Quesnel and Surrounding Area Community Wildfire Protection Plan

Strategic Wildfire Prevention Initiative

1/15/2018

Aerial photo of Quesnel, 2016

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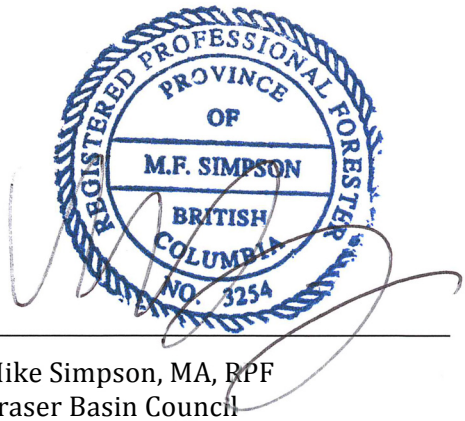

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List of Acronyms

AOI – Area of interest

BCWS – British Columbia Wildfire Service

BWBS - Boreal White and Black Spruce

CFDRS - Canadian Forest Fire Danger Rating System

CWH - Coastal Western Hemlock

CWPP – Community Wildfire Protection Plan

ESSF - Engelmann Spruce Sub-Alpine Fir

EOC - Emergency Operations Centre

FBC – Fraser Basin Council

FBP – Fire Behaviour Prediction

FESBC - Forest Enhancement Society of British Columbia

FRPA -Forest Planning and Practices Regulation,

GIS - Geographic Information System

MFLNRORD – Ministry of Forests, Lands, Natural Resource Operations and Rural Development

MS - Montane Spruce

NDT - Natural Disturbance Type

OGMA - Old Growth Management Areas

PSTA - Provincial Strategic Threat Analysis

SBS - Sub Boreal Spruce

SBPS - Sub-Boreal Pine Spruce

SWPI – Strategic Wildfire Prevention Program

UWR – Ungulate Winter Range

WHA – Wildlife habitat area

WUI - Wildland Urban Interface

Executive Summary

In 2017, The Fraser Basin Council, Bruce Morrow Consulting, and Porcupine Consulting were retained by the City of Quesnel, with the support of the Cariboo Regional District, to develop the Quesnel and Surrounding Area Community Wildfire Protection Plan. This plan encompasses several distinctive communities: The City of Quesnel, Lhtako Dene First Nation, Bouchie Lake, Ten Mile Lake, Kersley, Barlow Creek, and West Fraser, totaling 88,572 hectares.

The Community Wildfire Protection Plan (CWPP) Program was created in British Columbia to aid communities in developing plans to assist in improving safety and to reduce the risk of damage to property. To create this CWPP the authors used the 2017 Strategic Wildfire Protection Initiative CWPP template with associated GIS data and templates.

The area included in this CWPP is surrounded by large expanses of forested areas, which have been devastated by the mountain pine beetle. As the climate warms and different pests such as the Douglas-fir beetle, spruce beetle, and spruce budworm further impact forest health, the risk of wildfires will increase.

The unprecedented wildfires of 2017 affected communities across the Cariboo-Chilcotin Region and demonstrated the unpredictable nature, incredible force, and extent to which wildfires threaten human settlement.

The wildfires of 2017 have emphasized the need for greater consideration and due diligence with respect to fire risk in the wildland urban interface (WUI). Understanding the factors that contribute to wildfire risk is key for developing a comprehensive plan to identify and mitigate wildfire risk.

The scope of this project included three distinct phases:

- Multi-party engagement including consultation with key provincial, municipal, regional district, First Nation government staff and elected officials, as well as collaboration with various other interested parties to assist with defining the objectives for the wildfire protection plan.
- Use of geographic information system (GIS) information and analysis of maps to spatially define risk according to probability of wildfire and consequence of wildfire followed by 109 on the ground fuel threat assessment polygons.
- Outlining the measures needed to mitigate wildfire risk including: fuel management, communication and education programs, structure protection, emergency response and alternative management of forestlands adjacent to the communities within the plan area.

Summary of Community Wildfire Protection Plan Recommendations

Table 1: Summary of CWPP Recommendations

	Objective/Priority	Recommendation/ Next Steps	Responsibility/ Funding Source
Section 2: Local Area Description	Communication with neighbouring jurisdictions about their plans	**RECOMMENDATION #1:** Communicate regularly with ?Esdilagh, Cariboo Regional District and others about CWPPs that are adjacent to the Area of Interest	City of Quesnel
	Communication with forest industry	**RECOMMENDATION #2:** Communicate regularly with MFLNRORD, forest licensees, BC Timber Sales, and Quesnel Woodlot Association and individual woodlot licensees about coordinating fuel management activities	City of Quesnel
Section 3: Values at Risk	Identify and protect key communications infrastructure	**RECOMMENDATION #3:** Follow up with Shaw Communications during prescription development phase for locations of their infrastructure; encourage owners of communications infrastructure to complete fuel management treatments	City of Quesnel / SWPI or FESBC
	Identify and protect key cultural values	**RECOMMENDATION #4:** Consult with Lhtako Dene about conducting preliminary field reconnaissance for identification of archaeological and cultural values in the prescription development stage	City of Quesnel / SWPI or FESBC
Section 4: Wildfire Threat	Utilize forest fuel management to protect key values	**RECOMMENDATION #5:** Collaborate with MFLNRORD staff on innovative approaches to undertake forest fuel management in Old Growth Management Areas, ungulate winter ranges and other areas with additional resource values, and BC Parks for Provincial parks, to reduce the risk of wildfire to these values	City of Quesnel / SWPI or FESBC
	Enable site-specific recommendations and	**RECOMMENDATION #6:** Work with MFLNRORD to develop locally relevant	City of Quesnel / SWPI or FESBC

	management	fuel management standards for acceptable post-harvest conditions for WUI areas	
Section 5: Risk Management and Mitigation Factors	Maximize funding available annually, implement the plan in a timely manner	**RECOMMENDATION #7:** Apply for funding for prescription development and then implementation from UBCM, FESBC or other sources, aiming to tackle approximately 20% of the areas identified in each of years 2018 to 2022, by priority ranking	City of Quesnel / SWPI or FESBC
	Raise awareness of FireSmart with multiple audiences in multiple ways	**RECOMMENDATION #8:** Explore opportunities to implement FireSmart activities and raise awareness of FireSmart principles through various and multiple audiences. Key focus on communications towers, mailout/distribution of FireSmart brochures, and engaging adjacent landowners when fuel management operations are taking place	City of Quesnel
	Implement the plan in a timely manner	**RECOMMENDATION #9:** Assign responsibility for implementation of this plan to a dedicated staff person. Consider striking a multiparty implementation committee consisting of City, CRD, Lhtako Dene, MFLNRORD and forest industry representatives to coordinate resources, communicate regularly and work cooperatively to reduce fuel wildfire risk	City of Quesnel / FESBC or general revenue
Section 6: Wildfire Response	Enable trained capacity to respond to wildfires and emergencies	**RECOMMENDATION #10:** Maintain mutual aid agreements between fire departments covering the area of interest	City of Quesnel, CRD, Lhtako Dene / funding sources to be explored
		RECOMMENDATION #11: Identify training options to build capacity for wildfire suppression and emergency response, and pursue mock exercises with BC Wildfire Service	City of Quesnel, CRD, Lhtako Dene / funding sources to be explored

SECTION 1: Introduction

In 2007, the City of Quesnel and the Cariboo Regional District, with support from the Union of BC Municipalities and the Fraser Basin Council, developed a Community Wildfire Protection Plan (CWPP). In the decade since Quesnel's 2007 wildfire protection plan was written, 25 hectares of the wildland urban interface (WUI) has been treated to reduce forest fuel. Part of the reason very few fuel treatments were conducted in the WUI between 2007 and 2017 is that the Crown forest in this area requires more ecologically and socially sensitive harvesting; an expensive undertaking that requires public engagement and buy-in.

The City of Quesnel is surrounded by large expanses of forested areas, some of which have been devastated by the mountain pine beetle. As the climate warms and different pests (Douglas-fir beetle, spruce beetle, spruce budworm, etc.) affect forest health, the potential risk of wildfires will increase. The unprecedented wildfires of 2017 affected communities across the Cariboo-Chilcotin Region and demonstrated the unpredictable nature, incredible force, and extent to which wildfires may threaten human settlement. Reducing wildfire hazard involves a multi-layered approach that includes education, subdivision design, and building and landscape design that adheres to FireSmart practices (Quesnel OCP, 2017).

A multi-faceted and coordinated effort has been used for the development the Quesnel and Surrounding Area Community Wildfire Protection Plan, which articulates with the Quesnel Official Community Plan, the City Emergency plan, and the North Cariboo Trails Masterplan. The CRD emergency plan is outdated, and is in the process of being updated in 2017/2018.

This plan contains the following sections:

Section 1: Planning Process

Section 2: Local Area Description

Section 3: Values at Risk

Section 4: Wildfire Threat and Risk

Section 5: Risk Management and Mitigation

Section 6: Wildfire Response Resources

1.1 Purpose

The purpose of this CWPP is to identify the wildfire risks within the area of intent (AOI), to describe the potential threat to human life, property, and critical infrastructure, and recommend treatment options to reduce the wildfire risk. This plan will need to be renewed as the land, resources, and communities' needs within the AOI change, after approximately 5 years. This plan provides an accurate assessment of the risk areas within the AOI that need fuel treatments as well as an overview of different forest fuel modifications that can be utilised.

The CWPP planning process has provided a detailed framework to inform the implementation of specific actions that will ultimately result in:

- reduced likelihood of a wildfire entering the community
- reduced impacts and losses to property and critical infrastructure

- reduced negative economic and social impacts to the community
- reduced impacts on the local forest values

1.2 CWPP Planning Process

The Quesnel CWPP was created by the Fraser Basin Council (FBC), in collaboration with the City of Quesnel and the Cariboo Regional District. Fraser Basin Council staff consulted with Bev Atkins, Fuel Management Specialist, BC Wildfire Service (BCWS), Kelly Osbourne, BCWS, and Rowena Bastien, Protective Services Manager, Cariboo Regional District (CRD) as well as other relevant staff members from BCWS and the CRD.

In addition, the following other orders of government were engaged and invited to attend the initial planning meeting on May 18, 2017 at City Hall in Quesnel:

- Lhtako Dene First Nation
- Nazko First Nation
- ?Esdilagh First Nation
- BC Ministry of Environment, BC Parks
- BC Ministry of Forests, Lands and Natural Resource Operations and Rural Development – Quesnel Natural Resource District, Recreation Sites and Trails BC, BC Timber Sales and BC Wildfire Service
- Ministry of Transportation and Infrastructure

In addition, the following parties with a vested interest were also invited to attend:

- Tolko
- West Fraser
- CNC Wood Products
- Quesnel Woodlot Association
- CN Rail
- Telus
- Shaw
- BC Mining Association
- Fortis
- BC Wildlife Federation
- Cariboo Ski Touring Club
- Northern Health Authority
- Quesnel Cattlemens' Association
- Quesnel Air Quality Roundtable
- Volunteer Fire Departments (Bouchie lake, Kersley, Ten Mile, West Fraser, Quesnel)

Those present at the May 18, 2017 meeting were asked to fill out a worksheet seeking input on plans, policies, values at risk, FireSmart activities, communication initiatives, firefighting resources, water availability, ingress and egress, and structure protection. Those not present at the meeting were asked by email to provide this information.

All of the above were informed and engaged in the development of the plan, with updates posted to the website www.quesnel.ca as well as personal communications with various parties as needed on an ad hoc basis. All information received was incorporated in the plan.

Fieldwork took place between October 21 and November 10, 2017, with the completion of fuel threat assessment worksheet plots in 109 polygons. See section 4.3 Local Wildfire Threat Assessment for further details.

The final plan was presented to Quesnel City Council on January 23, 2017 and presented at the January 23rd, 2018 City Council meeting. The Mayor and Council endorsed the plan by resolutions 18-03-54 and 18-03-55.

SECTION 2: Local Area Description

Understanding the relationship of the community to its surrounding environment, and what that means in terms of the wildfire hazard, threat and risk of loss, is critical to help the community plan for mitigation activities and to respond to wildfire events (SWPI CWPP template, 2016). To support this understanding, the BCWS has conducted a Provincial Strategic Threat Analysis (PSTA) that was used to aid in the identification of the Wildland Urban Interface, wildfire threat, and potential fire behaviour. For a full description of the PSTA for the North Cariboo see Section 4.

BCWS provided the following data for this CWPP:

- The Provincial Strategic Threat Analysis (PSTA)
    - BC Fuel Type
    - Wildfire Threat
    - Head Fire Intensity, Spotting, Fire History
    - Wildland Urban Interface (Structure Density Classes, Structures)
    - Proposed and completed fuel treatments post-2013
- Fuel Treatment Opportunities assessment for Quesnel Natural Resource District, BA Blackwell and Associates Ltd., August 2016

A Quesnel District Landscape Fire Management Plan exists, but was not available during the development of the CWPP.

Other relevant data was acquired from the local government(s) including:

- 2016 Annual Water Report
- 2017 North Cariboo Trails Inventory and Master Plan
- 2017 Statistics & Follow-up from Wildfire Season

2.1 CWPP Area of Interest

The Area of Interest (AOI) covered by this CWPP can be seen in Map 1 (see Appendix 1). The AOI is generally defined by the wildland-urban interface (WUI). The WUI is the area within 2 kilometres of a community with a minimum density of 6 structures per square kilometre, although no structures were ignored due to low structure density. The WUI is also generally consistent with the boundary of the 2007 CWPP. The AOI followed a 2km buffer from the fire protections zones from Kersley, Bouchie Lake, 10 Mile Lake, West Fraser, and Barlow Creek and was expanded to include the communications towers on Dragon and Milburn Mountains.

