

>> Whatcom County

FIRE DISTRICT 19

Community

Wildfire

Protection

Plan

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Introduction

This is the first edition of the Community Wildfire Protection Plan (CWPP) for Whatcom County Fire District #19 created through collaborative efforts by students at Western Washington University and members of the District #19 Volunteer Fire Crew. This CWPP is intended to operate as a work in progress and will be regularly updated and maintained through a collaborative framework to ensure the provision of accurate and up-to-date information regarding wildfire risk and mitigation in Fire District #19.

Vision and Goals

The overarching vision of this CWPP is to protect lives, property, livelihoods and critical infrastructure through community outreach and collaboration, planning, and action.

This CWPP identifies potential evacuation plans that will reduce loss of life as well as buffer zones to protect lives, property and critical infrastructure. Additionally, this CWPP identifies actions that can be taken by individual property owners to reduce the ignitability of their properties to minimize or eliminate these types of losses.

The Whatcom County District #19 Community Wildfire Protection Plan recognizes the necessity of resilient, fire-adapted communities and identifies actions that support the development of such a community within the planning area. It is not a matter of if, but rather when wildfire will impact Fire District #19 or the surrounding area. How the community prepares for and responds to these events will determine their overall resilience.

Values

The residents within the fire district value their homes, their neighborhoods, their forests and their privacy. These are other community values identified during the development of this CWPP:

- Recreation
- Community Safety
- Firefighter training and safety
- Ecological health (clean water, clean air, forest health)
- Investing in the future

Planning Area

Regional Summary

The planning area of Fire District #19 is located within the Salish Sea Bioregion, approximately 6 miles south of the Canada-US border. This region includes the small town of Glacier in the North Fork Nooksack River Valley which totals an area of roughly two square miles. Glacier sits at an elevation of 906 ft, ten miles northwest of the Mount Baker Summit in Whatcom County, Washington. The CWPP will analyze within the designated boundary for Whatcom County Fire District 19, represented in Figure 1 below.

Glacier is the closest community to Mt. Baker, just a 20-mile drive to the Mt. Baker Ski Area. The town sees an influx of tourists and recreationalists during the winter months because of this. This also means that tourism plays a key role in the economy of the town.



Figure 1. Map of Fire Protection District 19 located within Whatcom County, Washington.

Existing Residential Areas

There are three existing residential communities within this fire district, Snowline, Mount Baker Rim, and Glacier Springs. Both are gated communities with moderate to high housing density. Both communities have gated emergency exits that require keys to open, which could delay evacuation efforts in the event of a wildfire. Data on the total number of residents in these communities is unavailable at this time.

Snowline Community

The Snowline property was deeded to the Sampson family in 1907 by the Federal Government as part of the Homestead Act. The Sampson cabin on this property was built in 1917 and was placed on the Washington State Registry of Historic Places in 1988 after being deemed a Historic Site (Snowline Community Club, 2024). Today there are 287 total lots in this neighborhood, about 9 of which are Community Club facilities, and over 250 of which are cabins. Figure 2 below is a map of the community sourced

from their Club website. There are many recreational and gathering spaces in Snowline, including a playground, picnic area, an outdoor pool, tennis and pickleball courts, a fishing pond, walking trails, a clubhouse, play fields and BBQ areas. There is limited to no cell service in the planning area, including within the Snowline community. Additionally, the internet is limited and slow, and power outages happen often. Snowline is bordered on one side by Mt. Baker Highway and is surrounded by Mt. Baker-Snoqualmie National Forest.

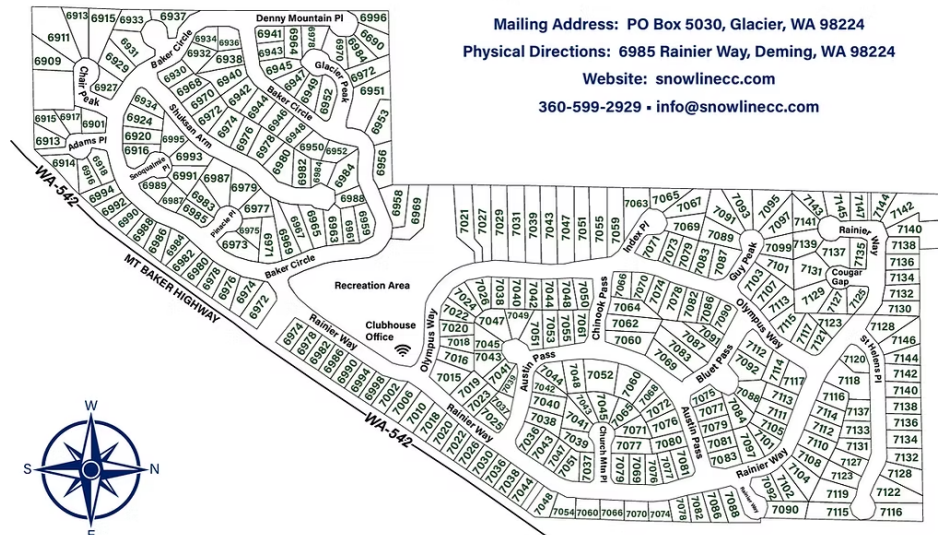


Figure 2. Map of Snowline Community Club (*Snowline Map | Snowline CC*).

Mount Baker Rim Community

The Rim Community is the largest community in the planning area with 490 lots and about 360 residences. Like Snowline, the Rim offers community members recreation areas such as a Clubhouse which sits above Glacier Creek, an outdoor swimming pool, a playground and community lawn area, an off-leash dog area, tennis courts and a pickleball court. Several of these areas are displayed in Figure 3 below.

Mail: P.O. Box 5074, Glacier, WA 98244-5074
 Phone: (360) 599-2946
 Fax: (360) 599-3313
 Web: www.mtbakerrim.com
 Email: office@mtbakerrim.com



**Mount
Baker
Rim**
Community Club

10315 Mt. Baker Highway
**Glacier,
Washington**

Figure 3. Map of Mount Baker Rim Community (*Map of MBR / Mt. Baker Rim*).

Glacier Springs Community

The Glacier Springs residential community is the smallest of the three communities in the planning area. The Glacier Springs subdivision spans roughly 120 acres including 283 lots pictures in Figure 4 with over 110 cabins (Glacier Springs, n.d.). The area was developed and sold by Glacier Springs Enterprises in the early 1970s. In 1971, Glacier Springs Property Owners Association (GSPOA) was established as a “non-profit community association” uniting property owners in overseeing the neighborhoods operation (Glacier Springs, n.d.).

Figure 4. Map of Glacier Springs Community ([Glacier Springs Site Map I Glacier Springs](#)).

Climate

Whatcom County Fire District #19 is situated in Western Washington, which has a temperate oceanic climate, characterized by warm, dry summers and cool, wet winters. Average annual precipitation in the area is high, averaging 75 inches of rainfall and 45 inches of snowfall per year (The Weather Network, 2024). It is important to note that due to climate change, there has been a reduction in precipitation during the summer, and an increase in rainfall during the winter and spring (USDA, n.d.).

This climate helps foster the growth of coniferous forests with a dense understory vegetation, creating a fuel-rich environment which elevates the risk of wildfires, especially during the summer months.

Stakeholders

As part of the continuation of this project, we would like to get as many stakeholders involved in the planning process as possible. Figure 5 depicts a map of major landownership within Fire District #19. The Forest Service owns most of the land in and around Glacier, so it is essential to partner with local representatives of the Mount Baker-Snoqualmie National Forest as this plan develops. Additional stakeholders would include the Glacier Water district, board members from both Snowline, Mt. Baker Rim, and Glacier Springs Community Clubs, local business owners, as well as encouraging public engagement in the process. Consideration of a wide variety of community

perspectives will enhance the robustness of this plan, ensuring that the plan caters to the needs and wants of the Fire District #19 community.

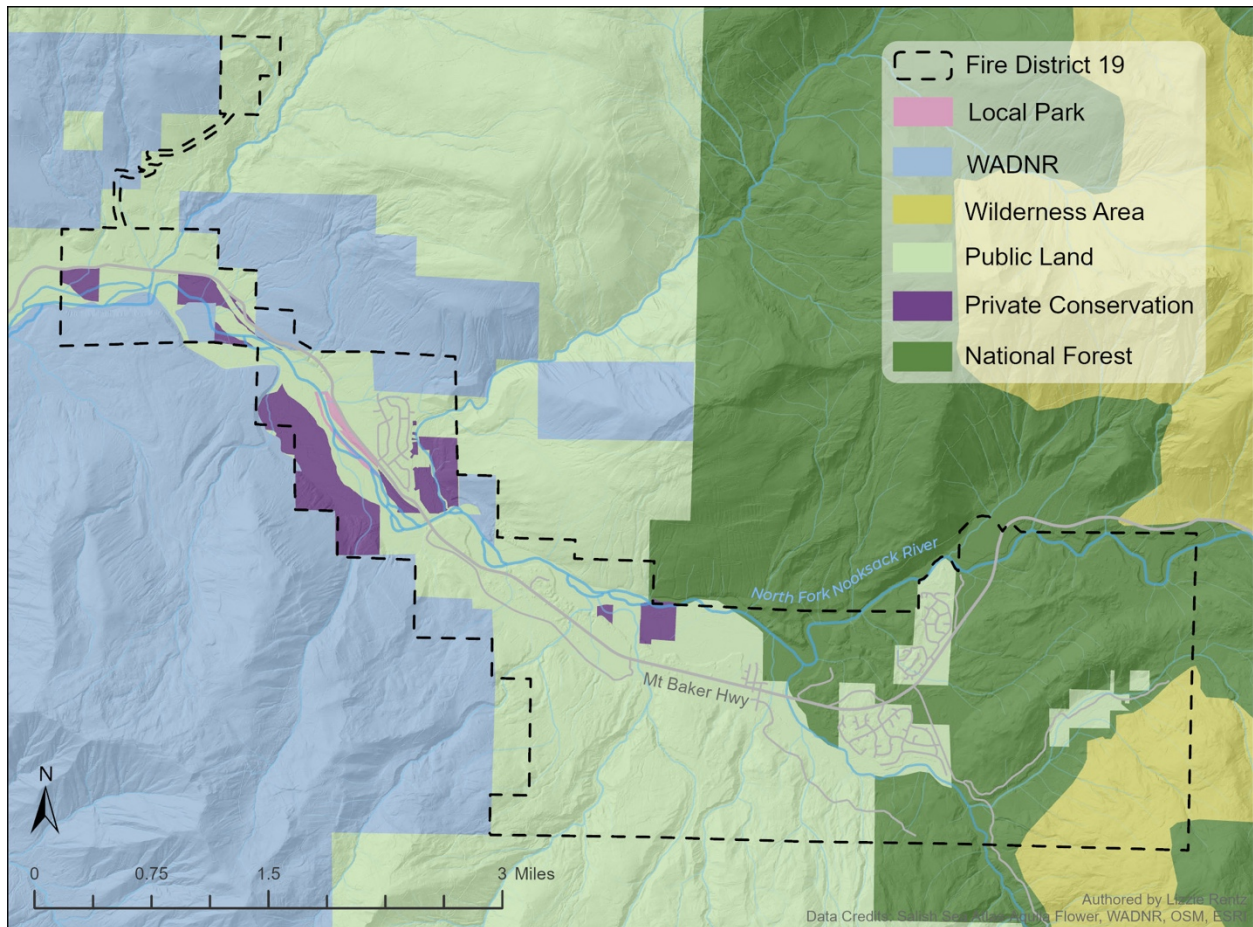


Figure 5. Map of major land ownership in Fire Protection District 19 excluding privately owned residences.

