District of Kent Community Wildfire Protection Plan 2017

Submitted by:

B.A. Blackwell & Associates Ltd.
270 – 18 Gostick Place
North Vancouver, BC, V7M 3G3
Ph: 604-986-8346
Email: bablackwell@bablackwell.com

Submitted to:

Gerald Basten, CFO, Deputy Fire Chief,
Emergency Program Coordinator
District of Kent
7170 Cheam Avenue, Box 70
Agassiz, BC, V0M 1A0
Ph: 604-796-2614
Email: gbasten@kentbc.ca

B.A. Blackwell & Associates Ltd.

DISTRICT OF KENT AGASSIZ

ACKNOWLEDGEMENTS

The authors would like to thank the following District of Kent staff: Gerald Basten (Emergency Program Coordinator and Deputy Fire Chief, Agassiz Fire Department); Wayne Dyer (Fire Chief - Agassiz Fire Department); Derek Dubiellak (Deputy Emergency Program Coordinator); Chris Hardy (Public Works Foreman); Jennifer Thornton (Director Community Services); Darcey Kohuch (Director Development Services); Patrick Stephens (Engineering Technologist); and Max Christenson (GIS/IT Supervisor). These individuals invested substantial time in meetings, answering questions, reviewing and commenting on the contents of this document.

In addition, the authors would like to thank staff from the BC Wildfire Service, including: Tony Botica (Wildfire Prevention Officer, Coastal Fire Centre); Orin Caddy (Forest Protection Technician, Fraser - Cultus/Haig Fire Zone); as well as Reg Dyck (Manager of Electoral Area Emergency Services, Fraser Valley Regional District); Stacey Barker (Deputy Director of Regional Programs, Fraser Valley Regional District); and Sam Stickney (Area Supervisor – North Fraser, BC Parks, Ministry of Environment and Climate Change Strategy).

This report would not be possible without the Strategic Wildfire Prevention Initiative (SWPI) Program and funding from the Union of British Columbia Municipalities (UBCM).

*Cover photo: Stefana Dranga, view from Mount Woodside.

REGISTERED PROFESSIONAL SIGN AND SEAL

Bruce A. Blackwell, RPF 2073, RPBio
Date: March 1, 2019

EXECUTIVE SUMMARY/ SUMMARY OF CWPP RECOMMENDATIONS

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

This CWPP will provide the District of Kent (the District) with a framework that can be used to review and assess areas of identified high fire risk within the District. 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 tabular 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 onto private land and therefore outside the District jurisdiction, the District's role may be limited to the role of an influencer in some instances, while other recommendations can be directly implemented by the District. The recommendations are displayed in totality in Table 1. Ultimately, the recommendations within this plan 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 District 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/First Nations Policies and Recommendations)				
Item	**Page No.**	**Priority**	**Recommendation / Next Steps**	**Estimated Cost ($) or Person hours**
Objective: Review and amend the current District of Kent regulatory framework to incorporate wildfire mitigation and preparedness considerations.				
1	10	Moderate	Consider reviewing and amending the Official Community Plan (OCP) to include a growth management policy which considers wildfire risk along with other natural hazards during strategy development.	~30-60 in-house hours (local government funding). May be eligible for UBCM CRI Program Funding[1]
2	10	Moderate	Review the OCP and recognize natural hazards, in addition to geotechnical hazards and flooding, that have the potential to impact values within the District of Kent. Natural hazards include, but are not limited to, wildfire and interface fire which has the potential to impact public health and safety, economics (i.e. through evacuations, loss of tourism, interruption of services), ecosystems, habitat, and water quality among other values.	~25-30 in-house hours (local government funding or UBCM CRI Program Funding)
3	11	Low	Review OCP Section 4.3 and ensure that wildfire hazard (in addition to explicitly mentioned geotechnical and flooding hazards, safe access, and water services) is considered in any feasibility study to extend or create the Residential – Lake Area land use designation.	~25-30 in-house hours (local government funding or UBCM CRI Program Funding)
4	13	High	Consider reviewing Section 9.0 of the OCP and incorporating a Wildfire Development Permit Area where wildfire interface guidelines based on FireSmart principles apply. See Section 5.2.2 *Planning and Development* for further details regarding a new development permit.	~25-50 in-house hours (local government funding or UBCM CRI Program Funding)

[1] 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 2: Local Area Description (2.5.3: Local Government/First Nations Policies and Recommendations)				
Item	**Page No.**	**Priority**	**Recommendation / Next Steps**	**Estimated Cost ($) or Person hours**
5	14	High	Review District Fire Prevention Bylaw No. 1448, 2009 and include wording that expands the types of combustible materials that are prohibited to accumulate on private property to include accumulations on and under exterior projections, such as decks and patios, near the home, and in gutters and roofs. The revised bylaw should provide the District the authority to require removal/clean-up of combustible materials or to complete removal and recoup costs from the owner.	~25-30 in-house hours (local government funding or UBCM CRI Program funding)
6	14	Low	Consider working with the Fire and Building 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 District-wide engagement campaign and providing incentives such as the opportunity to acquire/purchase discounted address signs.	~10-20 District staff hours required for internal work with the Fire and Building Department. Additional 25-30 hours for material development and distribution for incentive/engagement campaign)
7	16	Moderate	Review Subdivision Development Bylaw 1248 and consider amending to ensure aspects of subdivision design specific to access/egress comply with National Fire Protection Association (NFPA) 1141 *Standard for Fire Protection Infrastructure for Land Development in Wildland, Rural, and Suburban Areas*[2] (i.e., number of access points, width of streets and cul-de-sacs, etc.)	~30-50 in-house (local government funding or UBCM CRI Program Funding).
8	16	Moderate	Require a minimum of two points of access for new subdivisions.	~10-20 in-house District staff hours
9	16	Moderate	Continue having subdivision development applications reviewed by fire officials to ensure hydrant placement and access is acceptable for emergency response and suppression.	Within current local government budget

[2] National Fire Protection Association (NFPA).2017. Standard for Fire Protection Infrastructure for Land Development in Wildland, Rural, and Suburban Areas. Retrieved online at: https://www.nfpa.org/codes-and-standards/all-codes-and-standards/list-of-codes-and-standards/detail?code=1141

10	17	High	Review the OCP and associated supporting documents (i.e., Parks and Trail Priorities – 25 Year Plan and the Park Acquisition, Improvement and Trail Development Program) and consider parks acquisition and maintenance through a wildfire risk lens, including consideration for long-term maintenance costs and access.	~30-50 in-house hours (local government funding or CRI Program funding)
11	17	Moderate	Review the Park Acquisition, Improvement and Trail Development Program and ensure that guidance and direction in the Program considers and is not in conflict with wildfire risk reduction strategies. Ensure that any future parks and trails plans or masterplan include consideration for the placement, type, width, and objective of trails.	~15-20 in-house hours (local government funding or UBCM CRI Program funding)
Document Section 3: Values at Risk				
Item	**Page No.**	**Priority**	**Recommendation / Next Steps**	**Estimated Cost ($) or Person hours**
Objective: Protect critical infrastructure and mitigate post wildfire impacts				
12	22	High	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. Secondary power sources are important to reduce critical infrastructure vulnerability in the event of an emergency which cuts power for days, or even weeks.	~20-30 in-house District staff hours
13	22	High	It is recommended that formal FireSmart assessments (by a Qualified Professional, QP) be completed for critical infrastructure such as the fire hall, emergency operations centre, water infrastructure, and others as identified in this CWPP (Table 3) and by the District.	~$1,500-2,000 per location (consultant cost)

14	26	Low	The District should consider the option of conducting future assessments to explore the potential hydrologic and geomorphic impacts of wildfire on the watersheds and community. Alternatively, there may be an option to complete a stand-alone assessment to help identify and quantify the post-fire hazards and levels of risk to the community. Exploration of potential funding opportunities through the province and the National Disaster Mitigation Program may be worthwhile.[3]	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				
15	63	Moderate	The District should work with the Ministry of Transportation and Infrastructure (MOTI), to assess the area suitable for treatment (i.e., high hazard and non-private) along Highway 7 and Rockwell Drive and reduce hazardous fuels within 150 m of either side of the road, where possible. This is to increase public safety/improve emergency access in the event of an evacuation or wildfire event.	Appropriate funding stream to be identified. 20-30 in-house hours, however dependent upon District's role within the project
Objective: Reduce Wildfire Threat through Fuel Management				
16	65	High	Proceed with detailed assessment, prescription development and treatment of hazardous fuel units and FireSmart fuel treatment demonstration treatment areas identified and prioritized in this CWPP.	UBCM CRI Funding. Prescription development and operational implementation costs on coastal sites depend on specifics of site (i.e., access, operability, and overlap with values at risk) and will vary according to consultant bids. As such, the costs of prescription development and treatment implementation are highly variable (~$300-$500/hectare cost to develop and $15,000-$25,000/ha to implement, respectively).

[3] Public Safety Canada, National Disaster Mitigation Program. Retrieved online at: https://www.publicsafety.gc.ca/cnt/mrgnc-mngmnt/dsstr-prvntn-mtgtn/ndmp/index-en.aspx

Document Section 5: Risk Management and Mitigation Factors Recommendations				
Item	**Page No.**	**Priority**	**Recommendation / Next Steps**	**Estimated Cost ($) or Person hours**
17	73	Moderate	If and when operational fuel treatments are conducted within the District of Kent Area of Interest (AOI), 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 with a CWPP update or as a stand-alone exercise.	UBCM CRI Funding. Costs are dependent on specifics of site and will vary according to consultant bid.
Objective: Reduce Wildfire Hazard on Private Land				
18	78	High	The District should apply for a FireSmart demonstration grant through the CRI program. This type of fuel treatment can display the practices and principles of FireSmart activities to the public in the form of demonstration treatments.	20-25 in-house hours to complete application / UBCM CRI Funding to implement FireSmart demonstration treatment. Prescription development and implementation costs are similar to those provided above in Recommendation #16
19	78	High	Continue to offer yard waste disposal opportunities and consider expanding opportunities for inexpensive and convenient disposal of pruning, yard and thinning debris to support fuel treatment on private land. Consider developing and implementing a community chipper program with the help of neighbourhood representatives. 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.
20	79	High	Review the Official Community Plan (OCP); consider including wildfire as a natural hazard development permit area. A recommended development permit area for the District would include all areas within the District that are located within 200 m of moderate, high or extreme wildfire behaviour threat class areas. For further information see Section 5.2.2	40-80 in-house hours and $15,000 for consultant analysis and support (local government funding/ UBCM CRI funding)
21	80	Moderate	Ensure that Development Permit (DP) applications are provided to the fire department for opportunity for input prior to approval. As more wildfire DP applications are received, the importance of communication and integration between the fire department and the Development Services department will increase.	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**
22	80	Moderate	Develop a landscaping standard which lists flammable non-compliant vegetation and landscaping materials, non-flammable drought and pest resistant alternatives, and tips on landscape design to reduce maintenance, watering requirements, avoid wildlife attractants, and reduce wildfire hazard. Consider including the landscaping standard as a requirement of the Development Permit within the applicable area, as well as making it publicly available for residents and homeowners outside of the DP area (can be provided at issue of building permit and made available at the District Office or other strategic locations).	$2,000 - $3,000 to outsource. Alternatively, general FireSmart landscaping information is available free of charge, but is not climate/ plant hardiness zone specific
23	80	Moderate	Consider engaging the development/ building community (may include developers, builders, landscapers, and architects) in DP development process. This can be accomplished through a series of workshops/ informational sessions to: 1) increase awareness of wildfire risk, 2) demonstrate that there are a variety of actions which can be undertaken to immediately and measurably reduce the risk to the homeowner and community, 3) discuss various strategies and actions which could be implemented to meet DP objectives, 4) educate and inform regarding the DP process and expectations.	~40-60 in-house hours
24	80	Moderate	Consider incorporating Qualified Professional (QP) reports and sign-off as part of the Wildfire Interface Guidelines associated with a Wildfire Development Permit Area.	~10 in-house District staff hours
25	82	High	The District should hire a QP or consider training local fire department staff members as Local FireSmart Representatives to assist the various communities in complying with FireSmart principles at the neighbourhood and individual home-level.	~25 in-house hours (Consultant and/or Fire Department, Emergency Services staff)

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				
26	84	High	This report and associated maps should 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 in-house hours depending on method of distribution
27	85	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 District's wildfire threat assessment or the rate at which wildfire risk reduction efforts are implemented. An evaluation of major changes (including funding program changes that may lead to new opportunities) and the potential need for a CWPP update should be initiated every 5 - 7 years.	UBCM CRI funding (two eligibility tiers: $25,000 or $100,000; eligibility is based on local wildfire risk rating) / local government funding to supplement
28	85	Moderate	Develop a social media strategy and ensure that its full power is leveraged to communicate fire bans, high 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. [4]	~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
29	85	High	Consider promoting FireSmart approaches for wildfire risk reduction to District residents through Town Hall meetings, workshops and/or presentations. Aim to conduct the engagement/promotion campaign prior and during the fire season. Continue supplying FireSmart materials to homeowners in the interface during these engagement campaigns.	~20 hours. UBCM CRI funding
30	85	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.	~10 hours. FireSmart grant (when funding is available)

[4] Appendix K has general communication and social media information.

Document Section 5: Risk Management and Mitigation Factors Recommendations				
Item	**Page No.**	**Priority**	**Recommendation / Next Steps**	**Estimated Cost ($) or Person hours**
31	85	Moderate	Facilitate the FSCCRP uptake within the District and enhance its applications by including the following: 1) inviting British Columbia Wildfire Service (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 grant(s) available
32	85	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.	~3 hours / assessment
33	85	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).	~30-40 in-house hours
34	86	High	Develop and work with all key stakeholders (Industrial operators, MFLNRORD, BCWS, BC Parks, recreational groups/representatives, District staff, the Village of Harrison Hot Springs and FVRD) 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.	~ 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	86	Moderate	Work towards educating homeowners within unprotected areas (i.e., outside of the road accessible fire service area). This is particularly applicable to boat access only residents. It is common, especially in the case of second homeowners/ vacation owners, for them to be unaware of the lack of fire services in their area (in the event they call 911).	~10-20 in house hours

Document Section 5: Risk Management and Mitigation Factors Recommendations				
Item	**Page No.**	**Priority**	**Recommendation / Next Steps**	**Estimated Cost ($) or Person hours**
Objective: Reduce Wildfire Risk from Industrial Sources				
36	86	Low	Work with industrial operators such as BC Hydro and Fortis BC to ensure that high risk activities, such as grubbing/brushing and right-of-way mowing work are restricted (do not occur) during high fire danger times to reduce chance of ignitions.	~10 in-house hours
37	86	Low	Work with industrial operators (i.e., BC Hydro) to ensure that rights-of-way do not contain fine fuel accumulations (easily cured) prior to and during the fire season and are maintained in a low hazard state (to serve as fuel breaks).	~10 in-house hours
Objective: Improve Water Availability for Emergency Response				
38	90	Moderate	All new rural development outside existing District 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*[5]. The fire department 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.	~10-15 in-house hours
Objective: Improve Access/Egress to Enhance Emergency Preparedness				
39	92	High	In cooperation with the Village of Harrison, continue to work with relevant Provincial Ministries and stakeholders including BC Parks, Emergency Management BC, Ministry of Transportation and Infrastructure, MFLNRORD, Seabird Island Indian (holders of a woodlot license adjacent to Sasquatch Provincial Park), BC Hydro Fraser Valley Regional District, Enbridge (operating a line station at Ruby Creek) and Canadian Pacific Railway, to complete a second-means egress route (i.e., through Sasquatch Park or via Harrison East Forest Service Road). This will provide an alternate evacuation route for residents along Rockwell Drive as well as visitors to the park and surrounding area.	~40-50 in-house hours, dependent on task sharing with the Village of Harrison Hot Springs

[5] National Fire Protection Association (NFPA).2017. Standard on Water Supplies for Suburban and Rural Fire Fighting. Retrieved online on October 1,2018 at: https://www.nfpa.org/codes-and-standards/all-codes-and-standards/list-of-codes-and-standards/detail?code=1142

Document Section 5: Risk Management and Mitigation Factors Recommendations				
Item	**Page No.**	**Priority**	**Recommendation / Next Steps**	**Estimated Cost ($) or Person hours**
40	92	Moderate	Complete and participate in regular testing of, and updates to, the evacuation plan.	~30-40 hours to plan and stage; 8 hours to complete testing
41	92	Low	Consider developing a community wildfire pre-planning brochure that addresses the following: 1) locations of staging areas; 2) identifies water reservoirs, communications requirements (i.e., radio frequencies), minimum resource requirements for structure protection in the event of an interface fire, and values at risk; and 3) maps of the area of interest.	~10,000- $15,000 to complete (contractor estimate)
Objective: Include Wildfire Considerations when Trail Planning				
42	92	Moderate	Develop a Total Access Plan for the District to map and inventory trail and road network in natural areas for suppression planning, identify 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, BCWS and BC Parks 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)
43	92	Moderate	Include a qualified professional with experience in operational wildland / interface fire suppression in the planning and strategic siting of future trails and parks.	~5-10 hours to review current trails / map, provide recommendations

Document Section 6: Wildfire Response Resources Recommendations				
Item	**Page No.**	**Priority**	**Recommendation / Next Steps**	**Estimated Cost ($) or Person hours**
Objective: Enhance Wildfire Equipment and Training				
44	93	High	The Agassiz Fire Department (AFD) should work with BCWS to initiate and/or maintain an annual structural and interface training program. As part of the training, it is recommended to conduct annual reviews to ensure personal protective equipment (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 AFD engage in yearly practical wildland fire training with BCWS that covers at a minimum: pump, hose, hydrant, air tanker awareness, and employment of SPUs. Interface training should include completion of a joint wildfire simulation exercise and safety training specific to wildland fire and risks inherent with natural areas. It is recognized that BCWS crew resources are limited and their availability and is highly dependent upon the current fire season and other BCWS priorities.	Cost and time dependent upon training exercise (scope, number of participating members etc.). ~16-20 hours to initiate and/or maintain an interface training program. ~ 8 hours to conduct annual reviews of PPE and wildland equipment resources. ~16 hours/ FD member to complete a yearly joint wildfire simulation exercise and safety training course.
45	93	Moderate	The AFD should engage in regular cadence of communication with the BCWS Fraser Fire Zone, Cultus/Haig Fire Base to foster a strong relationship and identify potential cooperative wildfire risk reduction opportunities.	~4 hours/ year
46	93	High	Ensure that the AFD maintains the capability to effectively suppress wildland fires, through wildfire-specific training sessions. Ensure all AFD continue to have SPP-WFF 1, at a minimum. Consider expanding the training program to maintain a high level of member education and training specific to interface and wildland fires. The Office of the Fire Commissioner (OFC) also offers SPP 115 (formerly S-115) to train structural firefighters on the use of wildfire pumps and hose, and fire service hose and hydrants in the application of structural protection units (SPUs). The OFC is currently developing additional wildfire-specific Officer-level training courses (i.e., Engine Operations in the Wildland Urban Interface); the fire department 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 training budget plus additional 8-hour training session/firefighter for SPP-115

Document Section 6: Wildfire Response Resources Recommendations				
Item	**Page No.**	**Priority**	**Recommendation / Next Steps**	**Estimated Cost ($) or Person hours**
Objective: Encourage FireSmart Initiatives				
47	95	Low	Consider working with local distributors and homeowners within the District. The objective is to improve education of homeowners and remove some barriers to FireSmart action. Local distributors can include: hardware stores, garden centers, and aggregate providers. See Section 6.2 for additional details.	~60 hours
48	95	High	Consider expanding on existing 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. The current biannual "Clean-up Sessions" and Agassiz Green Bin Programs may be expanded to include scheduled community chipping opportunities, yard waste dumpsters available by month in neighbourhoods, or scheduled burning weekends. Programs should be available during times of greatest resident activity (likely spring and fall).	Time dependent upon program and number of neighbourhoods. May be eligible for UBCM CRI Program Funding. Additional time for advertisement of program availability will be required. ~$400 per neighbourhood to implement a community chipping day.
Objective: Enhance Protection of Municipal Infrastructure from Wildfire				
49	95	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.	~ 25-35 hours to complete vulnerability assessment and upgrading dependent on project(s) chosen
50	95	Low	Consider acquiring a Type 2 Structural Protection Unit (SPU) trailer to improve wildfire response (provides protection for 25-30 residences).	$100,000-$150,000 depending on configuration.

TABLE OF CONTENTS

List of Tables

List of Maps

List of Figures

COMMONLY USED ACRONYMS

AFD	Agassiz Fire Department
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
DP	Development Permit
FBP	Fire Behaviour Prediction System
FESBC	Forest Enhancement Society of British Columbia
FMP	Fire Management Plan
FRS	Fire Rescue Services
FSCCRP	FireSmart Canada Community Recognition Program
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
OFC	Office of the Fire Commissioner
PSTA	Provincial Strategic Threat Analysis
PTU	Proposed Treatment Unit
QP	Qualified Professional
SPU	Structural Protection Unit
SWPI	Strategic Wildfire Prevention Initiative
TSA	Timber Supply Area
UBCM	Union of British Columbian Municipalities
WUI	Wildland Urban Interface

SECTION 1: INTRODUCTION

In 2017, B.A. Blackwell and Associates Ltd. was retained to assist the District of Kent (the District) in developing a Community Wildfire Protection Plan (CWPP); hereinafter referred to as the CWPP. This CWPP document will focus on integrating the updated Provincial Strategic Threat Analysis (PSTA), updated BC Wildfire Service (BCWS) Fuel Type mapping, and the updated and improved wildfire threat analysis methodology. Furthermore, District staff have recognized that wildfire mitigation and planning is an important component of emergency planning and preparedness for the community.

Although forest fires are both inevitable and essential to the health of forested ecosystems, the 2003, 2004, 2009, 2010, 2015 and 2017 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. While final suppression costs for the 2018 season are yet to be calculated, the 2017 fire season costs were estimated at over $568 million. 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) demonstrate 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 mitigation in the wildland urban interface[6] (WUI).

1.1 PURPOSE

The purpose of this CWPP is to identify the wildfire risks within and surrounding the District of Kent, to describe the potential consequences if a wildfire were 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 District 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, is to identify measures necessary 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 occur, and 3) reduce the negative economic and social impacts of wildfire to the community.

[6] 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 D for a more detailed discussion.

1.2 CWPP PLANNING PROCESS

This CWPP is a review and synthesis of relevant background information and current data related to the Area of Interest (AOI) which represents the municipal boundary of the District of Kent. The CWPP consists of four general phases:

1) **Consultation involving key local government representatives, structural and wildfire specialists, First Nations, and stakeholders**. Information sharing with First Nations at various stages of the Plan development and ensuring linkages with relevant existing land use plans, legislation, and policy currently in place.
2) **Identification of the values at risk and assessment of the local wildfire threat**. Wildfire threat assessment takes into consideration Natural Fire Regime and Ecology, Provincial Strategic Threat Analysis (2017), and field work, fuel type verification, completion of WUI Threat Forms and GIS wildfire threat analyses.
3) **Developing a risk mitigation strategy**. A guide for the District 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 threat locally.
4) **Building a community engagement and education strategy**. This phase includes presentation of the CWPP to the Board or Council, the development of a Wildfire Working Group as well as comprehensive consultation with First Nations, government and non-governmental agencies. This CWPP provides recommendations for ongoing community education and engagement to support successful implementation of the CWPP.

1.2.1 Consultation

Broad engagement with local government, Provincial government landowner representatives, stakeholders and First Nations played a key role 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 District staff, which included: Emergency Program Coordinator, Deputy Emergency Program Coordinator, Public Works Foreman, Director of Community Services Director Development Services, Engineering Technologist, and GIS/IT Supervisor. Non-District staff included in the Working Group were: Fire Chief for the Agassiz Fire Department (AFD). During 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 District vulnerabilities, and to determine priorities and potential mitigation strategies. Members of the Working Group were consulted on an ongoing basis throughout plan development and were integral in providing Plan review and approval. The Wildfire Working Group was integral in the review of the draft of this CWPP and provided ongoing support throughout the CWPP process.

BCWS representatives from the Coastal Fire Centre, Fraser Fire Zone, Cultus/Haig Base (Wildfire Prevention Officer and Forest Protection Technician) were consulted as follows: 1) at the onset of the project planning phase and 2) throughout the CWPP development process, both via the submission of fuel type change rationales and questionnaire regarding concerns and priorities of BCWS with respect to wildfire and emergency planning in the District; and 3) to provide revisions to the draft document upon plan completion.

Information sharing took place with the Seabird Island Band, the Sts'ailes First Nation, Siska Indian Band, Cook's Ferry Indian Band, Coldwater Indian Band, Nlaka'pamux Nation Tribal Council (Oregon Jack Creek Indian Band, Lytton First Nation, Boothroyd Indian Band, Spuzzum First Nation, Skuppah Indian Band), and Lower Nicola Indian Band, as identified through the Consultative Areas Database and in consultation with Ministry of Forests, Lands, Natural Resources, and Rural Development (MFLNRORD) and the District of Kent, regarding the CWPP and locations of existing or potential cultural values at risk requiring protection consideration. Information sharing consisted of an initial phone call, and subsequent distribution of a referral letter and information package (maps, explanation of CWPP, 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 South Island Natural Resource District's Stewardship Forester; and the MFLNRORD Sunshine - South Island Recreation Officer; and BC Parks Area Supervisor for the North Fraser. 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. The wildfire threat in the District of Kent 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).

The relationship between wildfire hazard, threat and risk can be demonstrated in the following example. If a fire (defined as the hazard) ignites and spreads towards a community, the wildfire can become a threat to life and property, with an associated risk of loss, where:

$$\boldsymbol{Wildfire\ risk\ =\ Probability\ x\ Consequence}$$

And:

- Wildfire risk is defined as the potential losses incurred to human life, property and critical infrastructure within a community in the event of a wildfire;

- Probability is the likelihood of fire occurring in an area and is related to the susceptibility of an area to fire (fuel type, climate, probability of ignition etc.); and
- Consequences refer to the repercussions associated with fire occurrence in a given area (higher consequences are associated with densely populated areas, or areas of high biodiversity etc.).

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;
- Emergency response and preparedness;
- Evacuation and access; and
- Planning and development.

1.2.4 Building Community Engagement and Education Strategy

Engaging the community from local government staff and officials, to key stakeholders and residents in wildfire protection planning activities is key to ensuring successful implementation. A community engagement and education strategy is described in Section 5.3.

A presentation to the District Council will ensure high level approval and support for this CWPP.

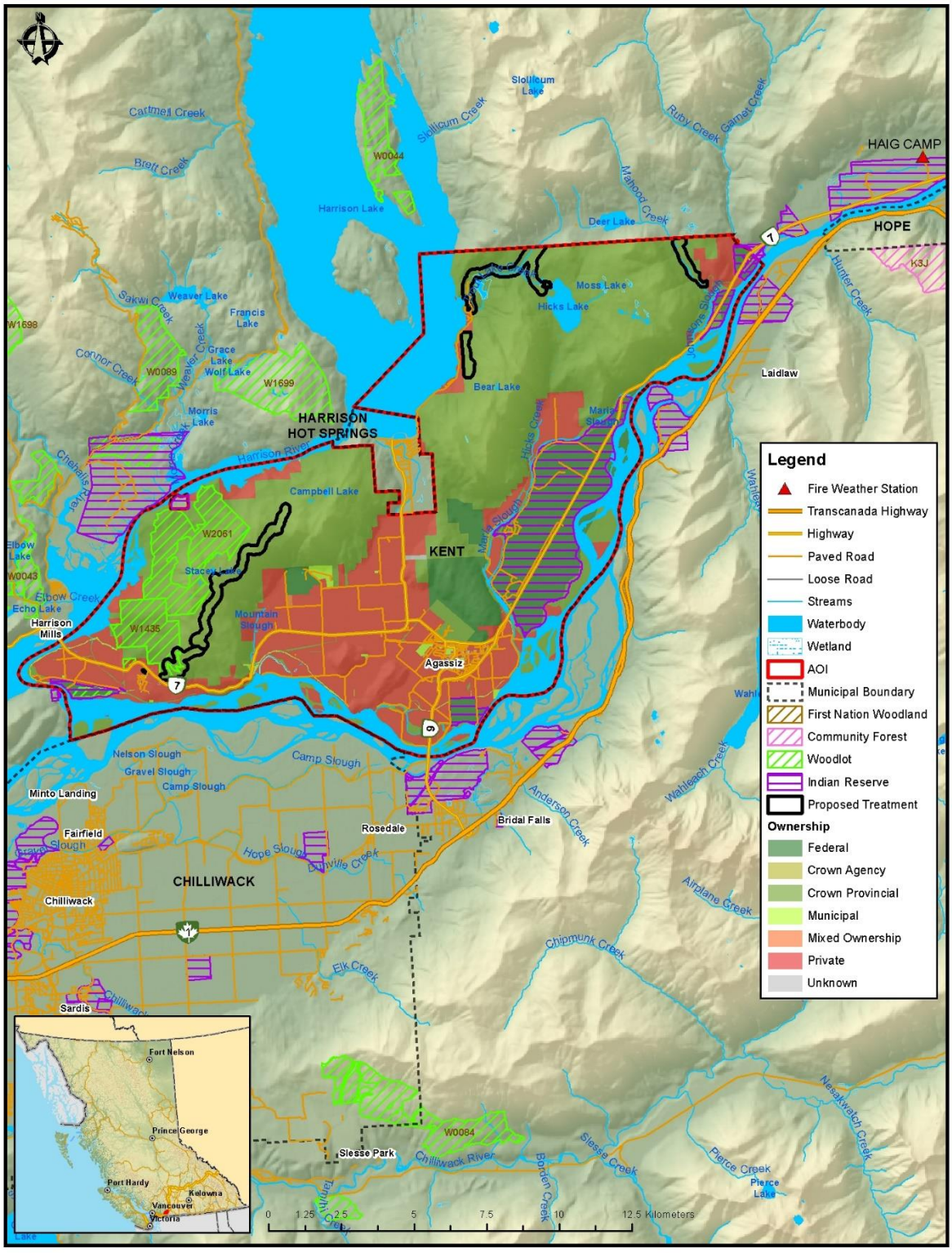
SECTION 2: LOCAL AREA DESCRIPTION

This section describes the extent of the District of Kent AOI and 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 District of Kent is located in the South Coast region of BC, approximately 120 kilometers (km) west of Vancouver in the Fraser Valley. The District is bordered on its north side by Harrison Lake and Green Mountain (the northern border extends to Sasquatch Provincial Park, just north of Hicks Lake). On its north and west sides, the District is bordered by Harrison River, and to the south and east it is bordered by the Fraser River with Hope and the Fraser Canyon to the east.

The AOI for the CWPP is illustrated below in Map 1. The AOI represents the municipal boundary of the District and encompasses 22,109 ha of land in total. A breakdown of the AOI's land ownership is provided in Table 2.



