

# Klahoose First Nation Community Wildfire Protection Plan



## Submitted by:

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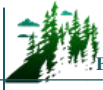


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## ACKNOWLEDGEMENTS

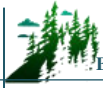
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The authors would like to thank the following Klahoose First Nation and Strathcona Regional District staff: Tina Wesley, Klahoose First Nation Fisheries Officer and Emergency Program Coordinator, and Shaun Koopman, Strathcona Regional District Protective Services Coordinator. These individuals invested substantial time in meetings, answering questions, reviewing and commenting on the contents of this document, or providing information.

In addition, the authors would like to thank staff from the BC Wildfire Service, including: Paul Bondoc (Wildfire Technician, Powell River Centre), Tony Botica (Fuel Management Specialist, Powell River Centre), and Dana Hicks (Fuel Management Specialist); staff from the Cortes Forest General Partnership (CFGP): Mark Lombard (Operations Manager), as well as staff from the Cortes Island Firefighting Association (CIFFA): Mac Diver (Fire Chief) and Eli McKenty (Fire Captain).

This report would not be possible without the Union of British Columbia Municipalities (UBCM) Community Resiliency Investment (CRI) Program, First Nations' Emergency Services Society (FNESS), and funding from the Province of British Columbia.

\*Cover photo Merrick Architecture- Klahoose First Nation Multipurpose Building. Accessed from <http://merrickarch.com/work/klahoose-multi-centre>



## REGISTERED PROFESSIONAL SIGN AND SEAL

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May 17, 2021	
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	
	



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## COMMONLY USED ACRONYMS

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BCWS	British Columbia Wildfire Service
BEC	Biogeoclimatic Ecosystem Classification
CDC	Conservation Data Centre
CCFC	Cortes Community Forest Cooperative
CFGP	Cortes Forestry General Partnership
CIFFA	Cortes Island Firefighting Association
CFFDRS	Canadian Forest Fire Danger Rating System
CRI	Community Resiliency Investment Program
CWPP	Community Wildfire Protection Plan
DPA	Development Permit Area
FBP	Fire Behaviour Prediction System
FMP	Fire Management Plan
FNESS	First Nations Emergency Services Society
FPA	Fire Protection Area
FSCNRP	FireSmart Canada Neighbourhood Recognition Program
FSP	Forest Stewardship Plan
GAR	Government Actions Regulation
HIZ	Home Ignition Zone
INAC	Indigenous and Northern Affairs Canada
ISC	Indigenous Services Canada
KFN	Klahoose First Nation
MFLNRORD	Ministry of Forests, Lands, Natural Resource Operations, and Rural Development
MOTI	Ministry of Transportation and Infrastructure
NDT	Natural Disturbance Types
NFPA	National Fire Protection Agency
OCP	Official Community Plan
OFC	Office of the Fire Commissioner
PSTA	Provincial Strategic Threat Analysis
PTU	Proposed Treatment Unit
SPU	Structural Protection Unit
SRD	Strathcona Regional District
TSA	Timber Supply Area
UBCM	Union of British Columbian Municipalities
VFD	Volunteer Fire Department
WRR	Wildfire Risk Reduction. Crown Land WRR is a category of funding for risk reduction activities on provincial Crown Land (introduced in 2019)
WUI	Wildland Urban Interface



## COMMONLY USED DEFINITIONS

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Crown Closure – the proportion of the sky hemisphere obscured by the crowns of live trees

Firebrand – A piece of burning wood or material.

Emergency Operations Centre – A designated facility established by an agency or jurisdiction to coordinate the overall agency or jurisdictional response and support to an emergency response<sup>1</sup>.

Emergency Support Services – A provincial program delivered by Local Authorities and First Nations' Governments that meet the basic needs of British Columbians impacted by disasters by providing short-term support<sup>2</sup>.

Official Community Plan – Plans that describe the long-term visions of communities through a statement of objectives and policies that guide decisions on municipal and regional district planning and land-use management<sup>3</sup>.

Reception Centre – A centre to receive evacuees who have been forced from their homes as a result of an emergency or disaster<sup>4</sup>.

Resiliency – The capability to recovering from a threat or disaster.

Stand Replacing Fire – A wildfire which kills all or most living overstory trees in a forest stand, initiating forest succession.

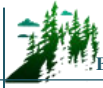
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<sup>1</sup> Justice Institute of BC, Emergency Management Division. *Emergency Operations Centre Operational Guidelines 2<sup>nd</sup> Addition*. Available from: <https://www2.gov.bc.ca/gov/content/safety/emergency-preparedness-response-recovery/emergency-management-bc/bcems>

<sup>2</sup> Government of British Columbia. *Emergency support services (ESS) volunteers*. Retrieved from: [Emergency support services \(ESS\) volunteers - Province of British Columbia \(gov.bc.ca\)](https://www2.gov.bc.ca/gov/content/safety/emergency-preparedness-response-recovery/emergency-support-services-ess-volunteers)s

<sup>3</sup> Government of British Columbia. *Official Community Plans for Local Governments*. Retrieved from: [Official Community Plans for Local Governments - Province of British Columbia](https://www2.gov.bc.ca/gov/content/safety/emergency-preparedness-response-recovery/official-community-plans-for-local-governments)

<sup>4</sup> Justice Institute of BC, Emergency Management Division. *What is a Reception Centre*. Available from: <https://irc.jibc.ca/modules/module-1-reception-centre-services/what-is-a-reception-centre/>



## **EXECUTIVE SUMMARY/ SUMMARY OF CWPP RECOMMENDATIONS**

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The Community Wildfire Protection Plan (CWPP) process was created in British Columbia (BC) as a response to the devastating 2003 wildfire in Kelowna. As an integral part of the Community Resiliency Investment (CRI) Program, managed by the Union of BC Municipalities (UBCM), CWPPs aim to develop strategic recommendations to assist in improving safety and to reduce the risk of damage to property from wildfires.

This CWPP will provide Klahoose First Nation with a framework that can be used to review and assess areas of identified high fire risk throughout Klahoose First Nation land on Cortes Island. Additionally, the information contained in this report should help to guide the improvement and/or development of emergency plans, emergency response, evacuation plans, communication and education programs (including FireSmart) 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 34 strategic recommendations are found in a tabularized format within this Executive Summary. In addition, these recommendations are more thoroughly discussed in their appropriate sections within the document. The recommendations within this strategy should be considered a toolbox of options to help reduce the wildfire risk to the community. There is not one combination or course of action which is the answer; Klahoose First Nation will have to further prioritize based on resources, strengths, constraints, and availability of funding and regularly update the prioritization and course of action as variables change through time.



**Table 1. Summary of CWPP Recommendations by Document Section.**

Document Section 2.5 Planning					
Item	Priority	Recommendation / Action	Rationale	Estimated Cost (\$) or Person Hours	Resources
1	High	Klahoose First Nation (KFN) should develop utility and road right-of-way best management practices (BMPs) for Klahoose staff to deploy regular brushing and clearing of woody debris and shrubs to help reduce fire risk, utility pole damage and subsequent outages. In addition, KFN should work with the Ministry of Transportation and Infrastructure to ensure public road rights-of-way do not contain fine fuel accumulations (< 7.5 cm, easily cured) and significant regeneration of conifer vegetation prior to and during the fire season and are maintained in a low hazard state.	Tree failures adjacent to power lines (transmission and distribution) are common occurrences and represent significant risks to ignition within the AOI. Encroachment of understory and overhanging vegetation was noted by consultants in multiple areas throughout Cortes Island. When right-of-ways are properly maintained, they can function as effective fire breaks.	~6 hours for 1 meeting/engagement with MOTI Klahoose First Nation/SRD	KFN initiative MOTI collaboration
2	High	KFN should continue to work with the Strathcona Regional District (SRD) to align the emergency response plans for both jurisdictions. The KFN emergency response plan may need to be updated to reflect updates to the Cortes Island evacuation plan, and vice versa.	Emergencies such as wildfires are likely to simultaneously affect both KFN and Cortes Island as a whole. Klahoose logistics and community needs should be considered for a potential island-wide evacuation. As of 2021 both emergency plans were being updated.	10-20 hours for collaboration during each update. Klahoose/SRD UBCM/FNESS Program Funding	KFN/SRD collaboration



Document Section 2.5 Planning					
Item	Priority	Recommendation / Action	Rationale	Estimated Cost (\$) or Person Hours	Resources
3	Medium	KFN should continue to assess the capacity of the KFN Multipurpose Building to function as the primary reception center for the community in the event of a wildfire. Review current capability to provide emergency support services (ESS). Upgrade or realign resources, as prioritized.	The Multipurpose Building is the community muster location in the event of a tsunami or wildfire.	Klahoose First Nation Funding source to be determined	KFN initiative
4	Medium	KFN and the SRD should renew and/or ratify the Klahoose First Nation Fire Service Agreement for another 5-year term.	The Klahoose First Nation Fire Service Agreement expired in December 2015 and has been renewed on a quarterly basis since. A renewed 5-year agreement will save administrative time and allow for a review of the agreement.	~15-20 SRD hours for contract development ~10 KFN hours and ~10 CIFFA hours for contract review and acceptance KFN/CIFFA/SRD Operational Budgets	KFN/CIFFA/SRD collaboration

Document Section 5.1 Fuel Management					
Item	Priority	Recommendation / Action	Rationale	Estimated Cost (\$) or Person Hours	Resources
5	High	Proceed with detailed assessment, prescription development and treatment of fuel treatment units identified and prioritized in this CWPP.	Reduce wildfire hazard in priority treatment units.	UBCM/FNESS CRI Program funding	KFN initiative SRD may support (regional application)



Document Section 5.1 Fuel Management					
Item	Priority	Recommendation / Action	Rationale	Estimated Cost (\$) or Person Hours	Resources
6	Medium	When operational fuel treatments are conducted, treatment monitoring 5-10 years out should be completed by a qualified professional to assess the efficacy of the treatment and to schedule maintenance activities. This can be completed with a CWPP update or as a stand-alone exercise.	Assess the efficacy of the treatment and to schedule maintenance activities. It is cheaper to perform maintenance early, when regeneration is small.	UBCM/FNESS CRI Program funding/Local Government funding	KFN initiative SRD may support (regional application)
7	Medium	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 Island'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 years.	A current (i.e., no more than 5 years old) CWPP is currently a requirement for further funding under the CRI Program.	UBCM/FNESS CRI Program funding	KFN initiative SRD may support (regional application)
8	Medium	Klahoose maintenance staff should continue to cut, collect and distribute firewood to community members during winter months while concurrently reducing woody debris loading from the KFN woodlot and mill site. Firewood distribution could occur in conjunction with FireSmart education, specifically related to FireSmart firewood storage; consider engaging a Local FireSmart Representative or CIFFA member to help.	Remove hazardous debris accumulation from the community while providing residents with firewood during winter months.	UBCM/FNESS CRI funding for educational materials Klahoose First Nation 2-4 additional weekly hours	KFN initiative



Document Section 5.2.3 Priority Areas					
Item	Priority	Recommendation / Action	Rationale	Estimated Cost (\$) or Person Hours	Resources
9	Medium	Continue working towards FSCNRP <sup>5</sup> status, building off the 2020 FireSmart Community Assessment Report. <sup>6</sup> Next steps for the community to take are: 1) formalize a FireSmart Committee/Board 2) Develop a Community Action Plan 3) Hold a Community FireSmart Cleanup Day. FireSmart Committee members can include emergency services personnel, maintenance staff, and community volunteers.	Increase community awareness and participation in FireSmart principles, improving community resilience	~40-80 hours UBCM/FNESS CRI grant(s) available	KFN initiative
10	High	Use fire-resistant construction materials (i.e., FireSmart Class A & B roofing materials), building design and landscaping for all structures when completing upgrades or establishing new infrastructure. Additionally, vegetation setbacks around structures should be compliant with FireSmart guidelines (no combustible material within 10 m of structures).	Flammable conifer vegetation noted in proximity to KFN Multipurpose Building. Incorporating FireSmart landscaping and construction will increase infrastructure wildfire resiliency through achieving FireSmart principles. See Section 5.2.3 for priority areas that would benefit from FireSmart programs.	Negligible in-house cost Campbell River FireSmart Guide to Gardening free online <sup>7</sup>	KFN initiative
11	High	In accordance with Recommendation #9, leverage the leadership of a Klahoose FireSmart Committee to provide outreach material to encourage residents to complete a FireSmart home assessment using the Home Assessment guide or the FireSmart Begins At Home mobile app, through a Local FireSmart Representative, or through the FireSmart Home Partners Program.	Educate residents on FireSmart principles and encourage residents to FireSmart homes. Could occur in conjunction with firewood delivery.	~1.5 hours / assessment  UBCM/FNESS CRI grant(s) available	KFN initiative

<sup>5</sup> FireSmart Canada Neighbourhood Recognition Program (Section 5.2.3)

<sup>6</sup> Nelson, Q. 2020. First Nations' Emergency Services, British Columbia. *FireSmart Hazard Assessment Report: Klahoose*.

<sup>7</sup> <https://srd.ca/wp-content/uploads/2020/10/final-cr-firesmart-guide-to-gardening-pdf-version-min-1.pdf>



Document Section 5.2.3 Priority Areas					
Item	Priority	Recommendation / Action	Rationale	Estimated Cost (\$) or Person Hours	Resources
12	Medium	Apply for funding from the UBCM CRI Program to develop a local FireSmart rebate program. The rebate program is described in detail in the CRI Program 2020 FireSmart Community Funding and Supports – Program & Application Guide and must adhere to the goals and objectives of FireSmart, as outlined in Section 5.2.1. Before applying for funding, Klahoose First Nation resources available to execute the program should be reviewed.	Incentivize residents to undertake FireSmart activities on their properties by allowing them to access partial rebates, if rated as high or extreme risk in a FireSmart home assessment.	20-35 in-house hours plus additional hours to administer the rebate program.  UBCM/FNESS CRI funding available for rebate	KFN initiative
13	Medium	Seek funding to fix sealing leaking fire hydrants.	There is currently a 15-minute lag time for CIFFA to respond to fire events within the AOI. Having a reliable and efficient hydrant system throughout Squirrel Cove is key for community resiliency and independence for responding to fire events.	Negligible in-house cost Klahoose First Nation	KFN initiative
14	High	KFN should consider coordinating with the SRD for access to a chipper during the SRD spring community chipping program. KFN maintenance staff should be engaged to collect woody debris for chipping from within the Home Ignition Zone of structures in the community	Aid residents in removing hazardous debris off of properties, while educating residents on FireSmart yard and landscaping principles. Currently, residents burn yard debris in small open fires on properties and along the beach.	Time dependent upon program. Klahoose First Nation Eligible for UBCM/FNESS CRI Program funding. Additional time for advertisement of program availability will be required.	KFN collaboration with SRD



Document Section 5.3 Communication					
Item	Priority	Recommendation / Action	Rationale	Estimated Cost (\$) or Person Hours	Resources
15	Medium	Encourage the Cortes Island School to adopt and deploy existing school education programs to engage youth in wildfire management. 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 (Powell River Fire Centre) as well as 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.).	Engage and educate youth in wildfire management and risk reduction.	~5-10 hours Klahoose Advocacy/SRD Initiative UBCM/FNESS CRI Program funding available FireSmart BC Education box - \$800 ( <i>Junior Kindergarten - Grade 12</i> )	KFN collaboration with School District 72 and/or SRD
16	Medium	A sign that depicts the current fire danger class rating, fire bans and general fire safety related warnings should be posted in a highly visible location within the AOI, such as at the entrance to the community. The sign should be updated at least weekly by the Klahoose Fire Officer (CIFFA member) or a designate during the fire season.	No fire danger rating sign is present within the AOI. This recommendation will build on the current door-to-door delivery of community newsletter containing fire ban information to increase local awareness of fire weather conditions and provide an opportunity to communicate fire bans.	~\$5,000/sign Klahoose First Nation funding	KFN Initiative



Document Section 5.3 Communication					
Item	Priority	Recommendation / Action	Rationale	Estimated Cost (\$) or Person Hours	Resources
17	High	Promote FireSmart approaches for wildfire risk reduction to residents through FireSmart workshops and/or presentations. Aim to conduct the engagement/promotion campaign prior and during the fire season. Supply FireSmart and/or emergency planning education material to residents during these engagement campaigns.	Increase community education on wildfire risk and FireSmart principles.	Klahoose First Nation UBCM/FNESS CRI Program funding 8-12 hours for a local LFR	KFN initiative Possible SRD collaboration
18	Medium	This report and associated maps to be made publicly available through webpage, social media, and public FireSmart meetings.	Increase community education on island-specific wildfire risk.	~3-6 hours depending on method of distribution	KFN initiative
19	High	An emergency pamphlet that outlines key information from both the updated Cortes Island Evacuation Plan and the KFN evacuation plan should be developed and delivered to each household within the community. Full copies of both plans should be available at the KFN Multipurpose Building.	Increase community understanding of the evacuation process so that the evacuation plan can be deployed efficiently and effectively.	~6-12 hours depending on method of distribution 30-60 hours for pamphlet development	KFN initiative SRD collaboration



Document Section 5.4 Other Measures					
Item	Priority	Recommendation / Action	Rationale	Estimated Cost (\$) or Person Hours	Resources
20	Medium	Klahoose Fire Officers should make an effort to record fire incidents and categorize incidents by urban fire and wildfire calls to increase UBCM funding opportunities and to obtain valuable data regarding wildfire threat.	Currently, wildfire incident calls are not recorded, possibly reducing funding opportunities.	~1 hour	KFN initiative
21	High	KFN should work to assess the carrying capacity of the Klahoose boat and fisheries boat and obtain life jackets for the capacity of each boat.	The Wildfire Working Group identified the Klahoose boat and fisheries boat as the primary off-island transportation resources. Current boat capacities are not clearly defined.	~4-8 hours + additional costs for life jackets (\$25-40 each)	KFN initiative
22	High	KFN maintenance staff should continue to incorporate FireSmart principles throughout yard maintenance work, including vegetation setbacks, FireSmart landscaping and storing combustible material >10m of structures.	Klahoose staff undertake yard maintenance throughout the fire season. Considering FireSmart principles throughout the duration of this work can increase the community's fire resiliency.	Potential additional labor hours; additional staff member(s) may be required Funding (e.g., FSERF) <sup>8</sup> may be available.	KFN initiative
23	High	KFN should consider training one or more community members as Local FireSmart Representatives, to help coordinate a community FireSmart Committee and facilitate FireSmart education and events	Formal FireSmart Assessments must be performed by an LFR. LFRs receive special training to assist communities in becoming more FireSmart.	LFR workshops are currently offered for free through FireSmart Canada ~8-hour workshop	KFN initiative

<sup>8</sup> <https://www.ubcm.ca/EN/main/funding/lgps/community-resiliency-investment/firesmart-economic-recovery-fund.html>



Document Section 5.4 Other Measures					
Item	Priority	Recommendation / Action	Rationale	Estimated Cost (\$) or Person Hours	Resources
24	Low	KFN should work with KFN woodlot operators and CFGP to ensure that high risk activities, such as vegetation management, pile burning and harvesting do not occur during high/extreme fire danger times to reduce chance of ignitions as per the Wildfire Act. Adequate fire suppression tools (as per wildfire act and regs) should be on-site during high-risk activities conducted in the woodlot.	Reduce chance of ignitions as per the <i>Wildfire Act</i> and reduce spread potential during an ignition event. KFN woodlot and CFGP are adjacent to the community.	Klahoose First Nation low overall cost	KFN/SRD/CFGP collaboration

Document Section 6. Training and Equipment					
Item	Priority	Recommendation / Action	Rationale	Estimated Cost (\$) or Person Hours	Resources
25	Moderate	In collaboration with CIFFA and SRD, pursue funding to train CIFFA members in SPP-115 to support the deployment of a structural protection unit (SPU) in the community during a wildfire event. SPP-115 provides training to structural firefighters on the use of wildfire pumps and hose (and fire service hose and hydrants) in the deployment of SPUs.	To support funding applications to obtain an SPU.	Time/cost dependent on numbers and training done.  Wildfire training may qualify for UBCM/FNESS CRI Program funding	KFN/SRD/CIFFA collaboration
26	High	Augment existing fire suppression resources in Squirrel Cove including acquiring additional hoses and hydrant tools. Apply for funding from Indigenous Services Canada (ISC) and/or the Community Emergency Preparedness Fund (CEPF) for additional equipment (if funding is available).	Improve wildfire resources so that CIFFA is equipped to respond to wildfire emergencies.	ISC or UBCM CEPF funding available	KFN initiative



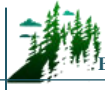
Document Section 6. Training and Equipment					
Item	Priority	Recommendation / Action	Rationale	Estimated Cost (\$) or Person Hours	Resources
27	Moderate	Consider obtaining a Type 2 Structural Protection Unit (SPU), complete with hoses, sprinklers, and fittings compatible with the on-reserve hydrant system to protect the 30-40 structures in the event of a wildfire. Alternatively, consider purchasing several sprinkler kits to protect the Klahoose Multipurpose Building.	KFN is single-access; mustering at the Multipurpose Building is Plan A in the event of a wildfire emergency.	Klahoose First Nation/UBCM/FNESS funding ~\$100,000 for SPU ~1,000 for 5 gutter-mount sprinkler kits <sup>9</sup>	KFN initiative Possible SRD/CIFFA collaboration
28	Low	KFN should apply for emergency operations funding to complete the construction of an emergency helipad.	To increase off-island evacuation methods in an emergency or disaster. Helipad construction is in progress; however, a lack of funds has challenged its completion.	Klahoose First Nation/UBCM/FNESS funding	KFN initiative
29	Moderate	KFN should work with CFGP to keep the Von Donop access road in driveable condition to aid with ground-based suppression access/anchoring point during a potential wildfire event west of Squirrel Cove	The existing road is narrow. Maintaining this road will help protect the community from a wind-driven forest fire spreading from the west. Aligns with anticipated 2022-2023 CFGP management plan updates.	CFGP funding	KFN/CFGP collaboration

<sup>9</sup> Example: <https://shop.waspswildfire.ca/collections/all-products/products/wasp-wildfire-community-pack5>



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## SECTION 1: INTRODUCTION

Although forest fires are both inevitable and essential to the health of forested ecosystems, the 2003, 2009, 2017 and 2018 wildfire seasons resulted in significant economic, social and environmental losses in BC. The 2018 fire season led to 66 evacuation orders and approximately 1,355,000 hectares burned, surpassing the 2017 fire season.<sup>10</sup> The final suppression costs for the 2018 fire season are estimated at over \$615 million.<sup>11</sup> Other recent wildfire disasters—like those experienced in Slave Lake, Alberta (2011), Washington State (2014 and 2015), Fort McMurray, Alberta (2016) and BC (2017-2018) and California (2017-2020) 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<sup>12</sup> (WUI).

### 1.1 PURPOSE

Klahoose First Nation and the Strathcona Regional District have recognized wildfire mitigation and planning to be a foundational component of emergency planning and preparedness. The purpose of this CWPP is to identify the wildfire risk within the Klahoose First Nation Area of Interest (AOI) with respect to human life, property and critical infrastructure, to describe the potential consequences of a wildfire, and to examine options and strategies to facilitate wildfire risk reduction. The information contained in this report will help guide the development of emergency plans, emergency response, public education programs, community planning, and the management of forested lands adjacent to the community.

The plan will provide Klahoose First Nation with:

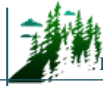
- an assessment of wildfire risk within and surrounding the community;
- an assessment of values at risk and potential consequences from wildfire;
- maps of fuel types and recommended areas for fuel treatments;
- an assessment of emergency response capacity and community FireSmart status and;
- options and strategies to reduce wildfire risk in seven FireSmart disciplines: education, legislation and planning, development considerations, interagency cooperation, cross-training, emergency planning, and vegetation management.

CWPPs are funded in BC by the Union of BC Municipalities (UBCM) under the Community Resiliency Investment (CRI) FireSmart Community Funding and Supports Program. As per funding requirements, this CWPP is completed according to the 2018 CRI template.

<sup>10</sup> BC Wildfire Service. *Wildfire Season Summary*. Retrieved from: <https://www2.gov.bc.ca/gov/content/safety/wildfire-status/about-bcws/wildfire-history/wildfire-season-summary>

<sup>11</sup> Ibid.

<sup>12</sup> The wildland urban interface is defined as the presence of structures in locations in which conditions result in the potential for their ignition from flames and firebrands/embers of a wildland fire (National Fire Protection Association). See Appendix D for a more detailed discussion.



