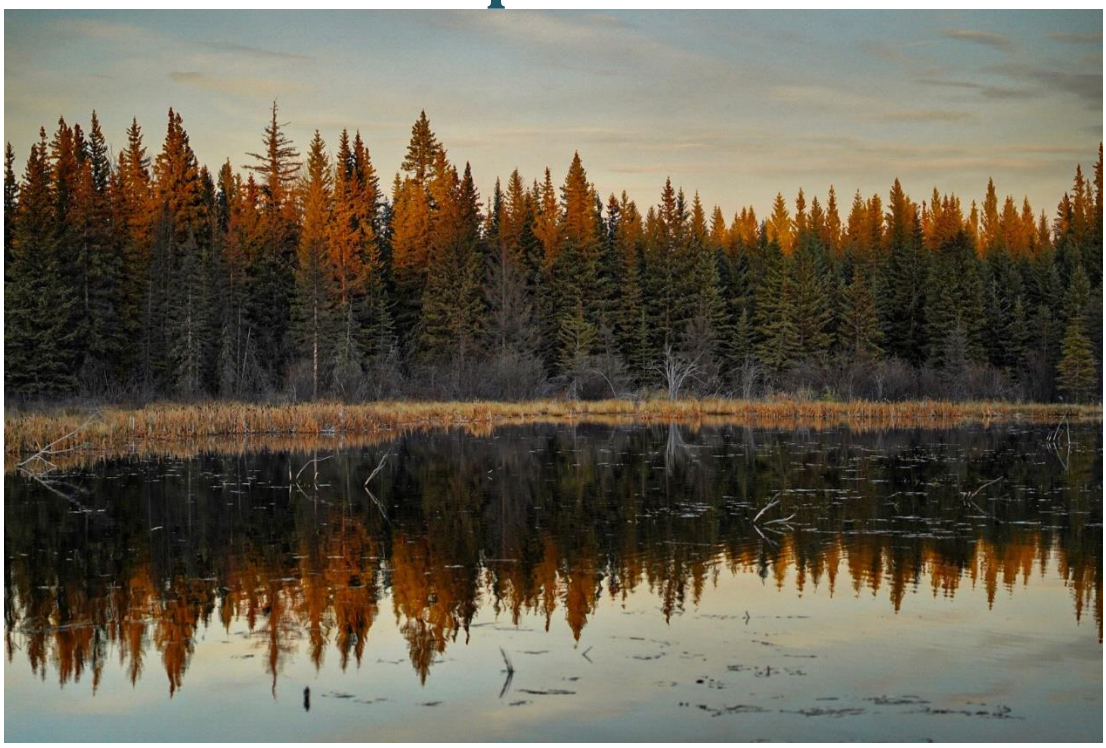
Cariboo Regional District
Community Wildfire Protection Plan 2019 Update



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*Cover photo: Stefana Dranga, Cariboo Regional District

REGISTERED PROFESSIONAL SIGN AND SEAL

RPF PRINTED NAME	
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I certify that the work described herein fulfills the standards expected of a member of the Association of British Columbia Forest Professionals and that I did personally supervise the work.	
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EXECUTIVE SUMMARY/ SUMMARY OF CWPP RECOMMENDATIONS

The Community Wildfire Protection Plan (CWPP) process was created in British Columbia (BC) as a response to the devastating 2003 wildfire in Kelowna. As an integral part of the Strategic Wildfire Prevention Initiative (SWPI), managed and funded through the Strategic Wildfire Prevention Working Group, CWPPs aim to develop strategic recommendations to assist in improving safety and to reduce the risk of damage to property from wildfires.

This CWPP Update will provide the Cariboo Regional District (CRD) with a framework that can be used to review and assess areas of identified high fire risk within the CRD. Additionally, the information contained in this report should help to guide the improvement and/or development of emergency plans, emergency response, evacuation plans, communication and education programs (including FireSmart), bylaw development in areas of fire risk, and the management of potentially hazardous forest lands adjacent to CRD communities.

Since the development of the last CWPP in 2006, the CRD has made progress at implementing recommendations from the report. The most notable actions include implementation of the following:[1]

- Requiring the completion of wildfire hazard mitigation reports by a qualified professional for the subdivision of lots in areas assessed as 'high' or 'extreme' wildfire interface hazard (Lac La Hache and South Cariboo OCPs, Section 8) (Recommendation 6)
- Developing a local emergency response plan (in progress) (Recommendation 10)
- A Structure Protection Unit (SPU) with hoses, pumps, and sprinklers is available to and shared by all South Cariboo Volunteer Fire Departments (Recommendation 12)
- Proposed treatments around the 108 Mile Greenbelt prescribed in the 1991 'Richardson's Report' were completed in 2010-2019 (Recommendation 19)

Wildfire management requires a multi-faceted approach for greatest efficacy and risk reduction outcomes. A total of 43 strategic recommendations are found in a tabularized format within this Executive Summary. In addition, these recommendations are more thoroughly discussed in their appropriate sections within the document. Because the area of interest extends outside the CRD boundary onto private land and therefore outside CRD jurisdiction, the CRD's role may be limited to the role of an influencer in some instances, while other recommendations can be directly implemented by the CRD. The recommendations are displayed in totality in Table 1. Ultimately, the recommendations within this strategy should be considered a toolbox of options to help reduce the wildfire threat to the community. There is not one combination or course of action which is the answer; the CRD will have to further prioritize based on resources, strengths, constraints, and availability of funding and regularly update the prioritization and course of action as variables change through time.

[1] A full enumeration of recommendations from the 2006 CWPP can be found in Appendix I – Summary of 2006 Recommendations.

Table 1. Summary of CWPP Recommendations by Document Section.

Document Section 2: Local Area Description (2.5.3: Local Government Policies and Recommendations)				
Item	**Page No.**	**Priority**	**Recommendation / Next Steps**	**Estimated Cost ($) or Person hours**
Objective: Review and amend the current regulatory framework to incorporate wildfire mitigation and preparedness considerations.				
1	10	Low	Amend Section 5.1 of the South Cariboo and Lac La Hache Official Community Plans (Environmental Management- Introduction) to include a section on wildfire risk and its potential to impact public health and safety, economics (i.e. through evacuations, loss of tourism, interruption of services), ecosystems, habitat, and water quality among other values. Identification of natural hazards can allow for planning and policies to be put in place to increase community resilience, mitigate potential damage and increase public and official awareness of wildfire risk.	15 in-house hours (Local Government funding/UBCM CRI Program Funding)
2	12	Moderate	Review and amend the Untidy and Unsightly Premises Bylaw No. 4628 to grant Fire Chiefs or a designate the authority to require the removal or mitigation of hazardous yard conditions on private property that can pose a safety risk in the event of a fire. The bylaw should also give the Fire Chief the authority to require the storage of combustible materials 10 m away from homes. The revised bylaw should also give the CRD the authority to require removal/clean-up of combustible materials and provide a mechanism to recoup costs for clean-up carried out on the owner's behalf.	15 in-house hours (Local Government funding/UBCM CRI Program Funding)
3	12	Moderate	Review and amend Section 19 of the CRD Development Approval Information Bylaw No. 5008 to specify that a wildfire hazard assessment and mitigation strategy be prepared by a Qualified Professional (QP) such as a registered forest professional prior to the approval of all new developments, rezoning applications, or subdivision of lots within 200 m of areas mapped as high or extreme wildfire threat class in this CWPP. If a wildfire development permit area (DPA) is developed (see Recommendation 16) amend Bylaw 5008 to directly reference and require compliance with the wildfire DPA. Amendments should also specify that the CRD reserves the right to approve applications subject to the implementation of wildfire mitigation strategies.	15 in-house hours (Local Government funding/UBCM CRI Program Funding)

Document Section 2: Local Area Description (2.5.3: Local Government Policies and Recommendations)				
Item	**Page No.**	**Priority**	**Recommendation / Next Steps**	**Estimated Cost ($) or Person hours**
4	12	Moderate	Review and amend the CRD Development Procedures, Guidelines & Fees Bylaw (5005, 2016) to spatially define the wildfire urban interface (WUI) where a landscaping/building design report is required to support a development application. Use local wildfire threat mapping completed as part of the CWPP. If a wildfire Development Permit Area (DPA) is developed (see Recommendation 16) consider amending Bylaw 5005 to directly reference and require compliance with the wildfire DPA.	15 in-house hours (Local Government funding/UBCM CRI Program Funding)
5	13	Moderate	Review and amend Section 17 of the Building Bylaw (4997, 2016) (Responsibilities of the Owner) in consultation with the local fire departments to specify what constitutes acceptable access for fire fighting vehicles. Review and amend Section 19 (Final Inspections and Occupancy) of the Building Bylaw to require accurate house numbering that can be clearly seen from the road at night to be posted prior to an occupancy permit being issued by a Building Official.	15-25 in-house hours (Local Government funding/UBCM CRI Program Funding)
6	13	Low	Consider park acquisition and maintenance through a wildfire lens. This will help ensure wildfire risk, mitigation, liability and future maintenance are considered as priorities in development of the parks and trails inventory, including consideration for long-term maintenance costs and access. Consider amendments to the Official Community Plan policies where needed, including requiring the use of a QP in review, assessment, and siting of parks and park access prior to acceptance into the CRD park inventory. Consideration should also be given to trail building and maintenance as these activities can affect wildfire risk.	15-25 in-house hours (Local Government funding/UBCM CRI Program Funding)

Document Section 3: Values at Risk				
Item	**Page No.**	**Priority**	**Recommendation / Next Steps**	**Estimated Cost ($) or Person hours**
Objective: Protect critical infrastructure and mitigate post-wildfire impacts				
7	18	High	Engage a qualified professional to complete formal FireSmart assessments of critical infrastructure such as fire halls, community centers, and water infrastructure as identified in this CWPP (Tables 3 and 4) or by CRD staff.	~$1,500-2,000 per location (consultant cost)

Document Section 3: Values at Risk				
Item	**Page No.**	**Priority**	**Recommendation / Next Steps**	**Estimated Cost ($) or Person hours**
8	18	High	Use fire-resistant construction materials, building design and landscaping for all CI when completing upgrades or establishing new infrastructure. Additionally, vegetation setbacks around critical infrastructure should be compliant with FireSmart guidelines (no combustible material within 10 m of structures).	Negligible in-house cost
9	18	High	The CRD should complete vulnerability assessments of all critical infrastructure, secondary power sources, and fuel availability. Review current capability of secondary power sources, identify vulnerabilities, and prioritize needs, in the case of prolonged or extensive power outages. Upgrade or realign resources, as prioritized.	~$1,500-$5,000 per location (consultant cost) or ~80 in-house hours or CRI program funding
10	21	Low	The CRD should conduct future assessments to explore the potential hydrologic and geomorphic impacts of wildfire on its watersheds and communities. Alternatively, there may be an option to complete a stand-alone assessment to help identify and quantify the post-fire hazards and levels of risk to the communities in the AOI.	To be determined, this cost would depend on the scope of the assessment (~$10,000-$40,000). UBCM funding may be available

Document Section 4: Wildfire Treat and Risk Recommendations				
Item	**Page No.**	**Priority**	**Recommendation / Next Steps**	**Estimated Cost ($) or Person hours**
Objective: Undertake and Maintain Fuel Treatments				
11	44	Moderate	The CRD should work with the Ministry of Transportation and Infrastructure (MOTI), to assess the entirety of Highway 97, Highway 24, Canim-Hendrix Lake Road, and Horse Lake Road within the District and reduce hazardous fuels within 100 m of either side of the road, where possible, and with consideration of private land overlap. This is to increase public safety / improve emergency access in the event of an evacuation or wildfire event.	Appropriate funding stream to be identified. 10-person hours, however dependent upon CRD's role within the project
12	46	High	Proceed with detailed assessment, prescription development and treatment of fuel treatment units identified and prioritized in this CWPP.	UBCM CRI Funding /MFLNRORD Wildfire Risk Reduction (WRR) Funding/Local Government Funding
13	46	Moderate	Consider developing a rationale for reduced stocking standards applicable to the CRD, by employing a qualified wildfire management professional, and in consultation with the Fuel Management Specialist (Cariboo Fire Centre) and MFLNRORD. Engage partners such as the 100 Mile Community Forest, who have already developed and applied interface stocking standards, and all other forest licensees to apply approved reduced fire management stocking standards in the wildland urban interface AOI to reduce interface wildfire threat.	UBCM CRI Funding/ Local Government Funding
14	61	High	Apply for funding through CRI for maintenance of previously treatment units as prioritized and scheduled in the 2019 Greenbelt report.	UBCM CRI Funding/ Local Government Funding
15	61	Moderate	When operational fuel treatments are conducted, treatment monitoring 5-10 years out should be completed by a qualified professional to assess the efficacy of the treatment and to schedule maintenance activities. This can be completed with a CWPP update or as a stand-alone exercise.	UBCM CRI Funding/ Local Government Funding

Document Section 5: Risk Management and Mitigation Factors Recommendations				
Item	**Page No.**	**Priority**	**Recommendation / Next Steps**	**Estimated Cost ($) or Person hours**
Objective: Develop a Wildfire Development Permit Area				
16	69	Moderate	Review the South Cariboo and Lac La Hache Official Community Plans (OCPs); consider including wildfire as a natural hazard development permit area (DPA). A recommended wildfire DPA would include all areas within the AOI that are located within 200 m of moderate, high or extreme wildfire behaviour threat class areas. This is a suggested distance which should be validated and defined through a more comprehensive GIS analysis of hazardous fuels and their proximity to the interface. Review similar wildfire hazard DPAs established in other jurisdictions and use as models for various aspects of the development process.	$20,000-$25,000 (consultant cost) UBCM CRI funding available
17	70	Moderate	Develop a landscaping standard which lists flammable non-compliant vegetation and landscaping materials, non-flammable drought and pest resistant alternatives, and tips on landscape design to reduce maintenance, watering requirements, avoid wildlife attractants, and reduce wildfire hazard. Consider including the landscaping standard as a development permit requirement within the applicable area, as well as making it publicly available for residents and homeowners outside of the DPA.	$2,000-$3,000 to outsource. FireSmart landscaping information is free of charge, but is not regionally specific
18	70	Moderate	Consider engaging the development/building community (may include developers, builders, landscapers, and architects) in DPA development process. This can be accomplished through a series of workshops/informational sessions to: 1) increase awareness of wildfire risk, 2) demonstrate that there are a variety of actions which can be undertaken to immediately and measurable reduce the risk to the homeowner and community, 3) discuss various strategies and actions which could be implemented to meet DPA objectives, 4) educate and inform regarding the DPA process and expectations.	25-50 in-house hours for meetings and workshops
Objective: Increase Wildfire Awareness and Prevention				
19	72	High	The CRD should hire a qualified professional (QP) or consider training local fire department members as Local FireSmart Representatives to assist the various communities in complying with FireSmart principles at the neighborhood and individual home-level.	3-5 in-house hours to coordinate training; UBCM CRI funding available

Document Section 5: Risk Management and Mitigation Factors Recommendations				
Item	**Page No.**	**Priority**	**Recommendation / Next Steps**	**Estimated Cost ($) or Person hours**
20	75	High	Make this report and associated maps publicly available through the CRD and 100 Mile House websites and social media platforms. In addition, this CWPP should be shared with local industry partners, particularly forest licensees such as the 100 Mile House Community Forest who may be interested in collaborating on direct fuel management treatments or with other sections of this CWPP. The wildfire threat class mapping included in this CWPP should be made available as a layer in the CRD online public map viewer.	3-6 in-house hours (local government funding)
21	75	Moderate	Complete or schedule periodic updates of the CWPP to gauge progress and update the threat assessment (hazard mapping) for changes in fuels, forest health, land planning, stand structure or changes to infrastructure in the interface. The frequency of updates is highly dependent upon major changes which would impact the CRD's wildfire threat assessment or the rate at which wildfire risk reduction efforts are implemented. An evaluation of major changes (including funding program changes that may lead to new opportunities) and the potential need for a CWPP update should be initiated every 5 - 7 years.	UBCM CRI funding
22	756	High	Develop a FireSmart/Wildfire Preparedness page on the CRD website. This page can serve as a platform to promote workshops, waste disposal opportunities, the Fire Smart Canada Community Recognition Program, and other community FireSmart initiatives. Updates on fire bans, high or extreme Fire Danger days, and current fires can be integrated with this page and with the existing emergency services pages on the CRD website. Updates and opportunities should also be communicated regularly through the CRD Facebook page.	~40 hours to design webpage. Additional daily/weekly hours to implement and update depending on strategy
23	75	High	Promote FireSmart approaches for wildfire risk reduction to CRD residents through FireSmart workshops and/or presentations. Aim to conduct the engagement/promotion campaign prior and during the fire season. Supply FireSmart resources to homeowners during these engagement campaigns and promote the FireSmart Begins At Home mobile app as a method of conducting home assessments.	~10 hours per event. May be eligible for UBCM / CRI grant
24	75	Moderate	Apply for a FireSmart demonstration grant through the UBCM CRI program. Preferential sites should incorporate residential structures as they are more applicable for homeowners, and should include both exterior building material and landscaping elements to display FireSmart principles.	UBCM/CRI funding may be available

Document Section 5: Risk Management and Mitigation Factors Recommendations				
Item	**Page No.**	**Priority**	**Recommendation / Next Steps**	**Estimated Cost ($) or Person hours**
25	75	High	Encourage and facilitate neighborhoods in the wildland urban interface (WUI) to attain FireSmart Canada Community Recognition Program (FSCCRP) status and encourage homeowners to complete a FireSmart home assessment using the Home Assessment guide or the FireSmart Begins At Home mobile app. Encourage FSCCRP neighborhoods to hold a home hazard assessment workshop as one of their FireSmart events. In addition, the CRD should promote the use of the FireSmart Home Partners Program which facilitates voluntary FireSmart assessments on private property to identify hazards and provide options to reduce the risk.	$5,000 / neighborhood FireSmart assessment. UBCM/CRI grant(s) available ~1.5 hours / Home Partners Program assessment
26	75	High	Apply for funding from the UBCM CRI Program to develop a local FireSmart rebate program. This will allow homeowners to access partial rebates for FireSmart activities on their properties, if rated as high or extreme risk in a FireSmart home assessment. The rebate program is described in detail in the CRI Program 2020 FireSmart Community Funding and Supports – Program & Application Guide and must adhere to the goals and objectives of FireSmart, as outlined in Section 5.2.1. Before applying for funding, CRD resources available to execute the program should be reviewed.	20-35 in-house hours plus additional hours to administer the rebate program. UBCM CRI funding available for rebate
27	76	Low	Encourage School District 27 to adopt and deploy existing school education programs to engage youth in wildfire management and risk reduction during Fire Prevention Week. There is emergency preparedness curriculum available provincially, which includes preparedness for a variety of natural hazards, including wildfire (Master of Disaster). Other options/value-added activities include consulting with Association of BC Forest Professionals (ABCFP) and BCWS (Cariboo Fire Centre) as well as local fire department and FireSmart representatives to facilitate and recruit volunteer teachers and experts to help with curriculum development to be delivered in elementary and/or secondary schools (field trips, guest speakers, etc.).	~30-40 hours

Document Section 5: Risk Management and Mitigation Factors Recommendations				
Item	**Page No.**	**Priority**	**Recommendation / Next Steps**	**Estimated Cost ($) or Person hours**
28	76	High	Develop and work with First Nations and all key stakeholders (100 Mile House Community Forest, other forest licensees, MFLNRORD, BCWS, BC Parks, recreational groups/representatives, local ranchers, CRD staff) to formalize an Interface Steering Committee. The purpose of the steering committee would be to identify wildfire related issues in the area and to develop collaborative solutions to minimize wildfire risks. The following subject areas are recommended for the group to explore: 1) Harvest planning to integrate existing and planned fuel breaks with future cutblocks to address identified hazardous fuel types and spotting potential; 2) Public education and awareness needs; 3) Multi-disciplinary, multi-jurisdictional fuel treatment projects/hazard abatement projects; 4) Development of a funding strategy; and 5) Reduction of human-caused fires, fire prevention and right of way management.	~ 40 hours to initiate group; an additional ~50 hours/year to coordinate meetings. UBCM CRI funding available
29	76	High	Work towards educating homeowners within unprotected areas (i.e., outside of Fire Protection Areas). It is common, especially in the case of second homeowners/vacation owners, for them to be unaware of the lack of fire services in their area (in the event they call 911).	5-10 in-house hours
30	76	Moderate	Promote and provide information to private landowners related to exterior residential sprinklers as a FireSmart prevention measure. At FireSmart events distribute information on exterior sprinkler component parts, manufacturers, and water supply system requirements to ensure they are effective measures to wet down homes and Fire Priority Zone 1 (0 - 10 m) and discourage home ignition. Develop general costs of exterior sprinkler equipment for property owners.	10-20 in-house hours to prepare materials and disseminate information to landowners
31	76	High	Promote improved planning and preparedness of ranchers/agriculture producers in the CRD and encourage FireSmart practices on private farm land through distribution or sharing of wildfire action planning resources prepared specifically for the agriculture sector by the BC Agriculture & Food Climate Action Initiative (i.e., on CRD website, mailouts).	~30-40 in-house hours
32	77	Moderate	Work with the 100 Mile House Community Forest, woodlots, and other forest licensees to ensure that high risk activities, such as vegetation management, pile burning and harvesting do not occur during high/extreme fire danger times to reduce chance of ignitions as per the Wildfire Act. Similarly, work with local recreation groups, e.g. Rod and Gun clubs, to communicate wildfire risk and backcountry closures.	4-8 in-house hours

Document Section 5: Risk Management and Mitigation Factors Recommendations				
Item	**Page No.**	**Priority**	**Recommendation / Next Steps**	**Estimated Cost ($) or Person hours**
33	77	Moderate	Develop utility right-of-way best management practices (BMPs) for regular brushing and clearing of woody debris and shrubs in coordination with industrial partners to help reduce fire risk, utility pole damage and subsequent outages. CN Rail, BC Hydro, Fortis BC, Enbridge, and the Ministry of Transportation and Infrastructure should ensure rights-of-way do not contain fine fuel accumulations (< 7.5 cm, easily cured) and significant regeneration of conifer vegetation prior to and during the fire season and are maintained in a low hazard state. (to serve as fuel breaks).	~12 hours (local government hours for 2 meetings with industrial partners)

Document Section 6: Wildfire Response Resources Recommendations				
Item	**Page No.**	**Priority**	**Recommendation / Next Steps**	**Estimated Cost ($) or Person hours**
Objective: Improve Water Availability for Emergency Response				
34	79	Moderate	Review the capacity to respond to interface fires with existing wildfire apparatus and personal protective equipment (PPE). Consider funding opportunities to obtain a 4x4 vehicle with wildland specific equipment, including wildfire hose and fittings, portable water tank and pump(s), and hand tools for each VFD in the AOI, as well as PPE such as leather boots, gloves, and fire-resistant Nomex overalls.	Variable
35	80	High	All new developments outside of existing water service areas should have a water system which meets or exceeds minimum standards of NFPA 1142, Standard on Water Supplies for Suburban and Rural Fire Fighting. Local fire departments should review the water supply to ensure it provides sufficient placement, flow, and reliability for suppression needs and that secondary power is available in the event of power outages.	~5-10 hours per development
36	81	High	Complete a fire flow/water vulnerability assessment to identify where upgrades to systems, flows, hydrant number or location, and water storage, or secondary power is required. Prioritize and rank projects and complete or require upgrades as resources allow.	$10,000
Objective: Improve Access/Egress to Enhance Emergency Preparedness				
37	82	High	Complete and participate in regular testing of, and updates to, a wildfire evacuation plan as part of an Emergency Response Plan for the CRD. Procedures for evacuation of livestock should be included in the plan.	~30-40 hours to plan and stage; 8 hours to complete testing
38	83	Moderate	Develop a wildfire pre-planning brochure that addresses the following: 1) locations of staging areas; 2) identifies water reservoirs, communications requirements (i.e., radio frequencies), minimum resource requirements for structure protection in the event of an interface fire, and values at risk; and 3) maps of the area of interest. This brochure would be for 1) CRD staff and included in the CRD Emergency Response Plan 2) local fire departments 3) industrial operators (woodlot licensees, 100 Mile House Community Forest).	~10,000- $15,000 to complete (contractor estimate)

Document Section 6: Wildfire Response Resources Recommendations				
Item	**Page No.**	**Priority**	**Recommendation / Next Steps**	**Estimated Cost ($) or Person hours**
39	83	Moderate	Develop a Total Access Plan for the CRD to map and inventory trail and road network for suppression planning, identification of areas with insufficient access, and to aid in strategic planning. Georeferenced maps with ground-truthed locations of existing and potential fuel breaks and tenure holders contact information should be developed as part of the Total Access Plan and shared with fire suppression personnel and BCWS to support emergency response in the event of a wildfire. The plan should be updated every five years, or more regularly, as needed to incorporate additions and/or changes.	~8,000-$10,000 to build plan, map, populate attributes and update (contractor estimate)
Objective: Enhance Wildfire Equipment and Training				
40	84	High	Fire departments should continue working with BCWS to maintain an annual structural and interface training program and foster a strong relationship. As part of the training, it is recommended to conduct annual reviews to ensure PPE and wildland equipment resources are complete, in working order, and the crews are well-versed in their set-up and use. It is recommended the CRD and 100 Mile House fire departments engage in yearly practical wildland fire training with BCWS that covers at a minimum: pump, hose, hydrant, air tanker awareness, and employment of SPUs. Interface training should include completion of a joint wildfire simulation exercise and safety training specific to wildland fire and risks inherent with natural areas. It is recognized that BCWS crew resources are limited and their availability and is highly dependent upon the current fire season and other BCWS priorities.	Cost and time dependent upon training exercise (scope, number of participating members etc.)
41	84	High	Ensure that the fire departments maintain the capability to effectively suppress wildland fires, through wildfire-specific training sessions. Ensure all fire department's training includes S100 or SPP-WFF1 at a minimum. Consider expanding the training program to maintain a high level of member education and training specific to interface and wildland fires. SPP-115 provides training to structural firefighters on the use of wildfire pumps and hose (and fire service hose and hydrants) in the application of structural protection units (SPUs).The fire departments should continue the practice of staying up to date on wildfire training opportunities, and to train members in this capacity, as training resources/budgets allow.	Within current training budget (a combination of S-100/SPP-WFF1 and S-215 currently implemented)

Document Section 6: Wildfire Response Resources Recommendations				
Item	**Page No.**	**Priority**	**Recommendation / Next Steps**	**Estimated Cost ($) or Person hours**
Objective: Encourage FireSmart Initiatives				
42	85	Low	Work with local hardware stores, garden centers, and building supply stores within the CRD to educate homeowners and remove some barriers to FireSmart action. Initiatives may include: 1) Developing and delivery of FireSmart workshop(s) for local distributors on FireSmart issues and solutions/advice for homeowners. These distributors can be educated upon which supplies are FireSmart and in what configuration they can be used (for example, external sprinkler system equipment, aggregates and ground cover, wire mesh for vents, deck skirting). 2) Advocating for a FireSmart branding in the retail stores (could be stickers on shelf pricing or a FireSmart-specific section) to increase public exposure to projects that can be done at a relatively low cost. 3) Compile a database of local service providers and retailers which can help to install or complete FireSmart home improvements. These providers may be able to further partner to flesh out a list of FireSmart options for various home improvements, based upon a range of variables (for example, price, time to deliver, installation costs, and aesthetics). 4) Develop general cost implications of improvements so property owners can prioritize replacements.	~60 hours
43	85	High	Apply for funding to extend the existing Red Cross FireSmart free wood disposal program at South Cariboo transfer stations past May 31, 2021. Explore other programs which serve to remove barriers to action for homeowners by providing methods for them to cheaply and easily dispose of wood waste removed from their property. Programs may include scheduled neighborhood chipping opportunities, yard waste dumpsters available by month in neighborhoods, or scheduled burning weekends (dependent on weather and venting). Programs should be available during periods where the majority of yard clearing takes place (spring and/or fall).	Time dependent upon program. May be eligible for UBCM/CRI grant. Additional time for advertisement of program availability will be required.

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COMMONLY USED ACRONYMS

BCWS	British Columbia Wildfire Service
BEC	Biogeoclimatic Ecosystem Classification
CCLUP	Cariboo Chilcotin Land Use Plan
CDC	Conservation Data Centre
CFFDRS	Canadian Forest Fire Danger Rating System
CRD	Cariboo Regional District
CRI	Community Resiliency Investment Program
CWPP	Community Wildfire Protection Plan
DPA	Development Permit Area
FBP	Fire Behaviour Prediction System
FMP	Fire Management Plan
FPA	Fire Protection Area
FSCCRP	FireSmart Canada Community Recognition Program
GAR	Government Actions Regulation
HIZ	Home Ignition Zone
MFLNRORD	Ministry of Forests, Lands, Natural Resource Operations, and Rural Development
MOTI	Ministry of Transportation and Infrastructure
NDT	Natural Disturbance Types
NFPA	National Fire Protection Agency
OFC	Office of the Fire Commissioner
PSTA	Provincial Strategic Threat Analysis
PTU	Proposed Treatment Unit
SWPI	Strategic Wildfire Prevention Initiative
TSA	Timber Supply Area
UBCM	Union of British Columbian Municipalities
VFD	Volunteer Fire Department
WRR	Wildfire Risk Reduction. Crown Land WRR is a category of funding for risk reduction activities on provincial Crown Land (introduced in 2019)
WUI	Wildland Urban Interface

SECTION 1: INTRODUCTION

In 2019, B.A. Blackwell and Associates Ltd. was retained to assist the Cariboo Regional District (CRD) in developing a Community Wildfire Protection Plan (CWPP) Update; hereinafter referred to as the CWPP Update, for the Lac La Hache and 100 Mile House fringe areas of the CRD. A CWPP was completed in 2006 for the entire CRD and was titled *Cariboo Regional District Community Wildfire Protection Plan*, hereinafter referred to as the 2006 CWPP. This CWPP revisits portions of the area assessed in the 2006 CWPP with a focus on integrating the updated Provincial Strategic Threat Analysis (PSTA), updated BC Wildfire Service (BCWS) Fuel Type mapping, and the updated and improved wildfire threat analysis methodology. Furthermore, CRD staff have recognized that there have been significant changes to the plan area since 2006 which have had a direct impact on wildfire mitigation activities and programs. The aforementioned changes include: continued growth and development in the last decade; implementation of bylaws regarding environmental management and open burning, building regulation and changes in fuels surrounding the community.

The impact of recent wildfires and evacuations in the province also inform the development of this CWPP. Although forest fires are both inevitable and essential to the health of forested ecosystems, the 2003, 2004, 2009, 2010, 2015, 2017 and 2018 wildfire seasons resulted in significant economic, social and environmental losses in BC. The 2018 fire season was the most extensive in terms of area burned provincially, surpassing the 2017 fire season. The total provincial suppression costs for the 2018 season were calculated at $615 million and the 2017 fire season costs were estimated at over $568 million.[2] Locally; the CRD experienced unprecedented wildfires burning close to communities in 2017, including the Gustafson wildfire that resulted in the evacuation of 108 Mile and 100 Mile House and the loss of several structures. Recent wildfire disasters like those experienced in Slave Lake, Alberta (2011), Washington State (2014 and 2015), Fort McMurray, Alberta (2016) and BC and California (2017 and 2018) all display the vulnerability of communities and the potential toll of wildfires on families, neighborhoods and the economy of entire regions. These events, along with critical lessons learned and important advances in knowledge and loss prevention programs have spurred the need for greater consideration and due diligence with respect to fire risk in the wildland urban interface (WUI).[3]

1.1 PURPOSE

The purpose of this CWPP Update is to identify and update the wildfire risks within and surrounding the CRD, specifically in the Lac La Hache and 100 Mile House fringe areas, to describe the potential consequences if a wildfire was to impact the community, and to examine options and strategies to reduce the wildfire risks. Each community has a unique risk profile. This CWPP Update provides a reassessment of the level of risk with respect to changes in the area that have occurred recently and gives the CRD a current and accurate understanding of the threats to human life, property and critical infrastructure faced by their communities from wildfires. The goal of this CWPP Update, in addition to defining the threats, is to identify measures necessary to mitigate these threats, and outline a plan of

[2] BC Wildfire Service. Wildfire Season Summary. Available online at: https://www2.gov.bc.ca/gov/content/safety/wildfire-status/about-bcws/wildfire-history/wildfire-season-summary

[3] Wildland/urban interface is defined as the presence of structures in locations in which conditions result in the potential for their ignition from flames and firebrands/embers of a wildland fire (National Fire Protection Association). See Appendix E for a more detailed discussion.

action for implementing these measures. Specifically, this CWPP Update is intended to serve as a framework to inform the implementation of specific actions and strategies that will serve to: 1) reduce the likelihood of wildfire entering the community, 2) reduce the impacts and losses to property and critical infrastructure if wildfire were to enter, and 3) reduce the negative economic and social impacts of wildfire to the community.

1.2 CWPP PLANNING PROCESS

This CWPP Update is a review and synthesis of the background information and current data related to the Area of Interest (AOI) which represents a two-kilometer spotting buffer around a threshold density of values at risk (structures). The CWPP Update process consists of four general phases:

1) **Consultation involving key local government representatives, structural and wildfire specialists, and stakeholders**. Information sharing with First Nations at various stages of the Plan development and ensuring linkages with relevant existing land use plans, legislation, and policy currently in place.
2) **Identification of the values at risk and assessment of the local wildfire threat**. Wildfire threat assessment takes into consideration Natural Fire Regime and Ecology, Provincial Strategic Threat Analysis (2019), and field work, fuel type verification, completion of WUI Threat Forms and GIS wildfire threat analyses.
3) **Developing a risk mitigation strategy**. A guide for the CRD to implement mitigation and risk reduction activities. The risk mitigation strategy accounts for prioritization of fuel treatments, FireSmart Activities, and wildfire response recommendations that will reduce wildfire risk locally.
4) **Building a community engagement and education strategy**. This phase includes presentation of the CWPP to the Board or Council, the formation of a Wildfire Working Group as well as comprehensive consultation with First Nations, government and non-governmental agencies (See Section 1.2.1 for specifics).

1.2.1 Consultation

Engagement with local government, Provincial government landowner representatives, stakeholders and First Nations played a key role in developing this CWPP Update.

The first step in the consultation process was to assemble the key players in the 'Wildfire Working Group'. This group was composed of key internal CRD staff, which included: Protective Services Manager, Regional Fire Suppression Services Manager, Senior Planner, GIS Technician, as well as executive and management personnel including Procurement Manager and Deputy Chief Administrative Officer. At the initial meeting of the Wildfire Working Group, the objective was to obtain information on wildfire risk mitigation initiatives currently in place or completed, existing plans and policies, current resources, identify areas of concern, identify CRD vulnerabilities, and to determine priorities and potential mitigation strategies. Members of the Working Group were consulted on an ongoing basis throughout plan development and were integral in providing Plan review and approval. The Wildfire Working Group was integral in the review of the draft of this CWPP and provided ongoing support throughout the CWPP process.

BCWS representatives from the Cariboo Fire Centre and the provincial Wildfire Threat Specialist were consulted as follows: 1) at the onset of the project planning phase and 2) throughout the CWPP development process, both via the submission of Fuel Type Change Rationales and questionnaire regarding concerns and priorities of BCWS with respect to wildfire and emergency planning in the CRD; and 3) revision of draft document upon plan completion.

Information sharing took place with the Canim Lake Indian Band, Esketemc First Nation, High Bar First Nation, Neskonlith Indian Band, Northern Shushwap Tribal Council Society, Stsewecm'c Xgat'tem First Nation, and Williams Lake Indian Band as identified through the Consultative Areas Database and in consultation with MFLNRORD and the CRD, regarding the CWPP Update and locations or potential for possible cultural values at risk requiring protection consideration. Information sharing consisted of an initial phone call, and subsequent distribution of a referral letter and information package (maps, explanation of CWPP Update and CWPP Update draft).

Additional stakeholders were consulted to identify synergies, opportunities for collaboration, and ensure linkages with adjacent and overlapping planning. These stakeholders included woodlot owners, the 100 Mile House Community Forest manager, the MFLNRORD 100 Mile House Natural Resource District Land and Resource Planning Specialist and BCWS Cariboo Fire Centre – Wildfire Prevention Officer and Senior Wildfire Prevention Officer. Combined, these various consultation and engagement opportunities have generated a shared understanding of the CWPP Update objectives and expected outcomes among local government, stakeholders, residents, and land managers.

1.2.2 Identification of Values at Risk and Local Wildfire Threat Assessment

The risks associated with wildfire must be clearly identified and understood before a CWPP can define strategies or actions to mitigate risks. The identified values at risk are described in Section 3 and concepts of wildfire threat and risk are elaborated on in SECTION 4: The wildfire threat in the CRD was assessed through a combination of the following approaches:

- Natural fire regime and ecology (Section ?);
- Provincial Strategic Threat Analysis (section 4.2); and
- Local wildfire threat analysis (Section 4.3).

1.2.3 Development of a Risk Management Strategy

An effective risk management strategy was developed considering a full range of activities relating to the following:

- Fuel management;
- FireSmart planning and activities;
- Community communication and education;
- Other prevention measures;
- Structure protection and planning (i.e., FireSmart activities);
- Emergency response and preparedness;
- Evacuation and access; and
- Planning and development.

1.2.4 Building Community Engagement and Education Strategy

Engaging the community from local government staff and officials, to key stakeholders and residents in wildfire protection planning activities is key to ensuring successful implementation. A community engagement and education strategy is described in Section 5.3. A presentation to the CRD Board will ensure high level approval and support for this CWPP Update.

SECTION 2: LOCAL AREA DESCRIPTION

This section defines the Area of Interest and describes communities within the AOI. It also summarizes the current community engagement in wildfire prevention and mitigation and identifies linkages to other plans and policies with relevance to wildfire planning.

2.1 AREA OF INTEREST

The Cariboo Regional District is located in the central interior of BC, and includes the municipalities of 100 Mile House, Williams Lake, Quesnel and Wells. The AOI for the CWPP is illustrated below in Map 1. The AOI represents a two-kilometer (km) spotting buffer around values at risk within portions of Electoral Areas G (Lac La Hache/108 Mile), H (Canim Lake/Forest Grove) and L (Lone Butte/Interlakes) of the CRD with a structure density $\geq$ 6 per km.^{2} The AOI includes the communities of Lac La Hache, 108 Mile Ranch, 105 Mile Ranch, Gateway, Buffalo Creek, Horse Lake, Lone Butte and 93 Mile as well as rural residential and institutional areas surrounding 100 Mile House. The municipality of 100 Mile House is excluded from the AOI. The AOI is characterized by a mix of rural properties, residential neighborhoods and range and forest tenure, including several woodlots and the 100 Mile House Community Forest. The AOI is within the 100 Mile House Natural Resource District.