Map 1. Area of Interest (AOI).

Table 2. Summary of AOI by land ownership.

Land Ownership*	Hectares
Private	5,400
Municipal	159
Provincial Crown	13,789
Crown Agency	2
Federal Crown (includes Indian Reserves)	2,750
Mixed Ownership	8
Unknown	36
Total	**22,109**

2.2 COMMUNITY DESCRIPTION

The District of Kent is a district municipality located in the Fraser Valley between the Fraser and Harrison Rivers and the south end of Harrison Lake. The District consists of the town of Agassiz (the commercial, retail and institutional centre) and several smaller communities including Kilby, Mount Woodside, Rockwell Drive, and Harrison Mills. The Kent AOI also includes several Indian Reserves and First Nations communities (under separate jurisdiction) including: Lukseetissum, Wahleach Island 2, Sea Bird Island, Tseatah 2, and Scowlitz 1. The Village of Harrison Hot Springs is a separate municipality that is partially surrounded by, but not included in the District of Kent municipal limits (a separate CWPP has been produced for the Village of Harrison Hot Springs, in tandem with this CWPP).

The District has a population of approximately 6,067 residents (2016)[7] and covers approximately 22,109 ha.[8] Services to residents of the District are provided both at the municipal and regional level through the District of Kent, and the Fraser Valley Regional District. The regional government provides environmental services, building services, strategic planning, emergency management services, and regional parks planning. At the municipal level, services provided include the enforcement of select bylaws; fire protection services; license and permitting services; building services; engineering, public works and utilities operations; community, recreation and park services; and planning and development.[9]

The South Coast region has been inhabited by the Coast Salish Aboriginal Peoples since before recorded time. The Sts'ailes, Squ'ewlets, and Stó:lō peoples are among the Coast Salish nations that historically occupied land (a complete list of First Nations with interest in the area is provided in Section 1.2.1 and Section 3.3.2). Development and growth in the District were spurred by the Fraser Canyon Gold Rush and Hudson's Bay Company fur trading activity. The subsequent construction of the Canadian Pacific

[7] Statistics Canada. 2016 Census.
[8] District of Kent Official Community Plan Bylaw No. 1508.
[9] District of Kent, 2018. District Hall Directory. Retrieved online from: https://www.district.kent.bc.ca/index-directory.html

Railway through Agassiz introduced more development and settlement in the District, which was incorporated in 1885.[10]

The District is topographically diverse, with low lying ecologically productive floodplain lands, uplands and mountainous terrain. The elevation varies from less than 20 m to over 1,000 m. Harrison Lake is the largest freshwater body within and adjacent to the AOI, with an area of over 20,000 ha and the AOI is bordered by the Harrison River and the Fraser River. Numerous streams and sloughs are present within the District, including Ruby Creek, Hicks Creek, Miami Creek, Maria Slough, Hotsprings Slough, and several other tributaries that drain into the major rivers, lakes and creeks.

The District of Kent economy was historically driven by agriculture and forestry, and has diversified to include tourism and recreation. The majority of the floodplain area, apart from the Agassiz townsite is still under agricultural use.[11] The logging industry spawned both tugboat towing and the development of mills along the Fraser River. The District also offers diverse outdoor recreation opportunities (including hiking, biking, fishing, hunting, boating and hang-gliding) and popular regional attractions such as Harrison Hot Springs Resort and local cultural/historic sites and museums including the Kilby Historic Site that attract visitors to the area. Two Federal correction facilities, a Federal agricultural research facility, and small-scale industry also operate in the area.

Fire protection within the AOI is the responsibility of the Agassiz Fire Department (AFD). Five mutual aid agreements and one automatic aid agreement exist between this department and other local fire departments (as discussed in greater detail in Section 6.1) and the AFD has a standing agreement in place with the BCWS. BCWS is responsible for responding to fires that are beyond the boundaries of the department Fire Service Areas. In the event of a wildfire, the District of Kent has limited emergency egress routes. The north and south running arterial route connecting Harrison Hot Springs (which is surrounded on three sides by the District of Kent) and recreation areas on Harrison Lake with Lougheed Highway (Highway 7), running generally east/west, and Highway 9, running south from Agassiz to Highway 1, are the only reliable, paved access routes. Additionally, the Rockwell Drive corridor northwest of Harrison Hot Springs is an area of particular concern with respect to limited emergency egress and lack of an alternate evacuation route (see Section 6.1.3 for further discussion). This limits the ability of fire crews to respond to fires and safely evacuate residents.

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 abandoned campfires and poor recreation practices (both boat and road access recreation areas). BCWS staff reported that slash accumulations following industrial logging can be an issue, particularly next to forest service roads.

[10] Agassiz-Harrison Museum. Retrieved online from: http://agassizharrisonmuseum.org/history/
[11] District of Kent Official Community Plan Bylaw No. 1508.

Based on the BCWS historical wildfire dataset, the largest fire to burn within and adjacent to the District AOI occurred in 1958, with an estimated area of over 3,052 ha. In 2018, a 427-ha fire burned on Mt. Hicks in the District of Kent. This fire burned for several weeks and resulted in the closure of the Lougheed Highway, which connects many Fraser Valley communities. In 2017 a human-caused fire on the eastern side of Harrison Lake, approximately 12 km northeast of Harrison Lake, near Slollicum Creek and just north of Sasquatch Provincial Park, burned over 94 ha. This fire started in a cut block and although no structures were at risk, it was a fire of note due to the large quantity of smoke and visibility from communities to the south (as far away as Mount Woodside). The AFD provided initial attack on this wildfire and BCWS faced challenges with keeping recreational boaters clear to allow air crews to "bucket" water. In the same summer, an earlier human-caused fire approximately 30 km north of Harrison Hot Springs near Silver River on the eastern shore of Harrison Lake burned approximately 195 ha. The Mt. Hicks wildfire, in combination with the 2016 Fort McMurray and 2017 and 2018 local and Province-wide wildfires, have alerted BCWS to the potential for large, catastrophic wildfires occurring within and surrounding the present AOI.

BC Wildfire Service historical ignition dataset demonstrates that the proportion of human-caused fires within the Kent AOI is substantially greater than that of the province as a whole. This ignition data shows that within the District AOI, approximately 87% of ignitions since 1951 have been human-caused versus 40% in the province of BC.[12] This statistic may be explained by the lower proportion and occurrence of lightning strikes in the Fraser Valley relative to other areas in the province. Additionally, high recreational use within many parts of the AOI and the prevalence of forestry activities within the AOI may also contribute to this statistic.

2.4 CURRENT COMMUNITY ENGAGEMENT

There is recognition and awareness, from both District staff and the community, of the threat posed to the community by wildfire. There has been limited community engagement in FireSmart initiatives to this point. FireSmart materials are distributed by the AFD door to door to WUI residents and links to FireSmart Canada resources, burning regulation and fire related bylaws are provided on the AFD website. Recommendations for further education and communication initiatives that may be undertaken by the District are provided in Section 5.3. The AFD has also collaborated in the past with the BCWS to provide a community FireSmart event. Furthermore, the fire department is consulted during community development planning. Several bylaws that relate to wildfire have been adopted by the District. These include the *Fire Prevention and Protection Regulation Bylaw (1448, 2009)* that addresses burning compliance and prohibits the accumulation of combustible materials on properties that create a fire hazard, and the *Nuisances, Noxious or Offensive Trades, Health and Safety Bylaw (1467, 2010)* that authorizes the District to require property owners to reduce fire hazard on property if it increases the fire danger. Both the *Fireworks Regulation Bylaw (1381, 2007)* and the *Parks and Public Facilities Regulation Bylaw (1443, 2009)* control the use of fireworks and/or fire in the District and in District parks. However, there is currently no established wildfire development permit area within the

[12] BCWS, 2018

District of Kent, which can set 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

Following is a summary of District policies 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 jointly by the District of Kent and the adjacent Village of Harrison Hot Springs (the Village), and they have created a comprehensive Emergency Management Plan to serve the two communities.[13] The plan was developed to optimize the response, resources and planning for major emergencies that may occur within the District and the Village. The plan outlines the Emergency Operations Centre (EOC) functions and activation, Incident Command Post (ICP) functions, guidelines for emergency response (communications, personnel identification, documentation, etc.), and hazard-specific roles and procedures. The hazard-specific roles and procedures for wildland interface fires list the possible major effects of such an event, the potential actions that may be required to address these effects, the associated actions of the EOC, and any resources that could aid in response. Emergency response is coordinated using the BC Emergency Management System (BCEMS) Site and Site Support Standard, with designated EOC locations and Incident Command (IC) for site level response. A Provincial Emergency Operations Centre (PREOC) and a Provincial Emergency Coordination Centre (PECC) may also be established if the emergency is large in scale.

2.5.2 Affiliated CWPPs

CWPPs have been developed for the District of Kent (2005), the City of Abbotsford (2009), the District of Mission (2005), and the District of Maple Ridge (2005). A CWPP for Seabird Island is currently being developed by Firefly Integrated Resources Enterprises Inc. 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, a CWPP for the Village of Harrison Hot Springs is being developed concurrently with this CWPP by the same consultant, ensuring consistency in recommendations and synergies within proposed future fuel treatment works.

2.5.3 Local Government/First Nation Policies and Recommendations

The intent of this section is to review all relevant local government plans, policies and bylaws and identify sections that are relevant to the CWPP. Fraser Valley Regional District (FVRD) and District of Kent bylaws that apply to the District of Kent were reviewed and incorporated where applicable. However, recommendations to revise or update FVRD bylaws were not included as this is considered outside of

[13] Emergency Response and Recovery Plan - Kent/Harrison Joint Emergency Program, 2015.

the scope of this plan. The following municipal bylaws, strategies and policies are relevant to wildfire planning in the AOI.

Bylaw No. 1508, 2014: District of Kent Official Community Plan.

The District of Kent Official Community Plan (OCP) provides guidance for land use, development and community evolution over the short, medium and long term within the District through 2040. Numerous sections contain objectives and policies which are directly relevant to wildfire risk reduction, emergency response, and post-disaster community resilience as described below.

2014 OCP Section 1.5: Regional Context

This section outlines the District's Regional Concept Statement that is consistent with the goals of the FVRD's 2004 *Regional Growth Strategy*. Nine growth management goals are outlined related to transportation, agriculture, densification and sustainable development, protection of the natural environment and environmental stewardship, management of rural and recreational lands, economic growth through industrial and commercial land use designation, and management of water, energy and waste. Goal number 3 relates to responsible urban land management by encouraging densification in areas that can be easily serviced in Agassiz and Mount Woodside. Goal number 4 relates to the development of sustainable communities through residential growth in a compact area. Urban development should also recognize settlement patterns that minimize risk associated with hazards including wildfire.

2014 OCP Section 2.2 Guiding Principles

The nine guiding principles of the OCP include growth management as the first principle. As discussed above, there is no specific consideration of managing growth and density in the context of natural hazards such as wildfire.

RECOMMENDATION #1: Consider reviewing and amending the OCP to include a growth management policy which considers wildfire risk along with other natural hazards during strategy development. By containing development within a specified area, the overall fire risk is less than when compared to areas of intermixed development, i.e. sprawl. By constraining development, the District can ensure that future development occurs where urban services, such as water for fire suppression, is available, reliable, and accessible. Overall intermix and rural areas are generally more vulnerable (at higher risk) for interface fires.

RECOMMENDATION #2: Review the OCP and recognize natural hazards, in addition to geotechnical hazards and flooding, that have the potential to impact values within the District of Kent. Natural hazards include, but are not limited to, wildfire and interface fire which has the potential to impact public health and safety, economics (*e.g.* through evacuations, loss of tourism, interruption of services), ecosystems, habitat, and water quality among other values. Identification of natural hazards such as wildfire can allow for planning and policies to be put in place to increase District resilience, mitigate potential damages and increase public and official awareness of risk.

2014 OCP Section 4.3: Residential Land Use

The Residential – Lake Area designation may be extended or created subject to a feasibility study considering sewer and/or water services, geotechnical and flooding hazards, safe and easy road access and other conditions.

RECOMMENDATION #3: Review OCP Section 4.3 and ensure that wildfire hazard (in addition to explicitly mentioned geotechnical and flooding hazards, safe access, and water services) is considered in any feasibility study to extend or create the Residential – Lake Area land use designation.

OCP Section 4.6: Institutional Land Uses

Policy number 4 refers to institutional uses identified at Mount Woodside including the accommodation of a small fire hall and public works facilities (south side of Lougheed Highway), while any additional future community uses (north side of Lougheed Highway) may be considered in accordance with the Mount Woodside Neighbourhood Plan.

OCP Section 4.7: Parks, Recreation and Open Space

While many parks, trails, and recreation sites within the Agassiz townsite are generally in low to non-fuel areas, some small neighbourhood parks including, Alm, Blair Henry and Mount Woodside Lookout Park are located in treed/forested areas. Outdoor recreation facilities outside of the townsite, and within proximity to forest fuels include a speedway, shooting range and motocross track (run by non-profits). Additionally, many hiking trails exist within the forested hills and mountains in the District including trails in and around Sasquatch Provincial Park and on crown land in the Bear Mountain, and Agassiz Mountain areas. Generally, trail maintenance is undertaken by local individuals.

Policy number 3 states that parks will be provided and developed as set out in the Parks, Recreation and Culture Master Plan. Policy number 22 states a commitment to acquire parks at the time of subdivision. The criteria for acquiring land for parks and trails at the time of subdivision development include considerations such as location, size, and protection of environmentally sensitive sites, but do not consider the current and/or future state of potential park lands with respect to wildfire threat. See the *District of Kent Park Acquisition, Improvement and Trail Development Program, 2015* below for a more detailed discussion of wildfire-related considerations for park land acquisition and maintenance and associated recommendations.

2014 OCP Section 4.8: Resource Management Use

The OCP has designated areas (generally Crown Land) to be maintained for managed resource development (i.e., forest management and mineral resource extraction) or that have environmental sensitivity or are subject to geological hazards. Other land uses (i.e., rural residential, recreation, public and other) in addition to resource development may be accommodated providing they can be done without environmental damage. Section 4.8 also outlines requirements for restoration, reforestation, and referral of plans to MFLNRORD within this land use designation. This section should include consideration of wildfire hazard and implications of activities/development on wildfire threat conditions and considerations for fuel management in this land use designation. Should the District choose to

conduct/allow operational fuel treatments within this land use designation, there should be a concerted effort made to protect sensitive sites.

2014 OCP Section 5.2: Geotechnical Hazards and Steep Slopes

It is recognized that, due to ALR restrictions and topography within the District, future development will be focused on hillsides and areas with steep slopes. It must be noted, that these same areas may also be vulnerable for wildfire. The stated policies address the application of Development Permit Area Guidelines for designated land and setback requirements in the vicinity of steep slopes. A similar set of policies to establish a Wildfire Hazard DPA and guidelines and ensure appropriate setbacks of residences from forested areas is recommended, to reduce the threat of wildfire to residential structures. Refer to the discussion under *2014 OCP Section 9.0: Development Permit Areas* for detailed recommendations.

2014 OCP Section 7.1: Water

Fire protection is provided by District-owned hydrants and draft fire wells (some of which are pressurized). These are operated by the fire department using mobile pumps. It is noted, however, that the effectiveness of these hydrants and draft wells may be reduced as they are often prone to siltation, requiring increased maintenance.

A key water policy is to ensure safe water supplies in Kent and well-maintained community water systems in Agassiz, Mount Woodside and Rockwell Drive. This should include considerations to ensure critical water system infrastructure complies with FireSmart standards and is not vulnerable to interface wildfire.

Historically, connection to the District's water system in Agassiz has been voluntary; however, the stated policy is to require new development to connect to the District's water system and encourage existing residents to connect rather than maintaining private wells by requiring it prior to issuing a permit for a new structure. Developments that are not on community water systems have the potential to have lower pressure, capacity and storage, which can limit suppression efforts in the event of a structural or interface forest fire.

2014 OCP Section 7.5: Emergency Program Planning

This section of the OCP provides a detailed discussion of a key emergency planning priorities of importance to both the District of Kent and the Village of Harrison Hot Springs; namely the establishment of an emergency evacuation route for residents and visitors along Rockwell Drive or the north end of Hot Springs Road on the east side of Harrison Lake. This single access route is vulnerable in the event of a wildfire or other major events and the two municipalities have been in discussions with provincial government representatives to fund and establish a bypass/evacuation route that would connect the north end of Rockwell Drive to Lougheed Highway. See Section 6.1.3 for further discussion of access and evacuation related issues in the District AOI and related recommendations.

2014 OCP Section 9.0: Development Permit Areas

The following six Development Permit Areas (DPAs) are identified in the OCP: DPA 1 – Hillside, DPA 2 – Marine Commercial, DPA 3 – Intensive, DPA 4 – Downtown Revitalization, DPA 5 – Mount Woodside, and DPA 6 – Industrial. There is, however, currently no provision for a Wildfire Hazard DPA. The Mount Woodside DPA (DPA 5) was established to protect developments from hazardous conditions and other purposes. While it provides consideration for environmental impact and geotechnical hazards, it does not specifically include consideration for wildfire hazard. Furthermore, DPA 5 requires landscaping to retain the forestry character, including incorporating mature trees into landscaping design, maintaining a continuous minimum 15 m landscaped buffer between any development and forestry uses. There is, however, no requirement that landscaping be FireSmart. It is recommended that a Wildfire Development Permit Area be developed and incorporated in the OCP. Refer to Section *5.2.2 Planning and Development* for detailed discussion and recommendations regarding a Wildfire Development Permit Area.

RECOMMENDATION #4: Consider reviewing Section 9.0 of the OCP and incorporating a Wildfire Development Permit Area where wildfire interface guidelines based on FireSmart principles apply. See Section 5.2.2 *Planning and Development* for further details regarding a new development permit.

2014 OCP Schedule D – Bylaw No. 1508: Mount Woodside Neighbourhood Plan

The Mount Woodside Neighbourhood Plan forms an integral part of the OCP and outlines policies and a planning framework for this neighbourhood with a focus on Phase 1 of two potential phases of development. The Plan provides for a combined fire hall, public works yard and community centre site. This infrastructure should be sited and constructed according to FireSmart principles and practices. It also recommends one centrally located park and one vista park be dedicated. See the *District of Kent Park Acquisition, Improvement and Trail Development Program, 2015* below for a detailed discussion of wildfire-related considerations for park land acquisition and maintenance and associated recommendations.

The Plan also requires that a suitable buffer be provided to agricultural and forestry lands and activities in the neighbourhood. This policy could be expanded to require appropriate setbacks of residences and other infrastructure from forested areas to reduce the wildfire threat.

With respect to water supply in the Mount Woodside Neighbourhood, Section 6.2.2 sets out the onsite water reservoir(s) required to service the Plan area (Phase 1 development). According the District (Wildfire Working Group communication) the current water supply was deemed to be adequate for the existing level of residential development and Phase 2 development (commercial), with additional water supply proposed to be developed as required. Meeting firefighting requirements is recognized as a significant issue as development is expected prior to sufficient funds coming onstream to construct a fire hall. As an interim measure, the Plan requires automatic building sprinklers until a fire hall is operational.

District of Kent Bylaw No. 1448, 2009: Fire Prevention and Protection Regulation Bylaw (Consolidated)

This bylaw addresses burning compliance in the District. Specifically, it controls outdoor fires, industrial burning and category 2 piles via issuance of permits. It further sets out various limitations, when, under what circumstances, and the boundaries within which burning restrictions apply for outdoor fires (sections 3 to 9). Under section 3, subsections (3) (b) through (d), the bylaw prohibits the deposition of combustible material on a lot if it creates a fire hazard. Similarly, large quantities of combustible construction materials are prohibited on a lot unless they are to be used promptly for building. This bylaw also requires that structures or yards be in a condition that is safe to guard against fire. Under 'Building Fire Prevention & Protection', section 14, this bylaw authorizes the Fire Chief or designate to require the removal of anything from a building or yard which is a fire hazard or increases the danger of fire. Under section 24, it requires that road and lane way access be maintained and readily accessible for fire department vehicles. It also sets requirements for public and private fire hydrants and standpipes including approval and maintenance requirements (section 25). Finally, under this bylaw, building addresses are required to be clearly visible and legible from the street, as specified in section 27.

RECOMMENDATION #5: Review District Fire Prevention Bylaw No. 1448, 2009 and include wording that expands the types of combustible materials that are prohibited to accumulate on private property to include accumulations on and under exterior projections, such as decks and patios, near the home, and in gutters and roofs. The revised bylaw should provide the District the authority to require removal/clean-up of combustible materials or to complete removal and recoup costs from the owner.

RECOMMENDATION #6: Consider working with the Fire and Building 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 District-wide engagement campaign and providing incentives such as the opportunity to acquire/purchase discounted address signs.

District of Kent Bylaw No. 1381, 2007: Fireworks Regulation Bylaw

This bylaw controls the use of fireworks within the District boundary via permits.

District of Kent Bylaw No. 1467, 2010: Nuisances, Noxious or Offensive Trades, Health and Safety Bylaw

This bylaw provides power to the Fire Chief to require property owners to take steps towards reducing fire hazard on their property if it is deemed to increase the fire danger (sections 11 and 12).

District of Kent Bylaw No. 1443, 2009: Parks and Public Facilities Regulation Bylaw (Consolidated)

This bylaw controls the use of fireworks and fire in District parks, unless in a designated place and/or accompanied by a permit.

District of Kent Bylaw No. 1318: Unsightly Premises

This bylaw enables the District to request accumulations of filth, discarded materials, rubbish, brush, trees or weeds, etc. be removed from properties. There is no specific mention of accumulations of combustible materials that create or increase fire hazard on private property; however, this is addressed above in the Fire Prevention and Protection Regulation Bylaw No. 1448, 2009 and Nuisances, Noxious or Offensive Trades, Health and Safety Bylaw No. 1467.

District of Kent Bylaw No. 722, 1977: Minimum Maintenance Standards

This bylaw requires that heavy undergrowth and noxious plants be eliminated from the yards of residential properties. With respect to non-residential property, the bylaw requires land to be kept free from rubbish and other debris. This bylaw does not specifically address the removal of undergrowth or debris to address any associated fire hazard. However, as noted above, this is adequately addressed in Bylaws No. 1448 and No. 1467.

District of Kent Bylaw No. 1248, 2003: Subdivision Development; Amendment No. 1278, 2003; and Amendment No. 1423, 2008

This bylaw speaks to minimum requirements, standards and specifications for parcel development and redevelopment of lands to ensure adequate water yield for domestic and fire protection requirements (flow required is the sum of the maximum daily flow plus the required fire flow as per Schedule A). Adequate water distribution must be provided by connection to either an adequate existing water distribution system or a proven groundwater source or by providing a new water distribution system in accordance with minimum requirements, standards, and specifications provided in the schedules.

Under Section 5.0 – Development Approvals, the District may require an environmental assessment for hazardous and sensitive areas and a qualified professional report for hazardous and steep slope areas. This section could be expanded to require assessment and qualified professional reporting and sign-off for wildfire hazard areas in addition to geotechnical hazards.

Schedule A, Section 3 of the bylaw specifies the minimum fire hydrant pressure requirements as well as the standards and specifications for siting and spacing of fire hydrants. With respect to private groundwater systems, Schedule A further specifies the water quantity requirements (wells must be capable of providing 2500 l/day and a peak flow of 9 l/minute for a 4-hour period) and requires a separate fire protection system (with stand-by power) be provided that is capable of providing the required fire flow.

Schedule A, Section 6 addresses standards and specifications for private road design and construction including width, loading, overhead clearance and dead-end road turnaround specifications. This has relevance to the provision of adequate access and egress for fire suppression and emergency management.

Schedule A, Section 8 addresses landscaping requirements for street, boulevard, median and yard trees. Including street tree spacing, location, clearances, and species selection standards and specifications.

This has relevance to adherence to FireSmart standards in the community and could be reviewed to ensure that guidelines are not in conflict with FireSmart guidelines with respect to landscaping and vegetation setbacks.

See Section 5.2.2, *Subdivision Design* and *Planning and Development* subsections for further discussion on FireSmart considerations and tools relevant to subdivision development and new building within the District.

RECOMMENDATION #7: Review Subdivision Development Bylaw 1248 and consider amending to ensure aspects of subdivision design specific to access/egress comply with National Fire Protection Association (NFPA) 1141 *Standard for Fire Protection Infrastructure for Land Development in Wildland, Rural, and Suburban Areas*[14] (i.e., number of access points, width of streets and cul-de-sacs, etc.)

RECOMMENDATION #8: Require a minimum of two points of access for new subdivisions.

RECOMMENDATION #9: Continue having subdivision development applications reviewed by fire officials to ensure hydrant placement and access is acceptable for emergency response and suppression.

District of Kent Bylaw No. 1450, 2009: Agassiz Fire Department Bylaw

The purpose of this bylaw is to establish and operate a fire department (the AFD) within the District. It outlines the appointment and role of the Fire Chief, the limits of jurisdiction, and operations of the fire department.

District of Kent Bylaw No. 1562, 2016: Water Regulation and Rates Bylaw; Amendment No. 1562.01, 2017; Amendment No. 1562.02, 2017; Amendment No. 1562.03, 2018; and Amendment No. 1562.04, 2018

In addition to setting out water connection, inspection, maintenance and fee requirements for supply and use of water from District systems, the bylaw specifies requirements for fire service installation and connection to the District's water supply system. It also specifies restrictions, permitting requirements and conditions for use of fire hydrants, stand-pipes or valves in the District water system. Furthermore, the bylaw authorizes the District to restrict the use of water in the event of water supply shortage. Amendment No. 1562.01 includes the requirement that fire hydrants added to parcels connected to the District's water system be clearly identified, inspected and maintained in accordance with the BC Fire Code and that the fire department be notified whenever a hydrant is out of service. Schedule G of the bylaw includes a map of the enhanced municipal fire protection area (encompassing the Agassiz townsite) within which properties are protected by fire hydrants and draft wells.

[14] National Fire Protection Association (NFPA).2017. Standard for Fire Protection Infrastructure for Land Development in Wildland, Rural, and Suburban Areas. Retrieved online at: https://www.nfpa.org/codes-and-standards/all-codes-and-standards/list-of-codes-and-standards/detail?code=1141

District of Kent Park Acquisition, Improvement and Trail Development Program, 2015

This program identifies and prioritizes park and trail infrastructure upgrades, improvements and parkland acquisition and provides guidelines for park acquisition. It is intended to guide the District in planning, land acquisition, and utilization of parks and trails over a 25-year time frame. The park acquisition guidelines and specific park and trail development recommendations do not consider the potential interface wildfire risk related to parks and trails. Parks provide a multitude of ecosystem, social, and economic benefits to the District, but also have the potential to impact the interface fire risk and increase the liability of the District should they not be maintained in an appropriate range of wildfire threat. New parks should be reviewed by a Qualified Professional (QP) such as a Registered Professional Forester, competent in fire suppression and fire behaviour to ensure that they are received in an acceptable range of threat at the time of assumption. Furthermore, assumed parks should have reasonable access to maintain an acceptable level of threat within the park in the future, as well as facilitate suppression access in the event of an interface fire. QPs competent in the field of wildfire threat and fire behavior can provide insight to the District regarding siting and access of future parks and trails.

RECOMMENDATION #10: Review the OCP and associated supporting documents (i.e., Parks and Trail Priorities-25 Year Plan and the Park Acquisition, Improvement and Trail Development Program) and consider parks acquisition and maintenance through a wildfire risk lens, including consideration for long-term maintenance costs and access. Consider amendments where needed, including the following: 1) require the use of a QP in review, assessment, and siting of parks and park access prior to acceptance; and 2) ensure that bylaws provide the District 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. QPs should utilize the provincially accepted standard methodology for wildfire threat assessment data collection (i.e., the Wildfire Threat Assessment Worksheet and Wildland Urban Interface Threat Assessment Guide (2017).[15] See Section 6.1.3 for related recommendations specific to access.

RECOMMENDATION #11: Review the Park Acquisition, Improvement and Trail Development Program and ensure that guidance and direction in the Program considers and is not in conflict with wildfire risk reduction strategies. Ensure that any future parks and trails plans or masterplan include consideration for the placement, type, width, and objective of trails. Consideration should also be given to trail building and maintenance as these activities can either increase wildfire risk (through fuels accumulations and unsafe work practices) or decrease wildfire risk (though proper placement, clean-up of combustible fuels trailside and work practices which adhere to Wildfire Act and Regulations). The Parks and trails plan / masterplan could also include an emergency response plan to deal with the risks of fire within parks.

Regional Growth Strategy for the Fraser Valley Regional District[16]

Eight growth management goals are outlined relating to transportation, the agricultural sector, responsible management of urban land, sustainable communities, protection of the natural environment, protection and management of rural and recreational lands, sustainable economic growth

[15] https://www.ubcm.ca/EN/main/funding/lgps/strategic-wildfire-prevention/2018-swpi-program.html

[16] "Choices for our Future", Fraser Valley Regional District, 2004.

and managing water, energy and waste responsibly. As a member municipality of the FVRD, the District of Kent's OCP is consistent with these goals. With respect to the goal of managing urban land responsibly, the Strategy supports contained development and OCPs that encourage compact development patterns. It also supports settlement patterns that minimize risk associated with hazards including wildfire.

2.5.4 Higher Level Plans and Relevant Legislation

Sustainable Resource Management Plan (SRMP) Biodiversity Chapter for East Harrison Landscape Unit[17]

The SRMP is the higher-level planning document for the East Harrison Landscape Unit (LU), which encompasses the District of Kent AOI. The plan describes the resource tenure holders in the LU, the resource values present, existing higher-level plans, First Nations, an analysis of the Old Growth Management Areas (OGMAs) and Wildlife Tree Retention within the LU, and a discussion regarding LU objectives.

Relevant Legislation

Spatially explicit ministerial orders pertaining to Old Growth Management Areas (OGMA) were identified within the District of Kent AOI. These orders must be reviewed, considered, and addressed during the fuel management prescription-level phase. Fuel management within these areas should aim to enhance these values within the AOI, whenever possible, and the land manager and/or stewardship Forester (Chilliwack Natural Resource District) must be consulted regarding any overlapping values at risk, spatially explicit ministerial orders, or other notable values on the land base, during prescription development.

Spotted Owl Management Plan[18]

A Wildlife Habitat Area (WHA) for spotted owls (established by government area regulation order) was identified in the District of Kent AOI. The Spotted Owl Management Plan is a guidance document for spotted owl management within the Chilliwack and Squamish Forest 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[19]. This document should be reviewed and integrated into any fuel management activities that are proposed within spotted owl management areas, Wildlife Habitat Areas (WHAs), or in areas of suitable spotted owl habitat such as late seral stage forests.

