address Wildfire Risk Factors

Risk Factor	Mitigation Activity
Fuel Source	• Identification of high fire threat areas • Vegetation management program • Increased line inspections • ROW inspection and maintenance • Mid-cycle trimming • Tree planting information on HCE website • AI-enhanced satellite vegetation scanning
Extreme Weather	• National weather service monitoring • Wildland Fire Assessment System monitoring • Fire weather monitoring • RFW alerts • Alternate recloser settings (fire mode) • Firewatch camera monitoring
Contact from Objects	• Hazard tree removal • Avian Protection Plan • Covered jumper and bushing caps • Fiberglass riser brackets • Underground construction • Vegetation clearance safety patrols
Equipment Failure	• Routine inspection and maintenance • Line detailed inspections • Intrusive pole testing and treatment • Detailed sUAS inspections of OH equipment • IR inspections of OH facilities (to first protection device) • CopperWeld conductor replacement program
Field Work	• Tailgate meetings prior to field work • RFW work protocols • Industrial Fire Protection Level monitoring • Fire watch services after field work

4.1 Situational Awareness and Assessment Tools

Situational assessment is the process by which current operating conditions are determined. Situational Awareness (SA) is the understanding of the working environment, which creates a foundation for successful decision making and the ability to predict how it might change due to various factors.

HCE uses all situational awareness resources at its disposal to monitor evolving fire weather, fuel, and other climatological conditions that may lead to fire events. It evaluates information such as real-time field observations, GIS data, asset maintenance reports, ongoing wildfire reporting and other resources.

HCE's System Operators monitor climatological conditions that may lead to fire events using the following resources along with local media such as local news channels, county emergency response information, and local weather alerts. Based on available information, HCE appropriately schedules work crews, adjusts field deployed equipment settings, and prepares for severe weather as needed.

- **WeatherSentry DTN:** Subscription based weather reporting service with monitoring and weather alerts providing advance notice of fire danger and severe weather in the service territory.
- **The National Weather Service (NWS):** The NWS provides on-line predictive fire weather forecasting tools in the form of a current fire-weather outlook, 2-day, and a 3-8 day outlook. (https://www.spc.noaa.gov/products/fire_wx/)
- **NOAA Weather and Hazards Data Viewer:** This on-line map provides historic or real-time surface observations including wind speed and direction, wind gust, dew point, relative humidity, and sea level pressure collected from remote automated weather stations (RAWS). Extreme-weather alerts such as fire weather watch, high wind watch, and red flag warning are provided from this resource. (https://www.wrh.noaa.gov/map/?wfo=psr)
- **Industrial Fire Level Precaution Levels (IFPL):** Fire season requirements, Fire Restrictions, become effective when fire season is declared. Fire restrictions can be enacted either by the Sheriff, the Board of County Commissioners, State, or National Forest Manager when certain environmental conditions are met. (http://www.coemergency.com/p/fire-bans-danger.html)
- **Pano Wildfire Cameras:** AI enhanced wildfire detection cameras to help increase awareness of ignitions and ongoing wildfires. HCE has access to 10, 360-degree panoramic cameras positioned in various high-altitude locations and communication tower sites.

4.2 Fire Settings Implementation Guidelines

To consistently operate the HCE Distribution System in a manner that provides appropriate levels of fire risk mitigation, system protection, and reliability of the system, HCE has developed operational protocols for high fire risk events referred to as " Operating Modes". These guidelines are detailed in HCE's System Operation Handbook (Document #7002).

System Operations is charged with monitoring the current stage of predicted wildfire risk, fire restrictions and Red Flag Warnings (RFW) which govern the implementation of various operational modes for field deployed equipment such as substation breakers (operated by Xcel Energy) and line reclosers. There will occasionally be a need to differ from these Operating Modes as local conditions change (rain, temperatures, etc.).

The VP of Engineering (VPE) or System Operations Management shall determine when local conditions require deviation from these guidelines. System Operations shall monitor The National Weather Service, County Governments, and WeatherSentry DTN for the issuance of any RFWs, Wildfire Watches, Industrial Fire Protection Levels (IFPL), and Wildfire Energy Event Index (EEI)[14].

4.2.1 Reclosing Operational Practices

When high fire risk conditions exist in the service area, such as during Red Flag Warnings, HCE implements "fire mode" on select line reclosers. The field devices that are set to "fire mode" will trip on relatively low amplitude faults and will trip very quickly. The fast tripping is key to minimizing the risk that the HCE system ignites a fire.

In addition, the implementation procedure calls for Xcel Energy to place the substation breakers in non-reclose mode depending on the level of risk expected for the area of concern.

4.2.2 Red Flag Warning Operational Protocols

A Red Flag Warning (RFW) is issued by the National Weather Service (NWS) when critical fire weather conditions are forecasted or met. The RFW is to call attention to limited weather conditions of importance that may result in extreme wildfire risk. The type of weather patterns that can cause an RFW include low relative humidity, strong winds, dry fuels, the possibility of dry lightning strikes, or any combination of the above.

When the System Operators receive notice that an RFW has been issued, work in high risk areas is performed only when the following conditions are met:

- Emergency and restoration work;
- Crew has fire suppression equipment accessible in the immediate area of work that would facilitate an immediate response to an ignition;
- Crews will be on alert for fires while working or passing through high risk areas and report fires or signs of fire to the emergency services or operations center as soon as feasible.

4.3 Fire Restrictions

The Industrial Fire Precaution Level (IFPL) system is intended to help land management agencies reduce fire risk and prevent wildfires during periods of high or extreme fire danger by regulating industrial and recreational activities on private and public lands[15]. Federal agencies such as the USFS, BLM, and the National Park Service can impose restrictions on the public lands they manage[16]. Individual states can

[14] WeatherSentry DTN
[15] 36 CFR 261.52
[16] http://www.coemergency.com/p/fire-bans-danger.html

also impose restrictions on state managed lands and counties may impose bans on private lands within county borders. Each summer, when qualifying conditions of fire hazard exist, various foresters will declare fire season to be in effect in their area of jurisdiction.

There are two fire restriction stages; Stage I and Stage II. There is one closure stage; Stage III. Definition for the various stages are as follows:

- Stage I imposes relatively minor restrictions aimed at preventing the start of wildfires based on human activities that are known to be high risk, specifically smoking and campfires.
- Stage II intensifies the restrictions from Stage I by focusing on activities that, although normally managed under permit or contract, have a relatively high risk of causing a fire start.
- Stage III is closure. This stage is selected when there are very high risks and the ability to manage those risks using Stage I or II restrictions is no longer viable.

During fire season, HCE monitors the status of these precaution levels. Service vehicles working on or adjacent to public lands are equipped with all suppression tools per IFPL requirements.

4.3.1 Post Field Work Fire Watch

During Stage II restrictions, a fire watch person(s) (lookout) will be at the site of any and all welding, fueling, tractor or other mechanized equipment operation, etc. This person(s) will have no other duty than to watch for fire starts and be ready to take immediate fire suppression action. If the fire watch person(s) locates a fire, he will report it to Emergency Services via 911, or have the company contact them if phone services are not available. They will give location of fire, name of reporting party, best known access route, description of fire size, and information on whether they are taking suppression action, if they are able to handle fire, or if they would like to request assistance.

The fire watch person(s) will remain on site observing for smoke or fire for a minimum of one half hour after cessation of operations requiring the fire watch. The fire watch person(s) will carry a shovel and have a four or five gallon backpack water pump (full and in good operating condition) immediately available. The fire watch person(s) will be in good physical condition and able to fight fires.

4.4 Temporary Faults on Main Feeders

Since temporary faults can sometimes turn into permanent faults, HCE patrols the main feeders for all substation trips, even when the breaker successfully re-closes. This practice minimizes the chance of a subsequent fault and a possible ignition source.

4.5 Wildfire Readiness Framework

HCE's enterprise-wide approach to wildfire readiness is comprised of the conditional levels depicted in Figure 8 below. These readiness protocols are intended to harden the system overall, create situational awareness within and outside the service area, implement conservative protection and control settings during critical fire weather conditions, deploy additional resources when needed, activate the PSPS Decision Team, and finally, in a worst-case scenario, preemptive de-energization of portions of the system.