Demographics

According to the 2020 US Census, the permanent population of Glacier totaled 300 individuals across 118 households. By the end of 2024, the population of Glacier is projected to increase to 337, an overall 12% increase (Washington Demographics, n.d.). According to the U.S. Census Bureau, the homeownership rate is 70.3%. Over 90% of Glacier's population is white; round 5% identify as Hispanic or Latino, some other race, or two or more races. The median household income was \$30,714, which is less than half the national median of \$67,521, and less than a third of the state median of \$94,605. Approximately 41% are living in poverty, about four times the state poverty rate (U.S. Census Bureau, 2020).

Nooksack Tribe

The Nooksack (*Noxws'á?aq*) people have lived on the lands surrounding Mount Baker (Koma Kulshan) since time immemorial. A major settlement of theirs was located in Deming, just 20 miles downriver of Glacier (Snowater Association, 2001). The Nooksack peoples had camps all along the branches of the Nooksack River and steam beds for hunting and fishing (Snowater Association, 2001). They subsided mainly on the salmon that ran up the Nooksack River, along with wild game and root crops (Nooksack Tribe, n.d.). In 1855, Nooksack leaders, along with other Coast Salish leaders, were coerced into signing the Treaty of Point Elliot. This treaty maintained Nooksack fishing, hunting, and gathering rights, but took their land to be used for European homesteaders and eventually the state of Washington and the area of Glacier (Treaty of Point Elliott, 1885). While the census says no Native American people live in Glacier now, the current population has the responsibility to continue to steward the land as the Nooksack tribe had for millennia.

History

National Fire History

Prior to European colonization of North America, wildfires, both natural and human-caused, were used by Native peoples for many different purposes. Within the Pacific Northwest, tribes primarily used fire to clear out dense underbrush in local forests, allowing the land to be used for agriculture, grazing, travel, and many other uses including the suppression of more severe wildfires. As European colonists spread across the continent, displacing Native peoples from their ancestral land, cultural burning practices fell out of widescale use in favor of fire suppression (National Park Service, 2022).

In 1885, America's first wildfire control program was established in the Adirondacks Reserve in New York, which focused on putting out all fires regardless of severity. After the burning of five million acres in 1910, the U.S. Forest Service (USFS) implemented a strict "no burn" policy. Starting in 1926 the USFS began allowing fires of 10 acres or less to burn. However, in response to the 1933 Tillamook burn, the USFS mandated that all fires be put out by 10 a.m. on the day after the fire's discovery. This policy stood until 1971 when the USFS began to allow some small lightning fires as prescribed burns, and by 1988 policy changes allowed for many more natural wildfires to burn on federal land (U.S. Fire Administration, 2000).

Wildland Urban Interface

The Wildland Urban Interface (WUI) is the transition zone where structures or other human development border or intermingle with undeveloped wildland or vegetative fuels (US Fire Administration, n.d.). As human development continues to spread, an increasing number of homes are being built within the WUI. According to USFA, the WUI area in the US grows by approximately 2 million acres per year (US Fire Administration, 2020). With this expansion comes the increased risk of loss of life and property from wildfire.

Communities within the WUI can be categorized as interface (neighborhoods which extend into the forest) or intermix (groups of houses within the forest) and individual properties (isolated inholdings) within the forest. Additionally, the US Department of Agriculture and Interior defines an interface community as having a population density of 250 or more people per square mile, while an intermix community has 28-250 people per square mile (Nowicki, 2002). The Washington Department of Natural Resources categorizes all WUI within the boundaries of the Fire District #19 as intermix (Washington State Department of Natural Resources, 2024). Mitigation efforts in intermix communities are of high priority to protect life and property.

Wildfire Awareness and Planning

Despite Fire District #19 not having experienced many severe wildfire events, awareness of fire risk has been increasing in the community in recent years. This is in large part due to community outreach efforts conducted by Whatcom County Fire District 19's Glacier Fire & Rescue team, a volunteer crew serving Glacier and the Mt. Baker National Forest since 1975. Some of these efforts include encouraging homeowners to partake in the Firewise USA program which provides guidance for reducing home ignition risks. Many homes in Snowline are in compliance with Firewise, but the rest of the planning area has not fully adopted the program. Residents can find a great deal of information on how to reduce home ignitability through the Whatcom County District #19 Fire and Rescue website.

Another effort to raise public awareness of wildfire risk is a "Fire Danger Today" sign with Smokey Bear outside of Glacier's Public Service Center, which alerts visitors and locals of the current fire risk. Additionally, each residential community in the planning area strictly enforces fire restrictions during burn bans and enforces fire regulations consistent



with those of Whatcom County. While these efforts indicate wildfire awareness is high within the Glacier community, more resources are needed in the form of funding and training to implement further mitigation actions.

Risk Assessment

The following is a risk assessment looking specifically within the boundaries of Fire District #19 and the risk of wildfires in the area. A risk assessment, as defined by the United Nations Office for Disaster Risk Reduction (UNDRR), is a qualitative or quantitative approach by examining potential hazards, in this case, wildfire, to evaluate existing levels of exposure and vulnerability (UNDRR, 2017). These vulnerabilities are critical to consider as they have the potential to adversely impact community livelihoods, at times in irreversible ways.

This risk assessment will consider where a wildfire could occur in the planning area, the possible extent and severity of a wildfire in the district, and an overview of previous occurrences. Additionally, this risk assessment will define how likely a wildfire is to occur, and how this likelihood will change over time. Finally, the risk assessment will discuss which assets are at risk or vulnerable to wildfire and how these assets could be impacted by a wildfire event.

Wildfire Risk and Behavior

What is Risk?

Disaster risk is expressed as the likelihood of destruction, damage, injury, or loss of life if a particular hazard were to occur. A risk assessment must take into account (1) the frequency and severity of a particular hazard, (2) the *exposure* of people and property to the hazard, and (3) the exposed communities' *vulnerability* to damage.

Exposure identifies communities and critical infrastructure that are located in fire-prone areas by referencing historical fire data coupled with the spatial distribution of people and assets. Vulnerability identifies potential losses as a result of wildfires, which is done through capacity assessments that measure a community's existing resources and ability to recover from the fire's impacts (Oliveira et al., 2021). Fuel loading, forest health, topography, local weather patterns, and climatic conditions all influence wildfire behavior and intensity, and must also be considered when assessing overall wildfire risk.

Changes in National Wildfire Risk

The risk of wildfire throughout the Pacific Northwest has historically been of relatively low concern to residents because of the region's wet climate and relatively high fire return interval. However, due to a national history of fire suppression leading to excessive fuel accumulation in forests, along with increasing drought trends and a warming climate, burned area from wildfires in the United States has nearly quadrupled over the last 40 years (Burke et al., 2021).

Climate stations closest to Fire District #19 indicate a trend of decreasing precipitation levels in recent years, despite an overarching trend of increasing precipitation in the Salish Sea bioregion. Additionally, mean annual temperature is expected to increase while summer precipitation is projected to decrease significantly, which is especially problematic in this context (Flower, 2022). The progression of drier and hotter conditions will result in increased wildfire activity and an extended fire season, therefore it is critical to prepare for these events.

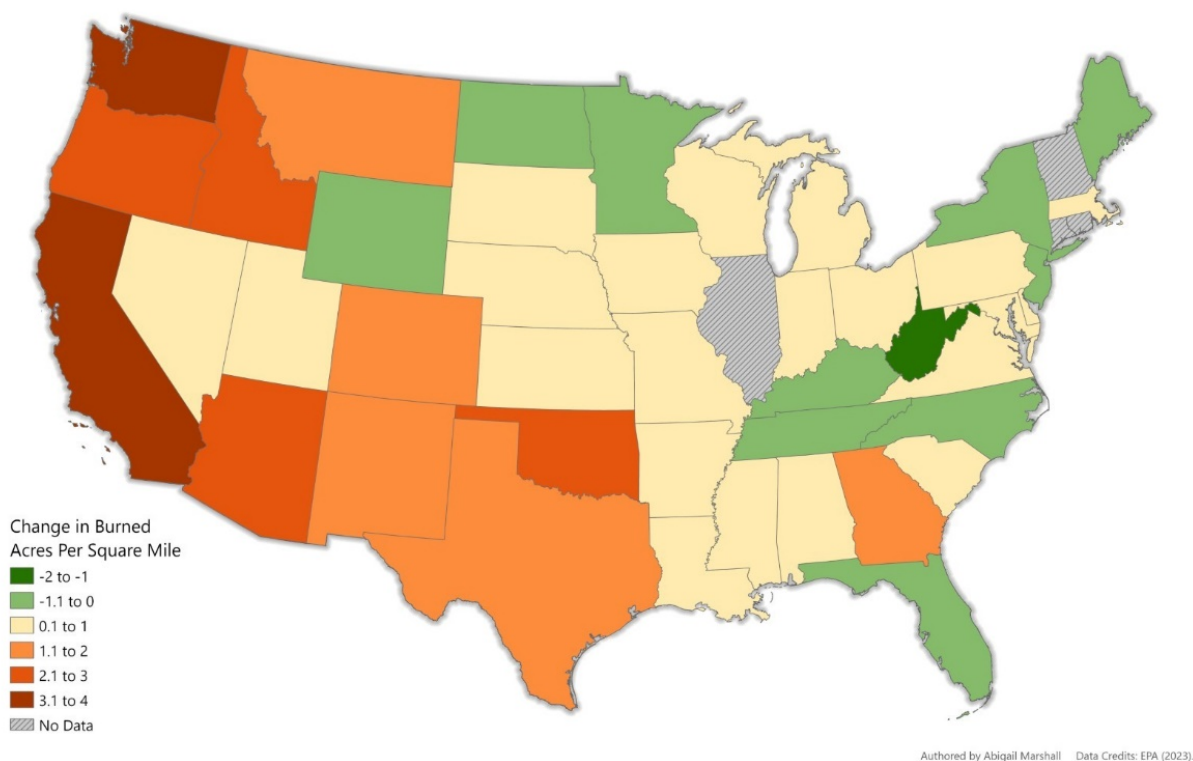


Figure 6. Change in Wildfire Occurrence Across the US.