Table 2: The Area of Intent (AOI) Description:

Jurisdiction	Gross area (ha)	Comments
City of Quesnel	3941	3198 ha is private
Lhtako Dene (aka Red Bluff)	665	Federal jurisdiction
Provincial parks (Dragon Mountain, Pinnacles, 10 Mile Lake)	2240	BC Parks jurisdiction
Private land within Cariboo Regional District	49 958	Electoral Areas A, B and C
Crown land or asserted First Nations territory	27 990	4951 ha within woodlot licences (Schedule B, Crown land)
Lakes, rivers, wetlands	3778	
TOTAL	88 572	

2.2 Community Description

The AOI is comprised of the following communities:

- City of Quesnel – approximate population of 10 000
- Lhtako Dene (Red Bluff) – approximate population of 83 people on reserve
- Barlow Creek – unincorporated community in the CRD, northeast of Quesnel
- 10 Mile - unincorporated community in the CRD, northeast of Quesnel
- Bouchie Lake - unincorporated community in the CRD, west of Quesnel
- West Fraser - unincorporated community in the CRD, southwest of Quesnel
- Kersley - unincorporated community in the CRD, south of Quesnel

The North Cariboo is one of BC's most forestry-dependent areas and the most heavily impacted by the most recent mountain pine beetle epidemic. Recent mill closures, impending reduced Annual Allowable Cut, the softwood lumber agreement, and the 2017 wildfires have all contributed to uncertainty in the region. The North Cariboo was in transition before the summer of 2017 and the wildfires have elevated the urgency of the

transition needs. The region needs to decrease its overall dependence on primary forest products (lumber and saw logs) to the types of fibre and products that will match the fibre supply in the medium term. Economic drivers in the area besides the forest industry are: agriculture, mining, and tourism. Kersley to the south and Bouchie Lake and West Fraser to the west are areas with extensive agricultural use.

The City of Quesnel is currently seeking to obtain a community forest license and the Lhtako Dene First Nation may obtain a First Nation Woodland License. The landbase for the proposed community forest and First Nation Woodland License falls within the interface area. The community forest and First Nation Woodland License will be long term area-based tenures that will allow for the management of other values including traditional use practices, non-timber forest products, and other uses for the forest beyond traditional forest products (lumber and saw logs).

The treatment options proposed in the CWPP will significantly reduce the wildfire threats in the wildland urban interface (WUI) areas and address the effects of the mountain pine beetle by removing built-up fuel, while at the same time ensuring the long term health of the local forest ecosystems. An updated inventory of forested stands in close proximity to residential areas will need to be completed so that priority can be assigned to areas that require fuel treatment. Updating inventories will provide a mechanism for monitoring progress toward reducing wildfire threats within the WUI.

Quesnel, as the main service hub for the AOI, has the following infrastructure and services: a hospital, and an airport with a 1677-meter-long runway and as of the summer of 2017, a 250-person wildfire camp to support additional fire fighters and aircrafts. Quesnel also has BC Wildfire Service Fire Zone office with a Zone Manager, Seasonal Protection Staff, a 20-person Unit Crew plus initial attack resources stationed at the airport.

Existing evacuation and egress routes are:

- Hwy 97
- the Quesnel Airport
- CN Rail line
- The West Fraser Road, connects south to Williams Lake.
- Highway 26, accesses Wells and the eastern Cariboo
- Highway 59, accesses Nazko and communities to the west.
- Quesnel Hydraulic Road, parallels the Quesnel River to the southeast.

Firefighting jurisdiction is covered by the following volunteer fire departments, encompassing the entire AOI:

- Quesnel
- West Fraser
- 10 Mile
- Bouchie Lake

- Barlow Creek
- Kersley
- Lhtako Dene

Note - Details on firefighting resources by department are covered in Section 6.

2.3 Past Wildfires, Evacuations and Impacts

There have been 82 wildfires to date in the AOI between 1919 and 2013, totaling 7918 ha, only 92 ha of which have burned in the AOI since 1990 and have not significantly impacted Quesnel. Several fires west of the AOI have impacted Quesnel with smoke and poor air quality in the past decade including:

- In 2014, the Euchiniko Lakes (19,923 ha) 120 km west of Quesnel which resulted in Evacuation Alerts and Orders and people evacuated into Quesnel
- In 2010, the Pelican Lake complex of fires north of Nazko which covered a combined area of 35,506 ha
- In 2009, a 6,618 ha fire in Kluskus area, west of Quesnel

The 2017 wildfires were not inside the AOI, but had many direct and indirect effects to residents, businesses, and non-profits in the North Cariboo sub-Region. The 2017 fires led to human and animal evacuations from neighboring communities (Williams Lake, West Fraser, and Nazko) and economic impacts from the road closures (businesses and non-profits lost revenue and festivals were cancelled). The 2017 wildfires provided many learning opportunities and some of the key learnings are outlined below to help the City of Quesnel and the Northern CRD Directors to better prepare for, respond to, and mitigate against future extreme wildfire events.

Some of the key learnings from the 2017 wildfires centre on:

- communications and public outreach
- emergency social services response
- establishing a fire base at the Quesnel airport, and
- communications infrastructure

1) Communications and Public Outreach

An immediate identified gap during the first few days of the wildfires was the lack of reliable information, compounded by social media misinformation. The response to this issue was to have Mayor Simpson deliver daily updates on Facebook regarding the fire situation, providing not only factual information about the fires, but also contextual information to help the community understand the situation better. This became a very well accessed source of information for the public across the entire Region and beyond.

The City communications department also made a significant amount of information available through social media and the City website. The City made the promotions space at the Spirit Square available to BC Wildfire Service to display maps and public information.

Key learning regarding communications and outreach in a wildfire event:

- Early accurate information is critical to dealing with misinformation and any

corresponding anxiety/panic

- Consistent information on a regular predictable schedule
- Social media is an excellent medium for relaying information (and misinformation)
- When there are official communication sources such as Wildfire BC, everyone else communicating to the public should refer to those sources, so that one unified message is consistently conveyed

2) Emergency Social Services Response - The City has a well-trained group of Emergency Social Services (ESS) volunteers. An Emergency Reception Centre (ERC) was initiated at the Rec Centre on July 7th at the request of the Alexandria First Nation, it operated for several days before being asked by the CRD EOC to stand down operations because Quesnel did not offer group lodging to evacuees. After being closed for one day, it re-opened for the duration of the wildfire event. It had become apparent that there was a significant unmet need to provide assistance to evacuees that were in this area despite no availability of group lodging.

Key learnings for ERC in a wildfire event:

- In any events causing wider evacuations, an Emergency Reception Centre is critical to providing necessary supports to the evacuees
- Despite not providing group lodging to evacuees in Quesnel, the ERC was able to provide services to more than 2600 evacuees between local hotels, established campsites, camping in city parks and voluntary residential lodging in the City
- A strong recommendation to EMBC (the Province) is to modernize the registration and voucher systems. They are very time intensive, repetitive functions that could be updated with existing technology and simplified processes
- A large force of trained ESS volunteers is critical to the success of this function, continual training of these individuals should receive priority by the Province

3) Establishing a Fire Base at Quesnel Airport

At the request of the FLNRORD, the City of Quesnel made the Airport available to operate a Base Command Fire Camp.

Key learnings for establishing an airport firebase during a wildfire:

- To facilitate the widespread firefighting, the airport must be kept available as a fire base. This is even more critical when the normal base operations at the Williams Lake airport are compromised due to fire or smoke.

4) Communications Infrastructure

The wildfire that occurred on Green Mt. in the Quesnel area was only a few miles from the Dragon Mountain communications towers that are used by the North Cariboo Fire Departments, ABC Communication Services, CN Rail, BCAS Emergency Services, EMCON Road Services, North Cariboo Hwy Rescue, RCMP, plus a multitude of logging contractors and other communication providers.

These towers are a lifeline to the North Cariboo and in the event these towers were to be

disabled due to wildfire in the area, the entire North Cariboo communications would be interrupted. The recent North Plateau wildfire damaged communication towers in the Fishpot Lake area, near Nazko, when these towers were not adequately protected.

Key learnings regarding communications infrastructure:

- Communications towers in Dragon Mountain need to be treated for fuel to mitigate risk of wildfire interrupting communications.
- Radio Communications infrastructure in the Quesnel area needs improvement, adding radio repeater towers are a potential solution. Since the 2017 wildfire season, Quesnel Search and Rescue has erected a repeater on Dragon Mountain, and are planning for several others.

2.4 Current Community Engagement

- The City of Quesnel prepared a CWPP in 2006-07 and it is available at www.quesnelfire.ca/cwpp. Fuel management projects were implemented in Kersley and Ten Mile Lake Provincial Park.
- Since 2007, the West Fraser Volunteer Fire Department has regularly distributed FireSmart brochures door-to-door, and had community wildfire meetings at the local community hall.
- Kersley Volunteer Fire Department notes that the Kersley walking park (lease land) project included gates to prevent access, massive removal of ladder fuels and spacing. The main effort was 8 years ago with upkeep by Kersley Community Association. FireSmart was presented at community meetings when possible but proper saturation of the community was not occurring to spring 2017. Current communication through electronic media, BCWS wildfire risk board in fire hall lot, CRD electronic evacuation notification system.
- BC Wildfire Service commissioned BA Blackwell and Associates Ltd. to complete a Fuel Treatment Opportunities assessment for Quesnel Natural Resource District. This was completed in August 2016 (discussed further in Section 4).
- Lhtako does not have a CWPP in place. No fuel reduction treatments have taken place. FireSmart education was delivered by FNESS at community meetings in the past; the Band currently communicates to community members via Facebook and posters.
- Quesnel Cattlemens' Association had MFLNRORD speak about forest fuel reduction at recent AGM; they currently communicate about fire risk with their members through email and telephone.
- Kersley Community Association has an emergency action plan that was created after the 2003 wildfires. Personnel were trained at the time, but little follow up training has occurred.

2.5 Linkages to Other Plans and Polices

2.5.1 Local Authority Emergency Plan

The Quesnel City Emergency Plan is a generic document that covers a broad range of potential public safety emergencies. While all emergency responses have some commonality, wildfire situations are particularly difficult due to their rapid onset, ability to spread very fast, unpredictability and their potential for extreme amounts of property damage and risk to life. City emergency plans and information can be found online at https://www.quesnel.ca/municipal-services/emergency-services/emergency-preparedness

The City is looking to have a more specific wildfire planning section in their emergency plan, including information from community stakeholders. As per the City Staff Report from October 23, 2017, a renewed Emergency Plan for the City of Quesnel may include:

- Defining the City wide evacuation procedures and muster zones, with special consideration for those residents needing more assistance.
- Securing bus transportation.
- Developing employee lists and position lists for key employees required to provide support during and after an evacuation alert. Working with CUPE to ensure availability of the needed employees.
- Managing vacation absences for critical employees to ensure key personnel are in place at all times.
- Consideration of the EOC logistics if an EOC for Quesnel had to be established, such as phone lines and staffing.
- Consideration of where to set up a remote EOC in the event of an evacuation from Quesnel.
- Development of public information proactively in the event of an evacuation being required for Quesnel. On the one hand City residents need to be informed with accurate information, but this is balanced with not unnecessarily alarming residents by discussions of evacuation prematurely.
- Development of a list of residents who were willing to take evacuees and/or their pets into their homes.
- Providing mapping support for emergency response and planning efforts.

Additionally, the City is looking to create a Wildfire Plan that will detail all aspects required for community evacuations, including working with Northern Health and other agencies to ensure appropriate prioritized facility evacuations. Evacuation routes and the best format for a local team to manage the wider community impacts of a wildfire response will be considered. Emergency response practices will be planned more regularly and will include engagement by key community stakeholders (this is mandated at the airport, but has not occurred for other types of emergency situations).

Local Emergency Planning Committee The key learnings from the Local Emergency

Planning Committee (EPC) from the 2017 wildfires show how the functions of the committee can potentially reduce impacts and losses to property and critical infrastructure as well as reduce negative economic and social impacts to the community by providing accurate and timely information to the public, facilitating minimal impact to people during road closures or using local input to adjust road blocks, and liaising with RCMP, EMBC, BCWS and various other groups during wildfire events.

In July 2017, after the beginnings of the wildfires, the City's EPC started meeting every morning. These meeting were held for as long as the fire situation was changing rapidly and the control lines and procedures were being established. After the fires were largely contained, and the fire emergency aspects were more settled, these meetings became ad hoc.

Initially the EPC consisted of the Mayor, City Manager, Deputy City Manager, Public Works Directors, the Fire Chief, the Director of Community Services, the Communication clerk, RCMP and Wildfire BC representative. This meeting quickly grew to also include the North Cariboo CRD directors, the Mayor and Administrator from Wells and the North Cariboo Fire Chiefs.

Due to the broad reach and diversity of this group, it was able to provide assistance in a number of areas including:

- Providing accurate timely information to the public based on daily in-person briefings by Wildfire BC by:
    - Posting daily social media releases by the Mayor
    - Copying Wildfire releases and CRD releases on City social media/website
    - Releasing live interviews with the Mayor
    - Distributing Wildfire BC briefings within community
    - Opening of Wildfire BC public information office in Spirit Centre, including space for public posting of wildfire maps
- Liaising with the regional district Emergency Operations Centre (EOC), MOTI and RCMP regarding road closures and road block placement.
    - Advising the Emergency Operations Centre (EOC) to adjust road blocks based on local input, especially from CRD directors
    - Advising the EOC to adjust evacuation order areas as fire risks changed
    - Providing advice for managing the process at the barricades, in particular were issues for ranchers needing to access their properties or those hauling livestock out of evacuation areas. Exit/Re-entry permits were a big challenge
- Liaising with RCMP and public communications on community safety issues
    - Thieves who were posing as fire officers to get people away from their residences
- Providing direction to assist with wildfire response logistics

- Fire camp establishment at airport, including space allocation and assisting with sourcing any supplies need
- Emergency reception centre establishment at Recreation Centre
- Making Alex Fraser Park available for the Pet Safe Coalition and evacuee camping
- Making camping available at other City parks

Key Learnings for sub-regional emergency management team:

- For wildfire incidents, all of the local Fire Departments should be included on the team from the start. The Fire Chiefs reportedly had difficultly accessing current situational information.