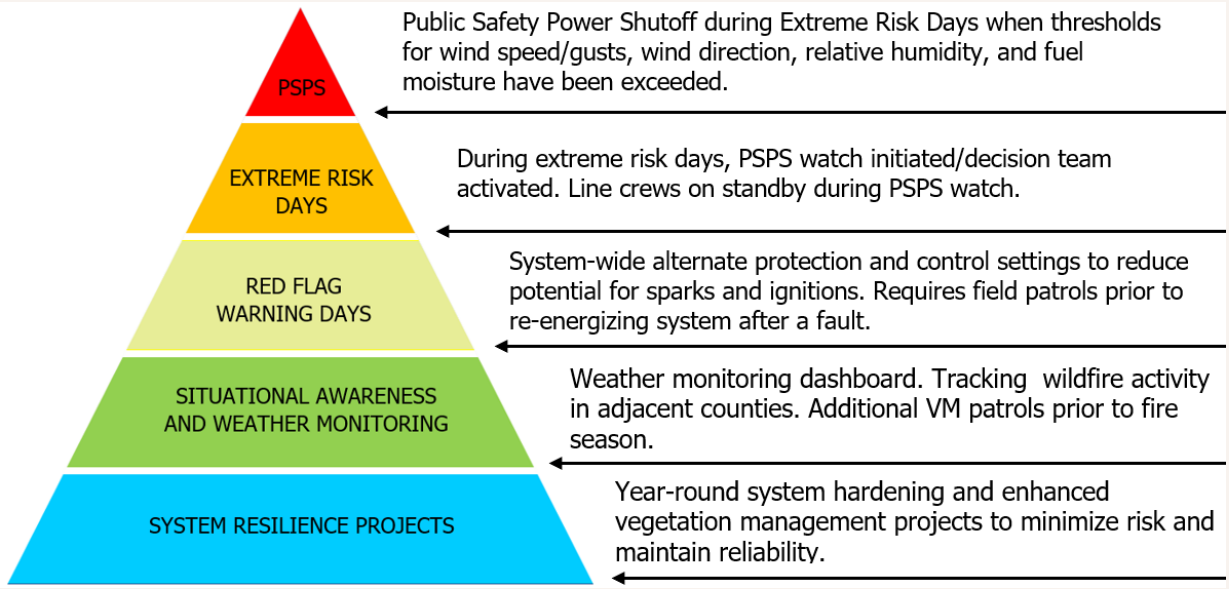
Figure 8. Wildfire Readiness Framework

4.6 De-energization of Powerlines (PSPS)

A Public Safety Power Shutoff (PSPS) preemptively de-energizes power lines during high wind events combined with hot and dry weather conditions. When considering de-energization, HCE examines the impacts on fire response, water supply, public safety, and emergency communications.

HCE considers the external risks and potential consequences of de-energization while striving to meet its main priority of protecting the communities and customers we serve. They include:

- Potential loss of water supply to fight wildfires due to loss of production wells and pumping facilities.
- Negative impacts to emergency response and public safety due to disruptions to the internet and mobile phone service during periods of extended power outages.
- Loss of key community infrastructure and operational efficiency that occurs during power outages.
- Medical emergencies for members of the community requiring powered medical equipment or refrigerated medication. Additionally, the lack of air conditioning can negatively impact medically vulnerable populations.
- Negative impacts on medical facilities, fire, police, and schools.



- Traffic congestion resulting from the public evacuation in de-energized areas can lengthen response times for emergency responders.
- Negative economic impacts from local businesses forced to close during an outage.
- The inability to open garage doors or motorized gates during a wildfire event.

The risks and potential consequences of initiating a PSPS are significant and extremely complex. Based on the above considerations, HCE reserves the option of implementing a PSPS when conditions dictate. While HCE believes the risks of implementing a PSPS far outweigh the chances of its electric overhead distribution system igniting a catastrophic wildfire, the PSPS provides a last resort tool and another mitigation option.

At this time HCE does not have a PSPS procedure and is currently exploring how a PSPS protocol could be implemented

5 Infrastructure Inspections and Maintenance

Recognizing the hazards of equipment that operate high voltage lines, HCE maintains formal time-based inspection and maintenance programs for distribution, and substation equipment which plays an essential role in wildfire mitigation, reliability, and safety. HCE currently patrols its system regularly and has increased the frequency in high-risk areas. The following sections outline the inspection practices for utility-owned assets. Table 5 provides a high-level overview of the inspection intervals.

Table 4. Inspection Program Summary

Asset Classification	Inspection Type	Frequency
Transmission*	Routine Inspection	Annual
	sUAS Detailed Inspection	Annual, or as needed with routine inspection
	Wood Pole Test and Treatment	Every 12 years
Overhead Distribution	Routine Inspection	Every 3 years
	sUAS Inspection	Every 7-8 years
	IR Inspection**	Annual
	Wood Pole Test and Treatment	Every 9 years
Substation	Routine Inspection	Monthly
	Detailed Inspection	Every 5 years
	Oil Testing	Annual

* HCE-owned transmission assets are inspected and maintained by Xcel Energy

** From substation exit to first protection device

5.1 Definition of Inspection Levels

1. **Routine Patrol Inspection:** A simple visual inspection of applicable utility equipment and structures designed to identify obvious structural problems and hazards. Patrol inspections may occur in the course of other company business.
2. **Detailed Inspection:** Individual pieces of equipment and structures receive a careful visual examination using routine diagnostic testing as appropriate.
3. **Wood Pole Test and Inspection:** This involves the movement of soil, boring holes in the wood pole above and below the ground line, checking for decay, and installing a fumigant as needed.

5.2 Overhead Asset Inspection Program

HCE and its contractors shall report hazards found as part of the OH inspection program, which is performed in concert with all overhead linework and vegetation line clearance operations. During the course of routine line operations, all spans of OH primary conductor will be inspected regardless of the presence of vegetation. While on each job site, line crews should also inspect secondary and service conductors.

Tree crew personnel are to identify obvious safety hazards on HCE's distribution and transmission overhead facilities that could pose a threat to the general public as well as our employees and contracted workers. Hazards that present an imminent threat to personal or public safety must be resolved immediately.

All transmission line facilities are inspected and maintained by Xcel Energy.

5.3 Substation Inspections

HCE performs detailed inspections on substations monthly to ensure safety and reliability. A "Detailed" inspection shall be defined as one where individual pieces of equipment and structures are carefully examined visually and through use of routine diagnostic test as appropriate. If practical and useful information can be gathered, equipment is opened and the condition of each piece of equipment evaluated and recorded.

Once per year, all substations are inspected using infrared (IR) thermography to identify thermal anomalies and deficiencies not readily visible. HCE also performs a dissolved gas analysis (DGA) test for all of our substation transformers yearly to look for increasing levels of certain gases that can predict internal transformers issues.

5.4 Pole Management Program

To maintain the Co-op's ~21,000 wood utility poles, a formal Pole Management Program was initiated with the goal to inspect approximately 12% of the distribution system poles per year. This interval meets RUS Bulletin 1730B-121 inspection and maintenance guidelines. Wood pole inspections are performed by qualified contractors on a planned basis to determine whether the wood structures have degraded below National Electric Safety Code (NESC) design strength requirements with safety factors.

In addition to assessing the condition of the wood pole, inspectors look for and note evident deficiencies of installed equipment such as missing ground wires, guy wire damage, damaged cross-arms, fire damage, as well as vegetation clearance violations and missing or damaged wildlife protection.

Poles which fail inspection are prioritized based on level of structural defect and scheduled for replacement or corrective repair accordingly. Wood poles that pass the intrusive inspections are re-tested with a target interval of every 9 years.

5.5 Instruction to Inspectors

HCE's maintenance plan is based on sound industry principles and best practices and is designed to provide safe reliable service. Maintenance work shall be based on a three-level rating system to prioritize action items to resolve safety and reliability issues.

The inspector will document the condition of the overhead systems, recording defects, deterioration, violations, safety concerns or any other conditions that require attention on the inspection tags. The focus of the inspection shall be on any hazards that could affect the integrity of the system or the safety of line workers and the general public.

Inspection tags (overhead) will be prioritized and issued as follows:

- **Priority # 1** – Immediate hazard:

Conditions that may affect the integrity of the system or present a hazard to workers or the general public. Priority #1 tags will be responded to **immediately** and appropriate action taken until the hazardous condition is remedied.

- **Priority # 2** – Non-emergency repair condition:

Conditions requiring maintenance that can be scheduled to maintain the integrity of the system. Priority #2 tags will be prioritized by urgency and will be scheduled to have appropriate repairs made to correct the condition within 6 months where practicable. If the Priority Level 2 issue is located in a Mitigation Zone and poses a potential fire risk, correction of the deficiency will occur within 2 months.

- **Priority # 3** – Non-emergency repair condition:

Conditions that do not present a situation that could jeopardize the safety of the system, line workers and the general public. Priority #3 tags will be submitted by the inspector with the time interval recommended. In the judgment of the Operations Department, work will be scheduled to be completed within five years.

