

Fraser Valley Regional District, Zone B Community Wildfire Protection Plan 2019



Submitted by:

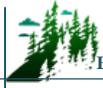
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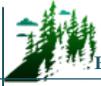
ACKNOWLEDGEMENTS

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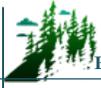
This report would not be possible without the Union of British Columbia Municipalities (UBCM) Community Resiliency Investment (CRI) Program and funding from the province of British Columbia.

Cover photo: Debrah Zemanek, Hemlock Valley Road



REGISTERED PROFESSIONAL SIGN AND SEAL

RPF PRINTED NAME	
Bruce Blackwell	RPF 2073
DATE SIGNED	
August 20, 2020	
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.	
Registered Professional Forester Signature and Seal	
	



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 B, which encompasses portions of Electoral Areas C, F and G. 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 **50 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 FVRD regulatory framework to incorporate wildfire mitigation and preparedness considerations.				
1	11	High	Review and amend the Official Community Plans (OCPs) for Electoral Areas (EA) C, F and G 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, are available, reliable, and accessible.	~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	Review and amend the OCPs for Electoral Areas (EA) C, F and G to include wildfire as a natural hazard which has the potential to impact public health and safety, economics (i.e. through evacuations, loss of tourism, interruption of services, etc.), ecosystems, habitat, and water quality, among other values (for example, as included in Section 11.4 of the OCP for Electoral Area G). Identification of natural hazards can allow for planning and policies to be put in place to increase FVRD resilience, mitigate potential damages, and increase public and official awareness of risk.	Can be done in conjunction with Recommendation #1; effort hours included in Recommendation #1. 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
Objective: Review and amend the current FVRD regulatory framework to incorporate wildfire mitigation and preparedness considerations.				
3	12	High	Revise the OCPs for Electoral Areas (EA) C, F and G to include an interface wildfire hazard objective which sets specific policies relating to development in the wildland-urban interface (for example, as included in Section 11.4 of the OCP for Electoral Area G). Policies could include: avoiding development in areas that are at higher risk to wildfire hazards (as identified in this CWPP) through the creation of a wildfire development permit area (DPA), requiring new tenure applications to provide a detailed wildfire hazard report, and encouraging existing homeowners in WUI areas to practice FireSmart techniques, install sprinklers and well pumps, and utilize rain storage tanks, whenever possible for firefighting on-site. See Section 5.2.2 for recommendations regarding the establishment of a DPA for wildfire hazard.	Can be done in conjunction with Recommendation #1; effort hours included in Recommendation #1. May be eligible for UBCM CRI Program funding
4	12	Low	Where screening of industrial lots or certain land uses is required in Zoning Bylaw 559, language should be included to require adherence with FireSmart principles, such as requiring an appropriate set-back of structures from conifer hedging in high hazard areas.	~40-80 in-house hours (local government funding). May be eligible for UBCM CRI Program Funding
5	12	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. Focus efforts in Hemlock Valley, identified as an area of concern by Hemlock Valley fire department.	~30-45 in-house hours (local government funding). May be eligible for UBCM CRI Program funding
6	13	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



Document Section 2: Local Area Description (2.5.3: Local Government Policies and Recommendations)				
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Objective: Review and amend the current FVRD regulatory framework to incorporate wildfire mitigation and preparedness considerations.				
7	13	Moderate	Complete updates to the FVRD Regional Parks Strategic Plan (2025-2035) to include wildfire threat as a parks acquisition criterium. Access and potential costs of park and trail maintenance to mitigate wildfire risk should be weighed against other acquisition criteria. Consider including the following in Bylaw 1190 (Campgrounds and Holiday Parks): 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).
8	14	Moderate	Develop a trails master plan in collaboration with member municipalities and interest groups 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 (through proper placement, clean-up of combustible fuels trailside and work practices which adhere to <i>Wildfire Act and Regulation</i>).	~50-80 in-house hours (local government funding)
9	14	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				
Item	Page No.	Priority	Recommendation / Next Steps	Estimated Cost (\$) or Person hours
Objective: Protect critical infrastructure and mitigate post-wildfire impacts				
10	19	Moderate	The use of fire-resistant construction materials, building design and landscaping should be considered for all critical infrastructure when completing upgrades or establishing new infrastructure. Additionally, vegetation setbacks around critical infrastructure should be compliant with FireSmart guidelines.	Negligible in-house cost



Document Section 3: Values at Risk				
Item	Page No.	Priority	Recommendation / Next Steps	Estimated Cost (\$) or Person hours
Objective: Protect critical infrastructure and mitigate post-wildfire impacts				
11	19	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, local government funding, or UBCM/CRI program funding)
12	22	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. Exploration of potential funding opportunities through the province and the National Disaster Mitigation Program may be worthwhile.	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				
13	44	Low	Work with the Ministry of Transportation and Infrastructure (MOTI), to assess high hazard fuel types (C-3 and M-1/2) along Hwy 7 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
Objective: Reduce Wildfire Threat through Fuel Management				
14	46	High	Proceed with detailed assessment, prescription development and treatment of the units identified in this CWPP.	UBCM CRI Program Funding ² / Local Government Funding

² Note that the UBCM SWPI funding stream has very 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 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				
15	46	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 the Mission Municipal Forest, woodlots and/or other licensees to apply the MFLNRORD approved alternative fire management stocking standards in the FVRD Zone B wildland urban interface to reduce interface wildfire threat.	~\$3,000, local government funding
16	54	Moderate	As treatments are implemented, treatment monitoring should be completed by a qualified professional in order to schedule the 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 Funding/ Local Government Funding
Objective: Reduce Wildfire Hazard on Private Land				
17	61	Moderate	Review the OCPs for Electoral Area C and the OCP for EA F and consider including wildfire as a natural hazard development permit area (DPA).The 'Interface Fire Hazards' section (11.4) in the OCP for EA G should be revised to ensure that the most up-to-date threat information is used for the DPA. A recommended development permit area for the FVRD Zone B 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.	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)
18	61	Moderate	Engage VFDs to assist in the identification of minimum design requirements for alternative water supply, emergency access/egress, and hydrant placement for wildfire DPA applications. Input provided by the VFDs should be considered in the development of policies and regulations associated with the wildfire hazard development permit area.	Dependent on the number of DP applications



Document Section 5: Risk Management and Mitigation Factors Recommendations				
Item	Page No.	Priority	Recommendation / Next Steps	Estimated Cost (\$) or Person hours
Objective: Reduce Wildfire Hazard on Private Land				
19	61	Moderate	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.	\$2,000 - \$3,000 to outsource. Alternatively, general FireSmart landscaping information is available free of charge, but is not climate/ plant hardiness zone specific
20	62	Moderate	Consider engaging the development/building community (may include developers, builders, landscapers, and architects) in wildfire risk reduction planning. 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, and 3) discuss various strategies and actions which could be implemented to meet wildfire mitigation objectives.	~40 hours, UBCM CRI Program funding/local government funding
21	63	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 (through signage, community work days, public tours, active demonstrations of operations, etc.) 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.
22	64	Moderate	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.	40-80 in-house administrative hours. Eligible for UBCM CRI Program funding.



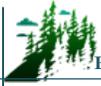
Document Section 5: Risk Management and Mitigation Factors Recommendations				
Item	Page No.	Priority	Recommendation / Next Steps	Estimated Cost (\$) or Person hours
Objective: Reduce Wildfire Hazard on Private Land				
23	64	High	Develop and implement a community chipper program with the help of neighbourhood representatives or community groups. As a demonstration, this program can begin twice per year in two separate neighbourhoods. 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.
24	65	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)
Objective: Increase Public Wildfire Awareness				
25	67	High	This report and associated maps to be made publicly available through webpage, social media, and public FireSmart meetings. In addition, this CWPP should be shared with local industry partners; in particular industrial forest companies who may be interested in collaborating on direct fuel management treatments or with other sections of this CWPP document.	3-6 hours depending on method of distribution
26	67	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
Objective: Increase Public Wildfire Awareness				
27	67	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
28	67	High	Promote FireSmart approaches for wildfire risk reduction to FVRD residents through Town Hall meetings, 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.	~10 hours. May be eligible for UBCM/CRI Program grant
29	68	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 the FVRD website, mailouts). Resources include a Wildfire Preparedness and Mitigation Plan - Guide and Workbook.	~30-40 in-house hours
30	68	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)
31	68	Moderate	Facilitate the FSCCRP uptake within the FVRD Zone B 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



Document Section 5: Risk Management and Mitigation Factors Recommendations				
Item	Page No.	Priority	Recommendation / Next Steps	Estimated Cost (\$) or Person hours
Objective: Increase Public Wildfire Awareness				
32	68	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
33	68	Low	Encourage schools to adopt and deploy existing school education programs 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 in-house hours
34	68	High	Develop and work with all key stakeholders (MFLNRORD, BCWS, BC Parks, BC Hydro, licensees, recreational groups/representatives, agricultural groups/representatives, neighborhood associations) 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
35	69	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

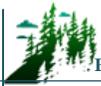


Document Section 5: Risk Management and Mitigation Factors Recommendations				
Item	Page No.	Priority	Recommendation / Next Steps	Estimated Cost (\$) or Person hours
Objective: Promote Fuel Management and Joint Initiatives				
36	69	Moderate	Work with industrial operators such as BC Hydro, Canadian National Railway and Canadian Pacific Railway to advocate that high-risk activities, such as grubbing/brushing, right-of-way mowing work, and rail grinding do not occur during high fire danger times to reduce chance of ignitions as per the Wildfire Act and Regulation.	4-6 in-house hours
37	69	Moderate	Work with industrial operators (i.e., BC Hydro and railways) to advocate that rights-of-way 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 in-house hours
Document Section 6: Wildfire Response Resources Recommendations				
Item	Page No.	Priority	Recommendation / Next Steps	Estimated Cost (\$) or Person hours
Objective: Improve Water and Equipment Availability for Emergency Response				
38	72	High	Pursue funding opportunities to acquire wildland specific equipment for fire departments in the AOI, especially Hemlock Valley and North Fraser VFDs. An off-road capable water tender, and a trailer of wildland specific firefighting equipment should be obtained by each department, including a collapsible water tank, portable pump, and hose lengths.	20-40 in-house hours
39	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, <i>Standard on Water Supplies for Suburban and Rural Fire Fighting</i> . ³ FVRD volunteer fire departments and/or FVRD engineering 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
40	73	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

³ 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>



Document Section 6: Wildfire Response Resources Recommendations				
Item	Page No.	Priority	Recommendation / Next Steps	Estimated Cost (\$) or Person hours
Objective: Improve Access/Egress to Enhance Emergency Preparedness				
41	75	High	Complete and participate in regular testing of, and updates to, the evacuation plan for the FVRD.	~30-40 hours to plan and stage; 8 hours to complete testing
42	75	High	Complete and participate in regular testing of, and updates to, an evacuation plan for the community of Hemlock Valley. Consider identifying and maintaining a secondary access/egress route in collaboration with MFLNRORD and Sasquatch Mountain Resort. Additionally, a defensible evacuation site and helipad should be identified in the community itself.	~10-30 hours to plan and stage; 8 hours to complete testing
43	76	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
44	76	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.	~8,000-\$10,000 to build plan, map, populate attributes and update (contractor estimate)
Objective: Increase and continually develop FVRD Volunteer Fire Department staff training				
45	76	High	FVRD Zone B 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 adjacent municipal fire departments 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 and is highly dependent upon the current fire season and other BCWS priorities.	Cost and time dependent upon training exercise (scope, number of participating members etc.)



Document Section 6: Wildfire Response Resources Recommendations				
Item	Page No.	Priority	Recommendation / Next Steps	Estimated Cost (\$) or Person hours
Objective: Improve Access/Egress to Enhance Emergency Preparedness				
46	77	Moderate	FVRD Zone B fire departments should engage in regular communication with the BCWS Fraser Fire Zone – Cultus/Haig Fire Base to foster strong relationships and identify potential cooperative wildfire risk reduction opportunities.	~4 hours/ year
47	77	High	Ensure that the FVRD Zone B fire departments maintain the capability to effectively suppress wildland fires by training members in SPP-WFF1 (or S-100 and S-185 combined), at a minimum. Consider expanding the training programs to maintain high level of member education and training specific to interface and wildland fires. SPP-115 (formerly S-115) trains structural firefighters on the use of wildfire pumps and hose, and fire service hose and hydrants in the application of structural protection units (SPUs). FVRD Zone B 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
Objective: Structure Protection				
48	78	Moderate	Consider developing or expanding on 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, scheduled burning weekends, or waiving green waste tipping fees. Programs should be available during times of greatest resident activity (spring and fall).	Time dependent upon program scope. May be eligible for UBCM/CRI Program funding. Additional time for advertisement of program availability will be required.
49	78	High	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
50	78	Low	Consider acquiring a Type 2 SPU trailer to improve wildfire response (provides protection for 25-30 residences) in Zone B. The SPU could be moved between fire departments within the AOI depending on training and demand for use.	\$100,000-\$150,000 depending on configuration.

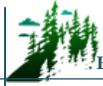
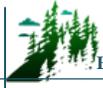


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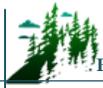


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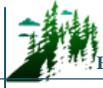
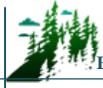


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COMMONLY USED ACRONYMS

ALR	Agricultural Land Reserve
BCWS	British Columbia Wildfire Service
BEC	Biogeoclimatic Ecosystem Classification
CDC	Conservation Data Centre
CFFDRS	Canadian Forest Fire Danger Rating System
CRI	Community Resiliency Investment Program
CWPP	Community Wildfire Protection Plan
DPA	Development Permit Area
EA	Electoral Area
FBP	Fire Behaviour Prediction System
FDU	Forest Development Unit
FESBC	Forest Enhancement Society of British Columbia
FMP	Fire Management Plan
FRS	Fire Rescue Services
FSCCRP	FireSmart Canada Community Recognition Program
FSP	Forest Stewardship Plan
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
NFPA	National Fire Protection Agency
OCP	Official Community Plan
OFC	Office of the Fire Commissioner
OGMA	Old Growth Management Area
PSTA	Provincial Strategic Threat Analysis
FTU	Fuel Treatment Unit
SWPI	Strategic Wildfire Prevention Initiative
TSA	Timber Supply Area
UBCM	Union of British Columbian Municipalities
VCB	Village Containment Boundary
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 B 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. 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.⁴ 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 (WUI).⁵

1.1 PURPOSE

The purpose of this CWPP is to identify and update the wildfire risks within and surrounding the AOI, 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.

⁴ Province of British Columbia. 2020. Wildfire Season Summary. <https://www2.gov.bc.ca/gov/content/safety/wildfire-status/about-bcws/wildfire-history/wildfire-season-summary>

⁵ 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 B 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).

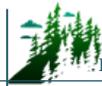
1.2.1 Consultation

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 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 44 First Nations, Indian Bands, Tribes and Tribal Councils 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); Northwest Hardwoods, Probyn Log Ltd., and the owners of Woodlots W0089, W2057, W2087, and W0043. 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 the AOI 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 (AOI) and describes communities within the AOI. It also summarizes the current community engagement in wildfire prevention and mitigation and identifies linkages to other plans and policies with relevance to wildfire planning.

2.1 AREA OF INTEREST

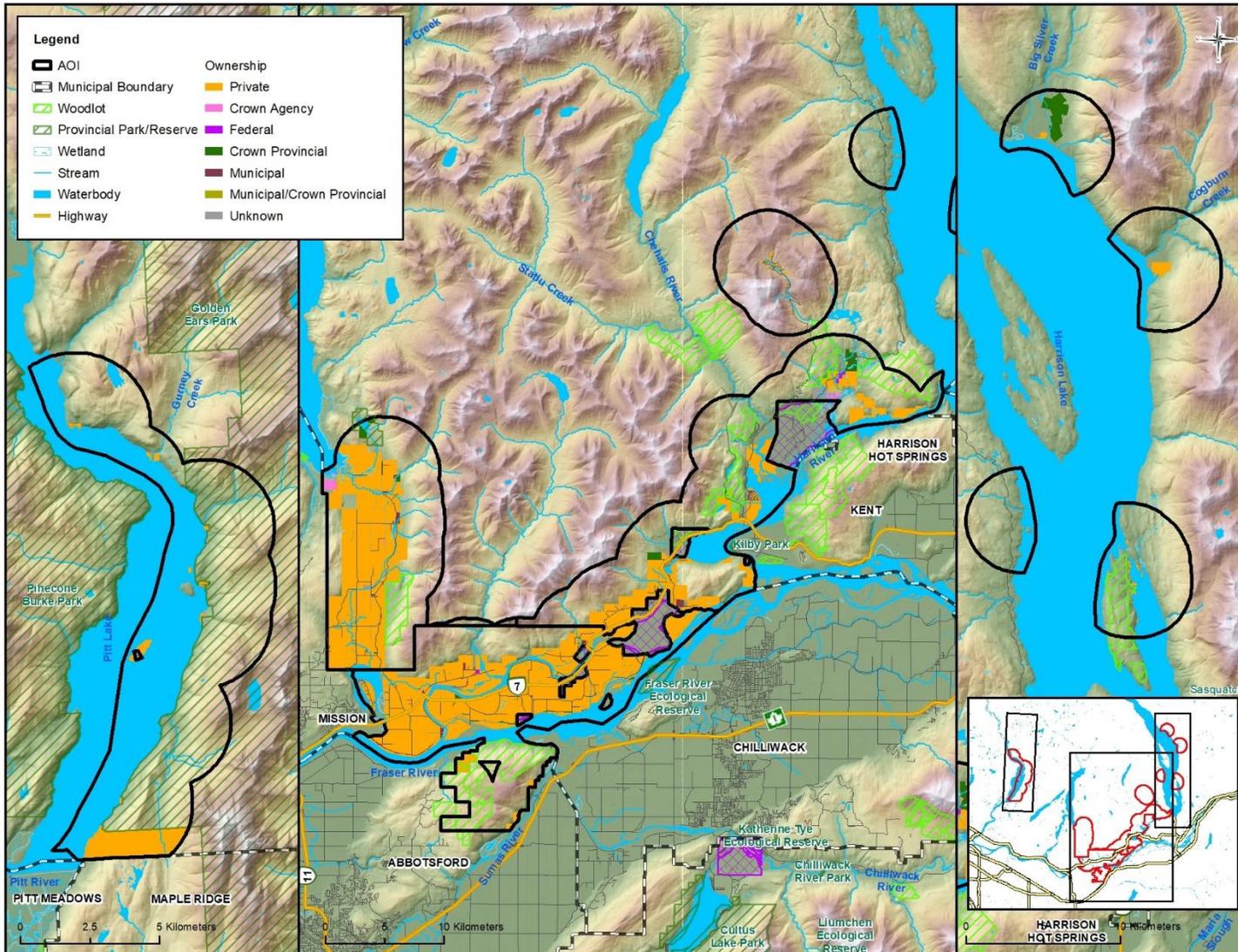
The Fraser Valley Regional District is located in the South Coast region of BC, approximately 150 kilometers (km) east of Vancouver. The AOI extends from Pitt Lake to Harrison Lake and is illustrated below in Map 1. The AOI represents a 2 km spotting buffer around values at risk (structures) within Electoral Areas (EA) C, F and G of the FVRD. The AOI is bordered by the Squamish-Lillooet Regional District on its north side, the Metro Vancouver region on its west side and the US border to its south. The AOI does not include any municipalities or First Nations communities but surrounds the District of Mission. There are multiple small, unincorporated communities located within the AOI including, Durieu, Hatzic, Dewdney, Deroche, Lake Errock, Harrison Mills, Morris Valley, and Hemlock Valley.

In its entirety, the FVRD has a population of 295,934 and covers approximately 13,335 km², including eight EAs and six municipalities.⁶ EA G (Nicomen Island – Deroche-Dewdney – Hatzic Island) is the largest of the three EAs in the AOI in terms of population, but the smallest in terms of land area. EA C (Sasquatch Country) has the largest land area and the smallest population and EA F (McConnell Creek – Hatzic Prairie) is the second largest on both measures. A breakdown of the AOI’s land ownership is provided in Table 2.

Table 2. Summary of AOI by land ownership.

Land Ownership	Hectares
Crown Agency	116
Crown Provincial	34,867
Federal	22
Mixed Ownership	16
Municipal	88
Private	10,866
Total	46,107

⁶ Fraser Valley Regional District. 2017. Retrieved online at: <https://www.fvrd.ca/assets/About~the~FVRD/Documents/2017%20Annual%20Report.pdf>



Map 1. Area of Interest (AOI).



2.2 COMMUNITY DESCRIPTION

The Fraser Valley region has been inhabited by the Stl'at'imc and the Coast Salish Aboriginal Peoples since time immemorial. The Sts'ails, Skatin, Skowlitz, Samahquam, Leq'a:mel and Douglas First Nations are among the many Stl'at'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), which range from rural/remote communities to town centres with high population densities. Some of the First Nations reserves adjacent to and/or encompassed by AOI are: Williams 2, Squawkum Creek 3, Yaalstrick 1, Papekwatchin 4, Holachten 8, Zaitscullachan 9, Skweahm 10, Lakahamen 11, Skumalasp 16, Chehalis 5.