## 1.2 CWPP PLANNING PROCESS

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This CWPP is a review and synthesis of the background information and current data related to the Area of Interest (AOI) which represents Squirrel Cove 8 and Tork 7 'Indian Reserve' Lands. The CWPP process consists of four general phases:

- 1) **Consultation involving key First Nation representatives, structural and wildfire specialists, First Nations and stakeholders.**
- 2) **Identification of the values at risk and assessment of the local wildfire risk.**
- 3) **Developing a wildfire risk mitigation strategy.**
- 4) **Building a community engagement and education strategy.**

### 1.2.1 Consultation

---

Engagement with Klahoose First Nation as well as regional and provincial government representatives played a key role in developing this CWPP. The first step in the consultation process was to assemble the key players in the 'Wildfire Working Group'. This group was composed of the Klahoose First Nation Emergency Program Coordinator and principal external personnel, including the Strathcona Regional District Protective Services Coordinator and the Cortes Island Fire Rescue Association (CIFFA) Fire Chief and CIFFA Fire Captain.

The objective of ongoing communications with the Wildfire Working Group was to obtain information on wildfire risk mitigation initiatives currently in place or completed, existing plans and policies, current resources, identify areas of concern, identify vulnerabilities, and to determine priorities and potential mitigation strategies. Members of the Working Group were consulted on an ongoing basis throughout plan development and were integral in providing plan review and approval. The Wildfire Working Group was integral in the review of the draft of this CWPP and provided ongoing support throughout the CWPP process.

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

Information sharing took place with the Xwemalhkwa Nation and Tla'amin Nation as identified through the Consultative Areas Database and in consultation with MFLNRORD First Nations Advisor. Information sharing consisted of an initial phone call, and subsequent distribution of a referral letter and information package (maps, explanation of CWPP and CWPP draft). Input regarding aboriginal interests or possible cultural values at risk were requested through this process.

Additional stakeholders were consulted to identify synergies, opportunities for collaboration, and ensure linkages with adjacent and overlapping planning. These stakeholders included Klahoose woodlot



manager and the Cortes Island Community Forest Manager. 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

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

- Natural fire regime and ecology (Section 4.1.1);
- Provincial Strategic Threat Analysis (Section 4.2) and;
- Local wildfire threat analysis (Section 4.3).

### 1.2.3 Development of a Risk Management Strategy

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

- Education;
- Legislation and planning;
- Development considerations;
- Interagency cooperation;
- Cross-training;
- Emergency planning and;
- Vegetation management.

### 1.2.4 Building Community Engagement and Education Strategy

---

Engaging the community in wildfire protection planning activities, from local First Nation staff and officials, to key stakeholders and residents, is key to ensuring successful implementation of CWPP recommendations. A community engagement and education strategy is described in Section 1.1. A presentation to the Chief and Council and/or Klahoose First Nation representatives will help ensure high level approval and support for this CWPP.

## SECTION 2: LOCAL AREA DESCRIPTION

---

This section defines the Klahoose First Nation Area of Interest (AOI) and describes the population distribution in the community. 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

Klahoose First Nations lands are located on the east coast of Cortes Island, within Electoral Area B of the Strathcona Regional District. Two individual, federal ‘Indian Reserve’ (IR) parcels comprise the AOI: Tork 7 and Squirrel Cove 8. The primary village site, Squirrel Cove, is located on the eastern edge of Tork 7 overlooking Marine Bay. Most of Tork 7 is mixed wood forest; the western half is the on-reserve portion of the Klahoose First Nation woodlot (W0090). Squirrel Cove 8 is located west of Marine Bay and is entirely forested land with no residences; it is boat access only and is primarily used for fisheries. The AOI for the CWPP is illustrated below in Map 2, representing Klahoose First Nation land on Cortes Island. A breakdown of the AOI’s land ownership is provided in Table 2.

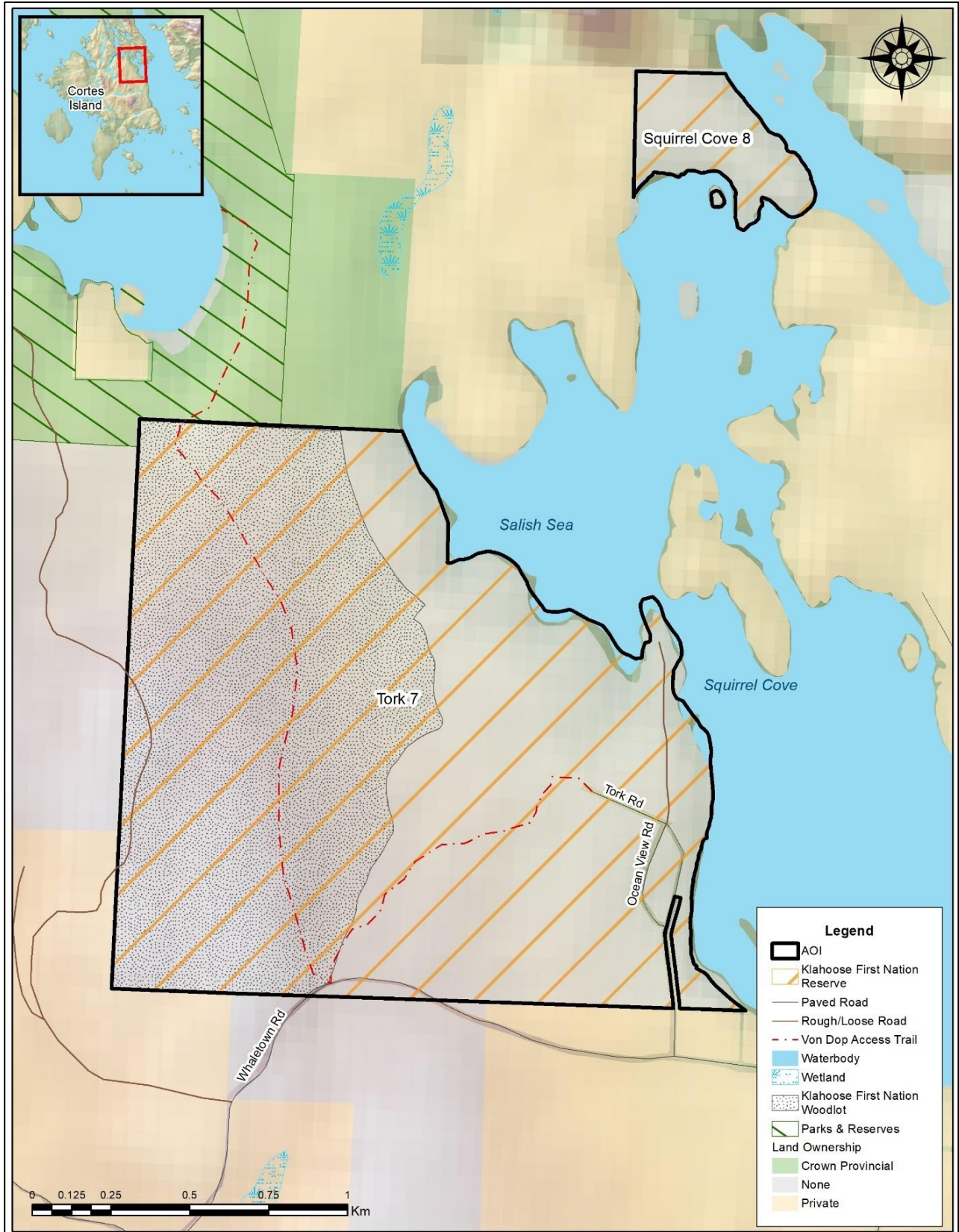
**Table 2. Summary of AOI by land ownership.**

Land Ownership	Hectares
Crown Agency	-
Crown Provincial	-
Federal/First Nation	300
Municipal	-
Private	0
Unknown	-

\*The land ownership source is ParcelMap BC, provided by the Land Title and Survey Authority (LTSA).

The wildfire threat of the AOI was analyzed and updated through a local wildfire threat assessment process as described in SECTION 4: Wildfire Threat and Risk and A-1- Fuel Type Attribute Assessment. Local wildfire behavior threat patterns of the AOI are illustrated in Map 1.

Wildfire threat in the AOI was analyzed and updated through a local wildfire threat assessment process as described in SECTION 4: Wildfire Risk and Appendix A-1 Fuel Type Attribute Assessment. The distribution of wildfire threat classes across the AOI is illustrated in Map 8 on page 35.



Map 2. Area of Interest (AOI).



## 2.2 COMMUNITY DESCRIPTION

The Klahoose Nation has occupied traditional territories spanning from Cortes Island to Toba Inlet since time immemorial. The AOI includes two of ten IRs held by Klahoose Nation, also including Ahpokum 9, Deep Valley 5, Klahoose 1, Quaniwsom 2, Quequa 6, Salmon Bay 3, Siakin 4 and Tatpo-oose 10.<sup>13</sup>

The village of Squirrel Cove has a small population but is critical to the functioning of the Nation. Squirrel Cove is home to ~70 full-time residents and Klahoose administrative offices, while ~350 Klahoose First Nation members reside off-reserve in coastal communities in the lower mainland and Washington State.<sup>14</sup> Klahoose has overlapping and shared territory with Xwemalhkwa (Homalco), Kwakwiltl and Tla'amin Nations. The three First Nations historically comprised the Tla'Amin (Mainland Comox), but were designated by the first Indian Affairs officials in the area as three separate band councils: Klahoose, Homalco and Tla'amin. Some members of Klahoose speak Lik'wala, a dialect of Kwak'wala.

Services to Klahoose residents are provided both by Klahoose First Nation and by the Strathcona Regional District (SRD). The SRD provides emergency management (including fire protection), administration and waste services throughout Cortes Island. Klahoose First Nation administers programs and services in Squirrel Cove including health care, public transportation, water treatment, fire hydrants, sewage treatment, landscaping, and emergency planning. The island is accessed via a BC Ferries route from Quadra Island, by private boat, or by private plane. Klahoose First Nation is actively engaged in forestry, fishing, and tourism activities in the AOI and throughout their traditional territory.

Tork 7 and Squirrel Cove 8 are almost entirely forested with very little development outside of the community of Squirrel Cove. Topography is similar to the rest of Cortes Island: flat to rolling with drier rocky outcrops near the ocean, and moist mixed wood forest to the interior. Like the rest of Cortes Island, Tork 7 and Squirrel Cove 8 lie in the rain shadow of Vancouver Island and the Olympic mountain. Summers are warm and dry and winters are mild and wet.

## 2.3 PAST WILDFIRES, EVACUATIONS AND IMPACTS

In the last century, wildfires on Cortes Island have been infrequent and relatively small in size. No historic fires on the Island have resulted in documented evacuation or structural loss. Nevertheless, the dry climate and high amount of forest cover on Cortes Island are both risk factors from a wildfire perspective. Local fire threat and fire weather is discussed in further detail in SECTION 4:

## 2.4 CURRENT COMMUNITY ENGAGEMENT

Klahoose First Nation does not have an official FireSmart program, but seasonal maintenance of homes in Squirrel Cove is in compliance with general FireSmart principles. Klahoose First Nation has also participated in several recent FireSmart initiatives on Cortes Island. The Wildfire Working Group indicated that community understanding of wildfire risk is generally high and community members are

<sup>13</sup> Indigenous and Northern Affairs Canada. 2019. Klahoose First Nation 553: *Reserves/Settlements/Villages*. Retrieved from: [https://fnppn.aadnc-aandc.gc.ca/fnp/Main/Search/FNReserves.aspx?BAND\\_NUMBER=553&lang=eng](https://fnppn.aadnc-aandc.gc.ca/fnp/Main/Search/FNReserves.aspx?BAND_NUMBER=553&lang=eng)

<sup>14</sup> Klahoose First Nation. N.D. *About*. Retrieved from: <https://www.klahoose.org/about>



largely supportive of fire safety. In collaboration with the First Nations' Emergency Services Society (FNESS), a Community Wildfire Hazard Assessment was completed for Squirrel Cove in 2020 as the first step in becoming a FireSmart Recognized Community.<sup>15</sup> Other initiatives carried out by Klahoose staff include FireSmart yard maintenance and yard and wood debris removal, a table-top exercise with BC Wildfire services (BCWS) in 2018 and frequent community newsletters that are delivered door to door outlining current fire risks and bans. It is recommended that these efforts continue and that future initiatives be focused during times of high public uptake in order to maximize the resources available for community engagement.

## 2.5 LINKAGES TO OTHER PLANS AND POLICIES

The following is a summary of Klahoose First Nation, SRD and provincial policies and guidelines that relate to strategic wildfire management, wildfire threat reduction, operational fuel treatments and emergency planning. Regional policies and bylaws are relevant to Klahoose First Nation because of their impact on the degree of FireSmart awareness and engagement of Cortes Island as a whole in emergency preparedness. Amendments to SRD plans and bylaws are SRD responsibility. This section recommends ways to further recognize and promote FireSmart principles in Klahoose First Nation planning and policies.

### 2.5.1 Local Authority Emergency Plan

Emergency preparedness and response is managed by Klahoose First Nation and is guided by an Emergency Plan for the community, which is regularly updated. The primary emergency response plan is for residents to muster at the Multipurpose Building, which is large and well equipped with an industrial kitchen, large hall, automatic propane generator, M-SAT communication system, and cache of cots, food, and tools. If evacuation from Squirrel Cove becomes necessary it would be conducted using two Klahoose boats.

An update to the island-wide Cortes Island Emergency Evacuation Plan<sup>16</sup> is currently being drafted by the SRD in collaboration with the Cortes Island Emergency Planning Committee. The plan provides guidelines and procedures for a coordinated evacuation from Cortes Island in case of an emergency. The plan includes basic contingencies in the event of a wildland/interface fire, including the designation of an Emergency Operations Centre, information on Emergency Support Services (ESS), specific and alternate evacuation routes to be used during an emergency situation, and a list of key contacts and the roles of local government personnel in the event of a wildfire. The interaction of the Klahoose Emergency Plan with the Cortes Island Emergency Evacuation Plan is not well-defined and it is recommended that Klahoose First Nation and the SRD work together to ensure that both plans align.

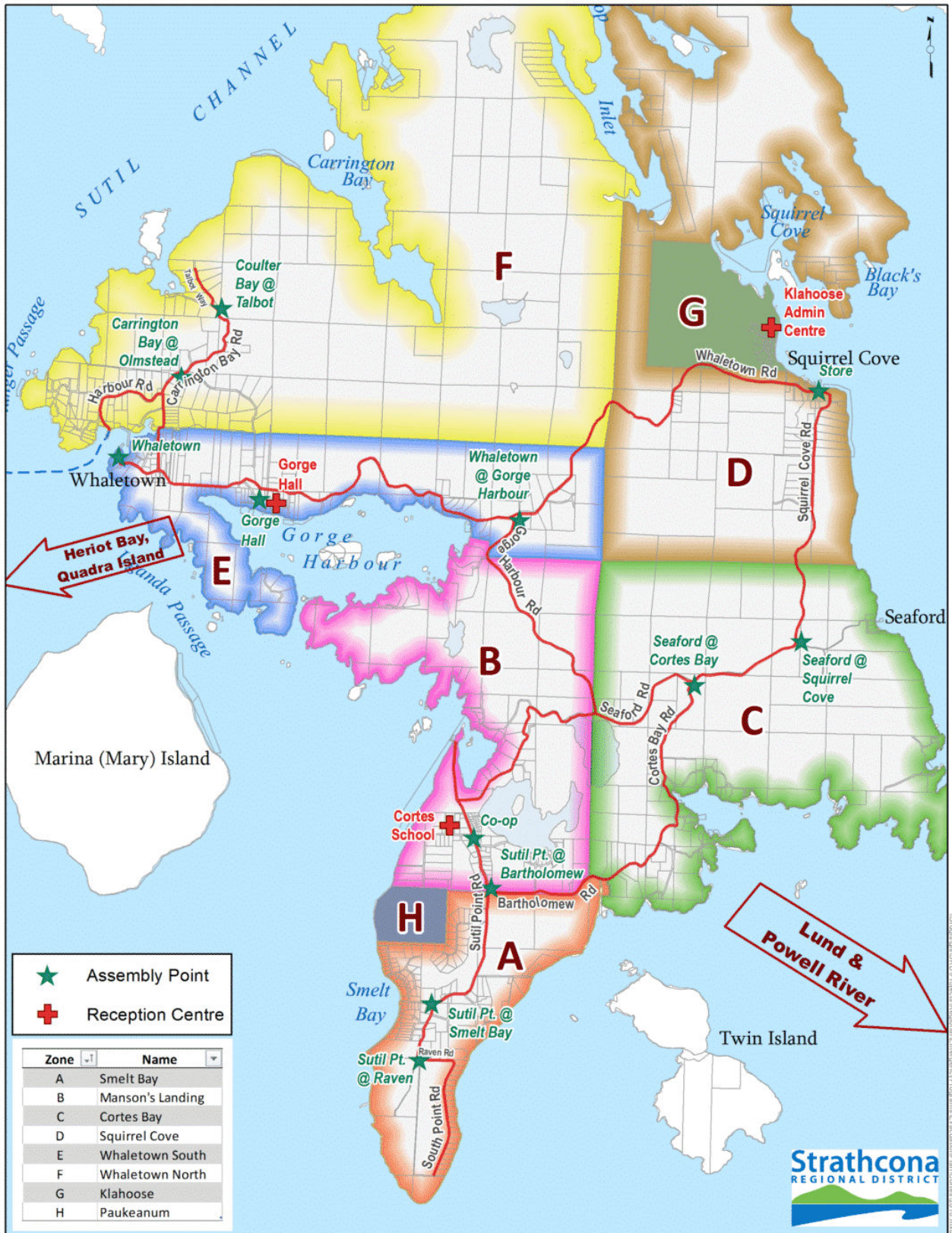
Squirrel Cove is one of six evacuation zones that have been established under the Cortes Island Evacuation Plan. Within each zone, respective assembly points, reception centers, boat ramps, wharfs and evacuation routes have been mapped and residence lists have been created. The Klahoose

<sup>15</sup> The FireSmart Canada Neighbourhood Recognition Program (FSCNRP) is discussed in Section 5.2.3.

<sup>16</sup> Strathcona Regional District. 2020. Cortes Island Evacuation Survey; *Community Wildfire Protection Plan & Evacuation Plan Survey*. Retrieved from: <https://srd.ca/projects/cortes-evacuation-survey/>



Multipurpose Building has been designated as the Reception Centre for Squirrel Cove (Evacuation Zone G) and the Squirrel Cove store has been identified as an Assembly Point. A synopsis of the updated Cortes Island Evacuation Plan and the Klahoose First Nation Emergency Evacuation Plan should be readily accessible for Klahoose community members through online platforms such as the Klahoose First Nation website, and tangible copies should be available at the Multipurpose Building.



Map 3. SRD Emergency Evacuation Staging Map- Cortes Island Emergency Evacuation Plan

## 2.5.2 Affiliated CWPPs

A CWPP was developed for Cortes Island in 2011<sup>17</sup> to assist the SRD in identifying wildland fire threat and providing applicable recommendations throughout the island. The 2011 document was reviewed for context and relevance. None of the recommended priority areas for fuel treatments to mitigate wildfire risk have been treated. Barriers to implementations were associated with funding limitations and increased costs of treating a remote island. The 2011 CWPP encompassed Cortes Island as a whole, including Klahoose First Nation. Areas of concern from the 2011 CWPP within the Klahoose AOI were revisited and proposed treatment units have been amended and added. Refer to 5.1.1 for further details regarding proposed treatment units. A Cortes Island CWPP update was developed in 2020/2021 in conjunction with this CWPP for Klahoose First Nation.

## 2.5.3 Regional Government/First Nation Policies and Recommendations

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

### ***Electoral Area B (Cortes Island) Official Community Plan- Bylaw No. 139***

An Official Community Plan (OCP) is a general statement of the objectives and policies of the local government, and provides the SRD with a long-range framework to guide, monitor and evaluate future land use and development throughout the respective Electoral Area. Section 203 of the Cortes Island OCP is directly relevant to wildfire risk reduction and emergency response within the Klahoose First Nation community and is summarized in Table 3 below.

**Table 3. Summary of relevant SRD Bylaws and Contracts**

Bylaw	Summary
Cortes Island Official Community Plan (OCP) Section 203 First Nations Policies	<ul style="list-style-type: none"> <li>The SRD should cooperate and coordinate with First Nations regarding the provision of fire services to reserve lands</li> <li>The Klahoose First Nations respond internally to fire events within the Klahoose community, however, the CIFFA may offer support upon request.</li> </ul>
Bylaw No. 331, South Cortes Island Fire Protection Services and Facilities Service Establishment Bylaw No. 1236, Amendment, Section 5.0 Service Area	<ul style="list-style-type: none"> <li>Authorizes the Cortes Island Fire Fighting Association to engage in wildfire suppression outside the service area when commissioned by the Ministry of Forests, Lands and Natural Resource Operation or another duly constituted provincial authority.</li> </ul>

<sup>17</sup> Broome, K., Andrew, B. 2011. B.A. Blackwell. *Cortes Island Community Wildfire Protection Plan*. Retrieved from [https://srd.ca/wp-content/uploads/2019/07/Cortes\\_CWPP\\_Final.pdf](https://srd.ca/wp-content/uploads/2019/07/Cortes_CWPP_Final.pdf)



Bylaw	Summary
Klahoose First Nation Fire Protection Service Agreement	<ul style="list-style-type: none"> <li>• A contract between the SRD and Klahoose First Nation to respond to fire emergencies which occur within Squirrel Cove.</li> <li>• The contract expired in 2015, and existing service contracts have been extended on a month-to-month basis</li> </ul>

### 2.5.4 Higher Level Plans and Relevant Legislation

Awareness of all relevant provincial legislation and regulations and land management plans is a critical step in ensuring a proactive and effective wildfire mitigation approach in the AOI. Table 4 summarizes the higher-level plans that apply to Cortes Island and their relationship to Klahoose First Nation wildfire planning.

**Table 4. Key Higher-Level Plans and Relationship to the CWPP**

Plan	Description	Relationship to CWPP
Klahoose First Nation Forest & Range Consultation and Revenue Sharing Agreement	The FCRSA establishes a process for forest and range development on Crown Lands within the Traditional Territory of Klahoose First Nation.	The Klahoose First Nation Woodlot (#0090) tenure is a result of the FCRSA Agreement. Wildfire risk during harvesting operations and stand alteration were considered throughout the development of this CWPP.
Woodlot License Replacement Offer	The Klahoose Woodlot (W0090) was reissued a 20-year term woodlot license in 2007 in accordance with section 46 of the <i>Forest Act</i> .	The Klahoose Woodlot accounts for approximately half of the AOI. Logging operations may increase wildfire hazards. Landscape level fuel breaks have been recommended within the woodlot to reduce the potential for crown fire behaviour, while meeting harvesting objectives.
Cortes Landscape Unit Plan (2012)	This Sustainable Resource Management Plans identifies protection measures for landscape level biodiversity and old growth forests in the Cortes Landscape Unit.	The Landscape Unit Plan summarizes OGMA units for each of the BEC zones within the landscape unit and sets objectives for the management within each zone. OGMA values have been considered in the development on the CWPP.
Strathcona Regional District Strategic Plan 2020 - 2024	The strategic plan outlines that supporting adaptation of climate change through sub-regional initiatives and increasing understanding and capabilities to respond to wildfire are key district strategic priorities.	Recommendations made throughout the CWPP are aimed to increase public understanding of wildfire hazards and FireSmart principles, while increasing Cortes Island’s wildfire resiliency.



