Fraser Valley Regional District Zone C
2019 Community Wildfire Protection Plan

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*Cover photo: Stefana Dranga, Chilliwack Lake Provincial Park, Fraser Valley Regional District

REGISTERED PROFESSIONAL SIGN AND SEAL

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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 Community Resiliency Investment (CRI) program, managed and funded through the Union of BC Municipalities, CWPPs aim to develop strategic recommendations to assist in improving safety and to reduce the risk of damage to property from wildfires.

This CWPP will provide the Fraser Valley Regional District (FVRD) with a framework that can be used to review and assess areas of identified high fire risk within FVRD Zone C, which encompasses portions of Electoral Areas D, E and H. 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 the community.

Wildfire management requires a multi-faceted approach for greatest efficacy and risk reduction outcomes. A total of **45 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 and are found in written format. Because the area of interest extends outside the FVRD boundary onto private land and therefore outside FVRD jurisdiction, the FVRD's role may be limited to the role of an influencer in some instances, while other recommendations can be directly implemented by the FVRD. 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 FVRD 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.

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	High	Review and amend the two OCPs applicable to Zone C (Electoral Area (EA) "E" and "H" OCP and Electoral Area "D" OCP) to include a growth management policy which considers wildfire risk and other natural hazards during development. By constraining development, the FVRD can ensure that future development occurs where urban services, such as water for fire suppression, is available, reliable, and accessible. Overall intermix and rural areas are generally more vulnerable (at higher risk) for interface fires. For additional detail see Section 2.5.3.	~200 consultant hours and 50-100 in-house hours (local government funding) per individual EA OCP. May be eligible for UBCM CRI Program Funding[1]
2	11	Moderate	Work with the Planning and Development Department (i.e., building inspectors) to ensure house numbering is posted prior to occupancy of new development and to provide instructions on how and where best to affix numbering to facilitate emergency response and evacuation efforts. Consider encouraging home owner participation via a FVRD-wide engagement campaign and providing incentives such as the opportunity to acquire/purchase discounted address signs.	~30-45 in-house hours (local government funding). May be eligible for UBCM CRI Program Funding.
3	11	Moderate	Review and amend Section 5.1.4 of Bylaw 1386 to specify what constitutes an effective means of extinguishing an open fire (i.e., camp fire). BCWS recommends 8 litres of water and a hand tool (shovel, Pulaski). In accordance with BCWS recommendations, this section should also require the clearing of a fuel break around a fire wide enough to stop the spread of the fire and the siting of the fire in a fire pit or rock ring that is at least 3 m from trees, shrubs, structures, and debris.	~30 in-house hours (local government funding). May be eligible for UBCM CRI Program Funding

[1] Note that the UBCM SWPI funding stream has recently transitioned into a new Community Resiliency Investment (CRI) Program. Refer to Section 5.1 and the Union of BC Municipality's website (https://www.ubcm.ca/EN/main/funding/lgps/community-resiliency-investment.html) for further information.

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	Complete updates to the FVRD Regional Parks Strategic Plan (2025-2035) to include wildfire threat as a parks acquisition criterion. Access and potential costs of park and trail maintenance to mitigate wildfire risk should be weighed against other acquisition criteria. Amend Bylaw 1190 Campgrounds and Holiday Parks to include the following provisions: 1) require the use of a QP in review, assessment, and siting of parks and park access prior to acceptance; and 2) ensure that OCPs provide the FVRD authority to request modification (either fuels, access, or siting) based upon QP recommendation and prior to acceptance to ensure that the park is received in, and able to be maintained in, an acceptable range of risk. (See Section 6.1.3 for related recommendations specific to access).	~30-60 in-house hours (local government funding or UBCM/CRI program funding).
5	12	Moderate	Develop a trails master plans in collaboration with member municipalities to complement the FVRD Regional Parks Strategic Plan and include considerations for the placement, type, width, and objective of trails. 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 *Wildfire Act* and Regulations).	~50-80 in-house hours (local government funding)
6	12	Moderate	Create a new bylaw or amend an appropriate existing bylaw to require applications for developments within 200 m of areas mapped as moderate, high or extreme wildfire threat class in this CWPP to include a wildlife hazard assessment and mitigation strategy prepared by a qualified professional.	40-80 in-house hours (Local Government Funding/ CRI Funding)

Document Section 3: Values at Risk Recommendations				
Item	**Page No.**	**Priority**	**Recommendation / Next Steps**	**Estimated Cost ($) or Person hours**
Objective: Protect critical infrastructure and mitigate post-wildfire impacts				
7	18	Moderate	The use of fire-resistant construction materials, building design and landscaping should be considered for all critical infrastructure (CI) when completing upgrades or establishing new infrastructure. Additionally, vegetation setbacks around critical infrastructure should be compliant with FireSmart guidelines. Secondary power sources are important to reduce critical infrastructure vulnerability in the event of an emergency which cuts power for days, or even weeks.	Negligible in-house cost
8	18	High	Complete formal FireSmart assessments (by a Qualified Professional) for CI such as the fire halls, emergency operations centres, water infrastructure, and others as identified in this CWPP (Table 3) and by the FVRD.	~$1,500-2,000 per location (consultant cost)
9	18	Moderate	Complete a vulnerability assessment 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	Consider the option of conducting future assessments to explore the potential hydrologic and geomorphic impacts of wildfire on the 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 communities.	To be determined, this cost would depend on the scope of the assessment (~$10,000-$40,000)
Document Section 5: Risk Management and Mitigation Factors Recommendations				
Item	**Page No.**	**Priority**	**Recommendation / Next Steps**	**Estimated Cost ($) or Person hours**
Objective: Undertake Fuel Treatments to Improve Emergency Access				
11	45	Low	Work with the Ministry of Transportation and Infrastructure (MOTI), to assess high hazard fuel types (C-3 and M-1/2) along the Columbia Valley Highway and Chilliwack Lake Road and reduce hazardous fuels within 100 m of either side of the road, where possible, with consideration of private land and topographic constraints. This is to increase public safety by improving emergency access in the event of an evacuation or wildfire event.	Appropriate funding stream to be identified. 10-person hours, however dependent upon FVRD's role within the project

Document Section 5: Risk Management and Mitigation Factors Recommendations				
Item	**Page No.**	**Priority**	**Recommendation / Next Steps**	**Estimated Cost ($) or Person hours**
Objective: Reduce Wildfire Threat through Fuel Management				
12	47	High	Proceed with detailed assessment, prescription development and treatment of hazardous fuel units and FireSmart fuel treatment demonstration treatment areas identified and prioritized in this CWPP.	UBCM CRI Program Funding/Local Government Funding
13	47	Low	Develop a rationale for alternative stocking standards applicable to the FVRD, by employing a qualified wildfire management professional, and in consultation with the Wildfire Prevention Officer (Coastal Fire Centre) and MFLNRORD. Engage partners such as woodlot and/or other licensees to apply the MFLNRORD approved reduced fire management stocking standards in the FVRD Zone C wildland urban interface to reduce interface wildfire threat.	$3,000
14	55	Moderate	As treatments are implemented, treatment monitoring should be completed by a qualified professional to schedule next set of maintenance activities (5 – 10 years out). This can be completed as part of a CWPP update or as a stand-alone exercise.	UBCM CRI Program Funding/Local Government Funding
Objective: Reduce wildfire hazard on private land				
15	62	Moderate	Review the Official Community Plans (OCPs) for Areas “D” and “E and H”; consider including wildfire as a natural hazard development permit area (DPA). A recommended development permit area for the FVRD Zone C would include all areas in the AOI that are located within 200 m of moderate, high or extreme wildfire behaviour threat class areas. For additional detail see Section 5.2.2.	Can be done in conjunction with Recommendation #1; effort hours included in Recommendation #1. Additional $10,000 for consultant analysis and support (Local Government Funding/ CRI Funding)
16	62	Moderate	Engage VFDs to assist in the identification of minimum design requirements for alternative water supply, emergency access/egress, and hydrant placement. Input provided by the VFDs should be considered in the development of policies and regulations associated with the wildfire hazard development permit area.	20-40 in-house hours (UBCM CRI Program funding associated with DPA/Local Government Funding)

Document Section 5: Risk Management and Mitigation Factors Recommendations				
Item	**Page No.**	**Priority**	**Recommendation / Next Steps**	**Estimated Cost ($) or Person hours**
17	63	Low	Develop a landscaping guide 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 referencing the landscaping guide in the development permit area bylaw, 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 the Regional District Office or other strategic locations).	$2,000 - $3,000 to outsource. Alternatively, general FireSmart landscaping information is available free of charge, but is not climate/ plant hardiness zone specific
18	63	Low	Engage the development/building community (may include developers, builders, landscapers, and architects) in wildfire risk reduction and the DP 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 DP objectives, 4) educate and inform regarding the DP process and expectations.	~40 hours
19	64	Moderate	Following FireSmart assessments of critical infrastructure, the FVRD should apply for FireSmart demonstration grants through the Community Resiliency Investment (CRI) Program. This type of project can display the practices and principles of FireSmart activities to the public in the form of demonstration treatments. FireSmart demonstration projects are beneficial in that they meet the dual objectives of enhancing public education of wildfire mitigation and FireSmart principles and improving the resilience of a structure(s) to wildfire.	20-40 in-house administrative hours. Cost varies depending on number of projects and extent of upgrades. Eligible for UBCM CRI Program funding.

Document Section 5: Risk Management and Mitigation Factors Recommendations				
Item	**Page No.**	**Priority**	**Recommendation / Next Steps**	**Estimated Cost ($) or Person hours**
20	65	Moderate	Develop and implement a community chipper program with the help of neighbourhood representatives and community groups. As a demonstration, this program can begin twice per year in two separate neighbourhoods or communities. This program can also be implemented in conjunction with community clean up days.	Time dependent upon program. Eligible for UBCM CRI Program Funding. Additional time for advertisement of program availability will be required.
21	66	High	The FVRD should hire a qualified professional (QP) or consider training additional local fire services staff members as Local FireSmart Representatives to assist the various communities in complying with FireSmart principles at the community, neighbourhood and/or individual home-level.	~25 in-house hours (Consultant and/or Fire Department, FVRD Emergency Management staff)
22	67	Moderate	The FVRD should 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 moderate, high or extreme risk in a FireSmart home and property assessment. The rebate program must adhere to the goals of FireSmart, as outlined in Section 5.2.1.	20-35 FVRD staff hours
Objective: Increase public wildfire awareness				
23	68	High	This report and associated maps should be made publicly available through webpage, social media, and public FireSmart meetings.	3-6 hours depending on method of distribution
24	68	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 FVRD'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 should be initiated every 5 - 7 years.	UBCM/CRI Program 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**
25	68	Moderate	Develop a social media strategy and ensure that its full power is leveraged to communicate fire bans, high or extreme Fire Danger days, wildfire prevention initiatives and programs, easily implementable FireSmart activities, updates on current fires and associated air quality, road closures, and other real-time information in an accurate and timely manner.	~40 hours to create strategy. ~20 hours to identify partners, initiate relationship and gain strategy support. Additional daily/weekly hours to implement and update depending on strategy
26	69	High	Promote FireSmart approaches for wildfire risk reduction to FVRD residents through Town Hall meetings, workshops FireSmart 101 course and/or presentations. Aim to conduct the engagement/promotion campaign prior and during the fire season. Consider supplying FireSmart materials to homeowners in the interface during these engagement campaigns.	~10 hours. May be eligible for UBCM/CRI Program grant
27	69	Moderate	Promote improved planning and preparedness of agriculture producers in the FVRD 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 FVRD website, mailouts). Resources include a Wildfire Preparedness and Mitigation Plan - Guide and Workbook.	30-40 in-house hours
28	69	Moderate	Work towards FireSmart community recognition, at the neighbourhood level and facilitate uptake into the FireSmart Canada Community Recognition Program (FSCCRP). This will help reduce fire risk and aid in further funding applications.	FireSmart grant (when funding is available)

Document Section 5: Risk Management and Mitigation Factors Recommendations				
Item	**Page No.**	**Priority**	**Recommendation / Next Steps**	**Estimated Cost ($) or Person hours**
29	69	Moderate	Facilitate the FSCCRP uptake within the FVRD Zone C and enhance its applications by including the following: 1) inviting BCWS crews to participate in and support the annual FireSmart events set up by participating neighbourhoods. 2) Encourage individual homeowner participants to complete the self-administered FireSmart home assessment tool. 3) Include within the FireSmart Canada Community Assessment Report the standard recommendation that participating neighbourhoods hold a home hazard assessment workshop as one of their FireSmart events.	$5,000/neighbourhood and an additional 40 hours/initiative UBCM/CRI Program grant(s) available
30	69	Moderate	Promote the use of the FireSmart Home Partners Program offered by the Partners in Protection Association, which facilitates voluntary FireSmart assessments on private property. Use the opportunity to educate the home or business owner about the hazards which exist on their property and provide easy improvements to reduce their risk.	~1.5 hours/assessment
31	69	Low	Encourage schools to adopt and deploy existing school education programs (e.g. FireSmart BC Education Package) to engage youth in wildfire management and risk reduction. 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 British Columbia Wildfire Service (BCWS) (Fraser Fire Zone), 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**
32	69	High	Develop and work with all key stakeholders (MFLNRORD, BCWS, BC Parks, BC Hydro, licensees, woodlot licence holders, and recreational groups/representatives) and First Nations 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) Development of large, landscape level fuel breaks; 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 plan, advertise/ communicate, attend, and debrief meetings; additional hours required depending on implementable actions and potential sub-committees developed
33	70	High	Promote and provide information to private landowners related to external residential sprinklers as a FireSmart prevention measure.	10-20 hours to prepare materials and disseminate information to landowners
Objective: Promote Fuel Management and Joint Initiatives				
34	70	Moderate	Work with industrial operators such as BC Hydro, FortisBC and Enbridge to advocate that high risk activities, such as grubbing/brushing and right-of-way mowing work do not occur during high fire danger times to reduce chance of ignitions as per the *Wildfire Act*.	4-6 hours
35	70	Moderate	Work with industrial operators (i.e., BC Hydro, FortisBC and Enbridge) to advocate that right-of-ways do not contain fine fuel accumulations (easily cured) or high conifer regeneration prior to and during the fire season and are maintained in a low hazard state (to serve as fuel breaks).	4-6 hours

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				
36	73	High	All new rural development outside existing FVRD water systems should have a water system which meets or exceeds minimum standards of NFPA 1142, *Standard on Water Supplies for Suburban and Rural Fire Fighting*. FVRD volunteer fire departments and/or Engineering and Community Services 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
37	74	Moderate	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				
38	74	High	Complete and participate in regular testing of, and updates to, the evacuation plan.	~30-40 hours to plan and stage; 8 hours to complete testing
39	75	Moderate	Include a qualified professional with experience in operational wildland/interface fire suppression in the planning and strategic siting of future trails and parks.	10-20 hours to review current trails/map, provide recommendations
40	75	High	Develop a Total Access Plan for the FVRD to create, map and inventory trail and road network in natural areas for suppression planning, identification of areas with insufficient access and to aid in strategic planning. Georeferenced maps with ground-truthed locations of potential optimal firebreaks 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. U-sing information from RAAD (Remote Access to Archeological Data), the Total Access Plan should also incorporate an inventory of registered and potential archeological sites that can be shared with BCWS during a wildfire event to address potential impacts to cultural sites. As part of this plan, relevant cultural information and protocols to share with BCWS should be developed in consultation with local First Nations.	~8,000-$10,000 to build plan, map, populate attributes and update (contractor estimate)

Document Section 6: Wildfire Response Resources Recommendations				
Item	**Page No.**	**Priority**	**Recommendation / Next Steps**	**Estimated Cost ($) or Person hours**
Objective: Increase and continually develop FVRD Volunteer Fire Department staff training				
41	76	High	FVRD fire departments should continue working with BCWS to maintain an annual structural and interface training program. 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 FVRD and member municipalities engage in yearly practical wildland fire training with BCWS that covers at a minimum: pump, hose, hydrant, air tanker awareness, and deployment 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.	Cost and time dependent upon training exercise (scope, number of participating members etc.)
42	76	Moderate	FVRD fire departments should engage in regular communication with the BCWS Fraser Fire Zone – Cultus/Haig Fire Base to foster a strong relationship and identify potential cooperative wildfire risk reduction opportunities.	~4 hours/ year
43	77	High	Ensure that the FVRD fire departments maintain the capability to effectively suppress wildland fires, through wildfire-specific training sessions. Maintain high level of member education and training specific to interface and wildland fires by including S-100 and S-185 (combined) 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 FVRD 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.	Current FVRD training budget and UBCM CRI Program Funding

Document Section 6: Wildfire Response Resources Recommendations				
Item	**Page No.**	**Priority**	**Recommendation / Next Steps**	**Estimated Cost ($) or Person hours**
Objective: Structure Protection				
44	78	Moderate	Develop 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 community chipping opportunities, yard waste dumpsters available by month in neighbourhoods, or scheduled burning weekends. Programs should be available during times of greatest resident activity (likely spring and fall).	Time dependent upon program. May be eligible for UBCM/CRI Program funding. Additional time for advertisement of program availability will be required.
45	78	Low	Consider acquiring a Type 2 SPU trailer to improve wildfire response (provides protection for 25-30 residences).	$100,000-$150,000 depending on configuration.

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COMMONLY USED ACRONYMS

BCWS	British Columbia Wildfire Service
BEC	Biogeoclimatic Ecosystem Classification
CDC	Conservation Data Centre
CFFDRS	Canadian Forest Fire Danger Rating System
CLVFD	Cultus Lake Volunteer Fire Department
CRI	Community Resiliency Investment Program
CRVVFD	Chilliwack River Valley Volunteer Fire Department
CVVFD	Columbia Valley/Lindell Beach Volunteer Fire Department
CWPP	Community Wildfire Protection Plan
DP	Development Permit
DPA	Development Permit Area
FBP	Fire Behaviour Prediction System
FMP	Fire Management Plan
FRS	Fire Rescue Services
FSCCRP	FireSmart Canada Community Recognition Program
FVRD	Fraser Valley Regional District
GAR	Government Actions Regulation
HIZ	Home Ignition Zone
LRMP	Land and Resource Management Plan
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
PVFD	Popkum Volunteer Fire Department
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 Fraser Valley Regional District (FVRD) in developing a Community Wildfire Protection Plan (CWPP); hereinafter referred to as the CWPP, for Zone C of the FVRD. This CWPP document integrates 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, the FVRD recognizes that wildfire mitigation and planning is an important component of emergency planning and preparedness.

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, surpassing the 2017 fire season. The total suppression costs for the 2018 season were calculated at $615 million and the 2017 fire season costs were estimated at over $568 million[2]. 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, neighbourhoods 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[3] (WUI).

1.1 PURPOSE

The purpose of this CWPP is to identify and update the wildfire risks within and surrounding the FVRD Zone C, 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 provides an assessment of the level of risk with respect to changes in the area that have occurred recently and gives the FVRD 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, in addition to defining the threats to human life, property and critical infrastructure, is to identify the necessary measures to mitigate these threats, and outline a plan of action for implementing these measures. Specifically, this CWPP 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.

[2] 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.

1.2 CWPP PLANNING PROCESS

This CWPP 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 values at risk (structures) within Zone C of the FVRD. The CWPP 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 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) **Development of a risk mitigation strategy**. A guide for the FVRD 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 outside 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 was crucial in developing this CWPP.

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 FVRD staff, which included: Manager of Electoral Area Emergency Services, Deputy Director of Planning and Development, Director of Engineering and Community Services, Planner, Manager of Park Operations, and GIS Technician. 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 FVRD vulnerabilities, and to determine priorities and potential mitigation strategies. Members of the Working Group were consulted on an ongoing basis throughout the plan development process and were integral in providing Plan review and approval.

BCWS representatives from the Coastal Fire Centre and Fraser Fire Zone (Wildfire Prevention Officer and Wildfire Technician) 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 FVRD; and 3) revision of draft document upon plan completion.

Information sharing took place with 27 First Nations with overlapping rights and title, as identified through the Consultative Areas Database and in consultation with MFLNRORD and the FVRD.

Consultation efforts involved the review of the draft CWPP document and focused on identifying areas where potential cultural values at risk may require protection and consideration. Information sharing consisted of an initial phone call, and subsequent distribution of a referral letter and information sharing package (maps, explanation of CWPP, and CWPP draft).

Additional stakeholders were consulted to identify synergies, opportunities for collaboration, and ensure linkages with adjacent and overlapping planning. These stakeholders included the MFLNRORD Chilliwack Natural Resource District's Stewardship Officer; BCWS Coast Fire Centre - Wildfire Officer; BC Parks staff for the South Coast Region (Parks and Protected Areas Section Head for the Lower Mainland); and the following forest licensees: Northwest Hardwoods and Ts'elxweyqw Forestry Limited Partnership. Combined, these various consultation and engagement opportunities have generated a shared understanding of the CWPP 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 Zone C of the FVRD was assessed through a combination of the following approaches:

- Natural fire regime and ecology (Section 4.1);
- 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 FVRD Board will ensure high level approval and support for this CWPP.

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

Zone C of the Fraser Valley Regional District is located in the South Coast region of BC, and is approximately 100 km east of Vancouver. The AOI for the CWPP is illustrated below in Map 1. The AOI represents a two-kilometer (km) spotting buffer around values at risk (structures) within portions of Electoral Areas H (Cultus Lake – Columbia Valley – Lindell Beach), E (Chilliwack River Valley) and D (Popkum – Bridal Falls). There are multiple bordering jurisdictions, which include the District of Kent on the north side, the City of Chilliwack in the northwest, the City of Abbottsford in the southwest, FVRD Electoral Area B to the east and the US border directly south. The AOI does not include any municipalities or First Nations communities. There are multiple small, unincorporated communities located within the AOI including Cultus Lake, Lindell Beach, Popkum Village, and Bridal Falls as well as rural residential and institutional areas in the Chilliwack River Valley. The AOI is characterized by a mix of residential, commercial, institutional and industrial properties.

