5.1 Wildfire Hazard Analysis

5.1.1 Introduction to Wildfire

Wildfire is an uncontrolled burning of any type of vegetation. Wildfires can become structural fires or can be started by structural fires, and the intersection of wildfire and the built environment is a primary issue that this plan attempts to address.

Wildfires are also a critical ecological process in many ecosystems,[22] with species adapted to thrive in regenerated post-fire landscapes. The modern ability to put out wildfires before they threaten development and key natural resources has reduced cycles of burning and regeneration in many locations, but the increased risk from extreme weather is in turn building conditions where wildfire suppression will become more and more difficult.

Any natural landscape has the potential to be the origin point of a wildfire, and the balance between maintaining natural ecosystems and protecting life and property has only grown more challenging with population growth into higher risk areas. Risk is also increasing due to changing conditions whereby "[c]ommunities susceptible to experiencing wildfire hazards can expect not only more frequent large-scale damaging wildfire hazard events but also fires of greater intensity and duration."[23] Wildfire, like all other natural hazards, cannot be fully controlled, but human systems can become more resilient to it, mirroring the adaptability of nature.

The behavior of wildfire−why it starts, how it becomes uncontrolled, and who it puts at risk−is caused by a combination of fuels, weather and topography that make up the Fire Behavior Triangle.[24]

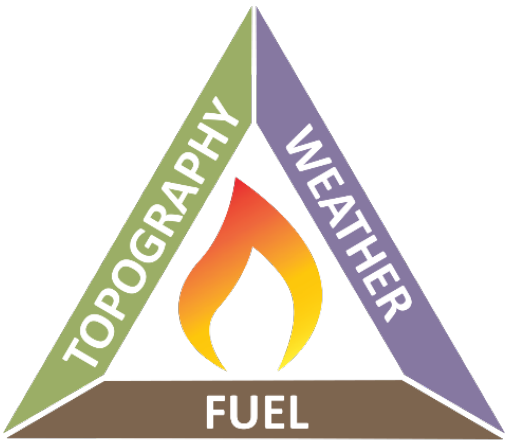


Figure 10 - Diagram from the Oregon State Extension Service.

Fuels

Wildfire fuels are any living or dead ignitable biomass and can be divided into ground fuels and canopy or crown fuels. These fuels can be made up of different types of vegetation, including grasses, shrubs, timber litter (dead vegetation on the forest floor), and trees.

- **Ground fuels** are those below the tree canopy and include fine fuels and ladder fuels.
    - *Fine fuels* are small pieces of vegetation that quickly ignite and burn rapidly when dry. These fuels include grass, leaves, pine needles, and moss.

[22] *Extreme Wildfire Events and Disasters; Root Causes and New Management Strategies*, Edited by F. Tedim, V. Leone, T. McGee, Section 8.6
[23] *Wildfire Hazards, Risks, and Disasters*, Edited by J. Shroder, D. Paton, Section 1.2
[24] Fire FAQs – What is forest fuel and what are fuel treatments, Oregon State Extension Service, S. Fitzgerald, C. Berger, D. Leavell, January 2019.

    - *Ladder fuels* are larger vegetation like shrubs and low-lying branches that lift a fire from an understory into the tree canopy. As flame heights increase, fires become much more difficult to control, so ladder fuels are a common priority for fuel reduction.
- **Crown fuels** (or canopy fuels) are the tops of a tree canopy, high above a forest understory. Once fire reaches forest crowns it becomes extremely intense and fast-moving, as the fire can jump from treetop to treetop and create a wall of flame. Fires at this height can also spread embers up to three miles, where they can start spot fires and ignite structures.

Once wildfire grows and escapes control, it can quickly turn homes and other development into wildfire fuel.

Weather

- **Wind** – Nearly every major fire in the recorded history of Multnomah County has happened during a high wind event. Wind is one of the key determinants of when a major fire will occur as it fans flames with oxygen, blows embers ahead of the fire, and causes sudden runs into new fuel sources. All of these factors can turn small fires into large ones quickly, making fire attack very difficult. High winds are one the key determinants of 'red flag warnings,' when wildfire risk is considered highest.
- **Humidity** – Dry fuels catch fire more easily and burn more quickly, making them another risk factor for rapid wildfire growth and escape from control. During periods of extremely low humidity, these fuels can reach their maximum ignitability potential.
- **Temperature** – The temperature of fuels can increase the likelihood of ignition.[25] Warm winters and long hot summers are drivers of wildfire risk through early season vegetation growth, low snowpack, and long-term drying of vegetation. However, air temperature is not as important a factor in wildfire ignition risk on a given day as winds and low humidity. Major fires can and have started on mild temperature days.

Topography

- **Slope** – Wildfire runs up slopes quickly. As heat from a fire rises, it preheats fuels, and upward drafts cause spot fires to start up the slope as the fire advances. This effect increases as slopes become steeper.[26]
- **Aspect** - The direction a slope faces also matters. South-facing slopes receive more direct sun, resulting in lower humidity, increased loss of moisture, and the presence of drier and lighter fuels,[27] giving those slopes a higher fire risk. North-facing slopes have the opposite effect and have a slightly lower fire risk.

When these elements of extreme fire behavior are elevated, the addition of an ignition source becomes the starting point for a dangerous wildfire. The vast majority of wildfires in Multnomah County are started by humans rather than by natural causes.

[25] Wildland Fire Behavior, National Park Service
[26] Slope effect on Rate of Spread, National Wildfire Coordinating Group
[27] Principles of Wildland Fire Behavior, National Wildfire Coordinating Group

Predicting Wildfire Events

Wildfire risk can be monitored through predictive modeling, based on the elements of wildfire described above. Awareness of periods of extreme risk is essential for preparation and risk reduction actions, as nearly every major recorded wildfire in Multnomah County has occurred during extreme weather and unseasonably dry conditions.

The Northwest Interagency Coordination Center (NWCC) is a local agency serving as a focal point for Pacific Northwest logistical support and intelligence for anticipated and ongoing wildfires. The NWCC provides publicly accessible morning briefings, seven-day outlooks for significant fire potential, and seasonal predictive outlooks, among other services.

Another predictive service is the National Weather Service, which issues Red Flag Warnings when strong winds, high temperatures, and low humidity create a high risk of wildfire. Many activities become restricted during these periods.

Preventative power shutoffs are a new tool across Oregon, including Multnomah County, to reduce the risk of wildfire being caused by electricity transmission equipment. Shutoffs are only performed during the highest periods of measurable risk, so they serve as another key alerting tool of extreme conditions.

5.1.2 The Wildland Urban Interface

Throughout this plan, wildfire vulnerability is described using a designation called the Wildland Urban Interface (WUI). The WUI is defined by the controlling federal legislation as "where humans and their development meet or intermix with wildland fuel." The HFRA continues this definition by dividing the WUI into two zones:

Interface communities are locations where structures are directly adjacent to wildland fuels and there is a clear difference between the locations of development and the fuels. These areas may be densely developed, and fire protection is most likely to be provided by a local fire district.

Intermix communities are locations where structures are scattered at a lower density within a wildland fuels area. Fuels in these areas are continuous through the developed area.

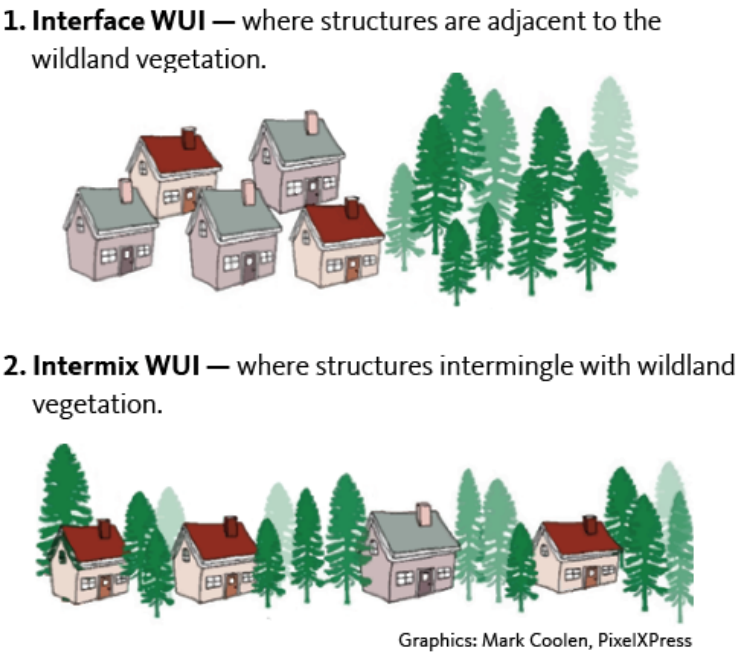


Figure 11 - Graphic showing the difference between interface and intermix areas.

Interface and intermix areas are both common in Multnomah County. Areas with little or no development are not considered to be part of the WUI, nor are urban core areas far enough away from concentrations of wildfire fuel to not be threatened by embers.

The 2011 CWPP defined a WUI area as being 500 feet from hazardous vegetation, and extended that range to as much as 1.5 miles or greater in more heavily forested areas where severe fire behavior could send embers much farther.

The analysis used in this plan indicates a more extensive WUI area, using a 1.5 mile distance from significant fuel sources in all locations, which indicates increased concern about more extreme fire behavior becoming more likely in more locations. In initial statewide mapping, about 4.4% of the land in Oregon was considered to be in the WUI. That percentage is considerably higher in Multnomah County, indicating that even with fire being less frequent here than other parts of Oregon, risk is high due to the large population in proximity to areas with risk of periodic extreme wildfire.

The WUI mapping used in this plan comes from the Oregon Department of Forestry and has not been updated for this plan revision. New mapping is anticipated within the next year that will establish a consistent definition of WUI areas in Oregon, so any additional local analysis will wait to see how effectively that mapping captures Multnomah County's locally perceived risk. The WUI mapping in this plan does not distinguish between interface and intermix areas but does use a tiered risk rating based on wildfire probability.

5.1.3 Planning Process and Stakeholders

One of the primary requirements of CWPPs is that they must be "collaboratively developed by local and state governments, in consultation with Federal partners and other interested parties".[28]

The group assembled for this planning project was a large and diverse group of local stakeholders, representing different areas of expertise. All of the stakeholders were invited to participate in all planning meetings for different elements of wildfire risk to bring a variety of viewpoints to those conversations.

There are eleven fire districts located in Multnomah County, with three of those districts having operations contracted out to departments that are part of this plan. All eight operational fire districts have contributed to the development of plan content and mitigation priorities. As the service areas of these eight districts cover the entire county (except federal management areas and remaining structural unprotected areas), chapters in this plan are organized by district, with information about city department stakeholders located in those chapters.

Those districts are:

- Cascade Locks Fire (opt-in services in structurally unprotected area of eastern Multnomah County)
- Corbett Fire
- Gresham Fire (including contracted service provision for Rural Fire Protection District #10 and the Cities of Fairview, Troutdale, and Wood Village)
- Lake Oswego Fire (including contracted service provision for Riverdale Fire Protection District #11 and the Alto Park Water District)
- Portland Fire and Rescue (Including coordination with the Port of Portland Fire Department)

[28] Preparing a Community Wildfire Protection Plan, A Handbook for Wildland-Urban Interface Communities, 2004

- Sauvie Island Fire
- Scappoose Fire
- Tualatin Valley Fire and Rescue

Interactive version of this map

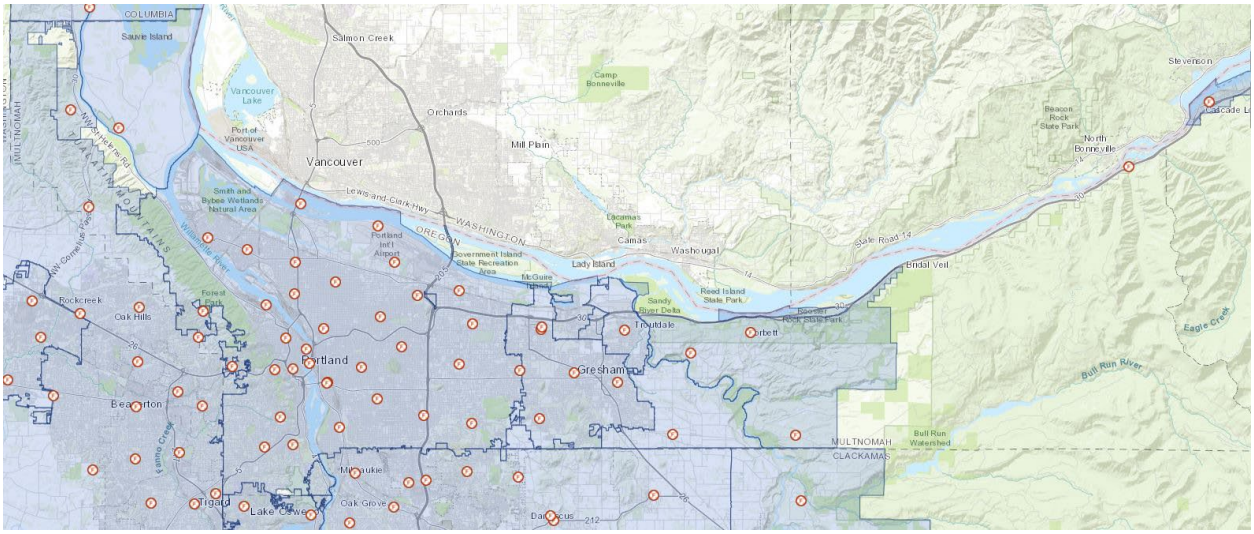


Figure 12 - Location of fire districts and fire stations across Multnomah County. Map from Oregon State Fire Marshal.

