District of Central Saanich 2019 Community Wildfire Protection Plan

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*Cover photo: Stefana Dranga, Gowlland Tod Provincial Park, District of Central Saanich

REGISTERED PROFESSIONAL SIGN AND SEAL

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May 26, 2020	
I certify that the work described herein fulfills the standards expected of a member of the Association of British Columbia Forest Professionals and that I did personally supervise the work.	
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EXECUTIVE SUMMARY/ SUMMARY OF CWPP RECOMMENDATIONS

The Community Wildfire Protection Plan (CWPP) process was created in British Columbia (BC) as a response to the devastating 2003 wildfire in Kelowna. As an integral part of the Community Resiliency Investment (CRI) Program, managed 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 Update will provide the District of Central Saanich (DCS) with a framework that can be used to review and assess areas of identified high fire risk within the DCS. Additionally, the information contained in this report should help to guide the improvement and/or development of emergency plans, emergency response, evacuation plans, communication and education programs (including FireSmart), bylaw development in areas of fire risk, and the management of potentially hazardous forest lands adjacent to the community.

Wildfire management requires a multi-faceted approach for greatest efficacy and risk reduction outcomes. A total of **36 strategic recommendations** are found in a tabularized format within this Executive Summary. In addition, these recommendations are more thoroughly discussed in their appropriate sections within the document and are found in written format. Because the majority of the area of interest includes private land and is therefore outside DCS jurisdiction, the District's role may be limited to the role of an influencer in some instances, while other recommendations can be directly implemented by the DCS. The recommendations are displayed in totality in Table 1. Ultimately, the recommendations within this strategy should be considered a toolbox of options to help reduce the wildfire threat to the community. There is not one combination or course of action which is the answer; the DCS will have to further prioritize based on resources, strengths, constraints, and availability of funding and regularly update the prioritization and course of action as variables change through time.

Table 1. Summary of CWPP Recommendations by Document Section.

Document Section 2: Local Area Description (2.5.3: Local Government Policies and Recommendations)				
Item	**Page No.**	**Priority**	**Recommendation / Next Steps**	**Estimated Cost ($) or Person hours**
Objective: Review and amend the current regulatory framework to incorporate wildfire mitigation and preparedness considerations.				
1	11	Moderate	Revise Bylaw No. 1595, 2002 to include language which allows the issuance of a permit for cutting of trees if it is required to reduce wildfire hazard within the wildland urban interface, as determined by a qualified professional (QP). This bylaw should also be reviewed to ensure that it does not limit the ability of homeowners to address wildfire hazards associated with trees on private property immediately adjacent to homes.	~30-45 in-house hours (local government funding). May be eligible for UBCM CRI Program Funding[1]
2	11	High	Review Bylaw No. 1845, 2014 and include wording that specifically prohibits the accumulation of combustible materials on the property (including on and under exterior projections, such as decks and patios, near the home, and in gutters and roofs). The revised bylaw should provide the District the authority to require removal/clean-up of combustible materials or to complete removal and recoup costs from the owner.	~30 in-house hours (local government funding). May be eligible for UBCM CRI Program Funding
3	12	Moderate	Work with the Building Department (i.e., building inspectors) to ensure house numbering is posted prior to occupancy of new development and to provide instructions on how and where best to affix numbering to facilitate emergency response and evacuation efforts. Consider encouraging home owner participation via a DCS-wide engagement campaign and providing incentives such as the opportunity to acquire/purchase discounted address signs.	4-6 DCS staff hours required for internal work with the Building Department. Additional 16 hours for material development and distribution for incentive/ engagement campaign)
4	12	High	Work with the DCS Parks Department and the Capital Regional District (CRD) to incorporate wildfire risk considerations (i.e., placement, type, width, and objective of trails) during municipal and regional park acquisition and future updates to the Regional Trails Management Plan. Consideration should also be given to trail building and maintenance as these activities can either increase wildfire risk (through fuels accumulations and unsafe work practices) or decrease wildfire risk (though proper placement, clean-up of combustible fuels trailside and work practices which adhere to *Wildfire Act* and Regulations).	~30-60 in-house hours (local government funding). May be eligible for UBCM CRI Program Funding

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

Document Section 3: Values at Risk				
Item	**Page No.**	**Priority**	**Recommendation / Next Steps**	**Estimated Cost ($) or Person hours**
Objective: Protect critical infrastructure and mitigate post-wildfire impacts				
5	17	High	The use of fire-resistant construction materials, building design and landscaping should be considered for all critical infrastructure (CI) when completing upgrades or establishing new infrastructure. Additionally, vegetation setbacks around critical infrastructure should be compliant with FireSmart guidelines. Secondary power sources are important to reduce critical infrastructure vulnerability in the event of an emergency which cuts power for days, or even weeks.	Negligible in-house cost
6	17	Moderate	Complete formal FireSmart assessments (by a Qualified Professional) for CI such as the fire halls, emergency operations centres, water infrastructure, and others as identified in this CWPP (Table 3) and by the DCS.	~$1,500-2,000 per location (consultant cost)
Document Section 5: Risk Management and Mitigation Factors Recommendations				
Item	**Page No.**	**Priority**	**Recommendation / Next Steps**	**Estimated Cost ($) or Person hours**
Objective: Reduce Wildfire Threat through Fuel Management				
7	43	High	Proceed with detailed assessment, prescription development and treatment of hazardous fuel units and FireSmart fuel treatment demonstration treatment areas identified and prioritized in this CWPP.	UBCM CRI Program Funding/Local Government Funding
Objective: Maintain Fuel Treated Areas to Maintain Acceptable Wildfire Threat Level				
8	46	Moderate	As treatments are implemented, treatment monitoring should be completed by a qualified professional to schedule next set of maintenance activities (5 – 10 years out). This can be completed as part of a CWPP update or as a stand-alone exercise.	UBCM CRI Program Funding/Local Government Funding
Objective: Reduce Wildfire Hazard on Private Land				
9	53	Moderate	Review the Official Community Plan (OCP); consider including wildfire as a natural hazard development permit area (DPA). A recommended development permit area for the DCS would include all areas that are located within 200 m of moderate or high wildfire behaviour threat class areas. This is a suggested distance which should be validated and defined through a more comprehensive GIS analysis of hazardous fuels and their proximity to the interface. Review similar wildfire hazard DPAs established in other jurisdictions and use as models for various aspects of the DP process.	40-80 in-house hours and $5,000 for consultant analysis and support (Local Government Funding/CRI Funding)

Document Section 5: Risk Management and Mitigation Factors Recommendations				
Item	**Page No.**	**Priority**	**Recommendation / Next Steps**	**Estimated Cost ($) or Person hours**
Objective: Reduce Wildfire Hazard on Private Land				
10	53	Moderate	Ensure that wildfire hazard development permit applications are provided to the fire department for opportunity for input prior to approval. As more development permit applications are received, the importance of communication and integration between the fire department and the Planning and Building Services Department will increase.	Dependent on the number of DP applications
11	53	High	Develop a landscaping guide which lists flammable non-compliant vegetation and landscaping materials, non-flammable drought and pest resistant alternatives, and tips on landscape design to reduce maintenance, watering requirements, avoid wildlife attractants, and reduce wildfire hazard. Consider including the landscaping guide as a development permit requirement within the applicable area, as well as making it publicly available for residents and homeowners outside of the DPA (can be provided at issue of building permit and made available at the Municipal Office or other strategic locations).	$2,000 - $3,000 to outsource. Alternatively, general FireSmart landscaping information is available free of charge, but is not climate/ plant hardiness zone specific
12	55	High	Develop and implement a community chipper program with the help of neighbourhood representatives. As a demonstration, this program can begin twice per year in two separate neighbourhoods.	Time dependent upon program. Eligible for UBCM CRI Program Funding. Additional time for advertisement of program availability will be required.
Objective: Reduce Wildfire Hazard on Private Land				
13	56	Moderate	The DCS should consider training additional local fire services staff members as Local FireSmart Representatives to assist the various neighbourhoods within the DCS in complying with FireSmart principles at the neighbourhood and individual home-level.	~25 in-house hours (Consultant and/or Fire Department, DCS Emergency Management staff)
14	57	High	The DCS should apply for funding from the UBCM CRI Program to develop a local FireSmart rebate program. This will allow homeowners to access partial rebates for FireSmart activities on their properties, if rated as moderate or high risk in a FireSmart home and property assessment. The rebate program must adhere to the goals of FireSmart, as outlined in Section 5.2.1.	20-35 DCS staff hours

Document Section 5: Risk Management and Mitigation Factors Recommendations				
Item	**Page No.**	**Priority**	**Recommendation / Next Steps**	**Estimated Cost ($) or Person hours**
Objective: Increase public wildfire awareness				
15	58	High	This report and associated maps should be made publicly available through webpage, social media, and public FireSmart meetings.	3-6 hours depending on method of distribution
16	58	Moderate	Complete or schedule periodic updates of the CWPP to gauge progress and update the threat assessment (hazard mapping) for changes in fuels, forest health, land planning, stand structure or changes to infrastructure in the interface. The frequency of updates is highly dependent upon major changes which would impact the DCS's wildfire threat assessment or the rate at which wildfire risk reduction efforts are implemented. An evaluation of major changes (including funding program changes that may lead to new opportunities) and the potential need for a CWPP update should be initiated every 5 - 7 years.	UBCM/CRI Program funding/Local Government funding
17	58	Low	Develop a social media strategy and ensure that its full power is leveraged to communicate fire bans, high or extreme Fire Danger days, wildfire prevention initiatives and programs, easily implementable FireSmart activities, updates on current fires and associated air quality, road closures, and other real-time information in an accurate and timely manner.	~40 hours to create strategy. ~20 hours to identify partners, initiate relationship and gain strategy support. Additional daily/weekly hours to implement and update depending on strategy
18	59	Moderate	Promote FireSmart approaches for wildfire risk reduction to DCS residents through Town Hall meetings, workshops, FireSmart 101 course and/or presentations. Aim to conduct the engagement/promotion campaign prior and during the fire season. Consider supplying FireSmart materials to homeowners in the interface during these engagement campaigns.	~10 hours. May be eligible for UBCM/CRI Program grant
19	59	Moderate	Promote improved planning and preparedness of agriculture producers in the DCS and encourage FireSmart practices on private farm land through distribution or sharing of wildfire action planning resources prepared specifically for the agriculture sector by the BC Agriculture & Food Climate Action Initiative (i.e., on DCS website, mailouts). Resources include a Wildfire Preparedness and Mitigation Plan - Guide and Workbook.	~30-40 hours

Document Section 5: Risk Management and Mitigation Factors Recommendations				
Item	**Page No.**	**Priority**	**Recommendation / Next Steps**	**Estimated Cost ($) or Person hours**
Objective: Increase public wildfire awareness				
20	59	Low	Work towards FireSmart community recognition, at the neighbourhood level and facilitate uptake into the FireSmart Canada Community Recognition Program (FSCCRP). This will help reduce fire risk and aid in further funding applications.	FireSmart grant (when funding is available)
21	59	Moderate	Facilitate the FSCCRP uptake within the DCS and enhance its applications by including the following: 1) inviting BCWS crews to participate in and support the annual FireSmart events set up by participating neighbourhoods. 2) Encourage individual homeowner participants to complete the self-administered FireSmart home assessment tool. 3) Include within the FireSmart Canada Community Assessment Report the standard recommendation that participating neighbourhoods hold a home hazard assessment workshop as one of their FireSmart events.	$5,000/ neighbourhood and an additional 40 hours/initiative UBCM/CRI Program grant(s) available
22	59	Low	Promote the use of the FireSmart Home Partners Program offered by the Partners in Protection Association, which facilitates voluntary FireSmart assessments on private property. Use the opportunity to educate the home or business owner about the hazards which exist on their property and provide easy improvements to reduce their risk.	~1.5 hours/assessment
23	59	Low	Encourage schools to adopt and deploy existing school education programs (e.g. FireSmart BC Education Package) to engage youth in wildfire management and risk reduction. There is emergency preparedness curriculum available provincially, which includes preparedness for a variety of natural hazards, including wildfire (Master of Disaster). Other options/value-added activities include consulting with Association of BC Forest Professionals (ABCFP) and British Columbia Wildfire Service (BCWS) (South Island Fire Zone), as well as local fire department and FireSmart representatives to facilitate and recruit volunteer teachers and experts to help with curriculum development to be delivered in elementary and/or secondary schools (field trips, guest speakers, etc.).	~30-40 hours

Document Section 5: Risk Management and Mitigation Factors Recommendations				
Item	**Page No.**	**Priority**	**Recommendation / Next Steps**	**Estimated Cost ($) or Person hours**
Objective: Increase public wildfire awareness				
24	59	High	Engage the CRD to build upon the framework and expand the scope of the FireSmart Committee to assist in the coordination of wildfire risk reduction efforts at the regional and municipal level. The Regional FireSmart Committee should include all key stakeholders (Municipalities, Capital Regional District, First Nations, BC Parks, BCWS, agricultural groups/representatives, and neighborhood associations). The objective of the Regional FireSmart Committee would be to identify wildfire related issues in the region and to develop collaborative solutions to minimize wildfire risks. The following subject areas are recommended for the group to explore: 1) Public education and awareness needs; 2) Multi-disciplinary, multi-jurisdictional fuel treatment projects/hazard abatement projects; 3) Development of a funding strategy; and 4) Reduction of human-caused fires, fire prevention and right of way management.	~ 20 hours to engage the CRD; an additional ~50 hours/year to plan, advertise/ communicate, attend, and debrief meetings; additional hours required depending on implementable actions and potential sub-committees developed
25	60	Moderate	Promote and provide information to private landowners related to residential sprinklers as a FireSmart prevention measure.	10-20 hours to prepare materials and disseminate information to landowners
Objective: Promote Fuel Management and Joint Initiatives				
26	60	Moderate	Work with industrial operators such as BC Hydro to ensure that high risk activities, such as grubbing/brushing and right-of-way mowing work do not occur during high fire danger times to reduce chance of ignitions as per the *Wildfire Act*.	4-6 hours
27	60	Moderate	Work with industrial operators such as BC Hydro to ensure that right-of-ways do not contain fine fuel accumulations (easily cured) or high conifer regeneration prior to and during the fire season and are maintained in a low hazard state (to serve as fuel breaks).	4-6 hours

Document Section 6: Wildfire Response Resources Recommendations				
Item	**Page No.**	**Priority**	**Recommendation / Next Steps**	**Estimated Cost ($) or Person hours**
Objective: Improve Water Availability for Emergency Response				
28	63	High	All new development should have a water system which meets or exceeds minimum standards of NFPA 1142, Standard on Water Supplies for Suburban and Rural Fire Fighting. CSFD should review the water supply to ensure it provides sufficient placement, flow, and reliability for suppression needs and that secondary power is available in the event of power outages.	~5-10 hours per development
Objective: Improve Water Availability for Emergency Response				
29	63	Moderate	Consider completing a fire flow/water vulnerability assessment to identify where upgrades to systems, flows, hydrant number or location, and water storage, or secondary power is required. Prioritize and rank projects and complete or require upgrades as resources allow.	$10,000
Objective: Improve Access/Egress to Enhance Emergency Preparedness				
30	63	High	Complete and participate in regular testing of, and updates to, the evacuation plan.	~30-40 hours to plan and stage; 8 hours to complete testing
31	64	Moderate	Include a qualified professional with experience in operational wildland/interface fire suppression in the planning and strategic siting of future trails and parks.	10-20 hours to review current trails/map, provide recommendations
Objective: Increase and continually develop CSFD Fire Department staff training				
32	65	Moderate	CSFD should work with BCWS to initiate and/or maintain an annual structural and interface training program. As part of the training, it is recommended to conduct annual reviews to ensure PPE and wildland equipment resources are complete, in working order, and the crews are well-versed in their set-up and use. It is recommended the CSFD engage in yearly practical wildland fire training with BCWS that covers at a minimum: pump, hose, hydrant, air tanker awareness, and employment of SPUs. Interface training should include completion of a joint wildfire simulation exercise and safety training specific to wildland fire and risks inherent with natural areas. It is recognized that BCWS crew resources are limited and their availability and is highly dependent upon the current fire season and other BCWS priorities.	Cost and time dependent upon training exercise (scope, number of participating members etc.)

Document Section 6: Wildfire Response Resources Recommendations				
Item	**Page No.**	**Priority**	**Recommendation / Next Steps**	**Estimated Cost ($) or Person hours**
Objective: Increase and continually develop CSFD Fire Department staff training				
33	65	Moderate	CSFD should engage in regular communication with the BCWS South Island Fire Zone/Cobble Hill Fire Base to foster a strong relationship and identify potential cooperative wildfire risk reduction opportunities.	~4 hours/year
33	65	Moderate	CSFD should engage in regular communication with the BCWS South Island Fire Zone/Cobble Hill Fire Base to foster a strong relationship and identify potential cooperative wildfire risk reduction opportunities.	~4 hours/year
34	65	High	Ensure that CSFD maintains the capability to effectively suppress wildland fires, through wildfire-specific training sessions. Maintain a high level of member education and training specific to interface and wildland fires by including S-100 and S-185 (combined) or SPP-WFF1, at a minimum. Consider expanding the training program to maintain a high level of member education and training specific to interface and wildland fires. SPP-115 provides training to structural firefighters on the use of wildfire pumps and hose (and fire service hose and hydrants) in the application of structural protection units (SPUs).The CSFD should continue the practice of staying up to date on wildfire training opportunities, and to train members in this capacity, as training resources allow.	Current CSFD training budget and UBCM CRI Program Funding
Objective: Structure Protection				
35	66	Low	Work with local distributors and homeowners within the District to improve education of homeowners and remove some barriers to FireSmart action. For additional detail see Section 6.2.	~60 hours
36	67	High	Develop programs which serve to remove barriers to action for homeowners by providing methods for them to cheaply and easily dispose of wood waste removed from their property. Programs may include scheduled community chipping opportunities, or yard waste dumpsters available by month in neighbourhoods. Programs should be available during times of greatest resident activity (likely spring and fall).	Time dependent upon program. UBCM/CRI Program funding. Additional time for advertisement of program availability will be required.

TABLE OF CONTENTS

List of Tables

List of Maps

List of Figures

COMMONLY USED ACRONYMS

BCWS	British Columbia Wildfire Service
BEC	Biogeoclimatic Ecosystem Classification
CDC	Conservation Data Centre
CFFDRS	Canadian Forest Fire Danger Rating System
CRD	Capital Regional District
CRI	Community Resiliency Investment Program
CSFD	Central Saanich Fire Department
CWPP	Community Wildfire Protection Plan
DP	Development Permit
DCS	District of Central Saanich
DPA	Development Permit Area
FBP	Fire Behaviour Prediction System
FD	Fire Department
FMP	Fire Management Plan
FSCCRP	FireSmart Canada Community Recognition Program
HIZ	Home Ignition Zone
LRMP	Land and Resource Management Plan
MFLNRORD	Ministry of Forests, Lands, Natural Resource Operations, and Rural Development
MOTI	Ministry of Transportation and Infrastructure
NFPA	National Fire Protection Agency
OFC	Office of the Fire Commissioner
PSTA	Provincial Strategic Threat Analysis
PTU	Proposed Treatment Unit
SWPI	Strategic Wildfire Prevention Initiative
TSA	Timber Supply Area
UBCM	Union of British Columbian Municipalities
WUI	Wildland Urban Interface

SECTION 1: INTRODUCTION

The District of Central Saanich (District or DCS) staff have recognized wildfire mitigation and planning to be a foundational component of emergency planning and preparedness. In 2019, B.A. Blackwell and Associates Ltd. was retained to assist the District of Central Saanich (DCS) in developing a Community Wildfire Protection Plan (CWPP). This CWPP document focuses on integrating the updated Provincial Strategic Threat Analysis (PSTA), updated BC Wildfire Service (BCWS) Fuel Type mapping, and the updated and improved wildfire threat analysis methodology. Furthermore, DCS staff have recognized that wildfire mitigation and planning is an important component of emergency planning and preparedness for the community.

Although forest fires are both inevitable and essential to the health of forested ecosystems, the 2003, 2004, 2009, 2010, 2015, 2017 and 2018 wildfire seasons resulted in significant economic, social and environmental losses in British Columbia (BC). The 2018 fire season was the most extensive in terms of area burned, surpassing the 2017 fire season. The total suppression costs for the 2018 season are estimated at $615 million and the 2017 fire costs were estimated at over $568 million[2]. Recent wildfire disasters like those experienced in Slave Lake, Alberta (2011), Washington State (2014 and 2015), Fort McMurray, Alberta (2016) and BC and California (2017, 2018) all display the vulnerability of communities and the potential toll of wildfires on families, neighbourhoods and the economy of entire regions. These events, along with critical lessons learned and important advances in knowledge and loss prevention programs have spurred the need for greater consideration and due diligence with respect to fire risk in the wildland urban interface[3] (WUI).

1.1 PURPOSE

The purpose of this CWPP is to identify and update the wildfire risks within and surrounding the DCS, to describe the potential consequences if a wildfire were to impact the community, and to examine options and strategies to reduce the wildfire risks. Each community has a unique risk profile. This CWPP provides an assessment of the level of risk with respect to changes in the area that have occurred recently and gives the DCS a current and accurate understanding of the threats to human life, property and critical infrastructure faced by their communities from wildfires. The goal of this CWPP, in addition to defining the threats, is to identify measures necessary to mitigate these threats, and outline a plan of action for implementing these measures. Specifically, this CWPP is intended to serve as a framework to inform the implementation of specific actions and strategies that will serve to: 1) reduce the likelihood of wildfire entering the community, 2) reduce the impacts and losses to property and critical infrastructure if wildfire were to enter, and 3) reduce the negative economic and social impacts of wildfire to the community.

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

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

1.2 CWPP PLANNING PROCESS

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

1) **Consultation involving key local government representatives, structural and wildfire specialists, and stakeholders**. Information sharing with First Nations at various stages of the Plan development and ensuring linkages with relevant existing land use plans, legislation, and policy currently in place.
2) **Identification of values at risk and assessment of the local wildfire threat**. Wildfire threat assessment takes into consideration Natural Fire Regime and Ecology, Provincial Strategic Threat Analysis (2019), and field work, fuel type verification, completion of WUI Threat Forms and GIS wildfire threat analyses.
3) **Development of a risk mitigation strategy**. A guide for the DCS to implement mitigation and risk reduction activities. The risk mitigation strategy accounts for prioritization of fuel treatments, FireSmart Activities, and wildfire response recommendations that will reduce wildfire risk locally.
4) **Building a community engagement and education strategy**. This phase includes presentation of the CWPP to the Board or Council, the formation of a Wildfire Working Group as well as comprehensive outside consultation with First Nations, government and non-governmental agencies (See Section 1.2.1 for specifics).

1.2.1 Consultation

Broad engagement with local government, Provincial government landowner representatives, stakeholders and First Nations played a key role in developing this CWPP.

The first step in the consultation process was to assemble the key players in the 'Wildfire Working Group'. This group was composed of key internal DCS staff, which included: the Fire Chief, Deputy Fire Chief, Fire Department Administrator, and Superintendent of Public Works. At the initial meeting of the Wildfire Working Group, the objectives were to obtain information on wildfire risk mitigation initiatives currently in place or completed, existing plans and policies, current resources, identify areas of concern, identify DCS vulnerabilities, and to determine priorities and potential mitigation strategies. Members of the Working Group were consulted on an ongoing basis throughout plan development and were integral in providing Plan review and approval. The Wildfire Working Group was integral in the review of the draft of this CWPP and provided ongoing support throughout the CWPP process.