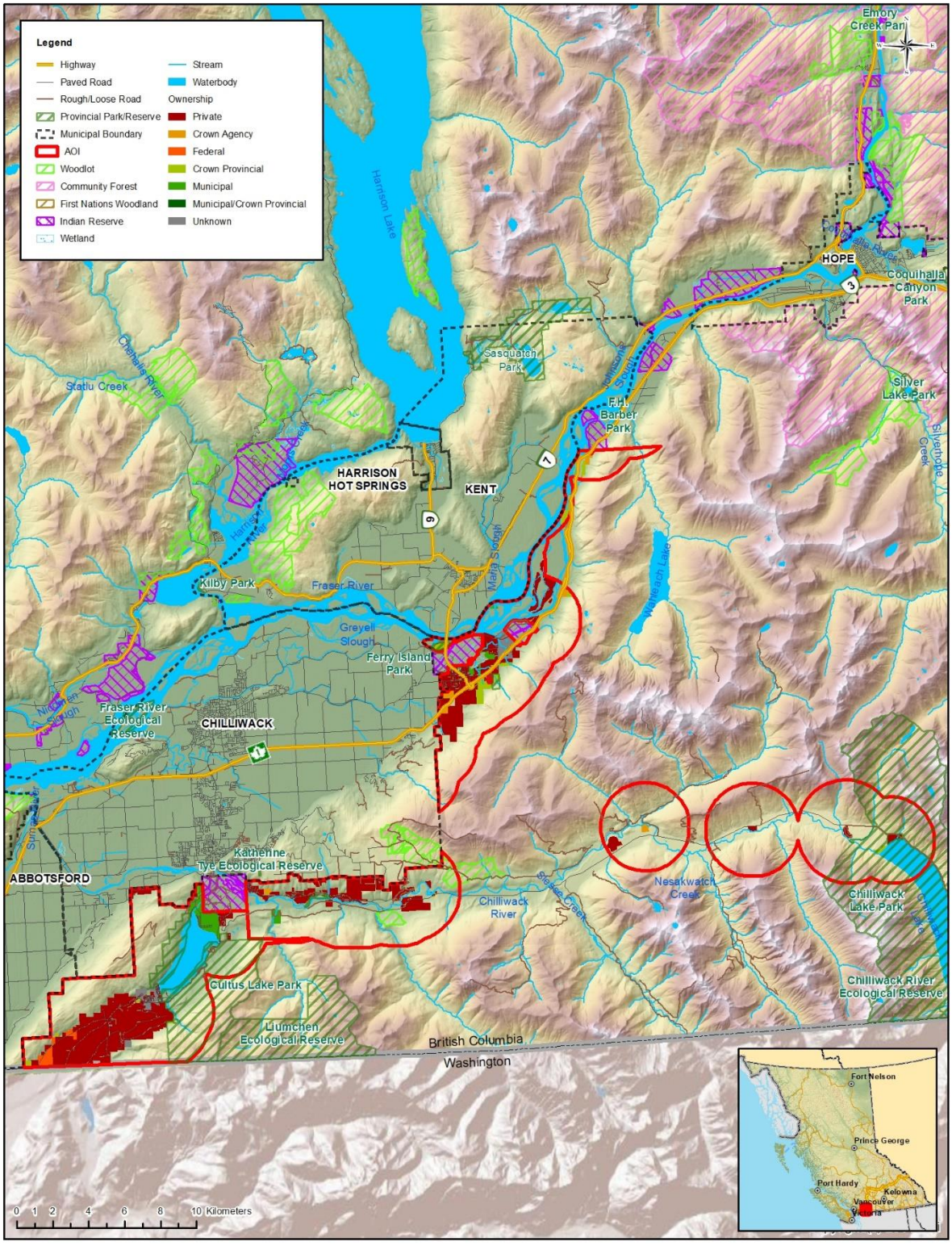
In its entirety, the FVRD has a population of 295,934 people and covers an area of approximately 13,336 km^2, including eight electoral areas and six municipalities[4]. The three Electoral Areas (H, E and D) that overlap the AOI have a total population of 4,916 people and encompass a combined area of approximately 970 km^2[5]. The population of the AOI is a subset of this total population. The AOI is composed of three polygons and spans approximately 24,406 ha. 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	3,218
Municipal	329
Provincial Crown	20,442
Crown Agency	105
Federal Crown	94
Unknown	217
Total	**24,406**

4 Fraser Valley Regional District. 2017. Retrieved online at: https://www.fvrd.ca/assets/Services/Documents/Strategic~Planning~and~Initiatives/Census%20Release%20Report%20FINAL%2014%20July.pdf

5 Statistics Canada. 2016 Census



Map 1. Area of Interest (AOI).

2.2 COMMUNITY DESCRIPTION

The entire Fraser Valley region has been inhabited by the Nlaka'pamux and the Coast Salish Aboriginal Peoples since time immemorial. The Cheam First Nations, Popkum Indian Band and Soowahalie Indian Band are among the many Stl'atl'imc and the Coast Salish First Nations that historically occupied the land, some of whom continue to live within the FVRD today. At present, the AOI includes multiple distinct communities (as listed in Section 2.1 above). Four First Nation Reserves are surrounded by or adjacent to the AOI including: Soowahlie No.14, Cheam No.1, Peters No. 1 and Popkum No.1.

The AOI encompasses portions of the FVRD Electoral Areas H, E and D and services to residents of the FVRD are provided both at the regional and the electoral area level. The regional government provides, emergency planning, economic development and regional parks planning. At the electoral level, some of the local services provided include land use planning, fire protection services, water/waste water services, flood control, waste management, transit, community parks, and street lighting.

The AOI is topographically diverse, with low lying agriculturally productive lands, large lakes and rivers, floodplains, rolling hills and mountainous terrain. Within the AOI, the elevation varies significantly from sea level to roughly 1,820 m. The AOI comprises multiple lakes, rivers and streams, including Cultus Lake which is the largest freshwater body in the AOI, a portion of Chilliwack Lake, as well as the Fraser and Chilliwack Rivers and Slesse Creek.

The economy of Zone C was historically driven by resource-based industries such as mining, forestry, agriculture, dairy farming, steelhead fishing, and tourism-and recreation developments[6]. Although these industries continue to remain important to the communities within the AOI, the economic focus has shifted in recent decades to residential and commercial developments, recreation, tourism, higher value agriculture, industrial livestock farming and independent hydro power projects[7].

Fire protection within the AOI is the responsibility of four volunteer fire departments (VFD) which include: the Popkum VFD (Popkum Hall #1), Columbia Valley/Lindell Beach VFD (Columbia Valley Hall #1), Cultus Lake VFD (Cultus Lake Hall #1) and the Chilliwack River Valley VFD (Chilliwack River Valley Hall #1). Mutual aid agreements exist between fire departments within the AOI and between other neighbouring fire departments. BCWS is responsible for responding to fires that are beyond the boundaries of the department Fire Service Areas.

In the event of a wildfire, communities within the AOI have limited emergency access and egress routes. The Trans-Canada Highway (Highway 1) and Chilliwack Lake Road are the only reliable, paved access routes. Furthermore, many of the developments within the AOI are located on single access roads which branch off of Highway 1 or Chilliwack Lake Road. 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.

[6] Fraser Valley Regional District. OCP Popkum-Bridal Falls, Electoral Area "D", 1997.
[7] Fraser Valley Regional District. OCP for Electoral Areas "E" and "H", 2011.

2.3 PAST WILDFIRES, EVACUATIONS AND IMPACTS

BCWS staff communicated that the majority of past wildfire activity within the AOI was human-caused and ignitions are primarily due to recreational and camp fire use, residential burning and, less common, lightning fire starts within the backcountry. BCWS staff reported that slash accumulations following industrial logging are generally not an issue within the AOI.

Based on the BCWS historical wildfire dataset, the two largest fires to burn within and adjacent to the AOI occurred in 1938, and burned a combined area of 11,517 ha. Both of these wildfires were human caused. The most recent fires to occur within the AOI were located along the east side of Cultus Lake and include a 2 ha wildfire in 2013 and a 17.2 ha wildfire in 2016. Both were human caused and identified as incendiary fires. Several significant and notable wildfires have recently (2018 and 2017) occurred in the vicinity of the AOI. These include the 2018 wildfire near Mt. Hicks in the District of Kent which burned an estimated area of 427 ha, a wildfire along Silver Skagit Road that burned a total of 17.9 ha and another within Skagit Valley Provincial Park near Silvertip Campground that burned a total area of 5,949 ha. Although no property was damaged due to this latter lightning caused fire, the fire lead to the closure of Skagit Valley Provincial Park.

Access and evacuation vulnerabilities are present in many locations throughout the AOI. Specific vulnerabilities noted by the FVRD are related to the single egress route for communities along the east shore of Cultus Lake and along Chilliwack Lake Road which runs through Slesse Park and leads to Chilliwack Lake Provincial Park.

The BC Wildfire Service historical ignition dataset demonstrates that the proportion of human-caused fires within the AOI is substantially greater than that of the province as a whole.[8] The ignition data shows that within the AOI, over 80% of all ignitions since 1950 have been human-caused (a conservative estimate not including miscellaneous/undetermined causes), versus the BC provincial average of 40%.[9] This statistic may be explained by the lower proportion and occurrence of lightning strikes in wet coastal areas of the province such as in the Cascade Mountain Range and near the Skagit Valley relative to other areas in the Province. Additionally, high 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, also contribute to this statistic.

2.4 CURRENT COMMUNITY ENGAGEMENT

There are varying levels of recognition and awareness, among both FVRD staff and the communities in Zone C, of the threat posed to communities by wildfire. As a result, there has been limited community engagement in FireSmart initiatives to this point. Within the AOI there are staff members who are trained as FireSmart representatives and are up to date in FireSmart training and are able to give FireSmart presentations to community members upon request. The FVRD also provides links to Emergency Management BC and BC Wildfire Service websites which in turn provide access to relevant information regarding wildfires, fire bans and wildfire prevention. The FVRD has also prepared a “Fraser

[8] BC Wildfire Service: Fire Incident Locations - Historical
[9] BCWS, 2019

Valley Regional District Emergency Preparedness Guide"[10] and workbook for residents including guidance on how to prepare in advance of a wildfire. Fire department-initiated education regarding wildfire threat and prevention varies by department and none of the volunteer fire departments have their own website.

The Chilliwack River Valley VFD has promoted awareness of wildfires and FireSmart practices through a recent community event held at the Chilliwack River Fire Hall during which FireSmart information was distributed to the public. Recommendations for further education and communication initiatives that may be undertaken by the Regional District are provided in Section 5.3. Additionally, the Chilliwack River Valley VFD has a sprinkler program that is available to residents through the Electoral Area Director. The FVRD does not have an established wildfire hazard development permit area in Electoral Areas H, D and E that addresses new development in the wildland urban interface, and sets standards based on FireSmart principles for building material use, landscaping and appropriate setbacks from forested areas. Future initiatives should focus engagement efforts during times of high public uptake (during or post wildfire season) in order to maximize the resources available for community engagement.

2.5 LINKAGES TO OTHER PLANS AND POLICIES

The following is a summary of FVRD 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 FVRD, which has created a comprehensive Emergency Management Response and Recovery Plan (FVRD, 2013)[11] to serve the region including electoral areas overlapping the AOI. This emergency management plan was developed to optimize the response, resources and planning for major emergencies that may occur within the FVRD. The plan outlines the overall emergency management structure; Emergency Operations Centre (EOC) organization, functions and activation; guidelines for emergency response (internal and external communications, personnel identification, documentation, etc.); and hazard-specific roles and procedures (response objectives) for priority risk hazards. The response objectives for wildland urban interface fires outline the roles and responsibilities of the FVRD EOC, as well as the respective roles and jurisdiction of the BC Wildfire Service, and, in the event of structural fire, the Chief of the responding fire department. Emergency response is coordinated using the BC Emergency Management System (BCEMS) Site and Site Support Standard, with designated EOC locations and Incident Command (IC) for site level response. A Provincial Emergency Operations Centre (PREOC) and a Provincial Emergency Coordination Centre (PECC) may also be established if the emergency is large in scale. The FVRD emergency management plan also establishes priorities for training and periodic reviews and revisions of the plan.

[10] https://www.fvrd.ca/assets/Services/Documents/Emergency~Services/Emergency%20Preparedness%20Workbook.pdf
[11] FVRD. 2013. Emergency Management Response and Recovery Plan – A Strategic Guide for Support to Major Emergencies and Disasters. Last reviewed May 2019.

The FVRD's Emergency Management Response and Recovery Plan is complemented by an all-hazard Evacuation Planning & Implementation Guide (FVRD, 2011)[12] intended to be used as a tool for emergency personnel and managers to support planning and implementation of an evacuation (an evacuation planning template is in development). The FVRD is in the process of developing, in a staged process, a comprehensive emergency management plan that would eventually repeal and replace all previous emergency management documents.

2.5.2 Affiliated CWPPs

CWPPs have been developed for the Chawathil First Nations (2013), Cultus Lake Parks Board (2011), District of Kent (2017), Harrison Hot Springs (2017), Peters Band (2016), and Seabird Island Band (2016). These documents, when available were reviewed for relevance (i.e., synergistic project opportunities, as well as to confirm that there are no contradicting recommendations). Furthermore, CWPPs for FVRD Zone A and Zone B were developed concurrently with this CWPP by the same consultant, ensuring consistency in recommendations and synergies within proposed future fuel treatment works.

2.5.3 Local 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. The following municipal bylaws, strategies and policies are relevant to wildfire planning in the AOI.

Electoral Areas D, E and H Official Community Plans

The Official Community Plans (OCP) for Electoral Areas "D", "E" and "H" provide guidance for general policies, land-use area designations, development permit areas, environmental protection, infrastructure and services throughout the Fraser Valley Regional District. 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. 0200, 1997: Official Community Plan for Popkum-Bridal Falls, Electoral Area "D"

1997 Popkum-Bridal Falls, Electoral Area "D" OCP Schedule D, Subsection 7.2.1: Community Water System

This section of the OCP outlines the appropriate procedures for developing new community water systems. Presently, there are two water systems in place, both under the jurisdiction of the Regional District. With increasing population and growing demand for new developments within the area it is recommended that the current water system be expanded and moved to provide a more reliable source for domestic water storage and fire protection.

Bylaw No. 1115, 2011: Official Community Plan for Electoral Area "E" and "H"

2011 Electoral Area "E" and "H" OCP, Subsection 7.8: Fire Protection

[12] FVRD. 2011. Fraser Valley Regional District Evacuation Planning & Implementation Guide.

This section of the OCP describes the current policies and procedures regarding fire protection within the Cultus Lake South area. The current policies recommend a fire protection engineering report be completed before any major developments have commenced and that new resort development or expansion proposals provide a comprehensive fire protection system. It also suggests a review of the capacity of rural volunteer fire departments serving Electoral Areas E and H, to ensure fire protection within the area keeps pace with development. Resort developments are required to provide community water systems with sufficient flow for fire suppression. Finally, it recommends that any amendments to the current fire protection plan be consulted and reviewed by the Regional District and the Fire Chief.

2011 Electoral Area "E" and "H" OCP, Subsection 8.1: Roads & Transportation

Emergency access and response is a concern in the area due to single access, via Chilliwack Lake Road and the Columbia Valley Highway, which can hinder first response times. It is suggested that a better understanding of the surrounding road networks and their capabilities be known. Such recommendations include identification, upgrading and construction of alternative emergency access and egress routes within the plan area.

2011 Electoral Area "E" and "H" OCP, Subsection 10.4: Interface Fire Hazards

This section of the OCP defines the Wildland-Urban Interface (WUI) area and policies and objectives surrounding community planning within areas that are considered higher risk. These policies include; avoiding development in areas that are at higher risk to wildfire hazards, requiring new tenure applications to provide a detailed wildfire hazard report and encourage existing homeowners in WUI areas to practice FireSmart techniques, installing sprinklers and well pumps, and utilizing rain storage tanks, whenever possible for fire-fighting on-site. Residents are also encouraged to be vigilant and responsive to Open Fire Bans and other fire smart practices during periods of high fire hazard to reduce the risk of wildfire initiation.

RECOMMENDATION #1: Review and amend the two OCPs applicable to Zone C (Electoral Area "E" and "H" OCP and Electoral Area "D" OCP) to include a growth management policy which considers wildfire risk and other natural hazards during development. By containing development within a specified area, the overall fire risk is less than when compared to areas of intermixed development, i.e. rural sprawl. In intermixed or rural areas there is often the potential to have inadequate or unreliable water supply for suppression, as well as longer emergency response times. By constraining development, the FVRD can ensure that future development occurs where urban services, such as water for fire suppression, is available, reliable, and accessible. Overall intermix and rural areas are generally more vulnerable (at higher risk) for interface fires.

Bylaw No. 1188, 2013: Building Bylaw

This bylaw is intended to regulate construction; which includes reconstruction, installation, repair and much more, within the Fraser Valley Regional District. This bylaw also aims to provide a framework to follow in terms of health, safety and the protection of persons and property while on the job site. This bylaw also outlines that applications for standard buildings should have structural, mechanical or fire suppression drawings prepared before building.

RECOMMENDATION #2: Work with the Planning and Development Department (i.e., building inspectors) to ensure house numbering is posted prior to occupancy of new development and to provide instructions on how and where best to affix numbering to facilitate emergency response and evacuation efforts. Additional specifications could be made in consultation with fire departments for reflective signs with a minimum number height to ensure visibility from the road at night, and instructions on how and where best to affix numbering to facilitate emergency response and evacuation efforts. Consider encouraging home owner participation via a FVRD-wide engagement campaign and providing incentives such as the opportunity to acquire/purchase discounted address signs.

Bylaw No. 1386, 2016: Open Fire Bylaw

This bylaw regulates open fires within the Fraser Valley Regional District in order to protect public health and safety and property. It does so by imposing open burning regulations and restrictions in areas during extreme fire conditions. It also stipulates in the regulations that all open fires must be under control and supervised, by a person at least 16 years old, at all times until they are extinguished. It also declares the authority of the Fire Chief and appointed officers in restricting and prohibiting open burning in designated fire protection service areas. The document also covers exemptions, offences and penalties relating to the bylaw. Note that the Fire Chief can allow open burning if the Board determines that extreme fire conditions no longer exist, despite a provincial fire ban.

RECOMMENDATION #3: Review and amend Section 5.1.4 of Bylaw 1386 to specify what constitutes an effective means of extinguishing an open fire (i.e., camp fire). BCWS recommends 8 litres of water and a hand tool (shovel, Pulaski). In accordance with BCWS recommendations,[13,14] this section should also require the clearing of a fuel break around a fire wide enough to stop the spread of the fire and the siting of the fire in a fire pit or rock ring that is at least 3 m from trees, shrubs, structures, and debris.

Bylaw No. 1190, 1979: Campground and Holiday Park Bylaw

This bylaw regulates the establishment, extension, design and servicing of campgrounds, holiday parks and natural campgrounds. Under services (section 7.08) it defines the specific violations and exemptions that relate to fire protection, including the provision of standpipes, fire hydrants, stoves, outdoor barbeques, fire extinguishers on site and other required firefighting equipment such as; axes, shovels, pulaskis or hand pumps.

Bylaw No. 0037, 1996: Unsightly Premises and Unwholesome Matter Regulations

The bylaw prohibits the accumulation of litter, debris, and any material which poses a fire, health, or environmental hazard on a site, including solid fuels but excluding firewood. It also regulates the storage of building materials. The bylaw provides the FVRD the authority to impose the removal/clean-up of materials and recoup costs from the owner in the case of failure to comply.

[13] Province of BC. 2019. Fire Bans and Restrictions. https://www2.gov.bc.ca/gov/content/safety/wildfire-status/fire-bans-and-restrictions

[14] Province of BC. 2019. British Columbia Campfire Regulations [poster]. https://www2.gov.bc.ca/assets/gov/public-safety-and-emergency-services/wildfire-status/fire-bans-and-restrictions/bcws_campfireposter.pdf

Bylaw 569, 2003: Regional Growth Management Strategy

This bylaw is a framework to guide growth in all areas of the FVRD and an assessment of current and future challenges. Many of the goals and related actions are applicable to wildfire risk planning, including goals to limit rural sprawl and non-contiguous (i.e. intermix) development; establish partnerships with First Nations, the provincial government, and stakeholders; and implement Regional Transportation Improvement Priorities.

FVRD Regional Parks Strategic Plan 2014-2024

This plan identifies priorities for FVRD regional park management, improvement, and acquisition over a ten- year period. The AOI overlaps two regional parks and one interregional park.

RECOMMENDATION #4: Complete updates to the FVRD Regional Parks Strategic Plan (2025-2035) to include wildfire threat as a parks acquisition criterion. Access and potential costs of park and trail maintenance to mitigate wildfire risk should be weighed against other acquisition criteria. Amend Bylaw 1190 Campgrounds and Holiday Parks to include the following provisions: 1) require the use of a QP in review, assessment, and siting of parks and park access prior to acceptance; and 2) ensure that OCPs provide the FVRD authority to request modification (either fuels, access, or siting) based upon QP recommendation and prior to acceptance to ensure that the park is received in, and able to be maintained in, an acceptable range of risk. (See Section 6.1.3 for related recommendations specific to access).