[17] The Province of BC, Ministry of Sustainable Resource Management, 2005.
[18] The Province of BC, 1997.
[19] Spotted Owl Best Management Practices Working Group, 2009. Retrieved online from: https://www.for.gov.bc.ca/ftp/DCK/external/!publish/LOCAL_DATA/Spotted_Owl_Management_Plan/DOCUMENTS/SPOWBestManagementPractiesJul2009.pdf

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.

The South Coast Response Fire Management Plan (FMP)[20] was developed for the Sea to Sky Natural Resource District (NRD), the Sunshine Coast NRD, and the Chilliwack NRD. The FMP was reviewed to identify any regional fire management planning objectives and their interpretation in the context of management considerations for the District 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).

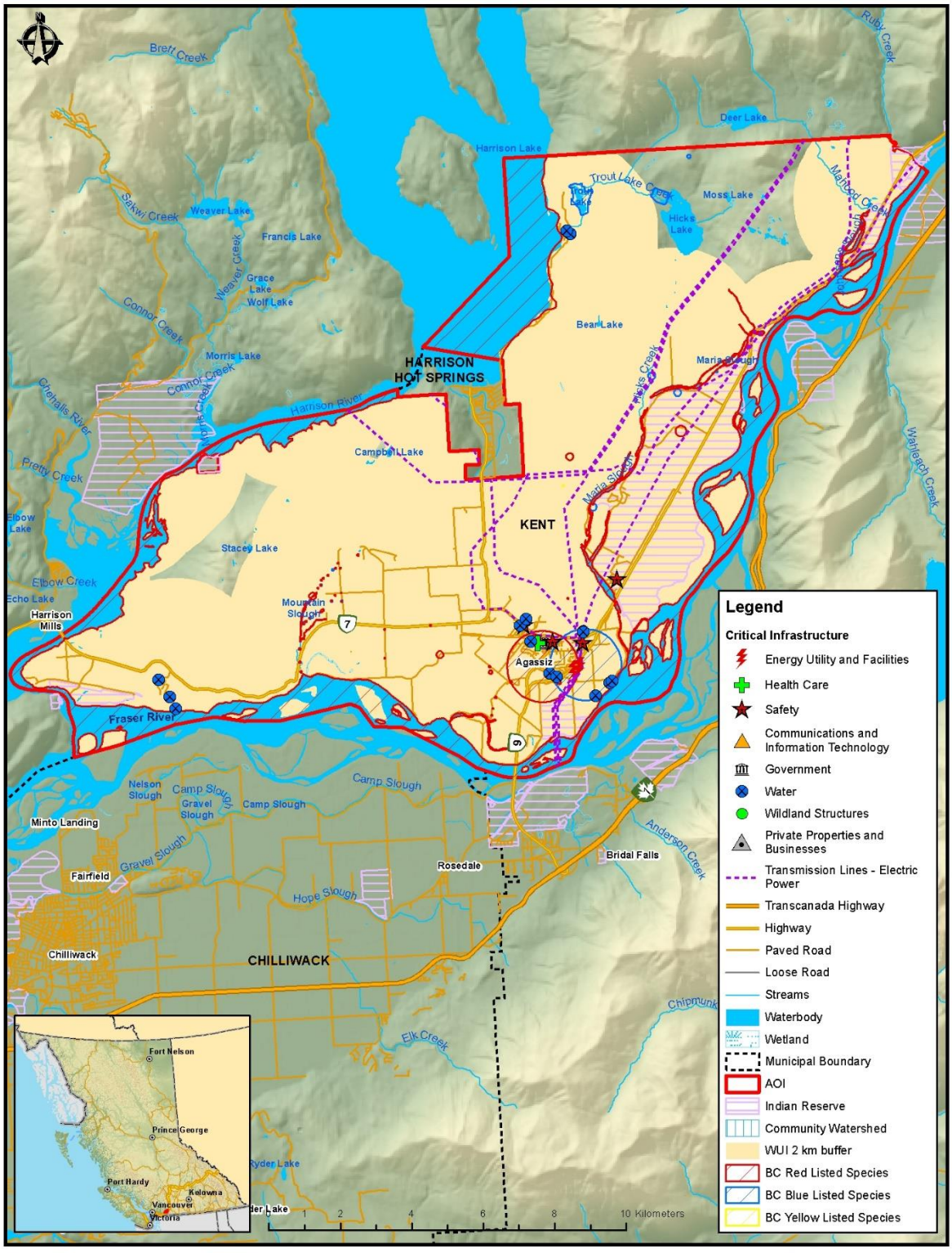
Nine approved Forest Development Units (FDUs) are located within and adjacent to the AOI with associated Forest Stewardship Plans which set specific forest practices obligations applicable to specific forest licensees.

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 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

The following is a description of the extent to which wildfire has the potential to impact the values at risk (VAR) within the District of Kent 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.

[20] South Coast Fire Management Plan. 2018. (Internal government document)
[21] Ministry of Forests, Lands and Natural Resource Operations. 2015



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, limited visibility, or by traffic congestion and/or accidents.

The population distribution (both people and structures) within the AOI is important in determining the wildfire risk and identifying mitigation activities. The population of the District of Kent increased moderately in recent years. It was last measured at 6,067 persons in 2016, up 7.1% from 2011.[23] This compares to 6.6% growth in the Fraser Valley Regional District as a whole during the same years. According to the 2016 Census, there are 2,351 private dwellings in the District AOI, approximately 161 of which are occupied on a part-time basis. In the 2014 OCP, the average annual population growth for the District was estimated at 0.75%, to reach approximately 6,200 people in 2040[24] and is expected to be determined by the availability of development opportunities, intensification of land use and ongoing growth in the Fraser Valley region. The District of Kent and neighbouring Village of Harrison Hot Springs also attract visitors for camping, hiking, canoeing, summer camps, and other recreational endeavors, particularly during the fire season (May – October). Several parks and recreation areas throughout the AOI are highly used during the summer months, including two Provincial Parks (Sasquatch and Kilby), Campbell Lake Trail, Bear Lake, District Parks Centennial and Pioneer, Mount Woodside Lookout Park and neighbourhood parks such as Rockwell Bay Parks. Furthermore, Highway 9 is frequently used as an access corridor for Sasquatch Provincial Park and Forest Service Roads and other recreation areas north of the park, 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 component of efficient and successful emergency response planning and the development of mitigation strategies and recommendations. Field visits to the District AOI and access to recent orthophotography and spatial data from the District enabled the development of a spatial layer with structure locations that accounts for the most recent development.

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

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

[23] Statistics Canada. 2016 Census.

[24] District of Kent Official Community Plan Bylaw No. 1508.

that essential services in the AOI 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, sewage/wastewater treatment, public works, municipal and social services, and communications infrastructure. Table 3 provides an inventory of critical infrastructure identified by the District staff and during field visits, while Map 2 provides a visual depiction of this critical infrastructure within the AOI.

Protection of critical infrastructure is 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 District's critical infrastructure (i.e., fire hall, ambulance station, water pump stations, etc.) is in various levels of compliance with FireSmart principles. While individual structures may be relatively FireSmart with respect to landscaping within the immediate FireSmart priority zones, many are located adjacent to forest lands. Informal FireSmart assessments of critical infrastructure have been completed by the District.

RECOMMENDATION #12: 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. Secondary power sources are important to reduce critical infrastructure vulnerability in the event of an emergency which cuts power for days, or even weeks.

RECOMMENDATION #13: It is recommended that formal FireSmart assessments (by a Qualified Professional) be completed of critical infrastructure such as the fire hall, emergency operations centre, water infrastructure, and others as identified in this CWPP (Table 3) and by the District.

3.2.1 Electrical Power

Electrical service for most of the District of Kent 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.

Three major radial transmission lines bisect the District AOI, connecting the Nicola to Meridian substations, the Nicola to Ingledow substations, and Kelly Lake to Clayburn substations. This system is

well-mapped and BC Hydro states that staff will work with local fire departments and BCWS to mitigate impacts to this infrastructure in the event of a wildfire.[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 event may cause power outages. Consideration must be given to protecting this critical service and providing power back up at key facilities to ensure that the emergency response functions are reliable.

Secondary power sources are important to reduce critical infrastructure vulnerability in the event of an emergency which cuts power for days, or even weeks. Secondary power is available for some critical infrastructure (fire hall, RCMP, emergency operations centre, and water pumping stations) via backup generators. The Municipal hall is not serviced with backup power supply, thereby leaving it inoperable and unable to provide business continuity during large-scale emergency events. 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. Additionally, all electronic public works monitoring systems would not function, requiring manual monitoring and resulting in increased demands on staff time. Refer to Section 6.1.2 for discussion and recommendations related to backup power and water availability for fire suppression.

3.2.2 Communications, Pipelines and Municipal Buildings

The District of Kent does not contain any hospitals or airports, as residents are serviced by Chilliwack General Hospital, Abbotsford International Airport, and Vancouver International Airport. While Agassiz is supplied with natural gas by FortisBC, a map of the FortisBC natural gas distribution system is not available to external companies. As such, it is not possible to identify specific areas that may be vulnerable to wildfire. A publicly available service area map[26] indicates that a Spectra Energy (now Enbridge Inc.) natural gas pipeline transects the AOI. A full inventory of critical infrastructure for communications, pipelines and District buildings with updated locations is presented in Table 3, below.

Table 3. Critical Infrastructure Identified in CWPP field visits.

Critical Infrastructure Type	Location
Electrical service	Service from regionally integrated transmission network. Distribution is combination of wood poles and underground servicing.
Agassiz Fire Department Fire Hall	7652 Industrial Way, Agassiz
District of Kent Municipal Hall	7170 Cheam Ave., Agassiz
RCMP Agassiz Detachment	6869 Lougheed Hwy, Agassiz
BC Ambulance Service Station 203	7260 Pioneer Ave., Agassiz
Agassiz Community Health Centre	7040 Cheam Ave., Agassiz

[25] https://www.bchydro.com/safety-outages/emergency-preparation/natural-disasters.html
[26] https://www.fortisbc.com/About/ServiceAreas/Pages/default.aspx

Critical Infrastructure Type	Location
Primary Emergency Operations Centre (EOC) – Agassiz Fire Department, Fire Hall	7652 Industrial Way, Agassiz
Alternate EOC – RCMP Agassiz Detachment	6869 Lougheed Hwy, Agassiz
Seabird Island Fire Department	2782 Chowat Rd, Agassiz, BC
Primary Emergency Social Services Reception Centre (ESS RC) – Agricultural Hall	6800 Pioneer Ave., Agassiz
District of Kent Public Works Yard	1963 Green Rd, Agassiz
Agassiz Elementary-Secondary School	7110 Cheam Ave., Agassiz
Agassiz Centre for Education	7110 Cheam Ave., Agassiz
Kent Elementary	7285 McCullough Rd, Agassiz
Agassiz Christian School	7571 Morrow Rd, Agassiz
Community Recreation and Cultural Centre (Centennial Park)	6660 Pioneer Ave., Agassiz
Harrison Mills Community Hall	1995 School Rd, Harrison Mills
Water system/ reservoirs/water towers/sewage	Refer to Table 4 for details

3.2.3 Water and Sewage

The District of Kent is located above a groundwater aquifer and water supply in the District is sourced primarily from wells. The District operates three water systems: Agassiz Townsite, Rockwell Bay Estates and Mount Woodside/Harrison Highlands, supplied by groundwater wells. Residents not on these systems rely on private wells/water systems. The Agassiz system utilizes two water storage tanks located on Green Mountain to provide fire flow and storage for the water system. The Rockwell system (constructed 1987) and Harrison Highland/Mount Woodside system (constructed 2010) each utilize reservoirs[27]. Water is supplied from reservoir tanks via gravity fed distribution systems. The Rockwell and Agassiz townsite water systems are supplied with mobile backup generators and the Mount Woodside/Harrison Highlands water system utilizes a stationary backup generator to run water pumps. A detailed account of water availability for wildfire suppression is provided in Section 6.1.2.

The District operates and maintains a wastewater treatment plant and sewer collection system that serves the Agassiz townsite as well as Seabird Island First Nation residences. This system uses a combination of gravity and pump stations. Phase 1 of the Mount Woodside development (also known as Harrison Highlands) has a separate wastewater treatment plant and sewer collection system. The majority of remaining properties in the District utilize private septic systems.

Locations for water and sewage infrastructure (current as of 2018) within the District AOI are detailed below in Table 4. The Wildfire Working Group indicated that water and wastewater/sewer treatment facilities in Harrison Highlands and water system infrastructure in Rockwell Bay are vulnerable to wildfire (see FireSmart priority area recommendations in Section 5.2.3).

[27] District of Kent Official Community Plan

Table 4. Critical Water and Sewer Infrastructure Identified in CWPP field visits.

Critical Infrastructure Type	Location
Water supply	• Agassiz Townsite o 2 water storage tanks on Green Mountain o Well #1 o Well #2 • Rockwell Area o Small reservoir, situated south-east (Up Mtn) o Pump house – Rockwell Drive o Well • Harrison Highlands/Mount Woodside o Well o Reservoir – 1849 Lougheed Highway o Pump o Water treatment plant
Sanitary sewer system	• Agassiz Sanitary Sewer System o Wastewater treatment plant (1088 Tranmer Rd.) o Vimy lift station, o Maple lift station, o McCaffrey lift station, o Cheam lift station (back-up generator) o Aberdeen lift station (back-up generator) • Mount Woodside Sanitary Sewer System o Wastewater treatment plant

3.3 HIGH ENVIRONMENTAL AND CULTURAL VALUES

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

3.3.1 Drinking Water Supply Area and Community Watersheds

The District of Kent draws its domestic water from deep wells accessing groundwater. The three District water systems previously described, include a total of four wells ranging from 111 ft or 33.8 m deep (Rockwell Bay water system) to 156 ft or 47.5 m deep (Agassiz townsite system). The aquifer which serves as the raw water source is considered to be very productive and water quantity is not generally a concern in the District.[27]

Three Community Watersheds intersect the District of Kent AOI: Edna, Thunderbird and Sasquatch Community Watersheds. The latter two are located adjacent to each other above Harrison Lake and residential lakeshore development on Rockwell Drive. Edna Community Watershed is on the southwest side of Mount Woodside above Harrison Highlands. Any fuel treatments in these Community Watersheds would require adherence to special management requirements and consultation with the MFLNRORD Chilliwack District to conserve quality, quantity and timing of water flow and prevent cumulative adverse hydrological effects. The potential impacts of wildfire on watersheds extend past

the time a fire is extinguished. Depending on fire size and severity, there is the potential for significant hydrological impacts, extending for years post-burn.[28] Some areas may have a lower threshold for precipitation triggered events and would be particularly vulnerable to post-wildfire debris flows, mass wasting, landslides, or flooding. This may directly impact the community (i.e., structure loss, risk to public safety) or indirectly, through loss or damage of critical infrastructure, roads, or impacts on the watershed affecting water quality.

RECOMMENDATION #14: The District should consider the option of conducting future assessments to explore the potential hydrologic and geomorphic impacts of wildfire on the watersheds and community. Alternatively, there may be an option to complete a stand-alone assessment to help identify and quantify the post-fire hazards and levels of risk to the community. Exploration of potential funding opportunities through the province and the National Disaster Mitigation Program may be worthwhile.[29]

3.3.2 Cultural Values

The Coast Salish are the main First Nations group whose territory overlaps the District of Kent. Within this group, a total of 37 First Nations with aboriginal interests in the AOI were identified in the BC Consultative Areas Database. These include the following mainland-based First Nations: Sto:lo Nation and Sto:lo Tribal Council, Soowahlie First Nation, Shxw'ow'hamel First Nation, Skawahlook First Nation, Leq'a:mel First Nation, Scowlitz First Nation, Kwaw-kwaw-apilt First Nation, Skwah First Nation, Chawathil First Nation, Seabird Island Band, Sts'ailes, Peters First Nation, Siska Indian Band, Cook's Ferry Indian Band, Coldwater Indian Band, Oregon Jack Creek Indian Band, Nlaka'pamux Nation Tribal Council, Nicola Tribal Association, Lower Nicola Indian Band, Lytton First Nation, Boothroyd Indian Band, Ashcroft Indian Band, Shackan Indian Band, Spuzzum First Nation, Skuppah Indian Band, Popkum First Nation, Cheam First Nation, Union Bar First Nations, Yale First Nation, Nooaitch Indian Band, and the following Vancouver Island based First Nations: Halalt First Nation, Stz'uminus First Nation, Cowichan Tribes, Lake Cowichan First Nation, Lyackson First Nation, and Penelakut Tribe.

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 BC are protected from disturbance, intentional and inadvertent, by the HCA. Sites that are of an unknown age that have a likely probability of dating prior to 1846 (i.e., lithic scatters) as well as Aboriginal pictographs, petroglyphs, and burials (which are likely not as old but are still 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 exist in the AOI. The

[28] 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.
[29] Public Safety Canada, National Disaster Mitigation Program. Retrieved online at: https://www.publicsafety.gc.ca/cnt/mrgnc-mngmnt/dsstr-prvntn-mtgtn/ndmp/index-en.aspx

District should ensure that they have direct access to Remote Access to Archaeological Data (RAAD), which allows users to look up or track any archeological sites in the area.[30] Prior to stand modification for fire hazard reduction, and depending on treatment location, preliminary reconnaissance surveys may be undertaken to ensure that cultural heritage features are not inadvertently damaged or destroyed. Pile burning and the use of machinery have the potential to damage artifacts that may be buried in the upper soil horizons. Above ground archaeological resources may include features such as Culturally Modified Trees (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 OGMAs. Any proposed fuel treatment that may overlap these areas requires MFLNRORD oversight at the prescription development phase, and works can only occur following MFLNRORD consultation and approval.

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

There are eight occurrences of Red-listed species and four occurrences of Red-listed ecological communities; 12 occurrences of Blue-listed species; and one occurrence of Yellow-listed species within the AOI (Table 5). Additionally, the AOI overlaps with three masked occurrences. Through consultation with the CDC and a biologist or qualified professional, all site level operational plans must determine if these occurrences will be impacted by fuel management or other wildfire mitigation activities. All future fuel treatment activities or those associated with recommendations made in this plan should consider the presence of, and impact upon, potentially affected species. Additionally, all site level operational plans should consult the most recent data available to ensure that any new occurrences or relevant masked occurrences are known and considered in the operational plan to mitigate any potential impacts on species at risk. The BC Species & Ecosystems Explorer, which allows combined searches for species and ecological communities, should also be consulted at the prescription phase. Due to potential limitations of existing databases, consultation with a QP with local knowledge may also be recommended at the prescription phase.

[30] MFLNRORD, Archaeology. Retrieved online at: https://www.for.gov.bc.ca/archaeology/accessing_archaeological_data/obtaining_access.htm

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

Common Name	Scientific Name	Category	BC List	Habitat Type
Batwing vinyl	*Leptogium platynum*	Fungus	Red	TERRESTRIAL: Cliff
Bog Bird's-foot Lotus	*Hosackia pinnata*	Vascular Plant	Red	RIVERINE: Riparian; Creek, TERRESTRIAL: Roadside
Chaffweed	*Anagallis minima*	Vascular Plant	Blue	PALUSTRINE: Forested Wetland
Double-crested Cormorant	*Phalacrocorax auritus*	Vertebrate Animal	Blue	MARINE; PROTECTED; TERRESTRIAL; ROCK OUTCROP
Douglas-fir / Dull Oregon-grape	*Pseudotsuga menziesii / Mahonia nervosa*	Ecological Community	Red	-
Edwards' Beach Moth	*Anarta edwardsii*	Invertebrate Animal	Red	TERRESTRIAL
Grand Fir / Dull Oregon-grape	*Abies grandis / Mahonia nervosa*	Ecological Community	Red	-
Great Blue Heron, Fannini Subspecies	*Ardea herodias fannini*	Vertebrate Animal	Blue	TERRESTRIAL: Woodland Mixed, Urban
Green-sheathed Sedge	*Carex feta*	Vascular Plant	Blue	TERRESTRIAL
Heterocodon	*Heterocodon rariflorus*	Vascular Plant	Blue	TERRESTRIAL: Grassland/Herbaceous
Macoun's Meadow-foam	*Limnanthes macounii*	Vascular Plant	Red	TERRESTRIAL: Seepage, Grassland/Herbaceous, PALUSTRINE: Temporary Pool; TERRESTRIAL: Seepage
Northern Red-legged Frog	*Rana aurora*	Vertebrate Animal	Blue	RIVERINE: Creek; TERRESTRIAL: Forest Broadleaf
Nuttall's Quillwort	*Isoetes nuttallii*	Vascular Plant	Blue	TERRESTRIAL; TEMPORARY POOL, PALUSTRINE: Temporary Pool
Poison Oak	*Toxicodendron diversilobum*	Vascular Plant	Blue	TERRESTRIAL; FOREST NEEDLELEAF
Propertius Duskywing	*Erynnis propertius*	Invertebrate Animal	Red	TERRESTRIAL; GRASSLAND/HERBACEOUS
Purple Martin	*Progne subis*	Vertebrate Animal	Blue	-
Purple Sanicle	*Sanicula bipinnatifida*	Vascular Plant	Red	TERRESTRIAL: Forest Broadleaf
Red Alder / Slough Sedge (Black Cottonwood)	*Alnus rubra / Carex obnupta (Populus trichocarpa)*	Ecological Community	Red	PALUSTRINE; FORESTED WETLAND

Common Name	Scientific Name	Category	BC List	Habitat Type
Slimleaf Onion	*Allium amplectens*	Vascular Plant	Blue	MARINE: Coastal Bluffs, TERRESTRIAL
Surf Scoter	*Melanitta perspicillata*	Vertebrate Animal	Blue	MARINE; NEARSHORE
Vancouver Island Beggarticks	*Bidens amplissima*	Vascular Plant	Blue	PALUSTRINE: Herbaceous Wetland
Vesper Sparrow, Affinis Subspecies	*Pooecetes gramineus affinis*	Vertebrate Animal	Red	TERRESTRIAL: Grassland/Herbaceous
Water Marigold	*Bidens beckii*	Vascular Plant	Yellow	LACUSTRINE; SHALLOW WATER
Western Redcedar / Common Snowberry	*Thuja plicata / Symphoricarpos albus*	Ecological Community	Red	-
White-top Aster	*Sericocarpus rigidus*	Vascular Plant	Red	TERRESTRIAL: Woodland Needleleaf

3.4 OTHER RESOURCE VALUES

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

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

Fuel reduction treatments are not anticipated to have a measurable effect on the timber harvesting land base. Typically, forest stands identified for fuels treatments are highly constrained for conventional logging and are often in undesirable or uneconomic stand types. Numerous forest tenures exist on crown land in the AOI including, but not limited to Tree Farm License (TFL) 43 operated by Homalco

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

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

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

Forestry Ltd. Partnership and two Woodlot Licenses. The opportunity exists to work with local licensees on commercial thinning projects that meet fuel management objectives.

3.5 HAZARDOUS VALUES

Hazardous values are defined as values that pose a safety hazard to emergency responders. Generally, the District of Kent does not have a significant number of industrial sites or facilities that can be considered hazardous values. A private recycling facility and propane storage/delivery facility have been identified (Table 6). Kent Recycling receives recyclables, including yard waste and a variety of household hazardous materials and/or combustible materials (i.e., tires, vehicle batteries, spray paint and paint cans, and paper). The management and treatment of fuels in proximity to hazardous infrastructure is critical in order to reduce the risks associated with both structural fire and wildfire. Specifically, best management practices recommended for management of hazardous values include: 1) incorporating FireSmart planning and setback requirements for all infrastructure in this category; and 2) maintaining emergency fuel/propane emergency shut off procedures to be enacted immediately and efficiently in the event of an approaching wildfire or ember shower.

Table 6. Hazardous Infrastructure Identified in CWPP field visits.

Critical/Hazardous Infrastructure Name	2018 Location
Kent Recycling	7659 Industrial Way, Agassiz
Burden Propane Delivery	1739 Industrial Way, Agassiz

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

Ecological Context and Forest Structure

The Biogeoclimatic Ecosystem Classification (BEC) system describes zones by vegetation, soils, and climate. Map 3 outlines the BEC zones found within the AOI. Regional subzones are derived from relative precipitation and temperature. Subzones may be further divided into variants based upon climatic

variation and the resulting changes in the vegetative communities; variants are generally slightly drier, wetter, snowier, warmer, or colder than the climate of the regional subzone.[34]The following section is synthesized from information found on MFLRNORD's Research Branch BECWeb.[34]

BEC zones have been used to classify the Province into five Natural Disturbance Types (NDTs). NDTs have influenced the vegetation dynamics and ecological functions and pathways that determine many of the characteristics of our natural systems. The 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[35].

The District of Kent AOI is characterized by the following BEC subzones in order of highest to lowest occurrence within the AOI:

Coastal Western Hemlock Dry Maritime Subzone (CWHdm) – NDT 2

The CWHdm is the dominant BEC subzone, comprising 89% of the District AOI (Table 7) at lower to mid elevations (0-650 m). The CWHdm is characterized by relatively mild winters and warm, dry summers. Moisture deficiencies occur uncommonly on zonal sites. These ecosystems support Douglas-fir, western redcedar, and western hemlock forest stands. The CWHdm is classified as a Natural Disturbance Type 2 – forest ecosystems with infrequent stand initiating events where fires are often of moderate size (20 to 1000 ha) with a mean return interval of fire of approximately 200 years.[35] Many of these fires occur after periods of extended drought and produce a forested landscape characterized by extensive areas of mature forest with intermixed patches of younger forests.[35] Although the fire frequency is not high and fires are generally not large, pre-planning and preparation are essential to reduce the negative impacts of a wildfire.

Coastal Western Hemlock Very Wet Maritime Subzone Montane Variant (CWHvm2) – NDT 1

The CWHvm2 makes up a small proportion (approximately 6%) of the District AOI, occupying the highest elevation sites within the AOI. In southern BC it occurs at elevations of approximately 650 to 1000 m[36]. The climate of the CWHvm2 is wet and humid, with cool short summers and cool winters with substantial snowfall[36]. Western hemlock, amabilis fir, yellow cedar and mountain hemlock are common tree species in these ecosystems. The CWHvm2 is classified as Natural Disturbance Type 1 – forest ecosystems 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 CWH ecosystems in this NDT experience a mean disturbance interval of 250 years.[35] Mitigation efforts should not be focused in this subzone.

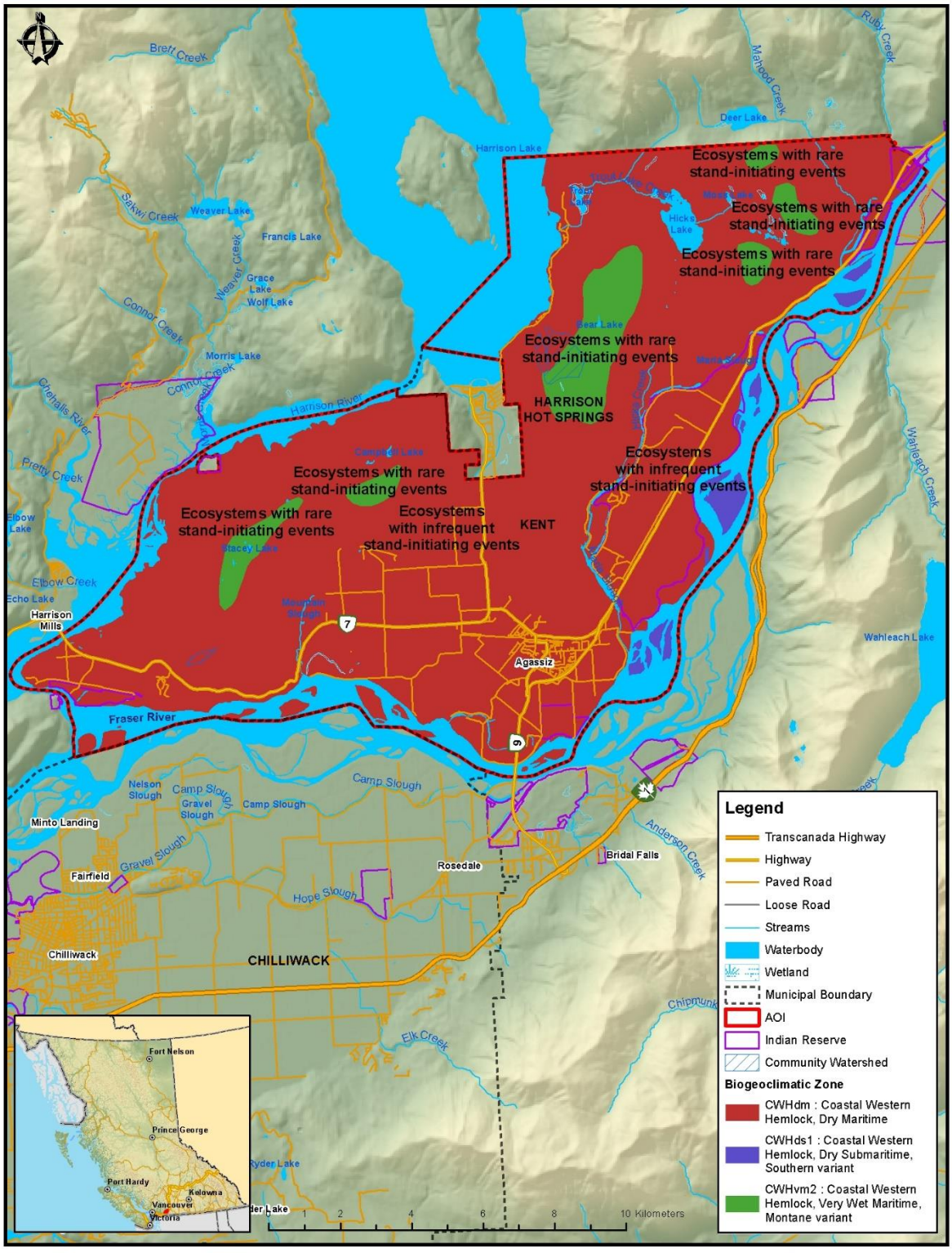
[34] https://www.for.gov.bc.ca/HRE/becweb/resources/classificationreports/subzones/index.html
[35] Province of British Columbia, 1995. Biodiversity Guidebook, s.l.: s.n.
[36] Green and Klinka, 1994.

Coastal Western Hemlock Southern Dry Submaritime Southern Variant (CWHds1) – NDT 2

The CWHds1 encompasses a small proportion of the AOI (approximately 5%), primarily on islands located in the Fraser River along the eastern edge of the AOI. Occurring at low to mid elevations (0-650 m), this BEC subzone and variant represents a transition between coastal and interior ecosystems and moisture deficiencies can be common on zonal sites during the dry summers.[36] The winters tend to be cool and moist with moderate snowfall. Compared to the CWHdm, which is present at similar elevations, the CWHds1 is drier and cooler. This BEC zone is dominated by forests of Douglas-fir and western hemlock, with a smaller component of western redcedar. The historical wildfire regime characteristic of CWHds1 is similar to that of CWHdm.[35]

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

Biogeoclimatic Zone	Natural Disturbance Type	Area (ha)	Percent (%)
CWHdm: Coastal Western Hemlock, Dry Maritime	NDT2	19,655	89%
CWHds1: Coastal Western Hemlock, Dry Submaritime, Southern variant	NDT2	1,195	5%
CWHvm2: Coastal Western Hemlock, Very Wet Maritime, Montane variant	NDT1	1,259	6%
TOTAL		**22,109**	**100%**



Map 3. Biogeoclimatic Zones within the AOI.