**Table 5. Summary of Planning Recommendations.**

Document Section 2.5 Planning					
Item	Priority	Recommendation / Action	Rationale	Estimated Cost (\$) or Person Hours	Resources
1	High	Klahoose First Nation (KFN) should develop utility and road right-of-way best management practices (BMPs) for Klahoose staff to deploy regular brushing and clearing of woody debris and shrubs to help reduce fire risk, utility pole damage and subsequent outages. In addition, KFN should work with the Ministry of Transportation and Infrastructure to ensure public road rights-of-way do not contain fine fuel accumulations (< 7.5 cm, easily cured) and significant regeneration of conifer vegetation prior to and during the fire season and are maintained in a low hazard state.	Tree failures adjacent to power lines (transmission and distribution) are common occurrences and represent significant risks to ignition within the AOI. Encroachment of understory and overhanging vegetation was noted by consultants in multiple areas throughout Cortes Island. When right-of-ways are properly maintained, they can function as effective fire breaks.	~6 hours for 1 meeting/engagement with MOTI Klahoose First Nation/SRD	KFN initiative MOTI collaboration
2	High	KFN should continue to work with the Strathcona Regional District (SRD) to align the emergency response plans for both jurisdictions. The KFN emergency response plan may need to be updated to reflect updates to the Cortes Island evacuation plan, and vice versa.	Emergencies such as wildfires are likely to simultaneously affect both KFN and Cortes Island as a whole. Klahoose logistics and community needs should be considered for a potential island-wide evacuation. As of 2021 both emergency plans were being updated.	10-20 hours for collaboration during each update. Klahoose/SRD UBCM/FNESS Program Funding	KFN/SRD collaboration



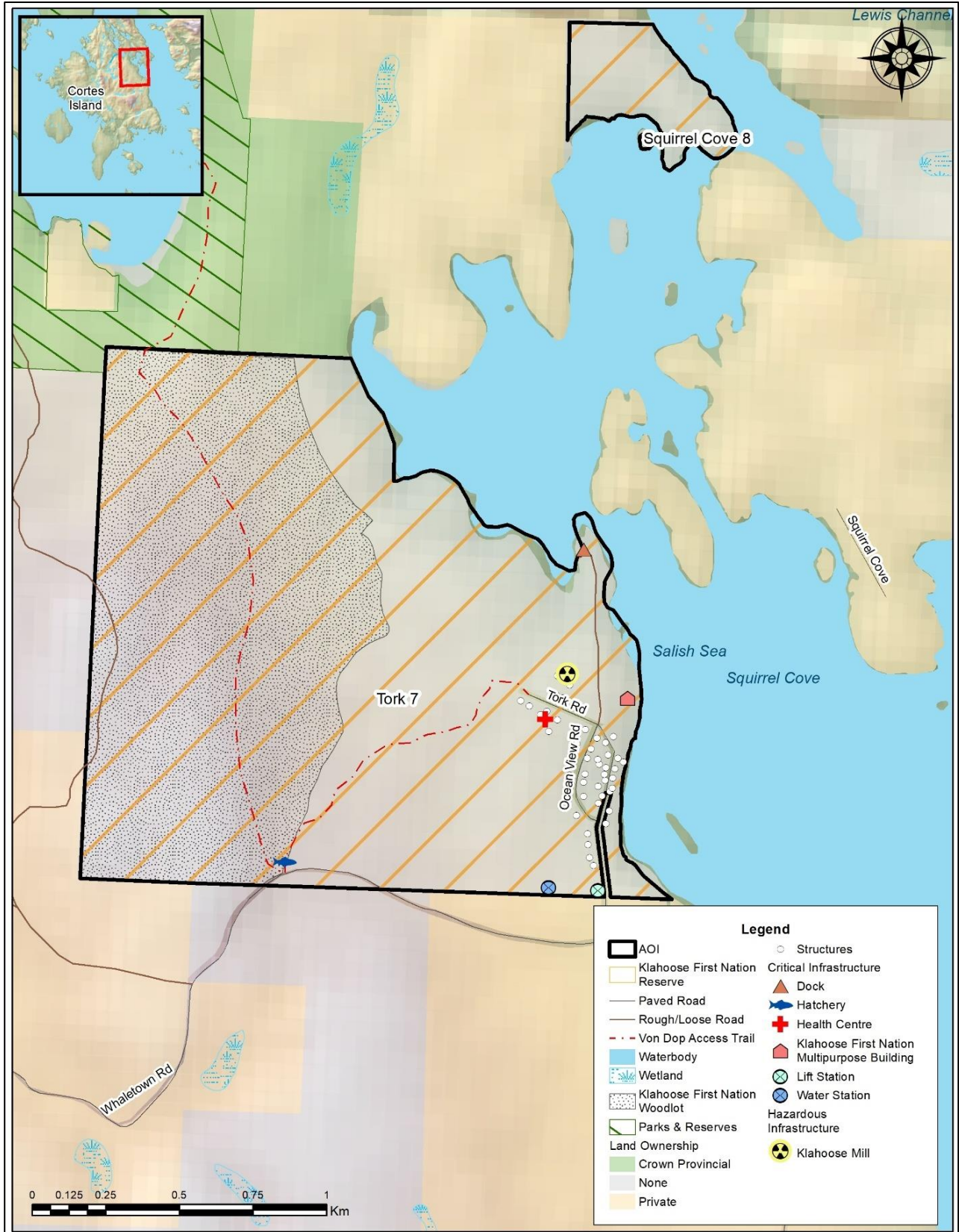
Document Section 2.5 Planning					
Item	Priority	Recommendation / Action	Rationale	Estimated Cost (\$) or Person Hours	Resources
3	Medium	KFN should continue to assess the capacity of the KFN Multipurpose Building to function as the primary reception center for the community in the event of a wildfire. Review current capability to provide emergency support services (ESS). Upgrade or realign resources, as prioritized.	The Multipurpose Building is the community muster location in the event of a tsunami or wildfire.	Klahoose First Nation Funding source to be determined	KFN initiative
4	Medium	KFN and the SRD should renew and/or ratify the Klahoose First Nation Fire Service Agreement for another 5-year term.	The Klahoose First Nation Fire Service Agreement expired in December 2015 and has been renewed on a quarterly basis since. A renewed 5-year agreement will save administrative time and allow for a review of the agreement.	~15-20 SRD hours for contract development ~10 KFN hours and ~10 CIFFA hours for contract review and acceptance KFN/CIFFA/SRD Operational Budgets	KFN/CIFFA/SRD collaboration



## **SECTION 3: VALUES AT RISK**

---

The following section is a description of the extent to which wildfire has the potential to impact the values at risk (VAR) within the AOI. The VAR are the human and natural resources that may be impacted by wildfire and 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 4. Values at Risk within the AOI.



Map 4. Values at Risk within the AOI.



## 3.1 HUMAN LIFE AND SAFETY

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

The population distribution (both people and structures) within the AOI is important in determining the wildfire risk and identifying mitigation activities. Statistics Canada census data of Squirrel Cove records a total population of 65 in 2016, which is a 18.8% decrease from the 2006 population.<sup>18</sup> The average age of the population is 46.6 years old. There are 30 occupied private dwellings in Squirrel Cove. Of this population, the majority of residents are elders and children, which should be considered for evacuation efforts.

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, consultation with the Wildfire Working Group, and access to recent orthophotography has enabled the development a spatial layer with structure locations that accounts for the most recent developments.

## 3.2 CRITICAL INFRASTRUCTURE

Protection of critical infrastructure (CI) during a wildfire event is an important consideration for emergency response effectiveness, ensuring that coordinated evacuation can occur if necessary, and that essential services can be maintained and/or restored quickly in the case of an emergency. 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 includes the Klahoose Multipurpose Building, hatchery, the water treatment plant/pump station and sewage station. A critical infrastructure dataset was built upon though consultation with the Wildfire Working Group and field visits. This data is included in Map 4. Table 6. Critical Infrastructure Identified in CWPP field visit details an inventory of critical infrastructure identified in the AOI

### 3.2.1 Electrical Power

Electrical service for Squirrel Cove is received through a network of transmission and wood pole distribution infrastructure supplied by BC Hydro. 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.<sup>19</sup> An underwater hydro line originating from Lund on the mainland services the entire island of Cortes.

A large fire has the potential to impact electrical service by causing disruption in network distribution through direct or indirect processes. For example, heat from flames or fallen trees associated with a fire

<sup>18</sup> Statistics Canada 2016 -all population, age, and dwelling statistics.

<sup>19</sup> BC Hydro, 2020. *Earthquakes, wildfire, and floods*. Retrieved from: <https://www.bchydro.com/safety-outages/emergency-preparation/natural-disasters.html>



event may cause power outages. Some wooden pole transmission lines have understory brush (i.e., cedar and Scotch broom) and consideration must be given to protecting this critical service and providing power back up at key facilities to ensure that the emergency response functions are reliable. It is recommended that utility right-of-way best management practices such as regular brushing and clearing of branches, woody debris and shrubs continue to be employed to help reduce fire risk, utility pole damage, and subsequent outages.

Secondary power sources are important to reduce critical infrastructure vulnerability in the event of an emergency which cuts power for days, or even weeks. The Multipurpose Building, water treatment facility and sewage station are equipped with backup gas-powered generators. Due to the rural nature and remoteness of Cortes Island, along with the island’s exposure to south/southwesterly winds during winter months, power outages for prolonged periods of time during winter months are common. As such, every dwelling, with the exception of one duplex building, has a wood stove and approximately half of the community has a propane or diesel-powered generator for back-up power. 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.

### 3.2.2 Communications, Pipelines and Municipal Buildings

The primary administrative buildings in the AOI are the Klahoose Multipurpose Building (Klahoose First Nation Administration Office), Health Centre and Fitness Centre. A 15-passenger bus services the community with trips to and from Quadra Island and Campbell River twice each week via BC Ferries sailings. The closest cell tower to Squirrel Cove is on the mainland, north of Lund, so cell service is spotty. There are two radio towers located in Mansons Landing (~8 km southwest of the AOI). Telecommunication distribution lines also rely on wooden poles, increasing the vulnerability of these structures.

A full inventory of critical infrastructure for communications, and community buildings with updated locations is presented in Table 6, below. All critical infrastructure in the AOI is owned and operated by the Klahoose First Nation.

**Table 6. Critical Infrastructure Identified in CWPP field visit**

Critical Infrastructure Type	Location
Klahoose First Nation Multipurpose Building	1790 Tork Road, Squirrel Cove VOP 1T0
Dock	End of Tork Road, Squirrel Cove
Hatchery	Whaletown Road, west of Squirrel Cove
Health Centre	1735 Tork Road, Squirrel Cove
Water station	1668-1670 Tork Road, Squirrel Cove VOP 1T0
Lift station	1668-1670 Tork Road, Squirrel Cove VOP 1T0



### 3.2.3 Water and Sewage

The Klahoose water system was upgraded in March 2020. The system is supplied primarily from groundwater sources and is used for plumbing as well fire hydrants. A new filtration plant treats water so it is potable. Squirrel Cove is the only neighbourhood on Cortes Island equipped with fire hydrants, enhancing their ability to respond to fire events. Klahoose maintenance crews are responsible for hydrant maintenance.

The sewage system is comprised of underground pipe infrastructure and a lift station. During the Wildfire Working Group, it was noted that the current sewage system is due for updates.

**Table 7. Artificial water supply throughout the AOI**

Critical Infrastructure Type	Location
Fire hydrants	Various locations throughout the AOI
Water station	1668-1670 Tork Road, Squirrel Cove VOP 1T0
Lift station	1668-1670 Tork Road, Squirrel Cove VOP 1T0

## 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

There are no designated community watersheds within the AOI, and Squirrel Cove residents are supplied with drinking water from a community well system. Due to their subsurface nature, well water systems are inherently less vulnerable to wildfire effects than surface water systems. However, depending on fire size and severity, there is the potential for significant hydrological impacts to local riparian systems, which may extend for years post-burn.<sup>20</sup> Some areas may have a lower threshold for precipitation triggered events and would be particularly vulnerable to post-wildfire debris flows, mass wasting, landslides, or flooding. This may directly impact the community (i.e., structure loss, risk to public safety) or indirectly, through loss or damage of critical infrastructure, roads, or impacts on the watershed affecting water quality. The low slope gradient of most of the AOI mitigates this risk and no recommendations are made to upgrade the Klahoose drinking water system to increase wildfire resiliency.

### 3.3.2 Cultural Values

Archaeological sites and remains in BC that pre-date 1846 are protected from disturbance, intentional and inadvertent, by the *Heritage Conservation Act* (HCA). The HCA applies on both private and public

<sup>20</sup>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 1<sup>st</sup> Specialty Conference on Disaster Mitigation. Calgary, AB May 23 -26, 2006.



lands but not on federal/First Nation lands; however, it provides guidance that can be helpful to local governments and contractors and contains. 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 there are known overlaps with archeological sites within the AOI, and there is high to moderate potential for previously unidentified archeological sites to exist elsewhere in the AOI. Prior to stand modification for fire hazard reduction, and depending on treatment location, preliminary reconnaissance surveys or archeological impact assessments may be undertaken to ensure that cultural heritage features are not inadvertently damaged or destroyed. These activities would be led by Klahoose First Nation. Fuel treatment activities must include consultation at the site level with Klahoose First Nation and any other First Nations with an identified interest in the area with sufficient time for review and input prior to prescription finalization or implementation.

### 3.3.3 High Environmental Values

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No ecosystem or species at risk occurrences that have been identified through the B.C. Conservation Data Center (CDC) have been observed and recorded within the AOI boundary. A fish-bearing stream runs from west to east, draining to the ocean. The Klahoose Hatchery is located along this creek. Through consultation with the CDC and a biologist or qualified professional, all site level operational plans must identify and mitigate potential impacts to ecosystems or species at risk.

## 3.4 OTHER RESOURCE VALUES

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There are multiple resources values associated with the land base, including timber supply, fisheries, wildlife habitat, drinking water supplies, non-timber forest products, recreation and tourism.

Approximately half of the AOI (147.13 hectares) is comprised of the Klahoose woodlot (#W0090), which is administered by the Klahoose Forestry No. 2 Limited Partnership. There is a second Klahoose woodlot parcel on Crown land in the middle of Cortes Island. Natural resource development within the Klahoose Woodlot is a major economy driver for Klahoose First Nation. Fuel reduction treatments proposed within the Klahoose woodlot 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. However, there is a potential opportunity for the proposed fuel break within the woodlot to be commercial harvested (commercial thinning).

## 3.5 HAZARDOUS VALUES

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Hazardous values are defined as values that pose a safety hazard to emergency responders. Anywhere combustible materials, explosive chemicals, or gas is stored can be considered a hazardous value.



Protecting hazardous values from fires is important to preventing interface fire disasters. The Klahoose mill is considered a hazardous value due to the accumulation of combustible woody debris and wood products. In addition, small amounts of propane and diesel for back-up generators are stored throughout the AOI. FireSmart storage of these combustible materials should be encouraged.

## SECTION 4: WILDFIRE THREAT AND RISK

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

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

$$\textit{Wildfire risk} = \textit{Probability} \times \textit{Consequence}$$

Where:

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

### 4.1 FIRE REGIME, FIRE WEATHER AND CLIMATE CHANGE

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

#### 4.1.1 Fire Regime and Fire Weather

##### *Historic Fire Regime*

The Biogeoclimatic Ecosystem Classification (BEC) system classifies the province into zones by vegetation, soils, and climate. Regional subzones are derived from relative precipitation and temperature. Subzones may be further divided into variants based upon climatic variation and the resulting changes in the vegetative communities; variants are generally slightly drier, wetter, snowier, warmer, or colder than the climate of the regional subzone.<sup>21</sup> BEC zones have been used to classify the Province into five Natural Disturbance Types (NDTs). NDTs have influenced the vegetation dynamics and ecological functions and pathways that determine many of the characteristics of our natural systems. The NDT classification is based on the frequency and severity of pre-European disturbance events (including but limited to wildfires) and provides an indication of historical fire regime. The physical and

<sup>21</sup>BECWeb. *Zone and Subzone Descriptions*. Retrieved from: <https://www.for.gov.bc.ca/HRE/becweb/resources/classificationreports/subzones/index.html>



temporal patterns, structural complexity, vegetation communities, and other resultant attributes of NDT types should be used to help design fuel treatments, and where possible, to help ensure that treatments are ecologically and socially acceptable.<sup>22</sup> The AOI is characterized by the BEC subzone and associated NDT as outlined in Table 8, Table 9 and Map 5.

**Table 8. BEC zones and natural disturbance types found within the AOI<sup>23</sup>.**

Biogeoclimatic Zone	Natural Disturbance Type	Area (ha)	Percent (%)
CWHxm1: Coastal Western Hemlock, Very Dry Maritime	NDT2	300.45	100%

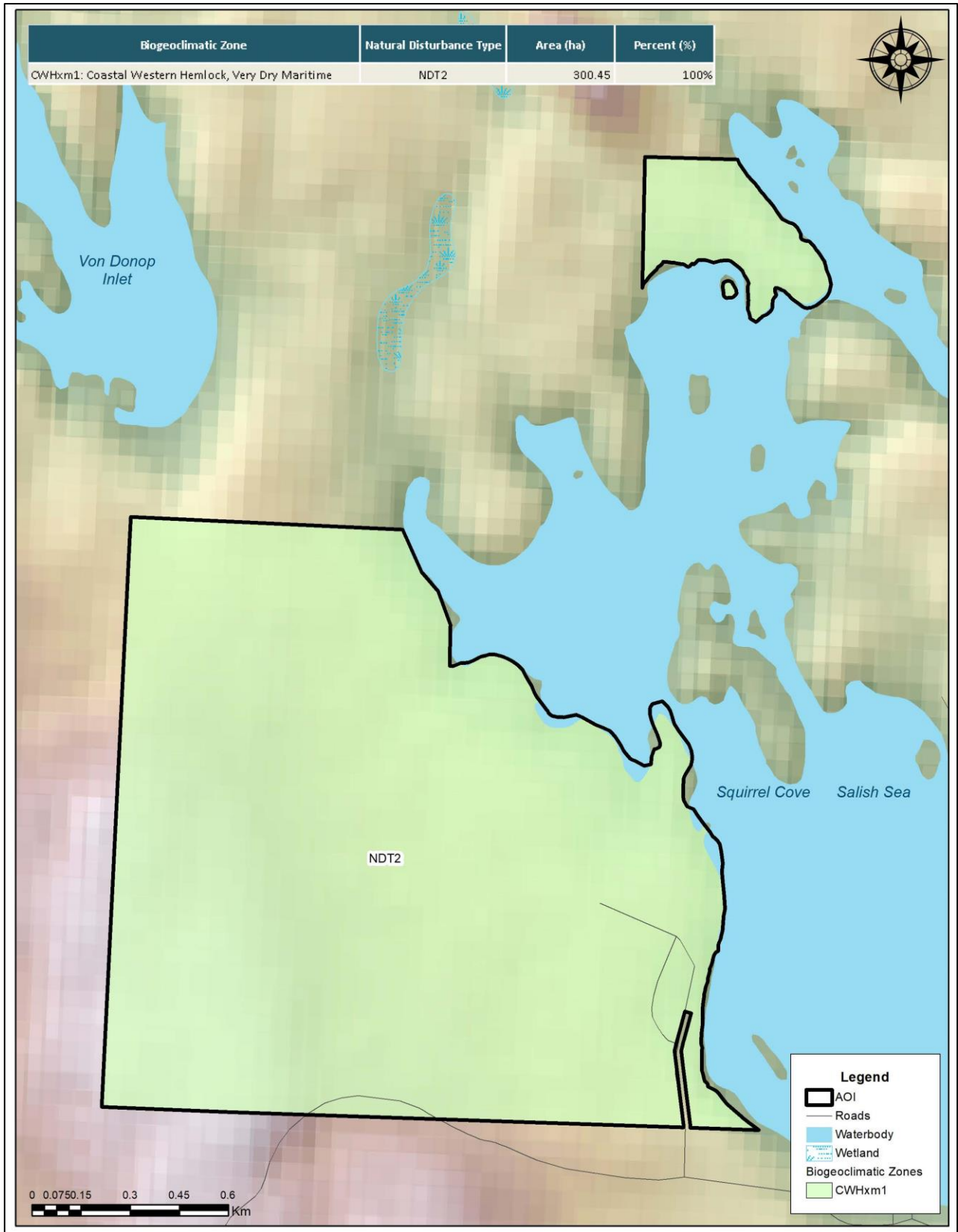
The AOI is entirely characterized as Natural Disturbance Type 2 (NDT2): ecosystems with infrequent stand-initiating events. NDT2 ecosystems can be generalized as even-aged forest stands with extended post-fire regeneration periods. As a result, uneven-aged tendencies (i.e., patch dynamics) can occur when forested areas remain undisturbed for significant periods of time. Fires are often moderate in size (20 – 1000 hectares), with unburned areas resulted from sheltering terrain features and high site moisture. Fires have historically resulted in a a mosaic of mature forests across the landscape interspersed with younger forests. The mean return interval for fires and other disturbances in the NDT2 has generally been 200 years. The fire regime in the CWHxm1 has been modified by human activities during the last century, which include forest harvesting and fire suppression.<sup>11</sup>

While natural disturbance regimes are useful for describing the historical disturbance pattern typical for an area, fire history is complex and highly variable across space and time for many ecosystems.<sup>24</sup> Furthermore, forest health issues, human development and natural events contribute to changes in the fire regime, forest attributes and fuel hazard around the community.

<sup>22</sup> Province of British Columbia, 1995. Biodiversity Guidebook.

<sup>23</sup> MFLNRORD BEC Map (DataBC)

<sup>24</sup> Hall, E. 2010. Maintaining Fire in British Columbia's Ecosystems: An Ecological Perspective. Report submitted to the Wildfire Management Branch, Ministry of Forests and Range.



Map 5. Biogeoclimatic Zones and natural disturbance regimes within the AOI.



### ***Forest Health Issues***

The 2015-2017 Coastal Timber Supply Areas Forest Health Overview outlines forest health issues and best management practices by Natural Resource District. The Sunshine Coast District is applicable to the AOI.<sup>25</sup> In comparison to other coastal regions, the Sunshine Coast District's timber supply loss due to pests and abiotic damaging agents is minor. Damaging agents responsible for the most significant annual unsalvageable loss throughout the District include Western blackheaded budworm and episodic windthrow events. In drier regions of the District, laminated root rot may be present in young Douglas-fir stands.

These forest health factors have implications for the level of surface fuel accumulation in affected stands, as well as access and working conditions for fire fighters in the event of wildfire. Standing dead and downed Douglas fir and hemlock were observed during the field visit and contributed to the hazard rating of some stands.

### ***Human Development and Natural Events***

Land cover change in the AOI is minor and can be described as interface development. Forest harvesting occurs in the Klahoose woodlot on Cortes Island but none currently on the portion contained within the AOI. Forest harvesting and land clearing generally increases the slash (S-1 to S-3) and mixed conifer/deciduous (M-1/2) fuel types on the landscape as stand development occurs. Interface development in the AOI is concentrated in Squirrel Cove along Tork Road, adjacent to the ocean. The overall implication of human development is an increase in human ignition potential and an increase in interface and intermixed development areas.

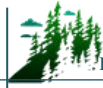
### ***Fire Weather Rating***

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 local governments to monitor fire weather, restrict high risk activities when appropriate, and to determine hazard ratings associated with bans and closures.

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

- **Class 1 (Very Low):** Fires are likely to be self-extinguishing and new ignitions are unlikely. Any existing fires are limited to smoldering in deep, drier layers.
- **Class 2 (Low):** Creeping or gentle surface fires. Ground crews easily contain fires with pumps and hand tools.

<sup>25</sup> BC FLNRORD. 2015. *Coast Area: 2015-17 Coastal Timber Supply Areas Forest Health Overview*. Retrieved from: [https://www.for.gov.bc.ca/ftp/HFP/external/!publish/Forest\\_Health/TSA\\_FH\\_Strategies/2015-Coast%20FH%20Strategy.pdf](https://www.for.gov.bc.ca/ftp/HFP/external/!publish/Forest_Health/TSA_FH_Strategies/2015-Coast%20FH%20Strategy.pdf)



- **Class 3 (Moderate):** Moderate to vigorous surface fires with intermittent crown involvement. They are challenging for ground crews to handle; heavy equipment (bulldozers, tanker trucks, and aircraft) are often required to contain these fires.
- **Class 4 (High):** High-intensity fires with partial to full crown involvement. Head fire conditions are beyond the ability of ground crews; air attack with retardant is required to effectively attack the fire's head.
- **Class 5 (Extreme):** Fires with fast spreading, high-intensity crown fire. These fires are very difficult to control. Suppression actions are limited to flanks, with only indirect actions possible against the fire's head.

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

Figure 1 displays the average frequency of danger class days between the months of April and October. The data summarized comes from the TS Maurelle BCWS weather station, which is located on Maurelle Island and provides a 10-year fire weather data collection interval for the AOI. See Figure 2 for BCWS weather stations surrounding the AOI. According to Figure 1, fire weather in the AOI is the highest from July to September. There is an average of 8-16 days with 'high' or 'extreme' danger class days during each of these months. August has the most severe fire weather on average, with 16 days of high, or extreme fire danger. There are historically 3-7 'high' danger class days each in May, June, September, and October, demonstrating the potential for ignitions during warm and dry periods in the early summer and fall.