The map in Figure 6 includes data from the EPA's Climate Change Indicators project. It shows the change in burned acres per square mile for each state from 1984 to 2020.

This change was calculated by simply comparing the average burned acres per square mile for 1984-2001 to the average for 2002-2020.

This data demonstrates the changing dynamics of wildfire in the United States. Wildfire areas are increasing in most states throughout the Western US. Washington State shows one of the most dramatic increases in wildfire as a proportion of its total area, preceded only by California. Washington's wildfire area increased by 3.01 acres per square mile from 1984-2001 to 2002-2020. This increasing trend reflects the importance of wildfire mitigation as factors such as climate change and fuel accumulation continue to exacerbate its effects.

Wildfire Risk in Fire District 19

The Figure 7 map shows estimated hazard potential of difficult-to-manage wildfire in Whatcom County Fire District #19 and the surrounding area, using data from the US Forest Service's Wildfire Risk to Communities program (Jaffe et al., 2024). This assessment is based on factors such as burn probability and fire intensity. Wildfire risk throughout the jurisdiction is generally low. This is due to Glacier and the surrounding areas temperate climate. Outside of District #19's boundaries, wildfire hazard becomes more moderate, reaching high hazard potential in some areas to the north (Figure 7). This is an important consideration, as fires in this area may still pose danger to the community. Increasing temperatures exacerbated by climate change will also continue to increase wildfire hazard in and around the district as wildfire season continues to get longer and more extreme throughout the western US.

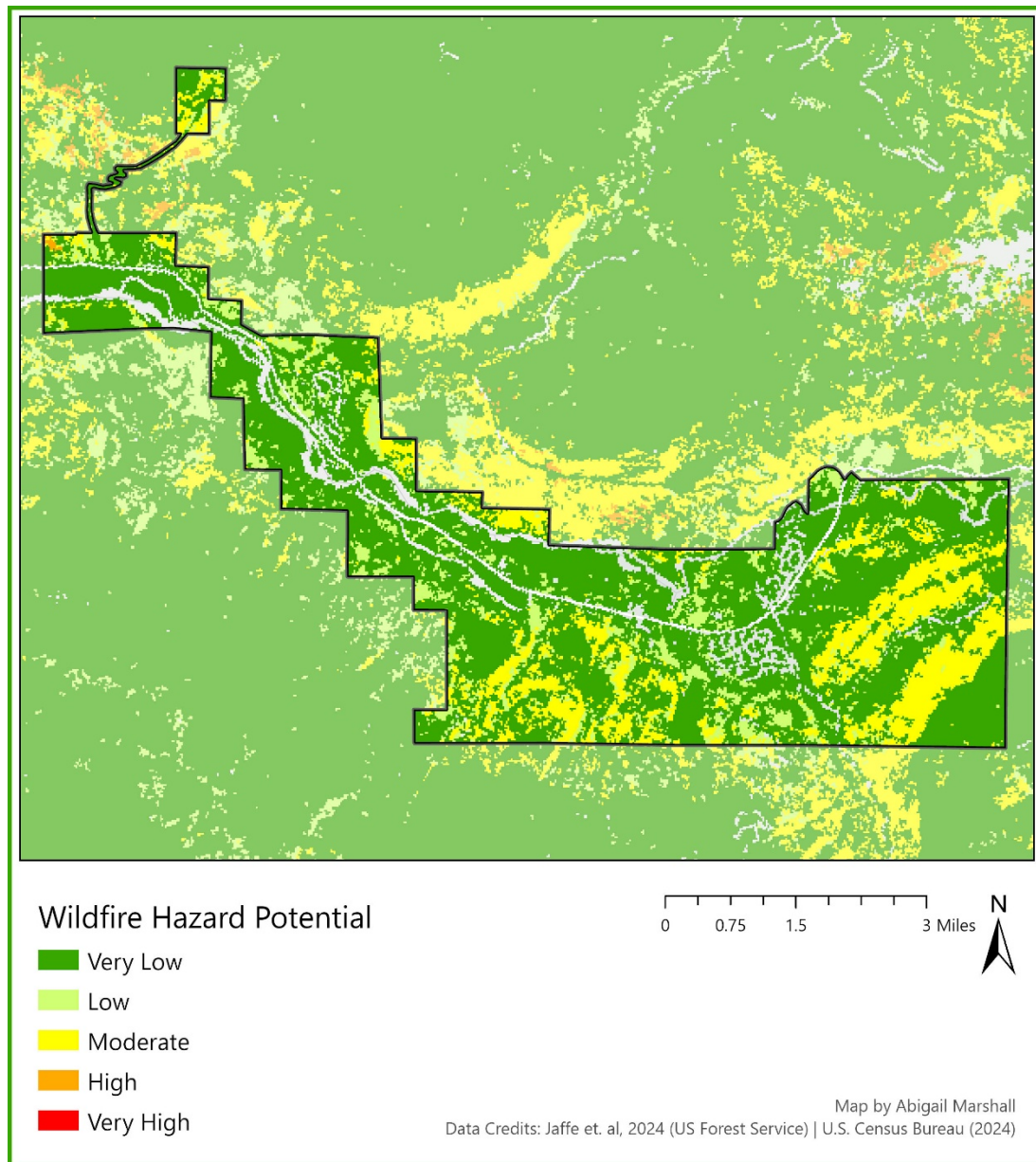


Figure 7. Wildfire Hazard Potential Map.

Historical Fire Regimes

Fire regimes are another method of fire modeling that incorporates the fire return interval, fire severity, and general fire behavior characteristics. The fire return interval indicates the average number of years between two successive fires in the same region, whereas fire severity is measured in percent of topkill. These three components are used to distinguish 13 separate fire regime groups as shown in Table 1 below.

Table 1. Fire Regime Groups (LF Attribute Data Dictionary).

Gro up	Fire return interval (yrs)	Replacement severity (%)	Shared attributes
I-A	0-5	<66.7	Generally low-severity fires replacing less than 25% of the upper canopy layer of vegetation; can include mixed-severity fires that replace up to 75% of the upper canopy layer
I-B	6-15	<66.7	
I-C	16-35	<66.7	
II-A	0-5	>66.7	Fires that replace more than 75% of the upper canopy layer (also called high-severity fires)
II-B	6-15	>66.7	
II-C	16-35	>66.7	
III-A	36-100	<80	Generally mixed-severity fires; can also include low-severity fires
III-B	101-200	<66.7	
IV-A	36-100	>80	Fires that replace more than 75% of the upper canopy layer (also called high-severity fires)
IV-B	101-200	>66.7	
V-A	201-500	Any severity	Generally replacement-severity fires but can include fires of any severity
V-B	>500	Any severity	

The map in Figure 8 shows the historical wildfire regimes in the fire district area. This data from the Federal LANDFIRE program shows fire regime classes based on an assessment of landscape and fire behavior before European colonization (LANDFIRE, 2016). This provides context for the fire regime that the local ecosystem is adapted to, despite fire suppression. For a more detailed list of each of the regime classes included in this model, see Table 1 above.

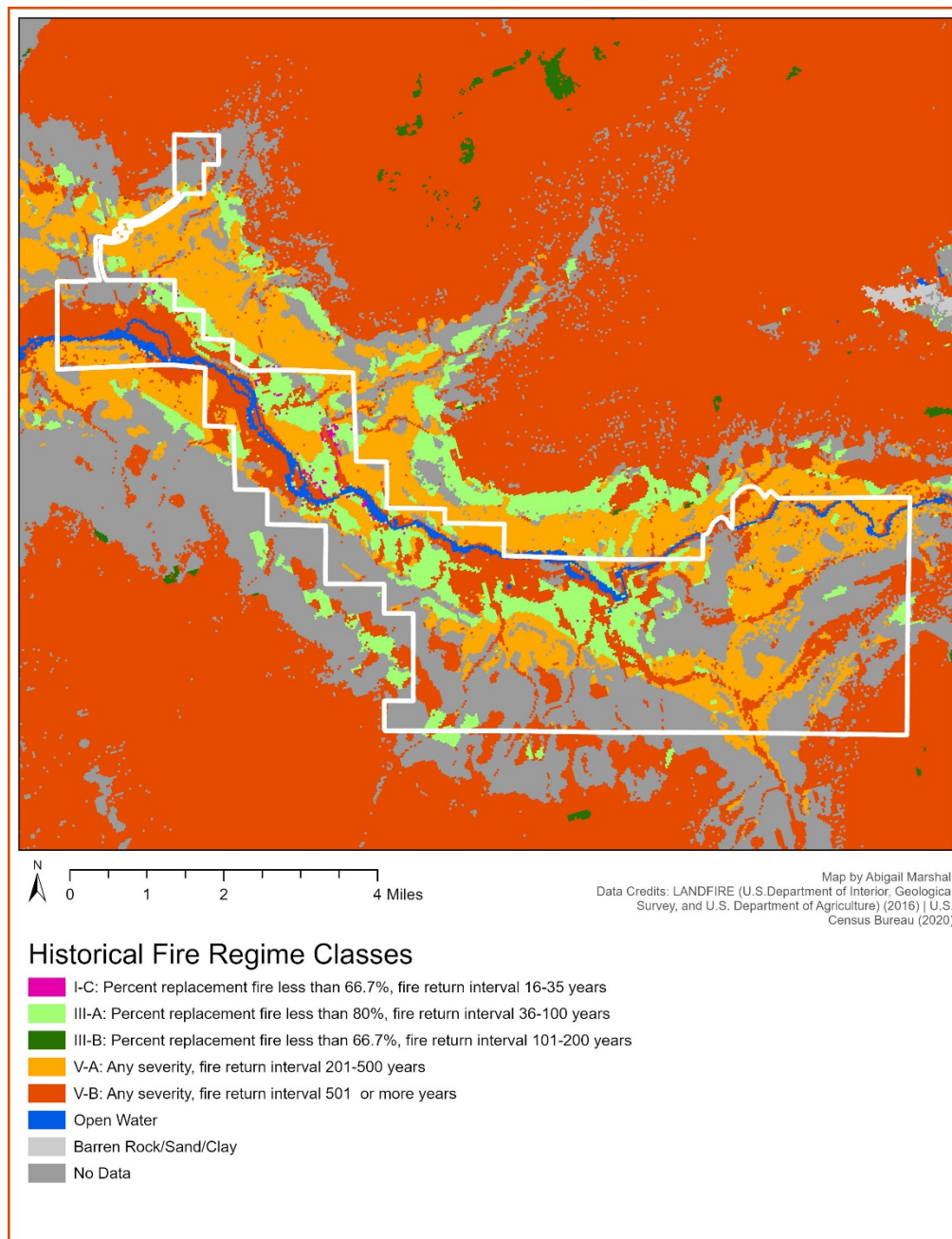


Figure 8. LANDFIRE Historical Fire Regime Classes Map.