Forest Health Issues

The Coast Forest Health Overview outlines forest health issues present within the Fraser TSA.[37] This overview and forest health strategy (2015-2017) outlines several forest health issues that are most prevalent within the timber supply area. Of particular concern, due to the severity or extent of outbreaks, are the Douglas-fir beetle, Swiss needle cast and Douglas-fir needle cast, mountain pine beetle, root diseases (primarily laminated root disease and Armillaria spp.), drought, and windthrow. Outbreaks of western hemlock looper and western spruce budworm were a concern in the past, however, occurrences of these pests have declined in recent years.

Spatial data available through DataBC[38] indicates past wildfire impacts affecting areas affecting a total area of 36 ha (2013 and 2014), as well as incidences of Douglas-fir beetle (1992, 1996 and 2014, affecting 0.3, 0.5 and 15.8 ha respectively) and mountain pine beetle (2010 – 3 outbreaks totaling 15 ha, and 2011 – 10 outbreaks totaling 53 ha). The insect outbreaks occurred primarily in the Mount Woodside area and some occurred east of the Village of Harrison Hot Springs and south of Sasquatch Provincial Park. Several incidences of windthrow in 1990-1992, ranging in size from 3 - 30 ha were concentrated on the northwest side of Mount Woodside. Additionally, multiple outbreaks of unknown defoliating insect were observed in 2005 along the shores of the Fraser River.

These forest health factors have implications for the level of surface fuel accumulation in affected stands, as well as access and working conditions for fire fighters in the event of wildfire. 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 agricultural, residential and commercial 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 District of Kent, 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.

- 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. Over the past 50 years, new residential development has been concentrated in and near the Agassiz townsite

[37] 2015-17 Coastal Timber Supply Areas Forest Health Overview. 2015.
[38] https://catalogue.data.gov.bc.ca/pt_BR/dataset/pest-infestation-polygons (current as of September, 2017)

and limited development has occurred in the Mount Woodside area[39]. This has generally resulted in an increased wildland-urban interface in particular areas (Section 5.2.3) and an increase in fire suppression in ecosystems that had a historic fire interval of 200-250 years. Population growth is expected to continue and the District's proximity to larger Fraser Valley communities, favourable climate and high recreational and landscape values make it a desirable place to live and work or retire.

- Forest industry activities – forest harvesting is common on provincial crown land within the AOI.
- Poor slash hazard abatement practices have been attributed to some operations which can lead to high fuel loading along roadsides.
- Within the District AOI, approximately 29% of the landbase is characterized as ALR. This area is dominated by irrigated crop or 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.

4.1.2 Fire Weather Rating

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

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

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

[39] District of Kent OCP

- **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 Haig Camp weather station (daily data for the years 2002 – 2018). According to Figure 1, the months with the highest average number of 'high' fire danger class days are August and July. Historically, 'high' fire danger days also occur in June and even extend into May and October. The average number of 'extreme' fire danger class days is highest in July and August. However, 'extreme' fire danger class days extend into June and September. August historically has the highest number of days in the 'extreme' class when compared to June, July, and September; August also has the highest number of 'high' danger class days.

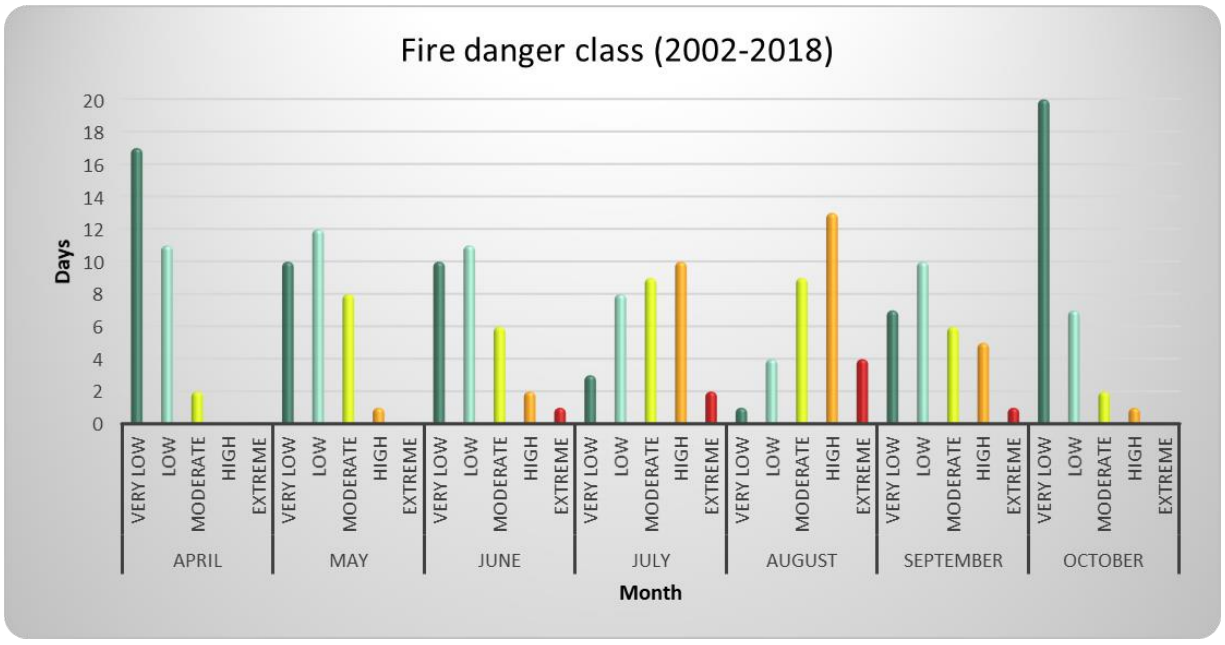


Figure 1. Average number of danger class days for the Haig Camp weather station. Summary of fire weather data for the years 2002 - 2018.

4.1.3 Climate Change

Climate change is a serious and complex aspect to consider in wildfire management planning. Warming of the climate system is unequivocal, and since the 1950s, each of the last three decades has been successively warmer at the Earth's surface than any preceding decade since 1850. The period from 1983 to 2012 was likely the warmest 30-year period of the last 1400 years in the Northern Hemisphere.[40]

Numerous studies outline the nature of these impacts on wildland fire across Canada, and globally. Although there are uncertainties regarding the extent of the impacts of climate change 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 run-off, and soil and fuel moisture during early fire season.

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

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

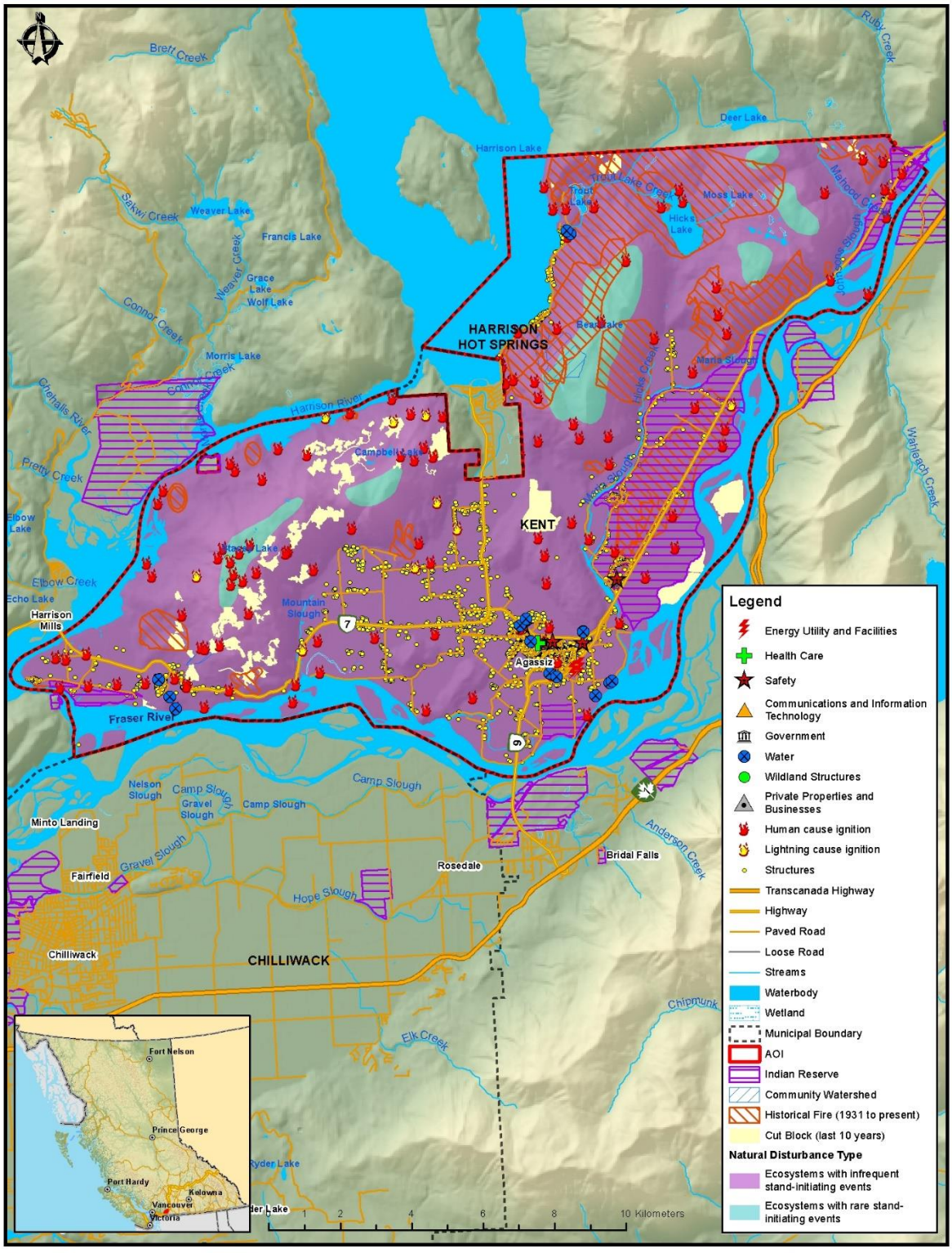
Insects and disease occurrence of spruce beetle and Swiss needle cast may increase; outbreaks of western hemlock looper may increase.[43] Other research regarding the intricacies of climate change and potential impacts on wildfire threats to Canadian forests has found that:

[40] International Panel on Climate Change. (2014) Climate change 2014: Synthesis report, summary for policymakers. 32p.
[41] Dale, V. et al. 2001.
[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.

- Fuel moisture is highly sensitive to temperature change and projected precipitation increases will be insufficient to counteract the impacts of the projected increase in temperature. Results conclude that future conditions will include drier fuels and a higher frequency of extreme fire weather days.[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.[45] The length of fire seasons is expected to increase and the increase will be most pronounced in the northern hemisphere, specifically at higher latitude northern regions. Fire season severity seems to be sensitive to increasing global temperatures; larger and more intense fires are expected and fire management will become more challenging.[46, 47]
- More extreme precipitation events (increased intensity and magnitude of extreme rainfall) are expected, particularly in April, May and June, along with dry periods between major events (increased summer drought periods). Annual runoff is also expected to increase and the timing of peak flows are anticipated to occur earlier in the spring.[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. This trend is expected to be disproportionately felt in northern latitudes.[50]

[44] Flannigan, M.D et al. 2016.
[45] deGroot, W. J. et al. 2013.
[46] Flannigan, M.D et al. 2013.
[47] Jandt, R. 2013. Alaska Fire Science Consortium Research Brief 2013-3.
[48] British Columbia Agriculture & Food Climate Action Initiative, 2012. https://pics.uvic.ca/sites/default/files/uploads/publications/Adapt-FraserMetroVan%20Crawford.pdf
[49] Picketts, I., A. Werner, and T. Murdock for Pacific Climate Impacts Consortium. 2009. Climate Change in Prince George Summary of Past Trends and Future Projections.
[50] All research noted was completed for Canada or globally, not for the study area. Direct application of trends may not be appropriate, although general expectations for Canada were noted to be consistent across multiple studies.



Map 4. Fire Regime, Ecology and Climate Change.

4.2 PROVINCIAL STRATEGIC THREAT ANALYSIS

The Provincial Strategic Threat Analysis (PSTA) evaluates multiple data sets to provide a coarse (high-level) spatial representation of wildfire threats across BC. The information in this section is a synthesis of the BCWS' Provincial Strategic Threat Analysis 2017 Wildfire Threat Analysis Component.[51] Three inputs are combined to create the PSTA Wildfire Threat Analysis (WTA) Component:

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) (see Map 5 below).
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 often associated with high intensity crown fires in coniferous fuels and structure losses. For the WTA, 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, a measure of the energy output of the flaming front. HFI is directly related to flame length, fire spread rate and fuel consumption and a fire's leading edge. There is a strong correlation between HFI, suppression effort required and danger posed to suppression personnel. The HFI used in the WTA was developed using the 90th percentile fire weather index value.

The final wildfire threat analysis value was developed through an average weighting process of the aforementioned three layers: fire density 30%; HFI 60%; and spotting impact 10%. Water bodies were automatically given a value of 'no threat' (-1). 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).

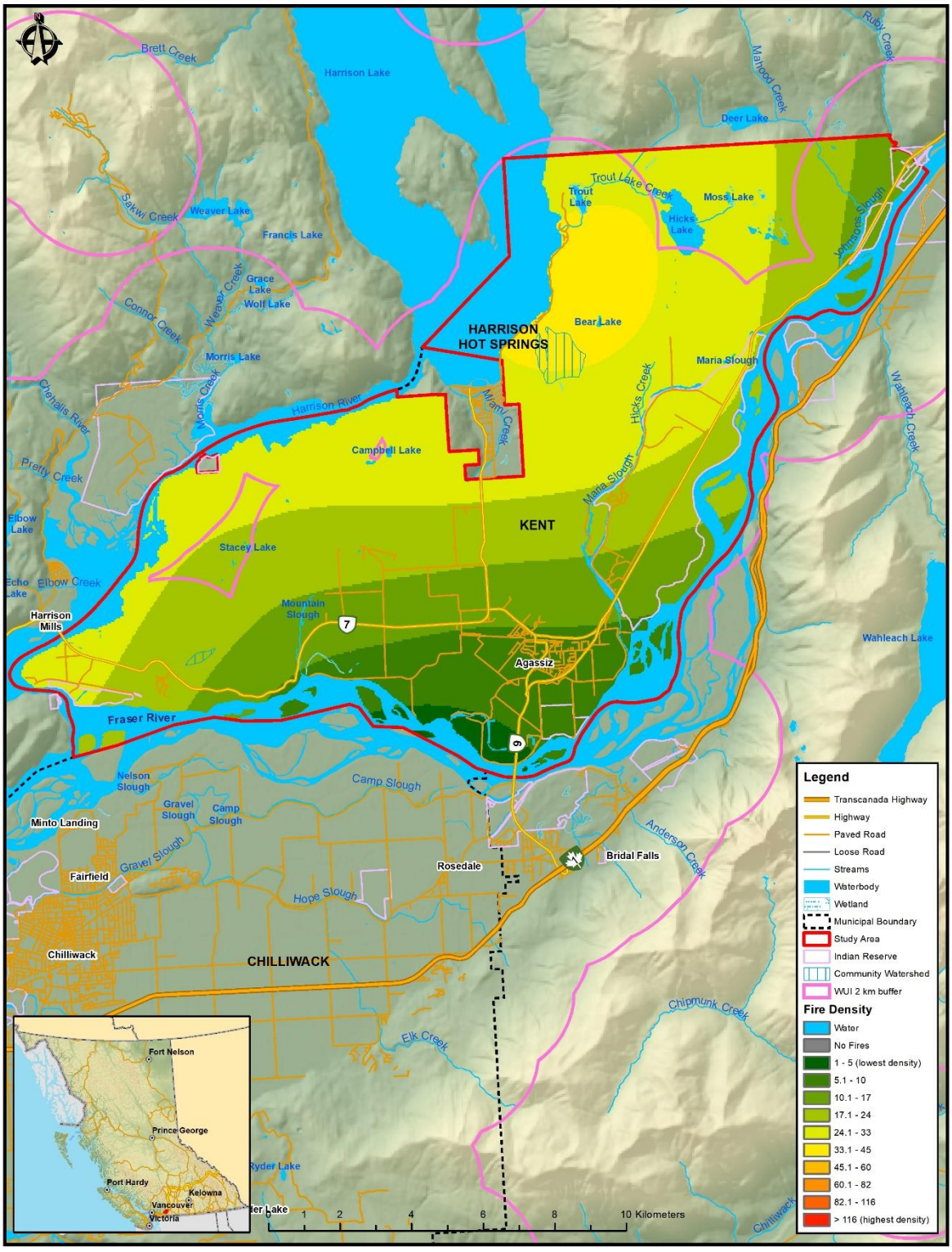
There are considerable limitations associated with the WTA Component based upon the accuracy of the source data and the modeling tools, the most notable being:

- Limited accuracy and variability of the fire history point data;
- Sensitivity to fuel type and the associated limitations of using fuel type approximations for fire behaviour modelling; and

[51] BC Wildfire Service. 2015. *Provincial Strategic Threat Analysis 2015 Wildfire Threat Analysis Component*. Retrieved from: https://www.for.gov.bc.ca/ftp/!Project/WildfireNews/PSTA/Provincial_Strategic_Threat_Analysis_PSTA_2015_REPORT.pdf. Accessed January 9, 2018.

- 90th percentile rating for HFI, which represents a near worst-case scenario which may be artificial in some circumstances.

The WTA serves to provide a provincial-level threat assessment for resource and land managers and local governments in order to complete landscape fire management planning and strategically plan efficient and effective wildfire risk reduction initiatives (i.e., placement or prioritization of fuel treatment areas, identification of values at risk, FireSmart planning, etc.). The WTA is then validated at the stand level in order to produce a finer, more accurate assessment of local threat.



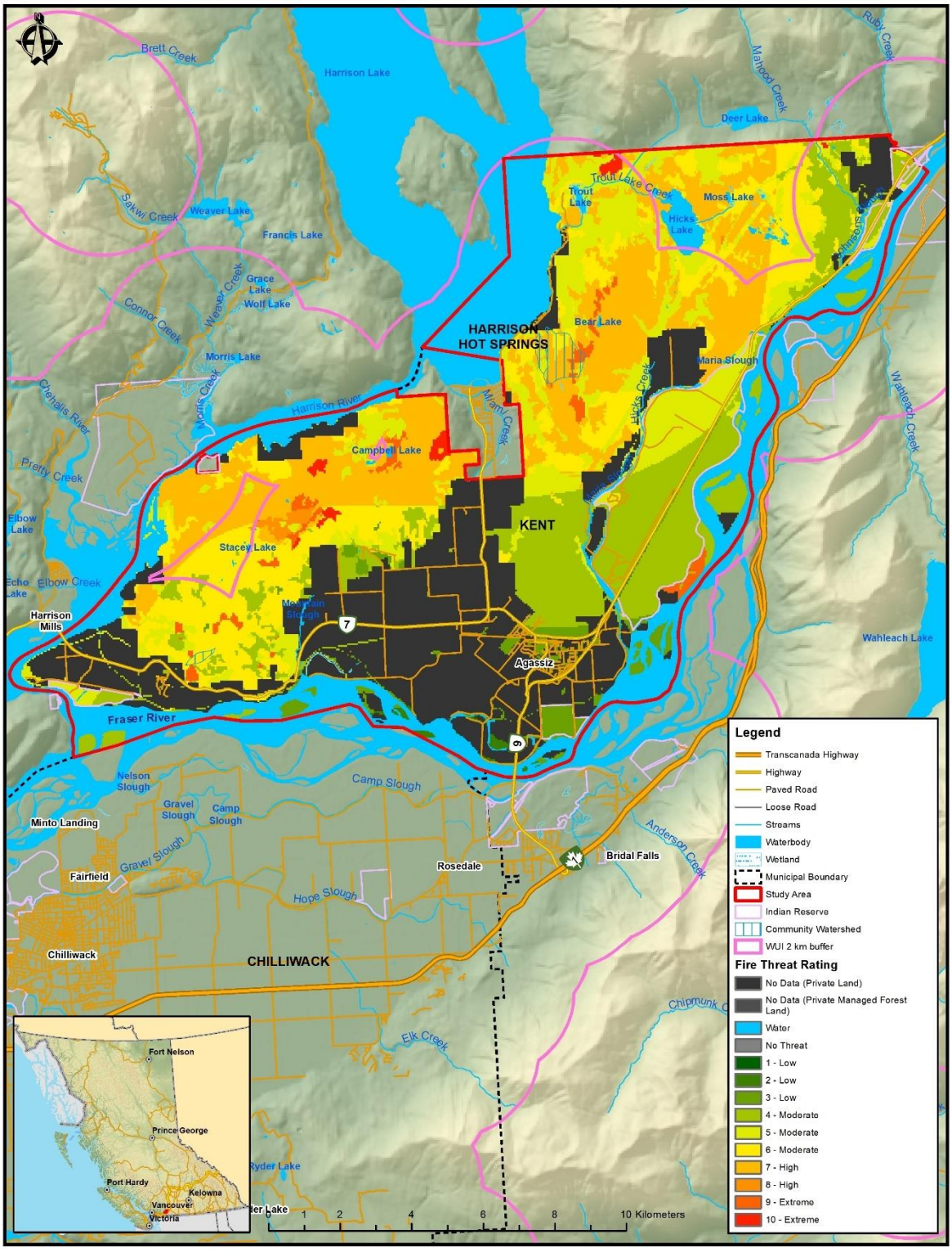
Map 5. Historical Fire Density.

4.2.1 PSTA Final Wildfire Threat Rating

Approximately a quarter of the AOI (24%) is categorized as either private land or private managed forest land and has no data for wildfire threat in the (PSTA). Low threat areas cover 3% of the AOI and water covers 16%. Approximately 39% of the AOI is categorized as having a moderate wildfire threat rating in the provincial Wildfire Threat Analysis (Table 8). High and extreme threat rating covers 20% of the study area, with the most notable high-threat areas being concentrated in the Mount Woodside area, particularly the north facing slopes above Harrison Lake, and the forested area (including Bear Lake and Hicks Lake areas) north and west of Maria Slough (Map 6). A patch of extreme threat area is also present east of the Seabird Island Indian Reserve and bordering the Fraser River.

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	5,278	No Data (Private Land)	24%
-2	0	No Data (Private Managed Forest Land)	0%
-1	3,441	Water	16%
0	0	No Threat	0%
1	0	Low	3%
2	72		
3	535		
4	3,158	Moderate	39%
5	2,560		
6	2,841		
7	3,817	High	18%
8	68		
9	239	Extreme	2%
10	100		
Total	**22,109**	-	**100%**



Map 6. Provincial Strategic Threat Rating.

4.2.2 Spotting Impact

Spotting impact is modeled by fuel type and distance class from a given fuel type. The layer estimates the threat of embers impacting a given point on the landscape from the fuel types surrounding it.

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 in advance of the fire front. Firebrands can be transported long distances ahead of the wildfire, across fire guards and fuel breaks, and accumulate in densities that can exceed 600 embers per square meter. Combustible materials found adjacent or near to values at risk can provide fire pathways allowing spot surface fires ignited by embers to spread and carry flames or smoldering fire into contact with structures.

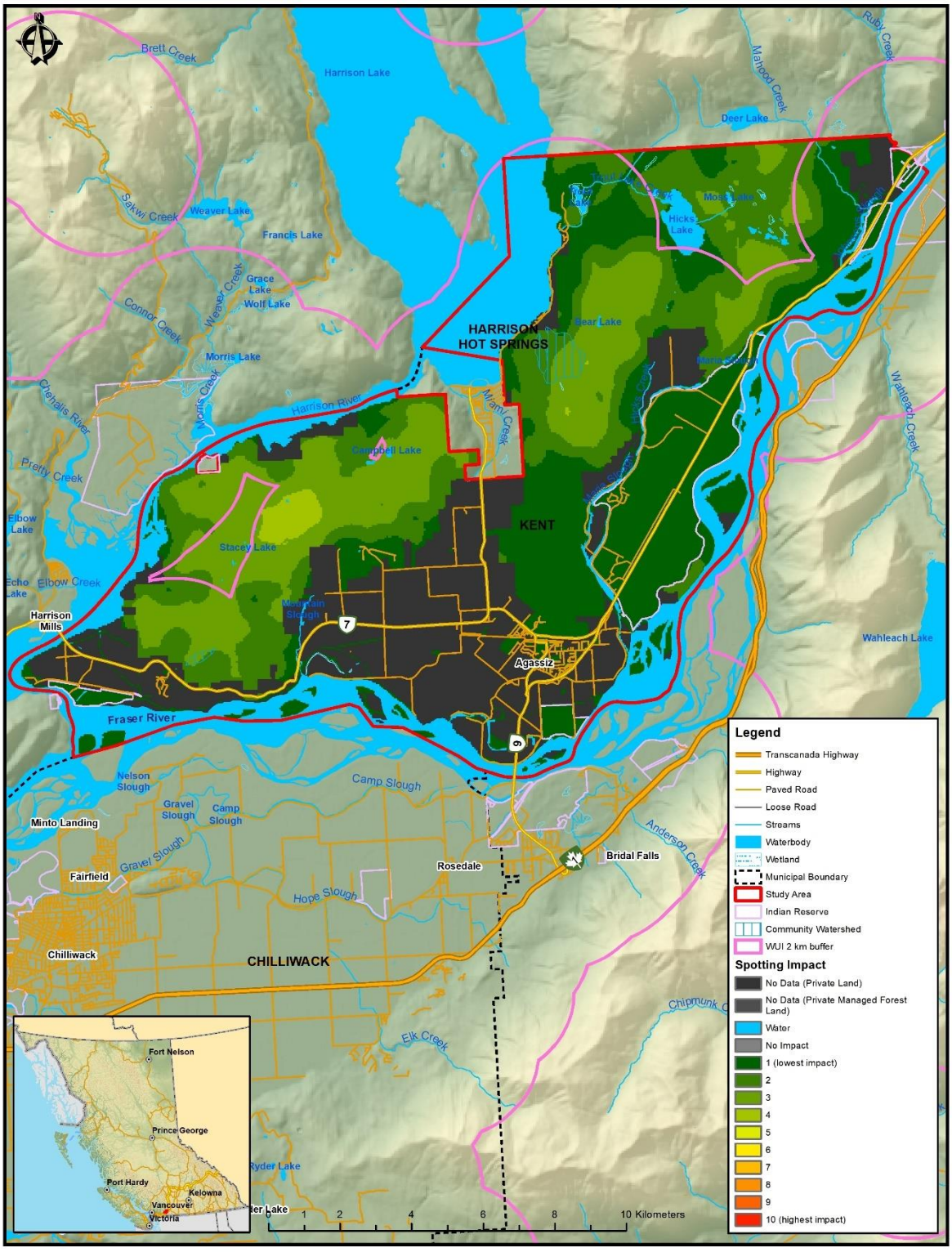
For example, an investigation of home destruction from the 2016 Fort McMurray, Alberta fire found that the vast majority of home ignitions in the interface (outer edges of urban neighbourhoods) were attributable to embers alighting on combustible material (home or adjacent areas).[52] Similarly, reports from the 2010 Fourmile Canyon fire outside Boulder, Colorado, found that only 17% of the 162 homes destroyed were attributed to crown fire.[53,54] Instead of high intensity flames or radiant heat, the majority of homes ignited as a result of firebrands (or embers), which ignited lower-intensity surface fires adjacent to structures or the home directly.[54] Post-fire studies have shown that it is uncommon for homes to be partially damaged by wildfire; survivability is based upon whether or not the structure, or area adjacent to the structure, ignites.

The AOI appears to be generally low in terms of spotting impact with one isolated area of moderate potential impact northeast of Stacy Lake in the Mount Woodside area and even smaller isolated patches of moderate potential impact south of Bear Lake (Map 7).

[52] Westhaver, A. 2017. *Why some homes survived. Learning from the Fort McMurray wildland/urban interface fire disaster*. A report published by the Institute for Catastrophic Loss Reduction – ICLR research paper series – number 56. https://www.iclr.org/images/Westhaver_Fort_McMurray_Final_2017.pdf

[53] 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/.

[54] Graham, R., M. Finney, C. McHugh, J. Cohen. D. Calkin, R. Stratton, L. Bradshaw, N. Nikolov. 2012. Fourmile Canyon Fire Findings. Gen. Tech. Rep. RMRS-GTR-289. Fort Collins, CO: U.S. Department of Agriculture, Forest Service, Rocky Mountain Research Station. 110 p.



Map 7. Spotting Impact within the AOI/Study Area.

