CLATSKANIE PEOPLE'S UTILITY DISTRICT

2021 Wildfire Mitigation Plan

CLATSKANIE PUD
Owned by the People We Serve

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1.INTRODUCTION

1.1 Policy Statement

Clatskanie People's Utility District's strategic goal and objective is to provide safe, reliable, and affordable electric service to the communities we serve. Clatskanie PUD has established guidelines and procedures outlined in the District's Wildfire Mitigation Plan that are consistent with our strategic plan. The Wildfire Mitigation Plan are implemented and supported accordingly by Clatskanie PUD personnel overseeing operations related to the mitigation of area wildfire occurrences. Additionally, the response strategies identified within the plan will be executed as necessary to minimize and/or eliminate wildfire risk factors within the Clatskanie PUD service territory which includes parts of Columbia and Clatsop Counties.

1.2 Purpose

It is Clatskanie PUD's priority to address all safety concerns related to the delivery of electricity within the District's service territory by developing and implementing mitigation strategies and tactics to reduce and/or eliminate hazards. The Clatskanie PUD Wildfire Mitigation Plan specifically addresses concerns related to the occurrence of wildfires in areas including electrical facilities and the operation and maintenance of these facilities. The Plan describes the wildfire risk assessment process, mitigation strategies, and response protocols the District is using to minimize the probability if wildfire ignition from the District's power lines or electrical equipment.

1.3 Objectives

The primary objectives of this Plan are to:

1. Mitigate the probability that Clatskanie PUD's power lines and/or electrical equipment may be the source of ignition of a wildfire, while continuing to provide safe, reliable, and affordable electric service to our customers.

2. Implement a Plan that prioritizes safety, situational awareness, and preventive methods in an effort to minimize fire ignitions from fault events by designing, constructing, operating and maintaining a hardened and resilient electric system.

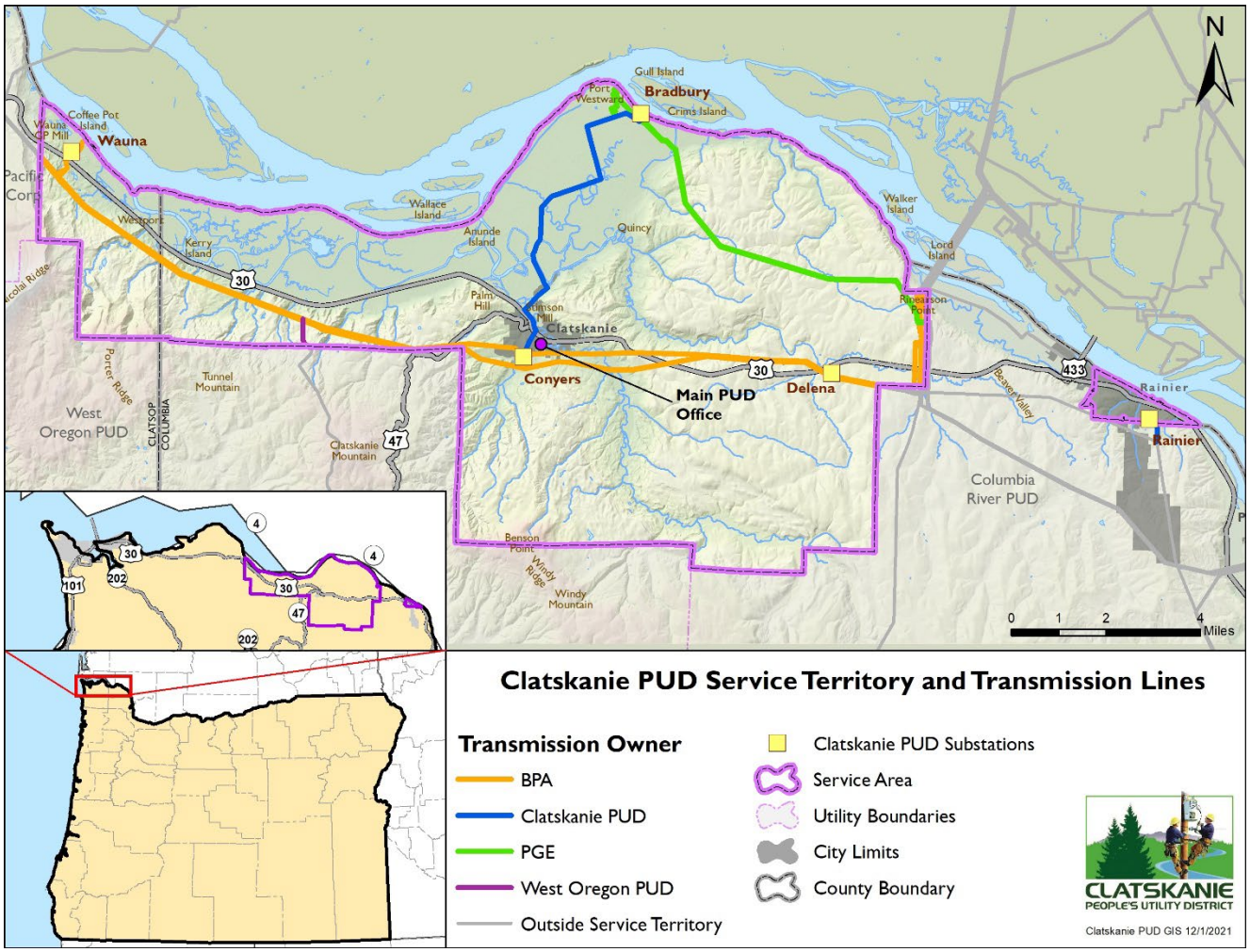
3. Maintain a Plan that aligns with prudent utility practices that will minimize the risk and impacts of a wildfire to the utility and the communities served. The Plan will include enhanced situational awareness, operational readiness, and effective response strategies**.**

2.UTILITY PROFILE

2.1 Service Area

Clatskanie PUD's service territory extends across 107 square miles bordering the Columbia River from Wauna to Rainier, and provides electric service to around 4,800 customers in Columbia and Clatsop counties (Figure 1: Clatskanie PUD Service Area). The terrain is a mix of rugged coastal range in the southern and eastern parts of the District, and flat dike lands along the Columbia in the northwest. The District is mostly rural, with two incorporated cities, Clatskanie and Rainier, two large mills in Wauna and Clatskanie, and an industrial center at Port Westward. The territory is broken into two separated areas: the main part of the District; and the city of Rainier, which is an island surrounded by Columbia River PUD service territory. The territory of PacificCorp borders us to the west, West Oregon Electric Cooperative to the south, and Columbia River PUD to the east. The Clatskanie PUD office is located in the town of Clatskanie.

Figure 1: Clatskanie PUD Service Area



2.2 Asset Overview

Clatskanie PUD receives electric service from Bonneville Power Administration at four substations, and power is delivered to a fifth substation by a Clatskanie PUD-owned 115kV overhead transmission line. Ten 12.47kV feeders distribute the electricity from the five substations to customers using both overhead and underground facilities (Table 1: Substations and Feeders). Portland General Electric and West Oregon Electric Cooperative also own transmission lines that run through the service area (Table 2: Transmission Lines within Clatskanie PUD Service Area). See Figure 1: Clatskanie PUD Service Area.

Table 1: Substations and Feeders

Substation	Feeder Count	Feeder Names
WAUNA	1	A
CONYERS	3	C, D, E
BRADBURY	2	N, P
DELENA	2	B, T
RAINIER	2	F, G
Total: 5	**Total: 10**	

Table 2: Transmission Lines within Clatskanie PUD Service Area

Owner	Voltage (kV)	Miles
BPA	230	45.12
BPA	115	22.43
PORTLAND GENERAL ELECTRIC	230	19.34
CLATSKANIE PUD	115	8.31
BPA	500	3.14
WEST OREGON ELECTRIC COOPERATIVE	115	0.60
	Total:	**98.94**

Clatskanie PUD owns and operates 8.4 miles of transmission lines (115 kV), 267 miles of primary distribution lines (high voltage at 12.4kV) and 103 miles of secondary lines (low voltage less than 600 volts). Clatskanie PUD has around 250 miles of overhead distribution lines and 120 miles of underground

distribution lines (Table 3: Clatskanie PUD Distribution Lines).

Table 3: Clatskanie PUD Distribution Lines

Type	Single Phase	Two Phase	Three Phase	Total
Primary Overhead	96.76	8.92	85.23	190.91
Primary Underground	52.70	2.00	20.84	75.54
Total Primary:	149.46	10.92	106.07	266.44
Secondary Overhead	55.63	0.56	1.58	57.78
Secondary Underground	43.68	0.00	1.71	45.39
Total Secondary:	99.31	0.57	3.29	103.16
			Total:	**369.61**

These facilities are distributed throughout the service territory by way of almost 6,150 Clatskanie PUD-owned poles, 140 foreign-owned poles (Table 4: Poles Holding Clatskanie PUD Owned Facilities), and 1,330 underground surface structures.

Table 4: Poles Holding Clatskanie PUD Owned Facilities

Owner	Support Structure Count
Clatskanie PUD	6147
City of Clatskanie	46
Frontier	35
Customer-Owned	29
CenturyLink	24
Other	5
Total:	**6286**

3. RISK PROFILE

3.1 Risk Setting

Wildfire risk is defined by the probability of ignition, likelihood of spread, and potential for impacts to community and critical infrastructure. Ignition in the context of this plan is the possibility of energized electrical facilities creating a spark that contacts a fuel source. Wildfire spread is driven by fuel (vegetation), topography, and weather, and impacts from fire are determined by population density and the location of critical facilities.

