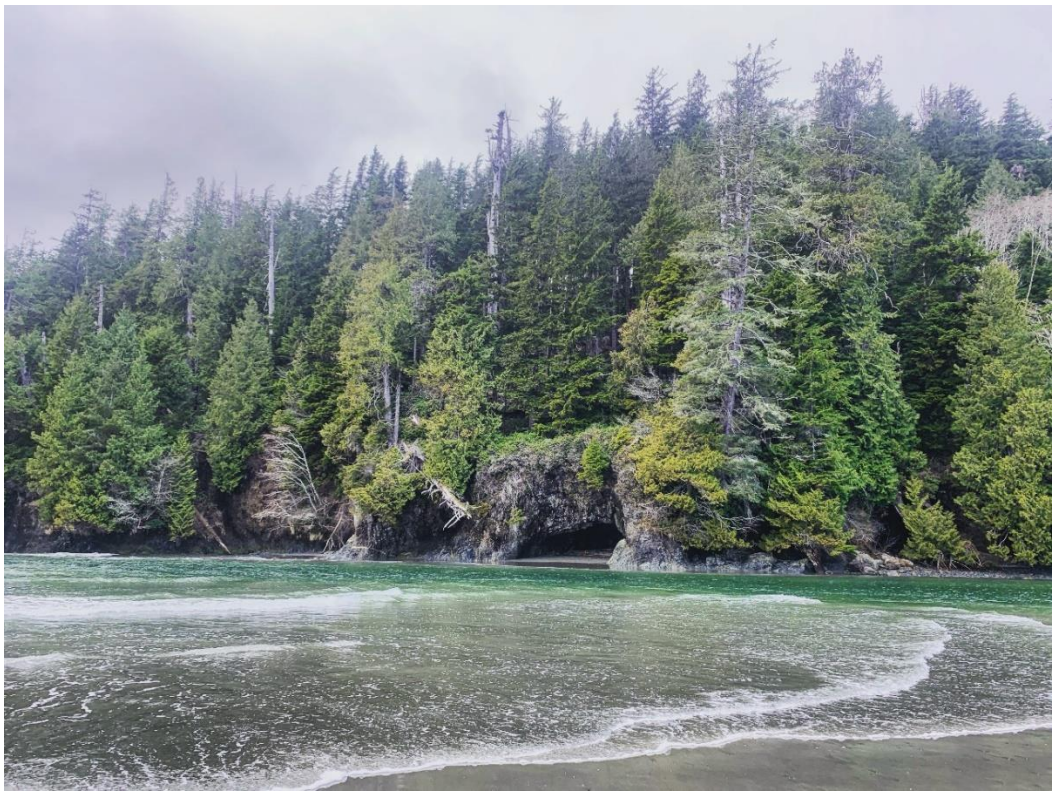
Alberni-Clayoquot Regional District Community Wildfire Protection Plan Update



Submitted by:
Stefana Aurora Dranga, RPF, RPBio
Bruce Blackwell, RPF, RPBio
B.A. Blackwell & Associates Ltd.
270 – 18 Gostick Place
North Vancouver, BC, V7M 3G3
Ph: 604-986-8346
Email: bablackwell@bablackwell.com

Submitted to:
Wendy Thomson
Manager of Administrative Services
Alberni-Clayoquot Regional District
3008 5th Ave,
Port Alberni, BC, V9Y 2E3
Ph: 250-720-2706
Email: wthomson@acrd.bc.ca

October 2019

B.A. Blackwell & Associates Ltd.

Alberni-Clayoquot Regional District

ACKNOWLEDGEMENTS

The authors would like to thank the following District of Alberni Clayoquot and City of Port Alberni staff: Kelly Gilday (Previous Protective Services Manager); Mike Cann and Rick Geddes (Fire Chief and previous Deputy Chief, Sproat Lake Volunteer Fire Department); Lucas Banton (Fire Chief, Cherry Creek Volunteer Fire Department); Lori Wilson (GIS and Mapping Technician); Julia Martin (Administrative Assistant); Mike Owens and Wes Patterson (Fire Chief and Deputy Chief, Port Alberni Fire Department), and Rob Gaudreault (Parks and Recreation Planner, City of Port Alberni). 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) and Jessica Duncan (Prevention Specialist); and staff from the Ministry of Forests, Lands, Natural Resource Operations and Rural Development: Mary Bauto (Resource Manager, South Island Natural Resource District) as well as staff from BC Parks: Andy Macdonald (Section Head, BC Parks, Haida Gwaii/South Island).

The authors extend their appreciation to the Hupacasath, Huu-ay-aht, Ka:yu:kth/Che:k:tles7et'h', K'omoks, Maa-nulth, Qualicum, Snaw'Naw'As, Tseshaht, Toquaht, Ucluelet, We Wai Kai First Nations, as well as the Nanwakolas Council and the Uchucklesaht Tribe.

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

REGISTERED PROFESSIONAL SIGN AND SEAL

RPF PRINTED NAME	
Stefana Aurora Dranga	RPF 5093
DATE SIGNED	
October 30, 2019	
I certify that the work described herein fulfills the standards expected of a member of the Association of British Columbia Forest Professionals and that I did personally supervise the work.	
Registered Professional Forester Signature and Seal	
	

EXECUTIVE SUMMARY/ SUMMARY OF CWPP RECOMMENDATIONS

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

This CWPP Update will provide the Alberni Clayoquot Regional District (ACRD) with a framework that can be used to review and assess areas of identified moderate and high fire risk within the ACRD. Additionally, the information contained in this report should help to guide the 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 48 strategic recommendations are summarized in Table 1 below. In addition, these recommendations are included and more thoroughly discussed in their appropriate sections within the document. The recommendations are categorized according to jurisdictions in order to facilitate collaborative planning and implementation. Jurisdictional categories include the ACRD (unincorporated communities and remote urban interface areas, referred to as remote communities in the summary of recommendations) and the City of Port Alberni (incorporated member municipality). 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 course of action or combination of actions that provides an answer to the challenge of wildfire risk in communities; the ACRD must further prioritize based on resources, strengths, constraints, and availability of funding, regularly updating priorities and its course of action, as variables and circumstances change through time.

Although the recommendations identified in the previous CWPP (2010) have yet to be implemented, the ACRD and City of Port Alberni staff recognize the risk of wildfire to their communities, and are currently engaged in strategic planning for future wildfire risk mitigation activities. It is important to note that in addition to the recommendations provided in this report, recommendations identified in the 2010 CWPP that are still applicable and have yet to be implemented should be considered and addressed as prioritized by the ACRD and City of Port Alberni. A summary of the 2010 CWPP recommendations is provided in Appendix L.

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**	**Jurisdiction (Area of Concern)**	**Estimated Cost ($) or Person hours**
Objective: Review and amend the current Alberni Clayoquot Regional District and City of Port Alberni regulatory framework to incorporate wildfire mitigation and preparedness considerations.					
1	11	High	Consider reviewing and amending the OCP to include a growth management policy which considers wildfire risk and other natural hazards during strategy development. By containing development within a specified area, the overall fire risk is lower than in areas of intermixed development, i.e. rural sprawl. By constraining development, the City of Port Alberni 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.	City of Port Alberni	~30-60 in-house hours (local government funding). May be eligible for UBCM CRI Program Funding[1]
2	12	Moderate	Support the development of a Trails Master Plan and consider parks acquisition and maintenance through a wildfire lens, to ensure wildfire risk, mitigation, liability and future maintenance are considered as priorities in development of the parks and trails inventory, including consideration for long-term maintenance costs and access.	City of Port Alberni and ACRD (Unincorporated Communities and Remote Urban Interface Areas)[2]	~50-80 in-house hours (local government funding)
3	14	Moderate	Review the Electoral Areas A, B, D, E and F OCPs and amend the existing language around natural hazards to include wildfire and interface fire. Natural hazards such as wildfire and interface fire, have the potential to impact public health and safety; economics (i.e., through evacuations, loss of tourism, interruption of services); ecosystems and habitat; and water quality, among others. Identification of natural hazards can allow for the implementation of plans and policies to increase ACRD resilience, mitigate potential damage, and increase public and official awareness of risk.	ACRD	~25-30 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.

[2] Hereafter referred to as ACRD

Document Section 2: Local Area Description (2.5.3: Local Government/First Nations Policies and Recommendations)					
Item	**Page No.**	**Priority**	**Recommendation/Next Steps**	**Jurisdiction (Area of Concern)**	**Estimated Cost ($) or Person hours**
4	14	Moderate	Consider incorporating QP reports and sign-off as part of the Natural Hazard Guidelines in Electoral Areas A, B, D, E and F OCPs.	ACRD	Negligible in-house cost
5	14	High	Review ACRD Bylaw No. 16, 1971 and include wording that specifically prohibits the accumulation of combustible materials on the property (including on and under exterior projections, such as decks and patios, near the home, and in gutters and roofs). The revised bylaw should provide the ACRD the authority to require removal/clean-up of combustible materials.	ACRD	~25-30 in-house hours (local government funding or UBCM CRI Program funding)
6	15	Low	Consider working with the Planning and Development Services 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 City-wide engagement campaign and providing incentives such as the opportunity to acquire/purchase discounted address signs.	City of Port Alberni	~10-20 District staff hours required for internal work with the Fire and Development Services Department. Additional 25-30 hours for material development and distribution for incentive/engagement campaign)
7	16	Moderate	Consider amending the City of Port Alberni Bylaw No. 4975, 2018, to include all buildings (occupied or vacant) and the yard, in order to reduce fire hazard on residential properties within the City boundary.	City of Port Alberni	~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**	**Jurisdiction (Area of Concern)**	**Estimated Cost ($) or Person hours**
Objective: Protect critical infrastructure and mitigate post wildfire impacts					
8	22	Moderate	The use of fire-resistant construction materials, building design and landscaping should be considered for all critical infrastructure when completing upgrades or establishing new infrastructure. Additionally, vegetation setbacks around critical infrastructure should be compliant with FireSmart guidelines. Secondary power sources are important to reduce critical infrastructure vulnerability in the event of an emergency which cuts power for days, or even weeks.	ACRD, City of Port Alberni, and First Nation Communities	Negligible in-house cost
9	22	High	It is recommended that formal FireSmart assessments (by a Qualified Professional) be completed of critical infrastructure such as fire halls, emergency operations centre, water infrastructure, and others as identified in this CWPP (Table 4) and by the ACRD and City of Port Alberni staff.	ACRD and City of Port Alberni	~$1,500-2,000 per location (consultant cost)
10	27	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.	ACRD	To be determined, this cost would depend on the scope of the assessment (~$10,000-40,000)
Document Section 4: Wildfire Threat and Risk					
Item	**Page No.**	**Priority**	**Recommendation/Next Steps**	**Jurisdiction (Area of Concern)**	**Estimated Cost ($) or Person hours**
Objective: Mitigate wildfire threat on private land					
11	64	High	The ACRD should work with local private landowners and private managed forest land managers (Mosaic Forest Management) to identify and pursue risk mitigation approaches in private areas located in the wildland urban interface, with consideration for potential funding resources and objectives.	ACRD	~30-40 in-house hours

Document Section 5: Risk Management and Mitigation Factors Recommendations					
Item	**Page No.**	**Priority**	**Recommendation/Next Steps**	**Jurisdiction (Area of Concern)**	**Estimated Cost ($) or Person hours**
Objective: Undertake Fuel Treatments to Improve Emergency Access					
12	68	Moderate	The ACRD should work with the Ministry of Transportation and Infrastructure (MOTI) and private managed forest land holders, to assess the area suitable for treatment (i.e., high hazard) along Highway 4 and Franklin River/Bamfield Road 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.	ACRD	Appropriate funding stream to be identified. 10-person hours, however dependent upon ACRD's role within the project
Objective: Reduce Wildfire Threat through Fuel Management					
13	70	High	Proceed with detailed assessment, prescription development, and treatment of hazardous units identified and prioritized in this CWPP and previously proposed treatment units (from the 2010 CWPP) that have yet to be implemented.	ACRD and City of Port Alberni	UBCM CRI Program Funding/Local Government Funding
14	83	Moderate	As treatments are implemented; treatment monitoring should be completed by a qualified professional 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.	ACRD, City of Port Alberni and First Nation Communities	UBCM CRI Funding/Local Government Funding
Objective: Reduce Wildfire Hazard on Private Land					
15	88	High	The ACRD and City of Port Alberni should apply for a FireSmart demonstration grant through the Community Resiliency Investment (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.).	ACRD City of Port Alberni	UBCM CRI Funding/Local Government Funding

Document Section 5: Risk Management and Mitigation Factors Recommendations					
Item	**Page No.**	**Priority**	**Recommendation/Next Steps**	**Jurisdiction (Area of Concern)**	**Estimated Cost ($) or Person hours**
16	88	High	Continue to offer yard waste disposal opportunities and 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 or curbside yard waste collection.	ACRD and City of Port Alberni	Time dependent upon program. Eligible for UBCM CRI Program Funding. Additional time for advertisement of program availability will be required.
17	90	High	Review the Port Alberni and ACRD Electoral Areas A, B, D, E and F OCPs; consider including wildfire as a natural hazard development permit area. A recommended development permit area for the ACRD and City of Port Alberni would include all areas within the AOI that are located within 200 m of moderate, high or extreme wildfire behaviour threat class areas. Review similar DPs established in other jurisdictions and use as models for various aspects of the DP process. Key aspects that should be considered in the OCP review and wildfire DP development are described in greater detail in text.	ACRD and City of Port Alberni	40-80 in-house hours and $5,000 for consultant analysis and support (Local Government Funding/ CRI Funding)
18	90	Moderate	Ensure that wildfire hazard development permit applications are provided to fire departments for opportunity for input prior to approval. As more wildfire DP applications are received, the importance of communication and integration between fire departments and the Planning Department increase.	ACRD and City of Port Alberni	Dependent on the number of DP applications
19	90	Low	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 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 Regional District or Municipal Office or other strategic locations).	ACRD and City of Port Alberni	$2,000 - $3,000 to outsource. Alternatively, general FireSmart landscaping information is available free of charge, but is not climate/ plant hardiness zone specific

Document Section 5: Risk Management and Mitigation Factors Recommendations					
Item	**Page No.**	**Priority**	**Recommendation Next Steps**	**Jurisdiction/ Area of Concern**	**Estimated Cost ($) or Person hours**
20	91	Moderate	Engage 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	ACRD and City of Port Alberni	~40 hours
21	93	Moderate	The ACRD and City of Port Alberni should hire a qualified professional (QP) or consider training additional 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.	ACRD and City of Port Alberni	~25 in-house hours (Consultant and/or Fire Department/ ACRD Emergency staff)
22	94	High	The ACRD and City of Port Alberni should apply for funding from the UBCM CRI Program to develop a local FireSmart rebate program. This will allow homeowners to access partial rebates for FireSmart activities on their properties, if rated as moderate, high or extreme risk in a FireSmart home and property assessment. The rebate program must adhere to the goals of FireSmart, as outlined in Section 5.2.1.	ACRD and City of Port Alberni	~20-35 District staff hours
Objective: Increase Public Wildfire Awareness					
23	95	High	This report and associated maps should be made publicly available through webpage, social media, and public FireSmart meetings. In addition, this Update 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 Update document	ACRD and City of Port Alberni	3-6 hours depending on method of distribution

Document Section 5: Risk Management and Mitigation Factors Recommendations					
Item	**Page No.**	**Priority**	**Recommendation Next Steps**	**Jurisdiction/ Area of Concern**	**Estimated Cost ($) or Person hours**
24	96	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 ACRD'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	ACRD	UBCM CRI funding (two eligibility tiers: $25,000 or $100,000; eligibility is based on local wildfire risk rating) / local government funding to supplement
25	96	Moderate	Develop a social media strategy and ensure that its full power is leveraged to communicate fire bans, high or extreme Fire Danger days, wildfire prevention initiatives and programs, easily implementable FireSmart activities, updates on current fires and associated air quality, road closures, and other real-time information in an accurate and timely manner.	ACRD and City of Port Alberni	~40 hours to create strategy. ~20 hours to identify partners, initiate relationship and gain strategy support. Additional daily/weekly hours to implement and update depending on strategy
26	96	High	Promote FireSmart approaches for wildfire risk reduction to ACRD and City of Port Alberni 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.	ACRD and City of Port Alberni	~10 hours. May be eligible for UBCM/ CRI grant

Document Section 5: Risk Management and Mitigation Factors Recommendations					
Item	**Page No.**	**Priority**	**Recommendation Next Steps**	**Jurisdiction/ Area of Concern**	**Estimated Cost ($) or Person hours**
27	96	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.	ACRD and City of Port Alberni	~20 hours. FireSmart grant
28	96	Moderate	Facilitate the FSCCRP uptake within the ACRD and City of Port Alberni and enhance its applications by including the following: 1) invite BC 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	ACRD and City of Port Alberni	$5,000/ neighbourhood and an additional 40 hours/ initiative UBCM/CRI grant(s) available
29	96	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 that exist on their property and provide easy improvement recommendations to reduce their risk.	ACRD and City of Port Alberni	~1.5 hours/ assessment
30	96	Low	Encourage schools to adopt and deploy existing school education programs to engage youth in wildfire management and risk reduction. There is emergency preparedness curriculum available provincially, which includes preparedness for a variety of natural hazards, including wildfire (Master of Disaster). Other options/value-added activities include consulting with Association of BC Forest Professionals and BCWS, as well as local fire department and FireSmart representatives to facilitate and recruit volunteer teachers and experts to help with curriculum development to be delivered in elementary and/or secondary schools (field trips, guest speakers, etc.).	ACRD and City of Port Alberni	~30-40 hours

Document Section 5: Risk Management and Mitigation Factors Recommendations					
Item	**Page No.**	**Priority**	**Recommendation Next Steps**	**Jurisdiction/ Area of Concern**	**Estimated Cost ($) or Person hours**
31	97	High	Develop and work with all key stakeholders (BCWS, BC Parks, recreational groups/representatives, ACRD and City of Port Alberni staff, industrial operators (i.e., Mosaic Forest Management and Crown forest tenure holders), and local First Nations) to formalize an Interface Steering Committee. The purpose of the steering committee would be to identify wildfire related issues in the area and to develop collaborative solutions to minimize wildfire risks.	ACRD and City of Port Alberni	~ 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
32	97	Moderate	Work towards educating homeowners within fire limits 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).	ACRD and City of Port Alberni	5-10 hours
33	97	Moderate	Promote and provide information to private landowners related to residential sprinklers as a FireSmart prevention measure.	ACRD and City of Port Alberni	10-20 hours to prepare materials and disseminate information to landowners
Objective: Reduce Wildfire Risk from Industrial Sources					
34	97	Moderate	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 do not occur during high fire danger times to reduce chance of ignitions as per the Wildfire Act.	ACRD and City of Port Alberni	2-4 hours

Document Section 5: Risk Management and Mitigation Factors Recommendations					
Item	**Page No.**	**Priority**	**Recommendation Next Steps**	**Jurisdiction/ Area of Concern**	**Estimated Cost ($) or Person hours**
35	98	Moderate	Work with industrial operators (i.e., BC Hydro) to ensure that right-of-ways do not contain fine fuel accumulations (easily cured) or high conifer regeneration prior to and during the fire season and are maintained in a low to moderate hazard state (to serve as fuel breaks).	ACRD and City of Port Alberni	2-4 hours
Objective: Improve Water Availability for Emergency Response					
36	101	Moderate	Consider entering into Water Use Agreements with relevant private land owners to ensure strategic water course access for use by local fire departments for emergency firefighting purposes.	ACRD	~20-30 hours to engage private land owners; ~40 hours to implement program (local government funding)
37	101	High	All new development outside existing ACRD and Improvement Districts water systems (e.g., Cherry Creek Waterworks District) should have a water system which meets or exceeds minimum standards of NFPA 1142, *Standard on Water Supplies for Suburban and Rural Fire Fighting*[3]. The fire departments should review the water supply to ensure it provides sufficient placement, flow, and reliability for suppression needs and that secondary power is available in the event of power outages.	ACRD	~5-10 hours per development
Objective: Improve Access/Egress to Enhance Emergency Preparedness					
38	103	High	Complete and participate in regular testing of, and updates to, the evacuation plan.	ACRD and City of Port Alberni	~30-40 hours to plan and stage; 8 hours to complete testing

[3] 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**	**Jurisdiction/ Area of Concern**	**Estimated Cost ($) or Person hours**
39	103	Moderate	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.	ACRD and City of Port Alberni	~10,000-$15,000 to complete (contractor estimate)
40	103	Moderate	Develop a Total Access Plan for the ACRD 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.	ACRD	~8,000-$10,000 to build plan, map, populate attributes and update (contractor estimate)
Objective: Include Wildfire Considerations when Trail Planning					
41	103	Moderate	Include a qualified professional with experience in operational wildland/interface fire suppression in the planning and strategic siting of future trails and parks.	ACRD and City of Port Alberni	10-20 hours to review current trails / map, provide recommendations

Document Section 6: Wildfire Response Resources Recommendations					
Item	**Page No.**	**Priority**	**Recommendation/Next Steps**	**Jurisdiction/ Area of Concern**	**Estimated Cost ($) or Person hours**
Objective: Enhance Wildfire Equipment and Training					
42	104	High	The ACRD and City of Port Alberni should continue working with BCWS to maintain an annual structural and interface training program. It is recommended the ACRD and City of Port Alberni 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.	ACRD and City of Port Alberni	Cost and time dependent upon training exercise (scope, number of participating members etc.)
43	105	Moderate	The ACRD should continue engaging in regular communication with the BCWS Mid Island Zone, Errington/Port Alberni Fire Base to foster a strong relationship and identify potential cooperative wildfire risk reduction opportunities.	ACRD	~4 hours/ year
44	105	High	Ensure that the ACRD and City of Port Alberni maintain the capability to effectively suppress wildland fires, through wildfire-specific training sessions. Ensure all ACRD and City of Port Alberni Fire Departments training includes S-100 and S-185 (combined) or SPP-WFF1, at a minimum. Consider expanding the training program to maintain a high level of member education and training specific to interface and wildland fires. The fire department should continue the practice of staying up to date on wildfire training opportunities offered by the OFC and/or the BCWS, and to train members in this capacity, as training resources/budgets allow.	ACRD and City of Port Alberni	Within current training budget (a combination of S-100/SPP-115 currently implemented)
Objective: Encourage FireSmart Initiatives					
45	106	Low	Consider working with local distributors and homeowners within the ACRD/City of Port Alberni. The objective is to improve education of homeowners and remove some barriers to FireSmart action. For more information see Section 6.2 *Structure Protection.*	ACRD and City of Port Alberni	~60 hours

Document Section 6: Wildfire Response Resources Recommendations					
Item	**Page No.**	**Priority**	**Recommendation/Next Steps**	**Jurisdiction/ Area of Concern**	**Estimated Cost ($) or Person hours**
46	106	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. Programs may include scheduled community chipping opportunities, yard waste dumpsters available by month in neighbourhoods, c or scheduled burning weekends. Programs should be available during times of greatest resident activity (likely spring and fall).	ACRD and City of Port Alberni	Time dependent upon program. Eligible for UBCM/CRI grant. Additional time for advertisement of program availability will be required.
Objective: Enhance Protection of Municipal Infrastructure from Wildfire					
47	107	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.	ACRD and City of Port Alberni	~ 20 hours to complete vulnerability assessment and upgrading dependent on project(s) chosen
48	107	Moderate	Consider acquiring a Type II SPU (provides protection for 25-30 residences) and an off-road capable wildfire response vehicle to improve wildfire response.	ACRD	$100,000-$150,000 depending on configuration.

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COMMONLY USED ACRONYMS

ACRD	Alberni Clayoquot Regional District
BCVFD	Beaver Creek Volunteer Fire Department
BCWS	British Columbia Wildfire Service
BEC	Biogeoclimatic Ecosystem Classification
BMP	Best Management Practices
BVFD	Bamfield Volunteer Fire Department
CCFD	Cherry Creek Fire Department
CDC	B.C. Conservation Data Centre
CFFDRS	Canadian Forest Fire Danger Rating System
CRI	Community Resiliency Investment Program
CWPP	Community Wildfire Protection Plan
DP	Development Permit
DPA	Development Permit Area
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
FSP	Forest Stewardship Plan
HIZ	Home Ignition Zone
MFLNRORD	Ministry of Forests, Lands, Natural Resource Operations, and Rural Development
MOTI	Ministry of Transportation and Infrastructure
NFPA	National Fire Protection Agency
OCP	Official Community Plan
OFC	Office of the Fire Commissioner
PAFD	Port Alberni Fire Department
PSTA	Provincial Strategic Threat Analysis
PTU	Proposed Treatment Unit
QP	Qualified Professional
SLVFD	Sproat Lake Volunteer Fire Department
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

The Alberni Clayoquot Regional District (ACRD) staff recognize wildfire mitigation and planning as a foundational component of emergency planning and preparedness. In 2018, B.A. Blackwell and Associates Ltd. was retained to assist the ACRD in developing an update to the previous 2010 Community Wildfire Protection Plan which was titled *Alberni-Clayoquot Regional District Community Wildfire Protection Plan*, hereinafter referred to as the 2010 CWPP. This CWPP Update document (funded under the 2017 Strategic Wildfire Prevention Initiative (SWPI) program) revisits the 2010 CWPP with a focus on integrating the updated Provincial Strategic Threat Analysis (PSTA), BC Wildfire Service (BCWS) fuel type mapping, and the updated and improved wildfire threat analysis methodology. Furthermore, ACRD staff recognized that there have been significant changes since 2010 which have had a direct impact on wildfire mitigation activities and programs. The aforementioned changes include: growth and development in the last decade; parks and green spaces and development services; and changes in fuels surrounding ACRD communities.

Although forest fires are both inevitable and essential to the health of forested ecosystems, the 2003, 2004, 2009, 2010, 2015, 2017 and 2018 wildfire seasons resulted in significant economic, social and environmental losses in BC. The 2018 fire season impacted various regions of the province, leading to 66 evacuation orders and approximately 1,355,000 hectares burned, surpassing the 2017 fire season.[4] The final suppression costs for the 2018 fire season are estimated at over $615 million.[4] Other recent wildfire disasters—like those experienced in Slave Lake, Alberta (2011), Washington State (2014 and 2015), Fort McMurray, Alberta (2016) and BC and California (2017-2018) 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 in the wildland urban interface[5] (WUI).

1.1 PURPOSE

The purpose of this CWPP Update is to identify and update the wildfire risks within and surrounding the ACRD, to describe the potential consequences of a wildfire impacting the area, and to examine options and strategies to reduce wildfire risk to the various ACRD communities. This CWPP Update provides a reassessment of the level of risk with respect to changes in the area that have occurred recently, giving the ACRD a more current and accurate understanding of the threats to human life, property and critical infrastructure faced by the community from wildfires. The goal of this CWPP, in addition to defining the threats, is to identify measures necessary to mitigate threats and outline a plan of action for implementing recommended measures. Specifically, this CWPP Update is intended to serve as a

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

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

framework to inform the implementation of specific actions and strategies that will serve to: 1) reduce the likelihood of wildfire entering communities, 2) reduce the impacts and losses to property and critical infrastructure in the event of a wildfire, and 3) reduce the negative economic and social impacts of wildfire to the community.

1.2 CWPP PLANNING PROCESS

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

1) **Consultation involving key local government representatives, structural and wildfire specialists, and stakeholders**. Consultation and information sharing occurred at various stages of the CWPP development and ensured 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), ground truthing, fuel type verification, completion of WUI Threat Forms and GIS wildfire threat analyses.
3) **Developing a risk mitigation strategy**. This phase provides a guide for the ACRD to implement mitigation and risk reduction activities. The risk mitigation strategy accounts for the identification and prioritization of fuel treatments, FireSmart activities, and wildfire response recommendations that will reduce wildfire risk locally.
4) **Building a community engagement and education strategy**. This phase includes presentation of the CWPP Update to the Regional Board, the formation of a Wildfire Working Group as well as comprehensive consultation with First Nations, government and non-governmental agencies. This CWPP Update 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 update.

The first step in the consultation process was to assemble key players in the 'Wildfire Working Group'. This group comprised key internal ACRD staff, including but not limited to the Protective Services Manager, Fire and Deputy Fire Chiefs from various ACRD Fire Departments, Lands and Resources Coordinator, GIS/Mapping Technician, and Administrative Assistant. Non-ACRD staff participating in the Wildfire Working Group included the Fire Chief, Deputy Fire Chief and a Parks and Recreation Planner from the City of Port Alberni. During the initial meeting of the Wildfire Working Group, the objectives were to obtain information about wildfire risk mitigation initiatives currently in place or completed in the ACRD. The initial meeting sought to identify existing plans, policies, and current resources for

emergency and fire suppression available to the ACRD, as well as areas of concern and vulnerabilities; in order to determine priorities and potential mitigation strategies. Members of the Wildfire Working Group were consulted on an ongoing basis throughout plan development and were integral in providing Plan review and approval.

BCWS representatives from the Coastal Fire Centre and Mid-Island Fire Zone – Errington/Port Alberni (Wildfire Technician) were consulted as follows: 1) at the onset of the project planning phase; 2) throughout the CWPP update 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 ACRD; and 3) to provide review and revision of the draft document upon plan completion.

Information sharing took place with the following First Nations groups: Hupacasath, Huu-ay-aht, Ka:yu:kth/Che:k:tles7et'h', K'omoks, Maa-nulth, Qualicum, Snaw'Naw'As, Tseshaht, Toquaht, Ucluelet, We Wai Kai First Nations, as well as the Nanwakolas Council and the Uchucklesaht Tribe as identified through the Consultative Areas Database, and in consultation with MFLNRORD and the ACRD. The Nations, Tribes and Councils were consulted during the development of the CWPP with regards to 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 (i.e., maps, an explanation of the CWPP, and a CWPP draft document). The First Nations were provided the Plan for review and feedback.

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 (Port Alberni) District Manager; the MFLNLRORD Sunshine -South Island Recreation Officer, BC Parks staff and various woodlot, community forests and First Nation woodlands license holders. 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. Wildfire threat in the ACRD 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 (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:

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

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 (e.g., fuel type, climate, probability of ignition); and
- Consequences refer to the repercussions associated with fire occurrence in a given area (i.e., 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 (i.e., FireSmart activities);
- Emergency response and preparedness;
- Evacuation and access; and
- Planning and development.

1.2.4 Building Community Engagement and Education Strategy

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

A presentation to the ACRD Board will aim to ensure high level approval and support for this CWPP.