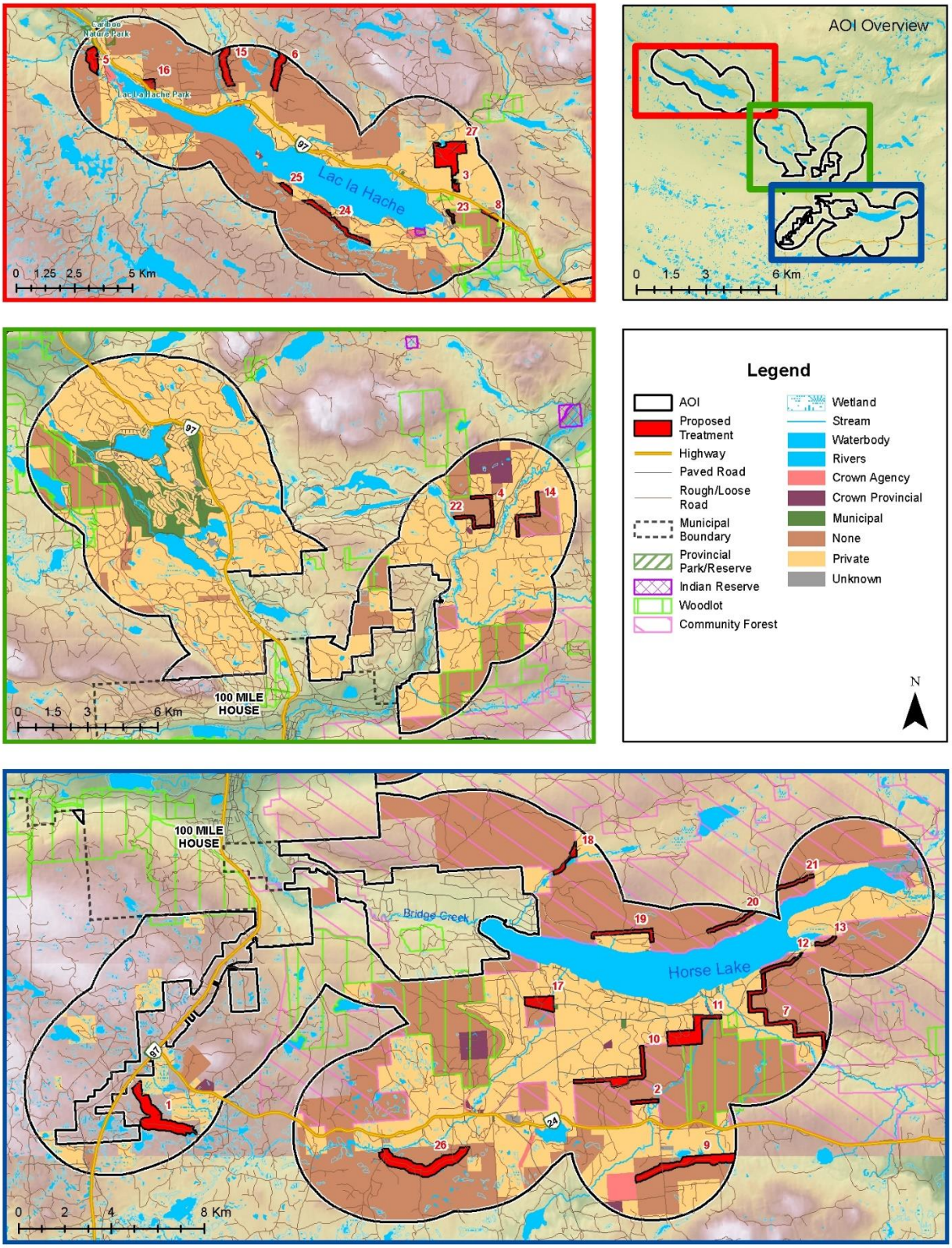
In its entirety, the CRD has a population of 61,998 and covers an area approximately 80,609 km,^{2} over twelve Electoral Areas. The three Electoral Areas (G, H and L) that comprise the AOI have a total population of 11,144 people and encompass a combined area of approximately 6,555 km^2.[4] The AOI is composed of four polygons and encompasses approximately 42,677 hectares. A breakdown of the AOI's land ownership is provided in Table 2.

Table 2. Summary of AOI by land ownership.

Land Ownership*	Hectares
Private	17,431
Municipal	641
Provincial Crown	24,260
Crown Agency	246
Federal Crown	0
Unknown (Includes First Nation Indian Reserves)	100
Total	**42,677**

*The land ownership source is ParcelMap BC, provided by the Land Title and Survey Authority (LTSA). This dataset does not differentiate Indian Reserves as Federal Crown parcels.

[4] Statistics Canada. 2016 Census



Map 1. Area of Interest (AOI).

2.2 COMMUNITY DESCRIPTION

The Cariboo plateau has been inhabited by the Secwepemc Aboriginal Peoples since time immemorial. The Stswecem'c Xgat'tem First Nation, the Williams Lake Indian Band, the High Bar First Nation, the Neskonlith Indian Band, the Esk'etemc First Nation, the Canim Lake Indian Band, and the Northern Shuswap Tribal Council Society are among the First Nation governments in the area. The Canim Lake Band (Canim Lake 4) and the Esk'etemc First Nation (Windy Mouth 7) both have land parcels on Lac La Hache that overlap the AOI.

Services to residents of the CRD are provided both at the regional and the local (Electoral Area) level. The regional government provides land use planning, weed control, building inspection, bylaw enforcement, administration, solid waste management, and recreation services. Fire protection, street lighting, and water/sewage is provided where available at the local level.

The Cariboo is a volcanic plateau characterized by rolling hills and many lakes and wetlands. Lac La Hache and Horse Lake are the largest lakes within the AOI. Land cover is mainly forest interspersed with open grasslands maintained for ranching. The elevation varies slightly within the AOI, from 930 m to roughly 1,200 m.

The economy of the Cariboo was historically driven by trapping, mining, and ranching. European settlement began by in the late 1700s. By the mid 1800's, ranching was widespread and roadhouses were built to support the travelling workers heading along the Gold Rush Trail between the Coast and the gold fields of Quesnel. In the last century, forestry has picked up in economic importance, with the population of the region remaining closely linked to the operation of local sawmills. Ranching and forestry remain important parts of the economy today,[5] along with other industries such as log home building and tourism (fishing resorts).

Fire protection within the AOI is the responsibility of 6 volunteer fire departments (VFDs). Lac La Hache, 108 Mile, Forest Grove, Lone Butte and Interlakes VFDs are administered by the CRD, and Greeny Lake VFD is administered independently. Mutual aid agreements exist between these VFDs and are used frequently. Generally, a fire that occurs outside of the VFD's Fire Protection Area (FPA) is under the jurisdiction of the BCWS; However, under exceptional circumstances, such as high to extreme fire hazard conditions, when directed by the BCWS, the VFD can respond to an interface fire up to an additional 3 kms outside of their designated FPA.

Access and egress are a concern within the AOI, due to single access routes and or isolated properties that cause suppression or evacuation concerns. Furthermore, many of the developments in the AOI are located on remote, dirt, single access roads that branch off of Highway 97 and Highway 24. This not only presents a challenge for emergency access and egress, but also limits the ability of fire crews to respond to fires and safely evacuate residents.

5 Cariboo Regional District. 2018. South Cariboo Area Official Community Plan Bylaw No. 5171. Retrieved online.

2.3 PAST WILDFIRES, EVACUATIONS AND IMPACTS

Based on the BCWS historical wildfire dataset, large (>2,000 ha) person-caused fires burned within and adjacent to the AOI in 1922, 1925, 1938, and 2017. Almost 25% of the total area of the AOI (including non-forested area) has burned in the last 100 years. The most recent fire and most severe fire to affect the AOI was the Gustafson fire, which was discovered on July 6, 2017 just west of 100 Mile House. It burned a total of 5,700 ha and prompted evacuation orders in 100 Mile House and 108 Mile, and evacuation alerts throughout the AOI.[6] In total, 9000 residents were under an evacuation order or alert. 15 homes and 34 other structures were lost. The fire was person-caused, most likely from a spark generated from recreational shooting.[7]

The CRD completed a thorough consultation process with residents after both the 2017 and 2018 fire seasons, as well as an EOC After Action Report that looks at the effectiveness of emergency actions taken by the CRD and provides recommendations.[8] Notably, EOC operations, the evacuation of residents, and the use of the CRD's emergency notification system was effective, although the evacuation of livestock was particularly challenging. One major recommendation to come out of the EOC After Action Report is to establish a Regional Community Emergency Support program to facilitate emergency preparedness and response, especially with regards to information sharing during an emergency. Other recommendations are to engage CRD staff and other groups in training exercises; develop maps for the EOC showing jurisdictional boundaries (i.e. BCWS, RCMP, Health Authority); and to enhance and promote FireSmart activities in areas at high risk of interface fire.

Seven smaller fires occurred in the AOI in 2007-2009, and one in 2018. Five of these fires were generated from open burning, four of which were not in compliance with regulations (likely fire bans); only one was generated from lightning. Other causes of wildfire ignitions in the AOI include welding or grinding, sparks from equipment use, powerline short-circuits, hot exhaust, open burning (pile burning and range enhancement), campfires, discarded cigarettes, building/equipment fires, and arson. Furthermore, within the last 10-15 years an average 2,827 ha per year have burned in the 100 Mile Fire Zone. BCWS indicated that the most volatile fuel type in the fire zone represents areas of dead and partially down/ elevated pine and all other fuel types during extreme fire conditions.

BCWS Cariboo Fire Zone Staff communicated that approximately 40% of all past wildfire activity within the AOI was human-caused and ignitions are primarily due to open burning, illegal use of fireworks, poor shooting practices and poor recreation practices (both boat and road access recreation areas). BCWS and CRD staff reported that pile slash accumulations on private land and dispersed slash accumulations following industrial logging and ROW clearing can be an issue, particularly next to forest service roads and under powerlines.

The BC Wildfire Service historical ignition dataset demonstrates that the proportion of human-caused fires within the AOI is slightly greater than that of the province as a whole.[9] This ignition data shows that

[6] Province of British Columbia. Wildfire Season Summary - Previous Wildfire Season Summaries. Retrieved From: https://www2.gov.bc.ca/gov/content/safety/wildfire-status/about-bcws/wildfire-history/wildfire-season-summary
[7] https://www.wltribune.com/news/2017-gustafsen-wildfire-was-caused-by-firearm-use-foi-documents-confirm/
[8] CRD- Post Disaster Reports. https://www.cariboord.ca/services/emergency-and-protective-services/EOC/recovery
[9] BC Wildfire Service: Fire Incident Locations - Historical

within the AOI, approximately 48% of ignitions since 1950 have been human-caused (a conservative estimate not including miscellaneous/undetermined causes), versus the BC provincial average of 40%.[10] This statistic may be explained by the higher proportion of industrial and recreational use within many parts of the AOI, specifically for camping, and the prevalence of forestry activities, railways, and other industrial activities within the AOI.

2.4 CURRENT COMMUNITY ENGAGEMENT

Although the CRD has no formal FireSmart program, there is widespread recognition and awareness, from both CRD staff and the surrounding communities, of the threat posed to communities in the AOI by wildfire. As a result, significant progress has been made to enhance community engagement in FireSmart initiatives. These initiatives, carried out by select VFDs, include: distributing educational materials, attending school information days, and using Facebook and other social media platforms to engage the public with fire danger information. The VFDs are also involved with advisories and educating homeowners about FireSmarting their properties. Within the Lac La Hache and South Cariboo Official Community Plans (OCPs), a FireSmart 'notification' covenant is applied to registered property titles. It should be noted, that the covenant encourages and outlines basic FireSmart practices and recommendations, but it does not require or enforce compliance.

2.5 LINKAGES TO OTHER PLANS AND POLICIES

The following is a summary of CRD and provincial policies and guidelines that relate to strategic wildfire management, wildfire threat reduction, operational fuel treatments and emergency planning.

2.5.1 Local Authority Emergency Plan

Emergency preparedness and response is managed by the CRD, which is guided by higher level emergency management legislation such as the provincial Emergency Program Act.[11] The Emergency Program Act describes the various roles and administrative duties of the province and local governments with regards to emergency organization, the implementation of higher level emergency plans, the processes of declaring a state of emergency and coordinating post disaster relief programs and assistance. Although the CRD does not currently have an Emergency Response Plan, information on emergency planning services and resources are available on the CRD Emergency & Protective Services webpage. Local emergency planning resources include a CRD Household Emergency Action Plan that community members can readily apply to better prepare in the event of a natural disaster, as well as CRD brochures covering topics including Evacuation Orders, Evacuation Alerts, Shelter-In-Place, and 72-Hour Preparedness Kits. The CRD webpage also provides links to local CWPPs and to provincial emergency guidance materials (Prepared BC).

The CRD Emergency Operations Centre (EOC) webpage provides instructions for reporting an emergency and provides up-to-date information current emergencies, evacuation orders or alerts (including maps), and disaster recovery information. Residents can sign up for the CRD Emergency Notification System which is deployed in the event of evacuations and other emergency events occurring near registered

[10] BCWS, 2019

[11] Cariboo Regional District, 1996. Cariboo Regional District Legislation Attachment: Emergency Program Act. Retrieved From: https://www.cariboord.ca/services/emergency-and-protective-services/emergency

recipients' homes, workplaces, schools and other registered addresses. In the fall of 2019, the CRD launched a new regional emergency preparedness communication program called the CRD Community Liaison Program. The program, funded by Canadian Red Cross, was initiated partly as a response to the 2017 fire season with the aim of creating better communication between rural CRD communities and the Regional District.

The CRD is also in the process of developing an Emergency Response Plan. An Emergency Response Plan (ERP) should include basic contingencies in the event of a wildland/interface fire, including the designation of a primary and secondary Emergency Operations Centre, information on Emergency Support Services (ESS), specific and alternate evacuation routes to be used during an emergency situation, and a list of key contacts and the roles of local government personnel in the event of a wildfire. See Section 6.1.3 for recommendations related to access and evacuation planning.

2.5.2 Affiliated CWPPs

Previous CWPPs have been developed for the Cariboo Regional District (2006), Canim Lake Band (2007), Williams Lake and Area Interface Fire Plan (2005) and CWPP (2019), Wells-Barkerville (2009), Big Creek (2009), West Chilcotin (2010), Williams Lake Indian Band (2009), Quesnel and Surrounding Area (2007 and 2017), and 100 Mile House (2007). These documents, when available were reviewed for relevance (i.e., synergistic project opportunities, as well as to confirm that there are no contradicting recommendations). The 2006 CRD CWPP covered the entire Regional District, with the exception of municipalities.

2.5.3 Regional Government Policies and Recommendations

The intent of this section is to review all relevant local government plans, policies and bylaws and identify sections within that are relevant to the CWPP Update. The following municipal bylaws, strategies and policies are relevant to wildfire planning in the AOI.

South Cariboo & Lac La Hache Official Community Plan (2018)

Due to significant overlap between the South Cariboo and Lac La Hache Official Community Plans, each containing nearly identical wildfire related objectives and policies, they have been combined in this document so as to limit redundancy. An Official Community Plan (OCP) is a general statement of the objectives and policies of the local government, and provides the CRD with a long-range framework to guide, monitor and evaluate future land use and development throughout each respective Electoral Area. The following sections contain objectives and policies which are directly relevant to wildfire risk reduction, emergency response, and community resilience post-disaster as described below.

Bylaw No. 5170 & 5171, 2018 South Cariboo & Lac La Hache Official Community Plan

2018 South Cariboo & Lac La Hache Official Community Plan Section 2.4 Context; Economy

This section of the OCPs describes the current economic climate within the AOI, specifically pertaining to forestry. This section of the OCPs recognizes the increased risk of large landscape fires as a result of climate change and widespread presence of mountain pine beetle affected stands, which when not properly managed, can significantly contribute to wildfire threat in the region.

2018 South Cariboo & Lac La Hache Official Community Plan Section 5.2 and 5.3 Environmental Management; Environmental Policies and Energy & Conservation

This section of the OCPs recognizes the importance of responsible environmental management and acknowledges riparian protection and climate change targets. Furthermore, in Subsection 5.3.10 it encourages initiatives to upgrade from wood burning stoves, through a woodstove exchange program, to other greener initiatives. These woodstove upgrades have potential to be safer from a fire risk standpoint as they limit the potential for spotting and number of hot embers exiting chimneys around homes. Section 5.3.18 further recommends and encourages that the burning of brush be minimized and that composting and chipping be implemented, wherever and whenever appropriate, as a priority.

RECOMMENDATION #1: Amend Section 5.1 of the South Cariboo and Lac La Hache Official Community Plans (Environmental Management- Introduction) to include a section on wildfire risk and its potential to impact public health and safety, economics (i.e. through evacuations, loss of tourism, interruption of services), ecosystems, habitat, and water quality among other values. Identification of natural hazards can allow for planning and policies to be put in place to increase community resilience, mitigate potential damage and increase public and official awareness of wildfire risk.

2018 South Cariboo & Lac La Hache Official Community Plan Section 8 Residential

This section of the OCPs describes the following residential areas within the South Cariboo Area: 108 Mile, 105 Mile, 103 Mile, Forest Grove, Horse Lake, Gateway/Buffalo Creek, Lone Butte, Canim Lake, 97/93 Mile and Simon/Straight Lakes. The section pertaining to 108 Mile relates to wildfires as it describes the use of cattle grazing in upland areas to ensure that grasses remain at a stable level which can potentially help to prevent the spread of wildfires. This section also addresses hazard and conflict mitigation by encouraging new developments that complies with the FireSmart Homeowners Manual and supporting public education initiatives regarding FireSmart practices. The OCPs for the South Cariboo and for Lac La Hache does not explicitly consider the establishment of a development permit area (DPA) to address wildfire risk mitigation. However, they require that a "wildfire hazard assessment and mitigation strategy prepared by a member of the Association of BC Forest Professionals is completed prior to the approval of a rezoning application or subdivision of three or more lots in an area with high or extreme wildfire rating."

2018 South Cariboo & Lac La Hache Official Community Plan Section 12 Transportation

This section of the OCPs pertains to wildfire preparedness and safety as it describes the Ministry of Transportation and Infrastructure (MOTI) plans to upgrade Highway 97 between Cache Creek and Prince George to four lanes improving safety in the event of a large-scale emergency such as a landscape level wildfire. These upgrades would significantly improve access and egress routes to and from the AOI, and therefore improve first responder call times and resident's safety. Work should be continued in upgrading existing infrastructure along Highway 24, specifically around Lone Butte and Horse Lake, to ensure safe and accessible roads.

2018 South Cariboo & Lac La Hache Official Community Plan Section 13 Infrastructure Services and Public Utilities

This section of the OCPs describes water services, water allocation, fire protection, liquid waste and solid waste disposal. Within the AOI, there are only 5 communities (108 Mile, Horse Lake, Gateway, Lac La Hache, 103 Mile) within the AOI that are serviced by a water system, as a result many residents rely on

their own private wells for water. The main objectives of the OCP are to maintain adequate water quality for domestic uses and recommend improvements for fire protection where communities are committed to funding and supporting infrastructure costs.

2018 South Cariboo & Lac La Hache Official Community Plan Section 17 and 17.3 Plan Implementation and Partnership Actions Arising from the Plan

This section of the OCPs pertains to the implementation of the OCP and potential for partnership actions to arise from the plan. These partnerships include continued coordination with provincial ministries to improve awareness of emergency forest fire response programs and other FireSmart guidelines.

CRD Bylaw No. 3501, 2018: South Cariboo Area Zoning Bylaw

This bylaw includes Electoral Areas G (Lac L Hache/108 Mile), H (Canim Lake/Forest Grove), and L (Lone Butte/Interlakes), and stipulates that no new developments should take place in areas labeled as sensitive or hazardous, including locations where susceptibility to flood, erosion, and or landslide is high. Development may only take place where a site-specific engineer has investigated and confirmed that the safe.

CRD Bylaw No. 4014, 2016: Fire Departments

This bylaw gives the Fire Chief and members of the Fire Departments the authority to cause actions necessary to deal with an incident, such as to prevent the spread of a fire. This authority includes passing through private property, demolishing structures, and establishing limits on persons entering an incident area. It is important to note that the jurisdiction of these VFD does not extend past the predetermined Fire Protection Area (FPA) boundary, without the written approval of the CRD Board. Future amendments should be made to authorize the VFDs to request the removal of hazardous materials from private property, that may pose a safety concern to the surrounding community.

CRD Bylaw No. 4628, 2011: Untidy and Unsightly Premises Bylaw

This bylaw requires the removal of accumulations of rubbish or unsightly materials, except where construction is taking place or where items cannot be seen from the road. Unsightly materials are defined as; accumulations of trash or unused items, old glass, plastic, metal, paper, wood products not presently in use, and old vehicles that are not roadworthy. Recommendations include modifications to this bylaw to include the removal of biomass accumulations that are potentially hazardous such as slash and greenwaste.

RECOMMENDATION #2: Review and amend the Untidy and Unsightly Premises Bylaw No. 4628 to grant Fire Chiefs or a designate the authority to require the removal or mitigation of hazardous yard conditions on private property that can pose a safety risk in the event of a fire. Examples include, but are not limited to: greenwaste accumulations, overgrown grass, weeds, and brush piles, woody debris, old appliances, discarded propane tanks, and other flammable or combustible debris. The bylaw should also give the Fire Chief the authority to require the storage of combustible materials (fire wood, propane tanks) 10 m away from homes. The revised bylaw should also give the CRD the authority to require removal/clean-up of combustible materials and provide a mechanism to recoup costs for clean-up carried out on the owner's behalf.

CRD Bylaw No. 5008, 2016: Development Approval Information Bylaw

This bylaw stipulates that the manager of planning services has the authority to request that reports relating to community services or facilities be required to identify wildfire risk and mitigation prior to being approved.

RECOMMENDATION #3: Review and amend Section 19 of the CRD Development Approval Information Bylaw No. 5008 to specify that a wildfire hazard assessment and mitigation strategy be prepared by a Qualified Professional (QP) such as a registered forest professional prior to the approval of all new developments, rezoning applications, or subdivision of lots within 200 m of areas mapped as high or extreme wildfire threat class in this CWPP. If a wildfire development permit area (DPA) is developed (see Recommendation 16) amend Bylaw 5008 to directly reference and require compliance with the wildfire DPA. Amendments should also specify that the CRD reserves the right to approve applications subject to the implementation of wildfire mitigation strategies. This recommendation is in line with General Implementation objectives (Section 1.4) of both the South Cariboo and Lac La Hache Official Community Plans, as well as Hazard and Conflict Mitigation objectives 8.3.15 (Lac La Hache) and 8.3.17 (South Cariboo).

CRD Bylaw No. 5005, 2016: Development Procedures, Guidelines, and Fees

This bylaw stipulates that all applications for development permits in the wildland urban interface must include a report with details on landscaping, siting, exterior building design and finish, and placement of trees, types of species to be planted. This includes the authority to request the avoidance and removal of flammable plant species and the placement of plants away from structures at specified distances.

RECOMMENDATION #4: Review and amend the CRD Development Procedures, Guidelines & Fees Bylaw (5005, 2016) to spatially define the wildfire urban interface (WUI) where a landscaping/building design report is required to support a development application. Use local wildfire threat mapping completed as part of the CWPP. If a wildfire Development Permit Area (DPA) is developed (see Recommendation 16) consider amending Bylaw 5005 to directly reference and require compliance with the wildfire DPA.

CRD Bylaw No. 4997, 2016: Building

This bylaw regulates the construction, alteration, repair, moving or demolition of buildings and structures. This bylaw ensures that building owners comply with the Building Code specifically with regards to ensuring that fire-fighting vehicles are provided acceptable access to the building in the case of a fire.

RECOMMENDATION #5: Review and amend Section 17 of the Building Bylaw (4997, 2016) (Responsibilities of the Owner) in consultation with the local fire departments to specify what constitutes acceptable access for fire fighting vehicles. Review and amend Section 19 (Final Inspections and Occupancy) of the Building Bylaw to require accurate house numbering that can be clearly seen from the road at night to be posted prior to an occupancy permit being issued by a Building Official.

CRD Bylaw No. 4935, 2014: Water Services Management

This bylaw manages and regulates the water supply available for fire-fighting from CRD- and privately-owned hydrants. This bylaw also gives authority to the Manager of Environmental Services, under the direction of the CRD Board, to manage and operate the water utility and the sale of water. This bylaw also stipulates that all privately-owned fire hydrants that are not available for firefighting should be removed.

CRD Bylaw No. 5184, 2018: 108 Greenbelt Community Use Property Control Bylaw

This bylaw governs the 108 Greenbelt, located behind 108 Mile residences, for community use. This bylaw outlines that no trees, brush, logs or other natural growth be removed without the written consent of the CRD. Furthermore, no lighting of campfires is to be permitted within the greenbelt at any given time.

RECOMMENDATION #6: As the CRD builds upon the existing network of parks, trails, and open spaces (Section 14 of the South Cariboo and Lac La Hache Official Community Plans), consider park acquisition and maintenance through a wildfire lens. This will help ensure wildfire risk, mitigation, liability and future maintenance are considered as priorities in development of the parks and trails inventory, including consideration for long-term maintenance costs and access. Consider amendments to the Official Community Plan policies where needed, including requiring the use of a QP in review, assessment, and siting of parks and park access prior to acceptance into the CRD park inventory. Consideration should also be given to trail building and maintenance as these activities can either increase wildfire risk (through fuels accumulations and unsafe work practices) or decrease wildfire risk (though proper placement, clean-up of combustible fuels trailside and work practices which adhere to the *Wildfire Act* and *Wildfire Regulation*).

2.5.4 Higher Level Plans and Relevant Legislation

The 100 Mile House Sustainable Resource Management plan (SRMP) was completed in 2005 to establish area-specific objectives and strategies identified under the higher-level Cariboo Chilcotin Land Use Plan (CCLUP). The SRMP identifies values at risk, but does not speak to the concept of wildfire prevention within the region. To address this gap, landscape level fuel break opportunities have been identified as part of this CWPP. These fuel breaks have been recommended in order to protect access and egress

routes in the CRD as well as to serve as strategic anchors for fire suppression and to reduce the potential for extreme crown fire behaviour.

In 2010 a Land Use Objectives Order (LUOO) set legal directives for the entire CCLUP area, including Wildlife Tree Retention, Old Growth Management Areas (OGMAs), Critical Habitat for Fish, Lakes and Riparian Area Management, Community Areas of Special Concern, Mature Birch Retention, Grasslands, Scenic Areas, High Value Wetlands for Moose, and Grizzly Bear. Any overlaps between proposed fuel treatment units and legal (LUOO) or non-legal (SRMP) designated areas are identified in Table 10. Further consultation with MNFLRORD must occur prior to implementation. Guidance is published for harvesting on designated Grassland Benchmark sites. There is also a Cariboo Biodiversity Conservation Strategy with guidance relating to the effects of mountain pine beetle and other bark beetles.

There are 7 legal Ungulate Winter Range (UWR) polygons that intersect the AOI. The majority of these polygons are "Conditional Harvest Zones" as per Government Actions Regulation (GAR) Order U-2-003. This GAR Order is intended to protect critical winter foraging habitats for mule deer populations and have specific management requirements associated with them.

2.5.5 Ministry or Industry Plans

Reviewing and incorporating other important forest management planning initiatives into the CWPP planning process is a critical step in ensuring a proactive and effective wildfire mitigation approach in the AOI.

Silviculture Strategy

A Type 4 Silviculture Strategy was developed in 2015 for the 100 Mile House Timber Supply Area (TSA). The Silviculture Strategy aims to mitigate impacts of pests, disease and wildfires on mid-term timber supply and habitat. The strategy makes silviculture-related recommendations in Section 3.5 that align with wildfire risk reduction objectives near values at risk and communities and are consistent with the recommendations in this CWPP Update.

Forest Stewardship Plans

There are many overlapping Forest Development Units (FDUs) within the AOI with associated Forest Stewardship Plans (FSPs). FSPs set specific forest practices obligations applicable to specific forest licensees. FSPs for West Fraser Mills Ltd., Tolko Industries Ltd., BC Timber Sales (BSTS), and Kenkeknem Forest Tenures Ltd. were recently renewed and are available online; other licensees with FSPs in the AOI include Pioneer Family Partnership, Interfor Adams Lake Lumber, and 100 Mile House Development Corporation (Community Forest). The FSPs each contain results and strategies to achieve government objectives, including those established under the CCLUP. The FSPs contain strategies for the protection of values under the *Forest and Range Practices Act*, including soils, biodiversity, wildlife, cultural heritage features, and range and grazing. The FSPs also spatially identifies Old Growth Management Areas, and provide details on declared areas (cutblocks and roads), measures for invasive species, and stocking standards.

Parks Management

There are two Provincial Parks that overlap with the AOI: Cariboo Nature Park and Lac La Hache Park. Management plans for these parks consist of Purpose Statement and Zoning Plans (PSZP). The PSZP for Lac La Hache Provincial Park identifies the primary purpose of the park as a campground and lake access. Special values in the park include old Douglas-fir and the historical Cariboo Wagon Road trail. Cariboo Nature Provincial Park has limited recreational value and is designated to protect the poorly represented Cariboo Basin Ecosection and IDFdk3 biogeoclimatic zone.

Forest Health Management

Forest health management and associated initiatives within the 100 Mile House Timber Supply Area (TSA) are guided by the 100 Mile House Natural Resource District Forest Health Strategy.[12] This plan informs operational planners, reviewing agencies and approval authorities with information of forest health risks, issues and best management practices. This plan should be reviewed, considered, and addressed during the prescription-level phase. Fuel management and prescriptions aimed at reducing wildfire hazard within the AOI should aim to incorporate the guiding principles and best management practices (BMPs) presented within this aforementioned plan.

Other

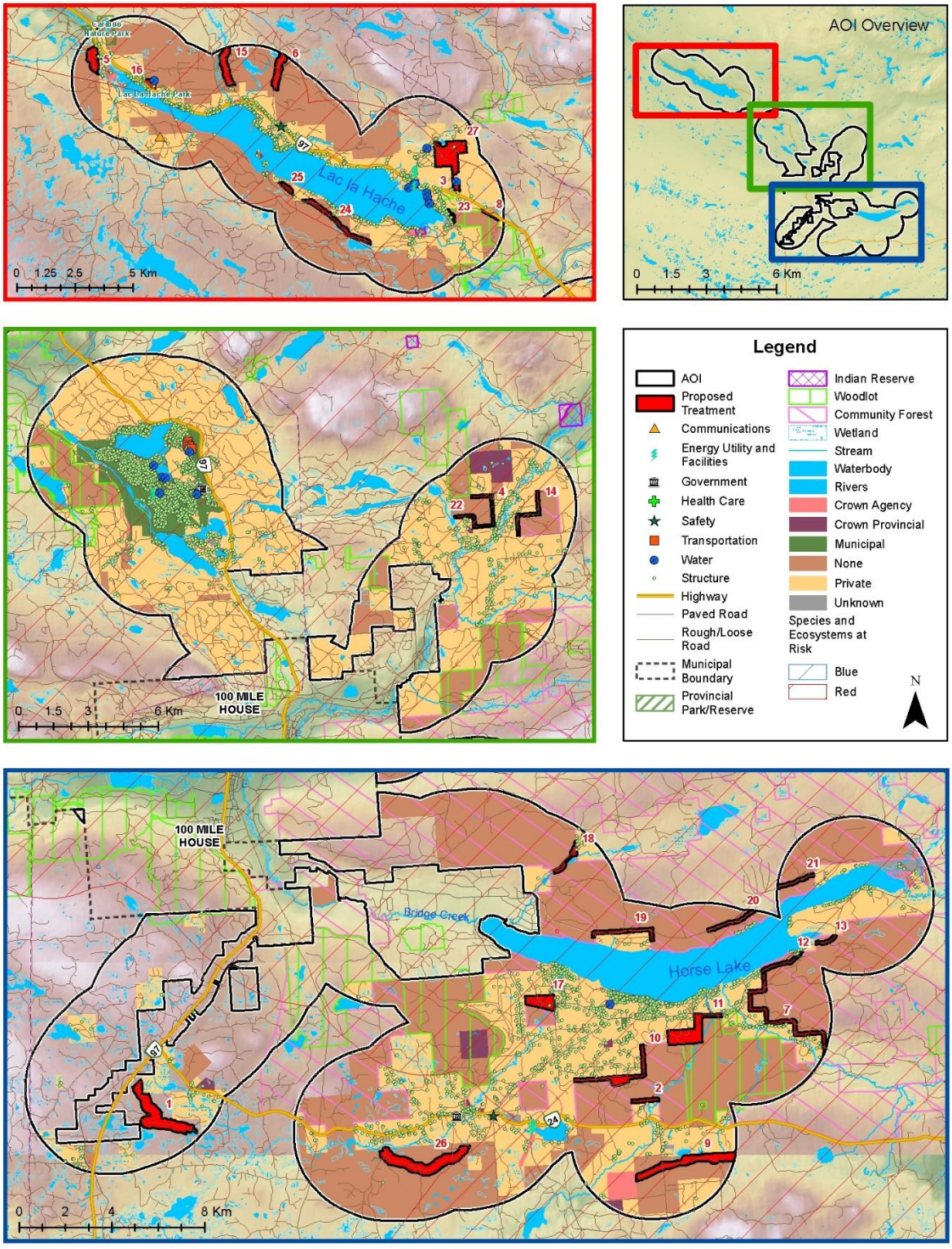
The Cariboo-Chilcotin Ecosystem Restoration Plan (CCERP) supports mitigation of high severity wildfire through the protection of arid grasslands and open rages. Treatments recommended for the potential increase in public safety and the restoration and protection of these rare ecosystems and habitats includes prescribed burning and/or mechanical thinning. [13] Efforts should be made to explore potential fuel treatment options in collaboration with the CCERPs recommendations.

SECTION 3: VALUES AT RISK

The following section is a description of the extent to which wildfire has the potential to impact the values at risk (VAR) within the AOI. The VAR or the human and natural resources that may be impacted by wildfire include human life and property, critical infrastructure, high environmental and cultural values, and other resource values. VAR also include hazardous values that pose a safety hazard. Key identified VAR are illustrated below in Map 2.

[12] 100 Mile House Natural Resource District Forest Health Strategy. 2019. https://www2.gov.bc.ca/assets/gov/farming-natural-resources-and-industry/forestry/forest-health/tsa-strategies/dmh_forest_health_strategy_2019-2020_signed.pdf

[13] Cariboo-Chilcotin Ecosystem Restoration Plan: Grassland Benchmark. 2007. https://www2.gov.bc.ca/assets/gov/farming-natural-resources-and-industry/natural-resource-use/land-water-use/crown-land/land-use-plans-and-objectives/cariboo-region/cariboochilcotin-rlup/cariboo_chilcotin_ecosystem_restoration_plan.pdf



Map 2. Values at Risk within the AOI.

3.1 HUMAN LIFE AND SAFETY

One of the primary goals of the BCWS is to support emergency response and provide efficient wildfire management on behalf of the BC government. BCWS aims to protect life and values at risk, while ensuring the maintenance and enhancing the sustainability, health and resilience of BC ecosystems.[14]

Human life and safety are the first priority in the event of a wildfire. A key consideration is the evacuation of at-risk areas and safe egress. Evacuation can be complicated by the unpredictable and dynamic nature of wildfire, which can move quickly. Evacuation takes time and safe egress routes can be compromised by wildfire causing limited visibility, or by traffic congestion and/or accidents.

The population distribution (both people and structures) within the AOI is important in determining the wildfire risk and identifying mitigation activities. The population of the CRD has remained relatively constant in the last decade. Between 2011 and 2016 the population dipped by 0.6 percent and the total population in 2016 was roughly 61,988 people. The average age of the population was 44 years old and the number of occupied private dwellings in 2016 was 26,700, the majority of these dwellings, 19,345 being single-detached homes.

Electoral areas G, H and L within the CRD attract visitors for hunting, camping, hiking, canoeing, motor boating, and other recreational endeavors year-round, but particularly during the fire season (May – October). Parks, recreation areas, and both frontcountry and backcountry lakes throughout the AOI are highly used during the summer months, including Lac La Hache Provincial Park, Irish Lake Recreation Site, and Horse Lake. Furthermore, the Cariboo Highway (Highway 97), which is frequently used as an access corridor between Cache Creek and Prince George and the Interlakes Highway (Highway 24), between 100 Mile House and Little Fort, are main tourist corridors during the summer months and therefore increases the number of people and time it takes to evacuate in the event of a wildfire.

Knowledge of and access to updated structure locations within an area is a critical step in efficient and successful emergency response planning and the development of mitigation strategies and recommendations. Field visits to electoral areas G, H and L, consultation with the Wildfire Working Group, and access to recent orthophotography has enabled the development a spatial layer with structure locations that accounts for the most recent developments.

3.2 CRITICAL INFRASTRUCTURE

Protection of critical infrastructure (CI) during a wildfire event is an important consideration for emergency response effectiveness, ensuring that coordinated evacuation can occur if necessary, and that essential services can be maintained and/or restored quickly in the case of an emergency. Critical infrastructure includes emergency and medical services, electrical and natural gas services, transportation, water, social services, and communications infrastructure. A critical infrastructure dataset was provided by the CRD's GIS staff and this data was included in Map 2. Table 3 details an inventory of critical infrastructure identified by the CRD and via field visits.

[14] BC Provincial Coordination Plan for Wildland Urban Interface Fires. 2016. https://www2.gov.bc.ca/assets/gov/public-safety-and-emergency-services/emergency-preparedness-response-recovery/provincial-emergency-planning/bc-provincial-coord-plan-for-wuifire_revised_july_2016.pdf

Protection of critical infrastructure is essential for wildfire preparedness, community services and business continuity. Survival and continued functionality of these facilities not only support the community during an emergency but also determine, to a great degree, the extent and cost of wildfire recovery and economic and public disruption during post wildfire reconstruction. Critical infrastructure provides important services that may be required during a wildfire event or may require additional considerations or protection. As outlined in Section 5.2, FireSmart principles are important when reducing wildfire risk to both classes of structure and are reflected in the outlined recommendations. During field visits, it was observed that the CRD's critical infrastructure (i.e., fire halls, hospitals, community centers, etc.) are in various levels of compliance with FireSmart principles.

RECOMMENDATION #7: Engage a qualified professional to complete formal FireSmart assessments of critical infrastructure such as fire halls, community centers, and water infrastructure as identified in this CWPP (Tables 3 and 4) or by CRD staff.

RECOMMENDATION #8: Use fire-resistant construction materials, building design and landscaping for all CI when completing upgrades or establishing new infrastructure. Additionally, vegetation setbacks around critical infrastructure should be compliant with FireSmart guidelines (no combustible material within 10 m of structures).

RECOMMENDATION #9: The CRD should complete vulnerability assessments of all critical infrastructure, secondary power sources, and fuel availability. Review current capability of secondary power sources, identify vulnerabilities, and prioritize needs, in the case of prolonged or extensive power outages. Upgrade or realign resources, as prioritized.

3.2.1 Electrical Power

Electrical service for most of the CRD is received through a network of wooden pole transmission lines, generating systems and underground distribution infrastructure supplied by BC Hydro. Multiple transmission lines bisect the AOI, connecting the 100 Mile House substation to the Carquille substation and another to the Soda Creek substation and the Kelly Lake substation to the 100 Mile House substation. This system is well-mapped and BC Hydro states that staff will work with local fire departments and BCWS to mitigate impacts to this infrastructure in the event of a wildfire.[15]

A large fire has the potential to impact electrical service by causing disruption in network distribution through direct or indirect processes. For example, heat from flames or fallen trees associated with a fire event may cause power outages. Consideration must be given to protecting this critical service and providing power back up at key facilities to ensure that the emergency response functions are reliable. Neighbourhoods with small, street-side wooden poles that connect to homes are particularly vulnerable to fire. It is recommended that utility right-of-way best management practices such as, regular brushing and clearing of woody debris and shrubs be employed to help reduce fire risk, utility pole damage and subsequent outages.