3.1.1 Topography

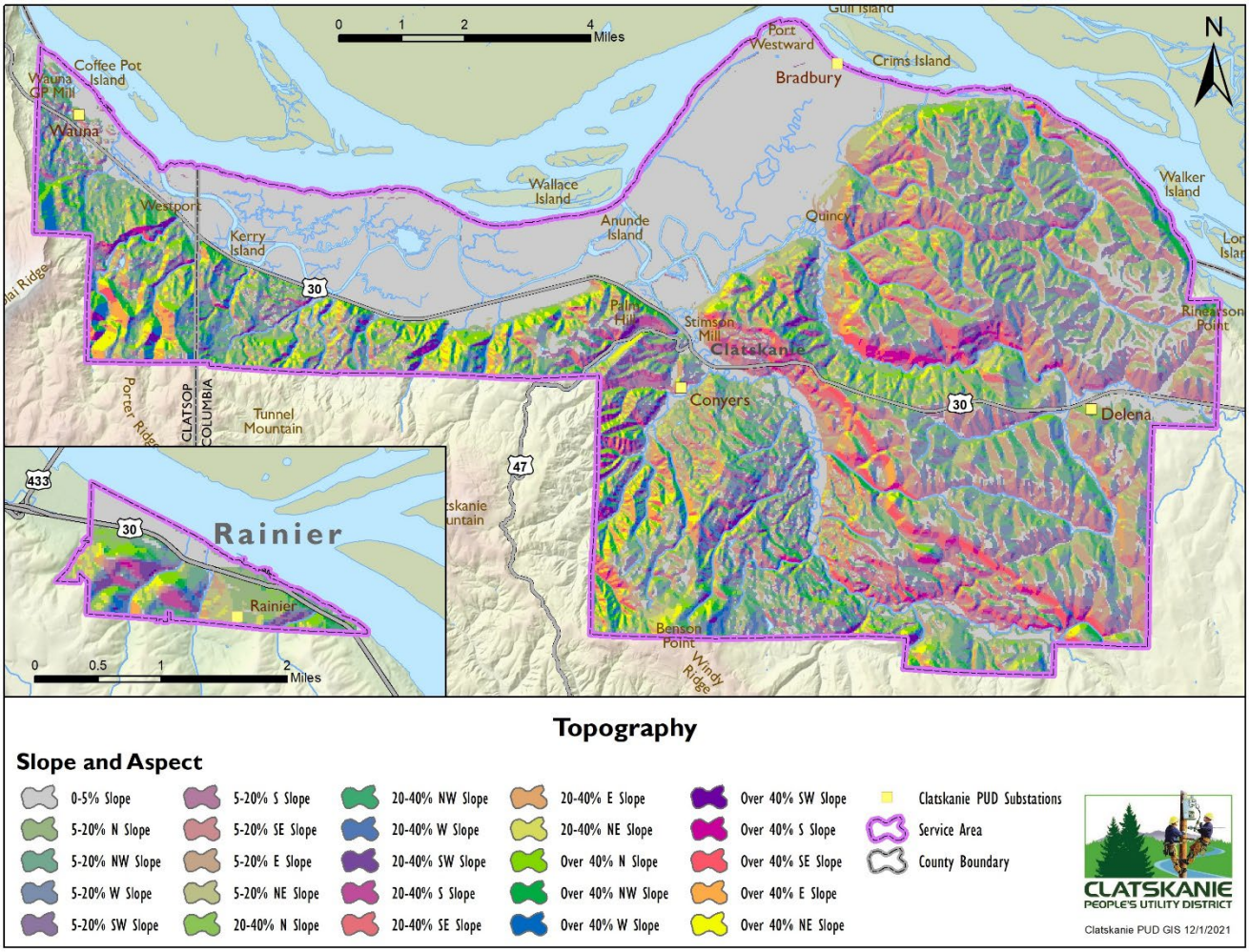
Clatskanie PUD's service area is located halfway between Portland and Astoria, along Highway 30 and the south bank of the Columbia River. It stretches from Wauna in the west to Rainier in the east. As such, the terrain is characterized

either by the northern end of the coast range as it dips down to meet the Columbia, or low-lying land behind dikes within the river floodplain itself.

Wildland fire is known to spread faster on steeper slopes. Fire will spread four times faster on a 20-40% slope, eight times faster on a 40-60% slope, and fourteen times faster on a 60-80% slope. Additionally, slopes with a south or southwest aspect receive more direct sun, have drier conditions and higher fuel temperatures, and are more favorable to fire spread, whereas north-facing aspects have more shade, resulting in lower temperatures, higher humidity, and heavier fuels with higher fuel moistures. East-facing aspects will experience heating in the early part of the day and cooling in the afternoon and evening. west-facing aspects do not begin to heat until later in the day (National Wildfire Coordinating Group, 2007).

The slopes in the service area vary from flat in the dike lands, up to 185% (62 degrees) in the steepest parts of the District. Slope aspect is variable, but tends toward north-facing as the general trend is from low elevation along the river in the north toward higher elevation moving south uphill into the Coast Range mountains (Figure 2. Topography).

Figure 2: Topography

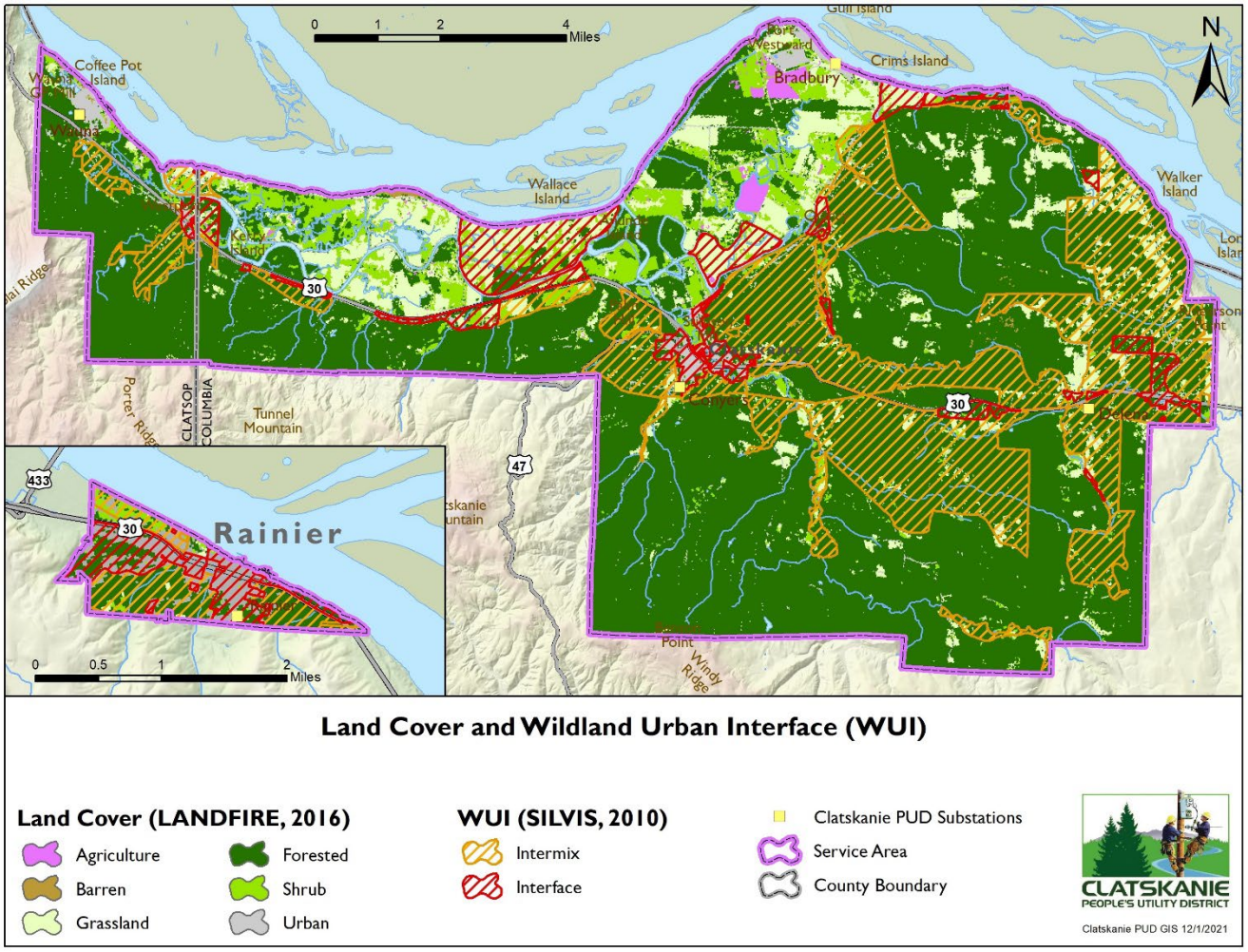


3.1.2 Land Cover

The District is predominantly rural, with two urban areas, Clatskanie and Rainier. Much of the upland area is dominated by forestland, with some cleared grasslands around areas of higher population density. The lowlands are generally grassland and shrub, either cultivated or wetland, with some natural spruce stands and hybrid-poplar tree plantations grown for pulp.

The wildland-urban interface (WUI) is the area where houses and wildland vegetation meet or intermingle, and where wildfire problems are most pronounced (Radeloff, 2018). Intermix WUI are areas where housing and vegetation intermingle; interface WUI are areas with housing in the vicinity of contiguous wildland vegetation (SILVIS Lab, 2010). A significant portion of the PUD service area is classed as WUI, both intermix and interface (Figure 3: Land Cover and Wildland Urban Interface).

Figure 3: Land Cover and Wildland Urban Interface



While any vegetation cover can ignite and burn given the right conditions, it is areas where tree heights are higher than electricity conductors that tend to pose greatest risk for utility fire ignitions from vegetation contacting or striking energized conductors. These areas have been identified using LANDFIRE data (U.S. Department of Interior, Geological Survey, and U.S. Department of Agriculture, 2019) and GIS analysis to inform vegetation management, as well as wildfire risk.

3.1.3 Land Ownership

There is very little public land within the Clatskanie PUD District. Most of the land is divided between large tracts of private industry (forestry or agriculture), and small private holdings (Table 5: Land Ownership). There are some Oregon Department of Forestry-managed tracts in the western end, but generally there are no large tracts of land in federal, state, or local government ownership.

Table 5: Land Ownership

Owner Type	Acres
Large Private/Industrial	32,419
Small Private/Agricultural	27,232
Public Land	5,910
Roads	2,504
Total:	**68,065**

This can add to vegetation management challenges, as each landowner must sign an individual easement to allow work within the specified right-of-way (10 feet either side of facilities, generally), and there is no codified agreement to manage vegetation outside of the specified easement distance.

3.1.4 Weather and Climate

The climate in the service area is typical for northwest Oregon, with the four seasons common to the Coast Range: a) a warm and wet spring and early summer with low fire hazard due to air and soil moisture; b) a hot and dry late summer and early fall with higher fire hazard potential due to dry soils and grasslands, and moisture-stressed plants, especially on an east wind; c) heavy fall rains; and d) winter frosts (Zybach, 2003).

There are no official National Weather Service RAWS stations within the District boundaries. The closest is Miller, on the other side of Clatskanie Mountain in Mist, which has markedly different conditions. There is one Cooperative

Observer Program station in the town of Clatskanie that records temperature and precipitation

observations. Observations from this station show the monthly mean temperature to vary between a low of 32.3F in December, and a high of 76.1F in August. Monthly mean precipitation varies from a low of 0.5 inches in July to a high of 9.3 inches in December. The mean annual precipitation total is 56 inches per year (National Centers for Environmental Information, 2020).

Wind direction at the closest airport, KKLS in Kelso WA, tends to be in the northwesterly direction in the warmer and drier months starting around May, and turning between September and October to south-southeasterly throughout the cooler wetter months (windhistory.com, 2011).

In 2021, ODF declared fire season in the NW Oregon Area starting June 22nd, and ended it October 1st. Most of the District falls in Fire Weather Zone OR602, which has had a mean 5-year moving average of 4.18 Red Flag Warning days annually since 2007 (Table 6: Red Flag Warning Days).

Table 6: Red Flag Warning Days

Year	Red Flag Warning Hours	Red Flag Warning Days	5-Year Moving Average Days
2007	82.65	3.44	
2008	15.92	0.66	
2009	41.00	1.71	
2011	50.95	2.12	
2012	114.45	4.77	2.54
2014	235.68	9.82	3.82
2015	109.35	4.56	4.60
2016	63.00	2.63	4.78
2017	170.07	7.09	5.77
2019	34.32	1.43	5.10
2020	79.10	3.30	3.80
2021	21.03	0.88	3.06
		5-year Average:	**4.18**

3.1.5 Wildland Fire History

There has been no large-area wildland fire within the District's boundary in recent history. In a total of 109 small fires recorded since 1992, the largest is 31 acres (Oregon Department of Forestry). Almost all fires have been human-caused, with only two of the recorded total caused by lightning (Figure 4: Wildland Fire History). The vast majority of fires happen in the months of July, August, and September (Figure 5: Fires by Month).