Before fire suppression altered Whatcom County's fire cycle, the area generally had a regime of long fire return intervals and intense, possibly stand-replacing fires. These intervals range from 36-500 years according to LANDFIRE's assessment (Figure 8). The severity of fires varies, with stand-replacement fires present in many areas in and around District 19. These long fire-return interval, high severity regimes are often associated with substantial fuel build-up, which contributes to the severity of fires when they do occur. Long-term suppression of fires increases fuel accumulation and alters

ecosystem dynamics, resulting in more severe and difficult to control fires when they do occur (Kreider et al. 2023). These patterns are important to consider, as we must account for the natural fire cycle to ensure the safety and longevity of the community and its surrounding ecosystem.

Fuel Models

An essential component of fire management is the ability to predict potential wildfire behavior and impacts based on historical trends and environmental factors like fuel, weather, climate, and topography. This can be partially accomplished through an analysis of fuel models, which are used as a tool to more accurately predict fire behavior in a given area based on the types of fuel present in the region. For this report, we will use the 13 Anderson Fire Behavior Fuel Model (FBFM13) and its associated data provided by LANDFIRE to analyze fuel-associated wildfire risk within the boundaries of Whatcom County Fire District 19. FBFM13 identifies 13 unique fuel models characterized by “the most common fire-carrying fuel type (grass, brush, timber litter, or slash), loading and surface area-to-volume ratio by size class and component, fuelbed depth, and moisture of extinction,” shown in Table 2 below (LANDFIRE, 2023).

Table 2. Anderson’s 13 Fire Behavior Fuel Models (LF Attribute Data Dictionary).

Grass and grass-dominated	FBFM1	Surface fires that burn fine herbaceous fuels, cured and curing fuels, little shrub or timber present, primarily grasslands and savanna
	FBFM2	Burns fine, herbaceous fuels, stand is curing or dead, may produce fire brands on oak or pine stands
	FBFM3	Most intense fire of grass group, spreads quickly with wind, one third of stand dead or cured, stands average 3 ft tall
Chaparral and shrub fields	FBFM4	Fast spreading fire, continuous overstory, flammable foliage and dead woody material, deep litter layer can inhibit suppression
	FBFM5	Low intensity fires, young, green shrubs with little dead material, fuels consist of litter from understory
	FBFM6	Broad range of shrubs, fire requires moderate winds to maintain flame at shrub height, or will drop to the ground with low winds
	FBFM7	Foliage highly flammable, allowing fire to reach shrub strata levels, shrubs generally 2 to 6 feet high
Timber litter	FBFM8	Slow, ground burning fires, closed canopy stands with short needle conifers or hardwoods, litter consist mainly of needles and leaves, with little undergrowth, occasional flares with concentrated fuels
	FBFM9	Longer flames, quicker surface fires, closed canopy stands of long-needles or hardwoods, rolling leaves in fall can cause spotting, dead-down material can cause occasional crowning
	FBFM10	Surface and ground fire more intense, dead-down fuels more abundant, frequent crowning and spotting causing fire control to be more difficult
Slash	FBFM11	Fairly active fire, fuels consist of slash and herbaceous materials, slash originates from light partial cuts or thinning projects, fire is limited by spacing of fuel load and shade from overstory
	FBFM12	Rapid spreading and high intensity fires, dominated by slash resulting from heavy thinning projects and clearcuts, slash is mostly 3 inches or less
	FBFM13	Fire spreads quickly through smaller material and intensity builds slowly as large material ignites, continuous layer of slash larger than 3 inches in diameter predominates, resulting from clearcuts and heavy partial cuts, active flames sustained for long periods of time, fire is susceptible to spotting and weather conditions

District #19 is primarily within the FBFM 8, 9 and 10 categories (Figure 9). These categories are associated with timber litter, and range in potential fire severity (Table 2). FBFM 8 is associated with less severe fires due to little undergrowth and is found primarily in the westernmost portion of the Glacier community. FBFM 9 is associated with more moderate-severity fires fed by higher fuel volumes and is found throughout

the eastern portion of Glacier and its surrounding areas. Finally, FBFM 10 is the timber litter fuel category associated with the most severe fires that often result in crowning and stand-replacing events. This fuel type is found in eastern Glacier and is also quite common in the surrounding landscape. See Figure 9 for the spatial distribution of each of these categories.

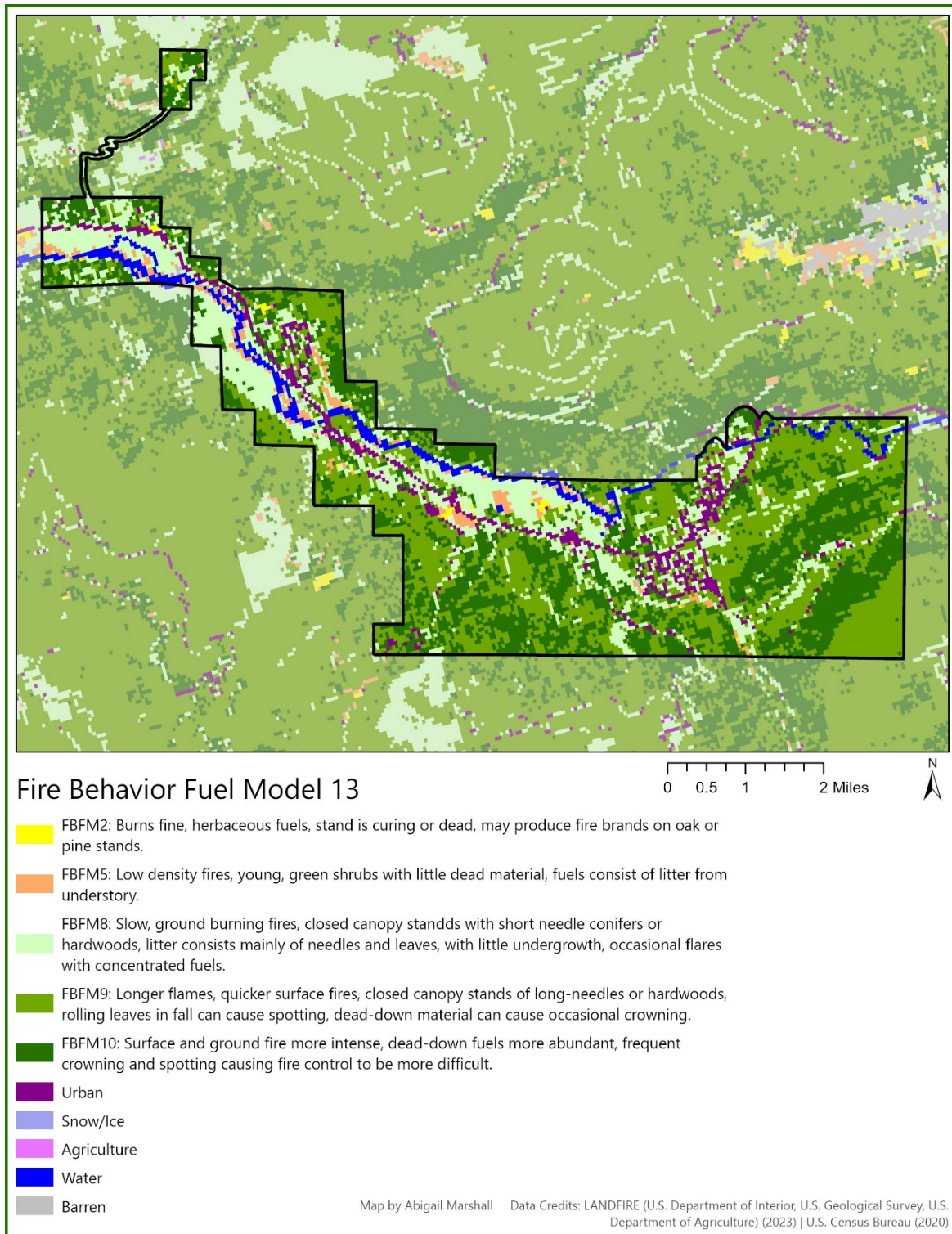


Figure 9. Fire Behavior Fuel Model Map.

Community Risk

Social

Roughly 300 people reside in Glacier year-round, but according to District 19's volunteer firefighters, the planning area sees large influxes of temporary renters and tourists throughout the year. District 19 and the surrounding area attract large numbers of recreationalists, such as campers, hikers, etc. due to the proximity to the Mount Baker-Snoqualmie National Forest and Nooksack River. Specifically, during the peak summer months, Glacier and its surrounding areas can experience a ten-fold increase in the number of people passing through. This means that during peak wildfire season, up to 4,000 people may pass through the area in a given day. Visiting populations add an aspect of vulnerability in the event of a wildfire, due to visitors typically being less familiar with the region and local evacuation plans and procedures. Additionally, visitors may pose additional risk to the region if they are unaware of or disregard local burn bans.

Economic

As a small, rural community bordering the Mt. Baker wilderness, Glacier and the surrounding fire district has an economy closely associated with its geographical surroundings. Glacier as it's known today developed in 1875 when a fire in the area cleared up space for construction of the first homesteads (Snowater Association, 2001). Soon after, coal deposits were discovered in Glacier Creek (Snowater Association, 2001). Early economic activity consisted of logging and mining of coal and gold (Snowater Association, 2001). Much of the surrounding lands were owned by several different logging companies throughout the 20th century. Most recently, the Trillium Corporation purchased permits to log 5,000 acres in the area until 2020 (Snowater Association, 2001). Over the years, these industries subsided, and tourism took over as the main form of income.

With the mining and logging industries fluctuating in demand, the region started drawing a growing number of outdoor enthusiasts (Snowline Historical Committee, n.d.). Within Snowline, Mt Baker Rim, and Glacier Springs communities, many people own vacations rentals or Airbnb's. During the summer, the town of Glacier attracts numerous hikers to the array of trails in and around the Mt. Baker wilderness. In the winter, skiers and snowshoers pass through, spending their weekends in Glacier, being the closest town to the ski area. These seasonal recreationalists bring in significant income to Glacier's local businesses, such as Grahams's Store, Glacier Ski Shop, and Wake 'N Bakery.

Nearly 91% of the population in Glacier are employed with about 27% of the population self-employed and working from home (US Census, 2020). The majority of current jobs are seasonal, including fishing, forest service, water district, and ski area employees. This is thought to contribute to Glacier being the poorest community in Washington. Just under 42% of people in Glacier are below the poverty line (US Census, 2020). The median household income is about \$30,000, less than a third of Washington State's median income (US Census, 2020). With so many homes being used as vacation rentals or Airbnb's, this is an additional source of income for the community that could be getting reported elsewhere. There is also an unknown number of retirees that have settled down in Glacier.