2.5.2 Affiliated CWPPs

The Cariboo Regional District developed a CWPP in 2006 that covered the entire regional district. It is understood that the CRD's CWPP will be updated in the near future. Duplication will be avoided as any joint projects within the AOI within CRD jurisdiction will need to be coordinated with them.

?Esdlilagh First Nation developed a CWPP in 2017 which is south of the Quesnel and Surrounding Area CWPP. ?Esdilagh has accessed funding to complete forest fuel management around their community, including a fuel break. It is unknown at this time if a portion of this fuel break may fall within the southern end of the AOI.

RECOMMENDATION #1: Communicate regularly with ?Esdilagh, Cariboo Regional District and others about CWPPs that are adjacent to the AOI.

2.5.3 Local Government and First Nation Plans and Policies

The following local government and First Nations plans have the following content that is relevant to community wildfire protection:

- The Quesnel Official Community Plan (OCP) was updated in 2017 and includes multiple levels of mitigation measures to be undertaken to reduce the risks of wildfires to residents. See https://www.quesnel.ca/building-development/planning-zoning/long-range-planning-policy
- Lhtako Dene Comprehensive Community Plan (CCP) – this plan was requested but not obtained. Please contact Lhtako Dene First Nation Band office at (250) 747-2900
- Cariboo Regional District – Quesnel fringe OCP approved in 2014 covers much of the AOI. It has objectives of reducing wildfire risk, and requires developers of subdivisions with 4 or more parcels to undertake a wildfire hazard assessment report (section 3.4.53). Schedule E contains a map of high wildfire probability. See http://www.cariboord.bc.ca/services/planning/ocp-s/quesnel-fringe-ocp
- City of Quesnel and Lhtako Dene have a protocol agreement, signed in 2017.

2.5.4 Higher Level Plans and Relevant Legislation

The AOI is covered by the Cariboo-Chilcotin Land Use Plan, Enhanced Resource

Development Zone E-3 (Quesnel). Portions of the CCLUP were declared a higher level plan in 1996.

The three provincial parks in the AOI have management plans in place:

- Dragon Mountain – management plan completed Dec 2015, available at http://www.env.gov.bc.ca/bcparks/explore/parkpgs/dragon_mt/dragon-mt-mp.pdf?v=1500323492073
    - Primary role of park is to protect local recreation opportunities
    - Secondary role of park is to provide mule deer winter range and old growth
- Pinnacles – no management plan in place; purpose statement and zoning plan as at May 2005 is available at http://www.env.gov.bc.ca/bcparks/planning/mgmtplns/pinnacles//pinnacles_pszp.pdf?v=1500323647536
    - Primary role of park is to protect dramatic example of hoodoos
    - Secondary role of park is to protect habitat for at-risk plant species
    - Zoning is 55% special feature (hoodoos) and 45% intensive recreation
- Ten Mile Lake - no management plan in place; purpose statement and zoning plan as at Feb 2003 is available at http://www.env.gov.bc.ca/bcparks/planning/mgmtplns/tenmile/tenmile_ps.pdf?v=1500323737915
    - Primary role of park is to provide a vehicle accessed camping area
    - Secondary role is to protect a small forested area in a developed, near-urban area
    - Zoning is 24% intensive recreation, and 76% natural environment

Generally, timber cannot be removed in provincial parks however forest fuel management that does not remove commercial material may be able to proceed.

Multiple objectives for wildlife, environmental and social values exist through a variety of mechanisms, generally through MFLNRORD and legislation under that ministry. This information is summarised in Table 3 below.

Table 3: Objectives for Wildlife, Environmental and Social Values

Objectives/item or constraint	Purpose	Establishment mechanism	Forest Fuel Management opportunities
Old growth management areas	Set aside areas of old growth for maintenance of biodiversity, old forest attributes, connectivity	Land Act s.93.4	May be limited; understory options may be able to proceed. See Section 4, Other Forest Values
Visual quality objectives	To maintain scenic areas or visual sensitivity classes	Forest Planning and Practices Regulation, FRPA	May be limited; understory options may be able to proceed. See Section 4, Other Forest Values
Mule deer (ungulate) winter range	Provide suitable winter cover and food sources for maintenance of mule deer populations	General Wildlife Measures, Forest and Range Practices Act	May be limited; understory options may be able to proceed. See Section 4, Other Forest Values
Wildlife Habitat Areas (WHA)	A 28 ha data-sensitive WHA exists at "Milburn" south of the Nazko Hwy, on the west side of the AOI	Government Actions Regulation, FRPA	May be limited; to be further explored.

2.5.5 Ministry or Industry Plans

A Type 4 Silviculture Strategy for the Quesnel Timber Supply Area was finalized in 2013. It is available at: www.for.gov.bc.ca/hfp/silstrat/Quesnel/Quesnel_Type_4_Silviculture_Strategy_20130702.pdf.

This strategy identifies the risk that dead (killed by mountain pine beetle) trees create as fuel and suggests creating fuel breaks, raising awareness among the public for fuel management, utilizing partial cutting techniques as fuel management and as a method of ecosystem restoration, as well as the opportunity to conduct fuel management in conjunction with spacing to grow timber supply.

Each forest licensee operating within the AOI has a forest stewardship plan. Each woodlot licensee in the area, of which there are 14 partially or wholly in the AOI, has a woodlot license plan. While each of these are only obligated to abate forest fire hazards that accumulate through their harvesting activities, additional forest fuel management activities may be undertaken at their own discretion.

RECOMMENDATION #2: Communicate regularly with MFLNRORD, forest licensees, BC Timber Sales and Quesnel Woodlot Association and individual woodlot licensees about coordinating fuel management activities.

SECTION 3: Values at Risk

The intent of this section is to introduce the extent to which wildfire has the potential to impact values within a community. Values at risk (VAR) are the human or natural resources that may be impacted by wildfire. This includes human life, property, critical infrastructure, high environmental and cultural values, and resource values.

Updating VAR data is critical for effective mitigation planning. This can be achieved through the use of high quality imagery to identify areas of new development and values such as critical infrastructure.

3.1 Human Life and Safety

The intent of this sub-section is to clearly identify and understand where people and structures are located within the AOI in order to effectively determine the wildfire risk and identify mitigation activities. In the event of a wildfire approaching one of the communities in the AOI, the first priority is human life and safety, including the evacuation of at-risk areas. Wildfire can move quickly and unpredictably, and it takes time for people to evacuate an area. Residences on the north and eastern edges of forest ecosystems are more at risk from wildfires than developments on the southern and western portions. Developments above forest ecosystems are at higher risk from wildfire events. Safe egress can be blocked by the fire itself or by vehicle congestion or accidents.

The majority of the population within the CWPP AOI live in a fairly urban setting within the City of Quesnel. Moving out from the main City core, the population becomes more spread out and rural. The rural homes and infrastructure is largely located along the main access corridors radiating from the City. The Provincial Strategic Threat Analysis (PSTA) data amalgamated by the BCWS provides a good database of rural structure distribution and location. The multiple sources used to create the structure data layer creates multiple points for many structures, points for minor outbuildings and address points with no structures. The GIS analysis completed as part of this process updated the PSTA as much as was feasible to improve the overall accuracy of the structure data. The results can be found on Map 2 in Appendix 1.

Ten Mile Lake Provincial Park, located in the northeast section of the AOI, has dozens of campsites and is a very popular local destination throughout the wildfire season. Although minor fuel management activities have been completed in the park, this site is identified as a high priority for forest fuel management activities due to the significant fuel load from dead pine.

The values at risk which we identified include municipal buildings, hospital, airport, schools, recreation areas, utilities, and volunteer fire departments:

- Quesnel City Hall
- Provincial Government building
- GR Baker Hospital
- Quesnel Airport

- Elementary Schools: Carson, Voyageur, Riverview, Red Bluff, Lakeview, Dragon Lake, Barlow Creek, Parkland, Bouchie Lake, Kersley, North Cariboo Christian
- Quesnel Junior School and Correlieu Senior Secondary
- Volunteer Fire Departments: Quesnel, West Fraser, Kersley, Barlow Creek, Ten Mile, Bouchie Lake
- Recreation areas: Robert's Roost Campground, Ten Mile Lake Provincial Park, Pinnacles Provincial Park, Dragon Mountain Provincial Park, Dragon Lake hiking trails, Hangman's Springs trails, Kosta's Cove picnic area at Ten Mile Lake, Lazy Days campground, Two Sisters Creek recreation area, Kersley Arena
- Community halls: Kersley, Bouchie Lake
- Utilities: Fortis gas substation, Dragon Mtn cell towers, Milburn Mtn cell towers,
- Other: Rocky's grocery store and gas station (Bouchie Lake), Six Mile grocery store and gas station (Barlow Creek), Alamo gas station, Kersley General Store

3.2 Critical Infrastructure

The intent of this sub-section is to clearly identify and understand where critical infrastructure is located within the Wildfire Urban Interface (WUI) in order to effectively determine the wildfire risk and identify priority mitigation activities. Critical infrastructure assets are those physical resources, service and information technology facilities, networks and assets which, if disrupted or destroyed, would have a serious impact on the operation of an organization, sector, region or government. The PSTA data, Local Authority Emergency Plan and any available infrastructure data (DataBC) was reviewed as part of this planning process and updated for errors and omissions.

The following sections outline the risk that wildfire poses to the infrastructure and was obtained through working with the asset owners. The impacts and implications of disruption of these services (electricity, communications, water supply, waste treatment, hospitals, schools, etc.), during and after a wildfire is discussed.

3.2.1 Electrical Power and Natural Gas

BC Hydro has the following assets in the area (personal communication November 2017):

1. Quesnel Substation
2. Red Bluff Substation
3. Barlow Substation
4. Transmission Lines
5. Distribution Lines (assumed a mix of wood and metal poles)

BC Hydro maintains approximately 90 km of major transmission lines through the Quesnel and Surrounding Area Community Wildfire Protection Plan Area of Intent, with 850 more kilometres of distribution lines. BC Hydro prepares for wildfires by evaluating assets at risk and criticality to mobilize resources for FireSmart initiatives at their substations, microwave sites and lines, by removing extensive flammable fuels.

Fortis BC does not typically provide schematics of infrastructure to outside agencies due to the possibility of misinterpretation of the data. In the event there is an issue which may impact critical infrastructure, FortisBC first responders who are knowledgeable will perform public safety efforts and liaison with regional or local emergency services.

Emergency dispatch has 24/7 emergency contact information, so there is never a time when FortisBC lacks coverage. FortisBC has approximately 7500m of distribution line in the AOI with 31m being critical to infrastructure such as hospital, school and key commercial customers, however, most, if not all of this infrastructure is below ground.

FortisBC has a Corporate Forest Fire Plan and a comprehensive Corporate Emergency Plan which guides their mitigation, planning, response and recovery activities when the risk of wildfires is present – it can be found at https://www.fortisbc.com/Safety/EmergencyPreparedness/Documents/CorporateEmergencyResponsePlan.pdf In the event of a wildfire on or near FortisBC infrastructure, direct contact with their Emergency Operations Centre is required to ensure appropriate personnel are dispatched to assess and support any situation which has the potential to, or has threatened their infrastructure. Direct contact information for FortisBC emergency operations center resides with whichever dispatch service (911, ECOMM etc.) utilized by the local municipalities (personal communication, TM Sandulak).

FortisBC holds public and employee safety as a main priority and works with provincial emergency officials to monitor various forest fire situations in BC; they also work with local fire and emergency authorities to ensure public safety and to protect their natural gas infrastructure.

3.2.2 Communications and Municipal Buildings

- There are several critical communications towers on Dragon Mountain which are used by the North Cariboo Fire Departments, ABC Communication Services, CN Rail, BCAS Emergency Services, EMCON Road Services, North Cariboo Hwy Rescue, RCMP, plus a multitude of logging and other communication services. These towers are a lifeline to the North Cariboo and in the event these towers were to be disabled due to wildfire in the area, the entire North Cariboo communications would be interrupted, causing extreme threat to public health and safety.
- Quesnel City Hall is located at 410 Kinchant Street, in downtown Quesnel.
- For CN Rail, all emergency related notifications should be relayed to CN Police at: 1-800-465-9239. Also see https://www.cn.ca/en/safety/municipalities for contacts and information on safety plans and procedures. Once notified, CN's internal emergency response protocol will be initialized and communications between agencies established. CN has a Wildfire Control Plan for all of BC and it includes specific information for what to do when a fire is discovered, key staff and emergency assistance numbers, CN firefighting and communications equipment, as well as values and structures at risk. CN's emergency response plan can be found
- There was no response from Shaw Communications about their communication infrastructure.

RECOMMENDATION #3: Follow up with Shaw Communications during prescription development phase for locations of their infrastructure; encourage owners of communications infrastructure to complete fuel management treatments.

3.2.3 Drinking Water Supply and Sewage

The City of Quesnel water system is comprised of 6 operating groundwater wells (main system), 8 reservoirs, 5 booster pump stations, 2 main PRV stations and approximately 100 km of water main. In addition the City also maintains one independent groundwater well on Sword Road (small system) in South Quesnel to provide water to the ball parks. At present there is no treatment or disinfection provided to the City's water system. Approximately 10,000 residents are serviced by the City water system (Quesnel Annual Water Report, 2016). There are no community watersheds within the AOI.

The City of Quesnel sanitary sewer system is comprised of 8 lift stations and a pre-treatment facility (near the confluence of Fraser and Quesnel Rivers). The City has a contract for treatment with Cariboo Pulp and Paper once it is pumped from the pre-treatment facility to the lagoons at Cariboo Pulp. The lift stations and pre-treatment plant have backup power generators in case of hydro loss.

3.3 High Environmental and Cultural Values

The intent of this sub-section is to clearly identify and understand where high environmental and cultural values are located within the WUI in order to effectively determine wildfire risk and identify mitigation activities.

Environmental and cultural values are high throughout the area of interest. Quesnel and surrounding area offer a range of outdoor activities that draw tourists including mountain biking, golfing, fishing, camping and hiking.