Figure 4: Wildland Fire History

According to the data, the number of fires per year within the service area has actually been trending downward since 1992 (Figure 6: Fires by Year). The overall pattern of fires shows no particular geographic trend, beyond following human occupancy patterns, and so was not used to model the District's wildfire risk.

(Iowa State University, 2021)

Figure 5: Fires by Month

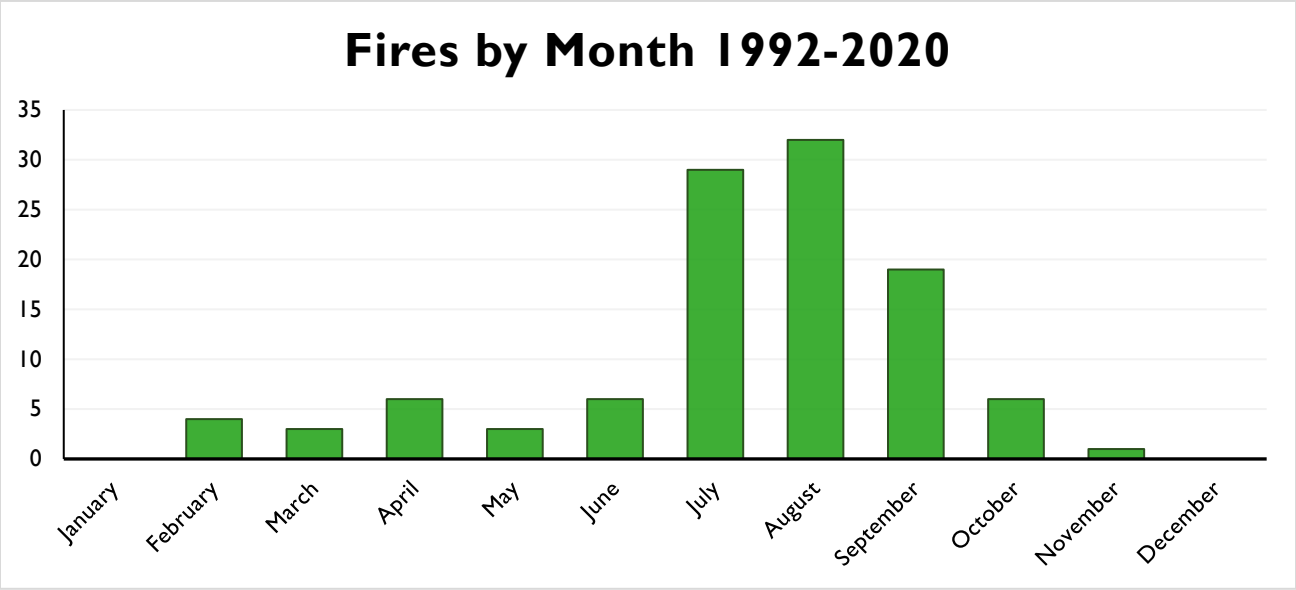
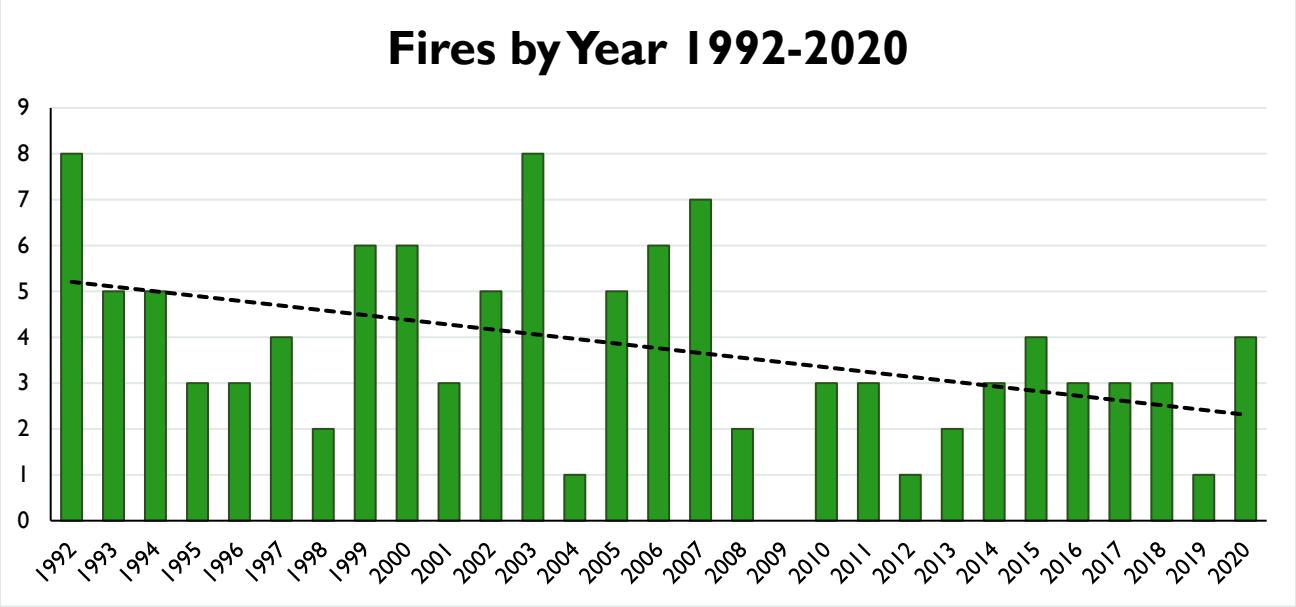


Figure 6: Fires by Year



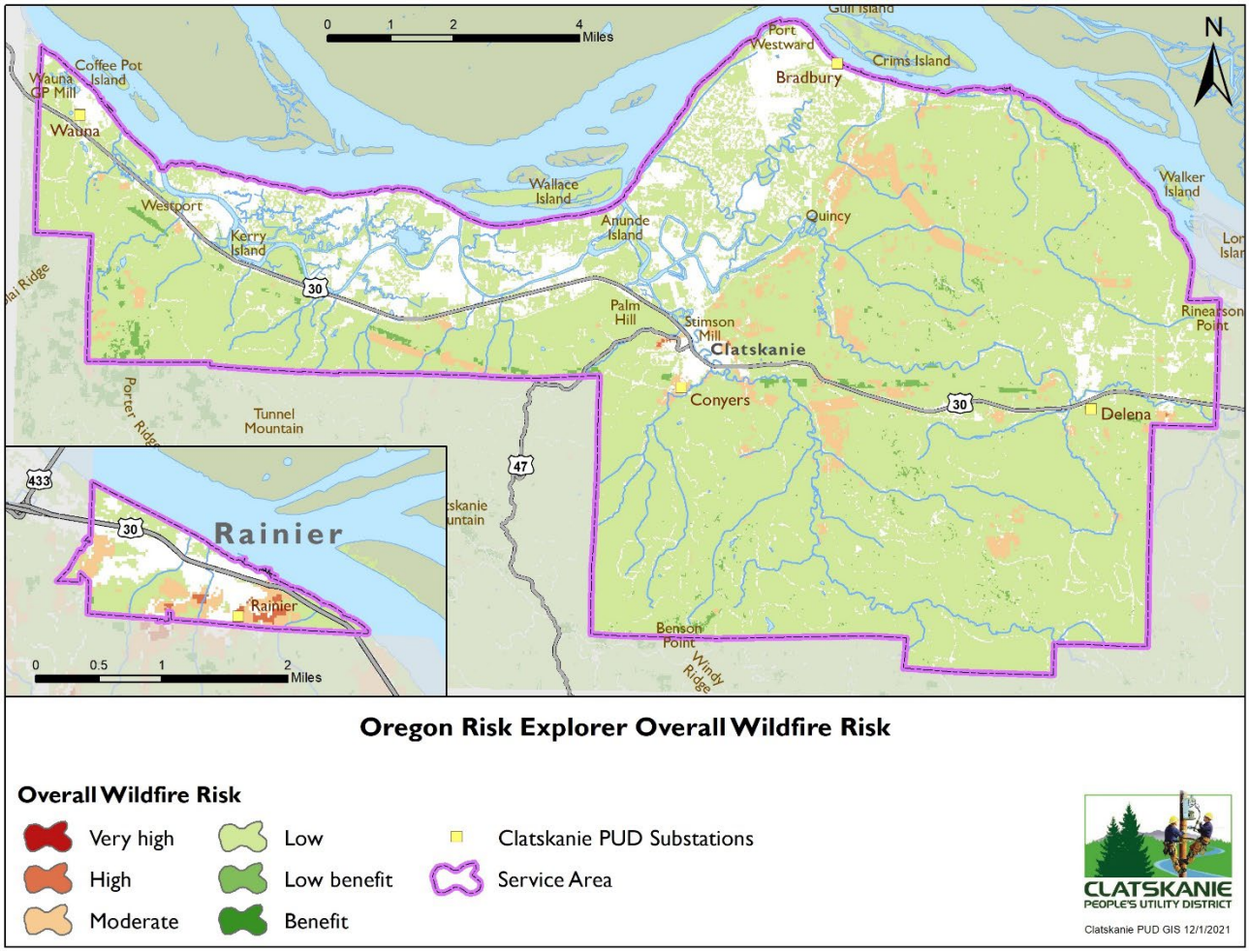
Three of the fires since 1992 have been caused by utility infrastructure, all of which occurred during August or September, and the largest of which was 1.25 acres. Most notably, one fire started during the 2020 Labor Day windstorm, after a tree fell from outside the right-of-way and struck Clatskanie PUD primary distribution along Highway 30, bringing energized lines down into roadside grass. This fire was quickly put out, as it was discovered immediately and easily accessed by local fire department personnel. Of the two other utility-caused fires, one was caused by a tree downing Clatskanie PUD energized lines in 2014, and the third was associated with BPA transmission lines in 2003.

3.2 Overall Wildfire Risk from Oregon Risk Explorer

The Overall Wildfire Risk layer from the Advanced Oregon Wildfire Risk Explorer shows mostly low wildfire risk throughout the District, with some areas of moderate risk, some areas of low benefit, and a few scattered pixels of high risk (Oregon State University Libraries & Press and Institute For Natural Resources, 2020).

While this may be a valid result when compared to other areas of Oregon, for several reasons the analyses were found to be insufficient for District use. Some areas inexplicably have no data (missing) values for overall wildfire risk, most notably road lines, along which many power lines run, as well as other areas, some of which are areas of concern for Clatskanie PUD (Figure 7: Oregon Explorer Overall Wildfire Risk, note white areas represent no data values).