[15] https://www.bchydro.com/safety-outages/emergency-preparation/natural-disasters.html

Secondary power sources are important to reduce critical infrastructure vulnerability in the event of an emergency which cuts power for days, or even weeks. Secondary power is available for all water pumping stations via natural gas generators, and some critical infrastructure such as the fire halls, emergency operations center, and RCMP. Vulnerabilities for secondary power sources include mechanical failure, potentially insufficient power sources should a wide-scale outage occur, and fuel shortage in the event of very long outages. Refer to Section 6.1 for discussion and recommendations related to backup power and water availability for fire suppression.

3.2.2 Communications, Pipelines and Municipal Buildings

Residents within the CRD are serviced by the 100 Mile District General Hospital, and by two airports with limited flights: the 100 Mile House Airport and the South Cariboo Regional Airport (108 Mile). A major Enbridge (previously Spectra Energy) natural gas pipeline runs north-south through the AOI roughly parallel to Highway 97. There are also Fortis BC natural gas distribution pipelines that supply the CRD. In the event of a wildfire, FortisBC and Embridge employees will work with local and provincial emergency responders and employ their own emergency response protocols, including shutting down compressor stations if required.[16]A full inventory of critical infrastructure for communications, pipelines and regional district buildings with updated locations is presented in Table 3, below.

Table 3. Critical Infrastructure Identified in CWPP field visits.

Critical Infrastructure Type	Location
Enbridge transmission line	Running north-south through the AOI from west of Lone Butte, through 100 Mile House, west of 108 Mile Lake, then north of Lac La Hache to Williams Lake
Enbridge Crossover Assembly	600 m northwest of intersection of Highway 97 and Timothy Lake Road, Lac La Hache
Fortis BC Value Assembly	600 m northwest of intersection of Highway 97 and Timothy Lake Road, Lac La Hache
South Cariboo Regional Airport	Telqua Drive, 108 Mile
Lac La Hache Rogers/Telus Cell Tower	Along Tattton Helena Forest Service Rd (51.838320, -121.632716), Lac La Hache
Lone Butte Telus Cell Tower	Northeast of intersection of Holmes Road and Highway 24-Huckleberry Butte
99 Mile Rogers Cell Tower	South of Ainsworth Road and the 100 Mile Nordic Ski Society
108 Mile Telus Cell Tower	Across Highway 97 from Easzee Drive and the South Cariboo Regional Airport in 108 Mile
Lone Butte Refuse Site	6106 Highway 24, Lone Butte
Mile 108 Elementary School	4958 Easzee Drive, 108 Mile Ranch
108 Mile House Volunteer Fire Department	4966 Easzee Drive, 108 Mile Ranch
Lone Butte Volunteer Fire Department	6060 Little Fort Highway 24, Lone Butte
Lac La Hache Volunteer Fire Department	3819 Dodge Road, Lac La Hache
Lone Butte Community Hall	5998 Interlakes Highway, Lone Butte

[16] https://www.fortisbc.com/safety-outages/preparing-for-emergencies/wildfires-and-evacuations; https://www.enbridge.com/about-us/safety/emergency-management and https://www.enbridge.com/wildfires-in-british-columbia

Critical Infrastructure Type	Location
Lac La Hache Community Club	3997 Cariboo Hwy 97 S, Lac La Hache

3.2.3 Water and Sewage

Where available, water systems are provided at the Electoral Area level. Within the AOI, portions of Lac La Hache, 108 Mile, 103 Mile, Gateway and Horse Lake (Anderson subdivision) have community water systems. Residents outside of these service areas such as 93 Mile and Lone Butte have private wells and septic tanks. These water utilities are mainly supplied through groundwater sources, although there are some private surface water diversions. Surface water is also used for irrigation in the AOI. The revenue for the operation, maintenance and capital and administration of these utilities comes directly from land owners and is raised through taxation and other user fees.

CRD sewer services are only provided in the Lac La Hache area; associated infrastructure includes a lift station and a sewage treatment lagoon. All other residents employ private on-site septic tank systems to store and treat sewage.

Table 4. Critical Infrastructure Identified in CWPP field visits.

Critical Infrastructure Type	Location
Reservoir (X2)	Along Kyllo Rd, 108 Mile
Pump House (Lacl La Hache Community Club)	3997 Cariboo Hwy 97 S, Lac La Hache
Reservoir	4821 Telqua Road, 108 Mile House
Reservoir	4947 Timothy Lake Road, Lac La Hache
Reservoir	South of Malm Drive and Mathews Road intersection, Horse Lake
Water Tower	Lac La Hache Provincial Park Access Road, Lac La Hache
Lift Station (McKinley) (X3)	West of McKinley Drive, Lac La Hache
Primary Control Site, Easzee Drive Pumphouse	Intersection of Easzee Dr and Plateau Rd, 108 Mile Ranch
Primary Pump House (Hamilton)	End of Hamilton Road, Lac La Hache
Lift Station (Hamilton)	Southern side of Hamilton Rd, Lac La Hache
Well Control and Generator	5347 Kallum Drive, 108 Mile Ranch
Secondary Site Booster	North End of Block Drive, 108 Mile Ranch
Well #1 (South end of Sepa Lake)	South of Sepa Lake along trail – access from Kallum Drive, 108 Mile Ranch
Well #2 (North end of Sepa Lake)	North of Sepa Lake along trail – access from Kallum Drive, 108 Mile Ranch
Sewage Lagoon	Off of Cariboo Hwy onto Bjornson Rd, Lac La Hache

3.3 HIGH ENVIRONMENTAL AND CULTURAL VALUES

The following section identifies high environmental and cultural values and where they are located. Environmental, cultural and recreational values are high throughout the AOI. A more detailed account of environmental and biodiversity aspects of this region is presented in Section 3.3.3.

3.3.1 Drinking Water Supply Area and Community Watersheds

The CRD draws its domestic water from groundwater wells. It should be noted that although groundwater is plentiful, the total service area covered by the CRD is relatively small in comparison to the CRDs total land area. As a result, many community members within the AOI rely upon their own private wells and surface water sources for drinking water purposes.

Within the CRD water system testing occurs regularly to ensure that supplied drinking water meets public health regulations. In the event of drinking water contamination, a Boil Water Notice would be issued and remain in effect until the CRD drinking water officer has identified the source of contamination and ensured that the water is safe to drink again. Typically, in order for a Boil Water Notice to be lifted, all conditions imposed by the Interior Health Authority must be met and the system has to be without contamination for two consecutive days. To manage for drinking water contamination, water within the CRD is monitored a minimum once per month to ensure there is no bacteria, such as coliforms in the drinking water supply, and annually to ensure that the drinking water is in compliance with the Canadian Drinking Water Quality Guidelines and is free of any undesirable chemical and physical properties.

Although the gentle topography and prevalence of groundwater wells limits the vulnerability of CRD drinking water quality to wildfire, there is still the potential for wildfire to result in impacts to water supply. Depending on fire size and severity, there is the potential for significant hydrological impacts, extending for years post-burn.[17] Some areas may have a lower threshold for precipitation triggered events and would be particularly vulnerable to post-wildfire debris flows, mass wasting, landslides, and flooding. This could directly impact the communities through structure loss and risk to public safety, or indirectly, through loss or damage of critical infrastructure, roads, or impacts on the watershed affecting water quality.

RECOMMENDATION #10: The CRD should conduct future assessments to explore the potential hydrologic and geomorphic impacts of wildfire on its watersheds and communities. Alternatively, there may be an option to complete a stand-alone assessment to help identify and quantify the post-fire hazards and levels of risk to the communities in the AOI.

3.3.2 Cultural Values

The Secwepemc (Shuswap) people have inhabited the AOI since time immemorial. Using the BC Consultative Areas Database, seven Secwepemc groups were identified as having interests in the AOI: Esk'etemc First Nation, High Bar First Nation, Stswecem'c Xgat'tem First Nation, the Williams Lake Indian Band, Neskonlith Indian Band, the Canim Lake Band, and the Northern Shuswap Indian Band. Almost all groups are in various stages of treaty negotiations with the Province of British Columbia, and some have signed revenue sharing or other agreements.

Archaeological sites and remains in BC that pre-date 1846 are protected from disturbance, intentional and inadvertent, by the *Heritage Conservation Act* (HCA), which applies on both private and public lands. Sites that are of an unknown age that have a likely probability of dating prior to 1846 (i.e., lithic scatters)

[17] Jordan, P., K. Turner, D. Nicol, D. Boyer. 2006. Developing a Risk Analysis Procedure for Post-Wildfire Mass Movement and Flooding in British Columbia. Part of the 1st Specialty Conference on Disaster Mitigation. Calgary, AB May 23 -26, 2006.

as well as Aboriginal pictographs, petroglyphs, and burials (which are likely not as old but are still considered to have historical or archaeological value) are also protected. Under the HCA, protected sites may not be damaged, altered or moved in any way without a permit. It is a best practice that cultural heritage resources such as culturally modified tree (CMT) sites be inventoried and considered in both operational and strategic planning.

Due to site sensitivity, the locations of archaeological sites may not be made publicly available, however, data provided by the MFLNRORD Archaeology Branch confirms that there are known overlaps with archeological sites within the AOI, and there is high to moderate potential for previously unidentified archeological sites to exist elsewhere in the AOI. Prior to stand modification for fire hazard reduction, and depending on treatment location, preliminary reconnaissance surveys or archeological impact assessments may be undertaken to ensure that cultural heritage features are not inadvertently damaged or destroyed.

Pile burning and the use of machinery have the potential to damage artifacts that may be buried in the upper soil horizons. Above ground archaeological resources may include features such as CMTs, which could be damaged or accidentally harvested during fire hazard reduction activities. Fuel treatment activities must include consultation with all identified First Nations at the site level and with sufficient time for review and input regarding their rights and interests prior to prescription finalization or implementation.

3.3.3 High Environmental Values

The Conservation Data Centre (CDC), which is part of the Environmental Stewardship Division of the Ministry of Environment and Climate Change Strategy, is the repository for information related to plants, animals and ecosystems at risk in BC. To identify species and ecosystems at risk within the study area, the CDC database was referenced. Two classes of data are kept by the CDC: non-sensitive occurrences for which all information is available (species or ecosystems at risk and location); and masked, or sensitive, occurrences where only generalized location information is available.

The following is a specific list of animal species occurrences that have been identified through the B.C. Conservation Data Center (CDC), and have been specifically observed and recorded within the AOI boundary (Table 5): American badger (*Taxidea taxus*), American bittern *(Botarus lengtiginous)* and short-eared owl *(Asio flammeus)*.

Through consultation with the CDC and a biologist or qualified professional, all site level operational plans must determine if species at risk will be impacted by fuel management or other wildfire mitigation activities. All future fuel treatment activities or those associated with recommendations made in this plan should consider the presence of, and impact upon, potentially affected species. Additionally, all site level operational plans should consult the most recent data available to ensure that any new occurrences or relevant masked occurrences are known and considered in the operational plan to mitigate any potential impacts on species at risk. The BC Species & Ecosystems Explorer, which allows combined searches for species and ecological communities, should also be consulted at the prescription phase. Due to potential limitations of existing databases, consultation with a Qualified Professional with local knowledge is recommended at the prescription phase.

Table 5. Publicly available occurrences of Red and Blue-listed species recorded within the AOI.

Common Name	Scientific Name	Category	BC List	Habitat Type
American Bittern	*Botarus lengtiginous*	Vertebrate Animal	Blue	Terrestrial/Riparian: cultivated field; hedgerow; pasture/old field; shrub; grassland; lake; pond/open water; estuary; riparian herbaceous; marsh
American Badger	*Taxidea taxus*	Vertebrate Animal	Red	Terrestrial: Sub-soil; pasture/old field; talus; meadow; grassland; shrub – natural/logged; sagebrush/antelope brush steppe; conifer forest - mesic (average)/dry; krummholtz; alpine grassland
Short-eared Owl	*Asio flammeus*	Vertebrate Animal	Blue	Terrestrial: estuary; marsh; pasture/old field; cultivated field; hedgerow; meadow; grassland; pond/open water; riparian herbaceous

3.4 OTHER RESOURCE VALUES

There are multiple resources values associated with the land base, including timber supply, range, agriculture, wildlife habitat, drinking water supplies, and many others including recreation and tourism.

The AOI is encompassed by the 100 Mile House Timber Supply Area (TSA) and is administered by the Cariboo Resource Region. The total land base area of the TSA is 1.24 million ha. The most recent Annual Allowable Cut (AAC) determination occurred in 2013 which resulted in a reduction of the previous AAC, by 51,998 m^3.[18] The current AAC is now 967,805 m^3, of which no more than 477,707 m^3 are attributed to live trees. The AAC does not include area-based tenures, existing and future roads, trails and landings, non-commercial cover, old growth management areas and non-productive timber harvesting areas.

Fuel reduction treatments on provincial Crown land are not anticipated to have a measurable effect on the timber harvesting land base. Typically, forest stands identified for fuels treatments are highly constrained for conventional logging and are often in undesirable or uneconomic stand types. Numerous woodlots, community forests and other types of forest tenures exist on Crown land within the AOI. The potential opportunity to work with local woodlot owners, community forest managers and licensees on commercial thinning projects that meet multiple objectives, including fuel management, should be considered in the future.

3.5 HAZARDOUS VALUES

Hazardous values are defined as values that pose a safety hazard to emergency responders. The AOI does not contain a significant number of industrial sites and facilities that can be considered hazardous values. Lone Butte and Lac La Hache both have transfer stations (Table 6) that receive solid waste and recyclables, including household and industrial organic waste and a variety of household hazardous

[18]Ministry of Forests, Lands and Natural Resource Operations, 2013. 100 Mile House Timber Supply Area – Rationale for Allowable Annual Cut (AAC) Determination. Retried From: https://www2.gov.bc.ca/assets/gov/farming-natural-resources-and-industry/forestry/stewardship/forest-analysis-inventory/tsr-annual-allowable-cut/100_mile_house_tsa_rationale.pdf

materials and/or combustible materials (*e.g.*, tires, vehicle batteries, propane tanks, oil and oil filters and containers).

The management and treatment of fuels in proximity to hazardous infrastructure is critical in order to reduce the risks associated with both structural fire and wildfire. Specifically, best management practices recommended for management of hazardous values include: 1) incorporating FireSmart planning and setback requirements for all infrastructure in this category; and 2) maintaining emergency fuel/propane emergency shut off procedures to be enacted immediately and efficiently in the event of an approaching wildfire or ember shower.

Table 6. Hazardous Infrastructure Identified in CWPP field visits.

Critical/Hazardous Infrastructure Name	2018 Location
Lone Butte Refuse Site	6106 BC-24, Lone Butte
Canada's Log People	5467 Tatton Station Road, 100 Mile House BC
Lac La Hache Transfer Station	4202 Highway 97, Lac La Hache
Enbridge Crossover Assembly	600 m northwest of intersection of Highway 97 and Timothy Lake Road, Lac La Hache
Fortis BC Value Assembly	600 m northwest of intersection of Highway 97 and Timothy Lake Road, Lac La Hache

SECTION 4: WILDFIRE THREAT AND RISK

This section summarizes the factors that contribute to and were assessed in the determination of wildfire threat around the community. These factors include the natural fire regime and ecology, the Provincial Strategic Threat Analysis, and the local wildfire risk analysis completed for the AOI.

The relationship between wildfire hazard, threat and risk is defined as follows:

$$Wildfire\ risk\ =\ Probability\ x\ Consequence$$

Where:

- **Wildfire risk** is defined as the potential losses incurred to human life, property and critical infrastructure within a community in the event of a wildfire;
- **Probability** is the likelihood of fire occurring in an area and is related to the susceptibility of an area to fire (fuel type, climate, probability of ignition etc.); and
- **Consequences** refer to the repercussions associated with fire occurrence in a given area (higher consequences are associated with densely populated areas, or areas of high biodiversity etc.).

4.1 FIRE REGIME, FIRE WEATHER AND CLIMATE CHANGE

The ecological context of wildfire and the role of fire in the local ecosystem under historical conditions is an important basis for understanding the current conditions and the potential implications of future conditions on wildfire threat to a community. Historical conditions may be altered by the interruption of the natural fire cycle (i.e., due to fire exclusion, forest health issues, human development) and/or climate change.

4.1.1 Fire Regime and Fire Weather

Historic Fire Regime

The Biogeoclimatic Ecosystem Classification (BEC) system describes zones by vegetation, soils, and climate. Regional subzones are derived from relative precipitation and temperature. Subzones may be further divided into variants based upon climatic variation and the resulting changes in the vegetative communities; variants are generally slightly drier, wetter, snowier, warmer, or colder than the climate of the regional subzone.[19] BEC zones have been used to classify the Province into five Natural Disturbance Types (NDTs). NDTs have influenced the vegetation dynamics and ecological functions and pathways that determine many of the characteristics of our natural systems. The NDT classification is based on the frequency and severity of pre-European disturbance events (including but limited to wildfires) and provides an indication of historical fire regime. The physical and temporal patterns, structural complexity, vegetation communities, and other resultant attributes should be used to help design fuel treatments, and where possible, to help ensure that treatments are ecologically and socially acceptable.[20] The AOI is characterized by the BEC subzones and associated NDTs as outlined in Table 7 and Map 3.

Table 7. BEC zones and natural disturbance types found within the AOI[21].

Biogeoclimatic Zone	Natural Disturbance Type	Area (ha)	Percent (%)
IDFdk3: Interior Douglas-fir, Dry Cool, Fraser variant	NDT4	42,172	99%
SBSdw2: Sub-Boreal Spruce, Dry Warm, Blackwater variant	NDT3	505	1%
TOTAL		**42,677**	100%

The AOI is predominantly characterized as NDT4 (99%) with a very small component of NDT3 (1%), forest ecosystems with historically frequent disturbances. Natural Disturbance Type 4 comprises grassland, shrubland, and forested ecosystems (IDFdk3) with frequent stand-maintaining fires.[22] Fires are generally of a low intensity that allows fire-resistant tree species to persist on wetter sites and limits the encroachment of trees and shrubs into grasslands. Fires have historically resulted in a a mosaic of mostly uneven-aged forests across the landscape interspersed with grassy openings. The mean return interval for fires in the IDF has generally been 4 to 50 years for surface fires and 150 to 250 years or more for stand-initiating crown fires. The fire regime in the IDFdk3 has been modified by human activities during the last century, which include forest harvesting and fire suppression.

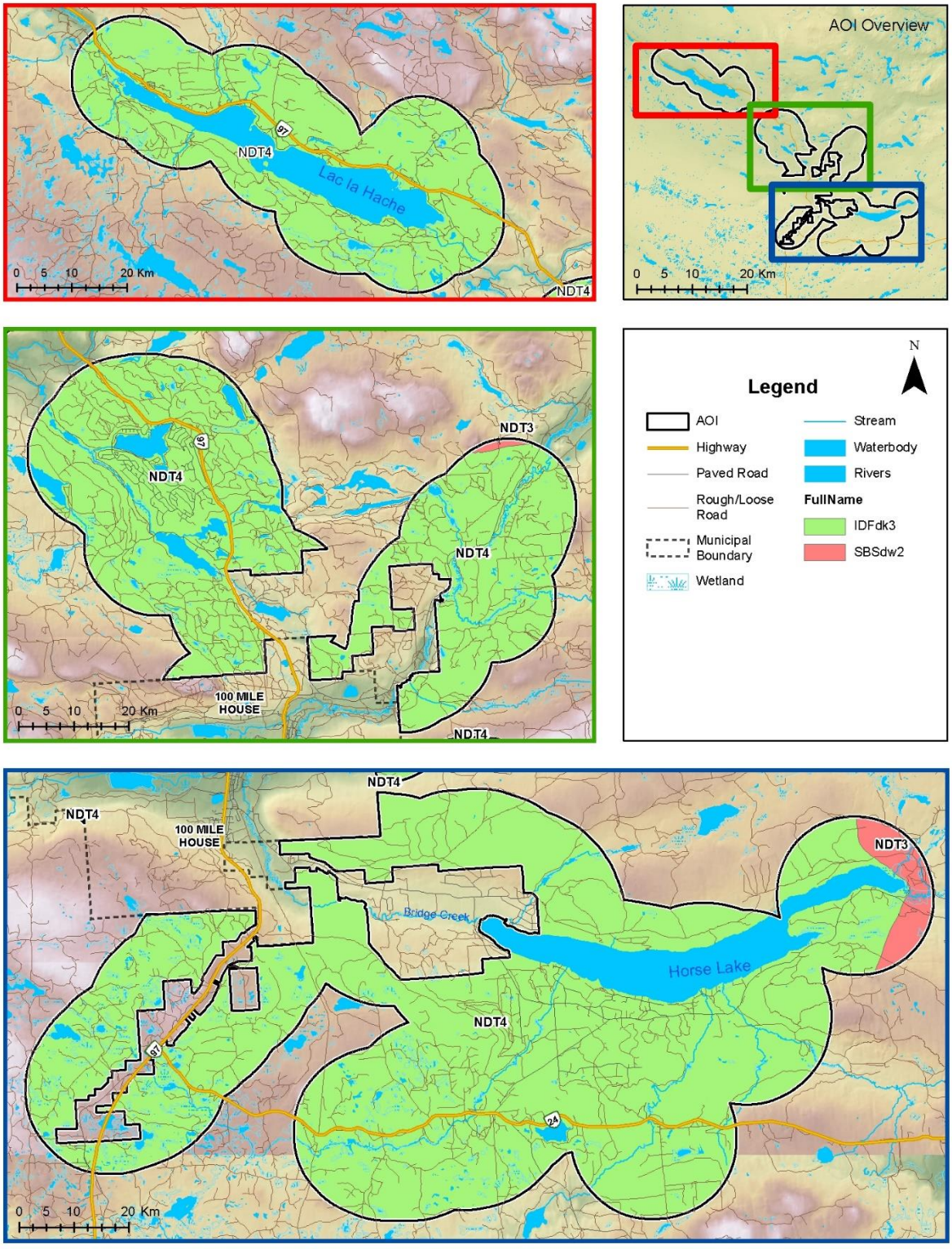
Natural Disturbance Type 3 comprises forest ecosystems (SBSdw2) with frequent stand initiating fire or disease events.[22] Fires historically ranged in size but could be as large as several thousand hectares. Large, high intensity fires combined with frequent disease outbreaks have historically resulted in a mosaic of even aged regenerating stands interspersed with mature, usually Douglas-fir, forest patches

[19] BECWeb: https://www.for.gov.bc.ca/HRE/becweb/resources/classificationreports/subzones/index.html
[20] Province of British Columbia, 1995. Biodiversity Guidebook.
[21] MFLNRORD BEC Map (DataBC)
[22] BC Environment. 1995. Biodiversity Guidebook.

that survive the fire. Because large, intense fires are frequent, pre-planning and preparation are essential to reduce the negative impacts of a wildfire to a community.

While natural disturbance regimes are useful for describing the historical disturbance pattern typical for an area, fire history is complex and highly variable across space and time for many ecosystems.[23] Furthermore, forest health issues, human development and natural events contribute to changes in the fire regime, forest attributes and fuel hazard around the community.

[23] Hall, E. 2010. Maintaining Fire in British Columbia's Ecosystems: An Ecological Perspective. Report submitted to the Wildfire Management Branch, Ministry of Forests and Range.



Map 3. Biogeoclimatic Zones and natural disturbance regimes within the AOI.

Forest Health Issues

The 2019-2020 100 Mile House Natural Resource District Forest Health Strategy outlines forest health issues and best management practices applicable to the AOI.[24] The District is coping with widespread mortality from mountain pine beetle in the early 2000s and from wildfires in the 2017 and 2018 seasons, resulting in salvage operations and associated AAC reductions. Currently, Douglas-fir and spruce beetles are identified as the priority forest health agents, as infestations are worsened in fire and drought-weakened stands. Western spruce budworm is also a high priority, followed by western balsam bark beetle, dwarf mistletoe, tomentosus, laminated and armillaria root diseases, lodgepole pine terminal weevil, and white pine weevil.

Spatial data available through DataBC[25] indicates that outbreaks of mountain pine beetle occurred throughout the AOI between 2003 and 2008, with the most severe outbreaks concentrated around 93 Mile and Horse Lake. Very large (10,000 ha or more) moderate to severe outbreaks of western spruce budworm occurred between 2001-2006 around 108 Mile and Lac La Hache. Smaller moderate to severe outbreaks of Douglas-fir beetle, aspen popular twig blight, and generalized aspen defoliation and decline have occurred in the last several years throughout the AOI.

These forest health factors have implications for the level of surface fuel accumulation in affected stands, as well as access and working conditions for fire fighters in the event of wildfire. Accumulations of standing dead as well as downed lodgepole pine and spruce were observed during the field visit and contributed to the hazardous rating of many stands.

Human Development and Natural Events

Most land cover change in the AOI can be described as rural development, forestry operations, or natural disturbance. Natural disturbance (mountain pine beetle and wildfire- see above) has resulted in salvage operations across the landscape and some large cutblocks (i.e. Big Lake), but forest harvesting with various levels of retention occurs on Crown land as well as on private land throughout the AOI. Rural development in the region is mainly characterized as land clearing on private lots and the maintenance of ranchlands. The overall implication of human development is an increase in human ignition potential and an increase in interface and intermixed development areas. Forest harvesting and land clearing generally increases the slash (S-1 to S-3) and mixed conifer/deciduous (M-1/2) fuel types on the landscape as stand development occurs. Areas maintained as open for ranching are typically non-irrigated O-1a/b fuel types (see Appendix A-1 for a description of fuel types)

Since the establishment of communities within the 100 Mile House area of the Cariboo Regional District, there have been numerous anthropogenic and natural changes that have occurred on the landscape. The following is a list of notable changes observed within the AOI and a description of associated implications regarding wildfire behaviour.

[24] 100 Mile House Natural Resource District Forest Health Strategy. 2019.
[25] https://catalogue.data.gov.bc.ca/pt_BR/dataset/pest-infestation-polygons (current as of September, 2017)

- Agricultural development – approximately 60% of land base is characterized as Agricultural Land Reserve (ALR). This area is dominated by natural pasture/rangeland, the majority of which is treed.[26]
- Residential land development has occurred across the AOI since the mid-19th century following wide-spread settlement by early pioneers engaging in resource-based activities. This has generally resulted in an increased wildland-urban interface in particular areas (Section 5.2.3) and an increase in fire suppression in ecosystems with historical fire return intervals of 4-50 years (NDT 4). The population of the area is expected to decline slightly over the next two decades, although population growth is expected in the Lac La Hache area.[26,27] Declining population growth does not necessarily lead to reduced wildfire risk, as current and future residents may choose to live in or near forested areas as opposed to in communities.
- Forest industry activities – forest harvesting is common on provincial Crown land as well as on private land within the AOI. Piling and burning are part of the slash hazard abatement practices in the area. A delay in pile burning can lead to high fuel loading along roadsides.
- Fuel treatments have been undertaken adjacent to neighborhoods around 108 Mile Lake as per recommendations in the previous (2006) CWPP and in the 'Richardson Report' of 1991. Further monitoring and management of these areas will be required in the future in order to maintain the fire threat and behaviour potential at or below moderate threat.
- Developed areas in the AOI include the main communities of Lac La Hache, 108 Mile House, Gateway, and Horse Lake. Many properties are highly intermixed within conifer leading stands and have only one access/egress route.
- Forest health - the entire AOI was severely affected by mountain pine beetle in the early 2000s, leaving thousands of hectares of dead pine, some of which was salvaged. In 2017 the Gustafsen wildfire between 100 Mile House and 108 Mile burned over 5,700 hectares of forest and caused the evacuation of several communities in the AOI.

Fire Weather Rating

Fire weather refers to weather conditions that are conducive to fire. These conditions determine the fire season, which is the annual period(s) of the year during which fires are likely to start, spread, and cause sufficient damage to warrant organized fire suppression. The Canadian Forestry Service developed the Canadian Forest Fire Danger Rating System (CFFDRS) to assess fire danger and potential fire behaviour. Fire Danger Classes provide a relative index of the ease of ignition and the difficulty of suppression. A network of fire weather stations is maintained during the fire season by MFLNRORD and the recorded data are used to determine fire danger, represented by Fire Danger Classes, on forestlands within a community. The information can be obtained from the BCWS and is most commonly utilized by municipalities and regional districts to monitor fire weather, restrict high risk activities when appropriate, and to determine hazard ratings associated with bans and closures.

[26] Lac La Hache Area Official Community Plan. 2018.
[27] South Cariboo Area Official Community Plan, Bylaw No. 5171, 2018. 2018.

The BC *Wildfire Act* [BC 2004] and Wildfire Regulation [BC Reg. 38/2005], which specify responsibilities and obligations with respect to fire use, prevention, control and rehabilitation, and restrict high risk activities based on these classes. Fire Danger Classes are defined as follows:

- **Class 1 (Very Low)**: Fires are likely to be self-extinguishing and new ignitions are unlikely. Any existing fires are limited to smoldering in deep, drier layers.
- **Class 2 (Low)**: Creeping or gentle surface fires. Ground crews easily contain fires with pumps and hand tools.
- **Class 3 (Moderate)**: Moderate to vigorous surface fires with intermittent crown involvement. They are challenging for ground crews to handle; heavy equipment (bulldozers, tanker trucks, and aircraft) are often required to contain these fires.
- **Class 4 (High)**: High-intensity fires with partial to full crown involvement. Head fire conditions are beyond the ability of ground crews; air attack with retardant is required to effectively attack the fire's head.
- **Class 5 (Extreme)**: Fires with fast spreading, high-intensity crown fire. These fires are very difficult to control. Suppression actions are limited to flanks, with only indirect actions possible against the fire's head.

It is important for the development of appropriate prevention programs that the average exposure to periods of high fire danger is determined. 'High fire danger' is considered as Danger Class ratings of 4 (High) and 5 (Extreme). Danger class days were summarized to provide an indication of the fire weather in the AOI. Considering fire danger varies from year to year, historical weather data can provide information on the number and distribution of days when the AOI is typically subject to high fire danger conditions, which is useful information in assessing fire risk.

Figure 1 displays the average frequency of danger class days between the months of April and October. The data summarized comes from the Timothy BCWS weather station, which is located in Lac La Hache and provides a 9-year fire weather data collection interval for the AOI. According to Figure 1, fire weather in the AOI is the most severe from July to September. There is an average of 3-5 days with 'high' or 'extreme' danger class days during each of these months. July has the most severe fire weather on average, with 15 days of moderate, high, or extreme danger class days. There are historically 1-3 'moderate' danger class days in October, May, and June.

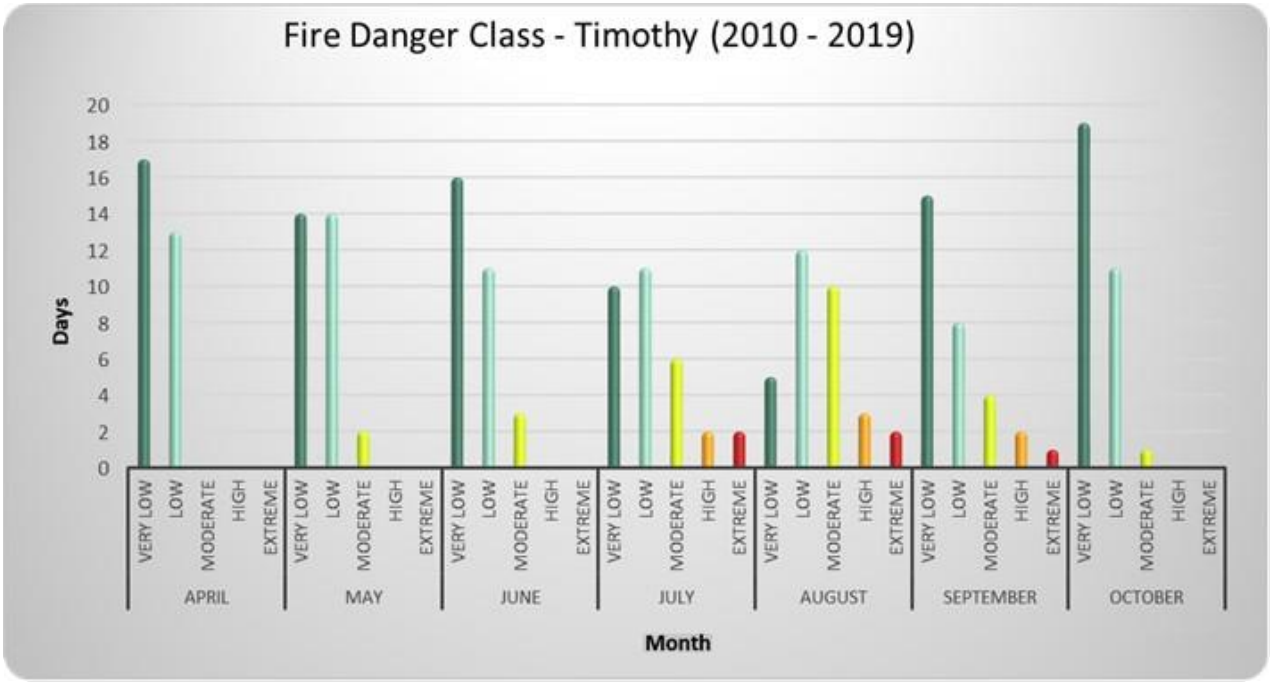


Figure 1. Average number of danger class days for the Timothy fire weather station. Summary of fire weather data for the years 2010- 2019.

4.1.2 Climate Change

Climate change is a serious and complex aspect to consider in wildfire management planning. "Climate change projections point to a warmer and drier environment and shifts in vegetation with the following implications in some areas of the province:

- Increased disturbances due to insects and disease
- Shifts in vegetation. Potential ranges of species will move northward and upward in elevation
- Increased forest fire frequency
- Longer and more intense wildfire seasons
- Increased number of high and extreme fire danger days for an average year.

As a result, some existing forests have an increased probability of more frequent, intense and more difficult to control wildfires that are likely to result in increased tree mortality, detrimental impacts to soils and hydrology, and increased threat to the community and interface areas."[28] Numerous studies outline the nature of climate change impacts on wildland fire across Canada, and globally.[29] Although there are uncertainties regarding the extent of these impacts on wildfire, it is clear that the frequency, intensity, severity, duration and timing of wildfire and other natural disturbances is expected to be altered significantly with the changing climate.[30] Despite the uncertainties, trends within the data are visible.

[28] Community Resiliency Investment Program. 2018. Community Wildfire Protection Plan Template.
[29] Flannigan, M.D et al. 2009. Implications of changing climate for global wildland fire. International Journal of Wildland Fire 18, 483-507.
[30] Dale, V., L. Joyce. S. McNulty, R. Neilson, M. Ayres, M. Flannigan, P. Hanson, L. Irland, A. Lugo. C. Peterson, D. Simberloff, F. Swanson, B. Stocks, B. Wotton. *Climate Change and Forest Disturbances*. BioScience 2001 51 (9), 723-734.

As outlined in *Climate Summary for: Cariboo Region*[31]the following climate projections for the CRD are made, along with impacts:

- Year round increases in temperature, with the greatest increases occurring in the summer months (an increase in average summer daytime high temperatures of 1.9 °C by the 2050s and 3.1 °C by the 2080s);
- A decrease in summer precipitation of 5% by the 2080s, leading to drier fuels and soils (increasing fire behaviour potential).
- Increase in fall, winter and spring precipitation by 10% by the 2080s
- As average winter temperatures increase, there is projected decreases in spring snowfall by the 2050s. Overall, a reduced winter snowpack and increased seasonal moisture variability could potentially influence watershed and groundwater storage ability, timing and amount of run-off, and soil and fuel moisture during early fire season.

An increased frequency of natural disturbance events is expected to occur as a result of climate change with coincident impacts to ecosystems. These include:

- Storm events, including catastrophic blowdown and damage to trees from snow and ice;
- Wildfire events and drought; and
- Increased winter precipitation which may result in slope instability, mass wasting, increased peak flows (loss of forest cover from fire or other disturbance may increase the chance of mass wasting).

Insects and disease occurrence of bark beetles and spruce budworm may increase; outbreaks of Douglas-fir tussock moth may occur more frequently (previously occurred beyond the southern extent of the 100 Mile Natural Resource District).[32] Insects and disease may exacerbate climate-related stresses on forests. Other research regarding the intricacies of climate change and potential impacts on wildfire threats to Canadian forests has found that:

- Fuel moisture is highly sensitive to temperature change and projected precipitation increases will be insufficient to counteract the impacts of the projected increase in temperature. Results conclude that future conditions will include drier fuels and a higher frequency of extreme fire weather days.[33]
- The future daily fire severity rating (a seasonally cumulative value) is expected to have higher peak levels and head fire intensity is expected to increase significantly in Western Canada. A bi-modal (spring-late summer) pattern of peak values may evolve to replace the historical late summer peak which is the current norm.[34]The length of fire seasons is expected to increase and the increase will be most pronounced in the northern hemisphere, specifically at higher latitude northern regions. Fire season severity seems to be sensitive to increasing global temperatures;

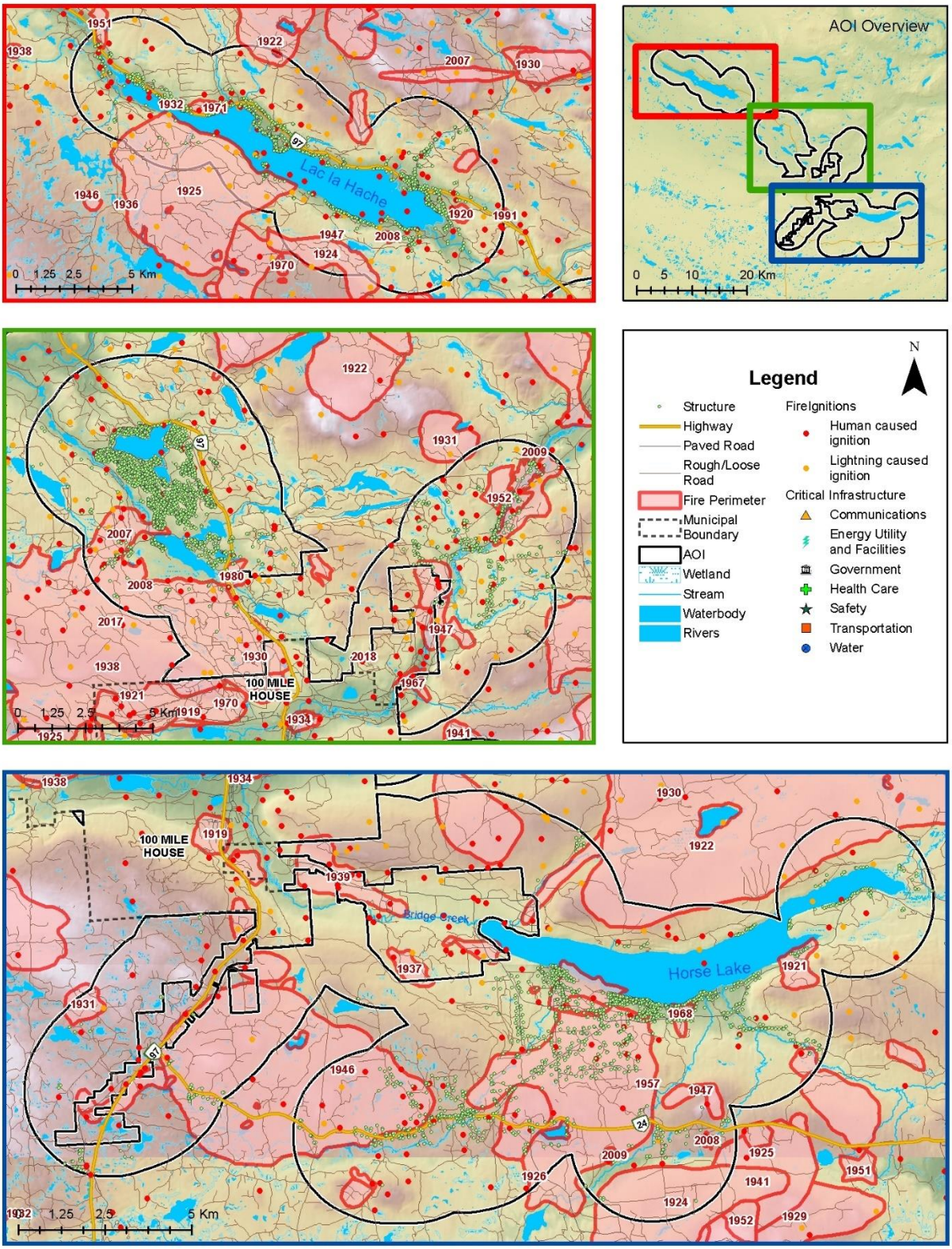
[31] Pacific Climate Impacts Consortium. Climate Summary For: Cariboo Region. 2013.
[32] Cariboo Region Forest Health Strategy
[33] Flannigan, M.D., B.M. Wotton, G.A. Marshall, W.J. deGroot, J. Johnston, N. Jurko, A.S. Cantin. 2016. *Fuel moisture sensitivity to temperature and precipitation: climate change implications*. Climatic Change (2016) 134: 59 -71. Accessed online at https://link.springer.com/content/pdf/10.1007%2Fs10584-015-1521-0.pdf.
[34] deGroot, W. J., M. D. Flannigan, A.S. Cantin. 2013. *Climate change impacts on future boreal fire regimes*. Forest Ecology and Management. 294: 35 -44.

larger and more intense fires are expected and fire management will become more challenging.[35, 36]

- More extreme precipitation events (increased intensity and magnitude of extreme rainfall) along with more extreme heat events, that along with drier summers, will contribute to increased wildfire risk in the CRD.[31]
- Future climatic conditions may lead to a reduction in snowpack, resulting in shorter winter logging seasons and the requirement for assisted migration of tree species.[31]

In summary, climate scientists expect that the warming global climate will trend towards wildfires that are increasingly larger, more intense and difficult to control. Furthermore, it is likely that these fires will be more threatening to WUI communities due to increased potential fire behaviour, fire season length, and fire severity.