3.3.1 Cultural Values

Cultural values within the study area include the Lhtako Dene traditional lands which include fish bearing habitat and traditional gathering sites of cultural significance. Other values within the study area include heritage buildings, Crown and private forest lands and Provincial parks and agricultural land.

The City of Quesnel and Lhtako Dene Nation have a Memorandum of Understanding that officially recognizes the Lhtako Dene Nation Traditional Territory and allows for cooperative government-to-government partnerships. Prior to any fuel treatments, a Preliminary Field Reconnaissance is recommended to identify any high value or sensitive cultural values on the Crown lands within the area of intent that would be impacted. There will be ongoing consultation for all future fuel management projects.

RECOMMENDATION #4: Consult with Lhtako Dene about conducting preliminary field reconnaissance for identification of archaeological and cultural values in the prescription development stage.

3.3.2 Trails

The community of Quesnel and its surrounding region have been a hub for trail transportation for hundreds of years. Located on the traditional territory of the Lhtako Dene First Nation, the area has also seen explorers, fur traders, the Cariboo Gold Rush, the development of telegraph routes, and modern transportation infrastructure. Consequently, there are currently almost 400 kilometres of trails within a 20 km radius of the city. Although the Quesnel economy has traditionally been based on local mining and forestry,

there is a strong opportunity to develop the recreational tourism sector. Therefore, the City of Quesnel has commissioned the North Cariboo Trails Inventory and Master Plan to create a strategy for the expansion and management of the regional trail system (see https://www.quesnel.ca/city-hall/major-initiatives/north-cariboo-trails-inventory-and-master-plan) Firebreaks were discussed during the Master Plan process as potential alignments for some trails. Further, any fuel treatments would take into consideration the existing trails networks and the potential for expanding the trail network using fuel treatment and demonstration projects.

Recreation Sites and Trails BC, a part of MFLNRORD, operate the following sites or trails within the AOI:

- Hangman's Springs Trails and Hangman's Springs Pit – a network of trails off the Nazko Highway, south of Milburn Mountain, on the west side of the AOI
- Hallis Lake Cross Country Ski Trails – managed by the Cariboo Ski Touring Club, located on the eastern edge of the AOI, east of Dragon Lake (this is outside of the AOI but needs to be referenced as it is a very high use area)
- Sisters' Creek recreation site – includes 850m of low-mobility trails, near Kersley
- Deserter's Creek Falls trail – trail along Narcosli Creek and Deserter's Creek, west of the Fraser River

3.3.3 Environmental Values

The extensive riparian areas in and around Quesnel are considered high environmental values and the protection of salmon habitat is paramount. As part of the fuel treatment prescription phase, all prescriptions are recommended to be site specific and be developed with the proper referrals to identify habitat and species at risk considerations. The species at risk within the AOI are: White Sturgeon (Fraser River population); Sprengel's sedge *Carex sprengelii*; American Sweet-flag – *Acorus americanus*; Riverbank anemone – *Anemone virginiana var. cylindroidea*. There are several Mule Deer Winter Range areas within the AOI as well.

3.4 Other Resource Values

- Quesnel Cattlemen identify rangeland, pastureland, forage land as important values. During forest fire season, thousands of cattle could be on the range within the AOI. In addition, fences, barns and other infrastructure are at risk of damage. Irrigated agricultural fields provide landscape-level fuel breaks within the AOI.
- Timber values – approximately 23,000 ha of timber harvesting landbase (THLB) are within the AOI. Portions of 14 woodlot licences are within the AOI. A community forest licence and First Nations Woodlot Licence are being pursued. While there are opportunities for forest licensees, BC Timber Sales and woodlot licensees to manage forest fuels in conjunction with their activities, there is also a desire to grow commercial fibre for future timber harvesting on this landbase.

3.5 Hazardous Values

The following is a list of hazardous values that pose a safety hazard to emergency

responders:

- Quesnel Cattlemens Association identified large quantities of fuel, oil and fertilizer at ranches as a hazard
- All gas stations in the AOI including the rural sites: Rocky's grocery store and gas station (Bouchie Lake), Six Mile grocery store and gas station (Barlow Creek), Alamo gas station
- Large quantities of chemicals onsite at 2 pulp mills, plywood plant, and MDF plant
- Two Mile Flat industrial site has 3 sawmills (Tolko Industries, C and C Wood products, and West Fraser Mills) with significant quantities of saw logs and lumber
- Landfills and transfer stations operated by the City of Quesnel and the Cariboo Regional District may have hazardous materials, and are often the location of arson fires, which pose a risk to adjacent forests, communities and values

SECTION 4: Wildfire Threat and Risk

Community Wildfire Protection Plans (the Plan) are generally considered active for a five year period; the treatment units identified in this plan focus on work that could be completed in a 5-7 year time frame. The fuel management locations recommendations in this plan do not completely reflect the entire scope of fuel treatments that should be considered in the Quesnel area but do include the highest priority identified sites. Recommended fuel treatment areas are all located on Crown land (minor exception in the Quesnel Industrial area where land ownership was undetermined at the time of assessment resulting in numerous treatment sites on private land. These treatment units were left in the plan) due to funding options. Numerous small parcels of crown land are scattered through the Area of Interest (AOI) covered in the Plan, surrounded by private land and largely have no direct access. These sites were reviewed through Google Earth and the ortho mosaic maps provided to determine if any posed a serious wildfire threat. These sites were not directly identified for fuel management treatments in this plan but should be reviewed again in further fuel management planning processes.

The Quesnel AOI can be threatened by wildfires in two basic scenarios. The first is a landscape level (large) wildfire establishing itself well outside the Quesnel area and moving into this area, threatening the entire community and surrounding area. The second is a wildfire starting within the Area of Interest and very quickly threatening the adjacent structures.

4.1 Landscape Wildfires Impacting the Quesnel Area of Interest

In B.C., while wildfires have the ability to spread in any direction, landscape level wildfires mainly spread hottest and fastest with the prevailing winds. Unsettled weather conditions that create cumulus clouds and thunderstorms can lead to very erratic, short term wildfire spread in multiple directions at once. Topography and available fuels can also play a significant role in direction of spread and wildfire intensity. This suggests that wildfires main direction of spread and highest intensity spread is to the north and east, placing the parts of the AOI on the southern and western parts of the AOI at the highest threat to landscape level wildfires.

The areas to the southwest and west of the Quesnel AOI have a very diverse mosaic of lodgepole pine plantations, mostly in the 15-25 year age class resulting from the salvage harvesting from the mountain pine beetle infestation, and spruce/deciduous mixed stands of varying compositions. These mixed stands have varying components of lodgepole pine that has almost all fallen out of the stand. Those areas not salvaged have varying degrees of surface fuel loads that increase the wildfire threats. Surface fuel loads exceeding 100 Tonnes per hectare were identified in the Hangman Pit area west of Baker Creek. There are very few pure conifer stands immediately southwest of the Quesnel AOI where a landscape level wildfire can develop and threaten the area. The exception would be the Baker Creek area and ribbons of private and crown land in the West Fraser and Garner Road areas.

The main wildfire threat areas on the southern boundary of the Quesnel AOI are found in the Douglas-fir/conifer leading types along the West Fraser Road, Kersley, Dragon Mountain Park and east of Dragon Lake. There are quite continuous bands of conifers that could allow a wildfire establishing itself south of Quesnel to spread directly into the

locations mentioned above, and the Hydraulic Road and north area. These areas are easily identified using either the Map 7 Local Fire Risk or Map 9 Vegetation Resource Inventory (VRI) map (see Appendix 1) that has the conifer leading stands identified.

4.2 Local Wildfires Ignited Within the Quesnel AOI

Of equal or even greater concern is the potential for wildfires to establish themselves with the Quesnel AOI itself and quickly threaten the local communities. Area such as:

- Baker Creek
- Pinnacles and Ten Mile Parks
- Dragon Mountain Park
- forest land south of Highway 26
- Nazko Highway and Hangman Pit Road area
- Marsh Road subdivision
- Sisters Creek in Kersley
- Quesnel Airport
- Lower Baker Creek Park
- North Road Industrial Area
- Hydraulic Road and Dragon Lake Area

All these areas are conifer dominated forest ecosystems with continuous surface fuels and the potential for aggressive wildfire behaviour under the right fire weather conditions. These sites have regular and often heavy public use with the potential of wildfire ignition through man caused starts. The main concern with these wildfires is that they would almost immediately threaten structures due to the proximity to developed areas. They can become serious problems for structural and wildland fire crews during short term wind events.

The proximity to structures does not allow for all the wildfire suppression tools to be used effectively and the potential loss of life and property can quickly overwhelm available resources. A weather event causing multiple starts is likely. The wildfire threats can be shown partly through the VRI data where conifer leading polygons are highlighted (Map 9, Appendix 1). The conifer leading polygon map and the wildfire threat map have significant similarities as the highest wildfire threat areas closely overlap the conifer dominate areas.

4.3 Other Forest Values

Forest fuel management treatments can have direct impacts on forest resource values that need to be considered. It is important to note that forest fuel management activities are intended to protect and enhance other forest values by limiting or reducing the impact of wildfires on the landscape. The concept of protecting forest values by drawing a line on a map and not allowing forest management activities within that area to support or enhance a specific forest value does not provide for effective forest fuel management activities. Continuing to conduct wildfire suppression activities but no other forest management is

also not a successful long-term strategy for protecting forest values. This is especially true in areas of continuous coniferous forest cover.

Recent wildfire history shows that wildfires that establish themselves in high wildfire threat areas, that is dense coniferous stands that are capable of supporting active candling crown fire behaviour, cannot be successfully contained under dry and hot conditions and tend to burn the entire timber type (Bruce Morrow, personal observation).

Forest fuel management, on a landscape scale, is designed to break up high wildfire threat stands to reduce the losses of entire timber types or ecosystems, thus reducing the wildfire impacts on other forest values. To protect large areas of coniferous forests, they need to be broken up to provide wildfire suppression opportunities to minimize wildfire impacts. To significantly reduce the wildfire threats in the Quesnel area, there will be impacts on other forest values. There needs to be a serious discussion with the land managers about the priority of forest fuel management and wildfire threat reduction activities in relation to other forest values and managing for other attributes on the land base.

The forest values and management strategies most directly impacted by forest fuel management activities include:

- Old Growth Management Areas – OGMAs attributes can be retained and enhanced while conducting properly planned and conducted forest fuel management activities. This is not a common practice at this time but will be necessary to implement this plan. An alternative is to move the OGMAs out of the Quesnel AOI to allow for forest fuel management activities in the identified areas.
- Ungulate Winter Range – partial cut activities and long term controlled access, strategically placed, within a designated UWR area can have significant wildfire threat reduction benefits while only impacting (and potentially enhancing) a portion of the area.
- Visual Quality Objectives – forest fuel management activities visual impacts can be minimized through partial cut activities and hand treatments when sensitive sites are being treated.
- Recreational Opportunities – forest fuel management activities can enhance recreational opportunities by creating controlled access into presently inaccessible areas and providing roads and trails for multiple uses, to form the backbone of a trail and recreational area.
- Access Management – forest fuel management activities provide wildfire suppression opportunities through faster, more efficient access and egress, tie points for wildfire suppression activities, fuel breaks and burn off locations. This access often requires tight controls, seasonal closures and extensive public education to minimize impacts on other forest values.

RECOMMENDATION #5: Collaborate with MFLNRORD staff on innovative approaches to undertake forest fuel management in OGMAs, ungulate winter ranges and other areas with additional resource values, and BC Parks for Provincial Parks, to reduce the risk of wildfire to these values.

4.4 Fire Regime

The Quesnel area is dominated by the Sub Boreal Spruce (SBS) biogeoclimatic zone and the Natural Disturbance Type (NDT) 3 fire regime. See Map 3, Appendix 1. The following information was taken from the Biodiversity Guidebook:

- Historically, these forest ecosystems experienced frequent wildfires that ranged in size from small spot fires to conflagrations covering tens of thousands of hectares. Average fire size was likely 300 ha in some parts of the Boreal White and Black Spruce (BWBS) biogeoclimatic zone, but went as high as 6000 ha in other parts of the zone where topographic features did not limit fire spread. The largest fires in the province occur in this NDT, often exceeding 100,000 ha and sometimes even 200,000 ha.
- Natural burns usually contained unburned patches of mature forest that were missed by fire. Consequently, these forests produced a mosaic of even-aged regenerating stands ranging in size from a few to thousands of hectares and usually containing mature forest remnants.
- There were also frequent outbreaks of defoliating insects and an extensive presence of root diseases caused by Armillaria and Phellinus (especially in the Interior Cedar Hemlock biogeoclimatic subzones). The impact of these infections on tree survival and stand structure ranged from low to severe. Tree mortality within mature forest remnants and regenerating stands resulted in dead trees, decaying logs, and canopy gaps. Riparian areas within the forest landscape provided special habitat characteristics not found in the upland areas.
- Mean return interval for disturbances is about 100 years for the wind-dominated Coastal Western Hemlock CWH and the fire-dominated Sub-boreal pine spruce SBPS and Boreal White and Black Spruce (BWBS) with deciduous species prominent. For the SBS and BWBS with coniferous species prominent, the mean fire return interval is about 125 years. The Engelmann Spruce sub-Alpine Fir ESSF, Interior Cedar Hemlock (ICH) and Montane Spruce MS units in this Natural Distrbance site NDT experience a mean disturbance return interval of about 150 years.
- The presence or absence of Douglas-fir does not influence the disturbance frequency, but determines the number and size of mature remnant stands that survive extensive crown fires to provide structural diversity. Douglas-fir is the most fire-resistant tree species in this NDT.

More information on the NDT3 can be found on:

https://www.for.gov.bc.ca/tasb/legsregs/fpc/fpcguide/biodiv/chap2b.htm

Fire exclusion and timber harvesting practices have significantly altered the forest ecosystems in the NDT3. Fire exclusion allowed mature pine stands to age and provide a good host for the mountain pine beetle. This has contributed to the large MPB epidemic that swept through the Quesnel area in the mid 2000's. This resulted in extensive salvage harvesting followed by pine plantation establishment, creating a forest mosaic not unlike that resulting from small fire events. These stands do not typically have an early seral stage dominated by deciduous shrubs and trees, as they do following a wildfire, but are planted

to conifer trees with the deciduous component removed to speed free-to grow plantations.