SECTION 2: LOCAL AREA DESCRIPTION

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

2.1 AREA OF INTEREST

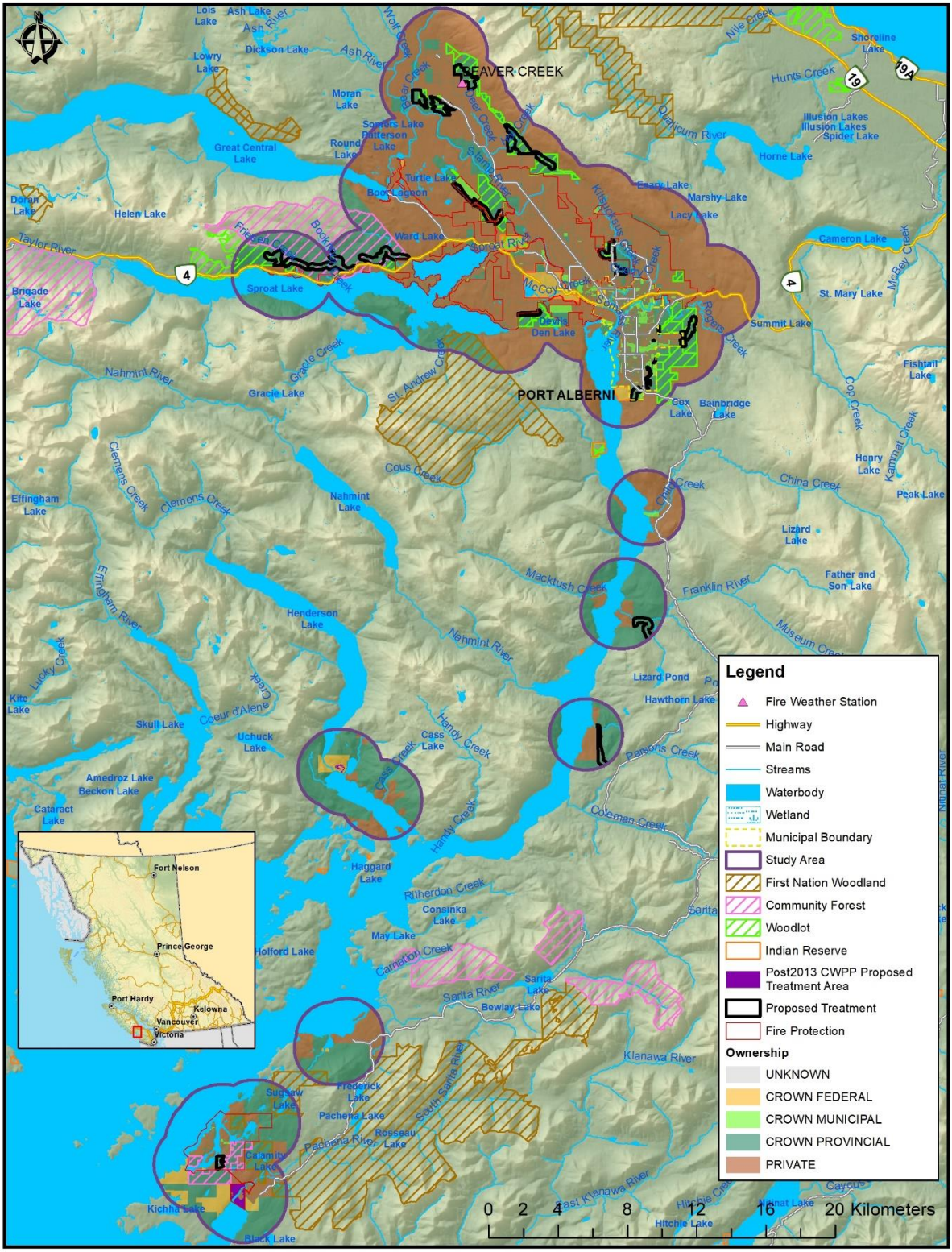
The ACRD has a total land area of 6,589 square km (2016 Census) and is located in the central portion of Vancouver Island, encompassing the Alberni Valley, Bamfield, Ucluelet and Tofino areas. The Regional District AOI consists of one-member municipality (City of Port Alberni), two Treaty First Nations (Huu-ay-aht and Uchucklesaht Tribe Government), as well as 5 electoral areas: Bamfield (Area A), Beaufort

(Area B), Sproat Lake (Area D), Beaver Creek (Area E) and Cherry Creek (Area F). Within the AOI boundaries there is a mix of residential, commercial, industrial and boat-only access waterfront properties, as well as large areas of private managed forest land.

The AOI for the CWPP is illustrated below in Map 1. The AOI represents a two-kilometer spotting buffer around values at risk within ACRD priority communities and includes the Alberni Valley with multiple small unincorporated communities, such as Cherry Creek, Sproat Lake, Beaver Creek, and Beaufort, as well as areas surrounding Franklin River Road, Sarita, Bamfield and Kildonan. The AOI is composed of seven polygons and spans approximately 50,250 ha. A breakdown of the AOI's land ownership is provided in Table 2.

Table 2. Summary of AOI by land ownership.

Land Ownership	Hectares
CROWN FEDERAL	1,214
CROWN MUNICIPAL	698
CROWN PROVINCIAL	2,4248
PRIVATE	2,4083
UNKNOWN	6
Total	**50,250**



Map 1. Area of Interest (AOI).

2.2 COMMUNITY DESCRIPTION

The South Island region has been inhabited by the Nuu-chah-nulth and Coast Salish Aboriginal Peoples since before recorded time. The Hupacasath, Tseshaht, Huu-ay-aht First Nations and Uchucklesaht Tribe are among the Nuu-chah-nulth First Nations that historically occupied land, all of whom continue to live within the AOI today. At present, the ACRD includes multiple distinct communities (as listed in Section 2.1 above), four First Nations Reserves, and 11 Treaty Land Areas (six belonging to the Huu-ay-aht First Nations and five to the Uchucklesaht Tribe), which range from rural/remote communities to town centres with high population density. The First Nations reserves include: Ahahswinis 1, Alberni 2, Klehkoot 2, and Tsahaheh 1.

The AOI encompasses portions of the ACRD Electoral Areas A, B, D, E and F. These represent five of the six Electoral Areas that make up the ACRD. Services to residents of the ACRD member jurisdictions are provided both at the regional and electoral area level. The regional government provides waste management, emergency planning, economic development and regional parks planning. At the electoral area level, services provided include land use and community planning, water/waste water services, bylaw development and enforcement and fire protection.

The AOI is bounded by Electoral Area C to the west, the Comox Valley Regional District to the northwest, the Regional District of Nanaimo to the north and northeast, and by the Barkley Sound and Cowichan Valley Regional District to the south. The ACRD is topographically diverse, with low lying valley bottom lands, rolling hills and mountainous terrain. Due to this variable topography, the elevation varies significantly from sea-level to alpine mountain peaks exceeding 1,600m. However, the AOI is limited to low to mid-mountain elevations. Sproat Lake is the largest freshwater body in the AOI with an area of over 4,230 ha, however the AOI also includes numerous other lakes and streams and is transected by Sproat, Stamp, Somass and Ash Rivers.

The ACRD and Port Alberni Valley economy was and continues to be driven by resource industries (forestry, commercial fishing), shipbuilding and marine industry and recreation, with forestry (logging and milling) being a key economic driver in the area.[6] The forest and shipbuilding industries remains important to the communities within the AOI; however, in recent decades, the economic focus has shifted to include tourism, residential/recreational property development and agriculture[7]. The AOI is characterized by small communities and concentrations of residential development separated by lands with active forestry use. Outdoor recreation opportunities abound in the Port Alberni Valley area which is located within 40-minute commuting distance to Qualicum Beach and one hour to Nanaimo.

Fire protection within the AOI is the responsibility of several departments including: Port Alberni Fire Department (PAFD), Cherry Creek Fire Department (CCFD), Beaver Creek VFD (BCVFD), Sproat Lake VFD (SLVFD) and Bamfield VFD (BVFD). The PAFD is also responsible for providing fire protection services to

[6] City of Port Alberni. 2019. Retrieved online at: https://www.portalberni.ca/community-profile

[7] Alberni-Clayoquot Regional District. 2019. Retrieved online at: https://www.acrd.bc.ca/agriculture

the Tseshaht and Hupacasath First Nations, Cameron Shops, and San Group Sawmill (formerly, Coulson's Sawmill). Formal and automatic mutual aid agreements exist between the four Alberni Valley fire departments (PAFD, CCFD, BCVFD and SLVFD). Each department has a particular Fire Service Area (FSA). BCWS is responsible for responding to fires that are beyond the boundaries of the department FSAs.

In the event of a wildfire, communities within the AOI have limited emergency egress routes. Highway 4 connects the Alberni Valley to Nanaimo, while Franklin River Road connects to Bamfield Road and is the only access/egress into the remote community of Bamfield and to Highway 4. These narrow and forested corridors are areas of particular concern with respect to limited emergency egress and lack of an alternate evacuation route. Many developments within the AOI are located on single access roads which branch off of Highway 4, Franklin River Road, Bamfield Road, or have boat only access (*e.g.,* Kildonan). This not only presents a challenge for emergency access, but also limits the ability of fire crews to respond to fires and safely evacuate residents. In addition, access and evacuation is hindered in some areas due to varied land ownership and gated roads on private property.

2.3 PAST WILDFIRES, EVACUATIONS AND IMPACTS

BCWS Coastal Fire Zone staff communicated that the majority of past and current wildfire activity within the AOI is human-caused and ignitions are primarily due to poor recreation practices (i.e., exhaust from off road vehicles) and careless fire use (i.e., abandoned and/or large campfires). BCWS staff reported that slash fuel types are the most volatile within the AOI. According to BCWS, debris resulting from historical and current logging practices has contributed to fire cause and/or spread on all major fires that occurred in the AOI within the last 10-15 years. In recent years, BCWS has also noted an increase in grass fire occurrences, which are linked to backyard open burning practices.

Based on the BCWS historical wildfire dataset, the largest fire to burn within the AOI occurred in 1926, with an estimated area of 1,035 ha. In 2018, multiple small fires occurred within and around the AOI, with the most notable ones being the Arbutus Summit (32 ha), Lacy Lake (Beaufort Range, 10.4 ha), and Turtle Lake Road (4ha) which caused visual distractions along Highway 4 and throughout the Alberni Valley due to smoke conditions. These fires, in combination with the 2016 Fort McMurray and 2017 and 2018 local and Province-wide wildfires, have alerted the ACRD and member municipalities to the potential for large, catastrophic wildfires occurring within and surrounding the present AOI.

The BCWS historical ignition dataset demonstrates that the proportion of human-caused fires within the AOI is greater than that of the province as a whole. This ignition data shows that within the Regional District AOI, approximately 71% of ignitions since 1950 have been human-caused versus 40% in the province of BC.[8] This statistic may be explained by the lower proportion and occurrence of lightning strikes on Vancouver Island relative to other areas in the province. Additionally, high recreational and industrial use within many parts of the AOI may also contribute to this statistic.

[8] BCWS, 2019

2.4 CURRENT COMMUNITY ENGAGEMENT

There is recognition and awareness, from both ACRD staff and member municipalities, of the threat posed to the communities by wildfire, and support for hazard mitigation activities. There has been low community engagement in FireSmart initiatives in the AOI to this point. FireSmart materials are distributed to residents by the ACRD and links to FireSmart Canada resources and fire regulation related bylaws are provided on the City of Port Alberni website. FireSmart presentations and workshops have been provided in the past, but these events have generally had low attendance. Recommendations for further education and communication initiatives that may be undertaken by the District are provided in Section 5.3. The ACRD does not have an established wildfire hazard development permit area that addresses new development in the wildland urban interface, and sets standards based on FireSmart principles for building material use, landscaping and appropriate setbacks from forested areas. Future initiatives should focus engagement efforts during times of high public uptake (during or post wildfire season) in order to maximize the resources available for community engagement.

Fire department-initiated education regarding wildfire threat and prevention varies by department. Some fire departments within the AOI also provide public information through their websites in the form of current fire hazard rating, fire ban/restriction updates and information on fire prevention, open burning and the FireSmart approach.

2.5 LINKAGES TO OTHER PLANS AND POLICIES

Following is a summary of Regional District and Municipal policies and guidelines that relate to strategic wildfire management, wildfire threat reduction, operational fuel treatments and emergency planning.

2.5.1 Local Authority Emergency Plan

Emergency preparedness and response is managed by the ACRD, which has created a comprehensive Emergency Plan for the Alberni Valley to serve the region including the City of Port Alberni and electoral areas, and work collaboratively with the First Nations. The plan was developed to optimize the response, resources and planning for major emergencies that may occur within the Regional District. 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 urban 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 Cowichan Valley Regional District North, Central, South and West Zones (2017), K'omoks First Nation (2017), Uchucklesaht Tribe (2013), Snaw-Naw-As First Nation (2011), Huu-ay-aht First Nations (2013). These documents, when available, were reviewed for relevance (i.e., synergistic project opportunities, as well as to confirm that there are no contradicting recommendations).

2.5.3 Local Government/First Nation Policies and Recommendations

The intent of this section is to review all relevant ACRD and City of Port Alberni (Port Alberni) plans, policies and bylaws and identify sections within that are relevant to the CWPP Update. The following municipal bylaws, strategies and policies are relevant to wildfire planning in the AOI.

Bylaw No. 4602, 2005: City of Port Alberni Official Community Plan

The City of Port Alberni Official Community Plan (OCP) provides guidance for land use, residential, commercial and industrial development, transportation infrastructure, parks and recreation amenities and community evolution throughout the City of Port Alberni over the next 20 years. The following sections contain objectives and policies which are directly relevant to wildfire risk reduction, emergency response, and community resilience post-disaster as described below.

2005 Port Alberni OCP Section D, Subsection 1.4: Hazardous Areas

This section of the OCP outlines the Tsunami Floodplain Management Strategy (TFMS) which further outline emergency measures, evacuation routes and warning systems. This section could be expanded to include interface areas that are at high risk for wildfire, along with the necessary measures and steps needed to take action if such an event happens.

2005 Port Alberni OCP Section D, Subsection 3.1: Public Administration/Institutional

This section states that the City will determine the possible need for further fire halls within the City boundary in order to ensure that an adequate level of service is provided, while continuing to support the current fire protection services. The City also supports the fire fighting agreements currently in place with other jurisdictions throughout the Alberni Valley.

2005 Port Alberni OCP Section D, Subsection 3.6: Heritage

This section outlines the City's commitment to identify and protect the remaining intact heritage buildings within the City. This Section should also note the importance in protecting and preserving archaeological sites and recognize the history and contributions of First Nations to the Port Alberni area. This is particularly relevant in the case where the ACRD undertakes fuel management projects where there is potential to damage archaeological values. See Section 3.3.2 below for details on the *Heritage Conservation Act* and how to ensure that archaeological values are protected during on-the-ground operational projects, through the use of desktop and field value identification and First Nations consultation.

2005 Port Alberni OCP Section D, Subsection 3.8: Regional Context

This section describes the possibility of future City expansion and general Regional District growth adjacent to the City. It states that all growth shall be conducted in a planned and sustainable manner, with consideration for the maintenance and servicing of these newly developed areas, (i.e., provision of emergency response, fire and water servicing). It should be noted that expansion outside of the urban boundary into the interface will create additional intermix areas where there is often higher potential to have inadequate or unreliable water supply for suppression, as well as longer emergency response times.

RECOMMENDATION #1: Consider reviewing and amending the OCP to include a growth management policy which considers wildfire risk and other natural hazards during strategy development. By containing development within a specified area, the overall fire risk is lower than in areas of intermixed development, i.e. rural sprawl. By constraining development, the City of Port Alberni 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.

2005 Port Alberni OCP Section D, Subsection 8.1: Roads

This section outlines road network planning throughout the City including the construction of new roads, usage of existing ones and emergency access. It makes a special note when prioritizing the need for new roads that emergency access, traffic volumes and development pressure will have an influence on the construction time frame. Roadways and emergency access routes needed for evacuation purposes for such events as flooding, tsunamis or wildfire should be prioritized when beginning new construction.

2005 Port Alberni OCP Section D, Subsection 8.2.2: Trails

This section overviews trail usage and the development of new trails within the City boundary. As of now, the development of a Trails Master Plan is supported, though one does not exist.

Parks provide a combination of ecosystem, social, and economic benefits to the ACRD and the City of Port Alberni, but also have the potential to impact interface fire risk and increase the liability of the ACRD should they not be maintained in accordance with an acceptable wildfire threat. Furthermore, acquired 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 a wildfire.

RECOMMENDATION #2: Support the development of a Trails Master Plan and consider parks acquisition and maintenance through a wildfire lens, to ensure wildfire risk, mitigation, liability and future maintenance are considered as priorities in development of the parks and trails inventory, including consideration for long-term maintenance costs and access. Consider amendments where needed, including the following: 1) require the use of a Qualified Professional (QP) who is competent in fire suppression in review, assessment, and siting of parks and park access prior to acceptance; and 2) ensure that bylaws provide the ACRD authority to request modification (either fuels, access, or siting) based upon QP recommendation and prior to acceptance to ensure that the park is received in, and able to be maintained in, an acceptable range of risk. See Section 6.1.3 for related recommendations specific to access.

2005 Port Alberni OCP Section D, Subsection 9.1: Water Distribution

This section outlines the current drinking water system capacity, while also stating that the expansion of water services outside the City boundary will not be permitted.

2005 Port Alberni OCP Section E, Subsection 1.0: Development Permit Areas

Across all development permit areas (residential, commercial or industrial) there is no mention of guidelines or requirements for building with fire resistant materials, following FireSmart guidelines or requiring buildings to have adequate access for emergency vehicles. Recommendations regarding a wildfire hazard development permit area are addressed in Section 5.2.2.

ACRD Electoral Areas A, B, D, E and F Official Community Plans.

Due to all five applicable electoral areas having very similar Official Community Plans, each containing nearly identical wildfire related objectives and policies, they have been combined in this document so as to limit redundancy. An Official Community Plan (OCP) is a general statement of the objectives and policies of the local government, and provides the ACRD with a long-range framework to guide, monitor and evaluate future land uses and development throughout each respective Electoral Area. The following sections contain objectives and policies which are directly relevant to wildfire risk reduction, emergency response, and community resilience post-disaster as described below.

General Planning Section

This section covers a variety of planning and development objectives throughout the various Electoral Areas. It states that a 10m fuel free or fuel reduced buffer is required in the wildfire interface area between the forested lands and any building or structure to minimize the danger of fire for all development adjacent to forested lands and woodlots. A 10m buffer of treed land is required between agricultural and non-agricultural land as recommended by the Provincial guidelines in the *Guide to Edge Planning*[9], while a general reduction in the amount of fuel loading between trees and buildings to reduce the risk of fire is recommended. This section goes on to further encourage landscape plans and site

[9] Ministry of Agriculture. *Guide to Edge Planning*. Retrieved online at: https://www2.gov.bc.ca/gov/content/industry/agriculture-seafood/agricultural-land-and-environment/strengthening-farming/edge-planning

development to support water conservation measures such as using indigenous, drought tolerant, fire resistant plants, which will further help reduce the chances of fire starting or spreading.

Natural Environment Section

This section outlines the policies associated with the protection, restoration and enhancement of ecosystems throughout the various Electoral Areas. It states that beach burning is only permitted on specific sites and discourages open burning of waste and refuse in order to protect air quality and prevent air-pollution related health risks within the plan area. The section states that the ACRD should work with provincial authorities to prevent the introduction and spread of invasive plant species such as scotch broom. Invasive plant species such as scotch broom which are highly flammable, increase fuel loads and wildfire hazard. Scotch broom is a highly competitive evergreen shrub which out-competes native species to create impenetrable thickets. On Vancouver Island, Scotch broom is, in some cases, displacing less flammable plant and tree species. By controlling invasive species, not only is the forest health improved, but fire behaviour potential of the area is also reduced.

Infrastructure Section

This section outlines the existing infrastructure within the plan areas such as roads, water systems, community services, utilities, emergency services, etc. It states that the fire protection services currently in place will continue to be supported, while focusing on fire prevention and education throughout the various areas. For the Bamfield OCP specifically, it mentions working with the Huu-ay-aht First Nations to further strengthen the relationship of the shared fire department services that are currently in place. Also mentioned within this section is the importance of considering fire suppression capacity, when identifying water as a resource for drinking and for agriculture, thereby ensuring there is enough supply to meet demands during peak fire flows, as well as adequate coverage throughout the Regional District.

Heritage and Culture Section

This section outlines the Electoral Areas' commitment to identify, protect and conserve heritage and archaeological sites and recognize the history and contributions of First Nations to the various Electoral Areas. This is particularly relevant in the event that the ACRD undertakes fuel management projects where there is potential to damage archaeological values.

Natural Hazard Areas Protection Section

This section notes the impact that climate change will have on flooding and sea level rise and notes that all development along the coastline should take this into account. Fire related history is also noted, with new development adjacent to forestry lands requiring a 10m fuel free or fuel reduced buffer zone between the forest and buildings to reduce potential fire spread. The expected impact of climate change on natural disturbance regimes, particularly wildfire, is significant; with an anticipated overall increase in fire intensity, severity, and occurrence. These considerations highlight the significance of climate change adaptation and mitigation policies to increase community resilience and promote educational resources for the public. The resilience of social and infrastructure systems and access to educational resources are integral factors in community planning and adaptation. Further details regarding climate change and the implications on fire can be found in Section 4.1.3 of this CWPP document.

RECOMMENDATION #3: Review the Electoral Areas A, B, D, E and F OCPs and amend the existing language around natural hazards to include wildfire and interface fire. Natural hazards such as wildfire and interface fire, have the potential to impact public health and safety; economics (i.e., through evacuations, loss of tourism, interruption of services); ecosystems and habitat; and water quality, among others. Identification of natural hazards can allow for the implementation of plans and policies to increase ACRD resilience, mitigate potential damage, and increase public and official awareness of risk.

RECOMMENDATION #4: Consider incorporating QP reports and sign-off as part of the Natural Hazard Guidelines in Electoral Areas A, B, D, E and F OCPs.

Industrial Use Section

This section encourages the expansion of current services or the establishment of new services such as fire protection and water utilities to industrial areas that may require greater coverage due to an increased intensity of activities within these areas.

Parks and Recreation Use Section

For the 2014 Sproat Lake OCP specifically, policy 17.2.4 states that through the subdivision process and by collaborating with the relevant Ministry, public access to the foreshore and appropriate streams should be obtained. This will not only help improve public recreation, but it will also allow emergency services quicker and more efficient access to these areas for fire related purposes or for rescue.

Beaver Creek Bylaw No. 234, 2009: Subdivision Water Regulation Bylaw

This bylaw states that any person(s) building a subdivision who want to connect to the Beaver Creek Improvement District's water system must first send in an application. Following this, a calculation of the peak fire flow demand during hourly water demand and pressure requirement must be provided to ensure that the proposed projects meet the minimum requirements and comply with this bylaw.

ACRD Bylaw No. 16, 1971: Unsightly Premises Bylaw

This bylaw states that the owner or occupier of a respective premise must not have any accumulation of filth, discarded material or garbage of any kind, as this may result in emergency access being restricted and an increase amount of flammable material surrounding the property, heightening fire risk.

RECOMMENDATION #5: Review ACRD Bylaw No. 16, 1971 and include wording that specifically prohibits the accumulation of combustible materials on the property (including on and under exterior projections, such as decks and patios, near the home, and in gutters and roofs). The revised bylaw should provide the ACRD the authority to require removal/clean-up of combustible materials.

ACRD Bylaw No. PS1005-5, 2012: Building Code Bylaw

This bylaw overviews the various building code requirements for different building types throughout the ACRD. It specifically mentions that fire-stopping is required in new buildings, that properties must allow access for emergency vehicles at all times and that no fences or walkways obstruct direct access to fire hydrants or fire alarm boxes.

ACRD Bylaw No. R1025, 2013: Bamfield Residential Backyard Burning Bylaw

This bylaw outlines the policies and guidelines when conducting open air burning within the Bamfield Fire Specified Area, including overall fire size and minimum safe burning distances from property lines, buildings, trees, etc. It also notes the rules and regulations regarding burning practices and outlines who is given the authoritative power to order/cause the extinguishment of such fires. Lastly, it notes that all campfires must follow provincial wildfire service regulations.

City of Port Alberni Bylaw No. 3297, 1975: House Numbering Bylaw

This bylaw states that all houses shall have the appropriate representative number located on the structure to which the property is on, while also being plainly visible from the street line. This will aid emergency service crews in locating the proper house accurately and efficiently in case of an incident such as a fire or first aid scenario.

RECOMMENDATION #6: Consider working with the Planning and Development Services 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 City-wide engagement campaign and providing incentives such as the opportunity to acquire/purchase discounted address signs.

City of Port Alberni Bylaw No. 4494, 2001: Waterworks Bylaw

This bylaw overviews water use throughout the City. It prohibits anyone from connecting to the Waterworks or in any way tamper with, operate, remove, or make any alteration to any fire hydrant, meter, curb stop, valve or pumping station, unless otherwise authorized. The bylaw prohibits anyone from using water from a fire line service connection or from the fire line branch of a dual-purpose service connection for any purpose other than firefighting. It also notes service connection for fire specific purposes only and how to obtain the temporary use of a fire hydrant if needed.

City of Port Alberni Bylaw No. 4712, 2009: Property Maintenance Bylaw

This bylaw states that all property owners of a property shall not allow the accumulation or storing of wood, fabrics, roofing material, metal, etc. on their property for a period exceeding 12 months unless a building code has been issued. It also prohibits grass, weeds or uncultivated brush to grow taller than 15cm and notes that no noxious weeds are allowed on the property.

City of Port Alberni Bylaw No. 4802, 2012: Solid-Fuel Burning Appliance Emissions Bylaw

This bylaw states that no person shall install a solid-fuel burning appliance, furnace or boiler, either indoors or outdoors which is used for heating purposes unless it meets the appropriate emission standards. Furthermore, only wood pellets or untreated, non-contaminated and seasoned wood shall be burned in a wood burning appliance or fireplace.

City of Port Alberni Bylaw No. 4819, 2013: Fireworks Regulation Bylaw

This bylaw outlines the rules regarding the possession, acquisition and discharge of fireworks within the City. It states that no person can store, hold, possess, discharge or use fireworks unless a fireworks event permit is held. It also outlines the application process, the restrictions on firework events, the exemptions possible and the certifications needed to legally discharge fireworks within the City boundary.

City of Port Alberni Bylaw No. 4836, 2014: Emergency Plan

This bylaw states that the City will prepare and amend the current emergency plan identifying potential disasters or large-scale emergencies while establishing a coordinated response system to deal with such disasters or emergencies. The emergency program coordinator will implement this plan on the direction of the committee. This bylaw notes who is part of the committee and outlines individual and coordinator responsibilities.

City of Port Alberni Bylaw No. 4876, 2015: Fire Control Bylaw

Within this bylaw are many policies, definitions and objectives that pertain to building codes, public duties and obligations, emergency response, burning regulations and all other fire related activities. This bylaw is comprehensive and covers many relevant and crucial points that aid in the creation of a community wildfire protection plan. Below is a list of each relevant section:

Sections 3-8: Fire Chief and Fire Services
Sections 9-14: Fire Enforcement and Obstruction of Fire Services
Sections 15: Open Burning
Sections 16: Fire protection Equipment
Sections 17: Fire Hydrants
Sections 18-21: Fire Alarms and Safety
Sections 22-25: Fire Hazards and Inspections
Sections 26-32: Incidents, Fees and Penalties

It should be noted that “Section 15: Open Burning” has been replaced by Bylaw 4906, 2015, altering some open burning regulations within the City.

City of Port Alberni Bylaw No. 4975, 2018: Building Standards Bylaw

This bylaw states that vacant buildings must have all combustible materials removed to reduce potential fire loading, while fire escapes, stairs, porches and balconies shall be maintained, in safe and clean condition, in good repair and free from excessive damage. However; the bylaw does not address accumulations of combustible materials in occupied buildings and yards. Additionally, all fire alarms and protection systems must be maintained and in operational condition.

RECOMMENDATION #7: Consider amending the City of Port Alberni Bylaw No. 4975, 2018, to include all buildings (occupied or vacant) and the yard, in order to reduce fire hazard on residential properties within the City boundary.

City of Port Alberni Bylaw No. 4577, 2005: Building Bylaw

This bylaw overviews the building code requirements throughout the City, with each project requiring firestopping, the bracing of chimneys and that adequate fire flows are available when constructing a new development.

2.5.4 Higher Level Plans and Relevant Legislation

Vancouver Island Land Use Plan (VLUP)[10]

The Vancouver Island Land Use Plan (VLUP) is the higher-level planning document for all of Vancouver Island, including the ACRD. The plan provides strategic direction for the following categories: 1) Protected Areas Network; 2) Forest Land Base; 3) Regional Biodiversity Direction; 4) Food Production Activities; 5) Settlement Lands; 6) Energy and Mining Opportunities; 7) Integrated Coastal Management; and 8) Community Stability. The plan also identifies Land Use Zones, which are used to delineate areas which require specific management.

ACRD Parks and Trails Strategic Plan 2015[11]

This document provides a comprehensive strategy for the maintenance, development and renewal of the parks, trails and open spaces throughout the ACRD. The plan identifies park and recreational needs, trends and gaps and targets the following objectives: 1. Governance; 2. Acquisition; 3. Economic development; 4. Parks planning and management; 5. Volunteers; 6. Partnerships; and 7. Environmental protection. The document provides an analysis and classification of the existing park inventory, and identifies the possibility for new facilities, future capital projects, the current operational/management challenges and service levels, as well as the opportunities and deficiencies in the present parks system.

High-use recreational parks and trails can be beneficial when frequent use provides increased early detection and reporting for fires. Alternatively, these areas can also potentially be locations of increased ignitions in the interface (high–use areas). For trails in particular, depending upon the width, clearance and surfacing, they can provide points of access for suppression efforts, serve as surface fire fuel breaks, and act as control lines for suppression efforts if a fire is nearby.

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 Vancouver Island Central Coast Response Fire Management Plan (FMP)[12] that encompasses the AOI was reviewed to identify future landscape level fire management planning at the Natural Resource District level. The FMP was completed in 2018 for the Coastal Fire Centre and three Natural Resource Districts, including the South Island District relevant to the AOI. The FMP identifies values at risk and prioritizes broad categories of values as 'themes' for categorizing response through the Resource

[10] The Province of BC, 2000.

[11] ACRD. 2015. Retrieved online at: https://www.acrd.bc.ca/cms/wpattachments/wpID364atID2071.pdf

[12] Ministry of Forests, Lands, Natural Resource Operations and Rural Development, 2018.

Strategic Wildfire Allocation Protocol (RSWAP). The 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. The FMP does not identify potential fuel breaks around the municipalities within the AOI. To address this gap, landscape level fuel break opportunities have been identified as part of this CWPP. These fuel breaks have been recommended in order to protect access and egress routes in the AOI as well as to serve as strategic anchors for fire suppression and to reduce the potential for extreme crown fire behaviour. Due to the fact that the AOI has limited access and egress options, improving access and increasing public safety in the event of an emergency evacuation should be a priority. There may be funding opportunities for fuel breaks on Crown land along Highway 4 and other single-access roads through the Forest Enhancement Society of British Columbia (FESBC). Communication with the Natural Resource District and Ministry of Transportation and Infrastructure should be initiated to explore potential fuel treatments.

The "Alberni" Tree Farm Licence (TFL) 44 overlaps portions of the AOI. This TFL represents an area-based tenure in which exclusive rights to harvesting, management and conservation of forest resources are granted to the tenure holder (Western Forest Products Incorporated). Consultation with the tenure holder is required for all fuel treatment areas that overlap TFL44 in order to ensure that proposed activities comply with associated Management Plans and Orders.[13] Numerous approved Forest Development Units (FDUs) are located within the AOI with associated Forest Stewardship Plans (FSPs) which set specific forest practices obligations applicable to specific forest licensees. In addition, there are numerous other forestry tenure holders that operate within the AOI, such as: BC Timber Sales, the Huu-ay-aht, Hupacasath and Tseshaht First Nations, two woodlots (W1479 and W011), as well as the Alberni Valley Community Forest.

Forest health management and associated initiatives within the Arrowsmith and the Pacific Timber Supply Areas (TSA) are guided by the *Coast Area 2015-17 Coastal Timber Supply Areas Forest Health Overview*[14]. 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 this aforementioned plan.