4.2.3 Head Fire Intensity

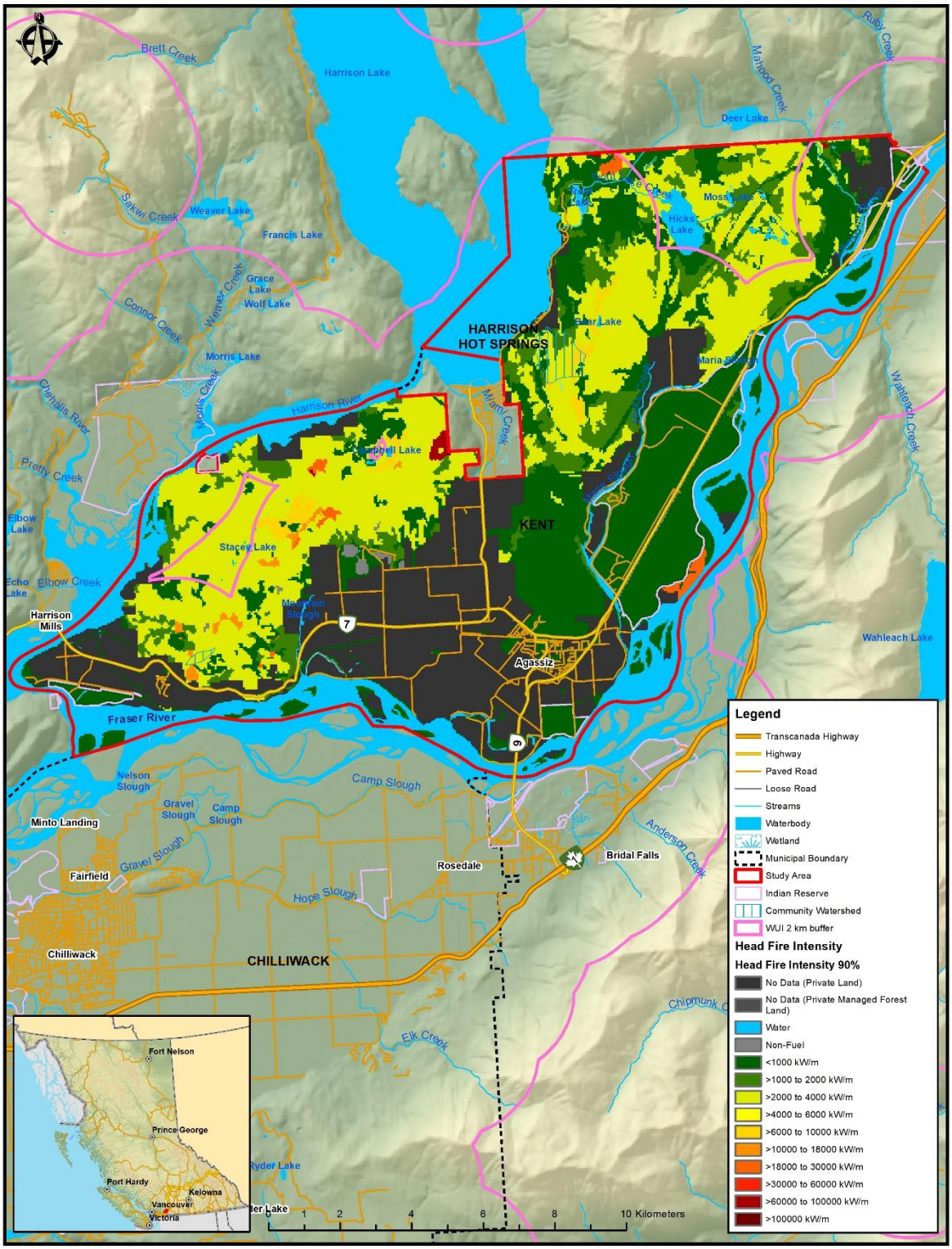
HFI is correlated with flame length and fire behaviour. The greater the fire intensity (kW/m), or HFI and fire intensity class, the more extreme the fire behaviour is likely to be and the more difficult the fire will likely be to suppress (Table 9 and Map 8).

In the AOI, generally speaking, the highest fire intensity class is 9, which represents a blowup or conflagration with extreme and aggressive fire behaviour (Table 9). Class 9 as well as class 6, representing highly vigorous surface fire with torching and/or continuous crown fire; and class 4, representing vigorous surface fire with occasional torching, are quite uncommon in the AOI (<1% to 1% of the area, respectively). Classes 1 and 3 dominate throughout at 26% and 25% of the AOI area, respectively (Map 8). Class 3 is described as vigorous surface fire and classes 2 and 1 are described as moderate vigour surface fire and smouldering surface fire, respectively.

Table 9. Head Fire Intensity Classes and Associated Fire Behaviour.

PSTA - HFI Class	Fire Intensity kW/m	Fire Intensity Class[55]	Percent of AOI	Flame Length (meters)[56]	Likely Fire Behaviour[57]
1	0.01 – 1,000	2	26	< 1.8	Smouldering surface fire
2	1,000.01 – 2,000	3	7	1.8 to 2.5	Moderate vigour surface fire
3	2,000.01 – 4.000	4	25	2.5-3.5	Vigorous surface fire
4	4,000.01 – 6,000	5	1	3.5 to 4.2	Vigorous surface fire with occasional torching
5	6,000.01 – 10,000	5	0	4.2 to 5.3	Vigorous surface fire with intermittent crowning
6	10,000.01 – 18,000	6	1	12.3 to 18.2	Highly vigorous surface fire with torching and/or continuous crown fire
7	18,000.01 – 30,000	6	0	18.2 to 25.6	Extremely vigorous surface fire and continuous crown fire
8	30,000.01 – 60,000	6	0	>25.6[58]	Extremely vigorous surface fire and continuous crown fire, and aggressive fire behaviour
9	60,000.01 – 100,000	6	<1	>25.6	Blowup or conflagration, extreme and aggressive fire behaviour
10	≥ 100,000	6	0	>25.6	Blowup or conflagration, extreme and aggressive fire behaviour

[55] Head fire intensity should be classified by intensity class not fire rank. Fire rank is a visual description of conifer fires for air operations.
[56] For calculating Flame Length, Bryam (1959) was used for surface fire (<10 000 kW/m) and Thomas (1963) was used for crown fire situations (>10 000 kW/m).
[57] These characteristics will be different in open and closed forest fuel.
[58] With HFI over 30 000 kW/m the function of the equation are stretched beyond the expectation of the equation, fire is under the influence too many other factors.



Map 8. Head Fire Intensity within the AOI/Study area.

4.2.4 Fire History

Fire ignition and perimeter data are depicted in Map 4. It was reported from BCWS (personal communication) that most fire activity in the District AOI has occurred due to recreationalists leaving abandoned campfires, and using cut blocks for target practice. Locally, BCWS prevention activity is focused on patrolling popular areas to enforce fire bans during the fire season.

As shown in Map 4, small to large historical wildfires have burned throughout the AOI. Fire ignition data for the area is available for 1951-2017 and fire perimeter data from 1931-2018. Based on the fire ignition data, there have been 190 fire incidents within the AOI; 165 of these ignitions were human-caused and 10 were of miscellaneous/undetermined cause. Based on the fire perimeter data, of the 26 fires that burned within the AOI, the top 10 fires burning the greatest number of hectares occurred throughout the range of the historical record (1931-2018) with the largest covering over 1,547 ha and the smallest covering 121 ha. Eight of these top 10 fires were human-caused (including the largest fire), one was lightning caused and one was of undetermined cause. The remaining fires in the historical record ranged in size from less than 1 ha to 86 ha.

4.3 LOCAL WILDFIRE THREAT ASSESSMENT

WUI Threat Assessments were completed over five field days in June, August and November of 2018, in conjunction with verification of fuel types. 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 WTA class - Field assessments were clustered in those areas with WTA classes of 5 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 provincial and municipal land was the main focus of field assessments.
- Local knowledge – Areas identified as hazardous, potentially hazardous, with limited access / egress, or otherwise of particular concern as vulnerable to wildfire, as communicated by local fire officials and BCWS zone staff.
- Observations – Additional areas potentially not recognized prior to field work were visually identified as hazardous and assessed during the week.

A total of 20 WUI threat plots were completed and over 175 other field stops (i.e., qualitative notes, fuel type verification, and/or photograph documentation) were made across the AOI (see Appendix E for WUI threat plot locations).

4.3.1 Fuel Type Verification

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.[59] 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.[60] 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 study area, fuel types which cannot accurately capture the natural variability within a polygon, and limitations in the data used to create initial fuel types.[60] Details regarding fuel typing methodology and limitations are found in Appendix F. 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 10 summarizes the fuel types by general fire behaviour (crown fire and spotting potential). In general, the fuel type that may be considered hazardous in terms of fire behaviour and spotting potential in the AOI is the C-3 fuel type, particularly if there are large amounts of woody fuel accumulations or denser understory ingrowth. The C-5 fuel type has a moderate potential for active crown fire when wind-driven.[60] An M-1/2 fuel type can sometimes be considered hazardous, depending on the proportion of conifer stems 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.[61] 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.

[59] Forestry Canada Fire Danger Group. 1992. Development and Structure of the Canadian Forest Fire Behavior Prediction System: Information Report ST-X-3.
[60] Perrakis, D. and G. Eade. 2015. BC Wildfire Service. Ministry of Forests, Lands, and Natural Resource Operations. *British Columbia Wildfire Fuel Typing and Fuel Type Layer Description* 2015 Version.
[61] Ibid.

Table 10. 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, C-4, C-7 and O-1a/b are not summarized below).

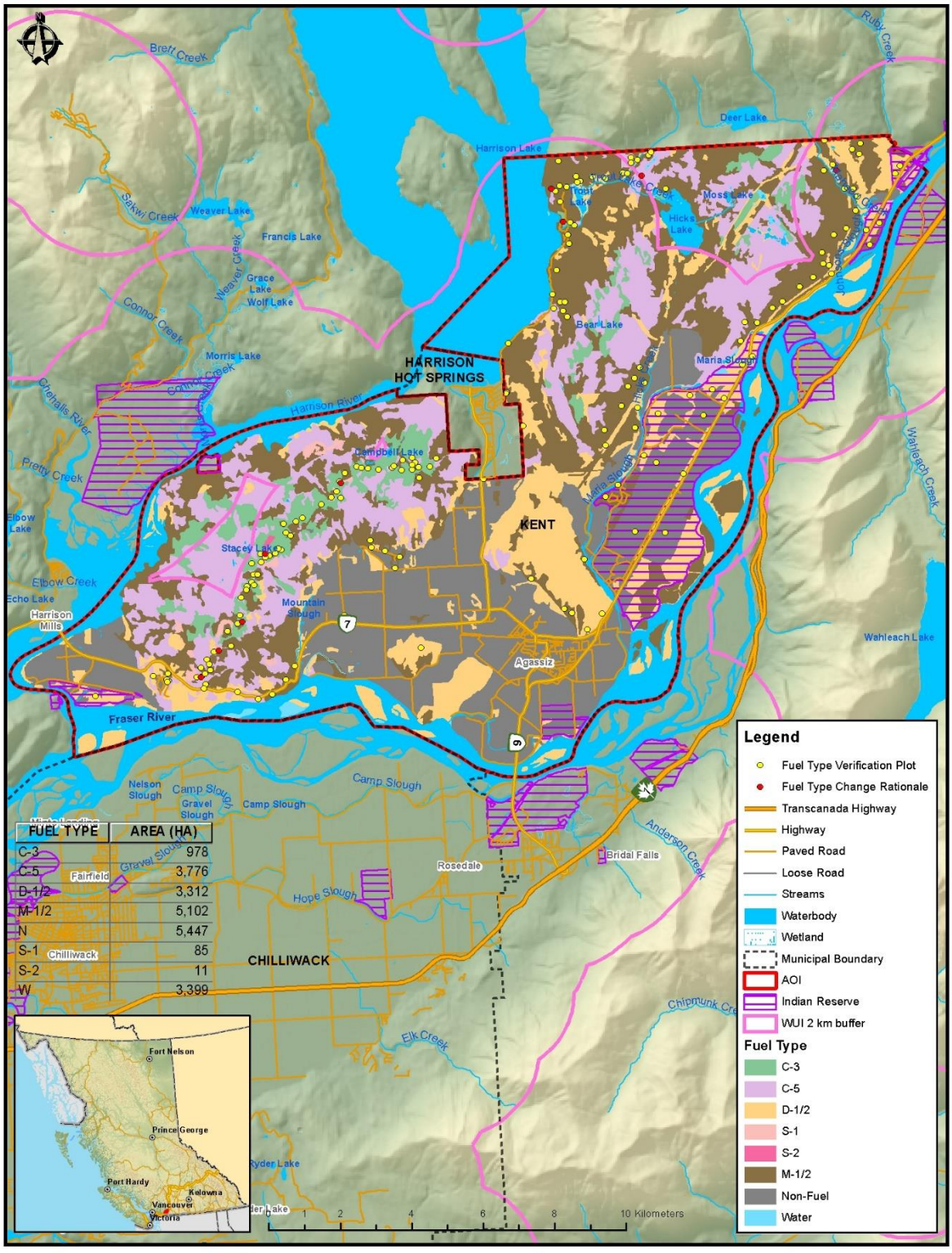
Fuel Type	FBP / CFDDRS Description	Study Area Description	Wildfire Behaviour Under High Wildfire Danger Level	Fuel Type – Crown Fire / Spotting Potential
C-3	Mature jack or lodgepole pine	Fully stocked, late young forest (western red cedar, hemlock, and/or Douglas-fir), with crowns separated from the ground	Surface and crown fire, low to very high fire intensity and rate of spread	High*
C-5	Red and white pine	Well-stocked mature forest, crowns separated from ground. Moderate understory herbs and shrubs. Often accompanied by dead woody fuel accumulations.	Moderate potential for active crown fire in wind-driven conditions. Under drought conditions, fuel consumption and fire intensity can be higher due to dead woody fuels	Low
M-1/2	Boreal mixed wood (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, nine 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-5;
- S-1 fuel types identified as C-5;
- D-1/2 fuel types identified as C-5;
- C-5 fuel types identified as M-1/2;
- S-2 fuel types identified as M-1/2;
- M-1/2 fuel types identified as S-1;
- C-3 fuel types identified as C-5;
- C-5 fuel types identified as D-1/2; and
- M-1/2 fuel types identified as D-1/2.

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



FUEL TYPE	AREA (HA)
C-3	978
C-5	3,776
D-1/2	3,312
M-1/2	5,102
N	5,447
S-1	85
S-2	11
W	3,399

Map 9. Updated Fuel Type.

4.3.2 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 given 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 11 describes the classes associated with proximity of fuels to the interface.

Table 11. 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	(101-500 m)	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.*

4.3.3 Fire Spread Patterns

Wind speed, wind direction, and fine fuel moisture condition influence wildfire trajectory and rate of spread. Wind plays a predominant role in fire behaviour and direction of fire spread and is summarized in the Initial Spread Index (ISI) Rose(s) from the local representative BCWS weather station, Haig Camp. [62] The ISI ose data is compiled hourly and provides an estimate of prevailing wind directions and wind speed in the area of the weather station.

During the fire season (April – October) winds from the northwest dominate in the afternoon (12-6pm) with the highest ISI values (related to wind speed) in the 18-24 range occurring in April and the highest frequency of high ISI values (12-18) occurring in July and August (based on hourly data for date ranges

[62] MFLNRORD, 2018. Retrieved online: https://www.for.gov.bc.ca/ftp/HPR/external/!publish/Website/ISI%20Roses/

as indicated in Figure 2). Winds are predominantly from the northwest and east overnight (between 6pm and 6am) and continue from these directions between 6 am and noon. Figure 3 illustrates the ISI windrose showing average daily wind readings during the fire season. The highest ISI values and frequency of winds generally occur from the northwest throughout the fire season (Figure 3). Potential treatment areas were identified and prioritized with the predominant wind direction in mind; wildfire that occurs upwind of a value poses a more significant threat to that value than one which occurs downwind.

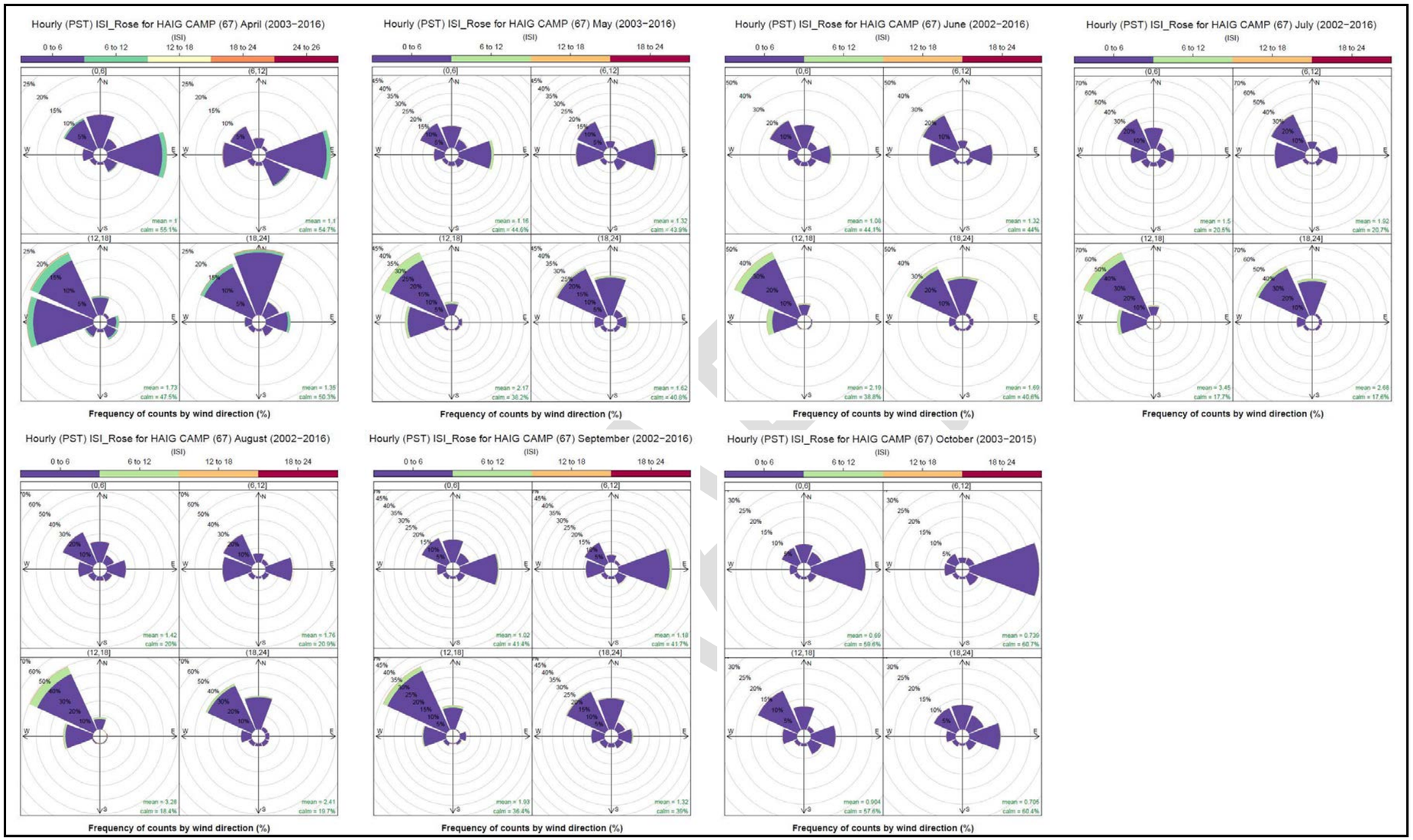


Figure 2. ISI roses depicting average hourly Initial Spread Index values (indicative of windspeed) for the fire season April – October. Data was sourced from the BCWS Haig Camp weather station for date ranges as indicated in each monthly graphic. The ISI roses in each month are depicted for four daily time periods: (000 – 600 hrs (0, 6), 600 -1200 hrs (6, 12), 1200 -1800 hrs (12, 18) and 1800 -2400 hrs (18, 24). The length of each bar represents the frequency of readings in % and bar colour indicate the ISI value range (reflecting windspeed) from lowest (purple) to highest (red). The mean ISI value and the percent frequency of 'no wind events' (calm) are provided in each graphic.[63]

[63] Source BCWS, 2018. Tools for Fuel Management. Initial Spread Index Roses. Retrieved online: https://www2.gov.bc.ca/gov/content/safety/wildfire-status/prevention/fire-fuel-management/fuel-management.

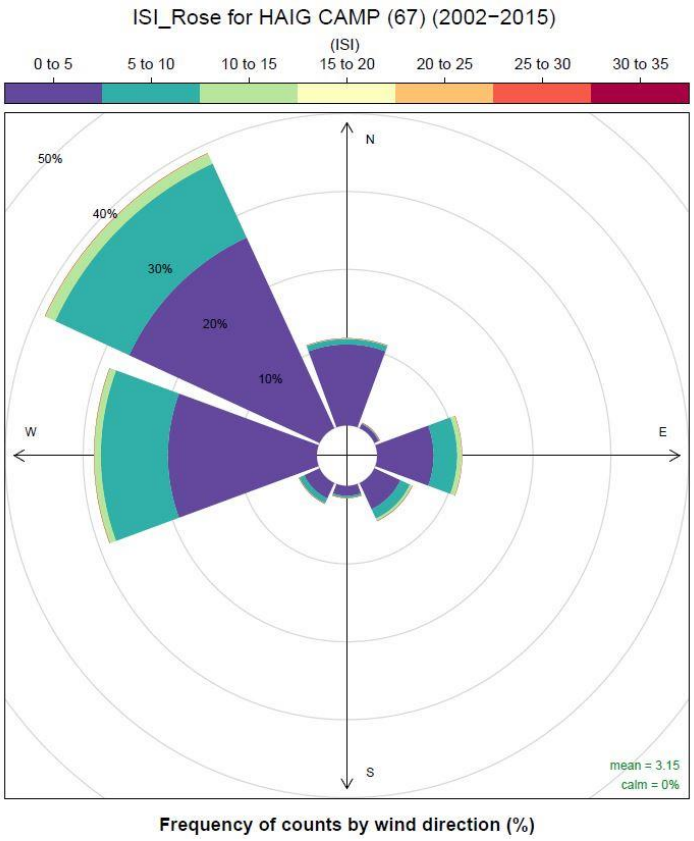


Figure 3. ISI rose showing average daily wind readings during the fire season (April 1 – October 31) 2002 – 2015. Data taken from the Haig Camp weather station. The length of each bar represents the frequency of readings in % and bar colour indicates the ISI value range from lowest (purple) to highest (red). The mean ISI value and the percent frequency of 'no wind events' (calm) is provided in bottom right hand corner of the graphic.

4.3.4 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 12 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 13. A value placed at the bottom of the slope is equivalent to a value on flat ground (see Table 12). A value on the upper 1/3 of the slope would be impacted by preheating and faster rates of spread (Table 13). Just over half of the AOI (55%) is on less than 20% slope and will likely not experience accelerated rates of spread due to slope class. Approximately 45% percent of the study area is likely to experience an increased or high rate of spread. On the larger topographic scale, the District of Kent and its commercial, recreational and residential developments would be considered valley bottom in the floodplain areas to bottom of the slope through upper slope in the hilly and mountainous areas of the AOI.

Table 12. Slope Percentage and Fire Behaviour Implications.

Slope	Percent of AOI	Fire Behaviour Implications
<20%	55	Very little flame and fuel interaction caused by slope, normal rate of spread.
21-30%	7	Flame tilt begins to preheat fuel, increase rate of spread.
31-45%	12	Flame tilt preheats fuel and begins to bathe flames into fuel, high rate of spread.
46-60%	10	Flame tilt preheats fuel and bathes flames into fuel, very high rate of spread.
>60%	16	Flame tilt preheats fuel and bathes flames into fuel well upslope, extreme rate of spread.

Table 13. Slope Position of Value and Fire Behaviour Implications.

Slope Position of Value	Fire Behaviour Implications
Bottom of Slope/ Valley Bottom	Impacted by normal rates of spread.
Mid Slope - Bench	Impacted by increased 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.

4.3.5 Local Wildfire Threat Classification

Using the verified and updated fuel types combined with field wildfire threat assessments, local wildfire threat for the study area was updated. Using the 2016 methodology, 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).

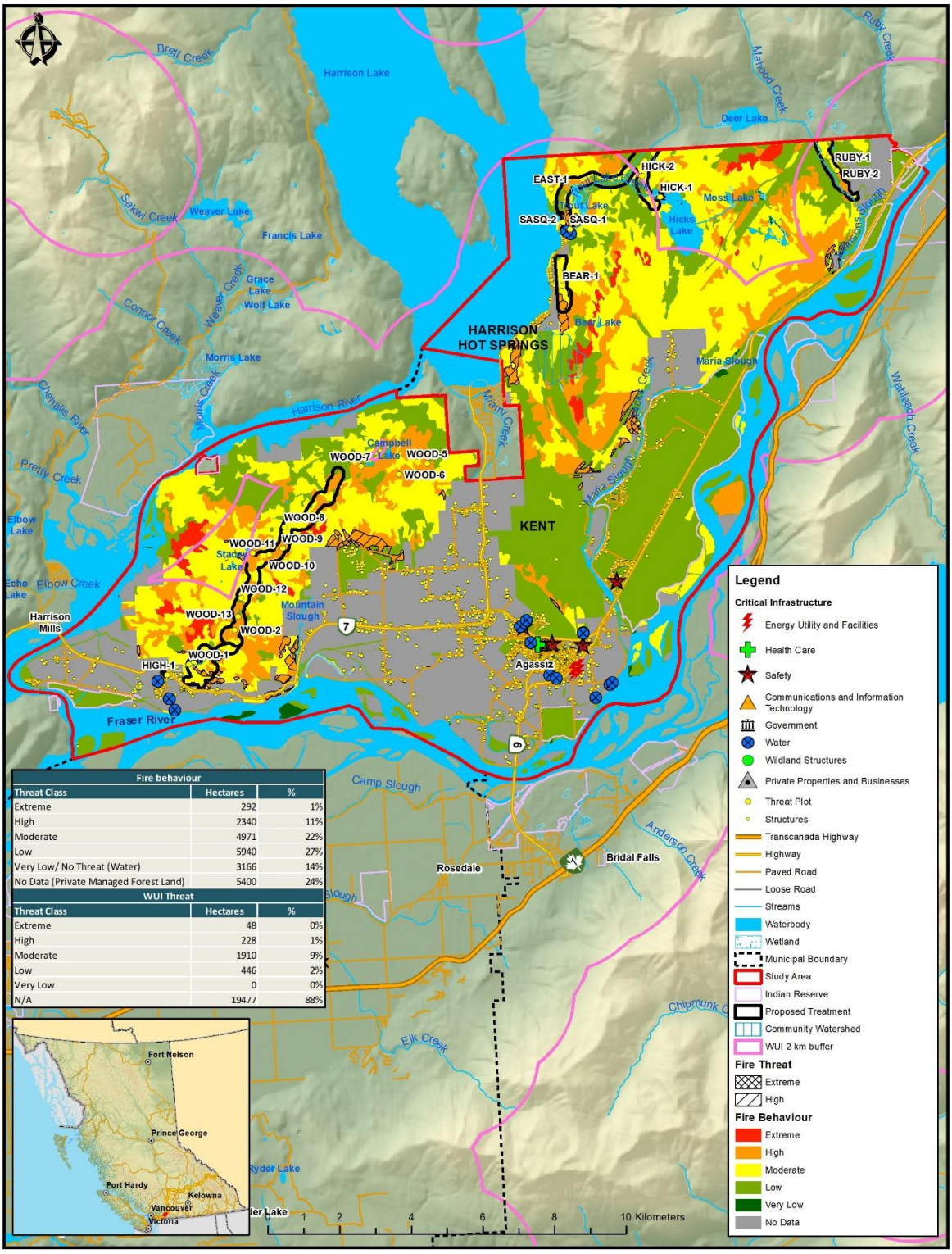
The result of the analysis shows that the study area is composed of a mosaic of very low, low, moderate and high threat class stands with a very minor component of extreme threat class. The variability in wildfire threat is dictated primarily by the level of natural and anthropogenic disturbances that have historically occurred and persist on the landbase. The study area is 1% extreme threat class rating, 7% high, 40% moderate, 26% low and 9% very low/water (Table 14). The remaining 17% 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 the Strategic Wildfire Protection Initiative (SWPI) and is therefore outside the scope of this CWPP. Table 14 also indicates the differences between the original PSTA threat rating and this CWPP's corrected fire behaviour threat.

The areas that represent the highest wildfire behavior potential and greatest risk to values within the Kent AOI are areas of high and extreme threat class in the Mount Woodside area, particularly adjacent to residential areas, the Federal prison and Cemetery Road area; and in the forested area between Harrison Lake and the Fraser River and east of Harrison Hot Springs.

For detailed methodology on the local threat assessment and classification, please see Appendix G – WUI Threat Assessment Methodology.

Table 14. Fire behaviour threat summary for the study area.

Wildfire Behaviour Threat Class	2017 PSTA Data	2017 CWPP
	Percent of AOI	Percent of AOI
Extreme	2	1
High	18	11
Moderate	39	22
Low	3	27
Very Low/ No Threat (Water)	16	14
No Data (Private Land and Private Managed Forest Land)	24	24



Fire behaviour		
Threat Class	Hectares	%
Extreme	292	1%
High	2340	11%
Moderate	4971	22%
Low	5940	27%
Very Low/ No Threat (Water)	3166	14%
No Data (Private Managed Forest Land)	5400	24%

WUI Threat		
Threat Class	Hectares	%
Extreme	48	0%
High	228	1%
Moderate	1910	9%
Low	446	2%
Very Low	0	0%
N/A	19477	88%

Map 10. Local Fire Behaviour Threat Rating and WUI Threat Rating.

SECTION 5: RISK MANAGEMENT AND MITIGATION FACTORS

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

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

5.1 FUEL MANAGEMENT

Fuel management, also referred to as vegetation management or fuel treatment, is a key element of wildfire risk reduction. For the purpose of this discussion, fuel management generally refers to native vegetation/fuel modifications in forested areas greater than 30 m from homes and structures. The principles of fuel management are outlined in detail in Appendix H. No known fuel treatments have been completed within the AOI to date.

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 this 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.

Historically, funds from public sources, such as the Forest Enhancement Society of BC (FESBC) and the Union of British Columbia Municipalities (UBCM), were only eligible to be used on Crown lands and could not be used to treat private land. While this is still the case for the FESBC program, the new Community Resiliency Investment (CRI) Program (formerly SWPI) provides funding for selected FireSmart activities and planning on private land (subject to program requirements and limits).[64] It is important to recognize that almost a quarter of the AOI (24%) is located on private land or private managed forest land, which increases some of the challenges encountered in mitigation of fuels on private lands. The best approach to mitigate fuels on private lands is to urge private landowners to comply with FireSmart guidelines (as described below in Section 5.2) and to conduct appropriate fuel modifications using their own resources (CRI program funding may be available). In general, when considering fuel management to reduce fire risk, the following steps should be followed:

- Carefully anticipate the likely wildfire scenarios to properly locate fuel modification areas;
- Acquire an understanding of local ecological, archaeological, and societal values of the site;
- Prescriptions should be developed by a qualified professional forester working within their field of competence;
- Public consultation should be conducted during the process to ensure community support;
- Potential treatment areas and draft prescriptions should be referred to First Nations with sufficient time for meaningful review and input;
- Treatment implementation should weigh the most financially and ecologically beneficial methods of fulfilling the prescription's goals;
- Treatment implementation should consider the possibility of invasive species spread during treatments and mitigation options should be considered;
- 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 primary fuel breaks as defined in Section 5.1.1, to reduce the wildfire potential around the AOI. Potential treatment activities include fuel removal, thinning, stand conversion, pruning, and chipping, or a combination of two or more of these activities. Stand conversion has been shown to be effective at reducing wildfire potential in mixed-wood or conifer dominated stands and is recommended as a BMP to encourage a higher deciduous component. This approach generally involves a thin-from-below to reduce ladder fuels and crown fuels continuity, targeting the removal of conifer species and the retention of broadleaf species. Stand conversion fuel treatments are intricately linked to the

[64] 2019 CRI FireSmart Community Funding & Supports – Program & Application Guide. Retrieved online on Sept 20, 2018. https://www.ubcm.ca/assets/Funding~Programs/LGPS/CRI/cri-2019-program-guide.pdf

establishment and enactment of fire management stocking standards within the WUI 2 km buffer. The implementation of modified stocking standards plays a pivotal role in ensuring the success and effectiveness of stand conversion fuel treatments and associated reduction of fire hazard.[65]

In addition to the treatment units proposed in the following section, it is recommended that the District recognize important fuel treatment opportunities to improve emergency access and public safety along Hot Springs Road (Highway 9), Rockwell Drive, Lougheed Highway 7, and Agassiz Rosedale Highway 9, in the event of evacuation through reduction of hazardous fuels and landscape level fuel treatment.