RECOMMENDATION #5: Develop a trails master plans in collaboration with member municipalities to complement the FVRD Regional Parks Strategic Plan and include considerations for the placement, type, width, and objective of trails. 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 *Wildfire Act* and Regulations).

RECOMMENDATION #6: Create a new bylaw or amend an appropriate existing bylaw to require applications for developments within 200 m of areas mapped as moderate, high or extreme wildfire threat class in this CWPP to include a wildlife hazard assessment and mitigation strategy prepared by a qualified professional.

2.5.4 Higher Level Plans and Relevant Legislation

Land use objectives, ministerial orders, and non-legal planning objectives outlined in the plans below should be reviewed, considered, and addressed during the fuel management prescription phase. Fuel management on Crown land within the AOI should aim to enhance these values, whenever possible, and the land manager (Chilliwack Natural Resource District and BC Parks) must be consulted during prescription development regarding any overlapping values at risk, spatially explicit ministerial orders, or other notable values on the land base.

Sustainable Resource Management Plans (SRMPs)

Within the AOI there are three overlapping landscape units (LUs), Chilliwack, Fraser Valley and Silver Hope. Some of these LUs have their own SRMP which are considered higher-level planning documents. The plan describes the resource tenure holders in the LU, the resource values and associated objectives,

existing higher-level plans, and an analysis of the Old Growth Management Areas (OGMAs) and Wildlife Tree Retention within the LU.

Spatially explicit ministerial orders pertaining to Old Growth Management Areas (OGMA) were identified within the AOI. Furthermore, numerous Wildlife Habitat Area (WHA) for spotted owls (established by government area regulation order) were identified in the AOI. These orders must be reviewed, considered, and addressed during the fuel management prescription-level phase. Fuel management within these areas should aim to enhance these values within the AOI, whenever possible, and the land manager and/or stewardship Forester (Chilliwack Natural Resource District) must be consulted regarding any overlapping values at risk, spatially explicit ministerial orders, or other notable values on the land base, during prescription development.

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 developing a proactive and effective wildfire mitigation approach.

Response Fire Management Plan

The South Coast Response Fire Management Plan (FMP)[15] was developed for the Chilliwack Natural Resource District (NRD), the Sea to Sky NRD, and the Sunshine Coast NRD. The FMP was reviewed to identify any regional fire management planning objectives and their interpretation in the context of management considerations for the AOI. The 2018 South Coast FMP identifies values at risk and prioritizes broad categories of values as 'themes' for response planning through the Resource Strategic Wildfire Allocation Protocol (RSWAP). The South Coast FMP briefly speaks to the concept of wildfire prevention engineering within the region, which includes fuel management such as locally identified fuel breaks, proposed treatment areas, or demonstration and operational treatment areas. In order to reduce local fire threat and to build defensible space around critical infrastructure and/or residential neighbourhoods, this CWPP identifies various fuel treatment opportunities (Section 5.1.1).

Coast Area Integrated Investment Plan

The 2019/2020 Coast Area Integrated Investment Plan[16] is a Provincial initiative that identifies and coordinates landbase investments for the south coast and the west coast regions and targets multiple objectives such as carbon sequestration, timber supply, forest rehabilitation, habitat and population enhancement and fuel management. The Integrated Investment Plan provides information to funders and stakeholders within the Coast Area regarding categories for potential investment, provincial and regional priorities, eligible and supported potential activities and funding opportunities. This Plan should be reviewed to ensure that fuel treatment opportunities proposed in this CWPP document align with Land Manager investment objectives and regional priorities.

[15] South Coast Fire Management Plan. 2018. (Internal government document)
[16] 2019/20 Coast Area Integrated Investment Plan. Retrieved online at: https://www2.gov.bc.ca/assets/gov/environment/natural-resource-stewardship/land-based-investment/coast_area_iip.pdf

Spotted Owl Management Plan17

The Spotted Owl Management Plan is a guidance document for spotted owl recovery within the Chilliwack and Squamish Natural Resource Districts. The goal of this plan is to stabilize, and ideally increase, spotted owl populations in the two districts over time while avoiding substantial impacts to forestry employment and timber supply. It includes a strategic management plan with objectives and policies and operational guidelines for forest practices and creating operational plans in spotted owl management areas. Best management practices to manage forests within Spotted Owl habitat were subsequently updated as a component of the Spotted Owl Management Plan. This document should be reviewed and integrated into any fuel management activities that are proposed within spotted owl management areas, Wildlife Habitat Areas (WHAs), or in areas of suitable spotted owl habitat such as late seral stage forests.

Forest Stewardship Plans (FSPs)

There are multiple Forest Stewardship Plans (FSPs) within the AOI, including the Northwest Hardwoods BCTS Chinook Chilliwack District, Ts'elxwéyeqw Forestry Limited Partnership and the Probyn Log Ltd FSPs. These plans are area-based, landscape level plans that outline potential forest development activities within the area. All tenure holders and forest agreement holders must provide a government approved plan before any harvesting or road building activities occur. These plans are critical at the prescription level phase and must be consulted before any implementation occurs.

Parks Management

Five Provincial Parks are also located within the AOI, including Cultus Lake, Chilliwack River, Chilliwack Lake, Bridal Veil Falls and Ferry Island Provincial Parks. There is currently no approved management plan for Cultus Lake Provincial Park. Chilliwack River and Bridal Veil Falls Provincial Parks have Master Plans developed in the 1980s[18] [19], and Chilliwack Lake Provincial Park and Chilliwack River Ecological Reserve have a comprehensive Master Plan developed in 2000.[20]

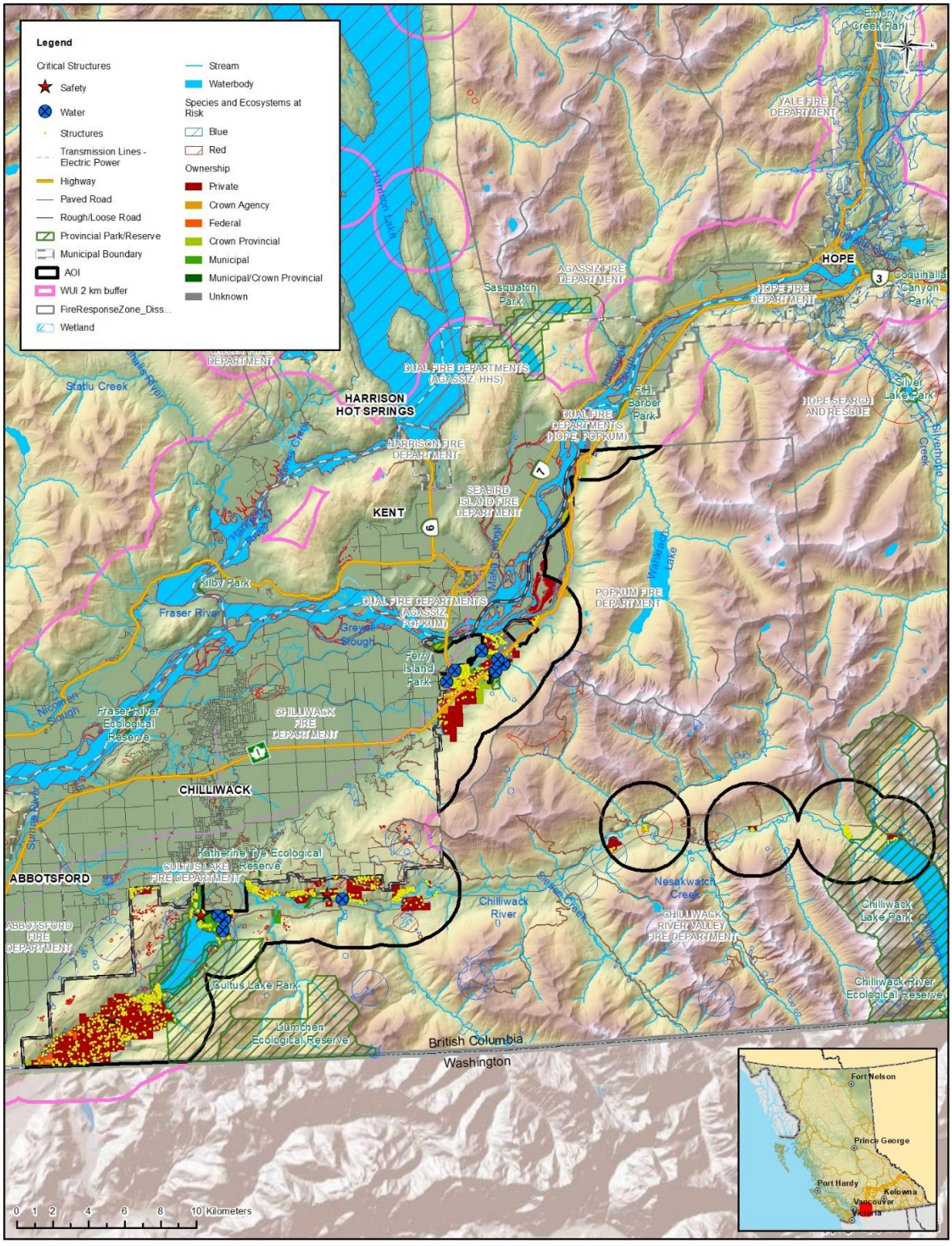
Forest Health Management

Forest health management and associated initiatives within the Fraser Timber Supply Area (TSA) are guided by the Coast Area 2015-17 Coastal Timber Supply Areas Forest Health Overview[21]. This plan and the most current forest health information (spatial data publicly available from DataBC) must 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 the aforementioned plan.

[17] The Province of BC. 1997. Spotted Owl Management Plan.
[18] Chilliwack River Master Plan (1980). Accessed at:
http://www.env.gov.bc.ca/bcparks/planning/mgmtplns/chill_rv/chilliwack_rv_mp.pdf?v=1576285161653
[19] Bridal Veil Park Master Plan (1984) Accessed at:
http://www.env.gov.bc.ca/bcparks/planning/mgmtplns/bridal_veil/bridal_veil_falls_mp.pdf?v=1576285589574
[20] Chilliwack Lake Provincial Park & Chilliwack River Ecological Reserve (2000). Accessed at:
http://www.env.gov.bc.ca/bcparks/planning/mgmtplns/chil_lak/chilliwacklake_mp.pdf?v=1576285337541
[21] Ministry of Forests, Lands and Natural Resource Operations. 2015

SECTION 3: VALUES AT RISK

Following is a description of the extent to which wildfire has the potential to impact the values at risk (VAR) within AOI. 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.



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.[22]

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 FVRD has increased significantly in recent years. The FVRD has a higher growth rate than Metro Vancouver and BC as a whole with a growth rate of approximately 6.6%. As a result, the overall population of the FVRD has increased significantly in recent years, and was last recorded at approximately 295,934 in total. The combined population for Electoral Areas H, E and D which overlap the AOI is 4,916 residents as of 2016[23]. More specifically, Electoral Area D was found to have a growth rate of 13.6% between 2011 and 2016, Electoral Area H had a growth rate of 4.4% and Electoral Area E had a growth rate of -3.1%. Within the Electoral Areas H, E and D of the FVRD there are approximately 2,725 dwellings, 25% of which are occupied on a part-time basis. Within the FVRD population density is the greatest in Abbotsford, Chilliwack, and Mission. Among the three electoral areas overlapping the AOI, Electoral Area H has the highest population of approximately 1,847 residents, Electoral Area E has approximately 1,540 residents and Electoral Area D has approximately 1,529 residents. The FVRD Electoral Areas H, E and D attract visitors for camping, hiking, canoeing, motor boating, and other recreational endeavors, particularly during the fire season (May – October). Several parks and recreation sites throughout the AOI are highly used during the summer months, including Cultus Lake Provincial Park, Chilliwack River Provincial Park, Chilliwack Lake Provincial Park, Bridal Veil Falls Provincial Park and Ferry Island Provincial Park. Furthermore, the Trans-Canada Highway (Highway 1) is frequently used as an access corridor from the Lower Mainland to the Fraser Valley, which increases the number of people 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 H, E and D and access to recent orthophotography and spatial data from the FVRD has enabled the development a spatial layer with structure locations that accounts for the most recent development.

[22] 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

[23] Statistics Canada. 2016 Census

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 gas services, transportation, water, social services, and communications infrastructure. Table 3 provides an inventory of critical infrastructure identified by the FVRD and during field visits, while Map 2 provides a visual depiction of the critical infrastructure within the AOI.

Protection of critical infrastructure is essential for wildfire preparedness. 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 FVRD's critical infrastructure (i.e., fire halls, community centres, etc.) is in various levels of compliance with FireSmart principles.

RECOMMENDATION #7: The use of fire-resistant construction materials, building design and landscaping should be considered for all CI when completing upgrades or establishing new infrastructure. Additionally, vegetation setbacks around critical infrastructure should be compliant with FireSmart guidelines. Secondary power sources are important to reduce critical infrastructure vulnerability in the event of an emergency which cuts power for days, or even weeks.

RECOMMENDATION #8: Complete formal FireSmart assessments (by a Qualified Professional) for CI such as the fire halls, emergency operations centres, water infrastructure, and others as identified in this CWPP (Table 3) and by the FVRD.

RECOMMENDATION #9: Complete a vulnerability assessment 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 FVRD Zone C is received through a network of wood pole transmission and underground distribution infrastructure supplied by BC Hydro. Neighbourhoods with small, street-side wooden poles to connect homes are particularly vulnerable to fire. It is recommended that utility right-of-way BMPs such as, regular brushing and clearing of woody debris and shrubs be employed to help reduce fire risk, utility pole damage and subsequent outages.

Various major radial transmission lines (500 kV) run along Highway 1, intersecting the northern AOI polygon, connecting the Nicola and Ingledow, Kelly Lake and Clayburn, and Rosedale to Wahleach

Substations. 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.[24]

A large fire has the potential to impact electrical service by causing disruption in network distribution through direct or indirect means. 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.

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 some critical infrastructure such as the fire halls, emergency operations centre, RCMP, and most infrastructure via backup generators. 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

The FVRD Zone C does not contain any hospitals or airports, as residents are serviced by hospitals and airports in adjacent municipalities of Chilliwack or Abbotsford. FortisBC supplies natural gas to the FVRD Zone C[25] and a publicly available infrastructure map[26] indicates that there is an Enbridge natural gas pipeline that transects the FVRD Zone C. A detailed map of either the FortisBC or Enbridge natural gas distribution system is not available to external companies. As such, it is not possible to identify specific areas that may be vulnerable to wildfire. The Enbridge company website states that during previous fire years (2017) Enbridge enacted emergency response plans to protect workers and safeguard facilities, as well as cooperated with the province and participated in its Emergency Response Centre operations. 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
Chilliwack River Valley Hall #1	48665 Chilliwack Lake Road
Columbia Valley Hall #1	1202 Kosikar Road
Cultus Lake Hall #1	4165 Columbia Valley Rd
Popkum Hall #1	10570 Popkum Road North
Emergency Operations Centre (EOC) 1 – FVRD office (not in AOI)	45950 Cheam Avenue
EOC 2 - Mission Fire Hall #1 (not in AOI)	33330 7th Ave
EOC 3- Agassiz Fire Hall #1 (not in AOI)	7652 Industrial Way
Emergency Support Services (ESS) – Primary Reception Centre	Media announcements and evacuation orders will direct evacuating public to a place of safety.

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

[25] https://www.fortisbc.com/about-us/our-service-areas

[26] https://www.enbridge.com/map#map:infrastructure

3.2.3 Water and Sewage

The FVRD operates and maintains 14 water systems, which provide water to residents and commercial operators within the region. In the FVRD Zone C, water is supplied through groundwater sources. The FVRD Wildfire Working Group noted that despite the growing population, the FVRD water systems are currently able to meet usage demand for domestic purposes. Additional water service is provided by several private systems. The FVRD tracks surface water storage levels and targets for all its reservoirs and maintains updated maps of all water systems within its jurisdiction.[27] A detailed account of water availability for wildfire suppression is provided in Section 6.1.2.

The FVRD operates and maintains six sewer systems (three within the AOI, Baker Trails Sewer System, North Cultus Sewer System and South Cultus Sewage Treatment System). Additional sewer systems throughout the FVRD are managed by private communities, individual private operators, and/or member municipalities.

Locations for water and sewage infrastructure within the AOI are detailed below in Table 4.

Table 4. Critical Infrastructure Identified in CWPP field visits.

Critical Infrastructure Type	Location
Water supply	Communities within the FVRD Zone C are served by the Electoral Area D Integrated Water System, Bell Acres Water System and Area H Integrated Water System with associated infrastructure, including the following: • Bell Acres Water System with a well, pumphouse and reservoir located at 49044 Riverbend Drive and 49071 Chilliwack Lake Rd, respectively. • Electoral Area D Integrated Water System with one reservoir, 2 wells and two pumphouses (Yale Rd East and Caryks Road). • Area H Integrated Water System with 2 wells, one reservoir and a pumphouse. Additionally, there are numerous private water systems located in the AOI.
Sanitary sewer system	Sewage is transported, treated, stored and discharged through 6 FVRD operated systems, and through other municipal and privately-operated independent systems. There are three FVRD operated sewage systems within the AOI: Baker Trails Sewer System, North Cultus Sewer System, and South Cultus Sewage Treatment System.

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.

[27] https://www.fvrd.ca/EN/main/services/water.html

3.3.1 Drinking Water Supply Area and Community Watersheds

Domestic water in the AOI is drawn from various surface and groundwater sources. Drinking water availability is a concern in the FVRD due to the dry spells that typically occur during the summer and is exacerbated by growing domestic and agricultural demand and climate change impacts.[28,29]

Thirteen Community Watersheds intersect the AOI: Nevin, Dunville and Elk (located in the southern end of the northernmost AOI polygon); Cupola (at the northeast end of Chilliwack Lake); Spring, Watt, Parent Creek, and Adams Spring (in the Lindell area); and Volkert, Ascaphus, Fin, Wells, and Edmeston Community Watersheds (in the Cultus Lake area). The potential impacts of wildfire extend past the time a fire is extinguished. Depending on fire size and severity, there is the potential for significant hydrological impacts, extending for years post-burn.[30] Some areas may have a lower threshold for precipitation triggered events and would be particularly vulnerable to post-wildfire debris flows, mass wasting, landslides, or flooding. This may directly impact the community (i.e., structure loss, risk to public safety) or indirectly, through loss or damage of critical infrastructure, roads, or impacts on the watershed affecting water quality.

RECOMMENDATION #10: Consider the option of conducting future assessments to explore the potential hydrologic and geomorphic impacts of wildfire on the 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 communities.

3.3.2 Cultural and Recreational Values

The Coast Salish are the main First Nations group whose territory overlaps the FVRD. Within this group, a total of 27 First Nations with aboriginal interests in the AOI were identified in the BC Consultative Areas Database. These include the following: Ashcroft Indian Band, Boston Bar First Nation, Coldwater Indian Band, Cook's Ferry Indian Band, Cowichan Tribes, Esh-kn-am Cultural Resources Management, Halalt First Nation, Lake Cowichan First Nation, Leq'a:mel First Nation, Lower Nicola Indian Band, Lyakson First Nation, Nicola Tribal Association, Nicomen Indian Band, Nlaka'pamux Nation Tribal Council, Nooaitch Indian Band, Penelakut Tribe, People of the River Referrals, Peters Band, Popkum Indian Band, Seabird Island First Nation, Shackan Indian Band, Shxw'ow'hamel First Nation, Siska Indian Band, Sto:lo Nation, Sto:lo Tribal Council, Stz'uminus First Nation, and Union Bar First Nation. The Stz'uminus First Nation is in Stage 4 of the treaty process.

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) as well as Aboriginal pictographs, petroglyphs, and burials (which are likely not as old but are still

[28] BC Agriculture and Climate Change Regional Adaptation Strategies Series: Fraser Valley Region. 2015. Retrieved online at: https://www.bcagclimateaction.ca/wp/wp-content/media/RegionalStrategies-FraserValley.pdf

[29] BC Agriculture and Climate Change Regional Adaptation Strategies Series: Fraser Valley Adaptation Strategies Update. Retrieved online at: https://www.bcagclimateaction.ca/wp/wp-content/media/RegionalStrategies-FraserValley-2018-update-report.pdf

[30] 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.

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 multiple sites do exist in the AOI. Prior to stand modification for fire hazard reduction, and depending on treatment location, preliminary reconnaissance surveys 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 should 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.

Outdoor recreational values in the AOI are significant with several trail systems, numerous recreation sites, particularly along the Chilliwack River. Several popular provincial parks in the area include: Cultus Lake, Chilliwack River, Chilliwack Lake, Bridal Veil Falls and Ferry Island Provincial Parks. Additionally, many trails intersect the AOI including the Gloria Thurston, Chipmunk Creek, Ford Mountain, Williams Peak, and Vedder Mountain Trails and multi-use Trans Canada Trail. These trails are managed and maintained by a range of agencies (Recreational Sites and Trails of BC), interest groups, and users. The trail systems are used by motorized users (i.e., off-road motorcycle) to diverse non-motorized users (hiking, mountain biking, horseback).

3.3.3 High Environmental Values

The AOI overlaps with multiple legal and non-legal OGMAs. Any proposed fuel treatment that may overlap these areas requires MFLNRORD oversight at the prescription development phase, and works can only occur following MFLNRORD consultation and approval.