State Wildfire Management Partners

Oregon Department of Forestry (ODF)

ODF is the primary state stakeholder for local CWPPs and, as the state entity responsible for forest management, is a statutorily required approver of plans and updates. ODF is also a key firefighting partner within their district boundaries. Multnomah County is represented by three ODF offices in two districts, with the eastern portion of the county served by the North Cascade District's Molalla office and the western portion served by offices in Columbia City and Forest Grove in the Northwest Oregon District. ODF also manages mitigation grants and supports fire prevention programs. Areas within the center of the county are not located in ODF District boundaries, but ODF provides planning support for the entire county's wildfire risk.

Figure 13 - ODF office boundaries in Multnomah County.

Oregon State Fire Marshal (OSFM)

The Oregon State Fire Marshal has recently added regional support for Wildfire Risk Reduction and Response Readiness,[29] with Multnomah County grouped into a Wildfire Risk Reduction region with Clackamas, Clatsop, Columbia, Tillamook, and Washington Counties.[30] OSFM also provides statewide support for fire safety regulation and fire codes, and manages grants for response and mitigation capacities. Joint Policy Bulletins, Technical Advisories, and Interpretations for fire prevention and life safety regulations are hosted on their website.

[29] For details on these programs, see information above about Senate Bill 762.
[30] Response Ready District boundaries differ slightly, with Multnomah County included with the same counties as the Wildfire Risk Reduction Region, but also with Lincoln, Marion, Polk, and Yamhill Counties.

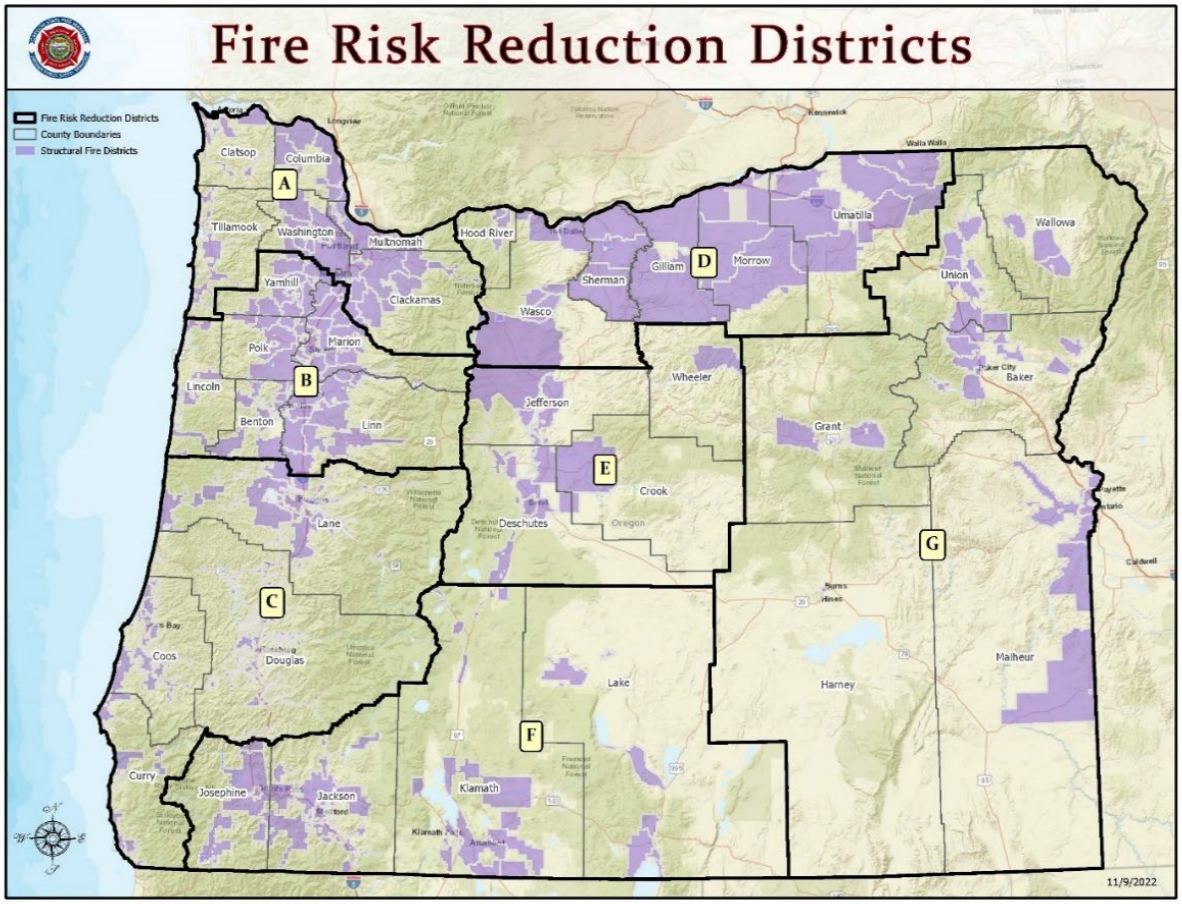


Figure 14 - OSFM Risk Reduction Districts in Oregon. [Response Ready Districts] have different boundaries.

Federal Wildfire Management Partner

U.S. Forest Service (USFS)

The eastern extent of Multnomah County includes two USFS management areas, represented in this plan by wildfire management specialists from the Mount Hood National Forest. USFS is a key partner in initial wildfire attack coordination in their management areas and shared information and resources for wildland fuel mitigation and fire detection.

Interactive version of this map

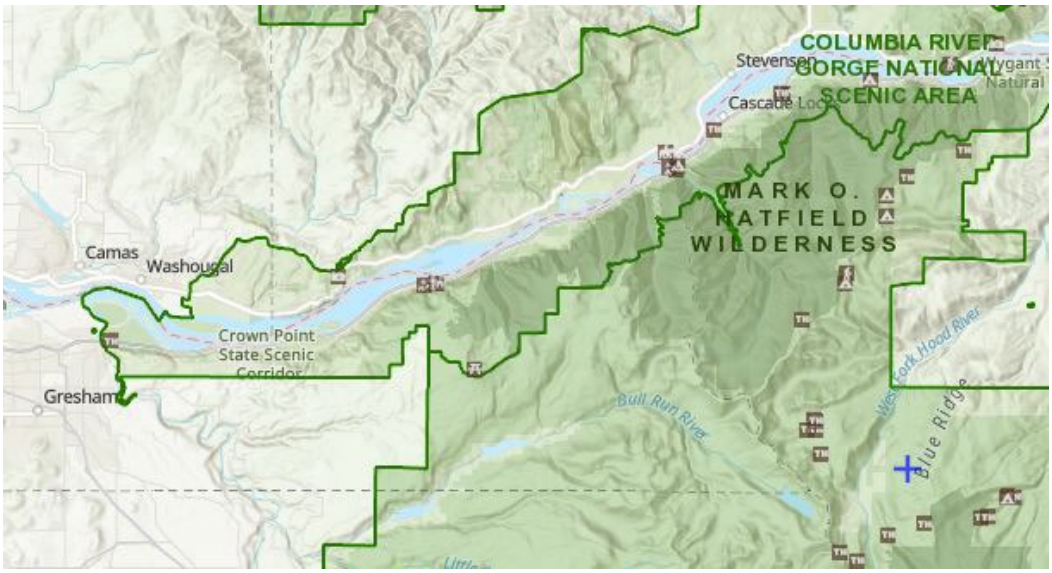


Figure 15 - US Forest Service management boundaries. The area south of the Columbia River Gorge National Scenic Area is all part of the Mount Hood National Forest.

Along with these fire management agencies, a number of other governmental departments, special districts and investor-owned electric utilities participated in this process.

- City of Portland Bureaus
  - Portland Parks and Recreation (PP&R)
  - Portland Water Bureau (PWB)
  - Bureau of Environmental Services (BES)
  - Bureau of Planning and Sustainability (BPS)
  - Bureau of Development Services (BDS)
  - Portland Bureau of Emergency Management (PBEM)
  - Portland Office of Budget and Management – Homelessness and Urban Camping Impact Reduction Program (HUCIRP)
  - Portland Police Bureau (PPB)
- City of Gresham Natural Resources Program
- Multnomah County/Joint City-County Departments
  - Multnomah County Emergency Management (MCEM)
  - Joint Office of Homeless Services (JOHS)
  - Multnomah County Office of Sustainability
  - Multnomah County Department of County Services - Land Use Planning, Transportation
- **Metro Parks and Nature** – Manages 120-130 natural areas across the region, including key wildfire risk areas at Oxbow Park, Willamette Cove, Smith & Bybee Wetlands, and properties adjacent to the Springwater Trail in Gresham. A continuing operating levy originally passed in 2013 and continued by regional voters in 2022 is allowing Metro to create site stewardship plans that align ecosystem restoration goals with wildfire risk reduction, including through invasive species removal, native plantings and prescribed

fire at some sites.[31] These plans are shared with local fire districts, and continuing coordination is needed with firefighting partners and with the public about natural area risk reduction efforts.

- **Oregon Parks and Recreation Department** (OPRD) – Manages several state parks in Multnomah County, including Tryon Creek State Natural Area, Dabney State Recreation Area, Lewis and Clark State Recreation area along the Sandy River, and numerous sites in the Columbia River Gorge. ODF provides wildland fire protection for Oregon state parks.
- Electric Power Utilities – Each of the major power utilities in Multnomah County participated in the development of this plan, with key intersections coming in mutual support of vegetative fuels reduction, fire weather forecasting, fire detection, operational response, and preventative action to reduce wildfire ignition. The three utilities represented in this plan maintain their own annual Wildfire Mitigation plans that define their risk and action strategies for reducing harm from future events.
    - **Bonneville Power Authority** (BPA) – Wildfire Mitigation Plan (2022)
    - **PacifiCorp** (Pacific Power) - Wildfire Mitigation Plan (2023)
    - **Portland General Electric** (PGE) - Wildfire Mitigation Plan (2023)
- **East Multnomah Soil and Water Conservation District** (EMSWCD) is a public unit that serves the entirety of Multnomah County east of the Willamette River. The district is a non-regulatory body that provides education and grants that promote the protection of natural lands and resource lands−including the promotion of native fire-adapted landscapes.
- **West Multnomah Soil and Water Conservation District** (WMSWCD) is the same type of unit as EMSWCD, but serves all areas in Multnomah County west of the Willamette River and all of Sauvie Island. The district guides conservation efforts on privately held lands to benefit wildlife, ecosystems, and the public. WMSWCD has been working with landowners to reduce risk through invasive species management and the promotion of defensible space by benefitting resilient native ecosystems.

[31] Creating healthy habitats and reducing wildfire risk at Graham Oaks, Metro, January 13, 2022

5.1.4 Wildfire Risk Assessment Introduction

Wildfire is not a new phenomenon in what is now Multnomah County. Fire has been part of this landscape since time immemorial and shaped the lives of native residents long before colonization and statehood. Fire is an important determinant of the health of native ecosystems, but can be incompatible with human development, requiring a balanced understanding of risk acceptance, disaster preparation, and resilience building.