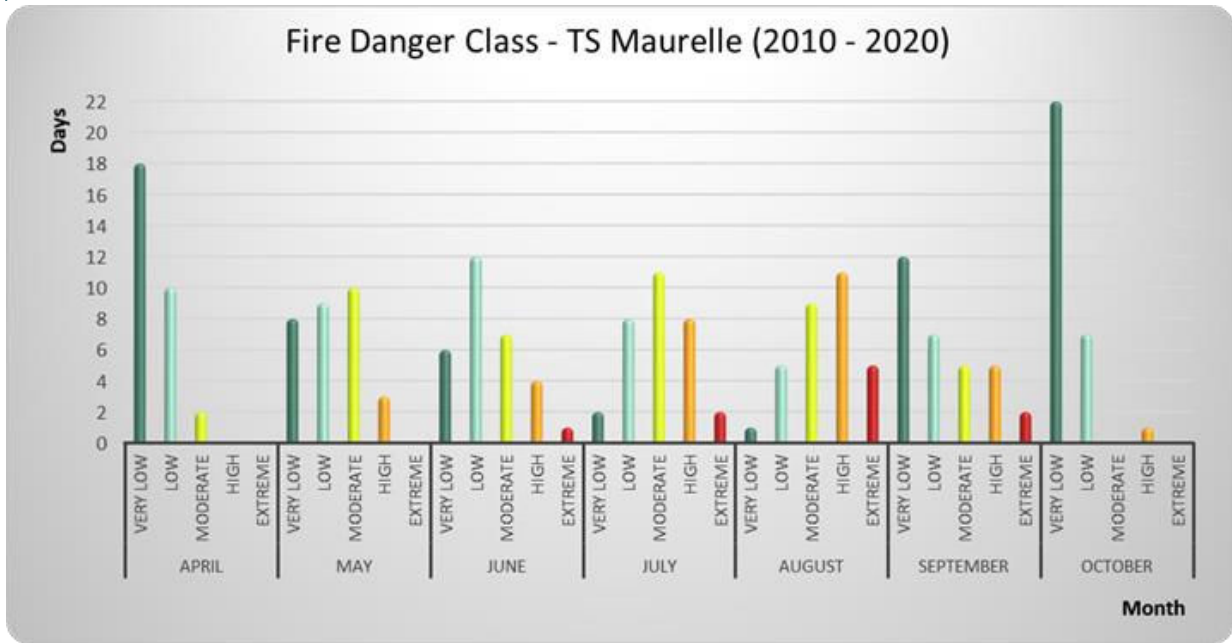


Figure 1. Average number of danger class days for the TS Maurelle fire weather station. Summary of fire weather data for the years 2010-2020.

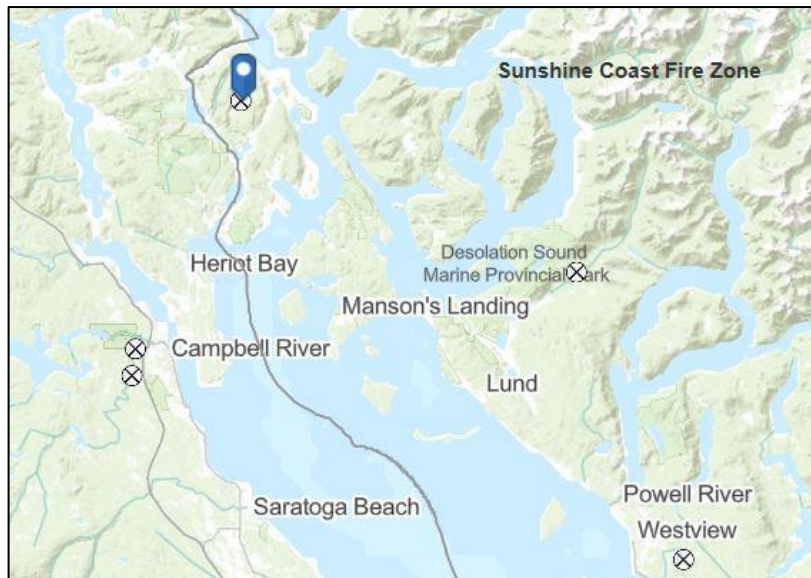


Figure 2. BCWS fire weather stations located in the Sunshine Coast Fire Zone and surrounding areas. TS Maurelle fire weather station is highlighted.

### 4.1.2 Climate Change

Climate change is a serious and complex aspect to consider in wildfire management planning. Numerous studies outline the nature of climate change impacts on wildland fire across Canada, and globally.<sup>26</sup>

<sup>26</sup> Flannigan, M.D et al. 2009. *Implications of changing climate for global wildland fire*. International Journal of Wildland Fire 18, 483-507.



Although there are uncertainties regarding the extent of these impacts on wildfire, it is clear that the frequency, intensity, severity, duration and timing of wildfire and other natural disturbances is expected to be altered significantly with the changing climate.<sup>27</sup> Despite the uncertainties, trends within the data are visible.

As outlined the *Climate Summary for the West Coast*<sup>28</sup> the following large-scale climate predictions for the West Coast of BC are made, including Cortes Island:

- Year-round moderate increases in temperature (an increase in mean temperature of 1.4° C by the 2050s)
- Decline in summer precipitation by approximately 10% by the 2050s. This trend is associated with drier fuels and soils, increasing fire behaviour potential.
- Increase in precipitation in other seasons - annual average of +6% by 2050s.
- A decrease in snowfall of 28% in the winter and 51% in the spring by the 2050s. Maritime watersheds that shift from rain/snow-driven to rain-driven hydrological regime will likely experience the greatest shift in flow patterns, and resultant soil and groundwater storage.<sup>29</sup>
- An additional 22 frost-free days and +327 growing degree days by the 2050s.

An increased frequency of natural disturbance events is expected to occur as a result of climate change with coincident impacts to ecosystems.<sup>32, 30</sup> These include:

- Storm events, including catastrophic blowdown and damage to trees from high winds;
- Wildfire events and drought;
- Increased winter precipitation which may result in slope instability, mass wasting, increased peak flows (loss of forest cover from fire or other disturbance may increase the chance of mass wasting) and;
- Severe river flooding and severe coastal storm surges, although these events are less likely to occur than preceding impacts.

Other research regarding the intricacies of climate change and potential impacts on wildfire threats to Canadian forests has found that:

- Fuel moisture is highly sensitive to temperature change and projected precipitation increases will be insufficient to counteract the impacts of the projected increase in temperature. Results conclude that future conditions will include drier fuels and a higher frequency of extreme fire weather days.<sup>31</sup>

<sup>27</sup> Dale, V., L. Joyce, S. McNulty, R. Neilson, M. Ayres, M. Flannigan, P. Hanson, L. Irland, A. Lugo, C. Peterson, D. Simberloff, F. Swanson, B. Stocks, B. Wotton. *Climate Change and Forest Disturbances*. BioScience 2001 51 (9), 723-734.

<sup>28</sup> Pacific Climate Impacts Consortium. *Climate Summary- West Coast*. 2013.

[https://pacificclimate.org/sites/default/files/publications/Climate\\_Summary-West\\_Coast.pdf](https://pacificclimate.org/sites/default/files/publications/Climate_Summary-West_Coast.pdf)

<sup>29</sup> MFLNRO, 2016. BC Provincial Government extension note *Adapting natural resource management to climate change in the West and South Coast Regions*. Retrieved from: <https://www2.gov.bc.ca/assets/gov/environment/natural-resource-stewardship/nrs-climate-change/regional-extension-notes/coasten160222.pdf>

<sup>30</sup> BC Provincial Government. 2020. *Preliminary Strategic Climate Risk Assessment*. Retrieved from:

<https://www2.gov.bc.ca/gov/content/environment/climate-change/adaptation/risk-assessment>

<sup>31</sup> Flannigan, M.D., B.M. Wotton, G.A. Marshall, W.J. deGroot, J. Johnston, N. Jurko, A.S. Cantin. 2016. *Fuel moisture sensitivity to temperature and precipitation: climate change implications*. *Climatic Change* (2016) 134: 59 -71. Retrieved from: <https://link.springer.com/content/pdf/10.1007%2Fs10584-015-1521-0.pdf>.



- 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.<sup>32</sup> 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.<sup>33, 34</sup>
- Incidence of foliar and stem pests and diseases such as spruce beetles, swiss needle cast, and western hemlock loopers may become more frequent in response to changes in season moisture.

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

## 4.2 PROVINCIAL STRATEGIC THREAT ANALYSIS

The BCWS Provincial Strategic Threat Analysis (PSTA) evaluates multiple datasets to provide a coarse (high-level) spatial representation of approximate relative wildfire threats across BC. It provides a starting point to assess the local wildfire threat. Three inputs are combined to create the PSTA wildfire threat analysis component:<sup>35</sup>

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

<sup>32</sup> deGroot, W. J., M. D. Flannigan, A.S. Cantin. 2013. *Climate change impacts on future boreal fire regimes*. Forest Ecology and Management. 294: 35 -44.

<sup>33</sup> Flannigan, M.D., A.S. Cantin, W.J. de Groot, M. Wotton, A. Newbery, L.M. Gowman. 2013. *Global wildland fire season severity in the 21<sup>st</sup> century*. Forest Ecology and Management (2013) 294: 54 - 61.

<sup>34</sup> Jandt, R. 2013. *Alaska Fire Science Consortium Research Brief 2013-3*.

<sup>35</sup> 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](ftp://ftp.for.gov.bc.ca/HPR/external/publish/PSTA/Documents/Provincial%20Strategic%20Threat%20Analysis_2017%20Update.pdf).



be to suppress. The HFI used in the wildfire threat analysis was developed using the 90<sup>th</sup> percentile fire weather index value.

The final wildfire threat analysis value was developed through an average weighting process of the aforementioned three layers.<sup>36</sup> The values were then separated into 10 classes (1 – 10) which represent increasing levels of overall fire threat (the higher the number, the greater the fire threat); threat class 7 is considered the threshold. Threat classes of 7 and higher are locations where the threat is severe enough to potentially cause catastrophic losses in any given fire season, when overlapping with values at risk. Classes were grouped into the following general threat class descriptions: low (1 – 3); moderate (4 – 6); high (7 – 8); and, extreme (9 – 10).

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

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

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

The fire threat ratings from the 2019 PSTA are summarized for the AOI in Table 9 and spatially illustrated in Map 6 . Low threat areas cover 24% of the AOI and water covers 1%. Approximately 75% of the AOI is categorized as having a moderate wildfire threat rating in the provincial Wildfire Threat Analysis (Table 9). There are no areas rated as high or extreme threat in the study area.

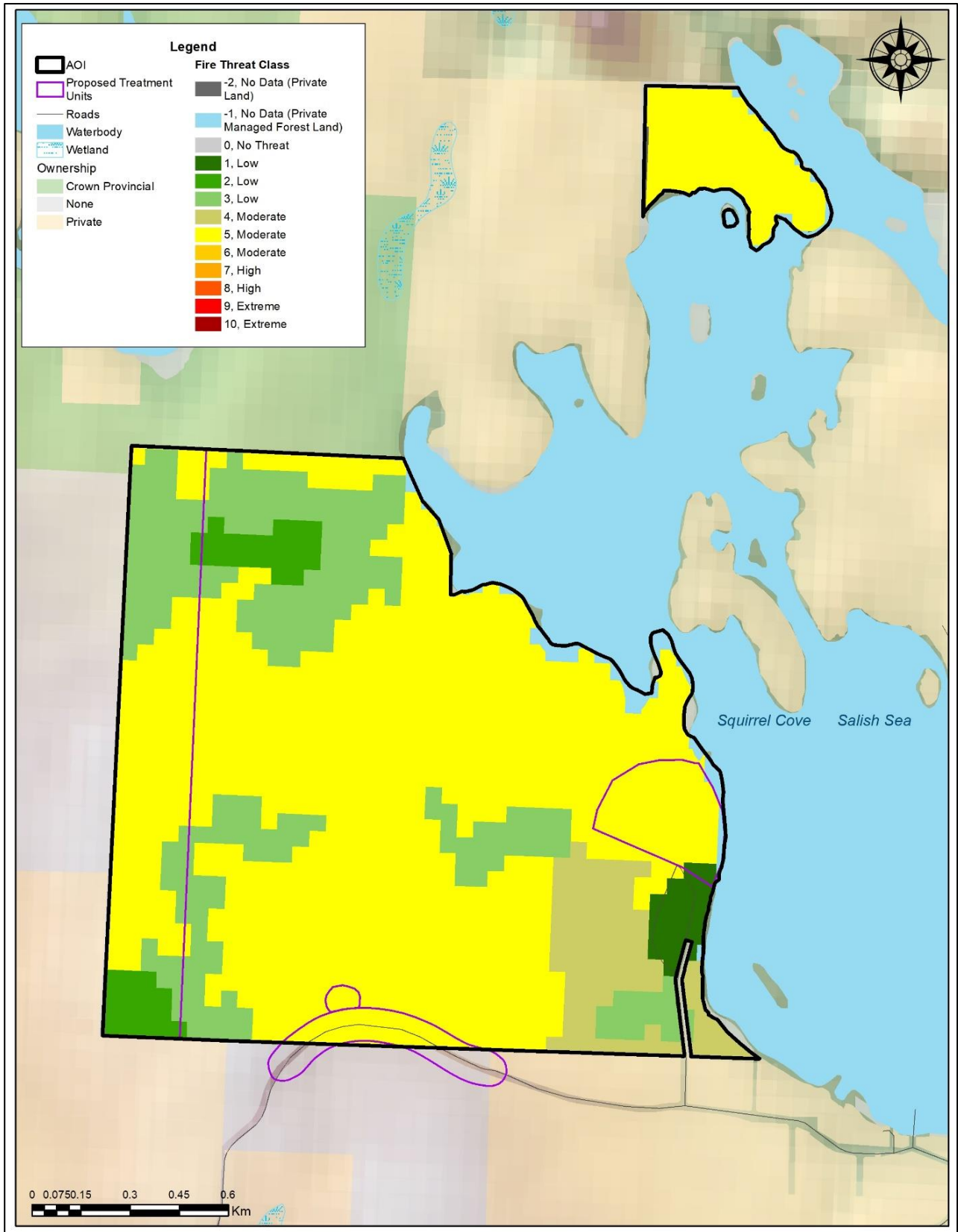
**Table 9. Overall PSTA Wildfire Threat Analysis for the AOI (rounded to the nearest hectare).**

Threat Class	Area (ha)	Threat Class Description	Percent of AOI
-3	0.0	No Data (Private Land)	0%
-2	0.7	No Data (Private Managed Forest Land)	0%
-1	4.2	Water	1%
0	0.0	No Threat	0%
1	4.7	Low	24%
2	9.5		
3	57.0		
4	18.4	Moderate	75%

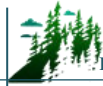
<sup>36</sup> Weighting of the three PSTA wildfire threat analysis components: Fire density 30%; HFI 60%; spotting impact 10% (water bodies were automatically given a value of ‘no threat’ [-1])



Threat Class	Area (ha)	Threat Class Description	Percent of AOI
5	205.9		
6	0.0		
7	0.0	High	0%
8	0.0		
9	0.0	Extreme	0%
10	0.0		
<b>Total</b>	300.4	-	<b>100%</b>



Map 6. Provincial Strategic Threat Rating



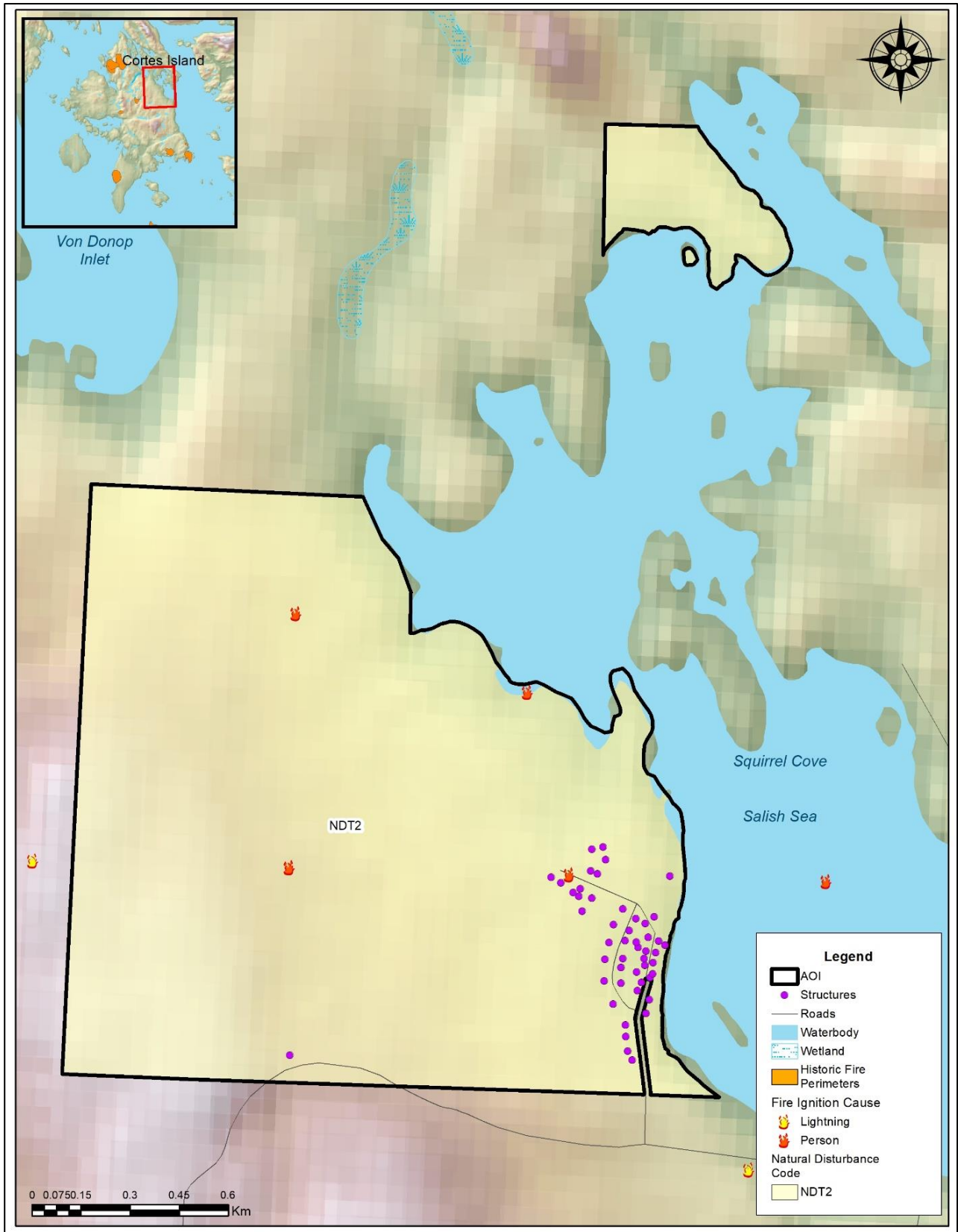
#### 4.2.1 Fire History

Fire ignition and perimeter data are depicted in Map 7. The following PSTA fire ignition data is available from 1950-2018 and fire perimeter data is available from 1919-2018 for the area. Based on the BCWS historical wildfire dataset, several fire ignitions have occurred within the AOI, however, no substantial fires were represented by the PSTA fire perimeter data. This ignition data shows that within the AOI, 100% of ignitions since 1950 have been human-caused. Open burning was identified by BCWS as the cause of most human-caused ignitions. Lightning caused fire ignitions adjacent to the AOI occurred in 1975 and 1996.

No significant stand-replacing fires have occurred on Cortes Island, however much larger historical fires have occurred in neighboring jurisdictions of the SRD. Quadra Island has experienced much more fire activity with a 1925 fire burning approximately 58% of the island at 15, 908 hectares (ha) in size. Likewise, the Sayward fire of 1938 on Vancouver Island burned approximately 25, 000 ha and profoundly impacted the region. These fires occurred in similar fuels and within the same regional climate, suggesting that in the absence of active fire suppression, the AOI is capable of supporting similar fires during prolonged ignition periods of high to extreme fire danger.

BCWS has limited capabilities of monitoring and enforcing slash piling and slash burning on commercially harvested forest land on Cortes Island due to the remoteness of the island and the lack of a BCWS fire base. Although there have been no cited issues with Wildfire Act compliance, piled slash/timber accumulations were noted at the Klahoose mill that pose a wildfire hazard to the community during the fire season.

It was noted by the Wildfire Working Group that residents are relatively diligent when burning yard waste, often utilizing burn barrels or burning debris in rock circles at the public beach, however the potential of escaping fires does exist. Expanding the SRD driveway chipping program initiated in 2020 to include Squirrel Cove, and continuing with yard maintenance work will help mitigate this risk.



Map 7. Fire Regime, Ecology and Climate Change.



## 4.3 LOCAL WILDFIRE THREAT ASSESSMENT

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

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

WUI Threat Assessments were completed over one field day in July of 2020, in conjunction with verification of fuel types (see Appendix C – Wildfire Threat Assessment Worksheets and Photos). WUI Threat Assessments were completed in interface (i.e., abrupt change from forest to residential development) and intermix (i.e., where forest and structures are intermingled) areas of the AOI to support development of priority treatment areas, and in order to confidently ascribe threat to polygons which may not have been visited or plotted, but which have similar fuel, topographic, and proximity to structure characteristics to those that were.

Field assessment locations were prioritized based upon:

- 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, especially in potential locations for landscape-level fuel breaks.
- Local knowledge – Areas identified as hazardous, potentially hazardous, with limited access/egress, or otherwise of particular concern as vulnerable to wildfire, as communicated by local fire officials and community forest representatives
- Observations – Additional areas potentially not recognized prior to field work were visually identified as hazardous and assessed during the week.
- Verifying provincial classification – areas classified as high threat in the provincial PSTA dataset, or with an uncommon fuel type, were assessed to ground-truth the fuel type and threat, even if they were relatively far from values

A total of 8 WUI threat plots were completed and over 40 other field stops (e.g., qualitative notes, fuel type verification, and/or photograph documentation) were made across the AOI (see Appendix F for

WUI threat plot locations). Although plots were concentrated in the areas listed above, observations were made in all parts of the AOI that had road or trail access, in order to build the most accurate assessment of local fire risk possible. It should be noted that Squirrel Cove 8 is boat access only and was not assessed in the field due to limited access, and distance from the community. The parcel is used primarily for fisheries and there no homes in this area.

Using the verified and updated fuel types (Appendix A-1, Map 10) combined with field wildfire threat assessments and office-based analysis (Appendix A-1 to A-4), local wildfire threat for the AOI was updated. Using the Wildfire Threat Assessment methodology,<sup>37</sup> 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 and moderate threat class stands, with two isolated high threat class stands; the variability in wildfire threat is dictated primarily by the level of natural and anthropogenic disturbances that have historically occurred and persist on the land base. The AOI is 2% high threat class rating, 74% moderate, 24% low and <1% very low/water (Table 10). Table 10 also indicates the differences between the original PSTA threat rating and this CWPP’s corrected fire behaviour threat.