RECOMMENDATION #15: The District should work with the Ministry of Transportation and Infrastructure (MOTI), to assess the area suitable for treatment (i.e., high hazard and non-private) along Highway 7 and Rockwell Drive and reduce hazardous fuels within 150 m of either side of the road, where possible. This is to increase public safety/improve emergency access in the event of an evacuation or wildfire event.

5.1.1 Proposed Treatment Units

Funding opportunities from UBCM have historically been limited to Crown Provincial, Regional District, or Municipal land under the SWPI Program. The UBCM SWPI funding stream (in place at the time this CWPP was developed) has transitioned, as of September 2018, into a new provincial program, the Community Resiliency Investment (CRI) Program, that will consider fire prevention activities on provincial Crown land and private land, in addition to local government and reserve land[66]. 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 either 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 or private managed forest 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 areas 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

[65]Forest Practices Board. (2006). Managing Forest Fuels. Special Report. Available online at: https://www.bcfpb.ca/wp-content/uploads/2016/04/SR29-Managing-Forest-Fuels.pdf

[66] This new funding program (up to $50 million over three years) was initiated 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

number of values at risk, common fire weather (wind direction), and expected efficacy of treatment. Although potential treatment areas have been ground-truthed during field work, additional refinement of the polygons will be required at the time of prescription development. Polygons will require detailed site-level assessment to stratify treatment areas (and areas of no treatment), identify values and constraints, and identify and engage all appropriate Provincial agencies, First Nations, and stakeholders.

Recommended potential treatment areas within the AOI are outlined in Table 15 and displayed in Map 11. 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), addressing fuels between the fuel break and structures (Interface Fuel Treatments), and applying FireSmart Standards to structures and the surrounding vegetation. Fuel breaks require periodic maintenance to retain their effectiveness.

Interface Fuel Breaks

Fuel breaks on Crown Land immediately adjacent to private land and in close proximity to the wildland urban interface and/or intermix areas, are termed 'interface fuel breaks'. These are designed to modify fire behaviour, create fire suppression options, and improve suppression outcomes. Interface fuel treatments are relatively small (approximately 100 metres 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 (at times with portions on private land) in strategic locations beyond the interface fuel treatments. Private land may be included in a primary fuel break so that the break represents a continuous fuel reduced area. Primary Fuel Breaks are designed to modify fire behaviour and create fire suppression options that reduce the risk of a crown fire reaching a community and/or adjacent private lands. Primary Fuel Breaks may be located to completely surround a community or be strategically placed upwind of communities and perpendicular to fire season winds. Primary Fuel Breaks have sufficient width and appropriate fuel reduction measures to break the crown fire threshold and reduce fire intensity such that overstory fire moves to the ground surface and spread rates are reduced. While there are no absolute standards for fuel break width or fuel manipulation in the literature and fuel break width will vary based on fuel type, topography, and expected fire behaviour[67], 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 #16: Proceed with detailed assessment, prescription development and treatment of hazardous fuel units and FireSmart fuel treatment demonstration treatment areas identified and prioritized in this CWPP.

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

Table 15. Proposed Treatment Area Summary Table.

FTU # and Stratum	Geographic Area	Priority	Total Area (ha)	Treatment Unit Type/ Objective	Local Fire Threat (ha)			Overlapping Values / Treatment Constraints*	Treatment Rationale
					Extreme / High	Mod	Low/Very Low		
1	Mount Woodside North	High	219.9	**Primary Fuel break Objective:** Fuel treatment will result in residual stands with characteristics that lower overall wildfire behaviour, reduce fuel loading and potential for extreme crown fire.	118.3	87.6	14.1	This proposed treatment unit (PTU) has minor overlap with pending woodlot W2061 under the client District Manager Chilliwack. There is also overlap with a forest licence under the client Western Canadian Forest (Canfor) Products, FFID A20542. Seven forest development units (FDUs) overlap with the PT under various clients. There are two active research installations present. A masked CDC Species at Risk (SAR) and two legal Old-Growth Management Areas (OGMAs), overlap the PTU. An active guide outfitting licence entirely encompasses the PTU, number 200698. Multiple fish species have been observed on the western edge of this TU. Consultation with an ecosystem biologist, Canfor, Ministry of Forests Lands and Natural Resource Operations and Rural Development (MFLNRORD) Chilliwack Natural Resource District, Forest Inventory MFLNRORD department, and all appropriate licensees must occur during prescription development and prior to implementation to ensure all concerns are addressed.	The Mount Woodside proposed treatment areas (2) are together intended to function as Primary Fuel Break by creating a 300 m wide area with decreased fire behaviour potential. The proposed fuel break is located on Mount Woodside Forest Service Road (FSR), to the northwest of the Mount Woodside neighbourhood and the Village of Harrison Hot Springs. This fuel break was strategically selected given its location upwind of prevailing fire season wind direction in relation to private residences. Mount Woodside FSR is primarily characterized by higher density conifer stands (C-3 fuel types), with smaller proportions of intermediate to mature conifer stands (C-5 fuel types), and mixed deciduous and conifer stands (M-1/2 fuel types). These stands have significant accumulations of coarse woody fuels and conifer ingrowth. Laddering Potential varies throughout the PTU but is generally high.

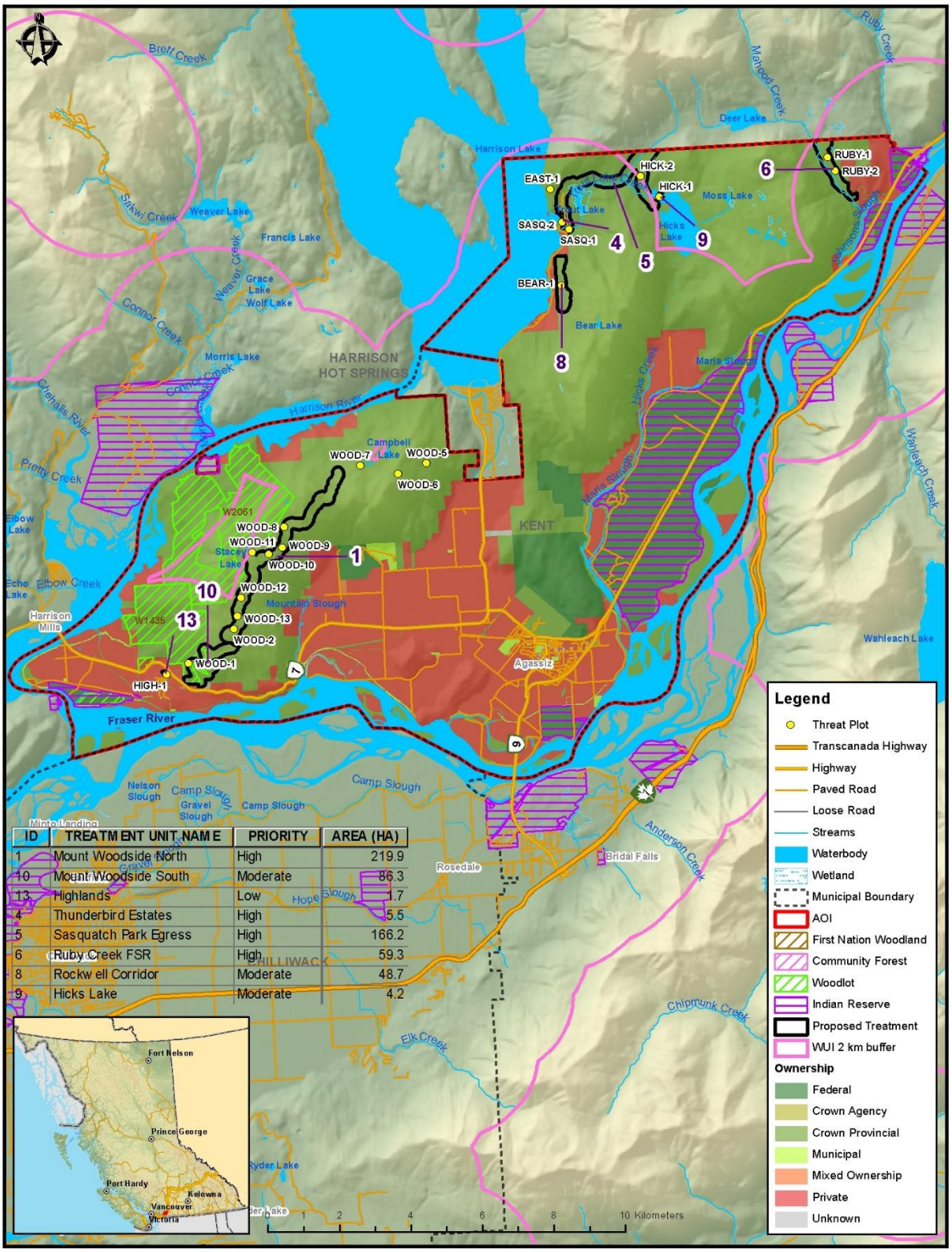
FTU # and Stratum	Geographic Area	Priority	Total Area (ha)	Treatment Unit Type/ Objective	Local Fire Threat (ha)			Overlapping Values / Treatment Constraints*	Treatment Rationale
					Extreme / High	Mod	Low/Very Low		
4	Thunderbird Estates	High	5.5	**Interface Fuel break Objective:** Fuel treatment will result in residual stands with characteristics that will reduce continuity of fuel loads, crown and surface fire behaviour, and wildfire risk.	5.5	0.0	0.0	This PTU lies entirely within Sasquatch Provincial Park. The Cogburn/Bear Creek waterpower crown tenure intersects the PTU from north to south. Five FDUs are present and overlapping. A masked CDC SAR is present, as are two legal OGMAs. A spotted owl Wildlife Habitat Area (WHA) under a conditional harvest zone provision overlaps the PTU as well. An active guide outfitting licence entirely encompasses the PTU, number 200698. A water reserve stream passes through this PTU. Consultation with, BC Parks, an ecosystem biologist, MFLNRORD Chilliwack Natural Resource District, and all appropriate licensees must occur during prescription development and prior to implementation to ensure all concerns are addressed.	The proposed treatment area is located north of Thunderbird Estates within approximately 250 m of private residences. The stand's characteristics of this area are described as - moderate to high density conifer stands (C-3 fuel types) with patchy to continuous ladder fuels and moderate levels of fine/coarse woody debris.

FTU # and Stratum	Geographic Area	Priority	Total Area (ha)	Treatment Unit Type/ Objective	Local Fire Threat (ha)			Overlapping Values / Treatment Constraints*	Treatment Rationale
					Extreme / High	Mod	Low/Very Low		
5	Sasquatch Park Egress	High	167.7	**Primary Fuel break Objective:** Fuel treatment will result in residual stands that lower overall wildfire behaviour, reduce fuel loading and bolster access / egress route into and out of Sasquatch Park.	23.0	63.9	79.3	This PTU lies almost entirely within Sasquatch Provincial Park. The Cogburn/Bear Creek waterpower crown tenure intersects the PTU in its western arm. Trapline licence TR0210T001 has slight overlap, and 7 FDUs overlap as well. A BC Hydro overhead electrical distribution line has minor intersection in the PTU's extreme southern reach. In the western arm of the PTU there is moderate overlap with a masked CDC SAR, and elsewhere there are overlaps with the BC CDC blue-listed species, the Northern Red-Legged Frog (*Rana aurora*). Overlaps exist with two legal OGMAs, and a spotted owl WHA under a condition harvest zone provision overlaps the PTU as well. Three streams and/or watercourses pass through the PTU, as do multiple water reserve streams. An active guide outfitting licence entirely encompasses the PTU, number 200698. There are multiple minor overlaps with mapped wetlands. Multiple fish species have been observed within this TU. Water wells 107857, 113734, and 86658 lie within the PTU. Consultation with, BC Parks, BC Hydro, an ecosystem biologist, MFLNRORD regional hydrologist, MFLNRORD Chilliwack Natural Resource District, and all appropriate licence holders must occur during prescription development and prior to implementation to ensure all concerns are addressed.	The proposed area is located within Sasquatch Park and is the only access/egress route to Hicks Lake Campground. The area has been strategically identified as a primary fuel break to reduce potential fire behaviour and improve suppression and/or evacuation efforts in the event of a wildfire.

FTU # and Stratum	Geographic Area	Priority	Total Area (ha)	Treatment Unit Type/ Objective	Local Fire Threat (ha)			Overlapping Values / Treatment Constraints*	Treatment Rationale
					Extreme / High	Mod	Low/Very Low		
6	Ruby Creek FSR	High	59.3	**Primary Fuel break Objective:** Fuel treatment will result in residual stands with characteristics that lower overall wildfire behaviour, reduce fuel loading and potential for extreme crown fire.	13.9	21.3	24.1	Eight FDUs intersect and overlap this PTU. Two gas and oil pipelines (Harrison Lake and Ruby Creek) under crown right-of-way tenures intersect with the PTU, as does one electric powerline (Kelly Lake). A masked CDC SAR overlaps the entire PTU. An active guide outfitting licence entirely encompasses the PTU, number 200698. A fire occurred within this PTU in 1935. Consultation with an ecosystem biologist, BC Hydro, and all appropriate licence holders must occur during prescription development and prior to implementation to ensure all concerns are addressed.	The proposed treatment area is located on Ruby Creek FSR and has been strategically recommended as a primary fuel break in order to reduce potential extreme fire behaviour. The area is 800 m south of a substation. The stand's characteristics of the proposed treatment area are primarily mixed deciduous and conifer stands (M-1/2 fuel types) with low crown base heights and moderate surface fuel loading.
8	Rockwell Corridor	Moderate	48.7	**Interface Fuel break Objective:** Fuel treatment will result in residual stands with characteristics that will reduce continuity of fuel loads, crown and surface fire behaviour, and wildfire risk.	14.1	32.8	1.8	Eight FDUs are present within this PTU. A spotted owl WHA under a condition harvest zone provision overlaps the PTU. Three points of diversion licences are present on three existing and intersect streams/watercourses. An active guide outfitting licence entirely encompasses the PTU, number 200698. Consultation with an ecosystem biologist and all appropriate licence holders must occur during prescription development and prior to implementation to ensure all concerns are addressed.	The proposed treatment area is located upwind and within less than 300 m of private residences on Rockwell corridor. Stands within the area are characterized primarily as mixed deciduous and conifer stands (M-1/2) with moderate surface and ladder fuel continuity.

FTU # and Stratum	Geographic Area	Priority	Total Area (ha)	Treatment Unit Type/ Objective	Local Fire Threat (ha)			Overlapping Values / Treatment Constraints*	Treatment Rationale
					Extreme / High	Mod	Low/Very Low		
9	Hicks Lake	Moderate	4.2	**FireSmart Treatment**	0.0	4.2	0.0	This PTU is entirely within Sasquatch Provincial Park. There are five overlapping FDUs. An area of approximately 4.5 ha within the PTU is habitat for a BC CDC blue-listed species, the Northern Red-Legged Frog (*Rana aurora*). Five invasive plant sites have been identified. A stream runs through the northern half of this PTU. An active guide outfitting licence entirely encompasses the PTU, number 200698. A water reserve stream passes through this PTU, and multiple fish species have been observed within. Consultation with an ecosystem biologist, BC Parks and all appropriate licence holders must occur during prescription development and prior to implementation to ensure all concerns are addressed.	The proposed area is located within Sasquatch Park and is surrounding a BC Parks campground. The proposed area would bolster the only access/egress route to Hicks Lake Campground. The area has been strategically identified as a FireSmart treatment to reduce ignition potential and fire behaviour.

FTU # and Stratum	Geographic Area	Priority	Total Area (ha)	Treatment Unit Type/ Objective	Local Fire Threat (ha)			Overlapping Values / Treatment Constraints*	Treatment Rationale
					Extreme / High	Mod	Low/Very Low		
10	Mount Woodside South	Moderate	86.3	**Interface Fuel break Objective:** Fuel treatment will result in residual stands with characteristics that will reduce continuity of fuel loads, crown and surface fire behaviour, and wildfire risk.	19.6	61.7	5.1	There is an active residential inventory tenure present in the southern extent of this PTU. A Sq'ewlets woodlot, FFID W1435, overlaps the western portion of the PTU. There is a Western Canadian Timber Products Ltd. forest license overlap in the northern portion of the PTU, FFID A20542. Seven FDUs overlap, and a small pest infestation was recorded in the north of the PTU (pest species code NW). The Edna Community Watershed overlaps the western portion of the PTU. An active guide outfitting licence entirely encompasses the PTU, number 200698. Water well 101078 lies within the PTU on the extreme southern edge. Consultation with all appropriate licence holders/licensees must occur during prescription development and prior to implementation to ensure all concerns are addressed.	The Mount Woodside proposed treatment areas (2) are together intended to function as Primary Fuel Break by creating a 300 m wide area with decreased fire behaviour potential. The proposed fuel break is located on Mount Woodside Forest Service Road (FSR), to the northwest of Mount Woodside neighbourhood and the Village of Harrison Hot Springs. This fuel break was strategically selected given its location upwind of prevailing fire season wind direction in relation to private residences. This unit is primarily characterized by higher density conifer stands (C-3 fuel types), with smaller proportions of intermediate to mature conifer stands (C-5 fuel types), and mixed deciduous and conifer stands (M-1/2 fuel types). These stands have moderate accumulations of coarse woody fuels and conifer ingrowth. Laddering Potential varies throughout the PTU but is generally moderate.
13	Highlands	Low	1.7	**FireSmart Treatment**	0.0	1.5	0.2	Six FDUs overlap the PTU. An active guide outfitting licence entirely encompasses the PTU, number 200698. Consultation with all appropriate licence holders/licensees must occur during prescription development and prior to implementation to ensure all concerns are addressed.	The proposed treatment area was identified as a potential FireSmart demonstration project, and is located within the newly developed Harrison Highlands neighbourhood. The treatment area is characterized as a mixed deciduous and conifer stand (M-1/2 fuel type), with high occurrence of invasive species. Treatment within this area would be ideal to display FireSmart principles to residents of Harrison Highlands.



ID	TREATMENT UNIT NAME	PRIORITY	AREA (HA)
1	Mount Woodside North	High	219.9
10	Mount Woodside South	Moderate	86.3
13	Highlands	Low	1.7
4	Thunderbird Estates	High	5.5
5	Sasquatch Park Egress	High	166.2
6	Ruby Creek FSR	High	59.3
8	Rockwell Corridor	Moderate	48.7
9	Hicks Lake	Moderate	4.2

Map 11. Proposed and Past Fuel Treatments.

5.1.2 Maintenance of Previously Treated Areas

As no fuel treatments have occurred within the District AOI, maintenance activities of previously treated areas are not applicable. However, if fuel treatments are to occur in the District 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 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 #17: As/if treatments are implemented; treatment monitoring to be completed by a qualified professional to schedule next set of maintenance activities (5 – 10 years out). This can be completed with 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.[68] FireSmart spans the disciplines of hazard/threat assessment; regional planning and collaboration; policy and regulations; public communication and education; vegetation/fuel management; training and equipment; and, emergency preparedness and response. FireSmart concepts provide a sound framework for advancing the goal of wildfire loss reduction, as it is a common goal shared with CWPPs.

The FireSmart approach and concepts, including recommended FireSmart guidelines[69], 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.

The following are key principles of FireSmart:

[68] FireSmart is the registered trademark held by the Partners in Protection Association.
[69] FireSmart guidelines first published in the 1999 manual "*FireSmart: Protecting Your Community from Wildfire*", with a second edition published in 2003.

- Wildland fires are a natural process and critical to the health of Canadian ecosystems.
- Mitigation and response efforts must be carefully coordinated through all stages of planning and implementation.
- Threats and losses due to wildfires can be reduced by working together. Responsibility for effectively mitigating hazards must be shared between many entities including homeowners, industry, businesses and governments.[70]
- There are seven broad disciplines to help address the threat of wildfire: education, vegetation management, legislation and planning, development considerations, interagency cooperation, emergency planning, and cross training.[70]
- Solutions are required at all scales from individual backyards, to communities and the wider landscape. In order to succeed, these efforts must be integrated across the mosaic of land ownership (Figure 4).
- 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.

The highest level of planning within the FireSmart program is strategic direction, such as that provided in CWPPs.

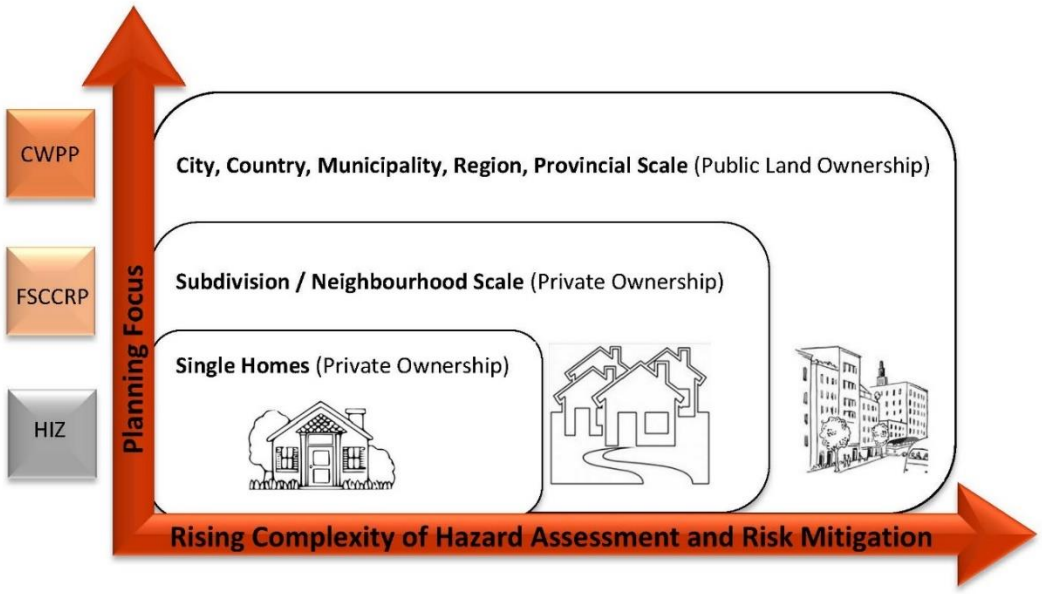


Figure 4. Diagram of the various, coordinated levels of the FireSmart program.[71] CWPP: Community Wildfire Protection Plan, FSCCRP: FireSmart Canada Community Recognition Program, HIZ: Home Ignition Zone.

[70] https://www.firesmartcanada.ca
[71] Figure and content developed by A. Westhaver. Adapted by A. Duszynska, 2017.

Home Ignition Zone

Multiple studies 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).[72,73] The HIZ includes the structure itself and three concentric, progressively wider Priority Zones. HIZ Priority Zones are based upon distance from structure: 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 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 Appendix I.

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.[73] It is for this reason that the key to reducing WUI fire structure loss is to reduce home ignitability; mitigation responsibility must be centered on homeowners. Risk communication, education on the range of available activities, and prioritization of activities should help homeowners to feel empowered to complete simple risk reduction activities on their property.

FireSmart Canada Community Recognition Program

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

[72] 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.
[73] Cohen, J. Preventing Disaster Home Ignitability in the Wildland-urban Interface. Journal of Forestry. p 15 - 21.

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 5).

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.[74]

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.[74]

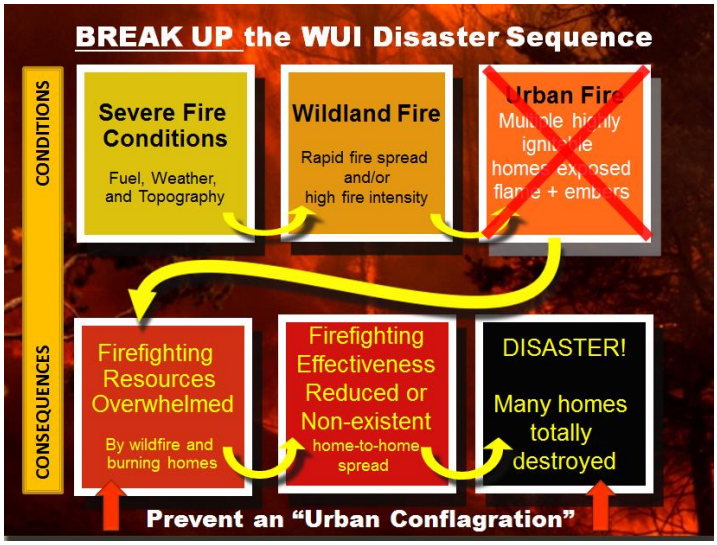


Figure 5. Wildland/urban interface disaster sequence.[75] It is possible to break up the disaster sequence by decreasing the number of highly ignitable homes exposed to embers, therefore reducing the number of homes ignited and removing the consequences of multiple structures lost.

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

[74] Calkin, D., J. Cohen, M. Finney, M. Thompson. "*How risk management can prevent future wildfire*"
[75] Graphic adapted from Calkin et. al, by A. Westhaver.

avenues for reducing fire risk within the community. An evaluation of the current level of FireSmart implementation within the District is also presented in this Section.

Communication, Education and Partnerships

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, District staff, and local utilities providers. Education and communication messages should be simple yet comprehensive. A basic level of background information is required to enable a solid understanding of fire risk issues and the level of complexity and detail of the message should be specific to the target audience.

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

The District of Kent (primarily the AFD) has undertaken some public education outreach in the community to date. This can be expanded upon and/or adapted to further enhance wildfire preparedness and education. The District should consider developing a school fire education program to include 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 District staff. The District should consider holding a wildland specific Fire Prevention Day or Week, or similarly formatted event, in the spring prior to the wildfire season. Timely educational materials to increase preparedness would be most effective immediately prior to the fire season.

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

FireSmart Vegetation Management

Some examples of actionable items for the District 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; 2) implementing fire resistive landscaping requirements as part of the development permitting process; and 3) provision of collection services for private landowners with a focus on pruning, yard and thinning debris.

The District of Kent 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 District does not currently enforce FireSmart landscaping requirements within development permits. More detailed recommendations regarding municipal policies and bylaws are provided below in Planning and Development. The District does; however, currently offer clean-up sessions at the municipal gravel pit twice annually to encourage residents to dispose of pruning and yard waste (smaller branches only)

at no charge. Additionally, the District provides a green waste bin in Agassiz for residential yard waste including small wood waste which is transferred to the municipal gravel pit where it is stored and burned (wood waste) or composted (green waste).

RECOMMENDATION #18: The District should apply for a FireSmart demonstration grant through the CRI program. This type of fuel treatment can display the practices and principles of FireSmart activities to the public in the form of demonstration treatments. These small projects are not necessarily completed to reduce fire behaviour or increase stand resiliency in any measurable way, but instead are prioritized more by their visibility to the public and combining the treatment with elements of public education (signage, community work days, public tours, active demonstrations of operations, etc.).

RECOMMENDATION #19: Continue to offer yard waste disposal opportunities and consider expanding opportunities for inexpensive and convenient disposal of pruning, yard and thinning debris to support fuel treatment on private land. Consider developing and implementing a community chipper program with the help of neighbourhood representatives. 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.

Planning and Development

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 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 and development objectives for the District of Kent are:

- To include wildfire considerations in the planning and acquisition strategy for parks and recreational areas.
- 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).

The OCP does not explicitly consider the establishment of a development permit (DP) area to address wildfire risk mitigation. It is recommended that the District review the OCP, with consideration towards establishing a wildfire development permit area. Other jurisdictions' wildfire development permit areas can serve as models for various components. [76] The first step should be to establish DP area 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

[76] The District of North Vancouver has a robust and well-documented Wildfire Hazard Development Permit process. Another jurisdiction which may be worth reviewing is Maple Ridge.

following components should be considered during the OCP review and DP area 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 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 Hillside (DA1) and Mount Woodside (DPA 5) are met;
- Review and approval process for submitted applications;
- Post-development inspections and sign-offs;
- Outline of responsibilities for staff and applicants; and
- 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.

In 2015, the province passed the *Building Act* as the new legislation to guide building and construction in the province (Spring 2015). 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.[77]

RECOMMENDATION #20: Review the Official Community Plan (OCP); consider including wildfire as a natural hazard development permit area.[76] A recommended development permit area for the District would include all areas within the District 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

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

similar DPs 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 DP development: 1) Establish DP 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 #21: Ensure that DP applications are provided to the fire department for opportunity for input prior to approval. As more wildfire DP applications are received, the importance of communication and integration between the fire department and the Development Services department will increase.

RECOMMENDATION #22: Develop a landscaping standard which lists flammable non-compliant vegetation and landscaping materials, non-flammable drought and pest resistant alternatives, and tips on landscape design to reduce maintenance, watering requirements, avoid wildlife attractants, and reduce wildfire hazard. Consider including the landscaping standard as a requirement of the Development Permit within the applicable area, as well as making it publicly available for residents and homeowners outside of the DP area (can be provided at issue of building permit and made available at the District Office or other strategic locations). For further assistance in creating a FireSmart landscape and to obtain a list of fire resistant plants, refer to the FireSmart Guide to Landscaping at https://www.firesmartcanada.ca/resources-library/firesmart-guide-to-landscaping.[78]
Other helpful links for finding fire resistant landscaping options can be found at:

- http://www.wacdpmc.org/images/Fire-Resistant-Plants.pdf
- http://www.firefree.org/wp-content/uploads/2016/02/Fire-Resistant-Plants.pdf
- https://www2.gov.bc.ca/gov/content/safety/wildfire-status/prevention/for-your-home-community
- http://articles.extension.org/pages/32729/selecting-firewise-plants

RECOMMENDATION #23: Consider engaging the development/ building community (may include developers, builders, landscapers, and architects) in DP development process. This can be accomplished through a series of workshops/ informational sessions to: 1) increase awareness of wildfire risk, 2) demonstrate that there are a variety of actions which can be undertaken to immediately and measurably reduce the risk to the homeowner and community, 3) discuss various strategies and actions which could be implemented to meet DP objectives, 4) educate and inform regarding the DP process and expectations.

RECOMMENDATION #24: Consider incorporating Qualified Professional (QP) reports and sign-off as part of the Wildfire Interface Guidelines associated with a Wildfire Development Permit Area.