Wildfire risk in western Oregon's wet climate has been historically different from other parts of the state. The wet climate supports rapid vegetation growth and typically keeps vegetation moist enough to limit extreme fire behavior through the dry summer period. However, during extended periods of drought this productive growing climate creates a huge mass of dry wildfire fuel. When conditions become severe enough, large 'stand replacement' fires become possible–fires so large that parts of forests are burned to the ground and then completely regenerate.

In comparison, dry forests in other parts of Oregon have historically had lower intensity fires every decade or so that clear forest litter and support the growth of large trees without killing them. It is important to recognize this difference, because a single statewide strategy around wildfire and land management will not have the same effectiveness in these different types of fire-adapted ecosystems.

Some pressing wildfire risks for Multnomah County are that:

- The county contains a variety of natural and built landscapes, creating the potential for many different types, frequencies and severities of wildfires.
- Infrequent but highly destructive fires are normal for the fire ecology of the region but create an extremely dangerous interface with development and the county's large population living in Wildland Urban Interface areas, and those risks may be difficult to mitigate.
- Statewide or regional mapping programs may classify the risk of wildfire in Multnomah County as low because of the smaller annual likelihood of fire compared to other parts of the state, which may impede the communication of wildfire risk and reduce access to statewide mitigation and prevention programs.
- Impacts of climate change, including to fire weather and local wildland ecologies, are altering risk in Multnomah County in ways that are not yet fully understood, and that also add to vulnerabilities to the county's large population.

The West-Side Fire and Climate Adaptation Research Initiative was launched in 2018 and is based in the U.S. Forest Service's Pacific Northwest Research Station. The initiative is working to develop more information about fire behavior in west side forests, which have not been studied as much as dry forests. The 2020 statewide fires burned extensively on the west side of the Cascades, and study indicated that those fires were consistent with the historical scope of wind and drought driven fire-and that adaptation in west side communities will have to be more reliant on "ignition prevention, fire suppression, and community preparedness".[32]

[32] Cascadia Burning: The historic, but not historically unprecedented, 2020 wildfires in the Pacific Northwest, USA; Reilly, Matthew J.; Zuspan, Aaron; Halofsky, Joshua S.; Raymond, Crystal; McEvoy, Andy; Dye, Alex W.; Donato, Daniel C.; Kim, John B.; Potter, Brian E.; Walker, Nathan; Davis, Raymond J.; Dunn, Christopher J.; Bell, David M.; Gregory, Matthew J.; Johnston, James D.; Harvey, Brian J.; Halofsky, Jessica E.; Kerns, Becky K.; Ecosphere, 2022

Figure 16 - Changing wildfire risk conditions in west side forests, from a Story Map called A "New Normal" for West-Side Fire. US Forest Service Pacific Northwest Research Station.

This section will explore different ways of evaluating Multnomah County's wildfire risk, including a look at historical fires and what current risk mapping tells us about the probability of wildfire, where it is most likely to occur, and who and what it puts at risk.

How is Wildfire Risk Determined?

The 2011 CWPP created an original risk map by assigning points for types of fuels, weather considerations, topography, historic fires sites, ignition sources, community values, and fire protection capability. The points were used to score areas as having extreme, high, medium, or low risk.

Since the 2011 plan was approved, new external risk mapping has been created which uses similar inputs in a more complex model to generate an analysis consistent for all of Oregon and Washington. Because of this new mapping, it was determined that a county-specific re-analysis was not required. Overall, the areas identified as being at risk have not significantly changed since the 2011 analysis, and landscape level risk areas are well understood by local fire districts.

Updated mapping is an identified mitigation need described in this plan, but that mapping is more likely to be sought at a neighborhood level and for purposes beyond just fire risk (for evacuation planning for example) to better understand small-scale vulnerabilities caused by unmapped intersections between fire potential and human development.

5.1.5 Wildfire Risk and Vulnerability Data

Nearly all of the data used in this plan comes from the Pacific Northwest Qualitative Wildfire Risk Assessment (PNW-QWRA), a detailed study of wildfire conditions in Oregon and Washington originally published in 2018 by Pyrologix in coordination with the U.S. Forest Service.

Quantitative Wildfire Risk Assessments are a tool that assists land management decision making by characterizing the benefits and risks from fire across a number of values.[33]

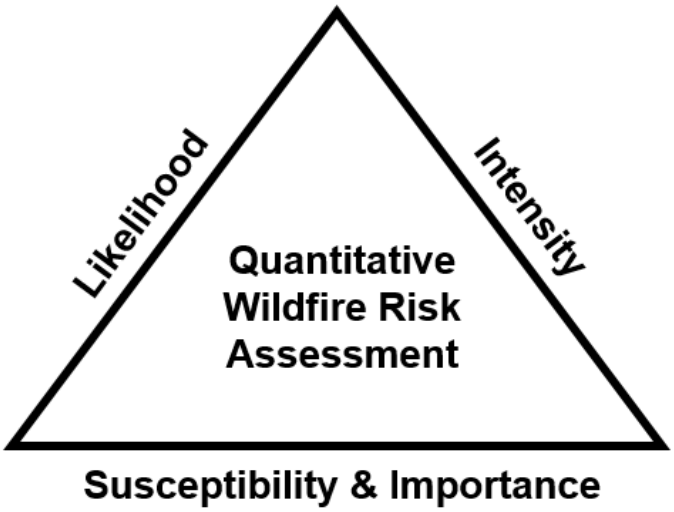


Figure 17 - QWRA analysis process. Figure from IFTDSS.

A number of dimensions of wildfire risk from the QWRA are hosted on the Oregon Wildfire Explorer, a site maintained by the Oregon Department of Forestry, which provides additional layers that can be used for spatial analysis purposes that inform planning. The PNW-QWRA includes an overall risk rating, but that is not used in this plan. Because it is a relative rating for Oregon and Washington and heavily uses annual fire probability in its calculation, it classifies most locations in Multnomah County as at low or moderate risk. This does not effectively capture the risk to Multnomah County from extreme weather driven events and periodic catastrophic fire in such a populated county. Instead, maps have been used that show Wildland Urban Interface areas and potential impact locations, as these better capture the large amount of people and structures at risk from periodic wildfire.

The Oregon Wildfire Explorer has mapping applications for public and planning use[34], with the planning version having additional data layers. The public map is simplified to provide residents tools to evaluate risk where they live and generate site-specific maps.

The PNW-QWRA uses methodology consistent with other QWRAs−assessing in all locations the probability and severity of wildfire hazard multiplied by the exposure and susceptibility of resources in those locations. In this analysis, *exposure* consists of the structures and other resources in a particular location and *susceptibility* is how damaged those resources would be from different intensities of fire.

[33] About Quantitative Wildfire Risk Assessment, Interagency Fuel Treatment Decision Support System
[34] Both versions are publicly available and can be used to generate risk information by address.

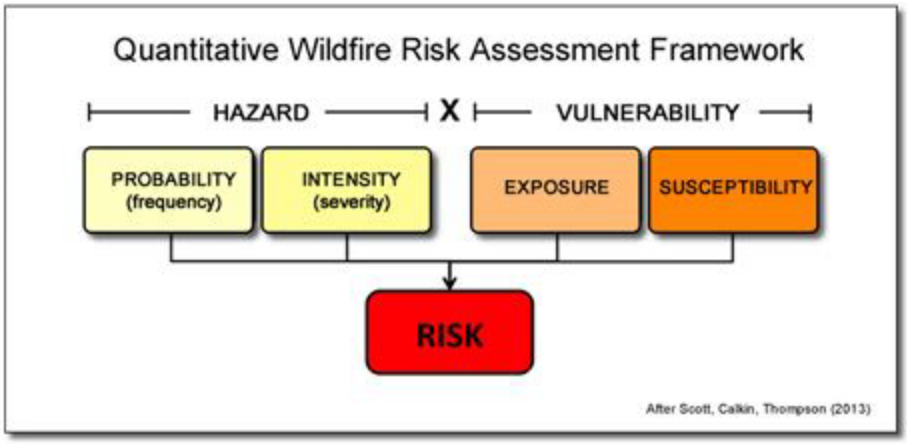


Figure 18 - The elements of a Quantitative Wildfire Risk Assessment from page 9 of the PNW-QWRA.

The baseline for mapping wildfire risk in the PNW-QWRA is the location of a potential wildfire of 250 acres or more. This provides a good foundation for understanding where risk exists for fires to escape control, but may omit some small-scale risk, although many known areas of isolated risk in urban areas are successfully captured by the analysis.

Another limitation of the PNW-QWRA is that it is a snapshot of risk at a moment in time and must be updated frequently to account for changes in risk caused by climate change and new development. A revised PNW-QWRA analysis is expected to become available later in 2023.

A statewide ODF risk map is expected to supersede the PNW-QWRA data when it is released in 2023, and how the revised PNW-QWRA may support future local CWPP uses is not currently known. It is expected that statewide and regional risk mapping will continue to be an active project, and local stakeholders will have to be proactive in assessing and integrating new mapping as it is released.

5.1.6 Wildfire History

Four historic fire events (or group of events) are described with greater detail in this section. These fires represent some of the wildfire types of highest concern:

- Large wilderness fire
- Large mixed forest wildfires
- Small urban wildfire
- Catastrophic weather-driven WUI event

History shows that some of the largest fires in Oregon's recorded history have occurred in northwest Oregon, such as the Tillamook Burn between 1933 and 1951, the million-acre 1865 Silverton Fire, and the 1849 Siletz Fire. Fires from the mid-19th century are not included in this section because they predate modern wildfire management and response, but they further indicate the historic prevalence and risk of infrequent but extremely large wildfires in this region.

- ***EAGLE CREEK FIRE (2017)***

On September 2, 2017, the Eagle Creek Fire ignited in the Columbia River Gorge. For years, concern of a large fire in the gorge had been feared, and smaller incidents had occurred periodically during late-summer wind events. By the time the Eagle Creek Fire was controlled over two months later, it stood as the largest fire in this county since at least the 1902 Yacolt Burn.

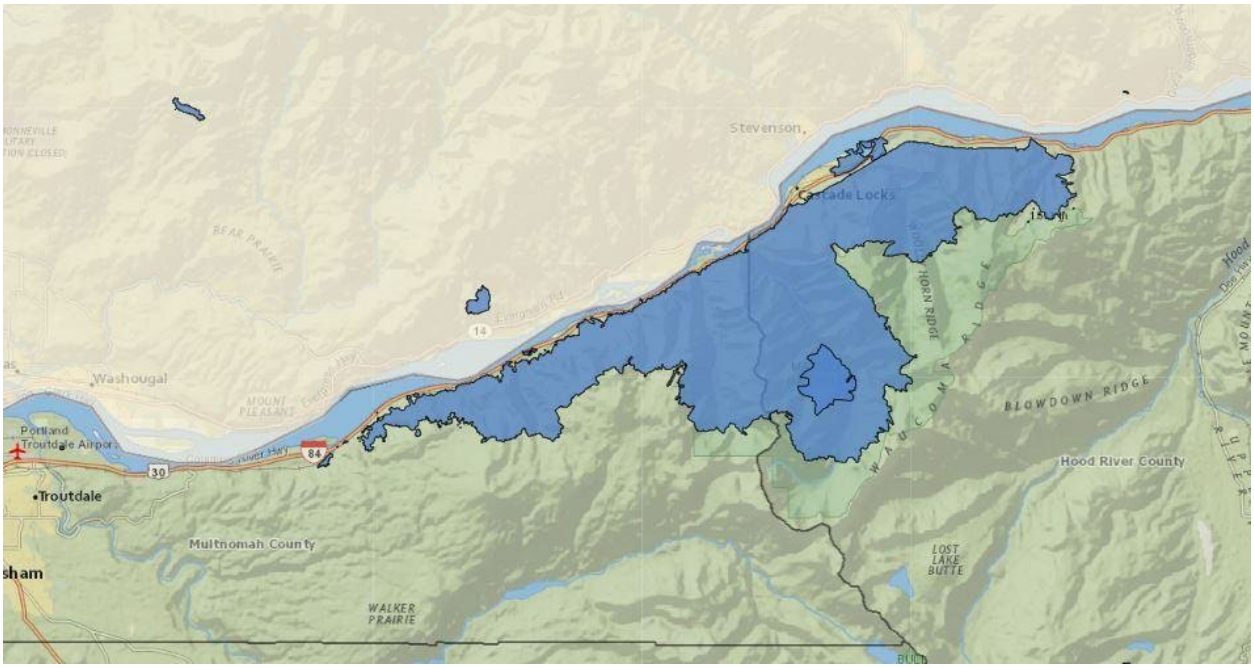


Figure 19 - Perimeter of the Eagle Creek Fire. The origin point was right in the center of this area, at the county line between Multnomah and Hood River Counties. Smaller spot fires started by embers crossing the Columbia River into Washington are also shown. Map from US Forest Service.