The AOI encompasses portions of the FVRD EA C, F and G 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 1,300 m. Harrison Lake is the largest freshwater body within the AOI, with an average area of about 250 km²; however, the AOI also includes other large lakes such as Pitt Lake and Stave Lake, as well as dozens of other smaller lakes and rivers.

The economy of the AOI was historically driven by resource based activities: logging and sawmilling, agriculture, dairy farming, ranching, and aggregate mining for road and railway construction.⁷ Although these industries remain important to the communities within the AOI, the economic focus has shifted in recent decades to include tourism, recreation, and residential development.

Fire protection within the AOI is the responsibility of 4 fire departments and 6 fire halls: North Fraser Volunteer Fire Department (VFD) (3 halls), Hemlock Valley VFD, Abbotsford Fire Rescue Services (FRS), and Agassiz VFD. Mutual aid agreements exist between these departments and other departments in the region. BCWS is responsible for responding to fires that are beyond the boundaries of the department Fire Service Areas and will work with all departments to respond to wildland/interface fires. All Indian Reserves adjacent to the AOI are included in the FVRD Fire Service Areas but are not addressed in this plan.

In the event of a wildfire, Lougheed Highway (Highway 7) and main paved roads that connect with it provide emergency access and egress for communities in the AOI. However, some residential roads are single access, and a number of recreation sites are accessed along unpaved single access forest service roads. 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 and recreational users.

⁷ FVRD. Official Community Plan Bylaw No. 0999, 2010. Hatzic Valley, Electoral Area F



2.3 PAST WILDFIRES, EVACUATIONS AND IMPACTS

BCWS Coastal Fire Zone Staff communicated that the majority of past wildfire activity within the AOI was human-caused and ignitions are primarily due to escaped residential burning, abandoned campfires, or recreational shooting (both boat and road access recreation areas). Fires were reported to be common along the core transportation corridors of Highway 1 and Highway 7. BCWS staff reported that slash accumulations following industrial logging can be an issue, particularly next to forest service roads in the AOI.

Based on the BCWS historical wildfire dataset, two of the largest fires to occur in the AOI within the last century burned along the shore of Harrison Lake. The fires occurred in 1958 (lightening) and 2015 (undetermined) with an area of 3,052 hectares (ha) and 1,385 ha respectively. Another fire over 3,000 ha in size (person-caused) occurred in 1931 on the southern edge of Golden Ears Provincial Park between Alouette and Pitt Lake. Specific causes of historical person-caused ignitions are most commonly abandoned/escaped campfires or open burning, but also include discarded matches/cigarettes, logging, fireworks, children, powerline short circuits, railroads, blasting, burning buildings/equipment, and arson. Two wildfires to occur in recent years of person- or undetermined cause were both in August 2017 on the east shore of Harrison Lake. The Stollicum Creek fire burned roughly 94 ha just north of Sasquatch Provincial Park and the Silver Creek fire burned approximately 195 ha. In March of 2018 one fire caused by pile burning occurred just south of the Chehalis 5 Indian Reserve and burned over 28 ha.

Access and evacuation vulnerabilities are present in many locations throughout the AOI. Specific vulnerabilities noted by the FVRD related to the single egress route for the community of Hemlock Valley, serviced by the Hemlock Valley VFD, as well as the northern end of Sylvester Road, Stave Lake Road and Morris Valley Road, serviced by the North Fraser VFD.

The BCWS 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 This data shows that since 1950, approximately 75% of ignitions have been human-caused (a conservative estimate not including miscellaneous/undetermined causes), versus 40% in the province of BC.⁸ This statistic may be partly explained by the much lower average lightning flash density on the BC Coast relative to other areas in the province.⁹ According to BCWS staff, when lightening does occur, it often strikes along the east and west shores of Harrison Lake. 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, may contribute to this statistic.

2.4 CURRENT COMMUNITY ENGAGEMENT

There are varying levels of recognition and awareness, from both FVRD staff and the surrounding communities in Zone B, of the threat posed by wildfire. Abbotsford FRS has engaged residents of the

⁸ BC Wildfire Service, 2019. Provincial Strategic Threat Analysis Dataset. Fire Incident Locations – Historical and <https://www2.gov.bc.ca/gov/content/safety/wildfire-status/about-bcws/wildfire-response/fire-characteristics/causes>

⁹ Environment Canada. 2016. Map of Canada’s lightning hotspots. Available from <https://www.canada.ca/en/environment-climate-change/services/lightning/statistics/maps-hotspots.html>



City of Abbotsford that live in wildland interface areas regarding FireSmart,¹⁰ but there has been overall minimal community engagement in FireSmart initiatives in the AOI to this point. Recognizing that the capacity of VFDs is limited, future FireSmart presentations and workshops should be scheduled by the FVRD for interested groups in the AOI.

Fire department-initiated education regarding wildfire threat and prevention varies by department. Information on the various fire departments is available through the FVRD website (North Fraser and Hemlock Valley VFDs), as well as the websites for the District of Kent (Agassiz Fire Department) and the City of Abbotsford (Abbotsford FRS). The FVRD website also provides links to Emergency Management BC and Wildfire Management BC and posts information on BCWS fire bans during the fire season.

The Electoral Area G (Deroche, Nicomen, and Sumas Mountain) community planning framework includes policies to create a wildfire hazard development permit area (DPA) and encourage the use of fire-resistant building materials and landscaping in areas defined as high hazard. However, the FVRD does not have an established wildfire hazard DPA in Electoral Areas C and F 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 to serve the region.¹¹ 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 BCWS, 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

¹⁰ Personal communication, Don Beer (Abbotsford Fire Chief), April 2020

¹¹ FVRD. 2013. Emergency Management Response and Recovery Plan – A Strategic Guide for Support to Major Emergencies and Disasters. Last reviewed May 2019.



scale. The FVRD emergency management plan also establishes priorities for training and periodic reviews and revisions of the plan.

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 District of Kent (2017), City of Abbotsford (2009), Chawathil First Nations (2013), Village of Harrison Hot Springs (2017), Kanaka Bar First Nation (2015), Municipality of Lytton (Village) (2015), Skawahlook First Nation (2014), Skuppah Indian Band (2015), Soowahlie Indian Band (2011), Spuzzum First Nation (2015), Yale First Nation (2014). 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 C 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 Regional Government Policies and Recommendations

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

Electoral Areas C, F and G Official Community Plans

The Official Community Plans (OCPs) for EAs C (Hemlock Valley and Morris Valley, Harrison Mills, and Lake Errock), F (Hatzic Valley), and G (Deroche, Nicomen, and Sumas Mountain) provide guidance for general policies, land-use area designations, development permit areas, environmental protection, infrastructure, and services throughout the Fraser Valley Regional District. Hemlock Valley has an OCP separate from the rest of EA C. The objectives and policies which are directly relevant to wildfire risk reduction, emergency response, and community resilience post-disaster are summarized from the four OCPs below.

Bylaw No. 0030, 2000: Official Community Plan for Hemlock Valley, Electoral Area C

Subsection 7.3: Community Water System

This section of the OCP describes the current state of the community water system and describes recommendations for future expansions. These recommendations include improvements to the present storage and distribution systems to ensure the new upgrades meet peak daily flow requirements and full fire protection flows.

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



Subsection 7.7: Fire Protection and Emergency Services

This section defines the existing fire protection policies and outlines recommendations for future fire protection plans and services. The current OCP policies encourage that any servicing scheme amendments be made in accordance with the local Fire Departments to ensure sufficient water quantities are available for firefighting, fire hydrant placement and fire truck access. It also stipulates that adequate and constant supply of water should be maintained and that adequate snow removal be completed around hydrants in the winter months.

Bylaw No. 0020, 1998: Official Community Plan for Morris Valley, Harrison Mills, Lake Errock; Electoral Area C

Subsection 5.2: Water Systems

This section of the OCP describes the current state of the community water system and describes recommendations for future expansions. The area functions on a variety of services either community water systems, private water systems or individual on-site water supplies. Recommendations include updating infrastructure and addressing low water pressure issues.

Subsection 5.4: Fire Protection

Fire protection services in Morris Valley, Harrison Mills, and Lake Errock are the responsibility of the North Fraser Volunteer Fire Department. The OCP supports the maintenance and enlargement (if required) of volunteer fire services in the plan area. Recommendations include the installation of new water storage tanks for fire protection at Morris Valley as residential subdivisions densities increase and the development of Forest Fire protection service agreements with the Ministry of Forests and with First Nations.

Subsection 6.1: Road Network

Road networks are a critical component to any safety and emergency plan, thus access and egress to communities should be considered when developing a CWPP. This section of the OCP highlights the issues surrounding community road access and the potential issues resulting from having a single entrance and exit point for a community. Therefore, the plan encourages a discussion surrounding road width and right-of-way guidelines in the case of an emergency situation.

Subsection 8.3: Emergency Services

This section of the OCP outlines emergency services protocols for the area and describes areas that are covered by fire service agreements, not including rural plan areas, such as Weaver Creek. Due to the remote location of some of the infrastructure in the plan area response times may become limited and a hazard to community safety.

Bylaw No. 0866, 2009: Official Community Plan for Deroche, Nicomen, Sumas Mountain; Electoral Area G

Subsection 8.6: Fire Protection and Emergency services

This section of the OCP describes fire protection and emergency service regulations and protocols within the plan area. Within the Deroche Community Water Service area, fire protection is the responsibility of the North Fraser Volunteer Fire Department and is serviced by fire hydrants. The OCP also stipulates that all new developments should be equipped with fire hydrants for fire protection.



Subsection 11.4: Interface Fire Hazards

This section of the OCP defines interface wildfire zones as areas of urban or rural settlement adjacent to Crown forest land and outlines interface areas according to 2008 WUI provincial threat mapping from BCWS. A policy to establish a development permit area (DPA) within areas of high interface wildfire hazard is included, as is a policy to encourage building in accordance with the BC FireSmart Homeowners Manual and the use of fire-resistant native plants in landscaping in high hazard areas. See Section 5.2.2 for recommendations on the development of a wildfire DPA.

Bylaw No. 0999, 2010: Official Community Plan for Hatzic Valley; Electoral Area F

Subsection 6.0: Infrastructure & Services

This section of the OCP describes interface wildfire zones and the associated risks and consequences of planning developments within high wildfire hazard zones. The OCP also sets out to inform and encourage building in accordance with the BC FireSmart safety recommendations and protocols.

Subsection 6.2: Drinking Water

This section of the OCP describes the available drinking water infrastructure and services within the plan area. Such infrastructure includes the Hatzic Prairie Water Supply and Distribution system which provides drinking water, domestic irrigation and firefighting services. Additional infrastructure has been recommended in the OCP as communities continue to develop.

Subsection 6.6: Fire Protection & Emergency Services

This section of the OCP outlines the structural fire protection plan and emergency management plan within the OCP. Within EA F there are three volunteer fire halls that are responsible for protecting the local communities, outside of the area fire protection services fall under the jurisdiction of the Provincial Forest Service. In the case of an emergency the Regional District is responsible for coordinating an emergency response and providing social services to affected people. Furthermore, the OCP states that regional support should be provided to the volunteer fire departments and that fire hydrants should be serviced for fire protection.

RECOMMENDATION #1: Review and amend the OCPs for Electoral Areas (EA) C, F and G 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, are available, reliable, and accessible.

RECOMMENDATION #2: Review and amend the OCPs for Electoral Areas (EA) C, F and G to include wildfire as a natural hazard which has the potential to impact public health and safety, economics (i.e. through evacuations, loss of tourism, interruption of services, etc.), ecosystems, habitat, and water quality, among other values (for example, as included in Section 11.4 of the OCP for Electoral Area G). Identification of natural hazards can allow for planning and policies to be put in place to increase FVRD resilience, mitigate potential damages, and increase public and official awareness of risk.



RECOMMENDATION #3: Revise the OCPs for Electoral Areas (EA) C, F and G to include an interface wildfire hazard objective which sets specific policies relating to development in the wildland-urban interface (for example, as included in Section 11.4 of the OCP for Electoral Area G). Policies could include: avoiding development in areas that are at higher risk to wildfire hazards (as identified in this CWPP) through the creation of a wildfire development permit area (DPA), requiring new tenure applications to provide a detailed wildfire hazard report, and encouraging existing homeowners in WUI areas to practice FireSmart techniques, install sprinklers and well pumps, and utilize rain storage tanks, whenever possible for firefighting on-site. See Section 5.2.2 for recommendations regarding the establishment of a DPA for wildfire hazard.

Bylaw No. 559, 1992: Zoning Bylaw for Electoral Area “G, C, F” (Hatzic, Lake Errock, Nicomen Island)

This bylaw establishes regulations for land use and subdivision design in portions of EAs G, C, and F. It specifies regulations for occupation of a group camp, including the installation of a site-specific firefighting system approved by a qualified professional. Additionally, it prohibits any activity or use or storage of material that presents a fire hazard as part of either an Accessory Cottage Industry Use or an Accessory Home Occupation Use.

RECOMMENDATION #4: Where screening of industrial lots or certain land uses is required in Zoning Bylaw 559, language should be included to require adherence with FireSmart principles, such as requiring an appropriate set-back of structures from conifer hedging in high hazard areas.

Bylaw No. 1188, 2013: Building Bylaw

This bylaw is intended to regulate construction within the FVRD, including repair, renovation, and installation. 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 a structural, mechanical or fire suppression drawings prepared before building.

RECOMMENDATION #5: 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 homeowner participation via a FVRD-wide engagement campaign and providing incentives such as the opportunity to acquire/purchase discounted address signs. Additional specifications to be communicated to residents 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. Focus efforts in Hemlock Valley, identified as an area of concern by Hemlock Valley fire department.

Bylaw No. 1386, 2016: Open Fire Bylaw

This bylaw regulates open fires within the FVRD 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 (defined as conditions where a ban on open fires is imposed by the province). 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 or a designate in designated fire protection service areas to restrict open burning, inspect premises for fire and firefighting hazards, and require owners and occupiers of property to remove fire hazards. 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 #6: 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.

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 allows the FVRD the authority to affect the removal/clean-up of materials and recoup costs from the owner in the case of failure to comply.

Bylaw No. 1495, 2018: Solid Waste Removal Regulations Bylaw

This bylaw regulates the disposal of solid waste, including organic waste. Organic waste must be taken to either an organics facility or to a transfer station that accepts it.

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 park and one interregional park.

RECOMMENDATION #7: Complete updates to the FVRD Regional Parks Strategic Plan (2025-2035) to include wildfire threat as a parks acquisition criterium. Access and potential costs of park and trail maintenance to mitigate wildfire risk should be weighed against other acquisition criteria. Consider including the following in Bylaw 1190 (Campgrounds and Holiday Parks): 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 #8: Develop a trails master plan in collaboration with member municipalities and interest groups 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 (through proper placement, clean-up of combustible fuels trailside and work practices which adhere to Wildfire Act and Regulation).

RECOMMENDATION #9: 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.

FVRD Solid Waste Management Plan Update 2016-2026

This plan guides solid waste management programs and education initiatives in the FVRD. Illegal dumping is identified as a serious problem in the FVRD. Relevant strategies to improve solid waste management include implementing more restrictive bans on backyard/barrel burning and supporting community cleanup programs. The plan specifies that residents of EAs C, F, and G can dispose of green waste at the Mission Landfill. Although most FVRD transfer stations also accept woody material up to 6" in diameter, this is not specified in the plan.¹³

2.5.4 Higher Level Plans and Relevant Legislation

Sustainable Resource Management Plans (SRMPs)

The AOI overlaps multiple Sustainable Resource Management Plan (SRMPs) areas and associated landscape units within the Chilliwack Natural Resource District. SRMPs have been developed for the Chehalis, West Harrison, East Harrison, and Big Silver landscape units (LUs). The Widgeon, Hatzic, and Fraser Valley South landscape units fall under the Lower Fraser Sustainable Resource Management Plan. Each of these plans describe 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 Areas (WHA) for Northern Spotted Owls (*Strix occidentalis caurina*) and Pacific Water Shrew (*Sorex bendirii*), as well as Ungulate Winter Range polygons for black-tailed (*Odocoileus hemionus columbianus*) and mule deer (*Odocoileus hemionus hemionus*), were identified in the AOI. These areas are legally designated conditional harvest zones under government orders U-2-006, WHA 2-503, WHA 2-514 (Pacific Water Shrew), WHA 2-515 (Pacific

¹³ <https://www.fvrd.ca/assets/Services/Documents/Garbage/Sylvester%20Road%20TS%20Yard%20Waste%20Flyer.pdf>



Water Shrew), and WHA 2-500 (Northern Spotted Owl). 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 ensuring a proactive and effective wildfire mitigation approach in the AOI.

Response Fire Management Plan

The South Coast Response Fire Management Plan (FMP)¹⁴ 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).

Forest Stewardship Plans (FSPs)

There are multiple Forest Stewardship Plans (FSPs) applicable to forest development units (FDUs) within the AOI. 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.

Spotted Owl Management Plan¹⁵

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

¹⁴ South Coast Fire Management Plan. 2018. (Internal government document)

¹⁵ The Province of BC. 1997. Spotted Owl Management Plan.



management areas, Wildlife Habitat Areas (WHAs), or in areas of suitable spotted owl habitat such as late seral stage forests.

Coast Area Integrated Investment Plan

The 2019/2020 Coast Area Integrated Investment Plan¹⁶ is a provincial initiative that identifies and coordinates land base 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.

Parks Management

Several protected areas are located within the AOI. Golden Ears Provincial Park and Fraser Valley Ecological Reserve both have management plans,^{17,18} and there is a strategic plan for FVRD regional parks.¹⁹ Davis Lake Provincial Park does not have a management plan at this time nor a draft plan under development.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.

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 the 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.

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

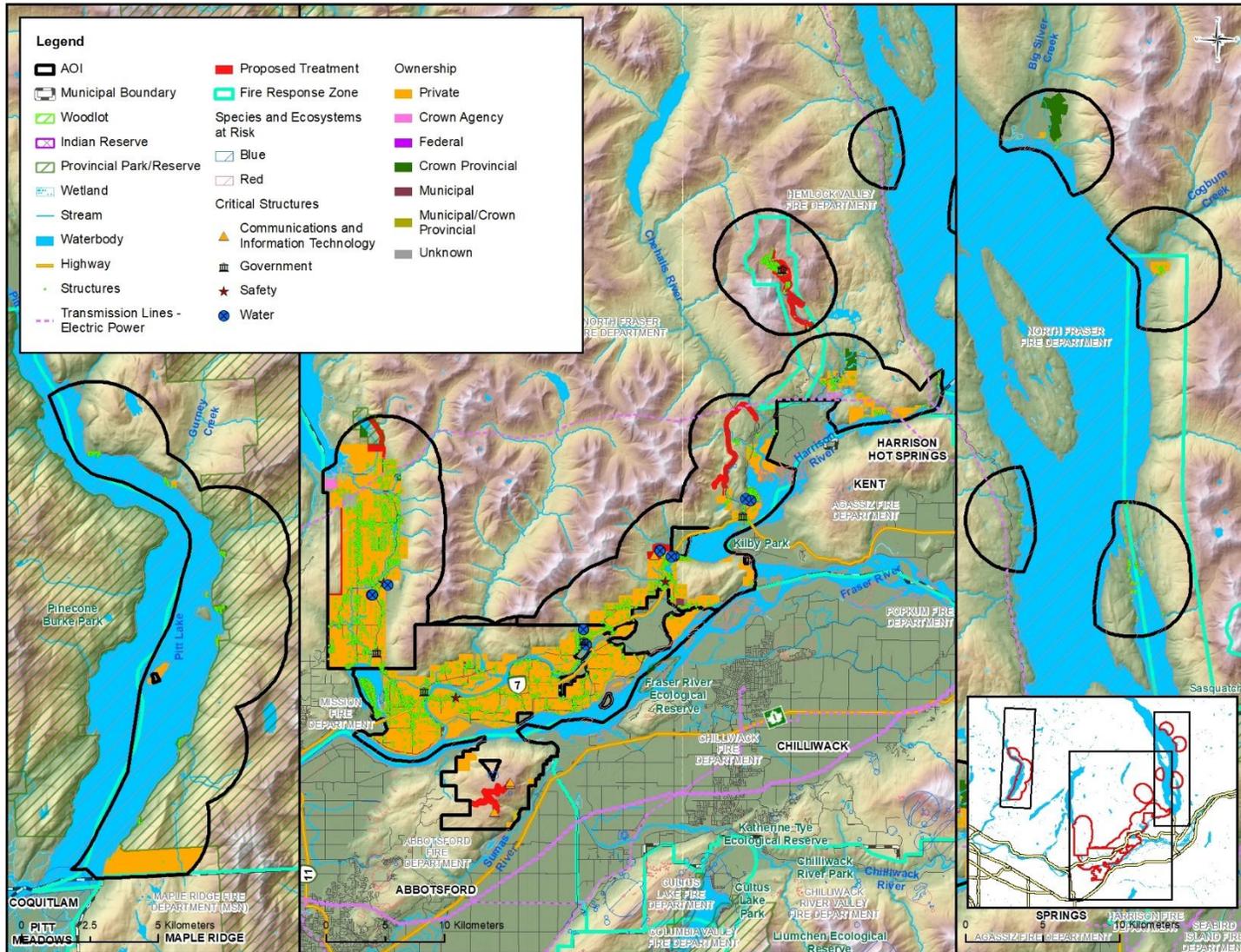
¹⁷ BC Parks 2013. http://www.env.gov.bc.ca/bcparks/explore/parkpgs/golden_ears/golden-ears-mp.pdf?v=1569875688798

¹⁸ BC Parks 1990. http://www.env.gov.bc.ca/bcparks/planning/mgmtplns/fraser_er/fraser_ms.pdf?v=1569875777949

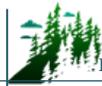
¹⁹ FVRD 2014. <https://www.fvrd.ca/assets/Parks~and~Recreation/Documents/2014%20-%202024%20Strategic%20Parks%20Plan.pdf>

²⁰ <http://www.env.gov.bc.ca/bcparks/planning/mgmtplns/>

²¹ Ministry of Forests, Lands, Natural Resource Operations and Rural Development. 2015. 2015-17 Coastal Timber Supply Areas Forest Health Overview.