Wildlife and habitat values in the AOI include ungulate winter range, spotted owl habitat and other designated wildlife habitat areas. Multiple Ungulate Winter Range (UWR) polygons intersects the AOI; four are “No Harvest Zones” as per Government Actions Regulation (GAR) Order U-2-001 and four are “Conditional Harvest Zones” as per GAR Order U-2-006. These GAR Orders are intended to protect critical winter foraging habitats for mountain goat populations (GAR U-2-001) and black-tailed and mule deer populations (GAR U-2-006) and have specific management requirements associated with them. Wildlife Habitat Areas (WHA) are also orders established under the Government Actions Regulation. Nine Spotted Owl Wildlife Habitat Area (WHA) polygons intersect the AOI (WHA 2-495, WHA 2-497, and WHA 2-501). Eight of these polygons are Long Term Owl Habitat Areas, while one is a Managed Forest Habitat Area. Additional WHA intersect the AOI including Riparian Zone, Upland Zone WHA and others. These WHA have varying polygon-specific harvest constraints ranging from no harvest to conditional harvest and must be considered at the prescription development phase for any fuel treatment that may

overlap these areas. The appropriate Ministries (MFLNRORD, Ministry of Environment and Climate Change Strategy) and qualified professionals must be consulted at the prescription stage and works can only occur following Ministry consultation.

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 AOI, 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.

There are 10 occurrences of Red-listed species, 12 occurrences of Blue-listed species and one Blue-listed ecological community within the AOI (Table 5). There are no overlaps with masked occurrences (as confirmed with the CDC). Through consultation with the CDC and a biologist or qualified professional, all site level operational plans must determine if these occurrences 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 QP with local knowledge may also be 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
Coastal Giant Salamander	*Dicamptodon tenebrosus*	Vertebrate Animal	Blue	RIVERINE: Creek, High Gradient, Riparian; TERRESTRIAL: Forest Broadleaf, Forest Mixed
Cultus Pygmy Sculpin	*Cottus sp. 2*	Vertebrate Animal	Red	LACUSTRINE: Deep Water
Cut-leaved Water-parsnip	*Berula erecta*	Vascular Plant	Blue	RIVERINE: Floodplain; PALUSTRINE: Herbaceous Wetland
Emma's Dancer	*Argia emma*	Invertebrate Animal	Blue	RIVERINE: Creek; Moderate Gradient; Lacustrine
Great Blue Heron, Fannini Subspecies	*Ardea herodias fannini*	Vertebrate Animal	Blue	TERRESTRIAL; FOREST BROADLEAF
Green-fruited Sedge	*Carex interrupta*	Vascular Plant	Blue	LACUSTRINE; BEACH
Marbled Murrelet	*Brachyramphus marmoratus*	Vertebrate Animal	Blue	TERRESTRIAL: Forest Mixed
Mountain Sucker	*Catostomus platyrhynchus*	Vertebrate Animal	Blue	RIVERINE; BIG RIVER; LOW GRADIENT; POOL

Common Name	Scientific Name	Category	BC List	Habitat Type
Northern Goshawk, Laingi Subspecies	*Accipiter gentilis laingi*	Vertebrate Animal	Red	TERRESTRIAL: Forest Needleleaf
Northern Red-legged Frog	*Rana aurora*	Vertebrate Animal	Blue	TERRESTRIAL: Roadside, Forest Mixed; PALUSTRINE: Herbaceous Wetland, Riparian; RIVERINE: Creek
Oldgrowth specklebelly	*Pseudocyphellaria rainierensis*	Fungus	Blue	TERRESTRIAL: Old Forest, Epiphytic
Olympic Shrew	*Sorex rohweri*	Vertebrate Animal	Red	TERRESTRIAL: Forest Needleleaf
Oregon Forestsnail	*Allogona townsendiana*	Invertebrate Animal	Red	TERRESTRIAL: Forest Mixed, Coarse Woody Debris
Pacific Water Shrew	*Sorex bendirii*	Vertebrate Animal	Red	PALUSTRINE: Herbaceous Wetland; RIVERINE: Riparian; TERRESTRIAL: Old Forest, Forest Mixed
Painted Turtle - Pacific Coast Population	*Chrysemys picta pop. 1*	Vertebrate Animal	Red	LACUSTRINE
Phantom Orchid	*Cephalanthera austiniae*	Vascular Plant	Red	TERRESTRIAL: Forest Mixed
Roell's Brotherella	*Brotherella roellii*	Nonvascular Plant	Red	TERRESTRIAL: Forest Mixed; Coarse Woody Debris
Short-fruited Smelowskia	*Smelowskia ovalis*	Vascular Plant	Blue	TERRESTRIAL; ALPINE; ROCK OUTCROP
Tall Bugbane	*Actaea elata var. elata*	Vascular Plant	Red	TERRESTRIAL: Forest Needleaf; Clearcut; Forest Needleleaf; Roadside
Trowbridge's Shrew	*Sorex trowbridgii*	Vertebrate Animal	Blue	TERRESTRIAL: Forest Mixed, Forest Needleleaf; RIVERINE; RIPARIAN
Western Hemlock - Douglas-fir / Electrified Cat's-tail Moss Dry Submaritime 1	*Tsuga heterophylla - Pseudotsuga menziesii / Rhytidiadelphus triquetrus Dry Submaritime 1*	Ecological Community	Blue	-
Western River Cruiser	*Macromia magnifica*	Invertebrate Animal	Blue	TERRESTRIAL: Roadside; RIVERINE: Creek
White Sturgeon (Lower Fraser River Population)	*Acipenser transmontanus pop. 4*	Vertebrate Animal	Red	RIVERINE: Big River; High Gradient; Low Gradient; Moderate Gradient; ESTUARINE: River Mouth; Tidal Flat

3.4 OTHER RESOURCE VALUES

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

The AOI is located in the Fraser Timber Supply Area (TSA), which encompasses approximately 1.4 million hectares of land and is administered by the Chilliwack Natural Resource District.[31] The last Timber Supply Review (TSR) was completed in 2015[32] and the Allowable Annual Cut (AAC) determination was completed in February of 2016;[33] however; effective August, 2016 the current AAC is 1,241,602 cubic metres (as a result of the surrender of a Tree Farm License).[31] The AAC is not applicable to private managed forest land. The effective timber harvesting land base in the TSA, based on the last TSR, is 250,405 ha or approximately 17.6% of the total land area.[32]

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 forest tenures exist on Crown land in the AOI including, but not limited to two active Woodlot Licenses (see Map 1). A Christmas Tree Permit exists along Chilliwack Lake Road. The opportunity exists to work with local licensees on commercial thinning projects that meet fuel management objectives.

3.5 HAZARDOUS VALUES

Hazardous values are defined as values that pose a safety hazard to emergency responders. Generally, the AOI does not have a significant number of industrial sites and facilities that can be considered hazardous values. The nearest landfill serving Electoral Areas D, E and H is Bailey Landfill located outside of the AOI. 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	Location
Bailey Landfill (outside of AOI)	5940 Matheson Road

[31] Government of BC, Fraser Timber Supply Area. Accessed at: https://www2.gov.bc.ca/gov/content/industry/forestry/managing-our-forest-resources/timber-supply-review-and-allowable-annual-cut/allowable-annual-cut-timber-supply-areas/fraser-tsa

[32] Ministry of Forests, Lands and Natural Resource Operations, Fraser TSA Timber Supply Analysis Discussion Paper. Accessed at: https://www2.gov.bc.ca/assets/gov/farming-natural-resources-and-industry/forestry/stewardship/forest-analysis-inventory/tsr-annual-allowable-cut/fraser_tsa_discussion_paper.pdf

[33] Fraser Timber Supply Area Rationale for AAC Determination. Accessed at: https://www2.gov.bc.ca/assets/gov/farming-natural-resources-and-industry/forestry/stewardship/forest-analysis-inventory/tsr-annual-allowable-cut/fraser_tsa_rationale.pdf

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 the 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.[34] 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

[34]BECWeb: https://www.for.gov.bc.ca/HRE/becweb/resources/classificationreports/subzones/index.html

acceptable[35]. The AOI is characterized by the BEC subzones and associated NDTs as outlined in Table 7 and illustrated in Map 3.

Table 7. BEC zones and natural disturbance types found within the AOI[36].

Biogeoclimatic Zone	Natural Disturbance Type	Area (ha)	Percent (%)
CMAunp: Coastal Mountain-heather Alpine, Undifferentiated and Parkland	NDT5	137	<1%
CWHdm: Coastal Western Hemlock, Dry Maritime	NDT2	12,879	53%
CWHds1: Coastal Western Hemlock, Dry Submaritime, Southern variant	NDT2	4,538	19%
CWHms1: Coastal Western Hemlock, Moist Submaritime, Southern variant	NDT2	3,048	12%
CWHvm2: Coastal Western Hemlock, Very Wet Maritime, Montane variant	NDT1	1,617	7%
CWHxm1: Coastal Western Hemlock, Very Dry Maritime, Eastern variant	NDT2	1,409	6%
MHmm1: Mountain Hemlock, Moist Maritime, Windward variant	NDT1	118	0%
MHmm2: Mountain Hemlock, Moist Maritime, Leeward variant	NDT1	658	3%
TOTAL		**24,406**	100%

The AOI is predominated by NDT2 (90%). Natural Disturbance Type 2 comprises forest ecosystems (CWHdm, CWHds1, CWHms1 and CWHxm1) with infrequent stand initiating events where fires were often of moderate size (20 to 1,000 ha) with a mean return interval of fire of approximately 200 years. Many of these fires occur after periods of extended drought and produce a forested landscape characterized by extensive areas of mature forest with intermixed patches of younger forests.[35] Although the fire frequency is not high and fires are generally not large, pre-planning and preparation are essential to reduce the negative impacts of a wildfire.

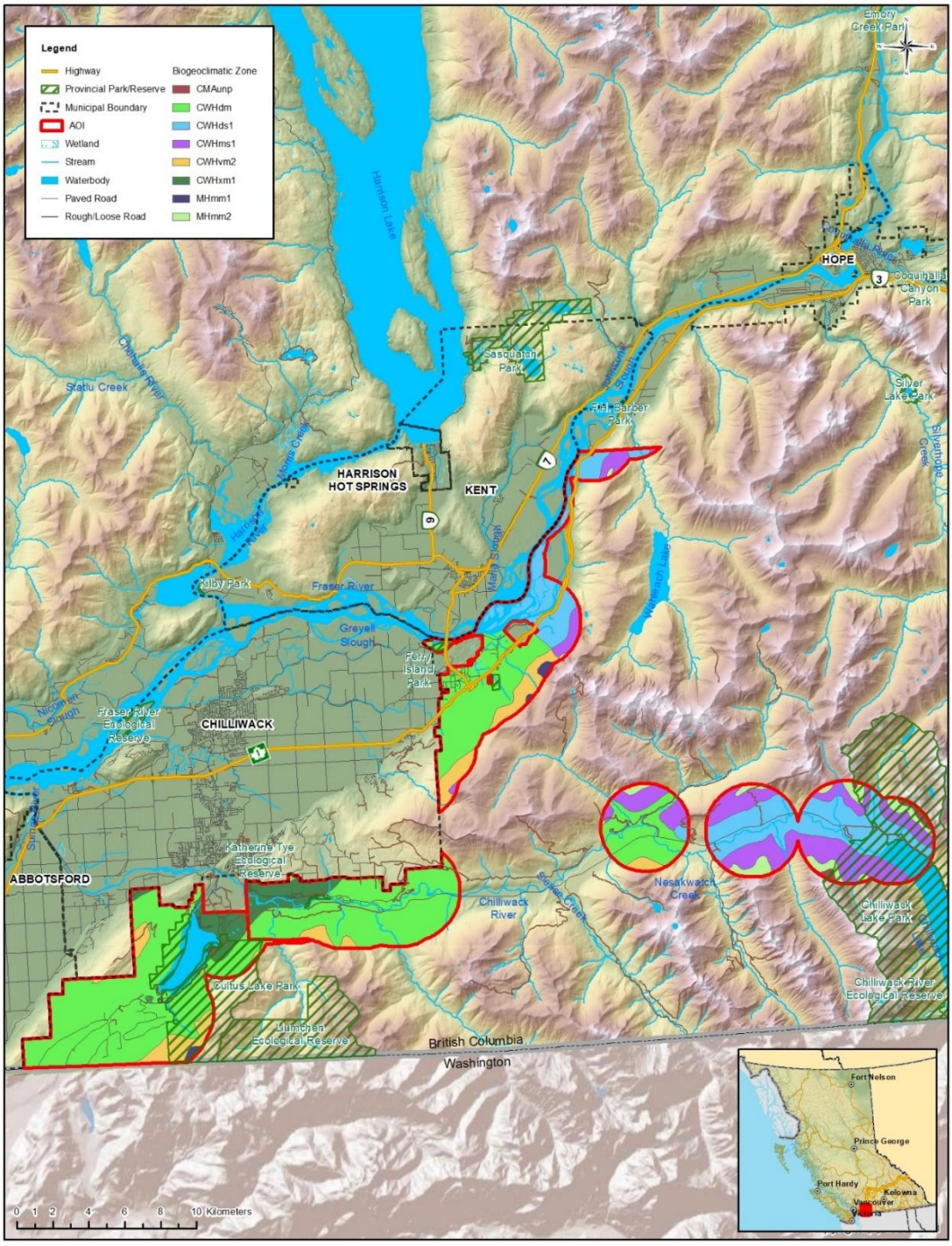
Natural Disturbance Type 1 (10% of the AOI) comprises ecosystems (CWHvm2, MHmm1, and MHmm2) with rare stand-initiating events. These are forest ecosystems that experience relatively small disturbances in terms of spatial extent. They have historically resulted in uneven-aged, heterogeneous stand structures from rare and small disturbances caused by fire, wind and/or landslides. The mean return interval for these disturbances has generally been 250 years for the CWH and 350 years for the MH. [35] While fire frequency is not high and fires are generally small, pre-planning and preparation will reduce the negative impacts of a wildfire.

Natural Disturbance Type 5 comprises alpine tundra and subalpine parkland (the CMAunp zone in the AOI) with infrequent but high severity fires. This NDT represents a minor component of the AOI (1%). Ecosystems in NDT5 can be dramatically impacted by wildfire.

[35] Province of British Columbia, 1995. Biodiversity Guidebook, s.l.: s.n.
[36] Source: MFLNRORD BEC Map (DataBC)

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[37]. Furthermore, forest health issues, human development and natural events contribute to changes in the fire regime, forest attributes and fuel hazard around the community.

[37] 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. Ecosystems with infrequent stand-initiating events include CWHdm, CWHds1, CWHms1 and CWHxm1; ecosystems with rare stand-initiating events include CWHvm2, MHmm1, and MHmm2; alpine tundra and subalpine parkland ecosystems with infrequent but high severity fires include the CMAunp.

Forest Health Issues

The Coast Forest Health Overview outlines forest health issues present within the Fraser TSA.[38] This overview and forest health strategy (2015-2017) outlines several forest health issues that are most prevalent within this timber supply area. Of particular concern, due to the severity or extent of outbreaks, are the Douglas-fir beetle, drought, root diseases (primarily laminated root disease and Armillaria spp.), forest tent caterpillar, and windthrow. Outbreaks of western hemlock looper and western spruce budworm were a concern in the past; however, occurrences of these pests have declined in recent years. The forest health impacts reported in DataBC[39] (2012-2017) are generally small in scope and include Douglas-fir beetle (831 ha), aspen serpentine miner (269 ha), forest tent caterpillar (210 ha), drought (79 ha), western balsam bark beetle (69 ha), flooding (18 ha), and fire (17 ha). These forest health factors may 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. Both laminated and armillaria root rot can result in high levels of windthrow due to the destabilization of infected trees' root systems.

Human Development and Natural Events

Most land cover change in the AOI can be described as rural residential and agricultural/commercial development. This process entails land clearing and road building. Forest harvesting is also common on provincial Crown land within the AOI. Abiotic and biotic natural events occur at small geographic scales. The overall implication of human development is an increase in human ignition potential with a decrease in hazardous fuels cover as land clearing for human development generally increases the non-fuel and O1a/b fuel types (see Appendix A-1 for a description of fuel types).

Since the establishment of communities within the FVRD Zone C, 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.

- Agricultural development – approximately 11% of the AOI is characterized as Agricultural Land Reserve (ALR). This area is dominated by farmland, cattle rearing, and berry plantations where the potential wildfire behaviour is greatly reduced due to the year-round irrigation, resulting in lower potential for curing during the wildfire season.
- 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 such as Lindell, Post Creek, Slesse Park, and Popkum (Section 5.2.3) and an increase in fire suppression in an ecosystem that had a historic fire interval of 200 years. Population growth is expected to continue and the area's proximity to larger urban areas (Chilliwack and Abbotsford), favourable climate and high recreational and landscape values make it a desirable place to live and work.
- Forest industry activities – forest harvesting is common on provincial Crown land within the AOI. Poor slash hazard abatement practices have been attributed to some operations which can lead to high fuel loading along roadsides.

[38] 2015-17 Coastal Timber Supply Areas Forest Health Overview. 2015.
[39] https://catalogue.data.gov.bc.ca/pt_BR/dataset/pest-infestation-polygons (current as of September, 2017)

- Developed areas in the AOI include the main communities of Cultus Lake, Popkum, Lindell, Lindell Beach, and satellite neighbourhoods such as Post Creek and Slesse Park. These satellite neighbourhoods are highly intermixed within conifer leading stands, and are in most situations neighbourhoods with one access/egress route.

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 Forest 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.

The BC *Wildfire Act* [BC 2004] and *Wildfire Regulation* [BC Reg. 38/2005], 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 Fire Danger Class days between the months of April and October. The data is summarized from the Ford Mountain fire weather station (years 2012 – 2019). According to Figure 1, the months with the highest average number of 'high' and 'extreme' fire danger class days are June, July, August and September. Historically, the month of August has the highest overall average number of 'high' and 'extreme' fire danger class days followed by July and September. Although highest fire danger is within these four months, it should be noted that there are 'high' and 'extreme' danger class days which extend into May and October (Figure 1).

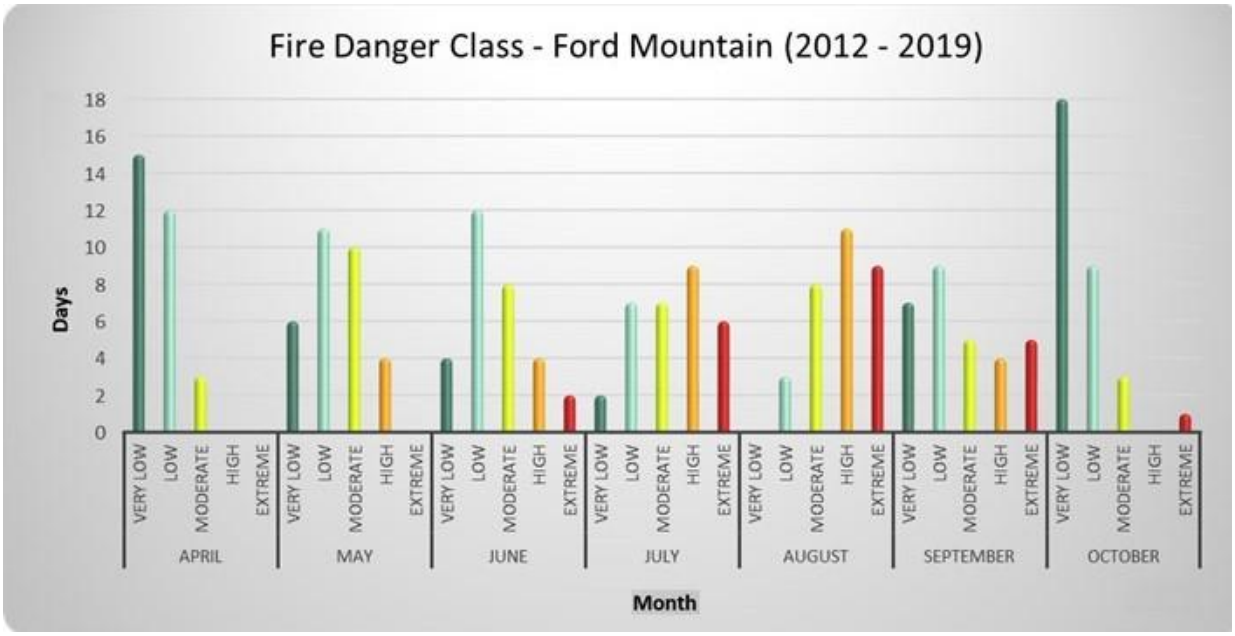


Figure 1. Average number of danger class days for the Ford Mountain weather station. Summary of fire weather data for the years 2012 - 2019.

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."[40] Numerous studies

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

outline the nature of climate change impacts on wildland fire across Canada, and globally.[41] 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.[42] Despite the uncertainties, trends within the data are visible.

As outlined by *BC Agriculture Climate Change Adaptation Risk & Opportunity Assessment Series Fraser Valley and Metro Vancouver Snapshot Report*[43], the following climate projections for the Fraser Valley are made:

- Increases in average annual temperature consistent with temperature increases for the province of BC (approximately 1.8° C increase from 1961-1990 baseline by 2050);
- Decline in summer precipitation (up to 14% decrease by 2050) leading to drier fuels and soils (increasing fire behaviour potential);
- Increase in winter precipitation (6% by 2050) in the form of rain and significant decreases in snowfall (-25% in the winter and -56% in the spring);
- Annual runoff from the Fraser River is expected to increase by approximately 14%, with increasing spring flow and decreasing summer flow;
- In the province as a whole, as average winter temperatures increase, more intense winter precipitation is expected to fall as rain during extreme events, and less falling as snow; potentially influencing 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 also 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. Furthermore, an increase in winter precipitation may result in slope instability, mass wasting, and increased peak flows (loss of forest cover from fire or other disturbance may increase the chance of mass wasting).