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

Information sharing took place with thirteen First Nations and Tribes, as identified through the Consultative Areas Database and in consultation with MFLNRORD and the DCS, regarding the CWPP and

locations or potential for possible cultural values at risk requiring protection consideration. Information sharing consisted of an initial phone call, and subsequent distribution of a referral letter and information package (maps, explanation of CWPP, and CWPP draft).

Additional stakeholders were consulted to identify synergies, opportunities for collaboration, and ensure linkages with adjacent and overlapping planning. These stakeholders included Capital Regional District, BCWS Coast Fire Centre - Wildfire Officer and the BC Parks Cowichan Area Supervisor. Combined, these various consultation and engagement opportunities have generated a shared understanding of the CWPP objectives and expected outcomes among local government, stakeholders, residents, and land managers.

1.2.2 Identification of Values at Risk and Local Wildfire Threat Assessment

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

- Fire Regime, Fire Weather and Climate Change (Section 4.1);
- Provincial Strategic Threat Analysis (Section 4.2); and
- Local Wildfire Threat Analysis (Section 4.3).

1.2.3 Development of a Risk Management Strategy

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

- Fuel management;
- FireSmart planning and activities;
- Community communication and education;
- Other prevention measures;
- Structure protection and planning (i.e., FireSmart activities);
- Emergency response and preparedness;
- Evacuation and access; and
- Planning and development.

1.2.4 Building Community Engagement and Education Strategy

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

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

SECTION 2: LOCAL AREA DESCRIPTION

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

2.1 AREA OF INTEREST

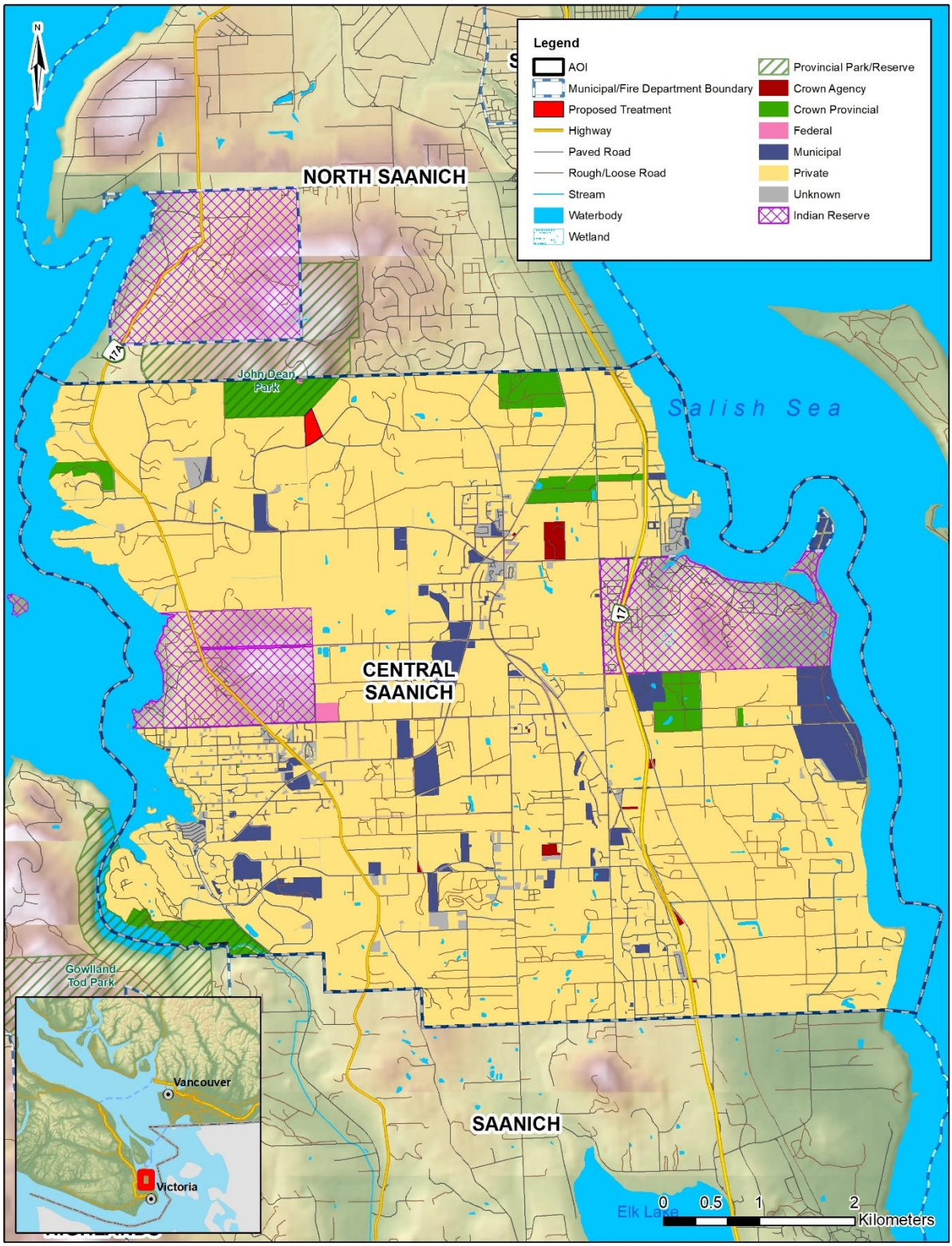
The District of Central Saanich is located in southern Vancouver Island, approximately 14 kilometers (km) north of Victoria. The AOI for the CWPP is illustrated below in Map 1. The AOI for this CWPP encompasses the municipal boundary of the District of Central Saanich as well as the Tsartlip and Tsawout First Nations Indian Reserves (IRs 1 and 2, respectively). This AOI is comprised of multiple small communities, including East Saanich, Saanichton, Brentwood Bay, as well as Tsartlip First Nation and Tsawout First Nation. The AOI is characterized by a mix of residential, commercial, and industrial properties.

The DCS has a population of 16,814 people and covers approximately 51 km^2.[4] A breakdown of land ownership within the AOI is provided in Table 2.

Table 2. Summary of AOI by land ownership.

Land Ownership	Hectares
Crown Agency	13.2
Crown Provincial	1,045.4
Federal	445.0
Municipal	191.5
Private	3,407.2
Unknown	72.2
Total	**5,174.5**

[4] Statistics Canada. 2016 Census.



Map 1. Area of Interest (AOI).

2.2 COMMUNITY DESCRIPTION

The South Island region has been inhabited by the Coast Salish peoples since time immemorial. The Tsartlip (W̱JOŁEŁP), Tsawout (SȾÁUTW̱), Pauquachin (BOḰEĆEN), Tseycum (W̱SIḴEM) and Malahat (MÁLEXEŁ), are the five First Nations which together constitute the Saanich (W̱SÁNEĆ) Nation.[5] These First Nations have occupied the region for tens of thousands of years and some continue to live within the AOI today. The Tsawout First Nation main village is located within the AOI in East Saanich IR 2, and the Tsartlip First Nation community is located within the AOI in South Saanich IR 1.

The Central Saanich AOI represents the centermost portion of the Saanich peninsula and encompasses Brentwood Bay, Saanichton and Keating. Services to DCS residents are provided at the municipal level. The municipal government provides administrative and legislative services, transportation, water and sewer, bylaw enforcement, pets and wildlife, and emergency services. As a member of the Capital Regional District, the regional government supplies water and waste and recycling services.

The DCS is relatively uniform in topography, with low lying agriculturally productive lands, rolling hills and rocky shorelines. Due to this homogeneous topography, the elevation varies minimally within the AOI, from sea level to about 300 m. Mount Newton is the highest elevation point within the AOI, at 306 m. The AOI also includes many streams, waterways, flatlands and beaches.

The DCS economy was historically driven by agriculture, quarrying, some logging, and fishing.[6] Although these industries remain important to the communities within the AOI, the economic focus has shifted in recent decades to tourism, residential development, and agriculture, specifically food production and vineyards.

Fire protection within the AOI is the responsibility of the Central Saanich Fire Department which is serviced by seven career fire fighters and 42 volunteer fire fighters. The Central Saanich Fire Department has a servicing agreement with both Tsawout and Tsartlip First Nations. BCWS is responsible for responding to wildfire incidents that exceed the response capacity of the Central Saanich Fire Department.

In the event of a wildfire, the DCS has limited emergency egress routes. West Saanich Road (Highway 17A) and Patricia Bay Highway (Highway 17), which runs north to south through the AOI, are the only reliable, paved access routes. Many developments within the DCS are located on single access roads which branch off West Saanich Road and the Patricia Bay Highway. This not only presents a challenge for emergency egress, but also limits the ability of fire crews to respond to fires and safely evacuate residents.

The Fire Department has an emergency program that supports the municipality in preparing for and responding to major emergencies. Part of the emergency program is a regional alert system, the Saanich Peninsula Alert (SPA); evacuation route planning, Emergency Operations Centre training with District

[5] District of Saanich. *Indigenous Relations.* Retrieved from: https://www.saanich.ca/EN/main/community/Indigenous-Relations.html

[6] District of Central Saanich. *History & Heritage Sites*. Retrieved from: https://www.centralsaanich.ca/our-community/history-heritage-sites

staff and First Nations representatives, and other training exercises in partnership with neighbouring Districts, townships, and First Nations.[7]

2.3 PAST WILDFIRES, EVACUATIONS AND IMPACTS

BCWS South Island Fire Zone staff (Dave Moon) communicated that although wildfires are not that common within the AOI, a large percentage of the past wildfire activity was human-caused. This is likely due to the fact that populations are concentrated, and in the coastal ecosystems within the AOI, lightning-caused fires are rare. According to the available records, BCWS has not responded to any fires within the DCS. It is likely that other wildfires have occurred in the past, but did not require BCWS assistance. BCWS staff have identified slash and standing grass as volatile fuel types in the South Vancouver Island Zone (SIFZ); however, slash burning has not been a significant issue as the DCS has bylaws in place to regulate open burning.

Currently the Central Saanich Fire Department is included in the Inter-Agency Operational Procedures agreement between the BCWS, the Fire Commissioner, and the Fire Chiefs Association of BC. Annual meetings and recent cross-training have not occurred between the South Island Fire Zone (SIFZ) and the DCS. Typically, these training events focus on fire departments with limited access to mutual aid from nearby departments. There is no formal training or coordination with the DCS emergency services; however, through the SIFZ BCWS wildfire officers and crews are trained in the Incident Command System. It is through the Coastal Fire Center that the SIFZ coordinates response and training with the Capital Regional District (CRD) emergency services and Emergency Management BC. Although no formal resource sharing agreements exist between the BCWS and the DCS, all resources contracted by the BCWS are available to the DCS as needed, subject to authorization by the Regional Wildfire Coordinator Officer.

Based on the BCWS historical wildfire dataset, the only fire to have burned within the DCS AOI occurred in 1947. This fire was person-caused, and the total area burned was less than one hectare in size. The two largest fires to burn within a 25 km buffer of the AOI both occurred in 1922 and were person-caused. Combined, the two fires burned approximately 3,472 ha. ha. In July 2019 a small wildfire occurred near Durrance Lake on federal land. Firefighters from Saanich, Central Saanich, Willis Point, Highlands, Canadian Forces Base Esquimalt and the BCWS cooperated to contain the fire, which burned approximately three hectares.[8] In early August of 2018, 34 new fires were ignited on Vancouver Island, primarily due to lightning events.[9] Several fires on northern Vancouver Island and near Nanaimo Lakes, which burned a total area of 182 ha, resulted in evacuation alerts and orders. The Lizard Lake wildfire and the Vancouver Island wildfires of 2018, in combination with the 2017 and 2018 Province-wide wildfires, have alerted BCWS to the potential for large, catastrophic wildfires occurring within and surrounding the present AOI.

[7] District of Central Saanich. *Annual Report*. 2018.
[8] *Crews contain wildfire on Saanich Peninsula rifle range.* CTV Vancouver Island. 2019. Retrieved from: https://vancouverisland.ctvnews.ca/crews-contain-wildfire-on-saanich-peninsula-rifle-range-1.4490629
[9] BC Wildfire Service, Interactive Map

Access and evacuation vulnerabilities are present in many locations throughout the AOI. Specific vulnerabilities noted by the DCS are related to restricted access and egress on main roads; and first responder access to properties and neighborhoods on narrow or winding roads. More detail on access and egress features and deficiencies is provided in Section 6.1.3.

The BCWS historical ignition dataset demonstrates that the proportion of human-caused fires within the AOI is substantially greater than that of the province as a whole.[10] This ignition data shows that within the AOI, close to 100% of reported ignitions since 1950 have been human-caused, versus 40% in the province of BC.[11] This statistic may be explained by the lower proportion and occurrence of lightning strikes on Vancouver Island relative to other areas in the province. Additionally, centers of concentrated population, high recreational use in some areas, and the presence of industrial activity within the AOI also contribute to this statistic.

2.4 CURRENT COMMUNITY ENGAGEMENT

There are varying levels of recognition and awareness, from both DCS staff and the community, of the threat posed to the community by wildfire. As a result, there has been minimal community engagement in FireSmart initiatives to this point. Efforts should be made to enhance the community's engagement in FireSmart initiatives. Examples of these future initiatives include: training more staff to deliver FireSmart presentations and workshops, distributing FireSmart educational materials, organizing community presentations, attending school information days, and using social media platforms to engage and inform the public regarding fire danger rating and threat information. Future initiatives should focus engagement efforts during times of high public uptake (during or post wildfire season) in order to maximize the resources available for community engagement. Recommendations for further education and communication initiatives that may be undertaken by the District are provided in Section 5.3.

Furthermore, several bylaws that relate to wildfire have been adopted by the District. These include the *Open Air Burning Regulation Bylaw (No. 1091)* and the *Parks Management and Control Bylaw (No. 804)* which enables the District to control the use of fire within the District boundary and in District parks. Although the DCS does not have an official wildfire development permit area, the 2018 OCP does support the regulation of building projects by implementing site management and building design approaches that minimize the risk of wildfires in high risk areas.

2.5 LINKAGES TO OTHER PLANS AND POLICIES

The following is a summary of DCS and provincial policies and guidelines that relate to strategic wildfire management, wildfire threat reduction, operational fuel treatments and emergency planning.

2.5.1 Local Authority Emergency Plan

Emergency preparedness and response is managed by the DCS. Although the DCS does not have an official emergency management plan, it has an emergency management program and provides a

[10] BC Wildfire Service: Fire Incident Locations - Historical
[11] BCWS. 2019

comprehensive list of resources and links on its website to serve the District. This list includes the Capital Regional District (CRD) Guide to Emergency Preparedness, the Saanich Peninsula Alert System (SPAS), and the Peninsula Emergency Measures Organization (PEMO). The emergency management program is a division of the Central Saanich Fire Department (CSFD), and was developed to optimize the response, resources, and planning for incidents that may occur within the DCS. More specifically, the program ensures continuity in government; provides a plan for preserving life and property; and coordinates response from elected officials, municipal departments, volunteer services, outside agencies, Emergency Operations Center (EOC) functions, and services such as the Saanich Peninsula Alert System.

The Guide to Emergency Preparedness provided by the CRD gives important information about jurisdiction and priority setting, as well as information on local emergency programs and how residents can prepare for emergencies. Other emergency services like SPAS are designed to deliver real time, public safety alerts to all registered residents and stakeholders in the Saanich Peninsula, including the Districts of North and Central Saanich and the town of Sidney. PEMO is another emergency service supported by the DCS that is run by volunteers and provides emergency support services, search and rescue, emergency communications and develops neighbourhood emergency preparedness programs.

2.5.2 Affiliated CWPPs

CWPPs have been developed the Cowichan Valley Regional District (2017, Four Zones - South, Central, West, and North) and Capital Regional District (2005-2010 - Saltspring Island; Mayne Island; Galiano Island; North and South Pender and Saturna Islands; and Juan de Fuca Electoral Area and District of Sooke). These documents, when available were reviewed for relevance (i.e., synergistic project opportunities, as well as to confirm that there are no contradicting recommendations). Furthermore, a CWPP for the District of North Saanich was developed concurrently with this CWPP by the same consultant, ensuring consistency in recommendations and synergies within proposed future fuel treatment works.

2.5.3 Local Government Policies and Recommendations

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

DCS Bylaw No. 1606 (2008): District of Central Saanich Official Community Plan

The District of Central Saanich Official Community Plan (OCP) provides guidance for land use, development, and community evolution within the District. Some sections contain objectives and policies which are directly relevant to wildfire risk reduction and emergency response as described below.

2008 OCP Section 4: Residential Growth Management and Housing

Section 3 outlines the projected demand for housing in the District and the plan to accommodate it. The community has voiced a preference for infill and intensification rather than sprawl, which is beneficial for reducing the wildfire urban interface in the District.

2008 OCP Section 6: Parks, Recreation and Open Space

Section 6 identifies the importance of parks and open spaces in the District and identifies objectives to guide planning. Objectives are centered around growing the park system to meet the present and future needs of residents while providing ecological services like habitat provision and carbon sequestration. The District identifies three types of parks: municipal, non-municipal, and 'open space', which includes streetscapes, beach accesses, and trails. The Capital Regional District (CRD) Regional Green/Blue Spaces Strategy is cited as a companion document.

2008 OCP Section 7: Environment

Section 7 outlines objectives for natural areas that are not encompassed in parks or private land. The District is committed to the fundamental principle of "Protect and Enhance the Environment, Biodiversity and Natural Ecosystems." Of special consideration in the District are marine shoreline ecosystems. Several subsections relate to fire risk management. Subsection 7.2.1, Policy 6, specifies the objective of enhancing the urban forest to increase landscape-level forest connectivity, while giving consideration to reducing wildfire risk. Subsection 7.2.4, Policy 1, recommends implementing site management/building design to minimize risk of wildfires in high risk areas, while considering sensitive ecosystems. Subsection 7.2.4 also recommends exploring the establishment of a Fire Hazard Development Permit Area.

2008 OCP Section 11: Development Permit Areas (DPA) and Guidelines

Section 11 divides the District into areas with similar development related considerations. No Fire Hazard Development Permit Area has been established at this time. In most areas, the OCP restricts the removal or alteration of vegetation and soil disturbance, except where exceptions exist. Emergency actions required to control a threat to human life, such as a forest fire, is one such exception, as is municipal works.

2008 OCP Section 12: Regional Context Statement

Section 12 outlines how the Regional Growth Strategy (RGS) for the CRD applies to the District of Central Saanich. Section 12.3 specifies objectives for growth management. The desire is to keep urban settlement compact by restricting the majority of growth to a designated Urban Settlement Area. This will help limit the extent of the wildfire urban interface within the District. The extension of utilities such as water lines to rural areas is not supported except to provide water for agricultural uses or fire suppression.

DCS Bylaw No. 1595 (2002): Tree Protection Bylaw

This bylaw prevents any protected tree from being cut down without a permit. Protected trees are all trees with at least 60 cm diameter at breast height; any *Quercus garryana* (Garry oak), *Arbutus menziesii* (arbutus), *Cornus nuttallii* (Pacific dogwood), *Taxus brevifolia* (Pacific yew), *Pinus contorta* (shore pine), or *Populus tremuloides* (trembling aspen) over 50 cm in height; any nesting tree; and other specially designated trees. Exceptions under this bylaw are as allowed under a development or tree cutting permit, for normal pruning, trees within the Agricultural Land Reserve (ALR), trees in danger of falling, or trees near utility lines. There is no explicit case where a tree cutting permit can be issued for fuel management activities.

RECOMMENDATION #1: Revise Bylaw No. 1595, 2002 to include language which allows the issuance of a permit for cutting of trees if it is required to reduce wildfire hazard within the wildland urban interface, as determined by a qualified professional (QP). This bylaw should also be reviewed to ensure that it does not limit the ability of homeowners to address wildfire hazards associated with trees on private property immediately adjacent to homes.

DCS Bylaw No. 993 (1990): Erosion Control and Tree Cutting Bylaw

This bylaw specifies areas of the District, called 'erosion districts', that are under special risk of erosion. Cutting or destroying a tree (defined as a woody plant at least 3 meters tall) in these districts requires a permit from the Municipal Engineer, unless it is a danger tree or the land is part of the ALR. The engineer may request that a permit application by accompanied by a report from a Qualified Professional certifying that the proposed cutting will not create a danger from flooding or erosion.

DCS Bylaw No. 1091 (1993): Open Air Burning Regulation Bylaw (currently under review)

This bylaw gives the Fire Chief the authority to grant permits for open air burning and incineration and to prohibit any burning where atmospheric or local conditions may create a hazard. The conditions for appropriate burning are outlined, including acceptable materials; distances from structures, standing timber, or brush; fire size; and timing.

DCS Bylaw No. 804 (1985): Parks Management and Control Bylaw

This bylaw governs conduct in parks and open spaces. Vegetation and soil may not be damaged or modified in any way. Permits are required for fires.

DCS Bylaw No. 1504 (2004): Development Application Procedures Bylaw

This bylaw specifies the review process of and requirements for a development permit application including site plans and landscaping plans. There are no explicit requirements for a risk assessment with regards to fire safety.

DCS Bylaw No. 1845 (2014): Unsightly Premises and Noxious Weeds Bylaw

The bylaw states that the owner or occupier of a property must not have allow dilapidation to occur on structures or allow any accumulation of discarded material or garbage of any kind. This extends to untended grass or ground cover (over 30 cm in height) and noxious weeds and is relevant for both aesthetic and safety purposes.

RECOMMENDATION #2: Review Bylaw No. 1845, 2014 and include wording that specifically prohibits the accumulation of combustible materials on the property (including on and under exterior projections, such as decks and patios, near the home, and in gutters and roofs). The revised bylaw should provide the District the authority to require removal/clean-up of combustible materials or to complete removal and recoup costs from the owner.

DCS Bylaw No. 1470 (2003): Building Bylaw

The bylaw regulates construction with the District. Fire suppression drawings prepared by a registered professional may be required by a building official along with a building permit application.

RECOMMENDATION #3: Work with the Building Department (i.e., building inspectors) to ensure house numbering is posted prior to occupancy of new development and to provide instructions on how and where best to affix numbering to facilitate emergency response and evacuation efforts. Consider encouraging home owner participation via a DCS-wide engagement campaign and providing incentives such as the opportunity to acquire/purchase discounted address signs.

DCS Bylaw No. 968 (1990): Soil Removal and Deposit Bylaw

Prohibits soil removal or deposition within the District except as allowed under a permit or under exceptions. Such exceptions include small amounts of soil or removal/deposition in parks or on municipal lands. This bylaw specifies that no permit is required for the deposit or removal of wood waste on or from land on which it has been lawfully produced.

Regional Green/Blue Spaces Strategy, 1997

This document proposes a network of parks, unprotected green space and waterways, agricultural land and managed forest land in the Capital Regional District. The primary goal of the strategy is to enable environmental protection and provision of ecological services across municipal boundaries. The District contains municipal, provincial (Gowlland Tod Provincial Park and ŁÁU,WELN̲EW̲/John Dean Provincial Park), and regional (Island View Beach) parks, as well as trails, open spaces, and beach accesses. The Lochside trail and Mount Newton Walkway are Regional Trails in the District.

Regional Parks Strategic Plan, 2012

This is a ten-year strategic plan for Regional Parks in the CRD, from 2012 to 2021. It is partly in response to rapid growth in populations and tourism in the region. As visits to parks in the CRD increase, so do opportunities for human-caused ignition of wildfires. Increased park popularity and associated facility development also increases the chances that humans or valuable park assets will be impacted by wildfire.