5.6 Infrared Thermography

Hundreds of different pieces of equipment may be found in an electrical distribution system. They start with electricity production, high voltage distribution, switchyards and substations, and end with service transformers, switchgear, breakers, meters and local distribution. Abnormal heating associated

with high resistance or excessive current flow is the main cause of many problems in these electrical systems.

Using FLIR cameras, also referred to as IR thermography, HCE inspects its substation equipment, and from the feeder exit to the first point of protection annually during high winter load to find and measure hidden electrical and mechanical issues before they become a reliability issue. FLIRs create images from heat, rather than visible light. But thermal imagers don't just make pictures from heat; they make pictures from the minute differences in heat between objects. Because excess heat is a sign of increased resistance, FLIR technology is well suited to locating defects in connections and components. Thermal imagers enable inspectors to see the heat signatures associated with high electrical resistance long before the circuit becomes hot enough to cause an outage or damage providing information critical to avoid system failures and fires.

5.7 Geographic Information Systems (GIS) Mapping

Each component of the distribution system, including meters, has a physical location and associated data. To plan, construct, maintain, operate, and manage the network, it is beneficial to create and manage this geospatial data.

HCE geolocates and manages its assets utilizing GIS mapping technology which has been integrated into its asset inspection and maintenance programs. This provides the ability to record and map this work to ensure assets are maintained on a prescribed schedule.

To streamline the inspection and maintenance process, HCE has also integrated handheld computer tablets with GIS mapping applications into its daily operations. The tablet interface allows field workers to capture and return field data that integrates into the GIS mapping platform. Inspectors, linemen, and VM crews can easily document field work, equipment condition, or vegetation clearance issues using the handheld mobile devices.

5.8 Small Unmanned Aircraft Systems (sUAS) Inspections

Many of HCE's distribution lines and structures are located in remote, mountainous, and difficult to access areas. The height and voltage levels of the equipment as well as conditions on the ground also limit how close an inspector can approach without de-energizing the lines. Due to these factors, HCE has contracted with an outside vendor to conduct systematic sUAS inspections on its ROWs on a 7-8 year cycle.

sUASs equipped with high-resolution cameras, as well as infrared thermographic (IR) cameras, allow for detailed inspections of crossarms, pole tops, hardware, and other equipment not visible from the ground. The result is a detailed inspection process that improves worker safety and system reliability while reducing man hours and overall maintenance cost. This technology is not a replacement for manned inspections, but another component of the asset inspection program. sUAS derived data is analyzed and used to generate work orders and/or assign maintenance work to line crews.

Figure 9. sUAS Inspection

6 Vegetation Management

HCE maintains approximately 1,100 miles of OH ROW to minimize interruptions of services to our members. This includes not only the maintenance of the hardware, conductors, and poles, but also trees and other vegetation that threaten to fall or grow into the conductors. Trees that grow within or adjacent to powerline right-of-ways (ROWs) are a common cause of outages and damage to facilities, as well as a potential cause for wildfire. While HCE is responsible for maintaining the ROW above and below our power lines, we strive to balance maintaining our natural surroundings with ensuring a reliable power supply by keeping power lines clear of vegetation. While we recognize and appreciate the beauty of trees, the three main benefits to tree trimming in ROW areas are; Safety, Reliability, and Affordability.

When work is well planned and completed, the overall impact on the desirable vegetation on the ROW is reduced, and the neighboring landowners, the motoring public, and the wildlife that uses the ROW for nesting and foraging will benefit. With a prescriptive and balanced approach to VM, HCE can focus more of its energy and resources on preparing for future weather events, improving the reliability of the grid, and controlling maintenance costs.

6.1 Trimming Standards

Trees are trimmed or removed for safety, reliability, and compliance with National Electric Safety Code (NESC) requirements[17]. HCE's tree trimming crews and contractors also adhere to "Best Management Practices-Utility Pruning of Trees[18]" which is a companion publication to the (ANSI) A300 Part 1: Tree, Shrub, and Other Woody Plant Maintenance. This standard is intended as a guide for federal, state, municipal, and private authorities including property owners, property managers,

[17] The National Electric Safety Code, Vegetation Management Section 2IS.A.I
[18] The International Society of Arboriculture

and utilities. Contracted and HCE tree workers are expected to have a copy of this booklet in the field, and to adhere to this standard when pruning trees near electric facilities.

Factors considered in determining the extent of vegetation management required include, but are not limited to:

- Tree species
- Species growth rates and failure characteristics
- Branch size
- Line voltage class
- Right-of-way limitations
- Framing and spacing between phases
- Vegetation's location in relation to the conductors
- Location of tree in regard to general public safety
- Potential combined movement of vegetation and conductors during routine winds
- Sagging of conductors due to elevated temperatures or icing
- Risk of wildfire ignition

6.2 Wire Zone/Border Zone

HCE's clearance guidelines are based on local tree growth rates, specific to individual trees on specific circuits. Clearances are determined based on species growth rates as well as line voltage, construction of facilities, and electric reliability performance.

Wherever feasible, the wire zone/border zone concept[19] shall be integrated into the vegetation management program to allow for different types and heights of vegetation in the ROW (Figure 10). This concept differentiates between the wire zone directly under the conductors and the remaining border zone. Generally; this concept allows for different, yet compatible, vegetation types in these separate zones.

- **Wire Zone:** Area directly underneath the conductor(s). Vegetation in the wire zone consists of low-growing forbs and grasses.
- **Border Zone:** Area that begins at the outside edge of the wire zone and extends to the edge of the easement. The border zone may contain additional low-growing woody plants and trees.

The wire zone/border zone concept, as applied by HCE, does not require removal of tall-growing trees if, at maximum mature height, the tree would not come within 15 feet of vertical clearance nor have the potential to fall into or overhang a conductor horizontally. Areas outside the border zone must be patrolled for trees of interest (Figure 11).

[19] Bramble and Byrnes, 2000

Figure 10. Wire Zone/Border Zone

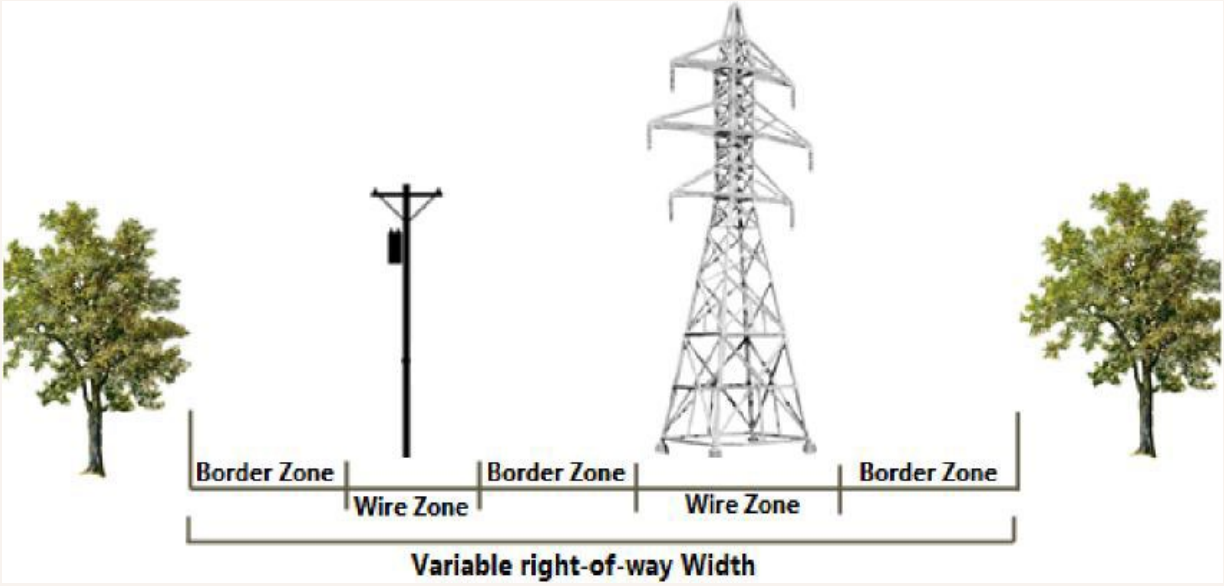
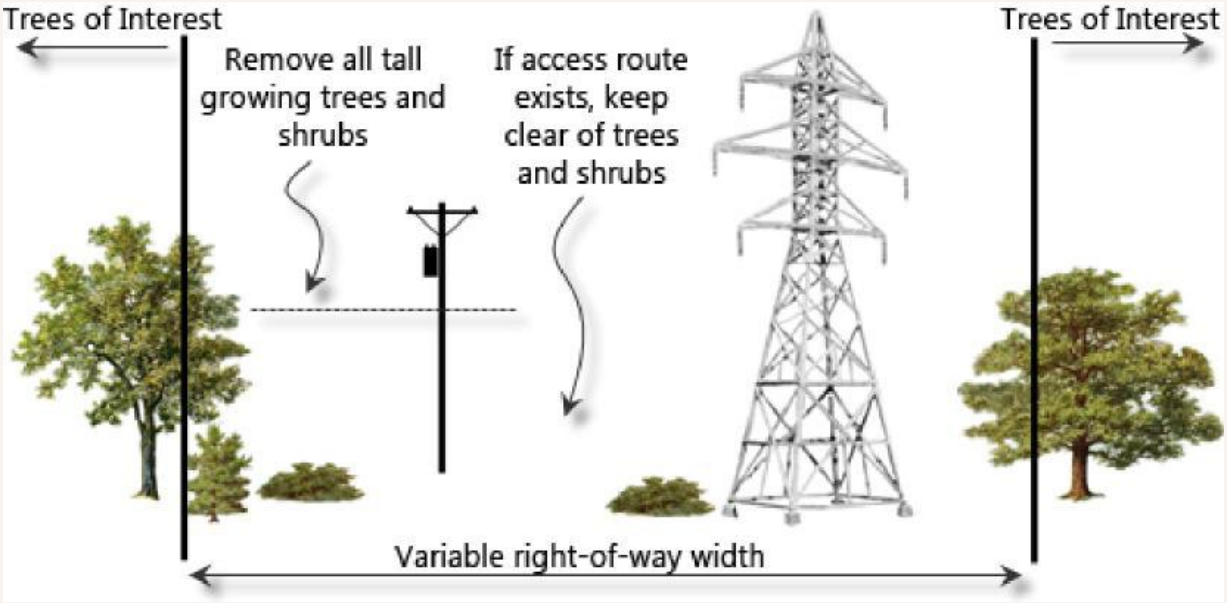