Insects and disease occurrence of spruce beetle and Swiss needle cast may increase; outbreaks of western hemlock looper may increase.[44] 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

[41] Flannigan, M.D et al. 2009. Implications of changing climate for global wildland fire. International Journal of Wildland Fire 18, 483-507.
[42] 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.
[43] British Columbia Agriculture & Food Climate Action Initiative, 2010. https://pics.uvic.ca/sites/default/files/uploads/publications/Adapt-FraserMetroVan%20Crawford.pdf
[44] MFLNRO, 2016. BC Provincial Government extension note '*Adapting natural resource management to climate change in the West and South Coast Regions*'. Accessed online at: https://www2.gov.bc.ca/assets/gov/environment/natural-resource-stewardship/nrs-climate-change/regional-extension-notes/coasten160222.pdf

conclude that future conditions will include drier fuels and a higher frequency of extreme fire weather days.[45]

- 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.[46]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; larger and more intense fires are expected and fire management will become more challenging.[47, 48]
- 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 FVRD.[49]
- Future climatic conditions may be more suitable for, or give competitive advantage to, new species of plants, including invasive species.[50]

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.

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[51]:

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).

[45] 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.

[46] 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.

[47] 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.

[48] Jandt, R. 2013. Alaska Fire Science Consortium Research Brief 2013-3.

[49] British Columbia Agriculture & Food Climate Action Initiative, 2013. Available online at: https://www.bcagclimateaction.ca/wp/wp-content/media/RegionalStrategies-Cowichan.pdf

[50] Pacific Climate Impacts Consortium, 2017. Climate Extremes in the Georgia Basin Summary Report, Available online at: https://www.pacificclimate.org/sites/default/files/publications/Summary-Climate_Extremes_in_the_Georgia_Basin-Final.pdf

[51] 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.

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[52]. 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 and Vegetation Resources Inventory (VRI) 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.

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.

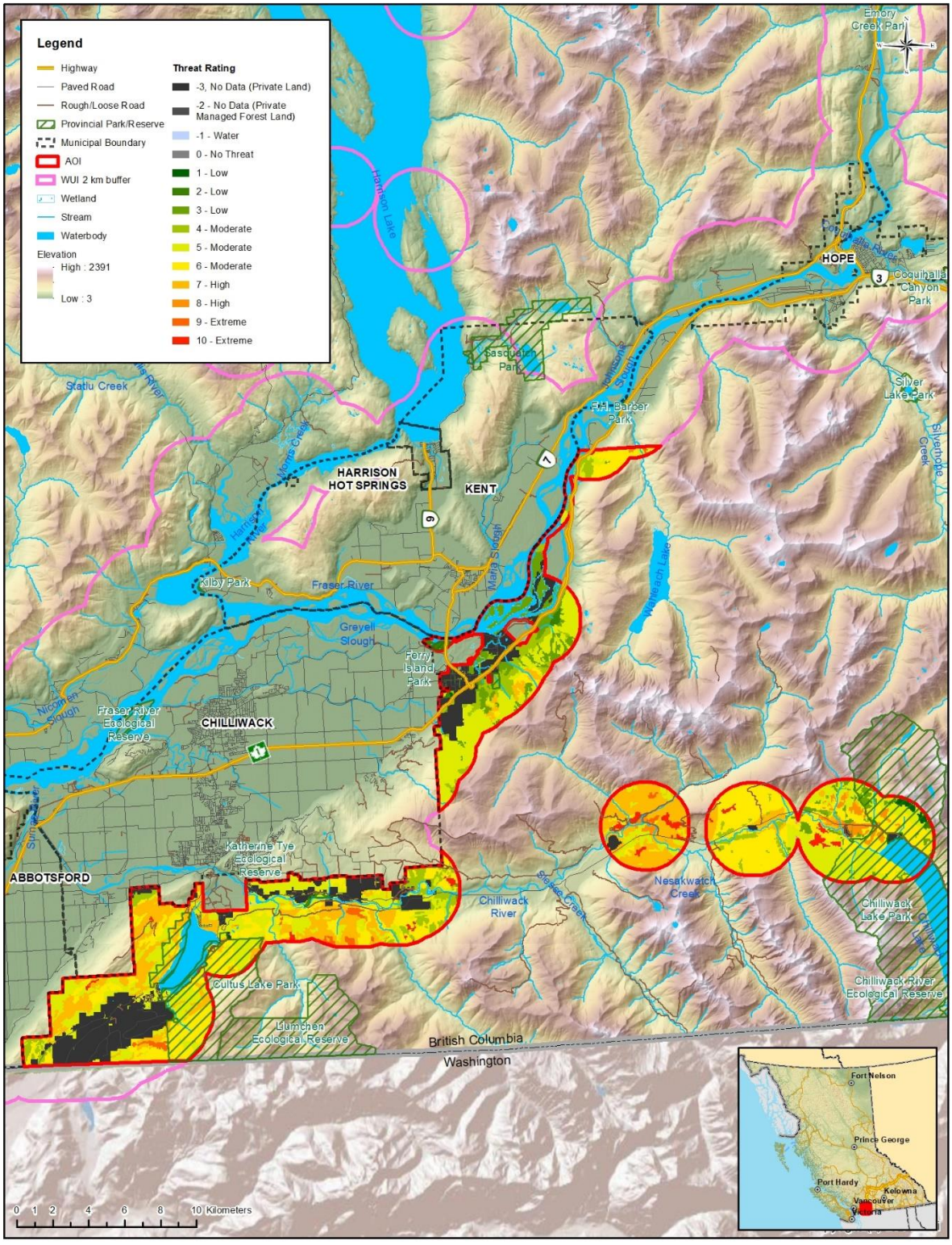
The fire threat ratings from the 2019 PSTA are summarized for the AOI in Table 8 and spatially illustrated in Map 4. Approximately 14% of the AOI is categorized as private land. Private land and private managed forest land has no data for wildfire threat in the PSTA dataset. Low threat areas cover 6% of the AOI and water covers 7%. Approximately 54% 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 19% of the AOI, with the most notable high-threat areas being concentrated in the easternmost polygons along

[52] 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])

the egress/access route to Chilliwack Lake Provincial Park and Campground, to the northwest of Cultus Lake and Lindell on Vedder Mountain and in small concentrations to the south of Slesse Park (Map 4).

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	3,354	No Data (Private Land)	14%
-2	0	No Data (Private Managed Forest Land)	0%
-1	1,749	Water	7%
0	0	No Threat	0%
1	71	Low	6%
2	130		
3	1,320		
4	1,495	Moderate	54%
5	6,202		
6	5,448		
7	3,845	High	17%
8	350		
9	176	Extreme	2%
10	267		
Total	**24,406**	**-**	**100%**

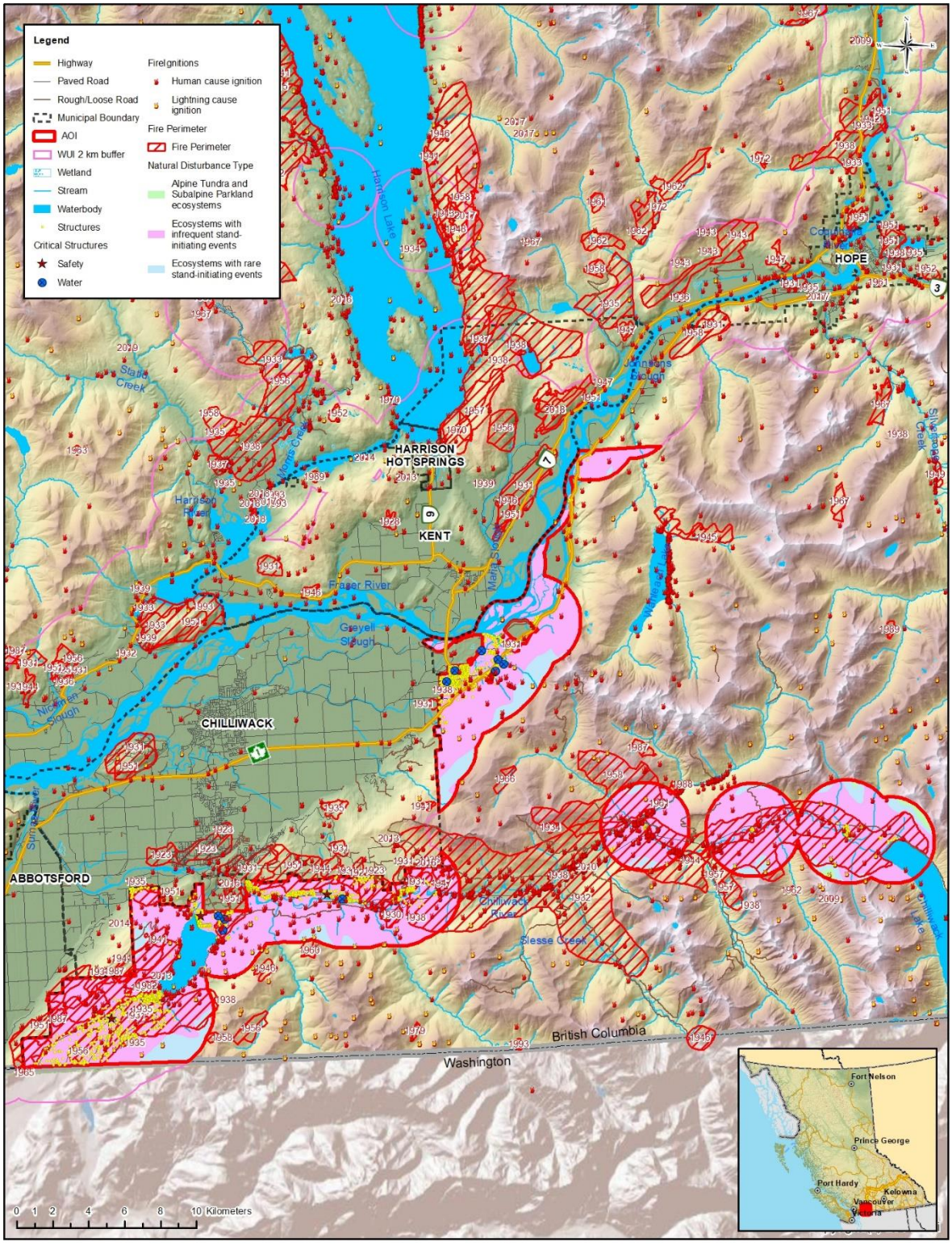


Map 4. Provincial Strategic Threat Rating.

4.2.1 Fire History

Fire ignition and perimeter data are depicted in Map 5. The following PSTA fire ignition data is available from 1950-2019 and fire perimeter data is available from 1917-2019 for the area. It was reported from BCWS (personal communication) that prevention activity locally is focused on open fires (i.e., residential burning and recreational fire use), while smoking and lightning caused ignitions are of lower concern. As shown in Map 5; small to large historical wildfires have burned within the AOI. Based on the fire ignition data, from the year 1950 to 2019, there have been 615 fire incidents within the AOI; approximately 525 of these ignitions were human-caused (a conservative estimate not including miscellaneous/undetermined causes).

Based on the fire perimeter data from 1917 to 2019, the top ten fires burning the greatest number of hectares within the AOI occurred between 1931 and 1958 with the largest covering 7,748 ha and the smallest of the ten covering 352 ha within the AOI (average of 1,847 ha). The most recent fires of note were person caused and occurred in 2013, 2014 and 2016, burning 2 ha, 0.9 ha and 17.2 ha, respectively. Additionally, in the last 10 years, several lightning fires were reported; some notable ones are: two in 2013 (Church Mountain and Chilliwack River/Mt. Liumchen), one in 2015 (Lindell Beach) and one in 2018 (Slesse Park). This fire history demonstrates that the vast majority of fires in the AOI occurred due to humans and that the common fires and relatively large scales seen in the first half of the 20th century have not occurred since.



Map 5. Fire Regime, Ecology and Climate Change.

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 four field days in July of 2019, in conjunction with verification of fuel types (see Appendix C for WUI 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.

Field assessment locations were prioritized based upon:

- PSTA wildfire threat analysis class - Field assessments were clustered in those areas with wildfire threat analysis classes of 6 or higher.
- 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 29 WUI threat plots were completed and over 150 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 0 to A-4), local wildfire threat for the AOI was updated. Using the Wildfire Threat Assessment methodology[53], 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).

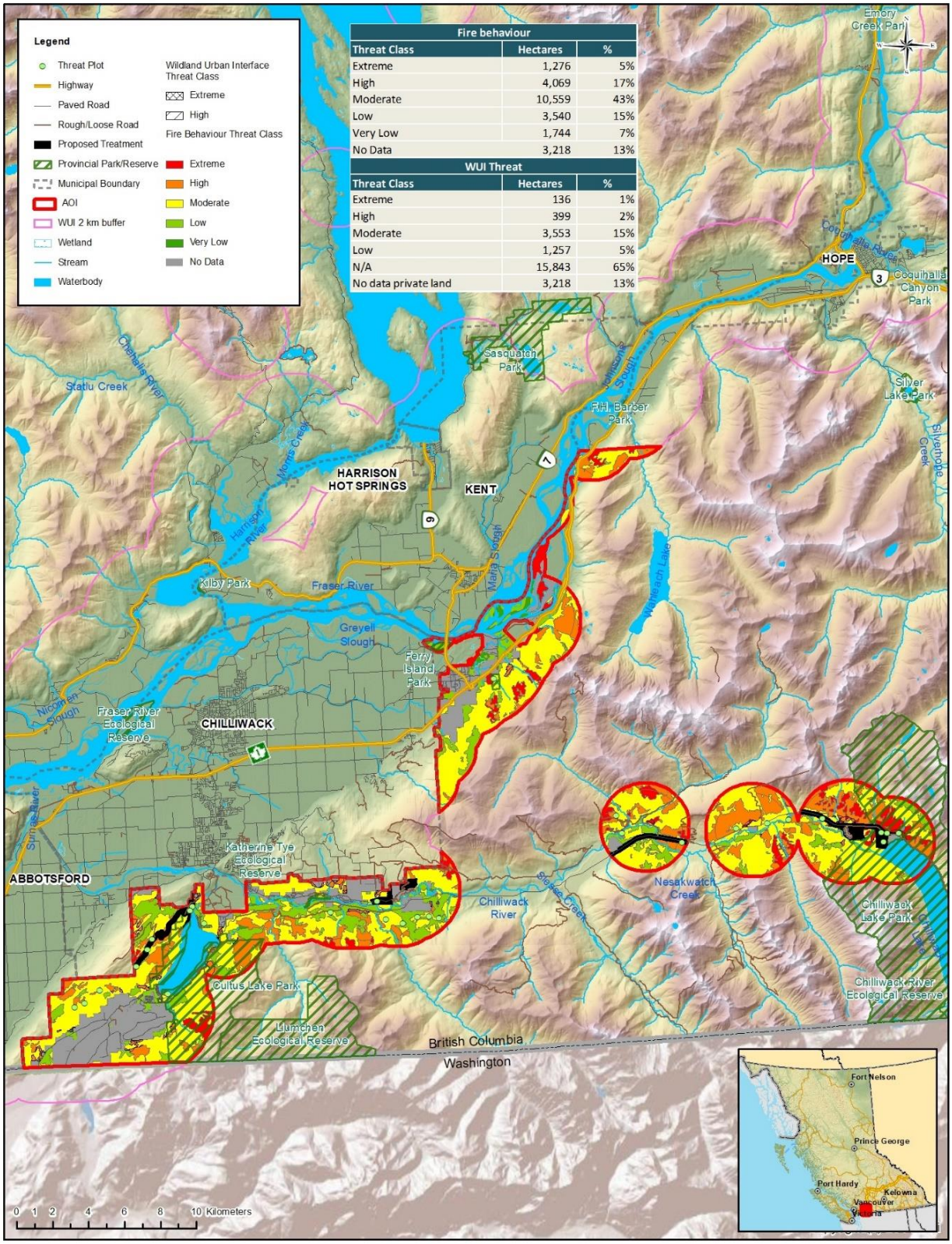
The result of the analysis shows that the AOI is composed of a mosaic of very low, low, moderate, high and extreme threat class stands; the variability in wildfire threat is dictated primarily by the level of natural and anthropogenic disturbances that have historically occurred and persist on the land base. The AOI is under 5% extreme threat class rating, 17% high, 43% moderate, 15% low and 7% very low/water (Table 9). The remaining 13% 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 the CRI Program 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.

The areas that represent the highest wildfire behavior potential and greatest risk to values within the AOI are areas of high and extreme threat class surrounding the development of Post Creek and along the access/egress route from Chilliwack Lake Provincial Park, south of Slesse Park, some areas along Vedder Mountain FSR, and southeast of the community of Popkum. For detailed field data collection and spatial analysis methodology for the local threat assessment and classification, see Appendix H – WUI Threat Assessment Methodology.

Table 9. Fire behaviour threat summary for the area of interest.

Wildfire Behaviour Threat Class	2019 PSTA Data	2019 CWPP
	Percent of AOI	Percent of AOI
Extreme	2%	5%
High	17%	17%
Moderate	54%	43%
Low	6%	15%
Very Low/ No Threat (Water)	7%	7%
No Data (Private Land)	14%	13%

[53] 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)



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 levels 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).

The objectives for fuel management are to:

- Reduce wildfire threat on private and public lands near 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 Crown land and provincial Crown land within local government administrative boundaries or within logical treatment units extending onto provincial Crow land may be funded by the Union of BC Municipalities (UBCM) through the Community Resiliency Investment (CRI) Program (subject to current program requirements). Fuel management on provincial Crown land only, may be funded through the new Crown Land Wildfire Risk Reduction (WRR) funding category[54] under the CRI Program (subject to program requirements). 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).[55] 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 primary fuel breaks as defined in Section 5.1.1, to reduce the wildfire potential around the AOI. Potential treatment activities include fuel removal, thinning from below, stand conversion, pruning, chipping, and pile burning 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 BMP to encourage a higher deciduous 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, it is recommended that the FVRD recognize important fuel treatment opportunities to improve emergency access and public safety along

[54] Crown Land WRR is a recently introduced category of CRI Program funding for risk reduction activities on provincial Crown Land effective 2020 that will be led by MFLNRORD (in partnership with local government and others) for wildfire risk reduction activities targeting provincially identified critical infrastructure, and treatment activities on provincial Crown land around communities.

[55] 2019 CRI FireSmart Community Funding & Supports – Program & Application Guide: https://www.ubcm.ca/assets/Funding~Programs/LGPS/CRI/cri-2019-program-guide.pdf

Chilliwack Lake Road in the event of evacuation through reduction of hazardous fuels and landscape level fuel treatment.

RECOMMENDATION #11: Work with the Ministry of Transportation and Infrastructure (MOTI), to assess high hazard fuel types (C-3 and M-1/2) along the Columbia Valley Highway and Chilliwack Lake Road and reduce hazardous fuels within 100 m of either side of the road, where possible, with consideration of private land and topographic constraints. This is to increase public safety by improving 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[56]. 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, regional district, or municipal 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.

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.

[56] 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

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 Fuel Break

Primary 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[57], 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 hazardous fuel units and FireSmart fuel treatment demonstration treatment areas identified and prioritized in this CWPP.

RECOMMENDATION #13: Develop a rationale for alternative stocking standards applicable to the FVRD, by employing a qualified wildfire management professional, and in consultation with the Wildfire Prevention Officer (Coastal Fire Centre) and MFLNRORD. Engage partners such as woodlot and/or other licensees to apply the MFLNRORD approved reduced fire management stocking standards in the FVRD Zone C wildland urban interface to reduce interface wildfire threat. These standards should take into consideration other values in the interface, such as provision of water, wildlife habitat, etc.

[57] 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		
1	Parmenter Rd	Moderate	35.2	**Interface Fuel Break Objective:** Fuel treatment will result in residual stands with characteristics that will reduce continuity of fuel loads, crown and surface fire behaviour, and wildfire risk.	23.7	11.5	0	The entire treatment unit (TU) boundary falls within the Fraser Timber Supply Area (TSA) and the Fraser Valley South Landscape Unit. The southern portion of the TU polygon overlaps with Cultus Lake Provincial Park, which is considered a Class A Provincial Park. There is also overlap with two species at risk polygons, both species are blue listed and include the Trowbridge's Shrew (*Sorex trowbridgii*) and the Coastal Giant Salamander (*Dicamptodon tenebrosus*). The proposed treatment unit overlaps a trapline licence (TR0203T001). The TU also overlaps with the Vedder Mountain BCTS operating area which is under the jurisdiction of the Chinook Timber Sales Business Area (Chilliwack). One BC Hydro OH Primary line also overlaps with the polygon. Multiple Forest Development Units (FDUs) overlap the TU boundary, including: TFLP, Northwest Hardwoods and the BCTS Chinook Chilliwack District. Consultation with all appropriate licensees, stakeholders and a wildlife biologist must occur during prescription development and prior to implementation to ensure all concerns are addressed.	Treatment area is located immediately adjacent (<200 m) to private residences. This treatment unit is recommended for treatment due to its proximity to a high recreational use area (Cultus Lake Park) and the presence of hazardous fuels. The stands characteristic of this area are primarily typed as C-5 and M-1/2 (80% conifer) fuel types with moderate stand densities, moderate fine and medium woody fuel levels present throughout, and scattered/patchy ladder fuels. The stands have a significant component of dead standing western redcedar (Cw), likely associated with sustained drought conditions over the last 3-5 years. The combination of these factors lead to potential for crown fire behavior during periods of high or extreme fire danger. Additionally, the proposed area was strategically located upwind of prevailing fire season wind direction in relation to private residences.