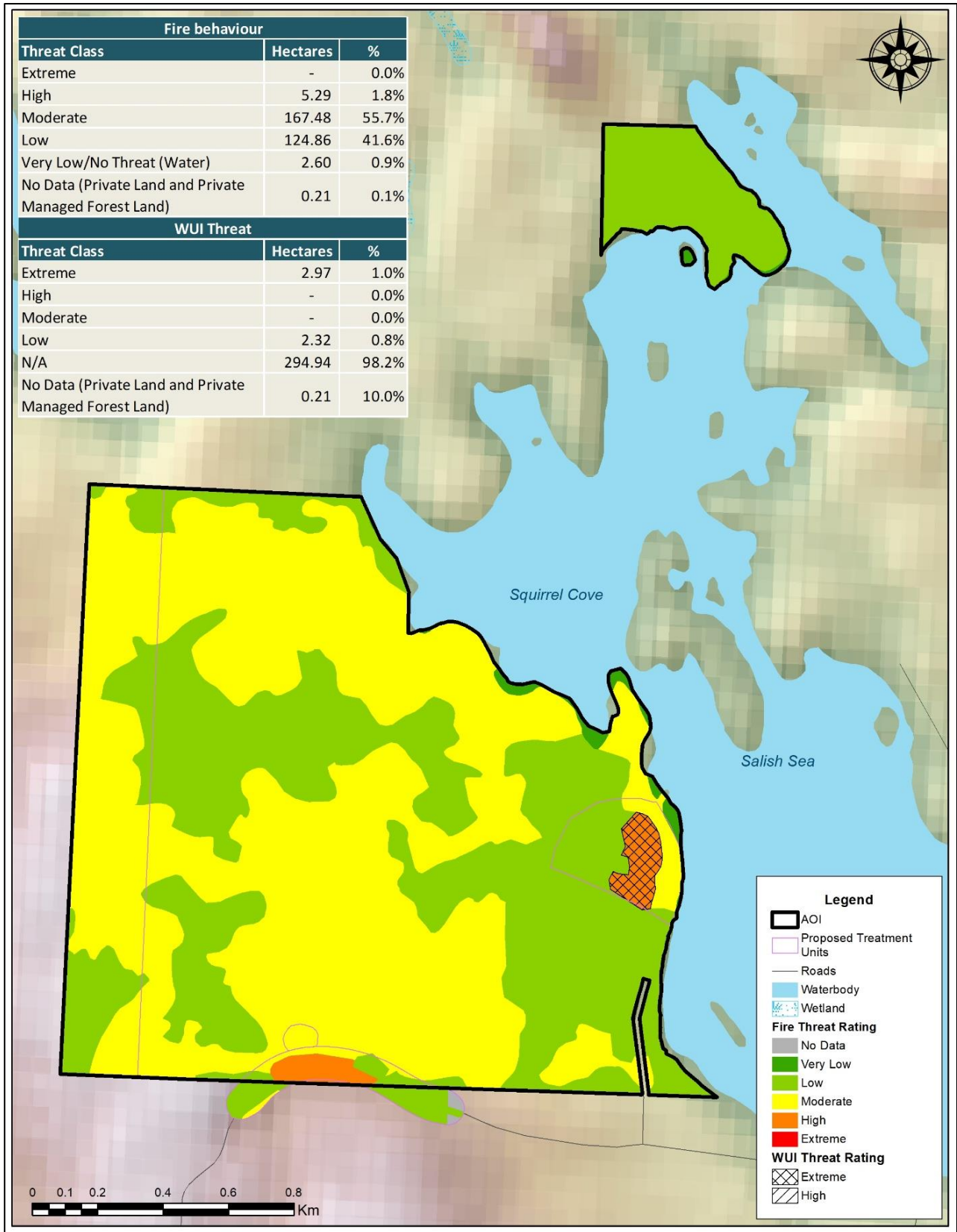
Moderate threat ratings exist throughout the AOI. However, the greatest risk to values within the Klahoose First Nation are in areas of high threat class surrounding the Multipurpose Building and along Squirrel Cove Road. These areas are associated with denser, conifer-dominated forest stands.

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

**Table 10. Fire behaviour threat summary for the AOI.**

Wildfire Behaviour Threat Class	2019 PSTA Data	2020 CWPP
	Percent of AOI	Percent of AOI
Extreme	0%	0%
High	0%	2%
Moderate	74%	56%
Low	24%	42%
Very Low/ No Threat (Water)	1%	1%
No Data (Private Land and Private Managed Forest Land)	0%	0%

<sup>37</sup> UBCM. 2013. *Wildland Urban Interface Threat Assessments in BC*. Retrieved from: <https://www.ubcm.ca/assets/Funding~Programs/LGPS/SWPI/Resources/swpi-WUI-WTA-Guide-2012-Update.pdf>



Map 8. Local Fire Behaviour Threat Rating and WUI Threat Rating.



## SECTION 5: RISK MANAGEMENT AND MITIGATION FACTORS

Development of a successful wildfire risk mitigation strategy is dependent on hazard identification within the community, which accounts for forest fuels, high risk activities, frequency and type of human use, and other important environmental factors. The resulting wildfire risk management and mitigation strategy aims to build more resilient communities and produces strategic recommendations or actionable items that can be categorized as follows:

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

### 5.1 FUEL MANAGEMENT

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

The objectives for fuel management are to:

- Reduce wildfire threat on land 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 are reduced (create more fire resilient landscapes).

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

Fuel management on First Nations land and provincial Crown land may be funded by the Union of BC Municipalities (UBCM) through the Community Resiliency Investment (CRI) Program (subject to current program requirements) and by the Wildfire Risk Reduction Program, administered by MFLNRORD.<sup>38</sup> The CRI Program (formerly the Strategic Wildfire Prevention Initiative or SWPI) also provides funding for selected FireSmart activities and planning on private land (subject to program requirements and limits).

The fuel treatment opportunities identified in this document include the use of interface and landscape fuel breaks as defined in Section 5.1.1, to reduce the wildfire potential around the AOI. Potential

<sup>38</sup>2019. *CRI FireSmart Community Funding & Supports – Program & Application Guide*. Retrieved from: <https://www.ubcm.ca/assets/Funding~Programs/LGPS/CRI/cri-2019-program-guide.pdf>



treatment activities include commercial or non-commercial thinning, stand conversion, pruning, surface fuel removal, pile burning, chipping, prescribed burning, or a combination of two or more of these activities.

### 5.1.1 Proposed Treatment Units

Funding opportunities from UBCM under the 2021 CRI Program, specifically under the FireSmart Community Funding and Supports program, will consider fuel management activities on local government land (First Nations, municipal, or Regional District parks). Fuel treatments that represent contiguous, logical units that extend onto Crown land or outside of local government boundaries may also be considered for funding through the CRI Program if the fuel management activities are adjacent to community structures and the units extend no further than 1 km from the structure density threshold (density class greater than 6). Eligible activities include development of fuel management prescriptions and burn plans, as well as operational implementation of those plans (treatments or prescribed burns).<sup>39</sup>

Funding for fuel treatments located exclusively on Crown land, outside of municipal boundaries, Regional District parks or First Nations land is administered through MFLNRORD under the Crown Land Wildfire Risk Reduction (WRR) program.<sup>40</sup> No candidate WRR units are proposed here.

The potential treatment areas represent moderate, high or extreme fire hazard areas on Klahoose First Nation land which are close to values at risk (structures or infrastructure), or have been identified as landscape level fuel breaks. One fuel break is identified that extends outside of the AOI onto Crown land (Cortes Community Forest tenure). Any CRI Program applications for prescribing and treating this unit must take into account this mixed ownership. Prescription funding for this unit was applied for in the Fall of 2020. All polygons identified for potential treatment have been prioritized based on fire hazard, operational feasibility, type and number of values at risk, and common fire weather (wind direction).

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. Prescription development must be carried out by a qualified forest professional and will require detailed site-level assessment to stratify treatment areas (and areas of no treatment), identify values and constraints, and identify and engage all appropriate provincial agencies and any stakeholders in addition to Klahoose First Nation.

Recommended potential treatment areas within the AOI are outlined in Table 11 and displayed in Map 9. Fuel treatment opportunities may be a fuel breaks (linear, beginning and ending at an anchor point, and a minimum of 1 km where possible) or polygon treatments (not necessarily forming a continuous fuel break unit or anchored into an anchor point).

The intent of establishing a fuel break or fuel polygon 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, but should be designed to

<sup>39</sup> The 2021 CRI program guide is available at <https://www.ubcm.ca/EN/main/funding/lgps/community-resiliency-investment.html>

<sup>40</sup> The 2020 -2021 Crown Land Wildfire Risk Reduction Planning Guide is available at <https://www2.gov.bc.ca/gov/content/safety/wildfire-status/prevention/funding-for-wildfire-prevention/crip/wrr>.



transition and keep a crown fire on the ground where wildfire crews have suppression opportunities.<sup>41</sup> 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 be applied to structures and surrounding vegetation to reduce the risk of structures igniting from a spot fire. Fuel treatment units require periodic maintenance to retain their effectiveness.

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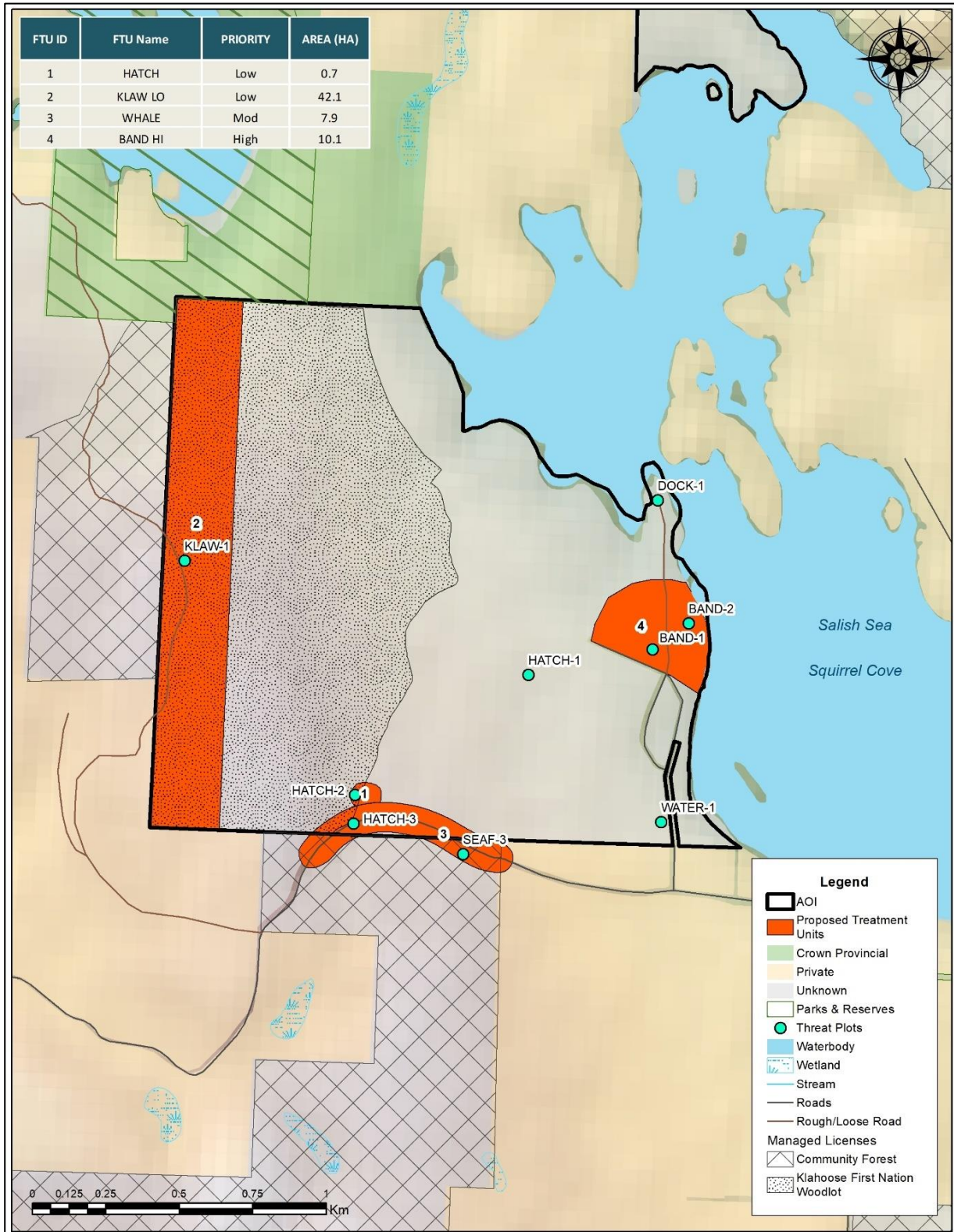
<sup>41</sup> BC Wildfire Service. 2020. *2020 Fuel Management Prescription Guidance*. Retrieved from: [https://www2.gov.bc.ca/assets/gov/public-safety-and-emergency-services/wildfire-status/prevention/fire-fuel-management/fuels-management/2020\\_fuel\\_management\\_prescription\\_guidance\\_final.pdf](https://www2.gov.bc.ca/assets/gov/public-safety-and-emergency-services/wildfire-status/prevention/fire-fuel-management/fuels-management/2020_fuel_management_prescription_guidance_final.pdf)

**Table 11. Proposed Treatment Area Summary Table.**

FTU ID	FTU Name & Priority	Total Area (ha)	Treatment Unit Type/ Objective	Wildfire Behaviour Threat				Overlapping Values / Treatment Constraints	Treatment Rationale
				High	Mod	Low	Very Low		
1	HATCH LO	0.7	Interface Fuel Break – Community Zone	0.0	0.7	0.0	0.0	This FTU partially overlaps the Klahoose First Nation Woodlot. The unit encompasses the Klahoose First Nation Hatchery. Prior to treatment implementation, managers of the woodlot and the hatchery should be consulted so that treatment is integrated with operational planning, and impacts to values can be prevented or mitigated.	This unit encompasses the Klahoose First Nation Hatchery, which was identified as critical infrastructure for the community. The unit is entirely composed of M-1/2 (50% conifer) fuel types. Standing dead Douglas-fir, moderate ladder fuel continuity and debris accumulation characterize the unit. Treat to protect the hatchery and to reduce debris accumulation and ladder fuels.
2	KLAW LO	42.1	Landscape Fuel Break – Community Zone	0.0	30.9	11.2	0.0	This FTU overlaps the Klahoose First Nation Woodlot. Private land abuts the unit to the west and southwest, and Hathayium Marine Provincial Park abuts the unit to the north. Prior to treatment implementation, adjacent private land holders, the Cortes Community Forest, and the woodlot managers should be consulted so that treatment is integrated with licensee planning, and impacts to values can be prevented or mitigated.	This unit is located ~1 km upwind of the Squirrel Cove village and is a buffer on the western IR boundary. Treatment will create a large interface north to south fuel break for the community. The unit is a mosaic of C-5 and M-1/2 (50% conifer) fuel types. Treat due to location direct upwind of values and to reduce density and crown continuity; consider commercial thinning.
3	WHALE MOD	7.9	Landscape Fuel Break – Landscape/Community Zone	2.2	1.2	4.3	0.3	This FTU partially overlaps the Cortes Island Community Forest and the Klahoose First Nation Woodlot. The unit extends beyond the Klahoose First Nation AOI onto Crown land. The unit is bordered by private land to the east. BC Hydro overhead lines fall within the unit. Prior to treatment, adjacent private land owners, the Cortes Community Forest, Klahoose First Nation Woodlot and BC Hydro should be consulted so that treatment is integrated with licensee planning, and	This unit is a roadside buffer along Whaletown Road. The unit is comprised of C-3, D-1/2, C-5 and M-1/2 (50% conifer) fuel types. There are high densities of live and dead hemlock saplings and suspended dead fuels throughout the site. Treatment would improve safety of Whaletown as a primary access/egress route for Squirrel Cove.



FTU ID	FTU Name & Priority	Total Area (ha)	Treatment Unit Type/ Objective	Wildfire Behaviour Threat				Overlapping Values / Treatment Constraints	Treatment Rationale
				High	Mod	Low	Very Low		
								impacts to values can be prevented or mitigated.	
4	BAND HI	10.1	Interface Fuel Break – Community Zone	2.9	2.3	4.8	0.0	This FTU encompasses the Klahoose First Nation Multipurpose Building (CI). The unit is adjacent to BC Hydro overhead lines. Multiple structures fall within the unit. Prior to treatment, careful consideration of public safety must be considered.	This unit is a FireSmart vegetation treatment surrounding critical infrastructure. The unit contains C-5 and C-3 fuel types, low crown base heights, and high surface fuel loading across all size classes. Continuous ladder fuels and suspended dead fuels exist throughout stand. Treat due to the importance of the Klahoose Multipurpose Building for community resilience and emergency response.



Map 9. Proposed Fuel Treatments.

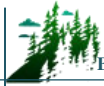


### 5.1.2 Maintenance of Previously Treated Areas

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The return interval for maintenance of treatment units 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. Maintenance activities may include additional thinning, conifer regeneration reduction, or removal of excess woody debris generated over time from windthrow or other disturbance.

Dense regeneration of conifers was observed in mesic to wet sites that were historically cleared on Cortes Island, or where canopy openings allowed sufficient sunlight penetration. Maintaining crown closure in the fuel treatment implementation phase will be an important factor in maximizing intervals between maintenance treatments, especially on flatter, productive sites where growth is limited by light, not moisture.



**Table 12. Summary of Fuel Management Recommendations.**

Document Section 5.1 Fuel Management					
Item	Priority	Recommendation / Action	Rationale	Estimated Cost (\$ or Person Hours)	Resources
5	High	Proceed with detailed assessment, prescription development and treatment of fuel treatment units identified and prioritized in this CWPP.	Reduce wildfire hazard in priority treatment units.	UBCM/FNESS CRI Program funding	KFN initiative SRD may support (regional application)
6	Medium	When operational fuel treatments are conducted, treatment monitoring 5-10 years out should be completed by a qualified professional to assess the efficacy of the treatment and to schedule maintenance activities. This can be completed with a CWPP update or as a stand-alone exercise.	Assess the efficacy of the treatment and to schedule maintenance activities. It is cheaper to perform maintenance early, when regeneration is small.	UBCM/FNESS CRI Program funding/Local Government funding	KFN initiative SRD may support (regional application)
7	Medium	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 Island'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 years.	A current (i.e., no more than 5 years old) CWPP is currently a requirement for further funding under the CRI Program.	UBCM/FNESS CRI Program funding	KFN initiative SRD may support (regional application)



Document Section 5.1 Fuel Management					
Item	Priority	Recommendation / Action	Rationale	Estimated Cost (\$) or Person Hours	Resources
8	Medium	Klahoose maintenance staff should continue to cut, collect and distribute firewood to community members during winter months while concurrently reducing woody debris loading from the KFN woodlot and mill site. Firewood distribution could occur in conjunction with FireSmart education, specifically related to FireSmart firewood storage; consider engaging a Local FireSmart Representative or CIFFA member to help.	Remove hazardous debris accumulation from the community while providing residents with firewood during winter months.	UBCM/FNESS CRI funding for educational materials Klahoose First Nation 2-4 additional weekly hours	KFN initiative



## 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<sup>®</sup> is the comprehensive nationally accepted set of principles, practices and programs for reducing losses from wildfire.<sup>42</sup> The FireSmart approach and concepts, including recommended FireSmart guidelines,<sup>43</sup> 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). FireSmart includes seven disciplines: education, legislation and planning, development considerations, interagency cooperation, cross-training, emergency planning, and vegetation management. Together, these disciplines provide a sound framework for reducing wildfire risk to communities.

The overarching goal of FireSmart is to encourage communities and citizens to adopt and conduct practices to mitigate the negative impacts of wildfire to assets on public and private property. While responsibility for effectively mitigating hazards must be shared between many entities including homeowners, industry, businesses and governments;<sup>44</sup> the ultimate root of the WUI interface problem is the vulnerability of structures and homes to ignition during wildfire events, in particular vulnerability to embers. This leads to an emphasis on risk mitigations on private properties. Findings from an investigation of how homes survived and ignited during the Fort McMurray 2016 Horse River wildfire, indicate that the vast majority of initial home ignitions in the WUI were caused by embers rather than direct contact by flames or radiant heat.<sup>45</sup> Surviving homes in both urban and rural areas exhibited many attributes of FireSmart principles, regardless of the broader wildfire threat surrounding them.<sup>45</sup>

#### *Home Ignition Zone*

Multiple studies have shown that the principal factors regarding home loss to wildfire are the structure's characteristics and immediate surroundings.<sup>45</sup> The area that determines the ignition potential of a structure to wildfire is referred to as the Home Ignition Zone (HIZ).<sup>46,47</sup> The HIZ includes the structure

<sup>42</sup> FireSmart is the registered trademark held by the Partners in Protection Association.

<sup>43</sup> FireSmart guidelines first published in the 1999 manual "*FireSmart: Protecting Your Community from Wildfire*", with a second edition published in 2003. The most recent "*FireSmart Begins at Home Manual*" is available at <https://firesmartcanada.ca/resources/>. The "*British Columbia FireSmart Begins at Home Manual*" provides detailed guidance and is available at BC FireSmart: <https://www2.gov.bc.ca/gov/content/safety/wildfire-status/prevention/firesmart>

<sup>44</sup> <https://www.firesmartcanada.ca>

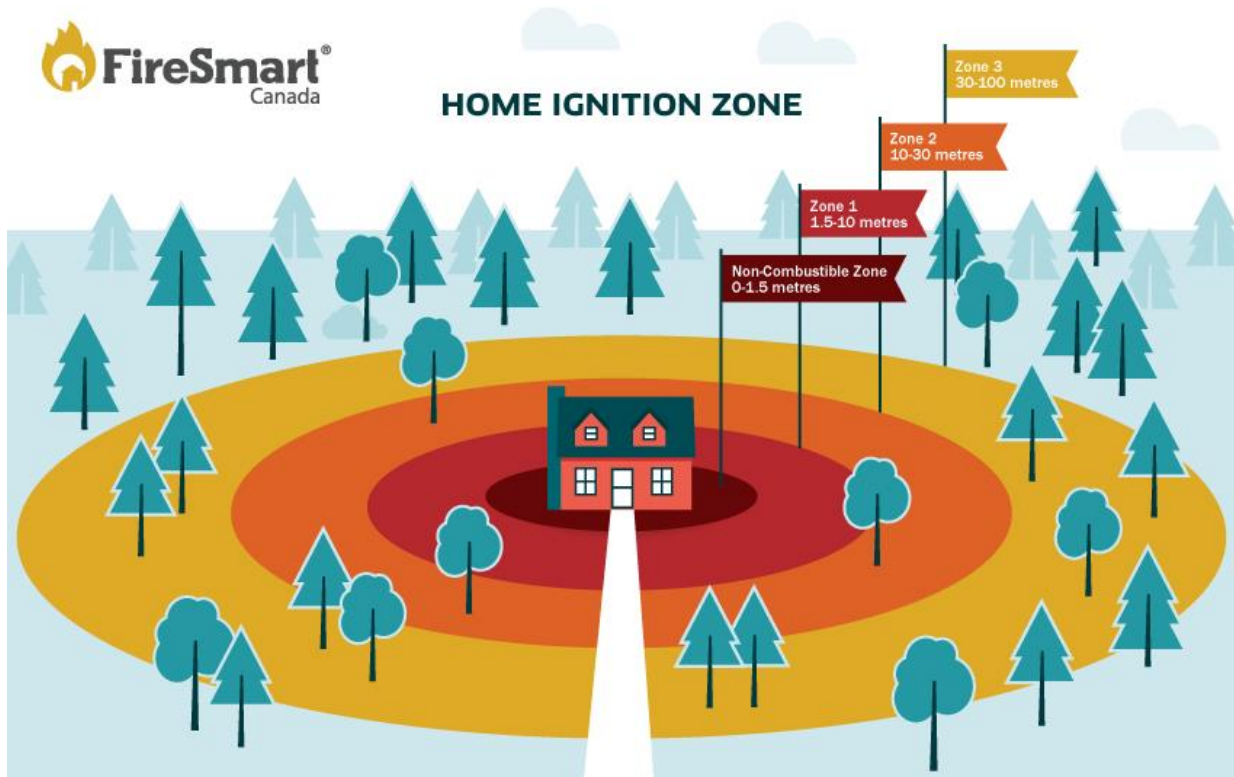
<sup>45</sup> Westhaver, A. 2017. *Why some homes survived: Learning from the Fort McMurray wildland/urban interface fire disaster*. Institute for Catastrophic Loss Reduction (ICLR) research paper series – number 56.

<sup>46</sup> 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.

<sup>47</sup> Cohen, J. *Preventing Disaster Home Ignitability in the Wildland-urban Interface*. *Journal of Forestry*. p 15 - 21.



itself and four concentric, progressively wider Priority Zones out to 100 m from the structure. More detail on priority zones can be found in the FireSmart Manual.<sup>48</sup>



**Figure 3. The Home Ignition Zone (HIZ) determines the likelihood of structure ignition during a wildfire event; the highest priority zones are located closest to the structure.<sup>49</sup>**

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.<sup>47</sup> Increasing ignition resistance would reduce the number of homes simultaneously on fire; extreme wildfire conditions do

<sup>48</sup> <https://firesmartcanada.ca/> and <https://www2.gov.bc.ca/gov/content/safety/wildfire-status/prevention/firesmart>

<sup>49</sup> FireSmart Canada. *Understanding the Home Ignition Zone*. Retrieved from: <https://firesmartcanada.ca/what-is-firesmart/understanding-firesmart/home-ignition-zone/>



not necessarily result in WUI fire disasters (Figure 4).<sup>50</sup> 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 Neighbourhood Recognition Program**

A neighborhood approach to FireSmart can be an effective method of reducing ignition potential for all homes within priority neighborhoods. The FireSmart Canada Neighbourhood Recognition Program (FSCNR Program), previously the FireSmart Canada Community Recognition Program, is a resident-led program facilitated by trained Local FireSmart Representatives that can help reduce fire risk at the neighborhood level. It provides groups of residents with critical information and a means of organizing themselves to progressively alter hazardous conditions within their neighborhood. The program also facilitates FireSmart knowledge and practices to quickly filter downwards onto the property of individual residents to further mitigate wildfire hazards at the single-home scale within the HIZ.