Figure 11. Typical Transmission and Distribution ROW



6.3 Minimum Clearance Guidelines

HCE has developed additional clearance guidelines for areas where the wire Zone/Border Zone concept cannot be achieved. Crews performing tree work must consider the tree species, growing environment, re-growth rate, maintenance cycle length, etc. in order to determine the amount of clearance required at the time of pruning. HCE has identified, in its VM Guidelines, the average re-growth rate of the common tree species found in the service area. During tree work, trimmers aim to achieve 10' of clearance plus 5-year regrowth at time of trim. Growth rates can be as low as 5 feet for Douglas fir, or as high as 31 feet for a weeping willow. Mid-cycle trimming is often necessary where ROW limitations do not allow for 5 years of growth to be trimmed.

Specifications for the vertical and horizontal clearance at the lowest sag point and structure for varying spans lengths have been developed and are contained in HCE's VM Guidelines document.

6.4 Safety Standards

All personnel performing vegetation management work on or near HCE facilities or ROWs shall follow approved safety guidelines and procedures. All contractors performing work for HCE shall comply with all applicable governmental safety and health regulations, and the safety and health provisions of their contracts.

HCE follow three important standards for tree worker safety:

- OHSA 1910.269;
- ANSI ZI33.1; and,
- Colorado Revised Statute (CRS) title 9 Article 2.5

Contract line clearance tree workers must meet the requirements of these standards as well as any other applicable federal, state, or local laws, codes, or regulations.

6.5 Vegetation Management Trimming Schedule

HCE has evaluated the vegetation characteristics and growth rates of the predominant species along the OH lines to determine the years of growth until they contact the conductor. Each ROW has an established maintenance cycle depending on the work required.

Cycle trimming is the cornerstone of the vegetation management program. Under this concept, all system electrical distribution lines are assigned a schedule for tree trimming and/or removal. Currently, the full tree trimming cycle is 5 years, which means every line in HCE's service territory receives attention every 5 years. The trimming cycle is broken out geographically based on season and access.

HCE-owned transmission lines are inspected and maintained by Xcel Energy on behalf of HCE. This includes any vegetation related work in accordance with North American Electric Reliability

Corporation (NERC) standards[20]. Table 6 illustrates scheduled trimming cycles for the T&D lines on the HCE system.

Table 5. Vegetation Management Schedules

Asset Classification	Operation Type	Frequency
Overhead Transmission	Inspection*	Every 3 years
	Trimming*	Every 5 years
Overhead Distribution	Inspection	Every 3 years
	Trimming	Every 5 years
Fast Growth Areas	Mid-cycle Trimming	Every 2.5 years or as needed

*Performed by Excel Energy

6.5.1 Mid-Cycle Trimming

The VM inspection process is driven by a certified arborist providing an ongoing assessment of vegetation growth throughout the system with special attention given to areas with increased potential for tree-caused damage to powerlines and utility equipment. By continuous evaluation of the system, tree trimming resources focus on certain high growth areas more frequently than the typical 5 year tree trimming cycle. Certain ROWs that cannot accommodate 10' plus 5 years of growth are trimmed mid-cycle to maintain the desired clearance from the power lines. The goal of this program is to address potential problems that may arise outside the 5 year tree trimming cycle.

6.6 Tree of Interest Mitigation

Electric utilities that investigate the actual causes of outages often find that the failure of branches and trees is a significant component of the tree-related outage category[21]. Hazard tree removals are assessed and completed as part of the normal cycle trim. These trees are generally outside the right-of-way and are deemed by an arborist to pose a potential threat to power lines. HCE makes it a priority to top or trim below line height or remove hazard trees as soon as they are identified.

[20] FAC-003-4 Transmission Vegetation Management
[21] NRECA Vegetation Management Manual

Any tree on or off the ROW with the potential to contact an electric supply line is considered a tree of interest. A tree of interest has an unacceptable risk of failing before the next maintenance cycle. Trees of interest should be topped or trimmed below line height or removed. Conditions that might indicate the presence of a hazard tree could include but are not limited to the following:

Biological Factors:

- Decay/deadwood/dead trees
- Cracks
- Weak branch unions
- Cankers/fungal bodies

Environmental Factors:

- Root damage, restrictions
- Changes in exposure
- Poor architecture (leaning, structural overloading, imbalance due to wounding, etc.)

6.7 Vegetation Inspection

The VM inspection program is designed to maintain the required vegetation clearances by inspecting each circuit on a 2-year cycle. A dedicated ROW Inspector conducts year-round patrols of all overhead power lines with a primary focus on identifying hazard trees and areas requiring mid-cycle trimming. The VM Supervisor then checks, prioritizes, and assigns trimmers to the locations identified by the inspector.

6.8 Multi-Spectral Satellite Imagery

Since 2021, HCE has employed advancements in satellite scanning technology and artificial intelligence to identify vegetation encroachment issues and hazard trees in and outside the ROW. While it can take weeks for sUASs to photograph the entire distribution system, a satellite can capture high-resolution imagery of the same area within hours (Figure 12). Through a contracted VM analytics company, HCE can acquire a complete overview of the entire system just days after the data has been recorded provides near real-time visibility of vegetation conditions and trimming status.

Machine learning algorithms can accurately distinguish between grassland, agricultural or urban areas, and vegetation that poses a risk to HCE assets. Algorithms can detect, at scale, the species and health of vegetation and its proximity to the overhead conductors, allowing for informed decision-making. The service also provides work prioritization and post-work verification.

A custom risk score is calculated based on customer impact, tree species, health, fire and encroachment hazard, cost, and other factors. This new VM inspection methodology assists the VM Supervisor in optimizing the trimming cycle as HCE moves away from circuit-based cycle trimming to a more strategic risk-based approach.

Figure 12. Satellite Vegetation Scanning Output

6.9 Controlling Incompatible Vegetation

In addition to the regular patrols by HCE field staff observing and reporting on incompatible uses and encroachments, HCE makes efforts to educate public and private landowners about incompatible vegetation that can pose risks if planted under or near conductors. HCE believes that the member plays an important part in our ability to address problems that may pose a threat to our power supply system. Member input, combined with regularly scheduled ROW maintenance, helps to ensure that our power system is as reliable as possible.

Only qualified tree workers can work on trees that have grown closer than non-qualified tree worker minimum approach distances. Therefore, HCE provides adequate clearance so that work by non-qualified workers can be performed safely. These clearance requests are known as "Safety Zone" requests.

Examples include:

- Pruning the portion of the tree back an adequate distance
- Dropping the tree on the ground
- Requesting that the conductor be de-energized

If the request pertains to a service line, street light wire or other secondary line, the requesting party can call HCE to request a "Line Drop" to temporarily remove the wire from the work zone.