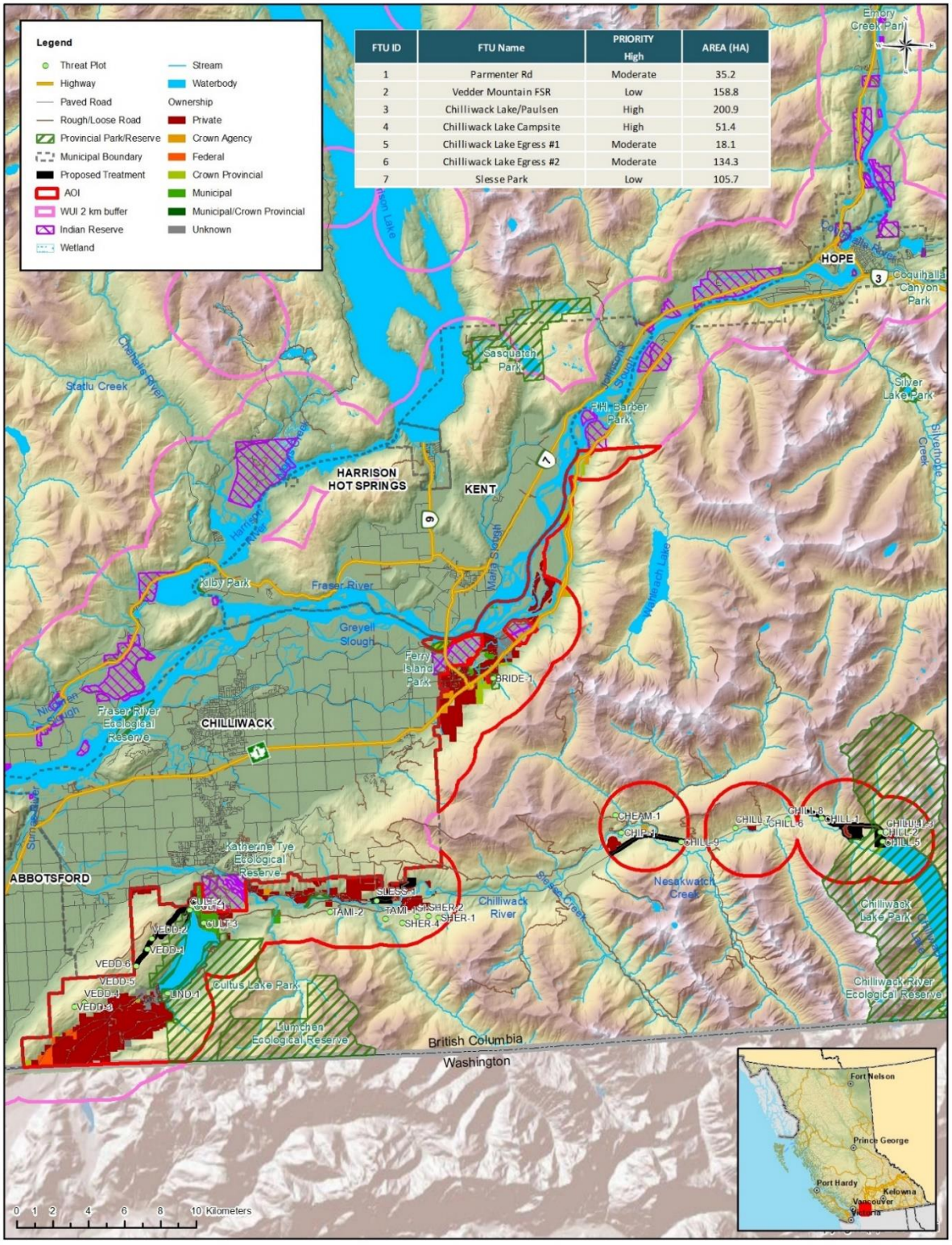
FTU # and Stratum	Geographic Area	Priority	Total Area (ha)	Treatment Unit Type/ Objective	Local Fire Threat (ha)			Overlapping Values / Treatment Constraints*	Treatment Rationale
					Extreme/ High	Mod	Low		
2	Vedder Mountain FSR	Low	158.8	**Primary Fuel Break Objective:** Fuel treatment will result in residual stands with characteristics that lower overall wildfire behaviour, reduce fuel loading and potential for extreme crown fire.	56.7	77.5	24.6	The entire TU boundary falls within the Fraser TSA in the Fraser Valley South and Chilliwack Landscape Units. The TU partially overlaps the Vedder Mountain - Chinook timber sales business and operating area. Multiple wildlife habitat area (WHAs) intersect the TU boundary; these WHAs include riparian and core areas for management of Tall Bugbane, Pacific Water Shrew and other sensitive species (WHAs 2-571, 2-661, 2-660 and 2-571). Various community watersheds also overlap with the AOI; these include, Wells Creek, Fin, and Ascaphus community watersheds. The TU overlaps a recreational trail (REC0350 1) and partially with Cultus Lake Provincial Park which is a Class A provincial park. Multiple species and ecosystem at risk overlaps occur within the AOI; these overlaps include the red listed Olympic Shrew (*Sorex rohweri*), the blue listed Trowbridge's Shrew (*Sorex trowbridgii*), the blue listed Coastal Giant Salamander (*Dicamptodon tenebrosus*), the Oregon Forest Snail (*Allogona townsendiana*) and the Northern Red-legged Frog (*Rana aurora*). The TU overlaps with an active trapline licence (TR0203T001) and two legal OGMAs, SRY_401_58 and SRY_401_24. Multiple FDUs overlap the TU boundary, including: TFLP, Northwest Hardwoods and BCTS Chinook Chilliwack District. Consultation with all appropriate licensees, stakeholders and a wildlife biologist must occur during prescription development and prior to implementation to ensure all concerns are addressed.	The proposed treatment area is located west of private residences near Cultus Lake (200-1000 m). The stands characteristic of this area are classified as a mix of fuel types (primarily M-1/2 with high conifer composition, with minor components of C-3 and C-5 fuel types). Low to moderate fine and medium fuel levels are present throughout, and ladder fuels are patchy to uniform. This type of stand is likely to exhibit high potential for crown fire behavior during periods of high or extreme fire danger. The proposed area was strategically selected as a primary fuel break, given its location upwind of prevailing fire season wind direction in relation to private residences.

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		
3	Chilliwack Lake Egress/ Paulsen (Post Creek)	High	200.9	**Primary Fuel Break Objective**: Fuel treatment will result in residual stands that lower overall wildfire behaviour, reduce fuel loading and bolster access/ egress route into and out of Chilliwack Lake Provincial Park and the community of Post Creek.	131.5	62.8	6.6	The entire TU boundary falls within the Fraser TSA and the Chilliwack Landscape Unit. There is slight overlap with an ungulate winter range (UWR) polygon for Black-tailed deer/Mule deer species along the northern portion of the TU boundary. The TU overlaps two WHA for long term spotted owl habitat. The Trans Canada Trail (designated recreation trail) intersects the TU and there is a partial overlap in the eastern portion of the TU boundary with Chilliwack Lake Provincial Park which is classified as a Class A provincial park. The TU overlaps two species at risk and sensitive ecosystem polygons, which include: the blue listed Coastal Giant Salamander (*Dicamptodon tenebrosus*), and the western hemlock-Douglas-fir/electrified cat's-tail moss Dry Submaritime 1. The TU overlaps two trapline licenses, TR0203T002 and TR0203T003 and a legal OGMA polygon, SRY_417_40. A BC Hydro OH primary line intersects the TU from east to west. Multiple FDUs overlap the TU boundary, including: TFLP, Northwest Hardwoods, and BCTS Chinook Chilliwack District. Consultation with all appropriate licensees, stakeholders and a wildlife biologist must occur during prescription development and prior to implementation to ensure all concerns are addressed.	The Chilliwack Lake Egress/Paulsen (Post Creek) proposed treatment area together with the two Chilliwack Lake Egress fuel breaks is intended to reduce fire behaviour potential and create defensible space against private residences within the community of Post Creek. The proposed fuel breaks are located on Chilliwack Lake Road, to the north/northwest of the Chilliwack Lake Provincial Park campground and the community of Post Creek. This fuel break was strategically selected given its location upwind of prevailing fire season wind direction in relation to private residences and to improve suppression and/or evacuation efforts in the event of a wildfire. The proposed treatment area is primarily characterized by higher density conifer stands (C-3 fuel types), with smaller proportions of intermediate to mature conifer stands (C-5 fuel types), and mixed deciduous and conifer stands (M-1/2 fuel types). These stands have significant accumulations of coarse woody fuels and conifer ingrowth. Laddering potential varies throughout the area but is generally high.

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		
4	Chilliwack Lake Campsite	High	51.4	**FireSmart Treatment**	22.3	29.1	0	The entire TU boundary falls within the Fraser TSA and the Chilliwack Landscape Unit. A BC Hydro OH Primary Line intersects with the TU. One trapline licence (TR0203T003) also overlaps with the TU. The entire TU is overlapped with two sensitive habitat and ecological communities at risk, these include the Western Hemlock-Douglas-fir/Electrified Cat's-tail Moss Dry Submaritime 1 ecosystem and core habitat areas for the blue listed Coastal Giant Salamander (*Dicamptodon tenebrosus*). The TU is within Chilliwack Lake Provincial Park which is a Class A Provincial Park. Two FDUs overlap the TU boundary, these FDUs are TFLP and Northwest Hardwoods. Consultation with all appropriate licensees, stakeholders and a wildlife biologist must occur during prescription development and prior to implementation to ensure all concerns are addressed.	The proposed treatment area is located in and around the Chilliwack Lake Provincial Park campground and is recommended for treatment due to the presence of high fire threat stands as well as the high frequency of recreational use. The treatment area stands are characterized as a mix of immature conifer stands typed as C-3 and mature C-5 stands. Conifer ladder and crown fuel continuity is uniform within the proposed treatment area. This type of stand is likely to exhibit high potential for crown fire behavior during periods of high or extreme fire danger.
5	Chilliwack Lake Egress #1	Moderate	18.1	**Primary Fuel Break Objective**: Fuel treatment will result in residual stands that lower overall wildfire behaviour, reduce fuel loading and bolster access/ egress route into and out of Chilliwack Lake Provincial Park and the community of Post Creek.	16.7	1.4	0	The entire TU boundary falls within the Fraser TSA, and is overlapped by the Chilliwack Landscape Unit. The Cupola Community Watershed partially overlaps with the TU boundary in the east. The Trans Canada Trail (designated recreation trail) intersects the TU boundary in the east. The entire TU boundary is within Chilliwack Lake Provincial Park, which is classified as a Class A Provincial Park. One ecosystem at risk overlaps with the TU (Western Hemlock-Douglas-fir/Electrified Cat's-tail Moss Dry Submaritime 1). The TU polygon also overlaps with blue listed Coastal Giant Salamander (*Dicamptodon tenebrosus*) core habitat. A trapline licence entirely overlaps with the TU (TR0203T003). A legal OGMA polygon also exists within the TU boundary (SRY_417_39). There is one BC Hydro OH primary that overlaps with the TU in the northwestern portion of the boundary. Two FDUs overlap the TU boundary, these FDUs are TFLP and Northwest Hardwoods. Consultation with all appropriate licensees, stakeholders and a wildlife biologist must occur during prescription development and prior to implementation to ensure all concerns are addressed.	The three Chilliwack Lake Egress proposed treatment areas (FTU #3, #5 and #6) are together intended to function as a Primary Fuel Break by creating a 300 m wide area with decreased fire behaviour potential. The proposed fuel breaks are located on Chilliwack Lake Road, to the north/northwest of the Chilliwack Lake Provincial Park campground, private residences on the shore of Chilliwack Lake and the community of Post Creek. Similar to the rationale provided above for FTU #3, Chilliwack Lake Egress #1 and #2, fuel breaks were strategically selected given their location upwind of prevailing fire season wind direction in relation to private residences. Additionally, the area has been strategically identified as a primary fuel break to improve suppression and/or evacuation efforts in the event of a wildfire. The eastern portion of Chilliwack Lake Road is primarily characterized by

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		
6	Chilliwack Lake Egress #2	Moderate	134.3	**Primary Fuel Break Objective**: Fuel treatment will result in residual stands that lower overall wildfire behaviour, reduce fuel loading and bolster access/ egress route into and out of Chilliwack Lake Provincial Park and the community of Post Creek.	24.6	41.5	68.2	The entire TU boundary falls within the Fraser LU. There is partial overlap with an UWR polygon in the eastern portion of the TU boundary for Black-tailed deer/Mule deer species and a WHA polygon for long-term spotted owl habitat. There is one recreational site that falls within the TU boundary (Camp Foley). The Trans Canada Trail (designated recreational trail) intersects the TU boundary from the east to west. Three water power licence of occupation tenures overlap with the TU boundary; the tenure locations pertain to Chilliwack Creek, Chipmunk Creek, Airplane Creek, Pierce Creek and the Chilliwack River Valley. Multiple species at risk overlap the AOI, including: the blue-listed Trowbridge's Shrew (*Sorex trowbridgii*), the red-listed Olympic Shrew (*Sorex rohweri*) and the blue-listed Coastal Giant Salamander (*Dicamptodon tenebrosus)*. The entire TU boundary overlaps with a trapline licence (TR0203T002). There is one active research installation within the TU (installation 44-Pierce Creek). The TU overlaps agriculture land reserve areas in the western portion of the TU boundary. A BC Hydro OH primary line intersects the TU. Multiple FDUs overlap the TU boundary, these FDUs include: TFLP, Northwest Hardwoods and BCTS Chinook Chilliwack District. Consultation with all appropriate licensees, stakeholders and a wildlife biologist must occur during prescription development and prior to implementation to ensure all concerns are addressed.	higher density conifer stands (C-3 fuel types), with smaller proportions of intermediate to mature conifer stands (C-5 fuel types), and mixed deciduous and conifer stands (M-1/2 fuel types). These stands have significant accumulations of coarse woody fuels and conifer ingrowth. Laddering potential varies throughout the area but is generally high.

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		
7	Slesse Park	Low	105.7	**Interface Fuel Break Objective:** Fuel treatment will result in residual stands with characteristics that will reduce continuity of fuel loads, crown and surface fire behaviour, and wildfire risk.	70	35.6	0.1	The entire TU boundary falls within the Fraser TSA and the Chilliwack Landscape Unit. There are multiple drinking water point of diversions (POD) within the proposed TU boundary; all of the PODs are under domestic licenses and draw water from either Nonie Creek or Meadowlark Brook. The TU overlaps tenures that include an institutional reserve area and tenure reserve for the environment, conservation and recreation along Chilliwack River. Within the TU boundary multiple WHAs exist; these include riparian and core areas that are both conditional and/or no harvest zones. Within the polygon there are overlaps with ecosystems and species at risk, which include the red listed Oregon Forest snail (*Allogona townsendiana*) and the blue listed Coastal Giant Salamander (*Dicamptodon tenebrosus*). Two legal OGMAs overlap the TU boundary (SRY_417_63). A BC Hydro OH primary line that diverges intro two separate distribution lines intersects the TU. Multiple FDUs overlap the TU boundary; these FDUs include: TFLP, Northwest Hardwoods and BCTS Chinook Chilliwack District. Consultation with all appropriate licensees, stakeholders and a wildlife biologist must occur during prescription development and prior to implementation to ensure all concerns are addressed.	The proposed treatment area is located west and north of private residences (<100 m) in the community of Slesse Park. The stands characteristic of this area are primarily typed as mixed deciduous and coniferous (M-1/2) fuel type with 50-60% conifer, moderate stand densities and fine and medium woody fuel loading and scattered/patchy ladder fuels. This type of stand is likely to exhibit potential for crown fire behavior during periods of high or extreme fire danger.



Map 7. Proposed Fuel Treatments (no past fuel treatments have occurred).

5.1.2 Maintenance of Previously Treated Areas

As no fuel treatments have occurred within the AOI, maintenance activities of previously treated areas are not applicable. However, if fuel treatments are implemented in the future, maintenance activities such as removing standing dead, reducing surface fuels, or additional thinning (overstorey reduction and thinning suppressed conifers or conifer regeneration) should occur as needed to maintain the effectiveness of these treatments. The return interval for maintenance activities depends upon site productivity and the 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: As treatments are implemented, treatment monitoring should be completed by a qualified professional to schedule next set of maintenance activities (5 – 10 years out). This can be completed as part of a CWPP update or as a stand-alone exercise.

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 a comprehensive, nationally accepted set of principles, practices and programs for reducing losses from wildfire.[58] 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[59], have been formally adopted by almost all Canadian provinces and territories, including British Columbia in 2000. FireSmart has become the de facto Canadian standard and is founded in standards published by the National Fire Protection Association (NFPA). The objective of FireSmart is to help homeowners, neighbourhoods, 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

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

[59] 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

to succeed, these efforts must be integrated across the mosaic of land ownership (Figure 2). The highest level of planning within the FireSmart program is strategic direction, such as that provided in CWPPs.

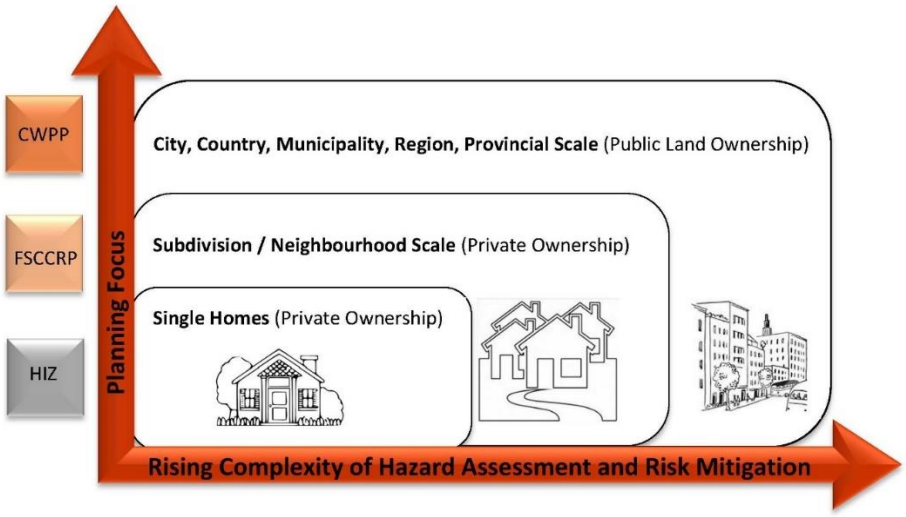


Figure 2. Diagram of the various, coordinated levels of the FireSmart program.[60] CWPP: Community Wildfire Protection Plan, FSCCRP: FireSmart Canada Community Recognition Program, HIZ: Home Ignition Zone.

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;[61] 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.[62] Surviving homes in both urban and rural areas exhibited many attributes of FireSmart principles, regardless of the broader wildfire threat surrounding them.[62]

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

[60] Figure and content developed by A. Westhaver. Adapted by A. Duszynska, 2017.
[61] https://www.firesmartcanada.ca
[62] 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"[63]

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).[64,65] 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-noncombustible zone), 0 – 10 m (Priority Zone 1), 10 – 30 m (Priority Zone 2), and 30 – 100 m (Priority Zone 3) (Figure 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[66].

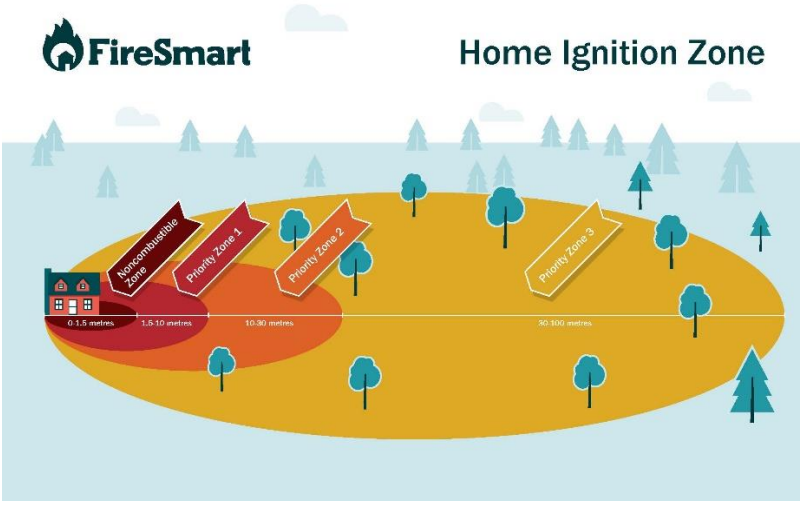


Figure 3. Illustration of FireSmart zones.
Retrieved from FireSmart Canada (https://www.firesmartcanada.ca/mdocs-posts/firesmart-home-ignition-zone-graphic/)

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

[63] Community Resiliency Investment Program. 2018. Community Wildfire Protection Plan Template.
[64] 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.
[65] Cohen, J. Preventing Disaster Home Ignitability in the Wildland-urban Interface. Journal of Forestry. p 15 - 21.
[66] https://firesmartcanada.ca/ and https://www2.gov.bc.ca/gov/content/safety/wildfire-status/prevention/firesmart

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.[65] Increasing ignition resistance would reduce the number of homes simultaneously on fire; extreme wildfire conditions do not necessarily result in WUI fire disasters.[67] 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.