The day the fire started, strong easterly winds were blowing and the Columbia River Gorge was exceptionally dry. In these highly dangerous conditions, a recreational trail user threw a lit firework from the Eagle Creek Trail into a steep canyon at about 4:30pm. Air resources were used to attack the fire in the first four to five hours, but the rapid spread trapped 150 hikers who were forced to spend the night in place before being evacuated the next day.

The fire moved quickly over the next days as the high winds drove it rapidly to the west. By the end of September 4, the fire had grown to over 14,000 acres and had pushed all the way towards Bridal Veil, at the western extent of the final fire perimeter. The communities of Bridal Veil, Corbett, Dodson and Warrendale were placed on Level 3 evacuation notice (Go!), the historic Multnomah Falls Lodge was threatened, and spot fires started across the Columbia River in Washington.

September 5 was the single largest day of growth as the fire reached to almost 30,000 acres as it moved mostly south into steep terrain in the heart of the Mark O. Hatfield Wilderness, moving closer to the protected Bull Run Watershed. The fire also began to move to the east, pushing to Highway 84 just across from the Bonneville Dam.

As the fire continued, it began to slow and shifting winds began to primarily move the fire eastward, where it flared up to threaten Hood River County communities beginning on September 10. Remaining fire growth in Multnomah County was at the southward boundaries of the fire perimeter.

Figure 20 - Looking west along the Columbia River from Angel's Rest. Photo US Forest Service

When the fire was considered to be under control on November 30, it had burned about 48,000 acres in Multnomah and Hood River Counties, cost $20 million to fight, destroyed four structures and caused four minor injuries.[35] At the peak of response, 1,060 personnel fought the fire to prevent it from spreading into populated areas and destroying cultural resources.

Areas burned in the fire were almost entirely federal lands.[36] Some of the most significant post-fire impacts were long-term closures of area transportation routes and highly valued recreational areas. Trains were stopped for three days, Highway 84 was closed at least partially for 19 days, and parts of the Historic Columbia River Highway were closed as late as the winter of 2021 because of post-fire landslide risk. Burn scar areas created ongoing risk of flooding, rock fall and debris flow on steep slopes above the gorge and in interior valleys.

Within two years of the fire, 70% of closed trails had been reopened,[37] and the forest's resilience to fire was in evidence. The fire burned almost exclusively in forested areas (primarily Western Hemlock Zone), which are in an ongoing regeneration process,[38] with the presence of invasive weeds among the primary management concern.[39]

As with most large fires, burn severity was mixed, with about 15% of the fire perimeter seeing high severity soil impacts (red), 30% with moderate effects (yellow), and the remaining 55% with low impacts (green).

[35] Eagle Creek Fire, At A Glance Facts, May 2018 – US Forest Service
[36] About 1,300 acres burned on state lands and just 232 acres of private land were located in the fire perimeter.
[37] 'The Gorge Isn't Dead': Weekend Marks 2 Years Since Eagle Creek Fire, Oregon Public Broadcasting, Meerah Powell, August 31, 2019.
[38] A Year On, See How the Eagle Creek Fire Changed the Columbia River Gorge, Northwest Public Broadcasting, Cassandra Profita, September 6, 2018
[39] Forest Regeneration After Eagle Creek Fire, Columbia River Gorge National Scenic Area

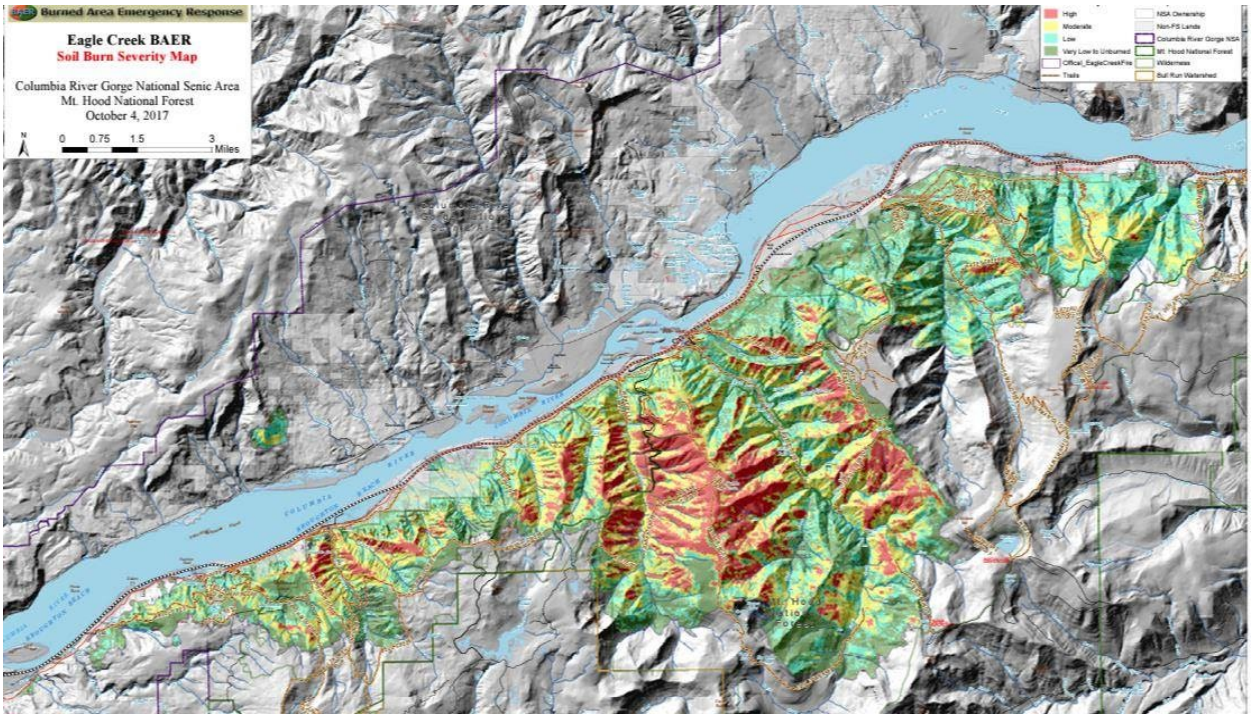


Figure 21 - Soil burn severity map of the Eagle Creek Fire showing locations of higher and lower intensity. Areas in red are high intensity, yellow is medium intensity and green is low intensity. Map from US Forest Service.

The fire was a confirmation of large wildfire risk in Multnomah County forests. The relatively small loss of structures was a testament to effective fire suppression efforts, but the fire was traumatic for communities that were forced to rapidly evacuate, and the long-term loss of popular recreational spaces affected the community at large. Winds moved the fire quickly through Multnomah County but then shifted, helping prevent the fire from moving farther into the county's Wildland Urban Interface areas. Fire remains unpredictable, but east county residents must remain aware of risks as similar or even larger fires are still very possible.

- ***WEST HILLS/FOREST PARK FIRES (1940, 1951)***

It has been a longer time since a severe fire has burned the West Hills/Forest Park area, but history shows that major fires are a significant recurring risk there as well. During very active wildfire conditions in northwest Oregon (the recurring fires of the Tillamook Burn occurred from 1933-1951), the West Hills area suffered multiple fires. The largest previous fire had been the 1889 Balch Creek Canyon fire (see under other fires), and a large 1939 fire in Dutch Creek Canyon in Columbia County that burned in similar fuels, topography, and conditions.

Figure 22 - 1940 Wildfire burning along NW Germantown Road, as seen from Downtown Portland. Photo from The Oregonian photo archives

The length of time since the last major fire in this area indicates a growing risk. The west side of Multnomah County has a mix of old-growth forest and mixed forests and grasslands that intersect with human uses. Buildups in wildfire fuels in some areas are increasing the probability of a large fire, and additional development has increased vulnerability. These historic fires also provide a sense of what recurrence intervals may be for uncontrolled fires driven by extreme weather conditions.

The 1940 Bonny Slope Fire started on August 17 during a period of high temperatures and strong winds. Three hundred twenty-five people fought the fire and 150 homes were evacuated. About 3,000 acres in Forest Park burned, destroying 11 structures along Bonny Slope between Skyline Boulevard and Cedar Mill. The cause of the fire was never determined.

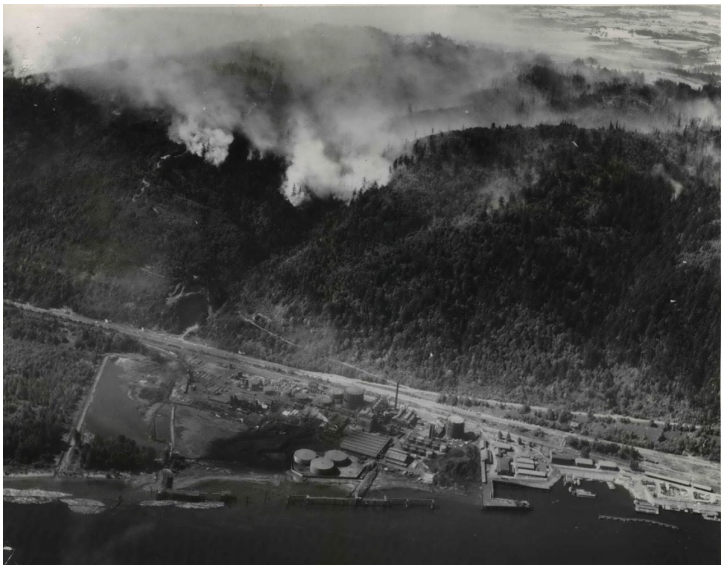


Figure 24 - 1951 wildfire coming over the ridge towards the Willamette River in Portland. Photo from The Oregonian photo archives

Figure 23 - Damage from the 1951 wildfire in Forest Park. Photo from The Oregonian photo archives

The next major West Hills/Forest Park fire started on August 19, 1951, near Leif Erikson Road in Forest Park. Over 500 City of Portland staff battled the fire, which crossed Skyline Road and spread into Bonny Slope and broke towards Forest Heights. Forest fire conditions in 1951 were considered to be unusually severe in western Oregon, with extremely dry conditions.[40]

The fire burned about 2,400 acres in the heart of Forest Park and served as a call for increased wildland fire training in the City of Portland. The Portland Parks Bureau later evaluated the burned area, with natural post-fire recovery resulting in a high amount of regeneration of deciduous trees[41] that have shaped the current forest mix.

- ***PORTLAND URBAN WILDFIRE (2019)***

A small 2019 fire in the City of Portland is included, as it shows that risk from wildfire can exist even at very small scales outside of large wooded tracts and can harm urban neighborhoods. When conditions are severe enough, almost any vegetated areas can become an ignition point for wildfire that can threaten nearby development.

[40] Comparative ratings of 1951 forest fire weather in western Oregon, United States Forest Service.
[41] Forest Park Planning Team Identifies Desired Future Condition, 2007.

Figure 25 - - Aftermath of the urban wildfire on SE 82nd Avenue in Portland. Aerial photo from Portland Fire and Rescue

The 2019 fire was caused by arson, and burned about four acres in an overgrown grassy lot that had previously been a golf driving range along NE Siskiyou Street and NE 82nd Avenue, not far from Rocky Butte. The fire occurred on August 26, 2019, during a red-flag warning when fire weather was considered to be extreme.

Although the fire was extinguished quickly, the small fire burned five structures, including two businesses and three homes, and destroyed a large number of cars parked in a commercial lot. The fire had limited long-term impact, but it caused about as much structural damage as the Eagle Creek Fire because of where it started.