Regional Trails Management Plan, 2016

This plan is intended to guide development and management decisions for regional trails in the CRD. One overall goal is increased connectivity of regional trails. Increasing trail connectivity and trail usage facilitates human access to forest land. One positive outcome of this is that fuel management prescriptions in these areas may be easier to implement, and fire suppression crews will be able to gain access to render emergency services quicker. A negative outcome of increased access is increased risk for wildfire ignition and human entrapment.

RECOMMENDATION #4: Work with the DCS Parks Department and the Capital Regional District (CRD) to incorporate wildfire risk considerations (i.e., placement, type, width, and objective of trails) during municipal and regional park acquisition and future updates to the Regional Trails Management Plan. Consideration should also be given to trail building and maintenance as these activities can either increase wildfire risk (through fuels accumulations and unsafe work practices) or decrease wildfire risk (though proper placement, clean-up of combustible fuels trailside and work practices which adhere to Wildfire Act and Regulations).

2.5.4 Higher Level Plans and Relevant Legislation

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

Vancouver Island Land Use Plan (VLUP)[12]

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

Relevant Legislation

There are no spatially explicit ministerial orders pertaining to the AOI; however, there are sensitive ecosystem occurrences, provincial parks, settlement areas and Agriculture Land Reserve (ALR) areas that overlap with the AOI which may impact potential fuel treatment activities. Fuel management within these areas should aim to enhance these values, whenever possible, and the land manager and/or BC Parks should be consulted regarding any overlapping values at risk, or other notable values, during prescription development.

2.5.5 Ministry or Industry Plans

Reviewing and incorporating other important forest management planning initiatives into the CWPP planning process is a critical step in ensuring a proactive and effective wildfire mitigation approach in the AOI.

The Vancouver Island Central Coast Response Fire Management Plan (FMP)[13] that encompasses the DCS was reviewed to identify future landscape level fire management planning at the Natural Resource District level. The FMP was completed in 2018 for the Coastal Fire Centre and three Natural Resource Districts, including the South Island District relevant to the AOI. The FMP identifies values at risk and prioritizes broad categories of values as 'themes' for categorizing response through the Resource Strategic Wildfire Allocation Protocol (RSWAP). The FMP briefly speaks to the concept of wildfire prevention engineering within the region, which includes fuel management such as locally identified fuel breaks, proposed treatment areas, or demonstration and operational treatment areas. The FMP does not identify potential fuel breaks around the municipalities within the AOI. To address this gap, interface fuel break and trailside treatment opportunities have been identified as part of this CWPP.

Two Provincial Parks partially overlap with the AOI, these include ŁÁU,WELṈEW̱/John Dean Provincial Park in the north, and Gowlland Tod Provincial Park in the southwest of the AOI. Management plans for

[12] The Province of BC, 2000.
[13] Ministry of Forests, Lands, Natural Resource Operations and Rural Development. 2018.

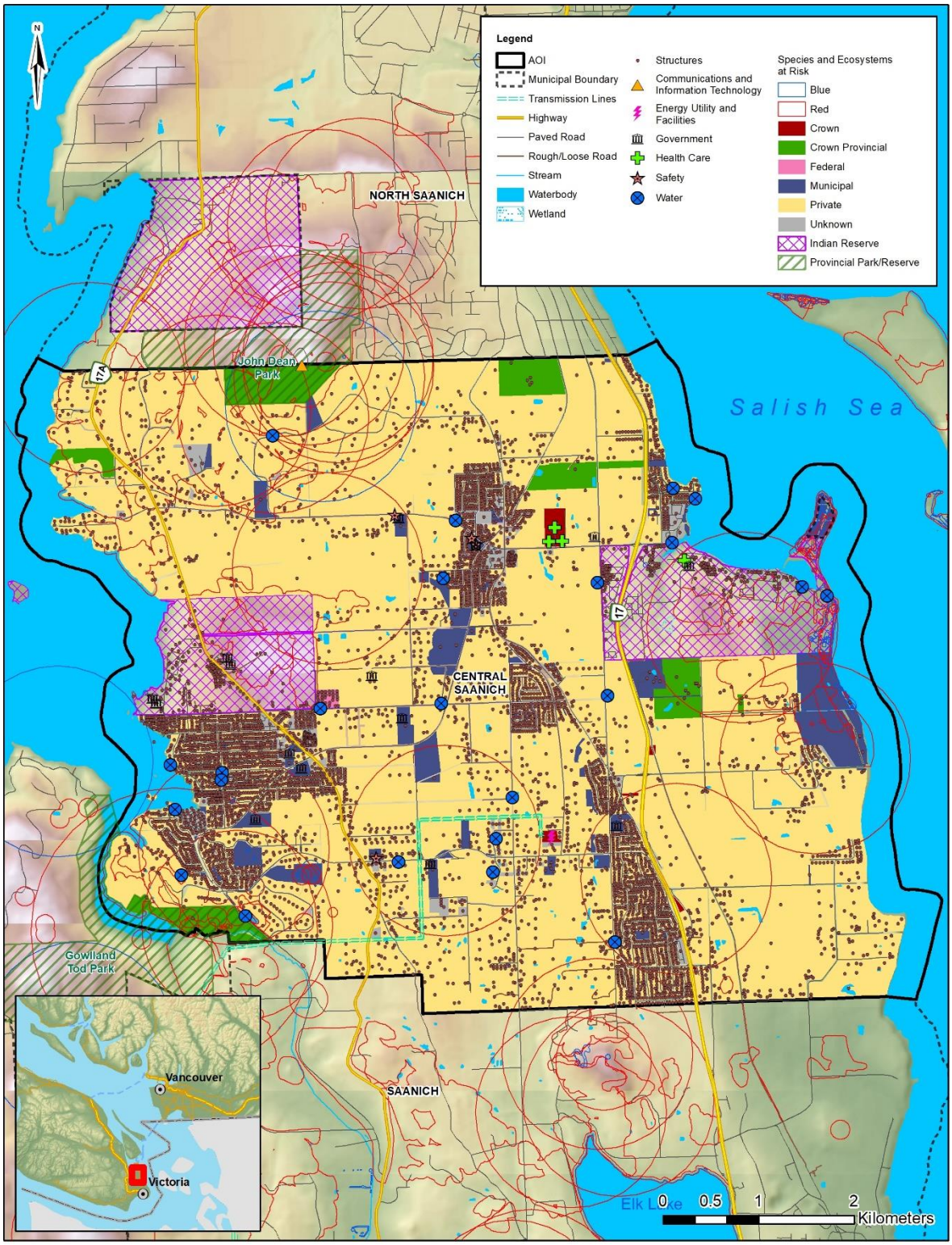
these parks consist of a Purpose Statement and Zoning Plans (PSZP 2003) for ŁÁU,WELṈEW̱/John Dean Provincial Park, and a more comprehensive Management Plan (MP 1996) for Gowlland Tod Provincial Park.

Forest health management and associated initiatives within the Arrowsmith Timber Supply Area (TSA) are guided by the Coast Area 2015-17 Coastal Timber Supply Areas Forest Health Overview[14]. This plan must be reviewed, considered, and addressed during the prescription-level phase. Fuel management and prescriptions aimed at reducing wildfire hazard within the AOI should aim to incorporate the guiding principles and best management practices (BMPs) presented within this aforementioned plan.

SECTION 3: VALUES AT RISK

Following is a description of the extent to which wildfire has the potential to impact the values at risk (VAR) within the DCS AOI. VAR or the human and natural resources that may be impacted by wildfire include human life and property, critical infrastructure, high environmental and cultural values, and other resource values. Furthermore, updating VAR data is critical for effective mitigation planning. This can be achieved through the Critical Infrastructure Assessments process during the development of the local Authority Emergency Plan, or by utilizing data sets for values that have already been identified. VAR also include hazardous values that pose a safety hazard. Key identified VAR are illustrated below in Map 2.

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



Map 2. Values at Risk within the AOI.

3.1 HUMAN LIFE AND SAFETY

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

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

The population distribution (both people and structures) within the AOI is important in determining the wildfire risk and identifying mitigation activities. The population of the DCS has increased slightly in the last decade. Between 2011 and 2016 the population rose by 5.5 percent, and the total population in 2016 was roughly 16,814 people.[4] The average age of the population was 47 years old. The total number of private dwellings within the AOI was 7,121 homes and more than half of these (3,750) were single detached homes. The average population density for the area was approximately 407 people per square kilometer.

The DCS attracts visitors for sightseeing, hiking, biking, sailing and boating and other recreational endeavors year-round, but particularly during the fire season (May – October). Several parks and recreation sites throughout the AOI are highly used during the summer months, including John Dean Provincial Park, Gowlland Tod Provincial Park, Island View Park and many others. Furthermore, the Patricia Bay Highway (Hwy 17), which is frequently used as an access corridor between Swartz Bay and Victoria, are main tourist corridors during the summer months and therefore increases the number of people to evacuate in the event of a wildfire.

Knowledge of and access to updated structure locations within an area is a critical step in efficient and successful emergency response planning and the development of mitigation strategies and recommendations. Field visits to the District of Central Saanich and access to recent orthophotography and spatial data from the DCS has enabled the development of 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. Critical infrastructure includes emergency and medical services, electrical and gas services, transportation, water, social services, and communications infrastructure. A critical infrastructure dataset was provided

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

by the DCS's GIS staff and this data was included in Map 2. Table 3 details an inventory of critical infrastructure identified by the DCS and via field visits.

Protection of critical infrastructure has shown itself to be an essential wildfire preparedness function. Survival and continued functionality of these facilities not only support the community during an emergency but also determine, to a great degree, the extent and cost of wildfire recovery and economic and public disruption during post wildfire reconstruction. Critical infrastructure provides important services that may be required during a wildfire event or may require additional considerations or protection. As outlined in Section 5.2, FireSmart principles are important when reducing wildfire risk to both classes of structure and are reflected in the outlined recommendations. During field visits, it was observed that the DCS's critical infrastructure (i.e., fire halls, community centres, etc.) are in various levels of compliance with FireSmart principles.

RECOMMENDATION #5: The use of fire-resistant construction materials, building design and landscaping should be considered for all CI when completing upgrades or establishing new infrastructure. Additionally, vegetation setbacks around critical infrastructure should be compliant with FireSmart guidelines. Secondary power sources are important to reduce critical infrastructure vulnerability in the event of an emergency which cuts power for days, or even weeks.

RECOMMENDATION #6: Complete formal FireSmart assessments (by a Qualified Professional) for CI such as the fire halls, emergency operations centres, water infrastructure, and others as identified in this CWPP (Table 3) and by the DCS.

3.2.1 Electrical Power

Electrical services for the DCS are received through a variety of distribution methods including a network of wooden pole transmission lines, generating systems and underground distribution infrastructure supplied by BC Hydro. Neighbourhoods with small, street-side wooden poles that connect to homes are particularly vulnerable to fire. It is recommended that utility right-of-way best management practices such as, regular brushing and clearing of woody debris and shrubs be employed to help reduce fire risk, utility pole damage and subsequent outages.

Two major transmission lines bisect the DCS; 2L132 connects the Pike Lake Substation with the Keating substation, and 60L087 connects the Keating substation with the Sidney substation. This system is well-mapped and BC Hydro states that staff will work with local fire departments and BCWS to mitigate impacts to this infrastructure in the event of a wildfire.[16]

A large fire has the potential to impact electrical service by causing disruption in network distribution through direct or indirect means. For example, heat from flames or fallen trees associated with a fire event may cause power outages. Consideration must be given to protecting this critical service and providing power back up at key facilities to ensure that the emergency response functions are reliable.

Secondary power sources are important to reduce critical infrastructure vulnerability in the event of an emergency which cuts power for days, or even weeks. Secondary power is available for some critical

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

infrastructure such as Municipal Hall, the Central Saanich Fire Department (CSFD), and some lift stations in the case of an emergency, via generators. The municipality also has access to two other generators. One is diesel-powered and is expected to supply power for 1-2 days. The other is propane-powered and can supply power for a maximum of five days. Vulnerabilities for secondary power sources include mechanical failure, potentially insufficient power sources should a wide-scale outage occur, and fuel shortage in the event of very long outages. Refer to Section 6.1 for discussion and recommendations related to backup power and water availability for fire suppression.

3.2.2 Communications, Pipelines and Municipal Buildings

Residents within the DCS are serviced by the Saanich Peninsula Hospital, which is located within the AOI, and the Victoria International Airport located in North Saanich. There are multiple underwater utility telecommunication lines that pass through the AOI and overlap with other Districts. The first telecommunication line runs from the DCS to the District of Highlands through Brentwood Bay. The second line passes through Cordova Bay to James Island, which is within the jurisdictional boundaries of the City of Victoria. There are two electrical powerlines that overlap with the AOI, both of which are underwater and connect with James Island. There are no known natural gas pipelines that intersect the AOI. A full inventory of critical infrastructure for communications and Municipal buildings with updated locations is presented in Table 3, below.

Table 3. Critical Infrastructure Identified in CWPP field visits.

Critical Infrastructure Type	Location
Bayside Middle School	1101 Newton Pl, Brentwood Bay
Brentwood Elementary	7085 Wallace Dr, Brentwood Bay
Central Saanich Fire Department – Hall #1	1512 Keating Cross Rd, Saanichton
Central Saanich Fire department Museum - Hall #2	1903 Mt Newton Cross Rd, Saanichton
Central Saanich Municipal Hall	1K8, 1903 Mt Newton Cross Rd
Central Saanich Police	1903 Mount Newton Cross-Road, Central Saanich
Central Saanich Public Services Yard	1703 Keating Cross Rd, Saanichton
Friendship Community Church	7820 Central Saanich Rd, Saanichton
Greater Victoria Public Library - Central Saanich Branch	1209 Clarke Rd, Brentwood Bay
Keating Elementary School	6843 Central Saanich Rd, Central Saanich
Keating Substation	Duracme Rd, Central Saanich
ŁÁU, WELṈEW̱ Tribal School	7449 W Saanich Rd, Brentwood Bay
Peninsula Health Unit	2170 Mt Newton Cross Rd, Saanichton
Radar Dome – Coast Guard	End of Dean Park Road
Saanich Country Fair/Market – Emergency Operations Center	1528 Stellys Cross Rd, Saanichton
Saanich Peninsula Hospital	2166 Mt Newton Cross Rd, Saanichton
Saanich Peninsula Hospital: Emergency Room	2166 Mt Newton Cross Rd, Saanichton
Saanichton Learning Centre	1649 Mt Newton Cross Rd, Saanichton
Stelly's Secondary School	1627 Stellys Cross Rd, Saanichton

Critical Infrastructure Type	Location
Tsartlip Band Council and Administration	1 Boat Ramp Rd, Brentwood Bay
Tsartlip Health Station	802 Stellys Cross Rd, Brentwood Bay
Tsawout Band Office	7728 Tetayut Rd, Saanichton
Tsawout First Nation Health Authority	7728 Tetayut Rd, Saanichton
W̱SÁNEĆ School/Heritage Board	7449 W Saanich Rd, Brentwood Bay

3.2.3 Water and Sewage

The District's water system is part of the Saanich Peninsula water system which falls within the Capital Regional District (CRD) integrated water system. It receives the majority of its water through the Bear Hill Reservoir and the Alderly pressure reducing valve (PRV). The DCS supplies, operates and maintains a number of water and sewer utilities within the municipality. Within the AOI, there are two CRD water mains that feed into the District, with a total of 11 supply points connecting to the municipal distribution network. In total, the District water system network is made up of 125 km of water mains, 480 hydrants, two active pump stations, one reservoir, and nine PRVs. These water utilities are supplied mainly by above ground water sources, and have been mapped for reference. Within the AOI, emergency water sources for fire protection are limited and unreliable. The CRD provides regional storage and supply, but the DCS does not have municipal balancing/fire protection storage. As a result, it is recommended that water be shuttled to the fire source. It is recommended that the location, relative quantity, and availability of emergency surface water sources, which are useable for fire suppression, be described and mapped for future reference.

The DCS operates a sanitary-only sewer collection system in four core areas, including Brentwood Bay, Saanichton, Keating Ridge and Turgoose Point. This system is maintained by the Public Works Department. In total, the sewer system consists of 89 kilometers of gravity fed sewers, 5 kilometers of force mains, 3.9 kilometers of siphons and 15 lift stations. This system supplies approximately 3,800 households and businesses and is also connected with the Tsartlip First Nation and two CRD lift stations. The effluent from this sewer system is transferred to the Saanich Peninsula Wastewater Treatment Plant operated by the Capital Regional District located in the District of North Saanich. The Tsawout First Nation operates its own system and is not connected to the District's network.

In the event of an emergency, or a loss of power, a few of the sewer stations within the DCS have built in generators. The DCS utility staff also has access to a portable generator which can be deployed to any location, as needed. In addition, all CRD wastewater pump stations in the Saanich Peninsula have fixed back-up generators. Furthermore, both the sewer and water systems are mapped and their locations are detailed below in Table 4.

Table 4. Critical Infrastructure Identified in CWPP field visits.

Critical Infrastructure Type	Location
CRD Water Center	North-east intersection of Gowdy Road and Stellys Cross Road
Fire Pump	North-west of 1649 Mt Newton Cross Rd, Saanichton
Lift Station	North-west of Scohon Dr and Mt Newton Cross Rd intersection
Pump Station	North of where Delamere Rd and Wallace Dr meet
Pump Station	North-east of Central Saanich Rd and Tanner Rd intersection
Pump Station	East of Meadowbank Road and Seabrook Road intersection
Pump Station	West of Keene Way, Brentwood Bay
Pump Station (Arthur)	North-east of Arthur Drive and James Island Rd intersection
Pump Station (Blackglama)	Western end of Blackglama Place
Pump Station (Butchart Gardens)	Parking Lot north of Benvenuto Ave
Pump Station (Butler Cr)	Pump station on west side of Butler crescent
Pump Station (Central Saanich Rd)	Pump station on east side of Central Saanich Road
Pump Station (Hagen)	North-west of Hagen Road and Peggy Anne Crescent intersection
Pump Station (Keating)	South-west of Willow Way and Keating Cross Rd intersection
Pump Station (Kirkpatrick)	East of Kirkpatrick Crescent
Pump Station (Lancelot Pl)	Pump station at end of Lancelot Place
Dean Park Reservoir (CRD)	North of Thomson Place
Dawson Upper Reservoir (CRD)	North of Wallace Drive and Garden Gate Drive intersection
Sewer Station (Stelly's Cross)	Sewer station north-east of Holm Road and Stellys Cross Road intersection
Tsawout Sewer Lift Station	South of 3021 Sa Su Rd, Saanichton
Tsawout Sewer Treatment Facility	Eastern end of Sa Su Road
Water Service Station	Water Service Station on west side of Central Saanich Rd. across from Tzui-Hau-Met Lane
Water Services	South-east intersection of Sluggett Rd and Hagen Rd
Water/Sewer Services	Between Park Access Rd and Mt. Newton Cross Rd

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

The DCS draws its domestic water from the CRD Sooke Reservoir, which supplies approximately 132 million liters of water daily to Greater Victoria, including the DCS. The Bear Hill and Dawson Upper Reservoirs (storage tanks), which are owned and operated by the CRD serve as balancing storage for the distribution system. The entire system is gravity fed and would therefore be unaffected in the event of a power outage. However, if a prolonged power outage were to occur the greatest threat to the system would be a potential supply interruption via large main trunk line failure.

Within the DCS water system testing occurs regularly to ensure that supplied drinking water meets public health regulations. The CRD also releases a weekly water watch report which outlines the water supply system in terms of useable volume in storage, average daily and 5-year demand, monthly rainfall amounts, and any water conservation advisories. The objective of these weekly reports is to inform the public on matters regarding drinking water supply and provide key contact information. Furthermore, the water quality reports provide reassurance to the public that the region's drinking water quality standards are met to ensure continued public health and safety. These drinking water reports include date of receipt of sample, the date of testing, the method used, deviations from the method, original data if the data is flagged as amended and the identification of persons authorizing the tests. In the future, regional drinking water levels are anticipated to be impacted by growing demand and climate change impacts.

The potential impacts of wildfire extend past the time a fire is extinguished. Depending on fire size and severity, there is the potential for significant hydrological impacts, extending for years post-burn.[17]. In the event of a catastrophic wildfire in proximity to the CRD Sooke reservoir, the CRD will strive to mitigate effects to the Sooke Reservoir and minimize the effects on raw water quality from fire ash, particulates, as well as surface runoff from barren slopes (personal communications with CRD Watershed Protection and Wastewater Infrastructure Operations departments). However, the CRD's water treatment processes do not currently include a filtration step which would treat raw water with elevated turbidity. As a result, in the event of a catastrophic wildfire near the CRD Sooke reservoir, the CRD may implement a region-wide boil water advisory to ensure the health and safety of its residents.

3.3.2 Cultural Values

The Coast Salish peoples are the main First Nations group whose territory overlaps the DCS. According to information from the BC Consultative Areas Database, there are 13 First Nations with territories that overlap the AOI for this CWPP. These First Nations, Tribes, or treaty association are as follows: Tsawout First Nation, Tsartlip First Nation, Stz'uminus First Nation, Lake Cowichan First Nation, Halalt First Nation, Lyackson First Nation, Pauquachin First Nation, and Tseycum First Nation, Malahat Nation, Songhees Nation, Cowichan Tribes, Penelakut Tribe and the Te'mexw Treaty Association. All of the aforementioned First Nations, Nations, Tribes and Treaty Associations were consulted with throughout the CWPP development process.

The following is a status update and overview of the ongoing treaty negotiations between First Nations and the Province of British Columbia. The Stz'uminus First Nation has signed a forest consultation and revenue sharing agreement with the Province, and is in Stage 5 Final Treaty Negotiations with the Province. The Te'mexw Treaty Association, which represents five member bands including Malahat Nation and Songhees Nation are currently in Stage 5 Final Treaty Negotiations, and have signed an Agreement-in-Principle with the Province. The Lake Cowichan, Halalt and Lyackson First Nations and the Penelakut Tribe are all part of the Hul'qumi'num Treaty Group, which represents a total of six member bands, which is currently in Stage 5 of the treaty negotiation process. Pauquachin First Nation, Tsartlip

[17] Jordan, P., K. Turner, D. Nicol, D. Boyer. 2006. Developing a Risk Analysis Procedure for Post-Wildfire Mass Movement and Flooding in British Columbia. Part of the 1st Specialty Conference on Disaster Mitigation. Calgary, AB May 23 -26, 2006.

First Nation, Tsawout First Nation, Tseycum First Nation and Songhees Nation are all signatories of Douglas Treaties, and are granted the rights to hunt over unoccupied lands and carry on their traditional fisheries.[18]

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

Due to site sensitivity, the locations of archaeological sites may not be made publicly available. However, data provided by the MFLNRORD Archaeology Branch confirms that multiple sites overlaps with the AOI. Prior to stand modification for fire hazard reduction, and depending on treatment location, preliminary reconnaissance surveys may be undertaken to ensure that cultural heritage features are not inadvertently damaged or destroyed.