FireSmart Canada Community Recognition Program

In the case of adjacent homes with overlapping HIZs, a neighbourhood (or subdivision) approach can be an effective method of reducing ignition potential for all homes within the neighbourhood. 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 neighbourhood. 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 4).

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.[68] Figure 4 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

[67] 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/

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

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.[68]

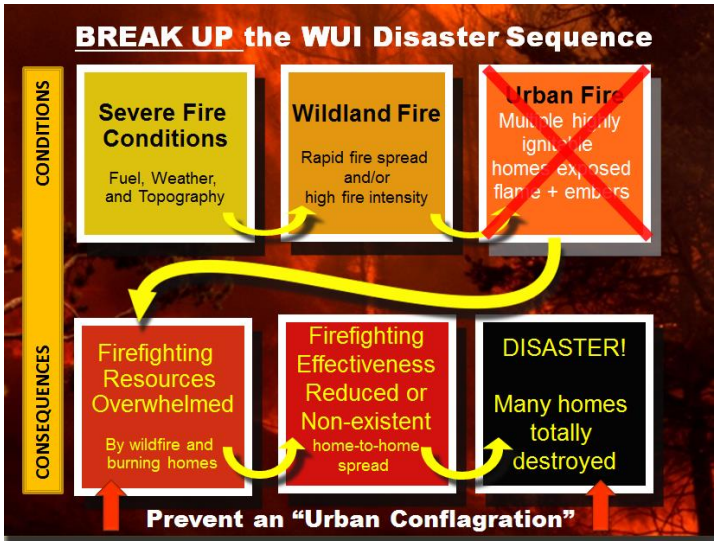


Figure 4. The wildland/urban interface disaster sequence and the possibility to break up the disaster sequence by decreasing the number of highly ignitable homes.[69]

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, FVRD staff, and local utilities providers. Education and communication messages should be simple yet comprehensive. A basic level of background information is required to build an 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 FVRD has undertaken some public education outreach in the community and online. This outreach effort can be expanded upon and/or adapted to further enhance wildfire preparedness and education. The FVRD should consider utilizing the FireSmart BC Education Package as an element of wildfire

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

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 FVRD staff. The FVRD 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

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 FVRD Zone C 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 communities at large. The development objectives/considerations for the FVRD Zone C 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 neighbourhoods, 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 FVRD Zone C 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 (as per FireSmart activities for private land discussed below).

The FVRD does not currently enforce FireSmart landscaping requirements within development permits. More detailed recommendations regarding wildfire hazard development permit areas are provided below.

Development Permit Areas for Wildfire Hazard

The OCPs within the FVRD Zone C do not explicitly consider the establishment of a development permit area (DPA) to address wildfire risk mitigation. It is recommended that the FVRD review the OCPs, with consideration towards establishing a wildfire development permit area for intermix or remote forested subdivisions (i.e., Slesse Park, Post Creek, Cultus Lake South and Lindell Beach). Other jurisdictions' wildfire development permit areas can serve as models for various components. [70] 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 flows 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*[71])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 servicing.
- 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.
- Coordinating QPs to ensure that requirements for overlapping, and potentially conflicting, development permit areas such as Streamside Protection and Enhancement are met.
- 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).

[70] The District of North Vancouver and City of Maple Ridge have robust and well-documented Wildfire Hazard Development Permit processes.

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

The FVRD is advised to engage the development community in the DP 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.[72]

RECOMMENDATION #15: Review the Official Community Plans (OCPs) for Areas "D" and "E and H"; consider including wildfire as a natural hazard development permit area (DPA). A recommended development permit area for the FVRD Zone C would include all areas in 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 or FireSmart standards, 5) underground servicing, 6) prompt removal of combustible construction materials or thinning/fuel management waste.

RECOMMENDATION #16: Engage VFDs to assist in the identification of minimum design requirements for alternative water supply, emergency access/egress, and hydrant placement. Input provided by the VFDs should be considered in the development of policies and regulations associated with the wildfire hazard development permit area.

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

RECOMMENDATION #17: Develop a landscaping guide 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 referencing the landscaping guide in the development permit area bylaw, 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 the Regional District Office or other strategic locations).

RECOMMENDATION #18: Engage the development/building community (may include developers, builders, landscapers, and architects) in wildfire risk reduction and the DP 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 DP objectives, 4) educate and inform regarding the DP 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 considerations for decreasing wildfire threat. Aspects of subdivision design that influence wildfire threat 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 communities and/or developed areas within the FVRD Zone C, on-street parking can pose access challenges on narrow or dead-end roads, which are already unlikely to have a high capacity under heavy smoke conditions.[73] When the time for evacuation is limited, poor access has contributed to deaths associated with entrapments and vehicle collisions during wildfires.[74] 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.[73] These factors should be considered during the review of applications for new developments occurring on vacant lots within the FVRD Zone C wildland urban interface.

For new development in rural settings where hydrants are limited or unavailable (or it is otherwise determined by the FVRD 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, cisterns or other underground storage, etc., should be reviewed by the FVRD and the fire departments prior to development approval.

[73] 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.

[74] 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 FVRD Zone C 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 FVRD based on assessment by internal trained Local FireSmart Representatives or an external Local FireSmart Representative consultant.

RECOMMENDATION #19: Following FireSmart assessments of critical infrastructure, the FVRD should apply for FireSmart demonstration grants through the Community Resiliency Investment (CRI) Program. This type of project can display the practices and principles of FireSmart activities to the public in the form of demonstration treatments. FireSmart demonstration projects are beneficial in that they meet the dual objectives of enhancing public education of wildfire mitigation and FireSmart principles (through signage, community work days, public tours, active demonstrations of operations, etc.) and improving the resilience of a structure(s) to wildfire.

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 FVRD can facilitate uptake within its communities 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 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. Planning for private land may include developing FireSmart Community Plans for identified areas (i.e., a WUI neighbourhood, community, subdivision) and conducting FireSmart home and property assessments.

RECOMMENDATION #20: Develop and implement a community chipper program with the help of neighbourhood representatives and community groups. As a demonstration, this program can begin twice per year in two separate neighbourhoods or communities. This program can also be implemented in conjunction with community clean up days.

FireSmart Compliance within the Area of Interest

There is a wide range of FireSmart compliance on private properties in the AOI. There are large differences in the degree to which FireSmart best practices are visible within individual HIZs, and in neighbourhoods throughout the AOI communities. Landscaping in the AOI is also in a range of FireSmart compliance. Generally speaking, most homes in interface areas such as Lindell Beach, Cultus Lake, Baker Trails, Slesse Park, and Post Creek do not maintain 10 m defensible space. The main concern in the aforementioned areas is the ubiquity of flammable landscaping options (*e.g.*, cedar hedging) in proximity to residences, as well as the lack of defensible space between property footprints and adjacent forested areas. Accumulations of conifer foliage in roof corners and gutters was not uncommon. Storage of combustible items under decks, carports, and other horizontal surfaces was common. On the other hand, some residences are surrounded by lawn, agricultural fields, 10 m defensible space, and/or hardscaping (rocks), all of which are FireSmart compliant. The community of Lindell displays the highest FireSmart compliance rate.

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, neighbourhoods or the communities as a whole. These factors include but are not limited to: the age of homes or subdivision; common design features and favored building materials of the era; proximity to forested area (both on private land and adjacent Crown or FVRD-owned land); density, lot size and lay-out of the subdivision; positioning of the home or neighbourhood in relation to slope, aspect and prevailing winds; and the stage and maturity of landscaping.

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

- Wildfire hazard levels range from moderate to high across communities within the AOI;
- The bulk of hazards are associated with conditions of natural and landscaped vegetation immediately surrounding residential properties;

- For new development, where landscaping is not yet completed, educational approaches may aid in promoting fire resistant landscaping options and achieving defensible space in the HIZ;
- Hazards are magnified in some communities due to poor access (i.e., presence of private and gated roads) and distance from nearest water supply or fire hydrant location; and,
- All communities have good opportunities to mitigate risk through individual and collective action.

RECOMMENDATION #21: The FVRD should hire a qualified professional (QP) or consider training additional local fire services staff members as Local FireSmart Representatives to assist the various communities in complying with FireSmart principles at the community, neighbourhood and/or 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 input from the FVRD and are not based on a scientific sample or formal data collection. Recommended FireSmart activities are essentially the same for each community or area; however, it is recommended that the FVRD further prioritize the communities in Table 11. In addition, every community within the AOI should continue and improve upon existing FireSmart activities and equally participate in FVRD's FireSmart program.

Table 11. Summary of FireSmart Priority Areas.

Area	FireSmart Y/N	FireSmart Canada Recognition Received Y/N	Recommended FireSmart Activities
Priority Area #1: Post Creek	N	Y	The following is a non-extensive list of FireSmart activities for which the FVRD can engage suggested communities/ 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.
Priority Area #2: Slesse Park	N	N	
Priority Area #3: Bell Acres Road	N	N	
Priority Area #4: Edwards Road/Estate Drive	N	N	
Priority Area #5: Baker Trails	N	N	
Priority Area #6: Lindell Beach	N	N	
Priority Area #7: Cultus Lake	N	N	

Area	FireSmart Y/N	FireSmart Canada Recognition Received Y/N	Recommended FireSmart Activities
Priority Area #10: Critical infrastructure	Y (partially)	N/A	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 adjacent to critical infrastructure. It is recommended that fuel treatments be considered for areas adjacent to critical infrastructure in order to bolster the effect of previous FireSmart setbacks. 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.

RECOMMENDATION #22: The FVRD should 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 moderate, high or extreme risk in a FireSmart home and property assessment. The rebate program must adhere to the goals of FireSmart, as outlined in Section 5.2.1.

5.3 COMMUNICATION AND EDUCATION

Establishing effective communication 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, industry, the efforts to reduce wildfire losses by public officials, fire departments, and others 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 FVRD staff and some 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 neighbourhoods. 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 FVRD 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 FVRD should consider creating an Interface Steering Committee to coordinate wildfire risk reduction efforts. The steering committee could include key stakeholders such as FVRD staff, Municipal/Village staff, BCWS, BC Parks, First Nations, woodlot owners, forest tenure license holders and recreational groups/representatives.

Significant areas of private land in the AOI are within the Agricultural Land Reserve (ALR), supporting a range of crop and livestock agriculture 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 to the agriculture sector/community will promote improved planning and preparedness of agriculture producers and encourage FireSmart practices on private farmland.

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 #23: This report and associated maps should be made publicly available through webpage, social media, and public FireSmart meetings.

RECOMMENDATION #24: 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 FVRD'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 should be initiated every 5 - 7 years.

RECOMMENDATION #25: Develop a social media strategy and ensure that its full power is leveraged to communicate fire bans, high or extreme Fire Danger days, wildfire prevention initiatives and programs, easily implementable FireSmart activities, updates on current fires and associated air quality, road closures, and other real-time information in an accurate and timely manner.

RECOMMENDATION #26: Promote FireSmart approaches for wildfire risk reduction to FVRD residents through Town Hall meetings, FireSmart 101 course, workshops and/or presentations. Aim to conduct the engagement/promotion campaign prior and during the fire season. Consider supplying FireSmart materials to homeowners in the interface during these engagement campaigns.

RECOMMENDATION # 27: Promote improved planning and preparedness of agriculture producers in the FVRD 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 FVRD website, mailouts). Resources include a Wildfire Preparedness and Mitigation Plan - Guide and Workbook.

RECOMMENDATION #28: Work towards FireSmart community recognition, at the neighbourhood level and facilitate uptake into the FireSmart Canada Community Recognition Program (FSCCRP). This will help reduce fire risk and aid in further funding applications.

RECOMMENDATION #29: Facilitate the FSCCRP uptake within the FVRD Zone C and enhance its applications by including the following: 1) inviting BCWS crews to participate in and support the annual FireSmart events set up by participating neighbourhoods. 2) Encourage individual homeowner participants to complete the self-administered FireSmart home assessment tool. 3) Include within the FireSmart Canada Community Assessment Report the standard recommendation that participating neighbourhoods hold a home hazard assessment workshop as one of their FireSmart events.

RECOMMENDATION #30: Promote the use of the FireSmart Home Partners Program offered by the Partners in Protection Association, which facilitates voluntary FireSmart assessments on private property. Use the opportunity to educate the home or business owner about the hazards which exist on their property and provide easy improvements to reduce their risk.

RECOMMENDATION #31: Encourage schools to adopt and deploy existing school education programs (e.g. FireSmart BC Education Package) to engage youth in wildfire management and risk reduction. 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 British Columbia Wildfire Service (BCWS) (Fraser Fire Zone), 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 #32: Develop and work with all key stakeholders (MFLNRORD, BCWS, BC Parks, BC Hydro, licensees, woodlot licence holders, and recreational groups/representatives) and First Nations 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) Development of large, landscape level fuel breaks; 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 #33: Promote and provide information to private landowners related to external residential sprinklers as a FireSmart prevention measure.

5.4 OTHER PREVENTION MEASURES

In addition to 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 be updated on a weekly basis; 2) fire ban alignment with provincial fire bans; and 3) enforcement of local bylaws such as the Unsightly Premises and Unwholesome Matter Regulations Bylaw. 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 FVRD and pertinent industrial partners.

RECOMMENDATION #34: Work with industrial operators (i.e., BC Hydro, FortisBC and Enbridge) to advocate that high risk activities, such as grubbing/brushing and right-of-way mowing work do not occur during high fire danger times to reduce chance of ignitions as per the *Wildfire Act*.

RECOMMENDATION #35: Work with industrial operators (i.e., BC Hydro, FortisBC and Enbridge) to advocate that right-of-ways do not contain fine fuel accumulations (easily cured) or high conifer regeneration 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[75]. The aforementioned document establishes a protocol for collaborative and integrated emergency management in the event of WUI fires within British Columbia.

6.1 LOCAL 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

[75] 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

emergency situation and loss of power, the FVRD owns one mobile generator and has 24/7 access to rentals to power critical infrastructure such as the Fire Halls and the EOC. Furthermore, all water and wastewater sites have backup generators. However; should a 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. Specific limitations of the FVRD water system with regards to wildfire suppression are detailed in Section 6.1.2.

Formal mutual aid agreements are in effect between the four primary fire departments within the AOI (more detail is provided in Section 6.1.1). In the event of a WUI fire emergency, mutual aid in the AOI is activated, as required, between the four principal fire departments. WUI fire events may also lead to aid requests with BCWS.

6.1.1 Fire Department and Equipment

Fire protection with the AOI is primarily the responsibility of four volunteer fire departments (VFD). These include the Popkum, Columbia Valley/Lindell Beach, Cultus Lake, and Chilliwack River Valley VFD. Additionally, small portions of AOI outside of the Fire Protection Service areas of the four VFDs are serviced by the Agassiz Fire Department, Chilliwack Fire Department and Hope Fire Department. Table 12 provides an overview of the fire services capacity in the AOI, including fire department personnel and equipment. In total, the various fire protection service areas cover the entirety of the AOI, inclusive of water bodies) and all major communities including First Nations Indian Reserves.

The greatest personnel deficiencies reported by fire departments are the lack of daytime responders (available prior to 5 pm) due to other employment commitments. In consultation with fire departments it was determined that there are some deficiencies due to aging structural firefighting equipment (Chilliwack River Valley VFD) and some departments are lacking in wildland firefighting equipment (Popkum and Columbia Valley VDFs).

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
Popkum Fire Service Area	Popkum Volunteer Fire Department	1	21 volunteer members including one Fire Chief and one Deputy Fire Chief	2 engines, 1 tender (2,500 US gallons) and 1 utility/rescue truck
Columbia Valley Fire Service Area	Columbia Valley/Lindell Beach Volunteer Fire Department	1	21 volunteer members including one Fire Chief and one Deputy Fire Chief	2 engines and 1 utility truck
Cultus Lake Fire Service Area	Cultus Lake Volunteer Fire Department	1	23 paid on-call members including one Fire Chief and one Deputy Fire Chief	2 engines and 2 rescue trucks

Fire Protection Zones	Fire Department	Number of Stations	Number of Members	Apparatus type and number
Chilliwack River Valley Fire Service Area	Chilliwack River Valley Volunteer Fire Department	1	23 volunteer members including one Fire Chief and one Deputy Fire Chief	2 engines, 1 tender (3,500 US gallons), 1 rescue truck, and 1 utility wildland truck

Within the AOI, the four volunteer fire departments have formal mutual aid agreements and can provide mutual aid within relatively short response times. Mutual aid agreements also exist with adjacent fire departments outside of the AOI. These mutual aid agreements are typically utilized multiple times a year for structural fires (1-2 times per year). Members of the primary fire departments within the AOI undergo training focused on structural firefighting and variable levels of training (at least once per year) related to wildfire, including annual wildfire interface training, structure protection program wildland firefighter level 1 (SPP-WFF1), SPP-115 training, incident command system (ICS-100), and/or S-100. The Chilliwack River Valley VFD has in-house train-the-trainers for SPP-WFF1, ICS-100, SPP-115 and S-100. It is recommended that all fire services members within the AOI maintain at a minimum, training in S-100 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 deployment of SPUs. The aforementioned cross-training opportunity could include, for example, a joint wildfire simulation exercise. This level of training would improve the local fire departments' commitment to wildfire preparedness.

The level of cross-training and working relationship with MFLNRORD's BCWS is also variable by fire department, and is generally well established, especially with the Chilliwack River Valley VFD. For example, within recent years, the Chilliwack River Valley VFD has undertaken annual cross-training with the BCWS. Any cross-training that occurs with the BCWS is generally in the form of table top exercises. In consultation with the BCWS, it was noted that the needs for cross-training vary from department to department. Cross-training with the BCWS would enable local fire departments to prepare their responders with technical and practical firefighting training in order to action both structural and wildland fires.

Over the previous years (2011-2018), the Columbia Valley/Lindell Beach, Chilliwack River Valley and Popkum VFDs responded to an average of 89 calls per year (averaged over all fire departments from 2011 to 2018), of which only one per year was classified as a wildland fire. Wildland fire calls have ranged from none for the Columbia Valley and Popkum VFD in 2011-2012, 2017-2018, and 2013, and 2016-2017, respectively, to a high of 4 for the Chilliwack River Valley VFD in 2018. Wildland fires averaged yearly over the period of 2011-2018 for each fire department are as follows: Columbia Valley VFD - 1, Popkum VFD - 1, and Chilliwack River Valley VFD– 2.

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 an adequate water supply is available. The Fire Underwriters Survey summarizes their

recommendations regarding water works systems fire protection requirements, in *Water Supply for Public Fire Protection* (1999).[76] 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 within the AOI is an important component of emergency response for a wildland urban interface fire in the event of a large-scale emergency, and in particular for structural fires. As previously noted in Sections 3.2.3 and 3.3.1, water service is provided by a number of distinct FVRD operated systems and the majority of the systems rely on groundwater sources. For suppression within the AOI, hydrant service is provided within the fire services area boundaries at varying levels of coverage. However, there are significant areas outside of the water systems boundary that are without hydrant service.

Several areas or neighbourhoods that have a lack of hydrants, water supply and/or water pressure were identified and that create suppression challenges in the AOI. In consultation with the Wildfire Working Group, a lack of hydrants was identified in the following neighbourhoods and developments: Paulsen Road (Post Creek), Slesse Park, Estate Drive, Baker Trails, and Lindell Beach. The FVRD did not express concerns with regards to water pressure from hydrants (i.e., where hydrant services exist, the hydrants meet Fire Underwriters Survey requirements).

To supplement water availability for firefighting, the FVRD fire departments can draft from natural and static water sources such as lakes, rivers and ponds (i.e., Cultus and Chilliwack Lakes) using either truck mounted or portable pumps. 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. These natural water sources are known and mapped.

RECOMMENDATION #36: All new rural development outside existing FVRD water systems should have a water system which meets or exceeds minimum standards of NFPA 1142, *Standard on Water Supplies for Suburban and Rural Fire Fighting*[77]. FVRD volunteer fire departments and/or Engineering and Community Services 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.

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

[77] 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

RECOMMENDATION #37: 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

Emergency access and evacuation planning is of particular importance in the event of a wildfire event or other large-scale emergency. The FVRD has developed an Emergency Management Response and Recovery Plan (EMRRP) in 2013 which includes basic contingencies in the event of a wildland/interface fire (i.e., contacts and roles of local government personnel). However, the EMRRP does not specify evacuation routes to be used during an emergency situation. The FVRD is currently developing a phased comprehensive Emergency Management Plan that will repeal and replace all previous documents. In addition, the FVRD webpage has an Emergency Services section which includes information on emergency preparedness for families, updates on any current emergencies, and emergency response procedures. As part of the FVRD emergency planning framework, each Electoral Area has an Emergency Planning Committee that assesses each evacuation situation as it arises, basic contingencies in the event of a wildland/interface fire, and the designated EOC. FVRD can request assistance of neighbouring Local Authorities and First Nations where they are not directly impacted by the same emergency. Any building anywhere can be designated as an EOC or Emergency Coordination Centre under a State of Local Emergency. FVRD recognizes the benefit of having EOC portability due to their local hazards and geography. It is recommended that the FVRD develop a detailed evacuation plan that includes the following provisions:

- Mapping and identification of safe zones, marshaling points and aerial evacuation locations;
- Creation of a Spontaneous Volunteer Management plan that would identify the method to task unaffiliated volunteers with key tasks during emergencies; and
- Development of an education/communication strategy to deliver emergency evacuation procedures to residents.

RECOMMENDATION #38: Complete and participate in regular testing of, and updates to, the evacuation plan.