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. With a growth rate of approximately 6.6%, the FVRD has a higher growth rate than Metro Vancouver and BC as a whole. As a result, the overall population of the FVRD has increased significantly in recent years and was last recorded at approximately 295,934. Within the AOI, the combined population for EA C, F and G is 5,677 residents as of 2016.²³ More specifically, EA C was found to have a growth rate of 5.1% between 2011 and 2016, EA G had a growth rate of 0.7% and EA F had a negative growth rate of -0.8%.²⁴ Within the three EAs, there are approximately 2,674 dwellings, 35% of which are occupied on a part-time basis. EA C has one of the highest percentages of unoccupied dwellings within the FVRD, potentially due to the ski resort community of Hemlock Valley. Within the AOI, EA G has the highest population of approximately 1,776 residents, EA F has approximately 1,293 residents and EA C has approximately 1,023 residents.

The AOI attracts visitors for camping, hiking, canoeing, summer camps, 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 Golden Ears Provincial Park, Davis Lake Park, and the Fraser River Ecological Reserve. Furthermore, the Lougheed Highway (Highway 7) is frequently used as an access corridor from the Lower Mainland to the Fraser Valley and the BC Interior, 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 the AOI 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 Province of British Columbia. 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

²⁴ Fraser Valley Regional District. Fraser Valley Regional District Census 2016 Release Report. Retrieved from: <https://www.fvrd.ca/assets/Services/Documents/Strategic~Planning~and~Initiatives/Census%20Release%20Report%20FINAL%2014%20July.pdf>



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. A critical infrastructure dataset was provided by the FVRD's GIS staff and these data were included in Map 2. Table 3 details an inventory of critical infrastructure identified by the FVRD and via field visits.

Protection of critical infrastructure has shown itself to be an essential wildfire preparedness function. 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 #10: The use of fire-resistant construction materials, building design and landscaping should be considered for all critical infrastructure when completing upgrades or establishing new infrastructure. Additionally, vegetation setbacks around critical infrastructure should be compliant with FireSmart guidelines.

RECOMMENDATION #11: 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.

3.2.1 Electrical Power

Electrical service for most of the AOI 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.

Two major BC Hydro transmission lines bisect the FVRD, connecting the Upper Harrison Terminal substation to the Rosedale substation and the Stave Falls substation to the Hope substation. This system is well-mapped and BC Hydro states that staff will work with local fire departments and BCWS to mitigate impacts to this infrastructure in the event of a wildfire.²⁵

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

²⁵ <https://www.bchydro.com/safety-outages/emergency-preparation/natural-disasters.html>



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 largely available for critical infrastructure including fire halls, the EOC, RCMP detachment, and all water pumping stations via backup generators or mobile diesel-powered 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 AOI does not contain any hospitals or airports, as residents are serviced by the Mission Memorial Hospital. There are no major Fortis BC transmission pipelines within the AOI, but there are FortisBC distribution pipelines in the Stave Lake and Sylvester Road area. The FortisBC company website states that employees will consult with local authorities and BCWS in the event of a wildfire. 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	Location
Rogers communication tower	East side of Deroche Mountain
Telus communication tower	Sumas Mountain
Glentel communications tower	Sumas Mountain
BC Hydro communications tower	Sumas Mountain
Hemlock Valley Fire Hall #1	47100 Laurel Rd., Hemlock Valley
North Fraser Fire Hall #1	8800 Rowan Rd., Hatzic
North Fraser Fire Hall #2	43824 Watkins Rd., Lake Errock
North Fraser Fire Hall #3	11980 Sylvester Rd., Durieu
Dewdney Elementary	37151 Hawkins Pickle Rd., Hatzic
Deroche Elementary	10340 North Deroche Rd., Deroche

3.2.3 Water and Sewage

The Engineering and Community Services Department of the FVRD operates and maintains 4 water systems within the AOI: Deroche, Hatzic Prairie, Morris Valley, and Lake Errock.²⁶ Critical infrastructure includes reservoirs, wells, and pumphouses. Residents not supplied by these water systems rely on private individual or community water systems. Groundwater wells provide much of the drinking water in the AOI, although surface water is also diverted. For example, residents in EA F on the eastern side of Pitt Lake divert drinking water from springs and creeks.

²⁶ FVRD. 2019. Water. Retrieved online at: <https://www.fvrd.ca/EN/main/services/water.html>



The protection of drinking water sources and the maintenance of adequate system pressure was identified as a priority in the OCPs reviewed for EAs C, G, and F. The risk of contamination from flooding and debris flows, water diversion for irrigation, and population expansion, place pressure on the existing water systems within the AOI.

The FVRD operates one sewer system in the community of Morris Valley. Additional sewer systems throughout the FVRD are managed by individual private operators, improvement districts, and municipalities. Descriptions of critical sewage and water infrastructure (current as of 2019) within the AOI are detailed below in Table 4.

Table 4. Critical Infrastructure Identified in CWPP field visits.

Critical Infrastructure Type	Description
Water supply	<p>Communities including DeRoche (Area G), Hatzic (Area F), Morris Valley (Area C), and Lake Errock (Area C) are serviced by FVRD water systems with associated infrastructure, including the following:</p> <ul style="list-style-type: none"> • Deroche Water System: reservoir, well, pumphouse • Hatzic Prairie Water System: reservoir, well, pumphouse • Lake Errock Water System: reservoir, two wells, pumphouse • Morris Valley Water System: reservoir, well, pumphouse <p>Additionally, the following 3 private water systems provide service in the AOI:</p> <ul style="list-style-type: none"> • Lake Errock Water System • Harrison Bay Improvement District • Hemlock Valley Water System (Hemlock Utility Services Ltd.)
Sanitary sewer system	<p>Sewage is transported, treated, stored and discharged through the Morris Valley system and through other improvement district, municipal and privately-operated independent systems. The Morris Valley sewer system includes the following infrastructure. No sewage infrastructure was identified as critical infrastructure by the client.</p> <ul style="list-style-type: none"> • Morris Valley Wastewater Treatment Plant <p>Additionally, Hemlock Utility Services Ltd. provides sewer services for residents of Hemlock Valley with the following infrastructure:</p> <ul style="list-style-type: none"> • Tertiary treatment plant and pumphouse

3.3 HIGH ENVIRONMENTAL AND CULTURAL VALUES

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

3.3.1 Drinking Water Supply Area and Community Watersheds

Eight community watersheds intersect the AOI: Deroche, Elbow, McKay, Engineers, Cohen Creek, Domitian Creek, Gurney, and Macsween. The potential impacts of wildfire on drinking water supply within and outside of community watersheds extends 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.²⁷ 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.

Debris flows can render surface water sources unsuitable. Debris flows from flooding and landslides in the Deroche Creek watershed prior to 2000 caused problems for drinking water supply and quality in Deroche Creek. This resulted in the upgrading of the Deroche Community Water System to a groundwater well source.²⁸

RECOMMENDATION #12: 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. Exploration of potential funding opportunities through the province and the National Disaster Mitigation Program may be worthwhile.²⁹

3.3.2 Cultural Values

The FVRD comprises the traditional territory of the Stó:lō people and other aboriginal groups. The Stó:lō Nation and the Stó:lō Tribal Council each represent several communities in the AOI. A total of 44 First Nations, Indian Bands, Councils or Associations with aboriginal interests in the AOI were identified in the BC Consultative Areas Database.

Archaeological sites in BC that pre-date 1846 are protected by the *Heritage Conservation Act* (HCA), which applies on both private and public lands. Archaeological remains in the Province of British Columbia are protected from disturbance, intentional and inadvertent, by the Heritage Conservation Act (HCA). Archaeological sites that pre-date 1846 are automatically protected under the Heritage Conservation Act whether on public or private land. Sites that are of an unknown age that have a likely probability of dating prior to 1846 (e.g., lithic scatters) as well as Aboriginal pictographs, petroglyphs, and burials (which are likely not as old but are still considered to have historical or archaeological value) are also protected. Under the HCA, protected sites may not be damaged, altered or moved in any way without a permit. It is a Best Practice that cultural heritage resources such as culturally modified tree (CMT) sites be inventoried and considered in both operational and strategic planning.

Due to site sensitivity, the locations of archaeological sites may not be made publicly available, however, data provided by the MFLNRORD Archaeology Branch confirms that multiple sites do exist within the AOI. The FVRD should ensure that they have direct access to Remote Access to Archaeological Data (RAAD), which allows the FVRD to look up or track any archeological sites in the area.³⁰ Prior to stand

²⁷ 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.

²⁸ Fraser Valley Regional District. 2009. Bylaw No. 0866, 2009. Official Community Plan- Electoral Area G.

²⁹ Public Safety Canada. 2019. National Disaster Mitigation Program (NDMP). <https://www.publicsafety.gc.ca/cnt/mrgnc-mngmnt/dsstr-prvntn-mtgtn/ndmp/index-en.aspx>

³⁰ Province of British Columbia. 2020. Remote Access to Archeological Data (RAAD).

https://www.for.gov.bc.ca/archaeology/accessing_archaeological_data/obtaining_access.htm



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.

3.3.3 High Environmental Values

The AOI overlaps with multiple legal OGMA's under the Chehalis, West Harrison, East Harrison, and Big Silver, and Lower Fraser Sustainable Resource Management Plans. Ungulate Winter Range (UWR) polygons and Wildlife Habitat Areas (WHA) intersect the AOI. UWR polygons for mule deer (*Odocoileus hemionus hemionus*) and Columbian black-tailed deer (*Odocoileus hemionus columbianus*) intersect the AOI in Hemlock Valley and on the north east side of Harrison Lake. WHA for spotted owl are also located on the north east side of Harrison Lake. These polygons are legally designated as conditional harvest zones under governmental orders implemented to protect critical habitats for wildlife populations. Any proposed fuel treatment that may overlap these areas requires MNFLRORD oversight at the prescription development phase, and works can only occur following MNFLRORD consultation and approval.

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

There are occurrences of 8 red-listed species and 3 blue-listed species within the AOI (Table 5). There are six overlaps with masked occurrences. Through consultation with the CDC and a biologist or qualified professional, all site level operational plans must determine if these species will be impacted by fuel management or other wildfire mitigation activities. All future fuel treatment activities or those associated with recommendations made in this plan should consider the presence of, and impact upon, potentially affected species. Additionally, all site level operational plans should consult the most recent data available to ensure that any new occurrences or relevant masked occurrences are known and considered in the operational plan to mitigate any potential impacts on species at risk. The BC Species & Ecosystems Explorer, which allows combined searches for species and ecological communities, should also be consulted at the prescription phase. Due to potential limitations of existing databases, consultation with a qualified professional with local knowledge is also 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
Barn Owl	<i>Tyto alba</i>	Vertebrate animal	Red	Terrestrial: Cropland/Hedgerow
Dun Skipper	<i>Euphyes vestris</i>	Invertebrate animal	Red	Terrestrial: Forest Mixed, Shrubland, Seepage
Barn Owl	<i>Tyto alba</i>	Vertebrate Animal	Red	Terrestrial: Cropland/Hedgerow
Dun Skipper	<i>Euphyes vestris</i>	Invertebrate Animal	Red	Terrestrial: Forest Mixed, Shrubland, Seepage
Garry Oak / Oceanspray	<i>Quercus garryana / Holodiscus discolor</i>	Ecological Community	Red	Terrestrial; Forest Broadleaf
Great Blue Heron, Fannini Subspecies	<i>Ardea herodias fannini</i>	Vertebrate Animal	Blue	Terrestrial: Forest Broadleaf, Forest Mixed Palustrine: Shrub Wetland, Herbaceous Wetland
Green-sheathed Sedge	<i>Carex feta</i>	Vascular Plant	Yellow	Terrestrial: Ditch, Roadside
Long-leaved Pondweed	<i>Potamogeton nodosus</i>	Vascular Plant	Yellow	Lacustrine: Shallow Water
Moss Grass	<i>Coleanthus subtilis</i>	Vascular Plant	Blue	Lacustrine: Shallow Water
Mountain Beaver	<i>Aplodontia rufa</i>	Vertebrate Animal	Yellow	Woodland Mixed
Northern Goshawk, Laingi Subspecies	<i>Accipiter gentilis laingi</i>	Vertebrate Animal	Red	Terrestrial: Forest Needleleaf
Northern Red-legged Frog	<i>Rana aurora</i>	Vertebrate Animal	Blue	Terrestrial: Forest Needleleaf, Roadside Lacustrine: Shallow Water Palustrine: Pond, Bog/Fen, Herbaceous Wetland Riverine: Creek
Oregon Forestsnail	<i>Allogona townsendiana</i>	Invertebrate Animal	Red	Terrestrial: Forest Mixed, Coarse Woody Debris, Forest Broadleaf, Roadside Riverine: Riparian
Oregon Spotted Frog	<i>Rana pretiosa</i>	Vertebrate Animal	Red	Terrestrial; Riverine: Creek
Pacific Water Shrew	<i>Sorex bendirii</i>	Vertebrate Animal	Red	Riverine: Riparian, Creek Terrestrial: Forest Needleleaf, Ditch Lacustrine: Shallow Water, Riparian Palustrine: Herbaceous wetland
Pointed Rush	<i>Juncus oxymeris</i>	Vascular Plant	Blue	Estuarine; Tidal Flat
Pygmy Longfin Smelt	<i>Spirinchus sp. 1</i>	Vertebrate Animal	Red	Lacustrine; Deep Water



Common Name	Scientific Name	Category	BC List	Habitat Type
Roell's Brotherella	<i>Brotherella roellii</i>	Nonvascular Plant	Red	Terrestrial: Forest Mixed; Coarse Woody Debris
Three-flowered Waterwort	<i>Elatine rubella</i>	Vascular Plant	Yellow	Riparian; Estuarine; Tidal Flat
Trowbridge's Shrew	<i>Sorex trowbridgii</i>	Vertebrate Animal	Blue	Riverine; Riparian; Forest Mixed
Two-edged Water-starwort	<i>Callitriche heterophylla</i> var. <i>heterophylla</i>	Vascular Plant	Blue	Lacustrine; Riparian; Shallow Water
White Sturgeon (Lower Fraser River Population)	<i>Acipenser transmontanus</i> 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 TSA, which encompasses approximately 1.4 million hectares of land and extends from Vancouver to Yale. The Fraser TSA is within the South Coast Natural Resource Region and is administered by the Chilliwack Natural Resource District. The effective timber harvesting land base in the TSA is 250,405 ha.³¹ The last Timber Supply Review (TSR) was completed in 2015³² and the most recent Allowable Annual Cut (AAC) determination was completed in early 2016. The current AAC is 1,220,808 cubic meters per year (the AAC is not applicable to private managed forest land).

Fuel reduction treatments 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 8 woodlot licenses (see Map 1). TFL 26, also known as the Mission Municipal Forest, abuts the AOI on the western boundary of FVRD EA F. The opportunity exists to work with local licensees on commercial thinning projects that meet fuels management objectives.

Outdoor recreational values in the AOI are significant with several trail systems, parks, and many recreation sites. The AOI includes both Golden Ears Provincial Park and Davis Lake Provincial Park, as well as portions of the Trans-Canada Trail. Cascade Falls Regional Park and Sumas Mountain Regional Park are also located within the AOI. Trails include Sumas Mountain bike trails, Dewdney Peak Trail (Dewdney Grind), and the Mount St. Benedict Trail. Many recreation sites and reserves are located in

³¹ Fraser Timber Supply Area Rationale for Allowable Annual Cut (AAC) Determination. 2016.

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

³² Fraser TSA Timber Supply Analysis Discussion Paper. 2015. 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



the AOI, especially around the Chehalis River and Harrison Lake, including Cascade Peninsula, Rainbow Falls, Cogburn Beach Wolf Lake, Grace Lake, Echo Lake, Weaver Lake, and Chehalis River. Trails are managed by a variety of agencies, including BC Parks, Recreation Sites and Trails BC, and the Fraser Valley Mountain Bikers Association. Sasquatch Mountain Resort (previously Hemlock Valley) also overlaps the AOI.

3.5 HAZARDOUS VALUES

Hazardous values are defined as values that pose a safety hazard to emergency responders. Generally, FVRD does not have a significant number of industrial sites and facilities that can be considered hazardous values. Three transfer stations serve the communities within the AOI: Harrison Mills, Sylvester Road, and Hemlock Valley. These stations do not accept hazardous waste. Stave Lake Cedar Mills was also identified as a possible safety hazard in the event of a fire. 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. The FVRD did not identify any hazardous values besides the transfer stations. Table 6 lists hazardous infrastructure identified in CWPP field visits.

Table 6. Hazardous Infrastructure Identified in CWPP field visits.

Critical/Hazardous Infrastructure Name	Location
Sylvester Road Transfer Station	10033 Sylvester Road, Dewdney BC
Harrison Mills Transfer Station	14050 Chehalis Forest Service Road, Harrison Mills BC
Hemlock Valley Transfer Station	47094 Laurel Road, Hemlock Valley BC
Stave Lake Cedar Mills	8653 River Road S., Dewdney BC

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.

4.1 FIRE REGIME, FIRE DANGER DAYS 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.³³ BEC zones have been used to classify the province into five Natural Disturbance Types (NDTs). NDTs have influenced the vegetation dynamics and ecological functions and pathways that determine many of the characteristics of our natural systems. The NDT classification is based on the frequency and severity of pre-European disturbance events (including but limited to wildfires) and provides an indication of historical fire regime. The physical and temporal patterns, structural complexity, vegetation communities, and other resultant attributes should be used to help design fuel treatments, and where possible, to help ensure that treatments are ecologically and socially acceptable.³⁴ 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.³³

Biogeoclimatic Zone	Natural Disturbance Type	Area (ha)	Percent (%)
CMAunp: Coastal Mountain-heather Alpine, Undifferentiated and Parkland	NDT5	126	<1%
CWHdm: Coastal Western Hemlock, Dry Maritime	NDT2	31200	68%
CWHds1: Coastal Western Hemlock, Dry Submaritime, Southern variant	NDT2	1634	4%
CWHms1: Coastal Western Hemlock, Moist Submaritime, Southern variant	NDT2	136	<1%
CWHvm1: Coastal Western Hemlock, Very Wet Maritime, Submontane variant	NDT1	5825	13%
CWHvm2: Coastal Western Hemlock, Very Wet Maritime, Montane variant	NDT1	5013	11%
CWHxm1: Coastal Western Hemlock, Very Dry Maritime, Eastern variant	NDT2	105	<1%
MHm1: Mountain Hemlock, Moist Maritime, Windward variant	NDT1	2061	4%
TOTAL		46,107	100%

The AOI is predominated by ecosystems classified as NDT2 (72%). 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

³³Ministry of Forests, Lands, Natural Resources and Rural Development BEC Map (DataBC). Retrieved from <https://catalogue.data.gov.bc.ca/dataset/bec-map>.