[78] Government of Alberta "FireSmart Guide to Landscaping"

Additional recommendations for amendments to policies and bylaws were discussed 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 communities and/or developed areas within the District, 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.[79] When the time for evacuation is limited, poor access has contributed to deaths associated with entrapments and vehicle collisions during wildfires.[80] 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.[79]

For new development in rural settings where hydrants are limited or unavailable (or it is otherwise determined by the District 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, private wells or cisterns, etc., should be reviewed by the District and the fire department prior to development approval.

Increasing Local Capacity

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); and
- 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.

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

FireSmart Compliance within the Area of Interest

As could be expected, there is a wide range of FireSmart compliance on private properties in the AOI. There are large differences in the degree to which FireSmart best practices are visible within individual HIZs, and in neighbourhoods throughout the District of Kent communities. Landscaping in the AOI is also

[79] 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.

[80] 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

in a range of FireSmart compliance. Generally speaking, most homes in the Harrison Highlands neighbourhood, an interface area, are predominantly wood construction and lack defensible space between property footprints and adjacent forested areas. Similarly, most homes in Mount Woodside, Rockwell Drive corridor, and Thunderbird Estates neighbourhoods, which are considered intermix, do not maintain 10 m defensible space and are commonly of wood construction. The main concern in this area is the lack of defensible space between property footprints and surrounding forested areas. Accumulations of conifer foliage in roof corners and gutters was not uncommon. Storage of combustible items under decks, carports, and other horizontal surfaces was common. On the other hand, many residences in the District of Kent are surrounded by lawn, agricultural fields, 10 m defensible space, and/or hardscaping (rocks), all of which are FireSmart compliant. The Agassiz townsite and Harrison Mills area display the highest FireSmart compliance rate.

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

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

- Wildfire hazard levels range from low to high across neighbourhoods within the AOI;
- The bulk of hazards are associated with conditions of natural and landscaped vegetation immediately surrounding residential properties;
- For new development, where landscaping is not yet completed, educational approaches may aid in promoting fire resistant landscaping options and achieving defensible space in the HIZ;
- Hazards are magnified in some neighbourhoods due to poor access (i.e., presence of private and gated 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 #25: The District should hire a qualified professional (QP) or consider training local fire department staff members as Local FireSmart Representatives to assist the various communities in complying with FireSmart principles at the neighbourhood and individual home-level.

5.2.3 Priority Areas within the AOI for FireSmart

This section identifies priority areas within the AOI that would benefit from FireSmart planning and activities.

These priorities are based on general field observations and input from the District and are not based on a scientific sample or formal data collection. Recommended FireSmart activities are essentially the same for each neighbourhood or area; however, it is recommended that the District prioritize the neighbourhoods in Table 16.

Table 16. Summary of FireSmart Priority Areas.

Area	FireSmart Y/N	FireSmart Canada Recognition Received Y/N	Recommended FireSmart Activities
Priority Area #1: Harrison Highlands	N	N	The following is a non-extensive list of FireSmart activities for which the District can engage suggested neighbourhood residents: 1) Provide guidance to ensure landscaping complies to the 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) Continue coordinating monthly or bi-monthly yard waste removal days prior to and during the fire season to reduce WUI fire hazard.
Priority Area #2: Rockwell Drive corridor (road and boat access homes)	N	N	
Priority Area #3: Thunderbird Estates	N	N	
Priority Area #4: Mount Woodside	N	N	
Priority Area #5: Kilby	N	N	
Priority Area #6: Critical infrastructure (i.e., Water and wastewater treatment facilities in Harrison Highlands and Water System Infrastructure in Rockwell Bay	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 remains 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, and other forest tenure holders, the efforts of public officials, fire department, and others to reduce wildfire losses will be hindered. In many communities, there is a general lack of understanding about interface fire, the relationship between ignition potential and loss of homes, and the simple steps that can be taken to minimize risk on private land. In addition, public perceptions regarding responsibility for risk reduction and the ability of firefighters to safely intervene to protect homes during a wildfire are often underdeveloped or inaccurate.

Based on the consultation completed during the development of this Plan, it is evident that District 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 AOI 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 District should consider creating an Interface Steering Committee to coordinate wildfire risk reduction efforts. The steering committee could include key stakeholders such as District staff, Village of Harrison Hot Springs and FVRD, BCWS, BC Parks, recreational groups/representatives, industrial operators, woodlot owners, and forest tenure license holders.

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

RECOMMENDATION #26: This report and associated maps should 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.

RECOMMENDATION #27: 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 District'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 #28: Develop a social media strategy and ensure that its full power is leveraged to communicate fire bans, high 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. [81]

RECOMMENDATION #29: Consider promoting FireSmart approaches for wildfire risk reduction to District residents through Town Hall meetings, workshops and/or presentations. Aim to conduct the engagement/promotion campaign prior and during the fire season. Continue supplying FireSmart materials to homeowners in the interface during these engagement campaigns.

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 District 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 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

[81] Appendix L has general communication and social media information.

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 (Industrial operators, MFLNRORD, BCWS, BC Parks, recreational groups/representatives, District staff, the Village of Harrison Hot Springs and FVRD) to formalize an Interface Steering Committee. The purpose of the steering committee would be to identify wildfire related issues in the area and to develop collaborative solutions to minimize wildfire risks. The following subject areas are recommended for the group to explore: 1) Development of large, landscape level fuel breaks; 2) Public education and awareness needs; 3) Multi-disciplinary, multi-jurisdictional fuel treatment projects/ hazard abatement projects; 4) Development of a funding strategy; and 5) Reduction of human-caused fires, fire prevention and right of way management.

RECOMMENDATION #35: Work towards educating homeowners within unprotected areas (i.e., outside of the road accessible fire service area). This is particularly applicable to boat access only residents. It is common, especially in the case of second homeowners/ vacation owners, for them to be unaware of the lack of fire services in their area (in the event they call 911).

5.4 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; 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 Fire Prevention and Protection; Nuisance, Noxious or Offensive Trades, Health and Safety; and Parks and Public Facilities bylaws. The aforementioned activities are either currently being applied or have potential to be applied in order to reduce the potential and threat of wildfire ignitions within the AOI.

Risk of human-caused ignition within the study area 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 study area. A cooperative approach for addressing the industrial area concerns must be undertaken by the District and pertinent industrial partners.

RECOMMENDATION #36 Work with industrial operators such as BC Hydro and Fortis BC to ensure that high risk activities, such as grubbing/brushing and right-of-way mowing work are restricted (do not occur) during high fire danger times to reduce chance of ignitions.

RECOMMENDATION #37: Work with industrial operators (i.e., BC Hydro) to ensure that rights-of-way do not contain fine fuel accumulations (easily cured) prior to and during the fire season and are maintained in a low hazard state (to serve as fuel breaks).

SECTION 6: WILDFIRE RESPONSE RESOURCES

This section provides a high-level overview of the local government resources accessible for emergency response and preparedness use. Accordingly, in emergency situations when multiple fires are burning in different areas of the Province, resource availability may be scarce. Therefore, local government preparedness and resource availability are critical components of efficient wildfire prevention and planning. Deployment of provincial resources occurs as per the process detailed in the *Provincial Coordination Plan for Wildland Urban Interface Fires* document[82]. The aforementioned document establishes a protocol for collaborative and integrated emergency management in the event of WUI fires within British Columbia.

6.1 LOCAL GOVERNMENT AND FIRST NATION 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 District has access to on-site or mobile diesel / natural gas generators to power critical infrastructure such as the Fire Hall (EOC) and the RCMP station. However, should a wide-scale outage occur, known vulnerabilities to secondary power sources include mechanical failure and potential fuel shortages. Although the local government has not identified any issues with water pressure within areas that have fire hydrant service, there are known limitations to water supply for firefighting in areas not supplied by the District water systems and consequently without hydrant service. Specific limitations of water availability with regards to wildfire suppression are detailed in Section 6.1.2.

Formal mutual aid agreements are in effect between the AFD and five local fire departments (FDs) and volunteer fire departments (VFDs) in neighbouring jurisdictions (Harrison Hot Springs FD, Chilliwack FD, Seabird Island VFD, Popkum VFD, and North Fraser FD). The AFT has one automatic aid agreement with the Harrison Hot Springs Fire Department for any and all responses related to the Rockwell Drive area. In the event of a WUI fire emergency, mutual aid in the AOI is activated, as required, between these fire departments. Mutual aid is activated on the majority of large fire incidents. WUI fire events may also lead to aid requests with BCWS. The AFD has a standing agreement in place with the BCWS and the AFD has responded, at the request of the Office of the Fire Commission (OFC), to assist with Provincial wildfire suppression efforts as well (i.e., providing surge capacity).

6.1.1 Fire Department and Equipment

Fire protection within the AOI is the responsibility of the Agassiz FD. Additionally, fire services are provided beyond the AFD fire protection zone to four neighbouring First Nations communities. Table 17 provides an overview of the fire services capacity in the AOI, including fire department personnel and

[82] 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

equipment. In total, the AFD fire protection services cover the entire area within the District municipal boundary that is accessible by road. This excludes mountain ranges, undeveloped forested lands and properties that are boat access only. The District has agreements in place with the BCWS for fire protection in these areas.

AFD personnel are largely volunteer (paid on call) firefighters in addition to two career positions. The main personnel deficiency reported by fire department is the difficulty in guaranteeing staffing and response numbers. In consultation with the fire department it was determined that the current equipment inventory limits fire response to areas with road access. The AFD's equipment is listed in Table 17 below and includes capability to draft from natural water sources by truck draft or using portable pumps.

Table 17. Fire department capacity and equipment within the AOI.

Fire Protection Zones	Fire Department	Number of Stations	Number of Members	Apparatus type and number
District of Kent municipal boundary (area accessible by road only)	Agassiz Fire Department	1	2 career, up to 30 paid on-call firefighters	1 utility (crew cab), 2 engines, 1 tanker/tender shuttle, 2 rescue, and wildfire equipment (water bladders, portable pumps, hand tools, forestry hose, and saws)

Members of the AFD undergo significant training focused on structural firefighting and annual structure protection program wildland firefighter level 1 (SPP-WFF 1) training. The AFD has approximately 9 in-house SPP-WFF 1 train-the-trainers. The AFD does not; however, have a junior firefighter work experience program. It is recommended that all AFD members continue to receive at a minimum SPP-WFF1 (or equivalent) training, and that fire department members engage in yearly practical wildland fire training with BCWS that covers at a minimum: pump, hose, hydrant, air tanker awareness, and employment of SPUs. The aforementioned cross-training opportunity could include, for example, a joint wildfire simulation exercise. This level of training would improve the local fire department's commitment to wildfire preparedness.

Over the previous 7 years (2011-2017), the AFD responded to an average of 35 calls per year (wildland and structure fire calls), of which approximately 11 per year were wildland (bush) fires. This ranged from a low of 5 wildland fire calls in 2015 to a high of 16 in 2013. In 2017, the AFD responded to 10 wildland fire calls.

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 sufficient water supply be available. The Fire Underwriters Survey summarizes their recommendations regarding water works systems fire protection requirements, in the document entitled

Water Supply for Public Fire Protection (1999).[83] Some key points from this document include the need for:

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

Water service within the District 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 three District operated systems which rely on groundwater from deep wells. For suppression within the AOI, hydrant (and draft well) service in the AOI is limited to the extent of these District water systems. With respect to the Agassiz townsite, properties protected by live fire hydrants and draft wells are encompassed by the enhanced municipal fire protection area[84]. In consultation with the AFD, it was noted that where hydrants are available, the water supply and pressure are good. Consequently, the majority of the District is without hydrant protection. Specifically, rural areas, rely on private groundwater wells for domestic water and may lack fire protection infrastructure.

The District engineering department stated that in the event of prolonged power outage (without utilizing the available backup generation), the capacities of the three District water systems and reservoirs are such that water supply in the Agassiz townsite and Rockwell water systems would last five days, while the Mount Woodside/Harrison Highlands water supply would last ten days. In consultation with the District's engineering department it was noted that water supply from the Agassiz townsite and Rockwell water systems is not susceptible to drought due to their wells being located adjacent to and/or under influence of the Fraser River and Harrison Lake respectively. While the Mount Woodside water system may be more susceptible to drought, it is also under direct influence of the Fraser River and no drought-related issues have been experienced to date in any of the District's water systems.

The Agassiz fire department can draft from natural static water sources such as Harrison Lake, Petty Pond (Harrison Highlands) and other smaller lakes and ponds using either truck mounted or portable pumps. The AFD may also draft from the Fraser River; however, due to heavy silt levels river water must first be pumped into settling ponds or bladders and suctioned from the top. These natural water sources are known and mapped. Harrison Lake in particular provides a large capacity freshwater reservoir that is not assumed to be immediately vulnerable to drought conditions or climate change.

[83] http://www.scm-rms.ca/docs/Fire%20Underwriters%20Survey%20-%201999%20Water%20Supply%20for%20Public%20Fire%20Protection.pdf
[84] District of Kent Bylaw No. 1562, 2016. Schedule G.

RECOMMENDATION #38: All new rural development outside existing District 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*[85]. The fire department 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.

6.1.3 Access and Evacuation

Road networks in a community serve several purposes including providing access for emergency vehicles, providing escape/evacuation routes for residents, and creating fuel breaks. Access and evacuation during a wildfire emergency often must happen simultaneously and road networks should have the capacity to handle both. In the event of a wildfire emergency, main egress routes include the north and south running arterial route connecting Harrison Hot Springs and environs (including Sasquatch Provincial Park and Harrison Lake residential/recreation areas) with Lougheed Highway (Highway 7), running generally east/west, and Highway 9, running south from Agassiz to Highway 1. A significant emergency evacuation concern has been identified in the Rockwell Drive corridor. There is currently no secondary exit or bypass from this corridor to provide reliable egress for area residents, visitors, and industrial users. This single access/egress route is vulnerable to wildfires, vehicular accidents and rockfall/geotechnical hazards. A potential secondary egress route through the park to Highway 7 has been proposed and discussions have proceeded with various provincial ministries; however, it is recognized that completion of this route will require multi-jurisdiction cooperation (local and provincial governments) and the accommodation and reconciliation of a range of management constraints and conflicts[86].[87]. If a wildfire were to block Rockwell Drive or any of the major evacuation routes described above, smoke and poor visibility, car accidents, wildlife, and other unforeseen circumstances can further complicate evacuations and hinder safe passage.

While the Rockwell Drive corridor is the development of greatest concern identified by the Wildfire Working Group, various other developments within the Kent AOI are located on single access roads or are isolated neighbourhoods that cause suppression or evacuation concerns (i.e., Hopyard Mountain, Stricker's Corner, Harrison Highlands, and Mount Woodside). Other issues related to access and evacuation, as identified by the AFD include long distance responses of up to 16 km to some more remote areas of the AOI and the limitation of a single AFD fire hall in the AOI.

In consultation with BCWS, varied road ownership and gated locations have not been a barrier to access for suppression. BCWS has a good working relationship with main industrial operators in the area to access their operational areas as needed.

[85] National Fire Protection Association (NFPA).2017. Standard on Water Supplies for Suburban and Rural Fire Fighting. Retrieved online on October 1,2018 at: https://www.nfpa.org/codes-and-standards/all-codes-and-standards/list-of-codes-and-standards/detail?code=1142

[86] Agassiz-Harrison Observer. Dec 13, 2017. Kent, Harrison continue to push for emergency route. Retrieved online from: https://www.agassizharrisonobserver.com/community/kent-harrison-continue-push-for-emergency-route/

[87] District of Kent OCP, pg 82.

Within the AOI, some of the critical infrastructure is reached via narrow and/or private, forested roads, which may impede suppression efforts and response times. Furthermore, there is a significant portion of land within the AOI which is inaccessible by roads. As such, a review of the fire protection area, accessibility issues, and the risks and benefits associated with the current fire protection jurisdiction is recommended.

Emergency access and evacuation planning is of particular importance in the event of a wildfire event or other large-scale emergency. The District of Kent and Village of Harrison have developed a Kent-Harrison Joint Emergency Response and Recovery Plan (2018) which includes basic contingencies in the event of a wildland/interface fire (i.e., contacts and roles of local government personnel). However, the ERP does not specify evacuation routes to be used during an emergency situation (in the absence of identified evacuation routes, it was noted by the Wildfire Working Group that all mapping is readily available through the District GIS Department). Evacuation would be conducted by first responders, RCMP, and the Kent Harrison Search and Rescue team. In the event of a wildfire emergency within the AOI, the District Fire Hall can be designated as the EOC. It is recommended that the District develop a detailed evacuation plan that includes the following provisions:

- Mapping and identification of safe zones, marshaling points and aerial evacuation locations;
- Planning of traffic control and accident management;
- Identification of volunteers that can assist during and/or after evacuation; 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 further to install 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.

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 fuel breaks during suppression efforts, it is recommended to develop a Total Access Plan. This plan should be made available to the AFD, other local fire departments (under mutual aid agreement) 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 #39: In cooperation with the Village of Harrison, continue to work with relevant Provincial Ministries and stakeholders including BC Parks, Emergency Management BC, Ministry of Transportation and Infrastructure, MFLNRORD, Seabird Island Indian (holders of a woodlot license adjacent to Sasquatch Provincial Park), BC Hydro Fraser Valley Regional District, Enbridge (operating a line station at Ruby Creek) and Canadian Pacific Railway, to complete a second-means egress route through Sasquatch Park. This will provide an alternate evacuation route for residents along Rockwell Drive as well as visitors to the park and surrounding area.

RECOMMENDATION #40: Complete and participate in regular testing of, and updates to, the evacuation plan.

RECOMMENDATION #41: Consider developing a community wildfire pre-planning brochure that addresses the following: 1) locations of staging areas; 2) identifies water reservoirs, communications requirements (i.e., radio frequencies), minimum resource requirements for structure protection in the event of an interface fire, and values at risk; and 3) maps of the area of interest.

RECOMMENDATION #42: Develop a Total Access Plan for the District to map and inventory trail and road network in natural areas for suppression planning, identify 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.

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.

6.1.4 Training

The AFD maintains a current level of structural protection training as described in Section 6.1.1. Additionally, all members have yearly refreshers and/or certification in SPP-WFF 1. According to the Office of Fire Commissioner, a new course on Engine Operations in the Wildland Urban Interface is currently being developed and expected to be released in 2018, which is a 1-day course that combines the SPP-WWF 1, the S115 and S215 (personal communication with Tom Boechler, Structure Protection Specialist). It is recommended that the AFD consider providing members with this course upon release, to ensure currency with techniques, applications and procedures for wildland urban interface fire suppression. 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 SPP-WFF1 (or equivalent), and that the fire department engage in yearly practical wildland fire training with BCWS.

The current level of communication between the AFD and BCWS is dictated by fire season demands and includes Emergency Management BC and FVRD spring readiness meetings. The BCWS participates in community events or public education opportunities as requested by the AFD. The AFD does not currently engage in cross-training with BCWS, but has done so in the past. Cross-training with the BCWS would enable the AFD to prepare its responders with the technical and practical firefighting experience in order to action both structural and wildland fires.

It is recommended that the AFD 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 outside the AOI (i.e., Harrison Hot Springs FD, Chilliwack FD, Seabird Island VFD, Popkum VFD, and North Fraser FD) to conduct joint training so as to further strengthen regional emergency response and firefighting training. Operationally, the AFD provided initial attack on a 2017 wildfire near Slollicum Creek in 2017 and participated in a multi-jurisdictional response with BCWS in 2014 that resulted in a valuable debrief and shared learning.

RECOMMENDATION #44: The AFD should work with BCWS to initiate and 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 AFD engage in yearly practical wildland fire training with BCWS that covers at a minimum: pump, hose, hydrant, air tanker awareness, and employment of SPUs. Interface training should include completion of a joint wildfire simulation exercise and safety training specific to wildland fire and risks inherent with natural areas. It is recognized that BCWS crew resources are limited and their availability and is highly dependent upon the current fire season and other BCWS priorities.

RECOMMENDATION #45: The AFD should engage in regular cadence of communication with the BCWS Fraser Fire Zone, Cultus/Haig Fire Base to foster a strong relationship and identify potential cooperative wildfire risk reduction opportunities.

RECOMMENDATION #46: Ensure that the AFD maintains the capability to effectively suppress wildland fires, through wildfire-specific training sessions. Ensure all AFD continue to have SPP-WFF 1 at a minimum. Consider expanding the training program to maintain a high level of member education and training specific to interface and wildland fires. The Office of the Fire Commissioner (OFC) also offers SPP 115

(formerly S-115) to train structural firefighters on the use of wildfire pumps and hose, and fire service hose and hydrants in the application of structural protection units (SPUs). The OFC is currently developing additional wildfire-specific Officer-level training courses (i.e., Engine Operations in the Wildland Urban Interface); the fire department should continue the practice of staying up to date on wildfire training opportunities, and to train members in this capacity, as training resources / budgets allow.

6.2 STRUCTURE PROTECTION

The AFD is well resourced in structural suppression equipment, but has limited wildland equipment (i.e., hand tools, hose and associated appliances). The wildland equipment is primarily used to defend properties close to road access. The fire department maintains a current level of training in both wildfire and structural firefighting (see Section 6.1.1 for additional detail). The AFD is not equipped with a Structural Protection Unit (SPU). The UBCM owns four complete SPUs, each equipped to protect 30 – 35 structures. The kits are deployed by the MFLNRORD/BCWS incident command structure and are placed strategically across the province during the fire season based on fire weather conditions and fire potential. When the kits are not in use, they may be utilized by fire departments for training exercises. SPUs can be useful tools in the protection of rural/ interface homes in the event of a wildfire. An important consideration in protecting the WUI zone from fire is ensuring that homes can withstand an interface fire event. Structure protection is focused on ensuring that building materials and construction standards are appropriate to protect individual homes from interface fire. Materials and construction standards used in roofing, exterior siding, window and door glazing, eaves, vents, openings, balconies, decks, and porches are primary considerations in developing FireSmart neighbourhoods. Housing built using appropriate construction techniques and materials in combination with fire resistant landscaping are less likely to be impacted by interface fires.

While many BC communities established to date were built without significant consideration with regard to 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 Appendix J.

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), clean 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 District of Kent 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 #47: Consider working with local distributors and homeowners within the District. The objective is to improve education of homeowners and remove some barriers to FireSmart action. Local distributors can include: hardware stores, garden centers, and aggregate providers. Initiatives may include:
1) Developing and delivery of FireSmart workshop(s) for local distributors on FireSmart issues and solutions/advice for homeowners. These distributors can be educated upon which supplies are FireSmart and in what configuration they can be used (for example, external sprinkler system equipment, aggregates and ground cover, wire mesh for vents, deck skirting).
2) Advocating for a FireSmart branding in the retail stores (could be stickers on shelf pricing or a FireSmart-specific section) to increase public exposure to projects that can be done at a relatively low cost.
3) Compile a database of local service providers and retailers which can help to install or complete FireSmart home improvements. These providers may be able to further partner to flesh out a list of FireSmart options for various home improvements, based upon a range of variables (for example, price, time to deliver, installation costs, and aesthetics).
4) Develop general cost implications of improvements so property owners can prioritize replacements.

RECOMMENDATION #48: Consider expanding on existing 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. The current biannual "Clean-up Sessions" and Agassiz Green Bin Programs may be expanded to include scheduled community chipping opportunities, yard waste dumpsters available by month in neighbourhoods, or scheduled burning weekends. Programs should be available during times of greatest resident activity (likely spring and fall).

RECOMMENDATION #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).

REFERENCES

BCWS. 2018. Wildfire Causes. Retrieved from: https://www2.gov.bc.ca/gov/content/safety/wildfire-status/about-bcws/wildfire-response/fire-characteristics/causes

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. 2001. *Climate Change and Forest Disturbances*. BioScience 2001 51 (9), 723-734.

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.

Green, R. N., and K. Klinka. 1994. A Field Guide for Site Identification and Interpretation for the Vancouver Forest Region. Land Management Handbook Number 28. Retrieved from: https://www.for.gov.bc.ca/hfd/pubs/docs/lmh/lmh28.pdf

Ministry of Forests, Lands, and Natural Resource Operations. 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

The Province of British Columbia. 1995. Biodiversity Guidebook. Retrieved from: https://www.for.gov.bc.ca/hfd/library/documents/bib19715.pdf

The Province of British Columbia. 1997. Spotted Owl Management Plan for Chilliwack and Squamish Forest District. Ministry of Environment, Lands and Parks, Lower Mainland Region (Abstract). Retrieved from: http://www.env.gov.bc.ca/wld/documents/ce09blackburn.pdf.

The Province of British Columbia. 2005. Sustainable Resource Management Plan Biodiversity Chapter for East Harrison Landscape Unit. Ministry of Sustainable Resource management, Coast Region – Chilliwack Office. Retrieved from: https://www.for.gov.bc.ca/tasb/slrp/srmp/coast/chilliwack/reports/East_Harrison/East_Harrison_LU_Plan_May2005.pdf

Ministry of Forests, Lands and Natural Resource Operations. 2015. Coast Area 2015-17 Coastal Timber Supply Area Forest Health Overview. Retrieved from: https://www.for.gov.bc.ca/ftp/HFP/external/!publish/Forest_Health/TSA_FH_Strategies/2015-Coast%20FH%20Strategy.pdf

Spotted Owl Best Management Practices Working Group, 2009. Best Management Practices for Managing Spotted Owl Habitat. Retrieved from: https://www.for.gov.bc.ca/ftp/DCK/external/!publish/LOCAL_DATA/Spotted_Owl_Management_Plan/DOCUMENTS/SPOWBestManagementPractiesJul2009.pdf

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

Provided separately as PDF package.

APPENDIX B – WILDFIRE THREAT ASSESSMENT WORKSHEETS AND PHOTOS

Provided separately as PDF package.

APPENDIX C – MAPS

Provided separately as PDF package.

APPENDIX D – 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.

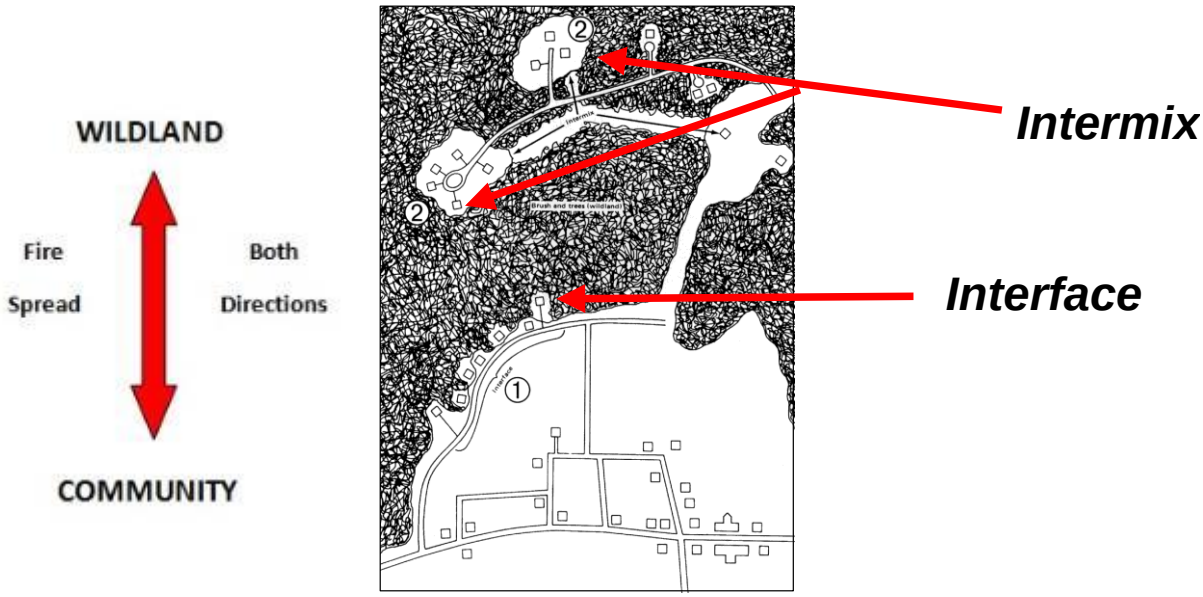


Figure 6. Illustration of intermix and interface situations.

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.

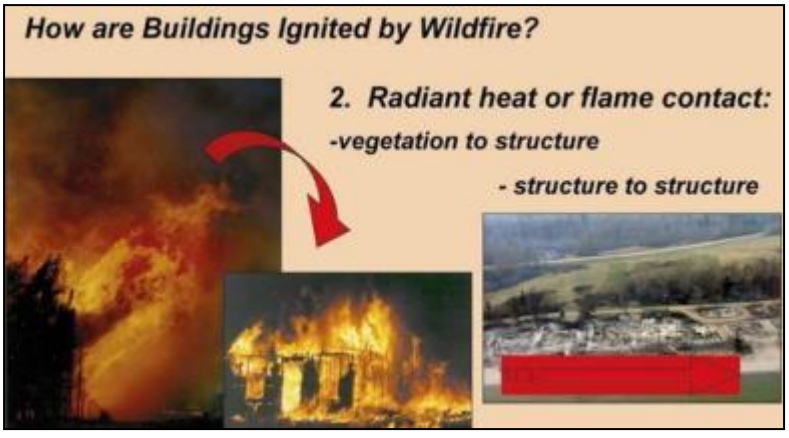


Figure 8. Radiant heat and flame contact allows fire to spread from vegetation to structure or from structure to structure.

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^{+} /m^2. Combustible materials found within the home ignition zone combine to provide fire pathways allowing spot fires ignited by embers to spread and carry flames or smoldering fire into contact with structures.

APPENDIX E – WUI THREAT PLOT LOCATIONS

Table 18 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 18. Summary of WUI Threat Assessment Worksheets.

WUI Plot #	Geographic Location	Wildfire Behaviour Threat Class	WUI Threat Class*
BEAR-1	Bear Creek FSR/Rockwell	MODERATE	N/A
EAST-1	Harrison East FSR	MODERATE	N/A
HICK-1	Hicks Lake / Sasquatch Park	MODERATE	N/A
HICK-2	Hicks Lake Park / Sasquatch Park	MODERATE	N/A
HIGH-1	Highlands	MODERATE	N/A
RUBY-1	Ruby Creek FSR	MODERATE	N/A
RUBY-2	Ruby Creek FSR	HIGH	MODERATE
SASQ-1	Rockwell Corridor	MODERATE	N/A
SASQ-2	Rockwell Corridor	HIGH	HIGH
WOOD-1	Mount Woodside FSR	MODERATE	N/A
WOOD-2	Mount Woodside FSR	HIGH	MODERATE
WOOD-5	Mount Woodside FSR	HIGH	LOW
WOOD-6	Mount Woodside FSR	HIGH	MODERATE
WOOD-7	Mount Woodside FSR	HIGH	LOW
WOOD-8	Mount Woodside FSR	MODERATE	N/A

WUI Plot #	Geographic Location	Wildfire Behaviour Threat Class	WUI Threat Class*
WOOD-9	Mount Woodside FSR	HIGH	LOW
WOOD-10	Mount Woodside FSR	HIGH	LOW
WOOD-11	Mount Woodside FSR	HIGH	LOW
WOOD-12	Mount Woodside FSR	MODERATE	N/A
WOOD-13	Mount Woodside FSR	HIGH	LOW

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

APPENDIX F – FUEL TYPING METHODOLOGY AND LIMITATIONS

The initial starting point for fuel typing for the study area was the 2017 provincial fuel typing layer provided by BCWS as part of the *2017 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 study area have been updated using orthoimagery of the study 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 study area. As a result, the AOI 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 South Coast region. Additionally, provincial fuel typing depends heavily on Vegetation Resource Inventory (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 and Eade, 2015.[88]

[88] Ibid.