Figure 7: Oregon Explorer Overall Wildfire Risk



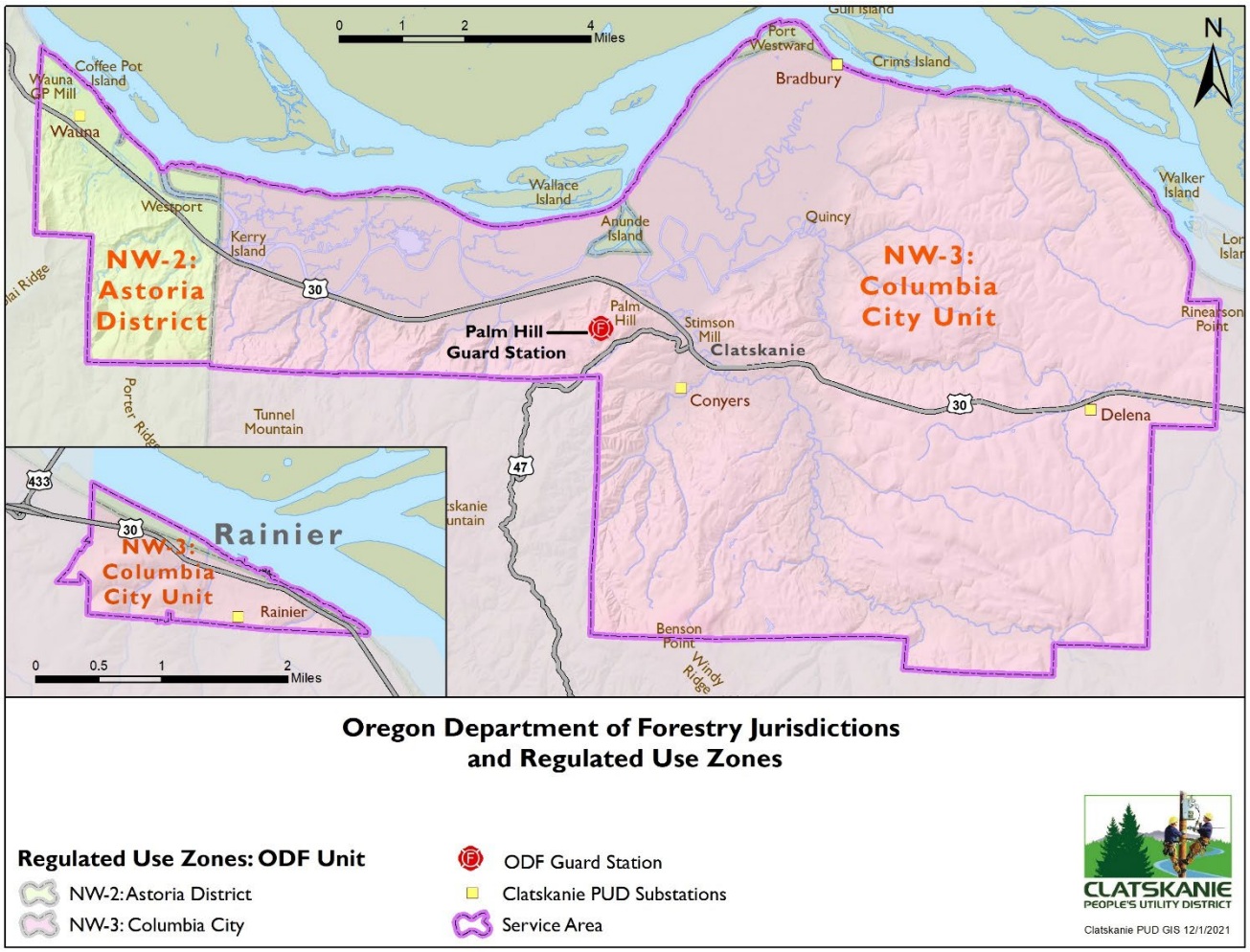
Additionally, the risk explorer contains broad-scale analyses that are not performed using local knowledge or utility-collected data—some areas shown as low risk are known to meet multiple criteria indicating higher risk from utility

ignitions, such as poor ingress/egress and frequent vegetation caused outages. For these reasons, it was decided to perform an in-house analysis using a more utility-centric approach to identify areas of higher concern for the District.

3.3 Fire Protection and Response

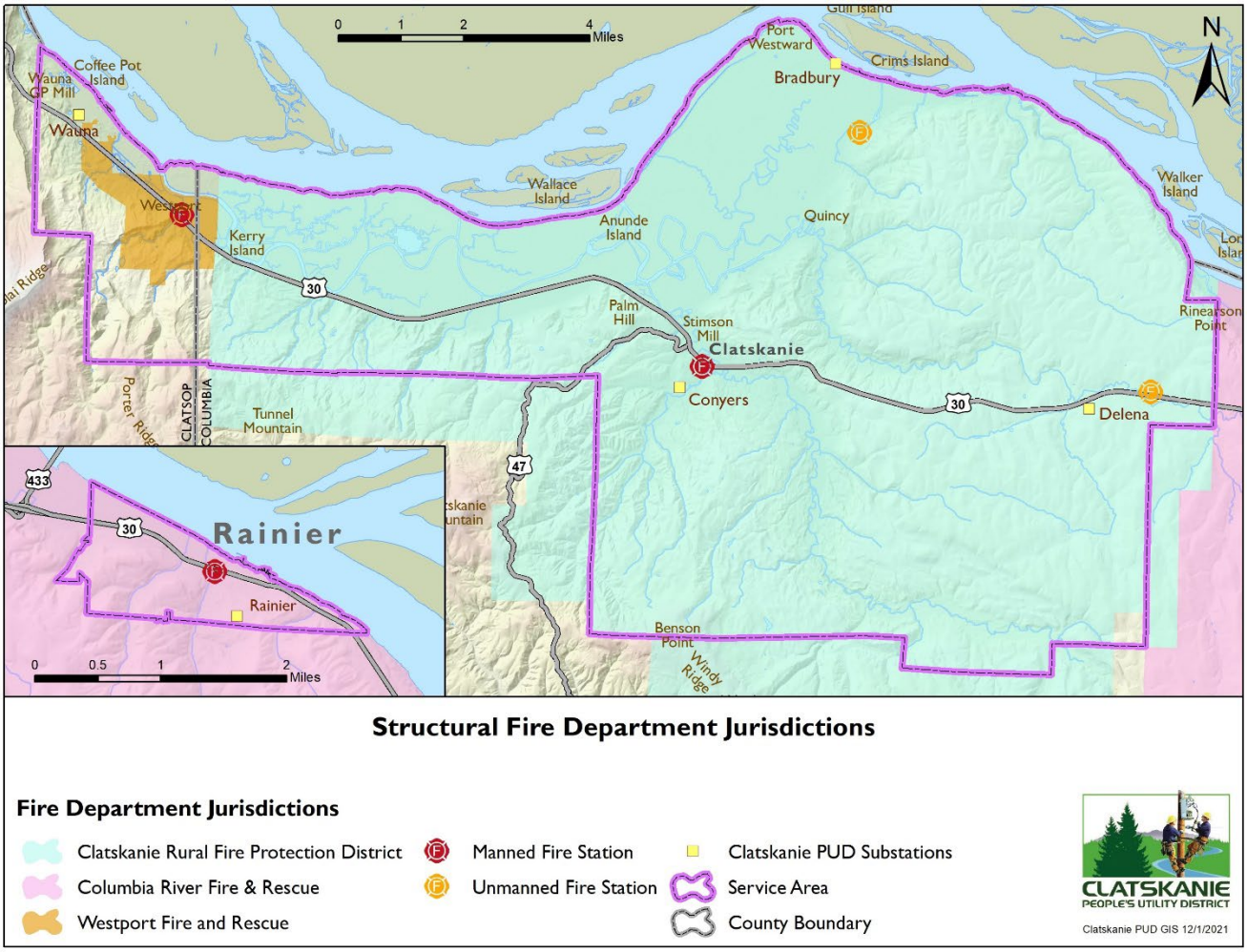
The Oregon Department of Forestry (ODF) protects private and state land from wildland fire, and imposes restrictions pertaining to public and work related activities during fire season (Regulated Use). Both the ODF fire protection jurisdiction and Regulated Use zone boundaries roughly follow the county boundaries within the Clatskanie PUD service area, with the Columbia County portion under the jurisdiction of the Columbia City Unit and within Regulated Use zone NW-3, and the Clatsop County portion under the jurisdiction of the Astoria District and within Regulated Use zone NW-2 (Figure 8: ODF Jurisdictions and Regulated Use Zones). The entire District is within ODF's Northwest Oregon Area. ODF operates a guard station within the service area, at Palm Hill, which is staffed during fire season, although the staff is generally out on patrol during normal working hours.

Figure 8: ODF Jurisdictions and Regulated Use Zones



First response to wildland fire, as well as structure protection, is also provided by local fire departments. The majority of the Clatskanie PUD service area falls in the Clatskanie Rural Fire Protection District (CRFPD), whose main station is in the town of Clatskanie. The CRFPD main station is fully staffed 24/7, and they also have two substations that are not manned, in Quincy and Delena. The area is also served by Columbia River Fire and Rescue from their Rainier station, which is also staffed 24/7, and Westport Fire and Rescue in the Clatsop County portion, which relies on volunteers (Figure 9: Structural Fire Department Jurisdictions).

Figure 9: Structural Fire Department Jurisdictions



4.RISK ASSESSMENT

4.1 Data Collection

For the last few years Clatskanie PUD has been moving data collection into a

seamless mobile and GIS, and away from isolated spreadsheets and paper forms. This enables better record-keeping and more data analysis.

4.1.1 System Audits

In 2017, Clatskanie PUD conducted a full system audit to record locations and other attributes of all District facilities. This audit formed the base of the current GIS system, and is the system of record.

In 2020, the PUD contracted a joint-use audit, including identification of all pole attachments and owners, attachment heights, and any violations caused by joint use attachments. These data have been used to correct violations and to remove any unauthorized attachments.

4.1.2 Vegetation Management

Vegetation management contract crews are supplied with a mobile device, which is used to assign work tasks, as well as to record vegetation conditions at work locations. Currently they record the vegetation growth rate at each location. As the vegetation management cycle is completed, these data will be used to refine the vegetation management rotation to revisit high-growth-rate areas sooner.

In 2017, the PUD contracted a system-wide vegetation assessment. This assessment identified and prioritized work locations, as well as hot spots and outage reduction locations. The results of this assessment have been used in vegetation management planning, and the PUD would ideally like to repeat this assessment every five years. However, a Request for Proposals put out in mid-2021 received no responses.