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.<sup>51</sup>

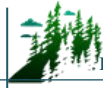


**Figure 4. The wildland/urban interface disaster sequence and the possibility to break up the disaster sequence by decreasing the number of highly ignitable homes.<sup>52</sup>**

<sup>50</sup> 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. Retrieved from: <http://www.ncbi.nlm.nih.gov/pmc/articles/PMC3896199/>.

<sup>51</sup> <https://firesmartcanada.ca/> and <https://www2.gov.bc.ca/gov/content/safety/wildfire-status/prevention/firesmart>

<sup>52</sup> Graphic adapted from Calkin et. al, by A. Westhaver.



## 5.2.2 Key Aspects of FireSmart for Local Governments

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A community wildfire risk mitigation strategy requires coordinated action from local governments, developers, private land owners, and industrial operators. This section presents FireSmart activities, which when enacted, provide avenues for reducing fire risk within the community. An evaluation of the current level of FireSmart implementation within Squirrel Cove is also presented in this section. All the activities listed in

Table **13** are eligible for funding under the 2021 CRI FireSmart Community Funding and Supports program.

**Table 13. FireSmart activities and their level of implementation in the AOI**

FireSmart Discipline/CRI Funding Category	FireSmart Activities	Current Status
Education	<ul style="list-style-type: none"> <li>Update public signage, social media, websites and/or newsletters</li> <li>Distribute FireSmart educational materials and resources</li> <li>Develop education for the reduction of local human-caused fires</li> <li>Encourage community participation in Wildfire Community Preparedness Day</li> <li>Organize and/or host a FireSmart events and workshops</li> <li>Participate in the FireSmart Canada Neighbourhood Recognition Program</li> </ul>	<ul style="list-style-type: none"> <li>Newsletters distributed door-to-door as frequently as necessary</li> <li>Not yet achieved (<i>See Recommendation 17</i>)</li> <li>Fire bans communicated to public via newsletters</li> <li>Klahoose First Nation privately attend to fire events</li> <li>Not yet achieved (<i>See Recommendation 8</i>)</li> </ul>
Planning	<ul style="list-style-type: none"> <li>Develop or amend a CWPP</li> <li>Develop FireSmart polices for the design and maintained of public land, such as regional parks, or buildings</li> <li>Conduct FireSmart Assessments for publicly owned buildings</li> </ul>	<ul style="list-style-type: none"> <li>2020 Klahoose First Nation CWPP</li> <li>No official polices, but seasonal maintenance conducted according to FireSmart principles</li> <li>Neighbourhood FireSmart Assessment completed in March 2020. No assessment specific to critical infrastructure (<i>See Recommendation 9</i>)</li> </ul>
Development Considerations	<ul style="list-style-type: none"> <li>Amend OCPs or bylaws to incorporate FireSmart principles</li> <li>Revise zoning and development permit documents to include FireSmart considerations</li> <li>Establish Development Permit Areas for Wildfire Hazard</li> <li>Include wildfire prevention and suppression considerations in the design of subdivisions</li> <li>Amend referral processes for new developments to ensure multiple departments, including the fire department and/or emergency management personnel, are included</li> </ul>	<ul style="list-style-type: none"> <li>Not achieved (not applicable)</li> <li>Not achieved (not applicable)</li> <li>Not achieved (not applicable)</li> <li>Not achieved, but a double access 'loop' road goes through Squirrel Cove</li> <li>Not achieved (not applicable)</li> </ul>
Interagency Cooperation	<ul style="list-style-type: none"> <li>Develop, coordinate and/or participate in a Neighbourhood FireSmart Resiliency Committee</li> <li>or multi-agency fire and/or fuel management planning table</li> </ul>	<ul style="list-style-type: none"> <li>Not yet achieved (<i>See Recommendation 8</i>)</li> </ul>



FireSmart Discipline/CRI Funding Category	FireSmart Activities	Current Status
	<ul style="list-style-type: none"> <li>• Provide Indigenous cultural safety and humility training to emergency management personnel</li> <li>• Attend 2021 FireSmart BC Conference, to be hosted by the BC FireSmart Committee</li> </ul>	<ul style="list-style-type: none"> <li>• Not yet achieved (<i>See Recommendation 10</i>)</li> <li>• Klahoose First Nation privately attend to fire events, CIFFA provides services when requested</li> <li>• Not achieved.</li> </ul>
Cross-Training	<ul style="list-style-type: none"> <li>• Provide or attend training for Local FireSmart Representatives (LFR)</li> <li>• Support LFRs to attend facilitator training</li> <li>• Cross-train fire department members (               <ul style="list-style-type: none"> <li>• SPP-WFF1 Wildland Firefighter Level 1</li> <li>• S-100 Basic fire suppression and safety</li> <li>• S-185 Fire entrapment avoidance and safety</li> <li>• ICS-100</li> <li>• Professional development to increase capacity for FireSmart activities</li> </ul> </li> </ul>	<ul style="list-style-type: none"> <li>• Not achieved (<i>See Recommendation 10</i>)</li> <li>• Not achieved (<i>See Recommendation 10</i>)</li> <li>• Annual CIFFA cross-training with BCWS</li> <li>• All CIFFA personnel maintain SPP-WFF1 or S-100 training at minimum</li> <li>• Not achieved.</li> <li>• Not achieved.</li> <li>• <i>See Recommendation 25</i></li> </ul>
Emergency Planning	<ul style="list-style-type: none"> <li>• Develop and/or participate in cross-jurisdictional meetings and tabletop exercises focused on wildfire preparedness</li> <li>• Assess structural protection capacity</li> <li>• Use and/or promote EMBC Wildfire Preparedness Guide for community emergency preparedness events focused on wildfire</li> </ul>	<ul style="list-style-type: none"> <li>• Annual cross-training with BCWS, 2018 tabletop exercise conducted on Cortes</li> <li>• <i>See Recommendation 27</i></li> <li>• <i>See Recommendation 25</i></li> </ul>
Vegetation Management  FireSmart Projects for Critical Infrastructure  FireSmart Activities for Residential Areas	<ul style="list-style-type: none"> <li>• Undertake fuel management on publicly owned land (fuel management prescriptions, treatments, maintenance, or prescribed burns)</li> <li>• Replace building materials with fire-resistant materials</li> <li>• Remove or reduce flammable vegetation up to 100 m from critical infrastructure</li> <li>• Develop plans for residential areas               <ul style="list-style-type: none"> <li>○ Conduct HIZ assessments for individual properties</li> <li>○ Develop FireSmart Neighbourhood Plans</li> </ul> </li> </ul>	<ul style="list-style-type: none"> <li>• Not yet achieved (<i>See Recommendation 4</i>)</li> <li>• Not yet achieved (<i>See Recommendations 9</i>)</li> <li>• FireSmart vegetation surrounding critical Infrastructure (<i>See Recommendations 9</i>)</li> <li>• Not achieved</li> <li>• Neighbourhood FireSmart Assessment completed in</li> </ul>



FireSmart Discipline/CRI Funding Category	FireSmart Activities	Current Status
	<ul style="list-style-type: none"> <li>○ Undertake Neighbourhood Wildfire Risk Assessments for neighbourhoods pursuing FSCCRP</li> <li>● Offer FireSmart rebate program</li> <li>● Provide vegetative debris disposal for homeowners               <ul style="list-style-type: none"> <li>○ Provide a dumpster or chipper</li> <li>○ Waive tipping fees</li> </ul> </li> <li>● Provide curbside debris pick-up</li> </ul>	<p>March 2020 (See Recommendation 25)</p> <ul style="list-style-type: none"> <li>● Not yet achieved (See Recommendation 25)</li> <li>● Not yet achieved (See Recommendation 11)</li> <li>● Chipping services offered by SRD in 2019 (See Recommendation 13)</li> </ul>

### 5.2.3 Priority Areas within the AOI for FireSmart

This section identifies priority areas within the AOI that would benefit from FireSmart activities, assesses FireSmart compliance within the AOI, and provides recommendations for FireSmart programs to improve compliance (Table 14). Recommendations surrounding communication and education are found in Table 16 in Section 5.2.

Priority areas are based on informal field observations, communication with the Wildfire Working Group, local wildfire threat (Section 4.3), and level of FireSmart implementation. Recommended FireSmart activities are essentially the same for each area; however, it is recommended that the Klahoose prioritize the areas in Table 14 below.

**Table 14. Summary of FireSmart Priority Areas.**

Area	FireSmart Y/N	FireSmart Canada Recognition Received Y/N	Recommended FireSmart Activities
Priority Area #1: Tork Road	Y (Partially)	N	Homes on Tork Road are less vulnerable to radiant heat compared to structures on Oceanview Road (further from forest) but equally vulnerable to ignition from embers. The following FireSmart retrofits and practices could be applied to many homes in Squirrel Cove: 1) replacement of vinyl siding with fiber board 2) closing of open decks and foundations 3) storage of firewood >10 m from homes.
Priority Area #2: Oceanview Road	N	N	In addition to the structure retrofits described above, setbacks from conifer vegetation were observed to be insufficient surrounding some homes on this road. Removal of conifers within FireSmart Priority Zone 1 (10 m) of homes, and



Area	FireSmart Y/N	FireSmart Canada Recognition Received Y/N	Recommended FireSmart Activities
			pruning and thinning of conifers beyond, is recommended.
Klahoose First Nation Multipurpose Building	Y (partially)	N/A	Based on field observations, Klahoose Multipurpose Building had combustible conifer vegetation and bark mulch in FireSmart Priority Zone 1 (0.5-10 m) and natural forest in parts of Priority Zones 2 and 3. The mass timber construction of the building is compliant with FireSmart principles and the building is in excellent condition. Vegetation management around this structure is recommended and is included in the rationale for the high-priority BAND fuel treatment unit.
Klahoose Hatchery	N	N/A	This structure has insufficient setbacks from surrounding vegetation. Regular cleaning of combustible debris from the roof is recommended. Vegetation management around this structure is recommended- moderate priority fuel treatment unit HATCH.
Klahoose Fisheries Dock	Y (partially)	N/A	The fisheries dock is surrounded by a non-fuel area and has good setback from the forest. Eventual retrofits should consider replacing wooden construction components with metal.
Klahoose Water Treatment and Pump Site	Y	N/A	The water treatment site is surrounded by a non-fuel asphalt area and maintained grass. Building construction is FireSmart compliant (metal roof, brick wall).

### *FireSmart Compliance within the Area of Interest*

FireSmart compliance in the AOI is generally good. Many homes maintain 10 m or more of defensible space, with the exception of majority of homes along Oceanfront Road which are built closer to the forest. Most roofing is FireSmart compliant with asphalt shingles or metal roofs instead of cedar shakes. The main FireSmart concerns are the ubiquity of vinyl siding and open decks and gaps beneath homes. Many residents store firewood or wooden construction materials adjacent to homes and under decks within Priority Zone 1 (0-10 m). Wooden roof trim, awnings, fences and deck railings are also common throughout the AOI, which can provide a point for ember accumulation and possible structure ignition.

On the other hand, landscaping is generally FireSmart, with deciduous trees and shrubs instead of conifer hedging, and regular lawn maintenance by Klahoose summer students and maintenance staff.

The best approach to mitigate fuels on in residential areas is to urge residents to comply with FireSmart guidelines and to independently conduct appropriate fuel modifications. CRI program funding may be available subject to current funding requirements. Klahoose can facilitate uptake within the AOI by: 1) completing or encouraging completion of Home Ignition Zone assessments of individual structures; 2) delivering one or more FireSmart presentations or workshops; 3) providing safe debris disposal for



residents who undertake their own vegetation management (with a focus on pruning, yard and thinning debris).

As mentioned above, the FireSmart Canada Neighbourhood Recognition Program (FSCNRP) is a useful tool to enable FireSmart uptake in communities and neighbourhoods. FSCNRP provides a framework and collective motivation for community members to work on FireSmart actions. Klahoose First Nation should consider continuing to participate in the FireSmart Canada Neighbourhood Recognition Program (FSCNRP) to increase wildfire resiliency across the community as an entirety. Next steps include initiating a FireSmart Board or Committee, developing a FireSmart Community Action Plan, and hosting a FireSmart cleanup day.

Based on field observations, some of the critical infrastructure is FireSmart compliant, such as the water treatment and pump site and the fisheries dock. The Multipurpose Building practices FireSmart construction principles, however combustible landscaping materials and the adjacent forest stand poses a wildfire risk. The hatchery building is surrounded by forest and is not FireSmart compliant. Consider conducting an official FireSmart assessment of critical infrastructure. It is recommended that the BAND and HATCH proposed treatment units are prescribed and treated to reduce forest fuels surrounding the Klahoose Multipurpose building and hatchery, respectively. Additionally, regular brushing activities to control weeds and grasses around critical infrastructure should be continued.



**Table 15. Summary of Recommendations for FireSmart Priority Areas.**

Document Section 5.2.3 Priority Areas					
Item	Priority	Recommendation / Action	Rationale	Estimated Cost (\$) or Person Hours	Resources
9	Medium	Continue working towards FSCNRP <sup>53</sup> status, building off the 2020 FireSmart Community Assessment Report. <sup>54</sup> Next steps for the community to take are: 1) formalize a FireSmart Committee/Board 2) Develop a Community Action Plan 3) Hold a Community FireSmart Cleanup Day. FireSmart Committee members can include emergency services personnel, maintenance staff, and community volunteers.	Increase community awareness and participation in FireSmart principles, improving community resilience	~40-80 hours UBCM/FNESS CRI grant(s) available	KFN initiative
10	High	Use fire-resistant construction materials (i.e., FireSmart Class A & B roofing materials), building design and landscaping for all structures when completing upgrades or establishing new infrastructure. Additionally, vegetation setbacks around structures should be compliant with FireSmart guidelines (no combustible material within 10 m of structures).	Flammable conifer vegetation noted in proximity to KFN Multipurpose Building. Incorporating FireSmart landscaping and construction will increase infrastructure wildfire resiliency through achieving FireSmart principles. See Section 5.2.3 for priority areas that would benefit from FireSmart programs.	Negligible in-house cost Campbell River FireSmart Guide to Gardening free online <sup>55</sup>	KFN initiative

<sup>53</sup> FireSmart Canada Neighbourhood Recognition Program (Section 5.2.3)

<sup>54</sup> Nelson, Q. 2020. First Nations' Emergency Services, British Columbia. *FireSmart Hazard Assessment Report: Klahoose*.

<sup>55</sup> <https://srd.ca/wp-content/uploads/2020/10/final-cr-firesmart-guide-to-gardening-pdf-version-min-1.pdf>



Document Section 5.2.3 Priority Areas					
Item	Priority	Recommendation / Action	Rationale	Estimated Cost (\$) or Person Hours	Resources
11	High	In accordance with Recommendation #9, leverage the leadership of a Klahoose FireSmart Committee to provide outreach material to encourage residents to complete a FireSmart home assessment using the Home Assessment guide or the FireSmart Begins At Home mobile app, through a Local FireSmart Representative, or through the FireSmart Home Partners Program.	Educate residents on FireSmart principles and encourage residents to FireSmart homes. Could occur in conjunction with firewood delivery.	~1.5 hours / assessment  UBCM/FNESS CRI grant(s) available	KFN initiative
12	Medium	Apply for funding from the UBCM CRI Program to develop a local FireSmart rebate program. The rebate program is described in detail in the CRI Program 2020 FireSmart Community Funding and Supports – Program & Application Guide and must adhere to the goals and objectives of FireSmart, as outlined in Section 5.2.1. Before applying for funding, Klahoose First Nation resources available to execute the program should be reviewed.	Incentivize residents to undertake FireSmart activities on their properties by allowing them to access partial rebates, if rated as high or extreme risk in a FireSmart home assessment.	20-35 in-house hours plus additional hours to administer the rebate program.  UBCM/FNESS CRI funding available for rebate	KFN initiative
13	Medium	Seek funding to fix sealing leaking fire hydrants.	There is currently a 15-minute lag time for CIFFA to respond to fire events within the AOI. Having a reliable and efficient hydrant system throughout Squirrel Cove is key for community resiliency and independence for responding to fire events.	Negligible in-house cost Klahoose First Nation	KFN initiative



Document Section 5.2.3 Priority Areas					
Item	Priority	Recommendation / Action	Rationale	Estimated Cost (\$) or Person Hours	Resources
14	High	KFN should consider coordinating with the SRD for access to a chipper during the SRD spring community chipping program. KFN maintenance staff should be engaged to collect woody debris for chipping from within the Home Ignition Zone of structures in the community	Aid residents in removing hazardous debris off of properties, while educating residents on FireSmart yard and landscaping principles. Currently, residents burn yard debris in small open fires on properties and along the beach.	Time dependent upon program. Klahoose First Nation Eligible for UBCM/FNESS CRI Program funding. Additional time for advertisement of program availability will be required.	KFN collaboration with SRD

## 5.3 COMMUNICATION AND EDUCATION

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Community education and engagement is a key aspect of a successful wildfire risk mitigation strategy. Moving from a CWPP to the implementation of specific actions requires that the community is aware of the reasons for and benefits of specific activities. A communication strategy must be enacted to effectively build support for actions that are being undertaken in the community.

FireSmart educational material is readily available and simple for local governments to disseminate. It provides concise and easy-to-use guidance that allows homeowners to evaluate their homes and take measures to reduce fire risk. However, the information needs to be supported by locally relevant information that illustrates the vulnerability of individual houses to wildfire. To strengthen community engagement, the CWPP must be made available to the public.

Based on the consultation completed during the development of this CWPP, it is evident that Klahoose staff and community members have a good level of awareness of interface fire risk and a strong level of commitment to continue to grow their awareness and understanding. However, field observations highlighted the opportunity to further educate the community at large on what Klahoose residents can do to build a FireSmart community. 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 Klahoose First Nations are:

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

Bringing organizations together to address wildfire issues that overlap physical, jurisdictional or organizational boundaries is a good way to help develop interagency structures and mechanisms to reduce wildfire risk. Engagement of various stakeholders can help with identifying valuable information about the landscape and help provide unique and local solutions to reducing wildfire risk. Klahoose leadership should consider meeting with the SRD Emergency Planning staff to discuss evacuation needs and challenges specific to First Nation lands and ensure that the island-wide evacuation plan aligns with the Klahoose Evacuation Plan.

In order to have successful CWPP implementation, the following communication and public education recommendations have been developed.



**Table 16. Summary of Communication and Education Recommendations.**

Document Section 5.3 Communication					
Item	Priority	Recommendation / Action	Rationale	Estimated Cost (\$) or Person Hours	Resources
15	Medium	Encourage the Cortes Island School to adopt and deploy existing school education programs to engage youth in wildfire management. 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 (ABC FP) and BCWS (Powell River Fire Centre) as well as 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.).	Engage and educate youth in wildfire management and risk reduction.	~5-10 hours Klahoose Advocacy/SRD Initiative UBCM/FNESS CRI Program funding available FireSmart BC Education box - \$800 ( <i>Junior Kindergarten - Grade 12</i> )	KFN collaboration with School District 72 and/or SRD
16	Medium	A sign that depicts the current fire danger class rating, fire bans and general fire safety related warnings should be posted in a highly visible location within the AOI, such as at the entrance to the community. The sign should be updated at least weekly by the Klahoose Fire Officer (CIFFA member) or a designate during the fire season.	No fire danger rating sign is present within the AOI. This recommendation will build on the current door-to-door delivery of community newsletter containing fire ban information to increase local awareness of fire weather conditions and provide an opportunity to communicate fire bans.	~\$5,000/sign Klahoose First Nation funding	KFN Initiative



Document Section 5.3 Communication					
Item	Priority	Recommendation / Action	Rationale	Estimated Cost (\$) or Person Hours	Resources
17	High	Promote FireSmart approaches for wildfire risk reduction to residents through FireSmart workshops and/or presentations. Aim to conduct the engagement/promotion campaign prior and during the fire season. Supply FireSmart and/or emergency planning education material to residents during these engagement campaigns.	Increase community education on wildfire risk and FireSmart principles.	Klahoose First Nation UBCM/FNESS CRI Program funding 8-12 hours for a local LFR	KFN initiative Possible SRD collaboration
18	Medium	This report and associated maps to be made publicly available through webpage, social media, and public FireSmart meetings.	Increase community education on island-specific wildfire risk.	~3-6 hours depending on method of distribution	KFN initiative
19	High	An emergency pamphlet that outlines key information from both the updated Cortes Island Evacuation Plan and the KFN evacuation plan should be developed and delivered to each household within the community. Full copies of both plans should be available at the KFN Multipurpose Building.	Increase community understanding of the evacuation process so that the evacuation plan can be deployed efficiently and effectively.	~6-12 hours depending on method of distribution 30-60 hours for pamphlet development	KFN initiative SRD collaboration



## **5.4 OTHER PREVENTION MEASURES**

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In addition to policy changes (Section 2.5), fuel management (Section 5.1), FireSmart planning and activities (Section 5.2), public communication and education (Section 5.2), and wildfire response resources (Section 6), there are additional measures that local governments can take as part of a wildfire risk mitigation strategy.



**Table 17. Summary of Other Measures Recommendations.**

Document Section 5.4 Other Measures					
Item	Priority	Recommendation / Action	Rationale	Estimated Cost (\$) or Person Hours	Resources
20	Medium	Klahoose Fire Officers should make an effort to record fire incidents and categorize incidents by urban fire and wildfire calls to increase UBCM funding opportunities and to obtain valuable data regarding wildfire threat.	Currently, wildfire incident calls are not recorded, possibly reducing funding opportunities.	~1 hour	KFN initiative
21	High	KFN should work to assess the carrying capacity of the Klahoose boat and fisheries boat and obtain life jackets for the capacity of each boat.	The Wildfire Working Group identified the Klahoose boat and fisheries boat as the primary off-island transportation resources. Current boat capacities are not clearly defined.	~4-8 hours + additional costs for life jackets (\$25-40 each)	KFN initiative
22	High	KFN maintenance staff should continue to incorporate FireSmart principles throughout yard maintenance work, including vegetation setbacks, FireSmart landscaping and storing combustible material >10m of structures.	Klahoose staff undertake yard maintenance throughout the fire season. Considering FireSmart principles throughout the duration of this work can increase the community's fire resiliency.	Potential additional labor hours; additional staff member(s) may be required Funding (e.g., FSERF) <sup>56</sup> may be available.	KFN initiative
23	High	KFN should consider training one or more community members as Local FireSmart Representatives, to help coordinate a community FireSmart Committee and facilitate FireSmart education and events	Formal FireSmart Assessments must be performed by an LFR. LFRs receive special training to assist communities in becoming more FireSmart.	LFR workshops are currently offered for free through FireSmart Canada ~8-hour workshop	KFN initiative

<sup>56</sup> <https://www.ubcm.ca/EN/main/funding/lgps/community-resiliency-investment/firesmart-economic-recovery-fund.html>



Document Section 5.4 Other Measures					
Item	Priority	Recommendation / Action	Rationale	Estimated Cost (\$) or Person Hours	Resources
24	Low	KFN should work with KFN woodlot operators and CFGP to ensure that high risk activities, such as vegetation management, pile burning and harvesting do not occur during high/extreme fire danger times to reduce chance of ignitions as per the Wildfire Act. Adequate fire suppression tools (as per wildfire act and regs) should be on-site during high-risk activities conducted in the woodlot.	Reduce chance of ignitions as per the <i>Wildfire Act</i> and reduce spread potential during an ignition event. KFN woodlot and CFGP are adjacent to the community.	Klahoose First Nation low overall cost	KFN/SRD/CFGP collaboration



## SECTION 6: WILDFIRE RESPONSE RESOURCES

This section provides a high-level overview of the local government resources available for interface wildfire suppression. In emergency situations when multiple fires are burning in different areas of the Province, BCWS resource availability may be scarce. Deployment of provincial resources occurs as per the process detailed in the Provincial Coordination Plan for Wildland Urban Interface Fires.<sup>57</sup> Therefore, the Klahoose First Nation's preparedness and resource availability are critical components of efficient wildfire prevention and planning.

### 6.1 LOCAL GOVERNMENT AND FIRE NATION FIREFIGHTING RESOURCES

Fire protection within the AOI is provided by the Cortes Island Firefighting Association (CIFFA) through the Strathcona Regional District (SRD). Though the AOI is outside of the CIFFA Fire Protection Area (FPA), CIFFA provides firefighting, fire suppression and fire prevention in Squirrel Cove, in accordance to the Klahoose First Nation Fire Protection Service Agreement Authorization.<sup>58</sup> The five-year service agreement was established in 2011, and has been renewed on a quarterly basis since it expired in 2016. It is recommended that Klahoose First Nation work with the SRD and CIFFA to ratify another 5-year agreement.