[35] Flannigan, M.D., A.S. Cantin, W.J. de Groot, M. Wotton, A. Newbery, L.M. Gowman. 2013. *Global wildland fire season severity in the 21st century*. Forest Ecology and Management (2013) 294: 54 - 61.
[36] Jandt, R. 2013. Alaska Fire Science Consortium Research Brief 2013-3.



Map 4. Fire Regime, Ecology and Climate Change.

4.2 PROVINCIAL STRATEGIC THREAT ANALYSIS

The Provincial Strategic Threat Analysis (PSTA) evaluates multiple data sets to provide a coarse (high-level) spatial representation of approximate relative wildfire threats across BC. It provides a starting point to assess the local wildfire threat. Three inputs are combined to create the PSTA wildfire threat analysis component:[37]

1) **Historic fire density**: represents the ignition and fire spread potential based upon historic patterns and fire density weighted by fire size (larger fire perimeters were given a higher weight in order to reflect the greater cost and damage usually associated with larger fires).
2) **Spotting impact**: represents the ability of embers or firebrands from a burning fire to be sent aloft and start new fires in advance of the firefront, or outside of the fire perimeter. Spotting is most associated with high intensity crown fires in coniferous fuels and structure losses. For the wildfire threat analysis, the spotting analysis is based on estimating the threat to a given point on the landscape from the fuels surrounding it, up to a distance of 2 km. Spotting distances greater than 2 km are rare and unpredictable.
3) **Head fire intensity (HFI)**: represents the intensity (kW/m) of the fire front. HFI is correlated with flame length and fire behaviour. The greater the fire intensity (kW/m), or HFI and fire intensity class, the more extreme the fire behaviour is likely to be and the more difficult the fire will likely be to suppress. The HFI used in the wildfire threat analysis was developed using the 90th percentile fire weather index value.

The final wildfire threat analysis value was developed through an average weighting process of the aforementioned three layers.[38] The values were then separated into 10 classes (1 – 10) which represent increasing levels of overall fire threat (the higher the number, the greater the fire threat); threat class 7 is considered the threshold. Threat classes of 7 and higher are locations where the threat is severe enough to potentially cause catastrophic losses in any given fire season, when overlapping with values at risk. Classes were grouped into the following general threat class descriptions: low (1 – 3); moderate (4 – 6); high (7 – 8); and, extreme (9 – 10).

There are considerable limitations associated with the PSTA wildfire threat analysis component based upon the accuracy of the source data and the modelling tools, the most notable being:

- Limited accuracy and variability of the fire history point data;
- Sensitivity to fuel type and the associated limitations of using fuel type approximations for fire behaviour modelling; and,
- 90th percentile rating for HFI, which represents a near worst-case scenario which may be artificial in some circumstances.

[37] BC Wildfire Service. 2017. Provincial Strategic Threat Analysis: 2017 Update. Retrieved from: ftp://ftp.for.gov.bc.ca/HPR/external/!publish/PSTA/Documents/Provincial%20Strategic%20Threat%20Analysis_2017%20Update.pdf.

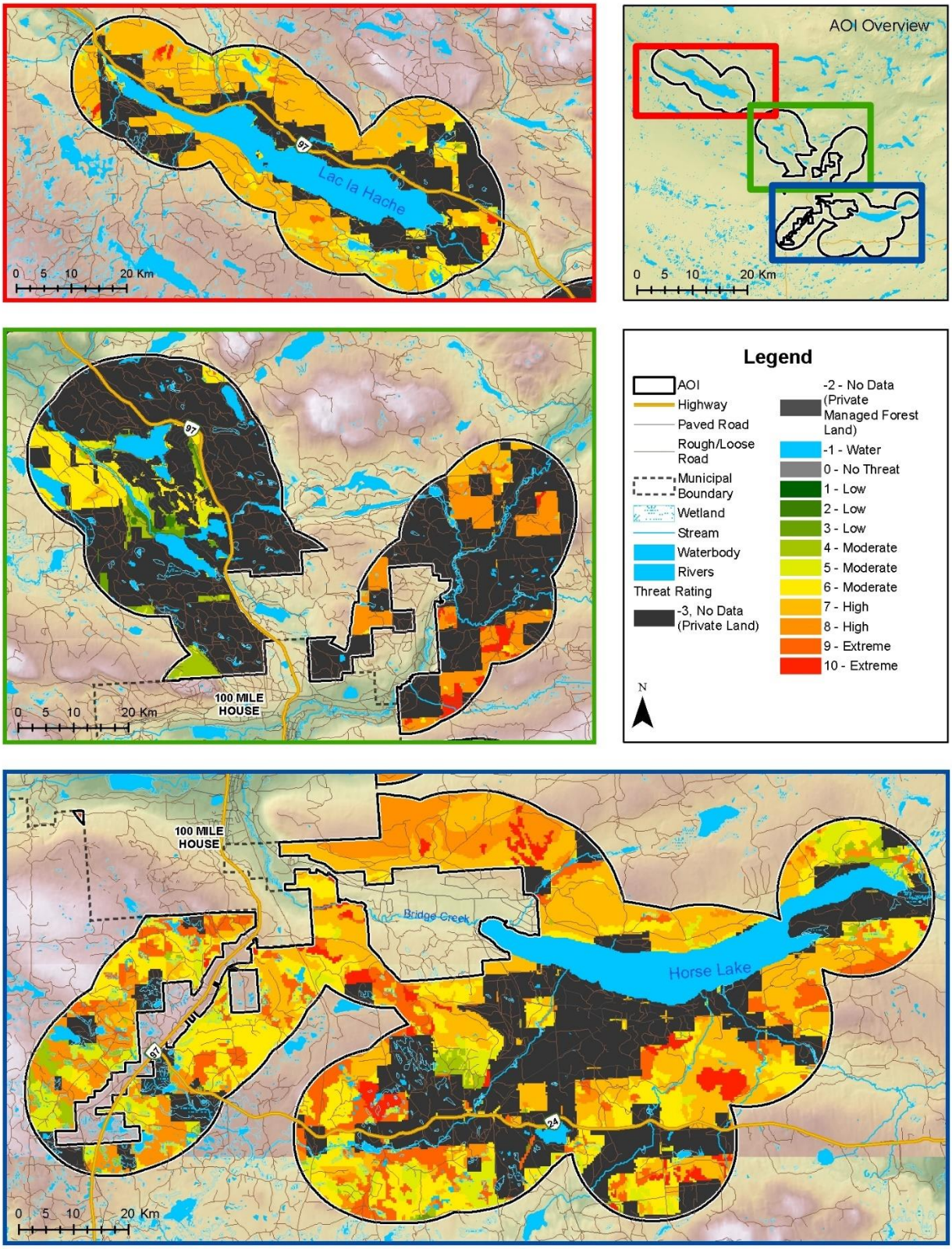
[38] Weighting of the three PSTA wildfire threat analysis components: Fire density 30%; HFI 60%; spotting impact 10% (water bodies were automatically given a value of 'no threat' [-1])

Consequently, the PSTA is complemented by a finer scale local wildfire threat analysis considering local factors to improve the wildfire threat assessment. The key steps to completing the local wildfire threat analysis and a detailed assessment of the local wildfire threat are described in Section 4.3 and Appendix A – Local Wildfire Threat Process.

The fire threat ratings from the 2019 PSTA are summarized for the AOI in Table 8 and spatially illustrated in Map 5. Approximately half of the AOI (42%) is categorized as private land and has no data for wildfire threat in the PSTA dataset. Low threat areas cover 1% of the AOI and water covers 10%. Approximately 16% of the AOI is categorized as having a moderate wildfire threat rating in the provincial Wildfire Threat Analysis (Table 8). High and extreme threat rating covers 32% of the study area, with the most notable high-threat areas being concentrated around Gateway and Horse Lake Road (Map 5).

Table 8. Overall PSTA Wildfire Threat Analysis for the AOI (rounded to the nearest hectare).

Threat Class	Area (ha)	Threat Class Description	Percent of AOI
-3	17,863	No Data (Private Land)	42%
-2	0	No Data (Private Managed Forest Land)	0%
-1	4,067	Water	10%
0	0	No Threat	0%
1	0	Low	1%
2	81		
3	184		
4	770	Moderate	16%
5	1,573		
6	4,581		
7	8,644	High	27%
8	2,694		
9	1,508	**Extreme**	5%
10	712		
Total	**42,677**	**-**	**100%**



Map 5. Provincial Strategic Threat Rating.

4.2.1 Fire History

Fire ignition and perimeter data are depicted in Map 4. The following PSTA fire ignition data is available from 1950-2018 and fire perimeter data is available from 1919-2018 for the area. Based on the BCWS historical wildfire dataset, several large (>2,000 hectare) person-caused fires burned in and adjacent to the AOI in 1922, 1925, 1938, and 2017. Almost 25% of the total area of the AOI (including non-forested area) burned in the last 100 years. This ignition data shows that within the AOI, approximately 48% of ignitions since 1950 have been human-caused (a conservative estimate not including miscellaneous and undetermined causes). Open burning was identified by BCWS as the cause of most human-caused ignitions, although fireworks, children with matches, campfires, recreational shooting, and sparks from the railway were also cited as causes.

The most recent and most severe fire to affect the AOI was the Gustafson fire in July 2017. It burned 5,711 hectares west of 108 Mile and 100 Mile House, causing the evacuation of both communities. In total, 9000 residents were under an evacuation order or alert. Fifteen homes and 34 other structures were lost. The fire was person-caused, most likely from a spark generated from recreational shooting.[39]

4.3 LOCAL WILDFIRE THREAT ASSESSMENT

The local wildfire threat assessment process includes several key steps as outlined in Appendix A – Local Wildfire Threat Process and summarized as follows:

- Fuel type attribute assessment, ground truthing/verification and updating as required to develop a local fuel type map (Appendix A-1).
- Consideration of the proximity of fuel to the community, recognizing that fuel closest to the community usually represents the highest hazard (Appendix A-2).
- Analysis of predominant summer fire spread patterns using wind speed and wind direction during the peak burning period using ISI Rose(s) from BCWS weather station(s) (Appendix A-3). Wind speed, wind direction, and fine fuel moisture condition influence wildfire trajectory and rate of spread.
- Consideration of topography in relation to values (Appendix A-4). Slope percentage and slope position of the value are considered, where slope percentage influences the fire's trajectory and rate of spread and slope position relates to the ability of a fire to gain momentum uphill.
- Stratification of the WUI according to relative wildfire threat based on the above considerations, other local factors and field assessment of priority wildfire risk areas.

WUI Threat Assessments were completed over five field days in October of 2019, in conjunction with verification of fuel types (see Appendix C – Wildfire Threat Assessment Worksheets and Photos). WUI Threat Assessments were completed in interface (i.e., abrupt change from forest to urban development) and intermix (i.e., where forest and structures are intermingled) areas of the AOI to support development of priority treatment areas, and in order to confidently ascribe threat to polygons which may not have been visited or plotted, but which have similar fuel, topographic, and proximity to structure characteristics to those that were.

[39] https://www.wltribune.com/news/2017-gustafsen-wildfire-was-caused-by-firearm-use-foi-documents-confirm/

Field assessment locations were prioritized based upon:

- Proximity to values at risk – Field assessments were clustered in the intermix and interface, as well as around critical infrastructure.
- Prevailing fire season winds – More field time was spent assessing areas upwind of values at risk.
- Slope position of value – More field time was spent assessing areas downslope of values at risk. Similarly, values at top of slope or upper third of the slope were identified as particularly vulnerable.
- Land ownership – Crown and municipal land was the main focus of field assessments.
- Local knowledge – Areas identified as hazardous, potentially hazardous, with limited access/egress, or otherwise of particular concern as vulnerable to wildfire, as communicated by local fire officials and BCWS zone staff.
- Observations – Additional areas potentially not recognized prior to field work were visually identified as hazardous and assessed during the week.

A total of 126 WUI threat plots were completed and over 900 other field stops (e.g., qualitative notes, fuel type verification, and/or photograph documentation) were made across the AOI (see Appendix F for WUI threat plot locations).

Using the verified and updated fuel types (Appendix A-1, Map 8) combined with field wildfire threat assessments and office-based analysis (Appendix A-1 to A-4), local wildfire threat for the AOI was updated. Using the Wildfire Threat Assessment methodology,[40] there are two main components of the threat rating system: the wildfire behaviour threat class (fuels, weather and topography sub-components) and the WUI threat class (structural sub-component).

The result of the analysis shows that the AOI is composed of a mosaic of high and moderate threat class stands; the variability in wildfire threat is dictated primarily by the level of natural and anthropogenic disturbances that have historically occurred and persist on the land base. The AOI is 5% extreme threat class rating, 27% high, 16% moderate, <1% low and 10% very low/water (Table 9). The remaining 42% of the AOI is classified as private land and as such has not been allocated fire threat data. Assessment of fire threat on private land is not funded by CRI and is therefore outside the scope of this CWPP. Table 9 also indicates the differences between the original PSTA threat rating and this CWPP's corrected fire behaviour threat.

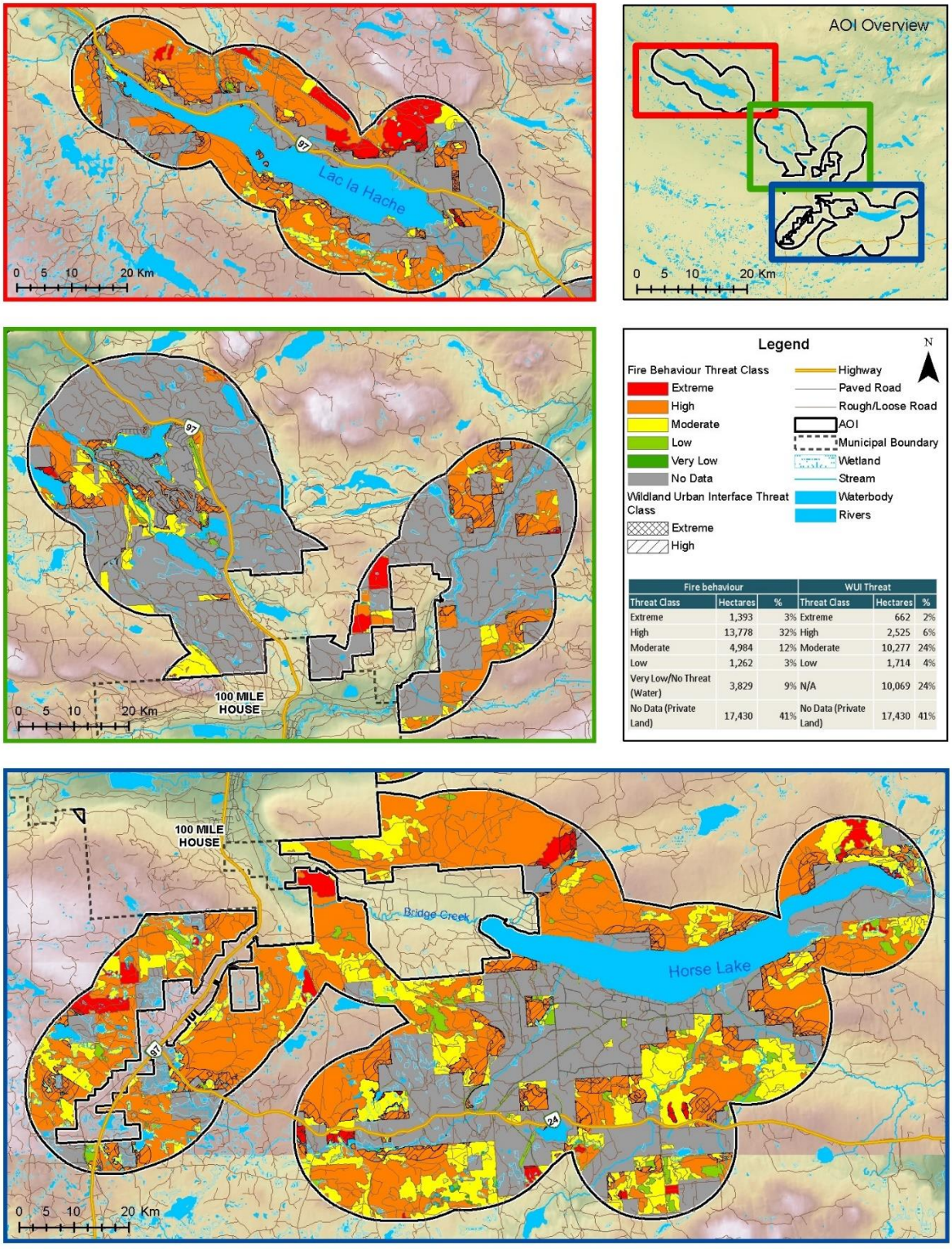
All parts of the AOI have significant areas with high wildfire behavior potential. However, the greatest risk to values within the CRD are in continuous areas of high and extreme threat class surrounding Lac La Hache, Gateway, and 93 Mile. 108 Mile and Horse Lake have areas of moderate threat class interspersed with higher threat classes.

[40] Using the 2012 WUI Wildfire Threat Assessments in B.C. Guide (https://www.ubcm.ca/assets/Funding~Programs/LGPS/SWPI/Resources/swpi-WUI-WTA-Guide-2012-Update.pdf)

For detailed field data collection and spatial analysis methodology for the local threat assessment and classification, please see Appendix H – WUI Threat Assessment Methodology.

Table 9. Fire behaviour threat summary for the AOI.

Wildfire Behaviour Threat Class	2019 PSTA Data	2019 CWPP
	Percent of AOI	Percent of AOI
Extreme	Extreme	5%
High	High	27%
Moderate	Moderate	16%
Low	Low	<1%
Very Low/ No Threat (Water)	Very Low/ No Threat (Water)	10%
No Data (Private Land)	No Data (Private Land)	42%



Fire behaviour			WUI Threat		
Threat Class	Hectares	%	Threat Class	Hectares	%
Extreme	1,393	3%	Extreme	662	2%
High	13,778	32%	High	2,525	6%
Moderate	4,984	12%	Moderate	10,277	24%
Low	1,262	3%	Low	1,714	4%
Very Low/No Threat (Water)	3,829	9%	N/A	10,069	24%
No Data (Private Land)	17,430	41%	No Data (Private Land)	17,430	41%

Map 6. Local Fire Behaviour Threat Rating and WUI Threat Rating.

SECTION 5: RISK MANAGEMENT AND MITIGATION FACTORS

This section outlines a wildfire risk management and mitigation strategy that accounts for fuel types present within the community, local ecology, hazard, terrain factors, land ownership, and capacity of local government and First Nations. Wildfire risk mitigation is a complex approach that requires cooperation from applicable land managers/owners, which includes all level of governments (local, provincial, federal and First nations), and private landowners. The cooperative effort of the aforementioned parties is crucial in order to develop and proactively implement a wildfire risk mitigation program. Development of a successful wildfire risk mitigation strategy is dependent on hazard identification within the community, which accounts for forest fuels, high risk activities, frequency and type of human use, and other important environmental factors. The resulting wildfire risk management and mitigation strategy aims to build more resilient communities and produces strategic recommendations or actionable items that can be categorized as follows:

1. Fuel management opportunities to reduce fire behaviour potential in the WUI;
2. Applications of FireSmart approaches to reduce fire risk and impacts within the community; and,
3. Implementation of communication and education programs to inform and remind the public of the important role it plays in reducing fire occurrence and impacts within its community.

5.1 FUEL MANAGEMENT

Fuel management, also referred to as vegetation management or fuel treatment, is a key element of wildfire risk reduction. For the purpose of this discussion, fuel management generally refers to native vegetation/fuel modifications in forested areas greater than 30 m from homes and structures (priority Zone 3 and beyond).

Provincially funded fuel treatments have been completed on approximately 50 ha within the AOI since development of the 2006 CWPP. These fuel treatments occurred on municipal Crown land in the 108 Mile Greenbelt area and consisted largely of small treatments in or beside homes, and adjacent to the South Cariboo Regional/108 Mile Airport. Treatments consisted of thinning, pruning, pile burning, and mechanical chipping. The 100 Mile House Community Forest is also currently engaged in implementing and planning fuel management treatments on their tenure in the Horse Lake area.

To complement the work completed to date and to further reduce the wildfire risk in the AOI, the objectives for fuel management are to:

- Reduce wildfire threat on private and public lands nearest to values at risk; and,
- Reduce fire intensity, rate of spread, and ember/spot fire activity such that the probability of fire containment increases and the impacts on the forested landscape and the watershed are reduced (create more fire resilient landscapes).

Ideally, these objectives will enhance protection to homes and critical infrastructure. Caveats associated with the statement include: 1) wildfire behaviour will only be reduced if the fire burns in the same location as treatments occurred, and 2) protection of homes and critical infrastructure is highly dependent upon the vulnerability to ignition by embers (ignition potential) directly around the value at

risk. In summary, fuel treatments alone should not be expected to protect a community from the effects of wildfire, namely structure loss.

Fuel treatments are designed to reduce the possibility of uncontrollable crown fire through the reduction of surface fuels, ladder fuels and crown fuels. However, the degree of fire behaviour reduction achieved by fuel management varies by ecosystem type, current fuel type, fire weather, slope and other variables and it is important to note that it does not stop wildfire.

Fuel management on local government and provincial Crown land may be funded by the Union of BC Municipalities (UBCM) through the Community Resiliency Investment (CRI) Program (subject to current program requirements) and by MFLNRORD through the Wildfire Risk Reduction (WRR) Program. The CRI Program (formerly the Strategic Wildfire Prevention Initiative or SWPI) also provides funding for selected FireSmart activities and planning on private land (subject to program requirements and limits).[41]It is important to recognize that much of the AOI (42%) is located on private land, which increases some of the challenges encountered in mitigation of fuels on private lands. The best approach to mitigate fuels on private lands is to urge private landowners to comply with FireSmart guidelines (as described below in Section 5.2) and to conduct appropriate fuel modifications using their own resources (CRI program funding may be available). In general, when considering fuel management to reduce fire risk, the following steps should be followed:

- Carefully anticipate the likely wildfire scenarios to properly locate fuel modification areas;
- Acquire an understanding of local ecological, archaeological, and societal values of the site;
- Prescriptions should be developed by a qualified professional forester working within their field of competence;
- Public consultation should be conducted during the process to ensure community support;
- Potential treatment areas and draft prescriptions should be referred to First Nations with sufficient time for meaningful review and input;
- Treatment implementation should weigh the most financially and ecologically beneficial methods of fulfilling the prescription's goals;
- Pre- and post-treatment plots should be established to monitor treatment effectiveness; and
- A long-term maintenance program should be in place or developed to ensure that the fuel treatment is maintained in a functional state.

The fuel treatment opportunities identified in this document include the use of interface and landscape fuel breaks as defined in Section 5.1.1, to reduce the wildfire potential around the AOI. Potential treatment activities include commercial or non-commercial thinning, stand conversion, pruning, surface fuel removal, pile burning, chipping, or a combination of two or more of these activities. Stand conversion has been shown to be effective at reducing wildfire potential in mixed-wood or conifer dominated stands and is recommended as a best management practice to encourage a higher deciduous

[41] 2019 CRI FireSmart Community Funding & Supports – Program & Application Guide: https://www.ubcm.ca/assets/Funding~Programs/LGPS/CRI/cri-2019-program-guide.pdf

component. This approach generally involves a thin-from-below to reduce ladder fuels and crown fuels continuity, targeting the removal of conifer species and the retention of broadleaf species.

In addition to the treatment units proposed in the following section, some of which are located adjacent to public roads, it is recommended that the CRD recognize important fuel treatment opportunities to improve emergency access and public safety along arterial roads in the AOI (Highway 97, Highway 24, Canim-Hendrix Lake Road, Horse Lake Road) in the event of evacuation through reduction of hazardous fuels and landscape level fuel treatment.

RECOMMENDATION #11: The CRD should work with the Ministry of Transportation and Infrastructure (MOTI), to assess the entirety of Highway 97, Highway 24, Canim-Hendrix Lake Road, and Horse Lake Road within the District and reduce hazardous fuels within 100 m of either side of the road, where possible, and with consideration of private land overlap. This is to increase public safety / improve emergency access in the event of an evacuation or wildfire event.

5.1.1 Proposed Treatment Units

Funding opportunities from UBCM under the CRI Program will consider fire prevention activities on provincial Crown land, local government and reserve land.[42] Fire prevention activities on private land that may be funded under this program are related to FireSmart activities (including FireSmart planning and assessments, local rebate programs for completion of eligible FireSmart activities, and provision of off-site disposal of vegetation management debris), subject to program requirements. This does not preclude other current and future funding opportunities or potential industrial partnerships and changes to existing programs.

The potential treatment areas represent moderate, high or extreme fire hazard areas which are close to values at risk (structures or infrastructure) or have been identified as landscape level fuel treatments and are located on Crown provincial or regional district land. It should be noted that the location of proposed treatment units on these land ownership types does not imply that high and extreme hazard areas do not exist on private land within the AOI. As stated in Section 5.1, mitigation approaches should also be pursued on private land where hazard exists, bearing in mind the different funding resources and objectives on these land types. Recommendation for treatment in areas of moderate fire hazard were limited to areas which would increase efficacy of, and/or create continuity between areas of low threat/no fuel areas. All polygons identified for potential treatment have been prioritized based on fire hazard, operational feasibility, estimated project cost, type and number of values at risk, common fire weather (wind direction), and expected efficacy of treatment. Although potential treatment areas have been ground-truthed during field work, additional refinement of the polygons will be required at the time of prescription development. Polygons will require detailed site-level assessment to stratify treatment areas (and areas of no treatment), identify values and constraints, and identify and engage all appropriate provincial agencies, First Nations, and stakeholders. In particular, areas that overlap with

[42] This new funding program (up to $50 million over three years) was initiated in 2018 as per recommendations from the 2017 BC Flood and Wildfire Review Report by Abbott and Chapman (https://www2.gov.bc.ca/assets/gov/public-safety-and-emergency-services/emergency-preparedness-response-recovery/embc/bc-flood-and-wildfire-review-addressing-the-new-normal-21st-century-disaster-management-in-bc-web.pdf). Program details are available on the UBCM's website: https://www.ubcm.ca/EN/main/funding/lgps/community-resiliency-investment.html

area-based forest tenures (woodlots and the 100 Mile House Community Forest) must involve tenure holders as early as possible in the project.

Recommended potential treatment areas within the AOI are outlined in Table 10 and displayed in Map 7. These fuel treatment opportunities include the use of interface fuel treatments (the treatment of both patches of fuels and linear interface fuel breaks) and primary fuel breaks as defined below.

Fuel Treatment Types

The intent of establishing a fuel break (and associated treated patches) is to modify fire behaviour and create a fire suppression option that is part of a multi-barrier approach to reduce the risk to values (*e.g.*, structures). A fuel break in and of itself, is unlikely to stop a fire under most conditions. The application of appropriate suppression tactics in a timely manner with sufficient resources, is essential for a fuel break to be effective. Lofting of embers (*i.e.*, "spotting") over and across a fuel break is a possibility (increasing with more volatile fuel types and fire weather) and has the potential to create spot fires beyond the fuel break that can expand in size and threaten values at risk, or land directly on or near structures and ignite them. To address spotting, fuels between the fuel break and the values at risk should be evaluated and treated to create conditions where extinguishment of spot fires is possible and FireSmart Standards should be applied to structures and associated vegetation and other fuel to reduce the risk of structures igniting. A multi-barrier approach that reduces the risk to values can include: establishing multiple fuel breaks (Interface Fuel Break and Primary Fuel Break), and applying FireSmart Standards to structures and the surrounding vegetation. Fuel breaks require periodic maintenance to retain their effectiveness.

Interface Fuel Breaks

Fuel breaks on Crown land immediately adjacent to private land and in close proximity to the wildland urban interface and/or intermix areas, are termed 'interface fuel breaks. These are designed to modify fire behaviour, create fire suppression options, and improve suppression outcomes. Interface fuel treatments are relatively small (approximately 100 meters wide) and when treated with appropriate fuel reduction measures, can break the crown fire threshold and reduce the risk of a crown fire reaching values at risk. Treatment widths can be varied to allow for alignment and to take advantage of natural and man-made fire resilient features that enhance effectiveness. Surface fire spread across the fuel treatment and spotting across the fuel treatment, are both concerns and rely on suppression actions to be effective. In order to reduce potential fire intensity and spotting, fuel on private land between the interface fuel treatment and structures should be treated according to FireSmart vegetation management standards. Structures in interface areas should be constructed or retrofitted to FireSmart design standards.

Primary/Landscape Level Fuel Break

Primary or Landscape Level Fuel Breaks are located on Crown land in strategic locations beyond the interface fuel treatments. Private land may be included in a primary fuel break so that the break represents a continuous fuel reduced area. Primary Fuel Breaks are designed to modify fire behaviour and create fire suppression options that reduce the risk of a crown fire reaching a community and/or adjacent private lands. Primary Fuel Breaks may be located to completely surround a community or be strategically placed upwind of communities and perpendicular to fire season winds. Primary Fuel Breaks

have sufficient width and appropriate fuel reduction measures to break the crown fire threshold and reduce fire intensity such that overstory fire moves to the ground surface and spread rates are reduced. While there are no absolute standards for fuel break width or fuel manipulation in the literature and fuel break width will vary based on fuel type, topography, and expected fire behaviour,[43] a 300-metre fuel break width is generally recommended. Fuel breaks should be designed to take advantage of natural and man-made fire resilient features and topography to enhance effectiveness. Surface fire spread across, and spotting over the fuel break are both concerns, and depend on the application of suppression resources to be effective.

RECOMMENDATION #12: Proceed with detailed assessment, prescription development and treatment of fuel treatment units identified and prioritized in this CWPP.

RECOMMENDATION #13: Consider developing a rationale for reduced stocking standards applicable to the CRD, by employing a qualified wildfire management professional, and in consultation with the Fuel Management Specialist (Cariboo Fire Centre) and MFLNRORD. Engage partners such as the 100 Mile Community Forest, who have already developed and applied interface stocking standards, and all other forest licensees to apply approved reduced fire management stocking standards in the wildland urban interface AOI to reduce interface wildfire threat.

[43] Agree, J.K., Bahro, B., Finney, M.A., Omi, P.N., Sapsis, D.B., Skinner, C.N., van Wagtendonk, J.W., Weatherspoon, C.P. The use of shaded fuelbreaks in landscape fire management. Forest Ecology and Management, 127 (2000), 55-66.

Table 10. Proposed Treatment Area Summary Table.

FTU # and Stratum	Geographic Area	Priority	Total Area (ha)	Treatment Unit Type/ Objective	Local Fire Threat (ha)			Overlapping Values / Treatment Constraints	Treatment Rationale
					Extreme/ High	Mod	Low/Very Low		
15	Kokanee Pitt Rd	Low	53.8	Primary	45.6	1.9	6.2	No private land borders this unit; intersected by Kokanee Pit Road. Overlap with multiple range tenures and forest development units. Within trapline boundary TR0502T017 and a guide outfitter areas (Shawn Dalman). 75% overlap with tenure for sand and gravel (CL#046880). Intersected by a power line. The following applies under the Cariboo Chilcotin Land Use Plan (CCLUP): overlap with non-legal mountain bike trails; within the Gustafson Enhanced Resource Development Zone; and slight overlap with a non-legal riparian management zone. Complete overlap with an occurrence of red-listed *Taxidea taxus* (American badger) and with Ungulate Winter Range (Conditional Harvest); 40% overlap with a legal OGMA. The unit also overlaps area of moderate and high archeological potential. Prior to treatment implementation, adjacent private land holders, licensees, MFLNRO, a wildlife biologist, the Archeology Branch, MOTI, BC Hydro, and local First Nations should be consulted so that impacts to values can be prevented or mitigated.	This unit is located ~700 m north of Highway 97 and homes at the western end of Lac La Hache. Stands are characterized by high density C-3 conifer fuel type and some mixed (M-1/2) fuel type with high conifer percentage. Surface fuel is moderate. Treatment would create a landscape level fuel break that ties into a gravel pit and to a proposed MLFNRO interface fuel break to the south. Unit is located downwind (north) of values.
6	Dodge Rd.	Low	49.2	Primary	45.9	3.1	0.1	A pipeline right-of-way intersects the unit. Overlap with multiple range tenures and forest development units. Within trapline boundary TR0502T017 and a guide outfitter areas (Shawn Dalman). The following applies under the Cariboo Chilcotin Land Use Plan (CCLUP): overlap with non-legal mountain bike trails; within the Gustafson Enhanced Resource Development Zone; and overlap with a non-legal riparian management zone. Complete overlap with an occurrence of red-listed *Taxidea taxus* (American badger) and with Ungulate Winter Range (Conditional Harvest); 40% overlap with a legal OGMA. The unit also overlaps area of moderate and high archeological potential. Prior to treatment implementation, licensees, MFLNRO, a wildlife biologist, the Archeology Branch, and local First Nations should be consulted so that impacts to values can be prevented or mitigated.	This unit is located ~900 m north of Highway 97 and homes at the western end of Lac La Hache. Stands are characterized by C-3 conifer fuel type with varying densities; surface fuel loading is very heavy in places. Treatment to reduce wildfire risk on either side of Dodge Road would create a landscape level fuel break that ties into a proposed MFLNRO interface fuel break to the south. Unit is located downwind (north) of values.

FTU # and Stratum	Geographic Area	Priority	Total Area (ha)	Treatment Unit Type/ Objective	Local Fire Threat (ha)			Overlapping Values / Treatment Constraints	Treatment Rationale
					Extreme/ High	Mod	Low/Very Low		
3	Bjornson Rd.	Low	10.5	Interface	10.5	0.0	0.0	Private land borders the unit to the south and east; adjacent to Bjornson Road and to Cariboo Regional District sewage lagoon. Overlap with multiple range tenures and forest development units. Within trapline boundary TR0502T012 and a guide outfitter areas (Shawn Dalman). The following applies under the Cariboo Chilcotin Land Use Plan (CCLUP): 20% overlap with a legal Scenic Corridor; within the Interlakes Special Resource Development Zone; 80% overlap with a legal Grassland Benchmark Areas; overlap with a non-legal riparian management zone (CCLUP). Complete overlap with an occurrence of red-listed *Taxidea taxus* (American badger) and with Ungulate Winter Range (Conditional Harvest). The unit also overlaps area of moderate and high archeological potential. Prior to treatment implementation, adjacent private land holders, licensees, MFLNRO, a wildlife biologist, the Archeology Branch, MOTI, and local First Nations should be consulted so that impacts to values can be prevented or mitigated.	This unit is located north of Highway 97 in Lac La Hache and <50 m from structures and critical infrastructure (Cariboo Regional District sewage lagoon). The unit is characterized by conifer stands of varying densities (C-3 and C-7 fuel types). The unit is surrounded by private land but is continuous with O-1a/b and C-3 fuel types to the north (TIMO PTU). Treatment would reduce the risk of a wildfire ignited near the highway spreading into other areas.
16	Lac La Hache Provincial Park	Moderate	18.9	Interface	8.3	9.4	1.2	This unit is entirely within Lac La Hache Provincial Park and is adjacent to Highway 99. Several groundwater wells are located within the unit. Private land borders the unit. Tenure for UREP/Recreation to the north and east (CL#0210226). Overlap with multiple range tenures and forest development units. Within trapline boundary TR0502T017 and a guide outfitter areas (Shawn Dalman). The following applies under the Cariboo Chilcotin Land Use Plan (CCLUP): 60% overlap with a legal Scenic Corridor; within the Gustafson Enhanced Resource Development Zone; overlap with a legal class B lakeshore management zone. Complete overlap with an occurrence of red-listed *Taxidea taxus* (American badger) and with Ungulate Winter Range (Conditional Harvest). The unit also overlaps area of moderate and high archeological potential. Prior to treatment implementation, BC Parks, adjacent private land holders, licensees, MFLNRO, a wildlife biologist, the Archeology Branch, MOTI, BC Hydro, and local First Nations should be consulted so that impacts to values can be prevented or mitigated.	This unit comprises the entirety of Lac La Hache Provincial Park north of Highway 97. Treatment would tie into a proposed MFLNRO interface fuel break to the north and east. The unit is comprised of C-5 fuel types that require minimal treatment (campground) and more hazardous C-3 conifer fuel types with high densities near the highway and further into the park. The unit also encompasses critical infrastructure (park water tower) and is located <30 m from homes along Ferguson Road. Treat due to close proximity to homes and to reduce the chance of accidental wildfire ignition resulting from recreation use of the park.