4.1.3 Line Inspections

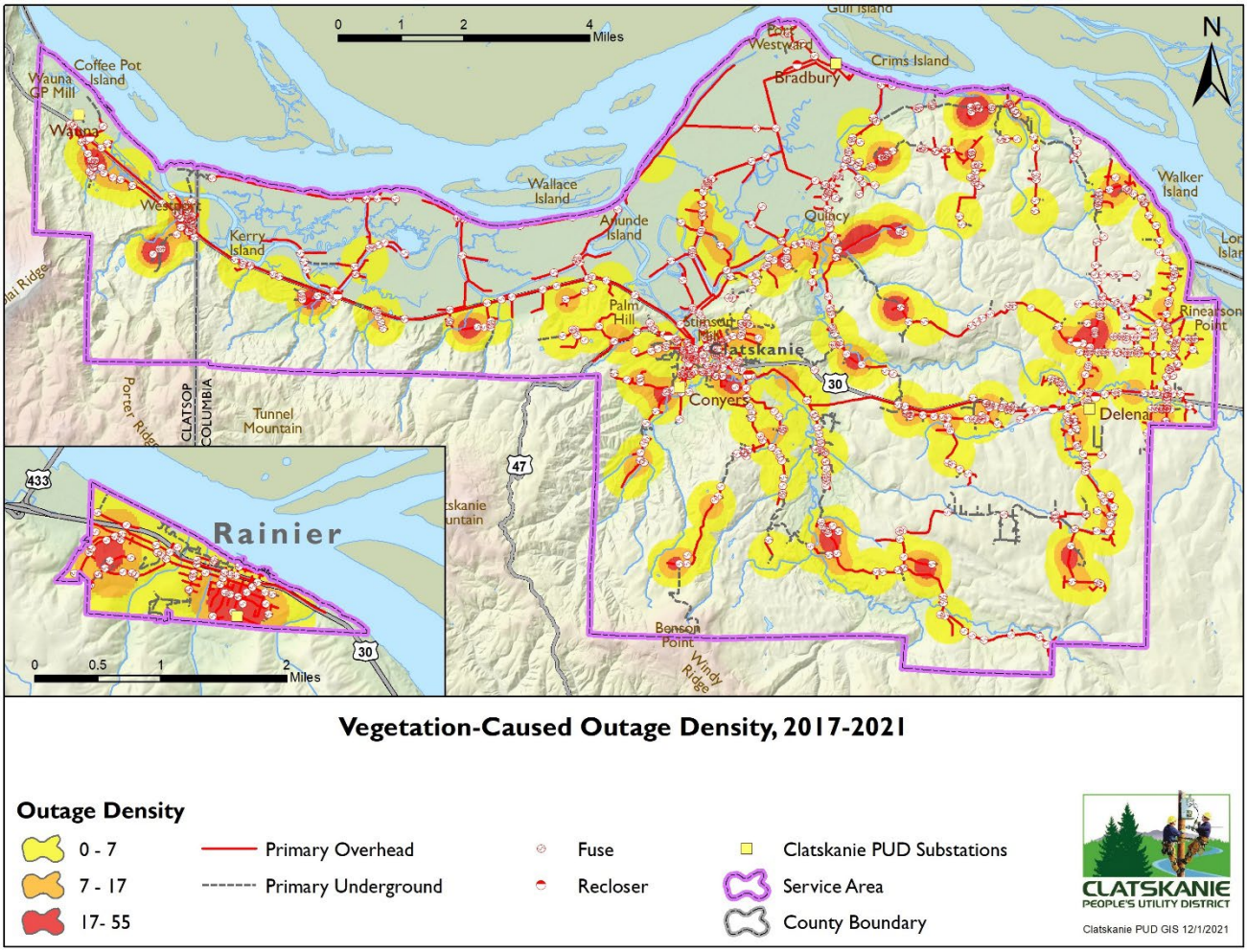
Pole test and treat is done annually on one fifth of the system. The contractor identifies reject poles as well as any wood decay or other damage. Underground facilities are inspected by the District's line crew on a 5-year rotation. All observations and data are recorded using the mobile devices directly into GIS. All issues noted during these inspections are evaluated and addressed.

4.1.4 Outage Management System

Prior to 2018, outage information was recorded both on paper, and within the American Public Power Association's eReliability outage tracker. Since the beginning of 2018, Clatskanie PUD tracks outages using NISC's® Outage Management System (OMS). OMS records the outage location and cause, and can also be used to record the exact location of contact by vegetation or other foreign object.

The outage data can be used to identify areas with higher than normal outage incidents and can help inform system improvements and vegetation management to reduce both outage frequency and wildfire risk. Figure 10: Vegetation-Caused Outage Density, overlays the PUD's electric grid with the calculated outage density. Areas of high outage density are used to identify areas of high wildfire risk and to determine solutions for outage reduction.

Figure 10: Vegetation-Caused Outage Density



4.1.5 Future Plans

Clatskanie PUD plans to continue expansion of digital data collection into other facility inspections. For example, the District will be implementing mobile tracking of overhead transmission and distribution line inspections in the early part of 2022. As crew and contractors become more familiar with mobile data collection methods, District data will become more complete and accurate, enabling a clearer operating picture and better visualization of issues. The District will continue to refine data collection and analyses, using them to inform and refine future planning and management efforts and operational decisions.

Clatskanie PUD is also budgeting for the installation of a District weather station in 2022. The station will include a fuel moisture sensor, and will stream live data to enable the District to get real-time fire weather conditions within the District.

4.2 Risk Analysis

The PUD has conducted its own analysis to determine areas of concern from wildfire ignitions, using public and utility-specific data inputs, and by creating sub-models to predict both potential for ignition and possibility of rapid spread and/or serious consequence from ignition caused by utility infrastructure.

4.2.1 Analysis Inputs

Risk analysis input layers were carefully chosen to model conditions known to be critical to wildfire risk: topography, vegetation, population, ingress for firefighting resources, and egress for evacuation.

Where possible, the most authoritative and recent data sources publically available were used. Sub-models were created for ingress/egress, and results of these models were proofed with field and local fire personnel to the extent possible. In addition, appropriate utility-specific data were used, including outage history, and span height. See Table 7: Wildfire Risk Analysis Inputs, for a summary of all inputs, sources, and criteria used for risk assessment.

Critical facilities were also considered as an input, but ultimately rejected because there is little guidance as to what facilities should be included in such an analysis, and how or if each facility should be weighted. Additionally, while the presence of critical facilities does increase risk of impacts from a catastrophic wildfire, they may also be adversely affected in the event of a PSPS, so their exact interaction when considering operational decisions is unclear. In fact, they are only defined by the OPUC in regards to special consideration when planning PSPS events.

4.2.2 Analysis Methods

Wildfire Risk Analysis for the Clatskanie PUD service area was conducted using raster analysis. Input layers were created or acquired with coverage across the entire service area, except in the case of utility-specific data such as outage history and span height, which are only relevant in the areas of PUD facilities. Each of these inputs was classed into low, medium, and high values. All inputs were added together to create a combined score, and this total score was again classed into three categories, with the highest being considered to represent areas of greatest concern for the PUD.

Table 7: Wildfire Risk Analysis Inputs

Input	Description	Low Score	Moderate Score	High Score	Data Source
Slope	Terrain steepness in percent	0-20	20-60	Greater than 60	Publically available LiDAR[2]
Aspect	Slope direction	NE, N, NW	E, SE, W	S, SW	Publically available LiDAR[2]
Fire Station Travel Time	Time in minutes for firefighting resources to arrive from closest manned fire station	0-10	10-20	Greater than 30	Open Street Map roads[3]
WUI-Veg	Interaction of population and vegetation	Cultivated or non-vegetated	Vegetated but non-WUI	WUI	LANDFIRE[4] SILVIS[5]
Veg Height Above Conductor	Veg height in feet above calculated conductor height. Conductor height approximated by subtracting buried pole length (10% of pole height + 2 feet) from pole height, and then taking mean of both calculated heights.	0-10	10-40	Greater than 40	Pole heights from Clatskanie PUD GIS data, LANDFIRE[6]
Outage Density	Outages from 1/1/2017 to 11/1/2021 that were recorded as being vegetation-caused and where the vegetation contact location was recorded well enough to be mapable (213 outages). Kernel density in square miles using a 2000ft search radius. Classified into three classes using Natural Breaks method.	0-7	7-17	17-55	Clatskanie PUD OMS data
Egress	Ease of escape to highway: number of road exits and distance from highway	2 exits and within 3 miles of highway	2 exits and more than 3 miles, or 1 exit and within 3 miles	1 exit and more than 3 miles	Open Street Map roads[3]

[2] https://gis.dogami.oregon.gov/maps/lidarviewer/
[3] © OpenStreetMap contributors
[4] (U.S. Department of Interior, Geological Survey, and U.S. Department of Agriculture, 2016)
[5] (SILVIS Lab, 2010)
[6] (U.S. Department of Interior, Geological Survey, and U.S. Department of Agriculture, 2019)

4.2.3 Analysis Results

The results of the risk analysis were refined using a generalization process to aggregate areas of fragmented high score, with the intention of segmenting regions that are operationally similar. Polygons were created from these generalized areas, and these polygons were intersected with overhead lines to identify concern areas that are at potentially higher fire risk from District-owned facilities. Figure 11: Wildfire Risk Analysis Results, shows the results of this analysis. Table 8: List of Concern Areas, contains a summary of these areas of concern within the District. Since some inputs are only valid in the area of Clatskanie PUD facilities, analysis results should be disregarded outside of this area.

Figure 11: Wildfire Risk Analysis Results

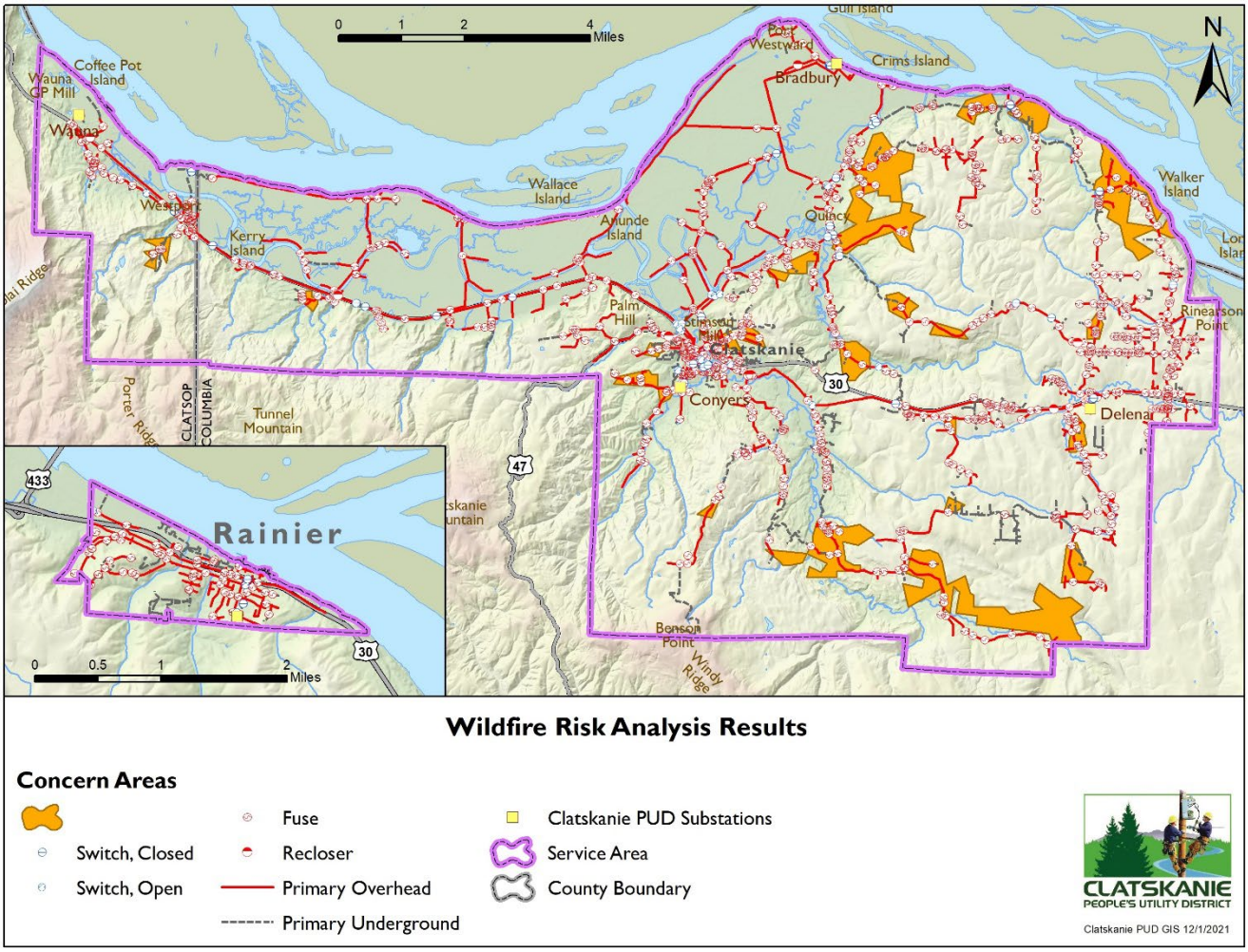


Table 8: List of Concern Areas

Areas of Concern
Mayger
West Ilmari/Stewart
McLean Hill
Alston/Delena Mayger
Mallory Park/Beaver Falls
Jolma Rd
Watach Rd
Middle Shepard Road
Marston Lane/Delena Mayger
Haven Acres
SW Orchard Drive
Middle Beaver Falls
Hall Road
Hall Road/Conyers Creek Intersection
Lindberg/Palm Creek
Lost Creek Road
Middle Cedar Grove
Clatskanie Heights
Scout Lake Rd
Alder Grove/ Maddox
Lost Creek/Winslow Rd
End of Swedetown Rd

5. MITIGATION STRATEGIES

Clatskanie PUD uses a variety of proactive measures to mitigate for fire ignitions on its transmission and distribution systems. The mitigation strategies for wildfire prevention intersect with the utility's engineering principles and operating policies for overall system resiliency.