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

3.3.3 High Environmental Values

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

There are 28 occurrences of red listed species and/or ecological communities, 7 occurrences of Blue-listed species, and one yellow listed species (Table 5). There are multiple overlaps with masked occurrences. Through consultation with the CDC and a biologist or qualified professional, all site level operational plans must determine if these occurrences will be impacted by fuel management or other wildfire mitigation activities. All future fuel treatment activities or those associated with recommendations made in this plan should consider the presence of, and impact upon, potentially affected species. Additionally, all site level operational plans should consult the most recent data

[18] https://www2.gov.bc.ca/assets/gov/farming-natural-resources-and-industry/forestry/stewardship/forest-analysis-inventory/tsr-annual-allowable-cut/arrowsmith_tsa_discussion_paper.pdf

available to ensure that any new occurrences or relevant masked occurrences are known and considered in the operational plan to mitigate any potential impacts on species at risk. The BC Species & Ecosystems Explorer, which allows combined searches for species and ecological communities, should also be consulted at the prescription phase. Due to potential limitations of existing databases, consultation with a QP with local knowledge is recommended at the prescription phase.

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

Common Name	Scientific Name	Category	BC List	Habitat Type
American Glehnia	*Glehnia littoralis ssp. leiocarpa*	Vascular Plant	Blue	Marine: Beach
Audouin's Night-stalking Tiger Beetle	*Omus audouini*	Invertebrate Animal	Red	
Beach Bindweed	*Calystegia soldanella*	Vascular Plant	Blue	Marine: Beach
Black Knotweed	*Polygonum paronychia*	Vascular Plant	Blue	Marine: Beach
Black Knotweed - Yellow Sand-verbena	*Polygonum paronychia - Abronia latifolia*	Ecological Community	Red	
Common Ringlet, Insulana Subspecies	*Coenonympha tullia insulana*	Invertebrate Animal	Red	Terrestrial: Cropland/Hedgerow, Old Field, Suburban/Orchard
Common Ringlet, Insulana Subspecies	*Coenonympha tullia insulana*	Invertebrate Animal	Red	Terrestrial: Grassland/Herbaceous
Contorted-pod Evening-primrose	*Camissonia contorta*	Vascular Plant	Red	Terrestrial: Grassland/Herbaceous, Sand/Dune
Douglas-fir - Arbutus	*Pseudotsuga menziesii - Arbutus menziesii*	Ecological Community	Red	Terrestrial; Forest Mixed
Douglas-fir/Alaska Oniongrass	*Pseudotsuga menziesii / Melica subulata*	Ecological Community	Red	Terrestrial; Forest Mixed
Douglas-fir/Dull Oregon-grape	*Pseudotsuga menziesii / Berberis nervosa*	Ecological Community	Red	
Edwards' Beach Moth	*Anarta edwardsii*	Invertebrate Animal	Red	Terrestrial; Marine: Beach
Fern-leaved Desert-parsley	*Lomatium dissectum var. dissectum*	Vascular Plant	Red	Terrestrial: Woodland Broadleaf, Forest Mixed
Garry oak/California brome	*Quercus garryana / Bromus carinatus*	Ecological Community	Red	Terrestrial; Forest Mixed
Garry Oak/Oceanspray	*Quercus garryana / Holodiscus discolor*	Ecological Community	Red	Terrestrial; Forest Mixed
Georgia Basin Bog Spider	*Gnaphosa snohomish*	Invertebrate Animal	No Status	Palustrine: Herbaceous Wetland, Shrub Wetland
Giant Chain Fern	*Woodwardia fimbriata*	Vascular Plant	Blue	Terrestrial: Forest Needleleaf
Grand Fir/Dull Oregon-grape	*Abies grandis / Berberis nervosa*	Ecological Community	Red	Terrestrial; Forest Needleleaf
Grand Fir/Three-leaved Foamflower	*Abies grandis / Tiarella trifoliata*	Ecological Community	Red	Terrestrial; Forest Needleleaf
Great Blue Heron, Fannini Subspecies	*Ardea herodias fannini*	Vertebrate Animal	Blue	Terrestrial: Forest Mixed

Common Name	Scientific Name	Category	BC List	Habitat Type
Howell's Triteleia	*Triteleia howellii*	Vascular Plant	Red	Terrestrial: Grassland/Herbaceous, Woodland Broadleaf
Howell's Triteleia	*Triteleia howellii*	Vascular Plant	Red	Terrestrial: Woodland Broadleaf
Large-headed Sedge Herbaceous Vegetation	*Carex macrocephala Herbaceous Vegetation*	Ecological Community	Red	
Painted Turtle - Pacific Coast Population	*Chrysemys picta pop. 1*	Vertebrate Animal	Red	Lacustrine: Shallow Water; Terrestrial: Roadside
Peacock vinyl	*Leptogium polycarpum*	Fungus	Yellow	Terrestrial: Forest Needleleaf, Woodland Broadleaf, Rock Outcrop
Phantom Orchid	*Cephalanthera austiniae*	Vascular Plant	Red	Terrestrial: Forest Mixed
Propertius Duskywing	*Erynnis propertius*	Invertebrate Animal	Red	Terrestrial; Woodland Mixed; Shrubland; Woodland Needleleaf
Red Alder/Skunk Cabbage	*Alnus rubra / Lysichiton americanus*	Ecological Community	Red	Terrestrial; Forest Mixed
Red Alder/Slough Sedge [Black Cottonwood]	*Alnus rubra / Carex obnupta [Populus trichocarpa]*	Ecological Community	Red	
Sand-verbena Moth	*Copablepharon fuscum*	Invertebrate Animal	Red	Terrestrial: Sand/Dune; Marine: Beach
Silky Beach Pea	*Lathyrus littoralis*	Vascular Plant	Red	Terrestrial: Sand/Dune; Marine: Beach
Slimleaf Onion	*Allium amplectens*	Vascular Plant	Blue	Terrestrial: Rock Outcrop, Woodland Broadleaf
Trembling Aspen/Pacific Crab Apple/Slough Sedge	*Populus tremuloides / Malus fusca / Carex obnupta*	Ecological Community	Red	
Western Branded Skipper, oregonia subspecies	*Hesperia colorado oregonia*	Invertebrate Animal	Red	Terrestrial: Sand/Dune
Western Redcedar/Indian-plum	*Thuja plicata / Oemleria cerasiformis*	Ecological Community	Red	Terrestrial; Forest Mixed
Western Redcedar/Vanilla-leaf	*Thuja plicata / Achlys triphylla*	Ecological Community	Red	Terrestrial; Forest Mixed
Yellow Sand-verbena	*Abronia latifolia*	Vascular Plant	Blue	Terrestrial: Sand/Dune; Marine: Beach

3.4 OTHER RESOURCE VALUES

There are multiple resources values associated with the land base, including large scale and hobby agriculture, recreation, tourism and wildlife habitat.

The Arrowsmith Timber Supply Area (TSA) encompasses the District of Central Saanich AOI, although no primary forestry activities occur within the District. As such, higher level planning documents associated

with the TSA do not apply and fuel reduction treatments will not have an effect on the timber harvesting land base.

3.5 HAZARDOUS VALUES

Hazardous values are defined as values that pose a safety hazard to emergency responders. Generally, the DCS does not have a significant number of industrial sites and facilities that can be considered hazardous values. The CRD provides bi-weekly pickup of certain recycling materials. Garbage collection services are not offered by the DCS, and residents have to arrange garbage collection though local private companies, or drop off residential garbage at the Hartland landfill (located outside of the AOI).

The management and treatment of fuels in proximity to hazardous infrastructure is critical in order to reduce the risks associated with both structural fire and wildfire. Specifically, best management practices recommended for management of hazardous values include: 1) incorporating FireSmart planning and setback requirements for all infrastructure in this category; and 2) maintaining emergency fuel/propane emergency shut off procedures to be enacted immediately and efficiently in the event of an approaching wildfire or ember shower.

SECTION 4: WILDFIRE THREAT AND RISK

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

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

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

Where:

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

4.1 FIRE REGIME, FIRE WEATHER AND CLIMATE CHANGE

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

4.1.1 Fire Regime and Fire Weather

Historic Fire Regime

The Biogeoclimatic Ecosystem Classification (BEC) system describes zones by vegetation, soils, and climate. Regional subzones are derived from relative precipitation and temperature. Subzones may be further divided into variants based upon climatic variation and the resulting changes in the vegetative communities; variants are generally slightly drier, wetter, snowier, warmer, or colder than the climate of the regional subzone.[19] BEC zones have been used to classify the Province into five Natural Disturbance Types (NDTs). NDTs have influenced the vegetation dynamics and ecological functions and pathways that determine many of the characteristics of our natural systems. The NDT classification is based on the frequency and severity of pre-European disturbance events (including but limited to wildfires) and provides an indication of historical fire regime. The physical and temporal patterns, structural complexity, vegetation communities, and other resultant attributes should be used to help design fuel treatments, and where possible, to help ensure that treatments are ecologically and socially acceptable[20]. The AOI is characterized by the BEC subzone and associated NDT as outlined in Table 6.

Table 6. BEC zones and natural disturbance types found within the AOI[21].

Biogeoclimatic Zone	Natural Disturbance Type	Area (ha)	Percent (%)
CDFmm : Coastal Douglas-fir, Moist Maritime	NDT2	5,182.2	100%

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

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

Forest Health Issues

Several forest health issues were identified during field assessments in the AOI. Invasive species commonly occur in many of the parks and protected areas in the municipality, with some areas having low to no forest cover due to invasive species competition during stand establishment or development.

[19]BECWeb. Retrieved online at: https://www.for.gov.bc.ca/HRE/becweb/resources/classificationreports/subzones/index.html
[20] Province of British Columbia, 1995. Biodiversity Guidebook, s.l.: s.n.
[21] MFLNRORD BEC Map (DataBC)
[22] 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.

The occurrence of species such as English holly, English ivy and Himalayan blackberry were noted in low-disturbance interface forest stands within 200 m from the nearest road or establishment. The removal of invasive species should occur concurrently with fuel treatments to ensure cost efficiencies. Site monitoring should occur post-treatment to evaluate treatment efficacy and assess further mitigation requirements.

English holly treatment may be in the form of manual removal, with small plants being pulled to remove the roots and large plants cut at the root collar to suppress the growth of future sprouts. English ivy mitigation can occur via manual pruning or pulling of the plant at the root and removal of resulting plant material from the site, avoiding cuttings, as those can sprout. Areas treated for English ivy removal should be mulched or covered in chips produced during the fuel treatment, and frequently monitored and managed post-treatment. Himalayan blackberry treatment may be done manually, individual stems less than 1 cm in diameter can be pulled or dug out by root crowns and larger patches should be brushed or mowed twice seasonally. For the most effective results, the first treatment should be done in May and the second removal should be completed by the end of June once all the stored carbohydrates in the roots have been deployed into the foliage.

The Coast Forest Health Overview outlines forest health issues present within the Arrowsmith TSA.[23] This overview and forest health strategy (2015-2017) outlines ten forest health issues that are most prevalent within this timber supply area: Douglas-fir beetle, drought, gypsy moth, mountain pine beetle, root diseases (primarily laminated root disease and *Armillaria* spp.), spruce aphid, western black headed budworm, western hemlock looper, western spruce budworm and windthrow. The 2017 provincial summary of forest health conditions identified recent forest health impacts in the Arrowsmith TSA.[24] These include laminated root disease, a common damaging agent in southern BC; balsam bark beetle; and only five spot disturbances of armillaria root disease; Douglas-fir beetle infestations, which rose in the West Coast Region; and white pine blister rust.

Spatial data available through DataBC[25] do not indicate that any significant forest health impacts have occurred within the AOI, either historically or contemporarily. This is likely attributed to agricultural and residential development that has reduced continuous forest cover within the AOI. Forest health factors are important to note, because they have implications for the level of surface fuel accumulation in affected stands, as well as access and working conditions for firefighters in the event of wildfire. Both laminated and armillaria root rot can result in high levels of windthrow due to the destabilization of infected trees' root systems.

Human Development and Natural Events

Most land cover change in the AOI can be described as agricultural, residential and some commercial/industrial development. These processes entail land clearing and road building. Forest harvesting is not common within the AOI. Abiotic and biotic natural events occur at small geographic scales. The overall implication of human development is an increase in human ignition potential with a

[23] 2015-17 Coastal Timber Supply Areas Forest Health Overview. 2015.
[24] 2017 Summary of Forest Health Conditions in British Columbia. 2017.
[25] https://catalogue.data.gov.bc.ca/pt_BR/dataset/pest-infestation-polygons

decrease in hazardous fuels cover as land clearing for human development generally increases the non-fuel and O-1a/b fuel types (see Appendix A-1 for a description of fuel types).

Since the establishment of settler communities within the DCS, there have been numerous anthropogenic and natural changes that have occurred on the landscape. The following is a list of notable changes observed within the AOI and a description of associated implications regarding wildfire behaviour.

- Agricultural development – approximately 60% of the DCS is part of the Agricultural Land Reserve (ALR). Farmland in the DCS is used for dairy, and poultry production; for fruit, vegetable, and hay farming; and for livestock rearing including sheep, goats, and beef cattle.[26] In agricultural areas with year-round irrigation, the potential for fine fuels to cure during the wildfire season is low, and the potential wildfire behaviour is greatly reduced.
- Residential land development has occurred across the AOI since the mid-19th century following wide-spread settlement by early pioneers engaging in resource-based activities. The majority of the AOI has been developed into privately owned parcels. This has generally resulted in significant land-cover change, an increased wildland-urban interface in particular areas (Section 5.2.3), and an increase in fire suppression in an ecosystem that had a historic fire interval of 200 years. Population growth is expected to continue and the area's proximity to the Greater Victoria Area, favourable climate and high recreational and landscape values make it a desirable place to live and work.

Fire Weather Rating

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

The BC *Wildfire Act* [BC 2004] and *Wildfire Regulation* [BC Reg. 38/2005], 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.

[26] District of Central Saanich Agricultural Area Plan. 2011. https://www.centralsaanich.ca/sites/default/files/uploads/documents/agricultural_area_plan_0.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 Fire Danger Class days between the months of April and October. The data is summarized from the Victoria Airport (EC) weather station (years 2010 – 2019) which provides the longest fire weather data collection interval within the AOI. According to Figure 1, the months with the highest average number of 'high' and 'extreme' fire danger class days are June, July, August and September. The month of August historically has the highest overall average number of 'extreme' fire danger class days followed by July and September. Although highest fire danger is within these four months, it should be noted that there are 'high' and 'extreme' danger class days which extend into May and October (Figure 1).

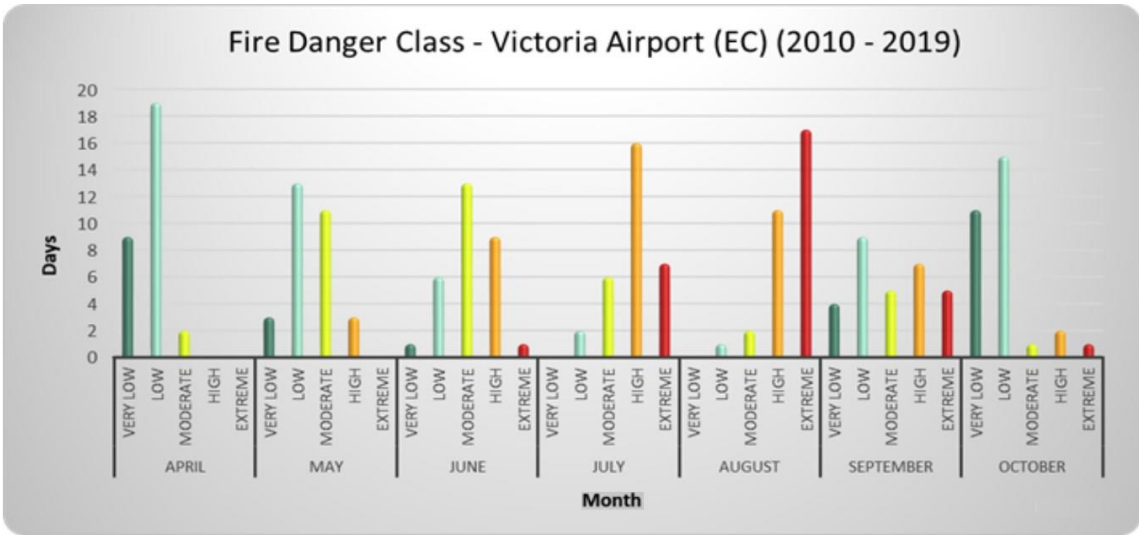


Figure 1. Average number of danger class days for the Victoria Airport (EC) fire weather station. Summary of fire weather data for the years 2010 - 2019.

4.1.2 Climate Change

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

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

As a result, some existing forests have an increased probability of more frequent, intense and more difficult to control wildfires that are likely to result in increased tree mortality, detrimental impacts to soils and hydrology, and increased threat to the community and interface areas."[27] Numerous studies outline the nature of climate change impacts on wildland fire across Canada, and globally.[28] 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.[29] Despite the uncertainties, trends within the data are visible. As outlined *in Climate Projections for the Capital Region*[30], the following climate projections for the Capital Regional District, including the District of Central Saanich are made:

- Year round increases in temperature, with the greatest increases occurring in the summer months (an increase in average summer daytime high temperatures of 3.2° C by the 2050s and 5.2° C by the 2080s);
- More than triple the number of days above 25°C, from a past average of 12 days per year to 36 days per year by the 2050s.
- Increase in the 1-in-20-year hottest day's temperature from a past of 32° C to 36° C by the 2050s.
- Decline in summer precipitation by approximately 20% by the 2050s, and increase in summer dry spells by approximately 20% by the 2060s. This trend is associated with drier fuels and soils, increasing fire behaviour potential.
- Overall increase in precipitation by 5% by the 2050s, with the greatest increase occurring during the fall season, in increasingly extreme events. Approximately 31% more precipitation on very wet days, and 68% more precipitation on extremely wet days is projected. This change to the hydrological regime in the region may influence watershed and groundwater storage ability; timing and quantity of run-off; and soil and fuel moisture during early fire season.

[27] Community Resiliency Investment Program. 2018. Community Wildfire Protection Plan Template.
[28] Flannigan, M.D et al. 2009. Implications of changing climate for global wildland fire. International Journal of Wildland Fire 18, 483-507.
[29] 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.
[30] Capital Regional District. *Climate Projections for the Capital Region.* 2017. Retrieved from: https://www.crd.bc.ca/docs/default-source/climate-action-pdf/reports/2017-07-17_climateprojectionsforthecapitalregion_final.pdf?sfvrsn=bb9f39ca_12

- Average winter temperatures are projected to increase, with a 69% decrease in the number of frost days. The "new normal" is a climate that is almost entirely frost free at lower elevations (inclusive of the DCS, which is located within 100 m of sea level).

An increased frequency of natural disturbance events is expected to occur as a result of climate change with coincident impacts to ecosystems. Models project a high level of annual variability, with considerably more precipitation falling in some years, while other years will experience droughts. Projected changes to natural disturbance regimes include:[30]

- Increased number of storm events, with associated catastrophic blowdown and damage to trees from high winds;
- Increased potential for longer and more severe drought conditions, and increased potential for wildfire events;
- 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).

Insects and disease occurrence of spruce beetle and Swiss needle cast may increase; outbreaks of western hemlock looper may increase.[31] 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.[32]
- 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.[33] 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.[34, 35]

[31] MFLNRO, 2016. BC Provincial Government extension note '*Adapting natural resource management to climate change in the West and South Coast Regions*'. Accessed online at: https://www2.gov.bc.ca/assets/gov/environment/natural-resource-stewardship/nrs-climate-change/regional-extension-notes/coasten160222.pdf

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

[33] 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.

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

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

- Future climatic conditions may be more suitable for, or give competitive advantage to, new species of plants, including invasive species.[36]

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

4.2 PROVINCIAL STRATEGIC THREAT ANALYSIS

The Provincial Strategic Threat Analysis (PSTA) evaluates multiple data sets to provide a coarse (high-level) spatial representation of approximate relative wildfire threats across BC. It provides a starting point to assess the local wildfire threat. Three inputs are combined to create the PSTA wildfire threat analysis component[37]:

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

The final wildfire threat analysis value was developed through an average weighting process of the aforementioned three layers[38]. 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).

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

[37] 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.

[38] 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])

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

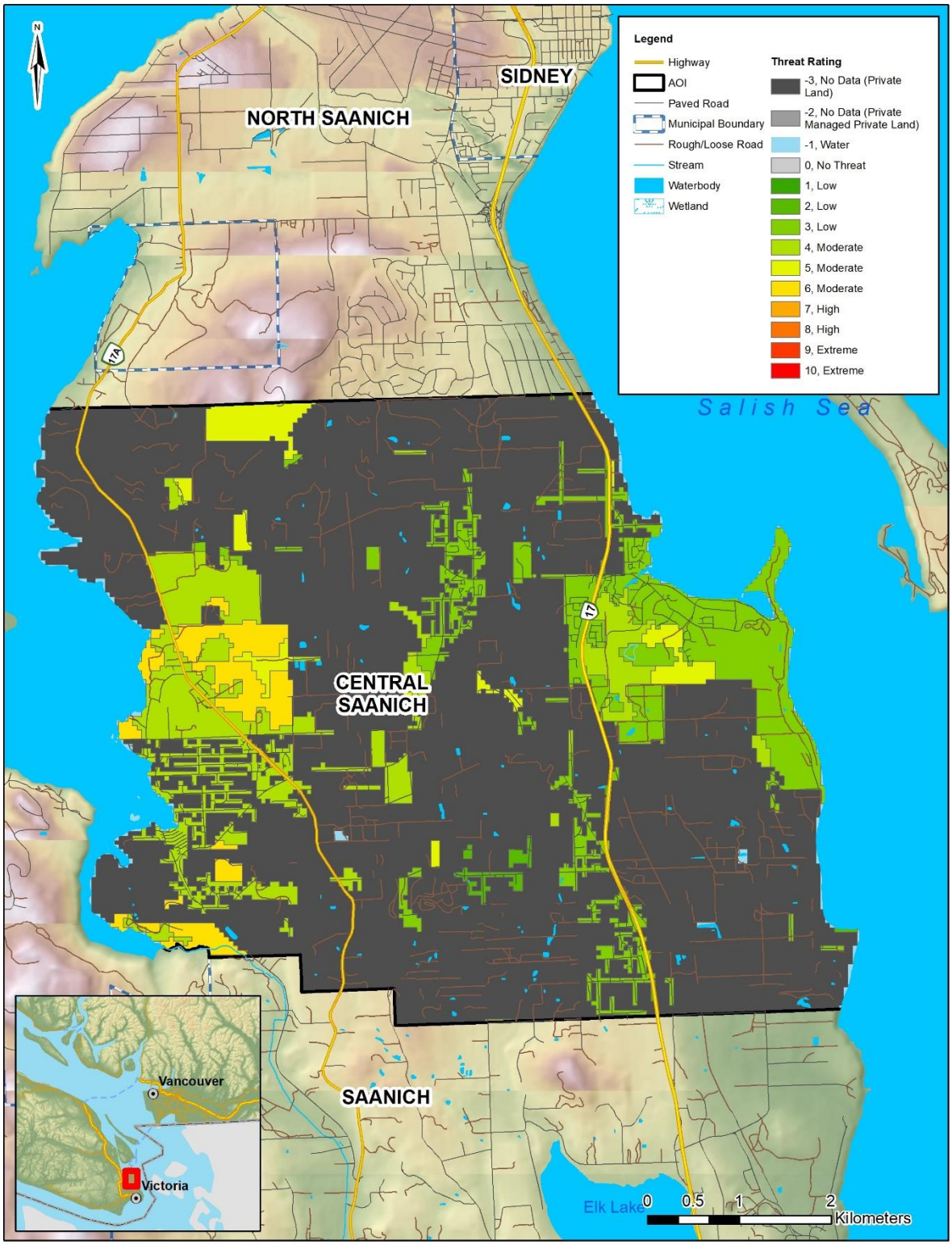
- Limited accuracy and variability of the fire history point and Vegetation Resources Inventory (VRI) data;
- Sensitivity to fuel type and the associated limitations of using fuel type approximations for fire behaviour modelling; and,
- 90th percentile rating for HFI, which represents a near worst-case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

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

The fire threat ratings from the 2019 PSTA are summarized for the AOI in Table 7 and spatially illustrated in Map 3. More than half of the AOI (67%) is categorized as private land and has no data for wildfire threat in the PSTA dataset. Low threat areas cover 10% of the AOI and water covers 11%. Approximately 13% of the AOI is categorized as having a moderate wildfire threat rating in the PSTA dataset (Table 7). According to the PSTA, the AOI does not contain high and extreme threat rated polygons (Map 3).