Recent spread of the Douglas Fir Beetle in the Quesnel area is a cause of great concern for wildfire threat reduction activities. Opening up Douglas-fir stands may cause stress that will increase fir beetle activity. High mortality in Douglas-fir stands may alter harvesting practices and prevent forest fuel management activities in the most suitable locations. Tree mortality may also cause a significant increase in wildfire threats due to large numbers of dead and dying trees on the landscape that may require a total re-assessment of the wildfire threats in the Quesnel area.

4.5 Fire Weather Rating

Wildfire threat exposure within the AOI will vary throughout the fire season based on the fuels present, the moisture content of fuels, and fire weather conditions. Consequences of a threat may be realized when an ignition occurs during high or extreme wildfire conditions, as represented by Fire Danger Rating. A general indication of the likelihood of high fire threat to the community can be assessed by reviewing the level and frequency of high and extreme fire danger ratings typically experienced in the local area during the fire season.

Table 4: Quesnel Area Fire Weather Data Summary (2007-2017)

Wx Station	Moderate Average Days (Range)	High Average Days (Range)	Extreme Average Days (Range)	Maximum High and Extreme Days (year)
Benson	23.64 (6-42)	7.73 (0-33)	1.45 (0-11)	44 (2017)
Nazko	49.1 (25-63)	17.9 (3-51)	5.8 (0-20)	71 (2009)
Quesnel	36.7 (9-56)	14.5 (0-41)	5.6 (0-21)	51 (2017)
Tautri	43.2 (27-63)	21.5 (1-44)	6.6 (0-45)	73 (2017)

The Quesnel area fire weather data suggests that there are consistent and significant fire weather conditions in the Quesnel area. The fire weather is concentrated in the July and August months as expected. It also suggests that the surrounding area, specifically to the west and southwest are drier and warmer and are a likely location for a large wildfire event, as occurred in 2017.

4.6 Climate Change

In May, 2013 the concentration of carbon dioxide in the atmosphere reached 400 parts per million, the highest since three million years ago (Rising Seas, National Geographic, 2013). This rise in greenhouse gases is expected to contribute to rising global temperatures and changes in weather patterns, moisture distribution and plant ecosystems. One of the main concerns relating to plant ecosystems is the expected rapid change in weather conditions. Plants will have to migrate to more suitable habitat in short periods of time. This will be very difficult for large plants with heavy seeds and narrow geographic ranges. The weather is expected to change faster than many plants can adapt. This could significantly impact the conifer species in the AOI.

Table 5: Predicted Impacts of Climate Change on Climate Variables and Forests in B.C. During the 21st Century

Expected Impact of Climate Change on Climatic Variables in B.C.
1 to 4 degree Celsius increase in surface air temperature with winter temperatures most affected
10 to 20% increase in annual precipitation with less snowfall and more rainfall
Reduced snow depth and an increase in the length of the growing season
Increasing the risk of summer drought and decreasing soil moisture
More thunderstorm activity
Predicted Impacts of Climate Change on B.C. Forests
Increase in frequency and severity of forest damaging events including forest fires
Higher than present treeline and northward migration of treeline
Major expansions of grasslands and shrublands
Disappearance of wetlands, shrinking lakes and changing hydrology
Increase in incidents of insects, disease outbreaks and spread of invasive species
New assemblages of species occurring in time and space
Overall loss of biodiversity
Changes in disturbance regimes and forest productivity
Forest migration into previously treeless landscapes
Reduced access for winter logging

The impacts of climate change on Sub Boreal Spruce biogeoclimatic zones in the North Cariboo sub-region area are likely to be:

- The SBS biogeoclimatic zone that we know of today may also be shifted upwards in elevation and further north.
- Severe moisture stress and insect infestations. This may lead to increasing tree mortality on the lower slopes and drier areas dominated by Douglas-fir. This has already occurred in the Lodgepole Pine stands in the Quesnel area.
- Climate change occurring at a rate faster than the forest can adapt, creating potentially catastrophic conditions. This could include high mortality of the present forest cover in a short period of time.
- Longer and more severe fire seasons.
- Increased wildfire starts from increased thunderstorm activity.
- Less available water for wildfire suppression activities.
- Stress on riparian area deciduous trees due to changing hydrology.
- Loss/alteration of lakeshore habitat.
- Changes in mule deer winter range.
- Additional stress on Species at Risk Act (SARA) listed species.
- Less opportunity to utilize heavy equipment on frozen ground for fuel management and

timber harvesting to minimize site impacts.

4.7 Climate Change Impacts on Fuel Management/Wildfire Threat Reduction Activities in the Quesnel area

- The protection and enhancement of riparian/wetland areas must be a priority for any forest related activities in the Quesnel area.
- Tree mortality in the lower Douglas-fir stands can be expected to increase substantially.
- All fuel management activities must be designed to ensure stand resiliency through partial retention of all available tree species and size classes.
- Management for mule deer winter range should be conducted outside the presently identified winter range. This suggests more partial cut/select harvest type activities.
- Forest stands being managed specifically for wildfire threat reduction to communities and infrastructure are to be treated as as required to reach the moderate wildfire threat goal while retaining biodiversity, stand resiliency and other forest values.
- Old Growth Management Areas located within the Quesnel AOI should be moved elsewhere to allow for fuel management activities in these stands where required or alternatively allow for fuel management activities that decrease wildfire threats but still retain the OGMA attributes being managed for.
- Modify silvicultural practices and standards to allow for more deciduous trees in harvested areas to encourage a mixed stand over time.
- Develop access into and create wildfire suppression openings within areas of continuous conifer stands regardless of other forest management strategies in place.

RECOMMENDATION #6: Work with MFLNRORD to develop locally relevant fuel management standards for acceptable post-harvest conditions for WUI areas.

4.8 Provincial Strategic Threat Analysis (PSTA)

The PSTA data is a worthwhile reference tool for the Quesnel AOI wildfire threat assessment (see Map 4A, Appendix 1). The historical wildfire and structure layers are valuable. The PSTA fuel type data is problematic and does not consistently reflect the forest ecosystems present or have a direct relationship to the wildfire threats posed by specific polygons. The coarse nature of the fuel typing data, a lack of any reasonable assessment of surface fuel loadings from dead pine trees and issues with the algorithm that consistently identifies forested polygons as open grasslands, limit the value of this portion of the data. In addition, the lack of a suitable fuel type for young conifer plantations or areas with significant dead and down pine surface fuels make the fuel typing data a poor assessment tool. The Vegetative Resource Index (VRI) data with the conifer leading polygons highlighted (Map 9) is a far better visual tool for identifying high wildfire threat areas in the Quesnel area.

4.9 Spotting Impact

Spotting impacts are most severe in mature conifer types with lower crown base heights or ladder fuels that allow for consistent candling and crowning activity. These sites are best identified on the wildfire threat assessment map and the VRI conifer leading polygon map. The fuel typing map provided in the PSTA consistently identifies forested stands as O-1a/b (grassland) fuel type which greatly underestimates spotting potential. Spotting potential is greatest downwind of candling and crowning forests, thus the south, southwest and

western perimeters of the Quesnel developed areas are most likely to be exposed to spotting from approaching wildfires. See Map 4B, Appendix 1.

4.10 Head Fire Intensity

Table 6: Head Fire Intensity Classes and Associated Fire Behaviour

PSTA - HFI Class	Fire Intensity kW/m	Fire Intensity Class	Flame Length (meters)	Likely Fire Behaviour
1	0.01 – 1,000	2	< 1.8	Smouldering surface fire
2	1,000.01 – 2,000	3	1.8 to 2.5	Moderate vigour surface fire
3	2,000.01 – 4.000	4	2.5-3.5	Vigorous surface fire
4	4,000.01 – 6,000	5	3.5 to 4.2	Vigorous surface fire with occasional torching
5	6,000.01 – 10,000	5	4.2 to 5.3	Vigorous surface fire with intermittent crowning
6	10,000.01 – 18,000	6	12.3 to 18.2	Highly vigorous surface fire with torching and/or continuous crown fire
7	18,000.01 – 30,000	6	18.2 to 25.6	Extremely vigorous surface fire and continuous crown fire
8	30,000.01 – 60,000	6	>25.6	Extremely vigorous surface fire and continuous crown fire, and aggressive fire behaviour
9	60,000.01 – 100,000	6	>25.6	Blowup or conflagration, extreme and aggressive fire behaviour
10	≥ 100,000	6	>25.6	Blowup or conflagration, extreme and aggressive fire behaviour

NB: The descriptions in this table will vary by fuel type and should only be used as guidance for expected fire behaviour.

Head fire intensity is a very good indicator of wildfire suppression failure, candling and crowning potential, rate of spread and overall wildfire threat. The head fire intensity based on fuel type will be consistently underestimated in fuel types that do not recognize the

downed pine surface fuel load. This will include many of the mixed forest types which had a significant component of lodgepole pine before the pine beetle epidemic. Head fire intensity is always greatest when wind and slope align. This suggests locations like Baker Creek and Dragon Mountain, the steepest creek draw and mountainous terrain in the area have the greatest potential for high head fire intensity in a wildfire event. It also suggests that developments on the north and eastern edges of forest ecosystems are more at risk from wildfires than developments on the southern and western portions. See Map 4C, Appendix 1.

4.11 Fire History

The fire history in the Quesnel AOI suggests that wildfires are either a spot fire event with minimal impacts or a relatively significant event with fairly large wildfires. This is consistent with the NDT3 fire regime. Timber harvesting and silviculture activities have likely reduced the average wildfire size in the area by breaking up the continuous conifer forest cover required to create large wildfires. Recent wildfire events suggest that landscape wildfires are most likely to threaten the Quesnel AOI from the west and south. Wildfires in this area consistently spread hottest and fastest with the prevailing winds, in a northerly and easterly direction with topography playing a significant localized role. Recent wildfires have been most significant in conifer dominate ecosystems. Minimal terrain features that can limit wildfire spread allows for large wildfires to develop on the Chilcotin Plateau west and southwest of Quesnel and spread towards the community. See Maps 4D and 5, appendix 1.

4.12 Local Wildfire Threat Assessment

The wildfire threat assessment process used for the Quesnel Community Wildfire Protection Plan followed the 2012 Wildland Urban Interface Wildfire Threat Assessments in B.C. (the Guide) process. The threat worksheet used for the field assessments is a provincial form designed to quantify wildfire threats over all the forest ecosystems found in B.C. The worksheet has some limitations for quantifying specific ecosystems and requires some local 'fine tuning' to reflect specific threats found in the Quesnel area. One hundred and nine worksheets were completed within the Area of Interest. It was determined that numerous high wildfire threat stands did not reach the threshold for funding under the Strategic Wildfire Prevention Initiative (SWPI) program, the main funding source for this activity. The main reasons that the forest ecosystems did not reach the threshold score for treatment funding are:

- Flat or rolling ground,
- Low coniferous crown closure,
- Deciduous component in the stand,
- Moss or deciduous shrub surface cover,
- Under scoring for the surface fuel load of dead and down debris,
- Historical fire weather that may not reflect the present and future weather in the Quesnel area.

While all these factors do impact on the wildfire threat, they do not reduce the wildfire

threat to below funding and treatment standards (Bruce Morrow, RPF, professional opinion). To more accurately reflect the high wildfire threats in the Quesnel area, a high wildfire threat score of 84 or higher (not 96 as on the worksheet) should be considered as a significant wildfire threat and be considered for fuel treatment funding. A change in the 2017 funding criteria that allows for areas not rated as high and extreme to be funding eligible, with reasonable rationale, is a positive step towards managing all serious wildfire issues in the Quesnel area. This lower high wildfire threat score was not reflected on the wildfire threat map, because the areas are mapped as per the 2012 Guide.

An attempt was made to quantify wildfire threats within the first 200 meters of private land with structures throughout the Area of Interest. This was achieved in a majority of locations but not all. Private land barriers and limited access to many sites did not allow for full ground truthing of all the Wildland Urban Interface boundaries. Outside of the immediate Wildland Urban Interface (WUI) area, the forest ecosystems were sampled to attempt to quantify wildfire threats in all the fuel complexes found in the Quesnel area. The five most common fuel complexes sampled included;

- Pure birch and/or aspen stands,
- Spruce leading stands with dead pine mostly down,
- Dry pure Douglas-fir stands,
- Spruce/aspen/birch stands with varying species composition,
- Lodgepole pine plantations from 15-30 years old.

The spruce with deciduous mix stands are the most difficult to accurately quantify. These stands are very diverse with pockets of very dense spruce that would support aggressive wildfire behaviour and very significant spotting and candling activity, surrounded by areas with a lower coniferous component that are good sites for receiving spotting and burning but not contribute significantly to wildfire spread. This patchy spruce component can be a significant wildfire threat to structures immediately adjacent, but not lead to continuous wildfire spread or adequately assessed wildfire threat. The dead and down pine component on these stands greatly impacts on the fire intensity, initial attack failures, fire holdovers and other wildfire suppression and wildfire threat challenges. These types of stands are only a serious wildfire threat under extreme wildfire weather conditions, similar to those exhibited in the summer of 2017. The wildfire threat assessment also does not fully reflect the wildfire threats found in the deciduous dominated sites during the early spring when very short term, aggressive surface fires can occur between the snow free period and the spring green up, when the deciduous trees are still dormant and in a low moisture content state.

The Woodlots located within and adjacent to the Quesnel AOI have not been included in this wildfire threat assessment process as they are planning their own wildfire mitigation activities. The private land has also not been included in the wildfire threat assessment except to focus the proposed Crown land treatments on the highest wildfire threat and highest density structure areas.

The two kilometer buffer placed on the private land in the Quesnel area does not account for landscape level fuel treatments that could greatly contribute to wildfire threat reduction

in the Quesnel area. The two to five kilometer area, or even further out, should be planned for landscape level treatments, along the same concepts as used within the Quesnel CWPP AOI, to enhance the treatments and plans within this CWPP.