FTU # and Stratum	Geographic Area	Priority	Total Area (ha)	Treatment Unit Type/ Objective	Local Fire Threat (ha)			Overlapping Values / Treatment Constraints	Treatment Rationale
					Extreme/ High	Mod	Low/Very Low		
2	Barrett Rd.	Low	8.0	Interface	4.0	4.0	0.0	Private land borders the unit to the south. Overlaps the 100 Mile House Community Forest (K2W) and multiple range tenures and forest development units. Within trapline boundary TR0502T004 and a guide outfitter area (Eberhard Mussfeld). overlap with legal buffered trails; within the Interlakes Special Resource Development Zone; and slight overlap with a non-legal riparian management zone. Complete overlap with an occurrence of red-listed *Taxidea taxus* (American badger). The unit also overlaps area of moderate and high archeological potential. Prior to treatment implementation, the 100 Mile House Community Forest, adjacent private land holders, other licensees, MFLNRO, a wildlife biologist, the Archeology Branch, and local First Nations should be consulted so that impacts to values can be prevented or mitigated.	This unit is located <50 m north (upwind) of homes along Barrett Road in Lone Butte. Stands are composed of mixed fuel type (50% conifer); heavy coarse woody debris loading due to blowdown. Treat due to hazardous stand condition and close proximity to homes.
4	Canim Lake	High	19.0	Interface	18.6	0.0	0.4	Private land borders the unit to the north and east. The unit is intersected by a transmission line and by Back Valley Road. Overlaps with multiple range tenures and forest development units. Within trapline boundary TR0502T004 and a guide outfitter areas (Shawn Dalman). The following applies under the Cariboo Chilcotin Land Use Plan (CCLUP): 100% overlap with a First Nations- Cultural Significance tenure (CL#5407690); 15% overlap with a legal Scenic Corridor under the Cariboo Chilcotin Land Use Plan, complete overlap with a non-legal Backcountry Area; overlap with a non-legal riparian management zone; within the Interlakes Special Resource Development Zone. Complete overlap with an occurrence of red-listed *Taxidea taxus* (American badger) and with Ungulate Winter Range (Conditional Harvest); ~50% overlaps with a legal OGMA. The unit also overlaps area of moderate and high archeological potential. Prior to treatment implementation, adjacent private land holders, licensees, MFLNRO, a wildlife biologist, the Archeology Branch, BC Hydro, MOTI, and local First Nations should be consulted so that impacts to values can be prevented or mitigated.	This unit is located <100 m upwind (west and south) from homes along Canim Hendrix Road and Back Valley Road in Gateway. The unit is comprised of a conifer dominated C-7 fuel type stand with moderate densities. Reduce surface fuel loading and understory stem densities. Treat due to close proximity to homes and continuity with conifer fuel type stands.

FTU # and Stratum	Geographic Area	Priority	Total Area (ha)	Treatment Unit Type/ Objective	Local Fire Threat (ha)			Overlapping Values / Treatment Constraints	Treatment Rationale
					Extreme/ High	Mod	Low/Very Low		
7	Fawn Creek Rd.	Moderate	47.6	Interface	44.9	2.4	0.3	The unit abuts private land parcels to the west, overlaps with Fawn Creek Road and recreation trail. Overlap with 100 Mile House Community Forest (K2W) and multiple range tenures and forest development units. Within trapline boundary TR0502T004 and a guide outfitter area (Eberhard Mussfeld). The following applies under the Cariboo Chilcotin Land Use Plan (CCLUP): <5% overlap with a legal Scenic Corridor and 40% overlap with a legal Partial Retention Scenic Area; almost complete overlap with a non-legal Backcountry Area; within the Interlakes Special Resource Development Zone; and slight overlap with a non-legal riparian management zone. Complete overlap with an occurrence of red-listed *Taxidea taxus* (American badger) and with Ungulate Winter Range (Conditional Harvest); ~50% overlap with a legal OGMA. The unit also overlaps area of moderate and high archeological potential. Prior to treatment implementation, the 100 Mile House Community Forest, adjacent private land holders, other licensees, MFLNRO, a wildlife biologist, the Archeology Branch, MOTI, BC Hydro, and local First Nations should be consulted so that impacts to values can be prevented or mitigated.	This unit is located less than 30 m of structures along Fawn Creek Road and Horse Lake Road. The unit is downwind of structures, but is composed primarily of conifer dominated C-3 fuel type stands. Density and surface fuel loading are variable throughout. Treatment would tie into PTU HORSE-2 along Horse Lake Road. Treat due to very close proximity to homes and continuity with C-3 fuel type stands. Much of the unit is planned for fuel treatment by the 100 Mile House Community Forest.
27	Timothy Lake Rd	Moderate	128.0	Interface	113.4	14.0	0.7	The unit is borders private land and is accessed off Timothy Lake Road. Overlap with multiple range tenures and forest development units. West Fraser has laid out part of this unit. Within trapline boundary TR0502T012 and a guide outfitter areas (Shawn Dalman). The following applies under the Cariboo Chilcotin Land Use Plan (CCLUP): <5 % overlap with a legal Scenic Corridor; partially within the Interlakes Special Resource Development Zone and the Gustafson and Rail Enhanced Resource Development Zones; slight overlap with a legal Grassland Benchmark Areas; overlap with a non-legal riparian management zone, and a legal class C lakeshore management zone. Overlap with an occurrence of red-listed *Taxidea taxus* (American badger) and with Ungulate Winter Range (Conditional Harvest). The unit also overlaps area of moderate and high archeological potential. Prior to treatment implementation, adjacent private land holders, licensees, MFLNRO, a wildlife biologist, the Archeology Branch, and local First Nations should be consulted so that impacts to values can be prevented or mitigated.	This unit is located downwind (east) <100 m of homes along Timothy Lake Road. It is comprised of conifer dominated fuel types with varying stem densities and amounts of surface fuel (C-3, C-7, and some C-5). Treat to break up the fuel continuity of the forested stand and reduce wildfire threat to nearby residents. Potential to build treatment off old roads.

FTU # and Stratum	Geographic Area	Priority	Total Area (ha)	Treatment Unit Type/ Objective	Local Fire Threat (ha)			Overlapping Values / Treatment Constraints	Treatment Rationale
					Extreme/ High	Mod	Low/Very Low		
23	Lac La Hache Station Rd	Low	7.0	Interface	0.2	6.8	0.1	Private land borders the unit to the west. Overlap with woodlot W05732 (Allen Law) and multiple forest development units and range tenure. Within trapline boundary TR0502T005. The following applies under the Cariboo Chilcotin Land Use Plan (CCLUP): slight overlap with a legal Grassland Benchmark Areas; within the Interlakes Special Resource Development Zone. Complete overlap with an occurrence of red-listed *Taxidea taxus* (American badger) and with Ungulate Winter Range (Conditional Harvest). The unit also overlaps area of moderate and high archeological potential. Prior to treatment implementation, adjacent private land holders, licensees, MFLNRO, a wildlife biologist, the Archeology Branch, and local First Nations should be consulted so that impacts to values can be prevented or mitigated.	This unit is less than 20 m downwind (east) of residences along Station Road at the eastern end of Lac La Hache. The unit is comprised of C-3 conifer fuel types with variable densities is continuous with a larger C-3 polygon to the east. Surface fuel loading from understory mortality is high in places. Treat due to very close proximity to homes.
10	Horn Rd.	High	37.1	Interface	26.7	10.4	0.0	The unit abuts private land parcels to the north and west. Overlap with Overlaps 100 Mile House Community Forest (K2W) and multiple range tenures and forest development units. The following applies under the Cariboo Chilcotin Land Use Plan (CCLUP): complete overlap with a non-legal Backcountry Area; overlap with legal buffered trails; overlap with a non-legal riparian management zone; within the Interlakes Special Resource Development Zone. Complete overlap with an occurrence of red-listed *Taxidea taxus* (American badger). The unit overlaps area of moderate and high archeological potential. Prior to treatment implementation, the 100 Mile House Community Forest, adjacent private land holders, other licensees, MFLNRO, a wildlife biologist, the Archeology Branch, and local First Nations should be consulted so that impacts to values can be prevented or mitigated.	This unit is located upwind (< 50 m) and south of homes along Garrett Road in Lone Butte. Fuel types are mainly mixed forest (dense juvenile conifers) and some C-3. Treatment would reduce risk to local residents from a wildfire spreading from the south. Treat due to very close proximity to homes and location of the unit between upwind of values. Much of the unit has been treated by the 100 Mile House Community Forest.

FTU # and Stratum	Geographic Area	Priority	Total Area (ha)	Treatment Unit Type/ Objective	Local Fire Threat (ha)			Overlapping Values / Treatment Constraints	Treatment Rationale
					Extreme/ High	Mod	Low/Very Low		
17	Horse Lake Rd/Lone Bute	Moderate	28.6	Interface	19.0	5.3	4.3	Private land parcels border the unit to the east and west; intersected by Horse Lake Road. Overlap with 100 Mile House Community Forest (K2W) and multiple forest development units. Within trapline boundary TR0502T004, TR0502T001 and a guide outfitter area (Eberhard Mussfeld). 100% overlap with two UREP/recreation reserves (CL#5402441 and 0065999). The following applies under the Cariboo Chilcotin Land Use Plan (CCLUP): 95% overlap with a legal Scenic Corridor under the Cariboo Chilcotin Land Use Plan; within the Interlakes Special Resource Development Zone; slight overlap with a non-legal riparian reserve zone and management zone. Complete overlap with an occurrence of red-listed *Taxidea taxus* (American badger). The unit also overlaps area of moderate and high archeological potential. Prior to treatment implementation, the 100 Mile House Community Forest, adjacent private land holders, other licensees, MFLNRO, a wildlife biologist, the Archeology Branch, MOTI, BC Hydro, and local First Nations should be consulted so that impacts to values can be prevented or mitigated.	This unit is located < 70 m upwind (south) from homes along Horse Lake Road and McMillan Road. The unit is comprised of C-7 and C-3 conifer dominated fuel types with mature Douglas fir in the overstory and patches of higher density lodgepole pine. Treat due to close proximity to homes and continuity with conifer fuel type stands.
12	North Shore Lake Rd #2	High	21.2	Interface	8.8	3.4	0.0	The unit abuts private land parcels to the south and is intersected by North Shore Horse Lake Road. Overlap with 100 Mile House Community Forest (K2W) and multiple range tenures and forest development units. 20% overlap with grazing tenure (CL#0198505). A point of water diversion is located within the unit (Mercer Spring- Megan and Shane Gunn). Within trapline boundary TR0502T004 and a guide outfitter area (Eberhard Mussfeld). The following applies under the Cariboo Chilcotin Land Use Plan (CCLUP): 100% overlap with a legal Retention Scenic Area; complete overlap with a non-legal Backcountry Area; adjacent to a legal buffered trail; within the Interlakes Special Resource Development Zone; and slight overlap with a non-legal riparian management zone. Complete overlap with an occurrence of red-listed *Taxidea taxus* (American badger) and with Ungulate Winter Range (Conditional Harvest); complete overlap with a legal OGMA. The unit also overlaps area of moderate and high archeological potential. Prior to treatment implementation, the 100 Mile House Community Forest, adjacent private land holders, other licensees, MFLNRO, a wildlife biologist, the Archeology Branch, BC Hydro, MOTI, and local First Nations should be consulted so that impacts to values can be prevented or mitigated.	This unit is located downwind (north) 100-300 m from homes along Northshore Drive on the north side of Horse Lake. The unit is composed almost entirely of hazardous C-3 fuel types that are continuous with other conifer fuel type stands in all directions. Treatment would complement ongoing work by the 100 Mile House Community Forest.

FTU # and Stratum	Geographic Area	Priority	Total Area (ha)	Treatment Unit Type/ Objective	Local Fire Threat (ha)			Overlapping Values / Treatment Constraints	Treatment Rationale
					Extreme/ High	Mod	Low/Very Low		
11	Horse Lake Rd. #1	High	56.0	Interface	24.0	28.8	3.2	The unit abuts private land parcels to the north and west and is adjacent to Horse Lake Road. Overlap with 100 Mile House Community Forest (K2W*, woodlot W0813 (Stanley Stenserson), and multiple range tenures and forest development units. Within trapline boundary TR0502T004 and a guide outfitter area (Eberhard Mussfeld). 10% overlap with a grazing tenure (CL#0206284). The following applies under the Cariboo Chilcotin Land Use Plan (CCLUP): 20% overlap with a legal Scenic Corridor and 50% overlap with a legal Partial Retention Scenic Area; complete overlap with a non-legal Backcountry Area; overlap with legal buffered trails; within the Interlakes Special Resource Development Zone; overlap with legal Critical Habitat for Fish and slight overlap with a non-legal riparian management zone. Complete overlap with an occurrence of red-listed *Taxidea taxus* (American badger). The unit also overlaps area of moderate and high archeological potential. Prior to treatment implementation, the 100 Mile House Community Forest, adjacent private land holders, other licensees, MFLNRO, a wildlife biologist, the Archeology Branch, MOTI, BC Hydro, and local First Nations should be consulted so that impacts to values can be prevented or mitigated.	This unit is located upwind (south) and east 100-300 m from homes along Horse Lake Road. The unit is composed of C-3 and mixed fuel types with high conifer percentage (50-75%). Surface fuel loading from dead lodgepole pine is high. Treat due to hazardous stand condition and location of unit upwind of values. Treatment would be one of a series of treatment units along Horse Lake Road. Part of the unit has been treated by the 100 Mile House Community Forest.
14	Lower Houseman Rd.	Low	25.4	Interface	21.5	2.6	1.3	The unit is bordered by private land to the north and west and accessed off Lower Houseman Road. Overlap with 100 Mile House Community Forest (K2W), multiple range tenures and forest development units. Within trapline boundary TR0502T004 and a guide outfitter areas (Brent Giles). The following applies under the Cariboo Chilcotin Land Use Plan (CCLUP): within the Interlakes Special Resource Development Zone; and slight overlap with a non-legal riparian management zone. Complete overlap with an occurrence of red-listed *Taxidea taxus* (American badger) and with Ungulate Winter Range (Conditional Harvest). The unit also overlaps area of moderate and high archeological potential. Prior to treatment implementation, the 100 Mile House Community Forest, adjacent private land holders, other licensees, MFLNRO, a wildlife biologist, the Archeology Branch, and local First Nations should be consulted so that impacts to values can be prevented or mitigated.	This unit is located <100 m east (downwind) of homes along Lower Houseman Road in Gateway. The unit is comprised of high-density C-3 fuel type stands. Treat due to close proximity to homes and continuity with conifer fuel type stands.

FTU # and Stratum	Geographic Area	Priority	Total Area (ha)	Treatment Unit Type/ Objective	Local Fire Threat (ha)			Overlapping Values / Treatment Constraints	Treatment Rationale
					Extreme/ High	Mod	Low/Very Low		
22	Pine Valley Dr.	Low	17.4	Interface	17.4	0.0	0.0	Private land borders the unit to the south. Intersected by a transmission line. Overlap with multiple range tenures and forest development units. Within trapline boundary TR0502T004 and a guide outfitter areas (Shawn Dalman). The following applies under the Cariboo Chilcotin Land Use Plan (CCLUP): 100% overlap with a First Nations- Cultural Significance tenure (CL#5407690); <5% overlap with a legal Scenic Corridor; complete overlap with a non-legal Backcountry Area; within the Interlakes Special Resource Development Zone; slight overlap with a non-legal riparian management zone and a legal class D lakeshore management zone. Complete overlap with an occurrence of red-listed *Taxidea taxus* (American badger) and with Ungulate Winter Range (Conditional Harvest); ~50% overlap with a legal OGMA. The unit also overlaps area of moderate and high archeological potential. Prior to treatment implementation, adjacent private land holders, licensees, MFLNRO, a wildlife biologist, the Archeology Branch, and local First Nations should be consulted so that impacts to values can be prevented or mitigated.	The unit is located downwind (north) and <20 m from homes along Pinevalley Drive in Gateway. Stand densities are high and surface fuel loading is very high from lodgepole pine mortality. The unit consists of C-7 fuel type. Treat due to close proximity to homes and hazardous stand condition.
13	Horse Lake Rd. #3	Moderate	6.4	Interface	6.4	0.0	0.0	The unit abuts private land to the east and west and is intersected by Horse Lake Road. Overlap with 100 Mile House Community Forest (K2W) and multiple range tenures and forest development units. Within trapline boundary TR0502T004 and a guide outfitter area (Eberhard Mussfeld). The following applies under the Cariboo Chilcotin Land Use Plan (CCLUP): 100% overlap with a legal Scenic Corridor; almost complete overlap with a non-legal Backcountry Area; within the Interlakes Special Resource Development Zone; and overlap with a non-legal riparian management zone. Complete overlap with an occurrence of red-listed *Taxidea taxus* (American badger) and with Ungulate Winter Range (Conditional Harvest). The unit also overlaps area of moderate and high archeological potential. Prior to treatment implementation, the 100 Mile House Community Forest, adjacent private land holders, other licensees, MFLNRO, a wildlife biologist, the Archeology Branch, MOTI, BC Hydro, and local First Nations should be consulted so that impacts to values can be prevented or mitigated.	The unit is located ~200 m west of homes along Horse Lake Road. Stand types are mixed with high conifer percent (75-80%). Treatment would improve the safety of Horse Lake Road as a primary access/egress route.

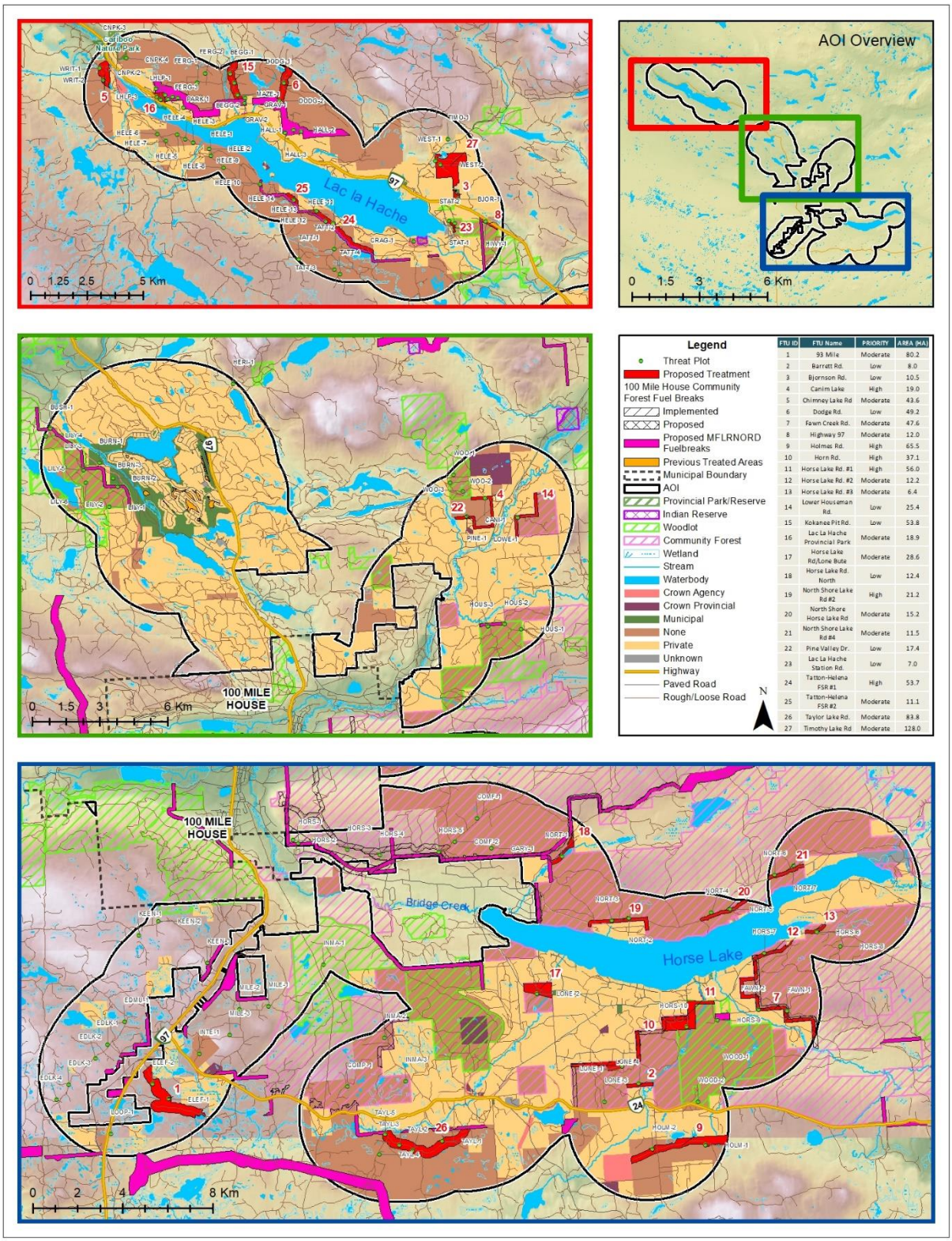
FTU # and Stratum	Geographic Area	Priority	Total Area (ha)	Treatment Unit Type/ Objective	Local Fire Threat (ha)			Overlapping Values / Treatment Constraints	Treatment Rationale
					Extreme/ High	Mod	Low/Very Low		
12	Horse Lake Rd. #2	Moderate	12.2	Interface	8.8	3.4	0.0	The unit abut private land to the east and west and is intersected by Horse Lake Road. Overlap with 100 Mile House Community Forest (K2W) and multiple range tenures and forest development units. Within trapline boundary TR0502T004 and a guide outfitter area (Eberhard Mussfeld). 30% overlap with two UREP/recreation reserves (CL#5402798 and 5402742); Horse Lake East Recreation Reserve (REC6012). The following applies under the Cariboo Chilcotin Land Use Plan (CCLUP): 100% overlap with a legal Scenic Corridor and 70% overlap with a Partial Retention Scenic Area; almost complete overlap with a non-legal Backcountry Area; within the Interlakes Special Resource Development Zone; overlap with a non-legal riparian management zone. Complete overlap with an occurrence of red-listed *Taxidea taxus* (American badger) and with Ungulate Winter Range (Conditional Harvest). The unit also overlaps area of moderate and high archeological potential. Prior to treatment implementation, the 100 Mile House Community Forest, adjacent private land holders, other licensees, MFLNRO, a wildlife biologist, the Archeology Branch, MOTI, BC Hydro, and local First Nations should be consulted so that impacts to values can be prevented or mitigated.	The unit is <70 m upwind (southwest) of homes along Horse Lake Road. Stand types are primarily C-3 fuel type with heavy coarse woody debris loading from lodgepole pine mortality. Treat due to close proximity to homes, location of the unit upwind of values, and to improve the safety of Horse Lake Road as primary access/egress route.
18	Horse Lake Rd. North	Low	12.4	Interface	10.2	2.2	0.0	Private land borders the unit to the east; it is intersected by Horse Lake North Road. Overlaps 100 Mile House Community Forest (K2W) and multiple range tenures and forest development units. Within trapline boundary TR0502T004 and a guide outfitter area (Eberhard Mussfeld). 30% overlap with grazing tenure (CL#0215219). The following applies under the Cariboo Chilcotin Land Use Plan (CCLUP): 100% overlap with a legal Retention Scenic Area; almost complete overlap with a non-legal Backcountry Area; within the Interlakes Special Resource Development Zone; and overlap with a non-legal riparian management zone. Complete overlap with an occurrence of red-listed *Taxidea taxus* (American badger) and with Ungulate Winter Range (Conditional Harvest); ~70% overlap with a legal OGMA. The unit also overlaps area of moderate and high archeological potential. Prior to treatment implementation, the 100 Mile House Community Forest, adjacent private land holders, other licensees, MFLNRO, a wildlife biologist, the Archeology Branch, MOTI, BC Hydro, and local First Nations should be consulted so that impacts to values can be prevented or mitigated.	This unit is located along the south side of Horse Lake North Road <20 m west (upwind) of homes. Fuel types are primarily C-3 with high stand densities. Treat due to close proximity to homes, location of the unit upwind of values, and to improve the safety of Horse Lake North Road as a primary access/egress route. Part of the unit has been treated by the 100 Mile House Community Forest.

FTU # and Stratum	Geographic Area	Priority	Total Area (ha)	Treatment Unit Type/ Objective	Local Fire Threat (ha)			Overlapping Values / Treatment Constraints	Treatment Rationale
					Extreme/ High	Mod	Low/Very Low		
20	North Shore Horse Lake Rd.	Moderate	15.2	Interface	10.3	4.9	0.0	No private land borders the unit. Intersected by North Shore Horse Lake Road. Overlap with 100 Mile House Community Forest (K2W) and multiple range tenures and forest development units. Within trapline boundary TR0502T004 and a guide outfitter area (Eberhard Mussfeld). 100% overlap with grazing tenure (CL#0198505). The following applies under the Cariboo Chilcotin Land Use Plan (CCLUP): <5% overlap with a legal Retention Scenic Area; almost complete overlap with a non-legal Backcountry Area; within the Interlakes Special Resource Development Zone; and slight overlap with a non-legal riparian management zone. Complete overlap with an occurrence of red-listed *Taxidea taxus* (American badger) and with Ungulate Winter Range (Conditional Harvest); complete overlap with a legal OGMA. The unit also overlaps area of moderate and high archeological potential. Prior to treatment implementation, the 100 Mile House Community Forest, other licensees, MFLNRO, a wildlife biologist, the Archeology Branch, MOTI and local First Nations should be consulted so that impacts to values can be prevented or mitigated.	This unit is located along North Shore Horse Lake Road approximately 250 m north (downwind) of a neighborhood along the lake. Fuel types are a mix of C-3, mixed (40% conifer) and C-7 with moderate to heavy coarse woody debris. Treatment would improve the safety of North Shore Horse Lake Road as a primary access/egress route.
21	North Shore Lake Rd. #4	Moderate	11.5	Interface	11.5	0.0	0.0	The eastern end of the unit abuts private land; intersected by North Shore Horse Lake Road. Overlaps 100 Mile House Community Forest (K2W) and with multiple range tenures and forest development units. Within trapline boundary TR0502T004 and a guide outfitter area (Eberhard Mussfeld). 100% overlap with grazing tenure (CL#0198505). The following applies under the Cariboo Chilcotin Land Use Plan (CCLUP): 100% overlap with a legal Retention Scenic Area; complete overlap with a non-legal Backcountry Area; within the Interlakes Special Resource Development Zone. Complete overlap with an occurrence of red-listed *Taxidea taxus* (American badger) and with Ungulate Winter Range (Conditional Harvest); complete overlap with a legal OGMA. The unit also overlaps area of moderate and high archeological potential. Prior to treatment implementation, the 100 Mile House Community Forest, adjacent private land holders, other licensees, MFLNRO, a wildlife biologist, the Archeology Branch, MOTI and local First Nations should be consulted so that impacts to values can be prevented or mitigated.	This unit is located ~250 m north and west (crosswind) to homes along North Shore Horse Lake Road. The unit is composed of C-3 fuel type stands with high stem densities that are continuous outside of the unit. Treatment would improve the safety of North Shore Horse Lake Road as a primary access/egress route. Treatment would complement ongoing work by the 100 Mile House Community Forest.

FTU # and Stratum	Geographic Area	Priority	Total Area (ha)	Treatment Unit Type/ Objective	Local Fire Threat (ha)			Overlapping Values / Treatment Constraints	Treatment Rationale
					Extreme/ High	Mod	Low/Very Low		
9	Holmes Rd.	High	65.5	Interface	42.5	16.8	6.2	Private land borders the unit to the north; intersected by Holmes Road. Overlap with multiple range tenures and forest development units. Within trapline boundary TR0502T003, TR0502T002 and a guide outfitter area (Eberhard Mussfeld). 60% overlap with a grazing tenure (CL#5404294). The following applies under the Cariboo Chilcotin Land Use Plan (CCLUP): complete overlap with a non-legal Backcountry Area; overlap with legal buffered trails; within the Interlakes Special Resource Development Zone; adjacent to and slight overlap with legal High Value Wetlands for Moose; overlap with a legal class B lakeshore management zone and a non-legal riparian management zone. Complete overlap with an occurrence of red-listed *Taxidea taxus* (American badger). The unit also overlaps area of moderate and high archeological potential. Prior to treatment implementation, adjacent private land holders, licensees, MFLNRO, a wildlife biologist, the Archeology Branch, MOTI, BC Hydro and local First Nations should be consulted so that impacts to values can be prevented or mitigated.	This unit is located upwind (south) ~200 m from homes along Holmes Road, off Hwy 24 in Lone Butte. The unit is composed of C-3 and mixed (40-80% conifer) fuel types. Conifer stem densities are very high. Treatment would create a large interface fuel break that ties into O-1a/b fuel types adjacent to Hwy 24. Treat due to location upwind of values and to reduce density and crown continuity; consider retaining clumps.
24	Tatton-Helena FSR #1	High	53.7	Primary	50.4	2.2	1.1	Private land borders the unit to the northeast; on either side of Tatton-Helena Forest Service Road. Overlap with multiple range tenures and forest development units. Within trapline boundary TR0502T005. The following applies under the Cariboo Chilcotin Land Use Plan (CCLUP): 40% overlap with a First Nations- Cultural Significance tenure (CL#5407690); 10% overlap with a legal Retention Scenic Area; adjacent to non-legal mountain bike trails; within the Gustafson Enhanced Resource Development Zone; overlap with a non-legal riparian management zone and a legal class D lakeshore management zone. Complete overlap with an occurrence of red-listed *Taxidea taxus* (American badger) and with Ungulate Winter Range (Conditional Harvest). The unit also overlaps area of moderate and high archeological potential. Prior to treatment implementation, adjacent private land holders, licensees, MFLNRO, a wildlife biologist, the Archeology Branch, and local First Nations should be consulted so that impacts to values can be prevented or mitigated.	This unit is located upwind (southwest) ~350 m upslope from homes along Caverley Road, on the south side of Lac La Hache. The unit is composed almost entirely of hazardous C-3 fuel types with continuous ladder fuels and surface fuel loading. Treatment would tie into a proposed MFLNRO fuel break along the south side of Tatton Helena Forest Service Road, creating in total a 250 m wide landscape level fuel break that would also serve to improve access/egress for residents on the south shore of Lac La Hache.

FTU # and Stratum	Geographic Area	Priority	Total Area (ha)	Treatment Unit Type/ Objective	Local Fire Threat (ha)			Overlapping Values / Treatment Constraints	Treatment Rationale
					Extreme/ High	Mod	Low/Very Low		
5	Chimney Lake Rd	Moderate	43.6	Interface	37.5	2.2	3.8	Private land borders the unit to the east. Overlap with multiple range tenures and forest development units. Within trapline boundary TR0502T005. The following applies under the Cariboo Chilcotin Land Use Plan (CCLUP): 100% overlap with a legal Partial Retention Scenic Area; overlap with non-legal trails under the Cariboo Chilcotin Land Use Plan (Gold Rush Trail); within the Gustafson Enhanced Resource Development Zone; and slight overlap with a legal class B lakeshore management zone (CCLUP). Complete overlap with an occurrence of red-listed *Taxidea taxus* (American badger) and within Ungulate Winter Range (Conditional Harvest). The unit also overlaps area of moderate and high archeological potential. Prior to treatment implementation, adjacent private land holders, licensees, MFLNRO, a wildlife biologist, the Archeology Branch, and local First Nations should be consulted so that impacts to values can be prevented or mitigated.	This unit is located upwind (west) < 50 m of homes along Wright Station Road on the south side of Lac La Hache and is ~100 m from Highway 97. The unit is almost entirely composed of C-3 fuel types with some C-7; densities variable. Lodgepole pine mortality has led to moderate surface fuel loading. Treat due to proximity to homes and location upwind of values. Treatment would reduce the risk to residents from a wildfire spreading from the west and reduce fire threat from accidentally ignition near the highway.
25	Tatton-Helena FSR #2	Moderate	11.1	Primary	9.3	1.8	0.0	Private land borders the unit to the northeast; on either side of Tatton-Helena Forest Service Road. Overlap with multiple range tenures and forest development units. Within trapline boundary TR0502T005. The following applies under the Cariboo Chilcotin Land Use Plan (CCLUP): 100% overlap with a legal Retention Scenic Area; adjacent to non-legal mountain bike trails; within the Gustafson Enhanced Resource Development Zone; and slight overlap with a legal class B lakeshore management zone. Complete overlap with an occurrence of red-listed *Taxidea taxus* (American badger) and with Ungulate Winter Range (Conditional Harvest); complete overlap with a legal OGMA. The unit also overlaps area of moderate and high archeological potential. Prior to treatment implementation, adjacent private land holders, licensees, MFLNRO, a wildlife biologist, the Archeology Branch, and local First Nations should be consulted so that impacts to values can be prevented or mitigated.	This unit is located ~100 m from homes on the south side of Lac La Hache. The unit is composed almost entirely of C-3 fuel types. Treatment would tie into a proposed MFLNRO fuel break along the south side of Tatton Helena Forest Service Road, creating in total a 250 m wide landscape level fuel break that would also serve to improve access/egress for residents on the south shore of Lac La Hache.

FTU # and Stratum	Geographic Area	Priority	Total Area (ha)	Treatment Unit Type/ Objective	Local Fire Threat (ha)			Overlapping Values / Treatment Constraints	Treatment Rationale
					Extreme/ High	Mod	Low/Very Low		
26	Taylor Lake Rd.	Moderate	83.8	Primary	52.1	31.6	0.1	Private land borders the unit to the north. Intersected by Taylor Lake Road. Overlap with multiple range tenures and forest development units. Within trapline boundary TR0502T001, TR0502T003 and a guide outfitter area (Eberhard Mussfeld). The following applies under the Cariboo Chilcotin Land Use Plan (CCLUP): within the Gustafson Enhanced Resource Development Zone; overlap with a non-legal riparian management zone. Slight overlap with an occurrence of red-listed *Taxidea taxus* (American badger). The unit also overlaps area of moderate and high archeological potential. Prior to treatment implementation, adjacent private land holders, licensees, MFLNRO, a wildlife biologist, the Archeology Branch, MOTI, BC Hydro and local First Nations should be consulted so that impacts to values can be prevented or mitigated.	This unit is located upwind and south (200-500 m) from homes along Taylor Lake Road and Highway 24. Stand types are C-3 and mixed (75% conifer) fuel types with some C-7. Surface fuel loading is heavy and stem densities are high throughout most of the unit. Treatment would tie into O-1a/b fuel type polygons and a proposed MFLNRO interface fuel break. Treat due to location of unit upwind of values and to reduce the risk to residents from a wildfire spreading from the south.
1	93 Mile	Moderate	80.2	Primary	72.8	4.0	3.5	Private land borders the unit to the north east and a transmission line borders the unit to the northwest. Overlap with multiple range tenures and forest development units. Within trapline boundary TR0502T001 and a guide outfitter area (Eberhard Mussfeld). The following applies under the Cariboo Chilcotin Land Use Plan (CCLUP): 100% overlap with a First Nations- Cultural Significance tenure (CL# 5407690); within the Gustafson Enhanced Resource Development Zone; slight overlap with a non-legal riparian management zone. The unit also overlaps area of moderate and high archeological potential. Prior to treatment implementation, adjacent private land holders, licensees, MFLNRO, the Archeology Branch, BC Hydro and local First Nations should be consulted so that impacts to values can be prevented or mitigated.	The unit is located upwind (southwest) ~700 m from homes along Highway 24 just south of the junction with Highway 97. Stand types are C-3 and mixed (75% conifer) fuel types with high stand densities and heavy surface fuel loading. Treatment would tie into a transmission line right-of-way and reduce the risk to 93 Mile residents from a wildfire spreading from the south or west. Treat due to location of unit upwind of values.
8	Highway 97	Moderate	12.0	Primary	8.8	0.7	2.5	Private land borders the unit to the east; adjacent to Highway 97. Within trapline boundary TR0502T005. 60% overlap with a sand and gravel tenure (CL#0246282). The following applies under the Cariboo Chilcotin Land Use Plan (CCLUP): 30% overlap with a legal Modification Scenic Area and 100% overlap with a legal Scenic Corridor; within the Interlakes Special Resource Development Zone. Complete overlap with an occurrence of red-listed *Taxidea taxus* (American badger) and within Ungulate Winter Range (Conditional Harvest). The unit also overlaps area of moderate and high archeological potential. Prior to treatment implementation, adjacent private land holders, licensees, MFLNRO, a wildlife biologist, the Archeology Branch, MOTI, BC Hydro and local First Nations should be consulted so that impacts to values can be prevented or mitigated.	This unit is located south of Highway 97 just east of Lac La Hache and <40 m across the highway from structures. The unit is composed of C-3 fuel type stands with moderate densities and discontinuous ladder fuels. Surface fuel loading is high from lodgepole pine and Douglas fir mortality. Treatment would tie into a proposed MFLNRO fuel break. The unit is continuous with more C-3 fuel type stands to the south.



Map 7. Proposed and Past Fuel Treatments.

5.1.2 Maintenance of Previously Treated Areas

The CRD has shown leadership in completing fuel management projects within the AOI to reduce associated wildfire hazard. Following recommendations in the 2006 Cariboo Regional District CWPP and the 1991 'Richardson Report', fuel treatments were completed on municipal land in 108 Mile from 2010-2012. A total of 49 hectares was treated, consisting of small parcels of land behind homes and around the 108 Mile Airport. These treated polygons, as well as some that were never treated, were assessed in a formal review in 2019 and are in various states of hazard, some of which require additional fuel management activities (maintenance) in order to maintain or re-attain moderate or lower threat class ratings.[44] Maintenance activities may include additional thinning, conifer regeneration reduction, or surface fuel continuity reduction (removal of excess woody debris). Strategies cited in the 2019 report include manual fuel removal, and burning or intensive grazing for grassland units.

The return interval for maintenance activities depends upon site productivity and type and intensity of treatment. Less productive areas can likely withstand a longer frequency between maintenance activities, while more productive areas would require treatments more often.

RECOMMENDATION #14: Apply for funding through CRI for maintenance of previously treatment units as prioritized and scheduled in the 2019 Greenbelt report.[44]

RECOMMENDATION #15: When operational fuel treatments are conducted, treatment monitoring 5-10 years out should be completed by a qualified professional to assess the efficacy of the treatment and to schedule maintenance activities. This can be completed with a CWPP update or as a stand-alone exercise.

[44] Day, K. 2019. 108 Mile Greenbelt 2019 Field Review of Fuel Treatment Areas.

5.2 FIRESMART PLANNING AND ACTIVITIES

This section provides detail on: 1) the current level of FireSmart implementation and uptake within the community; 2) identified FireSmart subdivisions and/or acceptance into the FireSmart Canada Community Recognition Program (FSCCRP); and 3) recommended potential FireSmart activities that can be applied within the AOI at a future date.

5.2.1 FireSmart Goals and Objectives

FireSmart® is the comprehensive nationally accepted set of principles, practices and programs for reducing losses from wildfire.[45] FireSmart spans the disciplines of hazard/threat assessment; regional planning and collaboration; policy and regulations; public communication and education; vegetation/fuel management; training and equipment; and, emergency preparedness and response. FireSmart concepts provide a sound framework for advancing the goal of wildfire loss reduction, as it is a common goal shared with CWPPs.