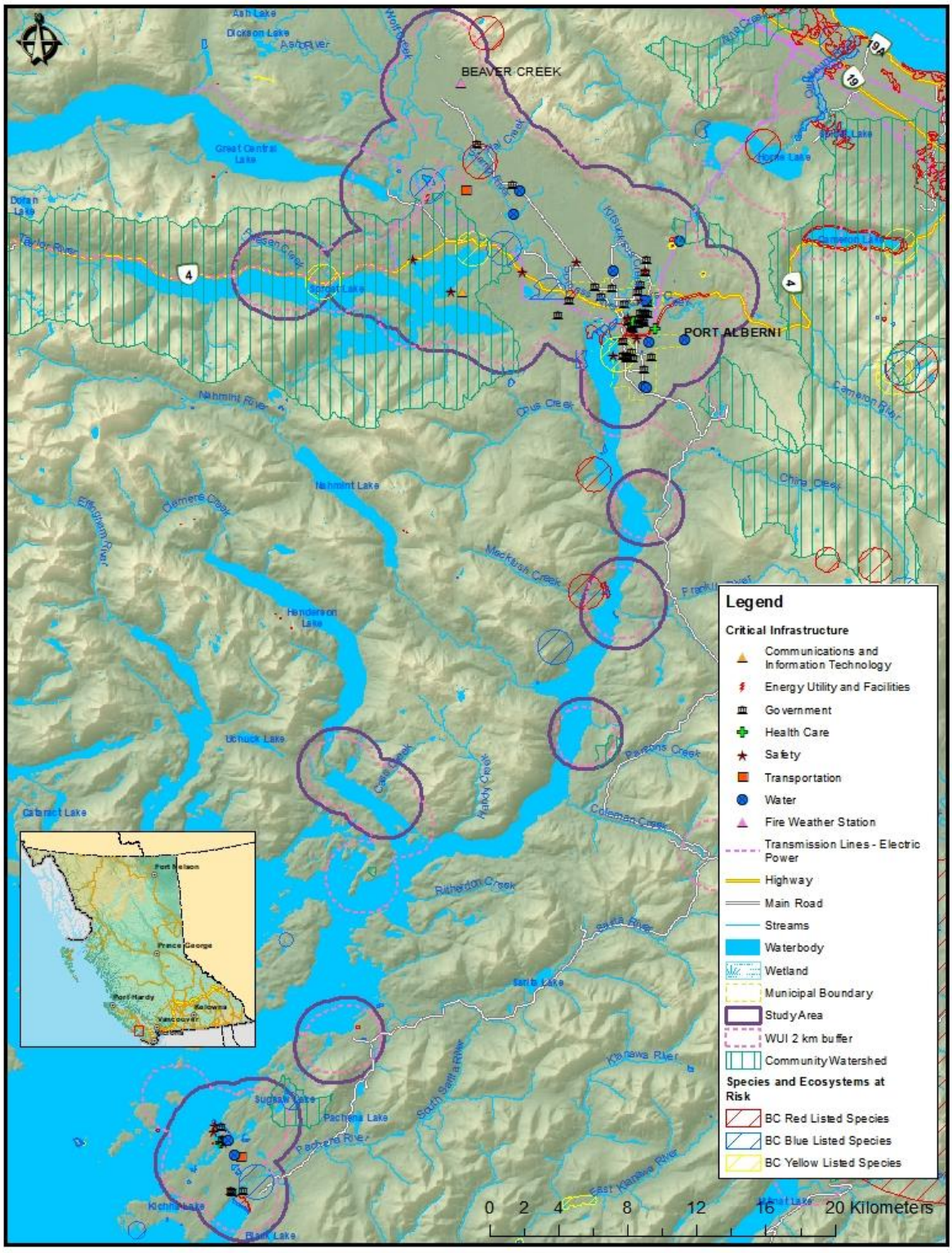
One National Park (Pacific Rim National Park Reserve) and four Provincial Parks are also located within the AOI, including Sproat Lake, Fossli, Taylor Arm and Stamp River Provincial Parks. The first three have approved Management Plans while the latter has an approved Purpose Statement and Zoning Plan. BC Parks should be consulted and management plans should be reviewed prior to fuel treatment planning or prescription development in these parks.

[13] Tree Farm Licences. Retrieved online at: https://www2.gov.bc.ca/gov/content/industry/forestry/forest-tenures/timber-harvesting-rights/tfl/tfl-44

[14] Ministry of Forests, Lands and Natural Resource Operations. 2015

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 AOI. VAR or the human and natural resources that may be impacted by wildfire include human life and property, critical infrastructure, high environmental and cultural values, and other resource values. VAR also include hazardous values that pose a safety hazard. Key identified VAR are illustrated below in Map 2.



Map 2. Values at Risk within the AOI.

3.1 HUMAN LIFE AND SAFETY

One of the primary goals of the BCWS is to support emergency response and provide efficient wildfire management on behalf of the BC government. BCWS aims to protect life and values at risk, while ensuring the maintenance and enhancing the sustainability, health and resilience of BC ecosystems.[15]

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 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 ACRD has slightly decreased in recent years. It was last measured at 30,981 residents in 2016, down 0.3% from 2011.[16] This compares to 5.6% growth in the province of British Columbia during the same years. According to the 2016 Census there are 15,490 private dwellings in the ACRD, approximately 1,836 of which are occupied on a part-time basis. The aforementioned figures are calculated using the 2016 Census population statistics for the ACRD.

The ACRD is a major destination for outdoor recreation on Vancouver Island, including, hiking, mountain biking, kayaking, fishing and surfing. These activities can occur year-round, but are especially popular during the fire season (April – October). Several parks throughout the AOI experience high-use throughout the year: Sproat Lake, Stamp River, and Taylor Arm Provincial Parks, as well as Pacific Rim National Reserve and various other ACRD and City of Port Alberni community parks. Additionally, the seasonal increase in population due to tourism within the AOI also raises concern with regards to potential evacuation in the event of a wildfire. Furthermore, Highway 4 acts as a main travel hub for commuters, tourists and recreationalists who are travelling from Comox to Tofino and/or Ucluelet, which may lead to additional pressures on emergency management resources, in the event of an evacuation.

Knowledge of and access to updated structure locations within an area is a critical step in efficient and successful emergency response planning and the development of mitigation strategies and recommendations. Field visits to the AOI and access to recent orthophotography and spatial data from the Regional District has enabled the development of an updated structures dataset that accounts for new development in the interface.

[15] BC Provincial Coordination Plan for Wildland Urban Interface Fires. 2016. Retrieved 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

[16] Statistics Canada. 2016 Census.

3.2 CRITICAL INFRASTRUCTURE

Protection of critical infrastructure during a wildfire event is an important consideration for emergency response effectiveness, ensuring that coordinated evacuation can occur, if necessary, and 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, social services, and communications infrastructure. Table 4 provides an inventory of critical infrastructure identified by the ACRD and City of Port Alberni staff and during field visits, while Map 2 provides a visual depiction of the 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 critical infrastructure and are reflected in the outlined recommendations. During field visits, it was observed that the District's critical infrastructure (*e.g.,* fire hall, ambulance station, water pump stations, etc.) is in various levels of compliance with FireSmart principles. While some structures may be relatively FireSmart with respect to landscaping within the immediate FireSmart priority zones, many are located adjacent to forest lands. Formal FireSmart assessments of critical infrastructure along with vegetation management have been completed by the District for select critical infrastructure.

RECOMMENDATION #8: 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 #9: It is recommended that formal FireSmart assessments (by a Qualified Professional) be completed of critical infrastructure such as fire halls, emergency operations centre, water infrastructure, and others as identified in this CWPP (Table 4) and by the ACRD and City of Port Alberni staff.

3.2.1 Electrical Power

Electrical service for the ACRD is received through a network of wood pole and underground distribution infrastructure supplied by BC Hydro. Neighbourhoods with small, street-side wooden poles connecting homes are particularly vulnerable to fire. It is recommended that utility right-of-way best management practices (BMP) such as regular brushing and clearing of woody debris and shrubs be employed to help reduce fire risk, utility pole damage and subsequent outages.

The AOI contains two substations, the Great Central Lake and Port Alberni substations. The Great Central Lake substation is located in the western portion of the AOI and is connected via one radial transmission line to each of the Long Beach (69 kV), Ash River (138 kV) and Port Alberni (138 kV) substations. The Port Alberni substation is located centrally in the City of Port Alberni and connects via two radial transmission lines to the Dunsmuir substation (138 kV). 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.[17]

A large fire has the potential to impact this service by causing a disruption in network distribution through direct or indirect means. For example, heat from the 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 backup at key facilities to ensure that the emergency response functions are reliable. ACRD and City of Port Alberni pump stations that rely on electricity to distribute water and maintain hydrant pressure for suppression activities are of concern.

Secondary power sources are important to reduce critical infrastructure vulnerability in the event of an emergency which can cut power for days, or even weeks. Secondary power availability is described in detail below in Table 3. 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 or if a fire prevents access to the site. Refer to Section 6.1.2 for discussion and recommendations related to backup power and water availability for fire suppression.

Table 3. Secondary Power Availability for ACRD Critical Infrastructure.

Critical Infrastructure Type	Secondary Power Available (Y/N) and Comments	Type
ACRD Administration Building	Y; generator	Diesel
Emergency Operating Centre	Y; generator	Diesel
Beaver Creek VFD Fire Hall	Y; generator	Diesel
Bamfield VFD Fire Hall	Y; generator currently removed from Pachena Rd, but is available for use, if required	Diesel
Sproat Lake VFD Fire Hall (3)	N	-
Cherry Creek FD Fire Hall	N; however, plug-in external generator is available, if required	Diesel
Long Beach Airport	N; however, plug-in external generator is available to supply power for runway lighting only	-
Alberni Valley Regional Airport	N	-
Alberni Valley Landfill	Y; generator	Diesel
Bamfield Water System	Y; generator	Propane
Beaver Creek Water System	Y; generator at Strick Rd. pump station	Diesel
Cherry Creek Water System	Not applicable as system is gravity fed and mechanically controlled	-

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

3.2.2 Communications, Pipelines and Municipal Buildings

The ACRD is serviced by a hospital (West Coast General Hospital), two airports (Alberni Valley Regional Airport and Bamfield Airport) and multiple regional government buildings. There is a network of FortisBC distribution pipelines that supplies the ACRD with natural gas. A map of the FortisBC natural gas distribution system for the ACRD is not available to external companies. As such, it is not possible to identify specific areas that may be vulnerable to wildfire. However, a publicly available service area map[18] of British Columbia indicates that a natural gas transmission line transects the AOI. The FortisBC company website states that employees will consult with local authorities and BCWS in the event of a wildfire. A full inventory of critical infrastructure for communications, pipelines and municipal buildings with locations is presented in Table 4, below.

Table 4. Critical Infrastructure Identified in 2018 field visits.

Critical Infrastructure Type	Location
Alberni Athletic Hall	3727 Roger Street
Alberni Clayoquot Recycling Depot	3620 3rd Avenue
Alberni Community and Women's Services Society	3082 3rd Avenue
Alberni District Secondary School	4000 Roger Street
Alberni Elementary School	4645 Helen Street
Alberni Valley Landfill	7080 McCoy Lake Road
Alberni Valley Multiplex	3737 Roger Street
Alberni Valley Regional Airport	7400 Airport Road
Alberni Valley Regional District Administration Building	3008 5th Avenue
Alberni Valley Rescue Squad	4790 Tebo Avenue
AW Neill Elementary School	5055 Compton Road
Bamfield Airport	399 Binnacle Road
Bamfield Community School	240 Nuthatch Road
Bamfield Health Center	353 Bamfield Road
Bamfield Marine Sciences Center	100 Pachena Road
Bamfield Water Reservoirs	320 Binnacle Road
Bamfield Water Treatment Plant	315 Grappler Road
BC Ambulance Service	4760 Roger St
BC Hydro Substation	Central Lake Road (no civic address)
BCWS Kitsuksis Reservoir	5960 Kitsuksis Street
BCWS McKenzie Rd PumpHouse	7690 McKenzie Road
BCWS North Reservoir	7668 Beaver Creek Road
Beaver Creek Community Hall	8505 Beaver Creek Road
Beaver Creek Volunteer Fire Department	A6038 Beaver Creek Road
Burde Street Pump House	3601 Dundalk Avenue S
Burde Street Reservoir	3598 Burde Street
Canadian Coast Guard	65 Boardwalk
Cherry Creek Community Center	3720 Moore Road

[18] https://www.fortisbc.com/About/ServiceAreas/Pages/default.aspx

Critical Infrastructure Type	Location
Cherry Creek Fire Department	5920 Cherry Creek Road
Cherry Creek Reservoir	No civic address
Choices DL School	2941 8th Avenue
Community Police Center	9-5440 Argyle Street
East Bamfield Volunteer Fire Department	368 Pachena Road
Echo Aquatic and Fitness Centre	4255 Wallace Street
Echo Field House	4200 King Street
Echo Village Long Term Care	4200 10th Avenue
Ecole des Grands-Cedres School	5100 Tebo Avenue
EJ Dunn Elementary School	3500 Argyle Street
Fir Park Village Continuing Care Facility	4411 Wallace Street
Gill School (vacant)	5520 Beaver Creek Road
Glenwood Sports Center	4480 Vimy Street
Haahuupayak School	6000 Santu Drive
Heritage Place Assisted Living	4200 10th Avenue
House of Huu-ay-aht	171 Nookemus Road
Hupacasath House of Gathering	5500 Ahahswinis Drive
Huu-ay-aht Multiuse Building	170 Nookemus Road
John Howitt Elementary School	3867 Marpole Street
John Paul II Catholic School	4006 8th Avenue
Johnston Road Reservoir	3759 Maple Way
Kackaamin Family Development Centre	7830 Beaver Creek Road
Library	4245 Wallace Street
Lower Cowichan Water Reservoir	No civic address
Maquinna Elementary School	3881 Bruce Street
North Island College	3699 Roger Street
Nuu-chah-nulth Tribal Council	5001 Mission Road
Paawats Kindergarten	01 Paawats Way
Pacific Coast University	4755 Cherry Creek Road
Police (RCMP)	4444 Morton Street
Port Alberni Christian School	6211 Cherry Creek Road
Port Alberni City Hall	4850 Argyle Street
Port Alberni Fire Department	3699 10th Avenue
Provincial Court House	2999 4th Avenue
Service BC	4070 8th Avenue
SLVFD Faber Rd Firehall #1	9501 Faber Road
SLVFD Lakeshore Firehall #2	10605 Lakeshore Road
Smiley Arena	345 Grappler Road
Sproat Lake Volunteer Fire Department	7667 Pacific Rim Highway
Telecom Tower	540 Cous Creek Road
Upper Cowichan Water Reservoir	2100 15th Ave
West Bamfield Fire Hall	164 Bond Street
West Coast General Hospital	3949 Port Alberni Highway
Wood Elementary School	4111 Wood Avenue
Municipal Works Yard	4150 6th Avenue
Youth Health Center	3245 7th Avenue

3.2.3 Water and Sewage

Domestic water supply in the AOI is delivered via the following four water systems: 1. City of Port Alberni, 2. Beaver Creek Water System, 3. Cherry Creek Waterworks District, and 4. Bamfield water system. In 2010 the ACRD commissioned a study of the existing water supply systems in the Alberni Valley, which was developed to identify and address the inherent challenges the ACRD faces when operating multiple distinct systems[19]. A long-term planning document was developed in 2013 for the Bamfield Water System in order to determine renewal, replacement and upgrade needs for the water system to provide water for drinking and fire protection needs.[20] Additionally there are several private water systems that utilize Sproat Lake as a domestic water source: Anchor Bay Water Society, Lake Shore Campground, Sproat Lake Mobile Park, Tall Timbers Holiday Park, Dockside at Sproat Lake, West Bay Hotel and the Fish and Duck Pub. The City of Port Alberni system services properties on the Ahahswihis #1 reserve, while the Tsahaheh #1 reserve maintains its own distribution system, which is supplied through paid connections to the City of Port Alberni system.

According to the 2010 study, the City of Port Alberni receives its domestic water supply from a surface water intake located on China Creek and a stored water source in Bainbridge Lake. In the event that the China Creek water source experiences a high turbidity spike, the water is gravity fed from Bainbridge Lake instead, and pumped from the Lower Cowichan to the Upper Cowichan Reservoir. The Beaver Creek Water system receives water from the City of Port Alberni at Strick Road where booster pumps exist that fill reservoirs at North Road and Kitsukisis Road. The Cherry Creek Waterworks District draws its water from an intake impoundment located on Cold Creek which is fed by Lacy Lake. The Bamfield water system sources its water from Sugsaw Lake via a shallow intake which gravity feeds into a new water treatment facility on Grappler Road. Pumps feed water from the treatment facility to two reservoirs located at the east end of Binnacle Road. A detailed account of water availability for wildfire suppression is provided in Section 6.1.2, while Table 5 below outlines the water systems and associated infrastructure within the ACRD.

The City of Port Alberni operates a wastewater treatment facility including a wastewater lagoon to treat wastewater from approximately 18,000 people in the Alberni Valley.[21] The wastewater treatment plant and lagoon are currently undergoing upgrades to aging infrastructure and to meet changed Canadian wastewater treatment standards.

[19] Alberni Valley Regional Water Study Update. 2010. Retrieved online at: https://www.acrd.bc.ca/cms/wpattachments/wpID249atID804.pdf

[20] Bamfield – Water System Study. 2013. Retrieved online at: https://www.acrd.bc.ca/cms/wpattachments/wpID367atID1881.pdf

[21] https://www.letsconnectpa.ca/port-alberni-wastewater-treatment-plant-upgrades

Table 5. Critical Infrastructure Identified in 2018 CWPP field visits.

Critical Infrastructure Type	Description
Water Supply	City of Port Alberni Water System includes four reservoirs and two pump stations.
	Cherry Creek Waterworks District includes an intake and an impoundment.
	Beaver Creek Water System includes two reservoirs and one pump station.
	Bamfield Water System includes a pump station and two reservoirs.
Sanitary Sewer System[22]	Port Alberni Wastewater Treatment Plant and Lagoon and 5 sewage pump stations including: • Wallace; • Argyle; • Josephine; • Margaret; and • 4th Ave One storm lift station: Margaret

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

As outlined above, communities within the AOI receive their gravity fed potable water from surface water sources. The primary challenge associated with the water systems within the AOI is a heightened risk of turbidity spikes due to high runoff and sediment deposition. Existing water supply in the Alberni Valley (accounting for the China Creek/Bainbridge Lake, Sproat Lake, Somass River and Great Central Lake sources) is anticipated to be adequate to meet 2050 maximum summer season demand conditions.[19] ACRD staff did not express immediate concerns related to water availability from the various water distribution systems.

The AOI overlaps the Sugsaw Lake, Cousteau, Sproat, and Cold community watersheds. The latter two are located in the Alberni Valley in the communities of Sproat Lake and Cherry Creek, respectively. Due to their status as a community watershed, special management considerations are required within and adjacent to their perimeter to maintain timing of flow and the volume and quality of the water source. The potential impacts of wildfire extend past the time a fire is extinguished. Depending on fire size and severity, there is the potential for significant hydrological impacts, extending for years post-burn.[23] 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

[22] https://www.portalberni.ca/sewer-and-drainage-infrastructure-inventory

[23] 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.

community (i.e., structure loss, risk to public safety) or indirectly, through loss or damage of critical infrastructure, roads, or impacts on the watershed affecting water quality.

RECOMMENDATION #10: 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.[24]

3.3.2 Cultural Values

The Coast Salish are the main First Nations group whose territory overlaps the ACRD. Within this group, a total of 13 First Nations and two treaty organizations with aboriginal interests in the AOI were identified using the BC Consultative Areas Database. These include the following First Nations, Tribes or Treaty Associations: Hupacasath, Huu-ay-aht, Ka:yu:kth/Che:k:tles7eth, K'omoks, Maa-nulth, Qualicum, Snaw'Naw'As, Tseshaht, Toquaht, Ucluelet, We Wai Kai First Nations, as well as Laich-kwil-tach Treaty Society, Nanwakolas Council, Te'mexw Treaty Association, and the Uchucklesaht Tribe. The Maa-nulth First Nations Final Agreement took effect on April 1, 2011.[25] This treaty agreement includes the Huu-ay-aht First Nation and the Uchucklesaht Tribe.

Archaeological sites and remains in BC that pre-date 1846 are protected from disturbance, intentional and inadvertent, by the *Heritage Conservation Act* (HCA), which applies on both private and public lands. Sites that are of an unknown age that have a likely probability of dating prior to 1846 (i.e., lithic scatters) as well as Aboriginal pictographs, petroglyphs, and burials (which are likely not as old but are still 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 numerous sites exist in the AOI. The 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.[26] 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.

[24] 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

[25] BC Treaty Commission. 2019. Retrieved online at: http://www.bctreaty.ca/maa-nulth-first-nations-huu-ay-aht-kayukthchektles7eth-toquaht-uchucklesaht-ucluelet

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

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

3.3.3 High Environmental Values

There is an established legal order for a Marbled Murrelet Wildlife Habitat Area (WHA) in the eastern extent of the AOI bordering the Macktush Creek Outlet (WHA #1-471)[27]. Additionally, there is a minor overlap in the western portion of the AOI with two Ungulate Winter Range (UWR) polygons designated under a legal order (UWR #U1-013). These Orders and associated wildlife measures should be reviewed and adhered to if a fuel treatment is proposed within this area. 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 AOI, the CDC database was referenced. Two classes of data are kept by the CDC: non-sensitive occurrences for which all information is available (species or ecosystems at risk and location); and masked, or sensitive, occurrences where only generalized location information is available.

There are 10 Red-listed species (18 occurrences), 12 Blue-listed species (22 occurrences) and four Yellow-listed species (7 occurrences) within the AOI (Table 6). Additionally, the AOI overlaps with one masked occurrence. 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.

[27] Order – Wildlife Habitat Areas #1-: 028a, 058, 109, 255-257, 427-433, 435-439, 441, 443, 445-449, 453-455a, b, c, 458-468, 470, 471 Marbled Murrelets South Island Forest District. Accessed online from: http://www.env.gov.bc.ca/wld/documents/wha/MAMU-1-028a_various_to_471_ord.pdf

Table 6. Publicly available occurrences of Red and Blue-listed species recorded within the AOI.

Common Name	Scientific Name	Category	BC List	Habitat Type
American Water Shrew	*Sorex navigator brooksi*	Vertebrate Animal	Blue	Terrestrial; Forest Needleleaf; Riverine; Riparian
Branching Montia	*Montia diffusa*	Vascular Plant	Red	Terrestrial
California-tea	*Rupertia physodes*	Vascular Plant	Blue	Terrestrial: Roadside
California-tea	*Rupertia physodes*	Vascular Plant	Blue	Terrestrial; Forest Needleleaf
California-tea	*Rupertia physodes*	Vascular Plant	Blue	Terrestrial; Forest Mixed
Chamisso's Montia	*Montia chamissoi*	Vascular Plant	Blue	Terrestrial; Grassland/Herbaceous
Common Bluecup	*Githopsis specularioides*	Vascular Plant	Red	Terrestrial: Rock Outcrop
Common Bluecup	*Githopsis specularioides*	Vascular Plant	Red	Terrestrial: Rock Outcrop
Dromedary Jumping-slug	*Hemphillia dromedarius*	Invertebrate Animal	Red	Terrestrial
Dromedary Jumping-slug	*Hemphillia dromedarius*	Invertebrate Animal	Red	Terrestrial; Forest mixed
Dun Skipper	*Euphyes vestris*	Invertebrate Animal	Red	Terrestrial; Shrubland; Bog
Estuarine Paintbrush	*Castilleja ambigua ssp. ambigua*	Vascular Plant	Blue	Estuarine: Herbaceous Wetland; River Mouth
Estuarine Paintbrush	*Castilleja ambigua ssp. ambigua*	Vascular Plant	Blue	Estuarine: Herbaceous Wetland; River Mouth
Estuarine Paintbrush	*Castilleja ambigua ssp. ambigua*	Vascular Plant	Blue	Estuarine: Herbaceous Wetland; River Mouth
Estuarine Paintbrush	*Castilleja ambigua ssp. ambigua*	Vascular Plant	Blue	Estuarine: Tidal Flat
Geyer's Onion	*Allium geyeri var. tenerum*	Vascular Plant	Yellow	Estuarine: Herbaceous Wetland
Great Blue Heron, Fannini Subspecies	*Ardea herodias fannini*	Vertebrate Animal	Blue	Terrestrial: Forest Mixed
Henderson's Checker-mallow	*Sidalcea hendersonii*	Vascular Plant	Blue	Estuarine: Tidal Flat
Howell's Violet	*Viola howellii*	Vascular Plant	Red	Terrestrial; Grassland/Herbaceous

Common Name	Scientific Name	Category	BC List	Habitat Type
Howell's Violet	*Viola howellii*	Vascular Plant	Red	Terrestrial; Grassland/Herbaceous
Least Moonwort	*Botrychium simplex var. compositum*	Vascular Plant	Yellow	Terrestrial: Rock Outcrop
Least Moonwort	*Botrychium simplex var. compositum*	Vascular Plant	Yellow	Terrestrial; Seepage Slope
Northern Red-legged Frog	*Rana aurora*	Vertebrate Animal	Blue	Palustrine: Pond, Bog/Fen, Shrub Wetland, Herbaceous Wetland
Northern Red-legged Frog	*Rana aurora*	Vertebrate Animal	Blue	Palustrine; Pond
Northern Red-legged Frog	*Rana aurora*	Vertebrate Animal	Blue	Lacustrine; Palustrine: Herbaceous Wetland
Northern Red-legged Frog	*Rana aurora*	Vertebrate Animal	Blue	Terrestrial: Forest Needleleaf; Palustrine: Pond, Herbaceous Wetland
Northern Red-legged Frog	*Rana aurora*	Vertebrate Animal	Blue	Palustrine: Bog/Fen
Oregon Ash	*Fraxinus latifolia*	Vascular Plant	Red	Estuarine: River Mouth
Oregon Ash	*Fraxinus latifolia*	Vascular Plant	Red	Riverine: Riparian; Terrestrial: Forest Broadleaf
Oregon Ash	*Fraxinus latifolia*	Vascular Plant	Red	Riverine; Sand/Gravel Bars
Peacock vinyl	*Leptogium polycarpum*	Fungus	Yellow	Terrestrial: Forest Mixed, Rock Outcrop
Peacock vinyl	*Leptogium polycarpum*	Fungus	Yellow	Terrestrial: Forest Mixed
Peacock vinyl	*Leptogium polycarpum*	Fungus	Yellow	Terrestrial: Forest Mixed
Pink Sand-verbena	*Abronia umbellata var. breviflora*	Vascular Plant	Red	Terrestrial: Sand/Dune
Pointed Rush	*Juncus oxymeris*	Vascular Plant	Blue	Estuarine: Herbaceous Wetland
Redwood Sorrel	*Oxalis oregana*	Vascular Plant	Blue	Terrestrial; Forest Needleleaf
Redwood Sorrel	*Oxalis oregana*	Vascular Plant	Blue	Terrestrial; Roadside; Forest Needleleaf
Salt Marsh Philadelphia Daisy	*Erigeron philadelphicus var. glaber*	Vascular Plant	Red	Estuarine: Tidal Flat

Common Name	Scientific Name	Category	BC List	Habitat Type
Salt Marsh Philadelphia Daisy	*Erigeron philadelphicus var. glaber*	Vascular Plant	Red	Estuarine: Tidal Flat
Three-flowered Waterwort	*Elatine rubella*	Vascular Plant	Yellow	Estuarine: Tidal Flat
Vancouver Island Beggarticks	*Bidens amplissima*	Vascular Plant	Blue	Estuarine: Tidal Flat
Warty Jumping-slug	*Hemphillia glandulosa*	Invertebrate Animal	Red	Terrestrial: Forest Broadleaf; Mature Forest
Warty Jumping-slug	*Hemphillia glandulosa*	Invertebrate Animal	Red	Terrestrial: Forest Broadleaf; Mature Forest
White-top Aster	*Sericocarpus rigidus*	Vascular Plant	Blue	Terrestrial: Cliff
White Meconella	*Meconella oregana*	Vascular Plant	Red	Terrestrial: Rock Outcrop
Wolverine, Vancouverensis Subspecies	*Gulo gulo vancouverensis*	Vertebrate Animal	Red	Terrestrial; Forest Needleleaf
Yellow Sand-verbena	*Abronia latifolia*	Vascular Plant	Blue	Terrestrial: Sand/Dune

3.4 OTHER RESOURCE VALUES

The AOI is located primarily in the Arrowsmith Timber Supply Area (TSA), which encompasses 1,574,719 hectares of land. The Arrowsmith TSA is within the West Coast Natural Resource Region and is administered by the South Island Natural Resource District. The effective timber harvesting land base in the TSA is 54,444 ha or approximately 6.5% of the total land area.[28] The last Timber Supply Review (TSR) was completed in 2016[29] and the most recent Allowable Annual Cut (AAC) determination was completed in early 2018. The current AAC is 348,000 cubic meters per year (the AAC is not applicable to private managed forest land).

A small portion of the AOI (southwestern and western portions) also overlaps the Pacific TSA, which encompasses 698,041 ha of land. The Pacific TSA is located within the West Coast and South Coast Natural Resource Regions and 93% of its AAC is administered by BCTS, with First Nations administer the remaining 7%.[30] As of August 2017, the effective timber harvesting land base in the TSA is 102,187 ha or approximately 15% of the total land area.[30] The last Timber Supply Review (TSR) was completed in 2016

[28] Arrowsmith TSA Rationale for Allowable Annual Cut Determination. 2018. https://www2.gov.bc.ca/assets/gov/farming-natural-resources-and-industry/forestry/stewardship/forest-analysis-inventory/tsr-annual-allowable-cut/arrowsmith_tsa_rationale_2018.pdf

[29] Arrowsmith TSA Discussion Paper, 2016: https://www2.gov.bc.ca/assets/gov/farming-natural-resources-and-industry/forestry/stewardship/forest-analysis-inventory/tsr-annual-allowable-cut/arrowsmith_tsa_discussion_paper.pdf

[30] Timber Supply Review – Analysis Report Pacific TSA. 2016. Retrieved online at: https://www2.gov.bc.ca/assets/gov/farming-natural-resources-and-industry/forestry/stewardship/forest-analysis-inventory/tsr-annual-allowable-cut/pacific_tsa_analysis_report_with_data_package.pdf

and the most recent Allowable Annual Cut (AAC) determination was completed in 2017.[31] The current AAC outside of the Great Bear Rainforest is 803 300 cubic metres per year (the AAC is not applicable to private managed forest land).

Fuel reduction treatments are not anticipated to have a measurable effect on the timber harvesting land base. Typically, forest stands identified for fuels treatments are highly constrained for conventional logging and are often in undesirable or uneconomic stand types. Numerous forest tenures exist on crown land in the AOI including, but not limited to TFL 44 operated by Western Forest Products, six woodlot licences, two community forests, and two First Nation woodlands. The opportunity exists to work with local licensees on commercial thinning projects that meet fuels management objectives.

3.5 HAZARDOUS VALUES

Hazardous values are defined as values that pose a safety hazard to emergency responders. Generally, the ACRD does not have a significant number of industrial sites or facilities that can be considered hazardous values at risk. A list of hazardous values within the AOI is included in Table 7.

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 7. Hazardous Infrastructure Identified in CWPP field visits.

Critical/Hazardous Infrastructure Name	Location
Alberni Valley Landfill	7080 McCoy Lake Rd
Alberni Clayoquot Recycling Depot	3614 3rd Ave

SECTION 4: WILDFIRE THREAT AND RISK

This section summarizes the factors that contribute to and were assessed in the determination of wildfire threat in the AOI. 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

[31]Pacific TSA. Rationale for Allowable Annual Cut (AAC) Determination. 2017. Retrieved online at: https://www2.gov.bc.ca/assets/gov/farming-natural-resources-and-industry/forestry/stewardship/forest-analysis-inventory/tsr-annual-allowable-cut/pacific_tsa_rationale.pdf

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.[32] The following section is synthesized from information found on MFLRNORD's Research Branch BECWeb.[32]

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. [33]

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

Coastal Western Hemlock, Very Dry Maritime, Eastern Variant (CWHxm1) and Western Variant (CWHxm2) BEC Zone – NDT 2

The CWHxm2 makes up 52% of the AOI and the CWHxm1 encompasses approximately 23% of the AOI (Table 8). The CWHxm supports forests on zonal sites that are dominated by Douglas-fir, accompanied by western hemlock and minor amounts of western red cedar and is normally found at elevations between sea level and 700 m.[34] The CWHxm is characterized by warm, dry summers and moist, mild winters. The CWHxm 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.[33] 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. 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 Hypermaritime Subzone Southern Variant (CWHvh1) – NDT 1

The CWHvh1 represents approximately 13% of the AOI (Table 8) occurring at low elevations (0-200 m) along a narrow coastal fringe of outer Vancouver Island and BC's mainland. The CWHvh1 is characterized by cool and wet climate with low snowfall levels. This BEC subzone and variant is characterized by fog,

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

cloud, and drizzle throughout the year, as well as a high level of precipitation, though variability exists and is highly dependent on topography. These ecosystems support western hemlock, amabilis fir, western redcedar and to a lesser extent, yellow cedar forest stands. The CWHvh1 is classified as NDT 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.[33]

Coastal Western Hemlock Very Wet Maritime Subzone Submontane Variant (CWHvm1) – NDT 1

The CWHvm1 represents approximately 11% of the AOI (Table 8) at lower to mid elevations (0-650 m) above the CWHdm. The CWHvm1 is characterized by wet and humid climate with relatively mild and warm winters and cool summers. This BEC subzone and variant receive a high level of precipitation, though variability exists and is highly dependent on topography.[34] These ecosystems support western hemlock, amabilis fir and to a lesser extent, western red cedar forest stands. The CWHvm1 has a similar NDT as the CWHvh1.