APPENDIX G – 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
- Photo Location
- Proposed Treatment
- Structures
- Threat Plot
- Wildland Urban Interface

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

model has been built to assume Fire Threat based on spatially explicit variables that correspond to the WUI Threat Assessment worksheet.

Field Data Collection

The primary goals of field data collection are to confirm or correct the provincial fuel type, complete WUI Threat Assessment Plots, and assess other features of interest to the development of the CWPP. This is accomplished by traversing as much of the 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 20 WUI threat plots on a variety of fuel types, aspects, and slopes and an additional 175+ 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 19 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 19. 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	

WUI Threat Sheet Attribute	Used in Analysis?	Comment
Continuous forest/slash cover within 2 km	No	
WEATHER SUBCOMPONENT		
BEC zone	Yes	
Historical weather fire occurrence	Yes	
TOPOGRAPHY SUBCOMPONENT		
Aspect	Yes	
Slope	Yes	Elevation model was used to determine slope.
Terrain	No	
Landscape/ topographic limitations to wildfire spread	No	
STRUCTURAL SUBCOMPONENT		
Position of structure/ community on slope	No	
Type of development	No	
Position of assessment area relative to values	Yes	Distance to structure is used in analysis; position on slope relative to values at risk is too difficult to analyze spatially.

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

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

There are obvious limitations in this method, most notably that not all components of the threat assessment worksheet are scalable to a GIS model, generalizing the Fire Behaviour Threat score. The WUI Threat Score is greatly simplified, as determining the position of structures on a slope, the type of development and the relative position are difficult in an automated GIS process. This method uses the best available information to produce the initial threat assessment across the 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 Section 4.3.1) impacts the threat assessment, as well.

APPENDIX H – PRINCIPLES OF FUEL MANAGEMENT

Fuel or vegetation management is a key element of the FireSmart approach. Given public concerns, fuel management is often difficult to implement and must be carefully rationalized in an open and transparent process. Vegetation management should be strategically focused on minimizing impact while maximizing value to the community. The decision whether or not to implement vegetation management must be evaluated against other elements of wildfire risk reduction to determine the best avenue for risk reduction. The effectiveness of fuel treatments is dependent on the extent to which hazardous fuels are modified or removed and the treatment area size and location (strategic placement considers the proximity to values at risk, topographic features, existing fuel types, etc.) in addition to other site-specific considerations. The longevity of fuels treatments varies by the methods used and site productivity.

What is Fuel Management?

Fuel management is the planned manipulation and/or reduction of living and dead forest fuels for land management objectives (*e.g.*, hazard reduction). Fuels can be effectively manipulated to reduce fire hazard by mechanical means, such as tree removal or modification, or abiotic means, such as prescribed fire. The goal of fuel management is to lessen potential fire behavior proactively, thereby increasing the probability of successful containment and minimizing adverse impacts to values at risk. More specifically, the goal is to decrease the rate of fire spread, and in turn reduce fire size and intensity, as well as crowning and spotting potential (Alexander, 2003).

Fire Triangle:

Fire is a chemical reaction that requires fuel (carbon), oxygen and heat. These three components make up the fire triangle and if one is not present, a fire will not burn. Fuel is generally available in adequate quantities in the forest. Fuel comes from living or dead plant materials (organic matter). Trees and branches lying on the ground are a major source of fuel in a forest. Such fuel can accumulate gradually as trees in the stand die. Fuel can also build up in large amounts after catastrophic events such as insect infestations. Oxygen is present in the air. As oxygen is used up by fire it is replenished quickly by wind. Heat is needed to start and maintain a fire. Heat can be supplied by nature through lightning or people can be a source through misuse of matches, campfires, trash fires and cigarettes. Once a fire has started, it provides its own heat source as it spreads through a fuel bed capable of supporting it.

Forest Fuels:

The amount of fuel available to burn on any site is a function of biomass production and decomposition. Many of the forest ecosystems within BC have the potential to produce large amounts of vegetation biomass. Variation in the amount of biomass produced is typically a function of site productivity and

climate. The disposition or removal of vegetation biomass is a function of decomposition. Decomposition is regulated by temperature and moisture. In wet maritime coastal climates, the rates of decomposition are relatively high when compared with drier cooler continental climates of the interior. Rates of decomposition can be accelerated naturally by fire and/or anthropogenic means.

A hazardous fuel type can be defined by high surface fuel loadings, high proportions of fine fuels (<1 cm) relative to larger size classes, high fuel continuity between the ground surface and overstory tree canopies, and high stand densities. A fuel complex is defined by any combination of these attributes at the stand level and may include groupings of stands.

Surface Fuels:

Surface fuels consist of forest floor, understory vegetation (grasses, herbs and shrubs, and small trees), and coarse woody debris that are in contact with the forest floor. Forest fuel loading is a function of natural disturbance, tree mortality and/or human related disturbance. Surface fuels typically include all combustible material lying on or immediately above the ground. Often roots and organic soils have the potential to be consumed by fire and are included in the surface fuel category.

Surface fuels that are less than 7 cm in diameter contribute to surface fire spread; these fuels often dry quickly and are ignited more easily than larger diameter fuels. Therefore, this category of fuel is the most important when considering a fuel reduction treatment. Larger surface fuels greater than 7 cm are important in the contribution to sustained burning conditions, but, when compared with smaller size classes, are often not as contiguous and are less flammable because of delayed drying and high moisture content. In some cases, where these larger size classes form a contiguous surface layer, such as following a windthrow event or wildfire, they can contribute an enormous amount of fuel, which will increase fire severity and the potential for fire damage.

Aerial Fuels:

Aerial fuels include all dead and living material that is not in direct contact with the forest floor surface. The fire potential of these fuels is dependent on type, size, moisture content, and overall vertical continuity. Dead branches and bark on trees and snags (dead standing trees) are important aerial fuels. Concentrations of dead branches and foliage increase the aerial fuel bulk density and enable fire to move from tree to tree. The exception is for deciduous trees where the live leaves will not normally carry fire. Numerous species of moss, lichens, and plants hanging on trees are light and easily ignited aerial fuels. All of the fuels above the ground surface and below the upper forest canopy are described as ladder fuels.

Two measures that describe crown fire potential of aerial fuels are the height to live crown and crown closure (Figure 9 and Figure 10). The height to live crown describes fuel continuity between the ground surface and the lower limit of the upper tree canopy. Crown closure describes the inter-tree crown continuity and reflects how easily fire can be propagated from tree to tree. In addition to crown closure, tree density is an important measure of the distribution of aerial fuels and has significant influence on the overall crown and surface fire conditions (Figure 11). Higher stand density is associated with lower inter tree spacing, which increases overall crown continuity. While high density stands may increase the

potential for fire spread in the upper canopy, a combination of high crown closure and high stand density usually results in a reduction in light levels associated with these stand types. Reduced light levels accelerate self-tree pruning, inhibit the growth of lower branches, and decrease the cover and biomass of understory vegetation.

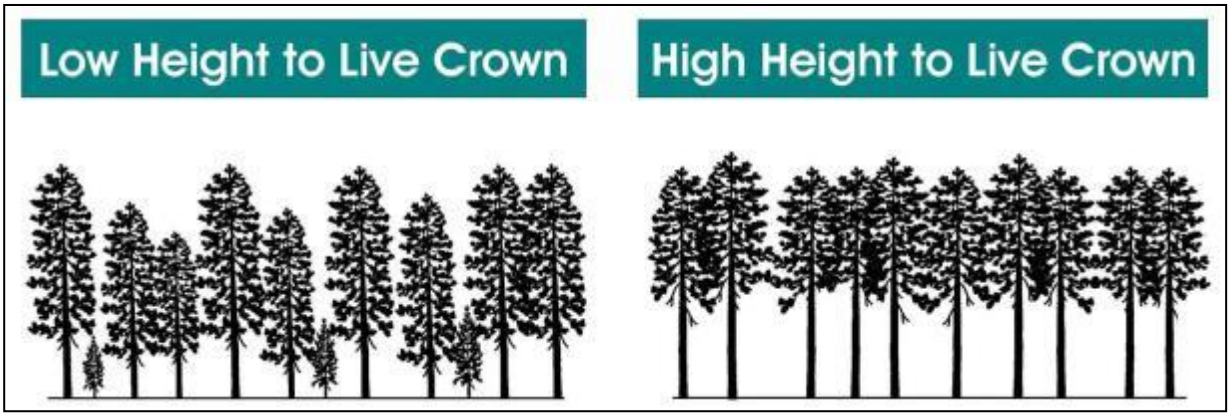


Figure 9. Comparison of stand level differences in height-to-live crown in an interior forest, where low height to live crown is more hazardous than high height to live crown.

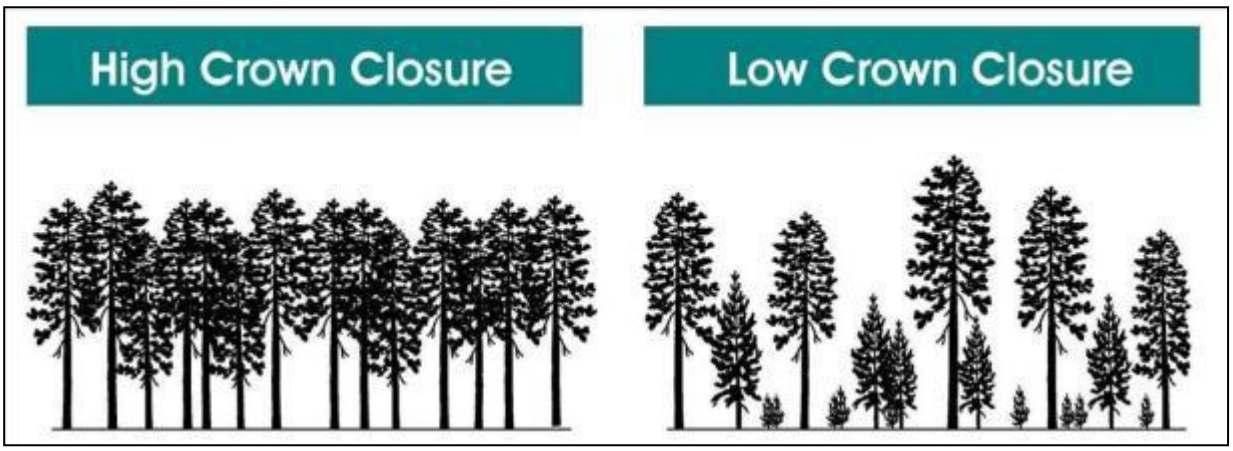


Figure 10. Comparison of stand level differences in crown closure, where high crown closure/continuity contributes to crown fire spread, while low crown closure reduces crown fire potential.

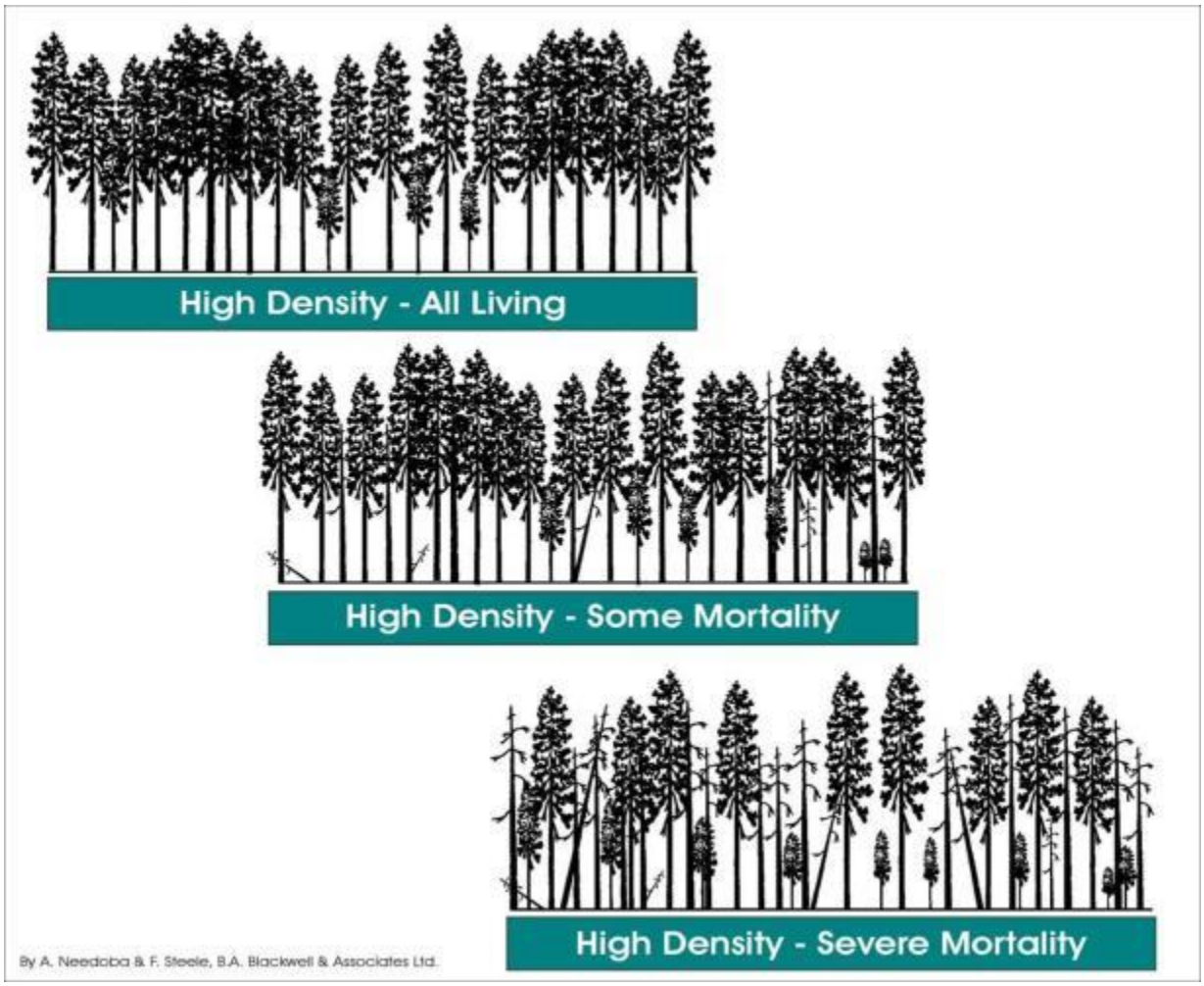


Figure 11. Comparison of stand level differences in density and mortality, and the distribution of live and dead fuels in these types of stands.

Thinning is a preferred approach to fuel treatment (Figure 12.) and offers several advantages compared to other methods:

- Thinning provides the most control over stand level attributes such as species composition, vertical structure, tree density, and spatial pattern, as well as the retention of snags and coarse woody debris for maintenance of wildlife habitat and biodiversity.
- Unlike prescribed fire treatments, thinning is comparatively low risk, and is less constrained by fire weather windows.
- Thinning may provide marketable materials that can be utilized by the local economy.
- Thinning can be carried out using sensitive methods that limit soil disturbance, minimize damage to leave trees, and provide benefits to other values such as wildlife.

The main wildfire objective of thinning is to shift stands from having a high crown fire potential to having a low surface fire potential. In general, the goals of thinning are to:

- Reduce stem density below a critical threshold to minimize the potential for crown fire spread;
- Prune to increase the height to live crown to reduce the potential of surface fire spreading into tree crowns; and
- Remove slash created by spacing and pruning to minimize surface fuel loadings while still maintaining adequate woody debris to maintain ecosystem function.

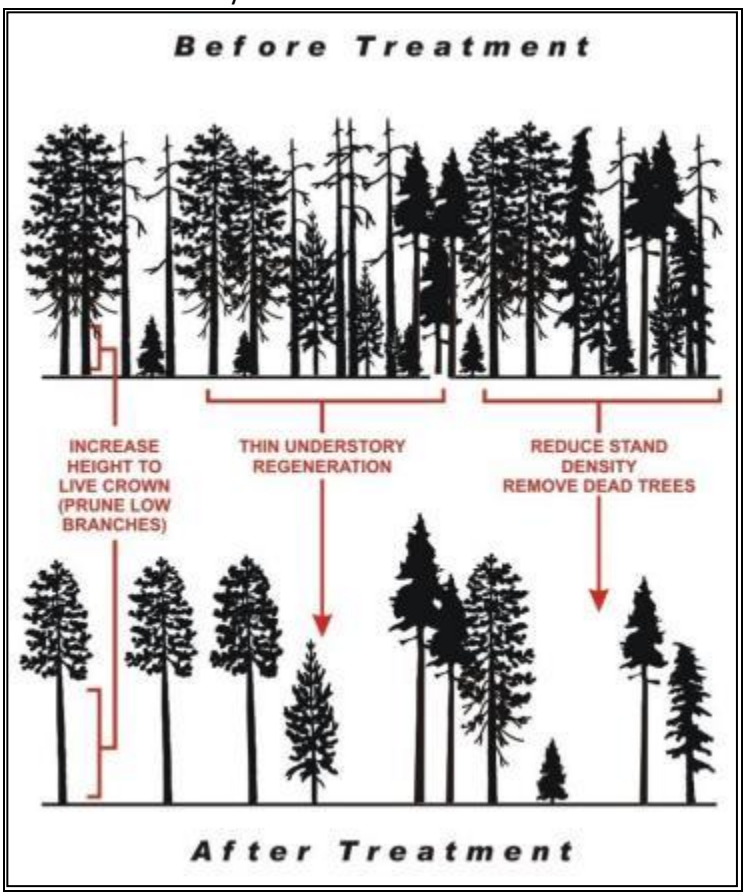


Figure 12. Illustration of the principles of thinning to reduce the stand level wildfire hazard.

Fuel type, weather and topography are all primary factors that influence the spread of fires. The three most important components of weather include wind, temperature and humidity. Fuel type and slope are primary concerns related to fire spread along the forested areas on the slopes surrounding the District communities. The steepness of a slope can affect the rate and direction a fire spreads and generally fires move faster uphill than downhill, and fire will move faster on steeper slopes. This is attributed to (MFLNRO, 2014):

- *On the uphill side, the flames are closer to the fuel;*
- *The fuels become drier and ignite more quickly than if on level ground;*
- *Wind currents are normally uphill and this tends to push heat flames into new fuels;*
- *Convected heat rises along the slope causing a draft which further increases the rate of spread; and*
- *Burning embers and chunks of fuel may roll downhill into unburned fuels, increasing spread and starting new fires.*

APPENDIX I – FIRESMART FUEL TREATMENTS

The following information regarding fuel treatments is based on the FireSmart Manual (Partners in Protection 2002).

Priority Zone 1 is a 10 m fuel free zone around structures. This ensures that direct flame contact with the building cannot occur and reduces the potential for radiative or conductive heat to ignite the building. While creating this zone is not always possible, landscaping choices should reflect the use of less flammable vegetation such as deciduous shrubs, herbs and other species with low flammability. Coniferous vegetation such as juniper or cedar shrubs and hedges should be avoided, as these are highly flammable.

Priority Zone 2 extends from 10 to 30 m from the structure. In this zone, trees should be widely spaced 5 to 10 m apart, depending on size and species. Tree crowns should not touch or overlap. Deciduous trees have much lower volatility than coniferous trees, so where possible deciduous trees should be preferred for retention or planting. Trees in this area should be pruned as high as possible (without compromising tree health), especially where long limbs extend towards buildings. This helps to prevent a fire on the ground from moving up into the crown of the tree or spreading to a structure. Any downed wood or other flammable material should also be cleaned up in this zone to reduce fire moving along the ground.

Priority Zone 3 extends from 30 to 100 m from the home. The main threat posed by trees in this zone is spotting, the transmission of fire through embers carried aloft and deposited on the building or adjacent flammable vegetation. To reduce this threat, cleanup of surface fuels as well as pruning and spacing of trees should be completed in this zone (Partners in Protection 2002).

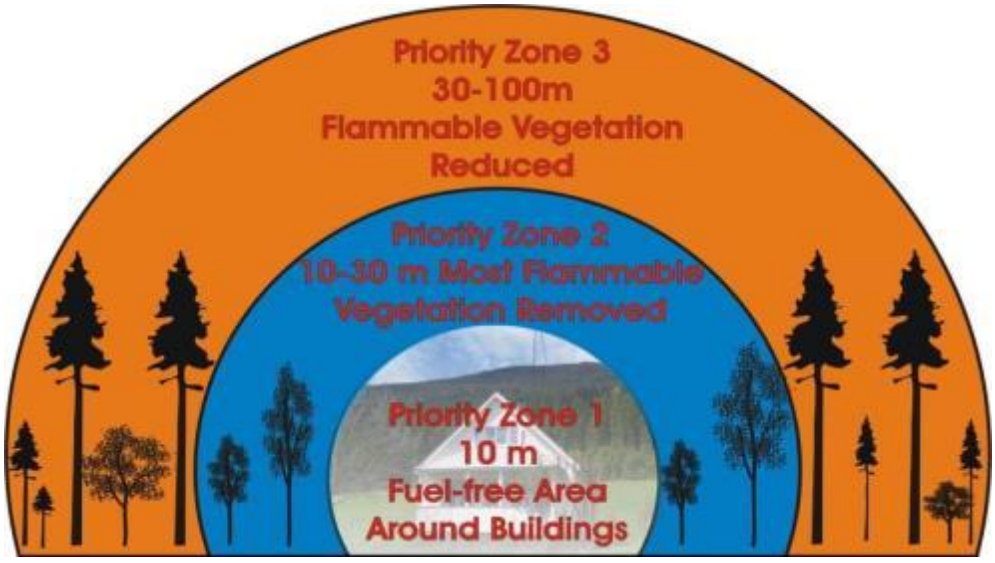


Figure 13. Illustration of FireSmart zones. (Figure adapted from FireSmart)

APPENDIX J – FIRESMART CONSTRUCTION AND LANDSCAPING

Two recent studies by Westhaver (2015, 2017) found that certain "fatal flaws", such as high-flammability landscaping like bulky ornamental junipers and large, easily ignited fuel sources (e.g. motorized vehicles, firewood, construction materials, *etc*.) were sufficiently influential to result in structure ignition of homes otherwise assessed as "Low" hazard by overwhelming the advantages provided by highly fire resistant structures[89].

In the 2017 Fort McMurray investigations (Westhaver) it was found that the most notable observed attributes of the surviving interface homes were: vegetation and fuels within the HIZ which were compliant with FireSmart practices, HIZs with relatively few combustible objects and ignition sites (examples of ignition sites include: combustible accumulations on roofs, gutters, *etc*.) , and Low to Moderate structural hazard ratings.[90,91] This investigation, and other similar investigations, indicate that the FireSmart principles can be effective at reducing structure loss, particularly in the urban perimeter where fire initially spreads from the forest to structures. .

The following link accesses an excellent four-minute video demonstrating the importance of FireSmart building practices during a simulated ember shower: https://www.youtube.com/watch?v=IvbNOPSYyss.

FireSmart Construction

Roofing Material:

Roofing material is one of the most important characteristics influencing a home's vulnerability to fire. Roofing materials that can be ignited by burning embers increases the probability of fire related damage to a home during an interface fire event.

In many communities, there is no fire vulnerability standard for roofing material. Homes are often constructed with unrated materials that are considered a major hazard during a large fire event. In addition to the vulnerability of roofing materials, adjacent vegetation may be in contact with roofs, or roof surfaces may be covered with litter fall from adjacent trees. This increases the hazard by increasing the ignitable surfaces and potentially enabling direct flame contact between vegetation and structures.

Soffits and Eaves

Open soffits or eaves provide locations for embers to accumulate, igniting a structure. Soffits and eaves should be closed. Vents which open into insulated attic space are of particular concern, as they provide a clear path for embers to a highly flammable material inside the structure. Any exhaust or intake vents that open into attic spaces should resist ember intrusion with non-combustible wire mesh no larger than 3 mm.

[89] Westhaver, A. 2017. *Why some homes survived. Learning from the Fort McMurray wildland/urban interface fire disaster*. A report published by the Institute for Catastrophic Loss Reduction – ICLR research paper series – number 56. https://www.iclr.org/images/Westhaver_Fort_McMurray_Final_2017.pdf

[90] Ibid.

[91] Using the FireSmart hazard assessment system.

Building Exterior - Siding Material:

Building exteriors constructed of vinyl or wood are considered the second highest contributor to structural hazard after roofing material. These materials are vulnerable to direct flame or may ignite when sufficiently heated by nearby burning fuels. The smoke column will transport burning embers, which may lodge against siding materials. Brick, stucco, or heavy timber materials offer much better resistance to fire. While wood may not be the best choice for use in the WUI, other values from economic and environmental perspectives must also be considered. It is significantly less expensive than many other materials, supplies a great deal of employment in BC, and is a renewable resource. New treatments and paints are now available for wood that increase its resistance to fire and they should be considered for use.

Balconies and Decking:

Open balconies and decks increase fire vulnerability through their ability to trap rising heat, by permitting the entry of sparks and embers, and by enabling fire access to these areas. Closing these structures off limits ember access to these areas and reduces fire vulnerability. Horizontal surfaces, such as decks, of flammable materials are vulnerable to ignition from embers. Fire resistant decking/ patio materials will reduce the ignitability of the home.

Combustible Materials:

Combustible materials stored within 10 m of residences are also considered a significant issue. Woodpiles, propane tanks, recreational motorized vehicles, and other flammable materials adjacent to the home provide fuel and ignitable surfaces. Locating these fuels away from structures helps to reduce structural fire hazards and makes it easier and safer for suppression crews to implement suppression activities adjacent to a house or multiple homes.

FireSmart Landscaping

Future landscaping choices should be limited to plant species with low flammability within 10 m of the building. Coniferous vegetation such as Juniper, Cypress, Yew or Cedar hedging or shrubs of any height should not be planted within this 10 m zone as these species are considered highly flammable under extreme fire hazard conditions.

Decorative bark mulch, often used in home landscapes is easily ignitable from wildfire embers or errant cigarettes and can convey fire to the home. Alternatives to bark mulch include gravel, decorative rock, or a combination of wood bark and decorative rock.[92]

Landscaping Alternatives

The landscaping challenges faced by many homeowners pertain to limited space, privacy and the desire to create visually explicit edge treatments to demarcate property ownership from adjacent lots with evergreen vegetation screens. Ornamental plant characteristics fulfilling these criteria have an upright

[92] *Fire Resistant Plants for Home Landscapes: Selecting plants that may reduce your risk from wildfire*. 2006. A Pacific Northwest Extension Publication (PNW 590).

branching habit, compact form, dense foliage, as well as a moderate growth rate. Dwarf and ornamental conifers such as Arborvitae hedging are popular choices, yet conifers such as these which have needle or scale-like foliage are highly flammable and not compliant with FireSmart principles and should be omitted from the 10 m Fire Priority Zone of the planned home footprint.

There are a number of broadleaved deciduous and evergreen plants with low flammability which can be used for landscaping within FireSmart PZ 1 (within 10 m of structures). Landscaping should be selected for the appropriate Canadian Plant Hardiness Zone (see www.planthardiness.gc.ca for the Hardiness Zone specific to the various study area). The majority of the areas would be within Zone 3b.

Plants that are fire resistant/ have low flammability generally have the following characteristics:

- Foliage with high moisture content (moist and supple),
- Little dead wood and do not tend to accumulate dry and dead foliage or woody materials, and
- Sap that is water-like and without a strong odour.[3]

It is important to note that even fire resistant plants can burn if not maintained. Grass, shrubs, and herbs must be maintained in a state that reduces fire hazard by maintaining foliar moisture content. This can be accomplished by:

- Choosing plant species that are well-adapted to the site (microclimate and soil conditions of the parcel);
- Incorporating a landscape design where shrubs, herbs, and grasses are planted in discrete units manageable by hand watering;
- Removal of dead and dying foliage; and/or,
- Installing irrigation.

Depending solely on irrigation to maintain landscaping in a low flammability state can be limiting and may actually increase the fire hazard on the parcel, particularly in times of drought and watering restrictions. Lack of irrigation in times of watering restrictions may create a landscape which is unhealthy, unsightly, as well as dead, dry, and highly flammable.

There are a number of resources available to aid in development of FireSmart compliant landscaping curriculum or educational material; links can be found below.

The Canadian and U.S. systems for determining Plant Hardiness Zones differ.

- The USDA bases hardiness zones on minimum winter temperatures only: http://planthardiness.ars.usda.gov/PHZMWeb/Default.aspx,
- The Canadian system bases them on seven climatic factors including frost free days, and minimum and maximum temperature: http://www.planthardiness.gc.ca/

APPENDIX K – COMMUNICATION AND EDUCATION

Communicating effectively is the key aspect of education. Communication materials must be audience specific and delivered in a format and through a medium that will reach the target audience. Audiences should include home and landowners and occupiers, school students, local businesses, municipal officials and staff, community members, and other community groups. Education and communication messages should be engaging, empowering, 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.

Websites and social media are some of the most cost-effective methods of communication available. Pew Research Center recently found that approximately 60% of Americans get their news from social media; 44% get their news from Facebook.[93] Twitter, LinkedIn, and Instagram are other social media platforms which can be used to provide real-time information to a large audience and are used, albeit to a lesser extent, by users as their primary news source.[94]

The challenge of all social media is to ensure that your message reaches the intended audience, accomplished by having users 'like' the page, engage with the posts, or re-share information to an even larger audience. There are communication experts who specialize in social media who can evaluate an organization's goals and offer tips to increase engagement and create compelling content to communicate the message. Likewise, it is important to be aware of the demographic of the community; a younger, more digitally connected community is more likely to use social media to get updates on 'newsworthy items'.[95]

[93] Pew Research Center Journalism and Media. Social media news use: Facebook leads the pack. May 25, 2016. Accessed December 17, 2017 from http://www.journalism.org/2016/05/26/news-use-across-social-media-platforms-2016/pj_2016-05-26_social-media-and-news_0-03/.

[94] Although the research cited in this document is of American social media users, it can be cautiously assumed that, while data and numbers are not likely exact to the Canadian demographic, similar trends in Canada likely occur.

[95] The Pew Research Center finds that 69% of Facebook users are 49 and younger. Only 8% of Facebook users are older than 65.