The fire raises a need for continuing management of small risk areas in all Multnomah County communities with preparation activities, fire prevention efforts, and fuel treatments.

- ***ALMEDA DRIVE FIRE, JACKSON COUNTY, OREGON (2020)***

The Almeda Drive Fire is the only fire included in this chapter that occurred outside of Multnomah County, burning in Southern Oregon during the destructive 2020 Oregon wildfire season. Although the location of the fire occurred in a different wildfire regime, this event is still notable because of what it shows us about catastrophic weather-driven wildfire in urban locations and how wildfire is increasingly threatening populations with barriers to preparedness, resilience, and recovery.

The 2020 Oregon wildfire season burned over 1 million acres and destroyed over 4,000 homes. The Almeda Drive Fire was not one of the larger fires of the season in size, only burning about 3,000 acres (about 6% the size of the Eagle Creek Fire). The fire was contained in about a week, but despite its small size the Almeda Drive Fire was the single most destructive fire in all of Oregon in 2020, destroying at least 2,600 homes and killing three people.

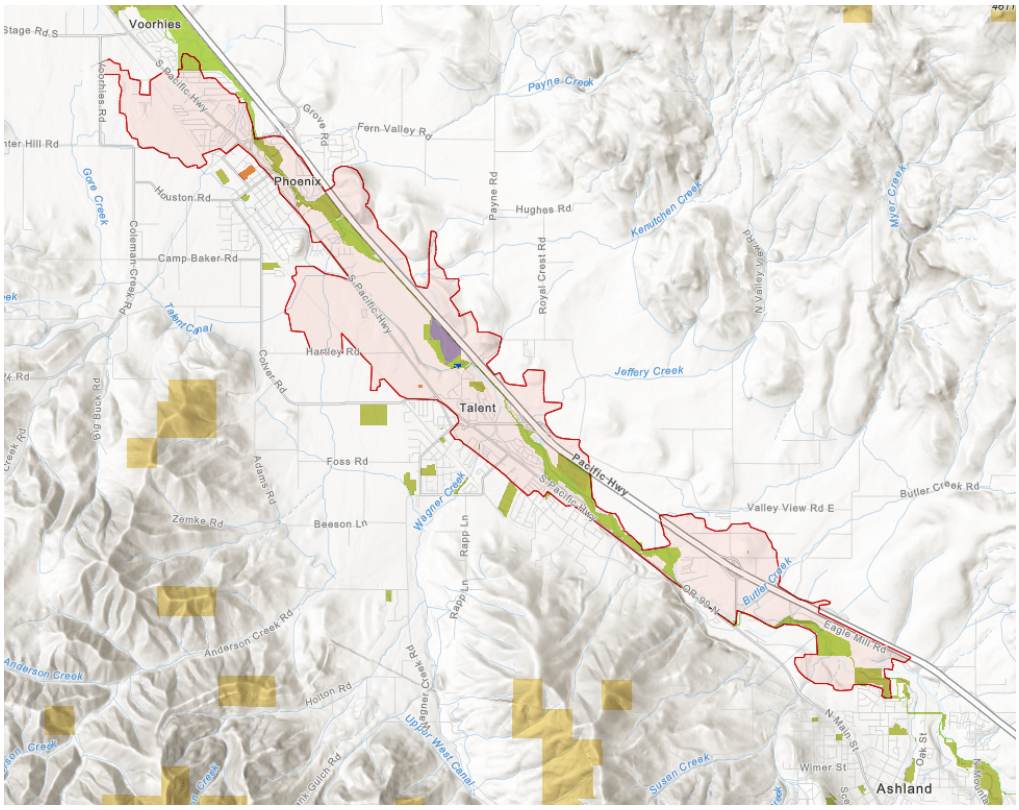


Figure 26 - A map showing the burn area of the Almeda Drive Fire. Map created by Rich Nauman. Green areas are city and county parks, and the purple area is a federal rest area on Interstate-5.

The Almeda Drive Fire started on September 8, at the same time that extreme drought conditions intersected with a statewide high-wind event, creating dozens of new fires and exploding existing fires into infernos across Oregon. The cause of the Almeda Drive Fire is still as yet unknown, but the origin point was identified in a grassy field surrounded by homes and a wastewater treatment plant.[42]

With winds gusting 40 miles per hour, the fire moved five miles along Interstate 5 to the edge of the City of Talent just two hours after ignition. Four hours after ignition it had moved another four miles along the highway to the City of Phoenix.[43] Nearly all of the fire's destruction occurred in a single afternoon.

Of the some 2,600 structures burned, 1,500 were manufactured homes mostly located in a series of densely built parks. These manufactured homes were a considerable portion of the Medford region's affordable housing. Those impacted were disproportionately Hispanic, many of whom did not have fire insurance. The event was a mass displacement disaster, with, by one account, more than 3,000 people dislocated from neighborhoods, schools and services.

The elements of this fire that are significant for Multnomah County wildfire mitigation planning are that:

- the fire started and fully burned in an urban valley, not in wildlands or forested uplands;

[42] Two years later, Almeda Fire remains under investigation, Ashland.news, Bert Etling, September 6, 2022
[43] Mapping the Almeda Drive Fire, Rich Nauman, ESRI, October 9, 2020.

- the fire started as a grass fire and traveled through transportation right-of-ways, and woods and invasive shrub fuels along the Bear Creek Greenway and other parklands; and
- the fire was especially harmful to locations with dense, lower-cost housing where residents faced significant barriers to resilience and recovery.

Other Fires of Note

Bull Run Watershed Fires – 1493, 1663, 1693, 1873, 1881

Research of trees in the Bull Run Watershed show how wildfire has been a periodic event even in the extremely wet old-growth forests of Multnomah County. The fire in 1493 is believed to have burned the entire watershed, while the other years noted here averaged about 5,000 acres burned per event.[44]

1889 – Balch Creek Canyon Fire

This fire burned approximately 9,000 acres, beginning in a canyon adjacent to what is now the Willamette Heights neighborhood in Portland. The fire burned west over the ridgeline of the West Hills into what is now the Cedar Mill neighborhood of Portland. This is the largest fire in western Multnomah County in over 100 years.

1900 – Tryon Creek

The area that is now Tryon Creek State Recreation Area had been a timberland used for charcoal production. A fire in 1900,[45] of unknown size, reportedly burned down the trees and ended the site's suitability for industrial use.

September 1902 – Yacolt Burn

The Yacolt Burn was a series of fires that became one of the largest wildfire events in the recent history of the region. The majority of impact from the fire occurred in Washington, but the first fire is believed to have started in Multnomah County by children attempting to burn a hornets' nest, with blowing embers then igniting fires in Washington.

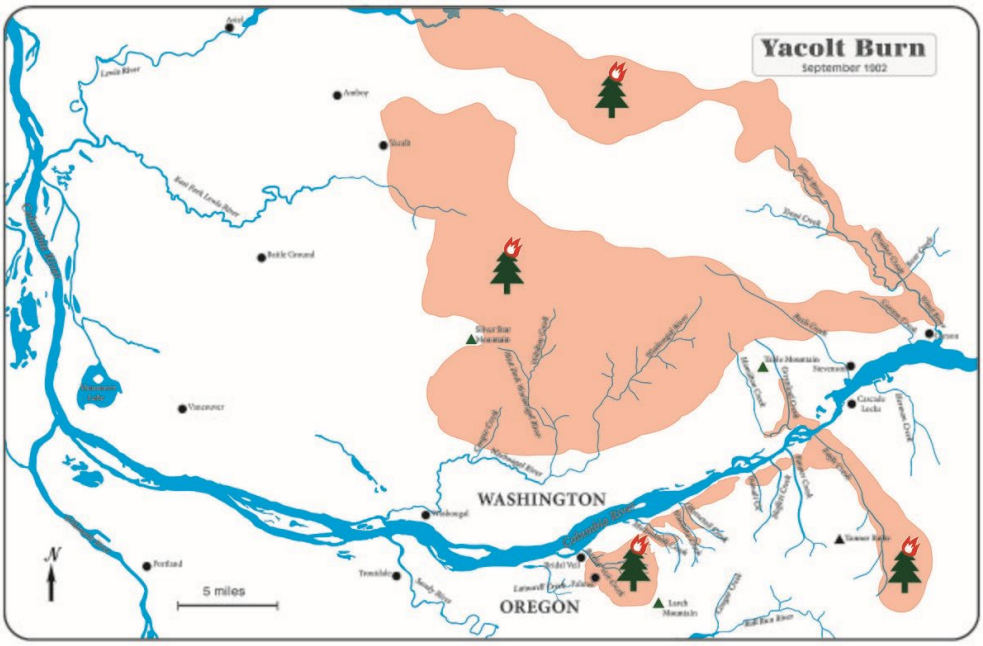


Figure 27 - Map of the burn area of the Yacolt Burn. Map from Wikipedia

[44] About the Bull Run Watershed, Portland Water Bureau.
[45] Tryon State Park, Oregon Encyclopedia

The initial fire started on September 8, after a dry summer and during a strong easterly September wind event.[46] The fire burned 238,000 acres in total.

September 1971 – Skyhook Fire

The Skyhook fire burned nearly 2,000 acres in the Mount Hood National Forest and on private timberlands in Hood River and Multnomah Counties. The fire was in a logging area[47] and was started by slash pile burning fanned by 60 mile per hour winds.[48]

October 1991 – Falls Fire

The Falls Fire burned 1,430 acres[49] in steep terrain between Multnomah Falls and Bridal Veil in the Columbia River Gorge, pushed west by 20 mile per hour easterly winds. The fire required the evacuation of 75 residents in Bridal Veil and reportedly came within 10 feet of the Multnomah Falls Lodge, which had been covered in fire retardant. The Columbia Gorge Scenic Highway was closed between Larch Mountain and Multnomah Falls.

Figure 28 - 1971 Skyhook fire in eastern Multnomah County. Photo from the 1971 National Forests in the Pacific Northwest report.

August 2001 – Mocks Crest Fire

This fire started at the base of the Willamette Bluff in Portland, in an industrial area below homes. During the five-alarm fire, flames rose to 100 feet[50] in height before City of Portland firefighters were able to get it under control with no homes lost, after five hours and 38 acres burned. The cause of the fire was reported to be sparks from a passing train which were fanned into a large fire by 18-20 mile per hour winds. The same area saw a smaller ten-acre fire the next year, burned again in 2011,[51] and again in 2018 in the same location as the 2011 fire,[52] which was able to be quickly suppressed because of a lack of wind.

Powell Butte Fires, 2002-2012

Powell Butte, in East Portland, has been the site of a number of small brush fires over the last twenty years. The 603-acre City of Portland nature park has also been the site of controlled burns to limit grassy fuels.

[46] The Yacolt Burn of 1902, University of Washington State Climatologist, September 2015.
[47] 1971 National Forests in the Pacific Northwest report.
[48] Information from 2013 Hood River Community Wildfire Protection Plan.
[49] https://www.oregonlive.com/history/2017/09/eagle_creek_fire_not_first_tim.html
[50] https://www.seattlepi.com/local/article/Train-started-blaze-gives-Portland-a-big-night-1062322.php
[51] https://www.portlandoregon.gov/fire/article/365650
[52] https://www.portlandoregon.gov/fire/article/365616

Wildfires occurred in 2002, 2003, and 2012. None of these fires caused significant damage and in total burned less than 100 acres.

September 2005 - Vista House Fire

A 10-acre fire that started on a trail about half a mile from the Vista House, just off the Historical Columbia River Highway. The cause was not determined and Corbett Fire provided the initial attack.

2020 Sauvie Island Grass Fire

A 91-acre grass fire of unknown origin[53] started near a beach at Willow Bar on Sauvie Island on July 25, in the middle of the long, destructive statewide drought and wildfire season. The fire was located just across the Columbia County line on the island, but the fire was extinguished by Sauvie Island Fire with support from Portland Fire and Rescue brush units, and the Multnomah County Sheriff's Office helped summer visitors exit the island.

Figure 29 - Smoke from the 2020 Riverside Fire as it moved just outside of Estacada, in Clackamas County. Photo from the U.S. Forest Service.