B.A. Blackwell previously completed a GIS exercise that covered a significant portion of the Quesnel AOI. This exercise consisted of identifying where crown and private land interface in forested areas. One hundred meter wide continuous fuel breaks were identified in these areas as a possible method for buffering the private land. The exercise did not take into account timber types (i.e. deciduous vs conifer), harvesting potential or treatment options. This approach assists in identifying areas of concern that require further assessment but in themselves cannot be considered as a fuel management plan. These sites are included on Map 7 – Local Fire Risk for reference and possible future reference for fuel management activities.

4.13 Fuel Type Verification

The following table shows the fire behaviour potential of the Fire Behaviour Prediction (FBP) fuel types grouped into 4 categories based on their relevance to a wildfire threat assessment.

Table 7: Fuel Type Categories and Crown Fire Spot Potential

Fuel Type Categories	Fuel Type - Crown Fire/ Spot Potential
1: C1, C2, C4, M3-M4 (>50% C/DF)	High
2: C3, C7, M3-M4 (<50% C/DF) M1-M2 >50% Conifer	Moderate
3: C5, C6, O1a/b, S1- S3[1] M1-M2 (26-49% Conifer)	Low
4: D1, D2, M1-M2 (<26% Conifer)	Very Low

The fuel typing provided in the provincial data is the best product available and has been reproduced as provided (Map 6, appendix 1). The fuel typing was not used for wildfire threat assessments or any other assessment or planning functions. It should not be used for fire modelling or wildfire threat assessments in the Wildland Urban Interface.

The Canadian Forest Fire Danger Rating System (CFFDRS) fuel typing system was never intended for use as a determination of wildfire threat or risk as described in the 2017 CWPP Guide. The biggest challenge is that there are no fuel types within the CFFDRS that accurately reflects many of the forest ecosystems found in B.C. Fuel type verification cannot be completed as described.

4.14 Proximity of Fuel to the Community

Fuel closest to the community usually represents the highest hazard. The recommended approach is to treat fuels to achieve a desired level of hazard reduction, from the value or structure outward, ensuring mitigation continuity. Untreated areas between treatment areas and the value or structure may allow a wildfire to build in intensity and rate of spread, which can increase the risk to the value. To capture the importance of fuel proximity in the local wildfire threat assessment, the WUI is weighted more heavily from the value or structure outwards. Fuels adjacent to the values and/or structures at risk

receive the highest rating followed by progressively lower ratings moving out.

The local wildfire threat assessment process subdivides the WUI into 3 areas – the first 100 meters (WUI 100), 101 to 500 meters (the WUI 500), and 501 to 2000 meters (the WUI 2000). These zones provide guidance for classifying threat levels and subsequent priorities of treatments (see Table 8). The maps provided with this CWPP show the two kilometer WUI buffer as provided in the PSTA data. There have been no significant changes in structure density of developments that would change this boundary.

Table 8: Proximity to the Interface

Proximity to the Interface	Descriptor*	Explanation
WUI 100	(0-100 m)	This Zone is always located adjacent to the value at risk. Treatment would modify the wildfire behaviour near or adjacent to the value. Treatment effectiveness would be increased when the value is FireSmart.
WUI 500	(101-500m)	Treatment would affect wildfire behaviour approaching a value, as well as the wildfire's ability to impact the value with short- to medium- range spotting; should also provide suppression opportunities near a value.
WUI 2000	(501-2000 m)	Treatment would be effective in limiting long - range spotting but short- range spotting may fall short of the value and cause a new ignition that could affect a value.
	>2 000 m	This should form part of a landscape assessment and is generally not part of the zoning process. Treatment is relatively ineffective for threat mitigation to a value, unless used to form a part of a larger fuel break / treatment.

** Distances are based on spotting distances of high and moderate fuel type spotting potential and threshold to break crown fire potential (100m). These distances can be varied with appropriate rationale, to address areas with low or extreme fuel hazards.*

Wildland Urban Interface forest fuel management activities should always target from the values being protected outwards as the first priority. Continuous treatment from the FireSmart immediate treatment around structures and values to the forest fuel management activities on crown land provides the most effective wildfire threat reduction. The private landowner plays a big part in this process. Conducting forest fuel management activities on crown land can only be effective if the private land around the structure has FireSmart principles applied to it. The larger the untreated gap between the treated forest and the structure, the less effective the overall threat reduction work and the less defendable the value.

In general, fuel management treatments on forested land should be a minimum of two tree lengths in width to allow for proper danger tree management. The actual width of the

treatment will be very site specific. The main considerations are economics, treatment capacity, wildfire threat, continuity of forest fuels, intensity of treatment and number of structures being protected. Treatments may also be conducted in phases such that the first 100 meters around values are completed in the first pass to provide as many areas as possible with some wildfire threat reduction, then further widening the treatments over time as capacity and funding allow.

Landscape level fuel treatments are most effective when they create access into and break the continuity of coniferous dominated forest land. The type and intensity of the fuel break is highly variable and very site specific. The style and intensity of the treatment often depends on the other forest values being managed for in the area. Low intensity treatments over large areas can often be the most effective treatment as it minimizes the impacts on other forest values, compared to high intensity treatments. It also provides the most options for wildfire suppression.

4.15 Summary of Fire Risk Classes, Map 7 Appendix 1

Low (Green): The combination of the local fuel hazard, weather influences, topography, proximity to the community, fuel position in relation to fire spread patterns, and known local wildfire threat factors make it a lower potential for threatening a community. These stands will support surface fires, single tree or small groups of conifer trees could torch/ candle in extreme fire weather conditions. Fuel type spot potential is very low, low risk to any values at risk.

Moderate (Yellow): The combination of the local fuel hazard, weather influences, topography, proximity to the community, fuel position in relation to fire spread patterns and known local wildfire threat factors make it possible that a wildfire in this area would threaten the community. Areas of matted grass, slash, conifer plantations, mature conifer stands with very high crown base height, and deciduous stands with 26 to 49% conifers. These stands will support surface fires, single tree or small groups of conifer trees could torch/ candle. Rates of spread would average between 2-5 meters/ minute. Forest stands would have potential to impact values in extreme weather conditions. Fuel type spot potential is unlikely to impact values at a long distance (<400m).

High (Orange): The combination of the local fuel hazard, weather influences, topography, proximity to the community, fuel position in relation to fire spread patterns, and known local wildfire threat factors make it likely that a wildfire in this area would threaten the community. This includes stands with continuous surface/ crown fuel that will support regular torching/ candling, intermittent crown and/or continuous crown fires. Rates of spread would average 6 -10 meters/ minute. Fuel type spot potential is likely to impact values at a long distance (400 -1000m).

Extreme (Red): The combination of the local fuel hazard, weather influences, topography, proximity to the community, fuel position in relation to fire spread patterns, and known local wildfire threat factors make it very likely that a wildfire in this area would threaten the community. Stands with continuous surface/ crown fuel and fuel characteristics that tend to support the development of intermittent or continuous crown fires. Rates of spread would average >10 meters/ minute. Fuel type spot potential is probable to impact values at a long distance (400 -1000m or greater). These forest stands have the greater potential to

produce extreme fire behaviour (long range spotting, fire whirls and other fire behaviour phenomena.

SECTION 5: Risk Management and Mitigation Factors

The intent of this section is to outline the strategies the community can put into practice to reduce the risk and the impact of a wildfire. Risk mitigation choices can vary by community, fuel type, ecology, hazard, terrain factors, land ownership, other unique local risk factors, Local Government and First Nation capacity, and/or public acceptance.

5.1 Fuel Management

The intent of this section is to propose more detailed work on the highest local risk areas of the WUI and design logical treatment units for future prescription development and operational fuel treatments within the highest risk areas. See Map 8, Appendix 1.

Table 9: Quesnel AOI Fuel Treatment Summary

Fuel Treatment Unit #	Total Area	Priority	Fuel Break Type	Local Wildfire Threat	Wildfire Threat Plot	Overlapping Values/ Constraints	Treatment Type	Rationale
1	15	17	Interface Fuel Break	High	Yes	Private Land	Hand/Harvest	Structure Protection
2	11	16	Interface Fuel Break	High	Yes	Private Land	HAND	Structure Protection
3	12	15	Interface Fuel Break	High	Yes	Private Land	HAND	Structure Protection
4	7	13	Interface Fuel Break	High	Yes	Private Land	Hand/Harvest	Structure Protection
5	7	14	Interface Fuel Break	High	Yes	Private Land	Hand/Harvest	Structure Protection
6	3	3	Interface Fuel Break	High	Yes	10 Mile Prov Park	HAND	Value Protection
7	13	4	Interface Fuel Break	High	Yes	10 Mile Prov Park	Hand/Harvest	Value Protection
8	24	5	Interface Fuel Break	Moderate/ High	Yes	10 Mile Prov Park	Hand/Harvest	Value Protection
9	88	6	Interface Fuel Break	High	Yes	10 Mile Prov Park	HAND	Value Protection
10	9	7	Interface Fuel Break	Moderate/ High	Yes	None Identified	Hand/Harvest	Structure Protection
11	90	8	Primary Fuel Break	High	Yes	Pinnacles Prov Park	Hand/Harvest	Value Protection
12	18	29	Interface Fuel Break	Moderate/ High	Yes	None Identified	HARVEST	Structure Protection
13	12	18	Interface Fuel Break	High	Yes	None Identified	HAND	Structure Protection

14	87	11	Interface Fuel Break	High	Yes	None Identified	Hand/Harvest	Structure Protection
15	326	1	Interface Fuel Break	High	Yes	OGMA	Hand/Harvest	Structure Protection
16	89	19	Interface Fuel Break	Moderate/ High	Yes	None Identified	HAND	Structure Protection
17	120	26	Primary Fuel Break	High	Yes	None Identified	HARVEST	Value Protection
18	235	24	Primary Fuel Break	High	Yes	None Identified	HARVEST	Value Protection
19	222	25	Primary Fuel Break	High	Yes	None Identified	HARVEST	Value Protection
20	28	23	Interface Fuel Break	High	Yes	None Identified	HARVEST	Structure Protection
21	187	10	Primary Fuel Break	Moderate/ High	Yes	None Identified	HARVEST	Value Protection
22	56	34	Primary Fuel Break	Moderate/ High	No*	None Identified	HARVEST	Value Protection
23	64	9	Interface Fuel Break	High	Yes	None Identified	Hand/Harvest	Structure Protection
24	22	28	Interface Fuel Break	Moderate/ High	Yes	None Identified	HARVEST	Structure Protection
25	55	31	Primary Fuel Break	High	Yes	None Identified	HAND	Value Protection
26	19	32	Primary Fuel Break	High	Yes	None Identified	HARVEST	Value Protection
27	96	30	Interface Fuel Break	High	Yes	None Identified	HARVEST	Structure Protection
28	8	22	Interface Fuel Break	High	Yes	None Identified	Machine Treatment	Structure Protection
29	341	2	Interface Fuel Break	High	Yes	Recreation Area	Hand/Harvest	Structure Protection
30	57	20	Primary Fuel Break	High	No*	None identified	HARVEST	Value Protection
31	21	33	Interface Fuel Break	High	Yes	None identified	HARVEST	Structure Protection
32	121	21	Primary Fuel Break	High	No*	OGMA	HARVEST	Value Protection
33	38	12	Interface Fuel Break	High	Yes	None identified	Hand	Structure Protection
34	219	27	Primary Fuel Break	High	Yes	Ungulate winter rng	HARVEST	Value Protection
TOTAL 2723 ha								

* GIS analysis only, no access

RECOMMENDATION #7: Apply for funding for prescription development and then implementation from UBCM, FESBC or other sources, aiming to tackle approximately 20% of the areas identified above in each of years 2018 to 2022, by priority ranking.

5.2 Wildfire Threat Reduction Options

Reducing the wildfire threat to existing communities, homes, and to future developments can be a very complex planning process. All plans or prescriptions for wildfire threat

reduction must be site specific, aesthetically pleasing, economically feasible and environmentally sensitive.

The objective of wildfire threat reduction efforts should not be to stop all fires, which is not realistic or achievable. The objectives should be:

- to alter wildfire behaviour on the forested land adjacent to developments, through forest fuel management, to greatly reduce the potential for house and structure losses,
- to create safe access for wildland fire crews to more efficiently and effectively control wildfires, and
- to construct and maintain houses that are designed to withstand a wildfire.

Table 10: Recommended Wildfire Hazard Reduction Guidelines for Each Wildfire Hazard Class

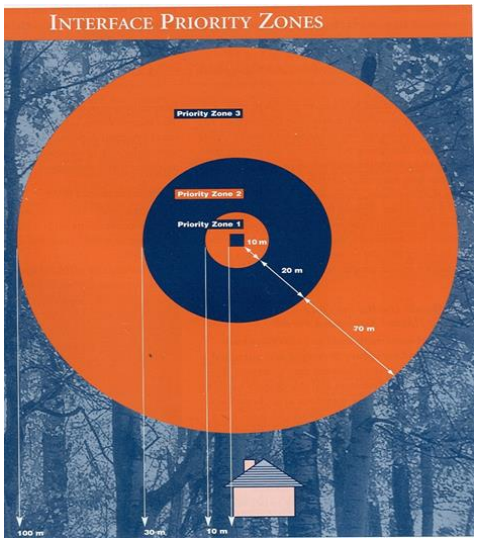
Wildfire Behaviour Threat Class[1]	Forest Fuel Description[2]	Wildfire Behaviour	Maximum Fire Intensity Rank	Wildfire Threat Reduction Requirements [3]
Low	None	Smoldering	1	None
Moderate	Grass/Sage, fuel reduced forested areas, Deciduous forest - Surface Fuels Only	Surface Fires	2 - 3	Priority Zone 1 and 2 (as required)
High	Conifers dominated stands and Surface Fuels	Candling/Crown Fires	4 – 5	Priority Zone 1 and 2 and 3 (as required)
Extreme	Continuous, Dense Conifers and Surface Fuels	Aggressive Crown Fires	4 - 6	Priority Zone 1, 2 and 3 (as required)

FireSmart Interface Zones

1 *Wildfire Hazard Class for Priority Zone 2 from FireSmart*

2 *See full definitions for each Priority Zone 2 Hazard Class*

3 *Priority Zones from FireSmart*



5.2.1 Forest Fuel Modification

Wildfire behaviour is based on three factors.