³⁴ Province of British Columbia, 1995. Forest Practices Code of British Columbia Biodiversity Guidebook.



forested landscape characterized by extensive areas of mature forest with intermixed patches of younger forests.³⁴

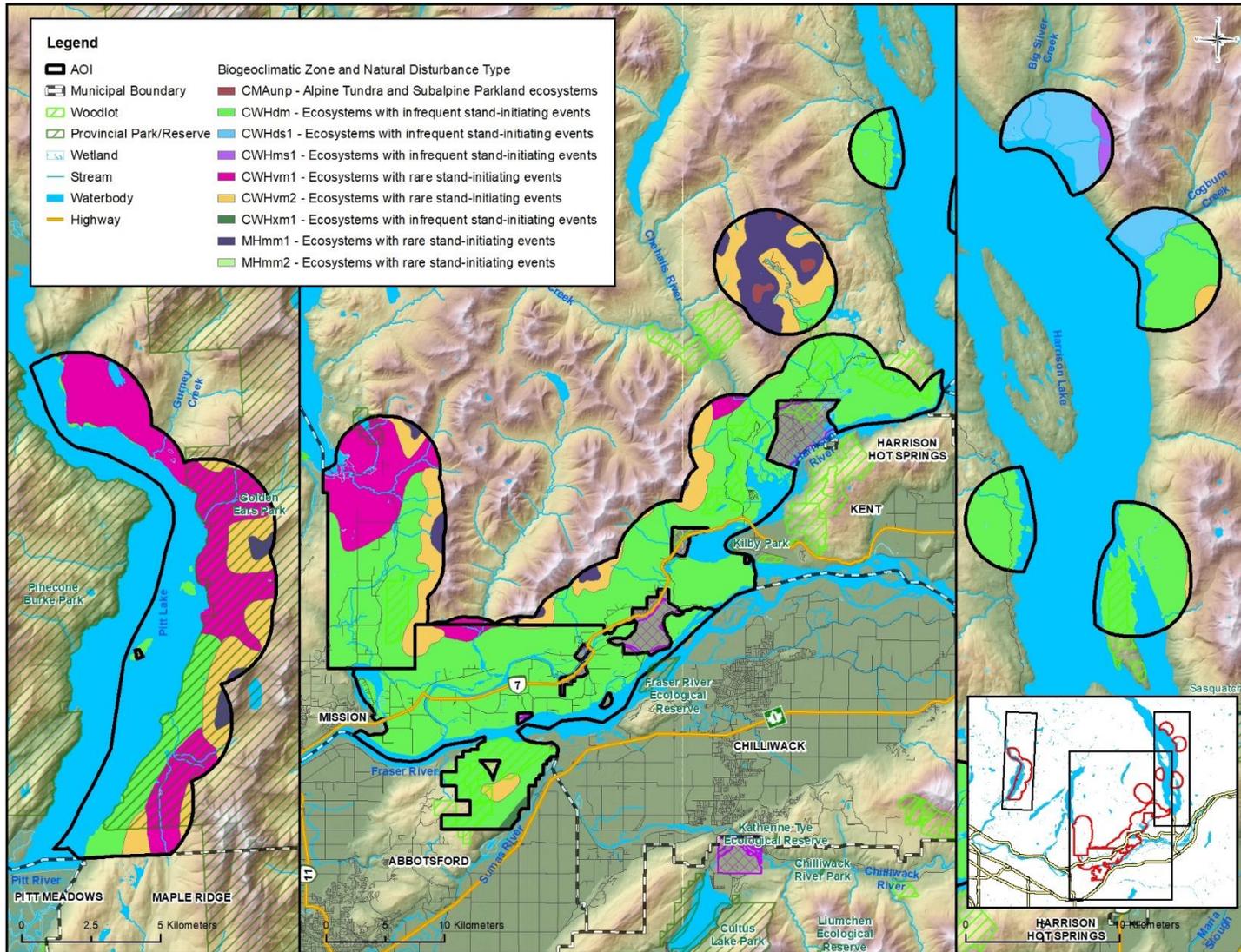
NDT1 (28% of the AOI) comprises ecosystems (CWHvm1, CWHvm2, MHmm1, and MHmm2) with rare stand-initiating events. These are forest ecosystems that experience relatively small disturbances in terms of spatial extent. They have historically resulted in uneven-aged, heterogeneous stand structures from rare 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.³⁴ While fire frequency is not high and fires are generally small, pre-planning and preparation will reduce the negative impacts of a wildfire in NDTs 1 and 2.

NDT5 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 due to the severe climate and limited growing season.³⁵

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.³⁶ Furthermore, forest health issues, human development and natural events contribute to changes in the fire regime, forest attributes and fuel hazard around the community.

³⁵ Province of British Columbia, 1995. Forest Practices Code of British Columbia Biodiversity Guidebook.

³⁶ Hall, E. 2010. Maintaining Fire in British Columbia's Ecosystems: An Ecological Perspective. Report submitted to the Wildfire Management Branch, Ministry of Forests and Range.



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



Forest Health Issues

The Coast Forest Health Overview (2015-2019) and the most recent aerial overview survey of the TSA (2019) outline forest health factors present within the Fraser TSA.^{21,37} In 2019, bark beetles (spruce, balsam, Douglas-fir) were prevalent forest health factors in terms of area impacted (over 11,000 ha total), although the severity was low in most areas. Smaller areas (~200 ha total) were also impacted by laminated root disease and by drought. The Coast Forest Health Overview also identifies Armillaria root disease, forest tent caterpillar, and windthrow as forest health factors of concern. Outbreaks of western hemlock looper and western spruce budworm have previously occurred in the AOI, however, pest infestation data indicates that occurrences of these pests have declined in recent years. Pest infestations within the AOI between 2000 and 2018 have been generally small in scope and include outbreaks of swiss needle cast, Douglas-fir beetle, and laminated root rot, all targeting Douglas-fir, and western hemlock looper.³⁸ Mountain pine beetle has had a limited effect in the AOI due to the low proportion of pine species in coastal forests. Between 2016 and 2018 drought has caused mortality in western red cedar throughout the AOI. 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 residential and commercial/industrial development. This process entails land clearing and road building. Forest harvesting is also common on Provincial Crown land as well as on private 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 O-1a/b fuel types.

Since the establishment of communities within the FVRD, 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 20% of land base is characterized as Agricultural Land Reserve (ALR) concentrated east of Mission between Highway 7 and the Fraser River, and along Sylvester Road towards Durieu. This area, which comprises the communities of Dewdney and Deroche, is dominated by farmland 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 (Section 5.2.3)

³⁷ The most recent provincial forest health aerial survey data is available by TSA at <https://www2.gov.bc.ca/gov/content/industry/forestry/managing-our-forest-resources/forest-health/aerial-overview-surveys/data-files>

³⁸ Province of British Columbia. Data Catalogue- Pest Infestation Polygons. Retrieved November 2019 from https://catalogue.data.gov.bc.ca/pt_BR/dataset/pest-infestation-polygons



and an increase in fire suppression in an ecosystem that had a historic fire interval of 200-300 years. Population growth is expected to continue and the proximity of the AOI to Metro Vancouver as well as mild 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 as well as on private land within the AOI. Poor slash hazard abatement practices have been attributed to some operations which can lead to high fuel loading along roadsides.
- Developed areas in the AOI include the main communities of Durieu, Hatzic, Dewdney, Deroche, Lake Errock, Harrison Mills, Morris Valley, and Hemlock Valley. Although farmland comprises a large portion of most developed areas, every community is bounded by forest. Neighborhoods on the edge of communities are highly intermixed within conifer leading stands, and are in many situations have only 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], which specify responsibilities and obligations with respect to fire use, prevention, control and rehabilitation, and restrict high risk activities based on these classes. Fire Danger Classes are defined as follows:

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



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

Figure 1 displays the average frequency of Fire Danger Class days between the months of April and October. The data summarized comes from the UBC Research weather station (years 2010 – 2019) which provides the longest fire weather data collection interval within the AOI. According to Figure 1, the months that on average experience ‘extreme’ Fire Danger Class days are July, August and September; ‘high’ Fire Danger Class days have also occurred in June and in October. Historically, there is an average of six ‘extreme’ Fire Danger Class days throughout the fire season.

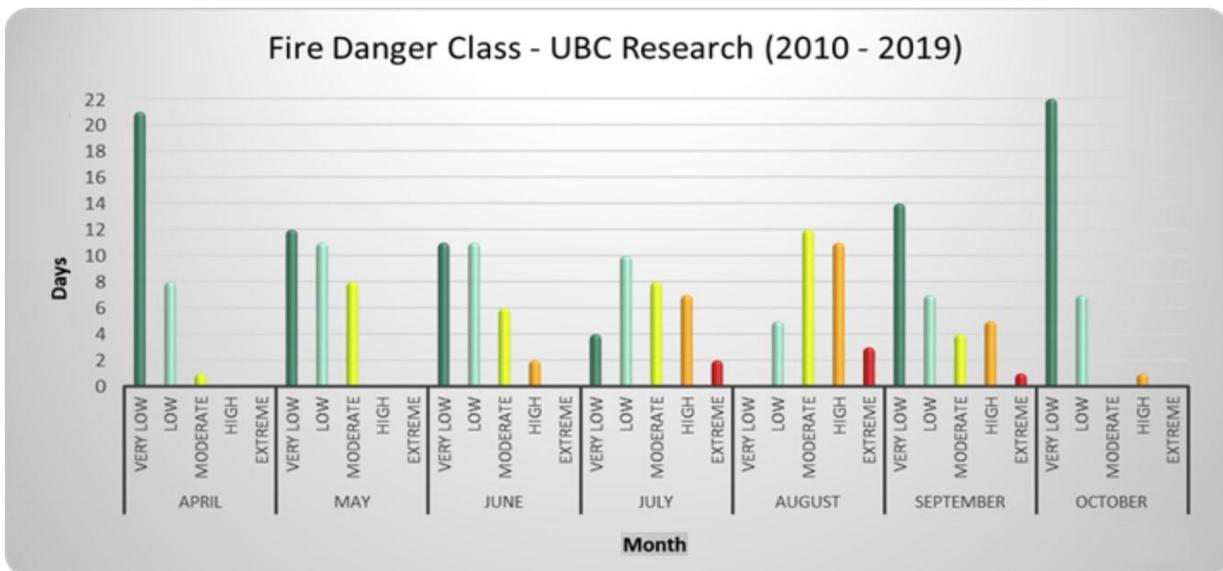


Figure 1. Average number of danger class days for the UBC Research Forest fire weather station. Summary of fire weather data for the years 2010 - 2019.

4.1.2 Climate Change

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

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

As a result, some existing forests have an increased probability of more frequent, intense and more difficult to control wildfires that are likely to result in increased tree mortality, detrimental impacts to



soils and hydrology, and increased threat to communities and interface areas.”³⁹ Numerous studies outline the nature of climate change impacts on wildland fire across Canada, and globally.⁴⁰ 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.⁴¹ 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*⁴², 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 runoff, 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.⁴³ 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

³⁹ Community Resiliency Investment Program. 2018. Community Wildfire Protection Plan Template.

⁴⁰ Flannigan, M.D et al. 2009. Implications of changing climate for global wildland fire. *International Journal of Wildland Fire* 18, 483-507.

⁴¹ 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.

⁴² British Columbia Agriculture & Food Climate Action Initiative, 2010.

<https://pics.uvic.ca/sites/default/files/uploads/publications/Adapt-FraserMetroVan%20Crawford.pdf>

⁴³ 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.⁴⁴

- 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.⁴⁵The 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.^{46, 47}
- 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.⁴⁸
- Future climatic conditions may be more suitable for, or give competitive advantage to, new species of plants, including invasive species.⁴⁹

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:⁵⁰

- 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).

⁴⁴ 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>.

⁴⁵ 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.

⁴⁶ 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.

⁴⁷ Jandt, R. 2013. Alaska Fire Science Consortium Research Brief 2013-3.

⁴⁸ British Columbia Agriculture & Food Climate Action Initiative, 2013. Available online at: <https://www.bcagclimateaction.ca/wp/wp-content/media/RegionalStrategies-Cowichan.pdf>

⁴⁹ 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

⁵⁰ BC Wildfire Service. 2019. *Wildfire Threat Assessment Guide and Worksheets*. Retrieved March 20, 2020 from: <https://www.ubcm.ca/assets/Funding~Programs/LGPS/CRI/Resources/2019-20-wildfire-threat-assesment-guide.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 layers⁵¹. 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 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 24% of the AOI is categorized as either private land or private managed forest land and has no data for wildfire threat in the PSTA dataset. Low threat areas cover 5% of the AOI and water covers 15%. Approximately 50% of the AOI is categorized as having a moderate wildfire threat rating in the provincial Wildfire Threat Analysis. High and extreme threat rating covers 6% of the AOI.

⁵¹ 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])



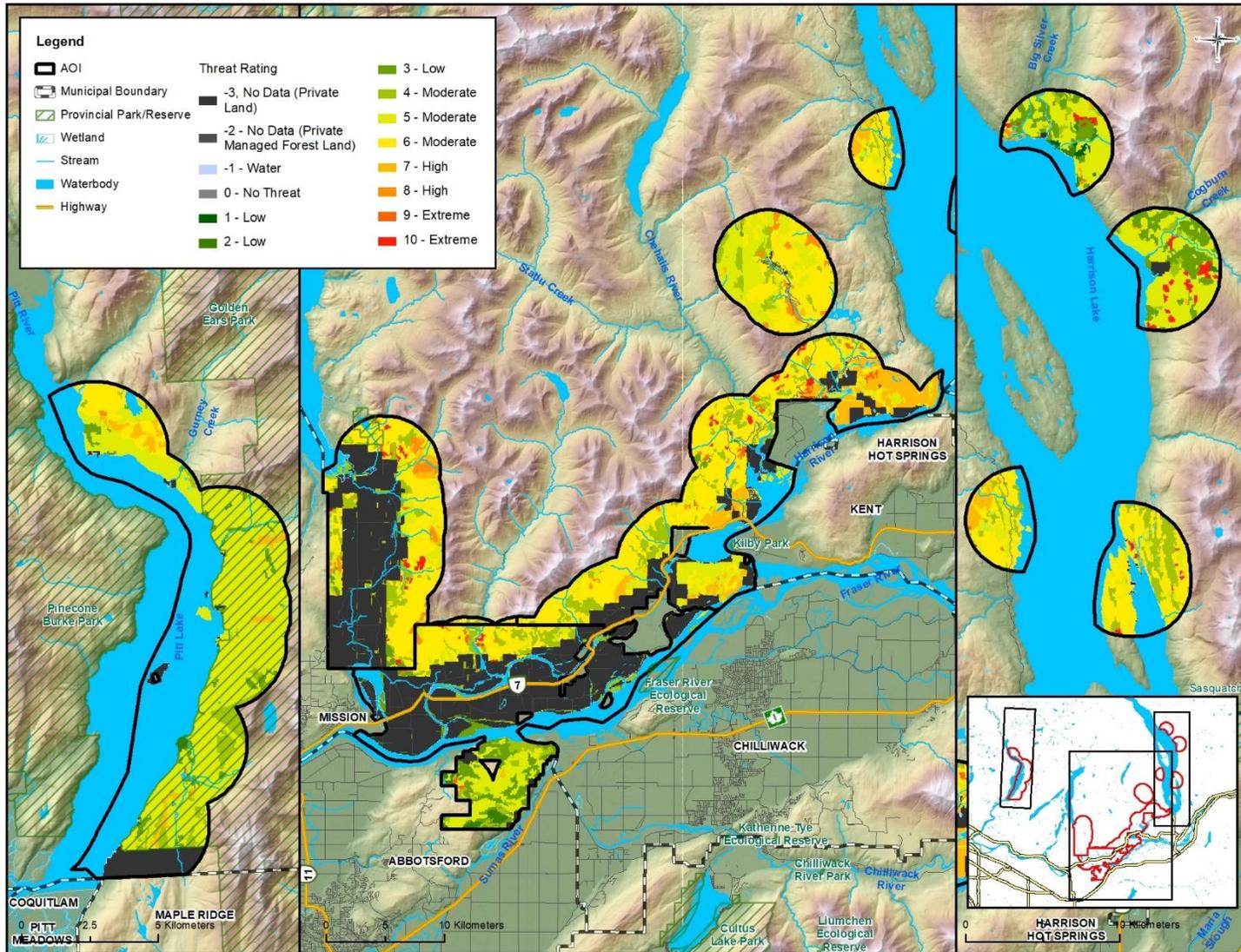
Extreme threat areas are scattered throughout the AOI with a concentration of high-threat area at the eastern end of the AOI around Harrison Mills (Map 4).

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

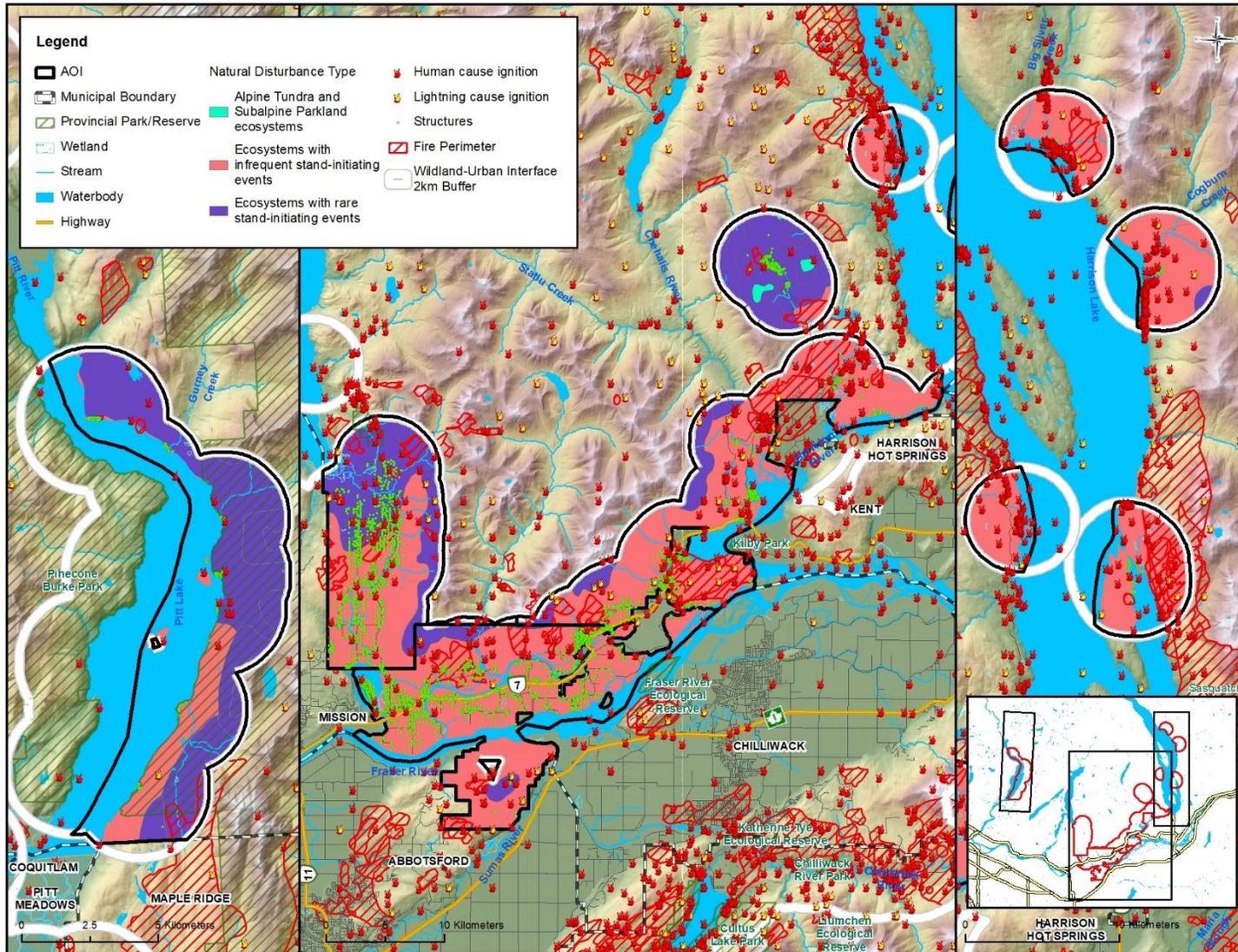
Threat Class	Area (ha)	Threat Class Description	Percent of AOI
-3	10,875	No Data (Private Land)	24%
-2	0	No Data (Private Managed Forest Land)	0%
-1	6,935	Water	15%
0	0	No Threat	0%
1	31	Low	5%
2	261		
3	1,918		
4	3,729		
5	9,005	Moderate	50%
6	10,403		
7	1,845		
8	585	High	5%
9	146		
10	374		
Total	46,107	-	100%

4.2.1 Fire History

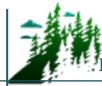
Fire ignition and perimeter data are depicted in Map 5. The following PSTA fire ignition data is available from 1950-2018 and fire perimeter data is available from 1918-2018 for the area. Based on the historical fire ignition data, there have been 283 fire incidents within the AOI during that time period, 75% of which were of human or undetermined cause. 56 wildfires of note burned within the AOI during that period, with the majority of fires burning close to lakes, provincial parks, or major roads.



Map 4. Provincial Strategic Threat Rating.



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 0). Slope percentage and slope position of the value are considered, where slope percentage influences the fire's trajectory and rate of spread and slope position relates to the ability of a fire to gain momentum uphill.
- Stratification of the WUI according to relative wildfire threat based on the above considerations, other local factors and field assessment of priority wildfire risk areas.

WUI Threat Assessments were completed over five field days in July and August 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 study area 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.
- Previous mitigation efforts – Those areas which had previously had fuel reduction or modification were field assessed.
- 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 38 WUI threat plots were completed and over 350 other field stops (e.g., qualitative notes, fuel type verification, and/or photograph documentation) were made across the AOI (see Appendix F for WUI threat plot locations).