7 Fire Mitigation Construction

HCE construction standards are designed for maximum safety and reliability. Its members are served through a heavily over-built system constructed to 25kV standards. Most taps off the main lines are

protected by a fuse or recloser and the distribution system is 80% sectionalized. HCE has worked to replace aluminum risers with fiberglass and use covered jumpers and bushing covers on every structure. Approximately 62% of the distribution system has been built using UG construction, which is the most effective wildfire mitigation method available.

7.1 Avian Protection Construction Standards

Since 2003, HCE has employed design and construction standards to protect raptors, migratory birds, and wildlife in general. The measures contained in HCE's Avian Protection Plan (APP) have been shown to reduce the collision and electrocution risk to wildlife and the number of birds injured. Consequently, avian protection strategies also reduce the potential for fire ignitions while helping to prevent power outages. Some of the strategies contained in HCE's 2019 APP update included:

- Covered wire for jumpers and stingers
- Caps on surge arresters, energized bushings, and terminators
- Bushing covers on transformers, capacitors, reclosers, and regulators
- Bird flight diverters on water-crossing spans
- Replaced grounded aluminum equipment brackets with non-grounded fiberglass
- Avian-friendly 3-phase tangents poles with dropped 8' fiberglass crossarms
- Builds many 3-phase deadend poles as avian-friendly
- Replaced double crossarms with single fiberglass crossarms to limit osprey nesting where needed

HCE employs a wide variety of techniques, activities, and work processes to avoid and/or minimize avian impacts when siting, designing, and constructing new facilities. These safety measures have reduced the potential for fire ignitions while also assuring compliance with the Migratory Bird Treaty Act (MBTA), Bald and Golden Eagle Protection Act (BGEPA), and the Endangered Species Act (ESA).

7.2 Copper Replacement Program

HCE has made proactive efforts to identify and replace the CopperWeld conductor remaining on its distribution system. When planning CopperWeld replacement projects, the priority is to upgrade circuits with higher customer density, with additional consideration given to areas with elevated wildfire risk.

7.3 Non-expulsion Fuses

Typical utility industry practice has been to install expulsion fuses on transformers and tap-lines as a means of protecting and isolating parts of the system that have experienced a faulted condition. Expulsion fuses utilize a tin or silver-link element in an arc-tube that expel gas and potentially molten metal to the atmosphere as a means of extinguishing an arc created by a faulted condition. The molten metal, however, can be a source of ignition for fire. In contrast, non-expulsion current-limiting fuses are a non-venting fuse encapsulated within a tube to contain the arc and gases, which

minimizes the potential for molten metals to be expelled. HCE has installed non-expulsion fuses on select OH lines in high-risk areas.

7.4 Circuit Recloser Upgrade

A circuit recloser is an automatic, high-voltage electric overcurrent protective device. Like a circuit breaker in a household electric panel, this class of switchgear is designed to shut off electric power when trouble occurs, such as a short circuit, then close back in multiple times to detect if the problem still exists. If the fault is temporary, the unit automatically resets and restores power[22].

Invented in the 1940s, reclosers were originally oil-filled devices with simple internal hydraulic mechanisms. Modern electronic vacuum reclosers provide fast, low-energy interruption with long contact life, are programable, and do not require the high maintenance demands associated with traditional reclosers.

HCE has replaced virtually all of its older oil-filled units with modern electronic vacuum reclosers, allowing connectivity to the operations center via the SCADA system. This major upgrade enables HCE to adjust settings, such as ”Fire Mode”, or changes in sensitivity remotely without rolling trucks, thus improving response time and safety. These “smart” devices also provide immediate notification of system disturbances through SCADA allowing the Operations Center to dispatch line crews.

[22] https://www.eaton.com/content/dam/eaton/products/medium-voltage-power-distribution-control-systems/reclosers/recloser-definition-information-td280027en.pdf

8 Emergency Response

HCE strives to minimize the impacts of any disruptive event regardless of the size or scope while consistently focusing attention on the community's most critical systems and infrastructure. This chapter will summarize HCE's emergency response and communication policies, land ownership in the service area, community outreach, and the restoration process.

8.1 Public Agency and Member Communications for Outages

HCE personnel understand that poor communication during an emergency can directly contribute to injury, property damage, and even death. In situations that could lead to a PSPS or other unplanned outage, HCE will convene a PSPS Decision Team made up of HCE department heads and senior leadership. This group will work together to ensure that appropriate and actionable information reaches all concerned stakeholders.

For scheduled maintenance outages, HCE provides as much notice as possible, typically 48 hours in advance. Information regarding PSPS or other unplanned outages will be shared with stakeholders as soon as feasible to allow for the maximum amount of time to prepare and respond. During these times HCE will utilize the following channels of communication.

- Emergency Management agencies in affected counties
- Communications companies attached to or collocated with HCE infrastructure
- News media outlets serving the affected areas
- HCE generated emails
- HCE's social media accounts (Facebook, twitter)
- Prominent postings on HCE's website (affecting 500 members or more)
- Talking points provided to HCE member services representatives
- Direct calls to key accounts
- SmartHub outage notification system (messages via email or text)
- HCE's online "Outage Center"

8.2 Crisis Communication Plan

A critical component of HCE's emergency preparedness and response planning includes the development of a Crisis Communication Plan (CCP) outlining the actions the Co-op's Member and Community Relations department takes during a crisis. The plan presents scenarios accompanied by response checklists. Useful tools include templates for press releases, website notifications, and social media postings to effectively dispense accurate information to employees, co-op members, the general public, and the news media.

The purpose of the CCP:

- Guide co-op management to more effectively manage an unusual situation to prevent confusion and misunderstanding.
- Provide a framework for prompt, accurate, and effective communications with key audiences, including employees, members, and the news media during crises.

The CCP receives an annual review and is updated accordingly. The Member and Community Relations department leads a post-crisis review to determine what worked or needs improvement and recommends, as required, revisions to the CCP. Management plans and conducts emergency management drills when appropriate.

8.3 Department of Emergency Management Communication and Coordination

During active emergencies, HCE coordinates and collaborates with our local emergency response agencies as well as other relevant local and state agencies as a peer partner. A small-scale emergency requires less resources and coordination than a large-scale event. Therefore a two-tiered approach to emergency management interaction is sensible.

During small-scale events HCE's dispatch personnel will coordinate recovery efforts with first responders. This coordination will be maintained until first responders declare the emergency over.

When large scale emergencies require county emergency managers to stand up their emergency operations center (EOC), it means that many diverse resources are needed. During such events, HCE's Safety Coordinator (SC) will contact the local EOC and establish themself as the duty officer for coordination. The SA will work with emergency management staff to ensure HCE is contributing the necessary resources to the areas needed. Depending on the circumstances this coordination may be via phone, email, or in person.

8.4 Jurisdictional Structure

HCE has considered the jurisdictional structure of the service area when developing or implementing its strategic plan, including those related to wildfires. Figure 13 illustrates the general land ownership within the service area (landowner data acquired from the BLM). The various stakeholders, and federal and state agencies with management responsibilities are listed below.

HCE serves portions of 5 counties in Colorado:

- Pitkin
- Eagle
- Garfield
- Mesa
- Gunnison

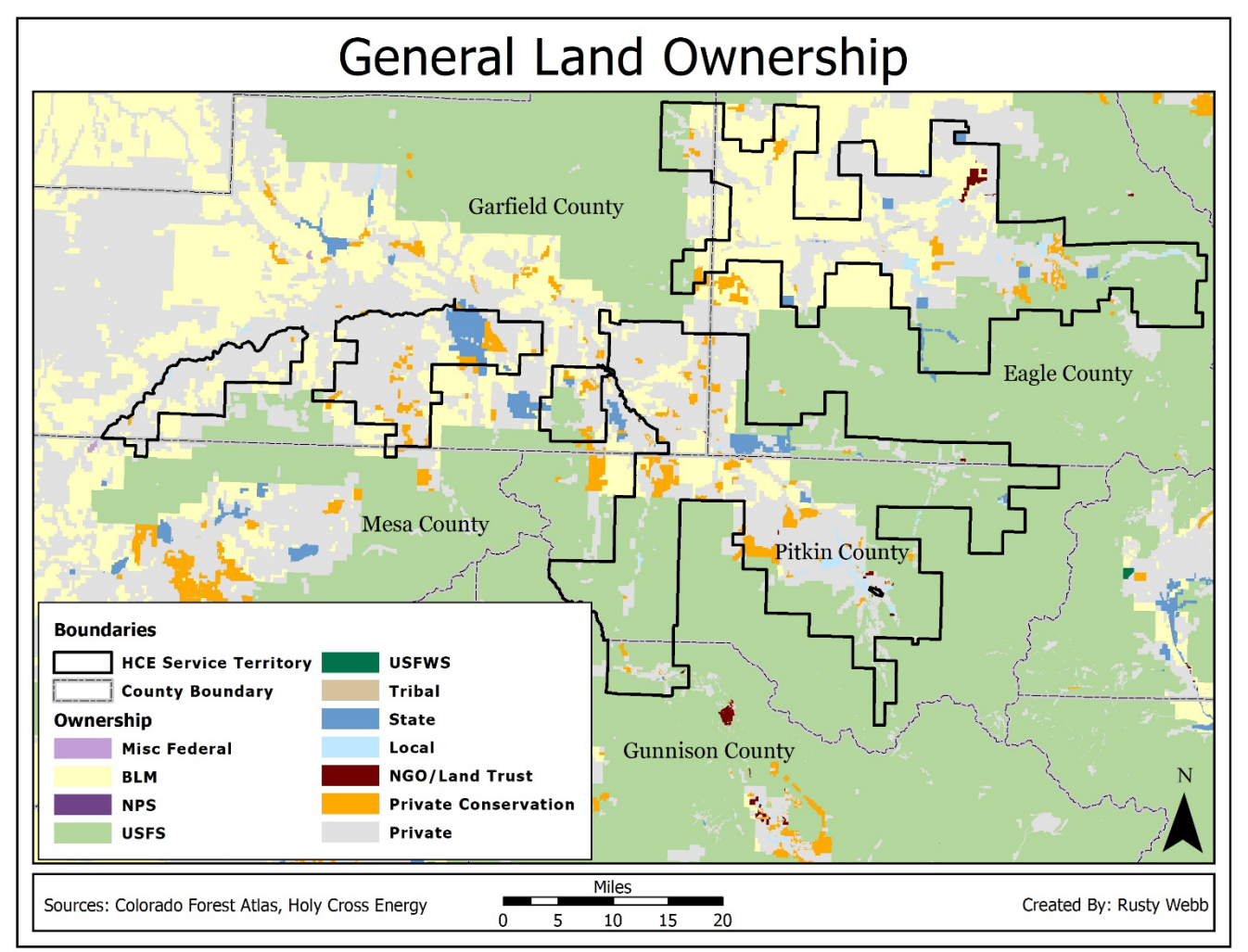
Federal lands are managed by the following agencies:

- White River National Forest
- BLM

Colorado State Agencies:

- Colorado Parks and Wildlife

Figure 13. General Land Ownership



8.5 Restoration Priorities

If an outside emergency management or emergency response agency requests a power shutdown, HCE staff will patrol the affected portions of the system before the system is re-energized. Suspect equipment or distribution lines that cannot immediately be patrolled will remain de-energized. Poles and structures damaged in a wildfire must be assessed and rebuilt as needed prior to re-energization.

For large-scale outages, HCE prioritizes feeders serving the largest numbers of members, essential services such schools, gas stations, grocery stores, and hospitals first. Smaller outages are then addressed, followed by outages affecting non-essential services.

8.6 Service Restoration Process

HCE work crews will take the following steps prior to restoring electrical service after a de-energization event. These measures are intended to protect the workers, general public, and the reliability of the system.

- **Patrol:** De-energized lines are patrolled to ensure no hazards have affected the system during the outage. If an outage is due to wildfire or other natural disaster, as soon as it is deemed safe by fire officials**,** lines and equipment are inspected for obvious damage or foreign objects and to estimate equipment needed for repairs and restoration. Lines located in remote and rugged terrain with limited access may require additional time for inspection. VM crews are called on to assist in clearing downed trees and limbs as needed.
- **Isolate:** Isolate the outage and restore power to areas not affected.
- **Repair:** After the initial assessment, HCE supervisors, managers, and engineers meet to plan the needed work. Re-building will commence as soon as affected areas become safe. Repair plans prioritize substations and transmission facilities, then distribution circuits that serve the most critical infrastructure needs. Additional crews and equipment will be dispatched as necessary.
- **Test:** After repairs are completed and the equipment is safe to operate, line segments are energized and tested.
- **Restore:** After successful line testing, power is restored to homes and businesses as quickly as possible. Members, local news, and other agencies are then notified of the restoration of electric service. Periodic member and media updates of restoration status prior to full restoration will be communicated. After initial power restoration, further demolition and rebuilding may take place.

8.7 Fire Suppression Resources

Wildfire protection responsibilities on non-federal lands in Colorado follow a hierarchy of local jurisdiction, to the County Sheriff, and finally to the State of Colorado.

The Chief of a Fire Protection District is responsible for fires that occur within the boundaries of their district, and that are within their capability to manage[23]. It is the duty of the County Sheriff to assume the responsibility for coordinating fire suppression efforts for:

- Fires that occur in the unincorporated area of the county, or;
- Fires that exceed the capabilities of a fire protection district[24].

When a wildfire exceeds the capability of the county to control or extinguish, the Sheriff shall request assistance from the Division of Fire Prevention and Control (DFPC). The Director of DFPC may assume any duty or responsibility given to the Sheriff, with the concurrence of the Sheriff[25].

8.8 Workforce Training

HCE is developing rules and complementary training programs for its workforce to reduce the likelihood of an ignition. In 2023, and annually thereafter, field staff will be:

- Trained on the content of the WMP
- Trained in proper use and storage of fire extinguishers
- Required, during pre-job briefings, to discuss the potential(s) for ignition, environmental conditions, and the closest fire extinguisher and other fire abatement tools
- Required to report all ignition events to management for follow-up
- Encouraged to identify deficiencies in the WMP and bring such information to management
- Avian Protection training for applicable personnel, including managers, line supervisors, engineers/designers/stakers, and field staff.

8.9 Community Outreach

Each year, wildland fires consume hundreds of homes in the Wildland-Urban Interface (WUI). Studies show that as many as 80% of the homes lost to wildland fire could have been saved if their owners had only followed a few simple fire-safe practices. Fuel reduction projects and vegetation treatments have been identified as effective means of mitigating wildfire hazards for property owners. Projects of this type include fuel breaks, thinning, pruning, landscape modifications, etc.

Defensible Space is often defined as an area around a home or outbuilding, where the flammable vegetation is modified and maintained to slow the rate and intensity of an advancing wildfire. In practice, this is an area with a minimum of 30 to 100 feet around a structure that is cleared of flammable brush or vegetation. This area also provides room for firefighters to work to protect a structure from advancing wildfire as well as protect the forest from a structure fire.

HCE encourages its members to take proactive measures to safeguard their homes from wildfire danger and to prepare for emergency events. To help create an awareness of fire danger in the service area,

[23] (C.R.S. 29-22.5-103(1)(a))

[24] (C.R.S. 30-10-513(1)(a))

[25] 2022 Colorado Wildfire Preparedness Plan-DFPC

and what homeowners can do to minimize it, HCE provides information on prevention and mitigation on its website and social media platforms.

Members will also find links to the following information on the HCE website:

- Right Tree in the Right Place Planting Guide
- Wildfire Mitigation Plan Overview
- Local fire districts
- Firewise USA-Defensible Space
- Emergency alert systems
- Outage map
- Outage preparation guide
- Outage alert signup (SmartHub)

8.10 Industry Collaboration

In addition to its commitment to supporting the local community, HCE is joining with local and regional partners to reduce wildfire risks. HCE participates with county wide wildfire advisory groups. These groups consist of local and county government, local fire agencies and utilities. The discussions range from wildfire mitigation strategies to wildfire response.

HCE is also heavily involved with the Colorado and national public utility community. HCE are a member and/or contributor to the following organizations.

- Eagle Valley Wildland (EVW)
- Roaring Fork Wildfire Collaborative
- Colorado Rural Electric Association (CREA)
- National Rural Electric Cooperative Association (NRECA)
- Utility Arborists Association (UAA)

9 Performance Metrics and Monitoring

This chapter identifies HCE management responsibilities for plan implementation and oversight. In addition to a robust mitigation strategy, HCE management and Operations Department staff have developed performance metrics to help analyze and monitor HCE's wildfire mitigation efforts over time. These metrics aim to provide a data-driven evaluation to determine the effectiveness of various

programs and identify areas for possible improvement. This chapter also identifies the methods for identifying plan deficiencies and the quality control and audit process for the inspection, maintenance, and VM programs.