Table 7. Overall PSTA Wildfire Threat Analysis for the AOI (rounded to the nearest hectare).

Threat Class	Area (ha)	Threat Class Description	Percent of AOI
-3	3,450.1	No Data (Private Land)	67%
-2	0.0	No Data (Private Managed Forest Land)	0%
-1	569.4	Water	11%
0	0.0	No Threat	0%
1	0.0	Low	10%
2	23.0		
3	480.3		
4	427.3	Moderate	13%
5	104.2		
6	127.9		
7	0.0	High	0%
8	0.0		
9	**0.0**	**Extreme**	0%
10	**0.0**		
Total	**5,182.2**	**-**	**100%**

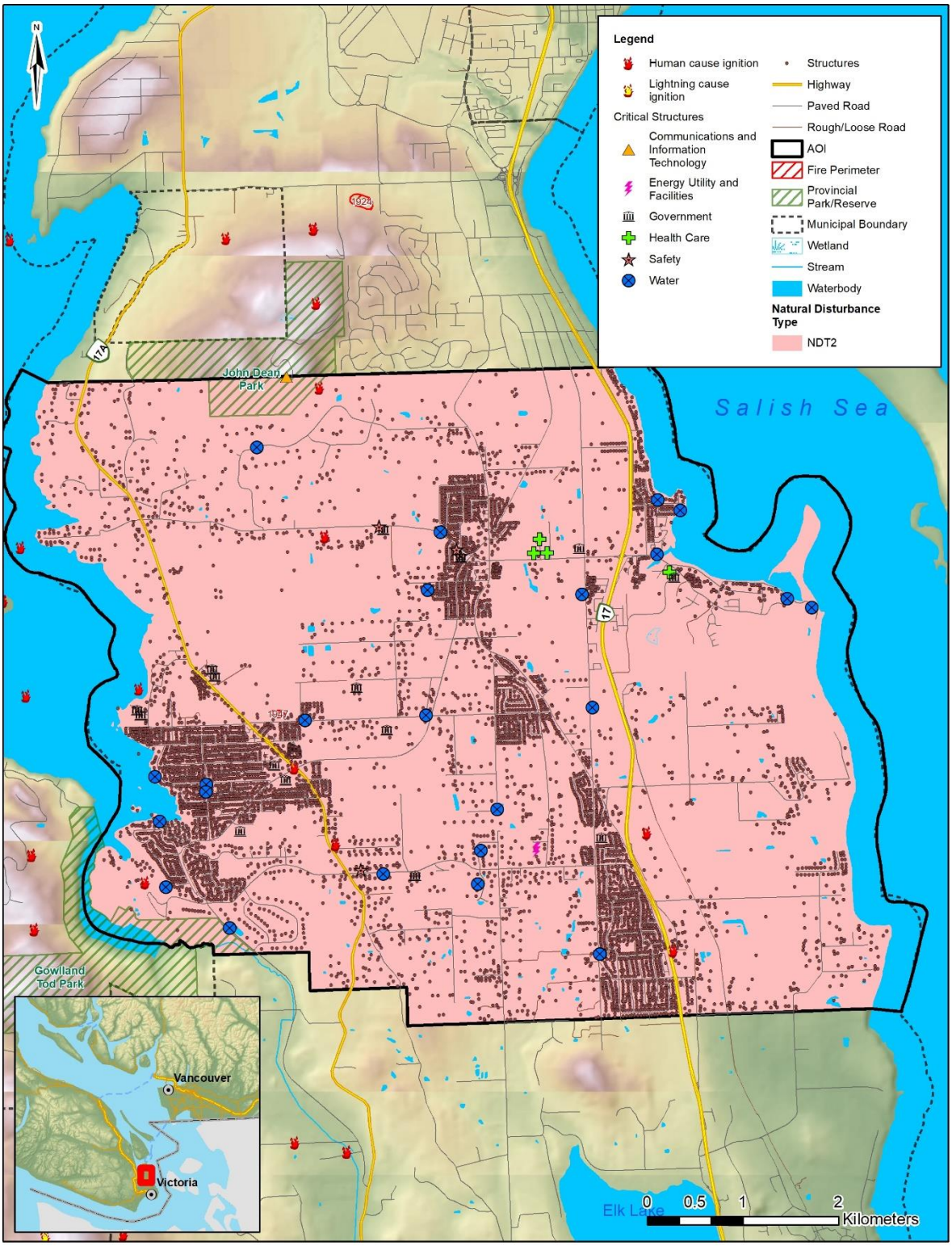


Map 3. Provincial Strategic Threat Rating.

4.2.1 Fire History

Fire ignition and perimeter data are depicted in Map 4. Fire ignition data for the area is available from 1950-2019 and fire perimeter data is available from 1917-2019. Based on the fire ignition data, there have been 18 fire incidents within the AOI, of which 89% were human caused. Only one historical fire has burned within the AOI, which occurred in 1947 and was 0.8 ha in size.

Based on the fire perimeter data from 1917 to 2019, the top ten fires burning the greatest number of hectares adjacent to the AOI occurred between 1919 and 1968 with the largest covering 1,109 ha and the smallest covering approximately 50 ha (average of 225 ha). This fire history demonstrates that the vast majority of fires in the AOI and adjacent occurred due to humans and that the common fires and relatively large scales seen in the first half of the 20th century have not occurred since.



Map 4. Fire Regime, Ecology and Climate Change.

4.3 LOCAL WILDFIRE THREAT ASSESSMENT

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

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

WUI Threat Assessments were completed over four field days in September of 2019, in conjunction with verification of fuel types (see Appendix C for WUI Threat Assessment worksheets and photos). WUI Threat Assessments were completed in interface (i.e., abrupt change from forest to urban development) 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.
- Slope position of value – More field time was spent assessing areas downslope of values at risk. Similarly, values at top of slope or upper third of the slope were identified as particularly vulnerable.
- Land ownership – Crown and municipal land was the main focus of field assessments.
- Local knowledge – Areas identified as hazardous, potentially hazardous, with limited access/egress, or otherwise of particular concern as vulnerable to wildfire, as communicated by local fire officials and BCWS zone staff.
- Observations – Additional areas potentially not recognized prior to field work were visually identified as hazardous and assessed during the week.

A total of 26 WUI threat plots were completed and over 130 other field stops (e.g., qualitative notes, fuel type verification, and/or photograph documentation) were made across the AOI (see Appendix F for WUI threat plot locations).

Using the verified and updated fuel types (Appendix A-1, Map 7) 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[39], 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).

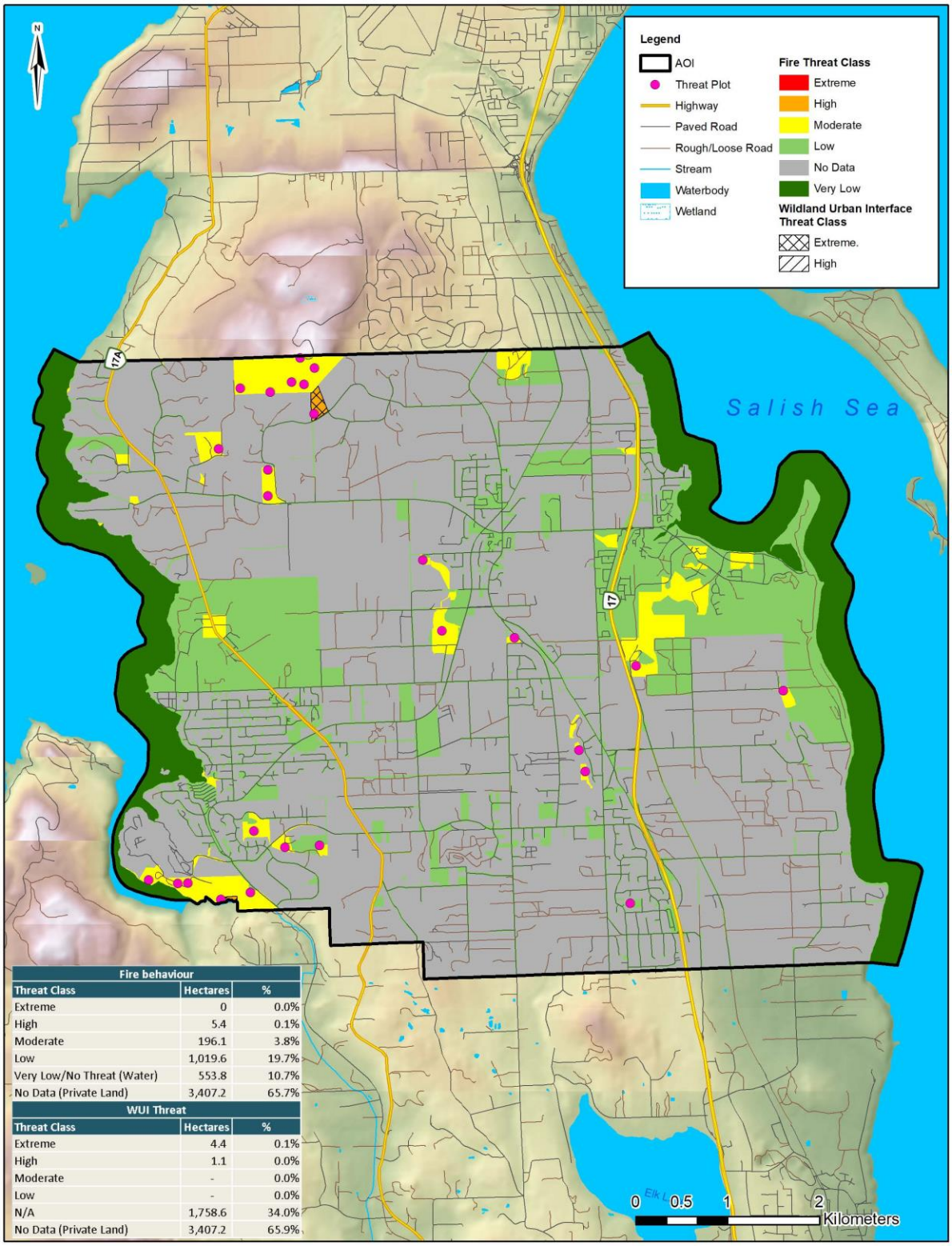
The result of the analysis shows that the AOI is primarily composed of a mosaic of very low, low, and moderate threat class stands; the variability in wildfire threat is dictated primarily by the level of natural and anthropogenic disturbances that have historically occurred and persist across the landscape. The AOI is less than 1% high threat class rating, 4% moderate, 20% low, 11% very low/water (Map 5 and Table 8). The remaining 66% of the AOI is classified as private land and as such has not been allocated fire threat data. Table 8 also indicates the differences between the original PSTA threat rating and this CWPP's corrected fire behaviour threat.

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 8. Fire behaviour threat summary for the AOI.

Wildfire Behaviour Threat Class	2019 PSTA Data	2019 CWPP
	Percent of AOI	Percent of AOI
Extreme	0%	0%
High	0%	0.1%
Moderate	13%	4%
Low	10%	20%
Very Low/ No Threat (Water)	11%	11%
No Data (Private Land and Private Managed Forest Land)	67%	66%

[39] Using the 2012 WUI Wildfire Threat Assessments in B.C. Guide (https://www.ubcm.ca/assets/Funding~Programs/LGPS/SWPI/Resources/swpi-WUI-WTA-Guide-2012-Update.pdf)



Fire behaviour		
Threat Class	Hectares	%
Extreme	0	0.0%
High	5.4	0.1%
Moderate	196.1	3.8%
Low	1,019.6	19.7%
Very Low/No Threat (Water)	553.8	10.7%
No Data (Private Land)	3,407.2	65.7%

WUI Threat		
Threat Class	Hectares	%
Extreme	4.4	0.1%
High	1.1	0.0%
Moderate	-	0.0%
Low	-	0.0%
N/A	1,758.6	34.0%
No Data (Private Land)	3,407.2	65.9%

Map 5. Local Fire Behaviour Threat Rating and WUI Threat Rating.

SECTION 5: RISK MANAGEMENT AND MITIGATION FACTORS

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

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

5.1 FUEL MANAGEMENT

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

The objectives for fuel management are to:

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

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

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

Fuel management on local government 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). 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).[40] It is important to recognize that a significant portion of the AOI (66%) is located on private land, which poses a challenge in mitigation of fuels. The best approach to mitigate fuels on private lands is to urge private landowners to comply with FireSmart guidelines (as described below in Section 5.2) and to conduct appropriate fuel modifications using their own resources (CRI program funding may be available). In general, when considering fuel management to reduce fire risk, the following steps should be followed:

- Carefully anticipate the likely wildfire scenarios to properly locate fuel modification areas;
- Acquire an understanding of local ecological, archaeological, and societal values of the site;
- Prescriptions should be developed by a qualified professional forester working within their field of competence;
- Public consultation should be conducted during the process to ensure community support;
- Potential treatment areas and draft prescriptions should be referred to First Nations with sufficient time for meaningful review and input;
- Treatment implementation should weigh the most financially and ecologically beneficial methods of fulfilling the prescription's goals;
- Pre- and post-treatment plots should be established to monitor treatment effectiveness; and
- A long-term maintenance program should be in place or developed to ensure that the fuel treatment is maintained in a functional state.

The fuel treatment opportunities identified in this document include the use of interface fuel breaks and interface fuel treatment as defined in Section 5.1.1, to reduce the wildfire potential around the AOI. Potential treatment activities include fuel removal, thinning, stand conversion, pruning, and chipping, or a combination of two or more of these activities. Stand conversion has been shown to be effective at reducing wildfire potential in mixed-wood or conifer dominated stands and is recommended as a BMP to encourage a higher deciduous component. This approach generally involves a thin-from-below to reduce ladder fuels and crown fuels continuity, targeting the removal of conifer species and the retention of broadleaf species.

5.1.1 Proposed Treatment Units

Funding opportunities from UBCM under the CRI Program will consider fire prevention activities on provincial Crown land, local government and reserve land[41]. Fire prevention activities on private land

[40] 2019 CRI FireSmart Community Funding & Supports – Program & Application Guide: https://www.ubcm.ca/assets/Funding~Programs/LGPS/CRI/cri-2019-program-guide.pdf

[41] This funding program (up to $50 million over three years) was initiated in 2018 as per recommendations from the 2017 BC Flood and Wildfire Review Report by Abbott and Chapman (https://www2.gov.bc.ca/assets/gov/public-safety-and-emergency-services/emergency-preparedness-response-recovery/embc/bc-flood-and-wildfire-review-addressing-the-new-normal-21st-century-disaster-management-in-bc-web.pdf). Program details are available on the UBCM's website: https://www.ubcm.ca/EN/main/funding/lgps/community-resiliency-investment.html

that may be funded under this program are related to FireSmart activities (including FireSmart planning and assessments, local rebate programs for completion of eligible FireSmart activities, and provision of off-site disposal of vegetation management debris), subject to program requirements. This does not preclude other current and future funding opportunities or potential partnerships and changes to existing programs.

The potential treatment areas represent moderate or high fire hazard areas which are close to values at risk (structures or infrastructure) and are located on Crown provincial or municipal land. It should be noted that the location of proposed treatment units on these land ownership types does not imply that high and extreme hazard areas do not exist on private land within the AOI. As stated in Section 5.1, mitigation approaches should also be pursued on private land where hazard exists, bearing in mind the different funding resources and objectives on these land types. Recommendation for treatment in areas of moderate fire hazard were limited to areas which would increase efficacy of, and/or create continuity between areas of low threat/no fuel areas. All polygons identified for potential treatment have been prioritized based on fire hazard, operational feasibility, estimated project cost, type and number of values at risk, common fire weather (wind direction), and expected efficacy of treatment. Although potential treatment areas have been ground-truthed during field work, additional refinement of the polygons will be required at the time of prescription development. Polygons will require detailed site-level assessment to stratify treatment areas (and areas of no treatment), identify values and constraints, and identify and engage all appropriate provincial agencies, First Nations, and stakeholders.

Recommended potential treatment areas within the AOI are outlined in Table 9 and displayed in Map 6. These fuel treatment opportunities include the use of trailside treatment and interface fuel treatments (the treatment of both patches of fuels and linear interface fuel breaks) as defined below.

Fuel Treatment Types

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

Trailside Treatments

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

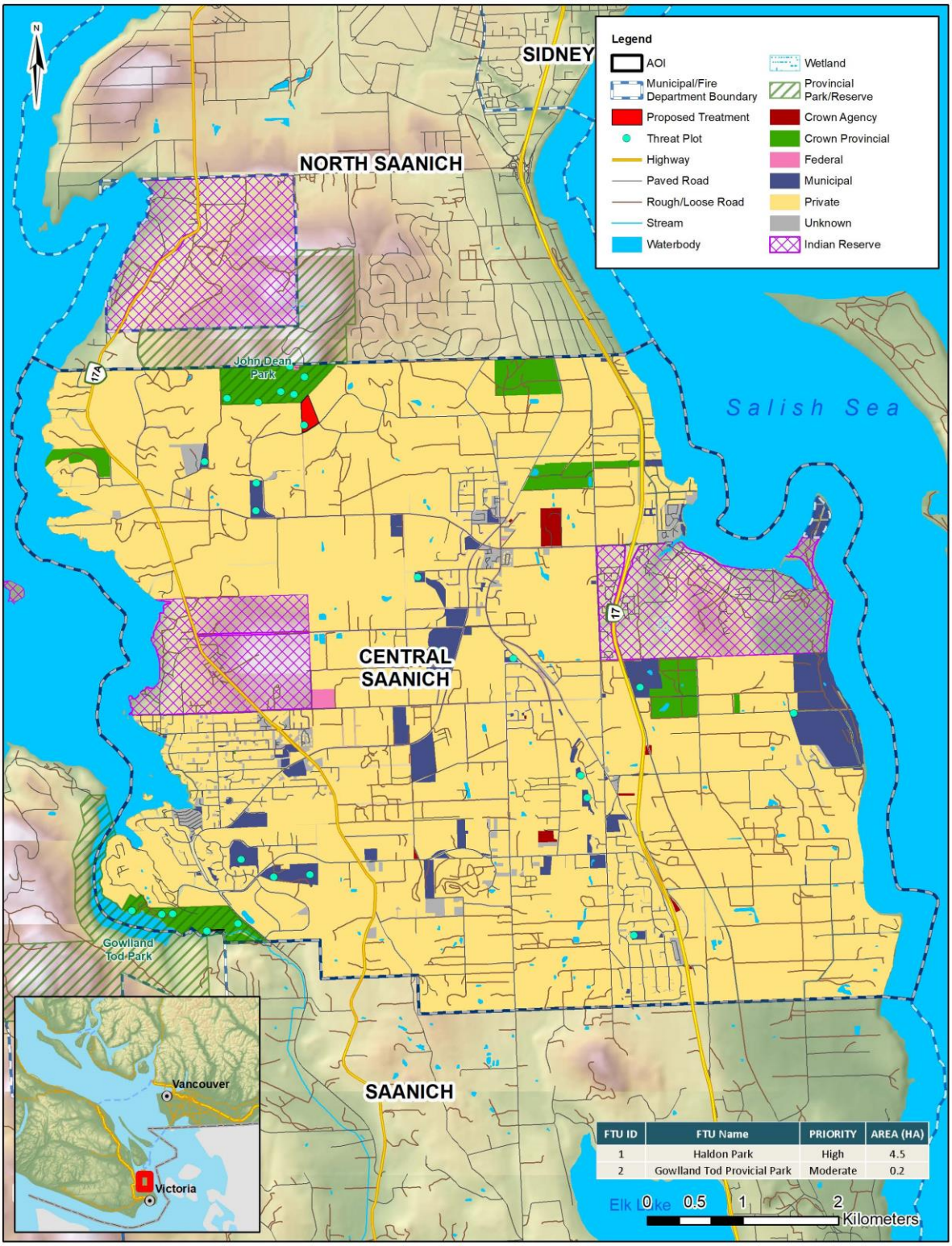
Interface Fuel Breaks

Fuel breaks on Crown land immediately adjacent to private land and in close proximity to the wildland urban interface and/or intermix areas, are termed 'interface fuel breaks. These are designed to modify fire behaviour, create fire suppression options, and improve suppression outcomes. Interface fuel treatments are relatively small (approximately 100 meters wide) and when treated with appropriate fuel reduction measures, can break the crown fire threshold and reduce the risk of a crown fire reaching values at risk. Treatment widths can be varied to allow for alignment and to take advantage of natural and man-made fire resilient features that enhance effectiveness. Surface fire spread across the fuel treatment and spotting across the fuel treatment, are both concerns and rely on suppression actions to be effective. In order to reduce potential fire intensity and spotting, fuel on private land between the interface fuel treatment and structures should be treated according to FireSmart vegetation management standards. Structures in interface areas should be constructed or retrofitted to FireSmart design standards.

RECOMMENDATION #7: Proceed with detailed assessment, prescription development and treatment of hazardous fuel units identified and prioritized in this CWPP.

Table 9. Proposed Treatment Area Summary Table.

FTU # and Stratum	Geographic Area	Priority	Total Area (ha)	Treatment Unit Type/ Objective	Local Fire Threat (ha)			Overlapping Values / Treatment Constraints*	Treatment Rationale
					Extreme/ High	Mod	Low		
1	Haldon Park	High	4.5	Interface Fuel Break	4.4	0.1	0.0	This proposed treatment unit (PTU) is located south of John Dean Provincial Park. The PTU overlaps several CDC species at risk polygons and one masked occurrence. The PTU is also flanked on its southern border by BC Hydro utility lines. Consultation with a Provincial ecosystem biologist and BC Hydro must occur during the prescription development phase and prior to implementation to ensure all concerns are addressed.	Treatment area is located immediately adjacent (<200m) from intermixed private residences. This area has been recommended for treatment due to its high recreational use and the presence of hazardous fuels. The stands characteristic of this area are primarily typed as C-3 fuel type with moderate-high stand densities, moderate fine and medium woody fuel levels present throughout, and patchy to continuous ladder fuels. This type of stand is likely to exhibit high potential for crown fire behavior during periods of high or extreme fire danger. Additionally, the proposed area was strategically selected given its location upwind in relation to nearby private residences.
2	Gowlland Tod Provincial Park	Moderate	0.2	Trailside Treatment	0.2	0.0	0.0	This PTU lies entirely within Gowlland Tod Provincial Park. The PTU overlaps several CDC species at risk polygons and one masked occurrence. Consultation with a Provincial ecosystem biologist must occur during the prescription development phase and prior to implementation to ensure all concerns are addressed.	The proposed treatment area is located within 200-300m of private residences. The stands characteristic of this area are mature mixed conifer/deciduous stands typed as M-1/2 with high percent conifer. Conifer ladder fuel continuity within the proposed treatment area is patchy to uniform. This type of stand is likely to exhibit high potential for crown fire behavior during periods of high or extreme fire danger. When implemented, this fuel break will reduce the potential for human ignitions along a high-use trail.