- Forest Fuel – the woody material available to burn, configuration and continuity
- Weather – daytime temperature, the amount of drying and wind
- Topography – the lay of the land, slope, aspect and terrain

Of these three factors, only the forest fuels are within our control. Reducing the volume and continuity of the forest fuels can reduce the intensity, maximum behaviour and the rate of spread of a wildfire, thus reducing the wildfire threat. The objectives for forest fuel management should be:

- Reducing the crown fire potential,
- Reducing the surface fire intensity,
- Improving wildland fire suppression opportunities through better access, better site lines and fewer danger trees,
- Maintaining bio-diversity and wildlife habitat, and
- Minimizing site impacts during fuel management activities.

Other important benefits include better firefighter safety and greater effectiveness of aerial wildfire suppression resources.

There are two basic approaches to wildfire threat reduction or forest fuel management. The chosen method will depend on numerous site-specific factors.

5.2.2 Timber Harvesting/Mechanical Fuel Management Treatments

Timber harvesting in interface areas can be a very effective management tool. In large areas of commercially viable forest, a form of timber harvesting to remove a portion of the stand is the most logical option. The wildfire threat reduction work can be self-funding and a valuable resource gets properly utilized. The intensity and method of harvesting will depend on the topography, trees species, forest health, wildfire threat, community acceptance and a variety of other site-specific factors. Clearcut harvesting, while usually not a very popular option for any community, may be the only solution in pure pine or spruce forest stands decimated by bark beetles.

Where necessary, a form of partial or selective harvesting is better accepted. Removal of targeted tree species, based on forest health, wind firmness, diameter limits and a wide assortment of other factors is a common practice.

Harvesting for fuel management, or wildfire threat reduction, is significantly different from conventional commercial harvesting. The emphasis should be directed towards the final product left behind in the forest, not necessarily the timber removed from the site. This can result in additional costs. The post-harvest fuel loading standards, where cleanup is required above and beyond the standard harvesting opening can also significantly increase costs.

5.2.3 Hand Crew Forest Fuel Management

In immature, inaccessible, steep, highly visible, sensitive and small patches of forestland

where harvesting is not an option, wildfire threat reduction efforts can be completed without timber extraction. Treatments can be carried out by hand, with equipment or a combination of the two. These treatments are rarely self-funded and require a funding source for completion. Treatments can vary in cost from $2800 to $7000 per hectare. Hand crew treatments are effectively an understory treatment where the main canopy stays in place but the suppressed and poorly formed understory conifers are removed, the crown base height is raised through pruning and surface fuels are reduced. These treatments are often not as effective as harvesting activities and usually need to be wider to provide a similar amount of wildfire threat reduction.

Reducing the amount and configuration of the forest fuels consists of five basic activities.

Danger Tree Removal

Dead and dangerous trees that will add significantly to the future surface fuel loading should be targeted for removal. Dead trees that can reach private land or access roads must be removed before fuel management activities commence. Retention of high value wildlife trees must be considered.

Spacing or Thinning

Spacing, thinning or tree removal involves the reduction of the number of stems and associated branches and needles within the forest canopy. There are a number of different techniques. The spacing treatment necessary is dependent on many factors including; tree species, forest health, age of the stand, stand structure and other factors. Spacing treatments must be designed on a site-specific basis. In some cases, small scale forest harvesting may be the best method to space the area and cover the costs of the treatment. Any forest harvesting in interface areas must be well planned and supervised.

Spacing activities in multi-layered stands involves the removal of the weakest trees on site. These trees have usually been outcompeted, damaged or suffered forest health issues and are falling out of the stand. Caution must be taken to ensure the multi-aged characteristics of the stand are maintained. This is often referred to as 'spacing from below', or forest health style spacing. This usually increases the crown base height and creates a healthier, more vigorous forest. In relatively even aged stands, spacing the trees so the crowns are separated by a set average distance is a reasonable treatment option. This inter-crown distance should be increased on slopes. This spacing distance is also dependent on crown base height and the amount of surface fuel remaining after the site treatment.

Pruning

Pruning involves the removal of the lower live and dead branches of coniferous tree species to separate the crown fuels from the surface fuels. By raising the Crown Base Height (CBH) within the stand, it will be more difficult for a surface fire to spread upwards into the tree canopy where it will spread quickly, greatly increase the wildfire intensity and create ember showers, or spotting, onto adjacent structures. The required height of the pruning is variable depending on; canopy closure, tree species, topography and amount of surface fuels remaining after the site treatment.

One commonly used convention for pruning is a three meter crown base height. This is based as much on the crew's reach as on crown fire initiation concerns. Again, there is no

one prescription to manage all situations. Pruning must take into account the tree height and amount of live crown. The tree must be left a certain portion of its live crown to remain healthy and vigorous.

Surface Fuel Reduction

Surface fuel reduction involves the collection of the accumulated felled, spaced and pruned material, and sometimes additional downed and dead material that will contribute to wildfire spread. Collection of the fine (small diameter) fuels is the priority as these fuels dry out quickly, ignite easily and are the main contributor to surface fire spread on most sites. Surface fuel treatments are often considered the most important component of any fuel modification activities and the most expensive. Overly aggressive surface fuel clean up can cause serious environmental impacts including erosion, introduction of noxious weeds and loss of wildlife habitat.

Debris Removal

A fuel management project is not complete until the created debris is removed from the site. This can be accomplished through open burning, chipping and spreading or removal from the site. Open burning is almost always the least expensive option and necessary on steep sites with poor access but is discouraged close to communities due to air quality issues. Removing the debris from the site is far most costly but done properly creates a wood product for use.

Hand crew techniques should only be employed on the forested land adjacent to homes or new developments in all High and Extreme wildfire behaviour threat class areas to reduce the wildfire threat. Landscape level treatments should be mechanized operations. No one prescription will solve all wildfire threat problems. All prescriptions must be site specific and developed by an experienced individual.

5.2.4 Other Factors to Consider When Conducting Fuel Management

The 'All Things Considered' approach is necessary when conducting any forest management activity; fuel management is no exception. Fuel management plans and prescriptions must address other forest values that could be impacted by the planned treatments. The other values include: visuals, water, wildlife habitat, site stability, noxious weeds, access, biodiversity, Old Growth Management Areas and endangered species.

A widely spaced and pruned forest will not support crown fires.

5.2.5 Implications of Wildfire Threat Reduction Work

Reducing wildfire threats through the reduction of the forest fuels sounds simple enough, but forest fuel treatments can have a wide range of implications. Fuel treatments can have both positive and negative effects on wildfire threats.

Mechanized timber harvesting as a stand-alone treatment can be very effective in reducing crown fires but usually results in a significant increase in finer surface fuels composed of needles, limbs and tops. This surface debris can increase surface fire intensity.

Hand crew treatments of dead and danger tree removal, spacing, pruning and surface fuel removal techniques can create lower fuel loaded, more open forest stand. Open forest stands:

- allow more light to reach the surface, often drying out the site or allowing more grass, herb and shrub growth, creating heavier, more continuous surface fuels
- can lengthen the fire season on the site by allowing the site to dry up faster and stay dry longer,
- allow more wind to move through the stand and along the surface, possibly increasing the rate of spread of surface fires, and
- often have lower relative humidity in the summer months from the increased sunlight and temperatures.

The positive effects of wildfire threat reduction through forest fuel reduction include;

- lower probability of crown fires due to the more open forest canopy and higher crown base height,
- lower intensity surface fires from the reduced forest fuels,
- easier and safer access for wildland firefighters, and
- more effective aerial fire control efforts with air tankers.

In general, properly planned and implemented forest fuel reduction work reduces the

crown fire potential and overall intensity of wildfires within the treatment area. This will increase the survivability of the trees in the stand and of adjacent homes and structures. Forest fuel reduction work can also increase the dryness on the site, and allow more wind to reach the surface, creating conditions for fast moving, low intensity wildfires to spread.

5.2.6 Effectiveness of Hand Fuel Management Treatments

Hand crew treatments are usually the preferred fuel management option, compared to mechanized harvesting and treatments, immediately adjacent to structures because of:

- Better visuals and aesthetics,
- Limited impact on recreational opportunities and established trails,
- Less overall site impacts and soil disturbance, minimizing noxious weed potential impacts, and
- Better protection of wildlife habitat, biodiversity and water resources.

Hand crew completed fuel management treatments usually consist of a combination of danger tree removal, spacing, pruning and surface fuel removal, at varying intensities. The main forest canopy is often kept in place. Much of the work on Crown land is often restricted by merchantable timber utilization standards, where only live trees below the utilization standards can be cut and removed.

This type of treatment can be very effective for small fires that start in the community or within the treatment area. Good visuals, reduced danger trees and ladder fuels can allow safe, fast, aggressive wildfire suppression action within the managed area. Initial attack success can be far higher under these circumstances. Hand crew treatments can be less effective in a landscape level wildfire event that sweeps into the treatment area from the unmanaged forestland. A well-developed Rank 5 or 6 wildfire (continuous crown fire) that spreads into a hand treatment area surrounding a community, may easily spread quickly and aggressively through all or a portion of the hand treated fuel management treatment area, providing only minimal safety to the community. The aggressiveness of the treatment will also need to determine the width of the treatment. A lower intensity treatment will have to be wider than a more aggressive treatment to be as effective.

Hand crew fuel management treatments are most effective when supported by forest harvesting along the treatment area perimeter. If the harvesting can reduce the wildfire intensity significantly before the wildfire enters the hand treatment areas, the effectiveness of the hand treatments is significantly increased.

5.3 FireSmart Planning & Activities

The intent of this section is to summarize the current level of FireSmart activities that have been completed, are under implementation, and to identify areas that are FireSmart, or have received FireSmart recognition through the FireSmart Canada Recognition Program, and to identify future FireSmart activities within the AOI.

5.3.1 FireSmart Goals & Objectives

The City of Quesnel needs to ensure no new developments or subdivisions are established without adequate wildfire threat reduction efforts put in place before construction begins. By ensuring the new developments are adequately planned and managed to reduce the

wildfire hazard to acceptable levels, many of the present problem areas will have their wildfire threats reduced. This has been done in the 2017 update of the Quesnel OCP – see https://www.quesnel.ca/building-development/planning-zoning/long-range-planning-policy

5.3.2 FireSmart Landscaping

Separating homes and other structures from the forest environment involves establishing FireSmart landscaping around the structure so a wildfire cannot spread directly up to the structure. Direct radiant and convective heat can ignite structures. Creating a barrier between the structure and the combustible material will greatly increase structure survivability in the event of a local wildfire. FireSmart landscaping can include a wide variety of plants and surface covers, as long as they do not support combustion. FireSmart landscaping is referred to as Priority Zone One in the FireSmart manual and is discussed in detail in Chapter 3 of that publication.

A minimum of 10 meters of FireSmart landscaping from the structure to unmanaged forested land is recommended. This distance should be increased with increasing slopes and the extent of the wildfire threat in the adjacent forest. For example, a 10-meter buffer would likely be sufficient on flat ground adjacent to an unmanaged field of matted grass. The distance should be increased greatly, or combined with other treatments in an area of continuous, dense, tall coniferous trees on a steep (greater than 20%) slope. FireSmart landscaping alone is suitable for structures adjacent to Low and Moderate (relatively flat ground) Wildfire Behaviour Threat Class areas as identified on the maps attached to this report.

FireSmart landscaping alone is not enough to increase house survivability in the areas identified as high and extreme Wildfire Behaviour Threat Class areas in this report. The high and extreme wildfire behaviour threat class areas will need much wider FireSmart landscaping or some other type of forest fuel modification on the adjacent forest lands. Landowner awareness and buy-in are the only options for reducing the wildfire hazard to their own property. FireSmart information needs to be distributed to the private landowners in established developments with unacceptably high wildfire threat.

5.3.3 FireSmart Construction

Building construction materials and design are outside the scope of this report but are discussed in detail in the FireSmart manual, Chapter 3. Improving structure survivability through forest fuel management has two key components; one, separating the structures from the forest with FireSmart landscaping, and two, reducing or modifying the forest fuels in the surrounding forest to reduce the wildfire behaviour.

5.3.4 Key Aspects of FireSmart for Local Governments

The intent of this sub-section is to provide a summary of FireSmart activities that can be used to measure current level of implementation and to recommend next steps. There are many different ways that members of the community and stakeholders can provide options

to mitigate the risk (FireSmart, 2003).

Table 11: FireSmart Practices and Activities

Topic	FireSmart Examples
Communication, Education & Partnerships	• Host a FireSmart day • Use local government newsletters, content in local print media, City website and social media • Undertake FireSmart Local Representative or Community Champion training • Apply for FireSmart Community Recognition • Form a FireSmart committee • Encourage homeowners and/or neighborhoods to undertake FireSmart site assessments and area assessments through FireSmart Canada – see https://www.firesmartcanada.ca/firesmart-communities/get-your-application-ready-canada-wildfire-community-preparedness-day-2018 • Distribute FireSmart brochure in annual property tax notice, utility bill or similar mailed content
Vegetation management	• Develop policies and practices for FireSmart maintenance of public spaces, such as parks and open spaces • Use landscaping requirements in zoning and development permits to require fire resistive landscaping (i.e., no conifers near structures; rocks, not bark for ground cover) • Provide access to a chipper or dumpster for debris drop-off from pruning or thinning on private properties • Promote deciduous or low flammability fuel breaks in green belt areas
Planning & Development	• Develop policies and practices for FireSmart construction and maintenance of public buildings • Establish and implement a Wildfire Interface Development Permit Area addressing development, landscaping, building material (underway as of fall 2017) • Consider wildfire prevention and suppression in the design of subdivisions (e.g. road widths, turning radius for emergency vehicles, and access and egress points) • Coordinate the reviews of new developments across multiple departments, including the fire department • Maintain mutual-aid fire control agreements with neighbouring volunteer fire departments
Increasing local capacity	• Develop and maintain Structural Protection Units (SPU) and/or learn how Emergency Management BC deploys SPUs for interface fires • Provide sprinkler kits (at cost, or subsidized) to residents • Cross-train fire departments to include structural fire and wildfire training

5.3.5 Identify Priority Areas within the Area of Interest for FireSmart

The intent of this sub-section is to use the relative wildfire risk in the WUI (Section 4.0 above) to best understand the priority areas for FireSmart planning and activities. This could be based on the relative level of wildfire risk adjacent to established neighborhoods, although the application of FireSmart principles to isolated critical infrastructure could also be a priority.