Using the verified and updated fuel types (Appendix A-1, Map 8) combined with field wildfire threat assessments and office-based analysis (Appendix A-1 to 0), local wildfire threat for the study area was updated. Using the Wildfire Threat Assessment methodology,⁵² 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 study area 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 study area is under 6% extreme threat class rating, 11% high, 42% moderate, 2% low and 15% very low/water (Map 6, Table 9). The remaining 24% of the AOI is classified as private land and private managed forest land and as such has not been allocated fire threat data. Assessment of fire threat on private land is not funded by UBCM 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.

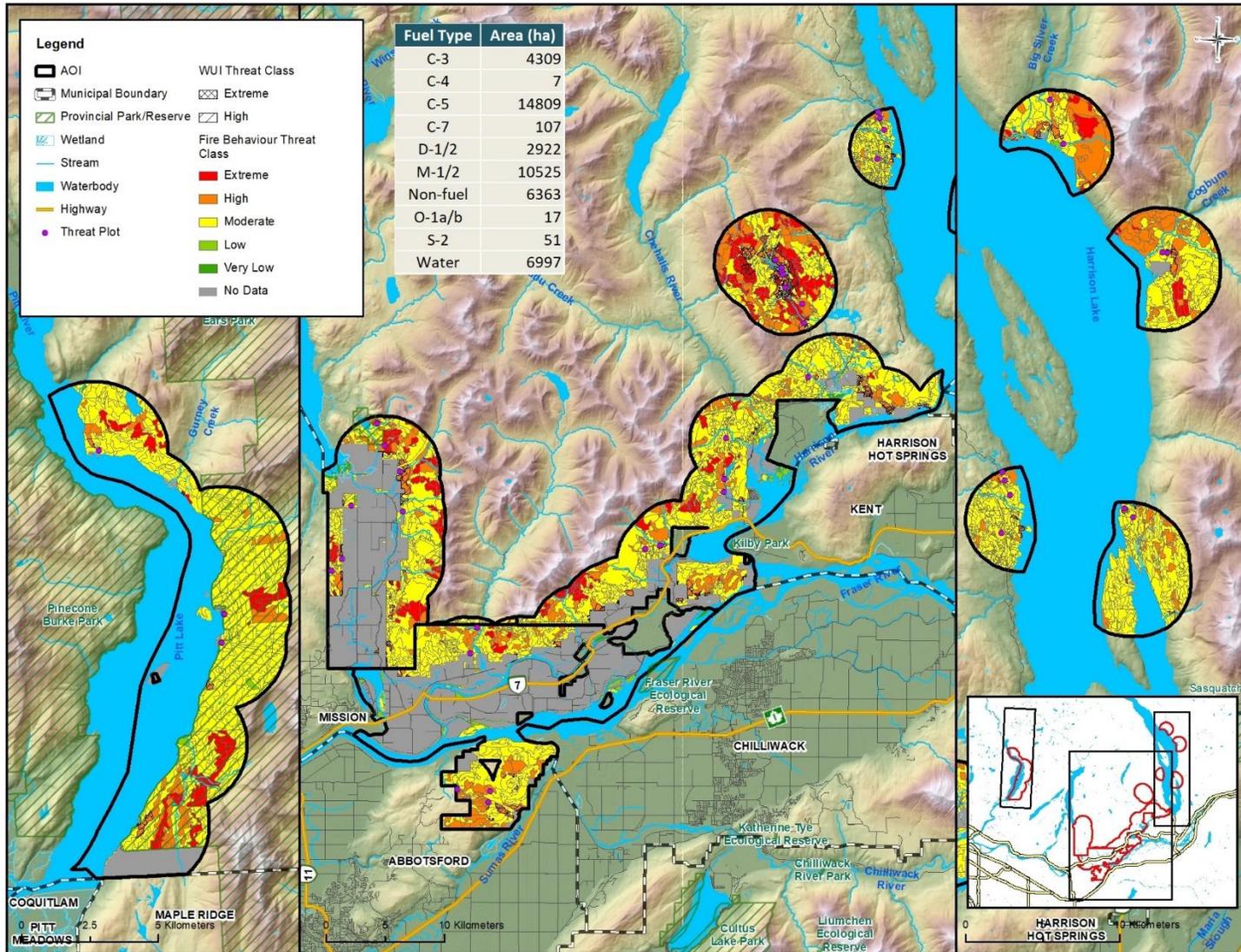
The areas that represent the highest wildfire behaviour potential and greatest risk to values within the AOI are areas of high and extreme threat class surrounding Hemlock Valley; on the east side of Harrison Lake; and along the north edge of the AOI where values at risk are highly intermixed with forest. There are also some areas of high or extreme threat class above the eastern edge of Pitt Lake.

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 study area.

Wildfire Behaviour Threat Class	2019 PSTA Data	2019 CWPP
	Percent of AOI	Percent of AOI
Extreme	1%	6%
High	5%	11%
Moderate	50%	42%
Low	5%	2%
Very Low/ No Threat (Water)	15%	15%
No Data (Private Land)	24%	24%

⁵² 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 all level of governments (local, provincial, federal and First nations), and private landowners. The cooperative effort of the aforementioned parties is crucial in order to develop and proactively implement a wildfire risk mitigation program. Development of a successful wildfire risk mitigation strategy is dependent on hazard identification within the community, which accounts for forest fuels, high risk activities, frequency and type of human use, and other important environmental factors. The resulting wildfire risk management and mitigation strategy aims to build more resilient communities and produces strategic recommendations or actionable items that can be categorized as follows:

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

5.1 FUEL MANAGEMENT

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

The objectives for fuel management are to:

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

Ideally, these objectives will enhance protection to homes and critical infrastructure. Caveats associated with the statement include: 1) wildfire behaviour will only be reduced if the fire burns in the same location as treatments occurred, and 2) protection of homes and critical infrastructure is highly dependent upon the vulnerability to ignition by embers (ignition potential) directly around the value at risk. In summary, fuel treatments alone should not be expected to protect a community from the effects of wildfire, namely structure loss.

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

Fuel management on local government Crown land and provincial Crown land within local government administrative boundaries or within logical treatment units extending onto provincial Crown land may be funded by the Union of BC Municipalities (UBCM) through the Community Resiliency Investment (CRI) Program (subject to current program requirements). Fuel management on provincial Crown land only may be funded by a new Crown Land Wildfire Risk Reduction (WRR) funding category⁵³ 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).⁵⁴ 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 fuel breaks and fuel treatments, as defined in Section 5.1.1, to reduce the wildfire potential in the AOI. Potential treatment activities include fuel removal, thinning, stand conversion, pruning, and chipping, or a combination of these activities. Stand conversion has been shown to be effective at reducing wildfire potential in mixed-wood or conifer dominated stands and is recommended as a best management practice to encourage a higher deciduous 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.

⁵³ 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.

⁵⁴ 2019 CRI FireSmart Community Funding & Supports – Program & Application Guide:
<https://www.ubcm.ca/assets/Funding~Programs/LGPS/CRI/cri-2019-program-guide.pdf>



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 Highway 7 in the event of evacuation through reduction of hazardous fuels and landscape level fuel treatment.

RECOMMENDATION #13: Work with the Ministry of Transportation and Infrastructure (MOTI), to assess high hazard fuel types (C-3 and M-1/2) along Hwy 7 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.⁵⁵ Fire prevention activities on private land that may be funded under this program are related to FireSmart activities (including FireSmart planning and assessments, local rebate programs for completion of eligible FireSmart activities, and provision of off-site disposal of vegetation management debris), subject to program requirements. This does not preclude other current and future funding opportunities or potential industrial partnerships and changes to existing programs.

The potential treatment areas represent moderate, high or extreme fire hazard areas which are close to values at risk (structures or infrastructure) or have been identified as landscape level fuel treatments and are located on Crown provincial or 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.

⁵⁵ 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>



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

Fuel Treatment Types

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

Interface Fuel Breaks/Treatments

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. These 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 behaviour⁵⁶, 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 #14: Proceed with detailed assessment, prescription development and treatment of the units identified in this CWPP.

RECOMMENDATION #15: 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 the Mission Municipal Forest, woodlots and/or other licensees to apply the MFLNRORD approved alternative fire management stocking standards in the FVRD Zone B wildland urban interface to reduce interface wildfire threat.

⁵⁶ Agree, J.K., Bahro, B., Finney, M.A., Omi, P.N., Sapsis, D.B., Skinner, C.N., van Wagtenonk, 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	Beaudry Rd Interface	Moderate	79.7	Interface Fuel Break/ By reducing surface, ladder, and crown fuels, the fuel treatment will result in forest stands with lower overall wildfire behaviour threat and ignition potential adjacent to values at risk.	8.2	71.4	0.1	This proposed fuel treatment unit (FTU) is entirely within the Hatzic landscape unit of the Lower Fraser Sustainable Resource Management Plan (SRMP). It overlaps a communication tower site, and a well and reservoir for the FVRD-operated Lake Errock water system. There is overlap with a masked occurrence of a species at risk and two points of diversion for drinking water (springs). The FTU is bordered by a BC Hydro overhead transmission line and by private land parcels. Consultation with BC Hydro, tenure holders, licensees, FVRD water system managers, and a qualified ecosystem biologist, must occur during prescription development and prior to implementation to ensure all concerns are addressed.	This FTU has been recommended for treatment due to its proximity to private residences (<50 m) and to critical infrastructure (Lake Errock water system infrastructure and communication tower site). The FTU is primarily composed of mixed wood conifer-dominant stands (50% or greater conifer component). The stands are primarily characterized as immature stands with uniform ladder fuels. The proposed treatment will provide an anchor point for suppression efforts and reduce local wildfire threat for Lake Errock residents.
2	Mission TFL 26 Interface	Moderate	55.2	Interface Fuel Break/ By reducing surface, ladder, and crown fuels, the fuel treatment will result in forest stands with lower overall wildfire behaviour threat and ignition potential adjacent to values at risk.	22.3	32.9	0.0	The FTU is entirely within the Hatzic landscape unit of the Lower Fraser SRMP; there is overlap with one legal OGMA. The FTU overlaps a trapline license, a mapped wetland, and a masked occurrence of a species at risk. Private land parcels border the FTU along the eastern and southern edges and TFL 26 (Mission Municipal Forest) borders the FTU to the southwest. Consultation with MFLNRORD, tenure holders, private land holders, and a qualified ecosystem biologist must occur during prescription development and prior to implementation to ensure all concerns are addressed.	This FTU has been recommended for treatment due to its proximity (~500 m) to private residences along Stave Lake Road. The proposed treatment would reduce the risk to the Durieu community from a wildfire starting to the west of the community (TFL 26) and provide an anchor point for suppression efforts. The FTU is currently comprised of stands with a mix of fuel types and hazard levels, from high (C-3) to moderate (C-5) threat. The proposed treatment would create a continuous strip of reduced-hazard stands.



FTU # and Stratum	Geographic Area	Priority	Total Area (ha)	Treatment Unit Type/ Objective	Local Fire Threat (ha)			Overlapping Values / Treatment Constraints*	Treatment Rationale
					Extreme / High	Mod	Low		
3	Hemlock Valley Primary #1	High	40.6	Primary Fuel Break/ By reducing surface, ladder, and crown fuels, the fuel treatment will result in forest stands with lower overall wildfire behaviour threat and ignition potential and will create an anchor point for firefighting suppression efforts.	28.5	12.1	0.0	The FTU is entirely within the West Harrison landscape unit under the West Harrison SRMP; there is overlap with one legal OGMA. The FTU overlaps a recreation tenure for alpine skiing (Sasquatch Mountain Resort), a trapline license, and an active forest license at the southeastern corner. There is also overlap with several streams and a masked occurrence of a species at risk. A BC Hydro overhead line intersects the FTU along Hemlock Valley Road. Consultation with tenure holders, licensees, BC Hydro, MFLNRORD, and a qualified ecosystem biologist must occur during prescription development and prior to implementation to ensure all concerns are addressed.	This FTU is located along the Hemlock Valley Road and has been recommended for treatment due to the presence of high hazard stands and proximity to private residences in Hemlock Valley (300-400 m). Proposed treatment would bolster the access/egress route for the community of Hemlock Valley and provide an anchor point for fire suppression efforts. The FTU is primarily composed of high hazard C-3 fuel types dominated by western hemlock and western redcedar with high understory stem densities (2500-4000 stems per hectare (sph)).
4	Hemlock Valley WUI N	High	11.8	Interface Fuel Break/ By reducing surface, ladder, and crown fuels, the fuel treatment will result in forest stands with lower overall wildfire behaviour threat and ignition potential adjacent to values at risk.	10.9	0.0	0.9	The FTU is entirely within the West Harrison landscape unit under the West Harrison SRMP. It overlaps a recreation tenure for alpine skiing (Sasquatch Mountain Resort), a trapline license, and a guide outfitter area. There is also overlap with several streams and with a masked occurrence of a species at risk. Private land parcels border the FTU. Consultation with tenure holders, private land holders, licensees, and a qualified ecosystem biologist must occur during prescription development and prior to implementation to ensure all concerns are addressed.	This FTU has been recommended for treatment due to the presence of high hazard stands and proximity to private residences in Hemlock Valley (<10 m). Proposed treatments will reduce the fire hazard around homes and help protect the community from the risk of a fire from the south. The FTU is primarily composed of high hazard C-3 fuel types dominated by western hemlock and amabilis fir with moderate understory stem densities (~2500 sph).



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		
5	Hemlock Valley WUI E	High	33.7	Interface Fuel Break/ By reducing surface, ladder, and crown fuels, the fuel treatment will result in forest stands with lower overall wildfire behaviour threat and ignition potential adjacent to values at risk.	22.0	10.5	1.2	The FTU is entirely within the West Harrison landscape unit under the West Harrison SRMP; there is overlap with one legal OGMA on the eastern edge. The FTU overlaps a recreation tenure for alpine skiing (Sasquatch Mountain Resort), a trapline license, and a guide outfitter area. There is overlap with several streams, a masked occurrence of a species at risk, and a watershed reserve (Cohen Creek) on the western boundary. An active occupant license to cut overlaps the FTU in association with a license of occupation for a parking facility. Consultation with MFLNRORD, licensees, tenure holders, private land holders, and a qualified ecosystem biologist must occur during prescription development and prior to implementation to ensure all concerns are addressed.	This FTU has been recommended for treatment due to the presence of high hazard stands and proximity to private residences in Hemlock Valley (<10 m). Proposed treatments will reduce the fire hazard around homes and help protect the community from the risk of a fire from the south. The FTU is primarily composed of high hazard C-3 fuel types dominated by amabilis fir with moderate understory stem densities (~2500 sph).
6	Hemlock Valley WUI S	High	48.1	Interface Fuel Break/ By reducing surface, ladder, and crown fuels, the fuel treatment will result in forest stands with lower overall wildfire behaviour threat and ignition potential adjacent to values at risk.	38.8	6.3	3.0	The FTU is entirely within the West Harrison landscape unit under the West Harrison SRMP; there is overlap with one legal OGMA. Private land parcels border the FTU. The FTU overlaps with a trapline license and a guide outfitter area. There is also overlap with streams, a masked occurrence of a species at risk and with BC Hydro overhead lines. Consultation with BC Hydro, licensees, tenure holders, private land holders, and a qualified ecosystem biologist must occur during prescription development and prior to implementation to ensure all concerns are addressed.	This FTU has been recommended for treatment due to the presence of high hazard stands and proximity to private residences in Hemlock Valley (<10 m). Proposed treatment will reduce the fire hazard around homes and help protect the community from the risk of a fire from the south, which is the prevailing wind direction in the region. The FTU is primarily composed of high hazard C-3 fuel types dominated by western hemlock and amabilis fir with moderate understory stem densities (~2500 sph).



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	Hemlock Valley Primary #2	High	72.5	Primary Fuel Break/ By reducing surface, ladder, and crown fuels, the fuel treatment will result in forest stands with lower overall wildfire behaviour threat and ignition potential and will create an anchor point for firefighting suppression efforts.	50.3	20.5	1.7	The FTU is entirely within the West Harrison landscape unit under the West Harrison SRMP. It overlaps a recreation tenure for alpine skiing (Sasquatch Mountain Resort), a trapline license, a guide outfitter area, and a woodlot operated by the Sts'ailes First Nations. There is also overlap with several streams and with a masked occurrence of a species at risk. A BC Hydro overhead transmission line runs the length of the FTU along Hemlock Valley Road. Consultation with BC Hydro, tenure holders, licensees and a qualified ecosystem biologist must occur during prescription development and prior to implementation to ensure all concerns are addressed.	This FTU has been recommended for treatment due to the presence of high hazard stands and location along Hemlock Valley Road. The proposed treatment would bolster the access/egress route for the community of Hemlock Valley and provide an anchor point for fire suppression efforts in combination with Hemlock Valley Primary #1 FTU and Hemlock Valley WUI FTUs. The FTU is primarily composed of high hazard C-3 fuel types dominated by western hemlock and western redcedar with moderate to high understory stem densities (2500-4000 sph).
8	Chehalis FSR Primary #1	High	110.2	Primary Fuel Break/ By reducing surface, ladder, and crown fuels, the fuel treatment will result in forest stands with lower overall wildfire behaviour threat and ignition potential and will create an anchor point for firefighting suppression efforts.	33.7	61.2	15.3	The FTU is partially within the Chehalis landscape unit in the north and the Hatzic landscape unit in the south, under the Chehalis and Lower Fraser SRMPs; there is overlap with one legal OGMA. It is entirely within the Elbow community watershed and overlaps the eastern shore of Elbow Lake. The FTU overlaps several streams, three wells, one guide outfitter area and several occurrences of species at risk. The FTU also overlaps three active forest licenses, one timber license, and a woodlot managed by C&H Forest Products. Consultation with MFLNRORD, licensees, tenure holders, and a qualified ecosystem biologist must occur during prescription development and prior to implementation to ensure all concerns are addressed.	In combination with Chehalis FSR Interface FTU and Chehalis FSR Primary #2 FTU, the proposed treatment will reduce the risk to the community of Harrison Mills from a fire starting along Chehalis Forest Service Road. The FTU is composed of stands in a range of hazardous conditions, from moderate (C-5 fuel type) to extreme (C-3 fuel type with high ladder fuel continuity and low crown base heights).