Coastal Western Hemlock Moist Maritime Subzone Submontane Variant (CWHmm1) – NDT 2

The CWHmm1 makes up a small proportion (<1%) of the AOI (Table 8) at low to mid elevation sites within the AOI at approximately 450-700 m, above the CWHxm. The CWHmm1 is characterized by a climate with moist, mild winters and cool, dry summers. Historically, this BEC subzone and variant has occasionally had stand-replacing fires due to dry summers, resulting in high Douglas-fir post-fire stand components. [34] These ecosystems support stands of western hemlock, amabilis fir and Douglas-fir. The CWHmm1 has a similar NDT as the CWHxm.

Coastal Western Hemlock Moist Maritime Subzone Montane Variant (CWHmm2) – NDT 2

The CWHmm2 makes up a small proportion (1%) of the AOI (Table 8) and mid to high elevation sites (700-1,100 m) within the AOI. The CWHmm2 is characterized by a cooler climate with a short growing season, and higher occurrence of snowfall and snowpack persistence through the winter. This BEC subzone and variant has a summer season water deficit due to the rain shadow effect of the Vancouver Island mountains.[34] These ecosystems support stands of western hemlock, amabilis fir, Douglas-fir and to a lesser extent yellow cedar and mountain hemlock found primarily at higher elevation and moisture sites. The CWHmm2 has a similar NDT as the CWHmm1.

Mountain Hemlock Moist Maritime Subzone Windward Variant (MHmm1) – NDT 1

The MHmm1 makes up a small proportion (<1%) of the AOI (Table 8) and occupies the highest elevation sites within the AOI at approximately 800-1350 m, above the CWHvm2. The MHmm1 is characterized by a wet climate with cold, wet winters and cool, moist summers.[34] This BEC subzone and variant receives a high level of precipitation, typically in the form of snow, and snowpacks can persist well into the summer months. These ecosystems support stands of mountain hemlock, amabilis fir and to a lesser extent, yellow-cedar. The MHmm1 is classified as NDT 1 – forest ecosystems with rare stand-initiating

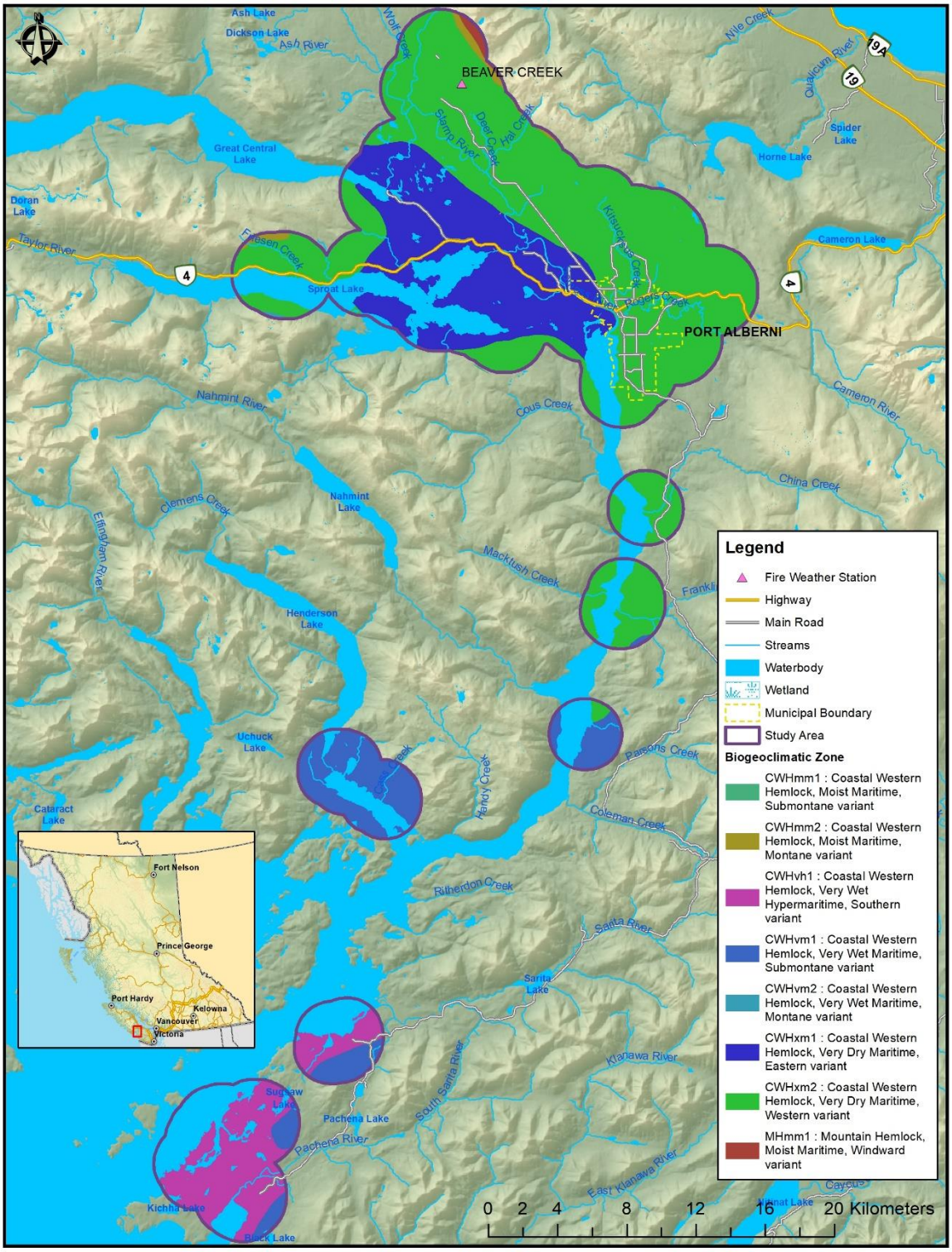
events. These are forest ecosystems that experience relatively small disturbances in terms of spatial extent. They have historically resulted in uneven-aged, heterogeneous stand structures from rare and small disturbances caused by fire, wind and/or landslides. The MH ecosystems in this NDT experience a mean disturbance interval of 350 years.[33]

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

The CWHvm2 represents a minor part of the AOI (<1%), occupying the elevation sites above CHWvm1 within the AOI. In southern BC it occurs at elevations of approximately 650 to 1000 m. The climate of the CWHvm2 is wet and humid, with cool short summers and cool winters with substantial snowfall. [34] Western hemlock, amabilis fir, yellow cedar and mountain hemlock are common tree species in these ecosystems. [34] The CWHvm2 has a similar NDT as the CWHvm1 and CWHvh1.

Table 8. BEC zones and natural disturbance types found within the AOI.

Biogeoclimatic Zone	Natural Disturbance Type	Area (ha)	Percent (%)
CWHmm1: Coastal Western Hemlock, Moist Maritime, Submontane variant	NDT2	8	<1%
CWHmm2: Coastal Western Hemlock, Moist Maritime, Montane variant	NDT2	346	1%
CWHvh1: Coastal Western Hemlock, Very Wet Hypermaritime, Southern variant	NDT1	6,728	13%
CWHvm1: Coastal Western Hemlock, Very Wet Maritime, Submontane variant	NDT1	5,376	11%
CWHvm2: Coastal Western Hemlock, Very Wet Maritime, Montane variant	NDT1	34	<1%
CWHxm1: Coastal Western Hemlock, Very Dry Maritime, Eastern variant	NDT2	11,460	23%
CWHxm2: Coastal Western Hemlock, Very Dry Maritime, Western variant	NDT2	26,157	52%
MHmm1: Mountain Hemlock, Moist Maritime, Windward variant	NDT1	141	<1%
TOTAL		**50,250**	100%



Map 3. Biogeoclimatic Zones within the AOI.

Forest Health Issues

Several forest health issues were identified during field assessments in the AOI. Invasive species commonly occur in many regional district parks with some areas having low to no forest cover due to invasive species competition during stand establishment or development. The occurrence of species such as Himalayan blackberry and English ivy were noted in low-disturbance interface forest stands within upwards of 200 m from the nearest road or establishment. The removal of invasive species should occur concurrently with fuel treatments to ensure cost efficiencies. Site monitoring should occur post-treatment to evaluate treatment efficacy and assess further mitigation requirements. Although the management of Himalayan blackberry is resource-intensive, some strategies include, but are not limited to: 1. mechanical control via frequent mowing or cutting followed by spot application of herbicides or hand digging to remove the roots; or 2. Chemical control via herbicide application.[35] The latter must comply with the *Integrated Pest Management Act* requirements and must consider individual site characteristics. English ivy mitigation can occur via manual pruning or pulling of the plant at the root and removal of resulting plant material from the site, avoiding cuttings, as those can sprout. Areas treated for English ivy removal should be mulched or covered in chips produced during the fuel treatment, and frequently monitored and managed post-treatment.

Impacts of recent windstorm events were noted throughout the AOI and were reflected as large windthrow hotspots. The latest large windstorm event which occurred on December 20, 2018 was preceded by more than 400 millimeters of rain, saturating the soil and increasing the vulnerability of shallow rooted trees.[36] The storm produced winds in excess of 100 kilometers per hour, and was deemed the most destructive in BC Hydro's history.[36] An additional explanation for higher levels of damage from windthrow in southern Vancouver Island area, may be due to significant exposure of second growth stands to prevailing winds off Alberni Inlet. Windthrow results in increased levels of both aerial and ground surface fuel loading, which is concerning both from a fire hazard and public safety perspective. This issue is particularly critical in interface areas, where private residences abut forested edges, or are intermixed with forested stands. In order to increase forest resilience and reduce local fire risk within the AOI, it is recommended that the ACRD conducts an assessment of stands within 300 m of interface development or critical infrastructure, with a focus on grounding aerial/partially downed trees and reducing the continuity of windthrown stems, by bucking up recently windthrown material and removing or interspersing woody material.

Exploration of potential funding opportunities through the province and the National Disaster Mitigation Program may be worthwhile.[37]

[35] Invasive Species Council of BC. 2014. Himalayan Blackberry Fact Sheet. Retrieved online at: https://bcinvasives.ca/documents/Himalayan_Blackberry_TIPS_Final_08_06_2014.pdf

[36] BC Hydro. 2019. Report: The most damaging storm in BC Hydro's history. Retrieved online at: https://www.bchydro.com/news/press_centre/news_releases/2019/storm-report-most-damaging-storm.html

[37] 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

The Coast Forest Health Overview outlines forest health issues present within the Arrowsmith TSA.[38] This overview and forest health strategy (2015-2017) outlines ten forest health issues that are most prevalent within this timber supply area: Douglas-fir beetle, drought, gypsy moth, mountain pine beetle, root diseases (primarily laminated root disease and armillaria spp.), spruce aphid, western black headed budworm, western hemlock looper, western spruce budworm and windthrow. The 2017 provincial summary of forest health conditions identified recent forest health impacts in the Arrowsmith TSA.[39] These include laminated root disease, a common damaging agent in southern BC; balsam bark beetle; five spot disturbances of armillaria root disease; Douglas-fir beetle infestations, which rose in the West Coast Region; and white pine blister rust.

Spatial data available through DataBC[40] indicates one severe fire damage instance in 2015, of approximately 448 ha adjacent to Dog Mountain. Four instances of Douglas-fir beetle damage of low and moderate severity (13.2 total ha in 2013, 1.75 ha in 2011 and 1411 ha in 2010, respectively) were also noted. The presence of Douglas-fir beetle (*Dendroctonus pseudotsugae*) poses an additional concern in the AOI with regards to windthrow and the resulting fresh aerial or downed woody material. Recent windthrow events in the AOI have led to an overabundance of freshly downed Douglas-fir stems, which can result in population increase of Douglas-fir beetle. In order to reduce favourable habitat for the Douglas-fir beetle, special considerations and strategies should be implemented during fuel management, with regards to coarse woody debris recruitment and species selection.

Mortality and reduced vigour of western hemlock and western redcedar were also noted during field assessments of the AOI. These forest health factors have implications for the fire behaviour potential, level of surface fuel accumulation in affected stands, as well as access and working conditions for fire fighters in the event of wildfire.

Human Development and Natural Events

Since the establishment of communities in the AOI, there have been numerous anthropogenic and natural changes that have occurred on the landscape. Most land cover change in the AOI in recent years can be described as rural residential and industrial development. This process entails land clearing and road building. Abiotic and biotic natural events have typically occurred at small geographic scales. The overall implication of rural human development in the AOI is the creation of additional intermix neighbourhoods in areas with potential access/egress issues. The interface and/or intermix development areas are associated with an increase in human ignition potential and fire suppression challenges.

[38] 2015-17 Coastal Timber Supply Areas Forest Health Overview. Ministry of Forests, Lands and Natural Resource Operations. 2015.

[39] 2017 Summary of Forest Health Conditions in British Columbia. 2017.

[40] https://catalogue.data.gov.bc.ca/pt_BR/dataset/pest-infestation-polygons (current as of June, 2019)

The following is a list of notable changes observed within the AOI and a description of associated implications regarding wildfire behaviour.

- Rural-residential and industrial land development has occurred in the AOI since the mid-19th century, following settlement by early pioneers engaging in resource-based activities. New residential development has expanded from the existing neighborhoods of Alberni Valley into the forested edges. This has 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 200-350 years.
- The forest industry continues to be a primary economic driver within the AOI. As a result, historical and current harvesting and silviculture regimes within the study area have led to a mosaic of stand ages and structures, which result in potentially complex wildfire behaviour. Forest harvesting is common on provincial crown land as well as on private land within the AOI. Poor slash hazard abatement practices have been attributed to some operations which can lead to high fuel loading along roadsides.
- Frontcountry and backcountry use of trails within the ACRD is prevalent. Increased recreational use of forested areas has implications for human caused ignitions, particularly when these activities are undertaken during the dry summer months. Backcountry activities have the added complication of being areas with poor access for suppression efforts.

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.
- **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 Beaver Creek fire weather station (daily data for the years 1998 – 2018). According to Figure 1, the months with the highest average number of 'high' fire danger class days are July and August. Historically, 'high' fire danger days also occur in May, June and September. The average number of 'extreme' fire danger class days is highest in July, August, and September. Historically, the month of August has the highest number of days in the 'extreme' class while July has the highest number of 'high' danger class days.

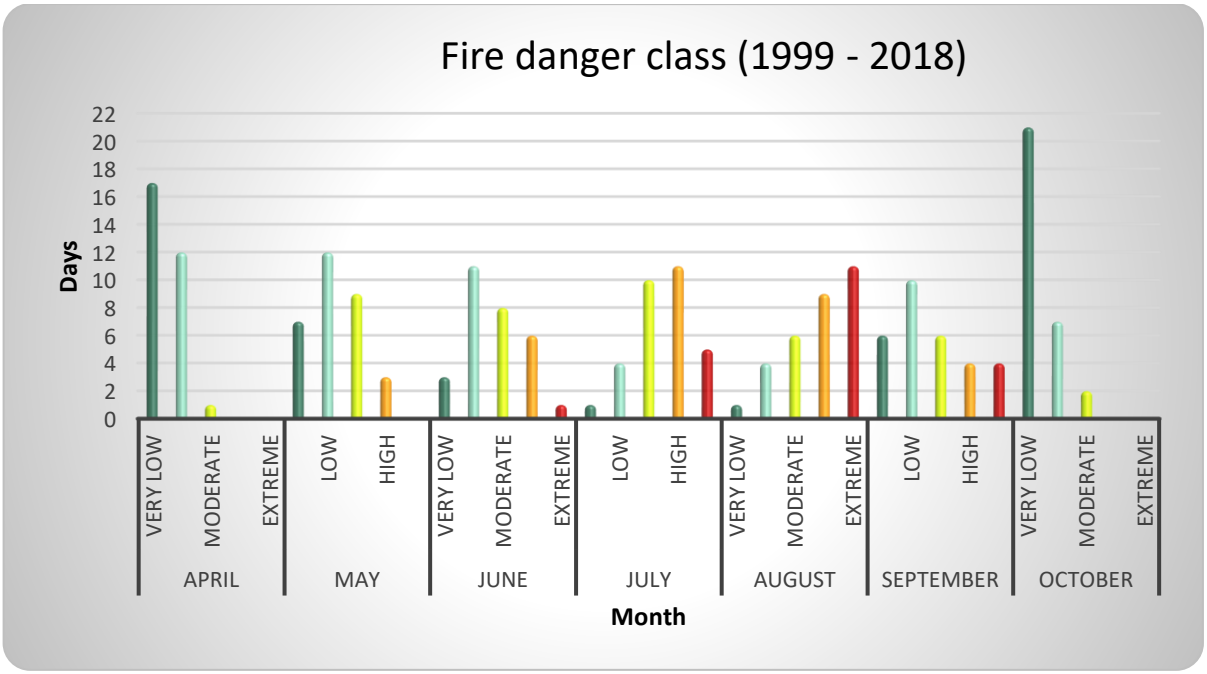


Figure 1. Average number of danger class days for the Beaver Creek fire weather station. Summary of fire weather data for the years 1998- 2018.

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.[41]

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.[42] Despite the uncertainties, trends within the data are visible. As outlined by the Pacific Climate Impacts Consortium (PCIC)[43], the following climate projections are made for Vancouver Island:

- Increases in average annual temperature consistent with temperature increases for the province of BC (approximately 1.5^{o}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 (-30% in the winter and -50% in the spring);
- 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.[44] Other research regarding the intricacies of climate change and potential impacts on wildfire threats to Canadian forests has found that:

- Fuel moisture is highly sensitive to temperature change and projected precipitation increases will be insufficient to counteract the impacts of the projected increase in temperature. Results

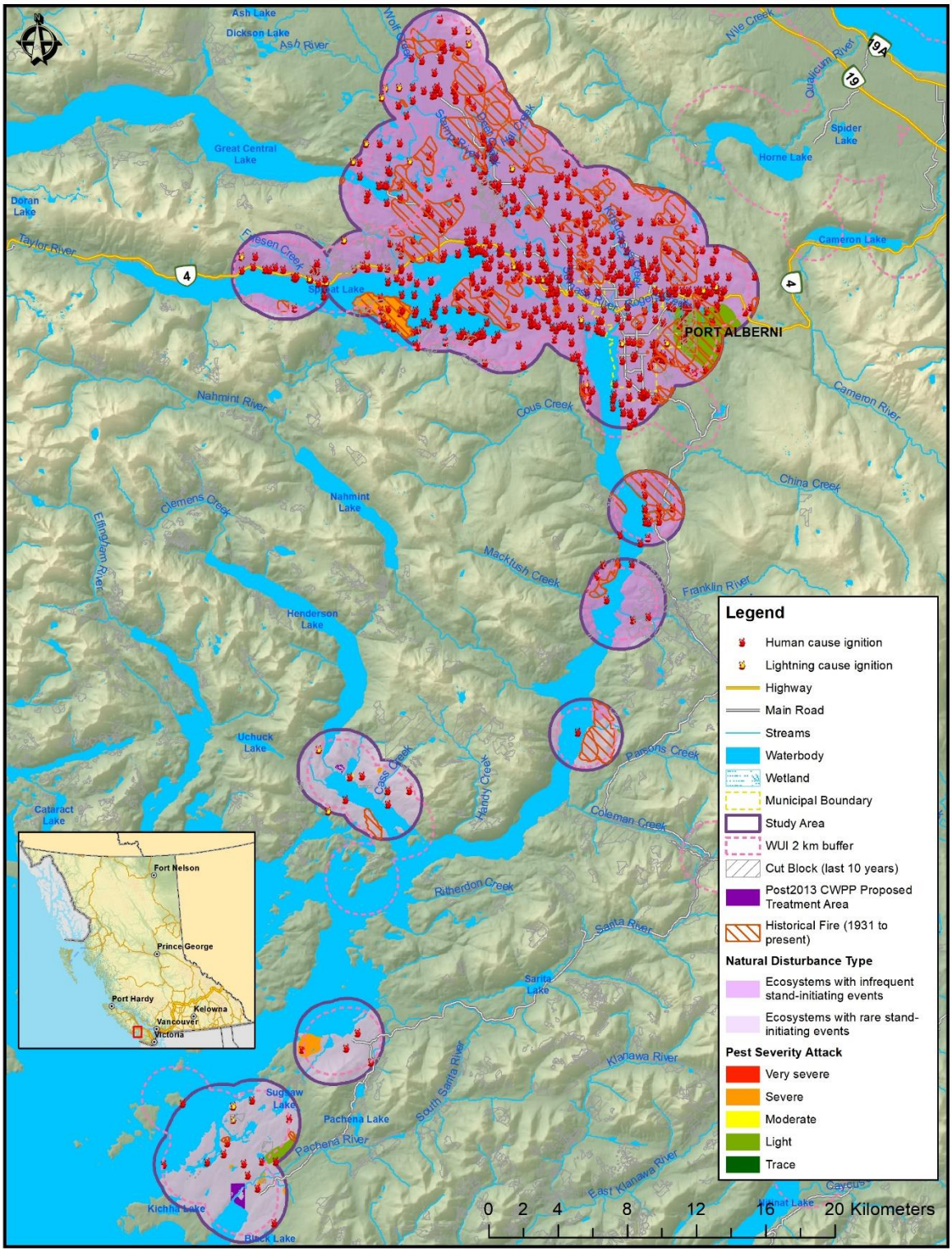
[41] International Panel on Climate Change. 2014. Climate change 2014: Synthesis report, summary for policymakers. 32p.
[42] Dale, V. et al. 2001.
[43] PCIC. 2012. Summary of Climate Change for Vancouver Island in the 2050s. Retrieved online at: http://www.plan2adapt.ca/tools/planners?pr=34&ts=8&toy=16&oldregion=4&oldvar=0&oldres=0&oldexpt=11&oldts=8&oldpr=34&dpoint=&seltab=0&fringe_size=0&view_x=-125.999467335166&view_y=50.1962950169984&th=0&zoom=2
[44] MFLNRO. 2016

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

- The future daily fire severity rating (a seasonally cumulative value) is expected to have higher peak levels and head fire intensity is expected to increase significantly in Western Canada. A bi-modal (spring-late summer) pattern of peak values may evolve to replace the historical late summer peak which is the current norm.[46] The length of fire seasons is expected to increase and the increase will be most pronounced in the northern hemisphere, specifically at higher latitude northern regions. Fire season severity seems to be sensitive to increasing global temperatures; larger and more intense fires are expected and fire management will become more challenging.[47, 48]
- More extreme precipitation events (increased intensity and magnitude of extreme rainfall) 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.[49]
- Future climatic conditions may be more suitable for, or give competitive advantage to, new species of plants, including invasive species.[50]

In summary, climate scientists expect that the warming global climate will trend towards wildfires that are increasingly larger, more intense and difficult to control. Furthermore, it is likely that these fires will be more threatening to WUI communities due to increased potential fire behaviour, fire season length, and fire severity. This trend is expected to be disproportionately felt in northern latitudes.[51]

[45] Flannigan, M.D et al. 2016.
[46] deGroot, W. J. et al. 2013.
[47] Flannigan, M.D et al. 2013.
[48] Jandt, R. 2013. Alaska Fire Science Consortium Research Brief 2013-3.
[49] British Columbia Agriculture Climate Change Adaptation, 2012. Risk + Opportunity Assessment Series – Vancouver Island. Retrieved online at: https://www.bcagclimateaction.ca/wp/wp-content/media/AdaptROseries-VancouverIsland.pdf
[50] 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.
[51] All research noted was completed for Canada or globally, not for the AOI. 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.[52] 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 -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).

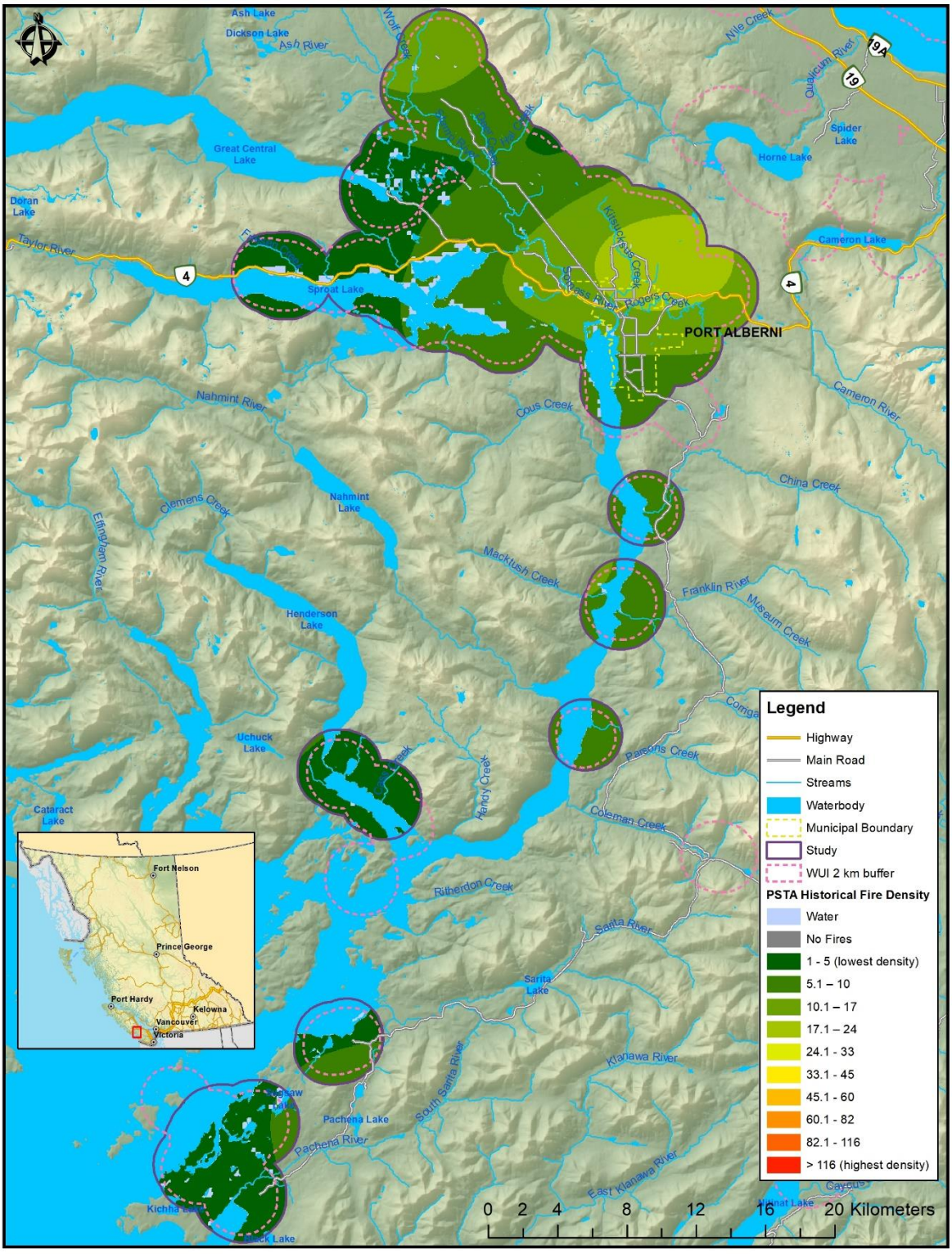
There are considerable limitations associated with the WTA Component based upon the accuracy of the source data and the modeling tools, the most notable being:

- 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

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

- 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.



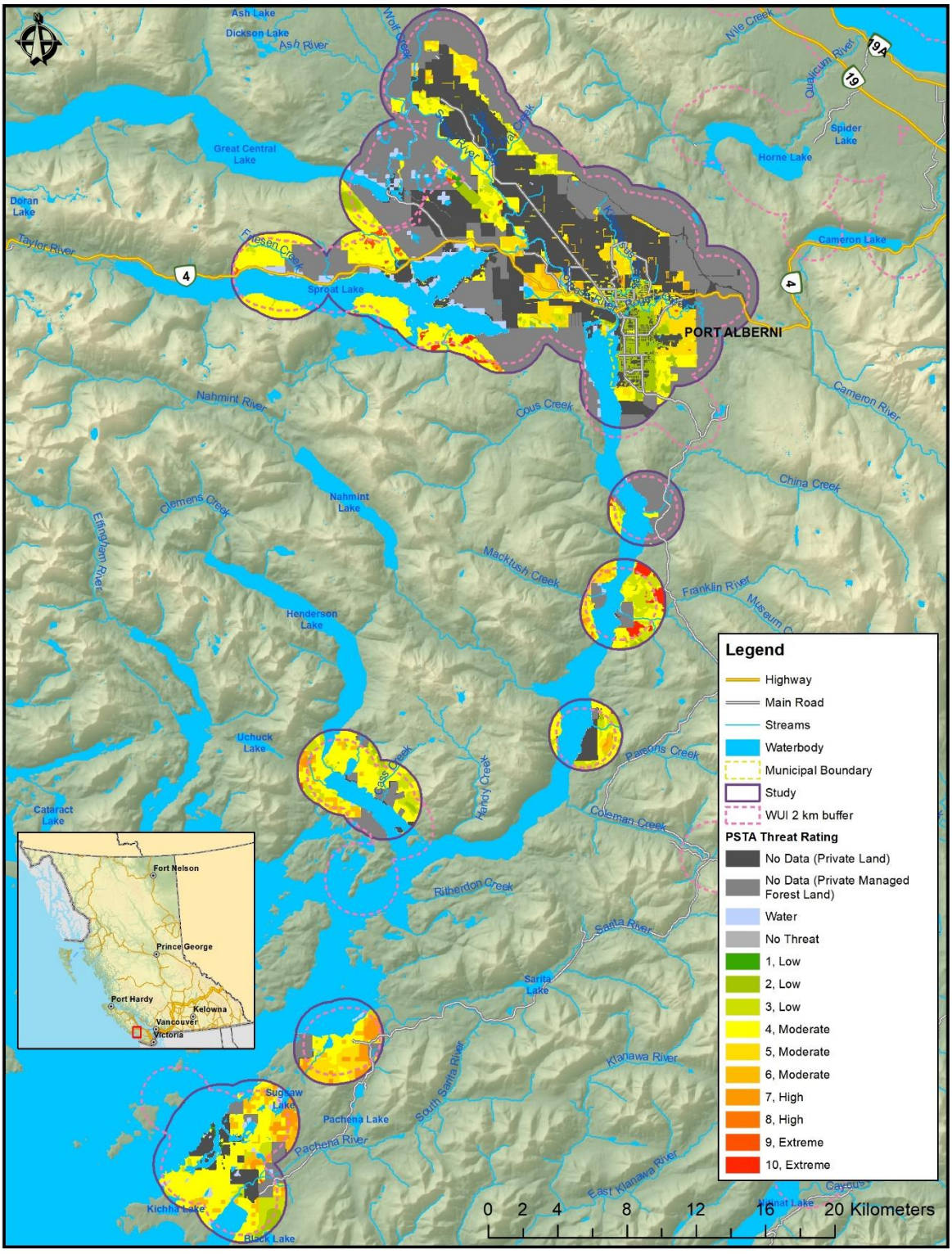
Map 5. Historical Fire Density.