Infrastructure

District 19 contains a small community primarily composed of private structures used for housing or travel accommodation. These structures are grouped into 3 general areas, as seen in Figure 10. Fire District 19 is located along Washington State Route 542, also called Mount Baker Highway. There are 2 bridges on SR 542 within the district. One of these bridges is located in the center of the populated area, and the second is on the north side. Puget Sound Energy also has a battery storage project in Glacier, which stores power to increase flexibility during changes in supply and demand. It can also provide backup power to nearby areas of Glacier during an outage. The location of each of these infrastructures is indicated in Figure 10.

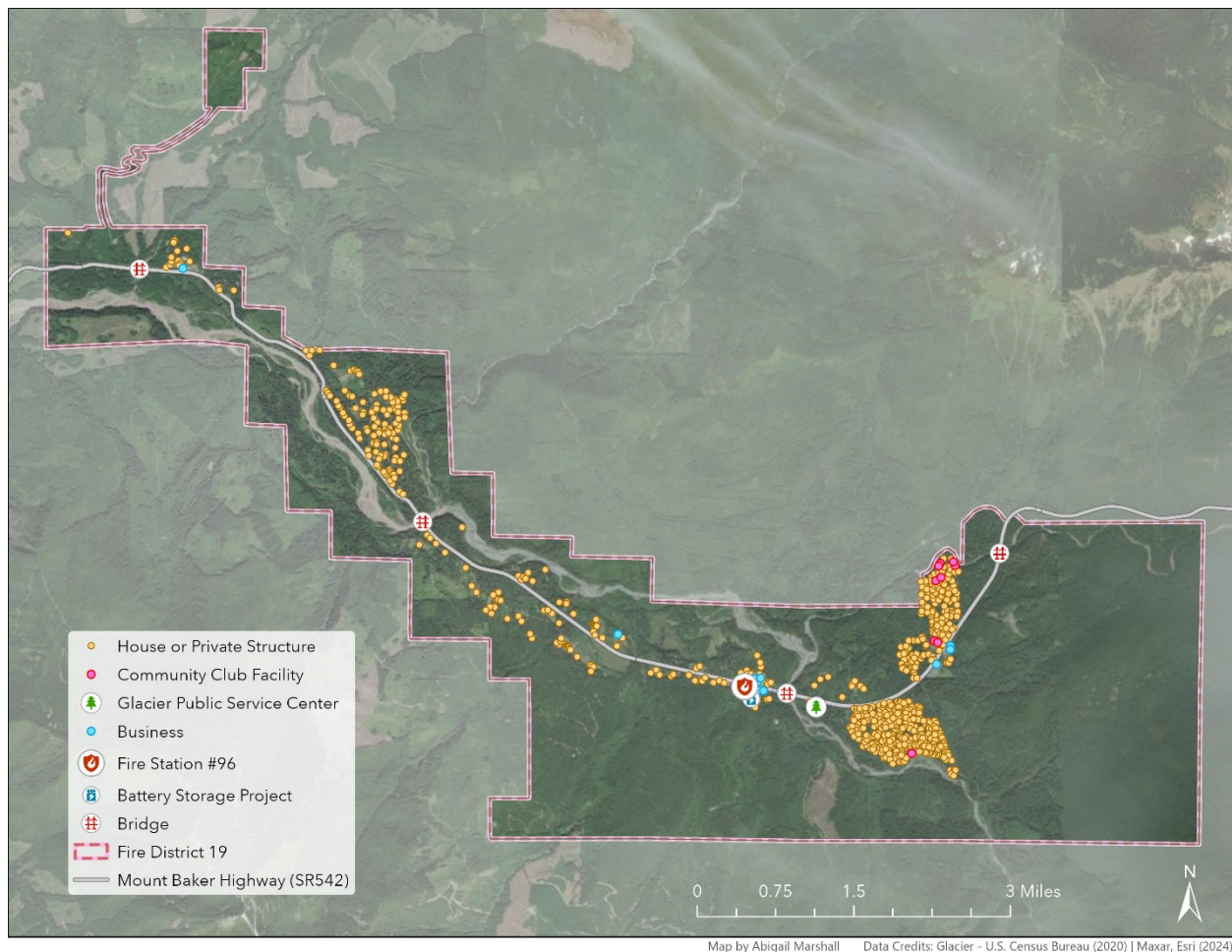


Figure 10. Infrastructure Map.

The Figure 10 map shows the general infrastructure of District 19. The border shown on the map indicates the census designated boundary. Structures on the map were estimated using satellite imagery and publicly available information about businesses and other structures in the area. As a result, the map may not be a perfect representation of each structure but reflects the overall layout and infrastructure patterns of the area. Travel accommodations are included within the “House or Private Structure” category, as mitigation strategies will be similar for both structure types.

A primary concern is the single main road in and out of the district. Dense canopy and ground vegetation create fuel loads directly adjacent to the road, which are not only at risk of ignition but are susceptible to inclement weather as well. A single downed tree would temporarily halt all evacuation by vehicle from the district. As it is managed by the National Forest Service, they should reconsider forest management strategies along this road such as thinning or complete removal within a certain distance from the road to reduce potential risk and severity of blockage. Other areas where car traffic could be blocked by tree falls are at the entrances of the two main gated communities in Glacier.

Bridge failure could also occur. Because of all these potential blockages road maintenance and protection are critical to the evacuation plan as are the development of community safe zones (CSZ). CSZs serve as a contingency in a worst-case scenario where passage out of town is blocked and can provide a last resort-refuge. They are one of our primary recommended preparedness strategies.

Capacity Assessment

The following section is a wildfire capacity assessment of the planning area. A capacity assessment is an evaluation of a group's overall ability to achieve desired goals (wildfire resiliency) for individual and community well-being (UNDRR, 2009). This process identifies existing capacities (in the form of community capitals), highlighting their strengths and weaknesses, as well as missing capacities that require development (UNDRR, 2009). The assessment will provide an overview of the district's social, built, and natural capitals to determine how planners and communities can reduce wildfire related risks. Maintaining a balance in community capitals is essential in disaster prevention and provides a basis for risk reduction in the planning area (UNDRR, 2021).

This capacity assessment utilizes the Community Capitals Framework developed by Flora and Flora, which states that the health, happiness and resilience of a community is dependent on the strength of several community capitals (Flora, 2014). These community capitals include natural, built, social, political, human, cultural, and financial capitals. Community capitals support community planning efforts and play a key role in community response to hazards and disasters. For the sake of time, this assessment will look at just three of these within the planning area, those being built, social and natural capitals, as shown in Figure 11.

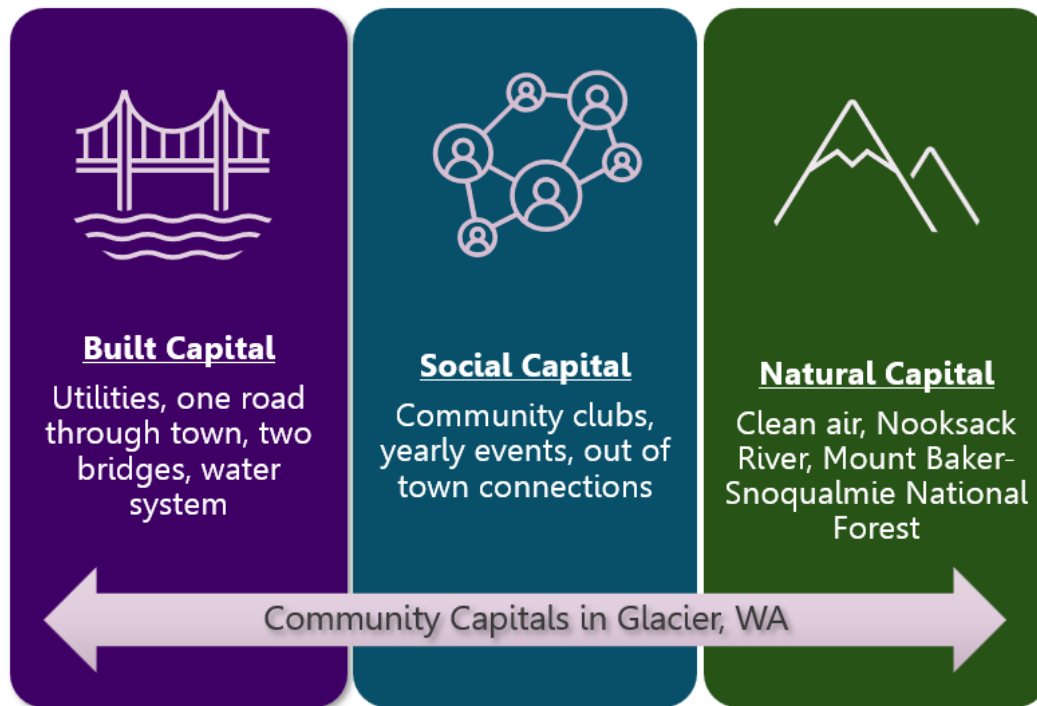


Figure 11. Graphic of Glacier Community Capitals by Emily.

Built Capital

Being such a small area, built capital is minimal within District 19. Built capital refers to infrastructure, including roads, buildings, and utility systems that support communities and enable societal functions (Beaulieu, 2014). Inadequately built capital such as weak or insufficient infrastructure can displace individuals, undermining the social networks crucial for community resilience and amplifying the risk of natural hazards such as wildfires (Norris et al., 2007).

In terms of meeting basic needs in the aftermath of a wildfire that has burned around or in town, some resources are available depending on damages. Assuming the survival of most structures, there are no community food banks, and only several food service businesses that could potentially feed displaced people in the short term at their own cost. The battery storage facility would be able to keep refrigerators running for food preservation. If water mains remain intact, running water should not be an issue, with the Nooksack river being a short term back up. In terms of public shelter, there are several communal buildings and community clubhouses that could be used temporarily. Glacier's internet connection was recently upgraded to fiber-optic cables and depending on whether they are mounted on power poles adjacent to power lines or buried underground and how close the fire gets to them, they could potentially survive undamaged, and communications could remain up with power from the battery storage.

Social Capital

In this assessment, social capital refers to the web of social relationships or the “glue” that holds the community together (Beaulieu, 2014). Social capital consists of several elements including bonding capital, bridging capital and vertical linkages. Bonding capital represents the strong relationships and interactions among friends, family, neighbors and colleagues. Bridging capital refers to linkages between people or groups in the community who have limited interactions or with individuals and organizations outside of the locality. Finally, vertical linkages represent ties that connect community members to external organizations and resources which can support local initiatives (Beaulieu, 2014). This assessment will discuss each of these aspects of social capital within the district.