Map 6. Proposed Fuel Treatments (no fuel treatments have occurred).

5.1.2 Maintenance of Previously Treated Areas

As no fuel treatments have occurred within the AOI, maintenance activities of previously treated areas are not applicable. However, if fuel treatments are implemented in the future, maintenance activities such as removing standing dead, reducing surface fuels, or additional thinning (overstorey reduction and thinning suppressed conifers or conifer regeneration) should occur as needed to maintain the effectiveness of these treatments. The return interval for maintenance activities depends upon site productivity and the type and intensity of treatment. Less productive areas can likely withstand a longer frequency between maintenance activities, while more productive areas would require treatments more often.

RECOMMENDATION #8: As treatments are implemented, treatment monitoring should be completed by a qualified professional to schedule next set of maintenance activities (5 – 10 years out). This can be completed as part of a CWPP update or as a stand-alone exercise.

5.2 FIRESMART PLANNING AND ACTIVITIES

This section provides detail on: 1) the current level of FireSmart implementation and uptake within the community; 2) identified FireSmart subdivisions and/or acceptance into the FireSmart Canada Community Recognition Program (FSCCRP); and 3) recommended potential FireSmart activities that can be applied within the AOI at a future date.

5.2.1 FireSmart Goals and Objectives

FireSmart® is the comprehensive nationally accepted set of principles, practices and programs for reducing losses from wildfire.[42] FireSmart spans the disciplines of hazard/threat assessment; regional planning and collaboration; policy and regulations; public communication and education; vegetation/fuel management; training and equipment; and, emergency preparedness and response. FireSmart concepts provide a sound framework for advancing the goal of wildfire loss reduction, as it is a common goal shared with CWPPs.

The FireSmart approach and concepts, including recommended FireSmart guidelines[43], have been formally adopted by almost all Canadian provinces and territories, including British Columbia in 2000; FireSmart has become the de facto Canadian standard. FireSmart is founded in standards published by the National Fire Protection Association (NFPA). The objective of FireSmart is to help homeowners, neighbourhoods, whole communities and agencies with fire protection and public safety mandates to work together to prepare for the threat of wildfire in the WUI. Coordinated efforts between all levels of planning and action are integral to effectively and efficiently reducing the risk to communities. Solutions are required at all scales from individual backyards, to communities and the wider landscape. In order to

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

[43] 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

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

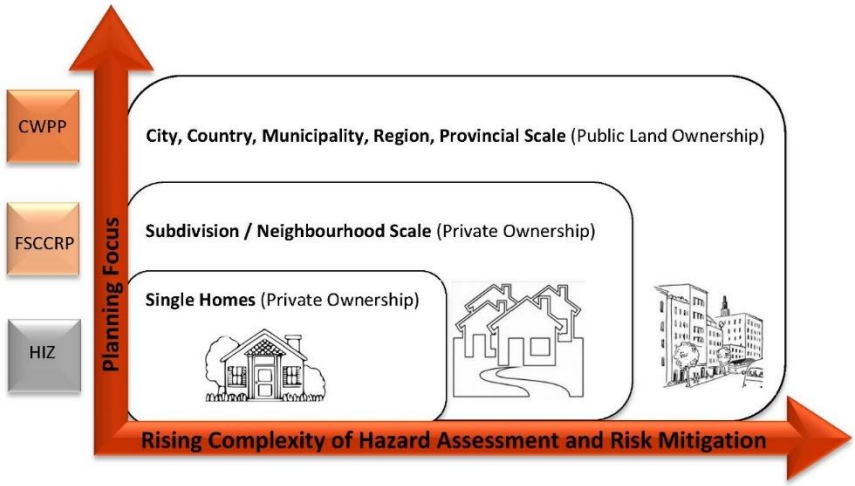


Figure 2. Diagram of the various, coordinated levels of the FireSmart program.[44] CWPP: Community Wildfire Protection Plan, FSCCRP: FireSmart Canada Community Recognition Program, HIZ: Home Ignition Zone.

The overarching goal of FireSmart is to encourage communities and citizens to adopt and conduct FireSmart practices to mitigate the negative impacts of wildfire to assets on public and private property. While responsibility for effectively mitigating hazards must be shared between many entities including homeowners, industry, businesses and governments;[45] 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.[46] Surviving homes in both urban and rural areas exhibited many attributes of FireSmart principles, regardless of the broader wildfire threat surrounding them.[46]

The goal of FireSmart with respect to private properties is to encourage homeowners to implement FireSmart practices to reduce damages to their property and minimize the hazards associated with wildfire. These FireSmart practices should aim to accomplish the following:

- "Reduce the potential for an active crown fire to move through private land
- Reduce the potential for ember transport through private land and structures
- Create landscape conditions around properties where fire suppression efforts can be effective and safe for responders and resources

[44] Figure and content developed by A. Westhaver. Adapted by A. Duszynska, 2017.
[45] https://www.firesmartcanada.ca
[46] Westhaver, A. 2017. Why some homes survived: Learning from the Fort McMurray wildland/urban interface fire disaster. Institute for Catastrophic Loss Reduction (ICLR) research paper series – number 56.

- Treat fuel adjacent and nearby to structures to reduce the probability of ignition from radiant heat, direct flame contact and ember transport
- Implement measures to structures and assets that reduce the probability of ignition and loss"[47]

Home Ignition Zone

Multiple studies (including the previously referenced recent Fort McMurray WUI fire investigation) have shown that the principal factors regarding home loss to wildfire are the structure's characteristics and immediate surroundings; the area that determines the ignition potential is referred to as the Home Ignition Zone (HIZ).[48,49] The HIZ includes the structure itself and four concentric, progressively wider Priority Zones. HIZ Priority Zones are based upon distance from structure: 0 to 1.5 m (Priority Zone 1a-noncombustible zone), 0 – 10 m (Priority Zone 1), 10 – 30 m (Priority Zone 2), and 30 – 100 m (Priority Zone 3) (Figure 3). These zones help to guide risk reduction activities, with Recommended FireSmart Guidelines being most stringent closest to the structure. The likelihood of home ignition is mostly determined by the area within 30 m of the structure (Priority Zones 1a, 1 and 2). Recommended FireSmart guidelines address a multitude of hazard factors within the HIZ: building materials and design; vegetation (native or landscaped materials); and the presence of flammable objects, debris, and vulnerable ignition sites. More detail on priority zones can be found in the FireSmart Manual[50].

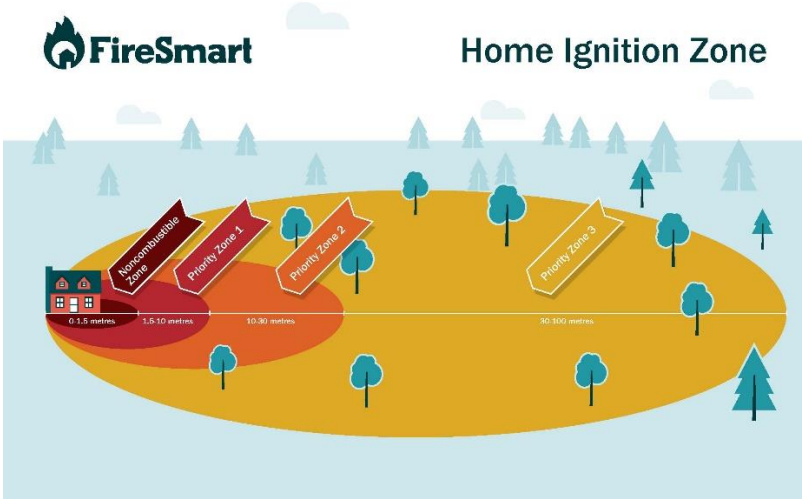


Figure 3. Illustration of FireSmart zones.
Retrieved from FireSmart Canada (https://www.firesmartcanada.ca/mdocs-posts/firesmart-home-ignition-zone-graphic/)

It has been found that, during extreme wildfire events, most home destruction has been a result of low-intensity surface fire flame exposures, usually ignited by embers. Firebrands can be transported long distances ahead of the wildfire, across fire guards and fuel breaks, and accumulate within the HIZ in densities that can exceed 600 embers per square meter. Combustible materials found within the HIZ

[47] Community Resiliency Investment Program. 2018. Community Wildfire Protection Plan Template.
[48] 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.
[49] Cohen, J. Preventing Disaster Home Ignitability in the Wildland-urban Interface. Journal of Forestry. p 15 - 21.
[50] https://firesmartcanada.ca/ and https://www2.gov.bc.ca/gov/content/safety/wildfire-status/prevention/firesmart

combine to provide fire pathways allowing spot surface fires ignited by embers to spread and carry flames or smoldering fire into contact with structures.

Because ignitability of the HIZ is the main factor driving structure loss, the intensity and rate of spread of wildland fires beyond the community has not been found to necessarily correspond to loss potential. For example, FireSmart homes with low ignitability may survive high-intensity fires, whereas highly ignitable homes may be destroyed during lower intensity surface fire events.[49] Increasing ignition resistance would reduce the number of homes simultaneously on fire; extreme wildfire conditions do not necessarily result in WUI fire disasters.[51] It is for this reason that the key to reducing WUI fire structure loss is to reduce home ignitability; mitigation responsibility must be centered on homeowners. Risk communication, education on the range of available activities, and prioritization of activities should help homeowners to feel empowered to complete simple risk reduction activities on their property.

FireSmart Canada Community Recognition Program

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

WUI Disaster Sequence

Calkin et al (2014) coined the 'WUI disaster sequence', a six-step sequence which has been used to describe the situation in which the firefighting capacity of a community is overwhelmed by wildland/ interface fires in highly ignitable communities: 1) extreme wildfire behaviour weather combined with, 2) a fire start, which 3) exposes numerous homes with high ignition potential, and results in numerous structures burning, 4) overwhelms suppression efforts and capabilities, and 5) leads to unprotected homes, and therefore 6) considerable structure loss (Figure 4).

Once multiple homes are ignited in an urban area, there is increasing potential for fire to spread from structure to structure, independently of the wildland vegetation. This is known as an urban conflagration. Effective fire protection depends on ignition resistant homes and properties during extreme wildfire events.[51] Figure 4 illustrates that it is possible to break up the disaster sequence by decreasing the number of highly ignitable homes exposed to embers, therefore reducing the number of homes ignited and removing the consequences of multiple structures lost.

Overall, FireSmart leads to communities that are better adapted to wildfire, more resilient and able to recover following wildfires by sustaining fewer losses and disruptions, and safer places to live and

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

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.[51]

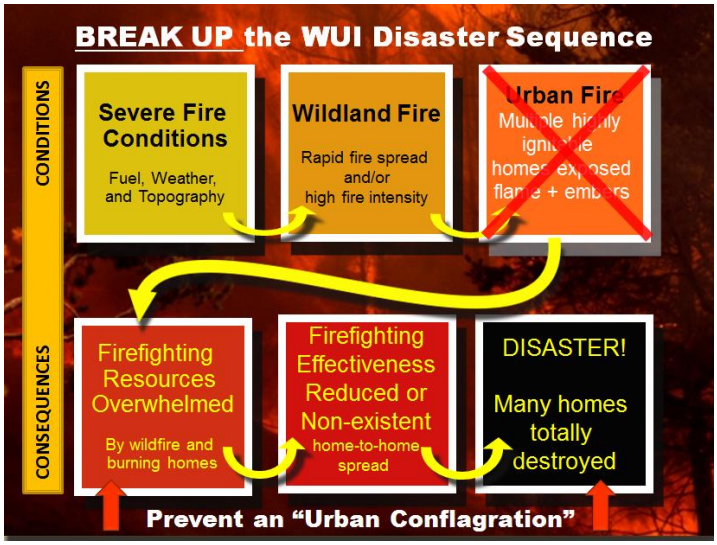


Figure 4. The wildland/urban interface disaster sequence and the possibility to break up the disaster sequence by decreasing the number of highly ignitable homes. [51]

5.2.2 Key Aspects of FireSmart for Local Governments

Reducing the fire risk profile of a community through FireSmart implementation requires coordinated action from elected officials, local government planners, developers, private land owners and industrial managers. This section presents various options of FireSmart practices, which when enacted, provide avenues for reducing fire risk within the community. An evaluation of the current level of FireSmart implementation within the DCS is also presented in this section.

Education

Communicating effectively is a key aspect of any education strategy. Communication materials must be audience specific and delivered in a format and through mediums that reach the target audience. Audiences should include home and landowners, students, local businesses, elected officials, DCS municipal staff, and local utilities providers. Education and communication messages should be simple yet comprehensive. A basic level of background information is required to enable a solid understanding of fire risk issues and the level of complexity and detail of the message should be specific to the target audience.

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

The DCS has undertaken some public education outreach in the community and online. These can be expanded upon and/or adapted to further enhance wildfire preparedness and education. The DCS should consider holding a wildland specific Fire Prevention Day or Week, or similarly formatted event, in the

spring prior to the wildfire season. Timely educational materials to increase preparedness would be most effective immediately prior to the fire season. A full list of recommendations pertaining to the Communication and Education strategy is presented in Section 5.3.

Planning and Development Considerations

Municipal policies and bylaws are tools available to mitigate wildfire risk to a community. It is recognized that, to be successful, all levels of government (municipal, provincial, and federal) and individual landowners need to work together to successfully reduce their risk. To that end, local government can use a range of policy tools and practices to help the community to incrementally increase FireSmart compliance over the mid-term (5 – 20 years) and therefore play a role in reducing the chance of structure loss from wildfire.

The planning objectives/considerations for the DCS are:

- To include wildfire considerations in the planning and acquisition strategy for parks and recreational areas.
- To develop policies and practices for design and maintenance of FireSmart publicly owned land such as community parks and open spaces and FireSmart publicly owned buildings.
- To conduct FireSmart and/or risk assessments of publicly owned lands and buildings to inform planning for prevention and mitigation activities as required.

FireSmart policies and practices can be incorporated in various aspects of development design, zoning and permitting to reduce wildfire hazard on private land and in the community at large. The development objectives/considerations for the DCS are:

- To utilize regulatory and administrative tools to reduce wildfire hazard on private land and increase number of homes compliant with FireSmart guidelines (with low ignition potential).
- To ensure higher level planning and regulation (i.e., OCP and/or land use, engineering and public works bylaws) incorporate FireSmart policies, as applicable, to reduce wildfire hazard in vulnerable WUI neighbourhoods, and include measures that address wildfire prevention and suppression in subdivision design.
- To ensure multiple departments (including fire departments and/or emergency management staff) are included in the referral process for new developments.

FireSmart Vegetation Management

Some examples of actionable items for the DCS with regards to vegetation or fuel management and the FireSmart approach include: 1) policy development and implementation of FireSmart maintenance for community parks and open spaces (as per planning considerations discussed above); 2) implementing fire resistive landscaping requirements as part of the development permitting process (as per development considerations discussed above); and 3) provision of incentives (i.e., a local rebate program) and/or collection services for private landowners with a focus on pruning, yard and thinning debris (FireSmart activities for private land). More detailed recommendations regarding FireSmart activities for private land are discussed below.

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

Development Permit Areas for Wildfire Hazard

The OCP has specific language in Section 7.2.4. Regulating Development, Policy 2 that supports the establishment of a development permit area (DPA) to address wildfire risk mitigation. It is recommended that the DCS review the OCP, with consideration towards establishing a wildfire development permit area. Other jurisdictions' wildfire development permit areas can serve as models for various components. [52] The first step should be to establish DPA objectives (for example, minimize risk to property and people from wildland fires; minimize risk to forested area surrounding communities and development in the AOI; conserve the visual and ecological assets of the forest surrounding these areas, etc.). The following components should be considered during the OCP review and DP development process in order to help meet the established objectives:

- Use of fire resistant exterior construction materials within the established development permit area, based on recognized standards such as NFPA 1144 (*Standard for Reducing Structure Ignition Hazards from Wildland Fire*[53]*)*or FireSmart.
- Inclusion of minimum setbacks from forested edge and top of slope based on FireSmart principles.
- Use of FireSmart landscaping (low flammability plants, appropriate spacing and low flammability aggregates/ground cover based on FireSmart principles).
- Underground servicing.
- Mitigation of fire hazard through fuel management activities based upon qualified professional recommendations (prescriptions and oversight). This is generally most applicable in the subdivision phase.
- Prompt removal of combustible construction materials, thinning/fuel management debris, or clearing debris during the fire season.
- Coordinating QPs to ensure that requirements for overlapping, and potentially conflicting, development permit areas such as Streamside Protection and Enhancement are met.
- Review and approval process for submitted applications.
- Post-development inspections and sign-offs.
- Outline of responsibilities for staff and applicants.
- Enforcement and regulation (consequences of non-compliance).

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

In 2015, the province passed the *Building Act* as the new legislation to guide building and construction in the province. This Act establishes the province as the sole authority to set building requirements and limits local government authority to set building requirements in their bylaws. Section 5 of the *Building*

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

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

Act provides an exception to the above limitation to local governments by giving them the authority to set local building bylaws for unrestricted and temporarily unrestricted matters, such as exterior design and finish of buildings in relation to wildfire hazard and within a development permit area. The British Columbia Building Code does not have any wildfire-specific fire-resistant design components. Until revisions of the Building Code to include requirements specific to prevention of wildfire spread are completed, local governments can set exterior requirements within an established development permit area for wildfire risk mitigation.[54]

RECOMMENDATION #9: Review the Official Community Plan (OCP); consider including wildfire as a natural hazard development permit area (DPA). A recommended development permit area for the DCS would include all areas that are located within 200 m of moderate or high wildfire behaviour threat class areas. This is a suggested distance which should be validated and defined through a more comprehensive GIS analysis of hazardous fuels and their proximity to the interface. Review similar wildfire hazard DPAs established in other jurisdictions and use as models for various aspects of the DP process.

RECOMMENDATION #10: Ensure that wildfire hazard development permit applications are provided to the fire department for opportunity for input prior to approval. As more development permit applications are received, the importance of communication and integration between the fire department and the Planning and Building Services Department will increase.

RECOMMENDATION #11: Develop a landscaping guide which lists flammable non-compliant vegetation and landscaping materials, non-flammable drought and pest resistant alternatives, and tips on landscape design to reduce maintenance, watering requirements, avoid wildlife attractants, and reduce wildfire hazard. Consider including the landscaping guide as a development permit requirement within the applicable area, as well as making it publicly available for residents and homeowners outside of the DPA (can be provided at issue of building permit and made available at the Municipal Office or other strategic locations).

Additional recommendations for amendments to policies and bylaws were discussed fully in Section 2.5.3.

Subdivision Design

Subdivision design should include consideration to decrease the overall threat of wildfire. Aspects of subdivision design that influence wildfire risk are access, water pressure and hydrant locations. The number of access points and the width of streets and cul-de-sacs determine the safety and efficiency of evacuation and emergency response. In the neighbourhoods and/or developed areas within the DCS, on-street parking can contribute hazards on narrow or dead-end roads, which are already unlikely to have a high capacity under heavy smoke conditions.[55] When the time for evacuation is limited, poor access has contributed to deaths associated with entrapments and vehicle collisions during wildfires.[56] Methods for

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

[55] 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.

[56] De Ronde, C. 2002. Wildland fire-related fatalities in South Africa – A 1994 case study and looking back at the year 2001. Forest Fire Research & Wildland Fire Safety, Viegas (ed.), http://www.fire.uni-freiburg.de/GlobalNetworks/Africa/Wildland.cdr.pdf

access design at the subdivision level can provide tools that help manage the volume of cars that need to egress an area within a given period of time.[55] These factors should be considered during the review of applications for new developments occurring on vacant lots within the DCS's wildland urban interface.

For new development in rural settings where hydrants are limited or unavailable (or it is otherwise determined by the DCS that adequate or reliable water supply systems may not exist), the NFPA 1142 can be used to help determine minimum requirements for alternative water supply (natural or artificial). Alternative water sources, such as dry hydrant systems, water usage agreements for accessing water on private land, cisterns or other underground storage, etc., should be reviewed by the DCS and the fire departments prior to development approval.

Increasing Local Capacity – Interagency Cooperation, Emergency Planning and Cross Training

Local capacity for emergency management and efficient response to wildland urban interface fires can be enhanced by addressing the following steps:

- Development and/or maintenance of Structural Protection Units (SPUs) which can be deployed in the event of a WUI fire;
- Conducting a comprehensive review of Emergency Management BC SPU deployment procedures for the purpose of fighting interface fires;
- Provision of sprinkler kits to community residents (at a cost);
- Engagement in annual cross-training exercises with adjacent fire departments and/or BCWS in order to increase both local and regional emergency preparedness with regards to structural fire and wildfire training;
- Participation in cross-jurisdictional tabletop exercises and seasonal readiness meetings;
- Development and/or participation in regional or multi-agency fire or fuel management tables (i.e., interface steering committee or wildfire working group) to facilitate communication and co-operation between groups and agencies responsible for wildfire preparation and response; and
- Provision of training and/or professional development for Local FireSmart Representatives, community champions to increase capacity for FireSmart activities.

A detailed account of current local capacity for the DCS and recommendations to address gaps is provided in Section 6.

FireSmart Demonstration Projects

FireSmart demonstration projects for publicly owned buildings or public and provincially owned critical infrastructure (as identified in Section 3.2) can display the practices and principles of FireSmart to the public. This may be in the form of replacing building materials with fire resistant materials, replacing landscaping with fire-resistant plants, and demonstration HIZ fuel treatments. Ideally, these projects would include elements of public education (signage, public tours, active demonstrations of operations, etc.). Appropriate/candidate FireSmart demonstration projects may be identified by the DCS and should be based on assessment by internal trained Local FireSmart Representatives or external Local FireSmart Representative consultant.

FireSmart Activities for Private Land

The best approach to mitigate fuels on private lands is to urge private landowners to comply with FireSmart guidelines and to conduct appropriate fuel modifications using their own resources (CRI program funding may be available subject to current funding requirements). The DCS can facilitate uptake within the community and various neighbourhoods by: 1) supporting and/or facilitating planning for private land (with property owners' consent); 2) offering local rebate programs to homeowners on private land and First Nations land who complete eligible FireSmart activities on their properties; and as previously indicated (FireSmart vegetation management), 3) providing off-site debris disposal for private landowners who undertake their own vegetation management (with a focus on pruning, yard and thinning debris). Off-site debris disposal options include providing a dumpster, chipper or other collection method; providing curbside debris pick-up; and waiving tipping fees). Planning for private land may include developing FireSmart Community Plans for identified areas (i.e., a WUI neighbourhood, community, subdivision) and conducting FireSmart home and property assessments.

RECOMMENDATION #12: Develop and implement a community chipper program with the help of neighbourhood representatives. As a demonstration, this program can begin twice per year in two separate neighbourhoods.