4.2.1 PSTA Final Wildfire Threat Rating

Approximately half of the AOI (47%) 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 7% of the AOI and water covers 20%. Approximately 24% of the AOI is categorized as having a moderate wildfire threat rating in the provincial Wildfire Threat Analysis (Table 9). High and extreme threat rating represents 2% of the AOI, with the most notable high-threat areas being concentrated, particularly east and west of the Alberni Inlet (Franklin River southern polygon), southern portion of the Kildonan polygon, and eastern sections of the Sarita and Bamfield polygons (Map 6). Patches of extreme threat are also present east of the Alberni Inlet in the Franklin River polygon, as well as south of the community of Sproat Lake in the Alberni Valley polygon.

Table 9. Overall PSTA Wildfire Threat Analysis for the AOI (rounded to the nearest hectare).

Threat Class	Area (ha)	Threat Class Description	Percent of AOI
-3	9,161	No Data (Private Land)	18%
-2	14,485	No Data (Private Managed Forest Land)	29%
-1	9,890	Water	20%
0	0	No Threat	0%
1	43	Low	7%
2	1,297		
3	2,126		
4	8,786	Moderate	24%
5	2,294		
6	1,140		
7	634	High	1%
8	24		
9	100	Extreme	1%
10	271		
Total	**50,250**		**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.

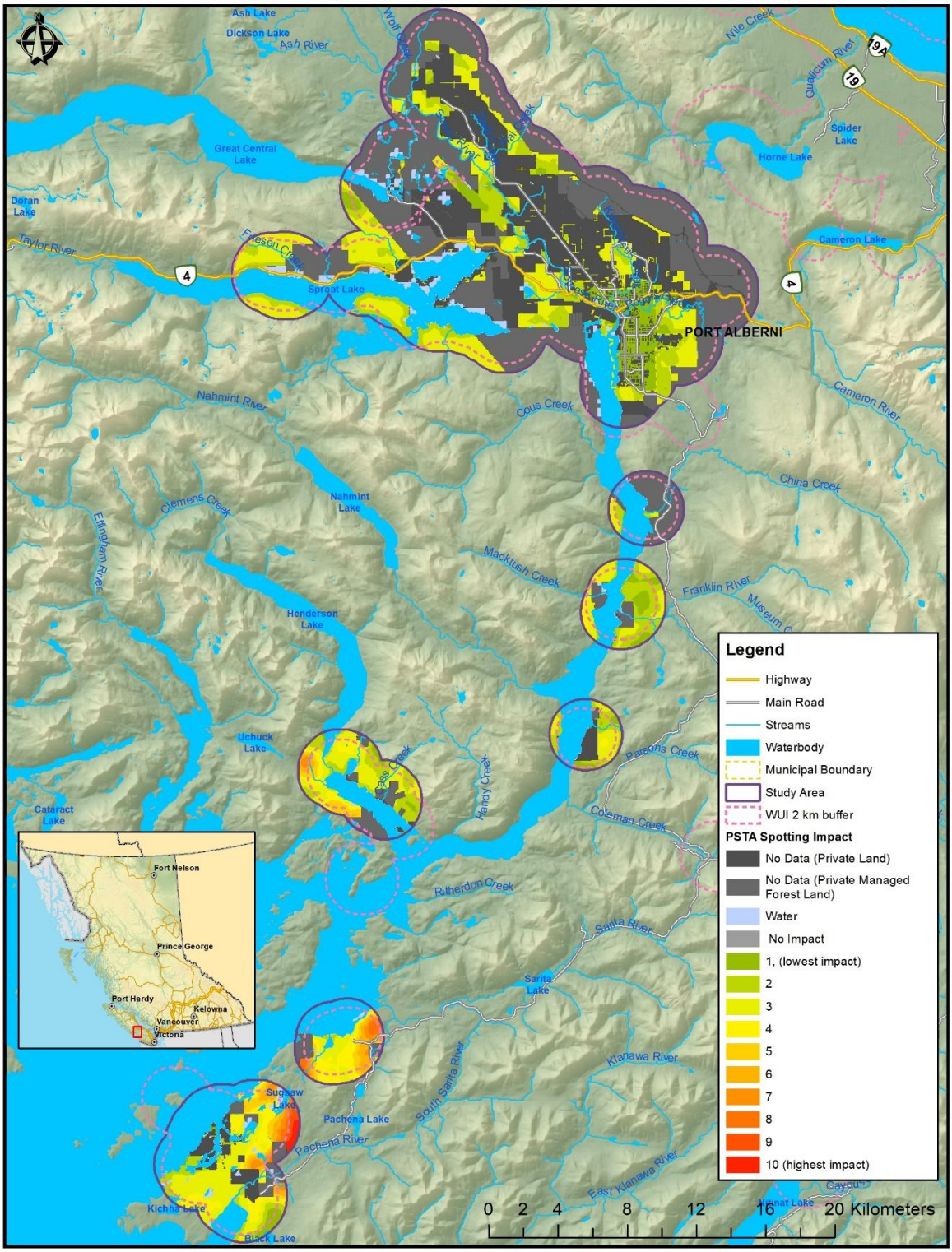
For example, an investigation of home destruction from the 2016 Fort McMurray, Alberta fire found that the vast majority of home ignitions in the interface (outer edges of urban neighbourhoods) were attributable to embers alighting on combustible material (home or adjacent areas).[53] Similarly, reports from the 2010 Fourmile Canyon fire outside Boulder, Colorado, found that only 17% of the 162 homes destroyed were attributed to crown fire (*e.g.*, fire that travels from tree crown and spreads to a structure through contact).[54,55] Instead of high intensity flames or radiant heat, the majority of homes ignited as a result of firebrands (or embers), which ignited the home directly or ignited lower-intensity surface fires adjacent to structures.[55] 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 Alberni Valley polygon is generally low in terms of spotting impact, with isolated areas of low-moderate potential impact in the forested areas located north and south of Sproat Lake (Map 7). All other polygons in the AOI are represented by moderate spotting impact, with the exception of the western portions of Kildonan and Bamfield, and both the western and eastern portions of the Sarita polygon, which are classified as moderate-high spotting impact (Map 7).

[53] 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

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

[55] 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.

4.2.3 Head Fire Intensity

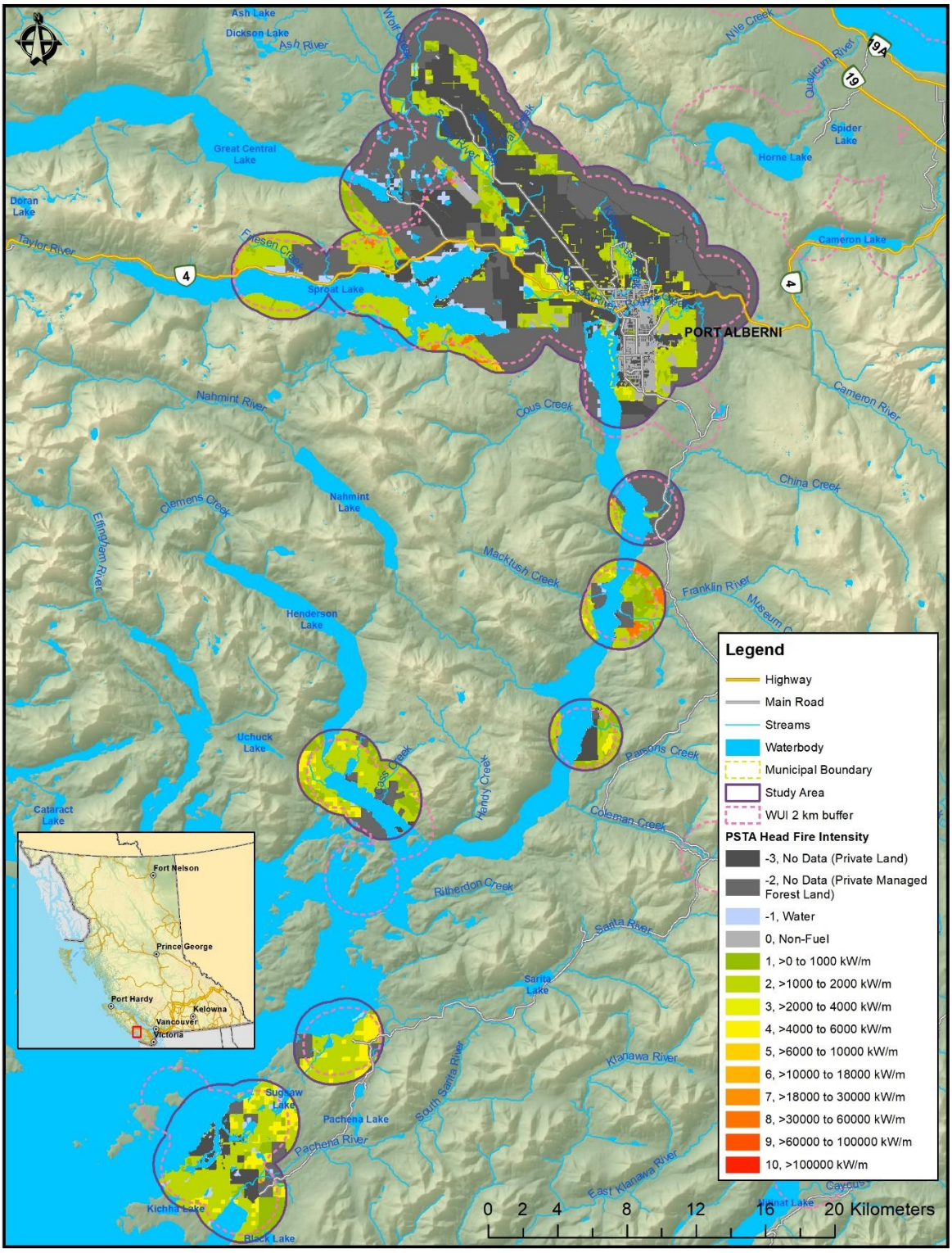
HFI is correlated with flame length and fire behaviour. The greater the fire intensity (kW/m), or HFI and fire intensity class, the more extreme the fire behaviour is likely to be and the more difficult the fire will likely be to suppress (Table 10 and Map 8).

In the AOI, generally speaking, the highest fire intensity class is 8, which represents an extremely vigorous surface fire and continuous crown fire, and aggressive fire behaviour (Table 10). Classes, 3 and 5 - 8 are quite uncommon in the AOI (1% to <1% of the area, respectively). Classes 2 and 1 dominate throughout at 21% and 5% of the AOI area, respectively (Table 10, Map 8). Class 2 is described as moderate vigour surface fire and classes 1 is described as smouldering surface fire, respectively.

Table 10. Head Fire Intensity Classes and Associated Fire Behaviour.

PSTA - HFI Class	Fire Intensity kW/m	Fire Intensity Class[56]	Percent of AOI	Flame Length (meters)[57]	Likely Fire Behaviour[58]
1	0.01 – 1,000	2	5%	< 1.8	Smouldering surface fire
2	1,000.01 – 2,000	3	21%	1.8 to 2.5	Moderate vigour surface fire
3	2,000.01 – 4.000	4	1%	2.5-3.5	Vigorous surface fire
4	4,000.01 – 6,000	5	2%	3.5 to 4.2	Vigorous surface fire with occasional torching
5	6,000.01 – 10,000	5	<1%	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	<1%	18.2 to 25.6	Extremely vigorous surface fire and continuous crown fire
8	30,000.01 – 60,000	6	<1%	>25.6[59]	Extremely vigorous surface fire and continuous crown fire, and aggressive fire behaviour
9	60,000.01 – 100,000	6	0%	>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

[56] Head fire intensity should be classified by intensity class not fire rank. Fire rank is a visual description of conifer fires for air operations.
[57] 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).
[58] These characteristics will be different in open and closed forest fuel.
[59] 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.

4.2.4 Fire History

Fire ignition and perimeter data are depicted in Map 4. BCWS reported (personal communication) that historically most fire activity in the AOI has occurred after the lifting of fire bans (fire bans are effective and change human behaviour). Locally, BCWS prevention activity is focused on open burning grass fires and those from poor recreation sources (large or unattended campfires), while smoking and lightning caused ignitions are of lower concern.

Fire ignition and perimeter data are depicted in Map 4. Fire ignition data for the area is available for 1950-2017 and fire perimeter data from 1919-2017. Based on the fire ignition data, there have been 706 fire incidents within the AOI during that time period; 502 of which were human-caused and 156 of which were of miscellaneous/undetermined cause.

Based on the fire perimeter data, of the 61 fires that burned within the AOI, 60 were human-caused and one had an undetermined caused. The majority of the fires in the AOI (88%) burned between 1919 and 1947 and ranged from 0.1 ha to 7,020 ha. The most recent fire of note occurred on the east southeastern side of Sproat Lake near Dog Mountain in September 2015 and burned approximately 450 ha. This fire history demonstrates that the vast majority of fires in the AOI occurred due to humans and that the common fires and relatively large scales seen in the first half of the 20th century have not occurred since.

4.3 LOCAL WILDFIRE THREAT ASSESSMENT

WUI Threat Assessments were completed over seven field days in March 2019, 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 AOI to support development of priority treatment areas, and in order to confidently ascribe threat to polygons which may not have been visited or plotted, but which have similar fuel, topographic, and proximity to structure characteristics to those that were visited.

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 due to vulnerability to wildfire, as communicated by local fire officials.
- Observations – Additional areas potentially not recognized prior to field work were visually identified as hazardous and assessed during the week.

A total of 56 WUI threat plots were completed and over 306 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.[60] 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.[61] It should be noted that there are significant limitations with the fuel typing system which should be recognized. Major limitations include: a fuel typing system designed to describe fuels which do not occur within the AOI, fuel types which cannot accurately capture the natural variability within a polygon, and limitations in the data used to create initial fuel types.[61] 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 11 summarizes the fuel types by general fire behaviour (crown fire and spotting potential) that exist within the AOI. 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.[61] 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.

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

[61] Perrakis, D.B., Eade, G and Hicks, D. 2018. BC Wildfire Service. Natural Resources Canada, Canadian Forest Service. British Columbia Wildfire Fuel Typing and Fuel Type Layer Description 2018 Version. Retrieved from: https://cfs.nrcan.gc.ca/publications?id=39432

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.

Table 11. Fuel Type Categories and Crown Fire Spot Potential. Only summaries of fuel types encountered within the AOI are provided. C-1, C-2 and C-7 fuel types occur on private land and have not been reclassified.

Fuel Type	FBP / CFDDRS Description	AOI Description	Wildfire Behaviour Under High Wildfire Danger Level	Fuel Type – Crown Fire / Spotting Potential
C-1	Spruce-lichen woodland	Located on private land - PSTA classification.	Low to very high fire intensity and rate of spread.	High
C-2	Boreal spruce	Located on private land - PSTA classification.	Almost always crown fire, high to very high fire intensity and rate of spread	High
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
C-7	Ponderosa pine and Douglas-fir	Open, uneven-aged forest, crowns separated from the ground except in conifer thickets, understory of discontinuous grasses, herbs. Areas harvested 25+ years ago (and not achieving M-1/2 or C-3 fuel type characteristics), open stand type (>40% crown closure). Located on private land - PSTA classification.	Surface fire spread, torching of individual trees, rarely crowning (usually limited to slopes > 30%), moderate to high intensity and rate of spread	Low

Fuel Type	FBP / CFDDRS Description	AOI Description	Wildfire Behaviour Under High Wildfire Danger Level	Fuel Type – Crown Fire / Spotting Potential
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 dominated stands.	Always a surface fire, low to moderate rate of spread and fire intensity	Low
O1-a/b	Grass	Matted and standing grass communities. Continuous standing grass with sparse or scattered shrubs and down woody debris. Vegetated, non-treed areas dominated by shrubs or herbs in dry ecosystems. Areas of very scattered trees. Hay fields.	Rapidly spreading, high-intensity surface fire when cured	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
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

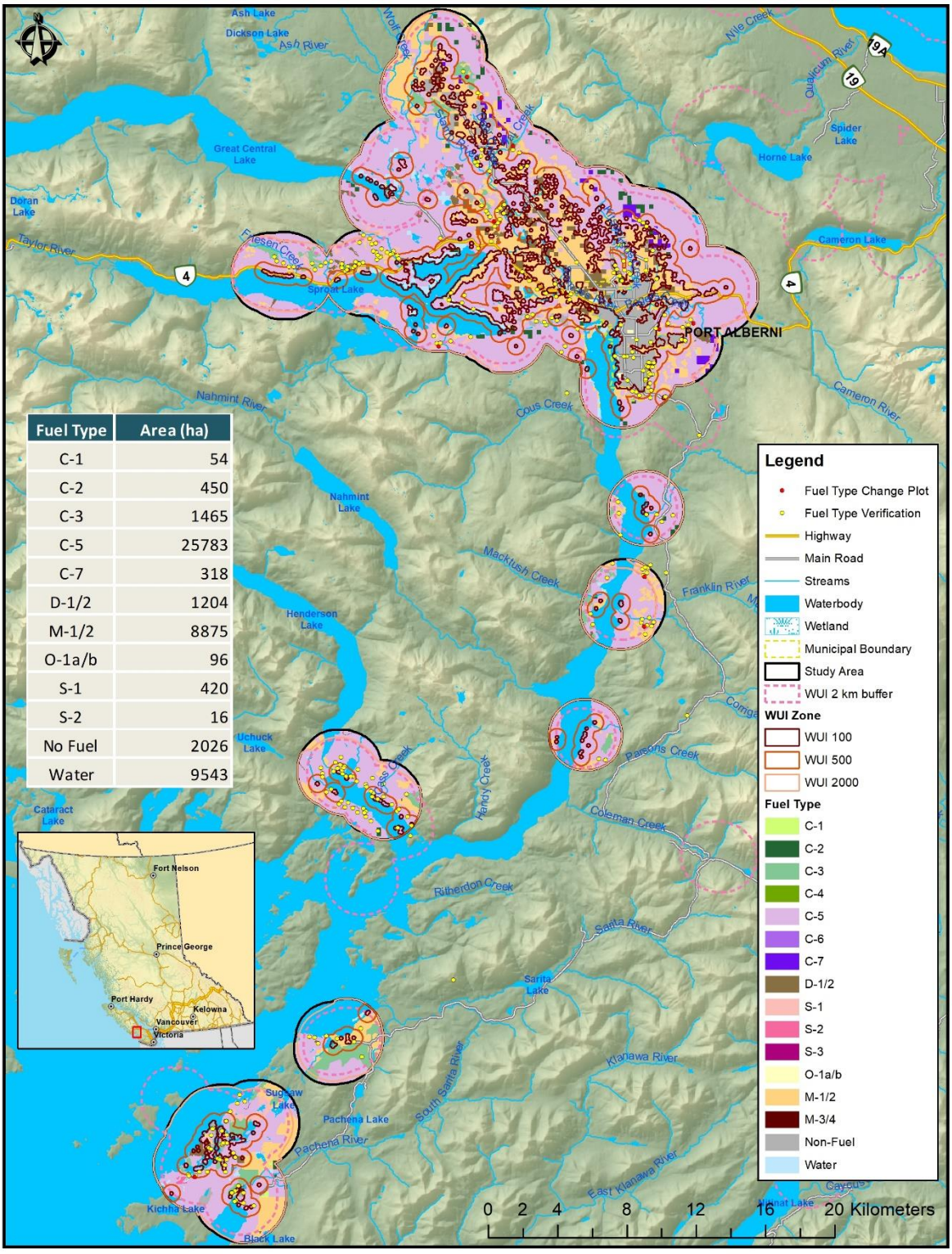
**C-3 fuel type is considered to have a high crown fire and spotting potential within the AOI due to the presence of moderate to high fuel loading (dead standing and partially or fully down woody material), and continuous conifer ladder fuels (i.e., western redcedar, Cw, and/or Douglas-fir, Fd).*

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

- C-5 fuel types being incorrectly identified by the PSTA as D-1/2;
- C-5 fuel types identified as M-1/2;
- C-5 fuel types identified as C-2;
- M-1/2 fuel types identified as D-1/2;

- M-1/2 fuel types identified as N;
- M-1/2 fuel types identified as C-5;
- M-1/2 fuel types identified as S-3;
- C-3 fuel types identified as M-1/2;
- C-3 fuel types identified as C-5;
- D-1/2 fuel types identified as S-1;
- S-1 fuel types identified as C-5;
- S-1 fuel types identified as S-3; and
- S-2 fuel types identified as C-5.

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



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 12 describes the classes associated with proximity of fuels to the interface.

Table 12. 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 fire weather station, Beaver Creek. [62] The ISI rose data is compiled hourly and provides an estimate of prevailing wind directions and wind speed in the area of the weather station.

[62] MFLNRORD, 2016. Retrieved online at: https://www.for.gov.bc.ca/ftp/HPR/external/!publish/Website/ISI%20Roses/Daily_ISI_Roses/ISI%20Roses%20Coastal%20Fire%20Centre%20(July%202016).pdf

During the fire season (April – October) predominant winds originate from the south and southeast. Winds also occur to a lesser degree from the north, northeast and east in most months and infrequently from the west. Wind speeds do not exceed 24 km/hour (Figure 2). An average of daily wind readings for the fire season also shows that winds are predominantly from the south and southeast at windspeeds up to 10 km/hour and gusting upwards of 10-15 km/hour (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.

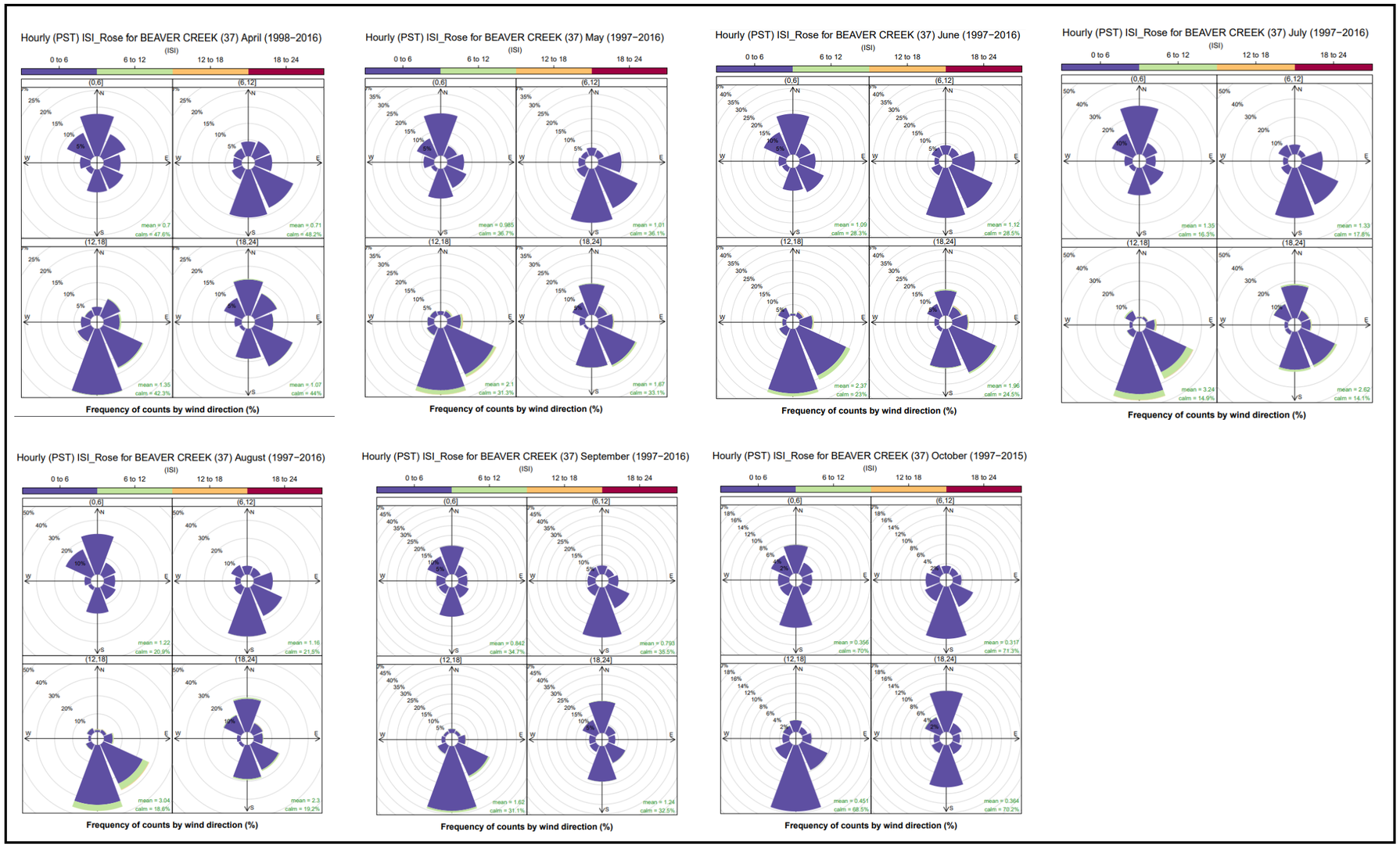


Figure 2. ISI roses depicting average hourly Initial Spread Index values (indicative of windspeed) for the fire season April – October. Data was sourced from the BCWS Beaver Creek weather station for date ranges as indicated in each monthly graphic. The ISI roses in each month are depicted for four daily 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 indicates 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] BCWS, 2019. 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.

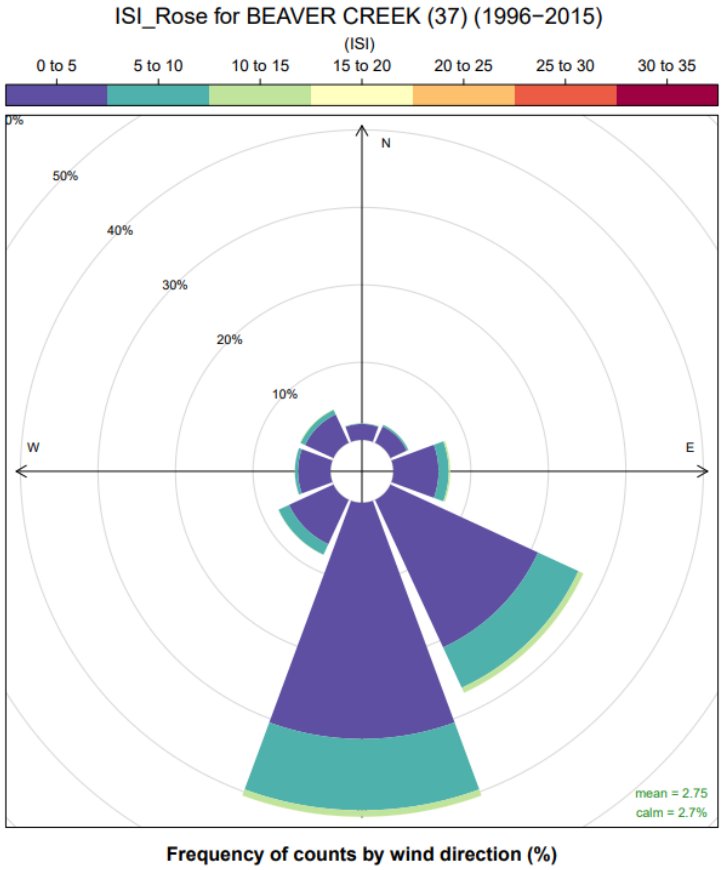


Figure 3. ISI rose showing average daily wind readings during the fire season (April 1 – October 31) 1996 – 2015. Data taken from the Beaver Creek fire weather station. The length of each bar represents the frequency of readings in % and bar colour indicates the ISI value range from lowest (purple) to 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.

ISI rose showing average daily wind readings during the fire season (April 1 – October 31) 1996 – 2015. Data taken from the Beaver Creek fire 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.

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 13 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 14. A value placed at the bottom of the slope is equivalent to a value on flat ground (see Table 13). A value on the upper 1/3 of the slope would be impacted by preheating and faster rates of spread (Table 14). Approximately 70% of the AOI is on less than 20% slope and will likely not experience accelerated rates of spread due to slope class. Approximately 31% percent of the AOI is likely to experience an increased or high rate of spread. On the larger topographic scale, the ACRD and its commercial, recreational, and residential developments would be considered to be at the bottom of the slope to mid slope in the higher elevation residential areas in the AOI.

Table 13. Slope Percentage and Fire Behaviour Implications.

Slope	Percent of AOI	Fire Behaviour Implications
<20%	69%	Very little flame and fuel interaction caused by slope, normal rate of spread.
21-30%	11%	Flame tilt begins to preheat fuel, increase rate of spread.
31-45%	9%	Flame tilt preheats fuel and begins to bathe flames into fuel, high rate of spread.
46-60%	5%	Flame tilt preheats fuel and bathes flames into fuel, very high rate of spread.
>60%	6%	Flame tilt preheats fuel and bathes flames into fuel well upslope, extreme rate of spread.

Table 14. 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 AOI 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 AOI is composed of a mosaic of 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 AOI is <1% extreme threat class rating, 8% high, 15% moderate, 11% low and 18% very low/water (Table 15). The remaining 48% 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. However, it should be noted that the lack of fire threat data on private land and private managed forest land does not imply that high or extreme hazard areas do not exist on private parcels. Table 15 also indicates the differences between the original PSTA threat rating and this CWPP's corrected fire behaviour threat.

RECOMMENDATION #11: The ACRD should work with local private landowners and private managed forest land managers (Mosaic Forest Management) to identify and pursue risk mitigation approaches in private areas located in the wildland urban interface, with consideration for potential funding resources and objectives.

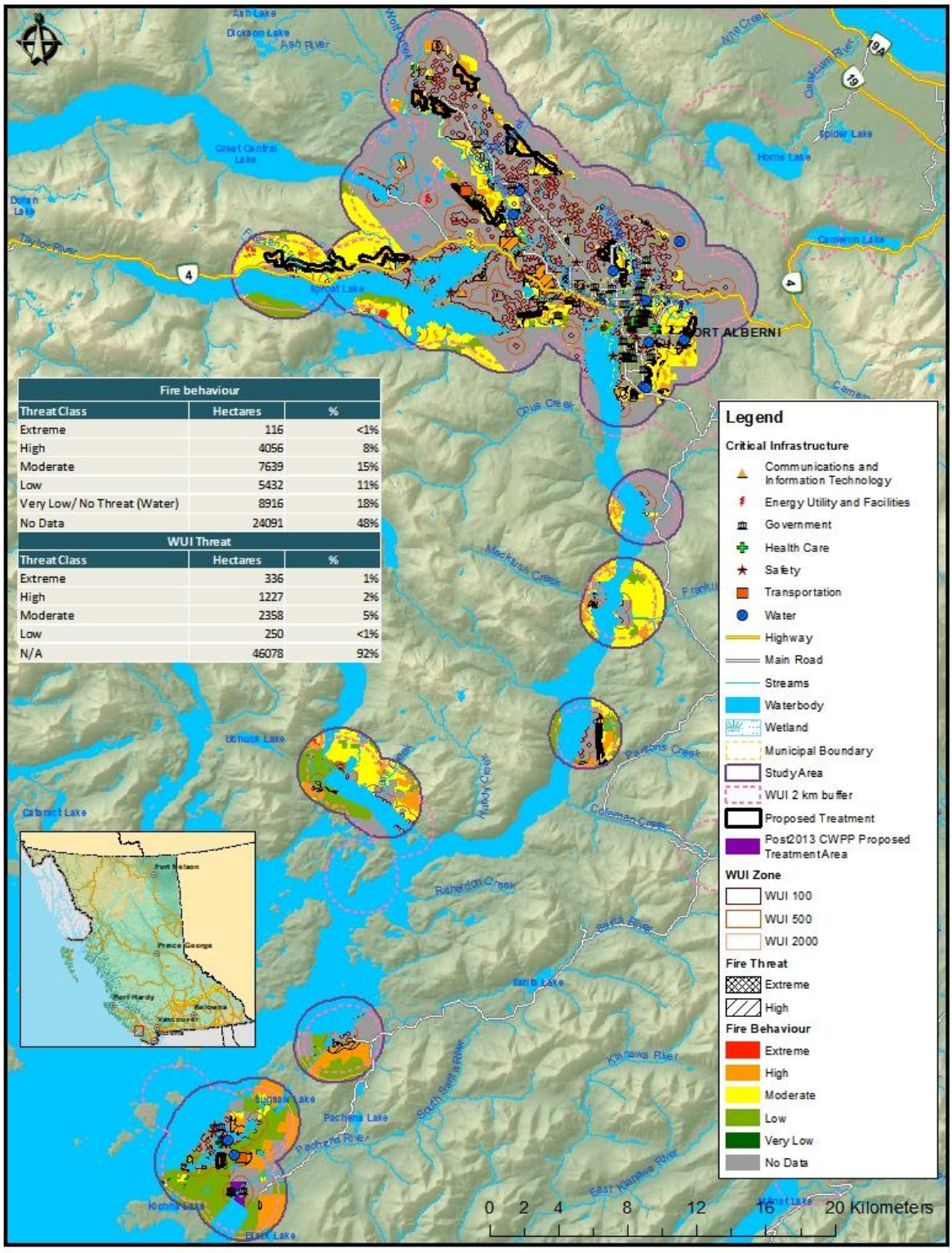
The areas that represent the highest wildfire behavior potential and greatest risk to values within the AOI polygons from north to south are as follows:

The Alberni Valley polygon is largely classified as low to moderate threat (on Crown Provincial or Municipal portions of the AOI). However, patches of high threat exist in the southeastern portion of the polygon between Cameron Heights and Arrowview Heights neighbourhoods, north of Sproat Lake community, adjacent to the Alberni Valley Regional Airport, and northeast of the community of Beaver Creek. The China Creek polygon is largely classified as moderate threat with pockets of high threat class west of the Alberni Inlet. The Franklin River polygons are largely classified as moderate threat with pockets of high threat class west and east of Alberni Inlet for the northern and southern polygons, respectively. The Kildonan polygon is largely classified as low threat south of Uchucklesit Inlet and moderate threat north of the Inlet with pockets of high threat class in the eastern, northwestern and southwestern portions of the polygon. The Sarita polygon is largely classified as low fire threat with areas of high threat class surrounding the Sarita Bay dry land log sort. The Bamfield polygon is primarily classified as low fire threat class, with areas of high threat located north and south of Sugsaw Lake, east of town centre and southeast of Pachena Bay Campground.