The FireSmart approach and concepts, including recommended FireSmart guidelines,[46] have been formally adopted by almost all Canadian provinces and territories, including British Columbia in 2000; FireSmart has become the de facto Canadian standard. FireSmart is founded in standards published by the National Fire Protection Association (NFPA). The objective of FireSmart is to help homeowners, neighborhoods, whole communities and agencies with fire protection and public safety mandates to work together to prepare for the threat of wildfire in the WUI. Coordinated efforts between all levels of planning and action are integral to effectively and efficiently reducing the risk to communities. Solutions are required at all scales from individual backyards, to communities and the wider landscape. In order to succeed, these efforts must be integrated across the mosaic of land ownership (Figure 5). The highest level of planning within the FireSmart program is strategic direction, such as that provided in CWPPs.

[45] FireSmart is the registered trademark held by the Partners in Protection Association.

[46] FireSmart guidelines first published in the 1999 manual "*FireSmart: Protecting Your Community from Wildfire*", with a second edition published in 2003. The most recent "*FireSmart Begins at Home Manual*" is available at https://firesmartcanada.ca/resources/. The "*British Columbia FireSmart Begins at Home Manual"* provides detailed guidance and is available at BC FireSmart: https://www2.gov.bc.ca/gov/content/safety/wildfire-status/prevention/firesmart

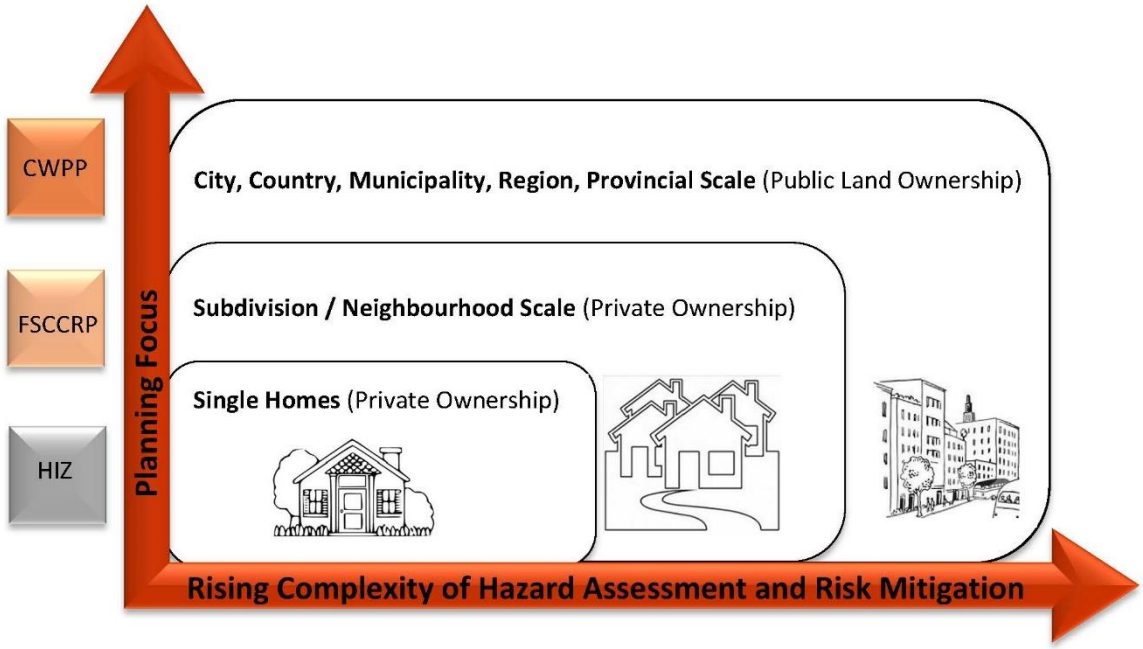


Figure 2. Diagram of the various, coordinated levels of the FireSmart program.[47] CWPP: Community Wildfire Protection Plan, FSCCRP: FireSmart Canada Community Recognition Program, HIZ: Home Ignition Zone.

The overarching goal of FireSmart is to encourage communities and citizens to adopt and conduct FireSmart practices to mitigate the negative impacts of wildfire to assets on public and private property. While responsibility for effectively mitigating hazards must be shared between many entities including homeowners, industry, businesses and governments;[48] the ultimate root of the WUI interface problem is the vulnerability of structures and homes to ignition during wildfire events, in particular vulnerability to embers. This leads to an emphasis on risk mitigations on private properties. Findings from an investigation of how homes survived and ignited during the Fort McMurray 2016 Horse River wildfire, indicate that the vast majority of initial home ignitions in the WUI were caused by embers rather than direct contact by flames or radiant heat.[49] Surviving homes in both urban and rural areas exhibited many attributes of FireSmart principles, regardless of the broader wildfire threat surrounding them.[49]

The goal of FireSmart with respect to private properties is to encourage homeowners to implement FireSmart practices to reduce damages to their property and minimize the hazards associated with wildfire. These FireSmart practices should aim to accomplish the following:

- "Reduce the potential for an active crown fire to move through private land
- Reduce the potential for ember transport through private land and structures
- Create landscape conditions around properties where fire suppression efforts can be effective and safe for responders and resources

[47] Figure and content developed by A. Westhaver. Adapted by A. Duszynska, 2017.
[48] https://www.firesmartcanada.ca
[49] Westhaver, A. 2017. Why some homes survived: Learning from the Fort McMurray wildland/urban interface fire disaster. Institute for Catastrophic Loss Reduction (ICLR) research paper series – number 56.

- Treat fuel adjacent and nearby to structures to reduce the probability of ignition from radiant heat, direct flame contact and ember transport
- Implement measures to structures and assets that reduce the probability of ignition and loss"[50]

Home Ignition Zone

Multiple studies (including the previously referenced recent Fort McMurray WUI fire investigation) have shown that the principal factors regarding home loss to wildfire are the structure's characteristics and immediate surroundings; the area that determines the ignition potential is referred to as the Home Ignition Zone (HIZ).[51,52] The HIZ includes the structure itself and four concentric, progressively wider Priority Zones. HIZ Priority Zones are based upon distance from structure: 0 to 1.5 m (Priority Zone 1a-fuel free zone), 0 – 10 m (Priority Zone 1), 10 – 30 m (Priority Zone 2), and 30 – 100 m (Priority Zone 3). These zones help to guide risk reduction activities, with Recommended FireSmart Guidelines being most stringent closest to the structure. The likelihood of home ignition is mostly determined by the area within 30 m of the structure (Priority Zones 1a, 1 and 2). Recommended FireSmart guidelines address a multitude of hazard factors within the HIZ: building materials and design; vegetation (native or landscaped materials); and the presence of flammable objects, debris, and vulnerable ignition sites. More detail on priority zones can be found in the FireSmart Manual.[53]

It has been found that, during extreme wildfire events, most home destruction has been a result of low-intensity surface fire flame exposures, usually ignited by embers. Firebrands can be transported long distances ahead of the wildfire, across fire guards and fuel breaks, and accumulate within the HIZ in densities that can exceed 600 embers per square meter. Combustible materials found within the HIZ combine to provide fire pathways allowing spot surface fires ignited by embers to spread and carry flames or smoldering fire into contact with structures.

Because ignitability of the HIZ is the main factor driving structure loss, the intensity and rate of spread of wildland fires beyond the community has not been found to necessarily correspond to loss potential. For example, FireSmart homes with low ignitability may survive high-intensity fires, whereas highly ignitable homes may be destroyed during lower intensity surface fire events.[52] Increasing ignition resistance would reduce the number of homes simultaneously on fire; extreme wildfire conditions do not necessarily result in WUI fire disasters.[54] It is for this reason that the key to reducing WUI fire structure loss is to reduce home ignitability; mitigation responsibility must be centered on homeowners. Risk communication, education on the range of available activities, and prioritization of activities should help homeowners to feel empowered to complete simple risk reduction activities on their property.

[50] Community Resiliency Investment Program. 2018. Community Wildfire Protection Plan Template.

[51] Reinhardt, E., R. Keane, D. Calkin, J. Cohen. 2008. Objectives and considerations for wildland fuel treatment in forested ecosystems of the interior western United States. Forest Ecology and Management 256:1997 - 2006.

[52] Cohen, J. Preventing Disaster Home Ignitability in the Wildland-urban Interface. Journal of Forestry. p 15 - 21.

[53] https://firesmartcanada.ca/ and https://www2.gov.bc.ca/gov/content/safety/wildfire-status/prevention/firesmart

[54] Calkin, D., J. Cohen, M. Finney, M. Thompson. 2014. *How risk management can prevent future wildfire disasters in the wildland-urban interface*. Proc Natl Acad Sci U.S.A. Jan 14; 111(2): 746-751. Accessed online 1 June, 2016 at http://www.ncbi.nlm.nih.gov/pmc/articles/PMC3896199/.

FireSmart Canada Community Recognition Program

In the case of adjacent homes with overlapping HIZs, a neighborhood (or subdivision) approach can be an effective method of reducing ignition potential for all homes within the neighborhood. The FireSmart Canada Community Recognition Program (FSCCR Program) is an 8-step resident-led program facilitated by trained Local FireSmart Representatives designed for this purpose. It provides groups of residents with critical information and a means of organizing themselves to progressively alter hazardous conditions within their neighborhood. The program also facilitates FireSmart knowledge and practices to quickly filter downwards onto the property of individual residents to further mitigate wildfire hazards at the single-home scale within the HIZ.

WUI Disaster Sequence

Calkin et al. (2014) coined the 'WUI disaster sequence', a six-step sequence which has been used to describe the situation in which the firefighting capacity of a community is overwhelmed by wildland / interface fires in highly ignitable communities: 1) extreme wildfire behaviour weather combined with, 2) a fire start, which 3) exposes numerous homes with high ignition potential, and results in numerous structures burning, 4) overwhelms suppression efforts and capabilities, and 5) leads to unprotected homes, and therefore 6) considerable structure loss (Figure 3).

Once multiple homes are ignited in an urban area, there is increasing potential for fire to spread from structure to structure, independently of the wildland vegetation. This is known as an urban conflagration. Effective fire protection depends on ignition resistant homes and properties during extreme wildfire events.[55] Figure 3 illustrates that it is possible to break up the disaster sequence by decreasing the number of highly ignitable homes exposed to embers, therefore reducing the number of homes ignited and removing the consequences of multiple structures lost.

Overall, FireSmart leads to communities that are better adapted to wildfire, more resilient and able to recover following wildfires by sustaining fewer losses and disruption, and safer places to live and recreate. Action by homeowners is the number one priority for reducing structure loss in the event of a WUI fire, but the overall adaptation of the community to wildfire is multi-pronged and the landscape should not be ignored.[55]

[55] Calkin, D., J. Cohen, M. Finney, M. Thompson. "*How risk management can prevent future wildfire*"

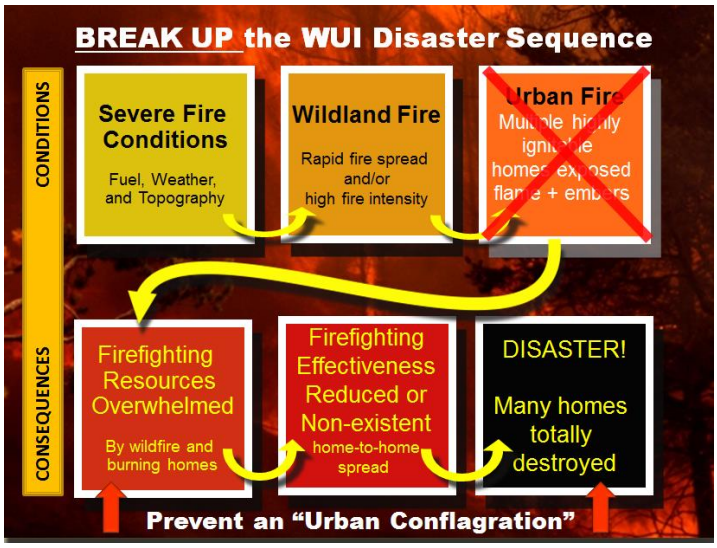


Figure 3. The wildland/urban interface disaster sequence and the possibility to break up the disaster sequence by decreasing the number of highly ignitable homes.[56]

5.2.2 Key Aspects of FireSmart for Local Governments

Reducing the fire risk profile of a community through FireSmart implementation requires coordinated action from elected officials, local government planners, developers, private land owners and industrial managers. This section presents various options of FireSmart practices, which when enacted, provide avenues for reducing fire risk within the community. An evaluation of the current level of FireSmart implementation within the AOI is also presented in this section.

Education

Effective communication is a key aspect of any education strategy. Communication materials must be audience specific and delivered in a format and through mediums that reach the target audience. Audiences should include home and landowners, students, local businesses, elected officials, CRD and municipal staff, and local utilities providers. Education and communication messages should be simple yet comprehensive. A basic level of background information is required to enable a solid understanding of fire risk issues and the level of complexity and detail of the message should be specific to the target audience.

FireSmart information material is readily available and simple for municipalities to disseminate. It provides concise and easy-to-use guidance that allows homeowners to evaluate their homes and take measures to reduce fire risk. However, the information needs to be supported by locally relevant information that illustrates the vulnerability of individual houses to wildfire.

The CRD has undertaken some public education outreach in the community and online. These can be expanded upon and/or adapted to further enhance wildfire preparedness and education. Local VFDs are present in the community and have distributed education materials, attended school information days, and have used social media to engage the public with fire danger information, advisories and educating

[56] Graphic adapted from Calkin et. al, by A. Westhaver.

homeowners about Firesmarting their properties. BCWS has also been involved in public education regarding wildfire prevention at the 100 Mile House Fall Fair.

The CRD should consider utilizing the FireSmart BC Education Package as an element of wildfire preparedness education to be presented annually in elementary or high schools. Programming could include volunteer/advocacy work from professional foresters, wildland firefighters or prevention officers, and CRD staff. The CRD should consider holding a wildland specific Fire Prevention Day or Week, or similarly formatted event, in the spring prior to the wildfire season. Timely educational materials to increase preparedness would be most effective immediately prior to the fire season.

A full list of recommendations pertaining to the Communication and Education strategy is presented in Section 5.3.

Planning and Development Considerations

Regional and municipal policies and bylaws are tools available to mitigate wildfire risk to a community. It is recognized that, to be successful, all levels of government (municipal, provincial, and federal) and individual landowners need to work together to successfully reduce their risk. To that end, local government can use a range of policy tools and practices to help the community to incrementally increase FireSmart compliance over the mid-term (5 – 20 years) and therefore play a role in reducing the chance of structure loss from wildfire.

The planning objectives/considerations for the CRD are:

- To include wildfire considerations in the planning and acquisition strategy for parks and recreational areas.
- To develop policies and practices for design and maintenance of FireSmart publicly owned land such as community parks and open spaces and FireSmart publicly owned buildings.
- To conduct FireSmart and/or risk assessments of publicly owned lands and buildings to inform planning for prevention and mitigation activities as required.

FireSmart policies and practices can be incorporated in various aspects of development design, zoning and permitting to reduce wildfire hazard on private land and in the community/s at large. The development objectives/considerations for the CRD are:

- To utilize regulatory and administrative tools to reduce wildfire hazard on private land and increase number of homes compliant with FireSmart guidelines (with low ignition potential).
- To ensure higher level planning and regulation (i.e., OCP and/or land use, engineering and public works bylaws) incorporate FireSmart policies, as applicable, to reduce wildfire hazard in vulnerable WUI neighborhoods, and include measures that address wildfire prevention and suppression in subdivision design.
- To ensure multiple departments (including fire departments and/or emergency management staff) are included in the referral process for new developments.

FireSmart Vegetation Management

Some examples of actionable items for the CRD with regards to vegetation or fuel management and the FireSmart approach include: 1) policy development and implementation of FireSmart maintenance for community parks and open spaces (as per planning considerations discussed above); 2) implementing fire resistive landscaping requirements as part of the development permitting process (as per development considerations discussed above); and 3) provision of incentives (i.e., a local rebate program) and/or collection services for private landowners with a focus on pruning, yard and thinning debris (FireSmart activities for private land). More detailed recommendations regarding FireSmart activities for private land are discussed below.

The CRD has not yet engaged in a proactive vegetation management strategy, targeting high-use areas near values at risk, within and immediately adjacent to developed areas. However, in the Lac La Hache and South Cariboo OCPs, CRD does support the design of new developments to meet FireSmart guidelines. More detailed recommendations regarding wildfire hazard development permit areas are provided below.

Development Permit Areas for Wildfire Hazard

The OCPs for the South Cariboo and for Lac La Hache does not explicitly consider the establishment of a development permit area (DPA) to address wildfire risk mitigation. However, they require that a "wildfire hazard assessment and mitigation strategy prepared by a member of the Association of BC Forest Professionals is completed prior to the approval of a rezoning application or subdivision of three or more lots in an area with high or extreme wildfire rating."[57] It is recommended that the CRD review the OCP, with consideration towards explicitly establishing a wildfire development permit area (DPA). Other jurisdictions' wildfire DPAs can serve as models for various components; it should be noted that other Regional Districts have developed/are developing wildfire DPAs.[58] The first step should be to establish DPA objectives (for example, minimize risk to property and people from wildland fires; minimize risk to forested area surrounding communities and development in the AOI; conserve the visual and ecological assets of the forest surrounding these areas; reduce the risk of post-fire landslides, debris follows and erosion, etc.). The following components should be considered during the OCP review and DP development process in order to help meet the established objectives:

- Use of fire-resistant exterior construction materials within the established development permit area, based on recognized standards such as NFPA 1144 (*Standard for Reducing Structure Ignition Hazards from Wildland Fire*[59]) or FireSmart.
- Inclusion of minimum setbacks from forested edge and top of slope based on FireSmart principles.
- Use of FireSmart landscaping (low flammability plants, appropriate spacing and low flammability aggregates/ground cover based on FireSmart principles).
- Underground electrical servicing.

[57] South Cariboo Official Community Plan (2018).

[58] The District of North Vancouver and City of Maple Ridge have robust and well-documented Wildfire Hazard Development Permit processes. The Regional District of Okanagan Similkameen is also in the process of having a Wildfire Hazard DPA developed.

[59] https://www.nfpa.org/codes-and-standards/all-codes-and-standards/list-of-codes-and-standards/detail?code=1144

- Mitigation of fire hazard through fuel management activities based upon qualified professional recommendations (prescriptions and oversight). This is generally most applicable in the subdivision phase.
- Prompt removal of combustible construction materials, thinning/ fuel management debris, or clearing debris during the fire season.
- Review and approval process for submitted applications.
- Post-development inspections and sign-offs.
- Outline of responsibilities for staff and applicants.
- Enforcement and regulation (consequences of non-compliance).

It is advised to engage the development community in the DPA development process to educate, inform, and allow for input. This can be accomplished in a variety of formats, including, but not limited to, workshops, informational sessions, or open-houses.

In 2015, the province passed the *Building Act* as the new legislation to guide building and construction in the province. This Act establishes the province as the sole authority to set building requirements and limits local government authority to set building requirements in their bylaws. Section 5 of the *Building Act* provides an exception to the above limitation to local governments by giving them the authority to set local building bylaws for unrestricted and temporarily unrestricted matters, such as exterior design and finish of buildings in relation to wildfire hazard and within a development permit area. The British Columbia Building Code does not have any wildfire-specific fire-resistant design components. Until revisions of the Building Code to include requirements specific to prevention of wildfire spread are completed, local governments can set exterior requirements within an established development permit area for wildfire risk mitigation.[60]

RECOMMENDATION #16: Review the South Cariboo and Lac La Hache Official Community Plans (OCPs); consider including wildfire as a natural hazard development permit area (DPA). A recommended wildfire DPA would include all areas within the AOI that are located within 200 m of moderate, high or extreme wildfire behaviour threat class areas. This is a suggested distance which should be validated and defined through a more comprehensive GIS analysis of hazardous fuels and their proximity to the interface. Review similar wildfire hazard DPAs established in other jurisdictions and use as models for various aspects of the DP process.

The following aspects should be considered in the OCP review and wildfire DPA development: 1) Establish DPA objectives (e.g. minimize risk to property and people from wildland fires; minimize risk to forested area surrounding the AOI; and conserve the visual and ecological assets of the forests surrounding communities; etc.; and 2) Where possible, it is recommended to mandate FireSmart construction materials, some of which may be beyond BC Building Code within the established wildfire hazard development permit area.

In order to meet objectives, consider including the following elements: 1) minimum setbacks from forested edge based on FireSmart, 2) fuel management based upon qualified professional recommendations, 3) landscaping to FireSmart guidelines, 4) building materials and design based on NFPA 1144 and FireSmart standards, 5) underground servicing, 6) prompt removal of combustible construction materials or thinning/fuel management waste.

[60] Building and Safety Standards Branch. 2016. Bulletin No. BA 16-01 Building Act Information Bulletin: Update for Local Governments.

RECOMMENDATION #17: Develop a landscaping standard which lists flammable non-compliant vegetation and landscaping materials, non-flammable drought and pest resistant alternatives, and tips on landscape design to reduce maintenance, watering requirements, avoid wildlife attractants, and reduce wildfire hazard. Consider including the landscaping standard as a development permit requirement within the applicable area, as well as making it publicly available for residents and homeowners outside of the DPA (can be provided at issue of building permit and made available at Regional District or Municipal Office or other strategic locations).

RECOMMENDATION #18: Consider engaging the development/building community (may include developers, builders, landscapers, and architects) in DPA development process. This can be accomplished through a series of workshops/informational sessions to: 1) increase awareness of wildfire risk, 2) demonstrate that there are a variety of actions which can be undertaken to immediately and measurable reduce the risk to the homeowner and community, 3) discuss various strategies and actions which could be implemented to meet DPA objectives, 4) educate and inform regarding the DPA process and expectations.

Additional recommendations for amendments to policies and bylaws were discussed fully in Section 2.5.3.

Subdivision Design

Subdivision design should include consideration to decrease the overall threat of wildfire. Aspects of subdivision design that influence wildfire risk are access, water pressure and hydrant locations. The number of access points and the width of streets and cul-de-sacs determine the safety and efficiency of evacuation and emergency response. In the communities and/or developed areas within the AOI, on-street parking can contribute hazards on narrow or dead-end roads, which are already unlikely to have a high capacity under heavy smoke conditions.[61] When the time for evacuation is limited, poor access has contributed to deaths associated with entrapments and vehicle collisions during wildfires.[62] Methods for access design at the subdivision level can provide tools that help manage the volume of cars that need to egress an area within a given period of time. These factors should be considered during the review of applications for new developments occurring on vacant lots within the CRD wildland urban interface.[61]

For new development where hydrants are limited or unavailable (or it is otherwise determined by the CRD that adequate or reliable water supply systems may not exist), the NFPA 1142 can be used to help determine minimum requirements for alternative water supply (natural or artificial). Alternative water sources, such as dry hydrant systems, water usage agreements for accessing water on private land, cisterns, or natural water sources, should be reviewed by the CRD and the fire departments prior to development approval.

[61] Cova, T. J. 2005. Public safety in the wildland-urban interface: Should fire-prone communities have a maximum occupancy? Natural Hazards Review. 6:99-109.

[62] De Ronde, C. 2002. Wildland fire-related fatalities in South Africa – A 1994 case study and looking back at the year 2001. Forest Fire Research & Wildland Fire Safety, Viegas (ed.), http://www.fire.uni-freiburg.de/GlobalNetworks/Africa/Wildland.cdr.pdf

Increasing Local Capacity – Interagency Cooperation, Emergency Planning and Cross Training

Local capacity for emergency management and efficient response to wildland urban interface fires can be enhanced by addressing the following steps:

- Development and/or maintenance of Structural Protection Units (SPUs) which can be deployed in the event of a WUI fire;
- Conducting a comprehensive review of Emergency Management BC SPU deployment procedures for the purpose of fighting interface fires;
- Provision of sprinkler kits to community residents (at a cost);
- Engagement in annual cross-training exercises with adjacent fire departments and/or BCWS in order to increase both local and regional emergency preparedness with regards to structural fire and wildfire training;
- Participation in cross-jurisdictional tabletop exercises and seasonal readiness meetings;
- Development and/or participation in regional or multi-agency fire or fuel management tables (i.e., interface steering committee or wildfire working group) to facilitate communication and co-operation between groups and agencies responsible for wildfire preparation and response; and
- Provision of training and/or professional development for Local FireSmart Representatives, community champions to increase capacity for FireSmart activities.

A detailed account of current local capacity for the CRD and recommendations to address gaps is provided in SECTION 6:.

FireSmart Demonstration Projects

FireSmart demonstration projects for publicly owned buildings or public and provincially owned critical infrastructure (as identified in Section 3.2) can display the practices and principles of FireSmart to the public. This may be in the form of replacing building materials with fire resistant materials, replacing landscaping with fire-resistant plants, and demonstration HIZ fuel treatments. Ideally, these projects would include elements of public education (signage, public tours, active demonstrations of operations, etc.). Appropriate/candidate FireSmart demonstration projects may be identified by the CRD in consultation with local government and based on assessment by internal trained Local FireSmart Representatives or external Local FireSmart Representative consultant.

FireSmart Activities for Private Land

The best approach to mitigate fuels on private lands is to urge private landowners to comply with FireSmart guidelines and to conduct appropriate fuel modifications using their own resources (CRI program funding may be available subject to current funding requirements). The CRD can facilitate uptake within the AOI by: 1) supporting and/or facilitating planning for private land (with property owners' consent); 2) offering local rebate programs to homeowners on private land and First Nations land who complete eligible FireSmart activities on their properties; and as previously indicated (FireSmart vegetation management), 3) providing off-site debris disposal for private landowners who undertake their own vegetation management (with a focus on pruning, yard and thinning debris). Off-site debris disposal options include providing a dumpster, chipper or other collection method; providing curbside debris pick-up; and waiving tipping fees at transfer stations that accept wood waste. Transfer stations within and adjacent to the AOI, with the exception of Lone Butte, currently accept residential yard waste and wood waste at no charge (commercial tipping fees apply). This free disposal program is

funded by the Canadian Red Cross and is scheduled to run until May 31, 2021. Planning for private land may include developing FireSmart Community Plans for identified areas (i.e., a WUI neighborhood, community, subdivision) and conducting FireSmart home and property assessments.

FireSmart Compliance within the Area of Interest

FireSmart compliance on private properties in the AOI is generally low. Generally speaking, most homes do not maintain 10 m defensible space. The main concerns are the ubiquity of wooden siding, unenclosed decks, and the lack of defensible space between property footprints and adjacent forested/grassland areas. Most homes in the AOI are in interface neighborhoods or are on larger acreages surrounded by forest and/or hay fields. Storage of combustible items (firewood, propane cylinders) under decks, carports, and other horizontal surfaces was common. On the other hand, some residences are surrounded by lawn, which are FireSmart compliant, and do not have conifers within 10 m of structures. It should be noted that grassland or non-irrigated hay fields (O-1a/b fuel type) can carry a fast-moving surface fire when grass is cured, and so FireSmart should be a priority for homes surrounded by grassland as well as forest. Of particular concern were neighborhoods around Horse Lake. Some homes are wood construction, seasonally occupied, surrounded by conifers, and are far from main roads.

Aside from differing levels of awareness, understanding and acceptance of recommended FireSmart guidelines by residential and commercial property owners, there are a number of other factors that add variability to the level of FireSmart compliance within the AOI. Ultimately, these also impact the vulnerability of structures and the amount of effort required to achieve a FireSmart rating for individual homes, neighborhoods or the communities as a whole. These factors include but are not limited to: the age of homes or subdivision; prevailing design features and favored building materials of the era; proximity to forested area (both on private land and adjacent Crown, municipal, or CRD-owned land); density, lot size and lay-out of the subdivision; positioning of the home or neighborhood in relation to slope, aspect and prevailing winds; and the stage and maturity of landscaping.

Neighborhoods in the AOI were unofficially surveyed during field work. The following observations were made:

- Wildfire hazard levels range from moderate to high across neighborhoods within the AOI;
- The bulk of hazards are associated with the proximity of homes to forest and/or grassland;
- Hazards are magnified in some neighborhoods due to poor access (i.e., single access roads, long driveways) and distance from nearest water supply or fire hydrant location; and,
- All neighborhoods have good opportunities to mitigate risk through individual and collective action.

RECOMMENDATION #19: The CRD should hire a qualified professional (QP) or consider training local fire department members as Local FireSmart Representatives to assist the various communities in complying with FireSmart principles at the neighborhood and individual home-level.

5.2.3 Priority Areas within the AOI for FireSmart

This section identifies priority areas within the AOI that would benefit from FireSmart planning and activities. These priorities are based on general field observations and are not based on a scientific sample or formal data collection. Recommended FireSmart activities are essentially the same for each neighborhood or area; however, it is recommended that the FRD prioritize the neighborhoods in Table 11.

Table 11. Summary of FireSmart Priority Areas.

Area	FireSmart Y/N	FireSmart Canada Recognition Received Y/N	Recommended FireSmart Activities
Priority Area #1: North Shore Horse Lake Road	N	N	The following is a non-extensive list of FireSmart activities for which the CRD can engage suggested neighbourhood residents: 1) Provide guidance to ensure landscaping is to an established FireSmart standard; 2) Incentivise private landowners to engage in retrofitting homes with building materials and design based on NFPA 1144 or FireSmart standards; 3) Encourage prompt removal of combustible construction materials or yard waste from private properties; and 4) Coordinate monthly or bi-monthly yard waste removal days prior to and during the fire season to reduce WUI fire hazard. Based on field observations, most critical infrastructure has had some level of FireSmart setback from forested areas. Consider conducting frequent (2-3 years) maintenance treatments to ensure the wildfire risk does not reach higher than moderate. It is recommended that fuel treatments be considered for areas adjacent to critical infrastructure in order to bolster the effect of previous FireSmart treatments. FireSmart treatments may include thinning from below to reduce ladder fuels and crown fire potential, pruning of retained trees to 3 m, and reducing surface fuels. Additionally, consider adding regular brushing activities to the maintenance treatment schedule to control weeds and grasses around critical infrastructure.
Priority Area #2: Mulligan Drive/Wolfe Road/Erickson Road (Horse Lake)	N	N	
Priority Area #3: Fallaway Road (Horse Lake)	N	N	
Priority Area #4: Sven Road/Horse Lake Road	N	N	
Priority Area #5: Houseman Road (Gateway)	N	N	
Priority Area #6: Pine Valley Road (Gateway)	N	N	
Priority Area #7: Ridgeview Road (Gateway)	N	N	
Priority Area #8: Park Place (Lac La Hache)	N	N	
Priority Area #9: Lac La Hache Station Road	N	N	
Priority Area #10: Southwest 108 Mile: Kallum Drive, Kitwanga Drive, Gloinnzun Crescent, Block Drive.	N	N	
Priority Area #11: Critical infrastructure	Y (partially)	N/A	

5.3 COMMUNICATION AND EDUCATION

Establishing effective communications and actively engaging key stakeholders in risk reduction activities are keystones to building a FireSmart community. Without the support and involvement of residents, businesses, public officials, and industry, the efforts of public officials, fire departments, and others to

reduce wildfire losses will be hindered. In many communities, there is a general lack of understanding about interface fire, the relationship between ignition potential and loss of homes, and the simple steps that can be taken to minimize risk on private land. In addition, public perceptions regarding responsibility for risk reduction and the ability of firefighters to safely intervene to protect homes during a wildfire are often underdeveloped or inaccurate.

Based on the consultation completed during the development of this Plan, it is evident that CRD staff and most residents have a good level of awareness of interface fire risk and a strong level of commitment to continue to grow their awareness and understanding. However, field observations highlighted the need to further educate the community at large on what private land owners can do to build a FireSmart community and take personal responsibility for the ignition potential of their homes, businesses, lands, and neighborhoods. Often, the risk of wildfire is at the forefront of public awareness during or after major wildfire events, whether close to home or further afield. The challenge is to retain this level of awareness beyond these times. The communication and education objectives for the CRD are:

- To improve public understanding of fire risk and personal responsibility by increasing resident and property owner awareness of the wildfire threat in their community, to establish a sense of responsibility for risk mitigation among property owners, and to empower them to act;
- To enhance the awareness of, and participation by, elected officials and all WUI stakeholders regarding proactive WUI risk mitigation activities; and,
- To reduce or avoid ignitions from industrial sources.

Bringing organizations together to address wildfire issues that overlap physical, jurisdictional or organizational boundaries is a good way to help develop interagency structures and mechanisms to reduce wildfire risk. Engagement of various stakeholders can help with identifying valuable information about the landscape and help provide unique and local solutions to reducing wildfire risk. The CRD should consider creating an Interface Steering Committee to coordinate wildfire risk reduction efforts. The steering committee could include key stakeholders such as CRD staff, municipal staff, BCWS, BC Parks, recreational groups/representatives, industrial operators, local ranchers, community forest managers, forest licensees; and, First Nations. Such a committee will also facilitate a shared understanding of wildfire risk mitigation and prevention.

Significant areas of private land in the AOI are within the Agricultural Land Reserve (ALR), supporting mainly livestock production. The agriculture sector faces unique challenges with respect to wildfire planning and preparedness (including but not limited to livestock relocation). Consequently, the BC Agriculture & Food Climate Action Initiative (CAI), in collaboration with partners and through workshops delivered in various agriculture communities in BC, has developed wildfire planning resources specific to the agriculture sector. These resources incorporate FireSmart practices and facilitate collaboration and communication with local government. Recognizing and disseminating these CAI resources[63] to the ranching/agriculture community in the CRD will promote improved planning and preparedness and encourage FireSmart practices on private farmland.

[63]BC Agriculture and Food Climate Action Initiaitve. Cariboo- Wildfire Preparedness & Mitigation Planning & Resources. https://www.bcagclimateaction.ca/regional-project/cb01/

Moving from the CWPP to implementation of specific activities requires that the community is well informed of the reasons for, and the benefits of specific mitigation activities. In order to have successful implementation, the following communication and public education recommendations are made:

RECOMMENDATION #20: Make this report and associated maps publicly available through the CRD and 100 Mile House websites and social media platforms. In addition, this CWPP should be shared with local industry partners, particularly forest licensees such as the 100 Mile House Community Forest who may be interested in collaborating on direct fuel management treatments or with other sections of this CWPP. The wildfire threat class mapping included in this CWPP should be made available as a layer in the CRD online public map viewer.

RECOMMENDATION #21: Complete or schedule periodic updates of the CWPP to gauge progress and update the threat assessment (hazard mapping) for changes in fuels, forest health, land planning, stand structure or changes to infrastructure in the interface. The frequency of updates is highly dependent upon major changes which would impact the CRD's wildfire threat assessment or the rate at which wildfire risk reduction efforts are implemented. An evaluation of major changes (including funding program changes that may lead to new opportunities) and the potential need for a CWPP update should be initiated every 5 - 7 years.

RECOMMENDATION #22: Develop a FireSmart/Wildfire Preparedness page on the CRD website. This page can serve as a platform to promote workshops, waste disposal opportunities, the Fire Smart Canada Community Recognition Program, and other community FireSmart initiatives. Updates on fire bans, high or extreme Fire Danger days, and current fires can be integrated with this page and with the existing emergency services pages on the CRD website. Updates and opportunities should also be communicated regularly through the CRD Facebook page.

RECOMMENDATION #23: Promote FireSmart approaches for wildfire risk reduction to CRD residents through FireSmart workshops and/or presentations. Aim to conduct the engagement/promotion campaign prior and during the fire season. Supply FireSmart resources to homeowners during these engagement campaigns and promote the FireSmart Begins At Home mobile app as a method of conducting home assessments.

RECOMMENDATION #24: Apply for a FireSmart demonstration grant through the CRI program. Preferential sites should incorporate residential structures as they are more applicable for homeowners, and should include both exterior building material and landscaping elements to display FireSmart principles.

RECOMMENDATION #25: Encourage and facilitate neighborhoods in the wildland urban interface (WUI) to attain FireSmart Canada Community Recognition Program (FSCCRP) status and encourage homeowners to complete a FireSmart home assessment using the Home Assessment guide or the FireSmart Begins At Home mobile app. Encourage FSCCRP neighborhoods to hold a home hazard assessment workshop as one of their FireSmart events. In addition, the CRD should promote the use of the FireSmart Home Partners Program which facilitates voluntary FireSmart assessments on private property to identify hazards and provide options to reduce the risk.

RECOMMENDATION #26: Apply for funding from the UBCM CRI Program to develop a local FireSmart rebate program. This will allow homeowners to access partial rebates for FireSmart activities on their

properties, if rated as high or extreme risk in a FireSmart home and property assessment. The rebate program is described in detail in the CRI Program 2020 FireSmart Community Funding and Supports – Program & Application Guide and must adhere to the goals and objectives of FireSmart, as outlined in Section 5.2.1. Before applying for funding, CRD resources available to execute the program should be reviewed.

RECOMMENDATION #27: Encourage School District 27 to adopt and deploy existing school education programs to engage youth in wildfire management and risk reduction during Fire Prevention Week. There is emergency preparedness curriculum available provincially, which includes preparedness for a variety of natural hazards, including wildfire (Master of Disaster). Other options/value-added activities include consulting with Association of BC Forest Professionals (ABCFP) and BCWS (Cariboo Fire Centre) as well as local fire department and FireSmart representatives to facilitate and recruit volunteer teachers and experts to help with curriculum development to be delivered in elementary and/or secondary schools (field trips, guest speakers, etc.).

RECOMMENDATION #28: Develop and work with First Nations and all key stakeholders (100 Mile House Community Forest, other forest licensees, MFLNRORD, BCWS, BC Parks, recreational groups/representatives, local ranchers, CRD staff) to formalize an Interface Steering Committee. The purpose of the steering committee would be to identify wildfire related issues in the area and to develop collaborative solutions to minimize wildfire risks. The following subject areas are recommended for the group to explore: 1) Harvest planning to integrate existing and planned fuel breaks with future cutblocks to address identified hazardous fuel types and spotting potential; 2) Public education and awareness needs; 3) Multi-disciplinary, multi-jurisdictional fuel treatment projects/hazard abatement projects; 4) Development of a funding strategy; and 5) Reduction of human-caused fires, fire prevention and right of way management.

RECOMMENDATION #29: Work towards educating homeowners within unprotected areas (i.e., outside of Fire Protection Areas). It is common, especially in the case of second homeowners/vacation owners, for them to be unaware of the lack of fire services in their area (in the event they call 911).

RECOMMENDATION #30: Promote and provide information to private landowners related to exterior residential sprinklers as a FireSmart prevention measure. At FireSmart events distribute information on exterior sprinkler component parts, manufacturers, and water supply system requirements to ensure they are effective measures to wet down homes and Fire Priority Zone 1 (0-10 m) and discourage home ignition. Develop general costs of exterior sprinkler equipment for property owners.

RECOMMENDATION #31: Promote improved planning and preparedness of ranchers/agriculture producers in the CRD and encourage FireSmart practices on private farm land through distribution or sharing of wildfire action planning resources prepared specifically for the agriculture sector by the BC Agriculture & Food Climate Action Initiative (i.e., on CRD website, mailouts).

5.4 OTHER PREVENTION MEASURES

In addition to fuel treatment and community communication and education, fire prevention in the AOI is also addressed via the following avenues: 1) public display of danger class rating signs throughout the AOI, which should updated on a weekly basis; 2) fire ban alignment with provincial fire bans; 3) potential enforcement or restricted access to backcountry areas similar to provincial requirements; and 4) enforcement of local bylaws such as the OCPs for 100 Mile House and Lac La Hache that require the

completion of wildfire hazard assessments (see Section 2.5.3), as well as the 108 Mile Greenbelt Community Use, Unsightly Premises, Development Procedures, and Development Approval Information bylaws. The aforementioned activities are either currently being applied or have potential to be applied in order to reduce the potential and/or threat of wildfire ignitions within the AOI.