2020 Labor Day Fires

Although no major wildfires escaped control in Multnomah County, the wind-driven explosion of fire in September continued to raise awareness of risk, and created a catastrophic local wildfire smoke event. Forest Park in Portland was closed for the first time in history because of the extreme risk.[54]

The massive 138,000 acre Riverside Fire in neighboring Clackamas County destroyed over 50 homes and caused at least a Level 1 evacuation zone (Be Ready) across the entire county. Although there were no evacuation levels established in Multnomah County, concern was high in neighborhoods closest to Clackamas County. Some Clackamas County residents fleeing the Riverside Fire found evacuation shelter in official and spontaneous sites in Multnomah County.

5.1.7 Wildfire Probability and Location

Probability of wildfire can be determined through analyzing historical frequencies of fires over long periods of time, and by developing models of expected return periods of fire based on different types of wildfire fuels and climates.

Determining probability, however, is challenging because of the unpredictable nature of when and where fire starts and which fires become large enough to cause damage. As many as 98% of all wildfires less than 250 acres and 99% of all reported wildfires are suppressed in the initial

[53] Portland Fire & Rescue twitter, July 25, 2020 (includes video)
[54] Neighbors near Portland's Forest Park organize to reduce wildfire danger, Oregon Public Broadcasting, Sage Van Wing, June 5, 2022

attack.[55] The specific frequency and location of fire in Multnomah County is highly dependent on rare weather-driven conditions intersecting with the elements of the wildfire behavior triangle and an ignition source. Additional factors that contribute to a fire escaping control, such as starting in an area without early detection or in an otherwise difficult location to access, are also factors.

Wildfire being relatively infrequent in this climate adds to difficulty in modeling fire probabilities, compared to larger historical fire datasets built from tree-ring research in drier locations. Wildfire in this region is also very subject to natural climatic cycles that create periods of higher and lower risk and cause clusters of events. Western Oregon is believed to have had a period of widespread fire between 1400 and 1650, followed by a low fire period between 1650 and 1800.[56] Fire frequency since 1800 has been heavily influenced by increased settlement and then by effective fire suppression. Impacts of climate change are also a challenge for current analysis.

That said, return intervals for wildfire can be established and modeled based on fuel types. This analysis of 'fire regimes' classifies how ecosystems have co-evolved with fire and adapted to and influenced naturally occurring fire patterns. These regimes have been altered by human activities, including more frequent fire ignition and fire suppression.

Fire regime analysis was the primary tool used in the 2011 version of this plan. The map of surface fuel groups shown below stands in for previous fire regime data. In these fuel groups, timber litter areas are those with closed canopies leading to slow-burning ground fires (unless under severe weather conditions) because of a lack of undergrowth.[57] Timber understory fuel groups have a larger amount of forest floor debris and shrub growth.

Interactive version of this map – (Fire Model Inputs and Fuelscapes - Fuel Model Groups)

[55] The challenge of quantitative risk analysis for wildland fire, Forest Ecology and Management, Mark A. Finney, 2011
[56] Regional synchroneity in fire regimes of western Oregon and Washington, USA, Forest Ecology and Management; P.J. Weisberg, F.J. Swanson; 2003
[57] Surface Fire Behavior Lookup Tools, National Wildfire Coordinating Group

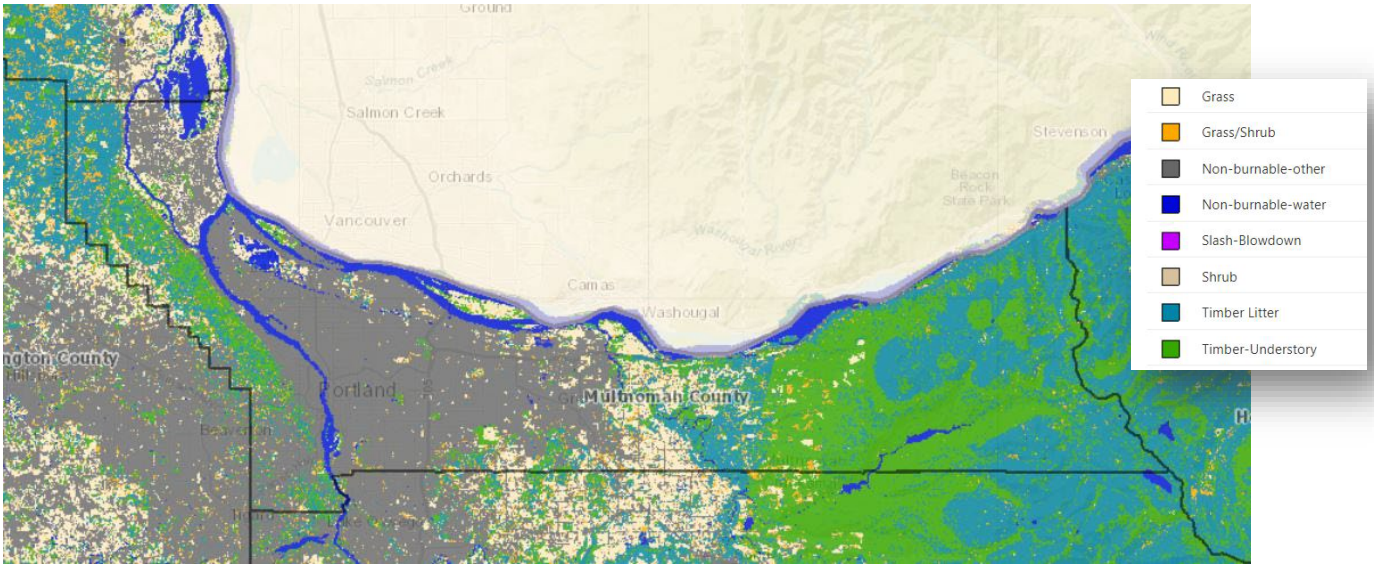


Figure 30 - Map showing locations of wildfire fuel groups in Multnomah County. Map information from the PNW-QWRA, with updated analysis conducted after the Eagle Creek Fire.

Generally, fire regimes in Multnomah County forests indicate infrequent but severe burning, with recurrence of stand replacement fire happening every 50-200+ years, depending on the timber fuel group. Grass and shrub areas have much more frequent burn cycles in this analysis, burning over less than every 35 years, but with lower intensity. Some analyses of the high-severity regimes in western Oregon place cycles for stand replacement fire at well over 200 years.

The PNW-QWRA has provided a new fire burn probability map that identifies an annual chance of a fire greater than 250 acres. Areas in Multnomah County were classified in low, moderate, and high risk of burn probability, in a classification relative to all other locations in Oregon and Washington.

- Areas of high probability are shown in yellow, and were evaluated to have a 0.2-2% chance (50 to 500 year event) of having a fire over that size in a given fire season.
- Areas of moderate probability are shown in green (aqua), and were evaluated to have a 0.02%-0.2% chance (500 to 5,000 year event) of having a fire over that size in a given fire season.
- Areas of low probability are shown in blue, and were evaluated to have a less than 0.02% chance (less frequent than every 5,000 years) of having a fire over that size in a given fire season.

Interactive version of this map – (Wildfire Threat - Burn Probability)

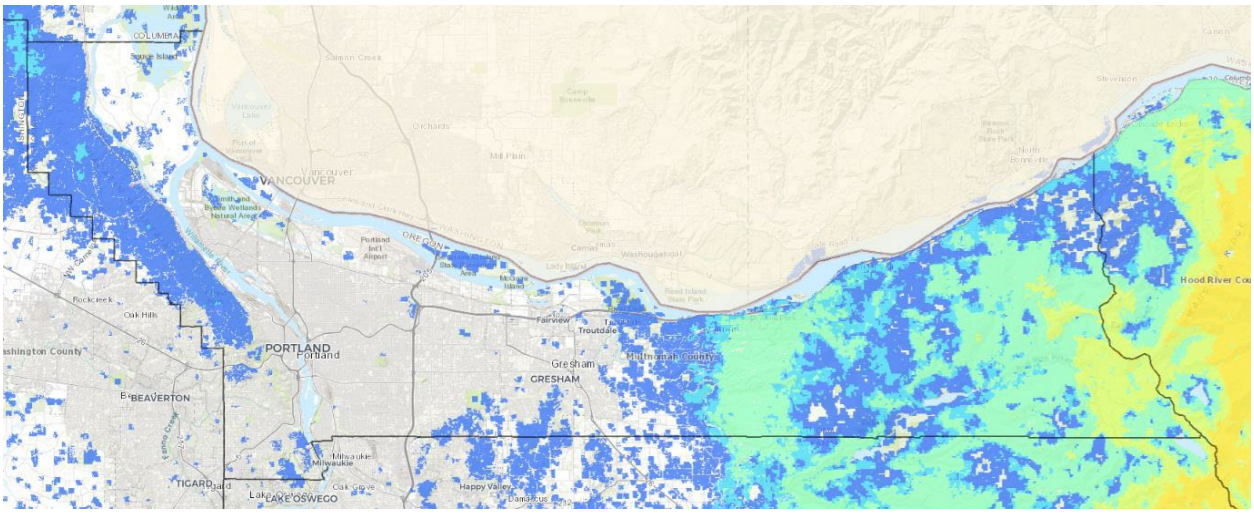


Figure 31 - Map showing burn probabilities across Multnomah County. Data comes from the 2018 PNW-QWRA.

This analysis provides some additional clarity for the probability of fire impacting county residents at a property level, which cannot necessarily be understood from return intervals of fire over an entire ecosystem. However, the extremely long duration between events at the property scale may give residents the impression of less risk, and the PNW-QWRA notes that these probabilities do not fully account for extreme climate conditions. This analysis also appears counter to fire regime analysis, because it shows the towering east county forests as having higher burn probability than more mixed-severity forests in the western part of the county. This may reflect fire protection analysis, as a 250-acre fire in more remote locations with rugged topography would cause much less vulnerability and would be managed differently than a similarly sized fire in Forest Park or outside Corbett.

In recent history, since the urban settlement of the county and under modern fire suppression capabilities, fire frequencies can be very roughly estimated from events. Two extremely large fires have occurred in the Columbia River Gorge over the last 120 years, while the Forest Park/West Hills area has seen three major fires over that time period. This is still, however, a small number of events from which to draw conclusions and cannot effectively account for increasing risk from climate change effects.

Potential Locations of Future Fires

The likeliest locations of future wildfires are already shown by probability data. Factors that especially influence where future fires may be more likely are given further consideration in this section.

Projected flame heights are an indication of where a wildfire can more rapidly spread and escape initial attack. Fires with just four feet of flame height become too intense for fire responders to attack directly and are high enough to create fire spread from embers landing ahead of the main fire. The map below shows areas in the county with conditions most likely to have flame heights of four feet or higher. Much of the highest probability is concentrated in the timber understory forest regimes in the east of the county, which is partly why those areas have higher probability of 250-acre-or-greater fire than more vulnerable WUI areas. However, fires of these heights are also projected in parts of Forest Park/West Hills, Gresham's East Buttes, along the Sandy River, and other locations.

Interactive version of this map – (Wildfire Threat - Probability of Exceeding 4' Flames)

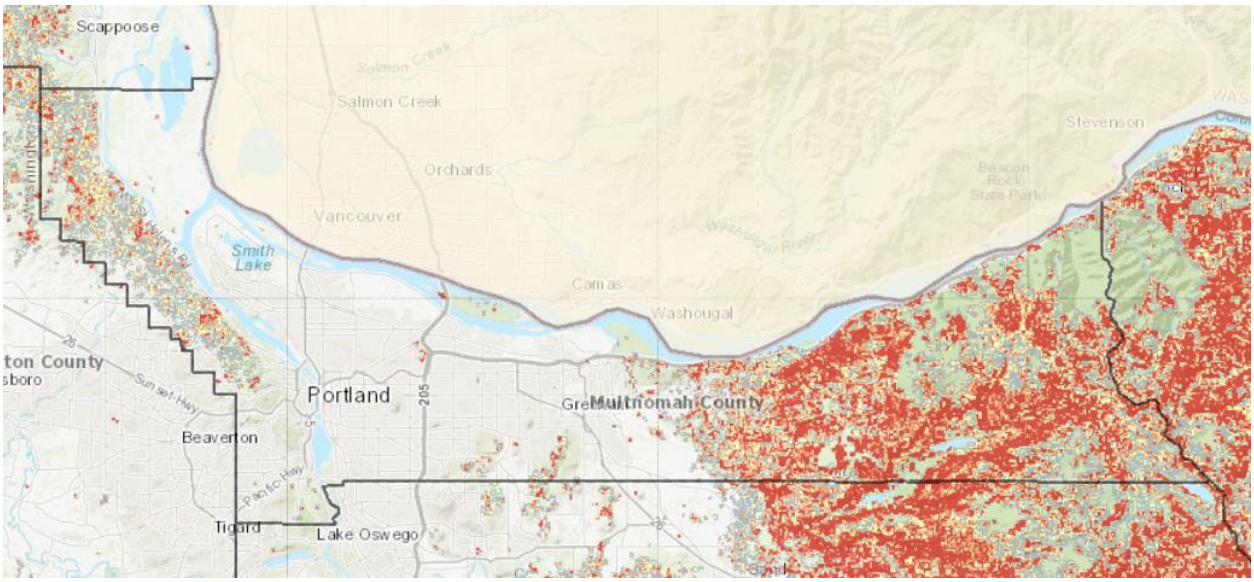


Figure 32- Locations of projected flame heights greater than four feet. Data from the 2018 PNW-QWRA .