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

Table 15. Fire behaviour threat summary for the AOI.

Wildfire Behaviour Threat Class	2017 PSTA Data	2017 CWPP
	Percent of AOI	Percent of AOI
Extreme	1%	<1%
High	1%	8%
Moderate	24%	15%
Low	7%	11%
Very Low/ No Threat (Water)	47%	18%
No Data (Private Land and Private Managed Forest Land)	20%	48%



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 fuel treatments have been completed within the AOI since the 2010 CWPP. To reduce the wildfire risk in the AOI, the objectives for fuel management are to:

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

Ideally, these objectives will enhance protection to homes and critical infrastructure. Caveats associated with 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 half of the AOI (48%) is located on private or private managed forest land, which increases some of the challenges encountered in fuel mitigation. 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.

[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

In addition to the treatment units proposed in the following section, it is recommended that the ACRD recognize important fuel treatment opportunities to improve emergency access and public safety along Highway 4 and Franklin River/Bamfield Road in the event of evacuation through reduction of hazardous fuels and landscape level fuel treatment.

RECOMMENDATION #12: The ACRD should work with the Ministry of Transportation and Infrastructure (MOTI) and private managed forest land holders, to assess the area suitable for treatment (i.e., high hazard) along Highway 4 and Franklin River/Bamfield Road 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[65]. 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 or high 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 provincial or municipal Crown land. It should be noted that the location of proposed treatment units on these land ownership types does not imply that high and extreme hazard areas do not exist on private land within the AOI. As stated in Section 5.1, mitigation approaches should also be pursued on private land where hazard exists, bearing in mind the different funding resources and objectives on these land types. Recommendation for treatment in areas of moderate fire hazard were limited to areas which would increase efficacy of, and/or create continuity between areas of low threat/no fuel areas). All polygons identified for potential treatment have been prioritized based on fire hazard, operational feasibility, estimated project cost, type and number of values at risk, common fire weather (wind direction), and expected efficacy of treatment. Although potential treatment areas have been ground-truthed during field work, additional refinement of the polygons will be required at the time of prescription development. Polygons will require detailed site-level assessment to stratify

[65] 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

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 16 and displayed in Map 11. These fuel treatment opportunities include the use of trailside treatments, 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. FireSmart standards should also be applied to structures and associated vegetation and other fuel to reduce the risk of structures igniting. A multi-barrier approach that reduces the risk to values can include: establishing multiple fuel breaks (Interface Fuel Break and Primary Fuel Break), and applying FireSmart Standards to structures and the surrounding vegetation. Fuel breaks require periodic maintenance to retain their effectiveness.

Trailside Treatments

Trailside treatments are implemented to address hazardous fuels adjacent to publicly used trails, where ignition potential may be higher due to increased recreational use by hikers and both motorized and non-motorized off-road vehicles. The primary objective of these treatments is to reduce potential fire intensity and the probability of ignition, which is achieved through the creation of defensible space surrounding these features. Potential strategies include reducing ladder and surface fuels, increasing crown base height of trees, and retaining fire-resistant tree species (deciduous and select conifers). Trailside treatments vary in size and are typically in the form of linear features which follow trail systems.

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 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[66], 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 #13: Proceed with detailed assessment, prescription development, and treatment of hazardous units identified and prioritized in this CWPP and previously proposed treatment units (from the 2010 CWPP) that have yet to be implemented.

[66] Agee, 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 16. 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	Cameron Rd (Beaufort Electoral Area)	High	31.9	**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.	30.8	1.1	0.0	Complete overlap with woodlot W0011 (South Island Natural Resource District). Overlap with Trapline: TR0107T410. Two research installations are present within the polygon. Consultation with all the appropriate licence holders must occur during prescription development and prior to implementation to ensure all concerns are addressed.	This proposed treatment unit (PTU) is located within 400m of private residences in the north central portion of the community of Beaver Creek. Stands in this PTU are characterized as an Fd leading, dense C-3 fuel type (>3000 stems per hectare) with high ladder and surface fuel continuity. Adjacent intermix private land has very little defensible space in the event of an extreme wildfire event. Recommended treatments include a precommercial thinning opportunity with a thin from below approach, pruning to increase crown base height and removal of surface fuels.
2	Woodlot 1902 South (Hupacasath Woodlot)	High	121.7	**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.	116.8	4.9	0.0	Partial overlap with woodlot W1902 (Hupacasath First Nation). Complete overlap with trapline licence: TR0107T410. Overlap with Stamp River Provincial Park located in northwestern and southern tips of both polygons. Stamp River runs adjacent to the southern portion of the polygons. BC Hydro distribution line intersects the western polygon. Additional BC Hydro distribution lines border the northern edge of both polygons. Agriculture Land Reserve (ALR) overlaps western and eastern polygons. Consultation with all the appropriate licence holders, BC Hydro and BC Parks must occur during prescription development and prior to implementation to ensure all concerns are addressed.	This PTU is located on Beaver Creek Road within 100m of intermix private properties in the community of Beaver Creek. The PTU is classified as an Fd-leading, dense C-3 fuel type (>4000 stems per hectare), with high ladder fuel continuity. Recommended treatments include thinning from below to reduce horizontal and vertical fuel continuity, removal of dead standing, pruning to increase crown base height, and removal of surface fuels.

FTU # and Stratum	Geographic Area	Priority	Total Area (ha)	Treatment Unit Type/ Objective	Local Fire Threat (ha)			Overlapping Values/Treatment Constraints	Treatment Rationale
					Extreme/ High	Mod	Low/Very Low		
3	Woodlot 1902 North (Hupacasath Woodlot)	High	77.5	**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.	74.	3.2	0.2	Polygon overlaps woodlot W1902 (Hupacasath First Nation) and trapline licence TR0107T410. Partial overlap with Agriculture Land Reserve in southwestern portion of polygon. Consultation with all the appropriate licence holders must occur during prescription development and prior to implementation to ensure all concerns are addressed.	This PTU is located within 200m of private residences that abut the Log Train Trail and Hupacasath First Nation Woodlot. This area has been recommended for treatment due to its proximity to private residences and the high hazard fuel type (C-3 fuel type) and high fuel loading present. The combination of low crown base heights, interlocking crowns, and ladder fuels, results in an increased potential for crown fire behaviour. Recommended treatments include removal of understorey conifers, pruning to increase crown base height, and removal of surface fuels. Adjacent intermix private land has very little defensible space in the event of an extreme wildfire event.
4	Hospital	Moderate	2.2	**Interface Fuel break Objective:** Fuel treatment will result in residual stands with characteristics that will reduce continuity of fuel loads, crown and surface fire behaviour, and wildfire risk.	2.2	0.0	0.0	Woodlot W1902 (Hupacasath First Nation) overlaps southern tip of polygon. Complete overlap with Trapline licence TR0107T409. Consultation with all the appropriate licence holders must occur during prescription development and prior to implementation to ensure all concerns are addressed.	This PTU is located within 200m of the West Coast General Hospital. The stands characteristic of this PTU are classified as M-1/2 fuel type with >75% conifers. This area has been recommended for treatment due to its proximity to ACRD critical infrastructure, as well as the presence of high density and surface fuel loading. Recommended treatments include removal of understorey conifers, pruning to increase crown base height, and removal of surface fuels.

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	Burde St	Low	0.2	**Interface Fuel break Objective:** Fuel treatment will result in residual stands with characteristics that will reduce continuity of fuel loads, crown and surface fire behaviour, and wildfire risk.	0.2	0.0	0.0	Complete overlap with Trapline licence TR0107T409. BC Hydro distribution lines are running west to east at north edge of polygon. Consultation with all the appropriate licence holders and BC Hydro must occur during prescription development and prior to implementation to ensure all concerns are addressed.	This PTU is located within 200m of private residences. This area has been recommended for treatment due to its proximity to private residences and the high hazard fuel type (C-3 fuel type) and high fuel loading present. The combination of low crown base heights, interlocking crowns, and ladder fuels, results in an increased potential for crown fire behaviour. Recommended treatments include removal of understorey conifers, pruning to increase crown base height, and removal of surface fuels. Due to its size and location, this PTU can be used as a demonstration treatment.
6	Carmichael Cr	High	0.8	**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.	0.8	0.0	0.0	Complete overlap with trapline licence TR0107T409. Consultation with all the appropriate licence holders must occur during prescription development and prior to implementation to ensure all concerns are addressed.	This PTU is located within 200m of private residences. This area has been recommended for treatment due to its proximity to private residences and the presence of high hazard fuel type (C-3 fuel type). The combination of low crown base heights, interlocking crowns, and ladder fuels, results in an increased potential for crown fire behaviour. Recommended treatments include removal of understorey conifers, pruning to increase crown base height, and removal of surface fuels.
7	S Bamfield Rd East	High	24.7	**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.	24.7	0.0	0.0	Complete overlap with trapline licences T_0103T416 and TR0103T402. BC Hydro distribution lines are found within and adjacent to the polygon. Consultation with all the appropriate licence holders and BC Hydro must occur during prescription development and prior to implementation to ensure all concerns are addressed.	This PTU is located within 200m of private residences in the community of Bamfield. This area has been recommended for treatment due to its proximity to private residences and the presence of high hazard fuel type (C-3 fuel type). The combination of low crown base heights, interlocking crowns, and ladder fuels, results in an increased potential for crown fire behaviour. Recommended treatments include removal of understorey conifers, pruning to increase crown base height, and removal of surface fuels.

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		
8	McCoy Lake	Moderate	21.0	**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.	12.0	6.6	2.5	Complete overlap with trapline licence TR0107T409. No overlap with Agricultural land reserve, but ALR found adjacent to polygon in northwest corner. Consultation with all the appropriate licencees must occur during prescription development and prior to implementation to ensure all concerns are addressed.	This PTU is located within 200m of large forested/intermix private parcels that abut the woodlot. This area has been recommended for treatment due to its proximity to intermix private parcels and the high hazard fuel type (C-3 fuel type) and high fuel loading present. The combination of low crown base heights, interlocking crowns, and ladder fuels, results in an increased potential for crown fire behaviour. Recommended treatments include removal of understorey conifers and hazard trees, pruning to increase crown base height, and removal of surface fuels. Adjacent intermix private land has very little defensible space in the event of an extreme wildfire event.
9	Airport Rd East	High	55.1	**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.	9.5	44.1	1.5	Partial overlap with woodlot licence W1479 (Island-Roots Forestry Services Ltd) and Trapline licences: TR0107T413 and T_0107T424. A BC Hydro distribution line intersects the center of polygon, running northwest to southeast. Nearly complete overlap with Agricultural Land Reserve. Consultation with all the appropriate licence holders and/or clients must occur during prescription development and prior to implementation to ensure all concerns are addressed.	This PTU is located within 500m of Alberni Valley Regional Airport (ACRD critical infrastructure). The stands characteristic of this area are classified as immature conifer plantation (M-1/2 fuel type with greater than 75% conifer content). This area has been recommended for treatment due to its proximity to ACRD critical infrastructure, as well as the presence of moderate conifer density and surface fuel loading. Recommended treatments include spacing of conifers saplings, pruning to increase crown base height, and removal of surface fuels.

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	Alberni Valley CF West	Low	120.0	**Primary Fuel Break:** Fuel treatment will result in residual stands with characteristics that will lower overall fire behavior, reduce fuel loading and potential for extreme crown fire.	24.5	74.9	20.6	Polygon overlaps with the Alberni Valley Community Forest Corporation. Overlap with trapline licence TR0107T407 and Sproat Community Watershed. Species at Risk found within AOI: *Leptogium polycarpum* (peacock vinyl). BC Hydro line found adjacent to polygon. Consultation with all the appropriate licence holders, ecosystem biologist and BC Hydro must occur during prescription development and prior to implementation to ensure all concerns are addressed.	The Alberni Valley Community Forest proposed treatment areas (2) are together intended to function as a Primary Fuel Break by creating a 300 m wide area with decreased fire behaviour potential. The proposed fuel break is located within the Alberni Valley Community Forest along the Aw Forest Service Road (FSR), to the north and northwest of private residences within the community of Sproat Lake. The stands within this area are characterized by a patchwork of higher density conifer stands (C-3 fuel type), with a component of intermediate to mature conifer stands (C-5 fuel type). These stands have significant accumulations of fine and coarse woody fuels and conifer ingrowth. Laddering potential varies throughout the PTU but is generally high.
11	Woodlot 1476 (Hupacasath Woodlot)	Moderate	101.1	**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.	21.7	78.9	0.4	Overlap with Tseshaht First Nation, Ditidaht First Nation Forest Development Units (FDUs). Area overlaps with woodlot W1476 (Hupacasath First Nation). Overlap with TFL 44, trapline licence TR0107T407 and Sproat Community Watershed. Consultation with all the appropriate licencees and/or clients must occur during prescription development and prior to implementation to ensure all concerns are addressed.	This PTU is located within >500m of private residences in the western portion of the community of Sproat Lake. This area has been recommended for treatment due to the presence of high hazard fuel type (C-3 fuel type) and its potential to bolster the efficacy of treatment proposed in the two Alberni Valley Community Forest fuel breaks. The combination of low crown base heights, interlocking crowns, and ladder fuels, results in an increased potential for crown fire behaviour. Recommended treatments include removal of understorey conifers, pruning to increase crown base height, and removal of surface fuels.

FTU # and Stratum	Geographic Area	Priority	Total Area (ha)	Treatment Unit Type/ Objective	Local Fire Threat (ha)			Overlapping Values/Treatment Constraints	Treatment Rationale
					Extreme/ High	Mod	Low/Very Low		
12	Woodlot 0011 (Thompson Woodlot)	Moderate	131.6	**Primary Fuel Break:** Fuel treatment will result in residual stands with characteristics that will lower overall fire behavior, reduce fuel loading and potential for extreme crown fire.	63.4	63.7	4.4	Overlap with woodlot W0011 and trapline licence TR0107T410. Consultation with all the appropriate licence holders and/or clients must occur during prescription development and prior to implementation to ensure all concerns are addressed.	This PTU is located within 200-500m of large forested/intermix private parcels that abut the woodlot. This area has been recommended for treatment due to its proximity to intermix private parcels and the high hazard fuel type (C-3 fuel type, minor component of C-5 fuel type) and high fuel loading present. The combination of low crown base heights, interlocking crowns, and ladder fuels, results in an increased potential for crown fire behaviour. Recommended treatments include removal of understorey conifers and hazard trees, pruning to increase crown base height, and removal of surface fuels. Adjacent intermix private land has very little defensible space in the event of an extreme wildfire event.
13	Alberni Valley CF East	High	117.2	**Interface Fuel break Objective:** Fuel treatment will result in residual stands with characteristics that will reduce continuity of fuel loads, crown and surface fire behaviour, and wildfire risk.	31.5	78.4	7.3	Complete overlap with Alberni Valley Community Forest. Complete overlap with Trapline licence TR0107T407 and Sproat Community Watershed. BC Hydro distribution lines run adjacent to polygon in the eastern corner. Consultation with all the appropriate licence holders and BC Hydro must occur during prescription development and prior to implementation to ensure all concerns are addressed.	The Alberni Valley Community Forest proposed treatment areas (2) are together intended to function as a Primary Fuel Break by creating a 300 m wide area with decreased fire behaviour potential. The proposed fuel break is located within the Alberni Valley Community Forest along the Ash Main (FSR), to the north and northwest of private residences within the community of Sproat Lake. The stands within this area are characterized primarily by higher density conifer stands (C-3 fuel type), with a minor component of intermediate to mature conifer stands (C-5 fuel type). These stands have significant accumulations of fine and coarse woody fuels and conifer ingrowth. Laddering potential varies throughout the PTU but is generally high.

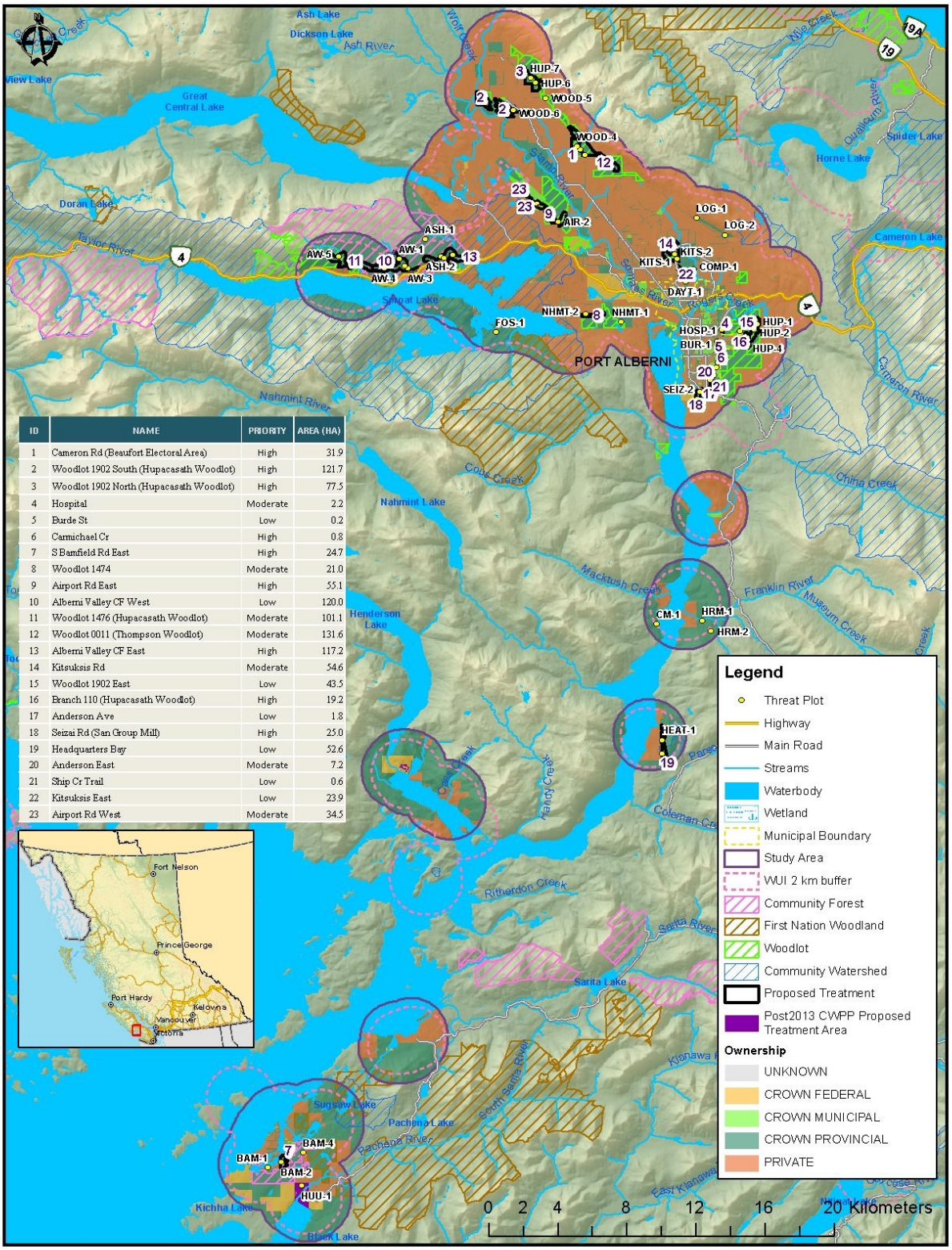
FTU # and Stratum	Geographic Area	Priority	Total Area (ha)	Treatment Unit Type/ Objective	Local Fire Threat (ha)			Overlapping Values/Treatment Constraints	Treatment Rationale
					Extreme/ High	Mod	Low/Very Low		
14	Kitsuksis Rd	Moderate	54.6	**Interface Fuel break Objective:** Fuel treatment will result in residual stands with characteristics that will reduce continuity of fuel loads, crown and surface fire behaviour, and wildfire risk.	21.8	32.8	0.0	Partial overlap with woodlot W1902 (Hupacasath First Nation). Complete overlap with Trapline licence TR0107T410. BC Hydro distribution lines run adjacent to polygon. Minor overlap with Agricultural Land Reserve northern portion of the polygon. Consultation with all the appropriate licence holders and BC Hydro must occur during prescription development and prior to implementation to ensure all concerns are addressed.	This PTU is located within 200m of private residences in the community of Cherry Creek. This area has been recommended for treatment due to the presence of high hazard fuel type (C-3 fuel type, minor component of M-1/2 and C-5 fuel types) and its potential to bolster the access/egress route to private residences in this area. The combination of low crown base heights, interlocking crowns, and ladder fuels, results in an increased potential for crown fire behaviour. Recommended treatments include removal of understorey conifers, pruning to increase crown base height, and removal of surface fuels.
15	Woodlot 1902 East	Low	43.5	**Primary Fuel Break:** Fuel treatment will result in residual stands with characteristics that will lower overall fire behavior, reduce fuel loading and potential for extreme crown fire.	8.2	35.3	0.0	Complete overlap with Woodlot W1902 (Hupacasath First Nation) and Trapline licence TR0107T409. Overlap with a low severity pest infestation polygon for IBD (Douglas-Fir Beetle). Consultation with all the appropriate licence holders must occur during prescription development and prior to implementation to ensure all concerns are addressed.	This PTU is located within >500m of private residences in Arrowview Heights neighbourhood (City of Port Alberni). This fuel treatment is intended to function as a Primary Fuel Break by creating a 300 m wide area with decreased fire behaviour potential. The proposed fuel break is located within the Hupacasath First Nation woodlot to the east and southeast private residences. This fuel break was strategically selected given its location upwind of prevailing fire season wind direction in relation to private residences. The stands within this area are characterized primarily by young, high density conifer stands (C-3 fuel type), with a component of intermediate to mature conifer stands (C-5 fuel type). These stands have accumulations of fine and 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		
16	Branch 110 (Hupacasath Woodlot)	High	19.2	**Interface Fuel break Objective:** Fuel treatment will result in residual stands with characteristics that will reduce continuity of fuel loads, crown and surface fire behaviour, and wildfire risk.	6.3	12.4	0.6	The polygon overlaps an active forest licence to cut (A90532). Complete overlap with Trapline licence TR0107T409. BC Hydro distribution lines run adjacent to polygon. The area overlaps a low severity pest infestation polygon (IBD) pest. Consultation with all the appropriate licence holders must occur during prescription development and prior to implementation to ensure all concerns are addressed.	This PTU is located within 100m of private residences in Arrowview Heights neighbourhood (City of Port Alberni). The stands characteristic of this area are a mix of immature conifer plantations classified as M-1/2 fuel type with greater than 75% conifer content, and a minor component of mature conifer stands (C-5 fuel type). This area has been recommended for treatment due to its proximity to private residences, as well as the presence of moderate density and surface fuel loading. Recommended treatments include spacing of conifers saplings, pruning to increase crown base height, and removal of surface fuels.
17	Anderson Ave	Low	1.8	**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.	0.0	1.8	0.0	Complete overlap with Trapline licence TR0107T409. BC Hydro distribution line intersects polygon. Consultation with all the appropriate licence holders and BC Hydro must occur during prescription development and prior to implementation to ensure all concerns are addressed.	This PTU is located within 100m of private residences in the southeastern portion of the City of Port Alberni. The stands characteristic of this area are primarily classified as mature conifer stands (C-5 fuel type). However, recent wind storms have resulted in windthrow and elevated surface fuel loading. Therefore, this area has been recommended for a light fuel reduction treatment due to its proximity to private residences. Recommended strategies are as follows: surface fuel and hazard tree removal, pruning of retained stems.
18	Seizai Rd (San Group Mill)	High	25.0	**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.	5.2	19.2	0.1	Complete overlap with Trapline licence TR0107T409. Consultation with appropriate licence holders must occur during prescription development and prior to implementation to ensure all concerns are addressed.	The PTU is located within 200 m of private residences along Seizai Road in the southernmost portion of the City of Port Alberni. The stands within this area are characterized primarily by higher density conifer stands (C-3 fuel type), with a minor component of intermediate to mature conifer stands (C-5 fuel type). These stands have significant accumulations of fine and 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		
19	Headquarters Bay Road	Moderate	52.6	**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.	2.9	42.6	7.2	Partial overlap with Ditidaht First Nation FDU 1. Southern portion of area overlaps with TFL44. Overlap with Trapline licence TR0107T403. Consultation with all appropriate licencees /licence holders must occur during prescription development and prior to implementation to ensure all concerns are addressed.	This PTU is located within 200-500m of private residences in large forested/intermix private parcels along the Heather Main FSR. The stands within this PTU are primarily classified as mature conifer forests (C-5 fuel type) with moderate surface fuel loading due to recent windthrow events and patchy vertical and horizontal ladder fuel continuity. Given the remote location of private residences within this area and the presence of a single access/egress route, a light fuel reduction treatment is recommended in this area. Recommended treatments include removal of understorey conifers and hazard trees, pruning to increase crown base height, and removal of surface fuels. Adjacent intermix private land has very little defensible space in the event of an extreme wildfire event.
20	Anderson East	Moderate	7.2	**Interface Fuel break Objective:** Fuel treatment will result in residual stands with characteristics that will reduce continuity of fuel loads, crown and surface fire behaviour, and wildfire risk.	3.4	3.3	0.5	Overlap with Trapline licence TR0107T409. BC Hydro distribution lines intersect southern portion of the polygon. Consultation with all the appropriate licence holders and BC Hydro must occur during prescription development and prior to implementation to ensure all concerns are addressed.	The PTU is located within 200 m of private residences along Fowler Crescent in the southeast of the City of Port Alberni. The stands within this PTU are primarily classified as mature conifer forests (C-5 fuel type). However, recent wind storms have resulted in windthrow and elevated surface fuel loading. Therefore, this area has been recommended for a light fuel reduction treatment due to its proximity to private residences. Recommended strategies are as follows: surface fuel and hazard tree removal, pruning of retained stems and removal of conifer saplings to reduce laddering potential.

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		
21	Ship Cr Trail	Low	0.6	**Trailside Treatment**	0.0	0.6	0.0	Overlap with Trapline licence TR0107T409. Consultation with the appropriate licence holder must occur during prescription development and prior to implementation to ensure all concerns are addressed.	This PTU is located within 200-500m of private residences in southeast City of Port Alberni. The stand is classified as C-5 fuel type, with significant understory conifer ingrowth along the trail. The combination of low crown base heights, interlocking crowns, and ladder fuels, results in an increased potential for crown fire behaviour. This area has been recommended for trailside treatment due to the stand type and the high ignition potential associated with high recreational use during the fire season months. Recommended treatments include removal of understorey conifers and hazard trees, pruning to increase crown base height, and removal of surface fuels.
22	Kitsuksis East	Low	23.9	**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.	0.4	20.5	3.0	Complete overlap with Trapline licence TR0107T410. BC Hydro distribution lines intersect southwestern portion of the polygon. Southeastern corner of the polygon overlaps ALR. Consultation with all the appropriate licence holders and BC Hydro must occur during prescription development and prior to implementation to ensure all concerns are addressed.	The PTU is located within 200 m of private residences along Strathcona street in the community of Cherry Creek. The stands within this PTU are primarily classified as intermediate or mature conifer forests (C-5 fuel type). However, recent wind storms have resulted in patchy windthrow and elevated surface fuel loading. Due to its proximity to private residences and high ignition potential associated with recreational use, this area has been recommended for a light fuel reduction treatment. Recommended strategies are as follows: surface fuel and hazard tree removal, pruning of retained stems and removal of conifer saplings to reduce laddering potential.

FTU # and Stratum	Geographic Area	Priority	Total Area (ha)	Treatment Unit Type/ Objective	Local Fire Threat (ha)			Overlapping Values/Treatment Constraints	Treatment Rationale
					Extreme/ High	Mod	Low/Very Low		
23	Airport Rd West	Moderate	34.5	**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.	26.1	7.8	0.6	Southern tip overlaps with woodlot W1479. Complete overlap with Trapline licence TR0107T413. BC Hydro distribution lines intersect eastern portion of the polygon. Partial overlap with ALR in eastern portion of polygon. Consultation with all the appropriate licence holders and BC Hydro must occur during prescription development and prior to implementation to ensure all concerns are addressed.	This PTU is located within 200-500m of Alberni Valley Regional Airport (ACRD critical infrastructure). The stands characteristic of this area are classified as an immature conifer plantation (M-1/2 fuel type with greater than 75% conifer content). This area has been recommended for treatment due to its proximity to ACRD critical infrastructure, as well as the presence of moderate conifer density and surface fuel loading. Recommended treatments include spacing of conifers saplings, pruning to increase crown base height, and removal of surface fuels.



ID	NAME	PRIORITY	AREA (HA)
1	Cameron Rd (Beaufort Electoral Area)	High	31.9
2	Woodlot 1902 South (Hupacasath Woodlot)	High	121.7
3	Woodlot 1902 North (Hupacasath Woodlot)	High	77.5
4	Hospital	Moderate	2.2
5	Burde St	Low	0.2
6	Carmichael Cr	High	0.8
7	S Bamfield Rd East	High	24.7
8	Woodlot 1474	Moderate	21.0
9	Airport Rd East	High	55.1
10	Alberni Valley CF West	Low	120.0
11	Woodlot 1476 (Hupacasath Woodlot)	Moderate	101.1
12	Woodlot 0011 (Thompson Woodlot)	Moderate	131.6
13	Alberni Valley CF East	High	117.2
14	Kitsuksis Rd	Moderate	54.6
15	Woodlot 1902 East	Low	43.5
16	Branch 110 (Hupacasath Woodlot)	High	19.2
17	Anderson Ave	Low	1.8
18	Seizai Rd (San Group Mill)	High	25.0
19	Headquarters Bay	Low	52.6
20	Anderson East	Moderate	7.2
21	Ship Cr Trail	Low	0.6
22	Kitsuksis East	Low	23.9
23	Airport Rd West	Moderate	34.5

Map 11. Proposed Fuel Treatments and Past Proposed Treatments that have yet to be completed.

5.1.2 Maintenance of Previously Treated Areas

As no fuel treatments have occurred within the AOI, maintenance activities of previously treated areas are not applicable. However, if fuel treatments are to occur in the future, maintenance activities such as reducing 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 #14: As treatments are implemented; treatment monitoring should be completed by a qualified professional 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.