Risk of human-caused ignition within the AOI is not limited to private property owners and individual residents. Power lines and industrial activities pose a risk of ignition, particularly in areas where cured fuels or fuel accumulations exist. Tree failures adjacent to power lines (transmission and distribution) are common occurrences and represent significant risks to ignition within the AOI. A cooperative approach for addressing the industrial area concerns must be undertaken by the CRD and pertinent industrial partners.

RECOMMENDATION #32: Work with the 100 Mile House Community Forest, woodlots, and other forest licensees to ensure that high risk activities, such as vegetation management, pile burning and harvesting do not occur during high/extreme fire danger times to reduce chance of ignitions as per the Wildfire Act. Similarly, work with local recreation groups, e.g. Rod and Gun clubs, to communicate wildfire risk and backcountry closures.

RECOMMENDATION #33: Develop utility right-of-way best management practices (BMPs) for regular brushing and clearing of woody debris and shrubs in coordination with industrial partners to help reduce fire risk, utility pole damage and subsequent outages. CN Rail, BC Hydro, Fortis BC, Enbridge, and the Ministry of Transportation and Infrastructure should ensure rights-of-way do not contain fine fuel accumulations (< 7.5 cm, easily cured) and significant regeneration of conifer vegetation prior to and during the fire season and are maintained in a low hazard state. (to serve as fuel breaks).

SECTION 6: WILDFIRE RESPONSE RESOURCES

This section provides a high-level overview of the local government resources accessible for emergency response and preparedness use. Accordingly, in emergency situations when multiple fires are burning in different areas of the Province, resource availability may be scarce. Therefore, local government preparedness and resource availability are critical components of efficient wildfire prevention and planning. Deployment of provincial resources occurs as per the process detailed in the *Provincial Coordination Plan for Wildland Urban Interface Fires* document[64]. The aforementioned document establishes a protocol for collaborative and integrated emergency management in the event of WUI fires within British Columbia.

6.1 REGIONAL GOVERNMENT FIREFIGHTING RESOURCES

Firefighting efforts and effectiveness can be affected by access to secondary power sources, water pressure and supply, and existing local government contingency plans. In the event of a wildfire emergency situation and loss of power, the CRD has access to backup generators, fueled by natural gas, to power critical infrastructure such as Community Halls, Fire Halls and the EOC. However, should a

[64] Provincial Coordination Plan for Wildland Urban Interface Fires. 2016. Available online at: https://www2.gov.bc.ca/assets/gov/public-safety-and-emergency-services/emergency-preparedness-response-recovery/provincial-emergency-planning/bc-provincial-coord-plan-for-wuifire_revised_july_2016.pdf

wide-scale outage occur, known vulnerabilities to secondary power sources include mechanical failure and potential fuel shortages. Although the local government has not identified any issues with water pressure within areas that have fire hydrant service, there are known limitations to water supply in areas with older private water systems, or for residents located outside of fire protection areas. Specific limitations of the CRD water system with regards to wildfire suppression are detailed in Section 6.1.2.

Formal mutual aid agreements are in effect between all 14 Volunteer Fire Departments (VFDs) within the South Cariboo (more detail is provided in Section 6.1.1). In the event of a WUI fire emergency, mutual aid in the CRD is activated, as required, between all VFDs. WUI fire events may also lead to aid requests with BCWS.

6.1.1 Fire Department and Equipment

Although there are six fire protection areas (FPAs) overlapping the AOI, fire protection within the AOI is primarily provided by four volunteer fire departments (VFDs): 108 Mile House, Lac La Hache, Forest Grove, and Lone Butte. Small portions of the AOI are serviced by the Interlakes VFD (eastern end of Horse Lake; non-certified) and the Greeny Lake VFD (North of Lac La Hache; independently administered). The 100 Mile House Fire Department FPA is restricted to the municipal boundary and does not overlap the AOI, but due to mutual aid agreements between local fire departments, departmental resources are included in Table 12 below. Mutual aid is utilized frequently between all departments (formal agreements are in place), and there is a training center in 100 Mile House that all local departments use occasionally. Table 12 provides an overview of the fire services capacity in the AOI, including fire department personnel and equipment.

In total, the various FPAs cover an area of roughly 76,047 hectares and approximately 60% of the AOI. Areas within the AOI not covered by an FPA include the south shore of Lac La Hache (with the exception of the east end of Caverley Road), the north shore of Horse Lake, and 93 Mile outside of the highway corridor. CRD VFDs are permitted to respond to fires outside of their FPA boundary up to 13 km from a departmental fire hall. Under BCWS direction, CRD VFDs are able to initially respond to wildfires in their FPA, and can assist BCWS in responding to wildfires outside of their FPA as long as there are enough members left within the FPA to respond to structural fires. However, the areas outside of FPAs are primarily under BCWS jurisdiction, and response resources would be supplied via the Cariboo Fire Centre/100 Mile Fire Zone.

In consultation with fire departments it was determined that there are no structural firefighting equipment deficiencies, but that some departments are lacking in wildland firefighting equipment. Some departments have initial attack trucks outfitted for wildfire response and/or additional wildland equipment. 108 Mile VFD has two initial attack trucks and Lac La Hache VFD carries portable water bladders on their water tenders. 100 Mile House also has an initial attack truck. Local VFDs have shared access to a sprinkler protection unit (SPU) trailer that includes hoses, pumps and sprinklers. The greatest equipment deficiencies reported by fire departments are restrictive budgets limiting the availability of wildfire specific equipment and PPE. It is recommended that all VFDs outfit a 4x4 vehicle with wildland specific equipment, including wildfire hose and fittings, portable water tank and pump(s), and hand tools.

Table 12. Fire department capacity and equipment within the AOI.

Fire Protection Zones	Fire Department	Number of Stations	Number of Members	Apparatus type and number
Lac La Hache	Lac La Hache VFD	1	26 (volunteer)	Two water tenders, each with a 2000-gallon bladder Two engines
108 Mile House	108 Mile House VFD	1	24 (volunteer; weekends paid-on-call)	Two water tenders One engine Two initial attack (brush) units One rescue truck
Lone Butte	Lone Butte VFD	1	20 (volunteer)	Two water tenders Two engines One rescue truck
Forest Grove	Forest Grove VFD	2 (outside AOI)	29 (volunteer)	Three engines Two water tenders
Interlakes	Interlakes VFD	3 (outside AOI)	47 (volunteer)	Three engines Three water tenders
Greeny Lake	Greeny Lake VFD Society (non CRD)	1	unknown	Two water tenders One rescue truck Two engines
100 Mile	100 Mile House Fire Rescue (non CRD)	1 (outside AOI)	unknown	Two engines One rescue truck One initial attack (brush) units One water tender One service van

Over the previous 9 years (2011-2010), local VFDs responded to an average of 49 fire calls per year (averaged over all fire departments from 2011 to 2019). 32 (65%) of these calls were to wildfires. Local VFDs will also respond to calls for medical aid, motor vehicle accidents, and other non-fire emergencies. Wildland fire calls have ranged from a low of 10 per year in 2014 and up to a maximum of 89 calls in one year. 2018 was also observed as an above-average year for wildland calls and a below-average year for structural calls.

RECOMMENDATION #34: Review the capacity to respond to interface fires with existing wildfire apparatus and personal protective equipment (PPE). Consider funding opportunities to obtain a 4x4 vehicle with wildland specific equipment, including wildfire hose and fittings, portable water tank and pump(s), and hand tools for each VFD in the AOI, as well as PPE such as leather boots, gloves, and fire-resistant Nomex overalls.

6.1.2 Water Availability for Wildfire Suppression

Water is the single most important suppression resource. In an emergency response scenario, it is critical that a sufficient water supply be available. The Fire Underwriters Survey summarizes their recommendations regarding water works systems fire protection requirements, in *Water Supply for Public Fire Protection* (1999).[65] Some key points from this document include the need for:

- Duplication of system parts in case of breakdowns during an emergency;
- Adequate water storage facilities;
- Distributed hydrants, including hydrants at the ends of dead-end streets;
- Piping that is correctly installed and in good condition; and
- Water works planning should always take worst-case-scenarios into consideration. The water system should be able to serve more than one major fire simultaneously, especially in larger urban centers.

Water service availability within the AOI is an important component of emergency response against a wildland urban interface fire or in the event of a large-scale emergency, such as a structural fire. As previously noted in Sections 3.2.3 and 3.3.1, water service is provided by the CRD regional district and supplied by privately operated systems. The majority of these systems relying on groundwater supply for fire suppression purposes. For suppression within the AOI, hydrant service is provided within the fire services area boundaries at varying levels of coverage. There are also significant areas outside of these boundaries that do not have fire hydrant services.

There are many areas within the AOI that have a lack of hydrants, water supply and/or water pressure and therefore rely on tender water support as their only source of water, creating potential fire suppression challenges within the AOI. The only areas with hydrants are 108 Mile, the eastern end of Lac La Hache, 103 Mile (east of Hwy 97), and around Mulligan Drive in Horse Lake. In consultation with the Wildfire Working Group, Horse Lake was identified as an area where water volume/pressure does not meet fire flow requirements.

To supplement water availability for firefighting, the CRD fire departments can draft from natural water sources such as lakes and ponds, or from dry hydrants, using either truck mounted or portable pumps. Due to this capacity and the multitude of lakes and ponds in the area, the CRD is well poised to cope with water supply problems. However, some of these sources are also at risk of drying or experiencing reduced water levels during drought events, which typically coincide with high and extreme fire danger rating days.

RECOMMENDATION #35: All new developments outside of existing water service areas should have a water system which meets or exceeds minimum standards of NFPA 1142, *Standard on Water Supplies for Suburban and Rural Fire Fighting.*[66] Local fire departments should review the water supply to ensure

[65] http://www.scm-rms.ca/docs/Fire%20Underwriters%20Survey%20-%201999%20Water%20Supply%20for%20Public%20Fire%20Protection.pdf

[66] National Fire Protection Association (NFPA). 2017. Standard on Water Supplies for Suburban and Rural Fire Fighting. Retrieved online at: https://www.nfpa.org/codes-and-standards/all-codes-and-standards/list-of-codes-and-standards/detail?code=1142

it provides sufficient placement, flow, and reliability for suppression needs and that secondary power is available in the event of power outages.

RECOMMENDATION #36: Complete a fire flow/water vulnerability assessment to identify where upgrades to systems, flows, hydrant number or location, and water storage, or secondary power is required. Prioritize and rank projects and complete or require upgrades as resources allow.

6.1.3 Access and Evacuation

Road networks in a community serve several purposes including providing access for emergency vehicles, providing escape/evacuation routes for residents, and creating fuel breaks. Access and evacuation during a wildfire emergency often must happen simultaneously and road networks should have the capacity to handle both. In the event of a wildfire emergency, arterial routes in the AOI consist of Highway 97, Highway 24, Canim-Hendrix Lake Road, and Horse Lake Road. Wildfire evacuations would be conducted by first responders, BCWS, and possibly Search and Rescue (CRD service). If a wildfire were to block an arterial route, evacuation from the AOI would be challenged; however, alternate routes for many communities in the AOI exist. For example, Bowers Lake Road connects Canim-Hendrix Lake Road and Highway 24, presenting an alternate evacuation route for communities east of 100 Mile. Other important backroads from an access/evacuation perspective are Watch Lake Road (Lone Butte to 70 Mile), Helena Lake Road (south Lac La Hache to 105 Mile), Dempsey Lake Road or Archie Meadows Road (108 Mile to Forest Grove) and Redeau Lake Road (Timothy Lake Road to 150 Mile). Recreational and industrial use of the region has kept many unpaved backroads in good condition, although the extent of plowing in the winter can be limited. Smoke and poor visibility, car accidents, wildlife, and other unforeseen circumstances can further complicate evacuations and hinder safe passage.

Despite the existence of backroads routes, many developments within the CRD are located on single access roads; this limits the ability of fire crews to respond to fires and safely evacuate residents. A number of single access routes or isolated neighborhoods that cause suppression or evacuation concerns were identified during field visits and in consultation with the Wildfire Working Group including: Caverley Road, McKinley Drive, Lac La Hache Station Road, Wright Station Road, Park Place, Ferguson Road, Birchwood Road, Bisset Road, Thorsteinson Road, Pine Valley Drive, Houseman Road, Horse Lake Road North, Perrey Road, Erikson Road, Monette Road, Sven Road, Unicorn Road, Hunt Road, Netherland Road, and Inman Road.

Although BCWS did not note any issues with access to private land for fire suppression, locked gates were noted on Exeter McKinley Road, at the east end of Tatton Helena FSR, and 103 Mile Lake Road. It is useful for fire departments and BCWS to have the most recent information on gate locations and ownership.

Within the AOI, some of the critical infrastructure is reached via narrow and/or private, forested roads, with generally rough and loose services, which may impede suppression efforts and response times. Furthermore, there is a significant portion of land within the AOI which is inaccessible by roads. Landscape level fuel breaks are a valuable tool in rural areas like the CRD. Well-designed fuel breaks can

slow down the spread of a fire, allowing more time for firefighters to initiate suppression activities and for evacuation to take place.

Emergency access and evacuation planning is of particular importance in the event of a wildfire event or other large-scale emergency. The CRD has undertaken some evacuation route assessment but no official planning, so each evacuation is dealt with on a case-by-case basis. Consideration should be taken to develop an evacuation plan as part of a broader Emergency Response Plan (ERP) which includes basic contingencies in the event of a wildland/interface fire, including specific and alternate evacuation routes to be used during an emergency situation, and a list of key contacts and the roles of local government personnel in the event of a wildfire. A detailed evacuation plan should include the following provisions:

- Mapping and identification of safe zones, marshaling points and aerial evacuation locations;
- Planning of traffic control and accident management;
- Identification of volunteers that can assist during and/or after evacuation;
- Development of an education/communication strategy to deliver emergency evacuation procedures to residents.
- Early notification to ranchers so that livestock can be evacuated

The creation of a Total Access Plan that includes georeferenced maps is recommended. In consultation with the Wildfire Working Group, out-of-date road information in the 911 spatial layer was identified as an issue. The plan should include up-to-date road networks, including names, the locations of fuel breaks (implemented or natural, for optimal burn-off locations), natural water sources, gates, critical and hazardous infrastructure, and tenure holders with associated contact numbers. Two lessons from the 2017 fires in the Cariboo were that a) [forest] licensees have valuable local information and that communication between licensees and BCWS in the event of a wildfire should be improved; and b) local ranchers need more notification prior to back burns so that livestock can be moved.[67] This plan should be made available to all local fire departments and the BCWS in the event that they are aiding suppression efforts on an interface fire in the AOI. The plan should also identify those natural areas where access is insufficient. Access assessment should consider land ownership, proximity of values at risk, wildfire threat, opportunities for use as fuel break or control lines, and requirements for future maintenance activities such as operational access for fuel treatments and other hazard reduction activities.

In addition to providing the safest, quickest, and easiest access routes for emergency crews, a Total Access Plan would minimize the need for using machinery or motorized access in an otherwise undisturbed area. This would reduce the risk of soil disturbance and other environmental damage, as well as reduce rehabilitation costs.

RECOMMENDATION #37: Complete and participate in regular testing of, and updates to, a wildfire evacuation plan as part of an Emergency Response Plan for the CRD. Procedures for evacuation of livestock should be included in the plan.

[67] Personal communication, 2019; Cariboo Chilcotin Wildfire 2017 Consultation Report. https://cariboord.ca/uploads/wildfirereport/Wildfire_Consultation_Report.pdf

RECOMMENDATION #38: Develop a wildfire pre-planning brochure that addresses the following: 1) locations of staging areas; 2) identifies water reservoirs, communications requirements (i.e., radio frequencies), minimum resource requirements for structure protection in the event of an interface fire, and values at risk; and 3) maps of the area of interest. This brochure would be for 1) CRD staff and included in the CRD Emergency Response Plan 2) local fire departments 3) industrial operators (woodlot licensees, 100 Mile House Community Forest).

RECOMMENDATION #39: Develop a Total Access Plan for the CRD to map and inventory trail and road network for suppression planning, identification of areas with insufficient access, and to aid in strategic planning. Georeferenced maps with ground-truthed locations of existing and potential fuel breaks and tenure holders contact information should be developed as part of the Total Access Plan and shared with fire suppression personnel and BCWS to support emergency response in the event of a wildfire. The plan should be updated every five years, or more regularly, as needed to incorporate additions and/or changes.

6.1.4 Training

All members of the CRD fire departments within the AOI receive wildfire specific training (S100 at a minimum) in addition to significant training focused on structural firefighting. Departments also have weekly written and practical training nights. It is recommended that all fire services members within the AOI have at a minimum S100 and/or SPP-WFF1 (or equivalent), and that the fire department members engage in yearly practical wildland fire training with BCWS that covers at a minimum: pump, hose, hydrant, air tanker awareness, and employment of SPUs. The aforementioned cross-training opportunity could include, for example, a joint wildfire simulation exercise. Provision of training opportunities for structural firefighters in the realm of wildland firefighting is critical to building capacity for suppression and emergency management at the local level. It must be noted that SPP-WFF1 (Wildland Firefighter Level 1 for structural firefighters) is a new S100 equivalent course for structure firefighters only, and as such BCWS has phased out instruction of S100 training for fire departments. SPP 115 is another course available to train structural firefighters in the application of structural protection units (SPUs).

Throughout the year, the CRD fire departments maintain regular communication with BCWS and adjust scheduled meetings as required by the fire season demands. BCWS has reported that it has a good working relationship with all departments and that meetings are scheduled regularly to touch base and exchange contact information. Furthermore, BCWS holds annual meetings and workshops in conjunction with Emergency BC and all other first responders interested emergency training. In addition to this training, it is recommended that the fire departments work cooperatively with the BCWS (Cariboo Fire Center) to conduct yearly mock exercises, where information and technical/practical knowledge are shared, such as: fireline construction, Mark 3 pump operations, sprinkler protection, portable water tank deployment, and wildland hose operations. These practices could also provide training to wildland crews on hydrant hookup methods, as well as provide an avenue to discuss working together on inter-agency fires. Additional training options could include engaging adjacent Fire Departments outside the AOI (i.e., 100 Mile House Fire Rescue) to conduct joint training so as to further strengthen regional emergency response and firefighting training.

RECOMMENDATION #40: Fire departments should continue working with BCWS to maintain an annual structural and interface training program and foster a strong relationship. As part of the training, it is recommended to conduct annual reviews to ensure PPE and wildland equipment resources are complete, in working order, and the crews are well-versed in their set-up and use. It is recommended the CRD and 100 Mile House fire departments engage in yearly practical wildland fire training with BCWS that covers at a minimum: pump, hose, hydrant, air tanker awareness, and employment of SPUs. Interface training should include completion of a joint wildfire simulation exercise and safety training specific to wildland fire and risks inherent with natural areas. It is recognized that BCWS crew resources are limited and their availability and is highly dependent upon the current fire season and other BCWS priorities.

RECOMMENDATION #41: Ensure that the fire departments maintain the capability to effectively suppress wildland fires, through wildfire-specific training sessions. Ensure all fire department's training includes S100 or SPP-WFF1 at a minimum. Consider expanding the training program to maintain a high level of member education and training specific to interface and wildland fires. SPP-115 provides training to structural firefighters on the use of wildfire pumps and hose (and fire service hose and hydrants) in the application of structural protection units (SPUs).The fire departments should continue the practice of staying up to date on wildfire training opportunities, and to train members in this capacity, as training resources/budgets allow.

6.2 STRUCTURE PROTECTION

The volunteer fire departments within the AOI are well resourced in structural fire suppression equipment with some wildland equipment and access to a shared SPU trailer that includes hose, pumps, and sprinklers. The UBCM also owns four complete SPUs, each equipped to protect 30 – 35 structures. The kits are deployed by the MFLNRORD/BCWS incident command structure and are placed strategically across the province during the fire season based on fire weather conditions and fire potential. When the kits are not in use, they may be utilized by fire departments for training exercises. SPUs can be useful tools in the protection of rural/interface homes in the event of a wildfire. An important consideration in protecting the WUI zone from fire is ensuring that homes can withstand an interface fire event. Structure protection is focused on ensuring that building materials and construction standards are appropriate to protect individual homes from interface fire. Materials and construction standards used in roofing, exterior siding, window and door glazing, eaves, vents, openings, balconies, decks, and porches are primary considerations in developing FireSmart neighborhoods. Housing built using appropriate construction techniques and materials in combination with fire resistant landscaping are less likely to be impacted by interface fires.

While many BC communities established to date were built without significant consideration of interface fire, there are still ways to reduce home vulnerability. Changes to roofing materials, siding, and decking can be achieved over the long-term through voluntary upgrades, as well as changes in bylaws and building codes. The FireSmart approach has been adopted by a wide range of governments and is a

recognized process for reducing and managing fire risk in the wildland urban interface. More details on FireSmart construction can be found in the "*FireSmart Begins at Home Manual*".[68]

It is recommended that homeowners take a building envelope – out approach, that is, starting with the home and working their way out. Addressing little projects first can allow for quick, easy, and cost-effective risk reduction efforts to be completed sooner, while larger, more costly projects can be completed as resources and planning allow. For example, prior to the fire season, clearing roofs and gutters of combustible materials (leaves and needles), cleaning out any combustible accumulations or stored materials from under decks, moving large potential heat sources such as firewood, spare building materials or vehicles as far from the structure as possible, maintaining a mowed and watered lawn, removing dead vegetation, and pruning trees are actionable steps that residents can start working on immediately. The following link accesses an excellent four-minute video demonstrating the importance of FireSmart building practices during a simulated ember shower: http://www.youtube.com/watch?v=_Vh4cQdH26g.

The structure protection objectives for the CRD are to:

- Encourage private homeowners to voluntarily adopt FireSmart principles on their properties and to reduce existing barriers to action;
- Enhance protection of critical infrastructure from wildfire (and post-wildfire impacts); and,
- Enhance protection of residential / commercial structures from wildfire.

RECOMMENDATION #42: Work with local hardware stores, garden centers, and building supply stores within the CRD to educate homeowners and remove some barriers to FireSmart action. Initiatives may include:
1) Developing and delivery of FireSmart workshop(s) for local distributors on FireSmart issues and solutions/advice for homeowners. These distributors can be educated upon which supplies are FireSmart and in what configuration they can be used (for example, external sprinkler system equipment, aggregates and ground cover, wire mesh for vents, deck skirting).
2) Advocating for a FireSmart branding in the retail stores (could be stickers on shelf pricing or a FireSmart-specific section) to increase public exposure to projects that can be done at a relatively low cost.
3) Compile a database of local service providers and retailers which can help to install or complete FireSmart home improvements. These providers may be able to further partner to flesh out a list of FireSmart options for various home improvements, based upon a range of variables (for example, price, time to deliver, installation costs, and aesthetics).
4) Develop general cost implications of improvements so property owners can prioritize replacements.

RECOMMENDATION #43: Apply for funding to extend the existing Red Cross FireSmart free wood disposal program at South Cariboo transfer stations past May 31, 2021. Explore other programs which serve to remove barriers to action for homeowners by providing methods for them to cheaply and easily dispose of wood waste removed from their property. Programs may include scheduled

[68] Available at https://firesmartcanada.ca/resources/ (FireSmart Canada) and https://www2.gov.bc.ca/gov/content/safety/wildfire-status/prevention/firesmart (BC FireSmart)

neighborhood chipping opportunities, yard waste dumpsters available by month in neighborhoods, or scheduled burning weekends (dependent on weather and venting). Programs should be available during periods where the majority of yard clearing takes place (spring and/or fall).

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APPENDIX A – LOCAL WILDFIRE THREAT PROCESS

The key steps to complete the local wildfire threat assessment are outlined below:

1. Fuel type attribute assessment, ground truthing/verification and updating as required to develop a local fuel type map (Appendix A-1).
2. Consideration of the proximity of fuel to the community, recognizing that fuel closest to the community usually represents the highest hazard (Appendix A-2).
3. Analysis of predominant summer fire spread patterns using wind speed and wind direction during the peak burning period using ISI Rose(s) from BCWS weather station(s) (Appendix A-3). Wind speed, wind direction, and fine fuel moisture condition influence wildfire trajectory and rate of spread.
4. Consideration of topography in relation to values (Appendix A-4). Slope percentage and slope position of the value are considered, where slope percentage influences the fire's trajectory and rate of spread and slope position relates to the ability of a fire to gain momentum uphill.
5. Stratification of the WUI based on relative wildfire threat, considering all of the above.
6. Consider other local factors (i.e., previous mitigation efforts, and local knowledge regarding hazardous or vulnerable areas)
7. Identify priority wildfire risk areas for field assessment.

The basis for the prioritization of field assessment locations is further detailed in Section 4.3. Wildfire Threat Assessment plot worksheets are provided in Appendix C (under separate cover), plot locations are summarized in Appendix F, and the field data collection and spatial analysis methodology is detailed in Appendix H.

A-1 FUEL TYPE ATTRIBUTE ASSESSMENT

The Canadian Forest Fire Behaviour Prediction (FBP) System outlines five major fuel groups and sixteen fuel types based on characteristic fire behaviour under defined conditions.[69] Fuel typing is recognized as a blend of art and science. Although a subjective process, the most appropriate fuel type was assigned based on research, experience, and practical knowledge; this system has been used within BC, with continual improvement and refinement, for 20 years.[70] It should be noted that there are significant limitations with the fuel typing system which should be recognized. Major limitations include: a fuel typing system designed to describe fuels which do not occur within the AOI, fuel types which cannot accurately capture the natural variability within a polygon, and limitations in the data used to create initial fuel types.[70] Details regarding fuel typing methodology and limitations are found in Appendix G. There are several implications of the aforementioned limitations, which include: fuel typing further from the developed areas of the study has a lower confidence, generally; and, fuel typing should be used as a starting point for more detailed assessments and as an indicator of overall wildfire threat, not as an operational, or site-level, assessment.

Table 13 summarizes the fuel types by general fire behaviour (crown fire and spotting potential). In general, the fuel type that may be considered hazardous in terms of fire behaviour and spotting potential in the AOI are C-3 and C-7, particularly if there are large amounts of woody fuel accumulations or denser understory ingrowth. C-5 fuel types have a moderate potential for active crown fire when wind-driven.[70] An M-1/2 fuel type can sometimes be considered hazardous, depending on the proportion of conifers within the forest stand; conifer fuels include those in the overstory, as well as those in the understory. An O-1b fuel type often can support a rapidly spreading grass or surface fire capable of damage or destruction of property, and jeopardizing human life, although it is recognized as a highly variable fuel type dependent upon level of curing.[71]. These fuel types were used to guide the threat assessment.

Forested ecosystems are dynamic and change over time: fuels accumulate, stands fill in with regeneration, and forest health outbreaks occur. Regular monitoring of fuel types and wildfire threat assessment should occur every 5 – 10 years to determine the need for threat assessment updates and the timing for their implementation.

[69] Forestry Canada Fire Danger Group. 1992. Development and Structure of the Canadian Forest Fire Behavior Prediction System: Information Report ST-X-3.
[70] Perrakis, D.B., Eade G., and Hicks, D. 2018. Natural Resources Canada. Canadian Forest Service. *British Columbia Wildfire Fuel Typing and Fuel Type Layer Description* 2018 Version.
[71] Ibid.

Table 13. Fuel Type Categories and Crown Fire Spot Potential. Only summaries of fuel types encountered within the AOI are provided (as such, other fuel types, i.e., C-1, C-2, and C-4 are not summarized below).

Fuel Type	FBP / CFDDRS Description	AOI Description	Wildfire Behaviour Under High Wildfire Danger Level	Fuel Type – Crown Fire / Spotting Potential
C-3	Mature jack or lodgepole pine	Fully stocked, late young forest (Douglas fir, spruce, or lodgepole pine), with crowns separated from the ground	Surface and crown fire, low to very high fire intensity and rate of spread	High*
C-5	Red and white pine	Well-stocked mature forest, crowns separated from ground. Moderate understory herbs and shrubs. Little grass or surface fuel accumulation.	Moderate potential for active crown fire in wind-driven conditions. Under drought conditions, fuel consumption and fire intensity can be higher due to dead woody fuels	Low
C-7	Ponderosa pine and Douglas-fir	Open, uneven-aged forest, crowns separated from the ground except in conifer thickets, understory of discontinuous grasses, herbs. Areas harvested 25+ years ago (and not achieving M-1/2 or C-3 fuel type characteristics), open stand type (>40% crown closure).	Surface fire spread, torching of individual trees, rarely crowning (usually limited to slopes > 30%), moderate to high intensity and rate of spread	Moderate
O-1a/b	Grass	Matted and standing grass communities; sparse or scattered shrubs, trees and down woody debris. Hay fields and seasonal wetlands that have the potential to cure. Areas harvested <7 years ago with good slash management.	Rapidly spreading, high- intensity surface fire when cured	Low
M-1/2	Boreal mixedwood (leafless and green)	Moderately well-stocked mixed stand of conifers and deciduous species, low to moderate dead, down woody fuels; areas harvested 10-20 years ago	Surface fire spread, torching of individual trees and intermittent crowning, (depending on slope and percent conifer)	<26% conifer (Very Low); 26-49% Conifer (Low); >50% Conifer (Moderate)
D-1/2	Aspen (leafless and green)	Deciduous stands	Always a surface fire, low to moderate rate of spread and fire intensity	Low

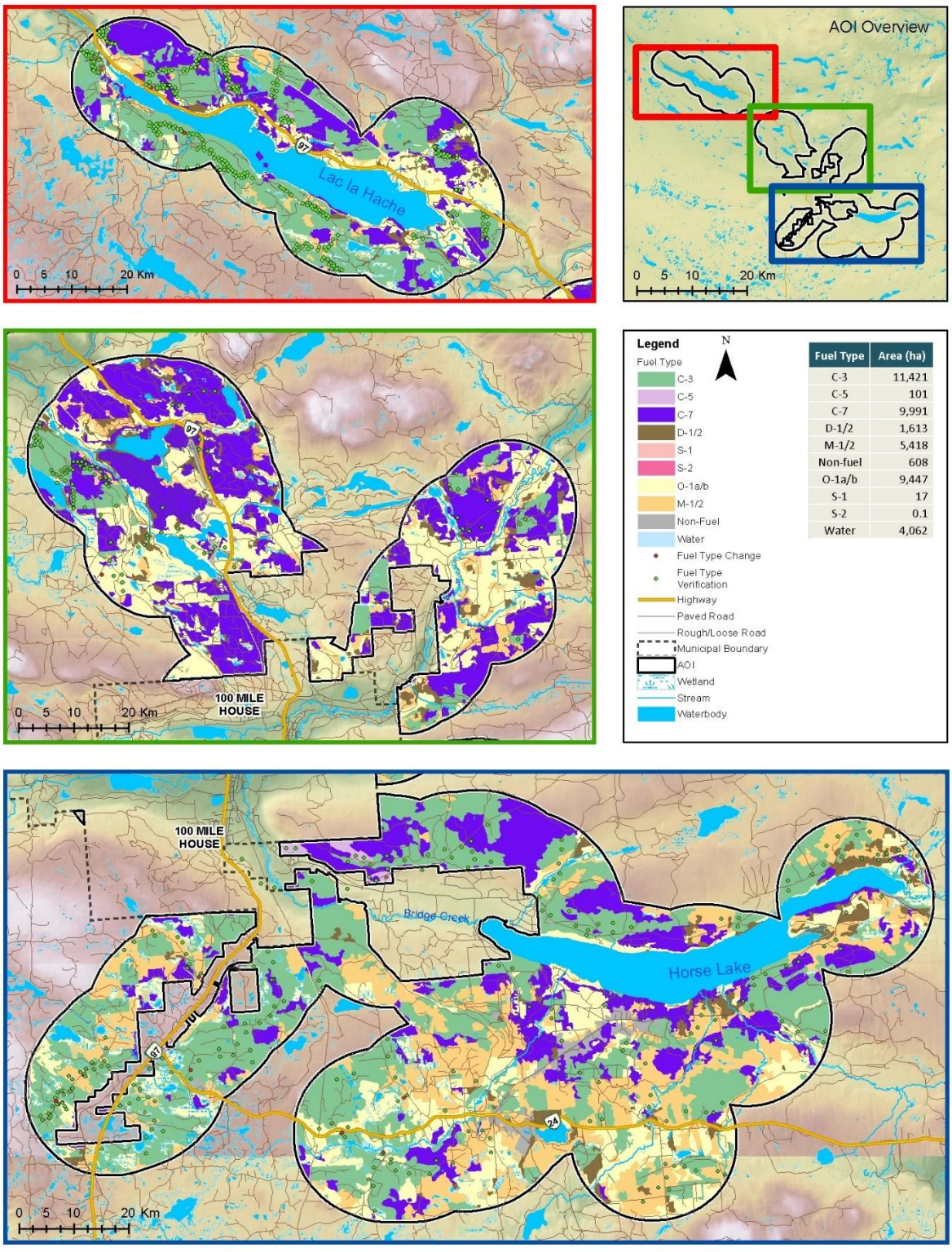
Fuel Type	FBP / CFDDRS Description	AOI Description	Wildfire Behaviour Under High Wildfire Danger Level	Fuel Type – Crown Fire / Spotting Potential
S-1/2	Slash (jack / lodgepole pine, white spruce / balsam, and coastal cedar / hemlock/ Douglas-fir, respectively)	Any conifer slash	Moderate to high rate of spread and high to very high intensity surface fire	Low
W	N/A	Water	N/A	N/A
N	N/A	Non-fuel: irrigated agricultural fields, golf courses, alpine areas void or nearly void of vegetation, urban or developed areas void or nearly void of forested vegetation; areas burned <5 years ago	N/A	N/A

**C-3 fuel type is considered to have a high crown fire and spotting potential within the AOI due to the presence of moderate to high fuel loading (dead standing and partially or fully down woody material), and continuous conifer ladder fuels.*

During field visits, fourteen recurring patterns of fuel type errors were found in the provincial dataset. They were:

- C-3 fuel types being incorrectly identified by the PSTA as C-7,
- C-5 fuel types identified as C-7,
- O-1a/b fuel types identified as C-7,
- C-7 fuel types identified as O-1a/b
- O-1a/b fuel types identified S-1,
- O-1a/b fuel types identified as D-1/2,
- S-1 fuel types identified as C-7,
- M-1/2 fuel types identified as C-2,
- M-1/2 fuel types identified as O-1a/b,
- M-1/2 fuel types identified as C-3
- C-5 fuel types identified as O-1a/b
- C-3 fuel types identified as O-1a/b,
- C-3 fuel types identified as M-1/2, and
- N fuel types identified as O-1a/b

All fuel type updates were approved by BCWS, using stand and fuel descriptions and photo documentation for the review process (see Appendix B for submitted fuel type change rationales).



Map 8. Updated Fuel Type.

A-2 PROXIMITY OF FUEL TO THE COMMUNITY

Fire hazard classification in the WUI is partly dictated by the proximity of the fuel to developed areas within a community. More specifically, fuels closest to the community are considered to pose a higher hazard in comparison to fuels that are located at greater distances from values at risk. As a result, it is recommended that the implementation of fuel treatments prioritizes fuels closest to structures and / or developed areas, in order to reduce hazard level adjacent to the community. Continuity of fuel treatment is an important consideration, which can be ensured by reducing fuels from the edge of the community outward. Special consideration must be allocated to treatment locations to ensure continuity, as discontinuous fuel treatments in the WUI can allow wildfire to intensify, resulting in a heightened risk to values. In order to classify fuel threat levels and prioritize fuel treatments, fuels immediately adjacent to the community are rated higher than those located further from developed areas. Table 14 describes the classes associated with proximity of fuels to the interface.

Table 14. 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.*

A-3 FIRE SPREAD PATTERNS

Wind speed, wind direction, and fine fuel moisture condition influence wildfire trajectory and rate of spread. The influence of topography on fire spread patterns is discussed in Appendix A-4. Wind plays a predominant role in fire behaviour and direction of fire spread and is summarized in the Initial Spread Index (ISI) Rose(s) from the local representative BCWS weather station. The Initial Spread Index (ISI) is a numeric rating of the expected rate of fire spread that combines the effects of wind speed and fine fuel moisture. ISI roses can help plan the location of fuel treatments on the landscape to protect values at risk based on the predominant wind direction and frequency of higher ISI values. Potential treatment areas were identified and prioritized with the predominant wind direction in mind; wildfire that occurs upwind of a value poses a more significant threat to that value than one which occurs downwind.

The local representative BCWS weather station for the AOI is Timothy. The Timothy weather station is located on Mount Timothy in Lac La Hache at an elevation of 1,161 m. Hourly ISI roses depicting the frequency of ISI values by wind direction for Timothy are shown below in Figure 4. Figure 5 displays the daily average ISI values for Timothy and for the Lone Butte weather station, which represents wind speeds and directions in the south of the AOI. Lone Butte station is located to the south of Highway 24 between Horse Lake and Green Lake at an elevation of 1,158 m.

During the fire season (April – October) predominant winds originate from the south. To a lesser degree, winds also occur from the north during the day (Lone Butte) and from the northeast overnight (Timothy). ISI values over 5 occur 25-30% of the time, with the highest values occurring most frequently with winds from the south and southwest (Figure 5).

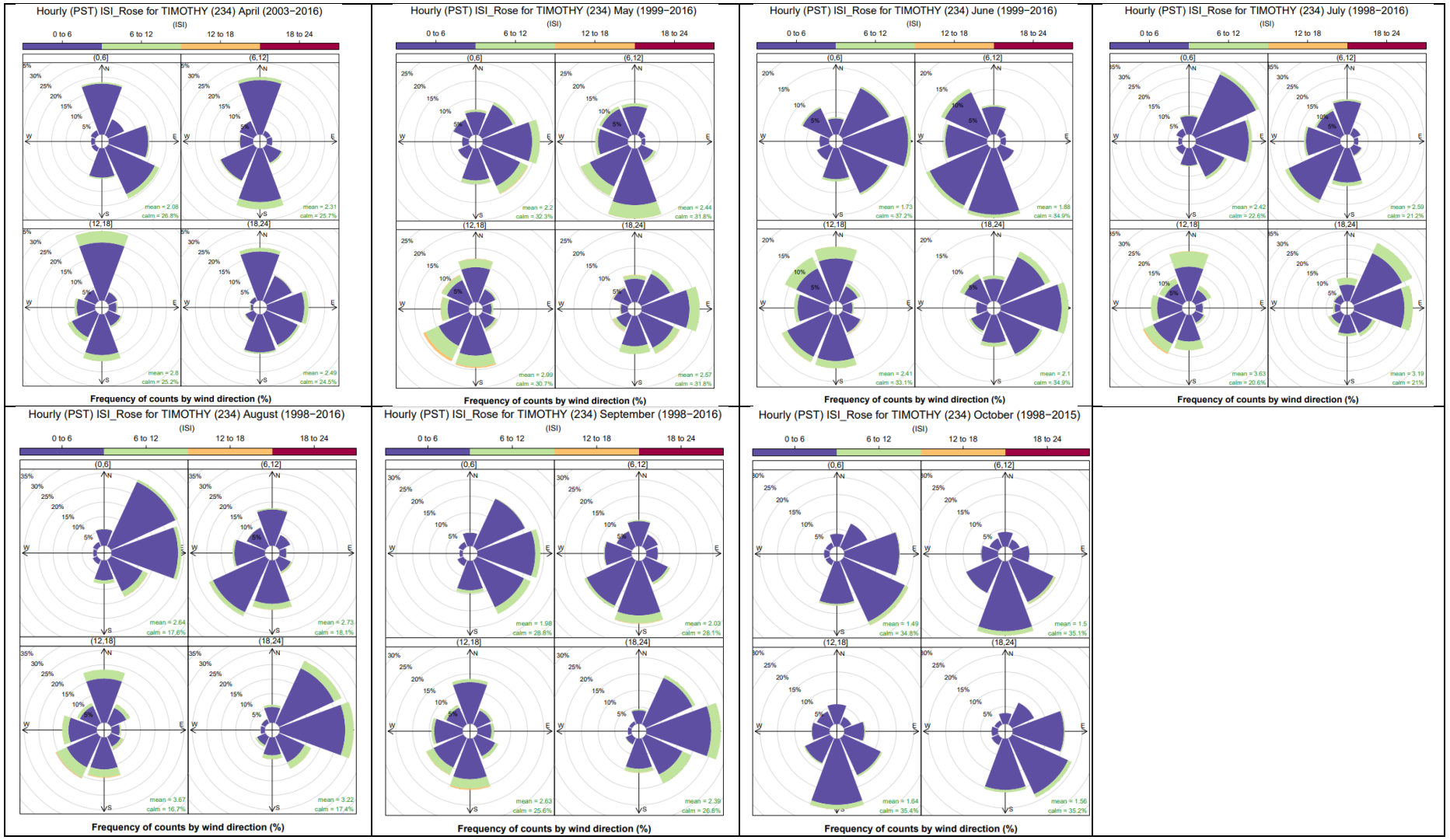


Figure 4. Initial Spread Index (ISI) roses depicting the average frequency of ISI values by wind direction for four 6-hour periods over the fire season April – October. Data taken from the Timothy weather station from 1998 to 2015.