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, Highway 1, Chilliwack Lake Road and Columbia Valley Highway are the only reliable, paved access routes to and from communities in the AOI. Paved roads also connect Lindell, Lindell Beach, Post Creek, Popkum, Cultus Lake, as well as several provincial campgrounds (i.e., Tamihi and Chilliwack Lake campgrounds). Evacuation in the AOI would be conducted by first responders and the RCMP. If a wildfire were to block Highway 1, Chilliwack Lake Road or the Columbia Valley Highway, evacuation from the AOI would be difficult. Smoke and poor visibility, car accidents, wildlife, and other unforeseen circumstances can further complicate evacuations and hinder safe passage.

Many developments within the AOI are located on single access roads which branch off of Highway 1, Chilliwack Lake Road and Columbia Valley Highway; this limits the ability of fire crews to respond to fires and safely evacuate residents. A number of single access routes or isolated communities that cause suppression or evacuation concerns were identified by the Wildfire Working Group including Post Creek, Slesse Park, Lindell Beach and the provincial campgrounds (Tamihi and Chilliwack Lake). Additionally, within the AOI, some of the critical infrastructure is reached via narrow and/or private, forested roads, which may impede suppression efforts and response times.

Recreation trails built to support ATVs can provide access for ground crews and act as fuel breaks for ground fires, particularly in natural areas. Strategic recreational trail development to a standard that supports ATVs, and the installation of gates or other barriers to minimize access by unauthorized users can be used as a tool that increases the ability of local fire departments to access interface areas.

RECOMMENDATION #39: Include a qualified professional with experience in operational wildland/interface fire suppression in the planning and strategic siting of future trails and parks.

The creation of a map book or spatial file that displays the trail network available for fire departments to access during an emergency or for fire suppression planning must accompany any fire access trail building activities. In order to effectively use the trails as crew access or as fuel breaks during suppression efforts, it is recommended that a Total Access Plan be developed. This plan should be made available to the AOI fire departments and the BCWS in the event that they are aiding suppression efforts on an interface fire in the AOI. The plan should include georeferenced maps with associated spatial data and ground-truthed locations of potential optimal firebreaks, identify the type of access available for each access route, identify those trails that are gated or have barriers, and provide information as to how to unlock or remove barriers. 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, trail and road network linkages where fuel-free areas or burn off locations can be created or used as potential sprinkler locations 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 #40: Develop a Total Access Plan for the FVRD to create, map and inventory trail and road network in natural areas for suppression planning, identification of areas with insufficient access and to aid in strategic planning. Georeferenced maps with ground-truthed locations of potential optimal firebreaks 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. Using information from RAAD (Remote Access to Archeological Data), the Total Access Plan should also incorporate an inventory of registered and potential archeological sites that can be shared with BCWS during a wildfire event to address potential impacts to cultural sites. As part of this plan,

relevant cultural information and protocols to share with BCWS should be developed in consultation with local First Nations."

6.1.4 Training

The fire departments within the FVRD Zone C maintain a current level of structural protection training as described in Section 6.1.1. Additionally, members have yearly refreshers and/or certification in either SPP-WFF1 (Wildland Firefighter Level 1), SPP-115 (focused on the use of wildfire pumps and hose, as well as the use of fire service hose and hydrants, in the application of sprinklers on structures), incident command system (ICS-100), and S-100. 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 is recommended that all fire department members at minimum have SPP-WFF1 (or equivalent) if they are going to be responding at the request of the province to be deployed on a wildfire, and that the fire departments engage in yearly practical wildland fire training with BCWS. It must be noted that SPP-WFF 1 is a new S100 and S-185 equivalent course for structure firefighters only, and as such BCWS has phased out instruction of S100 training for fire departments.

The fire departments maintain communication with BCWS throughout the year, as required by the fire season demands; however, the level of engagement with the BCWS is inconsistent between fire departments. It is recommended that the fire departments work cooperatively with the BCWS (Fraser Fire Zone-Cultus/Haig Fire Base) to conduct yearly mock exercises, where information and technical/practical knowledge are shared, such as: fireline construction, Mark 3 pump operations, sprinkler protection, skid pack operations, 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 within the AOI and outside the AOI (i.e. City of Chilliwack, City of Abbotsford, District of Kent, Village of Harrison Hot Springs, and City of Hope, etc.) to conduct joint training so as to further strengthen regional emergency response and firefighting training.

RECOMMENDATION #41 FVRD fire departments should continue working with BCWS to maintain an annual structural and interface training program. 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 FVRD and member municipalities engage in yearly practical wildland fire training with BCWS that covers at a minimum: pump, hose, hydrant, air tanker awareness, and deployment 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 is highly dependent upon the current fire season and other BCWS priorities.

RECOMMENDATION #42: FVRD fire departments should engage in regular communication with the BCWS Fraser Fire Zone – Cultus/Haig Fire Base to foster a strong relationship and identify potential cooperative wildfire risk reduction opportunities.

RECOMMENDATION #43: Ensure that the FVRD fire departments maintain the capability to effectively suppress wildland fires, through wildfire-specific training sessions. Maintain high level of member education and training specific to interface and wildland fires by including S-100 and S-185 (combined) 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 FVRD 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 in the AOI are adequately resourced in both structural and wildland fire suppression equipment. The fire departments maintain a current level of training in both wildfire and structural firefighting (see Section 6.1.1 for additional detail). The FVRD Zone C Fire Departments are not equipped with a Structural Protection Unit (SPU). The UBCM 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 neighbourhoods. 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*"[78].

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

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

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 FVRD 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 #44: Develop 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 community chipping opportunities, yard waste dumpsters available by month in neighbourhoods, or scheduled burning weekends. Programs should be available during times of greatest resident activity (likely spring and fall).

RECOMMENDATION #45: Consider acquiring a Type 2 SPU trailer to improve wildfire response (provides protection for 25-30 residences).

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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.[79] 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.[80] 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.[80] 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 is C-3, 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.[80] 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. 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.

[79] Forestry Canada Fire Danger Group. 1992. Development and Structure of the Canadian Forest Fire Behavior Prediction System: Information Report ST-X-3.

[80] 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.

Table 13. Fuel Type Categories and Crown Fire Spot Potential. Only summaries of fuel types encountered within the AOI are provided.

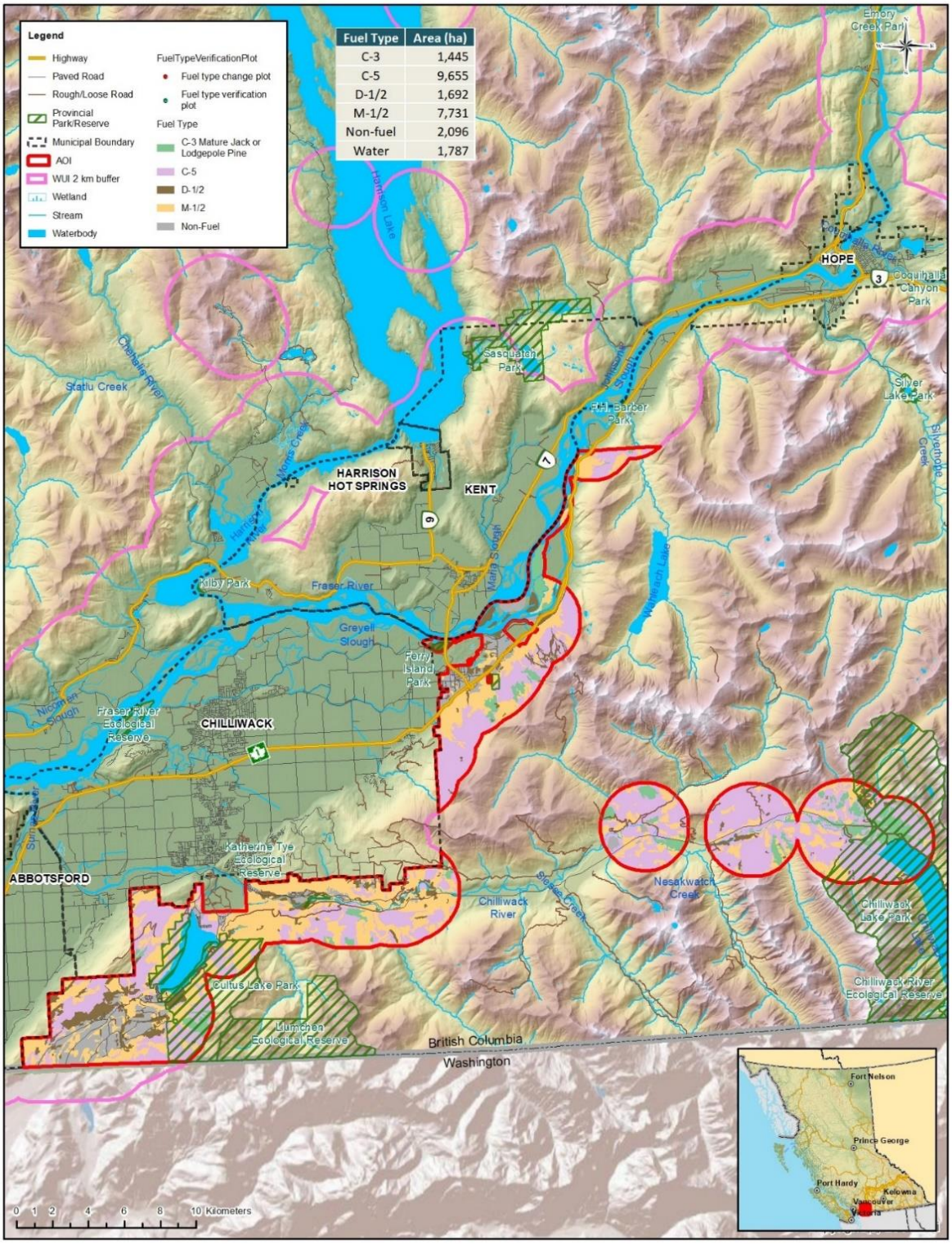
Fuel Type	FBP / CFDDRS Description	AOI Description	Wildfire Behaviour Under High Wildfire Danger Level	Fuel Type – Crown Fire / Spotting Potential
C-3	Mature jack or lodgepole pine	Fully stocked, late young forest (coastal lodgepole pine, western red cedar, hemlock, and/or Douglas-fir), with crowns generally 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. Often accompanied by dead woody fuel accumulations.	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
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.	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 (Bigleaf maple, cottonwood or red alder)	Always a surface fire, low to moderate rate of spread and fire intensity	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.	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 (i.e., western redcedar, Cw, Douglas-fir, Fd, western hemlock, Hw, or lodgepole pine, Pl).*

During field visits, five 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-5,
- C-3 fuel types identified as D-1/2,
- M-1/2 fuel types identified D-1/2,
- M-1/2 fuel types identified as S-3, and
- C-5 fuel types identified as M-1/2.

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 – Ford Mountain. The wind rose data is compiled hourly and provides an estimate of prevailing wind directions and wind speed in the area of the weather station.

During the fire season (April – October) predominant winds originate from the southwest, north and northeast. Winds also occur to a lesser degree from the south and northeast in most months. Wind speeds over 12 km/hour occur more frequently from the southwest between the months of April to September and between 6 am and 6 pm (Figure 5). Throughout the fire season, morning (12 am to 6 am) and evening (6 pm to 12 am) winds are primarily from the north, northwest and northeast and generally have lower wind speeds (<12 km/hour), with the exception of the month of May, where windspeeds can reach upward of 18 km/hour. 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.

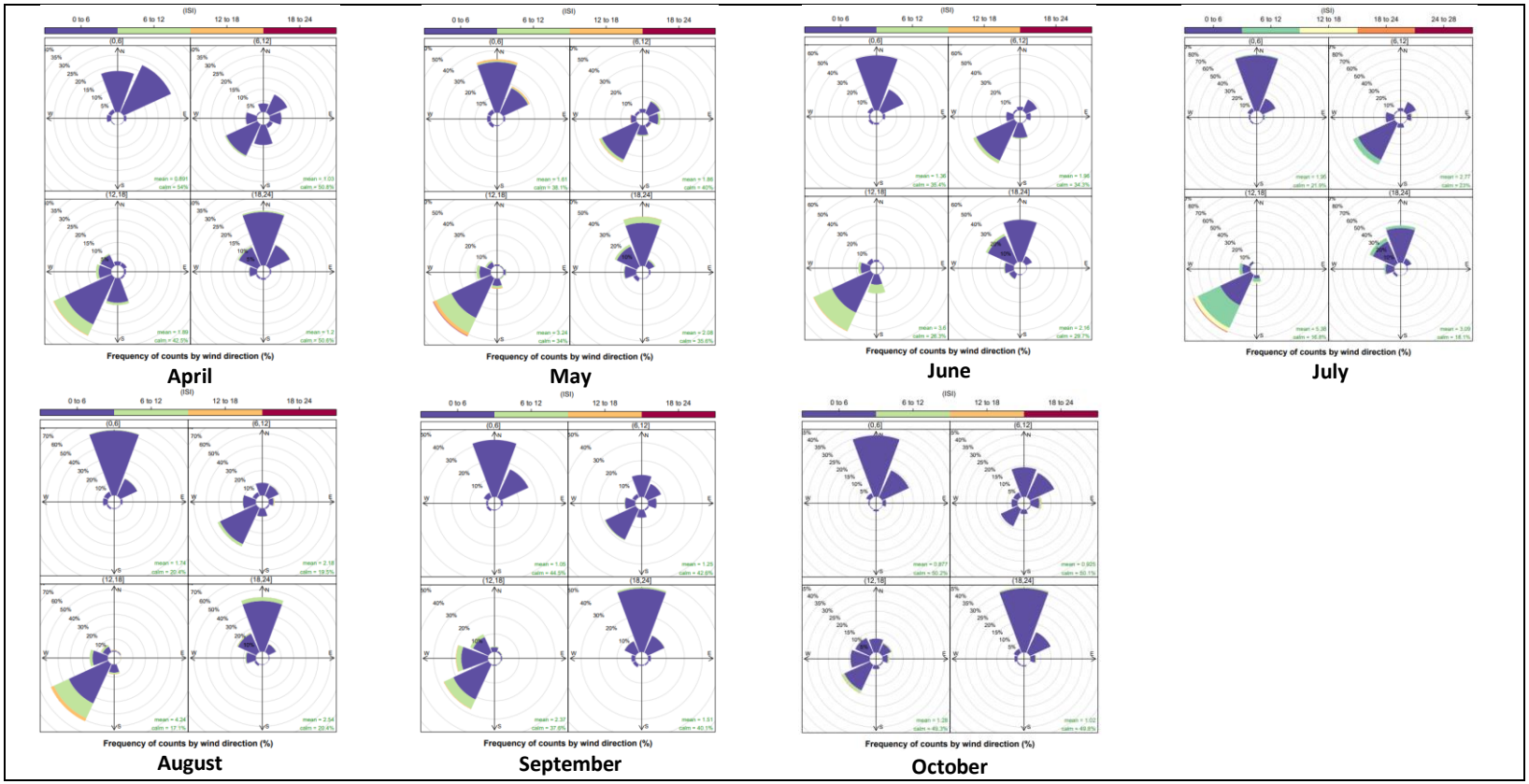


Figure 5. ISI Wind roses depicting average hourly wind speed for the fire season April – October at Ford Mountain fire weather station.

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). Approximately 34% of the AOI is on less than 20% slope and will likely not experience accelerated rates of spread due to slope class. Another 23% of the AOI is likely to experience an increased or high rate of spread, while the remaining 33% of the AOI will experience very high to extreme rate of spread. On the larger topographic scale, the communities in the AOI and surrounding agricultural, industrial, commercial, recreational and residential developments 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%	34%	Very little flame and fuel interaction caused by slope, normal rate of spread.
21-30%	9%	Flame tilt begins to preheat fuel, increase rate of spread.
31-45%	14%	Flame tilt preheats fuel and begins to bathe flames into fuel, high rate of spread.
46-60%	15%	Flame tilt preheats fuel and bathes flames into fuel, very high rate of spread.
>60%	28%	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 neighbourhoods 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.

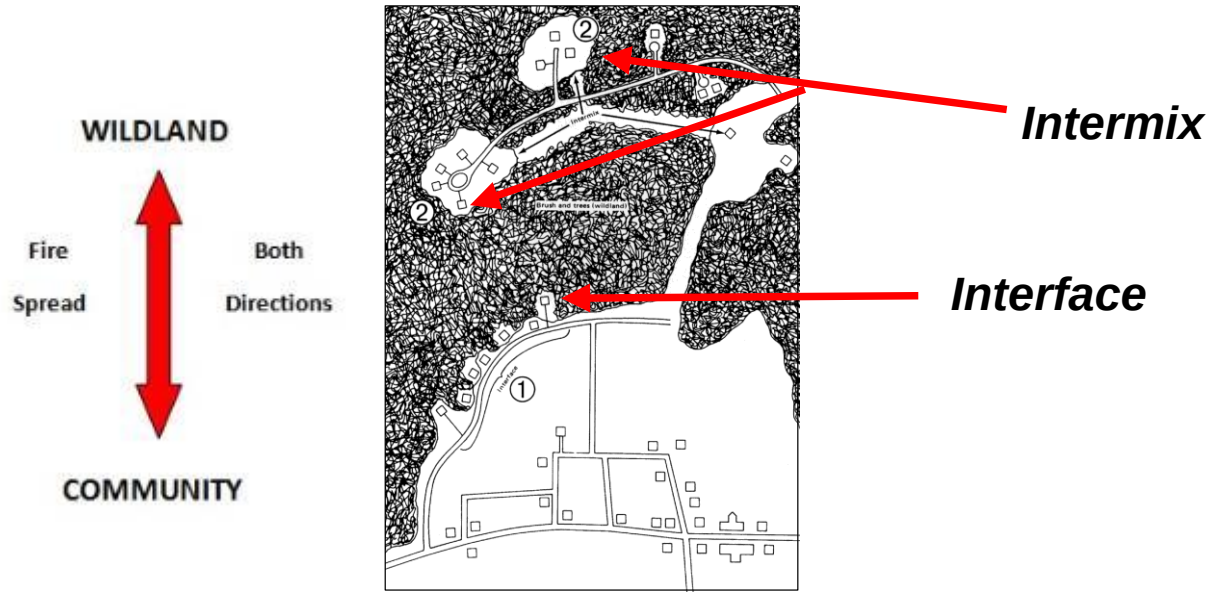


Figure 6. Illustration of intermix and interface situations.

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.

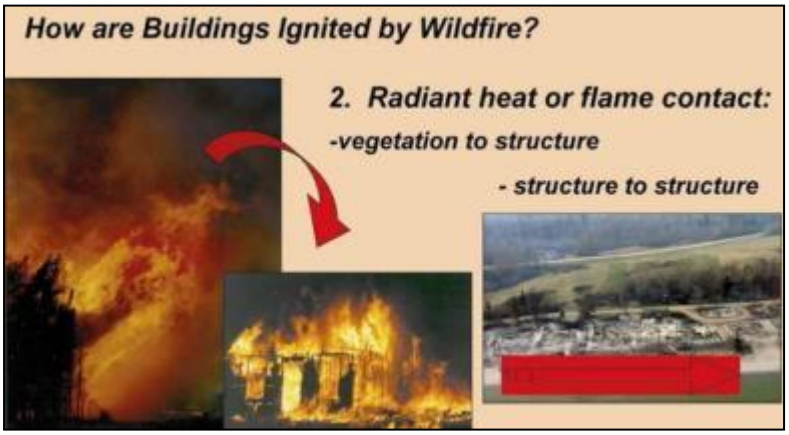


Figure 8. Radiant heat and flame contact allow fire to spread from vegetation to structure or from structure to structure.

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 were 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
BRIDE-1	Bridal Veil Falls	Moderate	-
CHEAM-1	Cheam FSR	High	Moderate
CHILL-1	Chilliwack Lake	High	Low
CHILL-2	Chilliwack Lake	High	High
CHILL-3	Chilliwack Lake	High	Moderate
CHILL-4	Chilliwack Lake	Extreme	Extreme
CHILL-5	Chilliwack Lake	High	Extreme
CHILL-6	Chilliwack Lake	Moderate	-
CHILL-7	Chilliwack Lake	Moderate	-
CHILL-8	Chilliwack Lake	High	Low
CHILL-9	Chilliwack Lake	High	Moderate
CHIP-1	Chipmunk FSR	Moderate	-
CULT-1	Cultus Lake	Moderate	-
CULT-2	Cultus Lake	High	Extreme
CULT-3	Cultus Lake	Moderate	-
LIND-1	Lindell Ave	Moderate	-
SHER-1	Slesse Creek	Moderate	-
SHER-2	Slesse Creek	Moderate	-
SHER-3	Slesse Creek	Moderate	-
SHER-4	Slesse Creek	Moderate	-
SLESS-1	Slesse Creek	Moderate	-
TAMI-1	Tamihi Creek	Moderate	-
TAMI-2	Tamihi Creek	Moderate	-
VEDD-1	Vedder FSR	Moderate	-
VEDD-2	Vedder FSR	High	Moderate
VEDD-3	Vedder FSR	Moderate	-

WUI Plot	Geographic Location	Wildfire Behaviour Threat Class	WUI Threat Class
VEDD-4	Vedder FSR	Moderate	-
VEDD-5	Vedder FSR	Moderate	-
VEDD-6	Vedder FSR	Moderate	-

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

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.[81]

[81] 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. 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 29 WUI threat plots on a variety of fuel types, aspects, and slopes and an additional 150+ 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	

WUI Threat Sheet Attribute	Used in Analysis?	Comment
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 200 m are rated as 'extreme', within 500 m are rated as 'high', within 2 km 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 CRI 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.