9.1 Plan Accountability

Staff responsibility for plan implementation, operations, and communications is described below:

- **The Board of Directors** Make policy decisions relative to the utility – they will be responsible for approving and adopting the WMP.
- The **CEO** directs management staff responsible for operations, engineering, finance, and information technology.
- The **Vice President of Engineering (VPE)** oversees the electric system's design.
- The **CEO** determines when and how to notify outside agencies in cases of wildfire emergency events.
- The **Vice President of Operations (VPO)** is responsible for implementing the plan in general. Staff will be directed as to their roles and responsibilities.
- The **VPO** and senior staff are responsible for monitoring and auditing the targets and performance metrics specified in the WMP to confirm that plan objectives are met.
- All emergency-related communications are reviewed by the **VP of Member and Community Relations (VPMCR)** before distribution.
- The **VPMCR** responds to the news media and general membership.
- The **VPMCR**, or designated staff, communicates with first responders, health agencies, and communication providers.
- The **Safety Coordinator (SC)** or designated staff communicates with the Offices of Emergency Management.
- The **Vegetation Management Supervisor (VMS)** oversees the contracted and in-house VM operations and inspections.
- The **Key Accounts Specialist (KAS)** communicates with key accounts prior to planned outages.

9.2 Monitoring and Auditing the Plan

The WMP will also be included as a discussion item on the agenda of regularly scheduled management meetings. Reports of the WMP's progress and risk reduction impacts will be developed annually and circulated to appropriate utility staff to generate collaborative discussions.

At the end of each fire season, HCE assesses company-wide wildfire mitigation efforts. All known fire starts within HCE's service territory are tracked. Lessons learned or new best practices are defined and incorporated into the next iteration of the WMP. The plan is updated to reflect changes in the environment, technology, regulations, or any other factors that may render portions of the WMP obsolete.

9.3 Identifying Deficiencies in the WMP

The CEO is responsible for ensuring that this WMP meets all public agency guidelines to mitigate the risk of its assets becoming the source or contributing factor of a wildfire. Staff responsible for assigned mitigation areas have the role of vetting current procedures and recommending changes or

enhancements to build upon the strategies in the WMP. Either due to unforeseen circumstances, regulatory changes, emerging technologies or other rationales, deficiencies within the WMP will be sought out and reported to the Board of Directors in the form of an updated WMP on a yearly basis.

The VPO or their designee will be responsible for spearheading discussions on addressing any plan deficiencies and collaborating on solutions when updating the WMP. At any point in time when deficiencies are identified, the VPO or their delegates are responsible for making the appropriate policy adjustments. HCE staff and qualified stakeholders are encouraged to bring any potential deficiencies to the attention of the VPO. The VPO, along with the appropriate staff, will evaluate each reported deficiency, and if determined to be valid, shall record the deficiency for further action.

9.4 Performance Metrics

HCE has developed performance metrics intended to gauge the effectiveness of its various programs and strategies for mitigating power-related ignitions. The tracking of these metrics will help identify circuits most susceptible to unexpected outages, time-of-year risks, and the adequacy of the VM and asset inspection schedules. The metrics are also intended to assess the performance of different aspects of the plan. These metrics quantify the risk environment of HCE's service territory and the mitigation policies of HCE.

A sample of items to review annually:

- Number and duration of Red Flag Warning days
- Number of days that reclosers are in "Fire Mode"
- SAIDI and SAIFI data
- Utility equipment caused ignitions
- Vegetation caused ignitions
- Facilities modified with improved fire protection

Because this WMP is in the initial stage of implementation, relatively limited data is on hand. However, as results of the mitigation programs become evident and additional data is collected, HCE will identify areas of its operations that will require a different approach, as well as develop additional methods to eliminate HCE asset-sourced ignitions.

As the metrics are analyzed in the coming years, refinements will be made, and the selected metrics, as with other aspects of the plan, will likely evolve in future iterations of the WMP.

Table 6. Performance Metrics

Metric	Rational	Indicator	Measure of Effectiveness
Red Flag Warnings in service area	Used to adjust annual variation in criteria	Count of RFW during analysis cycle	NA-Indication of overall threat level for each fire season
Number of days system is in "Fire Mode"	Assess practical length of fire season regarding system protective measures	Number of days reclosers in alternate settings	Synchrony between length of declared fire season and system effects
Number of system related ignitions	Effectiveness of the mitigation plan	Count of events	Reduction or no material increase
System Average Interruption Frequency Index (SAIFI)	Assess system hardening & overall reliability	Count of events	Reduction in general trend of events
System Average Interruption Duration Index (SAIDI)	Assess system hardening & overall reliability	Count of events	Reduction in general trend of events
Traditional fuse trip with fire reference	Identify areas for conversion to non-expulsion fuses	Count of events	Reduction in general trend of events

9.5 Programmatic Goals

HCE outlines and schedules fieldwork on an annual basis. Any incomplete or behind schedule work is flagged for review or field verification. The co-op strives to complete 95-100% of the work within the initially scheduled time frame. However, emergencies or other unforeseen contingencies can occur, requiring material and labor resources to be otherwise assigned. In this instance, the delayed work receives prioritization for future time frames and completed allowing for safe and reliable operation following industry safety standards.

9.5.1 Monitor and Audit the Effectiveness of Inspections

HCE will perform a review of construction/repairs completed by HCE and HCE's contractors annually. The review is performed by the VPO and/or VPE.

- A random 10% sample of completed Work Orders throughout HCE's system will be reviewed for accuracy, construction standards and thoroughness.
- HCE's VPO, Manager of Line Operations and Safety Coordinator also perform monthly site visits inspecting crew safety, quality control and work practices.

HCE also performs a detailed facility inspection and pole test and inspection on 10% of the system annually. The inspection process is administered by HCE's VPO and routine field verifications are performed throughout the year. HCE's VMS performs ongoing field visits to inspect ROW trimming, crew inspections, and condition of HCE's electrical system.

HCE continuously evaluates its facilities while performing activities such as outage patrols, vegetation safety patrols, wood pole inspections, restoration, and related fieldwork. HCE's compliance with NESC regulations and guidelines ensures that facilities are inspected and repaired in accordance with industry best practices. Any issues found impacting safety and reliability are addressed as outlined in those regulations and HCE's repair prioritization policy.

9.5.2 Vegetation Management Quality Control Process

HCE's VM quality control process is coordinated by the VMS. VM work is performed primarily by HCE staff with work contracted as needed. The VMS strives to achieve a 100% inspection rate of all VM work. This quality control process is in addition to observations by line crews during daily field work. Quality control efforts monitor program effectiveness, overall tree work performance, and determine the adequacy of the VM work trim cycle. Transmission line VM work and related audits are carried out by Xcel Energy staff.

9.5.3 Plan Approval Process

The President/CEO is responsible to establish and implement plans, procedures, and controls to effectively manage hazards and risks faced by the Cooperative. Effective risk management will enable the HCE to provide high quality services to its members, respond quickly and effectively to natural and man-made emergencies and disasters, better manage costs, maintain high employee productivity, and better fulfill its purpose and objective. The board will provide any necessary feedback and approve the plan.

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Appendix A: Definitions

ANSI Z—133.1: Defines an electric hazard to exist anytime a tree worker, tool, tree, or any other conductive object is closer than 10 feet from an energized conductor with a voltage of 50,000 volts or less. From this 10 foot baseline, 0.4 inches of required clearance is added for every 1,000 volts above the 50,000-volt baseline. ANSI Z-133 provides tables that outline minimum approach distances for both qualified and non-qualified tree workers based on voltage and elevation.

Artificial Intelligence (AI): "AI" is a catchall term for computer applications that perform complex tasks that typically require human input. AI allows machines to model or even improve upon the human mind's capabilities. The term is often used interchangeably with "machine learning."

Best Management Practices (BMP): Innovative environmental protection practices applied to help ensure that projects or regular operations are conducted in an environmentally responsible or effective manner.

***Burnable fuel*:** Refers to fuel models that are "ignitable" in the fire modeling. Burnable land cover includes grasses, herbs, shrubs, trees, leaf litter, dead-and-down branchwood, etc.

Danger Tree: A danger tree is any tree, on or off the right-of-way, that can contact electric power lines. A danger tree may be completely healthy and intact, or it may be sick or dead. Even a healthy tree could sustain damage in a severe storm and impact nearby power lines, thus the potential for "danger."

Distribution System: The final stage in the delivery of electric power carrying electricity from the transmission system to individual consumers. The HCE distribution system includes 14.4Kv lines not tied to generation facilities.

Defensible Space: An area around a structure, either natural or manmade, where material capable of causing a fire to spread has been treated, cleared, reduced, or changed to act as a barrier between an advancing wildfire and the structure. In practice, it is defined as an area a minimum of 30 feet around a structure that is cleared of flammable brush or vegetation.

Energy Event Index: The Energy Event Index (EEI), a licensed add-on to WeatherSentry®, is a categorical risk-based forecast for impactful weather hazards, including wind speed, wind gusts, lightning, heavy rains, snow, ice accretion, and wildfires. It provides forecasts three or five days out, which are updated once or twice each day.

Fire Mode: Protective relay setting that contain moderately sensitive instantaneous tripping and will perform a single automatic reclose operation.