The other major factor in evaluating where fires are most likely to start is where wildfire fuel overlaps with intensive human uses. Wildfires are either caused by a variety of human sources or by lightning.[58] Some human causes of recent major fires have been arson, fireworks, open burning, cigarettes, power infrastructure, and equipment and vehicles.

In southern and eastern parts of Oregon, lightning is a significant cause of wildfire ignition, but it is rarely a factor in fires in Oregon's Willamette Valley and Coastal Range. Lightning can occur in Multnomah County, and lightning-driven wildfire is especially dangerous because it can start wildfires in multiple locations at once, making it much more difficult to prevent fires from escaping control. Summer thunderstorms are unusual in northwest Oregon, but there is some evidence that weather pattern disruptions caused by climate change are altering the distribution of lightning events.[59] Because of the potential catastrophic nature of weather-driven wildfire in Multnomah County, it will be important to continue to monitor potential changes in late summer/early fall weather systems.

Interactive version of this map – (Fire History and Active Fires - Fire Locations 1992-2019)

[58] There are a few very rare other natural causes, such as volcanoes and meteors.
[59] Variation of lightning-ignited wildfire patterns under climate change, *Nature Communications*, F. Perez-Invernon, F. Gordillo-Vazquez, H. Huntreiser, P. Jockel, February 10, 2023

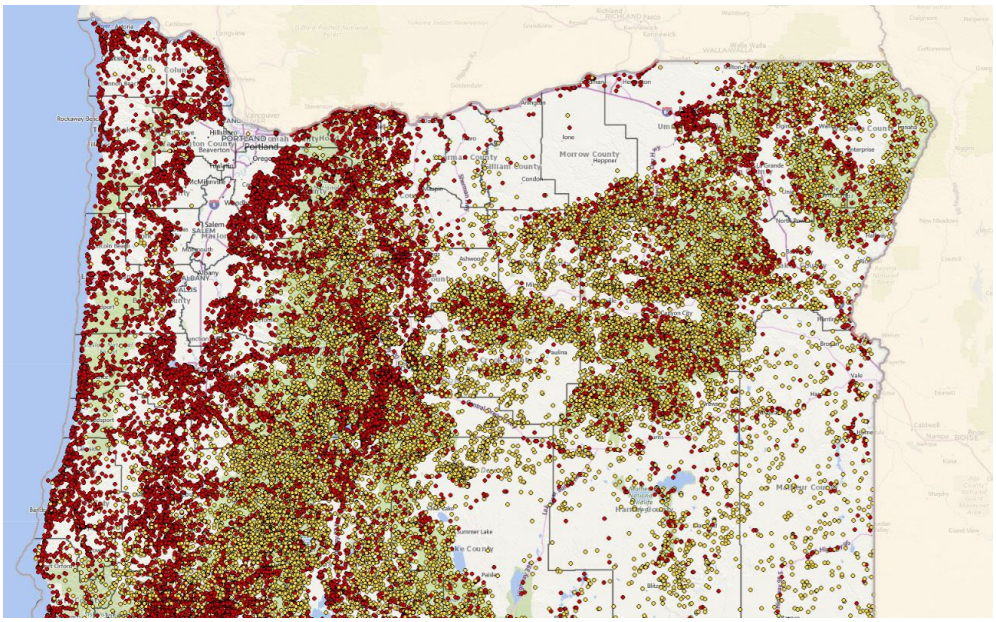


Figure 33 - Map showing locations of wildfires between 1992 and 2019 as recorded by the Oregon Department of Forestry. Human-caused fires are red and lightning-caused fires are yellow, showing the tremendous disparity in wildfire causation in different parts of the state.

Wildfires in Multnomah County over a 27-year period show almost none being caused by lightning. Vegetated areas where people live, work, and recreate are the most likely ignition points of future wildfire. The risk from human ignition in populated areas during extreme weather conditions is of particular concern, as these ignition locations may not be well captured as risk areas in burn probability or fire regime mapping.

Interactive version of this map – (Fire History and Active Fires - Fire Locations 1992-2019)

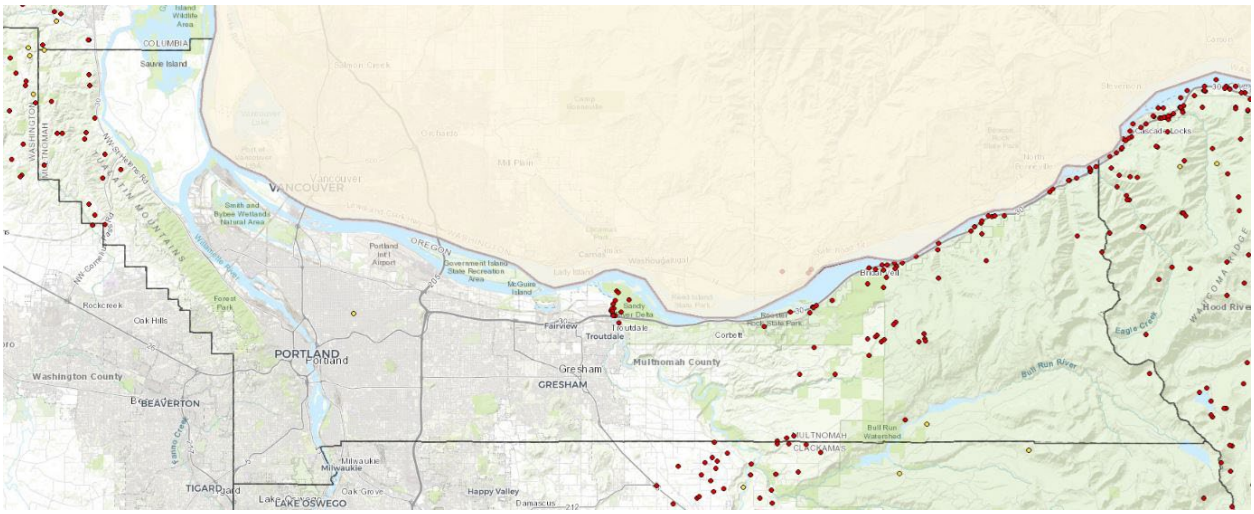


Figure 34 - Map showing wildfire ignition sites in Multnomah County between 1992 and 2019. Human-caused fires are marked in red, and lightning-caused fires in yellow. Note that this data is provided by ODF, so data was not collected in urban core areas between the agency's service boundaries.

The tables and charts below have been provided by the Oregon State Fire Marshal (OSFM), with greater detail of ignition sources over the period between 2016-2020. This information collects fire data from the entire year and of fires of all sizes–creating some limitation in understanding which risks may be the most significant during extreme fire weather.

But the data does further demonstrate that wildfire in Multnomah County is a human-driven event, with only 1% of over 11,000 outdoor fires in that time period being of natural cause. This data underlines the importance of fire prevention tools and public engagement to prevent fires during high-risk periods.

The five-year trend identified in the OSFM data shows a sharp increase in outdoor fires over the previous four years. It is not known what the cause of this rise is, although longer fire seasons may contribute, as well as the increase of unsheltered residents living outdoors. All defined types of fires increased in that time period, but outdoor fires increased the most.

Multnomah County – Fire Incidents by Category 2016 – 2020

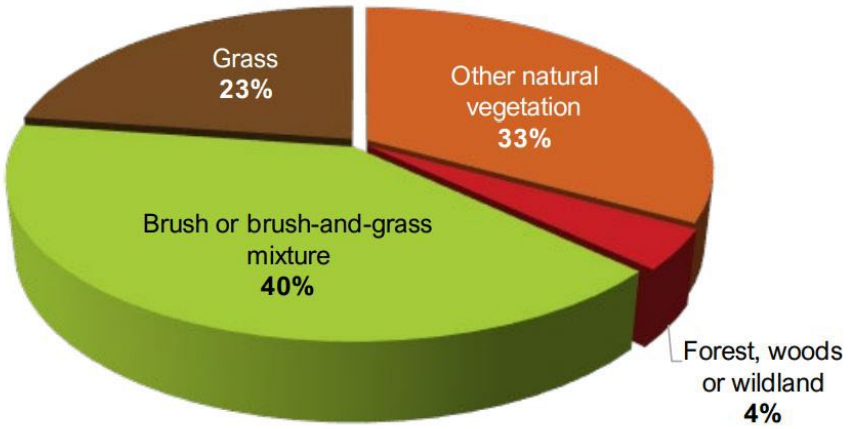
Structure Fires: (houses, buildings, cooking, chimneys, mobile property-fixed structure, etc.)
Total: **3,822** Annual Average: **764** Five-Year Trend: **+10%**

Vehicle Fires: (cars, trucks, trains, aircraft, boats, RVs, etc.)
Total: **2,096** Annual Average: **419** Five-Year Trend: **+14%**

Outdoor Fires: (natural and cultivated vegetation, outside rubbish/trash, outdoor equipment, etc.)
Total: **11,013** Annual Average: **2,203** Five-Year Trend: **+27%**

Other Fires: (fires reported without a specific incident type)
Total: **211** Annual Average: **42** Five-Year Trend: **-74%**

Natural Vegeation Fires by NFIRS Incident Type 2016 - 2020



Cause of Ignition	Fires	Pct
Unintentional	6,841	62%
Intentional	1,957	18%
Undetermined	1,631	15%
Other	288	3%
Under investigation	143	1%
Act of nature	77	1%
Failure of equipment or heat source	60	1%
Not Reported	16	<1%

Outdoor Fires Cause of Ignition

Outdoor Fires Top 10 Heat Sources

Heat Source	Fires	Pct
Cigarette	4,541	41%
Undetermined	2,679	24%
Lighter: cigarette, cigar	719	7%
Hot or smoldering object, other	613	6%
Heat from other open flame or smoking materials, other	519	5%
Flame/torch used for lighting	497	5%
Hot ember or ash	278	3%
Fireworks	251	2%
Heat from undetermined smoking material	157	1%
Spontaneous combustion, chemical reaction	94	1%

5.1.8 Wildfire Vulnerability

Due to the difficulty in predicting the time and location of future fires, for Multnomah County, for Multnomah County the potential *impacts* of future fire are the most important to understand in evaluating risk. By focusing on the vulnerability of people, structures, infrastructure, and key

natural resources, Multnomah County can become more resilient to fire across the whole county.

Two maps are used in this plan to express vulnerability:

- A Wildfire Urban Interface (WUI) map, which shows locations where development is within or near wildfire risk areas. This map is based off of ODF's statewide WUI analysis, current as of 2017.
- A Potential Impact Map, which identifies locations where wildfire would be most damaging to important resources. This map was created as part of the PNW-QWRA and includes critical infrastructure, recreation sites, housing unit density, historic structures, timber, municipal watersheds, and wildlife habitat among vulnerable resources.

These maps work well together as a full measure of vulnerability. The WUI map includes neighborhoods that are not in locations with fire ignition risk but are close enough to potential burn locations that embers could put them at danger from a structural conflagration. However, the WUI map does not include vulnerability where there are less than one residence per 40 acres, so risks to valuable resources other than housing are not captured. The Potential Impact Map fills that gap and also provides more varied levels of impact across the county, making it more suitable for identifying specific locations of highest mitigation need.

Both of these maps are also shown under each fire district subsection to provide a more local snapshot of vulnerability. Both maps are available to the public and can be used to determine vulnerability at a property level.