FireSmart Compliance within the Area of Interest

As could be expected, there is a wide range of FireSmart compliance on private properties in the AOI. There are large differences in the degree to which FireSmart best practices are visible within individual HIZs, and in neighbourhoods throughout the DCS. Landscaping in the AOI is also in a range of FireSmart compliance. Generally speaking, most homes in interface areas such as, Mount Newton, Brentwood Bay, and Tod Inlet, respectively, do not maintain 10 m defensible space. The main concern in the aforementioned areas is the ubiquity of flammable landscaping options (i.e., cedar hedging) in proximity to residences, as well as the lack of defensible space between property footprints and adjacent forested areas. Bark mulch is commonly used as a landscaping material within the HIZ. Accumulations of conifer foliage in roof corners and gutters was not uncommon. Storage of combustible items under decks, carports, and other horizontal surfaces was common. On the other hand, many residences are surrounded by lawn, agricultural fields, 10 m or greater of defensible space, and/or hardscaping (rocks), all of which are FireSmart compliant. The Hagan Valley and Pat Bay East areas display the highest FireSmart compliance rate.

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

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

- Wildfire hazard levels range from low to high across neighbourhoods within the AOI;
- The bulk of hazards are associated with conditions of natural and landscaped vegetation immediately surrounding residential properties;
- For new development, where landscaping is not yet completed, educational approaches may aid in promoting fire resistant landscaping options and achieving defensible space in the HIZ;
- Hazards are magnified in some neighbourhoods due to poor access (i.e., presence of private and gated roads) and distance from nearest water supply or fire hydrant location; and,
- All neighbourhoods have good opportunities to mitigate risk through individual and collective action.

RECOMMENDATION #13: The DCS should consider training additional local fire services staff members as Local FireSmart Representatives to assist the various neighbourhoods within the DCS in complying with FireSmart principles at the neighbourhood and individual home-level.

5.2.3 Priority Areas within the AOI for FireSmart

This section identifies priority areas within the AOI that would benefit from FireSmart planning and activities. These priorities are based on general field observations and input from the DCS and are not based on a scientific sample or formal data collection. Recommended FireSmart activities are essentially the same for each neighbourhood or area; however, it is recommended that the DCS prioritize the neighbourhoods in Table 10.

Table 10. Summary of FireSmart Priority Areas.

Area	FireSmart Y/N	FireSmart Canada Recognition Received Y/N	Recommended FireSmart Activities
Priority Area #1: Mount Newton Area	N	N	The following is a non-extensive list of FireSmart activities for which the DCS can engage suggested neighbourhood residents: 1) Provide guidance to ensure landscaping is to an established FireSmart standard; 2) Incentivise private landowners to engage in retrofitting homes with building materials and design based on NFPA 1144 or FireSmart standards; 3) Encourage prompt removal of combustible construction materials or yard waste from private properties; and 4) Coordinate monthly or bi-monthly yard waste removal days prior to and during the fire season to reduce WUI fire hazard.
Priority Area #2: Brentwood Bay	N	N	
Priority Area #3: Tod Inlet	N	N	
Priority Area #4: Saanichton	N	N	

Area	FireSmart Y/N	FireSmart Canada Recognition Received Y/N	Recommended FireSmart Activities
Priority Area #10: Critical infrastructure	Y (partially)	N/A	Based on field observations, some critical infrastructure has had some level of FireSmart setback from forested areas. Consider conducting frequent (2-3 years) maintenance treatments to ensure the wildfire risk remains moderate. It is recommended that fuel treatments be considered for areas adjacent to critical infrastructure in order to bolster the effect of previous FireSmart treatments. FireSmart treatments may include thinning from below to reduce ladder fuels and crown fire potential, pruning of retained trees to 3 m, and reducing surface fuels. Additionally, consider adding regular brushing activities to the maintenance treatment schedule to control weeds and grasses around critical infrastructure.

RECOMMENDATION #14: The DCS should apply for funding from the UBCM CRI Program to develop a local FireSmart rebate program. This will allow homeowners to access partial rebates for FireSmart activities on their properties, if rated as moderate or high risk in a FireSmart home and property assessment. The rebate program must adhere to the goals of FireSmart, as outlined in Section 5.2.1.

5.3 COMMUNICATION AND EDUCATION

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

Based on the consultation completed during the development of this Plan, it is evident that DCS staff and some residents have a good level of awareness of interface fire risk and a strong level of commitment to continue to grow their awareness and understanding. However, field observations highlighted the need to further educate the community at large on what private land owners can do to build a FireSmart community and take personal responsibility for the ignition potential of their homes, businesses, lands, and neighbourhoods. Often, the risk of wildfire is at the forefront of public awareness during or after major wildfire events, whether close to home or further afield. The challenge is to retain this level of awareness beyond these times. The communication and education objectives for the DCS are:

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

Bringing organizations together to address wildfire issues that overlap physical, jurisdictional or organizational boundaries is a good way to help develop interagency structures and mechanisms to reduce wildfire risk. Engagement of various stakeholders can help with identifying valuable information about the landscape and help provide unique and local solutions to reducing wildfire risk. The CRD has recently received funding to initiate a FireSmart Committee. It is recommended that the DCS engages the CRD to build upon the framework and expand the scope of the FireSmart Committee to coordinate wildfire risk reduction efforts both at the regional and municipal level. The committee could include key stakeholders such as Municipal staff, BCWS, BC Parks, recreational groups/representatives, and First Nations.

Significant areas of private land in the DCS are within the ALR, supporting a range of crop and livestock agriculture production. The agriculture sector faces unique challenges with respect to wildfire planning and preparedness (including but not limited to livestock relocation). Consequently, the BC Agriculture & Food Climate Action Initiative (CAI), in collaboration with partners and through workshops delivered in various agriculture communities in BC, has developed wildfire planning resources specific to the agriculture sector. These resources incorporate FireSmart practices and facilitate collaboration and communication with local government. Recognizing and disseminating these CAI resources to the agriculture sector/community will promote improved planning and preparedness of agriculture producers and encourage FireSmart practices on private farm land.

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

RECOMMENDATION #15: This report and associated maps to be made publicly available through webpage, social media, and public FireSmart meetings.

RECOMMENDATION #16: 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 DCS's wildfire threat assessment or the rate at which wildfire risk reduction efforts are implemented. An evaluation of major changes (including funding program changes that may lead to new opportunities) and the potential need for a CWPP update should be initiated every 5 - 7 years.

RECOMMENDATION #17: Develop a social media strategy and ensure that its full power is leveraged to communicate fire bans, high or extreme Fire Danger days, wildfire prevention initiatives and programs, easily implementable FireSmart activities, updates on current fires and associated air quality, road closures, and other real-time information in an accurate and timely manner.

RECOMMENDATION #18: Promote FireSmart approaches for wildfire risk reduction to DCS residents through Town Hall meetings, workshops, FireSmart 101 course and/or presentations. Aim to conduct the engagement/promotion campaign prior and during the fire season. Consider supplying FireSmart materials to homeowners in the interface during these engagement campaigns.

RECOMMENDATION #19: Promote improved planning and preparedness of agriculture producers in the DCS and encourage FireSmart practices on private farm land through distribution or sharing of wildfire action planning resources prepared specifically for the agriculture sector by the BC Agriculture & Food Climate Action Initiative (i.e., on DCS website, mailouts). Resources include a Wildfire Preparedness and Mitigation Plan - Guide and Workbook.[57]

RECOMMENDATION #20: Work towards FireSmart community recognition, at the neighbourhood level and facilitate uptake into the FireSmart Canada Community Recognition Program (FSCCRP). This will help reduce fire risk and aid in further funding applications.

RECOMMENDATION #21: Facilitate the FSCCRP uptake within the DCS and enhance its applications by including the following: 1) inviting BCWS crews to participate in and support the annual FireSmart events set up by participating neighbourhoods. 2) Encourage individual homeowner participants to complete the self-administered FireSmart home assessment tool. 3) Include within the FireSmart Canada Community Assessment Report the standard recommendation that participating neighbourhoods hold a home hazard assessment workshop as one of their FireSmart events.

RECOMMENDATION #22: Promote the use of the FireSmart Home Partners Program offered by the Partners in Protection Association, which facilitates voluntary FireSmart assessments on private property. Use the opportunity to educate the home or business owner about the hazards which exist on their property and provide easy improvements to reduce their risk.

RECOMMENDATION #23: Encourage schools to adopt and deploy existing school education programs (e.g. FireSmart BC Education Package) to engage youth in wildfire management and risk reduction. There is emergency preparedness curriculum available provincially, which includes preparedness for a variety of natural hazards, including wildfire (Master of Disaster). Other options/value-added activities include consulting with Association of BC Forest Professionals (ABCFP) and British Columbia Wildfire Service (BCWS) (South Island Fire Zone), as well as local fire department and FireSmart representatives to facilitate and recruit volunteer teachers and experts to help with curriculum development to be delivered in elementary and/or secondary schools (field trips, guest speakers, etc.).

[57] https://www.bcagclimateaction.ca/library/wildfire-preparedness/

RECOMMENDATION #24: Engage the CRD to build upon the framework and expand the scope of the FireSmart Committee to assist in the coordination of wildfire risk reduction efforts at the regional and municipal level. The Regional FireSmart Committee should include all key stakeholders (Municipalities, Capital Regional District, First Nations, BC Parks, BCWS, agricultural groups/representatives, and neighborhood associations). The objective of the Regional FireSmart Committee would be to identify wildfire related issues in the region and to develop collaborative solutions to minimize wildfire risks. The following subject areas are recommended for the group to explore: 1) Public education and awareness needs; 2) Multi-disciplinary, multi-jurisdictional fuel treatment projects/hazard abatement projects; 3) Development of a funding strategy; and 4) Reduction of human-caused fires, fire prevention and right of way management.

RECOMMENDATION #25: Promote and provide information to private landowners related to residential sprinklers as a FireSmart prevention measure.

5.4 OTHER PREVENTION MEASURES

Fire prevention in the AOI is also addressed via the following avenues: 1) public display of danger class rating signs throughout the AOI, which should be updated on a weekly basis; and 2) enforcement of the Open Air Burning Regulation Bylaw. The aforementioned activities are either currently being applied or have potential to be applied in order to reduce the potential and/or threat of wildfire ignitions within the AOI.

Risk of human-caused ignition within the AOI is not limited to private property owners and individual residents. Power lines and industrial activities pose a risk of ignition, particularly in areas where cured fuels or fuel accumulations exist. Tree failures adjacent to power lines (transmission and distribution) are common occurrences and represent significant risks to ignition within the AOI. A cooperative approach for addressing the industrial area concerns must be undertaken by the DCS and pertinent industrial partners.

RECOMMENDATION #26: Work with industrial operators such as BC Hydro to ensure that high risk activities, such as grubbing/brushing and right-of-way mowing work do not occur during high fire danger times to reduce chance of ignitions as per the *Wildfire Act*.

RECOMMENDATION #27: Work with industrial operators such as BC Hydro to ensure that right-of-ways do not contain fine fuel accumulations (easily cured) or high conifer regeneration prior to and during the fire season and are maintained in a low hazard state (to serve as fuel breaks).

SECTION 6: WILDFIRE RESPONSE RESOURCES

This section provides a high-level overview of the local government resources accessible for emergency response and preparedness use. Accordingly, in emergency situations when multiple fires are burning in different areas of the Province, resource availability may be scarce. Therefore, local government preparedness and resource availability are critical components of efficient wildfire prevention and planning. Deployment of provincial resources occurs as per the process detailed in the *Provincial*

Coordination Plan for Wildland Urban Interface Fires document[58]. The aforementioned document establishes a protocol for collaborative and integrated emergency management in the event of WUI fires within British Columbia.

6.1 LOCAL GOVERNMENT FIREFIGHTING RESOURCES

Firefighting efforts and effectiveness can be affected by access to secondary power sources, water pressure and supply, and existing local government contingency plans. In the event of a wildfire emergency situation and loss of power, the DCS has access to backup generators, fueled by diesel and propane, to power critical infrastructure such as the Municipal Hall and Fire Halls. However, should a wide-scale outage occur, known vulnerabilities to secondary power sources include mechanical failure and potential fuel shortages. Although the local government has not identified any issues with water pressure within areas that have fire hydrant service, there are known limitations to fire flows that create challenges for fire suppression. Specific limitations of the DCS water system with regards to wildfire suppression are detailed in Section 6.1.2.

Formal mutual aid agreements are in effect between the District of Central Saanich Fire Department and the surrounding municipalities including; the Town of Sidney, the District of North Saanich and the District of Saanich (more detail is provided in Section 6.1.1). In the event of a WUI fire emergency, mutual aid in the DCS is activated, as required, between all fire departments. WUI fire events may also lead to aid requests with BCWS, for areas within Mount Newton – John Dean Provincial Park or Gowlland Tod Provincial Park.

6.1.1 Fire Department and Equipment

Fire protection within the AOI is the primary responsibility of the Central Saanich Fire Department (CSFD). Table 11 provides an overview of the fire services capacity in the AOI, including fire department personnel and equipment. The CSFD fire protection service area covers the entire area within the District boundary; the DCS also has service agreements in place on First Nations land, which includes the Tsawout and Tsartlip First Nations.

The CSFD has both paid and volunteer members. In consultation with the CSFD it was determined that there are no significant structural firefighting equipment deficiencies; however, the department lacks in wildfire. The CSFD's equipment is listed in Table 11 below and includes capability to draft from natural water sources, including salt-water pumping capacity, by truck draft or using portable pumps.

Table 11. Fire department capacity and equipment within the AOI.

Fire Protection Zones	Fire Department	Number of Stations	Number of Members	Apparatus type and number
District of Central Saanich	Central Saanich	2	8 career and 45 volunteer firefighters	2 engines, 1 quint, 1 ladder truck, 2 rescue trucks, 2

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

Fire Protection Zones	Fire Department	Number of Stations	Number of Members	Apparatus type and number
				tenders, 5 trucks and 1 marine watercraft

Members of the CSFD undergo significant training focused on structural firefighting and annual structural protection program wildland firefighter level 1 (SPP WFF1) and S-100 training. It is recommended that all CSFD members continue to maintain at a minimum, training in S-100 and/or SPP-WFF1 (or equivalent), and that the fire department members engage in yearly practical wildland fire training with BCWS that covers at a minimum: pump, hose, hydrant, air tanker awareness, and employment of SPUs. The aforementioned cross-training opportunity could include, for example, a joint wildfire simulation exercise. This level of training would improve the local fire departments' commitment to wildfire preparedness.

The level of cross-training and working relationship with MFLNRORD's BCWS is minimal within the AOI. In consultation with the BCWS, it was noted that the needs for cross-training varies across communities, with cross-training events being focused on fire departments with limited access to mutual aid from nearby departments. Cross-training with the BCWS would enable local fire departments to prepare their responders with technical and practical firefighting training in order to action both structural and wildland fires.

Over the previous years (2011-2019) the CSFD responded to an average of 140 calls per year, of which 18 were classified as wildland fire. Wildland calls ranged from 11 in 2013 to 24 in 2015. The number of both structure and wildland calls received by the CSFD in 2019 was above average. The average response times for engines to arrive on the scene is an average between 2 and 7.5 minutes, while initial response to alarms from pumper and ladder companies is between 1 and 3 minutes.

6.1.2 Water Availability for Wildfire Suppression

Water is the single most important suppression resource. In an emergency response scenario, it is critical that a sufficient water supply be available. The Fire Underwriters Survey summarizes their recommendations regarding water works systems fire protection requirements, in *Water Supply for Public Fire Protection* (1999).[59] 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.

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

Water service within the DCS is an important component of emergency response for a wildland urban interface fire in the event of a large-scale emergency, and in particular for structural fires. As previously noted in Sections 3.2.3 and 3.3.1, water service is provided by the DCS and CRD. Based on fire flow testing within the DCS, 4 out of the 9 areas tested for fire flow were below acceptable levels.[60] Notable areas within the District of low fire flow were areas within Brentwood Bay (east of the Butchart Gardens and select areas in Pat Bay East. It is recommended that a water service bylaw be considered for the District and that fire flows for multi-family residential buildings be more carefully considered. For suppression within the AOI, hydrant service is provided within the fire services area boundaries at varying levels of coverage.

In areas where there is a lack of hydrants, water supply, and/or water pressure the District is able to deploy its Superior Tanker Shuttle Service (STSS) to protect homes and properties outside of the water service area. The Fire Underwriters Survey identified the following areas in which the DCS could improve: fire flow delivery by mains, reliability of principal mains and the installation of pipes to meet the acceptable fire protection standards. In consultation with the Wildfire Working Group, Verling Road was identified as an area lacking adequate fire flow.

To supplement water availability for firefighting, the DCS fire department can draft from natural and static water sources such as ponds, reservoirs and the ocean using either truck mounted or portable pumps. However, some of these sources are also at risk of drying or experiencing reduced water levels during drought events, which typically coincide with high and extreme fire danger rating days. These natural water sources are known and mapped.

RECOMMENDATION #28: All new development should have a water system which meets or exceeds minimum standards of NFPA 1142, *Standard on Water Supplies for Suburban and Rural Fire Fighting*[61]. CSFD should review the water supply to ensure it provides sufficient placement, flow, and reliability for suppression needs and that secondary power is available in the event of power outages.

RECOMMENDATION #29: Consider completing a fire flow/water vulnerability assessment to identify where upgrades to systems, flows, hydrant number or location, and water storage, or secondary power is required. Prioritize and rank projects and complete or require upgrades as resources allow.

6.1.3 Access and Evacuation

Emergency access and evacuation planning is of particular importance in the event of a wildfire event or other large-scale emergency. In 2019 the DCS along with other municipalities within the Capital Regional District received a grant to develop both a municipal and regional evacuation plan. Consideration should be taken to develop an Emergency Response Plan (ERP) which includes basic contingencies in the event of a wildland/interface fire, including the designation of specific 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. Currently, the DCS coordinates evacuations with the Central Saanich Police and adjacent

[60] Fire Underwriters Survey. District of Central Saanich Fire Insurance Grade Update Report. 2013

[61] 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

municipalities fire departments, as applicable. It is recommended that the DCS develop a detailed evacuation plan that includes the following provisions:

- Mapping and identification of safe zones, marshaling points and aerial evacuation locations;
- Planning of traffic control and accident management;
- Identification of volunteers that can assist during and/or after evacuation;
- Development of an education/communication strategy to deliver emergency evacuation procedures to residents.

RECOMMENDATION #30: Complete and participate in regular testing of, and updates to, the evacuation plan.

Road networks in a community serve several purposes including providing access for emergency vehicles, providing escape/evacuation routes for residents, and creating fuel breaks. Access and evacuation during a wildfire emergency often must happen simultaneously and road networks should have the capacity to handle both. In the event of a wildfire emergency, the Patricia Bay Highway (Highway 17) and West Saanich Rd (Highway 17A) are the only two reliable, paved access routes north and south to and from the AOI. Paved roads also connect the AOI east to west via Keating Cross Road and via Wallace Drive between Brentwood Bay and Saanichton. Evacuation would be conducted by First Responders, RCMP, and the Peninsula Emergency Measures Organization (P.E.M.O). If a wildfire were to block Highway 17 or Highway 17A, evacuation from the AOI would be difficult. Smoke and poor visibility, car accidents, wildlife, and other unforeseen circumstances can further complicate evacuations and hinder safe passage.

Some developments within the DCS are located on single access roads which branch off of Highway 17 and 17A; this limits the ability of fire crews to respond to fires and safely evacuate residents. A number of single access routes or isolated neighbourhoods that cause suppression or evacuation concerns were identified by the Wildfire Working Group including: south of Mount Newton (Alec Road) and Brentwood Bay (Butchard Gardens).

An important tool that can increase the ability of the local fire department to access interface areas is the strategic development of recreational trails to a standard that supports emergency vehicles, and the installation of gates or other barriers to minimize access by unauthorized users.

RECOMMENDATION #31: Include a qualified professional with experience in operational wildland/interface fire suppression in the planning and strategic siting of future trails and parks.

6.1.4 Training

The DCS fire department members maintain a current level of structural protection training as described in Section 6.1.1. Additionally, members have yearly refreshers of and/or certification in SPP-WFF1 (Wildland Firefighter Level 1) and S-100. Provision of training opportunities for structural firefighters in the realm of wildland firefighting is critical to building capacity for suppression and emergency management at the local level. It is recommended that all fire department members continue to be trained at minimum in SPP-WFF1 (or equivalent) if they are going to be responding at the request of the

province to be deployed on a wildfire, and that the fire departments engage in yearly practical wildland fire training with BCWS. It must be noted that SPP-WFF 1 is a new S100 and S-185 equivalent course for structure firefighters only, and as such BCWS has phased out instruction of S100 training for fire departments. Additional courses that could enhance DCS fire department member capacity and knowledge are SPP-115 (focused on the use of wildfire pumps and hose, as well as the use of fire service hose and hydrants, in the application of sprinklers on structures) and the incident command system course (ICS-100).

It is recommended that the fire departments maintain communication and work cooperatively with the BCWS (Coastal Fire Center) to conduct yearly mock exercises, where information and technical/practical knowledge are shared, such as: fireline construction, Mark 3 pump operations, sprinkler protection, skid pack operations, portable water tank deployment, and wildland hose operations. These practices could also provide training to wildland crews on hydrant hookup methods, as well as provide an avenue to discuss working together on inter-agency fires. Additional training options could include engaging adjacent Fire Departments within the AOI and outside the AOI (i.e., District of North Saanich, the Town of Saanich and the District of Saanich) to conduct joint training so as to further strengthen regional emergency response and firefighting training.

RECOMMENDATION #32: CSFD should work with BCWS to initiate and/or maintain an annual structural and interface training program. As part of the training, it is recommended to conduct annual reviews to ensure PPE and wildland equipment resources are complete, in working order, and the crews are well-versed in their set-up and use. It is recommended the CSFD engage in yearly practical wildland fire training with BCWS that covers at a minimum: pump, hose, hydrant, air tanker awareness, and employment of SPUs. Interface training should include completion of a joint wildfire simulation exercise and safety training specific to wildland fire and risks inherent with natural areas. It is recognized that BCWS crew resources are limited and their availability and is highly dependent upon the current fire season and other BCWS priorities.

RECOMMENDATION #33: CSFD should engage in regular communication with the BCWS South Island Fire Zone/Cobble Hill Fire Base to foster a strong relationship and identify potential cooperative wildfire risk reduction opportunities.

RECOMMENDATION #34: Ensure that CSFD maintains the capability to effectively suppress wildland fires, through wildfire-specific training sessions. Maintain a high level of member education and training specific to interface and wildland fires by including S-100 and S-185 (combined) or SPP-WFF1, at a minimum. Consider expanding the training program to maintain a high level of member education and training specific to interface and wildland fires. SPP-115 provides training to structural firefighters on the use of wildfire pumps and hose (and fire service hose and hydrants) in the application of structural protection units (SPUs).The CSFD should continue the practice of staying up to date on wildfire training opportunities, and to train members in this capacity, as training resources allow.

6.2 STRUCTURE PROTECTION

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

While many BC communities established to date were built without significant consideration of interface fire, there are still ways to reduce home vulnerability. Changes to roofing materials, siding, and decking can be achieved over the long-term through voluntary upgrades, as well as changes in bylaws and building codes. The FireSmart approach has been adopted by a wide range of governments and is a recognized process for reducing and managing fire risk in the wildland urban interface. More details on FireSmart construction can be found in the "*FireSmart Begins at Home Manual*"[62].

It is recommended that homeowners take a building envelope – out approach, that is, starting with the home and working their way out. Addressing little projects first can allow for quick, easy, and cost-effective risk reduction efforts to be completed sooner, while larger, more costly projects can be completed as resources and planning allow. For example, prior to the fire season, clearing roofs and gutters of combustible materials (leaves and needles), cleaning out any combustible accumulations or stored materials from under decks, moving large potential heat sources such as firewood, spare building materials or vehicles as far from the structure as possible, maintaining a mowed and watered lawn, removing dead vegetation, and pruning trees are actionable steps that residents can start working on immediately. The following link accesses an excellent four-minute video demonstrating the importance of FireSmart building practices during a simulated ember shower:
http://www.youtube.com/watch?v=_Vh4cQdH26g.