5.1 Vegetation Management

Clatskanie PUD's service territory is densely forested. As a result, more than half of all the utility's outages are related to vegetation coming into contact with conductor lines - either due to plant growth or windblown trees and limbs. Generally, high winds experienced during the winter months coincide with

heavy rain, minimizing the risk of fire ignition from vegetation contact. However, summer months can be dry and windy creating a potential for fire starts.

5.1.1 Overall Strategy

Clatskanie PUD manages vegetation clearing for its transmission and distribution systems in conjunction with each other. Adding resources to enhance vegetation clearing for both sectors will balance the need to act on wildfire mitigation with the need to deliver affordable electricity to customers. Vegetation management is completed on a three-year cycle by a contracted tree crew.

5.1.2 Transmission

As well as the District's three-year trim cycle, routine vegetation clearing in the transmission right-of-ways has been determined by the utility's five-year pole test and treat cycle, and so transmission lines are also cleared every five years in order to provide access for the pole inspections.

Off-cycle vegetation clearing of the right-of-ways and access roads is performed when access is required for maintenance work or pole replacements. Clatskanie PUD line crews also complete an annual transmission line inspection, which provides information on conditions within a transmission right-of-way and informs where vegetation clearing is needed as well as infrastructure maintenance.

5.1.3 Distribution

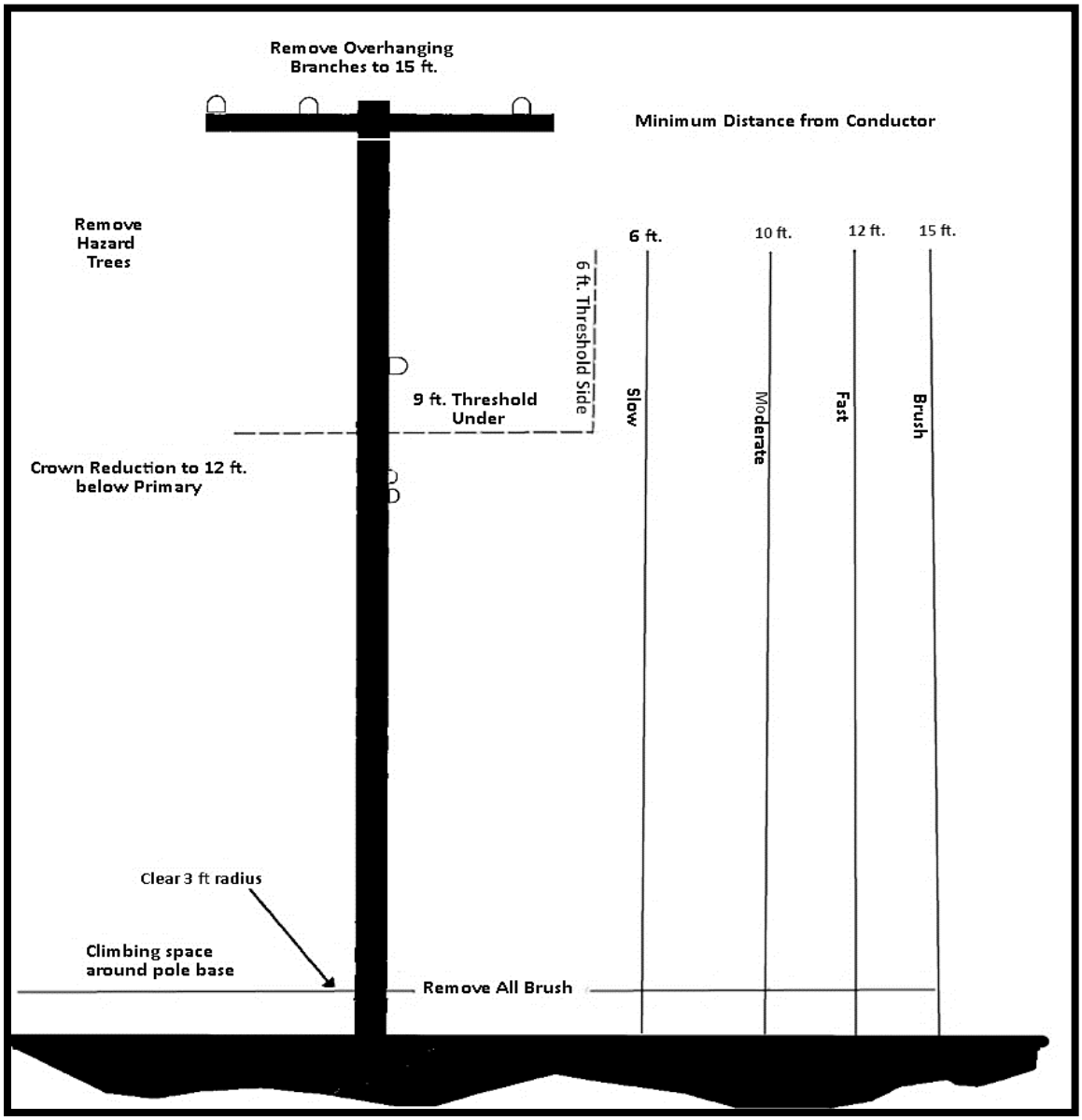
Distribution right of ways are cleared every three-years as part of the District's routine trim cycle. Additionally, off-cycle inspections of distribution lines occur through notifications from a variety of sources including tree crews doing drive-by visual inspections, engineers planning for conductor or pole replacement work, adjacent land owners, first responders, customers, and operations personnel responding to vegetation-related outages or easement issues.

In addition, a comprehensive vegetation assessment was completed in 2017 to identify high priority work areas for outage reduction and risk mitigation. The Customer Information System also records customer calls regarding potential tree hazards in proximity to electric lines, and service orders are created for tree crews to respond to and record completed work.

Clatskanie PUD seeks a minimum clearance of six-feet or more on either side of the conductor and ten-feet above the line at time of trim (Figure 12: Clatskanie PUD's Distribution Clearance Guidelines). Secondary or service conductors should have a minimum clearance of two-feet all around. Before trimming, tree crews consider location, line voltage, importance of line, height of

structures, growth habit of tree species, movement of trees and conductor in adverse weather, as well as, sag of conductor at elevated temperatures or under high load demand. Clearing for pole climbing space is determined by location of pole and growth habit of vegetation near the structure.

Figure 12: Clatskanie PUD's Distribution Clearance Guidelines



Tree removal is encouraged if the trees are a fast growing species, leaning heavily toward the line, are dead or dying, heavily topped with no chance of reasonable development, or are easily climbable trees that are near the lines. An herbicide is applied to cut stumps of fast growing trees. Areas of higher concern for fire risk may require more frequent trimming or warrant a cost-benefit analysis of alternatives to a particular overhead line. In areas of steep

terrain or tough access to our distribution lines, Clatskanie PUD will use a helicopter with an aerial saw to safely trim these hard to reach areas. Such as: Hwy.47, Hwy. 30 to Swedetown Rd. and Graham Hill.

5.1.4 Substations

A 20-foot defensible space beyond the perimeter fence line is maintained with vegetation trimming and clearing. A spray treatment is used to maintain a vegetation-free zone inside the fence line.

5.2 System Maintenance

5.2.1 Transmission

Ground-based inspections of the transmission lines occur every year. A driving or walking visual inspection is performed using binoculars to detect any damage to the overhead line, structures or attachments. Inspectors are also looking for conductor clearances and hazard trees. A drone assisted inspection may be performed to further investigate an identified issue. Intrusive inspections (pole test and treat) on the utility's wood transmission poles will be performed on a five-year cycle.

5.2.2 Distribution

Distribution pole and line inspections are performed on a five-year cycle by our line line crewcrews and Pole Test and Treat program. Inspectors perform a detailed visual inspection of poles, cross arms, attachments, conductor, service wire, ground rods and any other components associated with the pole, as well as communication line and vegetation clearances. The inspectors look for signs of defects, structural damages, broken or loose hardware, sagging lines, condition of conductor, service and ground wires, condition of guy wires and anchors, condition of insulators, fuse holders, disconnects, risers, transformers, reclosers and other equipment as well as any clearance violations. Inspectors use a combination of walking and driving to complete the inspection. The report informs future distribution maintenance work and the capital plan.