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.[67] 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[68], 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.

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

The following are key principles of FireSmart:

- 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.[69]
- 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.[69]
- 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.

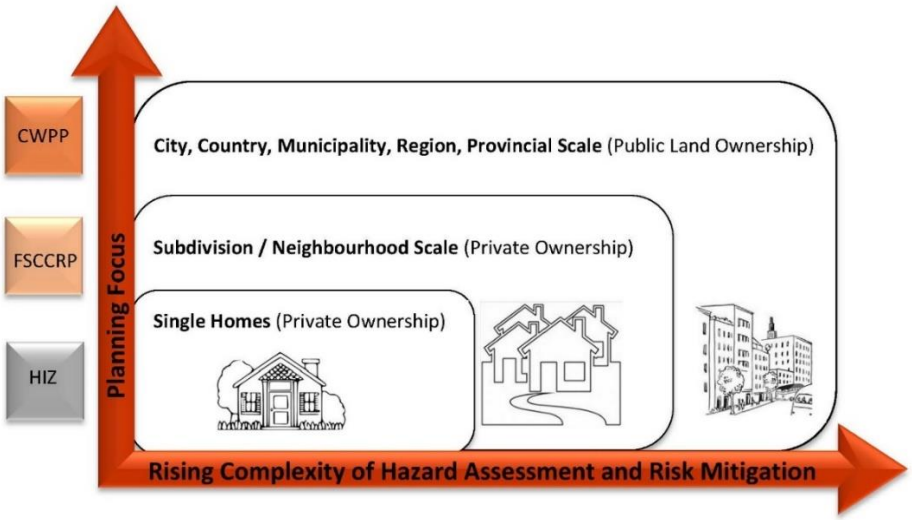


Figure 4. Diagram of the various, coordinated levels of the FireSmart program.[70] CWPP: Community Wildfire Protection Plan, FSCCRP: FireSmart Canada Community Recognition Program, HIZ: Home Ignition Zone.

[69] https://www.firesmartcanada.ca
[70] 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).[71,72] The HIZ includes the structure itself and three concentric, progressively wider Priority Zones. HIZ Priority Zones are based upon distance from structure: 0 to 1.5m (Priority Zone 1a-fuel free zone), 0 – 10 m (Priority Zone 1), 10 – 30 m (Priority Zone 2), and 30 – 100 m (Priority Zone 3). These zones help to guide risk reduction activities, with Recommended FireSmart Guidelines being most stringent closest to the structure. The likelihood of home ignition is mostly determined by the area within 30 m of the structure (Priority Zones 1a, 1 and 2). Recommended FireSmart guidelines address a multitude of hazard factors within the HIZ: building materials and design; vegetation (native or landscaped materials); and the presence of flammable objects, debris, and vulnerable ignition sites. More detail on priority zones can be found in 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.[72] 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.

[71] 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.
[72] 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.[73]

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.[73]

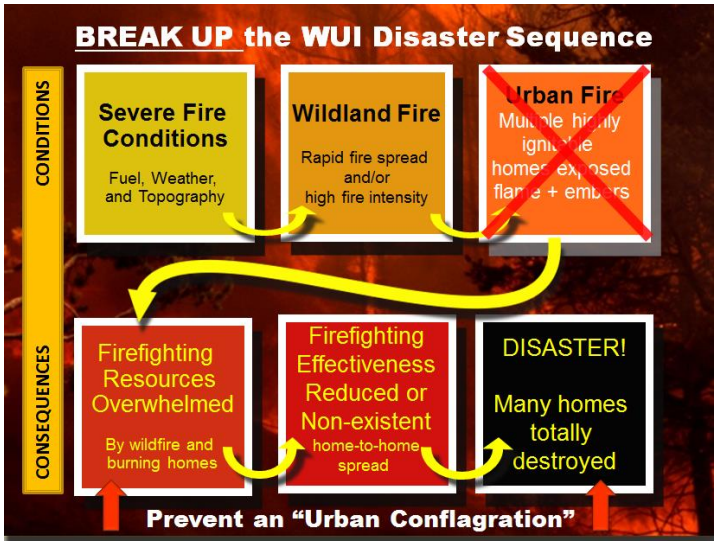


Figure 5. Wildland/urban interface disaster sequence.[74] It is possible to break up the disaster sequence by decreasing the number of highly ignitable homes exposed to embers, therefore reducing the number of homes ignited and removing the consequences of multiple structures lost.

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

[73] Calkin, D., J. Cohen, M. Finney, M. Thompson. "*How risk management can prevent future wildfire*"
[74] 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 ACRD and City of Port Alberni 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, ACRD or City of Port Alberni 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 ACRD and the City of Port Alberni have undertaken some public education outreach in the community and online. These can be expanded upon and/or adapted to further enhance wildfire preparedness and education. The ACRD and City of Port Alberni should consider developing a school fire education program to include an element of wildfire preparedness education to be presented annually in elementary schools. Programming could include volunteer/advocacy work from professional foresters, wildland firefighters or prevention officers, and ACRD and municipal staff. The ACRD should consider expanding upon the SLVFD Fire Smart Canada Day event and hold a yearly 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 ACRD and City of Port Alberni 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 ACRD and City of Port Alberni have 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 ACRD and City of Port Alberni do not currently enforce FireSmart landscaping requirements within development permit areas. More detailed recommendations regarding municipal policies and bylaws are provided below in Planning and Development.

RECOMMENDATION #15: The ACRD and City of Port Alberni 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 #16: Continue to offer yard waste disposal opportunities and 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 or curbside yard waste collection.

Planning and Development

Municipal or Regional District policies and bylaws are tools available for communities to mitigate local wildfire risk. 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 ACRD and City of Port Alberni 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 OCPs within the ACRD or the City of Port Alberni do not explicitly consider the establishment of a development permit area (DPA) to address wildfire risk mitigation. Building upon recommendations from the 2010 CWPP, it is recommended that the ACRD and City of Port Alberni review the various OCPs, with consideration towards establishing a wildfire development permit area. Other jurisdictions' wildfire development permit areas can serve as models for various components. [75] The first step should be to establish DPA objectives (for example, minimize risk to property and people from wildland fires; minimize risk to forested area surrounding communities and development in the AOI; conserve the visual and ecological assets of the forest surrounding these areas; reduce the risk of post-fire landslides, debris flows and erosion, etc.). The following components should be considered during the OCP review and DPA development process in order to help meet the established objectives:

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

- Use of fire-resistant exterior construction materials within the established development permit area, based on recognized standards such as NFPA 1144 (*Standard for Reducing Structure Ignition Hazards from Wildland Fire*[76]*)* or FireSmart.
- Inclusion of minimum setbacks from forested edge and top of slope based on FireSmart principles.
- Use of FireSmart landscaping (low flammability plants, appropriate spacing and low flammability aggregates/ ground cover based on FireSmart principles).
- Underground servicing.
- Mitigation of fire hazard through fuel management activities based upon qualified professional recommendations (prescriptions and oversight). This is generally most applicable in the subdivision phase.
- Prompt removal of combustible construction materials, thinning/fuel management debris, or clearing debris during the fire season.
- Coordinating QPs to ensure that requirements for overlapping, and potentially conflicting, development permit areas such as Streamside Protection and Enhancement are met.
- Review and approval process for submitted applications.
- Post-development inspections and sign-offs.
- Outline of responsibilities for staff and applicants.
- Enforcement and regulation (consequences of non-compliance).

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

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]

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

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

RECOMMENDATION #17: Review the Port Alberni and ACRD Electoral Areas A, B, D, E and F Official Community Plans (OCPs); consider including wildfire as a natural hazard development permit area. A recommended development permit area for the ACRD and City of Port Alberni would include all areas within the AOI that are located within 200 m of moderate, high or extreme wildfire behaviour threat class areas. This is a suggested distance which should be validated and defined through a more comprehensive GIS analysis of hazardous fuels and their proximity to the interface. Review similar 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 #18: Ensure that wildfire hazard development permit applications are provided to fire departments for opportunity for input prior to approval. As more wildfire DP applications are received, the importance of communication and integration between fire departments and the Planning Department increase.

RECOMMENDATION #19: 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 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 Regional District or Municipal 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

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

RECOMMENDATION #20: Engage 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.

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 ACRD or City of Port Alberni, 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] These factors should be considered during the review of applications for new developments occurring on vacant lots within the ACRD's wildland urban interface.

For new development in remote areas where hydrants are limited or unavailable (or it is otherwise determined by the ACRD and City of Port Alberni 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 ACRD and City of Port Alberni 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

[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

- 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 ACRD and City of Port Alberni 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 ACRD and City of Port Alberni communities. Landscaping in the AOI is also in a range of FireSmart compliance. Generally speaking, many homes in the interface areas of ACRD communities such as Beaver Creek, Sproat Lake, Cherry Creek and Bamfield, are predominantly wood construction and lack defensible space between property footprints and adjacent forested areas. Similarly, many homes that are boat access only or have single road access (e.g., Kildonan and Bamfield) do not maintain 10 m defensible space. Accumulations of conifer foliage in roof corners and gutters was common across the AOI. Storage of combustible items under decks, carports, and other horizontal surfaces was also noted. On the other hand, many residences in the ACRD and City of Port Alberni are surrounded by lawn, 10 m defensible space, and/or hardscaping (rocks), all of which are FireSmart compliant. Most neighbourhoods within the ACRD and City of Port Alberni represent the full spectrum of FireSmart compliance rates, from no defensible space and wood constructions to completely FireSmart compliant homes.

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 provincial or municipal Crown land); density, lot size and lay-out of the subdivision; positioning of the home or neighbourhood in relation to slope, aspect and prevailing winds; and the stage and maturity of landscaping.

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

- Wildfire hazard levels range from 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 #21: The ACRD and City of Port Alberni should hire a qualified professional (QP) or consider training additional 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 ACRD and City of Port Alberni 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 ACRD and the City of Port Alberni prioritize the neighbourhoods in Table 17.

Table 17. Summary of FireSmart Priority Areas.

Area	FireSmart Y/N	FireSmart Canada Recognition Received Y/N	Recommended FireSmart Activities
Priority Area #1: **Cherry Creek** including Cypress Blvd, Cowley Rd, Cherry Creek Rd, Horne Lake Rd and surroundings, Milligan Rd, and Cottam Rd	N	N	The following is a non-extensive list of FireSmart activities for which the Regional District can engage suggested neighbourhood/community 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) Coordinate monthly or bi-monthly yard waste removal days prior to and during the fire season to reduce WUI fire hazard.
Priority Area #2: **Beaver Creek** including interface areas along Woolsey Rd, Bryson Rd, Bland Rd, Smith Rd, Debeaux Rd, and Cameron Rd	N	N	
Priority Area #3: **Sproat Lake** including Faber Rd, Stirling Arm Crescent, Lakeshore Rd, and Central Lake Rd.	N	N	
Priority Area #4: **Kleecoot and Kleekoot IR 2**	N	N	
Priority Area #5: **Bamfield** including Huu-ay-aht First Nation Treaty Lands	N	N	
Priority Area #6: **Kildonan and Elhlateese IR 2**	N	N	

Area	FireSmart Y/N	FireSmart Canada Recognition Received Y/N	Recommended FireSmart Activities
Priority Area #7: **Tsahaheh IR 2, Ahahswinis IR 1, and Alberni IR 2**	N	N	
Priority Area 8: City of Port Alberni neighbourhoods including Arrowview Heights, Cameron Heights, Alberni and Sahara Heights.	N	N	
Priority Area #9: **Critical infrastructure** (i.e., emergency services, water and treatment facilities)	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.

RECOMMENDATION #22: The ACRD and City of Port Alberni should apply for funding from the UBCM CRI Program to develop a local FireSmart rebate program. This will allow homeowners to access partial rebates for FireSmart activities on their properties, if rated as moderate, high or extreme risk in a FireSmart home and property assessment. The rebate program must adhere to the goals of FireSmart, as outlined in Section 5.2.1.

5.3 COMMUNICATION AND EDUCATION

Establishing effective communications and actively engaging key stakeholders in risk reduction activities are keystones to building a FireSmart community. Without the support and involvement of residents, businesses, public officials, and industry, the efforts of public officials, fire 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 ACRD 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 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 ACRD and City of Port Alberni 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 identify valuable information about the landscape and provide unique and local solutions to reducing wildfire risk. The ACRD should consider creating an Interface Steering Committee to coordinate wildfire risk reduction efforts. The steering committee could include key stakeholders such as ACRD staff, City of Port Alberni Staff, ACRD and City of Port Alberni Fire Departments, Tseshaht First Nation, Hupacasath First Nation, BCWS, BC Parks, recreational groups/representatives, local environmental groups, and industrial operators (i.e., Mosaic Forest Management).

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

RECOMMENDATION #23: This report and associated maps should be made publicly available through webpage, social media, and public FireSmart meetings. In addition, this Update 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 Update document.

RECOMMENDATION #24: Complete or schedule periodic updates of the CWPP to gauge progress and update the threat assessment (hazard mapping) for changes in fuels, forest health, land planning, stand structure or changes to infrastructure in the interface. The frequency of updates is highly dependent upon major changes which would impact the ACRD'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 #25: Develop a social media strategy and ensure that its full power is leveraged to communicate fire bans, high or extreme Fire Danger days, wildfire prevention initiatives and programs, easily implementable FireSmart activities, updates on current fires and associated air quality, road closures, and other real-time information in an accurate and timely manner. [81]

RECOMMENDATION #26: Promote FireSmart approaches for wildfire risk reduction to ACRD and City of Port Alberni 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 #27: 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 #28: Facilitate the FSCCRP uptake within the ACRD and City of Port Alberni and enhance its applications by including the following: 1) invite 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 #29: 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 that exist on their property and provide easy improvement recommendations to reduce their risk.

RECOMMENDATION #30: 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 BCWS (Mid Island Fire Zone), as well as local fire department and FireSmart representatives to facilitate and recruit volunteer teachers and experts to help with curriculum development to be delivered in elementary and/or secondary schools (field trips, guest speakers, etc.).

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

RECOMMENDATION #31: Develop and work with all key stakeholders (BCWS, BC Parks, recreational groups/representatives, ACRD and City of Port Alberni staff, industrial operators (i.e., Mosaic Forest Management and Crown forest tenure holders), and local First Nations) to formalize an Interface Steering Committee. The purpose of the steering committee would be to identify wildfire related issues in the area and to develop collaborative solutions to minimize wildfire risks. The following subject areas are recommended for the group to explore: 1) Development of large, landscape level fuel breaks; 2) Public education and awareness needs; 3) Multi-disciplinary, multi-jurisdictional fuel treatment projects/ hazard abatement projects; 4) Development of a funding strategy; and 5) Reduction of human-caused fires, fire prevention and right of way management.

RECOMMENDATION #32: Work towards educating homeowners within fire limits 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).

RECOMMENDATION #33: Promote and provide information to private landowners related to residential sprinklers as a FireSmart prevention measure.

5.4 OTHER PREVENTION MEASURES

In addition to community communication and education, fire prevention in the AOI is also addressed via the following avenues: 1) public display of danger class rating signs throughout the AOI; 2) fire ban alignment with provincial fire bans; 3) ability to restrict access to back country areas similar to provincial requirements, if necessary; and 4) enforcement of local ACRD bylaws (Beaver Creek Subdivision Water Regulation, Unsightly Premises, Building Code, and Bamfield Backyard Burning) and City of Port Alberni bylaws (Fire Control, Building Standards, House Numbering, Wasteworks, Property Maintenance, Solid Fuel Burning Appliances Emissions, Fireworks Regulation, and Emergency Plan). 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 AOI is not limited to private property owners and individual residents. Power lines and industrial activities pose a risk of ignition, particularly in areas where cured fuels or fuel accumulations exist. Tree failures adjacent to power lines (transmission and distribution) are common occurrences and represent significant risks to ignition within the AOI. A cooperative approach for addressing the industrial area concerns must be undertaken by the ACRD and City of Port Alberni and pertinent industrial partners.

RECOMMENDATION #34: 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 do not occur during high fire danger times to reduce chance of ignitions as per the Wildfire Act.

RECOMMENDATION #35: Work with industrial operators (i.e., BC Hydro) to ensure that right-of-ways do not contain fine fuel accumulations (easily cured) or high conifer regeneration prior to and during the fire season and are maintained in a low to moderate 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 majority of critical infrastructure in the ACRD has secondary power sources. However, should a wide-scale outage occur, known vulnerabilities to secondary power sources include mechanical failure and potential fuel shortages or access to power sources, if roads are unreachable due to wildfire. The ACRD has also identified issues with water pressure within particular areas that have fire hydrant service, and there are known limitations to water supply for firefighting in areas not supplied by the ACRD 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 automatic aid agreements are in effect between the City of Port Alberni and Alberni Valley fire departments (SLVFD, BCVFD, CCFD). In the event of a WUI fire emergency, automatic aid in the AOI is activated, as required, between these fire departments. WUI fire events may also lead to aid requests with BCWS.

6.1.1 Fire Department and Equipment

Fire protection within the AOI is the responsibility of several departments including: PAFD, CCFD, BCVFD, SLVFD and BVFD. Table 18 provides an overview of the fire services capacity in the AOI, including fire department personnel and equipment. In total, the various fire protection services cover 8,083 ha (18% of the total AOI area, inclusive of water bodies) all major communities including First Nations Indian Reserves, but excluding large tracts of largely undeveloped, forested lands as well as private managed

[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

forest lands. Crown land outside of the fire protection services area served by the ACRD is under BCWS jurisdiction, and response resources would be supplied via the Mid Island Fire Zone. Private managed forest lands are under Mosaic Forest Management's jurisdiction. Wildfire response in these areas would be provided by the land holder with aid from BCWS.

Fire protection equipment includes both land and marine equipment and, apart from the City of Port Alberni FD, personnel are largely volunteer. The greatest personnel deficiencies reported by fire departments are limited availability of long-term career staff during summer months due to annual vacation, as well as other issues such as attrition and difficulty in maintaining currency to meet a wide range of training requirements (i.e., structure, wildland, marine firefighting, various rescue, etc.).

Table 18. Fire department capacity and equipment within the AOI.

Fire Protection Zones	Fire Department	Number of Stations	Number of Members	Apparatus type and number*
Sproat Lake Fire	Sproat Lake VFD	3	1 Fire Chief, 1 Deputy Chief, 1 Safety Officer, 1 Fire Prevention Officer. Hall 1 has 9 members; Hall 2 has 17 members; and Hall 3 has 30 members.	Hall 1: 1 engine(structure), 1 tender Hall 2: 1 engine(structure), 1 tender, 1 rescue truck Hall 3: 1 engine(structure), 1 tender
Cherry Creek Fire	Cherry Creek VFD	1	1 Fire Chief, 1 Deputy Chief, and 20 members	2 engines (structure) and 1 tender (with wildland tools)
Beaver Creek Fire	Beaver Creek VFD	1	1 Fire Chief, 1 Deputy Chief, 2 Assistant Chiefs, and 26 members	2 engines and 2 rescue trucks
Bamfield Fire	Bamfield VFD	2	1 Fire Chief, 1 Deputy Chief, 1 Safety Officer, and 18 members	Hall 1: 1 engine (structure) Hall 2: 1 rescue truck.
City of Port Alberni Fire	Port Alberni Fire Department	1	1 Fire Chief, 1 Deputy Chief, 1 Fire Inspector and 20 fire fighters	3 engines (structure), 2 pumpers, 1 ladder, 1 rescue truck with a wildland portable unit, and 1 high angle rescue system.

Members of the ACRD and City of Port Alberni Fire Departments undergo significant training focused on structural firefighting and variable levels of training (at least once per year) related to wildfire, including basic wildland fire suppression and safety (S-100), SPP wildland firefighter level 1 (SPP-WFF1) and/or structure protection program (SPP-115) training. Both the Cherry Creek and Beaver Creek VFDs have a junior firefighter work experience program. It is recommended that all fire services members within the AOI have at a minimum S-100 and S-185 (combined) or SPP-WFF1, and that the fire department members engage in yearly practical wildland fire training with BCWS that covers at a minimum: pump, hose, hydrant, air tanker awareness, and employment of structural protection units (SPUs). The aforementioned cross-training opportunity could include, for example, a joint wildfire simulation

exercise. This level of training would improve the local fire departments' commitment to wildfire preparedness.

The Port Alberni Fire Department has a well-established working relationship with BCWS and engages in annual cross training. Engagement and cross-training with BCWS ranges across the remaining local fire departments. It should be noted that, within the AOI, the needs for cross-training vary from department to department and also between volunteer and career staff. Cross-training with the BCWS would enable the local fire departments to prepare its responders with technical and practical firefighting training in order to action both structural and wildland fires.

Over the previous eight years (2011-2018), the City of Port Alberni fire department responded to an average of 1,298 calls per year, of which 23 per year were wildland (bush) fires. Total calls include alarms, assistance, burning complaints, bush fires, other fires, hydro lines fires, structure fires, hazardous materials, medical aid, mutual aid, motor vehicle accidents, and rescue. In comparison, over the same time period, Sproat Lake VFD has responded to an average of one wildland fire per year.

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 AOI is an important component of emergency response in the event of a large-scale emergency (i.e., for structural and/or WUI fires). As previously noted in Sections 3.2.3 and 3.3.1, water service is provided by a number of distinct ACRD operated systems which rely on surface water sources. For suppression within the AOI, hydrant service is provided within the fire services area boundaries at varying levels of coverage, with the exception of Sproat Lake, which is serviced by a total of seven hydrants. To compensate for limited hydrant service, the Sproat Lake VFD has received Superior Tanker Shuttle (STS) Accreditation through the Fire Underwriters Survey. In addition, there are areas outside of these boundaries with no hydrant service. Based on consultation with the Wildfire Working

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

Group and fire departments, areas with hydrant service generally have no water pressure issues, and have sufficient flow for one hour of firefighting. However, there are areas supplied by the Bamfield water system in east and west Bamfield that do not meet minimum required fire flow of 33 litres per second (lps) or 1,980 litres per minute.[20] Additionally, approximately 11% of the Beaver Creek water system does not meet minimum required fire flow.[84] In the event of power loss, secondary power exists for some but not all ACRD water systems. Strategic access to water courses on private land for emergency firefighting is not established within the AOI. Currently, tanks and mutual aid agreements, are the main emergency firefighting strategies available to ACRD and City of Port Alberni fire departments.

RECOMMENDATION #36: Consider entering into Water Use Agreements with relevant private land owners to ensure strategic water course access for use by local fire departments for emergency firefighting purposes.

To supplement water availability for firefighting, the ACRD fire departments can draft from natural and static water sources such as lakes, rivers and ponds (i.e., Lacy Lake, Turtle Lake, Great Central Lake, and Sproat Lake) using either truck mounted or portable pumps. However, some of these sources are also at risk of drying or experiencing reduced water levels during drought events, which typically coincide with high and extreme fire danger rating days. These natural water sources are known and mapped.

In the event of prolonged power outage, the capacity of the ACRD and adjacent Improvement Districts (e.g., Cherry Creek Waterworks District) water systems and reservoirs to operate under prolonged emergency conditions is limited. The aforementioned water systems were originally designed to support domestic water use and structure protection, therefore hydrant spacing, location, flow rates and capacity are all based on meeting these aforementioned needs. The ACRD and Cherry Creek Waterworks District's current water infrastructure and systems are not sufficient to concurrently support domestic, structural firefighting, and wildland firefighting needs.

RECOMMENDATION #37: All new development outside existing ACRD and Improvement Districts water systems (*e.g.,* Cherry Creek Waterworks District) 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 departments should review the water supply to ensure it provides sufficient placement, flow, and reliability for suppression needs and that secondary power is available in the event of power outages.

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

[84] ACRD. 2019. Beaver Creek Water System Asset Management Plan. Retrieved online at: https://www.acrd.bc.ca/cms/wpattachments/wpID277atID3138.pdf

[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

handle both. In the event of a wildfire emergency, main egress routes include Highway 4 and Franklin River Road/Bamfield Road. Emergency evacuation concerns have been identified for the communities of Bamfield, Beaver Creek and Sproat Lake and boat access only communities in Kildonan and Bamfield West. There is currently no secondary exit or bypass from these areas to provide reliable egress for area residents and visitors. Both Highway 4 and Franklin River Road/Bamfield Road are vulnerable to wildfires, vehicular accidents, and rockfall/geotechnical hazards. If a wildfire were to block these road systems, smoke and poor visibility, car accidents, wildlife, and other unforeseen circumstances can further complicate evacuations and hinder safe passage.

Many developments within the ACRD are located on single access roads which branch off Highway 4 and Franklin River Road/Bamfield Road; this limits the ability of fire crews to respond to fires and safely evacuate residents. A significant barrier to access and evacuation in the event of wildfire is the complicated and varied road ownership and multitude of locked gates on access roads on private property, including Mosaic Forest Management private forest land. In the event of a wildfire, it is critical for both ACRD fire departments and BCWS to have the most recent information on gate locations and ownership. Industrial landowners (e.g., Mosaic Forest Management) also have concerns regarding security and may limit access accordingly.

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 or other large-scale emergency. The Alberni Valley has an Emergency Plan (2014), which includes basic contingencies in the event of a wildland/interface fire (i.e., contacts and roles of local government personnel). However, the Plan does not specify evacuation routes to be used during an emergency situation. Evacuation would be conducted by first responders, RCMP, and the Alberni Valley Rescue squad. In the event of a wildfire emergency within the AOI, the ACRD Administrative Building can be designated as the Emergency Operations Centre (EOC). It is recommended that the ACRD 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 the installation of gates or other barriers to minimize access by unauthorized users can be used as a tool that increases the ability of local fire departments to access interface areas.

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 that a Total Access Plan be developed. This plan should be made available to the ACRD and Port Alberni Fire Departments and the BCWS in the event that they are aiding suppression efforts on an interface fire in the AOI. The plan should include georeferenced maps with associated spatial data and ground-truthed locations of potential optimal firebreaks, identify the type of access available for each access route, identify those trails that are gated or have barriers, and provide information as to how to unlock or remove barriers. The plan should also identify those natural areas where access is insufficient. Access assessment should consider land ownership, proximity of values at risk, wildfire threat, opportunities for use as fuel break or control lines, trail and road network linkages where fuel-free areas or burn off locations can be created or used as potential sprinkler locations; and requirements for future maintenance activities such as operational access for fuel treatments and other hazard reduction activities.

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

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

RECOMMENDATION #39: 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 #40: Develop a Total Access Plan for the ACRD 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 #41: 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 ACRD and Port Alberni Fire Departments maintain a current level of structural protection training as described in Section 6.1.1. Additionally, all members have yearly refreshers and/or certification in S-100 and some members are trained to SPP-115 as well. The ACRD Fire Departments participate in annual cross-training exercises with the City Port Alberni Fire Department, consisting of hose line deployment in a wildland fire event. Provision of training opportunities for structural firefighters in the field of wildland firefighting is critical to building capacity for suppression and emergency management at the local level. It is recommended that all fire department members at minimum have S-100 and S-185 (combined) or SPP-WFF1[86], and that the fire departments engage in yearly practical wildland fire training with BCWS. It must be noted that SPP-WFF1 is a S-100/S-185 equivalent course for structure firefighters only.

The ACRD and Port Alberni fire departments maintain communication with BCWS throughout the year, as required by the fire season demands. The BCWS participates in community events or public education opportunities (e.g., delivery of FireSmart workshops) as requested by the ACRD. The ACRD does not currently engage in cross-training with BCWS but has done so in the past. Cross-training with the BCWS prior to the fire season will enable the ACRD and City of Port Alberni to prepare its responders with technical and practical firefighting experience in order to action both structural and wildland fires.

It is recommended that the ACRD work cooperatively with the BCWS (Mid Island Fire Zone, Errington/Port Alberni 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. This practice 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., Regional District of Nanaimo – Errington VFD) to conduct joint training so as to further strengthen regional emergency response and firefighting training. Operationally, the Beaver Creek, Cherry Creek and Sproat Lake VFDs have provided initial attack on the 2018 Beaufort Fire. Additionally, the Sproat Lake VFD participated in a multi-jurisdictional response with BCWS in 2018 for the Turtle Lake Fire that resulted in a valuable debrief and shared learning.

RECOMMENDATION #42: The ACRD and City of Port Alberni should continue working with BCWS to maintain an annual structural and interface training program. As part of the training, it is recommended to conduct annual reviews to ensure PPE and wildland equipment resources are complete, in working order, and the crews are well-versed in their set-up and use. It is recommended the ACRD and City of Port Alberni 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

[86] Personal communication with Tom Boechler, Structure Protection Specialist, Ministry of Public Safety and Solicitor General/BCWS (May 27, 2019)

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 #43: The ACRD should continue engaging in regular communication with the BCWS Mid Island Zone, Errington/Port Alberni Fire Base to foster a strong relationship and identify potential cooperative wildfire risk reduction opportunities.

RECOMMENDATION #44: Ensure that the ACRD and City of Port Alberni maintain the capability to effectively suppress wildland fires, through wildfire-specific training sessions. Ensure all ACRD and City of Port Alberni Fire Departments training includes S-100 and S-185 (combined) or SPP-WFF1, at a minimum. Consider expanding the training program to maintain a high level of member education and training specific to interface and wildland fires. SPP-115 provides training to structural firefighters on the use of wildfire pumps and hose (and fire service hose and hydrants) in the application of structural protection units (SPUs).The fire department should continue the practice of staying up to date on wildfire training opportunities offered by the OFC and/or the BCWS, and to train members in this capacity, as training resources/budgets allow.

6.2 STRUCTURE PROTECTION

The ACRD and City of Port Alberni are well resourced in structural suppression equipment, but have 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 departments maintain a current level of training in structural firefighting, while wildland training should be expanded to meet the S100/S185 or equivalent standard (see Section 6.1.1 for additional detail). The ACRD and City of Port Alberni are not equipped with a Structural Protection Unit (SPU). The UBCM owns four complete SPUs, each equipped to protect 30 – 35 structures. The kits are deployed by the MFLNRORD/BCWS incident command structure and are placed strategically across the province during the fire season based on fire weather conditions and fire potential. When the kits are not in use, they may be utilized by fire departments for training exercises. SPUs can be useful tools in the protection of rural/ interface homes in the event of a wildfire. An important consideration in protecting the WUI zone from fire is ensuring that homes can withstand an interface fire event. Structure protection is focused on ensuring that building materials and construction standards are appropriate to protect individual homes from interface fire. Materials and construction standards used in roofing, exterior siding, window and door glazing, eaves, vents, openings, balconies, decks, and porches are primary considerations in developing FireSmart neighbourhoods. Housing built using appropriate construction techniques and materials in combination with fire resistant landscaping are less likely to be impacted by interface fires.

While many BC communities established to date were built without significant consideration 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 ACRD and City of Port Alberni 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 #45: Consider working with local distributors and homeowners within the ACRD/City of Port Alberni. 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 #46: 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. Programs may include scheduled community chipping opportunities, yard waste dumpsters available by month in neighbourhoods, or scheduled burning weekends. Programs should be available during times of greatest resident activity (likely spring and fall).

RECOMMENDATION #47: 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 #48: Consider acquiring a Type II SPU (provides protection for 25-30 residences) and an off-road capable wildfire response vehicle to improve wildfire response.

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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.