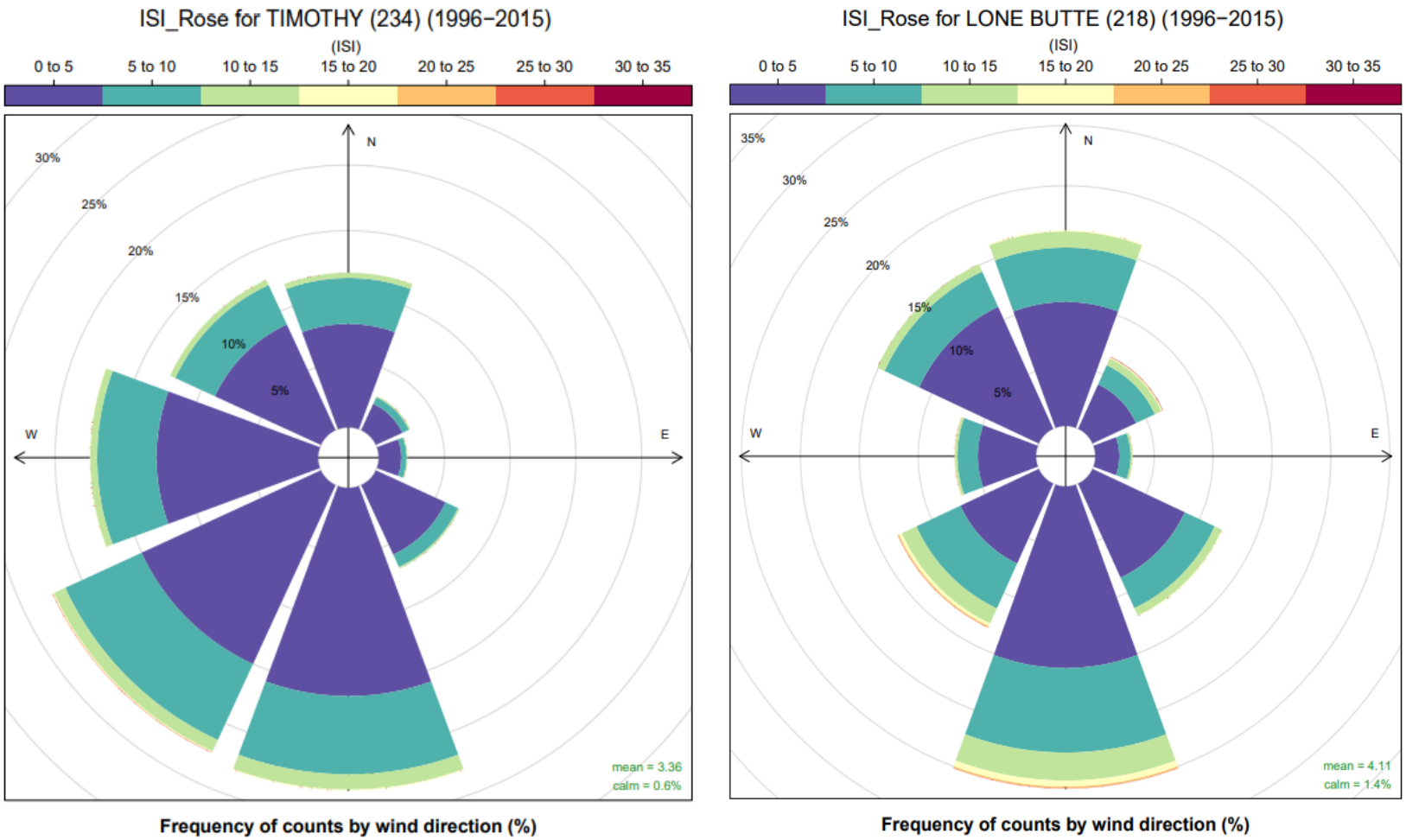


Figure 5. Initial Spread Index (ISI) roses depicting average daily wind speed and direction during the fire season (April – October) 1996 – 2015. Data taken from the Timothy fire weather station (left) and the Lone Butte weather station (right).

A-4 TOPOGRAPHY

Topography is an important environmental component that influences fire behaviour. Considerations include slope percentage (steepness) and slope position where slope percentage influences the fire's trajectory and rate of spread and slope position relates to the ability of a fire to gain momentum uphill. Other factors of topography that influence fire behaviour include aspect, elevation and land configuration.

Slope Class and Position

Slope steepness affects solar radiation intensity, fuel moisture (influenced by radiation intensity) and influences flame length and rate of spread of surface fires. Table 15 summarizes the fire behaviour implications for slope percentage (the steeper the slope the faster the spread). In addition, Slope position affects temperature and relative humidity as summarized in Table 16. A value placed at the bottom of the slope is equivalent to a value on flat ground (see Table 15). A value on the upper 1/3 of the slope would be impacted by preheating and faster rates of spread (Table 16). The majority of the AOI (95%) is on less than 20% slope and will likely not experience accelerated rates of spread due to slope class. Approximately 5% percent of the AOI is likely to experience an increased or high rate of spread. On the larger topographic scale, residential developments in the AOI would be considered bottom of the slope or valley bottom.

Table 15. Slope Percentage and Fire Behaviour Implications.

Slope	Percent of AOI	Fire Behaviour Implications
<20%	95%	Very little flame and fuel interaction caused by slope, normal rate of spread.
20-30%	4%	Flame tilt begins to preheat fuel, increase rate of spread.
30-45%	1%	Flame tilt preheats fuel and begins to bathe flames into fuel, high rate of spread.
40-60%	0.3%	Flame tilt preheats fuel and bathes flames into fuel, very high rate of spread.
>60%	0.01%	Flame tilt preheats fuel and bathes flames into fuel well upslope, extreme rate of spread.

Table 16. Slope Position of Value and Fire Behaviour Implications.

Slope Position of Value	Fire Behaviour Implications
Bottom of Slope/ Valley Bottom	Impacted by normal rates of spread.
Mid Slope - Bench	Impacted by increase rates of spread. Position on a bench may reduce the preheating near the value. (Value is offset from the slope).
Mid slope – continuous	Impacted by fast rates of spread. No break in terrain features affected by preheating and flames bathing into the fuel ahead of the fire.
Upper 1/3 of slope	Impacted by extreme rates of spread. At risk to large continuous fire run, preheating and flames bathing into the fuel.

APPENDIX B – WILDFIRE THREAT ASSESSMENT – FBP FUEL TYPE CHANGE RATIONALE

Provided separately as PDF package.

APPENDIX C – WILDFIRE THREAT ASSESSMENT WORKSHEETS AND PHOTOS

Provided separately as PDF package.

APPENDIX D – MAPS

Provided separately as PDF package.

APPENDIX E – WILDLAND URBAN INTERFACE DEFINED

The traditional and most simple definition for the wildland/urban interface (WUI) is "the place where the forest meets the community". However, this definition can be misleading. Incorrectly, it implies that neighborhoods and structures well within the perimeter of a larger community are not at risk from wildfire. As well, it fails to recognize that developments adjacent to grassland and bush are also vulnerable.

A more accurate and helpful definition of the WUI is based on a set of conditions, rather than a geographical location: "the presence of structures in locations in which conditions result in the potential for ignition of structures from the flames, radiant heat or embers of a wildland fire." This definition was developed by the National Fire Protection Association and is used by the US Firewise program. It recognizes that all types of wildland fuel/fire can lead to structural ignition (i.e. forest, grassland, brush) and also identifies the three potential sources of structural ignition.

Two situations are differentiated. Locations where there is a clean/abrupt transition from urban development to forest lands are usually specified as the "interface" whereas locations where structures are embedded or mingled within a matrix of dense wildland vegetation are known as the "intermix". An example of interface and intermixed areas is illustrated in Figure 6.

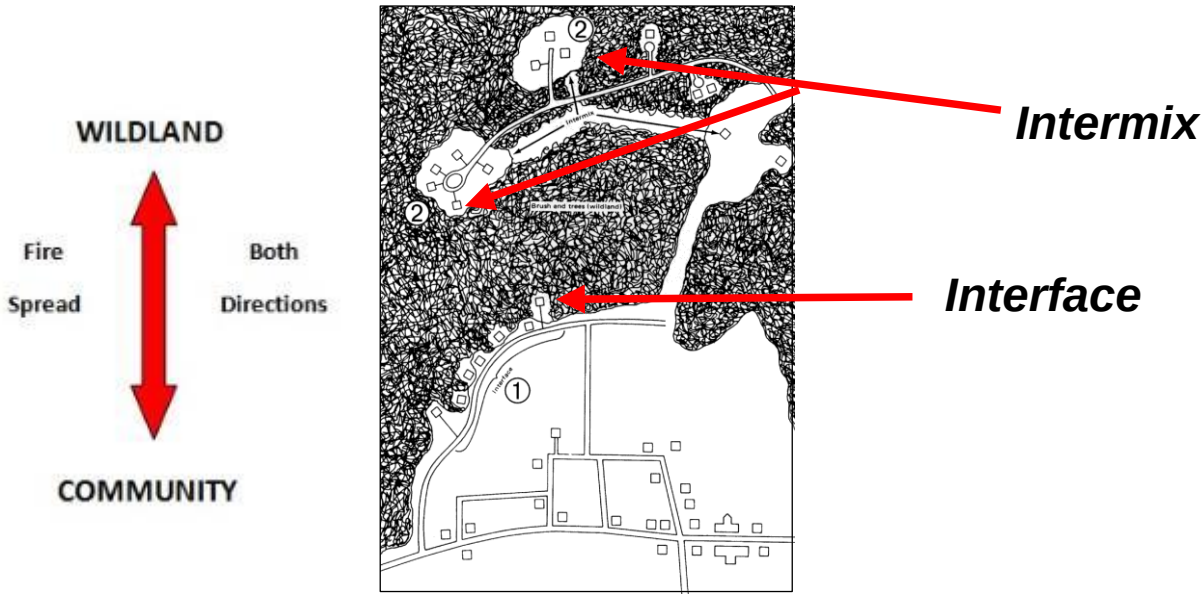


Figure 6. Illustration of intermix and interface situations.

Within the WUI, fire has the ability to spread from the forest into the community or from the community out into the forest. Although these two scenarios are quite different, they are of equal importance when considering interface fire risk. Regardless of which scenario occurs, there will be consequences for the community and this will have an impact on the way in which the community plans and prepares itself for interface fires.

Fires spreading into the WUI from the forest can impact homes in two distinct ways:

1. From sparks or burning embers carried by the wind, or convection that starts new fires beyond the zone of direct ignition (main advancing fire front), that alight on vulnerable construction materials

or adjacent flammable landscaping (roofing, siding, decks, cedar hedges, bark mulch, etc.) (Figure 7).

2. From direct flame contact, convective heating, conductive heating or radiant heating along the edge of a burning fire front (burning forest), or through structure-to-structure contact. Fire can ignite a vulnerable structure when the structure is in close proximity (within 10 meters of the flame) to either the forest edge or a burning house (Figure 8).

Figure 7. Firebrand caused ignitions: burning embers are carried ahead of the fire front and alight on vulnerable building surfaces.

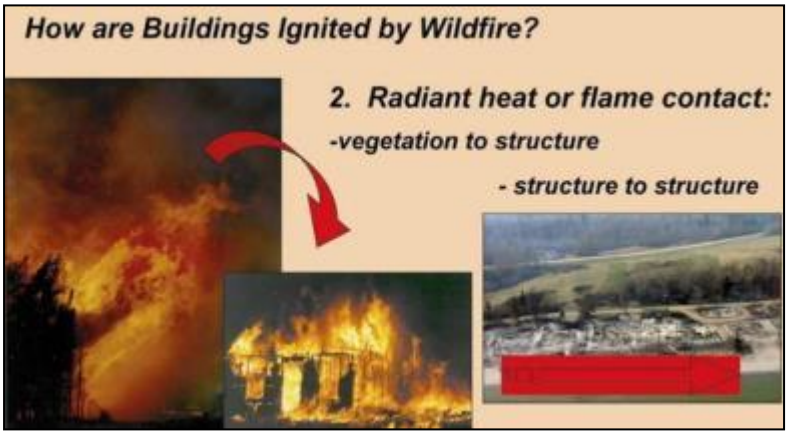


Figure 8. Radiant heat and flame contact allow fire to spread from vegetation to structure or from structure to structure.

Current research confirms that the majority of homes ignited during major WUI events trace back to embers as their cause (e.g. 50% – 80^{+} %). Firebrands can be transported long distances ahead of the wildfire, across any practicable fire guards, and accumulate on horizontal surfaces within the home ignition zone in densities that can reach 600^{+} /m^{2}. Combustible materials found within the home ignition zone combine to provide fire pathways allowing spot fires ignited by embers to spread and carry flames or smoldering fire into contact with structures.

APPENDIX F – WUI THREAT PLOT LOCATIONS

Table 17 displays a summary of all WUI threat plots completed during CWPP field work. The original WUI threat plot forms and photos will be submitted as a separate document. The following ratings are applied to applicable point ranges:

- Wildfire Behaviour Threat Score – Low (0-40); Moderate (41 – 95); High (96 – 149); Extreme (>149); and,
- WUI Threat Score – Low (0 – 13); Moderate (14 – 26); High (27 – 39); Extreme (>39).

Table 17. Summary of WUI Threat Assessment Worksheets.

WUI Plot #	Geographic Location	Wildfire Behaviour Threat Class	WUI Threat Class*
BEGG-1	West Lac La Hache- Kokanee Pit/Begg Road	High	Moderate
BEGG-2	West Lac La Hache- Kokanee Pit/Begg Road	High	Moderate
BJOR-1	West Lac La Hache- Kokanee Pit/Begg Road	High	Moderate
BURN-1	West of 108 Mile Green Belt	Moderate	n/a
BURN-2	West of 108 Mile Green Belt	Moderate	n/a
BURN-3	West of 108 Mile Green Belt	High	Moderate
BUSH-1	West of 108 Mile Green Belt- Bush Road	Moderate	n/a
CANI-1	Gateway- Back Valley Road	High	Moderate
CNPK-1	Cariboo Nature Provincial Park	High	Moderate
CNPK-2	Cariboo Nature Provincial Park	Moderate	n/a
CNPK-3	Cariboo Nature Provincial Park	Moderate	n/a
CNPK-4	Cariboo Nature Provincial Park	High	Moderate
COMF-1	100 Mile House Community Forest- Horse Lake Ridge Road	High	Moderate
COMF-2	100 Mile House Community Forest- Horse Lake Ridge Road	High	Low
COMP-1	West of Lone Butte, north of Hwy 24	High	Moderate
CRAG-1	East Lac La Hache- Lakeview Road	Moderate	n/a
DODG-1	West Lac La Hache- Dodge Road	High	Moderate

WUI Plot #	Geographic Location	Wildfire Behaviour Threat Class	WUI Threat Class*
DODG-2	West Lac La Hache- Dodge Road	High	Moderate
EDLK-1	93 Mile- Edmunds Lake Road	High	Moderate
EDLK-2	93 Mile- Edmunds Lake Road	Moderate	n/a
EDLK-3	93 Mile- Edmunds Lake Road	High	Moderate
EDLK-4	93 Mile- Edmunds Lake Road	High	Moderate
EDMU-1	93 Mile- Edmunds Lake Road	High	High
ELEF-1	93 Mile- Southeast of Hwy 24/Hwy 97 intersection	High	Moderate
ELEF-2	93 Mile- Southeast of Hwy 24/Hwy 97 intersection	High	High
FAWN-1	Horse Lake- Fawn Creek Road	High	High
FAWN-2	Horse Lake- Fawn Creek Road	High	High
FERG-1	West Lac La Hache- Northeast of Ferguson Road	High	Moderate
FERG-2	West Lac La Hache- Northeast of Ferguson Road	High	Moderate
FERG-3	West Lac La Hache- Northeast of Ferguson Road	High	High
GARY-1	Horse Lake- Gary Road	High	Moderate
GRAV-1	West Lac La Hache- Kokanee Pit/Begg Road	High	Moderate
GRAV-2	West Lac La Hache- Kokanee Pit/Begg Road	High	Moderate
HALL-1	Lac La Hache Fire Hall- Howarth Road	High	High
HALL-2	Lac La Hache Fire Hall- Howarth Road	High	Moderate
HALL-3	Lac La Hache Fire Hall- Howarth Road	High	High
HELE-1	Tatton Helena FSR- Southwest side of Lac La Hache	High	Extreme
HELE-10	Tatton Helena FSR- Southwest side of Lac La Hache	High	Moderate
HELE-11	Tatton Helena FSR- Southwest side of Lac La Hache	High	Moderate
HELE-12	Tatton Helena FSR- Southwest side of Lac La Hache	High	Moderate

WUI Plot #	Geographic Location	Wildfire Behaviour Threat Class	WUI Threat Class*
HELE-13	Tatton Helena FSR- Southwest side of Lac La Hache	High	Moderate
HELE-14	Tatton Helena FSR- Southwest side of Lac La Hache	High	High
HELE-2	Tatton Helena FSR- Southwest side of Lac La Hache	High	High
HELE-3	Tatton Helena FSR- Southwest side of Lac La Hache	High	Moderate
HELE-4	Tatton Helena FSR- Southwest side of Lac La Hache	High	Moderate
HELE-5	Tatton Helena FSR- Southwest side of Lac La Hache	High	Moderate
HELE-6	Tatton Helena FSR- Southwest side of Lac La Hache	High	Moderate
HELE-7	Tatton Helena FSR- Southwest side of Lac La Hache	High	Moderate
HELE-8	Tatton Helena FSR- Southwest side of Lac La Hache	High	Moderate
HELE-9	Tatton Helena FSR- Southwest side of Lac La Hache	High	Moderate
HERI-1	108 Mile- Sucker Lake- Archie Meadows Road	High	High
HIWY-1	East Lac La Hache off Highway 97	High	Moderate
HOLM-1	Horse Lake- Holmes Road	High	Moderate
HOLM-2	Horse Lake- Holmes Road	High	Moderate
HORS-1	Horse Lake Road- Finn Road	High	Extreme
HORS-10	Horse Lake Road- Woodlot- Fawn Creek Road	High	Low
HORS-2	Horse Lake Road- Finn Road	Moderate	n/a
HORS-3	Horse Lake Ridge Road	High	Moderate
HORS-4	Horse Lake Ridge Road	High	Low
HORS-5	Horse Lake Ridge Road	High	High
HORS-6	Horse Lake Road- Fawn Creek Trail	High	Low
HORS-7	Horse Lake Road- McNolty Road	High	Moderate
HORS-8	Horse Lake Road- Fawn Creek Trail	High	Low

WUI Plot #	Geographic Location	Wildfire Behaviour Threat Class	WUI Threat Class*
HORS-9	Horse Lake Road- 100 Mile House Community Forest- Watson Road	High	Moderate
HOUS-1	Gateway- Upper Houseman Road	High	High
HOUS-2	Gateway- Upper Houseman Road	High	Moderate
HOUS-3	Gateway- Upper Houseman Road	Moderate	n/a
INMA-1	Lone Butte- Inman Road- Woodlot	High	Moderate
INMA-2	Lone Butte- Inman Road- 100 Mile Community Forest	High	Moderate
INMA-3	Lone Butte- Inman Road- 100 Mile Community Forest	High	High
INTE-1	94 Mile FSR	High	High
KEEN-1	94 Mile- Edmunds Lake Road	High	High
KEEN-2	94 Mile- Edmunds Lake Road	High	Moderate
KEEN-3	94 Mile- Edmunds Lake Road	High	Moderate
LHLP-1	Lac La Hache Provincial Park	Moderate	n/a
LHLP-2	Lac La Hache Provincial Park	High	Extreme
LHLP-3	Lac La Hache Provincial Park	High	High
LILY-1	West of 108 Mile- Woodlot- Lily Pad Lake Road	High	High
LILY-2	West of 108 Mile- Woodlot- Lily Pad Lake Road	Moderate	n/a
LILY-3	West of 108 Mile- Woodlot- Lily Pad Lake Road	High	Moderate
LILY-4	West of 108 Mile- Woodlot- Lily Pad Lake Road	High	Moderate
LILY-5	West of 108 Mile- Woodlot- Lily Pad Lake Road	High	Moderate
LILY-6	West of 108 Mile- Woodlot- Lily Pad Lake Road	High	Moderate
LONE-1	Lone Butte- Garrett Road	High	High
LONE-2	Lone Butte- Perrey Road	High	High
LONE-3	Lone Butte- Barrett Road	High	High

WUI Plot #	Geographic Location	Wildfire Behaviour Threat Class	WUI Threat Class*
LONE-4	Lone Butte- Barrett Road	High	Extreme
LOOP-1	90 Mile Loop Road	High	Moderate
LOWE-1	Gateway- Lower Houseman Road	High	Extreme
MAZE-1	Lac La Hache- Kokannee Pit Road/Maze Forbes FSR	High	Moderate
MILE-1	94 Mile- Barrnett Road	High	Moderate
MILE-2	94 Mile	High	Moderate
MILE-3	94 Mile	High	Low
NORT-1	Horse Lake North Road	High	Moderate
NORT-2	North Shore Horse Lake Road	High	Moderate
NORT-3	North Shore Horse Lake Road	High	Moderate
NORT-4	North Shore Horse Lake Road	High	Low
NORT-5	North Shore Horse Lake Road	High	Moderate
NORT-6	North Shore Horse Lake Road	High	Low
NORT-7	North Shore Horse Lake Road	High	Moderate
PARK-1	Lac La Hache- Park Place	High	High
PARK-2	Lac La Hache- Park Place	Moderate	n/a
PARK-3	Lac La Hache- Park Place	Moderate	n/a
PARK-4	Lac La Hache- Park Place	High	High
PINE-1	Gateway- Pine Valley Drive	High	High
STAT-1	Lac La Hache Station Road- Woodlot	Moderate	n/a
STAT-2	Lac La Hache Station Road- Woodlot	High	Moderate
TATT-1	South side of Lac La Hache- Tatton Helena FSR	High	Low
TATT-2	South side of Lac La Hache- Tatton Helena FSR	Moderate	n/a

WUI Plot #	Geographic Location	Wildfire Behaviour Threat Class	WUI Threat Class*
TATT-3	South side of Lac La Hache- Tatton Helena FSR	Moderate	n/a
TATT-4	South side of Lac La Hache- Tatton Helena FSR	High	Low
TAYL-1	Lone Butte- Taylor Lake Road	High	Moderate
TAYL-2	Lone Butte- Taylor Lake Road	High	Moderate
TAYL-3	Lone Butte- Taylor Lake Road	High	Moderate
TAYL-4	Lone Butte- Taylor Lake Road	High	Moderate
TAYL-5	Lone Butte- Taylor Lake Road	High	High
TIMO-1	Lac La Hache- Timothy Lake Road	Moderate	n/a
WEST-1	Lac La Hache- Timothy Lake Road	Moderate	n/a
WEST-2	Lac La Hache- Timothy Lake Road	High	Moderate
WOO-1	Gateway- Back Valley Road- Woodlot	High	Moderate
WOO-2	Gateway- Back Valley Road- Woodlot	High	Moderate
WOO-3	Gateway- Back Valley Road- Woodlot	High	High
WOOD-1	East of Lone Butte- Woodlot	High	Moderate
WOOD-2	East of Lone Butte- Woodlot	High	Moderate
WRIT-1	West Lac La Hache- Wright Station Road	Moderate	n/a
WRIT-2	West Lac La Hache- Wright Station Road	High	Moderate

*Note that WUI threat scores are only collected for untreated polygons that rate high or extreme for Wildfire Behaviour Threat score.

APPENDIX G – FUEL TYPING METHODOLOGY AND LIMITATIONS

The initial starting point for fuel typing for the AOI was the 2019 provincial fuel typing layer provided by BCWS as part of the *2019 Provincial Strategic Threat Analysis* (PSTA) data package. This fuel type layer is based on the FBP fuel typing system. PSTA data is limited by the accuracy and availability of information within the Vegetation Resource Inventory (VRI) provincial data; confidence in provincial fuel type data is very low on private land. The PSTA threat class for all private land within the AOI was not available. Fuel types within the AOI have been updated using orthoimagery of the area with representative fuel type calls confirmed by field fuel type verification. Polygons not field-verified were assigned fuel types based upon similarities visible in orthophotography to areas field verified. Where polygons were available from the provincial fuel typing layer, they were utilized and updated as necessary for recent harvesting, development, etc.

It should be noted that fuel typing is intended to represent a fire behaviour pattern; a locally observed fuel type may have no exact analog within the FBP system. The FBP system was almost entirely developed for boreal and sub-boreal forest types, which do not occur within the AOI. As a result, the local fuel typing is a best approximation of the Canadian Forest Fire Danger Rating System (CFFDRS) classification, based on the fire behaviour potential of the fuel type during periods of high and extreme fire danger within the local MFLNRORD region. Additionally, provincial fuel typing depends heavily on VRI data, which is gathered and maintained in order to inform timber management objectives, not fire behaviour prediction. For this reason, VRI data often does not include important attributes which impact fuel type and hazard, but which are not integral to timber management objectives. Examples include: surface fuels and understory vegetation.

In some cases, fuel type polygons may not adequately describe the variation in the fuels present within a given polygon due to errors within the PSTA and VRI data, necessitating adjustments required to the PSTA data. In some areas, aerial imagery is not of sufficiently high resolution to make a fuel type call. Where fuel types could not be updated from imagery with a high level of confidence, the original PSTA fuel type polygon and call were retained.

For information on the provincial fuel typing process used for PSTA data as well as aiding in fuel type updates made in this document, please refer to Perrakis, Eade, and Hicks, 2018.[72]

[72] Perrakis, D.B., Eade G., and Hicks, D. 2018. Natural Resources Canada. Canadian Forest Service. *British Columbia Wildfire Fuel Typing and Fuel Type Layer Description* 2018 Version

APPENDIX H – WUI THREAT ASSESSMENT METHODOLOGY

As part of the CWPP process, spatial data submissions are required to meet the defined standards in the Program and Application Guide. As part of the program, proponents completing a CWPP or CWPP update are provided with the Provincial Strategic Threat Analysis (PSTA) dataset. This dataset includes:

- Current Fire Points
- Current Fire Polygons
- Fuel Type
- Historical Fire Points
- Historical Fire Polygons
- Mountain pine beetle polygons (sometimes not included)
- PSTA Head Fire Intensity
- PSTA Historical Fire Density
- PSTA Spotting Impact
- PSTA Threat Rating
- Structure Density
- Structures (sometimes not included)
- Wildland Urban Interface Buffer Area

The required components for the spatial data submission are detailed in the Program and Application Guide Spatial Appendix – these include:

- AOI
- Fire Threat
- Fuel Type
- Proposed Treatment
- Threat Plot

The provided PSTA data does not necessarily transfer directly into the geodatabase for submission, and several PSTA feature classes require extensive updating or correction. In addition, the Fire Threat determined in the PSTA is fundamentally different than the Fire Threat feature class that must be submitted in the spatial data package. The Fire Threat in the PSTA is based on provincial scale inputs - fire density; spotting impact; and head fire intensity, while the spatial submission Fire Threat is based on the components of the Wildland Urban Interface Threat Assessment Worksheet. For the scope of this project, completion of WUI Threat Assessment plots on the entire AOI is not possible, and therefore an analytical model has been built to assume Fire Threat based on spatially explicit variables that correspond to the WUI Threat Assessment worksheet.

Field Data Collection

The primary goals of field data collection are to confirm or correct the provincial fuel type, complete WUI Threat Assessment Plots, and assess other features of interest to the development of the CWPP update. This is accomplished by traversing as much of the AOI as possible (within time, budget and access constraints). Threat Assessment plots are completed on the 2012 version form, and as per the Wildland Urban Interface Threat Assessment Guide.

For clarity, the final threat ratings for the AOI were determined through the completion of the following methodological steps:

1. Update fuel-typing using orthophotography provided by the client and field verification.
2. Update structural data using critical infrastructure information provided by the client, field visits to confirm structure additions or deletions, and orthophotography
3. Complete field work to ground-truth fuel typing and threat ratings (completed 126 WUI threat plots on a variety of fuel types, aspects, and slopes and an additional 900+ field stops with qualitative notes, fuel type verification, and/or photographs)
4. Threat assessment analysis using field data collected and rating results of WUI threat plots – see next section.

Spatial Analysis

Not all attributes on the WUI Threat Assessment form can be determined using a GIS analysis on a landscape/polygon level. To emulate as closely as possible the threat categorization that would be determined using the Threat Assessment form, the variables in Table 18 were used as the basis for building the analytical model. The features chosen are those that are spatially explicit, available from existing and reliable spatial data or field data, and able to be confidently extrapolated to large polygons.

Table 18. Description of variables used in spatial analysis for WUI wildfire threat assessment.

WUI Threat Sheet Attribute	Used in Analysis?	Comment
FUEL SUBCOMPONENT		
Duff depth and Moisture Regime	No	Many of these attributes assumed by using 'fuel type' as a component of the Fire Threat analysis. Most of these components are not easily extrapolated to a landscape or polygon scale, or the data available to estimate over large areas (VRI) is unreliable.
Surface Fuel continuity	No	
Vegetation Fuel Composition	No	
Fine Woody Debris Continuity	No	
Large Woody Debris Continuity	No	
Live and Dead Coniferous Crown Closure	No	
Live and Dead Conifer Crown Base height	No	
Live and Dead suppressed and Understory Conifers	No	
Forest health	No	
Continuous forest/slash cover within 2 km	No	
WEATHER SUBCOMPONENT		
BEC zone	Yes	
Historical weather fire occurrence	Yes	
TOPOGRAPHY SUBCOMPONENT		
Aspect	Yes	
Slope	Yes	Elevation model was used to determine slope.
Terrain	No	
Landscape/ topographic limitations to wildfire spread	No	
STRUCTURAL SUBCOMPONENT		
Position of structure/ community on slope	No	
Type of development	No	
Position of assessment area relative to values	Yes	Distance to structure is used in analysis; position on slope relative to values at risk is too difficult to analyze spatially.

The field data is used to correct the fuel type polygon attributes provided in the PSTA. The corrected fuel type layer is then used as part of the initial spatial analysis process. The other components are developed using spatial data (BEC zone, fire history zone) or spatial analysis (aspect, slope). A scoring system was developed to categorize resultant polygons as having relatively low, moderate, high or extreme Fire Threat, or Low, Moderate, High or Extreme WUI Threat.

These attributes are combined to produce polygons with a final Fire Behaviour Threat Score. To determine the Wildland Urban Interface Score, only the distance to structures is used. Buffer distances are established as per the WUI Threat Assessment worksheet (<200, 200-500 and >500) for polygons that have a 'high' or 'extreme' Fire Behaviour Threat score. Polygons with structures within 200m are rated as 'extreme', within 500m are rated as 'high', within 2km are 'moderate', and distances over that are rated 'low'.

There are obvious limitations in this method, most notably that not all components of the threat assessment worksheet are scalable to a GIS model, generalizing the Fire Behaviour Threat score. The WUI Threat Score is greatly simplified, as determining the position of structures on a slope, the type of development and the relative position are difficult in an automated GIS process. This method uses the best available information to produce the initial threat assessment across the AOI in a format which is required by the UBCM SWPI program.

Upon completion of the initial spatial threat assessment, individual polygon refinement was completed. In this process, the WUI threat plots completed on the ground were used in the following ways:

- fuel scores were reviewed and applied to the fuel type in which the threat plot was completed;
- conservative fuel scores were then applied to the polygons by fuel type to check the initial assessment;
- high Wildfire Behaviour Threat Class polygons were reviewed in google earth to confirm their position on slope relative to values at risk.

In this way, we were able to consider fuel attributes outside the fuel typing layer, as well as assessment area position on slope relative to structures, which are included in the WUI threat plot worksheet.

Limitations

The threat class ratings are based initially upon (geographic information systems) GIS analysis that best represents the WUI wildfire threat assessment worksheet and are updated with ground-truthing WUI threat plots. WUI threat plots were completed in a variety of fuel types, slopes, and aspects in order to be able to confidently refine the GIS analysis. It should be noted that there are subcomponents in the worksheet which are not able to be analyzed using spatial analysis; these are factors that do not exist in the GIS environment.

The threat assessment is based largely on fuel typing, therefore the limitations with fuel typing accuracy (as detailed in Appendix A-1 and Appendix G) impacts the threat assessment, as well.

APPENDIX I – SUMMARY OF 2006 RECOMMENDATIONS

The following recommendations for wildfire risk reduction were made in the 2006 CWPP completed for the entire CRD. These recommendations were directed at "individual residents, the Cariboo Regional District, provincial government, utility companies, and First Nations reserves" and as such are not all applicable to CRD staff. However, some recommendations have been completed fully or in part. Actions taken by the CRD to implement applicable recommendations are summarized below.

Recommendation 1: Promote the FireSmart Home Owners' Manual widely as a reference for best practices to reduce the potential impact of a wildfire on property and buildings.

Not completed. The FireSmart Home Owner's Manual is not available on the CRD website.

Recommendation 2: Ensure that the timber mark application system is simple and easy to follow for residents wishing to remove trees from private property to meet FireSmart standards.

Not applicable (MFLNRORD).

Recommendation 3: Any proposed harvesting [by forest licensees] within 10 km of a population concentration or community should meet the FireSmart principles.

Not applicable (MFLNRORD).

Recommendation 4: Ensure that all forest fuel reduction activities: 1) Are documented in an area-specific plan; 2) Include consultation with agencies or groups responsible for managing the land use values identified in the plan; 3) Comply with the Open Burning Smoke Control Regulation or an Airshed Management Plan if one exists; 4) Incorporate proper disposal methods; and 5) Retain habitat values for Species and Risk and consider special features

Completed; 108 Mile Greenbelt Site Plan

Recommendation 5: The CRD should work with the Ministries of Forests and Range and Environment to establish locations where forest fuel debris can be deposited for safe burning when the air venting index is appropriate. As well, the Open Burning Smoke Control Regulation will have to be amended to allow for burning of waste debris when it has been removed from its place of origin.

Not applicable (MFLNRORD).

Recommendation 6: In the planning and development of new subdivisions, planners and developers should be required to: 1) Apply FireSmart standards; 2) Improve access for new subdivisions and cul-de-sacs according to MOTI standards; 3) Develop alternate access/egress routes and reactivate existing roads as required for emergency purposes; and 4) Prepare a CWPP for the subdivision.

Partially completed. The OCPs for Lac La Hache and the South Cariboo require wildfire mitigation strategies to be prepared by a qualified professional for new subdivisions.

Recommendation 7: The CRD should encourage the Ministry of Transportation to mow grass more frequently along the highway and arterial road rights-of-way within communities and interface areas.

Status unknown.

Recommendation 8: Establish a Development Permit Area policy for the identified interface areas to protect developments from hazardous conditions. Ensure compliance with Development Permit Areas by appropriate coverage of the Regional District's Building Inspection Service.

Not complete.

Recommendation 9: Through the referral process from the Ministry of Transportation, Highways Department, the CRD should require that in the planning and development of new subdivisions, planners and developers be required to: 1) Apply FireSmart standards; 2) Improve access for new subdivisions and cul-de-sacs according to MOTI standards; 3) Develop alternate access/egress routes and reactivate existing roads as required for emergency purposes; and 4) Prepare a CWPP for the subdivision.

Partially completed. See Recommendation 6.

Recommendation 10: The CRD should develop a local emergency response plan for each community within its geographic boundaries

Partially completed. An Emergency Response Plan was being developed by the CRD at the time of writing (2020).

Recommendation 11: All volunteer fire departments should have the appropriate equipment for fighting wildfires.

Partially completed. 108 Mile House and 100 Mile House VFDs have equipped initial attack/brush vehicles.

Recommendation 12: Obtain and locate sprinkler protection units (SPUs) for five buildings in each of the communities of 100 Mile House, Williams Lake, and Quesnel for quick initial deployment on an interface fire.

Completed. An SPU with pump, hoses, and sprinklers is shared by all South Cariboo VFDs.

Recommendation 13: Existing utility company rights-of-way close to communities should be enhanced where appropriate to serve as a fuel break

Status unknown.

Recommendation 14: Dovetail the efforts of First Nations and the Cariboo Regional District to manage fire hazard in certain areas

Not applicable; First Nations land is not included in this CWPP.

Recommendation 15: Initiate a process of informing area residents about FireSmart through a door-knocking campaign by structure fire department personnel, community associations, or Ministry of Forests and Range seasonal fire crews.

Partially completed. Local VFDs and BCWS crews participate in public education in the CRD.

Recommendation 16: The Union of BC Municipalities should be encouraged by the CRD to develop an educational program on the FireSmart program for school children in grades 1 to 6.

Status unknown.

Recommendation 17: Regularly include a small message in all CRD mail outs, newsletters, and other printed materials on the importance and need for all property owners to implement the FireSmart principles on their property.

Status unknown.

Recommendation 18: As a pilot project, implement the FireSmart principles relating to vegetation management strategies in the interface priority zones around each waste transfer station and landfill site to manage the fire hazard around them. In particular, the waste transfer stations at Alexis Creek, Tatla Lake, Big Lake, and Horsefly need immediate attention.

Status unknown.

Recommendation 19: As a pilot project, continue with the proposed treatments prescribed in the 'Richardson Report' of 1991 [108 Mile Greenbelt].

Completed. Treatments were completed in 2010-2012 and re-assessed in 2019.

Recommendation 20: Continue the clearing, brushing, and pruning work presently being done on the north side of Kersley as a pilot project.

Not applicable to this AOI.