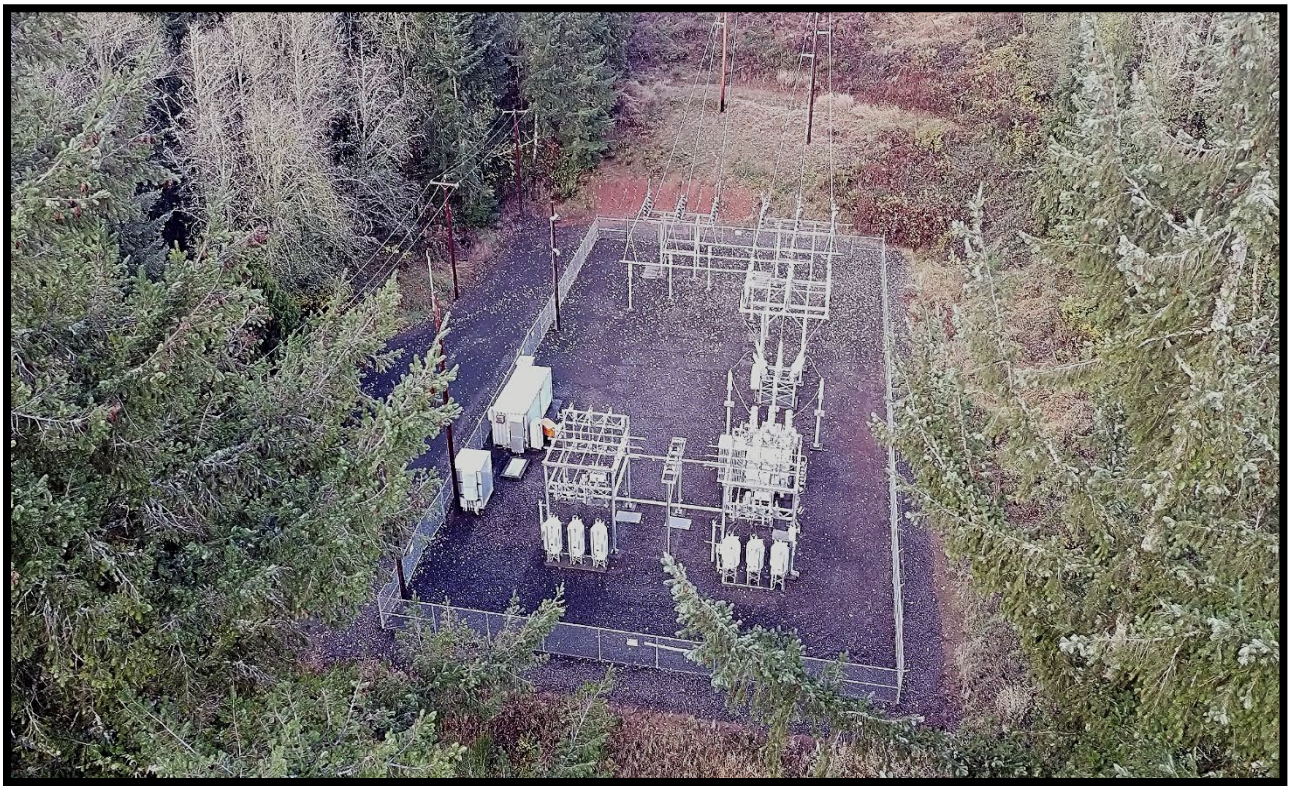
Operations and engineering personnel perform periodic drive by assessments of overhead distribution facilities and equipment. During a conductor rebuild, poles and attachments are replaced at the same time and the inspection cycle is reset for that particular line.

5.2.3 Substations

Equipment cabinets are inspected monthly for water intrusion, corrosion and pest infestation. Security perimeter fencing, grounds inside and outside the fence line, control building, signage, fire suppression system and battery banks are

inspected quarterly (Figure 13: Clatskanie PUD's Delena Substation). Switches, breakers, insulators, bus, structures and other hardware, as well as lines exiting the substation, are inspected three times a year to ensure all components are in good condition and functioning as intended. Transformers that are de-energized undergo a complete inspection of all electrical, relay and bushing components to ensure proper functionality and reliability.

Figure 13: Clatskanie PUD's Delena Substation



5.3 System Hardening

Clatskanie PUD's systems are designed and constructed for high winds and heavy rain. The utility's robust construction standards not only address extreme weather conditions, they also mitigate for potential fire ignitions from wire-to-wire contact due to high winds, failed equipment due to corrosion.

5.3.1 Transmission

Pole structures are designed to exceed wind loading standards, and heavier than required cross arms and all-aluminum alloy conductor wire is used to address wind loading as well as corrosion. Overhead wire spacing is increased to reduce wire to wire contact in high winds. Corrosion resistant materials are used on all structure attachments and components. Circuits are over insulated to reduce tracking and potential fire ignition.

5.3.2 Distribution

Larger class poles, shortened span lengths, and conductors installed with extra ground and tree clearance are used to address high winds and loading.

Circuits are over insulated to reduce tracking and potential fire ignition. Stainless steel is used for overhead transformers, pad-mount transformers in various areas. Cutout brackets and pressed or compressed connections are used to mitigate for corrosion.

600-amp conductor is used for enhanced capacity and minimal line loss. Covered (insulated) service wire is used throughout the District. The covered wire is designed to withstand inadvertent contact with vegetation or other objects without fire ignition. Overhead lines are undergrounded in areas prone to repeated outages due to high winds and tree exposure.

In areas of concern for fire risk, a steel or alternate material pole may replace a wood pole and non-expulsion devices may replace conventional equipment.

5.3.3 Substations

Circuits are over insulated to reduce tracking and potential fire ignition. Stainless steel is used for overhead transformers, pad-mount transformers in various areas. Cutout brackets and pressed or compressed connections are used to mitigate for corrosion.

600-amp conductor is used for enhanced capacity and minimal line loss. Covered (insulated) service wire is used throughout the District. The covered wire is designed to withstand inadvertent contact with vegetation or other objects without fire ignition. Overhead lines are undergrounded in areas prone to repeated outages due to high winds and tree exposure.

A fiber optic network connects all utility operations, substations and communication tower sites, ensuring SCADA-enabled control and high-speed communication between devices. The utility's fiber network has physical redundancy ensuring reliability during critical events.

5.4 System Protection

5.4.1 Hot Line Tag Settings

Under normal operating conditions, the utility's reclosers are set to open and close two times for incidental faults (such as an object blowing into the line) before opening for a more significant fault. During high fire-risk days, Supervisory Control and Data Acquisition (SCADA) can be used to remotely set the relays to hot line tag, which the utility calls its "wildfire setting." The wildfire setting disables the reclosing function so contacts with the conductor result in de-energization.

While disabling the reclose function does not fully eliminate ignition events from contacts with the line, it does reduce the number of potential ignitions (sparks).

5.4.2 Non-Expulsion Devices

Fuses protect the distribution system from faults and damaged lines and equipment. Conventional fuses, when operated, expel hot particles and gases, which can ignite fires. Clatskanie PUD primarily uses conventional expulsion fuses to protect its overhead circuits. However, system engineers are assessing current-limiting fuses and cut-out mounted reclosers that could be used to replace some expulsion fuses on overhead feeders in high fire-risk areas to mitigate for fire ignitions.

5.5 Operational Tools and Practices

AMI (advanced metering infrastructure) meters will be used to view meter status, monitor voltage at the meter level, measure usage, detect tampering, identify and isolate outages, perform remote connect/disconnects, and provide on-demand reads. Clatskanie PUD is implementing a complete AMI system build with Phase 1 and Phase 2 completed. The project will be fully deployed and integrated with the completion of Phase 3, by July of 2022. The AMI system will provide overall situational awareness in real time and allows for a proactive approach to potential fire-ignition issues.

OMS is used for tracking and responding to outages and system hazards. The OMS captures outage information in near real time from customer phone calls, consolidates field events to predict outage location, and alerts operators to potential issues impacting the system. OMS includes outage location, duration and number of customers impacted. The information is used to plan work and prioritize system upgrades including vegetation maintenance.

SCADA (supervisory control and data acquisition) is used to monitor, operate and remotely control field devices including substation reclosers to isolate a line or line section.

During fire season, work procedures are adjusted based on the Industrial Fire Precaution Levels (IFPL). Line and tree crews carry fire suppression equipment (firefighting tools, water, fire extinguishers) and follow a fire-watch protocol after work is completed. Tree crews carry chain saws equipped with spark arrestors. Operations supervisors monitor current and predicted weather using a variety of sources including NOAA, National Weather Service, weather apps and various websites.

5.6 Next Steps – Mitigation

Clatskanie PUD will continue to refine operational practices to improve and expand on wildfire risk mitigation measures. Some of the next steps the District has planned are:

- Expand the number of relays on the distribution system that are pre-programmed for the hot line tag setting, in order to retain the functionality to coordinate with fuses, relays and circuit breakers during a critical event.

- Expand on the deployment of non-expulsion devices in identified areas of higher fire concern. Installation work could be coordinated with other line work in the area for increased efficiency.

- Explore the use of fiberglass cross arms as a means to mitigate for fire ignition in concern areas.

- Explore the use of thermal imagery to discover abnormal conditions (hot spots) on substation and transmission facilities related to loose connections, splicing, arrestors or other hardware.

6. RESPONSE STRATEGIES

6.1 Situational Awareness

Clatskanie PUD's operations supervisors regularly monitor incoming weather using NOAA's National Weather Service data, weather apps and various websites. Currently, the District does not have fixed weather monitoring stations that provide localized weather information at the substation or feeder level, but a high-end District weather installation, including fuel moisture sensors is budgeted for in 2022.

During fire season, operations supervisors communicate with local wildfire management offices regarding IFPL restrictions and share relevant operational information. Operations supervisors notify field personnel and contractors of the changing restrictions in each zone and shift work protocols to meet each precaution level.

Red Flag Warnings and wildfire threat notifications are received by management as well as operations supervisors. Additional resources may be deployed to an area to further assess and monitor conditions at the local level. If an unusual weather event is expected, the engineering & operation's manager, safety coordinator, as well as engineering and operations supervisors, attend weather briefings hosted by county emergency management or joint fire command.

6.2 Interagency Coordination

Clatskanie PUD collaborates with local fire departments, county emergency management services, county fire councils, Oregon Department of Forestry, Bonneville Power Administration, and neighboring utilities through meetings, forums and exercises throughout the year to prepare for high fire-risk events.

Clatskanie PUD coordinates with local emergency responders, county and state road departments, and communication providers on smaller incidents throughout the year. Operation supervisors are familiar with the local agency representatives and benefit from the established relationships during a larger event with enhanced situational awareness and established communication paths.

Clatskanie PUD has mutual assistance agreements with Columbia River PUD, Cowlitz PUD, Lane Electric Cooperative, and West Oregon Electric Cooperative. Clatskanie PUD has provided mutual assistance to neighboring utilities on multiple occasions in the last three years and benefits from shared demonstrated technology, professional networking and industry coordination.

6.3 Operational Response

Clatskanie PUD understands that the availability of electricity during an emergency event is critical. First responders' communication systems, emergency medical services and community water all require electricity to operate. For those times when a potential for wildfire exists, the utility has a variety of measures and tools it can implement to deliver power safely.

6.3.1 Field Work

During high fire-risk days, work procedures are adjusted to mitigate for potential fire ignitions. Crews carry firefighting tools and extra water as well as refrain from using equipment that may spark. Upon completion of vegetation work, crews remain in the area for a prescribed amount of time to ensure there are no ignitions as a result of their work.

6.3.2 Adjusting Reclosers

For high fire-risk days, operators are able to adjust the recloser settings from normal to a wildfire hot line tag setting. The wildfire setting preserves the ability for devices (fuse, recloser, circuit breaker) to coordinate and permits the device closest to a fault to open, de-energizing that section of line. Once a line is de-energized, ground patrols, looking for vegetation in the line or damaged equipment, must inspect the line before re-energizing. The wildfire setting allows crews to confine the ground patrol to the section of line closet to where the device opened – eliminating the need to patrol the entire line and a prolonged outage for customers.

6.3.3 De-Energizing Lines

Under normal operating conditions, operations supervisors have the authority to proactively de-energize sections of transmission and distribution lines to make safe for employee/contractor work, as well as during isolated emergency events when requested by local law enforcement or fire officials to ensure public safety. In most cases, the transmission and distribution line sections can be isolated and de-energized remotely through SCADA. In the event of a wildfire, operations supervisors are authorized to de-energize at the request of the jurisdiction's unified Incident Command.