The structure protection objectives for the DCS are to:

- Encourage private homeowners to voluntarily adopt FireSmart principles on their properties and to reduce existing barriers to action;

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

- Enhance protection of critical infrastructure from wildfire (and post-wildfire impacts); and,
- Enhance protection of residential / commercial structures from wildfire.

RECOMMENDATION #35: Work with local distributors and homeowners within the District to improve education of homeowners and remove some barriers to FireSmart action. Local distributors can include: hardware stores, garden centers, and aggregate providers. Initiatives may include: 1) Developing and delivery of FireSmart workshop(s) for local distributors on FireSmart issues and solutions/advice for homeowners. These distributors can be educated upon which supplies are FireSmart and in what configuration they can be used (for example, external sprinkler system equipment, aggregates and ground cover, wire mesh for vents, deck skirting); 2) Advocating for a FireSmart branding in the retail stores (could be stickers on shelf pricing or a FireSmart-specific section) to increase public exposure to projects that can be done at a relatively low cost; and 3) Develop general cost implications of improvements so property owners can prioritize replacements.

RECOMMENDATION #36: Consider programs which serve to remove barriers to action for homeowners by providing methods for them to cheaply and easily dispose of wood waste removed from their property. Programs may include scheduled community chipping opportunities, or yard waste dumpsters available by month in neighbourhoods. Programs should be available during times of greatest resident activity (likely spring and fall).

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APPENDIX A – LOCAL WILDFIRE THREAT PROCESS

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

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

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

A-1 FUEL TYPE ATTRIBUTE ASSESSMENT

The Canadian Forest Fire Behaviour Prediction (FBP) System outlines five major fuel groups and sixteen fuel types based on characteristic fire behaviour under defined conditions.[63] 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.[64] 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.[64] 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

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

[64] 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.

starting point for more detailed assessments and as an indicator of overall wildfire threat, not as an operational, or site-level, assessment.

Table 12 summarizes the fuel types by general fire behaviour (crown fire and spotting potential). In general, the fuel type that may be considered hazardous in terms of fire behaviour and spotting potential in the AOI is C-3, particularly if there are large amounts of woody fuel accumulations or denser understory ingrowth. C-5 fuel types have a moderate potential for active crown fire when wind-driven.[64] An M-1/2 fuel type can sometimes be considered hazardous, depending on the proportion of conifers within the forest stand; conifer fuels include those in the overstory, as well as those in the understory. An O-1b fuel type often can support a rapidly spreading grass or surface fire capable of damage or destruction of property, and jeopardizing human life, although it is recognized as a highly variable fuel type dependent upon level of curing.[65] The O-1b fuel type was also attributed to sites dominated by invasive shrubs such as Scotch Broom. 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.

Table 12. Fuel Type Categories and Crown Fire Spot Potential. Only summaries of fuel types encountered within the AOI on Crown (Municipal, Federal or Provincial) are provided (as such, other fuel types, i.e., C-1, C-2, are not summarized below).

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

[65] Ibid.

Fuel Type	FBP / CFDDRS Description	AOI Description	Wildfire Behaviour Under High Wildfire Danger Level	Fuel Type – Crown Fire / Spotting Potential
O-1a/b	Grass	Matted and standing grass communities. Continuous standing grass with sparse or scattered shrubs and down woody debris. Vegetated, non-treed areas dominated by shrubs or herbs in dry ecosystems. Areas of very scattered trees. Hay fields. Areas harvested 7 – 24 years ago (dense or open and >4 m in height).	Rapidly spreading, high- intensity surface fire when cured	Low
M-1/2	Boreal mixedwood (leafless and green)	Moderately well-stocked mixed stand of conifers and deciduous species, low to moderate dead, down woody fuels.	Surface fire spread, torching of individual trees and intermittent crowning, (depending on slope and percent conifer)	<26% conifer (Very Low); 26-49% Conifer (Low); >50% Conifer (Moderate)
D-1/2	Aspen (leafless and green)	Deciduous stands (Bigleaf maple, cottonwood or red alder)	Always a surface fire, low to moderate rate of spread and fire intensity	Low
W	N/A	Water	N/A	N/A
N	N/A	Non-fuel: irrigated agricultural fields, golf courses, alpine areas void or nearly void of vegetation, urban or developed areas void or nearly void of forested vegetation.	N/A	N/A

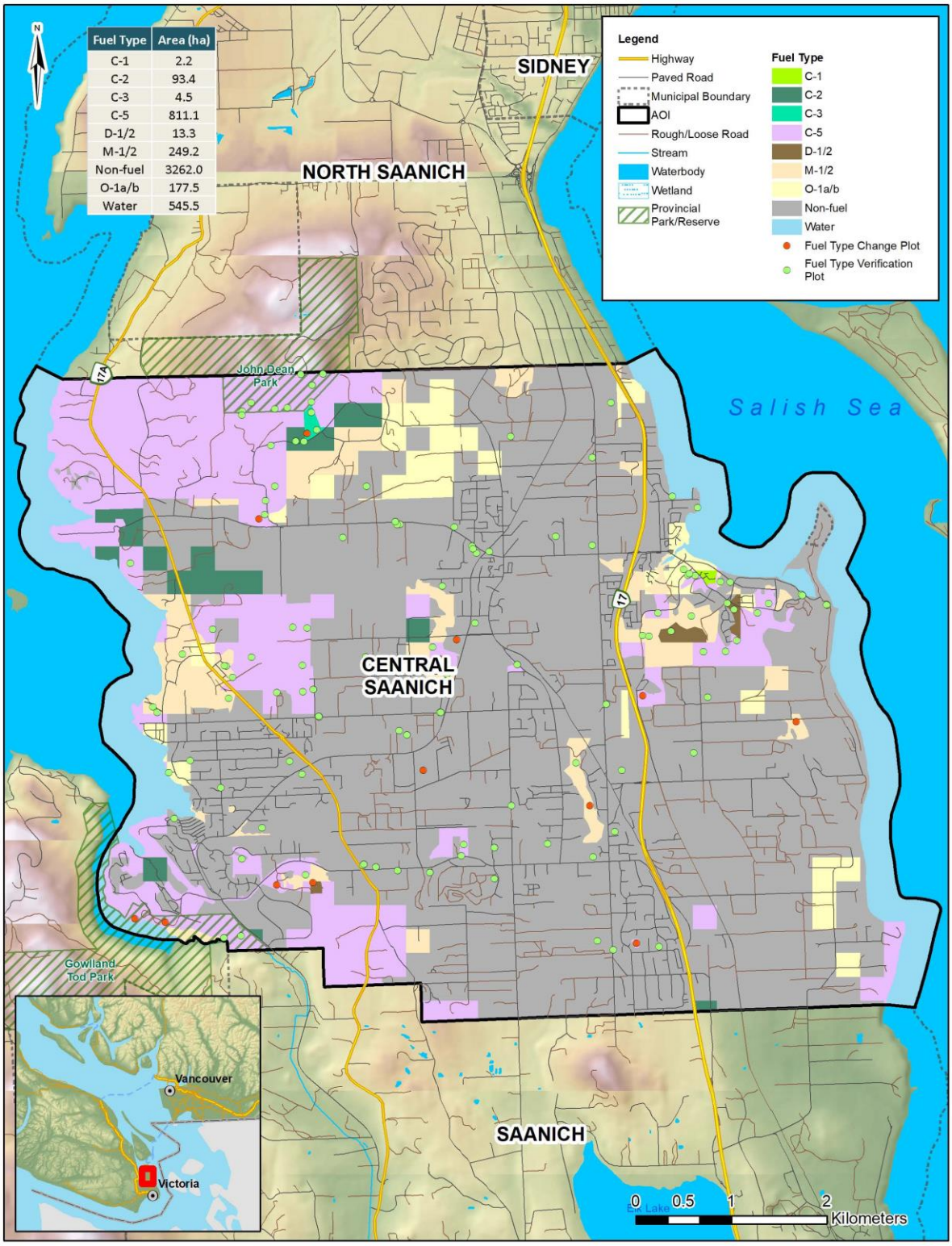
**C-3 fuel type is considered to have a high crown fire and spotting potential within the AOI due to the presence of moderate to high fuel loading (dead standing and partially or fully down woody material), and continuous conifer ladder fuels (i.e., western redcedar, Cw, and/or Douglas-fir, Fd).*

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

- C-5 fuel types being incorrectly identified by the PSTA as C-1,
- C-3 fuel types identified as C-2;
- C-5 fuel types identified as C-2;
- D-1/2 fuel types identified as C-2;
- C-5 fuel types identified as C-7;
- C-5 fuel types identified as M-1/2;
- Non-fuel identified as M-1/2;
- C-5 fuel types identified as non-fuel;
- M-1/2 fuel types identified as non-fuel;
- C-5 fuel types identified as O-1a/b;

- M-1/2 fuel types identified as O-1a/b;
- Non-fuel identified as O-1a/b; and
- C-5 fuel types identified as water.

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 7. 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 13 describes the classes associated with proximity of fuels to the interface.

Table 13. Proximity to the Interface.

Proximity to the Interface	Descriptor*	Explanation
WUI 100	(0-100 m)	This Zone is always located adjacent to the value at risk. Treatment would modify the wildfire behaviour near or adjacent to the value. Treatment effectiveness would be increased when the value is FireSmart.
WUI 500	(101-500m)	Treatment would affect wildfire behaviour approaching a value, as well as the wildfire's ability to impact the value with short- to medium- range spotting; should also provide suppression opportunities near a value.
WUI 2000	(501-2000 m)	Treatment would be effective in limiting long - range spotting but short- range spotting may fall short of the value and cause a new ignition that could affect a value.
	>2 000 m	This should form part of a landscape assessment and is generally not part of the zoning process. Treatment is relatively ineffective for threat mitigation to a value, unless used to form a part of a larger fuel break / treatment.

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

A-3 FIRE SPREAD PATTERNS

Wind speed, wind direction, and fine fuel moisture condition influence wildfire trajectory and rate of spread. The influence of topography on fire spread patterns is discussed in Appendix A-4. Wind plays a predominant role in fire behaviour and direction of fire spread and is summarized in the Initial Spread Index (ISI) Rose(s) from the local representative BCWS weather station – Victoria Airport (EC). The wind rose data is compiled hourly and provides an estimate of prevailing wind directions and wind speed in the area of the weather station.

The average of hourly wind readings for the fire season (April – October) shows that predominant winds originate from the west, southeast, and east, at windspeeds up to 25 to 30 km/hr and gusting upwards of >30 km/hr. Winds also occur to a lesser degree from the southwest and northeast (Figure 5). Potential treatment areas were identified and prioritized with the predominant wind direction in mind; wildfire

that occurs upwind of a value poses a more significant threat to that value than one which occurs downwind.

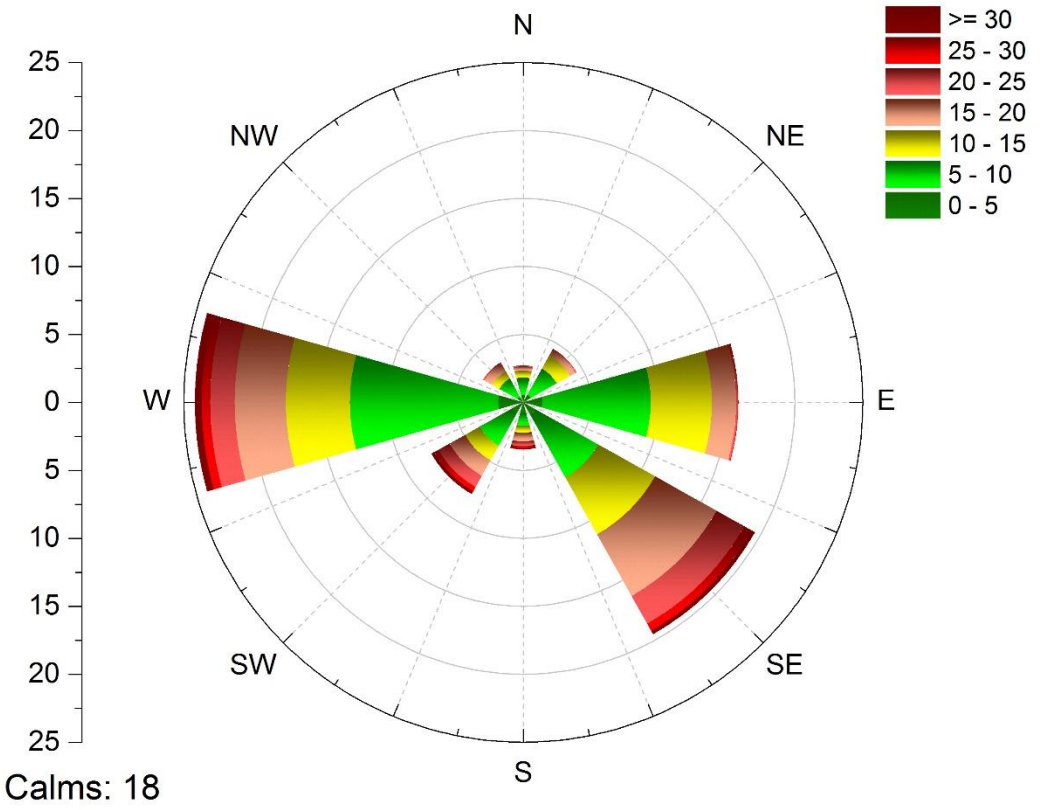


Figure 5. Windrose showing average hourly wind readings during the fire season (April 1 – October 31) 2010-2013. Data taken from the Victoria International Airport weather station.

A-4 TOPOGRAPHY

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

Slope Class and Position

Slope steepness affects solar radiation intensity, fuel moisture (influenced by radiation intensity) and influences flame length and rate of spread of surface fires. Table 14 summarizes the fire behaviour implications for slope percentage (the steeper the slope the faster the spread). In addition, Slope position affects temperature and relative humidity as summarized in Table 15. A value placed at the bottom of the

slope is equivalent to a value on flat ground (see Table 14). A value on the upper 1/3 of the slope would be impacted by preheating and faster rates of spread (Table 15). The majority of the AOI (99%) is on less than 20% slope and will likely not experience accelerated rates of spread due to slope class. Less than 1% percent of the AOI is likely to experience an increased or high rate of spread. On the larger topographic scale, the DCS and surrounding agricultural, industrial, commercial, recreational and residential developments would be considered bottom of the slope or valley bottom.

Table 14. Slope Percentage and Fire Behaviour Implications.

Slope	Percent of AOI	Fire Behaviour Implications
<20%	99%	Very little flame and fuel interaction caused by slope, normal rate of spread.
21-30%	<1%	Flame tilt begins to preheat fuel, increase rate of spread.
31-45%	<1%	Flame tilt preheats fuel and begins to bathe flames into fuel, high rate of spread.
46-60%	<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 15. Slope Position of Value and Fire Behaviour Implications.

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

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

Provided separately as PDF package.

APPENDIX C – WILDFIRE THREAT ASSESSMENT WORKSHEETS AND PHOTOS

Provided separately as PDF package.

APPENDIX D – MAPS

Provided separately as PDF package.

APPENDIX E – WILDLAND URBAN INTERFACE DEFINED

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

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

Two situations are differentiated. Locations where there is a clean/abrupt transition from urban development to forest lands are usually specified as the "interface" whereas locations where structures are embedded or mingled within a matrix of dense wildland vegetation are known as the "intermix". An example of interface and intermixed areas is illustrated in Figure 6.

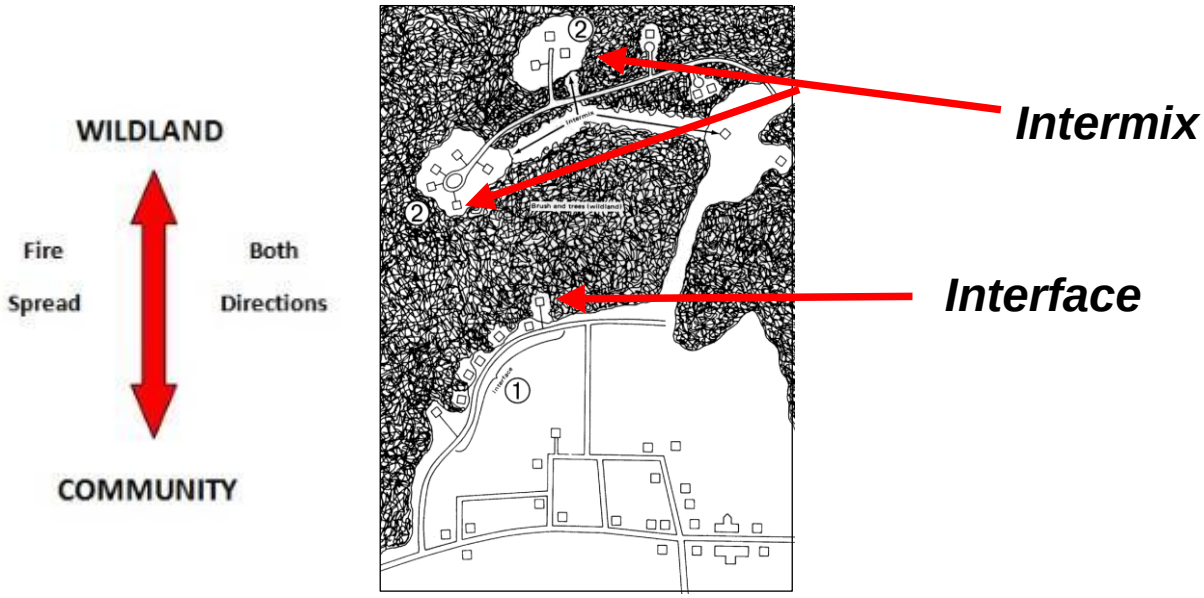


Figure 6. Illustration of intermix and interface situations.

Within the WUI, fire has the ability to spread from the forest into the community or from the community out into the forest. Although these two scenarios are quite different, they are of equal importance when considering interface fire risk. Regardless of which scenario occurs, there will be consequences for the community and this will have an impact on the way in which the community plans and prepares itself for interface fires.

Fires spreading into the WUI from the forest can impact homes in two distinct ways:

1. From sparks or burning embers carried by the wind, or convection that starts new fires beyond the zone of direct ignition (main advancing fire front), that alight on vulnerable construction materials or adjacent flammable landscaping (roofing, siding, decks, cedar hedges, bark mulch, etc.) (Figure 7).

2. From direct flame contact, convective heating, conductive heating or radiant heating along the edge of a burning fire front (burning forest), or through structure-to-structure contact. Fire can ignite a vulnerable structure when the structure is in close proximity (within 10 meters of the flame) to either the forest edge or a burning house (Figure 8).

Figure 7. Firebrand caused ignitions: burning embers are carried ahead of the fire front and alight on vulnerable building surfaces.

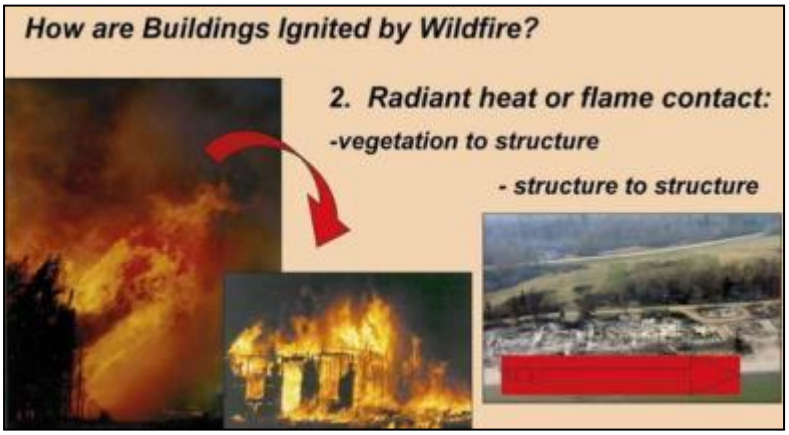


Figure 8. Radiant heat and flame contact allows fire to spread from vegetation to structure or from structure to structure.

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

APPENDIX F – WUI THREAT PLOT LOCATIONS

Table 16 displays a summary of all WUI threat plots completed during CWPP field work. The original WUI threat plot forms and photos are 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 16. Summary of WUI Threat Assessment Worksheets.

WUI Plot #	Geographic Location	Wildfire Behaviour Threat Class	WUI Threat Class*
BECC-1	Cultra Avenue	Moderate	N/A
BUTT-1	Butterfield Park	Moderate	N/A
BUTT-2	Butterfield Park	Moderate	N/A
CENT-1	Centennial Park	Moderate	N/A
COOP-1	Cooperidge Park	Moderate	N/A
COOP-2	Cooperidge Park	Moderate	N/A
DOME-1	John Dean Provincial Park	Moderate	N/A
GORE-1	Gore Nature Park	Moderate	N/A
GOWL-1	Gowlland Tod Provincial Park	Moderate	N/A
GOWL-2	Gowlland Tod Provincial Park	High	Moderate
GOWL-3	Gowlland Tod Provincial Park	Moderate	N/A
GOWL-4	Gowlland Tod Provincial Park	Moderate	N/A
GOWL-5	Gowlland Tod Provincial Park	Moderate	N/A
HALD-1	Haldon Park	High	Extreme
HERI-1	Saanich Historical Artifacts Exhibition	Moderate	N/A
HIGH-1	Highland Terrace	Moderate	N/A
LAUW-1	John Dean Provincial Park	Moderate	N/A
LAUW-2	John Dean Provincial Park	Moderate	N/A
OAKH-1	Oak Haven Park	Moderate	N/A
OAKH-2	Oak Haven Park	Moderate	N/A
RODO-1	Rodolph Park	Moderate	N/A
THOM-1	John Dean Provincial Park	Moderate	N/A
THOM-2	John Dean Provincial Park	Moderate	N/A
WARD-1	John Dean Provincial Park	Moderate	N/A
WHIT-1	White Road	Moderate	N/A
WOOD-1	Woodwyn Terrace	Moderate	N/A

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

APPENDIX G – FUEL TYPING METHODOLOGY AND LIMITATIONS

The initial starting point for fuel typing for the AOI was the 2019 provincial fuel typing layer provided by BCWS as part of the *2019 Provincial Strategic Threat Analysis* (PSTA) data package. This fuel type layer is based on the FBP fuel typing system. PSTA data is limited by the accuracy and availability of information within the Vegetation Resource Inventory (VRI) provincial data; confidence in provincial fuel type data is very low on private land. The PSTA threat class for all private land within the AOI was not available. Fuel types within the AOI with exception of those on private land 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.[66]

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

APPENDIX H – WUI THREAT ASSESSMENT METHODOLOGY

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

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

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

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

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

Field Data Collection

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

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

1. Update fuel-typing using orthophotography provided by the client and field verification.

2. Update structural data using critical infrastructure information provided by the client, field visits to confirm structure additions or deletions, and orthophotography
3. Complete field work to ground-truth fuel typing and threat ratings (completed 26 WUI threat plots on a variety of fuel types, aspects, and slopes and an additional 130+ 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 17 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 17. Description of variables used in spatial analysis for WUI wildfire threat assessment.

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

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

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

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

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

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

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

Limitations

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

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