Bonding Capital

As discussed previously, Glacier has a small, tight-knit population of just 300 year-long residents. Familial relationships as well as relationships among neighbors are strong. These relationships are facilitated and strengthened by neighborhood gathering spaces within the Snowline, Mount Baker Rim, and Glacier Springs Communities, such as Club Houses and recreation areas. Additionally, these communities host frequent events to bring residents together. For example, the Snowline Community Club hosts seasonal potlucks, as well as game nights, a fishing derby, a kids’ scavenger hunt, a pumpkin carving contest, a sports day, a bike parade and a visit with Santa (Snowline CC, n.d.). In addition, the Mount Baker Rim Community Club hosts about twelve events a year. These events, made possible by volunteers, play a major role in fostering a sense of community and strengthening bonding capital in Glacier.

Bridging Capital

Many homeowners in District 19 use their properties as seasonal residences, meaning they live outside of the town most of the year. This makes for strong bridging capital, as it connects residents with people and communities beyond the locality. In contrast, a high number of homeowners who rent out their properties in the district could negatively impact bridging capital. These property owners may feel less incentivized to prioritize mitigation at their homes as they don’t live in the planning area full time, which can increase risk to neighboring homes.

Vertical Linkages

Partnership with students at Western Washington University is a good example of a vertical linkage. Additionally, residents who are employed by the Forest Service may have connections that could be utilized in this process. Much of the land within the fire

district is owned by the Forest Service, therefore the agency will need to be involved in the planning and implementation phases of this CWPP.

Natural Capital

Located in a rich and diverse area, the region that houses Fire District 19 possesses many forms of natural capital. Natural capital refers to the natural environment of a community, including its resources, geographic features, climate, and scenic qualities that provide valuable goods and services to a community (Beaulieu, 2014). Natural capital maintains environmental health and typically enhances an area's resiliency to hazards unless otherwise depleted by human use.

District 19 is fortunate to have several freshwater resources within its boundaries, the North Fork Nooksack River being the most prominent. The region's northern boundary parallels the Nooksack River, providing a natural barrier between a potential wildfire and the community. The Nooksack is the northernmost river in Washington. Nooksack translates to "noisy water" in the Nooksack language. Its waters come straight from the glacial snowmelt of Mt. Baker and Mt. Shuksan (Nooksack River, 2024). The river provides habitat for salmon and other essential freshwater species. Additionally, the Nooksack creates a broader riparian habitat, supporting biodiversity of various flora and fauna in the area. The river also provides irrigation for farmlands and is a popular place for fishing and recreation.

Rivers are an important natural capital, especially for wildfires. Since a river and its immediate surrounding lack flammable material due to the contained moisture, it acts as a natural firebreak (Grant, 2023). In some scenarios it can provide refuge for people and wildlife (Grant, 2023). Rivers can also act as a body of water for firefighters to draw from to keep fires contained.

District 19 is directly on the boundary of the Mount Baker-Snoqualmie National Forest. This vast forest contributes to the good air quality in the area by absorbing carbon dioxide and releasing oxygen. The forests also provide habitat for countless species of flora and fauna. The western redcedar and douglas fir make up the majority of trees in this area, drawing hikers and recreationalists into the enchanting evergreen rainforest. This forest also provides timber as a resource and jobs to those in the logging industry.

Although the national forest provides all these benefits to the community and surrounding area, when considering wildfires, it is the most prominent threat. Since the area has been managed by the forest service since 1905, their "first duty" was to protect it from wildfire (Mt. Baker-Snoqualmie, n.d.). This led to a century of fire suppression

and therefore dangerous fuel buildup. If the district were to see a fire in upcoming years, it would be at a higher severity than it has been historically.

Mitigation Action Plan

The primary focus of a CWPP is to inform and direct mitigation strategies, which aim to reduce community losses of human life, critical infrastructure, and economic capital in the event of a wildfire as well as implement practices to reduce the risk of human caused fires in the future. We have divided our mitigation proposals into two main sections, emphasizing either community level actions to be undertaken by local and federal agencies, as well as individual actions that homeowners can use to modify the fire resilience of their own properties and structures.

Community Level

Here we list five mitigation processes that will provide community wide benefits and focus on fire risk reduction through alternate forest management practices and education on emergency planning for worst-case scenario survival and safety. We believe these are achievable with collaboration between Fire District 19's volunteer fire team and the National Forest Service.

Evacuation Preparedness

Depending on local conditions, wildfires have the potential of spreading rapidly and unexpectedly, posing an immediate threat to lives and property. Evacuation is critical in these situations; it involves relocating people from high-risk areas to protected locations. Familiarizing communities with ways to exit their neighborhoods in the case of an emergency will ensure a smooth process and minimize harm. Evacuation within the district will generally be to either head east or west on the Mt. Baker Highway depending on the direction the fire is moving.

The Snowline, Mt. Baker Rim, and Glacier Springs communities within the fire district all have minimal exits. Figures 12 and 13 depict potential evacuation roads to be considered by local and federal agencies to make evacuation more feasible in various conditions. These communities have only one main entrance into their communities that leads directly onto the highway. Snowline and Mt Baker Rim have an additional locked emergency exit which may be inaccessible during an emergency, as only a couple people have the key to unlock this gate. Adding further exit routes would be highly beneficial in the case of a wildfire. Each of the potential road additions seen in Figure 12 and 13 offer alternative routes to the highway if the main entrance were to be inaccessible, either due to fallen debris, gate malfunctions, or the threat of the wildfire

coming from the direction of the main entrance. Mt. Baker Highway is highlighted in red in Figure 12 and 13 to recognize its critical importance in the case of an emergency. Being the only road in and out of the town, it must be properly maintained at all times.

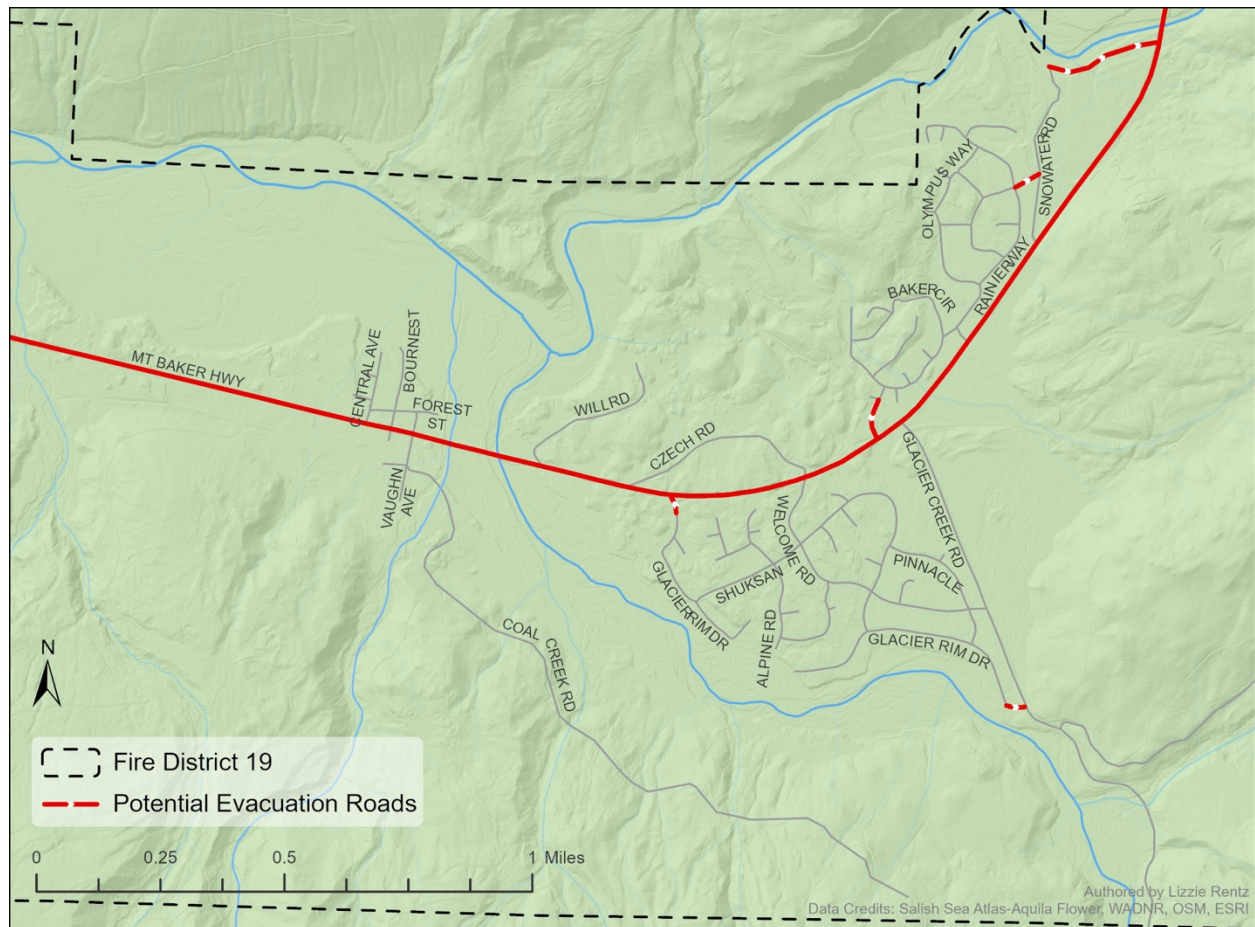


Figure 12. Map of potential emergency evacuation roads to be considered within the town central, Snowline, and Mt Baker Rim, highlighting Mt. Baker Highway as critical to evacuation.