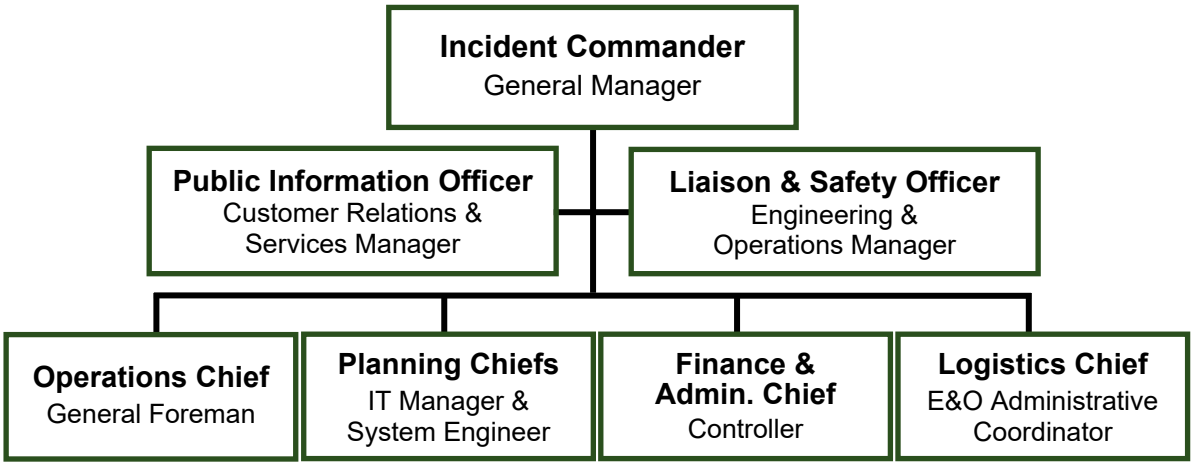
6.4 Employee Readiness

Clatskanie PUD's emergency response protocols reflect the national Incident Command System (ICS) framework. Emergency events impacting the utility are managed using ICS; therefore, all employees are required to complete the ICS 100 course.

6.4.1 Incident Command System

The utility's overarching Emergency Response Plan specifies the roles and responsibilities for each ICS position and is tailored to Clatskanie PUD's organizational structure and operations. The Emergency Response Plan identifies operational status levels including an Alert status. During Red Flag Warning Days, the utility moves to Alert status and employees are notified. As the situation escalates, employees follow the readiness protocols described in the Emergency Response Plan for their assigned ICS position. (Figure 14: Clatskanie PUD's Incident Command Team).

Figure 14: Clatskanie PUD's Incident Command Team



When the potential for fire ignition is high, the Incident Command Team considers likely scenarios based on environmental, locational and weather

conditions and develops an overall strategy. The overall strategy is carried out by the Command Staff and Sections Chiefs and additional ICS positions are added as the situation develops. The Operations and Planning Sections work together to protect utility infrastructure while continuing to deliver power to customers in a safe manner.

6.4.2 Stakeholder Communication

During an emergency event, ICS ensures clear lines of authority as well as the centralized dissemination of information. The Public Information Officer is responsible for preparing the communication plan based on information from the Incident Command Team. Consistent internal and external messaging is prioritized as well timely updates to stakeholders. Communication may be done through the utility website, via social media, by push notifications to SmartHub users, press releases, liaison to local agencies, and personal contact with key account representatives.

6.4.3 Industry Collaboration & Coordination

During an emergency event, ICS ensures clear lines of authority as well as the centralized dissemination of information. The Public Information Officer is responsible for preparing the communication plan based on information from the Incident Command Team. Consistent internal and external messaging is prioritized as well timely updates to stakeholders. Communication may be done through the utility website, via social media, by push notifications to Smart Hub users, press releases, liaison to local agencies, and personal contact with key account representatives.

During fire season, if Clatskanie PUD de-energizes lines proactively, or as a result of a wildfire, crews will patrol each line section prior to re-energizing. If there are more lines to patrol than the utility has resources to complete the inspections in a timely manner, Clatskanie PUD may call for mutual assistance from other utilities. Requests for assistance will go to neighboring utilities first and Clatskanie PUD will lean into its established mutual assistance agreements with American Public Power Association (APPA) and Western Regional Mutual Assistance Agreement Group (WRMAAG). Clatskanie PUD requests and manages mutual assistance crews using the ICS based protocols outlined in the enterprise Emergency Response Plan.

6.5 Public Safety Power Shut Off (PSPS)

A PSPS preemptively de-energizes power lines during high wind events combined with hot and dry weather conditions. Clatskanie PUD utilizes PSPS as a last response in mitigation strategies during red flag warnings or extreme conditions. (Figure 15: Summary of Clatskanie PUD’s Situational Response).

The necessity, location, duration, and timeline of a PSPS activation will be determined by the Incident Commander and may be in consultation with interagency partners including, but not limited to, the Oregon Department of Forestry, Columbia County Emergency Management, and local fire departments. The Incident Commander will evaluate conditions and will determine when it is safe for re-energization. Prior to re-energizing the system, full line patrols of the PSPS area will be performed by Operations field staff. When considering a PSPS, Clatskanie PUD examines external risks and potential consequences of a PSPS, including:

- 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 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 the local fire protection districts.
- 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 can lead to injuries and fatalities.

The risks and potential consequences of initiating a PSPS are significant and extremely complex. Based on the above considerations, Clatskanie PUD reserves the option of implementing a PSPS when conditions dictate. While Clatskanie PUD 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 option in a crisis.
On a case-by-case basis, Clatskanie PUD will consider de-energizing a portion of its system in response to a known public safety issue or a request from an outside emergency management/response agency.
The decision to implement a PSPS is based on multiple triggers accompanied with the unique understanding of the Clatskanie PUD system. No single element is determinative. Potential factors include:

- Imminent fire danger
- Critically dry vegetation that could serve as fuel for a wildfire

- Low humidity levels
- Red flag warnings
- Temperatures over 100ºF
- Winds projected beyond 40 mph in high-risk areas
- Mandatory fire orders in effect
- On-the-ground observations from Clatskanie PUD or other agency field staff
- Active wildfire in the service area
- Local topography

Communications

Internal and external communications are of the utmost importance before, during, and following a PSPS activation. The following depicts the typical communication strategies executed should a PSPS activation need to occur.

Internal Communications:

Prior to PSPS Activation

- Incident Command Staff will meet to discuss PSPS plan.
- Incident Commander will approve the PSPS plan and communications plan.
- Incident Command Staff will follow the chain of command to communicate the PSPS plan.
- An all staff email will be sent to notify staff of the formal PSPS plan.
- Incident Command Staff will be available to answer internal questions.

During PSPS Activation

- The Operations staff will provide updates to the Incident Commander as available/necessary.
- The PIO will distribute updates and information to staff and board via email as needed.
- Incident command Staff will be available for questions that arise.

Following PSPS Activation

- The Operations staff will inform the Incident Commander when the PSPS will be concluded.
- PIO will distribute concluding information to Clatskanie PUD staff and board via email.

External Communications:

Prior to PSPS Activation

- Incident Commander will approve the PSPS and communication plan.
- Incident Command Staff will communicate/coordinate PSPS plans with Interagency Partners.
- The Incident Commander will provide date(s), location(s), duration, and reasoning for PSPS to PIO.
- PIO will inform Interagency Partners of the PSPS plan that have not been already notified by the Incident Commander.
- The Liaison Officer will notify any Key Account Customers affected by the PSPS.
- PIO will distribute PSPS message to the public via multiple outlets including: social media accounts, Clatskanie PUD website, and if time allows print and radio media.

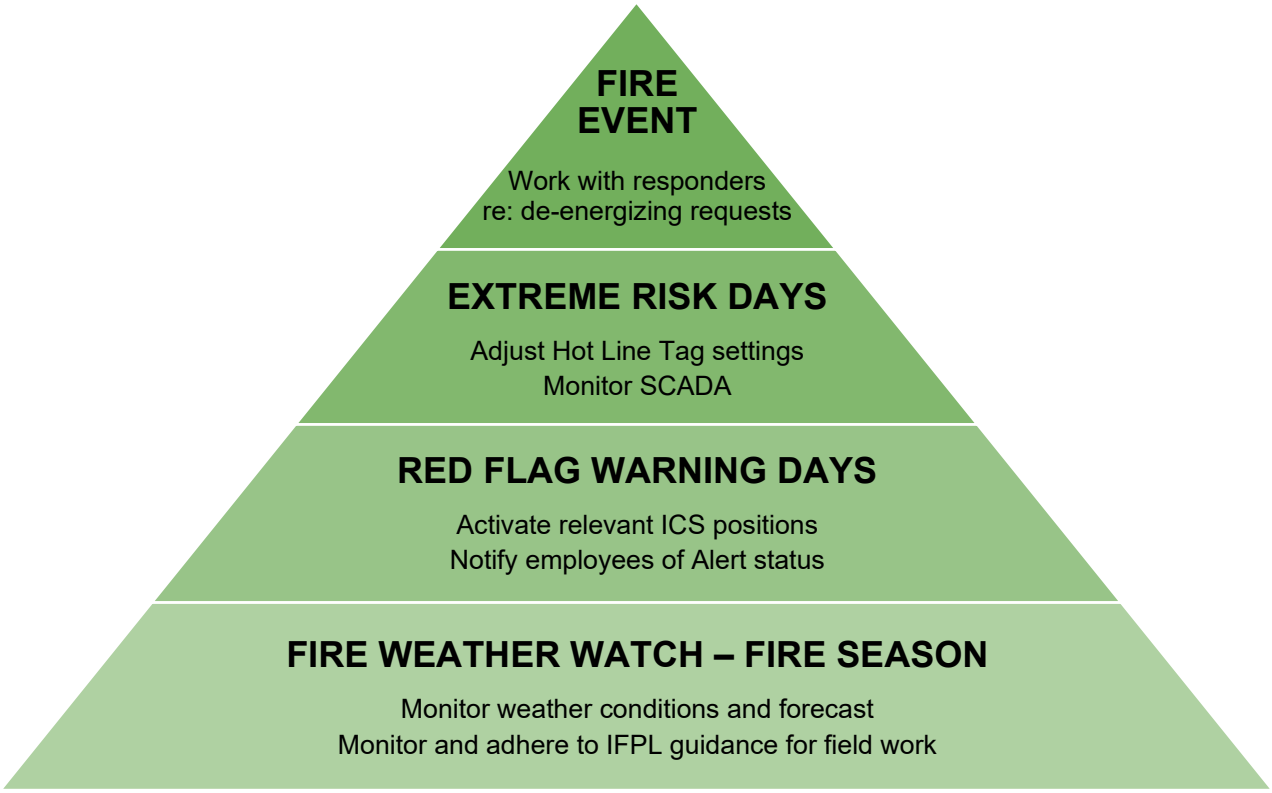
During PSPS Activation

- PIO and support staff will monitor social media outlets and respond to public inquiries.
- PIO will remain in close contact with Interagency Partners and provide updates as available.
- The Liaison Officer will remain in close contact with Key Account Customers and provide updates as available.
- PIO will provide additional updates and information, as approved by the Incident Commander, to the public as available and/or necessary.

Following PSPS Activation

- PIO will communicate PSPS has ended via the same channels information was initially distributed externally.
- PIO/Operations staff will follow-up with Interagency Partners when needed.
- The Liaison Officer will follow-up with Key Account Customers.

Figure 15: Summary of Clatskanie PUD's Situational Response



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