Fire Risk: "Risk" is the potential damage a fire can do, to the area under existing conditions, including any modifications such as defensible space, irrigation and sprinklers and ignition resistant building construction which can reduce fire risk. Risk considers the susceptibility of what is being protected.

Fire Season: 1) Period(s) of the year during which wildfires are likely to occur, spread, and affect resource values sufficiently to warrant organized fire management activities. 2) A legally enacted time during which burning activities area regulated by state or local authority.

Fire Weather Watch: A term used by fire weather forecaster to notify using agencies, usually 24 to 72 hours ahead of the event, that current and developing meteorological conditions may evolve into dangerous fire weather.

Hardening: Modifications to electric infrastructure to reduce the likelihood of ignition and improve the survivability of electrical assets.

Hazard Tree: A specific type of danger tree that poses a greater likelihood of causing damage to electric power lines or equipment. In this case, the tree is structurally unsound and positioned in such a way that it could fall onto conductors.

Hot Line Tag: Protective relay settings that contain very sensitive instantaneous tripping and will not allow an automatic reclose.

Industrial Fire Precaution Level (IFPL): Activated when needed during the summer fire season, IFPL are an activity closure system to reduce wildfire risk. By law (WAC 332-24-301), it applies to woods workers and other industrial forest users on 13 million acres of unimproved private, federal, and state forestlands protected by the BMLM or Forest Service. Levels range from Level-1 to Level-4.

Landscape: Refers generally to the area of interest in a project or study and could refer to modeled or on-the-ground conditions.

National Fire Danger Rating System (NFDRS): A uniform fire danger rating system that focuses on the environmental factors that control the moisture content of fuels. It combines the effects of existing and expected states of selected fire danger factors into one or more qualitative or numeric indices that reflect an area's fire protection needs.

OSHA Requirement 1910.269: Occupational Safety and Health Administration's vertical standard pertaining to the generation, transmission, and distribution of electricity. A specific section of OHSA 1910.269 requires that everyone performing tree work in proximity to electric hazards must be qualified and their training has to be documented.

Public Safety Power Shutoff (PSPS): When severe weather or conditions create a substantial wildfire risk, specific portions of the service area may be de-energized in the interest of public safety.

Pruning: Also referred to as “trimming”, tree pruning is the selective removal of branches that are not an adequate distance from the primary line, or that will grow too close to the power line before the next maintenance cycle.

Recloser: Recloser is a device that is typically used in over-head distribution systems to interrupt the circuit to clear faults. Automatic reclosers have an electronic control and vacuum interrupters that may automatically reclose to restore service if a fault is temporary. There may be several attempts that may be made to clear and reenergize the circuit if the fault still exists the recloser

locks out. Reclosers are made in single-phase and three-phase versions and use oil or vacuum interrupters.

Red Flag Warning (RFW)[26]: A term used by fire- weather forecasters to call attention to limited weather conditions of importance that may result in extreme burning conditions. A RFW will be issued when there is high confidence that Red Flag criteria will be met within the next 24 to 48 hours, or when those criteria are already being met or exceeded. A warning may be issued for all, or portions of a fire weather zone or region. Zones impacted by the event will be listed within the Red Flag Warning product.

Criteria: A combination of weather and fuels conditions (as determined by fire management) for any 3 hours or more in a 12 hour period. These criteria for the forecast area are defined as the following:

1. Relative humidity less than or equal to 15%, and;
2. A sustained wind average 25 mph or greater;
3. Dry thunderstorms (15% coverage or more, constituting Lightning Activity Level 6[27])

Other factors:

1. Haines Index of 5 or 6, indication a moderate or high potential for large, plume dominated fire growth.
2. Wind shifts associated with frontal passages.
3. First significant lightning event (wet or dry) after an extended hot and dry period.
4. Poor relative humidity recovery overnight (RH remains at 40% or lower).
5. Any combination of weather and fuel moisture conditions which, in the judgement of the forecaster, would cause extensive wildfire occurrences.

In addition to the basic criteria above, a combination of other elements may result in RFW conditions.

Remote Automatic Weather Station (RAWS): an apparatus that automatically acquires, processes, and stores local weather data for later transmission to the GOES Satellite, from which that data is retransmitted to an earth-receiving station for use in the national Fire Danger Rating System.

Right-of-Way (ROW): The corridor of land under (and adjacent to) a transmission or distribution line.

Risk: A measure of the probability and severity of adverse effects that result from exposure to a hazard.

SCADA: SCADA is an acronym for Supervisory Control and Data Acquisition. SCADA generally refers to an industrial computer system that monitors and controls a process. In the case of the transmission and

[26] Source: https://www.weather.gov/bou/RFW_Definitions

[27] Dry lightning (same as LAL 3 but without rain). This type of lightning has the potential for extreme fire activity and is normally highlighted in fire weather forecasts with a Red Flag Warning.

distribution elements of electrical utilities, SCADA will monitor substations, transformers, and other electrical assets. It is possible to control or reset equipment remotely using SCADA.

Substation: Part of the electrical generation, transmission and distribution system, substations transform voltage from high to low, or the reverse, or perform any of several other important functions. Between the generating station and consumer, electric power may flow through several substations at different voltage levels. A substation may include transformers to change voltage levels between high transmission voltages and lower distribution voltages, or at the interconnection of two different transmission voltages.

Transmission System: The bulk delivery of electrical energy from a generating site to an electrical substation. At HCE, for line maintenance purposes, the transmission system is comprised of 69kV radial (sub-transmission), 115kV lines, structures, and switches.

sUAS: A small unmanned aircraft system is a powered, aerial vehicle that does not carry a human operator, uses aerodynamic forces to provide vehicle lift, can fly autonomously or be piloted remotely.

Vegetation: Trees, shrubs, and any other woody plants.

Vegetation Management: A broad term that includes tree pruning; brush removal through the use of power saws and mowers; the judicious use of herbicides and tree growth regulators; hazard tree identification and removal; the implementation of strategies to minimize the establishment of incompatible species under and near power lines; and the control of weeds.

Wildfire: Also called wildland fire, an unplanned, uncontrolled fire in a forest, grassland, brushland or land sown to crops.

Wildfire Mitigation Plan (WMP): A comprehensive plan to reduce the threat and severity of wildfire within an electric utility's service area. Plans include the preventive strategies and programs adopted by the utility to minimize the risk of its facilities causing wildfires along with its emergency response and recovery procedures.

Wildlands: Forests, shrub lands, grasslands, and other vegetation communities that have not been significantly modified by agriculture or human development*. A more specific meaning for fire managers, used by the National Wildfire Coordinating Group (which coordinates programs of participating wildfire management agencies nationwide), refers to an area in which development is essentially non-existent (except for roads, railroads, power lines, and similar transportation facilities); structures, if any, are widely scattered.

Wildland Urban Interface (WUI): Line, area, or zone where structures and other human development meet or intermingle with vegetative fuels in wildlands.

Appendix A

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Appendix B: Acronym Glossary

AI	Artificial Intelligence
AMSL	Above Mean Sea Level
ANSI	American National Standards Institute
BIA	Bureau of Indian Affairs
BLM	U.S. Bureau of Land Management
BMP	Best Management Practices
CO	Colorado
COO	Chief Operations Officer
CPUC	Colorado Public Utilities Commission
CWPP	Community Wildfire Protection Plan
DLI	Detailed Line Inspections
DEM	Department of Emergency Management
DFPC	Division of Fire Prevention and Control
EEI	Energy Event Index
EM	Engineering Manager
EOC	Emergency Operation Center
GIS	Geographical Information System
HFTA	High Fire Threat Area
IFPL	Industrial Fire Protection Level
IR	Infrared (imaging)
KV	Kilovolt
KWH	Kilowatt Hours
MW	Mega Watts
MVCD	Minimum Vegetation Clearance Distance
NESC	National Electric Safety Code
NERC	North American Electric Reliability Corporation
NFDRS	National Fire Danger Rating System
NF	National Forest
NOAA	National Oceanic and Atmospheric Administration

NWS	National Weather Service
OH	Overhead
OEM	Office of Emergency Management
OS	Operations Superintendent
OSHA	Occupational Safety and Health Administration
HCE	Holy Cross Energy
RAWS	Remote Automated Weather Station
RFW	Red Flag Warning
ROW	Right-of-Way
SCADA	Supervisory Control and Data Acquisition
T&D	Transmission and Distribution
UG	Underground
USDA	United States Department of Agriculture
USFS	United States Forest Service
VM	Vegetation Management
WFAS	Wildland Fire Assessment System
WHP	Wildfire hazard Potential
WMP	Wildfire Mitigation Plan
WUI	Wildland Urban Interface