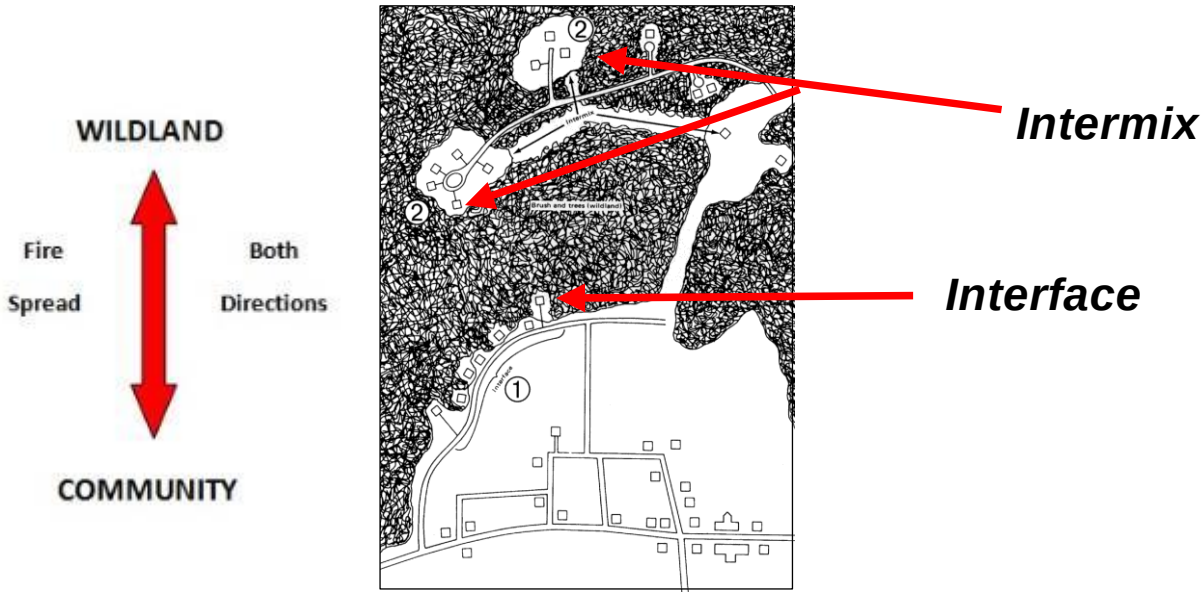

Figure 6. Illustration of intermix and interface situations.

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.

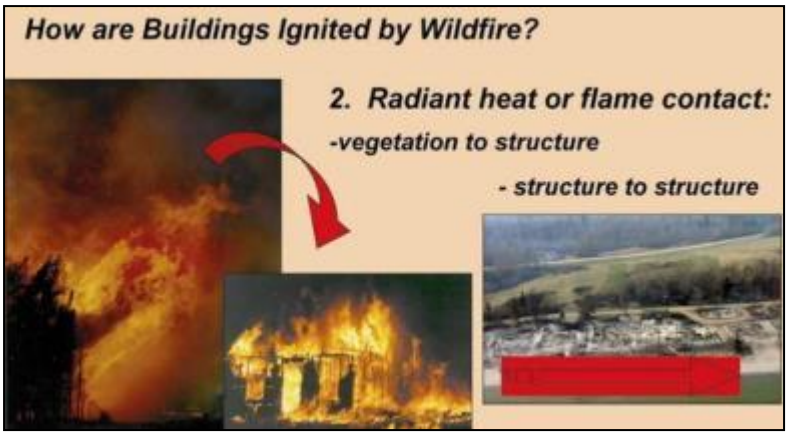

Figure 8. Radiant heat and flame contact allows fire to spread from vegetation to structure or from structure to structure.

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 19 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 19. Summary of WUI Threat Assessment Worksheets.

WUI Plot #	Geographic Location	Wildfire Behaviour Threat Class	WUI Threat Class*
AIR-1	Airport Road	Moderate	-
AIR-2	Airport Road	Moderate	-
ARG-1	Anderson Ave	Moderate	-
ARG-2	Reservoir/Anderson Rd	Moderate	-
ASH-1	Ash Main	Moderate	-
ASH-2	Ash Main	High	Moderate
ASH-3	Ash Main	High	Moderate
ASH-4	Ash Main	High	Moderate
AW-1	AW Road	Moderate	-
AW-2	AW Road	Moderate	-
AW-3	AW Road	High	Moderate
AW-4	AW Road	High	Moderate
AW-5	AW Road	High	Moderate
BAM-1	Bamfield East	High	High
BAM-2	Bamfield East	High	High
BAM-4	Binnacle Rd	Moderate	-
BRU-1	Bruce Street	Moderate	-
BUR-1	Burde Street	High	High
CM-1	Macktush Campground	Moderate	-
COMP-1	Strathcona Street	Moderate	-
COMP-2	Strathcona Street	Moderate	-
DAYT-1	Dayton Road	Moderate	-
FOS-1	Fossili Park	Moderate	-
HEAT-1	Heather Main	Moderate	-
HEAT-2	Heather Main	Moderate	-
HOSP-1	Hospital	Moderate	-
HOSP-2	Hospital	High	High
HRM-1	HR Main	Moderate	-

WUI Plot #	Geographic Location	Wildfire Behaviour Threat Class	WUI Threat Class*
HRM-2	HR Main	High	Moderate
HUP-1	Hupacasath First Nation Woodlot	High	Moderate
HUP-2	Hupacasath First Nation Woodlot	Moderate	-
HUP-3	Hupacasath First Nation Woodlot	Moderate	-
HUP-4	Hupacasath First Nation Woodlot	Moderate	-
HUP-5	Hupacasath FN Woodlot 1902	High	High
HUP-6	Log Train Trail Hupacasath	High	Moderate
HUP 7	Log Train Trail Hupacasath	High	Moderate
HUU-1	Huu-ay-aht / Bamfield	High	Moderate
KITS-1	Kitsuksis Rd	High	High
KITS-2	Kitsuksis Rd	Moderate	-
LOG-1	Cherry Creek - Log train Trail	Moderate	-
LOG-2	Cherry Creek - Log train Trail	Moderate	-
NHMT-1	Nahamit FSR	Moderate	-
NHMT-2	Nahamit FSR	High	Moderate
SEIZ-1	Seiza Rd.	High	High
SEIZ-2	Seiza Rd.	Moderate	-
SHIP-1	Maquina Elementary	Moderate	-
SHIP-2	Fowley Crescent	Moderate	-
SHIP-3	Fowley Crescent	High	High
SWEE-1	Argyle Street	Moderate	-
SWEE-2	Argyle Street	High	High
WOOD-1	Cameron Road/Woodlot	Moderate	-
WOOD-2	Cameron Road/Woodlot	High	High
WOOD-3	Cameron Road/Woodlot	Moderate	-
WOOD-4	Cameron Road/Woodlot	High	Moderate
WOOD-5	Log Train Trail/Woodlot	Moderate	-
WOOD-6	Beaver Creek Road	High	Moderate

*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 AOI 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 AOI have been updated using orthoimagery of the AOI with representative fuel type calls confirmed by field fuel type verification. Polygons not field-verified were assigned fuel types based upon similarities visible in orthophotography to areas field verified. Where polygons were available from the provincial fuel typing layer, they were utilized and updated as necessary for recent harvesting, development, etc.

It should be noted that fuel typing is intended to represent a fire behaviour pattern; a locally observed fuel type may have no exact analog within the FBP system. The FBP system was almost entirely developed for boreal and sub-boreal forest types, which do not occur within the AOI. As a result, the 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 et al, 2018.[87]

[87] Perrakis, D.B., Eade, G and Hicks, D. 2018. BC Wildfire Service. Natural Resources Canada, Canadian Forest Service. British Columbia Wildfire Fuel Typing and Fuel Type Layer Description 2018 Version. Retrieved from: https://cfs.nrcan.gc.ca/publications?id=39432

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 AOI as possible (within time, budget and access constraints). Threat Assessment plots are completed on the 2012 version form, and as per the Wildland Urban Interface Threat Assessment Guide.

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

1. Update fuel-typing using orthophotography provided by the client and field verification.
2. Update structural data using critical infrastructure information provided by the client, field visits to confirm structure additions or deletions, and orthophotography
3. Complete field work to ground-truth fuel typing and threat ratings (completed 56 WUI threat plots on a variety of fuel types, aspects, and slopes and an additional 306+ 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 20 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 20. 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 AOI in a format which is required by the UBCM SWPI program.

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

- fuel scores were reviewed and applied to the fuel type in which the threat plot was completed;

- conservative fuel scores were then applied to the polygons by fuel type to check the initial assessment;
- high Wildfire Behaviour Threat Class polygons were reviewed in Google Earth to confirm their position on slope relative to values at risk.

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

Limitations

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

The threat assessment is based largely on fuel typing, therefore the limitations with fuel typing accuracy (as detailed in 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.

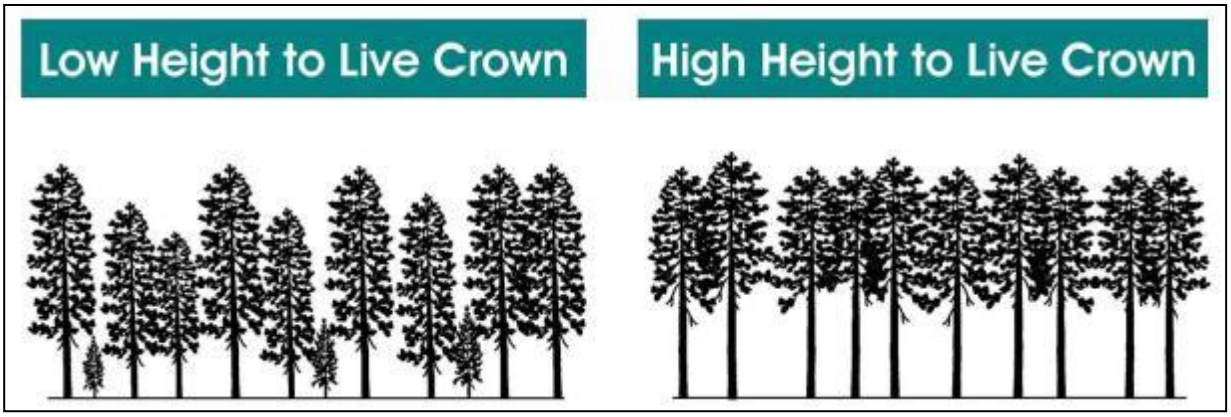

Figure 9. Comparison of stand level differences in height-to-live crown in an interior forest, where low height to live crown is more hazardous than high height to live crown.

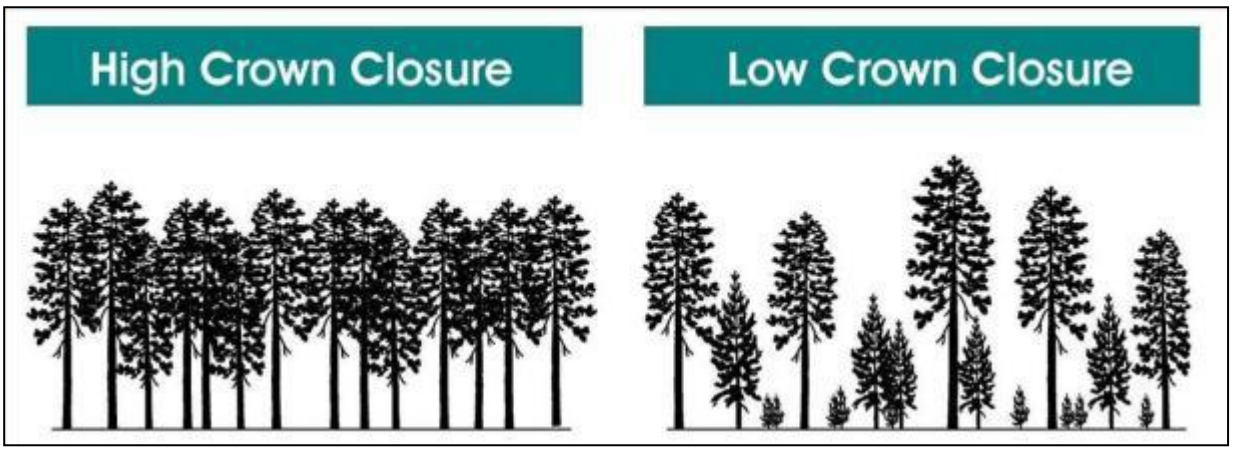

Figure 10. Comparison of stand level differences in crown closure, where high crown closure/continuity contributes to crown fire spread, while low crown closure reduces crown fire potential.

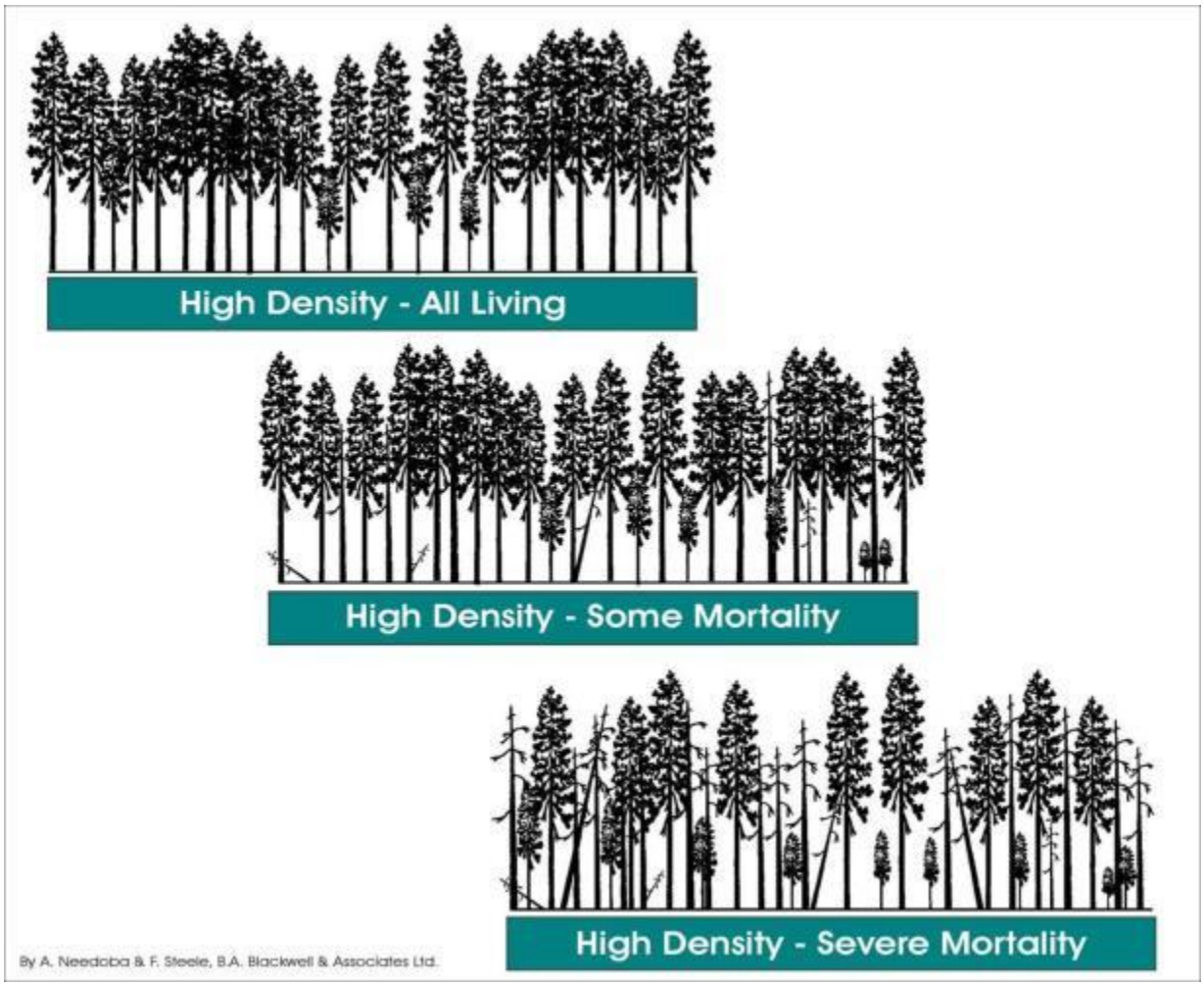

Figure 11. Comparison of stand level differences in density and mortality, and the distribution of live and dead fuels in these types of stands.

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.

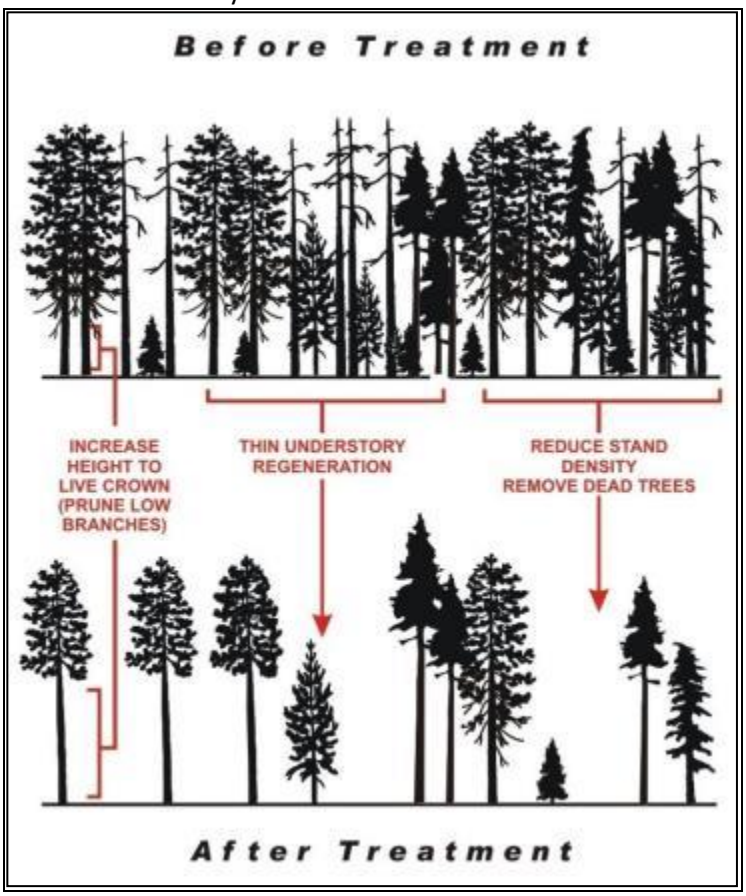

Figure 12. Illustration of the principles of thinning to reduce the stand level wildfire hazard.

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 Regional 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 (MFLNRORD, 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 1a is a 1.5 m combustible/fuel free zone around structures. This zone should be free of all vegetation (trees, shrubs, hedges, and grasses). This zone should only include non-flammable landscaping materials such as gravel, brick, or concrete. All living and dead vegetative material (branches, trees and woody shrubs) should be removed from this zone.

Priority Zone 1 is a 10 m fuel free zone around structures which ensures that direct flame contact with structures cannot occur and reduces the potential for radiative heat to ignite structures. Combustible materials such as firewood or other dead wood should not be stored in this zone. While creating this zone is not always possible, landscaping choices (including tree retention and replacement) should reflect the use of less flammable vegetation such as deciduous trees and shrubs, herbs and other species with low flammability. Coniferous vegetation, such as juniper or cedar hedges, is restricted in this 10 m zone, as these are highly flammable.

Priority Zone 2 extends from 10 m to 30 m from structures. 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 highly as possible (without compromising tree health), especially where long limbs extend toward 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 30 m to 100 m from structures. This zone will influence how a wildfire can spread towards structures. The goal in Zone 3, similar to that of Zone 2, is to reduce the rate of spread for a wildfire moving into or out from the site. Similarly to Zone 2, tree crowns should be well spaced (3 m apart), crowns should be pruned to limit low hanging branches within 2 m of the ground, small coniferous trees should be thinned out of the stand, and debris accumulations should be cleaned up from the forest floor.

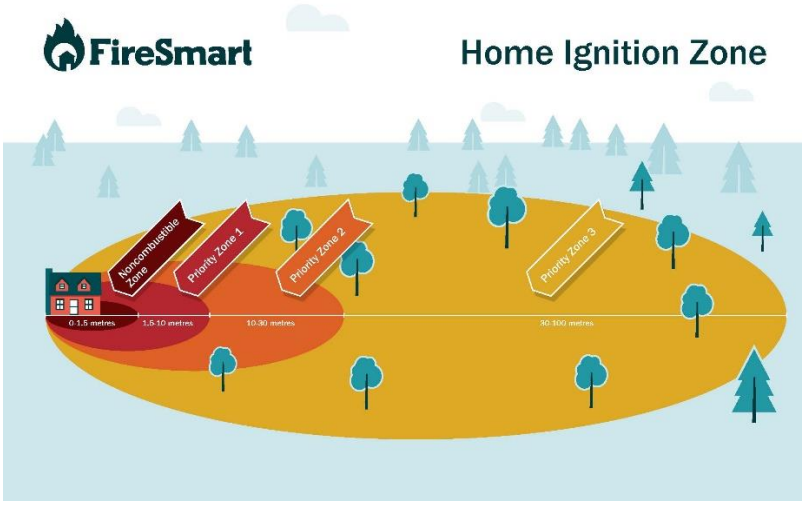

Figure 13. Illustration of FireSmart zones.
Retrieved from FireSmart Canada (https://www.firesmartcanada.ca/mdocs-posts/firesmart-home-ignition-zone-graphic/)

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[88].

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.[89] 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.

[88] 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

[89] 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.[90]

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

[90] *Fire Resistant Plants for Home Landscapes: Selecting plants that may reduce your risk from wildfire*. 2006. A Pacific Northwest Extension Publication (PNW 590). Retrieved from: https://ir.library.oregonstate.edu/concern/administrative_report_or_publications/pr76f369j

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 AOI). 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.[91] 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.[92]

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'.[93]

[91] 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/.

[92] 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.

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

APPENDIX L – SUMMARY OF 2010 CWPP RECOMMENDATIONS

2010 CWPP RECOMMENDATIONS TO BE IMPLEMENTED

The following recommendations from the 2010 CWPP should be considered and implemented as prioritized by the ACRD and City of Port Alberni. Additional 2010 recommendations that are no longer applicable or are addressed in current CWPP Update recommendations are listed below in *Other 2010 CWPP Recommendations*.

Communication and Education

Recommendation 3: The Regional District should investigate the potential for working with local developers to construct a FireSmart show home or public building with FireSmart landscaping as a tool to educate and communicate the principles of FireSmart to the public. The City of Port Alberni Fire Department has expressed interest in setting up a FireSmart pilot project at their McLean Mill site. This should be supported.

Recommendation 4: The standard for website information about fire should include an outline of community fire risks and fire danger. Information should include fire bylaws, campfire bans and wildfire hazard ratings, as well as FireSmart information

Recommendation 6: Signage consisting of current fire danger, campfire bans and general warnings regarding fire safety should be posted along main routes throughout the Regional District.

Recommendation 8: The Bamfield, Port Alberni, and other local Fire Departments should work with the ACRD, BC Parks and the Chamber of Commerce to educate the local business community, particularly businesses that depend on forest use (*i.e.,* tourism and recreation) on FireSmart preparation and planning.

Structure Protection

Recommendation 14: The District should consider conducting a review of hydrant distribution and fire flows in rural areas such as Cherry Creek and Beaver Creek to check whether any upgrades are required, particularly considering the possibility of multiple ignitions from spotting.

Emergency Response

Recommendation 18: As part of the evacuation plan, the Regional District should develop strategies to quickly identify and clear car accidents that block or impede traffic during evacuation efforts.

Recommendation 19: The Regional District should work towards improving access in areas of the Regional District that are considered isolated and that have inadequately developed access for evacuation and fire control (for example, by opening dead end roads, widening cleared road rights-of-way and connecting roads). The status of forestry road conditions should be kept current during the fire season.

Recommendation 20: New subdivisions should be developed with multiple access points that are suitable for evacuation and the movement of emergency response equipment. The number of access points and their capacity should be determined during subdivision design and should be based on threshold densities of houses and vehicles within the subdivisions.

Recommendation 21: Where forested lands abut new subdivisions, consideration should be given to requiring roadways to be placed adjacent to those lands. If forested lands surround the subdivision, ring roads should be part of the subdivision design.

Recommendation 22: The Emergency Planning Coordinator should maintain a copy of a gate location map and key status for private forest land within the interface area. Forest companies managing gated

roads should be encouraged to update the Port Alberni Fire Department whenever locks are changed so a set of current lock keys can be maintained.

Recommendation 23: During a large wildfire it is possible that critical infrastructure within the Regional District could be severely impacted by smoke. It is recommended that contingency plans be developed in the event that smoke causes evacuation of the community's incident command centres. The Regional District should co-operate with municipal and provincial governments to identify alternate incident command locations and a mobile facility in the event that the community is evacuated.

Training/Equipment

Recommendation 28: The Regional District should consider working with the municipalities to coordinate the creation of a regional and sub-regional mobile cache of wildland firefighting equipment. This would reduce the cost of purchasing and maintaining the cache and provide additional resources in the event of a wildfire.

OTHER 2010 CWPP RECOMMENDATIONS

The following 2010 CWPP recommendations are either superseded by recommendations in the current 2017 CWPP Update (i.e., they are addressed by one or more current recommendations) or are no longer applicable.

Communication and Education

Recommendation 1: The Regional District should consider working with the MOFR to enhance education and communication. Public education programs could be enhanced by: 1) integrating a unit of "FireSmart" and wildfire safety into the elementary school curriculum for local children, in conjunction with or addition to the current curriculum provided (Fire Safety House and Fire Prevention Week); 2) creating a "FireSmart" sticker program where Fire Department members attend residences and certify them as meeting "FireSmart" guidelines.

Recommendation 2: The Regional District should consider developing a communication plan to outline the purpose, methods and desired results of communication and education in the community. Educational information and communication tools need to be stakeholder specific. To establish effective communication within target groups, the plan should identify spokespersons who can best establish communication ties with target audiences and provide the educational information required.

Recommendation 5: The City of Port Alberni and the Alberni Clayoquot Regional District uses radio and local print media to communicate fire danger news to the community via the Port Alberni Fire Department. They should continue to use this and other local media such as pamphlet mailouts to deliver FireSmart educational materials and to communicate information on fire danger during periods of high and extreme fire danger. The use of rural fire departments in communicating fire danger information in their areas should be explored. This could include signage, door to door visits, etc.

Recommendation 7: The Regional District and Fire Departments should train additional personnel to deliver FireSmart information to the public. This initiative could be coordinated by ACRD staff.

Structure Protection

Recommendation 9: Where homes and businesses are built immediately adjacent to the forest edge, the Regional District should consider incorporating building setbacks into bylaw with a minimum distance of 10 m when buildings border the forest interface.

Recommendation 10: The Regional District should conduct a FireSmart hazard assessment of the community to educate residents on the hazards that exist on their properties and how to mitigate those hazards.

Recommendation 11: The Regional District should investigate the policy tools available for reducing wildfire risk. These include voluntary fire risk reduction for landowners, bylaws for building materials and subdivision establishment, covenants for vegetation setbacks, delineation of Wildfire Development Permit areas (http://www.regionaldistrict.com/docs/ planning/DPGuides/DP%20wildfire%20guide.pdf), incentives such as exclusion from a fire protection tax, and education. Specifically, the Regional District should investigate a process to create and/or review and revise existing bylaws to be consistent with the development of a FireSmart community.

Recommendation 12: The City of Port Alberni and the Alberni Clayoquot Regional District should consider requiring the use of roofing materials that are fire retardant with a Class A and Class B rating within new subdivisions. The City and Regional District should consider obtaining legal advice regarding the implementation of building requirements that are more restrictive than the BC Building Code. While restrictions to rated roofing are not supported in the Code at this time, there are several communities which have undergone or are undergoing various processes (e.g., lobbying, legal opinion, declaration of hazard by local Fire Chiefs) to enact roofing bylaws within their Wildfire Development Permit areas.

Recommendation 13: The Regional District should consider working with the Building Policy Branch to create a policy structure that would enable the Regional District to better address wildland urban interface protection considerations for buildings.

Recommendation 15: Subdivision design plans should be reviewed by the local Fire Department or Fire Services Coordinator to ensure that suitable access routes exist, that hydrant accessibility is adequate where applicable, and that interface fire related issues are addressed.

Recommendation 16: A formal communication structure should be established with the MOFR so that information regarding fires in the region is communicated to the Regional District in a timely manner. This might be best achieved through joint cooperation with the ACRD, ACRD municipalities, and the MOFR.

Recommendation 17: Consideration should be given to further developing community evacuation plans relating to interface wildfire, building on the ACRD evacuation plan currently in place for tsunamis. Appropriate evacuation routes should be mapped, considering Disaster Response Routes (DRR). Major evacuation routes should be signed and communicated to the public. The plan should identify loop roads and ensure access routes have sufficient width for two way traffic. In addition, alternative emergency responder access should be considered.

Recommendation 24: The Regional District should consider conducting a review of critical water infrastructure to identify areas where water infrastructure requires improvement. Mapping of water infrastructure should be shared with Regional District municipalities, as well as adjacent Regional Districts, which have mutual aid agreements, and with the MOFR to aid wildland suppression crews during a wildfire event.

Training/Equipment

Recommendation 25: The following training should be considered: 1) The S100 course training should be conducted on an annual basis if possible; and for all new fire department personnel; 2) The S215 course instruction should be given to Fire Chiefs and Deputies; 3) A review of the S215 course should be given on an annual basis; and, 4) Incident Command System training should be given to Fire Chiefs and Deputies.

Recommendation 26: Fire Departments should meet with the MOFR prior to the fire season to review the incident command system structure in the event of a major wildland fire. The review should include designated radio channels and operating procedures.

Recommendation 27: The ACRD Fire Departments should consider reviewing its existing inventory of interface firefighting equipment to ensure that items such as large volume fire hoses, portable pumps and firefighter personal protection equipment (PPE) are adequate to resource the interface area. Fire Department personnel should have correct personal protective equipment and wildland fire fighting

tools. Hoses, pumps and other equipment should be compatible with MOFR wildland firefighting equipment.

Recommendation 29: The Regional District should consider purchasing a mobile sprinkler kit. The UBCM should be consulted to see if supplemental funding is available. The Errington Volunteer Fire Department and Port Moody Fire Department can be consulted to review their mobile sprinkler systems.

Recommendation 30: The Regional District should consider purchasing and outfitting a mobile initial attack wildland interface trailer. This would be stocked with all required interface firefighting equipment. The Port Moody Fire Department can be consulted to review their wildland interface trailer.

Recommendation 31: Mutual aid agreements should be reviewed or established with MOFR, forest companies, municipalities within the ACRD, and adjacent Regional Districts to ensure that adequate resources and manpower support are available in the event of a wildfire.

Vegetation/Fuel Management

Recommendation 32: A portion of the hazardous fuel types in the ACRD are located on private property. The Regional District should work with private property owners to ensure they understand the importance and principles of FireSmart. The Regional District should investigate ways to support residents reducing fuels, making homes FireSmart and raising awareness of ignition hazards.

Recommendation 33: The Regional District should identify priority 1 and 2 stands on crown land, particularly adjacent to areas of higher risk shown in the WRMS Probability X Consequence analysis. These identified areas should be the focus of a progressive thinning program that is implemented over the next five to ten years. A qualified professional forester (RPF), with a sound understanding of fire behaviour and fire suppression, should develop treatment prescriptions.

Recommendation 34: The provincial government and the UBCM have funding programs specifically to address wildfire hazard on Crown and District lands. The Regional District should consider applying for UBCM funding to carry out fuel treatments that will strategically mitigate fuel hazard within 2 km of the identified high priority communities.

Recommendation 35: The Regional District should initially conduct fuel treatments in a pilot project area. This area should be used as an education tool to help residents understand the goals and methods of fuel treatments. The Resort Municipality of Whistler can be consulted to review their CWPP fuel thinning project (Rob Whitton, RMOW Fire Chief Office, 604-935-8260).

Recommendation 36: The Regional District should consider lobbying the province to identify and document hazardous fuel types on Crown lands that are not within 2 km of the identified high priority communities but that are within 5 km of residential areas that could be impacted by a wildland urban interface fire. Effort should be directed at encouraging the province to initiate a fuel treatment program for these lands. This may include coordinating lobbying initiatives with other local governments from within the ACRD.

Recommendation 37: The Regional District should consider lobbying the province to identify and document hazardous fuel types on Crown lands that are not within 2 km of the identified high priority communities but that are within 5 km of residential areas that could be impacted by a wildland urban interface fire. Effort should be directed at encouraging the province to initiate a fuel treatment program for these lands. This may include coordinating lobbying initiatives with other local governments from within the ACRD.