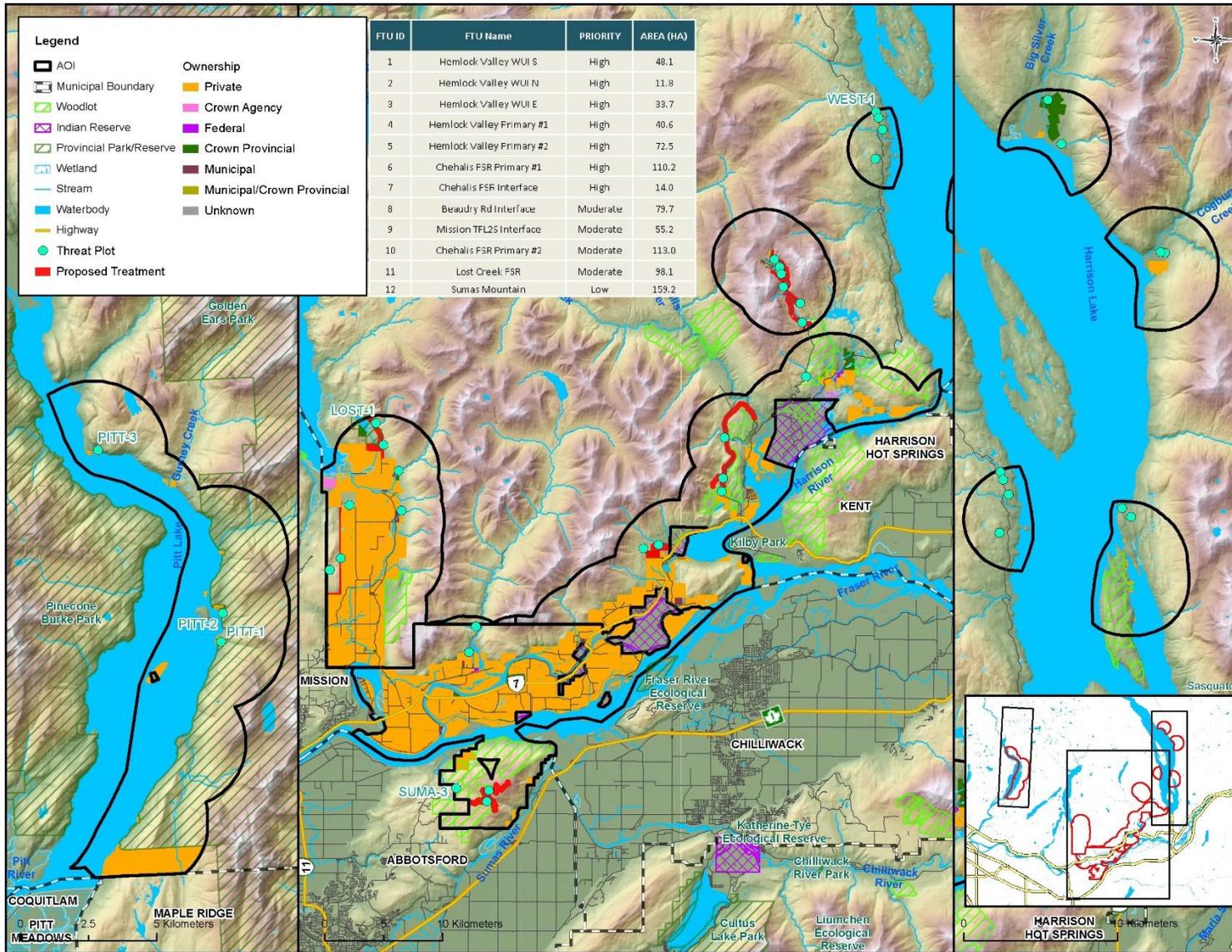


FTU # and Stratum	Geographic Area	Priority	Total Area (ha)	Treatment Unit Type/ Objective	Local Fire Threat (ha)			Overlapping Values / Treatment Constraints*	Treatment Rationale
					Extreme / High	Mod	Low		
9	Chehalis FSR Primary #2	Moderate	113.0	Primary Fuel Break/ By reducing surface, ladder, and crown fuels, the fuel treatment will result in forest stands with lower overall wildfire behaviour threat and ignition potential and will create an anchor point for firefighting suppression efforts.	14.1	97.1	1.8	The FTU is entirely within the Chehalis landscape unit under the Chehalis SRMP; there is overlap with several legal OGMA's. The Chehalis River flows east along the northern edge of the FTU and there is overlap with the Chehalis River recreation site polygon. A BC Hydro transmission line right-of-way intersects the FTU and there is a heritage/archeological site tenure in the northeastern corner. The FTU overlaps one trapline license, a guide outfitter area, two mineral claims, and one woodlot (C & H Forest Products Ltd.). There is one overlapping active forest license and one timber license. Consultation with BC Hydro, licensees, tenure holders, and MFNRORD must occur during prescription development and prior to implementation to ensure all concerns are addressed.	In combination with Chehalis FSR Interface FTU and Chehalis FSR Primary #1 FTU, the proposed treatment will reduce the risk to the community of Harrison Mills from a fire starting along Chehalis Forest Service Road. The FTU is composed of conifer-dominated mixed-wood stands (50% conifer or greater), and a mix of C-5 and C-3 fuel types.
10	Chehalis FSR Interface	High	14.0	Interface Fuel Break/ By reducing surface, ladder, and crown fuels, the fuel treatment will result in forest stands with lower overall wildfire behaviour threat and ignition potential adjacent to values at risk.	6.7	7.3	0.0	The FTU is partially within the Chehalis landscape unit in the north and the Hatzic landscape unit in the south, under the Chehalis and Lower Fraser SRMPs. It overlaps the Elbow community watershed, a guide outfitter area, an active forest license, and a woodlot managed by C & H Forest Products Ltd. The FTU is bordered by private land parcels to the southeast. There is overlap with several streams and with a masked occurrence of a species at risk. Consultation with MFLNRORD, tenure holders, licensees, private land holders, and a qualified ecosystem biologist must occur during prescription development and prior to implementation to ensure all concerns are addressed.	This FTU has been recommended for treatment due to its proximity to private residences around Echo Lake (250-350 m). The FTU is composed of a mix of high hazard mixed-wood stands (75% conifer or greater) and C-3 fuel types. Treatment will reduce the potential fire behaviour during periods of high or extreme fire danger.



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		
11	Lost Creek FSR	Moderate	98.1	Primary Fuel Break/ By reducing surface, ladder, and crown fuels, the fuel treatment will result in forest stands with lower overall wildfire behaviour threat and ignition potential and will create an anchor point for firefighting suppression efforts.	57.9	40.2	0.0	The FTU is entirely within the Hatzic landscape unit of the Lower Fraser SRMP. There is overlap with one no-harvest wildlife habitat area (WHA) for the Pacific Water Shrew (<i>Sorex bendirii</i>) and one legal OGMA encompassing Davis Lake Provincial Park. The FTU is partially within Davis Lake Provincial Park and is adjacent to Davis Lake. There is overlap with a trapline license, UREP/recreation reserve, several mapped streams, a masked occurrence of a species at risk and an occurrence of the red-listed Pacific Water Shrew. There are two active forest licenses that overlap the FTU. Consultation with MFLNRORD, BC Parks, licensees, tenure holders and a qualified ecosystem biologist must occur during prescription development and prior to implementation to ensure all concerns are addressed.	This FTU has been recommended for treatment due to the presence of high hazard stands and its proximity to private residences off of Sylvester Road and Beyer Road (100-200 m). The stands in this FTU are typed primarily as C-3, with high stem densities and high surface fuel loading and a minor proportion of C-5 and M-1/2 fuel types. The proposed treatment will reduce the potential fire behaviour during periods of high and extreme fire danger to the Durieu/McConnell Creek community should a fire start in the area around Davis Lake Provincial Park. The proposed treatment also provides an opportunity to reduce the ignition potential from recreational visitors to the park.
12	Sumas Mountain	Low	159.2	Primary Fuel Break/ By reducing surface, ladder, and crown fuels, the fuel treatment will result in forest stands with lower overall wildfire behaviour threat and ignition potential and will create an anchor point for firefighting suppression efforts.	63.2	96.0	0.0	The FTU is entirely within Sumas Mountain Regional Park and the Fraser Valley South landscape unit under the Lower Fraser SRMP. Several mountain biking trails intersect the FTU and there is overlap with the Sumas Mountain Staging Area recreation site, Sumas Peak watershed reserve, and with two communication tower sites. The western edge of the FTU borders private land parcels. There are two woodlots that overlap the western portion of the FTU (Sumas First Nation and Chilliwack District Manager) and three mineral claims. Several mapped streams flow through the FTU. Consultation with the Fraser Valley Mountain Bikers Association (FVMB), private land holders, FVRD parks management staff, licensees, and tenure holders must occur during prescription development and prior to implementation to ensure all concerns are addressed.	This FTU will improve emergency access/egress for Sumas Mountain Regional Park and for critical infrastructure (communication towers) located on Sumas Mountain. The enhancement of Sumas Mountain Regional Park is identified as a priority for the FVRD in both the <i>Regional Parks Strategic Plan 2014-2024</i> and in the <i>Experience the Fraser Implementation Plan</i> . This FTU is comprised of high-density C-3 stands with some lower density C-5 stands, mixed forest (M-1/2), and very high density (4000-10000 sph) C-4 stands.

*Some of the proposed fuel treatment units have direct overlap with known archaeological site(s). Consultation with First Nations and the MFLNRORD Archaeology Branch should occur during the prescription development and implementation phases to ensure that such sites are protected.



Map 7. Proposed and Past Fuel Treatments.



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 to occur 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 #16: As treatments are implemented, treatment monitoring should be completed by a qualified professional in order to schedule the 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 the comprehensive nationally accepted set of principles, practices and programs for reducing losses from wildfire.⁵⁷ 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 guidelines⁵⁸, have been formally adopted by almost all Canadian provinces and territories, including British Columbia in 2000; FireSmart has become the de facto Canadian standard. FireSmart is founded in standards published by the National Fire Protection Association (NFPA). The objective of FireSmart is to help homeowners, 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

⁵⁷ FireSmart is the registered trademark held by the Partners in Protection Association.

⁵⁸ 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.

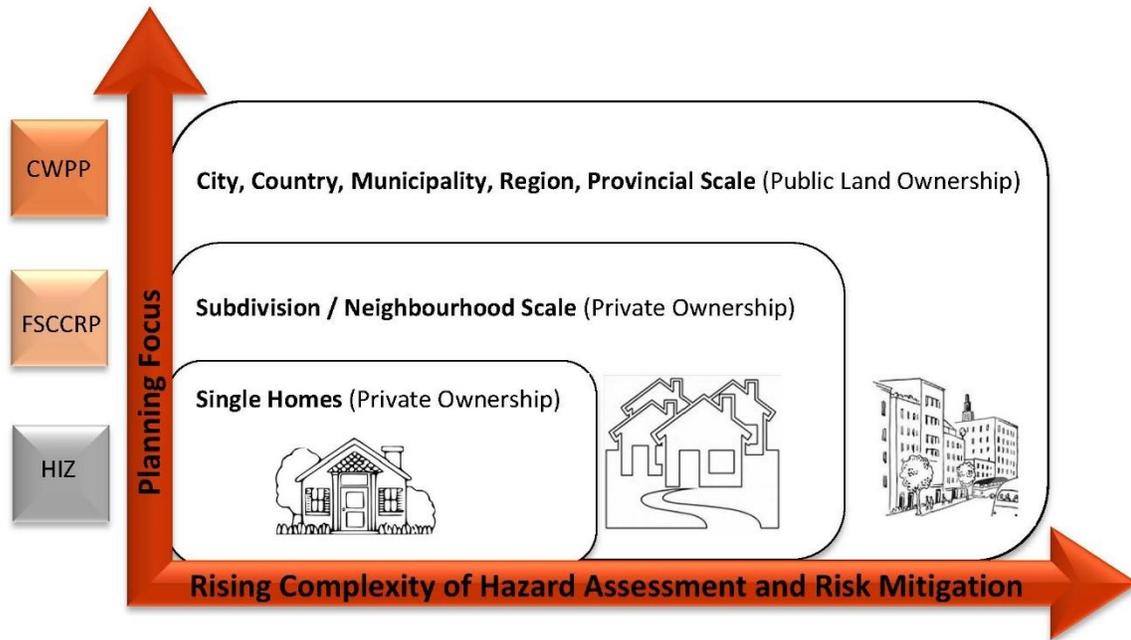


Figure 2. Diagram of the various, coordinated levels of the FireSmart program.⁵⁹ CWPP: Community Wildfire Protection Plan, FSCCRP: FireSmart Canada Community Recognition Program, HIZ: Home Ignition Zone.

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;⁶⁰ 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.⁶¹ Surviving homes in both urban and rural areas exhibited many attributes of FireSmart principles, regardless of the broader wildfire threat surrounding them.⁶¹

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

⁵⁹ Figure and content developed by A. Westhaver. Adapted by A. Duszynska, 2017.

⁶⁰ <https://www.firesmartcanada.ca>

⁶¹ 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.



- 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
- 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 loss⁶²

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).^{63,64} The HIZ includes the structure itself and four concentric, progressively wider Priority Zones. HIZ Priority Zones are based upon distance from structure: 0 to 1.5 m (Priority Zone 1a-fuel free zone), 0 – 10 m (Priority Zone 1), 10 – 30 m (Priority Zone 2), and 30 – 100 m (Priority Zone 3). These zones help to guide risk reduction activities, with 'Recommended FireSmart Guidelines' being most stringent closest to the structure. The likelihood of home ignition is mostly determined by the area within 30 m of the structure (Priority Zones 1a, 1 and 2). Recommended FireSmart guidelines address a multitude of hazard factors within the HIZ: building materials and design; vegetation (native or landscaped materials); and the presence of flammable objects, debris, and vulnerable ignition sites. More detail on priority zones can be found in the FireSmart Manual⁶⁵.

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

Because ignitability of the HIZ is the main factor driving structure loss, the intensity and rate of spread of wildland fires beyond the community has not been found to necessarily correspond to loss potential. For example, FireSmart homes with low ignitability may survive high-intensity fires, whereas highly ignitable homes may be destroyed during lower intensity surface fire events.⁶⁴ Increasing ignition resistance would reduce the number of homes simultaneously on fire; extreme wildfire conditions do not necessarily result in WUI fire disasters.⁶⁶ 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.

⁶² Community Resiliency Investment Program. 2018. Community Wildfire Protection Plan Template.

⁶³ 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.

⁶⁴ Cohen, J. Preventing Disaster Home Ignitability in the Wildland-urban Interface. *Journal of Forestry*. p 15 - 21.

⁶⁵ <https://firesmartcanada.ca/> and <https://www2.gov.bc.ca/gov/content/safety/wildfire-status/prevention/firesmart>

⁶⁶ 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/>.



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 trained 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 3).

Once multiple homes are ignited in an urban area, there is increasing potential for fire to spread from structure to structure, independently of the wildland vegetation. This is known as an urban conflagration. Effective fire protection depends on ignition resistant homes and properties during extreme wildfire events.⁶⁶ Figure 3 illustrates that it is possible to break up the disaster sequence by decreasing the number of highly ignitable homes exposed to embers, therefore reducing the number of homes ignited and removing the consequences of multiple structures lost.

Overall, FireSmart leads to communities that are better adapted to wildfire, more resilient and able to recover following wildfires by sustaining fewer losses and disruption, and safer places to live and recreate. Action by homeowners is the number one priority for reducing structure loss in the event of a WUI fire, but the overall adaptation of the community to wildfire is multi-pronged and the landscape should not be ignored.⁶⁶



Figure 3. The wildland/urban interface disaster sequence and the possibility to break up the disaster sequence by decreasing the number of highly ignitable homes.⁶⁷

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

Communicating effectively 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 enable a solid understanding of fire risk issues and the level of complexity and detail of the message should be specific to the target audience.

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

To date the FVRD has not undertaken significant public education outreach in the community or online concerning wildfire preparedness and education, although their website does contain links to provincial education resources and regulations for open burning. The FVRD should consider utilizing the FireSmart BC Education Package as an element of wildfire preparedness education to be presented annually in elementary or high schools. Programming could include volunteer/advocacy work from professional foresters, wildland firefighters or prevention officers, and FVRD staff. The FVRD should consider holding

⁶⁷ Graphic adapted from Calkin et. al, by A. Westhaver.



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 are:

- To include wildfire considerations in the planning and acquisition strategy for parks and recreational areas.
- To develop policies and practices for FireSmart design and maintenance of 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 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 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 has not yet engaged in a proactive vegetation management strategy, targeting high-use areas near values at risk, within and immediately adjacent to developed areas. Furthermore, the FVRD does not currently enforce FireSmart landscaping requirements within any development permit areas nor adjacent to critical infrastructure. More detailed recommendations regarding wildfire hazard development permit areas are provided below.

Development Permit Areas for Wildfire Hazard

The OCP for Electoral Areas C and F do not explicitly consider the establishment of a development permit area (DPA) to address wildfire risk mitigation. Interface fire hazard areas are identified in the OCP for EA G, but no DPA is established. It is recommended that the FVRD review the OCPs for EAs C, F, and G with consideration towards establishing a wildfire development permit area (DPA) in each area. Other jurisdictions' wildfire development permit areas can serve as models for various components.⁶⁸ 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 DPA 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*⁶⁹) 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).

It 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.

⁶⁸ The District of North Vancouver and City of Maple Ridge have robust and well-documented Wildfire Hazard Development Permit processes.

⁶⁹ National Fire Protection Association (NFPA). 2017. Standard on Water Supplies for Suburban and Rural Fire Fighting. Available from <https://www.nfpa.org/codes-and-standards/all-codes-and-standards/list-of-codes-and-standards/detail?code=1142>



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.⁷⁰

RECOMMENDATION #17: Review the OCPs for Electoral Area C and the OCP for EA F and consider including wildfire as a natural hazard development permit area (DPA). The ‘Interface Fire Hazards’ section (11.4) in the OCP for EA G should be revised to ensure that the most up-to-date threat information is used for the DPA. A recommended development permit area for the FVRD Zone B 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 #18: Engage fire departments to assist in the identification of minimum design requirements for alternative water supply, emergency access/egress, and hydrant placement for wildfire DPA applications. Input provided by the fire departments should be considered in the development of policies and regulations associated with the wildfire hazard development permit area.

RECOMMENDATION #19: 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).

⁷⁰ Building and Safety Standards Branch. 2016. Bulletin No. BA 16-01 Building Act Information Bulletin: Update for Local Governments.



RECOMMENDATION #20: Consider engaging the development/building community (may include developers, builders, landscapers, and architects) in wildfire risk reduction planning. 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 wildfire mitigation objectives, and 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 consideration to decrease the overall threat of wildfire. Aspects of subdivision design that influence wildfire risk are access, water pressure and hydrant locations. The number of access points and the width of streets and cul-de-sacs determine the safety and efficiency of evacuation and emergency response. In the communities and/or developed areas within AOI, on-street parking can contribute hazards on narrow or dead-end roads, which are already unlikely to have a high capacity under heavy smoke conditions.⁷¹ When the time for evacuation is limited, poor access has contributed to deaths associated with entrapments and vehicle collisions during wildfires.⁷² 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.⁷¹ These factors should be considered during the review of applications for new developments occurring on vacant lots within the FVRD wildland urban interface, as defined by a DPA or by areas mapped in this CWPP as having higher wildfire risk.

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, water usage agreements for accessing water on private land, cisterns or other underground storage, etc., should be reviewed by the FVRD and the fire departments in the AOI prior to development approval.

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);

⁷¹ 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.

⁷² 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>



- 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 FVRD Zone B 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 in consultation with local municipal governments and based on assessment by internal trained Local FireSmart Representatives or an external Local FireSmart Representative consultant.

RECOMMENDATION #21: 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 (FireSmart vegetation management), 3) providing off-site debris disposal for private landowners who undertake their own vegetation management (with a focus on pruning, yard and thinning debris). Off-site debris disposal options include providing a dumpster, chipper or other collection method; providing curbside debris pick-up; and waiving tipping fees). 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. It should be noted that although most local



transfer stations accept green waste up to a diameter of 6", the capacity to deal with large amounts of green waste is limited. No chipping has occurred at transfer stations in the FVRD with the exception of Electoral Area B.

RECOMMENDATION #22: 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.

RECOMMENDATION #23: Develop and implement a community chipper program with the help of neighbourhood representatives or community groups. As a demonstration, this program can begin twice per year in two separate neighbourhoods. This program can also be implemented in conjunction with community clean-up days.

FireSmart Compliance within the Area of Interest

As could be expected, there is a 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 communities in the AOI. Landscaping in the AOI is also in a range of FireSmart compliance. Generally speaking, most homes in interface areas on Pitt Lake and north of the Lougheed Highway (Dewdney, Deroche, etc.) do not maintain 10 m defensible space. Hemlock Valley was also identified as a community of concern during the field visit and in consultation with BCWS staff, as the homes are highly intermixed and built from flammable wooden construction materials.

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. Storage of combustible items such as firewood and propane under decks, carports, and other horizontal surfaces was common. On the other hand, many residences are surrounded by lawn, agricultural fields, and/or hardscaping (rocks), all of which provide defensible space and are FireSmart compliant.

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; prevailing design features and favored building materials of the era; proximity to forested area (both on private land and adjacent Crown or FVRD 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.

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



- Wildfire hazard levels range from moderate to high across neighbourhoods within the AOI with the exception of rural properties surrounded by farmland south of the Lougheed Highway, and in parts of Durieu and Dewdney, where the hazard is generally low;
- 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 neighbourhoods due to poor access (i.e., single access roads) and distance from nearest water supply or fire hydrant location; and,
- All neighbourhoods have good opportunities to mitigate risk through individual and collective action.

RECOMMENDATION #24: 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 local fire departments and are not based on a scientific sample or formal data collection. Recommended FireSmart activities are essentially the same for each community; however, it is recommended that the FVRD prioritize the neighbourhoods 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: Hemlock Valley	N	N	The following is a non-extensive list of FireSmart activities for which the FVRD can engage suggested neighbourhood residents: 1) Provide guidance to ensure landscaping is to an established FireSmart standard; 2) Incentivise private landowners to engage in retrofitting homes with building materials and design based on NFPA 1144 or FireSmart standards; 3) Encourage prompt removal of combustible construction materials or yard waste from private properties; and 4) Coordinate monthly or bi-monthly yard waste removal days prior to and during the fire season to reduce WUI fire hazard.
Priority Area #2: Deroche	N	N	
Priority Area #3: Durieu	N	N	
Priority Area #4: Lake Errock	N	N	
Priority Area #5: Pitt Lake	N	N	
Priority Area #6: Hatzic	Y (partially)	N	
Priority Area #7: Dewdney	Y (partially)	N	



Area	FireSmart Y/N	FireSmart Canada Recognition Received Y/N	Recommended FireSmart Activities
Priority Area #8: 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. It is recommended that fuel treatments be considered for areas adjacent to critical infrastructure in order to bolster the effect of previous FireSmart treatments. FireSmart treatments may include thinning from below to reduce ladder fuels and crown fire potential, pruning of retained trees to 3 m, and reducing surface fuels. Additionally, consider adding regular brushing activities to the maintenance treatment schedule to control weeds and grasses around critical infrastructure.

5.3 COMMUNICATION AND EDUCATION

Establishing effective communications and actively engaging key stakeholders in risk reduction activities are keystones to building a FireSmart community. Without the support and involvement of residents, businesses, public officials, industry, the efforts of public officials, fire departments, and others to reduce wildfire losses will be hindered. In many communities, there is a general lack of understanding about interface fire, the relationship between ignition potential and loss of homes, and the simple steps that can be taken to minimize risk on private land. In addition, public perceptions regarding responsibility for risk reduction and the ability of firefighters to safely intervene to protect homes during a wildfire are often underdeveloped or inaccurate.