The priority wildfire threat areas listed below are all located on BC Crown or municipal Crown land, except where stated. The communities and infrastructure adjacent are the highest priority for Fire Smart targeted activities.

Table 12: Wildfire Threat Areas by Priority

Fuel Treatment Unit #	Name	Priority	Local Wildfire Threat	FireSmart	FireSmart Canada Recognition Received	Recommended FireSmart Activities
15	Marsh Road	1	High	No	No	FireSmart Mail Outs, Community Meeting, Demonstration Day during Crown land operations
29	Hangman Pit/Nazko Hwy	2	High	No	No	FireSmart Mail Outs, Community Meeting, Demonstration Day during Crown land operations
6	Ten Mile Park and perimeter	3	High	No	No	Consult with Parks Staff on Work
7	Ten Mile Park and perimeter	4	High	No	No	Consult with Parks Staff on Work
8	Ten Mile Park and perimeter	5	Moderate/High	No	No	Consult with Parks Staff on Work
9	Ten Mile Park and perimeter	6	High	No	No	Consult with Parks Staff on Work
10	Ten Mile Park and perimeter	7	Moderate/High	No	No	Consult with Parks Staff on Work
23	Dragon Mountain Communications	9	High	No	No	Meet with local Stakeholders to discuss plans
14	Quesnel Airport	11	High	No	No	Contact user groups for planned work

33	Dragon Lake - Hydraulic Road	12	High	No	No	FireSmart Mail Outs, Community Meeting, Demonstration Day during Crown land operations
4	Parkland	13	High	No	No	Contact user groups for planned work
5	Parkland	14	High	No	No	Contact user groups for planned work
3	Industrial Area	15	High	No	No	Awareness Meeting with local Industry
2	Industrial Area	16	High	No	No	Awareness Meeting with local Industry
1	Industrial Area	17	High	No	No	Awareness Meeting with local Industry
13	Lower Baker Creek Park	18	High	No	No	FireSmart Mail Outs, Community Meeting, Demonstration Day
16	Kersley	19	Moderate/High	No	No	FireSmart Mail Outs, Community Meeting, Demonstration Day during Crown land operations
28	Milburn Mtn Commun-ications	22	High	No	No	Meet with local Stakeholders to discuss plans
20	Hwy 26	23	High	No	No	Meet with local Stakeholders to discuss plans
24	Cottonwood River	28	Moderate/High	No	No	FireSmart Mail Outs, Community Meeting, Demonstration Day during Crown land operations
12	Baker Creek Road	29	Moderate/High	No	No	FireSmart Mail Outs, Community Meeting, Demonstration Day during Crown land operations
27	Garner FSR	30	High	No	No	Meet with local Stakeholders to discuss plans
31	Claymine Rd CRD Trails	33	High	No	No	Discuss with CRD Staff

RECOMMENDATION #8: Explore opportunities to implement FireSmart activities and raise awareness of FireSmart principles through various audiences. Key focus on communications towers, mailout/distribution of FireSmart brochures, and engaging adjacent landowners when fuel management operations are taking place.

5.4 Community Communication and Education

The intent of this section is to describe ways to build engagement and support within the community for the CWPP, including education on fire prevention practices, outreach and community programs.

- The CWPP and associated maps will be posted on the City of Quesnel website at https://www.quesnel.ca/city-hall/major-initiatives/community-wildfire-protection-plan
- A concise summary of local wildfire threat, values at risk, proposed treatment units and FireSmart principles will be created in a poster format, and will be distributed.

- During the fire season, communications staff at City of Quesnel and Cariboo Regional District will be encouraged to remind people of FireSmart principles, and how to leave your house in the event of a wildfire for emergency personnel to access water, etc.
- A supply of FireSmart brochures will be made available at local government offices, and Fire Department staff will be encouraged to distribute them.

5.5 Other Prevention Measures

Fire prevention can be achieved through communication and education initiatives, as well as through the development and implementation of policies and regulations, including operational guidelines and restrictions. Fire prevention can be addressed at the community level through various avenues. Danger class rating signs within fire protection zones, public communication, industrial work restrictions and fire bans are examples of public fire prevention measures (CWPP Guide, 2016).

FireSmart principles that promote deciduous trees (i.e., aspen) are favourable as the high moisture content and lack of resins means they are not susceptible to wildfires like conifers. Homes around Fort McMurray adjacent to deciduous forests were not as impacted as those adjacent to conifers. Another bonus is for energy efficiency: shading in the summer, but letting light through in the winter around homes (Westhaver, 2017).

5.6 Summary of Recommendations

RECOMMENDATION #9: Assign responsibility for implementation of this plan to a dedicated staff person. Consider striking a multiparty implementation committee consisting of City, CRD, Lhtako Dene, MFLNRORD and forest industry representatives to coordinate resources, communicate regularly and work cooperatively to reduce fuel wildfire risk.

Table 13: Summary of Section 5 Recommendations:

Recommendation	Responsibility/Funding Source	Next Steps
RECOMMENDATION #7: Apply for funding for prescription development and then implementation from UBCM, FESBC or other sources, aiming to tackle approximately 20% of the areas identified above in each of years 2018 to 2022, by priority ranking	City of Quesnel / SWPI or FESBC	Next SWPI intake is Feb 23, 2018
RECOMMENDATION #8: explore opportunities to implement FireSmart activities and raise awareness of FireSmart principles through various audiences. Key focus on communications towers, mailout/distribution of FireSmart brochures, and engaging adjacent landowners when fuel management operations are taking place	City of Quesnel	Identify existing communication opportunities (i.e., mailing out of utility statements or other from City, CRD)
RECOMMENDATION #9: assign responsibility for implementation of this plan to a dedicated staff person. Consider striking a multiparty implementation committee consisting of City, CRD, Lhtako Dene, MFLNRORD and forest industry representatives to coordinate resources, communicate regularly and work cooperatively to reduce fuel wildfire risk	City of Quesnel / FESBC or general revenue	Explore implementation opportunities with FBC who have experience with a multiparty approach from Williams Lake, 2007-2012

SECTION 6: Wildfire Response Resources

Interface fires are complex incidents that typically involve both wildland and structural fires. During times when many fires are burning in the Province and threatening multiple communities at the same time, resource requests can exceed the resources available. In B.C. these resources are deployed according to BC Provincial Co-ordination Plan for Wildfire Revised July 2016 (CWPP Guide, 2016) . Note that there is a BCWS zone office located in Quesnel.

6.1 Local Government and First Nation Firefighting Resources

The intent of this sub-section is to identify implications of wildfire that impact firefighting efforts (e.g., loss of electrical power and water pressure and supply), the contingencies that have been put in place, and any recommended measures that would help to make community firefighting more effective, including a high level summary of mutual aid agreements.

6.1.1 Fire Departments and Equipment

Table 14: Resources available for each fire department in the AOI:

Fire Department	Paid staff, certifications	Volunteer staff, certifications	Equipment
Quesnel	4 with full qualified command duties	38 volunteers, 28 with NFPA 1001 and also with either S100 or NFPA standard for interface	3 fire engines, structural fire trailer
Bouchie Lake	No paid members	25 volunteers	1 fire engine, 1 ambulance, 2 tenders, and 1 ¾ ton truck that is used as a back-up FR vehicle as well as response to wildland fires with a portable water tank in pump in the back
Barlow Creek	None	40 volunteer fire fighters, 36 trained to the BC Playbook Exterior Operations level, and the other 4 trained to the NFPA-1001 Fire Fighter Level 1. All members trained in OFC Structural Wildfire Fire Fighter and sprinkler protection unit	1 engine and 2 tenders
Kersley	None	35 with OFC Playbook	2 engines, 2 tenders,

		exterior level firefighting including NFPA 1051	spare drop tank, 4 pumps with hose and misc tools
Ten Mile Lake	None	22 volunteers, 15 with Playbook exterior certifications	1 engine, 1 water tender, 1 rougher terrain engine
West Fraser	None	20 volunteers with Basic Firefighter Level 1, Exterior Attack Level 1 8 of which have Level 1 First Aid 15 with Level 1 Roadside Flagging	Engine 11, Tender 11, Squad 11
Lhtako Dene	None – municipal agreement for firefighting between City, CRD and Lhtako	Approximately 20 wildland firefighters	

All 6 volunteer fire departments in the North Cariboo have a mutual aid agreement currently in place that allows them to call any of the other departments for man power and water support if required. This has been implemented for major fires (ie: W.F. school, B. C. School, Riverview School, The Legion, wildfires, and major airport issues that have arisen in the past). All departments have worked well together, making minor changes to their equipment to adapt to the other department equipment for easier mutual aid efforts. A mutual training ground has been built at the Quesnel Regional Airport, and all departments have contributed budgeted funds for this greatly used facility (personal communication, Fire Chief Phil Megyesi).

RECOMMENDATION #10: Maintain mutual aid agreements between fire departments covering the area of interest.

Other than fire departments, the following organizations have equipment and personnel:

- West Fraser Timber: 2 fire trailers in Quesnel with tools and pumps for 2 – 15 man crews; 25 staff with S100 training; three initial attack kits for pickup trucks; and various logging contractors with heavy equipment available
- Tolko has heavy equipment and access to 7 logging contractors, and 3 staff with S100 training
- Ranches and agricultural operations – each is different, but many have heavy equipment

6.1.2 Water Availability for Wildfire Suppression

- Water sources in the rural areas, as well as the city hydrants have always been adequate for all volunteer fire department needs. All of the city wells have emergency power backups, so power outages would not be an issue, unless the fire

actually burns the generators. With so many lakes, rivers, and creeks in the fire protection boundaries, accessing water supplies would not be an issue. All fire engines are able to draft water from these sources into tanks for transport (personal communication, Fire Chief Phil Megyesi).

- City has municipal water supply, most water reservoirs are elevated and would provide sufficient water. City can draw water from lakes and rivers as needed.
- Ten Mile VFD has a 10,000 gallon tank that is automatically filled directly from Ten Mile Lake. No fire hydrants in the service area. Pump and floating screen intakes are used to get water from streams, lakes.
- Kersley VFD has the following: Static water tank at Kersley Arena – 25000 gal with 60 GMP refill rate (electric source); Spectra Energy, Australian station– 10000-gallon cistern with refill; Pinnacle Pellet – 5000 Gal cistern with refill from pond (gas pump); Kersley Pond behind Alamo grill – static water source – no pump. One of their firefighters has a skidder with a 1000-gallon tank, pump and 1000ft of line for Kersley VFD use around Kersley subdivision/lease land.
- Lhtako Dene – has large water tower with several hundred gallons of treated drinking water
- Tolko has truck-mounted water tanks that can be towed behind skidder tanks.

6.1.3 Access and Evacuation

- West Fraser VFD notes hills in their areas provide challenges (in winter).
- Kersley VFD notes that many of the rural dirt roads that feed of the highway are single access; all on the West side of the highway South of Edwards road have steep single lane roads. Some secondary exits exist but are of poor quality (narrow, soft, rough).
- Bridge limitations: 9 and 16 tonnes on Quesnel Hixon Highway.
- Most locations within City have at least two ways out. Main bridge over Fraser River, also a foot bridge to the north (wooden). Issue with maintenance of Moffat bridge and critical infrastructure – need to ensure if maintenance underway, it doesn't limit flow if evacuation is needed and that both lanes can quickly be re-opened.
- Consider staged evacuations of different parts of the City to minimize bottlenecks (based on Sat 15 July 2017 evacuation of Williams Lake).
- Access roads have been improved greatly in the ten years since the original 2007 CWPP. Most roads now have the capability to allow larger water tenders to pass comfortably in rural areas. In the event of an evacuation, both lanes of well-travelled roads would be easy to work with (personal communication, Firechief Phil Megyesi).

6.1.4. Training

Identify training options to build capacity within the suppression and emergency management area. Maintain the current level of structural protection training for response staff. Increase focus on interface training in S100 Introductory and S215 Advanced wildfire suppression training and mock exercises in partnership with BC Wildfire Service.

RECOMMENDATION #11: Identify training options to build capacity for wildfire suppression and emergency response, and pursue mock exercises with BC Wildfire Service.

6.2 Structure Protection

The intent of this section is to provide a summary of what is available to the community for structure protection, and provide any recommendations.

- City of Quesnel has a small trailer with enough equipment to protect 2-3 structural residences that is shared with the 6 local fire departments.
- Kersley VFD has limited plans at this time. Spectra Energy has just purchased $7000 worth of wildland gear & donated it to the fire hall (2 pumps, hose, misc gear). Cariboo Pulp has donated several of the square totes that can be chained together for additional small water storage. This is in addition to the wildland trailer that the North Cariboo Fire Chiefs purchased and maintain.
- Lhtako Dene only has hydrants, hoses – no structure protection units.

6.3 Summary of Recommendations

Table 15: Summary of Section 6 Recommendations:

Recommendation	Responsibility/Funding Source	Next Steps
#10: Maintain mutual aid agreements between fire departments covering the area of interest.	City of Quesnel, CRD, Lhtako Dene	Review when they expire
#11: Identify training options to build capacity for wildfire suppression and emergency response, and pursue mock exercises with BC Wildfire Service	To be explored.	Fire Chiefs to pursue