Interactive version of this map – (Planning and Cadastral - Oregon WUI Hazard Rating)

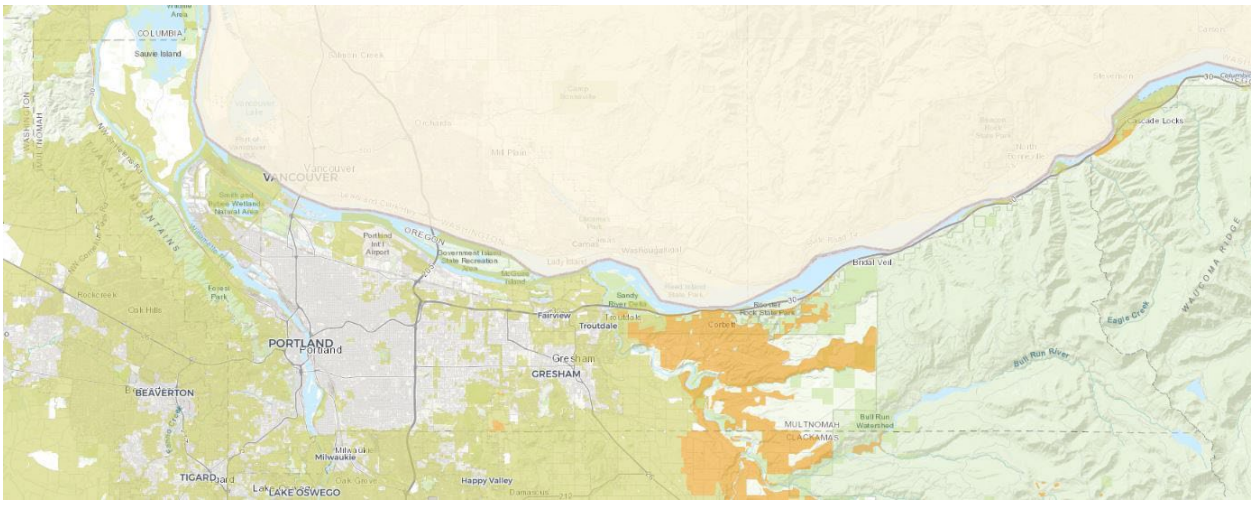


Figure 35 - Multnomah County WUI Hazard. Orange areas are those with moderate hazard (relative to statewide ratings) and green areas have lower hazard.

The WUI map, shown above, identifies the location where development and wildfire risk intersect, and also classifies that risk into degrees. The orange areas have higher WUI risk than the green areas, due to being closer to areas with higher potential for large fires. However, the map indicates broad susceptibility to wildfire in Multnomah County and can be used to more fully identify residences and businesses where enhancing defensible space and wildfire preparation would be valuable.

The WUI map is also an effective tool for identifying neighborhoods and other residential locations with residents that may not be aware of their wildfire risk and would face significant barriers to recovery from wildfire loss.

The Potential Impact map classifies risk into very high (dark red), high (red), moderate (orange), and low (yellow) impacts and also includes locations where fire could be a benefit to natural systems (green) and would not immediately threaten structures or infrastructure.

Interactive version of this map – (Wildfire Potential Impacts - Overall Potential Impact)

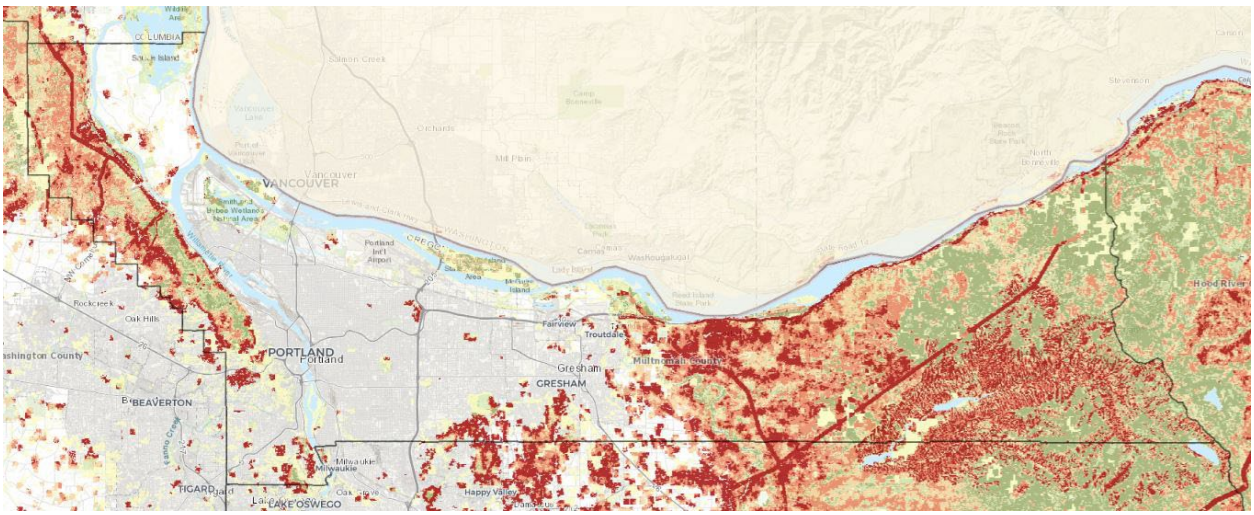


Figure 36 - Map showing overall potential impact of wildfire across Multnomah County. Map from PNW-QWRA.

This map does not classify areas of impact in relation to fire probability. This also makes the map valuable for planning purposes, as it reflects the uncertainty of where extreme weather driven-fire may occur in the future and instead focuses on areas most needing fire suppression, risk awareness and preventative action by residents and land managers.

Equity Impacts

The PNW-QWRA does not currently include social vulnerability as a factor in its overall impact mapping, although this is being considered as an additional input in the next version. Developing a better understanding of where wildfire risk creates increased risks to underserved populations is likely to be best determined at the local level and will be an ongoing priority for plan participants.

Infrastructure and Cultural Resources

Types of infrastructure that are included in the potential impact analysis are electric transmission lines, railroads, highways, cell towers, recreational sites, and historic buildings. Wildfire can shut down infrastructure during events and can damage even non-burnable facilities at high intensity. Some of these infrastructure types are also subject to damage and disruption from post-fire debris slides.

Watersheds are also included in the analysis, and the Bull Run Watershed in the southeast of the county is one of the most important civic assets, as the source of drinking water for residents of Portland and other communities in the region. A significant wildfire could be harmful to the water system by causing eroded sediment and debris to enter reservoirs. A more detailed consideration of the Bull Run Watershed is included in the City of Portland subsection.

Natural Resources

Effects to timber resources and to land and aquatic ecosystems are part of the impact mapping as well. Ecosystem effects are measured by how fire helps or harms certain endangered species in their range, and how it impacts the condition of local forests and other vegetation types. Many of these natural resource considerations benefit from low-intensity wildfire.

5.1.9 Concurrent Hazards and Recovery Planning

Post Wildfire Flood and Land Movement

Wildfire causes significant risk of flooding and increased runoff for years[60] after a fire. Wildfires destroy vegetation that holds slopes in place and also chemically alter the soil to make it much less able to absorb water. When heavy rains occur within the first few years after a fire, rates of runoff increase in speed and can cause flooding or carry sediment, rocks and trees in a dangerous channelized debris flow[61] that can travel over a mile, depending on the terrain.

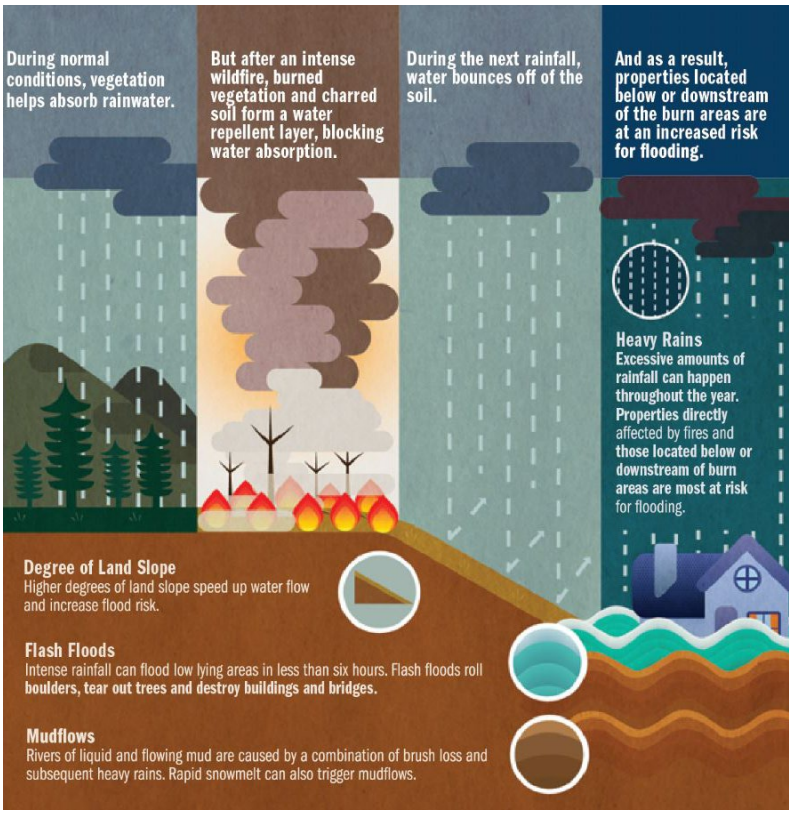


Figure 37 - Graphic from the National Flood Insurance Program explaining the risk of post-wildfire flood. More information on this risk can be found from the National Weather Service.

This effect was seen after the Eagle Creek Fire, as a huge area of increased flood and landslide risk was mapped and efforts were made to stabilize slopes in the Columbia River Gorge and prevent landslides from blocking highways and rail corridors. Despite these efforts, a fatal landslide occurred in the Dodson area of eastern Multnomah County in January 2021. The Dodson landslide occurred in a high-risk area with a history of previous landslides, but was also within the burn perimeter of the Eagle Creek Fire, which likely contributed to the tragic event.

The most recent catastrophic example of post-fire debris flows was in 2018 in Montecito, California. Huge fires burned through December 2017, and when a storm front moved in on January 8 with heavy rain, flows of debris as much as 15-feet high swept into the city and killed 23 people.

The lengthening of fire seasons is increasing this risk, as it becomes more likely that recently burned areas will interface with winter storms in a shorter time-frame. This plan does not contain mitigation strategies for post-wildfire landslide risk, which may also be part of Natural Hazards Mitigation Plans under examinations of landslide/land movement risk. Post-fire landslide conditions on U.S. Forest Service lands are mapped by Burned Area Emergency Response

[60] https://www.usgs.gov/centers/california-water-science-center/science/post-fire-flooding-and-debris-flow
[61] Information on post-fire debris flow is available from the Oregon Department of Geology and Mineral Industries (DOGAMI). DOGAMI is currently studying how wildfires impact channelized debris flows, with a project based on Eagle Creek and a number of 2020 Oregon fires expected to be completed in 2024.

(BAER) teams, with data used to evaluate post-fire threats and to attempt to stabilize areas with increased risks.

Post-Earthquake Fire

The risk of wildfires after an earthquake are not well studied. Fire is a common consequence of earthquakes, but risk is primarily understood as an urban, structural risk. If a large earthquake occurred at the peak of fire season, it is not inconceivable that a large wildfire could be triggered from burning structures or equipment. This concurrence of events is unlikely (major earthquakes have a roughly 300-500 year return interval in Multnomah County), but it would be difficult to fight a wildland fire in a post-earthquake environment with blocked and damaged roads and extreme emergency response needs across the county.

Recovery Planning

Multnomah County will be updating its recovery plan in the coming years, as part of a regional effort to define how to equitably and efficiently bounce back from disasters. The regional framework that was created in 2019 through the Regional Disaster Prevention Organization is intended for use in all hazards, but does not contain specific recovery strategies for wildfire.

Because specific locations of wildfire risk can be mapped and include the potential for significant loss of homes and life, it is recommended that future recovery planning include wildfire stakeholders and develop specific county strategies for avoiding disparate impacts to underserved communities in post-wildfire recovery