Based on the consultation completed during the development of this CWPP, 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 should include FVRD staff, First Nations as well as key stakeholders such as municipal staff, BCWS, BC Parks, recreational groups/representatives, industrial operators, woodlot owner, and forest tenure license holders.

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 provided:

RECOMMENDATION #25: This report and associated maps to be made publicly available through webpage, social media, and public FireSmart meetings. In addition, this CWPP should be shared with local industry partners; in particular industrial forest companies who may be interested in collaborating on direct fuel management treatments or with other sections of this CWPP.

RECOMMENDATION #26: 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 update should be initiated every 5 - 7 years.

RECOMMENDATION #27: 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 #28: Promote FireSmart approaches for wildfire risk reduction to FVRD residents through Town Hall meetings, 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 # 29: 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 #30: 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 #31: Facilitate the FSCCRP uptake within the FVRD 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 #32: 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 #33: Encourage schools to adopt and deploy existing school education programs (e.g. FireSmart BC Education Package⁷³) 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 #34: Develop and work with all key stakeholders (MFLNRORD, BCWS, BC Parks, BC Hydro, licensees, recreational groups/representatives, agricultural groups/representatives, neighborhood associations) 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.

⁷³ British Columbia FireSmart. Education Materials. <https://firesmartbc.ca/resource-types/education-materials/>



RECOMMENDATION #35: 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 fuel treatment and community communication and education, fire prevention in the AOI is also addressed via the following avenues: 1) public display of danger class rating signs throughout the AOI, which should be updated on a weekly basis; 2) fire ban alignment with provincial fire bans; 3) potential enforcement of restricted access to back country areas similar to provincial requirements; and 4) enforcement of local bylaws such as the Open Fire bylaw and Unsightly Premises 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. Railway operations also pose a risk of ignition, and represent a significant component of industrial activity within this AOI. Mechanisms of ignition may be related to the train operations themselves (exhaust emissions; overheated brake shoes or overheating while braking; and worn wheel bearings) or to track maintenance activities (rail grinding, cutting, or welding).⁷⁴ A cooperative approach for addressing the industrial area concerns must be undertaken by the FVRD and pertinent industrial partners. A cooperative approach for addressing the industrial area concerns must be undertaken by the FVRD and pertinent industrial partners.

Forest licensees and utility operators are required under the *Wildfire Act* and *Wildfire Regulation* to have adequate capacity for fire suppression when carrying out high-risk activities on both private and public land. High-risk activities include mechanical land clearing, right-of-way maintenance, and the operation of heavy equipment for forest harvesting. Many forest licensees operate within the AOI and have varying levels of training and resources for fighting wildfires. A cooperative approach for addressing the industrial area concerns must be undertaken by the FVRD and pertinent industrial partners.

RECOMMENDATION #36: Work with industrial operators such as BC Hydro, Canadian National Railway and Canadian Pacific Railway to advocate that high risk activities, such as grubbing/brushing, right-of-way mowing work, and rail grinding do not occur during high fire danger times to reduce chance of ignitions as per the *Wildfire Act* and *Regulation*.

RECOMMENDATION #37: Work with industrial operators (i.e., BC Hydro and railways) to advocate that rights-of-way 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).

⁷⁴ Wildland Fires Resulting from Railway Operations - A Public Safety Threat. Railway Fire Prevention Task Team, Canadian Interagency Forest Fire Centre. 2007. Retrieved from: <https://www.tc.gc.ca/media/documents/rfa-lsf/CIFFC.pdf>



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 REGIONAL GOVERNMENT FIREFIGHTING RESOURCES

Firefighting efforts and effectiveness can be affected by access to secondary power sources, water pressure and supply, and existing local government contingency plans. In the event of a wildfire emergency situation and loss of power, the FVRD has access to mobile diesel generators to power critical infrastructure such as the Fire Halls and the EOC, and all FVRD water systems. 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, with the exception of Hemlock Valley, there are known limitations to water supply in areas with older private water systems, or for residents located outside of fire protection areas. Specific limitations of the 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 and were updated in 2018 (more detail is provided in Section 6.1.1). In the event of a WUI fire emergency, mutual aid in the FVRD Zone B AOI is activated, as required, between the principal four fire departments. WUI fire events may also lead to aid requests with BCWS.

6.1.1 Fire Departments and Equipment

Fire protection with the AOI is primarily the responsibility of two volunteer fire departments (VFDs); Hemlock Valley and North Fraser. Fire protection in the portion of the AOI around Sumas Mountain, south of the Fraser River, is provided by Abbotsford Fire Rescue Services (FRS)/BCWS, and fire protection in the vicinity of the Harrison East FSR is provided by the Agassiz Fire Department/BCWS. In total, the various Fire Service Areas (FSAs) cover the entirety of the AOI, inclusive of all major communities. However, many FSAs cover remote areas with poor access, including Pitt Lake, Harrison Lake, Morris Valley Road east of the Chehalis River, and large tracts of forested lands in the AOI, including TFL 26 (Mission Municipal Forest). As the primary responsibility of the VFDs is to protect structures within their respective communities, they can attend to these areas if the fire represents a threat to homes or businesses, however, BCWS is generally better equipped to action fires in remote locations and will respond to fires outside of communities, including at all recreation sites. Mutual aid agreements exist

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



between fire departments within the AOI and between other neighboring fire departments, including Agassiz and Mission. Table 12 provides an overview of the fire services capacity in the AOI, including fire department personnel and equipment.

Several key concerns about fire department capacity were expressed by Wildfire Working Group members. Fire protection personnel within the AOI are primarily volunteers, which can be challenging for departments that have high call volumes. North Fraser VFD reported that there is a lack of personnel to respond to the high number of annual calls they receive (5-year average of ~400 calls), resulting in frequent reliance on mutual aid.⁷⁶ No structural firefighting equipment deficiencies were reported in the AOI, but some departments lack wildland firefighting equipment. Table 12 summarizes the personnel and equipment capacity of VFDs within the AOI. In addition to the resources stationed at Abbotsford Hall 7, Abbotsford FRS has access to additional paid on-call personnel, water tenders, engines, and a 4x4 wildland response vehicle (F550 with compressed air foam system).⁷⁷

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

Fire Service Area	Fire Department	Number of Stations	Number of Members	Apparatus type and number
Hemlock Valley Hall 1 Area C- Hemlock	Hemlock Valley Volunteer Fire Department	1	21 (volunteer)	2 engines
North Fraser Hall 1 North Fraser Hall 2 North Fraser Hall 3 Chehalis FSR Harrison FSR West Electoral Area C Electoral Area F	North Fraser Volunteer Fire Department	3	35 (volunteer)	Hall 1 (Dewdney): 1 engine, 1 tender, 1 rescue vehicle Hall 2 (Lake Errock): 1 engine Hall 3 (Durieu): 1 engine Some forestry hose
Abbotsford Hall 7-E	Abbotsford Fire Rescue Services	1	16 career; 18 paid on-call firefighters	Hall 7 (Sandy Hill): 1 engine, 1 tender; forestry hose and fittings, 2 portable Wajax Mark 3 pumps, chainsaws and hand tools, water bladder (2500 gal)
Harrison FSR East	Agassiz Fire Department	1	2 career; up to 30 paid on-call firefighters	1 utility (crew cab), 2 engines, 1 tender shuttle, 2 rescue, and wildfire equipment (water bladders, portable pumps, hand tools, forestry hose, and saws).

*FSAs that are the primary responsibility of the local VFDs (i.e., directly surrounding major communities) are indicated in **bold** text.

Within the AOI, the North Fraser VFD has formal mutual aid agreements in place with Agassiz and Mission fire departments. There is also an agreement that all FVRD fire departments can support each other if necessary. Hemlock Valley VFD has an agreement with North Fraser VFD that they will respond to large events in the Hemlock Valley Fire Service Area. These mutual aid agreements are consistently

⁷⁶ Personal communication, BCWS and North Fraser VFD, 2019.

⁷⁷ Personal communication, Don Beer (Abbotsford Fire Chief), April 2020.



used by or involve North Fraser VFD. Hemlock Valley VFD rarely uses outside support as the call volume for that fire department is very low (~5 calls from 2011-2018). Abbotsford FRS has mutual aid agreements in place with adjacent municipalities.

Neither Hemlock Valley nor North Fraser VFD completes any wildfire related training. Abbotsford FRS has internal trainers and all career and paid on-call staff receive annual wildfire interface training. It is recommended that all fire department members within the AOI have at a minimum S100 and/or SPP-WFF1 (or equivalent), and that the fire department members engage in yearly practical wildland fire training with BCWS that covers at a minimum: pump, hose, hydrant, air tanker awareness, and 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 has been generally not well established, with the exception of Abbotsford FRS. BCWS staff have indicated that there has been communications with the Mission Fire Department (outside the AOI) regarding the Mission Municipal Forest, and that they intending to establish communications with the Hemlock Valley VFD in 2020 regarding cross-training exercises. The Abbotsford FRS has worked with BCWS in the past to respond to wildfires in forested and/or unincorporated areas of the FVRD. Cross-training with the BCWS would enable all 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 8 years (2011-2018), North Fraser VFD responded to an average of 344 total calls and Hemlock VFD responded to an average of 8 total calls/year. Total calls include alarms, assistance, burning complaints, bush fires, other fires, hydro lines fires, structure fires, hazardous materials, medical aid, mutual aid, motor vehicle accidents, and rescue. North Fraser VFD responded to wildland fire calls about half as frequently as structure fire calls, with between 1 and 12 annual wildland fire calls from 2011-2018 (average of 5 per year) and between 6 and 13 structure fire calls (average of 9 per year). Hemlock Valley VFD had only one wildland fire call from 2011-2018, and has had up to 2 structure fire calls per year.

RECOMMENDATION #38: Pursue funding opportunities to acquire wildland specific equipment for fire departments in the AOI, especially Hemlock Valley and North Fraser VFDs. An off-road capable water tender, and a trailer of wildland specific firefighting equipment should be obtained by each department, including a collapsible water tank, portable pump, and hose lengths.

6.1.2 Water Availability for Wildfire Suppression

Water is the single most important suppression resource. In an emergency response scenario, it is critical that a sufficient water supply be available. The Fire Underwriters Survey summarizes their recommendations regarding water works systems fire protection requirements, in *Water Supply for Public Fire Protection* (1999).⁷⁸ Some key points from this document include the need for:

⁷⁸ <http://www.scm-rms.ca/docs/Fire%20Underwriters%20Survey%20-%201999%20Water%20Supply%20for%20Public%20Fire%20Protection.pdf>



- 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; and
- Piping that is correctly installed and in good condition.
- 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 as well as private and improvement district operated systems. The FVRD systems rely on groundwater. For suppression within the AOI, hydrant service is provided within most of the Fire Service Area boundaries. There are some areas both within and outside of these boundaries with limited or no hydrant service.

In consultation with the Wildfire Working Group, water provision in Hatzic Valley and Hemlock Valley were identified as concerns. Only a small portion of Hatzic Valley has hydrants and is serviced by the FVRD Hatzic Prairie water system. Hemlock Valley is provisioned by a private water system which has been identified as being at the limits of capacity for new development and has experienced past water pressure issues.

To supplement water availability for firefighting, the FVRD fire departments can draft from many natural water sources using truck mounted pump. Natural sources include the Fraser River, Chehalis River, Harrison River, Lake Errock, Pitt Lake, Hatzic Lake, Stave Lake, Harrison Lake, and other smaller water bodies. However, some of these sources may be at risk of experiencing reduced water levels during drought events, which typically coincide with high and extreme fire danger rating days. These natural water sources are known, mapped and have been shared with BCWS.

RECOMMENDATION #39: 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*. Fire departments should review the water supply to ensure it provides sufficient placement, flow, and reliability for suppression needs and that secondary power is available in the event of power outages.

RECOMMENDATION #40: Consider completing a fire flow/water vulnerability assessment to identify where upgrades to systems, flows, hydrant number or location, and water storage, or secondary power is required. Prioritize and rank projects and complete or require upgrades as resources allow.

6.1.3 Access and Evacuation

Road networks in a community serve several purposes including providing access for emergency vehicles, providing escape/evacuation routes for residents, and creating fuel breaks. Access and evacuation during a wildfire emergency often must happen simultaneously and road networks should have the capacity to handle both. Evacuation in the AOI would be conducted by first responders,



including the RCMP, fire departments, and Search and Rescue. Smoke and poor visibility, car accidents, wildlife, and other unforeseen circumstances can complicate evacuations and hinder safe passage.

In the event of a wildfire emergency, the Lougheed Highway (Highway 7) would be the main evacuation route for communities in the AOI, with the exception of Pitt Lake residents (boat-access). The Lougheed Highway is surrounded by cultivated farmland between Hatzic and Deroche and is at low risk from wildfire, and several alternate roads run west-east through the AOI south of the Lougheed Highway: Dyke Road, Nicomen Island Truck Road, McIntyre Road, and River Road. However, some highly intermixed neighborhoods north of Lougheed Highway are serviced by single access roads, such as Deroche Road and Brooks Road, which poses a concern for evacuation. The communities of Durieu and McConnell Creek are accessed via Sylvester Road and Farms Road that both connect to the Lougheed Highway. East of Deroche, evacuation becomes more of an issue. Highway 7 is the only arterial access/egress route for Lake Errock, Hemlock Valley, Morris Valley, and Harrison Mills. These communities, as well as recreation sites, are serviced by single access roads: Hemlock Valley Road, Morris Valley/Weaver Lake Road, Chehalis Forest Service Road (FSR), and East Harrison FSR. Roads that are unpaved, forested, or single access limit the ability of fire crews to respond to fires and safely evacuate residents and recreation users.

A significant barrier to access to forested parcels behind homes in the event of wildfire is the multitude of locked gates on both private roads that lead to Crown forest land, and on forest access roads, including those leading to Mission Municipal Forest and to Woodlot W-0001. These gates may be locked for public safety during periods of logging and/or to prevent recreational access. It is critical for the FVRD to have the most recent information on gate locations and ownership so that access can be gained by BCWS in the event of an interface fire event, although bolt cutters are standard equipment on most initial attack vehicles.

Within the AOI, some of the critical infrastructure, for example Sumas Mountain communication tower, is reached via narrow, gated, and/or private forested roads, which may impede suppression efforts and response times.

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.

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. In consultation with Hemlock Valley fire department, ATV trails were identified as the only secondary access/egress for the community in the case of a fire blocking Hemlock Valley Road. The mapping of these trails should be included in any evacuation plan developed by the FVRD and the identification and maintenance of a secondary evacuation route for Hemlock Valley should be prioritized.

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 Zone B 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 #41: Complete and participate in regular testing of, and updates to, the evacuation plan for the FVRD.

RECOMMENDATION #42: Complete and participate in regular testing of, and updates to, an evacuation plan for the community of Hemlock Valley. Consider identifying and maintaining a



secondary access/egress route in collaboration with MFLNRORD and Sasquatch Mountain Resort. Additionally, a defensible evacuation site and helipad should be identified in the community itself.

RECOMMENDATION #43: Include a qualified professional with experience in operational wildland/interface fire suppression in the planning and strategic siting of future trails and parks.

RECOMMENDATION #44: 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 AOI maintain a current level of structural protection training as required by the Office of the Fire Commissioner but as described in Section 6.1.1, most departments lack wildfire specific training. 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. Until these course developments are complete, it is recommended that all fire department members at minimum have S100 and/or SPP-WFF1 (or equivalent), 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 communicate with BCWS as required by fire season demands; however, the level of engagement with the BCWS is inconsistent between fire departments and has generally not been very strong in recent years. 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 (e.g. District of Mission) to conduct joint training so as to further strengthen regional emergency response and firefighting training.

RECOMMENDATION #45: FVRD Zone B 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 adjacent municipal fire departments 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 and is highly dependent upon the current fire season and other BCWS priorities.

RECOMMENDATION #46: Fire Departments should engage in regular communication with the BCWS Fraser Fire Zone (Cultus/Haig Fire Base) to foster strong relationships and identify potential cooperative wildfire risk reduction opportunities.

RECOMMENDATION #47: Ensure that the FVRD Zone B fire departments maintain the capability to effectively suppress wildland fires by training members in SPP-WFF1 (or S-100 and S-185 combined), at a minimum. Consider expanding the training programs to maintain high level of member education and training specific to interface and wildland fires. SPP-115 (formerly S-115) trains structural firefighters on the use of wildfire pumps and hose, and fire service hose and hydrants in the application of structural protection units (SPUs). FVRD Zone B 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

Fire departments in the AOI are well resourced in structural fire suppression equipment but are not equipped with a Structural Protection Unit (SPU). The UBCM owns four complete SPUs, each equipped to protect 30 – 35 structures with sprinklers and a water delivery system. 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*”⁷⁹.

It is recommended that homeowners take a building envelope – out approach, that is, starting with the home and working their way out. Addressing little projects first can allow for quick, easy, and cost-effective risk reduction efforts to be completed sooner, while larger, more costly projects can be completed as resources and planning allow. For example, prior to the fire season, clearing roofs and gutters of combustible materials (leaves and needles), cleaning out any combustible accumulations or stored materials from under decks, moving large potential heat sources such as firewood, spare building materials or vehicles as far from the structure as possible, maintaining a mowed and watered lawn, removing dead vegetation, and pruning trees are actionable steps that residents can start working on immediately. The following link accesses an excellent four-minute video demonstrating the importance of FireSmart building practices during a simulated ember shower: <http://www.youtube.com/watch?v=Vh4cQdH26g>.

The structure protection objectives for the 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 #48 Consider developing or expanding on 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, scheduled burning weekends, or waiving green waste tipping fees. Programs should be available during times of greatest resident activity (spring and fall).

RECOMMENDATION #49: 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.

RECOMMENDATION #50: Consider acquiring a Type 2 SPU trailer to improve wildfire response (provides protection for 25-30 residences) in Zone B. The SPU could be moved between fire departments within the AOI depending on training and demand for use.

⁷⁹ Available at <https://firesmartcanada.ca/resources/> (FireSmart Canada) and <https://www2.gov.bc.ca/gov/content/safety/wildfire-status/prevention/firesmart> (BC FireSmart)



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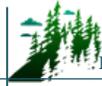
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APPENDIX A – LOCAL WILDFIRE THREAT PROCESS

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-1).
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 0). 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.⁸⁰ 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.⁸¹ 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.⁸¹ 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 types that may be considered hazardous in terms of fire behaviour and spotting potential in the AOI are C-4 and 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.⁸¹ An M-1/2 fuel type can sometimes be considered hazardous, depending on the proportion of conifers within the forest stand; conifer fuels include those in the overstory, as well as those in the understory. An O-1b fuel type often can support a rapidly spreading grass or surface fire capable of damage or destruction of property, and jeopardizing human life, although it is recognized as a highly variable fuel type dependent upon level of curing.⁸² 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.

⁸⁰ Forestry Canada Fire Danger Group. 1992. Development and Structure of the Canadian Forest Fire Behavior Prediction System: Information Report ST-X-3.

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*.

⁸² Ibid.



Table 13. Fuel Type Categories and Crown Fire Spot Potential. Only summaries of fuel types encountered within the AOI are provided (as such, other fuel types, i.e., C-1, C-2, and C-6 are not summarized below).