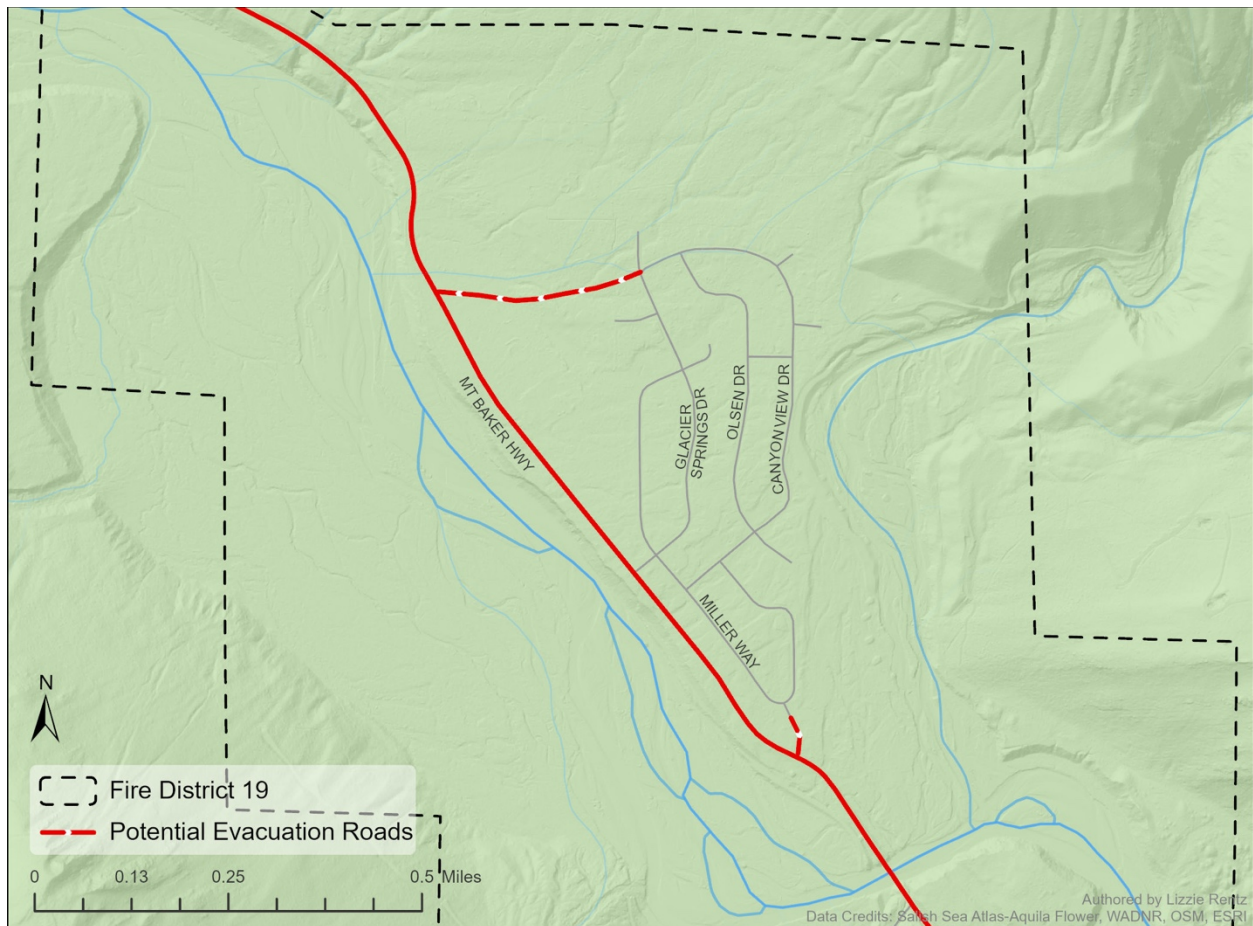


Figure 13. Map of potential emergency evacuation roads to be considered within Glacier Springs, highlighting Mt. Baker Highway as critical to evacuation.

Community Safe Zones

While it is safest to evacuate when a wildfire is near, evacuation may become impossible if Mt. Baker Highway becomes obstructed. In this case, community members should be able to gather in a Community Safety Zone. A Community Safety Zone is an area fire will burn around but not through (Mendocino County Fire Safe Council, n.d.). Firefighters prioritize preparing and defending these areas during wildfires.

These zones should be easily defensible by firefighters. A lack of fuel is what makes these areas safer and easier to control, so flammable materials need to be removed (Mendocino County Fire Safe Council, n.d.). Tree crowns should be thinned, branches should be pruned, and grass and shrubs should be cut short. The diameter of the community safe zone should be about four times the maximum sustained flame length, which is estimated at about twice the average overstory tree height (Nowicki, 2002). This is why this plan suggests a buffer of 400 meters or about ¼ mile wide around each Community Safety Zone.

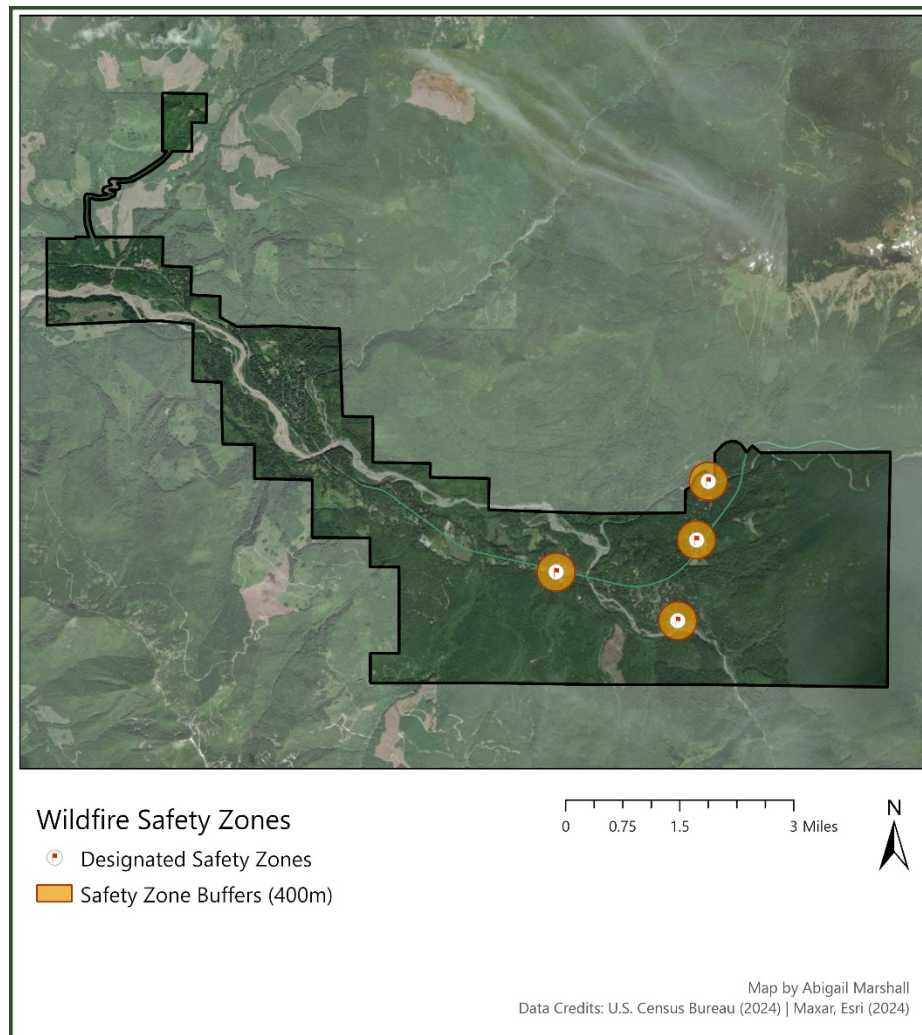


Figure 14. Wildfire Safety Zones Map.

Fire District 19 community safe zones will be at Glacier Fire and Rescue, Mount Baker Rim Clubhouse, Snowater Clubhouse, and Snowline Clubhouse, highlighted in Figure 14. In addition to removing fuel surrounding them, these buildings should be retrofitted with fireproof materials such as brick and concrete to further reduce their risk of ignition. HVAC filters should be installed in these buildings to decrease smoke particulates in the air. These facilities should also prepare to host people for several days during and after a wildfire. Supplies such as shelf-stable food, water, batteries, and medical equipment should be stored at these locations.

Emergency Communications

Community members should map out a phone tree in advance of a wildfire occurring. A phone tree is a system where people call a designated person or people when an

emergency happens, that person alerts their designated person or people, and so on. This is an efficient way to distribute information and check in on neighbors.

The [Wireless Emergency Alert \(WEA\)](#) system is the United States' geographically targeted public alert network. It works through FEMA's Integrated Public Alert & Warning System, which is a way for qualified government officials to send important alerts to mobile devices. WEA messages include AMBER alerts, Silver Alerts, National Alerts, Imminent Threat Alerts, and Public Safety Messages. Anyone in the area of an emergency will receive any WEA messages about that emergency. WEA alerts make distinct noises and vibrations, and bypass Do Not Disturb mode, so they are more likely to reach people immediately than regular text messages. People do not need to opt in to WEA messages, but they should ensure their phone settings allow the device to receive emergency alerts. Government and Emergency Alerts should be set to always deliver.

Residents and visitors should also sign up for Whatcom Unified AlertSense Messages. Through AlertSense, the Whatcom Unified Emergency Operations Center sends geographically targeted alerts in cases of emergency. Anyone can opt into this system and choose to receive emails, texts, and/or voice messages about emergency situations.

In case of an evacuation, one or both directions of Mt. Baker Highway may become dangerous or impassable. Because of this, emergency communications should include information about the status of this road, as well as whether it is safer for evacuees to flee East or West. 911 will call residents registered in Fire District 19 to check on them and inform them of the emergency and evacuation or shelter-in-place instructions.

Because cell service in District 19 is very poor, some people may need to be informed through a different medium to become aware of the emergency. If a wildfire burns nearby the siren on top of the fire station will sound. This siren should be upgraded to ensure it works. The district should also consider communicating with residents over HAM radio. A remote satellite should be set up to allow this.

Map Your Neighborhood

Map Your Neighborhood is a program designed by the Washington Emergency Management Division to help communities prepare for disaster together. The [Map Your Neighborhood Program Guide](#) is available to the public online and a group can finish the program in about an hour and a half. This workshop is a valuable way for neighbors to build trust amongst each other, consider their plans in case of a wildfire, and build a plan that will help everyone be resilient in the face of an emergency.

Hazardous Fuel Reduction

A feature of Fire District #19 low-frequency, high-severity fire regime is excessive fuel buildup. Because most of the vegetation in and around the district has not burned for hundreds of years, flammable plant matter has built up on the forest floor for generations. Reducing this fuel can limit the severity of wildfires, make them more manageable, and prevent loss of life and property.

The labor of fuel reduction can be done by hand, machine, fire, or animal. Work parties can remove dead plant matter with their hands or using machines. Grazing animals such as goats can be employed to clear out understory brush such as grasses, shrubs, and saplings (Rowntree, 1993). Prescribed fires have been used by indigenous peoples in the Pacific Northwest to manage land since time immemorial (Derr, 2014). Fuel reduction is particularly important around roads, houses, and community infrastructure, so land around these assets should be prioritized for fuel reduction.

Individual Property Level

This section will offer mitigation strategies that individual homeowners can use to reduce the risk of ignition and fire damage to their own properties as well as household emergency planning to improve preparedness for quick evacuation or survival near wildfire should evacuation be prohibited. For home protection, we emphasize Firewise guidelines recommended by the National Fire Protection Association which use easy-to-understand fire resilience concepts applicable to a wide range of property types. For emergency planning, the Washington State Emergency Management Division has created household preparedness plans and the EPA has guidelines for smoke safety.

Firewise

The National Fire Protection Agency in cooperation with the USDA Forest Service offers a program called Firewise USA. This program aims to create committees within communities to educate homeowners about ways they can reduce wildfire risk to their properties through building material and landscaping choices, so they eventually meet criteria to recognize them as Firewise sites. Participation is completely voluntary, so people are free to do as much or as little as they wish, but these strategies are most effective when used together.