CIFFA is a non-profit society under contract with the SRD to provide fire and emergency services throughout 6,400 hectares of Cortes Island. In accordance to the Service Agreement, Klahoose First Nation is to ensure that one resident volunteers on CIFFA as the Klahoose Fire Officer, to be the prime contact for CIFFA. Currently two residents volunteer on CIFFA and keep their protective equipment at Squirrel Cove, allowing them to rapidly to fire incidents using the fire hydrants and hoses in Squirrel Cove. Having Klahoose residents that are trained and equipped to respond to fire incidents is important for community protection, as Squirrel Cove is located at least 15 minutes from either of the two CIFFA fire halls (Figure 5).

Mutual aid between CIFFA and BCWS is utilized for response or standby 2-3 each year, and the association cross trains with BCWS at the Powell River Fire Centre on an annual basis. Table 18 provides an overview of the fire services capacity in the AOI, including CIFFA fire department personnel and equipment. Under BCWS direction, CIFFA are able to initially respond to wildfires on Cortes Island, and can assist BCWS in responding to wildfires outside of the fire protection boundary. It is recommended that CIFFA continues to support Klahoose fire incidents as needed.

Interface wildfire suppression and response can be affected by water pressure and supply, local fire department training and equipment, and access and evacuation routes. Currently, CIFFA has two tenders, two engines, one command truck, one rescue vehicle and a new wildfire skid unit, of which the

<sup>57</sup> Government of BC. 2016. *Provincial Coordination Plan for Wildland Urban Interface Fires*. Retrieved from: [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](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)

<sup>58</sup> Strathcona Regional District. 2011. *Klahoose First Nation Fire Protection Service Agreement*.



CIFFA is sufficiently trained upon to be incorporated as part of the fleet. The skid unit is a self-contained fire-fighting apparatus constructed on a 4x4 F-350 pick-up truck, equipped with 3 Honda pumps, wildland hose and appliances, a 300-gallon water tank and a 250' booster line reel of 1" hose. The skid unit also has foam capabilities.

Structural Protection Units (SPUs) can be useful tools in the protection of rural/interface homes in the event of a wildfire. To improve the community's ability to respond to fire incidents autonomously, Klahoose should consider obtaining a Type 2 SPU complete with hoses, sprinklers, and fittings compatible with the hydrant system.

**Table 18. Capacity and equipment within the AOI.**

Fire Protection Zones	Fire Department	Number of Stations	Number of Members	Apparatus type and number <sup>59</sup>
-	Klahoose First Nation	-	Variable (currently 3 CIFFA volunteers)	Fire hydrants, hoses, personal fire suppression equipment (x3)
Electoral Area 'B' "Cortes Island"	Cortes Island Fire Fighting Association (CIFFA)	Hall 1 – Mansons Landing	14 (13 volunteer)	1 tender (840/1200) 1 engine (850/500) 1 command truck 1 rescue truck 1 F-350 wildland truck (skid unit) (?/350)
		Hall 2 – Whaletown		1 tender (?/1750) 1 engine (1050/1000)

No data on the number of fire calls have been collected within the AOI. It is recommended that the Klahoose Fire Officer (CIFFA members(s)) record emergency incidents, categorizing events into medical aid, motor accidents, non-emergencies and fire incidents that volunteers respond to. Further, fire events should be classified as wildfire or urban fire to equip the Klahoose First Nation and CIFFA with valuable data that may increase funding opportunities.

<sup>59</sup> Information from CIFFA; apparatus specifications from [https://fire.fandom.com/wiki/Cortes\\_Island\\_Fire\\_Department](https://fire.fandom.com/wiki/Cortes_Island_Fire_Department). Volume in imperial gallons (pumping capacity/water tank capacity).



**Figure 5. Cortes Island Firefighting Association (CIFFA) Fire Protection Area (FPA). An agreement is in place for CIFFA to provide protection services outside of the FPA to Klahoose First Nation.**



### 6.1.1 Water Availability for Wildfire Suppression

Water is the single most important suppression resource. In an emergency response scenario, it is critical that a sufficient water supply be available. The Fire Underwriters Survey summarizes their recommendations regarding water works systems fire protection requirements, in *Water Supply for Public Fire Protection* (1999).<sup>60</sup> 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 supply for fire suppression in the AOI is sourced from fire hydrants, which are serviced by the Klahoose water facility. Although the water facility was upgraded in 2020, it has been noted that some hose and hookups to hydrants remain leaky. The Working Wildfire Group identified that the CIFFA response time to an incident in Squirrel Cove is approximately 15 minutes and that improving hose hookups will improve rapid fire response, as CIFFA members who reside in Squirrel Cove will be able to better attend to fires before fire engines arrive. It is recommended that Klahoose First Nation assess the feasibility of augmenting fire suppression supplies, including acquiring additional hoses and hydrant tools be augmented.

### 6.1.2 Access and Evacuation

Emergency access and evacuation planning is of particular importance in the event of a wildfire event or other large-scale emergency. In accordance to the 2011 Cortes Island CWPP recommendations, the SRD has developed an official evacuation plan for Cortes Island, which is discussed in more detail in Section 2.5.1.

The AOI is has been assigned as Evacuation Zone G within the Cortes Island Emergency Evacuation Plan. Procedures during an emergency event are for residents to muster at the Multipurpose Building. If an emergency evacuation off-island is needed, the community will evacuate members from the dock, using the Klahoose boat and a fisheries boat. The combined carrying capacity is approximately 14 – 26 passengers. It is recommended that the safe carrying capacity of each boat be assessed and an appropriate number of life jackets be obtained.

Road networks in a community serve several purposes including providing access for emergency vehicles, providing escape/evacuation routes for residents, and creating fuel breaks. Access and evacuation during a wildfire emergency often must happen simultaneously and road networks should have the capacity to handle both. In the event of a wildfire emergency, arterial routes within the AOI consist of Tork Road and Oceanview Road. Tork Road is the only road connecting to Whaletown Road,

<sup>60</sup> Canadian Insurance Industry. 1999. *Water Supply for Public Fire Protection*. Retrieved from: <http://www.scm-rms.ca/docs/Fire%20Underwriters%20Survey%20-%201999%20Water%20Supply%20for%20Public%20Fire%20Protection.pdf>



which connects to the road network throughout the rest of Cortes Island. If a wildfire were to block Tork Road between its intersection with Whaletown Road and Oceanview Road, evacuation from the AOI would be challenged; however, it is helpful that Oceanview Road and Tork road form a loop, providing an alternate route.

Secondary/alternate evacuation options for Squirrel Cove include mustering at the secondary muster location (Squirrel Cove Store) if access to the Multipurpose Building becomes compromised. The bus has a carrying capacity of ~15 passengers and may be used to shuttle residents to the BC Ferries Dock in Carrington Bay. Furthermore, Klahoose staff are in the process of developing an emergency helipad. It is recommended that the Klahoose First Nations assess the feasibility of securing funds to aid in this effort.

A narrow, forested road parallels the western boundary of the AOI, terminating in the Von Donop operating area of the Cortes Community Forest. This road provides important ground access for suppression crews (CIFFA or BCWS) to respond to wildfires on the western side of the AOI, but turnarounds are limited. It is recommended that Klahoose First Nation work with this Cortes Community Forest to maintain this road in a drivable condition. A BC Parks/Klahoose First Nation collaboration trail also intersects the AOI from south to north, providing foot access for visitors to Von Donop/Ha'thayim Marine Provincial Park. This trail enhances foot access for fire suppression, but also increases risk of human ignition.

The Multipurpose Building and the fisheries dock are reached via narrow roads, which may impede evacuation or fire suppression. Furthermore, most of the land within the AOI is inaccessible by roads. Landscape level fuel breaks, in conjunction with adequate access, are a valuable tool in forested areas such as this. Well-designed fuel breaks can slow down the spread of a fire, allowing more time for firefighters to initiate suppression activities and for evacuation to take place. There are two landscape level fuel break options for the community. The Van Dop access trail discussed above cuts through fairly open canopy, mixed forest and would form a good anchoring point for a fire-retardant break, should a fire approach the community from the west. A thinned landscape-level fuel break ("KLaw") is proposed on the western edge of the AOI in the Klahoose woodlot near the Von Donop operating area access road.

### 6.1.3 Training

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CIFFA personnel receive wildfire specific training (SPP-WFF1 at a minimum) in addition to significant training focused on structural firefighting. CIFFA has a mutual agreement with BCWS and conduct annual cross-training at the with the Powell River Initial Attack crew to the 'exterior operations Playbook standard'. 'Exterior operations' is a level of service of which a fire department does not undertake interior attack of rescue operation on a fire-involved structure or object, nor operate in an environment that is "immediately dangerous to life and health".<sup>61</sup> A principal minimum training is required to qualify for this level of service, as determined by the Fire Services Act of BC.

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<sup>61</sup> Office of the Fire Commissioner. 2015. *Structure Firefighters Competency and Training Playbook*. Retrieved from: <https://www2.gov.bc.ca/assets/gov/public-safety-and-emergency-services/emergency-preparedness-response-recovery/embc/fire-safety/playbook.pdf>



Cross-training with BCWS includes a table-top exercise within the AOI in 2017. Continual cross-training with the BCWS will prepare fire responders with technical and practical firefighting training in order to action both structural and wildland fires within the AOI.

Other off-island training courses are taken by CIFFA crew members consist of auto extrication and rope rescue courses. Past collaboration with BCWS include a 2018 tabletop exercise within the AOI and S100 courses. Additionally, BCWS has in the past hosted community engagement events on in Squirrel Cove and throughout Cortes Island such as public educational sessions.

SPP-115 provides training to structural firefighters on the use of wildfire pumps and hose as well as fire service hose and hydrants in the deployment of Structural Protection Units (SPUs). Having CIFFA members receive SPP-115 training to support the deployment of an SPU during a wildfire event will enhance community resiliency and should be explored.

## 6.2 STRUCTURE PROTECTION

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Squirrel Cove is moderately resourced in structural fire suppression equipment with fire hydrants throughout the AOI, hoses and CIFFA equipment. CIFFA volunteers living within the AOI keep their protective apparel in their vehicles, so that they can respond to a fire in Squirrel Cove before the rest of CIFFA arrives. Within the CIFFA contract with the SRD, it is identified that additional personnel and equipment may be deployed throughout the AOI as necessary, despite Squirrel Cove being located beyond the FPA.

The CIFFA has wildland firefighting equipment, including a new wildland skid truck, although they do not have an SPU. The UBCM also owns four complete SPUs, each equipped with sprinklers, hose, pumps and fittings 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.

An important component of structure protection is ensuring homes are as fire-resilient as possible. The application of FireSmart principles in the AOI are described in Section 5.2. Residents and community maintenance staff should be encouraged to take a building envelope – out approach, that is, starting with the home and working their way out. Addressing little projects first can allow for quick, easy, and cost-effective risk reduction efforts to be completed sooner, while larger, more costly projects can be completed as resources and planning allow. For example, prior to the fire season, clearing roofs and gutters of combustible materials (leaves and needles), cleaning out any combustible accumulations or stored materials from under decks, moving large potential heat sources such as firewood, spare building materials or vehicles as far from the structure as possible, maintaining a mowed and watered lawn, removing dead vegetation, and pruning trees are actionable steps that residents can start working on immediately. It is recommended that Klahoose summer students and maintenance staff continue to incorporate FireSmart principles throughout landscaping work. 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>.



**Table 19. Summary of Wildfire Response Recommendations**

Document Section 6. Training and Equipment					
Item	Priority	Recommendation / Action	Rationale	Estimated Cost (\$) or Person Hours	Resources
25	Moderate	In collaboration with CIFFA and SRD, pursue funding to train CIFFA members in SPP-115 to support the deployment of a structural protection unit (SPU) in the community during a wildfire event. SPP-115 provides training to structural firefighters on the use of wildfire pumps and hose (and fire service hose and hydrants) in the deployment of SPUs.	To support funding applications to obtain an SPU.	Time/cost dependent on numbers and training done.  Wildfire training may qualify for UBCM/FNESS CRI Program funding	KFN/SRD/CIFFA collaboration
26	High	Augment existing fire suppression resources in Squirrel Cove including acquiring additional hoses and hydrant tools. Apply for funding from Indigenous Services Canada (ISC) and/or the Community Emergency Preparedness Fund (CEPF) for additional equipment (if funding is available).	Improve wildfire resources so that CIFFA is equipped to respond to wildfire emergencies.	ISC or UBCM CEPF funding available	KFN initiative
27	Moderate	Consider obtaining a Type 2 Structural Protection Unit (SPU), complete with hoses, sprinklers, and fittings compatible with the on-reserve hydrant system to protect the 30-40 structures in the event of a wildfire. Alternatively, consider purchasing several sprinkler kits to protect the Klahoose Multipurpose Building.	KFN is single-access; mustering at the Multipurpose Building is Plan A in the event of a wildfire emergency.	Klahoose First Nation/UBCM/FNESS funding ~\$100,000 for SPU ~1,000 for 5 gutter-mount sprinkler kits <sup>62</sup>	KFN initiative Possible SRD/CIFFA collaboration

<sup>62</sup> Example: <https://shop.waspswildfire.ca/collections/all-products/products/wasp-wildfire-community-pack5>



Document Section 6. Training and Equipment					
Item	Priority	Recommendation / Action	Rationale	Estimated Cost (\$) or Person Hours	Resources
28	Low	KFN should apply for emergency operations funding to complete the construction of an emergency helipad.	To increase off-island evacuation methods in an emergency or disaster. Helipad construction is in progress; however, a lack of funds has challenged its completion.	Klahoose First Nation/UBCM/FNESS funding	KFN initiative
29	Moderate	KFN should work with CFGP to keep the Von Donop access road in driveable condition to aid with ground-based suppression access/anchoring point during a potential wildfire event west of Squirrel Cove	The existing road is narrow. Maintaining this road will help protect the community from a wind-driven forest fire spreading from the west. Aligns with anticipated 2022-2023 CFGP management plan updates.	CFGP funding	KFN/CFGP collaboration



## REFERENCES

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

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

BC Hydro. 2020. *Earthquakes, wildfires, and floods*. Retrieved from: <https://www.bchydro.com/safety-outages/emergency-preparation/natural-disasters.html>

BC Wildfire Service. 2016. *BC Provincial Coordination Plan for Wildland Urban Interface Fires*. Retrieved from: [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](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)

BC Wildfire Service. 2019. *Provincial Strategic Threat Analysis*. Retrieved from: <https://www2.gov.bc.ca/gov/content/safety/wildfire-status/prevention/vegetation-and-fuel-management/fire-fuel-management/psta>

BC Wildfire Service. 2019. *Wildfire Causes*. Retrieved from: <https://www2.gov.bc.ca/gov/content/safety/wildfire-status/about-bcws/wildfire-response/fire-characteristics/causes>

BC Wildfire Service. 2019. *Wildfire Threat Assessment Guide and Worksheets*. Retrieved from <https://www.ubcm.ca/assets/Funding~Programs/LGPS/CRI/Resources/2019-20-wildfire-threat-assesment-guide.pdf>.

Broome, K., Andrew, B. 2011. B.A. Blackwell. *Cortes Island Community Wildfire Protection Plan*. Retrieved from: [https://srd.ca/wp-content/uploads/2019/07/Cortes\\_CWPP\\_Final.pdf](https://srd.ca/wp-content/uploads/2019/07/Cortes_CWPP_Final.pdf)

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

British Columbia FireSmart. *Guides & Manuals*. Retrieved from <https://firesmartbc.ca/resource-types/guides-manuals/>

British Columbia Ministry of Forests, Lands and Natural Resource Operations. 2015. *2015-17 Coastal Timber Supply Areas Forest Health Overview*. Retrieved from: [https://www.for.gov.bc.ca/ftp/HFP/external/!publish/Forest\\_Health/TSA\\_FH\\_Strategies/2015-Coast%20FH%20Strategy.pdf](https://www.for.gov.bc.ca/ftp/HFP/external/!publish/Forest_Health/TSA_FH_Strategies/2015-Coast%20FH%20Strategy.pdf)

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



Calkin, D., J. Cohen, M. Finney, M. Thompson. 2014. How risk management can prevent future wildfire disasters in the wildland-urban interface. *Proceedings of the National Academy of Sciences* 111(2):746-751. Retrieved from: <http://www.ncbi.nlm.nih.gov/pmc/articles/PMC3896199/>.

Cohen, J. Preventing Disaster Home Ignitability in the Wildland-urban Interface. *Journal of Forestry* 98(3):15 - 21. Retrieved from: <https://www.fs.usda.gov/treearch/pubs/4688>.

Cortes Island Fire Fighting Association. 2020. *Our Equipment*. Retrieved from: <https://cortesfire.org/equipment/>

Cortes Forestry General Partnership. 2016. *Community Forest Management Objectives*. Retrieved from: <http://www.cortesforestrypartnership.com/wp-content/uploads/2019-CFMO.pdf>.

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.

Dale, V., L. Joyce, S. McNulty, R. Neilson, M. Ayres, M. Flannigan, P. Hanson, L. Irland, A. Lugo, C. Peterson, D. Simberloff, F. Swanson, B. Stocks, B. Wotton. *Climate Change and Forest Disturbances*. *BioScience* 2001 51 (9), 723-734.

Dave Mitchell & Associates Ltd. 2016. *Regional District of Nanaimo Fire Services Review*. Retrieved from: [https://rdn.bc.ca/sites/default/files/legacy\\_asp/events/attachments/evID7420evattID2802.pdf](https://rdn.bc.ca/sites/default/files/legacy_asp/events/attachments/evID7420evattID2802.pdf)

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.)*. Millpress, Rotterdam.

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

Flannigan, M.D., A.S. Cantin, W.J. de Groot, M. Wotton, A. Newbery, L.M. Gowman. 2013. Global wildland fire season severity in the 21st century. *Forest Ecology and Management* 294, 54 - 61.

Flannigan, M.D., B.M. Wotton, G.A. Marshall, W.J. deGroot, J. Johnston, N. Jurko, A.S. Cantin. 2016. *Fuel moisture sensitivity to temperature and precipitation: climate change implications*. *Climatic Change (2016) 134: 59 -71*. Retrieved from: <https://link.springer.com/content/pdf/10.1007%2Fs10584-015-1521-0.pdf>.

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

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

Indigenous and Northern Affairs Canada. 2019. *First Nation Detail: Klahoose First Nation*. Retrieved from: [https://fnp-ppn.aadnc-aandc.gc.ca/fnp/Main/Search/FNMain.aspx?BAND\\_NUMBER=553&lang=eng](https://fnp-ppn.aadnc-aandc.gc.ca/fnp/Main/Search/FNMain.aspx?BAND_NUMBER=553&lang=eng)



Indigenous and North Affairs Canada. 2019. *Population Characteristics: Klahoose First Nation (553)*. Retrieved from: [https://fnp-ppn.aadnc-aandc.gc.ca/fnp/Main/Search/FNPopulation.aspx?BAND\\_NUMBER=553&lang=eng](https://fnp-ppn.aadnc-aandc.gc.ca/fnp/Main/Search/FNPopulation.aspx?BAND_NUMBER=553&lang=eng)

Indigenous and North Affairs Canada. 2019. *Reserves/Settlements/Villages: Klahoose First Nation (553)*. Retrieved from: [https://fnp-ppn.aadnc-aandc.gc.ca/fnp/Main/Search/FNReserves.aspx?BAND\\_NUMBER=553&lang=eng](https://fnp-ppn.aadnc-aandc.gc.ca/fnp/Main/Search/FNReserves.aspx?BAND_NUMBER=553&lang=eng)

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

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 1<sup>st</sup> Specialty Conference on Disaster Mitigation. Calgary, AB May 23 -26, 2006.

Klahoose First Nation. N.D. *About*. Retrieved from: <https://www.klahoose.org/about>

Koopman, S. 2020. *Cortes Island Evacuation Survey; Community Wildfire Protection Plan & Evacuation Plan Survey*. Retrieved from: <https://srd.ca/projects/cortes-evacuation-survey/>

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

Nelson, Q. 2020. First Nations' Emergency Services, British Columbia. *FireSmart Hazard Assessment Report: Klahoose*.

Our Cortes. 2020. *Island History*. Retrieved from: <http://ourcortes.com/our-cortes/island-history/>.

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

Province of British Columbia. 2016. *British Columbia Provincial Coordination Plan for Wildland Urban Interface Fires*. Retrieved from: [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](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)

Province of British Columbia. 2020. *Emergency Program Act RSBC 1996 Chapter 111*. Retrieved from: [https://www.bclaws.gov.bc.ca/civix/document/id/complete/statreg/00\\_96111\\_01](https://www.bclaws.gov.bc.ca/civix/document/id/complete/statreg/00_96111_01)

Province of British Columbia. *Impacts of Climate Change*. Retrieved from: <https://www2.gov.bc.ca/gov/content/environment/climate-change/adaptation/impacts>.

Province of British Columbia, 2016. *ISI Roses Coastal Fire Centres. [graph]*. Retrieved from [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](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)

Province of British Columbia. 2020. *Issued\* Woodlot Licenses in the Province of British Columbia*. Retrieved from: [https://www2.gov.bc.ca/assets/gov/farming-natural-resources-and-industry/forestry/timber-tenures/woodlots/issued\\_woodlots\\_april\\_01\\_2020.pdf](https://www2.gov.bc.ca/assets/gov/farming-natural-resources-and-industry/forestry/timber-tenures/woodlots/issued_woodlots_april_01_2020.pdf)



Province of British Columbia. 2008. *Klahoose First Nation Interim Agreement on Forest Opportunities*. Retrieved from: [https://www2.gov.bc.ca/assets/gov/environment/natural-resource-stewardship/consulting-with-first-nations/agreements/forestry-agreements/klahoose\\_fro\\_feb08.pdf](https://www2.gov.bc.ca/assets/gov/environment/natural-resource-stewardship/consulting-with-first-nations/agreements/forestry-agreements/klahoose_fro_feb08.pdf)

Province of British Columbia. 2017. *Klahoose First Nation Forest & Range Consultation and Revenue Sharing Agreement (FCRSA) (the "Agreement")*. Retrieved from: [https://www2.gov.bc.ca/assets/gov/environment/natural-resource-stewardship/consulting-with-first-nations/agreements/klahoose\\_first\\_nation\\_-\\_fcrsa.pdf](https://www2.gov.bc.ca/assets/gov/environment/natural-resource-stewardship/consulting-with-first-nations/agreements/klahoose_first_nation_-_fcrsa.pdf)

Province of British Columbia. July 2019. *Preliminary Strategic Climate Risk Assessment for British Columbia*. Retrieved from: <https://www2.gov.bc.ca/assets/gov/environment/climate-change/adaptation/prelim-strat-climate-risk-assessment.pdf>.

Province of British Columbia. 2016. *Provincial Coordination Plan for Wildland Urban Interface Fires*. 2016. Retrieved from: [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](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)

Province of British Columbia. *Wildfire Season Summary - Previous Wildfire Season Summaries*. Retrieved From: <https://www2.gov.bc.ca/gov/content/safety/wildfire-status/about-bcws/wildfire-history/wildfire-season-summary>

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.

Statistics Canada. 2017. Strathcona B, RDA [Census subdivision], British Columbia and British Columbia [Province] (table). Census Profile. *2016 Census. Statistics Canada Catalogue no. 98-316-X2016001*. Retrieved from: <https://www12.statcan.gc.ca/census-recensement/2016/dp-pd/prof/index.cfm?Lang=E>.

Strathcona Regional District. 2016. *Community of Cortes Island Evacuation Operational Guidelines*.

Strathcona Regional District. 2012. *Official Community Plan for Electoral Area B (Cortes Island)*. Retrieved From: <https://srd.ca/wp-content/uploads/2018/09/Bylaw-No.-139-Adopted.pdf>

Strathcona Regional District. 2020. *Strathcona Regional District Strategic Plan 2020-2024*. Retrieved from: [https://srd.ca/wp-content/uploads/2020/03/StrategicPlan2020\\_web.pdf](https://srd.ca/wp-content/uploads/2020/03/StrategicPlan2020_web.pdf)

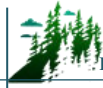
Strathcona Regional District. 2020. *Waste Services (Electoral Area A & B)*. Retrieved from: <https://srd.ca/services/waste/>

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

Westhaver, A. 2017. *Why some homes survived: Learning from the Fort McMurray wildland/urban interface fire disaster*. Institute for Catastrophic Loss Reduction (ICLR) research paper series – number 56.