Fuel Type	FBP / CFDDRS Description	Study Area 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 (western red cedar, hemlock, and/or Douglas-fir), with crowns separated from the ground	Surface and crown fire, low to very high fire intensity and rate of spread	High*
C-4	Immature jack or lodgepole pine	Dense/ overstocked pole-sapling forest and young plantations (>8000 stems per hectare and 4- 12 m in height), heavy standing dead and down, dead woody fuel accumulations, continuous vertical crown fuel continuity	Almost always crown fire, high 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
C-7	Ponderosa pine and Douglas-fir	Open, uneven-aged forest, crowns separated from the ground except in conifer thickets, understory of discontinuous grasses, herbs. Areas harvested 25+ years ago (and not achieving M-1/2 or C-3 fuel type characteristics), open stand type (>40% crown closure).	Surface fire spread, torching of individual trees, rarely crowning (usually limited to slopes > 30%), moderate to high intensity and rate of spread	Low
O-1a/b	Grass	Matted and standing grass communities. Continuous standing grass with sparse or scattered shrubs and down woody debris. Vegetated, non-treed areas dominated by shrubs or herbs in dry ecosystems. Areas of very scattered trees. Hay fields. Areas harvested 7 – 24 years ago (dense or open and >4 m in height). Scotch-Broom dominated right-of-ways.	Rapidly spreading, high- intensity surface fire when cured	Low



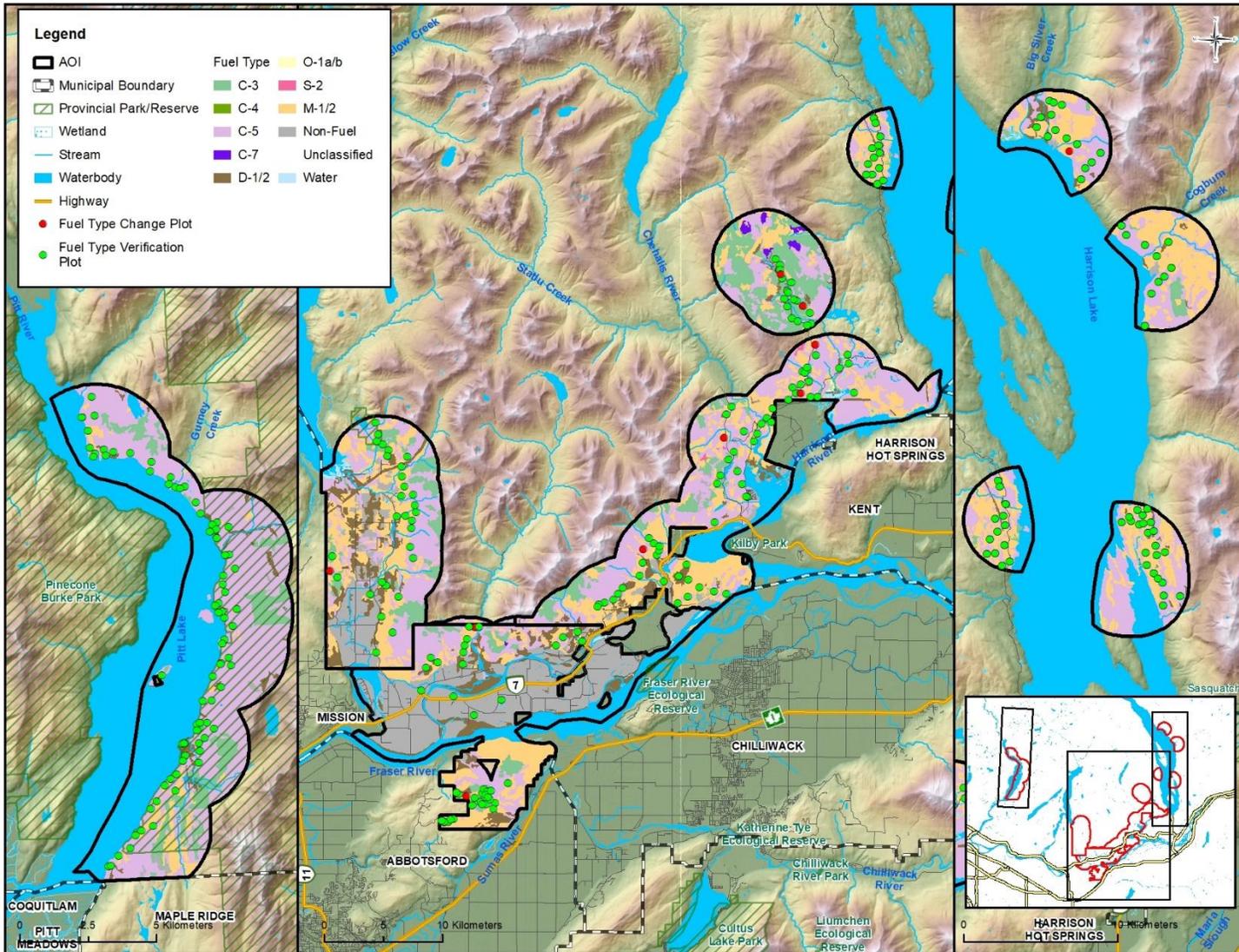
Fuel Type	FBP / CFDDRS Description	Study Area Description	Wildfire Behaviour Under High Wildfire Danger Level	Fuel Type – Crown Fire / Spotting Potential
M-1/2	Boreal mixedwood (leafless and green)	Moderately well-stocked mixed stand of conifers and deciduous species, low to moderate dead, down woody 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	Always a surface fire, low to moderate rate of spread and fire intensity	Low
S-1/2	Slash (jack / lodgepole pine, white spruce / balsam, and coastal cedar / hemlock/ Douglas-fir, respectively)	Jack or lodgepole pine slash, white pine/ balsam slash, coastal cedar/ hemlock/ Douglas-fir slash	Moderate to high rate of spread and high to very high intensity surface fire	Low
W	N/A	Water	N/A	N/A
N	N/A	Non-fuel: irrigated agricultural fields, golf courses, alpine areas void or nearly void of vegetation, urban or developed areas void or nearly void of forested vegetation.	N/A	N/A

**C-3 fuel type is considered to have a high crown fire and spotting potential within the study area 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, and/or Douglas-fir, Fd).*

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

- M-1/2 fuel types being incorrectly identified by the PSTA as C-3,
- M-1/2 fuel types identified as S-3,
- M-1/2 fuel types identified as S-1,
- M-1.2 fuel types identified as C-5
- M-1/2 fuel types identified D-1/2,
- S-2 fuel types identified as C-5,
- C-3 fuel types identified as M-1/2,
- C-3 fuel types identified as C-5, and
- D-1/2 fuel types identified as C-5.

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 0. Wind plays a predominant role in fire behaviour and direction of fire spread and is summarized in the Initial Spread Index (ISI) Roses from the local representative BCWS weather station – UBC Research. The Initial Spread Index (ISI) is a numeric rating of the expected rate of fire spread that combines the effects of wind speed and fine fuel moisture.⁸³ Hourly ISI roses depicting the frequency of ISI values by wind direction are available for each BCWS weather station. Hourly ISI roses can help plan the location of fuel treatments on the landscape to protect values at risk based on the predominant wind direction and frequency of higher ISI values. Wildfire that occurs upwind of a value poses a more significant threat to that value than one which occurs downwind.

UBC Research Weather Station

During the fire season (April – October) from 1997 to 2015, higher ISI values were most frequently associated with daytime (6 am to 6 pm) winds from the south (Figure 4). Overnight (6 pm to 6 am) the wind direction is from the north to northeast. Figure 5 shows the daily average of ISI counts over that time period, showing predominant southerly winds. The highest ISI value recorded over the time period was 35.

⁸³ Natural Resources Canada. Background Information- Canadian Forest Fire Weather Index (FWI) System.
<https://cwfis.cfs.nrcan.gc.ca/background/summary/fwi>

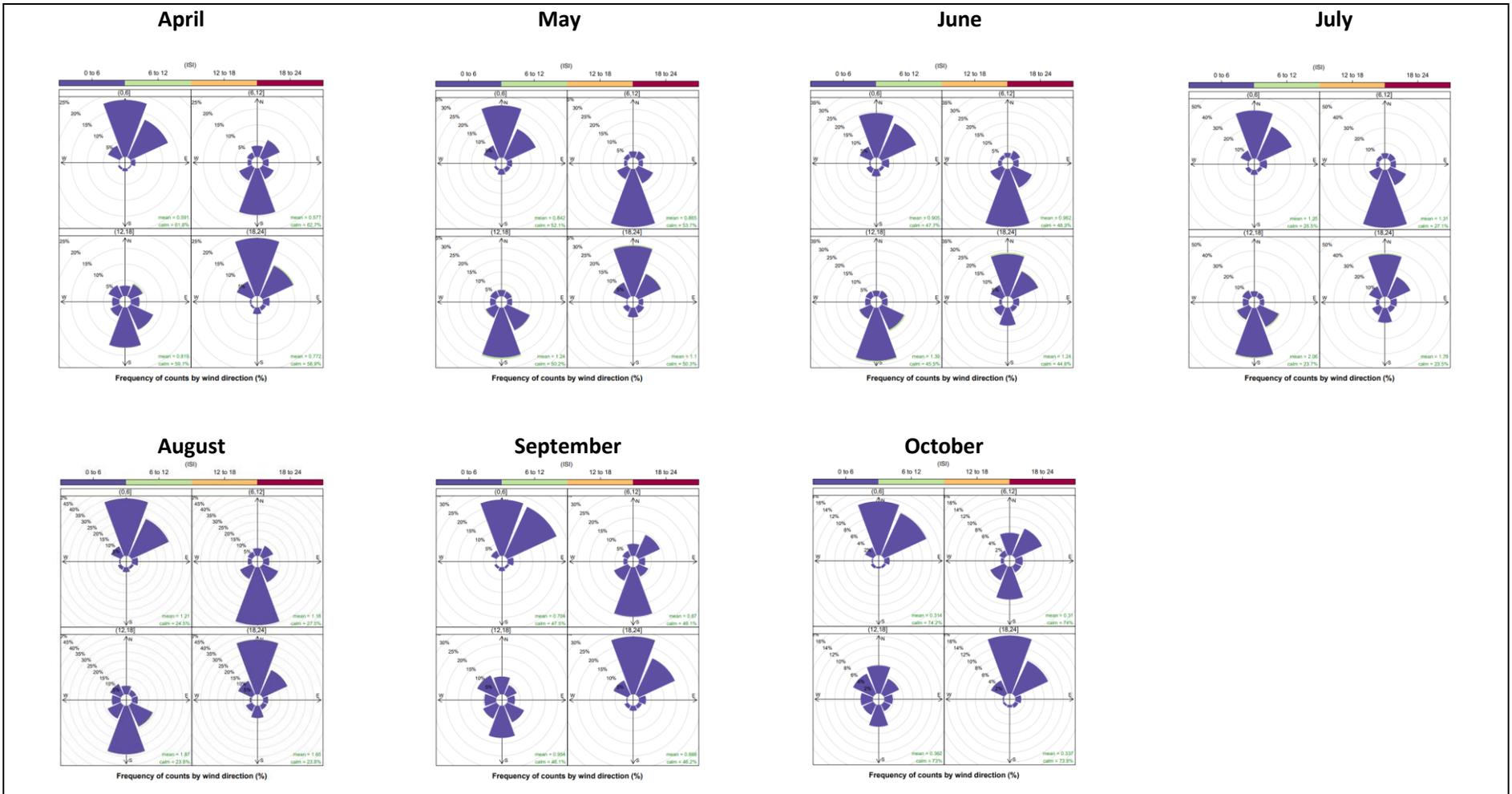
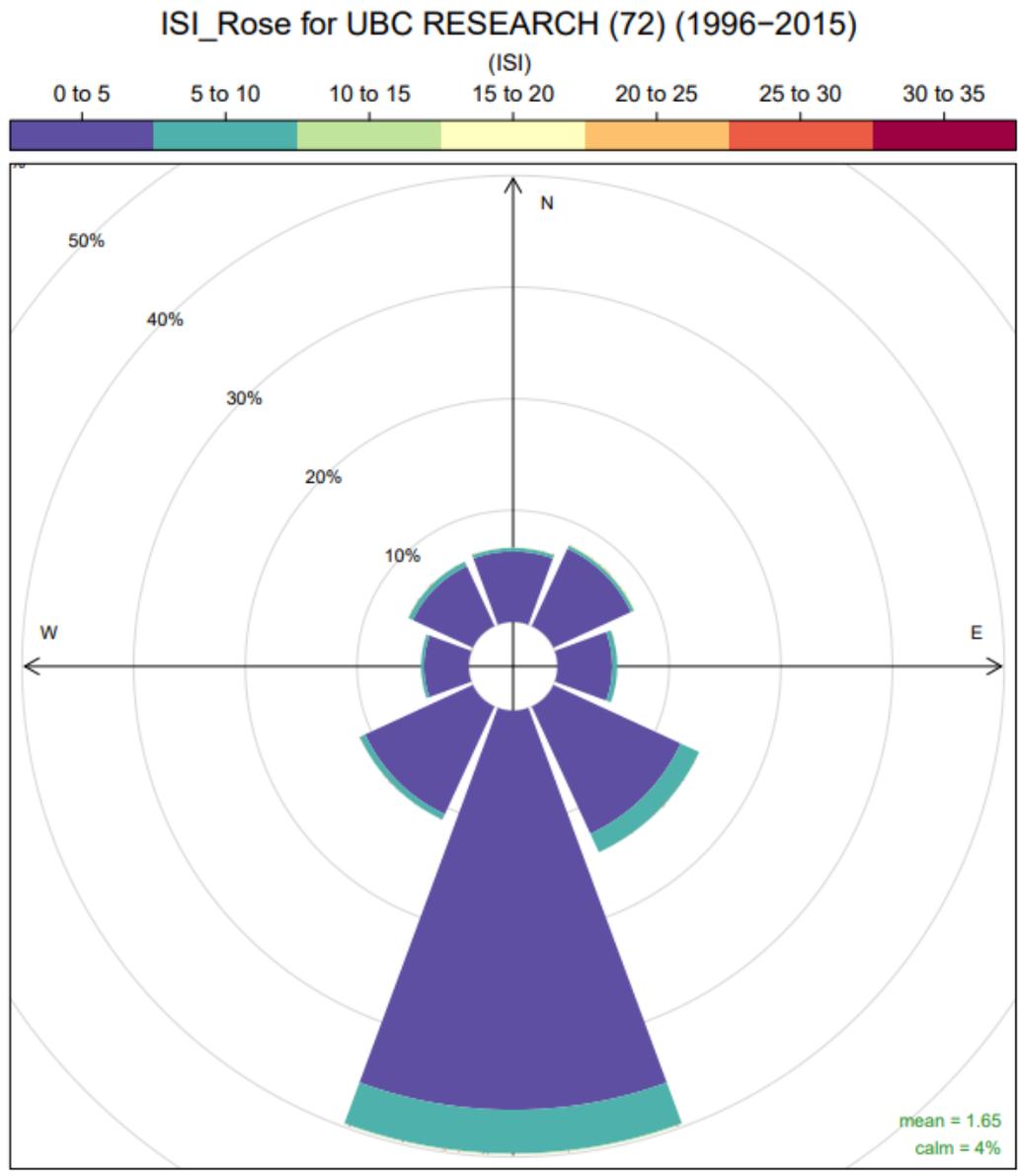


Figure 4. Hourly ISI roses depicting frequency of ISI counts by wind direction for the fire season April – October 1997 – 2015. Data taken from the UBC Research weather station.⁸⁴

⁸⁴ https://www.for.gov.bc.ca/ftp/HPR/external/!publish/Website/ISI%20Roses/Hourly_ISI_Roses/Coastal_Hourly/CoFC_UBCResearch_HourlyISIRoses_20160914.pdf



Frequency of counts by wind direction (%)

Figure 5. Daily ISI rose depicting average frequency of ISI counts by wind direction for the fire season April – October 1997 – 2015. Data taken from the UBC Research 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). The majority of the AOI (74%) is on less than 20% slope and will likely not experience accelerated rates of spread due to slope class. Approximately 21% percent of the study area is likely to experience an increased or high rate of spread. On the larger topographic scale, the communities in the Zone B 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%	74%	Very little flame and fuel interaction caused by slope, normal rate of spread.
21-30%	13%	Flame tilt begins to preheat fuel, increase rate of spread.
31-45%	8%	Flame tilt preheats fuel and begins to bathe flames into fuel, high rate of spread.
46-60%	3%	Flame tilt preheats fuel and bathes flames into fuel, very high rate of spread.
>60%	2%	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	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.

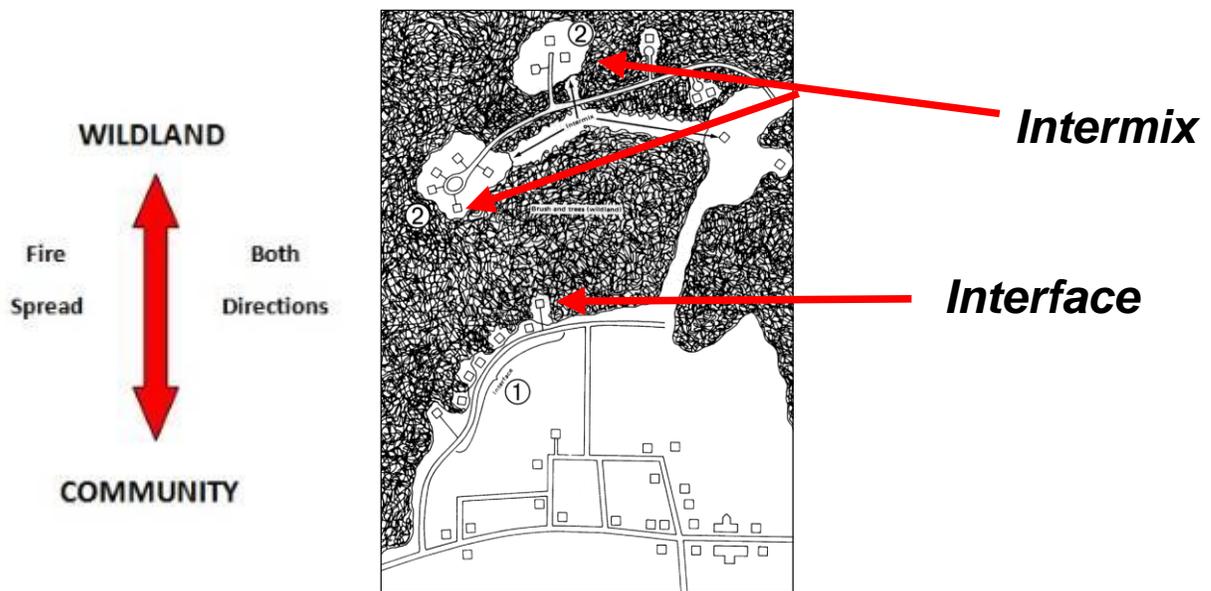


Figure 6. Illustration of intermix and interface situations.

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 allows 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+ /m². Combustible materials found within the home ignition zone combine to provide fire pathways allowing spot fires ignited by embers to spread and carry flames or smoldering fire into contact with structures.

APPENDIX F – WUI THREAT PLOT LOCATIONS

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

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

Table 17. Summary of WUI Threat Assessment Worksheets.

WUI Plot #	Geographic Location	Wildfire Behaviour Threat Class	WUI Threat Class*
BEAU-1	Beaudry Rd	High	Moderate
BEAU-2	Beaudry Rd	Moderate	N/A
CAS-1	Cascade Falls Provincial Park	Moderate	N/A
CASC-1	Harrison Lake	High	Moderate
CASC-2	Harrison Lake	Moderate	N/A
CHEL-1	Chehalis FSR	Moderate	N/A
CHEL-2	Chehalis FSR	High	Moderate
CHEL-3	Chehalis FSR	Moderate	N/A
EAST-1	Harrison Lake	Moderate	N/A
EAST-2	Harrison Lake	Moderate	N/A
EAST-3	Harrison Lake	Moderate	N/A
EAST-4	Harrison Lake	Moderate	N/A
HEM-1	Hemlock Valley Rd	High	Extreme
HEM-2	Hemlock Valley Rd	High	Extreme
HEM-3	Hemlock Valley Rd	High	Extreme
HEM-4	Hemlock Valley Rd	High	Extreme

WUI Plot #	Geographic Location	Wildfire Behaviour Threat Class	WUI Threat Class*
HEM-5	Hemlock Valley Rd	High	Extreme
HEM-6	Hemlock Valley Rd	High	Moderate
HEM-7	Hemlock Valley Rd	High	High
HEM-8	Hemlock Valley Rd	Moderate	N/A
LOST-1	Lost Lake FSR	Moderate	N/A
LOST-2	Lost Lake FSR	High	Moderate
MCF-1	Mission Municipal Forest	High	Low
MCF-2	Mission Municipal Forest	Moderate	N/A
NORR-1	Norrish FSR	Moderate	N/A
NORR-2	Norrish FSR	Moderate	N/A
PITT-1	Pitt Lake	Moderate	N/A
PITT-2	Pitt Lake	Moderate	N/A
PITT-3	Pitt Lake	Moderate	N/A
SUMA-1	Sumas Mountain Rd	High	Moderate
SUMA-2	Sumas Mountain Rd	High	Moderate
SUMA-3	Sumas Mountain Rd	High	Moderate
SYL-1	Sylvester Rd	Moderate	N/A
SYL-2	Sylvester Rd	Moderate	N/A
WEST-1	Harrison Lake	High	Moderate
WEST-2	Harrison Lake	Moderate	N/A
WEST-3	Harrison Lake	Moderate	N/A
WEST-4	Harrison Lake	Moderate	N/A

*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, 2018.⁸⁵

⁸⁵ Perrakis, D.B., Eade G., and Hicks, D. 2018. Natural Resources Canada. Canadian Forest Service. *British Columbia Wildfire Fuel Typing and Fuel Type Layer Description 2018 Version*

APPENDIX H – WUI THREAT ASSESSMENT METHODOLOGY

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

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

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

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

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

Field Data Collection

The primary goals of field data collection are to confirm or correct the provincial fuel type, complete WUI Threat Assessment Plots, and assess other features of interest to the development of the CWPP update. This is accomplished by traversing as much of the study area 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 study area 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 38 WUI threat plots on a variety of fuel types, aspects, and slopes and an additional 350+ 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 200m are rated as 'extreme', within 500m are rated as 'high', within 2km are 'moderate', and distances over that are rated 'low'.

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

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

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

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

Limitations

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

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