Extensive guidelines are published online that go into detail about ways to improve the fire resistance of nearly every relevant section of a structure, but we have included a summary of main ideas and primary concerns.

Decks

Decks can pose significant vulnerabilities to the safety of the entire structure because they are often made at least partially of combustible materials such as wood or wood-plastic composites, and embers can ignite exposed joists or fall through cracks between boards and ignite dry material underneath. This makes it imperative to remove all debris from under your deck.



Coatings

There are multiple options for fire resistant coatings on the outside of houses. Commonly used coatings intended to prevent moisture damage to wood often have fire retardant properties, though not always. Gel coatings are another layer of protection, but their effectiveness is temporary as they are comprised of water absorbent polymers that lose their moisture over time whether fire is present or not. Intumescent paints can also be effective as they swell when warmed by radiant heat, insulating the building material underneath the heat. However, similarly to gels, they too lose their effectiveness over time regardless of whether they are heated or not. Additionally, they are primarily used on indoor applications and accelerated weathering when used in outdoor applications can alter their performance life. Because all these options have limitations, they are best used in addition to other defensive strategies.



Roofing

Untreated wooden roofs are the least fire-resistant roofing material and most likely to ignite. More ideal options include synthetic materials like aluminum, recycled plastic and

rubber, fire-retardant/treated wood, asphalt, and concrete. In addition to a fire-resistant roof, gaps at the ridges and edges of roofs using open-eave construction should be sealed and converted to soffited-eave construction to prevent entry of embers underneath the roof and accumulation of nesting materials by animals which act as tinder. Roofs and gutters should be kept clear, vents should be screened with 1/8-inch metal mesh or covered completely with solid barrier if there is danger of fire.



- More information can be found at [NFPA - Preparing homes for wildfire](#)

Home Ignition Zones

To understand how being mindful of ignition zones can help protect property from forest fires, and understanding of mechanisms of ignition is necessary. There are three ways forests fire can ignite houses, and each poses a threat at a distance from the house, creating three conceptual ignition zones we need to treat. Forest fires can ignite houses 1) through indirect radiant heat raising the houses building material to their ignition point without ever actually touching them, 2) forest fire flames making direct physical contact with the house, and 3) firebrands (embers carried by wind) can directly land on the house and cause ignition (Nowicki, 2002).

To prevent radiant ignition, it is recommended trees surrounding the house in a 20–60-meter radius be thinned. How many trees should be removed depends on forest density and other factors like slope and tree height, but the area does not need to be completely cleared, only enough to sufficiently break up the flame front. Thinning out to 20 meters is the minimum amount necessary to provide significant protection, but 60 meters is recommended to provide a large margin of error for not only radiant ignition but also firebrands from steep slopes and tall trees.

However, firebrands have been documented to travel miles from the flame front in some cases and require additional consideration of the flammability of the house itself. To

reduce the risk of ignition by firebrands it is recommended to use fire resistant building materials, especially on roofs and decks. Covering flammable materials and clearing areas where firebrands can accumulate like gutters and roofs should also be cleared of fuels like needles, branches, and leaves. Even if large trees are thinned around a house, smaller flames from low vegetation may begin to encroach on the house itself. The best way to prevent them from reaching the house is to create breaks in continuous fuel between the fire and the house. This can be as simple as a raked dirt path, stone landscaping, or moist green grass (Nowicki, 2002).

Additionally, it is also beneficial to create a community protection zone extending even farther than the 60 meters home ignition zones. These areas are thinned similarly to home ignition zones to remove crown continuity and ladder fuels, and act as buffers around whole communities while providing defensible space for firefighters to safely control the fire. However, this may not be desirable in Fire District 19 because of the large size of the continuous area to be thinned and cleared of debris relative to the small population, as well as the ecological and aesthetic value of the surrounding forests which people may be reluctant to reduce. Home ignition zones on an individual property basis may be more practical.

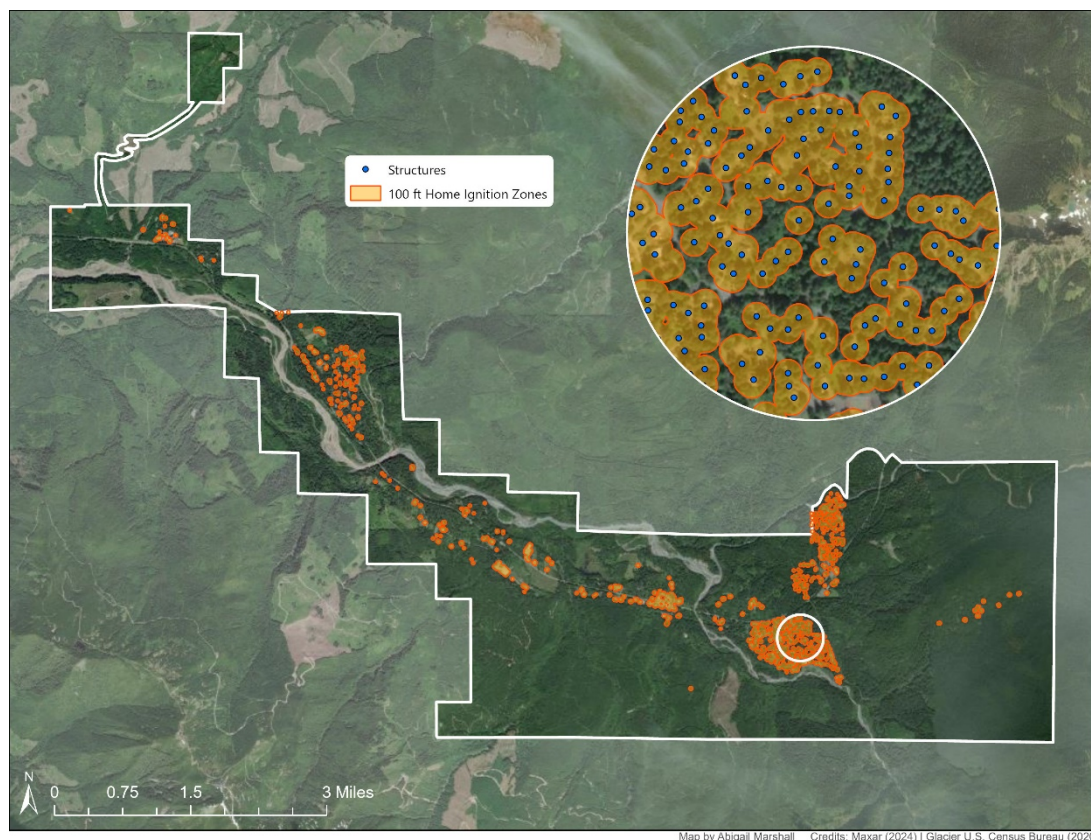


Figure 15. Home Ignition Zones Map.

Figure 15 shows the total area within 100 feet of each structure in Fire Protection District 19. Thinning efforts should be prioritized within these areas, as indicated by the Firewise guidelines listed above. The total area within the district's home ignition zones is approximately 1/3 square mile.

Be Two Weeks Ready

Be Two Weeks Ready is the Washington State Emergency Management Division's household preparedness plan. The program encourages households to learn what hazards they are exposed to, develop a plan for when emergencies occur, and build kits that will last the households two weeks after a disaster happens until help arrives.

It is particularly important for District 19 residents to be Two Weeks Ready. With only one densely forested road in and out, there is an increased risk that emergency services will be unable to reach households. If treefalls or landslides block Mt. Baker Highway, residents may need to shelter in place for days after a wildfire.

Every household should have a written plan for when a disaster happens. There are many elements to include in a household disaster plan. Households should decide ahead of time who they will call in case of emergency and how they will do it. It is a good idea to have out-of-area contact so they are less likely to be afflicted by the emergency, as well as extra batteries or a generator so that your household is able to contact them. Plans should include evacuation routes, which can be found in the evacuation section of this CWPP. You may also include a short list of items you would like to take with you in case of evacuation. Delegate tasks such as closing windows, checking Whatcom Ready and other news sources, contacting neighbors and loved ones, and retrieving supplies.

Households should also prepare grab-and-go kits in case of evacuation. These are collections of supplies that can be quickly taken to a car to evacuate with. Important supplies include shelf-stable food, a first aid kit, batteries, toilet paper, disinfectant, clothing, important documents such as social security cards and passports, and more. More exhaustive lists of supplies can be found in the [Emergency Management Division's Prepare in a Year Guide](#).

Smoke Safety

Smoke is one of the greatest health threats associated with wildfires. Even when wildfires are far away, people can experience negative health effects from wildfire smoke (Environmental Protection Agency, 2024). Children, elderly, and disabled people are especially susceptible to health complications from smoke (Weinhold, 2011). Smoke

safety preparedness is important every summer, not just in the case of a wildfire near Fire District 19

When there is smoke outside, it is best to remain indoors. It is important to keep windows and doors closed as much as possible to prevent smoke from infiltrating the building. There are several ways to make buildings safer from smoke. According to the EPA, it is advisable to use an air filter or high-efficiency HVAC filter. If this is inaccessible, a makeshift air filter can be made by attaching a furnace filter to a box fan, though this is likely less effective (Environmental Protection Agency, 2024). People should also avoid smoking, using gas, propane, or wood stoves, burning candles, frying food, and using aerosol products during smoke hazards to reduce the buildup of smoke and other particulates. Finally, people should wear high quality masks such as N95s, which reduce the amount of particulates the user inhales and the risk of health complications (Environmental Protection Agency, 2024).

Future Implications

This Community Wildfire Protection Plan is a draft that will be presented to the District 19 Fire Department. Feedback, advice, and revisions from the Western Washington University team and Whatcom County Fire District 19 will be incorporated. Furthermore, to ensure this document accurately reflects the needs and desires of the entire community, involvement of a broader range of stakeholders will be necessary as this document evolves. According to FEMA, the timeline for taking a plan such as this CWPP from initiation through approval is roughly 18 months (FEMA, 2023). With approval and adoption of the Fire Protection District 19 CWPP being the ultimate goal, much more time and involvement will be needed to meet FEMA criteria for approval.

This plan will be a living document. Following adoption of the CWPP, it must be updated every 3-5 years to account for changes in community structure, wildfire risk, and best practices for wildfire management. As climate change progresses, laws change, and the community of District 19 evolves, new risks and opportunities will emerge. Members of the Western Washington University group that wrote this draft will be available for ongoing advice and updates.

This plan focuses on fire risk and pre-emptive mitigation efforts. It does not contain a response plan for a wildfire event. In the case of a wildfire, the district fire department would work with FEMA, the Washington State Emergency Management Division, and the Whatcom Division of Emergency Management. A detailed response plan should be written using this document as a basis.

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