Walker, I., R., Pellatt, M., G. 2013. Canadian Water Resources Journal. *Climate Change in Coastal British Columbia – A Paleoenvironmental Perspective*. Retrieved from:  
<https://www.tandfonline.com/doi/pdf/10.4296/cwrj2804531>



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## APPENDIX A – LOCAL WILDFIRE THREAT PROCESS

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

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

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



## A-1 FUEL TYPE ATTRIBUTE ASSESSMENT

The Canadian Forest Fire Behaviour Prediction (FBP) System outlines five major fuel groups and sixteen fuel types based on characteristic fire behaviour under defined conditions.<sup>63</sup> 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.<sup>64</sup> 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.<sup>64</sup> Details regarding fuel typing methodology and limitations are found in Appendix G. There are several implications of the aforementioned limitations, which include: fuel typing further from the developed areas of the study has a lower confidence, generally; and, fuel typing should be used as a starting point for more detailed assessments and as an indicator of overall wildfire threat, not as an operational, or site-level, assessment.

Table 20 summarizes the fuel types by general fire behaviour (crown fire and spotting potential). C-5 fuel types have a moderate potential for active crown fire when wind-driven<sup>64</sup> and may be considered the most hazardous fuel-type within the AOI. An M-1/2 fuel type can sometimes be considered hazardous, depending on the proportion of conifers within the forest stand; conifer fuels include those in the overstory, as well as those in the understory. These fuel types were used to guide the threat assessment.

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

<sup>63</sup> Forestry Canada Fire Danger Group. 1992. *Development and Structure of the Canadian Forest Fire Behavior Prediction System*: Information Report ST-X-3.

<sup>64</sup> Perrakis, D.B., Eade G., and Hicks, D. 2018. Natural Resources Canada. Canadian Forest Service. *British Columbia Wildfire Fuel Typing and Fuel Type Layer Description 2018 Version*.



**Table 20. Fuel Type Categories and Crown Fire Spot Potential. Only summaries of fuel types encountered within the AOI are provided (as such, other fuel types, i.e., C-1, C-2, C-4, S-1 and S-3 are not summarized below).**

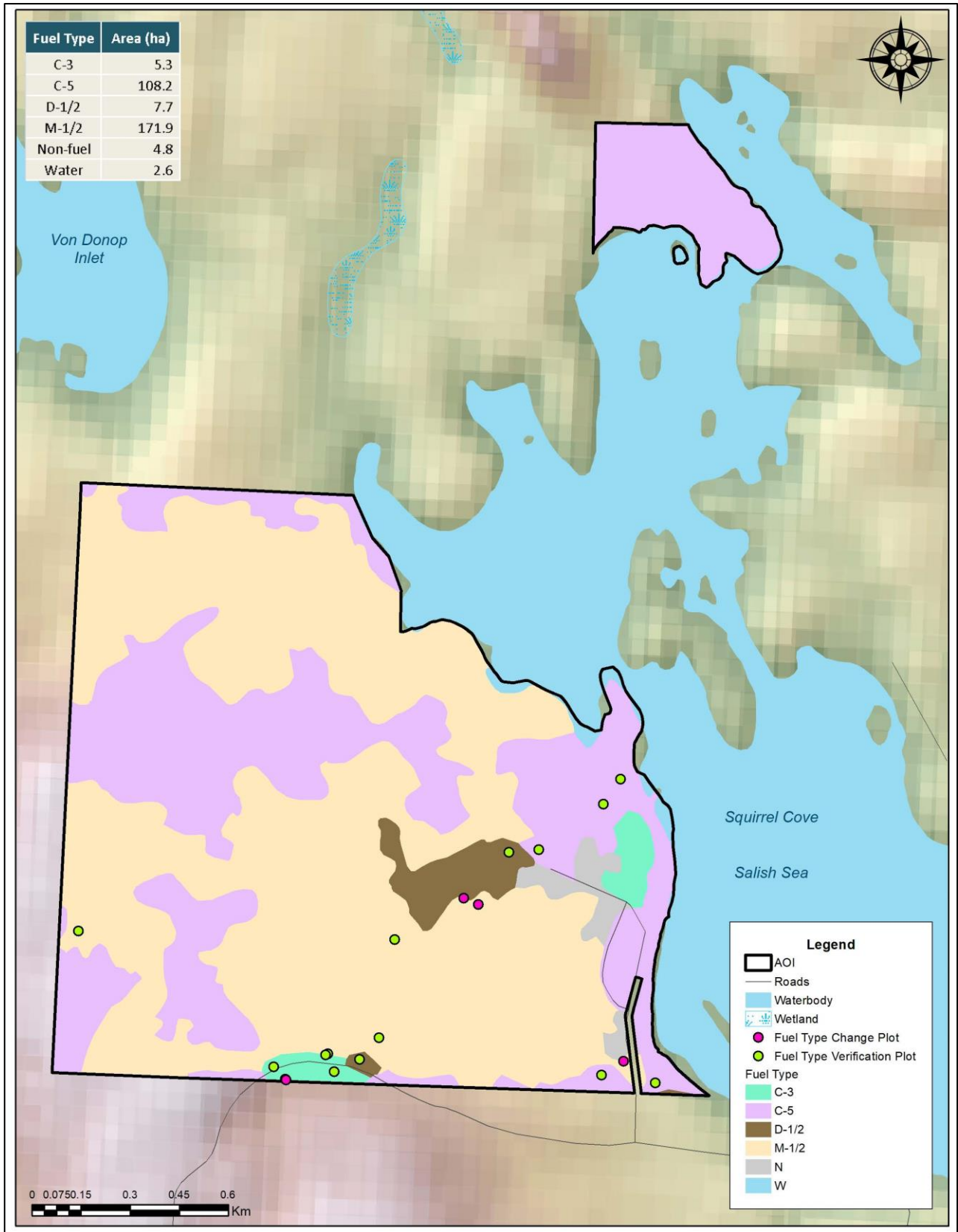
Fuel Type	Provincial Fuel Type 2018: % of study area	CWPP update 2020: % of study area (total ha)
C-3	0%	2%
C-5	68%	36%
D-1/2	7%	3%
M-1/2	23%	57%
Non-fuel	1%	2%
Water	1%	1%

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

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

- C-3 fuel types being incorrectly identified by the PSTA as C-5,
- M-1/2 (50% conifer) fuel types identified as C-5
- C-3 fuel types identified as D-1/2,
- M-1/2 (50% conifer) fuel types identified as D-1/2,

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



Map 10. Updated Fuel Type



## A-2 PROXIMITY OF FUEL TO THE COMMUNITY

Fire hazard classification in the WUI is partly dictated by the proximity of the fuel to developed areas within a community. More specifically, fuels closest to the community are considered to pose a higher hazard in comparison to fuels that are located at greater distances from values at risk. As a result, it is recommended that the implementation of fuel treatments prioritizes fuels closest to structures and / or developed areas, in order to reduce hazard level adjacent to the community. Continuity of fuel treatment is an important consideration, which can be ensured by reducing fuels from the edge of the community outward. Special consideration must be allocated to treatment locations to ensure continuity, as discontinuous fuel treatments in the WUI can allow wildfire to intensify, resulting in a heightened risk to values. In order to classify fuel threat levels and prioritize fuel treatments, fuels immediately adjacent to the community are rated higher than those located further from developed areas. Table 21 describes the classes associated with proximity of fuels to the interface.

**Table 21. Proximity to the Interface.**

Proximity to the Interface	Descriptor*	Explanation
<b>WUI 100</b>	(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.
<b>WUI 500</b>	(101-500m)	Treatment would affect wildfire behaviour approaching a value, as well as the wildfire’s ability to impact the value with short- to medium- range spotting; should also provide suppression opportunities near a value.
<b>WUI 2000</b>	(501-2000 m)	Treatment would be effective in limiting long - range spotting but short- range spotting may fall short of the value and cause a new ignition that could affect a value.
	>2 000 m	This should form part of a landscape assessment and is generally not part of the zoning process. Treatment is relatively ineffective for threat mitigation to a value, unless used to form a part of a larger fuel break / treatment.

*\*Distances are based on spotting distances of high and moderate fuel type spotting potential and threshold to break crown fire potential (100m). These distances can be varied with appropriate rationale, to address areas with low or extreme fuel hazards.*



### **A-3 FIRE SPREAD PATTERNS**

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

The local representative BCWS weather station for the AOI is Quinsam Base. The Quinsam Base weather station is located in Campbell River, approximately 45 km west of the AOI at an elevation of 78 m. Hourly ISI roses depicting the frequency of ISI values by wind direction for the Quinsam Base weather station are shown below in Figure 6. Figure 7 displays the daily average ISI values for Quinsam Base and for the TS Theodosia weather station, which represents wind speeds and directions in the east of the AOI. TS Theodosia weather station is located to the northeast of Theodosia Arm in the Desolation Sound at an elevation of 87 m.

During the fire season (April – October) predominant winds originate from the northwest. Winds generally come from the north, northeast and northwest during the day, while to a lesser degree, winds also occur from the south overnight. ISI values over 5 occur ~15% of the time, with the highest values occurring most frequently with winds from the north, northeast, northwest and south.

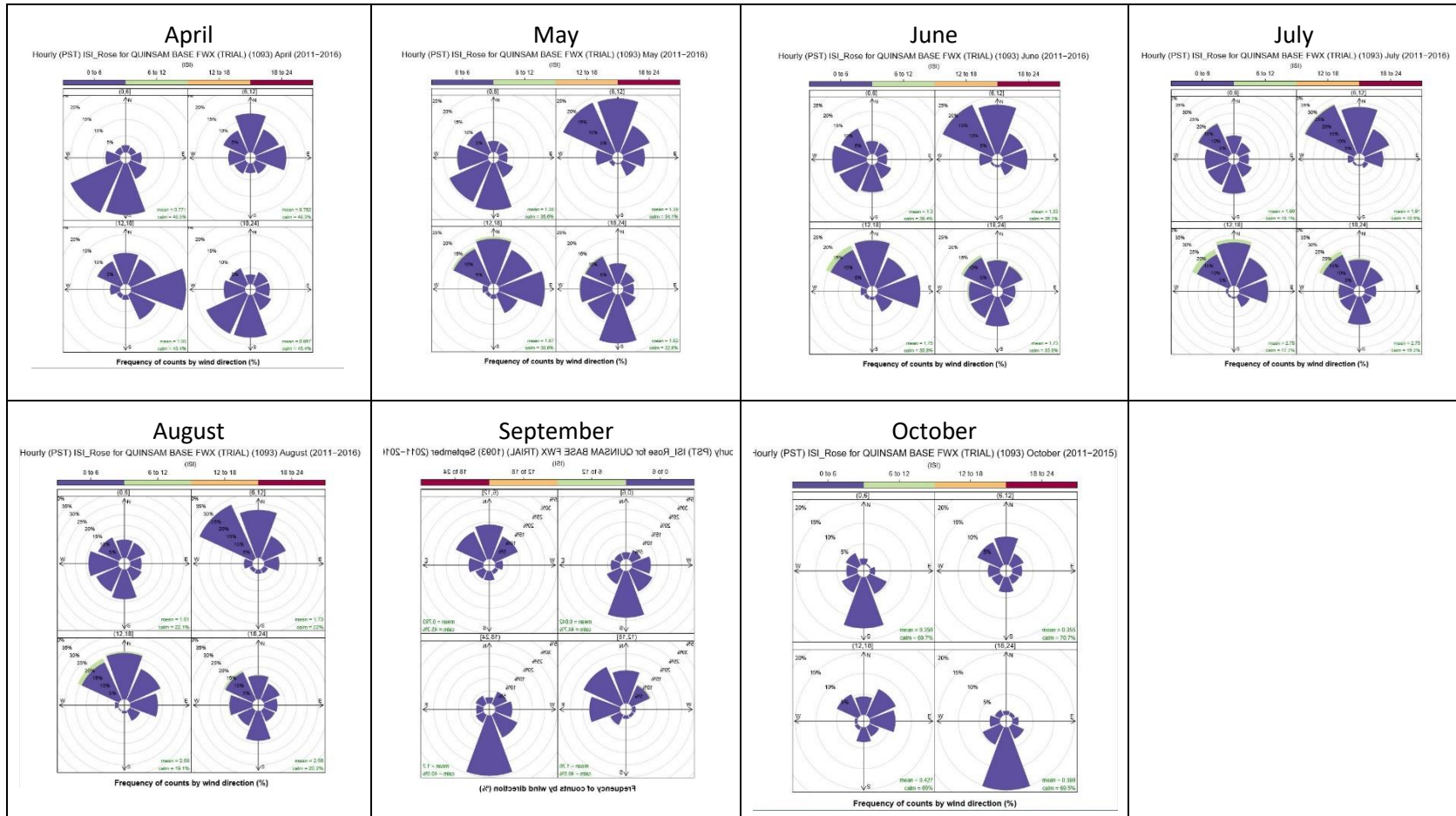


Figure 6. Initial Spread Index (ISI) roses depicting the average frequency of ISI values by wind direction for four 6-hour periods over the fire season April – October. Data taken from the Quinsam Base fire weather station

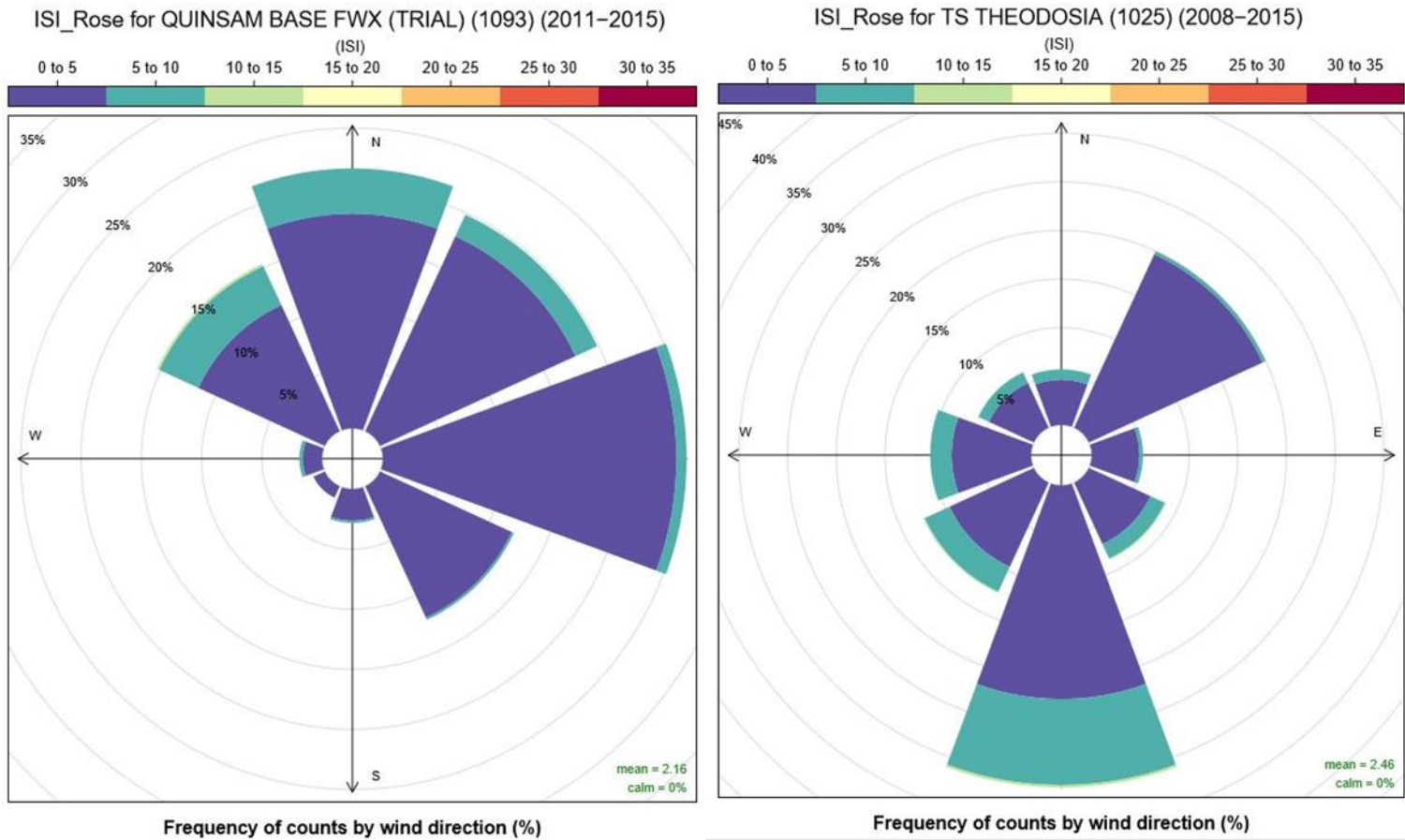


Figure 7. Initial Spread Index (ISI) roses depicting average daily wind speed and direction during the fire season (April – October) 1996 – 2015. Data taken from the Quinsam Base TWX fire weather station (left), 2011-2015 and TS Theodosia weather station (right), 2008-2015.



## A-4 TOPOGRAPHY

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

### *Slope Class and Position*

Slope steepness affects solar radiation intensity, fuel moisture (influenced by radiation intensity) and influences flame length and rate of spread of surface fires. Table 22 summarizes the fire behaviour implications for slope percentage (the steeper the slope the faster the spread). Slope position also affects temperature and relative humidity. A value placed at the bottom of the slope is equivalent to a value on flat ground. A value on the upper 1/3 of the slope would be impacted by preheating and faster rates of spread. The majority of the AOI (82%) is on less than 20% slope and will likely not experience accelerated rates of spread due to slope class. Approximately 18% percent of the AOI is likely to experience an increased or high rate of spread. On the larger topographic scale, residential developments in the AOI would be considered bottom of the slope or valley bottom.

**Table 22. Slope Percentage and Fire Behaviour Implications.**

Slope	Percent of AOI	Fire Behaviour Implications
<20%	82%	Very little flame and fuel interaction caused by slope, normal rate of spread.
20-30%	14%	Flame tilt begins to preheat fuel, increase rate of spread.
30-45%	3%	Flame tilt preheats fuel and begins to bathe flames into fuel, high rate of spread.
40-60%	1%	Flame tilt preheats fuel and bathes flames into fuel, very high rate of spread.
>60%	0%	Flame tilt preheats fuel and bathes flames into fuel well upslope, extreme rate of spread.

**Table 23. Slope Position of Value and Fire Behaviour Implications.**

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



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

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Provided separately as PDF package.



## **APPENDIX C – WILDFIRE THREAT ASSESSMENT WORKSHEETS AND PHOTOS**

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Provided separately as PDF package.



## **APPENDIX D – MAPS**

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Provided separately as PDF package.



## APPENDIX E – WILDLAND URBAN INTERFACE DEFINED

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

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

Two situations are differentiated. Locations where there is a clean/abrupt transition from urban development to forest lands are usually specified as the “interface” whereas locations where structures are embedded or mingled within a matrix of dense wildland vegetation are known as the “intermix”. An example of interface and intermixed areas is illustrated in Figure 8.



Figure 8. 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 9).

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 10).

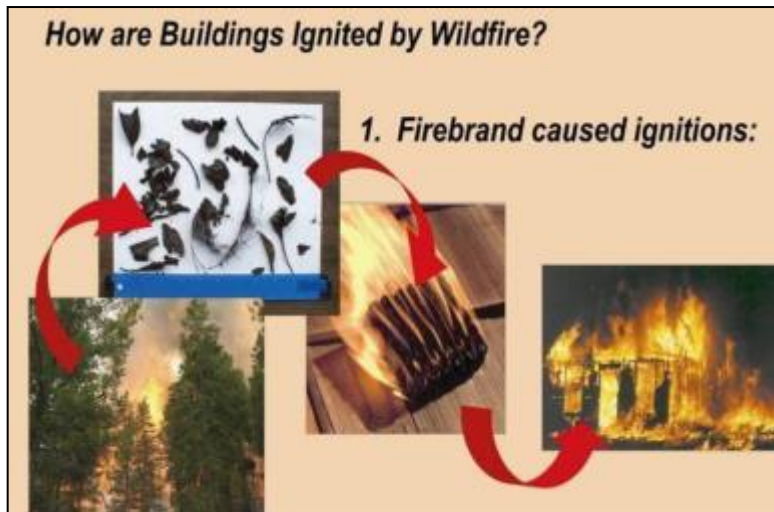


Figure 9. Firebrand caused ignitions: burning embers are carried ahead of the fire front and alight on vulnerable building surfaces.

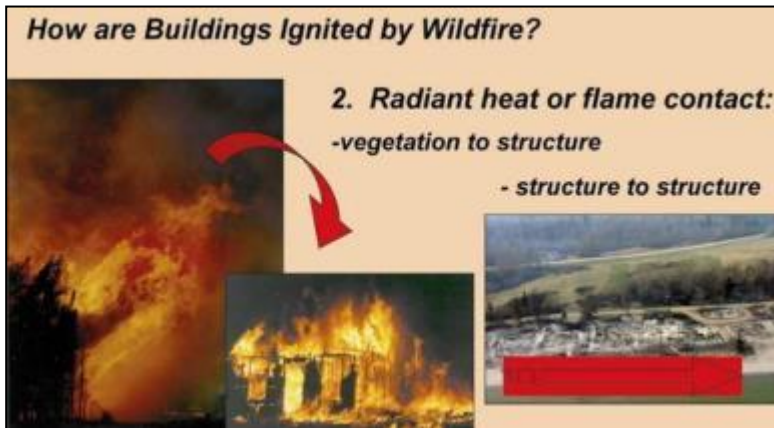


Figure 10. Radiant heat and flame contact allow fire to spread from vegetation to structure or from structure to structure.

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



## APPENDIX F – WUI THREAT PLOT LOCATIONS

Table 24 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 24. Summary of WUI Threat Assessment Worksheets.**

WUI Plot #	Geographic Location	Wildfire Behaviour Threat Class	WUI Threat Class*
BAND-1	Tork Road   Between sawmill and Multipurpose Building	High	High
BAND-2	Multipurpose Building	High	Extreme
DOCK-1	End of Tork Road	Moderate	N/A
HATCH-1	Creek west of community	Moderate	N/A
HATCH-2	Klahoose Hatchery	Moderate	N/A
HATCH-3	Whaletown Road adjacent to Klahoose Hatchery	High	High
SEAF-3	South of AOI in Community Forest along Whaletown Road	Moderate	N/A
KLAW-1	West perimeter of Tork 7	Moderate	N/A
WATER-1	Tork Road   Adjacent to water facility	Moderate	N/A

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



## APPENDIX G – FUEL TYPING METHODOLOGY AND LIMITATIONS

The initial starting point for fuel typing for the AOI was the 2018 provincial fuel typing layer provided by BCWS as part of the *2018 Provincial Strategic Threat Analysis (PSTA)* data package. This fuel type layer is based on the FBP fuel typing system. PSTA data is limited by the accuracy and availability of information within the Vegetation Resource Inventory (VRI) provincial data; confidence in provincial fuel type data is very low on private land. The PSTA threat class for all private land within the AOI was not available. Fuel types within the AOI have been updated using orthoimagery of the area with representative fuel type calls confirmed by field fuel type verification. Polygons not field-verified were assigned fuel types based upon similarities visible in orthophotography to areas field verified. Where polygons were available from the provincial fuel typing layer, they were utilized and updated as necessary for recent harvesting, development, etc.

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

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

For information on the provincial fuel typing process used for PSTA data as well as aiding in fuel type updates made in this document, please refer to Perrakis, Eade, and Hicks, 2018.<sup>65</sup>

<sup>65</sup> Perrakis, D.B., Eade G., and Hicks, D. 2018. Natural Resources Canada. Canadian Forest Service. *British Columbia Wildfire Fuel Typing and Fuel Type Layer Description 2018 Version*



## APPENDIX H – WUI THREAT ASSESSMENT METHODOLOGY

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

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

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

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

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

### *Field Data Collection*

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

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



1. Update fuel-typing using orthophotography provided by the client and field verification.
2. Update structural data using critical infrastructure information provided by the client, field visits to confirm structure additions or deletions, and orthophotography
3. Complete field work to ground-truth fuel typing and threat ratings (completed 39 WUI threat plots on a variety of fuel types, aspects, and slopes and an additional 400+ 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 25 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 25. Description of variables used in spatial analysis for WUI wildfire threat assessment.**

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



WUI Threat Sheet Attribute	Used in Analysis?	Comment
		to values at risk is too difficult to analyze spatially.

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

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

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

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

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

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

### Limitations

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

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